Before The
Federal Energy Regulatory Commission

Application For License For Major Project

SUSITNA HYDROELECTRIC PROJECT

(PROJECT NO. 7114-000)

RESPONSES TO AGENCY COMMENTS ON LICENSE APPLICATION

January 19, 1984

ALASKA POWER AUTHORITY

6.2.4.2

FEDERAL ENERGY REGULATORY COMMISSION

SUSITNA HYDROELECTRIC PROJECT

PROJECT NO. 7114

RESPONSE OF THE

ALASKA POWER AUTHORITY

TO

COMMENTS

ON THE

ALASKA POWER AUTHORITY'S

APPLICATION FOR LICENSE FOR MAJOR PROJECT

January 19, 1984

FEDERAL ENERGY REGULATORY COMMISSION
SUSITNA HYDROELECTRIC PROJECT
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TO COMMENTS ON
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JANUARY 19, 1984

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PREFACE

On or before November 28, 1983, eight state and federal agencies each filed a letter with the Federal Energy Regulatory Commission on the Alaska Power Authority's Application for License for the Susitna Hydroelectric Project, Federal Energy Regulatory Commission Project No. 7114. The document in which this Preface appears (the "Comment/Response Document") contain the Alaska Power Authority's detailed responses to more than 250 specific comments contained in the eight comment letters.

We have assigned each commenting agency a letter tab. A copy of each of the eight comment letters is enclosed in the Comment/Response Document behind the letter tab indicated in the Table of Contents.

To ensure the preparation of thorough responses to each of the eight agency comment letters, we have divided each comment letter into specific individual comments. Each individual comment has been assigned an alphanumeric comment code. The alphanumeric code simply identifies the commenting agency (alphabetically by Table of Contents tab) and the specific comment (by consecutive number). The alphanumeric comment codes are shown in brackets in the left-hand margin of each of the eight comment letters enclosed.

Behind each comment letter are all of the specific comments--directly quoted from their corresponding comment letters--with comment codes, followed by corresponding Alaska Power Authority Responses.

Individual Bibliographies are included at the end of the Responses for sections A, B, C, and F.

SUBJECT INDEX

This Index classifies Comments and Responses by subject matter. Each Comment/Response combination is listed by an alphanumeric identifying code opposite a subject discussed in the Comment and its accompanying Response. If a Comment/Response deals with more than one subject, it is listed opposite each subject with which it deals.

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A

FEDERAL ENERGY REGULATORY COMMISSION

SUSITNA HYDROELECTRIC PROJECT

PROJECT NO. 7114

RESPONSE OF

ALASKA POWER AUTHORITY

TO

NOVEMBER 4, 1983 LICENSE APPLICATION COMMENTS

OF

UNITED STATES DEPARTMENT OF THE INTERIOR,

BUREAU OF LAND MANAGEMENT

United States Department of the Interior

BUREAU OF LAND MANAGEMENT

Alaska State Office
701 C Street, Box 13
Anchorage, Alaska 99513

IN REPLY REFER TO
2800 (93

NOV

Memorandum

To: Office of Environmental Project Review

From: State Director, Alaska

Subject: Review of Application for the Susitna Project, FERC No. 7114, Matanuska-Susitna Division, Alaska

Review of the subject application has been completed. The BLM Alaska review team, in commenting for the Director, has prepared the following comments which are arranged according to: A) BLM direct administrative responsibility; and, B) general and specific comments on application contents arranged according to the volume and chapter of exhibit to which they apply.

A. PROJECT ELEMENTS WITH DIRECT BLM ADMINISTRATION

Principal BLM responsibility will be the access road from the Denali Road south to the project site and referred heretofore as the pioneer road. The BLM will grant a Right-of-Way for this route. Also, BLM is responsible for the administration of Federal mining claims.

1. General Comments:

Volumes 6A, 6B, Exhibit E, Fish, Wildlife, and Botanical Resources

ACCESS ROADS

[A.1] Please refer to the letter dated April 15, 1982 in which the Associate District Manager, BLM Anchorage District addressed and commented on Pioneer Road routes and Environmental Impacts on access routes for the Proposed Susitna Hydroelectric Project.

Volume 7, Exhibit E, Chapter 4, Historic and Archeological Resources

[A.2] BLM will consider any archeological sites in this project that are under its jurisdiction and that have tephra chronology to have cumulative research potential (36 CFR 60.6(d)). We view these items as representing part of a significant entity, whose components may lack individual distinction (36 CFR 60.6(c)).

Volume 9, Exhibit E, Chapter 10, Alternatives
Access

[A.3] The total proposed access plan is duly influenced by the preferences of private landowners in the Susitna project area. However, the more complete the project area is opened, the more significant attendant impacts on natural values and resources of the area will result.

2. Specific Comments.

Volumes 6A, 6B, Exhibit E, Fish, Wildlife, and Botanical Resources

[A.4] Page E-3-256 Side Borrow adjacent to or access balanced cut and fill techniques will minimize certain impacts, however, materials must be available in the access corridor. It should be stipulated the construction will have to be closely monitored. Monitoring will ensure contractors comply with licensing requirements and contract specifications.

Page E-32-264 is two to three feet of road crown, enough in areas of permafrost?

Volume 7, Exhibit E, Chapter 6, Geology and Soils

[A.5] There is no mention of the impact of the impoundment on Federal mining claims located, for example, along Jay Creek.

Volume 8, Exhibit E, Chapters 7, 8, 9 Recreation, Aesthetics, Land Use

[A.6] Sites 3.1.3 and 3.1.4 infer that access roads will be open to public use. Such decision, when made by the responsible land managers, should detail policy governing use and also the extent of facilities necessary to control or enhance public use and public safety. Public Access is not a foregone conclusion.

[A.7] Previous BLM comments in Section 4.1.4 should be restated. Whether or not the Denali Highway is designated a scenic highway, it remains a scenic attraction to the touring public. Therefore, all facilities and developments required by the project in relation with the Denali access corridor should be planned for minimum visual impact. This is to include temporary power lines, borrow pits, and staging locations as well as the roadway and its eventual operation and maintenance.

Volume 9, Exhibit E, Chapter 10, Alternatives

[A.8] It is indicated that bridges are preferred (to culverts) but specific locations or limits of use are not specified.

B. PROJECT ELEMENTS OUTSIDE BLM ADMINISTRATIONS

This portion of the review address concerns which are project-wide and not specific to BLM administration.

1. General Comments:

Volumes 6A, 6B, Exhibit E, Fish, Wildlife, and Botanical Resources

A general review was made of the Fish and Wildlife Service comments on the proposed project. It was apparent that their comments were applicable to the report on fish, vegetation, and wildlife resources of the area affected by the proposed Susitna Hydroelectric Project. We concur in their comments and also offer the following:

[A.9] FISH We submit that the quality of the fisheries is highly dependent on water use and quality. The Chapter 2 analysis has some deficiencies, most notably a valid temperature model and the lack of data on fish use downstream of Chulitna River.

[A.10] VEGETATION Vegetation section lacked quantification of areas which could be affected by changes in cover. A given species may benefit by vegetation cover changes whereas other species may be adversely affected. The vegetation map should be improved to better analyze moose and bear habitat.

[A.11] WILDLIFE The Jay Creek mineral lick for Dall Sheep will be impacted. Mitigation by exposing new soil in the area is suggested. No mention of an alternative, such as lowering the dam height to reduce the amount and escape route from being inundated, is mentioned. The dam will inundate Bald Eagle and Golden Eagle nest sites, which is in violation of the Bald Eagle Protection Act.

In summary, mitigation agreements should be arranged with landowners prior to licensing and incorporated in the license to ensure they will be adopted. Also, we concur with the applicant's proposal to establish an interagency monitoring team which should include monitoring construction activities to ensure compliance. The team should be funded by the project.

Volume 7, Exhibit E, Chapter 4, Historic and Archeological Resources

[A.12] The Advisory Council on Historic Preservation must be given the opportunity to comment on this project and the cultural resource reports.

The Bureau agrees with the applicant's approach to inventory and systematic testing since we are in the process of developing an agreement with the State Historic Preservation Officer that incorporates an analogous approach.

It is expressed several times that the project area "holds excellent potential for addressing many long standing anthropological questions". What these questions are is not specified. If sites are important for their ability to answer these questions, which sites answer which questions, and why, should be specified.

Volume 7, Exhibit E, Chapter 5, Socio Economics

[A.13] It appears that Regional-statewide impacts or effects of the project are understated since as the State's oil revenue decreases, a higher percentage of available capital and/or financing may be concentrated on the project, at the expense of other projects or programs. Other regional energy development may be adversely affected, as an example.

[A.14] The effects of in-migration on the economy are understated. Migration may include individuals travelling to speculate on employment, especially if employment or economic conditions in other parts of the State or nation are unfavorable. A large in-migration affects the demand for road maintenance and public works expenditures, for example.

[A.15] The cost of bringing the existing Alaska Railroad up to the operating level and line capacity which would be required for project use is not discussed. There is additional uncertainty surrounding railroad operation costs or charges due to the uncertain status of rail ownership.

[A.16] Access will be opened to private lands when the State purchases the rights to build the necessary roads. The cost of access could perhaps be mitigated by landowner participation, being a potential recipient of economic benefit of the roads themselves. The cost of access road construction may not be 100% related or attributable to the Hydro project alone.

[A.17] Access development, if exaggerated, will cause development of the region in general, not only development of a powersite. The effects of increased use and development, cannot be underestimated in effect upon the existing resident human population and local living conditions.

Volume 8, Exhibit E, Chapters 7, 8, 9 Recreation, Aesthetics, Land Use

[A.18] The transmission line rights-of-way may eventually be used as access corridors for ORV or other unplanned uses.

Volume 9, Exhibit E, Chapter 10, Alternatives

Transmission

[A.19] The transmission corridors are acceptable if state of the art siting and construction practices are employed.

2. Specific Comments:

Energy Alternatives - Natural Gas

[A.20] Section 4.3.1 infers that there is a supply of natural gas far exceeding expected demand in Cook Inlet. This source of fuel for energy generation was abruptly discussed and insufficiently weighed as an alternative.

Volume 7, Exhibit E, Chapter 6, Geology and Soils

[A.21] Section 2.1 - Regional geology, seismic geology, and geologic conditions appear to be well written, accurate, and concise.

[A.22] Sections 2, 5, 8 and 3.7 - Borrow pits and quarry sites - planning for eventual inundation of borrow pits, or their rehabilitation is sufficient unless the impoundment area is altered due to a change in project design. It is unclear where the borrow sites or material sources for the entire Denali access roadway are located.

FEDERAL ENERGY REGULATORY COMMISSION
PROJECT NO. 7114
RESPONSE OF ALASKA POWER AUTHORITY TO COMMENTS OF
UNITED STATES DEPARTMENT OF THE INTERIOR,
BUREAU OF LAND MANAGEMENT

COMMENT A.1:

"Volumes 6A, 6B, Exhibit E, Fish, Wildlife, and Botanical Resources

"ACCESS ROADS

"Please refer to the letter dated April 15, 1982 in which the Associate District Manager, BLM Anchorage District addressed and commented on Pioneer Road routes and Environmental Impacts on access routes for the Proposed Susitna Hydroelectric Project."

RESPONSE:

Exhibit E, Chapter 10, page E-10-36 of the License Application reflects that, as a result of comments by the public, organizations and agencies (including BLM), the Pioneer Road concept was eliminated, the evaluation criteria were refined and seven additional access alternatives were developed. The letter dated April 15, 1982, from the Associate District Manager, BLM Anchorage, weighed heavily in this decision.

Please also see Response to Comment F.7 for a summary of prior access studies.

REFERENCES

Bureau of Land Management, Associate District Manager - Anchorage District, Letter on Pioneer Road Route (April 15, 1982).

COMMENT A.2:

"Volume 7, Exhibit E, Chapter 4, Historic and Archeological Resources

"BLM will consider any archeological sites in this project that are under its jurisdiction and that have tephra chronology to have cumulative research potential (36 C.F.R. 60.6(d)). We view these items as representing part of a significant entity, whose components may lack individual distinction (36 C.F.R. 60.6(c))."

RESPONSE:

No response necessary.

COMMENT A.3:

"Volume 9, Exhibit E, Chapter 10, Alternatives Access

"The total proposed access plan is duly influenced by the preferences of private landowners in the Susitna project area. However, the more complete the project area is opened, the more significant attendant impacts on natural values and resources of the area will result."

RESPONSE:

The Power Authority anticipates that the DEIS will evaluate the impacts of alternative access routes and that such evaluation will incorporate the Power Authority's extensive work on the subject. A summary of the Power Authority's work follows:

A. The selection of an access plan for the Susitna Hydroelectric Project has been, and remains, a persisting policy decision. Analysis of alternative routes has incorporated defining design criteria, analysis of construction difficulty, analysis of impacts on construction schedule, life cycle construction and operating costs, assessment of risks

RESPONSE to COMMENT A.3 (cont.):

to schedule, environmental impacts and land use implications. No single route has been identified which has a consensus endorsement. This situation exists because the several access options present conflicting choices with respect to both resource management and project development.

Issues

Some of the issues raised during the analysis of access routes are discussed below. The issues are stated to highlight some of their embedded value judgments.

Given a need for project access, should that access:

1. Minimize present and future impacts on the remote ecosystems, that is, preserve its wilderness character?

2. Facilitate post-construction access to adjacent landowners and the public, that is, open up the area?

3. Minimize present and future access by adjacent landowners and the public, that is, a midpoint between wilderness and full access?

4. Minimize disturbance to existing users and use patterns?

5. Support a wide range of recreation uses and users?

6. Facilitate the economic development opportunities for the native corporations?

7. Minimize impacts on the small, adjacent communities?

Selection Criteria

During the process of evaluating alternative access plans, a number of selection criteria were identified. The use of these criteria reflect opportunity for value judgments on the part of the evaluator. Embodied in the selection criteria are some value judgments which reflect more immediate concerns related to project construction. These include:

RESPONSE TO COMMENT A.3 (cont.):

1. No prelicensing construction would be possible;

2. Minimization of the construction period and maximization of the net economic benefits is necessary;

3. Provision of access between Watana and Devil Canyon will some day be required;

4. Provision of flexibility of access to minimize schedule risks is necessary. (This is a criterion that effectively eliminates consideration of a rail-only access plan); and

5. Minimization of total cost and initial investment is desirable.

Discussion

Additional design criteria were used which bear upon details of route refinements and design, such as grade and curvature of roads, but do not significantly affect this discussion. More than 30 access alternatives have been considered. The Access Plan Recommendation Report of August 1982 evaluated three routes which seemed to highlight the contrast between alternatives with respect to the issues that had been identified and the criteria that had been established. The analysis addressed segments of the proposed corridors, thus allowing the reader the ability to combine segments and evaluate a host of options.

A number of active or passive participants to the access decision were identified in the August report and their preferences were reported. Agencies and individuals whose major concern was fish and wildlife favored plans that limited access. Native groups favored access to their lands. Recreational interests generally favored moderate access with minimal impacts. Some communities expressed a desire for the development opportunities the project would afford (Cantwell), while others wanted no part of it (Talkeetna, Trapper Creek).

The Access Plan Recommendation Report attempted to select an option which would balance the several input parameters and support early access to the project with minimal risk to schedule.

RESPONSE TO COMMENT A.3 (cont.):

Status

The Denali route was selected because it met most of the selection criteria: that is, it minimized impacts on local communities, provided access to native lands, had high probability of remaining within cost and schedule, and minimized the initial costs.

The route that was selected reflected compromises among values, selection criteria and players, and thus does not conform to the objectives of any one of them.

Project access and the Susitna Area Plan should reflect a common perspective for the region. When the Susitna Area Plan is available, the Power Authority will seek to bring the access corridors into conformance with the Plan.

B. The extent and mode of post-construction public access has not yet been determined. The Power Authority believes a final decision at this time on whether the access road to the dam sites will be public or private is premature. The Power Authority sees this issue as one which should be reviewed in the latter stages of project construction to determine public and agency preferences and then current resource tradeoffs. The recreation plan is based on the premise of public access. However, the recreation plan and impact analysis only assumes public access so far as to not understate possible impacts.

While the ultimate use of the access road will probably not be resolved for almost a decade, we agree that the road design criteria and routing should consider eventual public use and therefore its scenic potential. It must be remembered, however, that the first 15 years of access road life will be dedicated primarily to construction activities. Therefore, its suitability for construction uses is also very important. The trade-off between construction cost savings and long-term scenic values will be considered in an inter-disciplinary review of the access and aesthetic Mitigation Programs during FY 1985. This review will also consider the recommendations of the Denali Scenic Highway Study. Please also refer to the Responses to Comments A.6 and F.7.

RESPONSE TO COMMENT A.3 (cont.):

REFERENCES

Acres American Inc., Susitna Hydroelectric Project Access Plan Recommendation Report (August 1982).

COMMENT A.4:

"Volumes 6A, 6B, Exhibit E, Fish, Wildlife, and Botanical Resources

"Page E-3-256 Side Borrow adjacent to or access balanced cut and fill techniques will minimize certain impacts; however, materials must be available in the access corridor. It should be stipulated the construction will have to be closely monitored. Monitoring will ensure contractors comply with licensing requirements and contract specifications.

"Page E-32-264 is two to three feet of road crown, enough in areas of permafrost?"

RESPONSE:

The Contract Documents prepared for receiving construction bids will insure that during all phases of Susitna Hydroelectric Project construction, the work in progress will constantly be inspected and monitored by the "Engineer" who will be a separate entity from the contractor. The Engineer will be familiar with Alaska construction techniques. This inspection will insure that requirements of the contract plans and specifications are complied with. All material sources will be predetermined prior to construction. The contract specifications will require that borrow from these locations only be utilized to provide construction materials which cannot be obtained from the cut-and-fill operations (reference is made to last paragraph on FERC License Application page E-3-255).

Figure E.3.83 contains a typical cross-section of the side-borrow roadway. The feasibility design as shown indicates a variable subbase thickness. The reference to 2 to 3 feet road crown on FERC License Application page E-3-264 is an example for allowing the reader to compare a finished road

RESPONSE TO COMMENT A.4 (cont.):

section using side-borrow with the conventional roadway section. The actual thickness of roadway crown will be established prior to completing the construction specifications by design related investigations of the subbase material conditions in the field, including permafrost.

Roads susceptible to deterioration by permafrost usually lie on silt-covered lower hillslopes or organic-rich soil lowlands which contain a high percentage of ice and ice wedges. Thawing of such ground results in noticeable differential subsidence.

Because permafrost containing large amounts of ice has not been encountered along the proposed alignment, the roadway is expected to be subjected to only minor subsidence caused by thawing of the so-called "warm" permafrost prevalent in the area. Some slough and swale deposits may contain segregated ice, but these deposits are restricted and easily removable. For these reasons, the feasibility design using two to three feet of road crown is considered to be appropriate.

COMMENT A.5:

"Volume 7, Exhibit E, Chapter 6, Geology and Soils

"There is no mention of the impact of the impoundment on Federal mining claims located, for example, along Jay Creek."

RESPONSE:

The Alaska Power Authority will process Federal mining claims consistently with other private land title matters.

COMMENT A.6:

"Volume 8, Exhibit E, Chapters 7, 8, 9 Recreation, Aesthetics, Land Use

"Sites 3.1.3 and 3.1.4 infer that access roads will be open to public use. Such decision, when made by the responsible land managers, should detail policy governing use and also the extent of facilities necessary to control or enhance public use and public safety. Public Access is not a foregone conclusion."

RESPONSE:

The Power Authority does not propose that project roads will be open for general public use during the construction phase of the project. The FERC License Application simply addresses the road-open option during operation as a "worst case" because this would result in the greatest impacts to fish, wildlife and archeological resources. The road-open option would require the most mitigation for fish, wildlife, archeological resources and recreational uses in the project area. The Power Authority anticipates that the DEIS will address the full reasonable range of access options.

The Power Authority has suggested that a final decision with respect to access policy during the operational stage of the project be delayed until two years prior to completion of construction. At that time, the Power Authority suggests that discussions with resource agencies and comments from the public be incorporated into an access policy and plan.

Please also refer to Part B of the Response to Comment A.3.

COMMENT A.7:

"<u>Volume 8</u>, <u>Exhibit E</u>, <u>Chapters 7, 8, 9</u>, <u>Recreation</u>, <u>Aesthetics</u>, <u>Land Use</u>

"Previous BLM comments in Section 4.1.4 should be restated. Whether or not the Denali Highway is designated a scenic highway, it remains a scenic attraction to the touring public. Therefore, all facilities and developments required by the project in relation with the Denali access corridor should be planned for minimum visual impact. This is to include temporary power lines, borrow pits, and staging locations as well as the roadway and its eventual operation and maintenance."

RESPONSE:

Facilities and developments required by the Project in relation to the Denali access corridor will continue to be planned where possible to achieve minimum visual impact. This would include upgrading the Denali Highway from Cantwell to a point 21.3 miles east of Cantwell where the proposed access road to Watana intersects the Denali Highway. In addition, borrow pits, staging locations and proposed Phase I recreation facilities (such as the upgrading of Brushkana Creek Campground and a boat ramp at the Denali Highway bridge across the Susitna River) would also be included. It is currently anticipated that the transmission line which will be built to provide power to the Watana construction site will follow the proposed route from the Gold Creek Substation to Watana as shown in Exhibit G of the FERC License Application, rather than paralleling the Denali Highway.

The anticipated aesthetic impacts of the Watana access road, borrow sites and proposed recreational developments were discussed in FERC License Application Exhibit E, Chapter 8, Appendix E-8-F. Suggested mitigation measures were identified for those facilities on FERC License Application pages E-8-57 through E-8-59. Beginning in FY 1985, an interdisciplinary design team will be assembled and charged with reviewing aesthetic mitigation options for all project facilities. This review will be based in part on the FEIS aesthetic analysis. The team will participate in the facility design and policy development process and will review all resulting products to ensure that aesthetic and environmental considerations have been evaluated for all appropriate aspects of the project. Moreover, the upgrading

RESPONSE TO COMMENT A.7 (cont.):

of the Denali Highway between the Parks Highway and the Watana access road will be completed according to appropriate state design standards.

COMMENT A.8:

"Volume 9, Exhibit E, Chapter 10, Alternatives

"It is indicated that bridges are preferred (to culverts) but specific locations or limits of use are not specified."

RESPONSE:

Reference is made to FERC License Application Volume 6A, Exhibit E, Chapter 3, Section 2.3, "Anticipated Impacts to Aquatic Habitat" and Section 2.4, "Mitigation Issues and Mitigating Measures." Both culverts and bridges will be considered in the final designs.

Factors that affect the selection of culverts or bridges are hydraulic capacity and width of the waterway and the vertical clearance between roadway grade and thalweg. In cases where waterways have lower hydraulic capacities and vertical clearance is limited, culverts would be more appropriate. In cases where the breadth and hydraulic capacity of the waterway is great, a bridge would appear to be a logical solution. In most instances, economics will be a key factor in selecting the method of stream crossing to be utilized. When culverts are used, they will be designed so that fish passage will be unimpeded (see stream crossing mitigation measures outlined on FERC License Application pages E-3-152 and E-3-153 along with Table E.3.42 for criteria to be applied to stream crossings).

COMMENT A.9:

"Volumes 6A, 6B, Exhibit E, Fish, Wildlife, and Botanical Resources

"A general review was made of the Fish and Wildlife Service comments on the proposed project. It was apparent that their comments were applicable to the report on fish, vegetation, and wildlife resources of the area affected by the proposed Susitna Hydroelectric Project. We concur in their comments and also offer the following:

"FISH We submit that the quality of the fisheries is highly dependent on water use and quality. The Chapter 2 analysis has some deficiencies, most notably a valid temperature model and the lack of data on fish use downstream of Chulitna River.

"In summary, mitigation agreements should be arranged with landowners prior to licensing and incorporated in the license to ensure they will be adopted. Also, we concur with the applicant's proposal to establish an interagency monitoring team which should include monitoring construction activities to ensure compliance. The team should be funded by the project."

RESPONSE:

We disagree that the temperature models used as the basis for the temperature results presented in Chapter 2 of the FERC License Application are invalid. The reservoir temperature model DYRESM is a recognized state-of-the-art model and is used by universities and institutions worldwide including the University of California, University of Western Australia, Canadian Centre for Inland Waters and the University of Alaska (Fairbanks). The model has been used successfully on several reservoirs (Imberger and Patterson 1980).

The downstream river temperature model HEATSIM is also a valid temperature model. It was replaced by the model SNTEMP because SNTEMP has gained wider acceptance and because SNTEMP has two features not contained in the HEATSIM model, namely a shading factor and tributary inflow. Studies by the Arctic Environmental Information and Data Center (AEIDC) indicate that the shading factor is of minor importance (AEIDC 1983a).

RESPONSE TO COMMENT A.9 (cont.):

The lack of consideration of tributary inflow in the HEATSIM model is not important during winter operation of the project because tributary inflow between Watana and Gold Creek during winter accounts for only about three percent of the Gold Creek flow. Therefore, winter temperature predictions in the Watana and Talkeetna reach presented in FERC License Application Chapter 2 are valid. During summer, especially in June, tributary inflow becomes significant during project operation (AEIDC 1983b). Mainstem outflow temperatures are below natural temperatures. As the flow travels downstream, the river temperature tends to recover to natural conditions. It was previously believed that the tributary input would accelerate the recovery to natural conditions, and, therefore, it was assumed that the application of HEATSIM to summer conditions was conservative (i.e., HEATSIM would predict greater temperature impacts than will actually occur). However, the AEIDC study found that the cooler waters of the tributaries and the lower project flows in the mainstem combine in the effects to result in a slower recovery to natural conditions (AEIDC 1983b). Summer temperature simulations presented in the Application may slightly overestimate with-project mainstem temperatures in the Watana to Devil Canyon reach. A further discussion of the applicability of the temperature models is provided in the Response to Comment B.6.

With respect to data on fish downstream of Talkeetna, please refer to Responses to Comments B.8, C.37, F.15 and F.17 which discuss the considerable amount of data which are available for fishery resources downstream of Talkeetna (Chulitna River confluence).

The mitigation plan will be developed as part of the license process (see Response to Comment B.9). The Power Authority

RESPONSE TO COMMENT A.9 (cont.):

anticipates that FERC, in issuing the license, will stipulate specific monitoring programs.

REFERENCES

AEIDC (1983a), AEIDC Response to August 9, 1983 Harza-Ebasco Comments on AEIDC's June 30, 1983 Draft Report, Stream Flow and Temperature Modeling in the Susitna Basin Alaska (September 21, 1983).

AEIDC, Susitna River Hydroelectric Project Draft Aquatic Impact Assessment: Effects of Project-Related Changes in Temperature, Turbidity, and Stream Resources During June Through September (1983), previously submitted to the FERC on October 31, 1983

Imberger, J. and J. C. Patterson, A Dynamic Reservoir Simulation Model - DYRESM:5, Proc. Symposium on Predictive Ability of Surface Water Flow and Transport Models (1980).

COMMENT A.10:

"Volumes 6A, 6B, Exhibit E, Fish, Wildlife, and Botanical Resources

"A general review was made of the Fish and Wildlife Service comments on the proposed project. It was apparent that their comments were applicable to the report on fish, vegetation, and wildlife resources of the area affected by the proposed Susitna Hydroelectric Project. We concur in their comments and also offer the following:

"VEGETATION Vegetation section lacked quantification of areas which could be affected by changes in cover. A given species may benefit by vegetation cover changes whereas other species may be adversely affected. The vegetation map should be improved to better analyze moose and bear habitat.

"In summary, mitigation agreements should be arranged with landowners prior to licensing and incorporated in the license to ensure they will be adopted. Also, we concur with the applicant's proposal to establish an interagency monitoring team which should include monitoring construction activities to ensure compliance. The team should be funded by the project."

RESPONSE:

A. This BLM comment reflects concerns raised by other agencies (see comments contained in the U.S. Fish and Wildlife Service letter of January 14, 1983 on the Draft License Application, Susitna Hydroelectric Project License Application, Volume 10B). The Alaska Power Authority anticipates fully responding to any such other agency which possesses appropriate expertise and/or responsibility.

B. Chapter 3 of the FERC License Application contains extensive quantification of impacts on vegetation that are sufficient to assess all significant project impacts at this time. For the purposes of obtaining further details for particular permits, some additional wetland mapping is being planned as a joint APA/U.S. Fish and Wildlife Service effort. Work will be initiated in spring of 1984 and more detailed maps are scheduled for the winter of 1984.

RESPONSE TO COMMENT A.10 (cont.):

For the purposes of refining the moose model, more sophisticated mapping of browse quality is being planned. The mapping may be of additional use in the analysis of bear habitat. Base studies will be completed by spring of 1984 to permit planning the summer 1984 field program. This information will be used in refining and mitigation studies for moose (see also FERC License Application Volume 6A, Chapter 3, page E-3-201).

C. Mitigation planning has proceeded on a two-pronged approach. While the existing data base and models are sufficient to assess project impacts and appropriate mitigation, additional work is underway to provide more precise impact assessment and to refine mitigation plans. Thus, types and scales of impacts have been determined and are currently being refined (see Response to Comment F.6). Concurrently, candidate mitigation lands have been identified and management options are being developed. Preferred management options should emerge in mid-1984 at the same time that refined techniques emerge for assessing impacts more precisely and assessing quality of mitigation lands more accurately. Summer 1984 will see refined browse mapping activity underway to incorporate into impact and mitigation analysis the improved techniques that have been developed jointly by the Alaska Power Authority and the Alaska Department of Fish and Game. With the identification of candidate management lands and management options, resource agencies and land managers will be consulted by the Alaska Power Authority in order to develop specific mitigation plans. This activity should be underway in the summer of 1984. Final scaling of mitigation activity would await the completion of impact and mitigation analysis. Since several times the necessary mitigation lands required by even a worst case analysis are available, and since major impacts will not occur for a number of

RESPONSE TO COMMENT A.10 (cont.):

years, there is no imperative for early or interim action.

REFERENCES

Alaska Power Authority, Susitna Hydroelectric Project FERC License Application Project No. 7114-000 (1983), Volume 10B, U.S. Fish and Wildlife Service Letter on the Draft License Application.

COMMENT A.11:

"Volumes 6A, 6B, Exhibit E, Fish, Wildlife, and Botanical Resources

"A general review was made of the Fish and Wildlife Service comments on the proposed project. It was apparent that their comments were applicable to the report on fish, vegetation, and wildlife resources of the area affected by the proposed Susitna Hydroelectric Project. We concur in their comments and also offer the following:

"WILDLIFE The Jay Creek mineral lick for Dall Sheep will be impacted. Mitigation by exposing new soil in the area is suggested. No mention of an alternative, such as lowering the dam height to reduce the amount and escape route from being inundated, is mentioned. The dam will inundate Bald Eagle and Golden Eagle nest sites, which is in violation of the Bald Eagle Protection Act.

"In summary, mitigation agreements should be arranged with landowners prior to licensing and incorporated in the license to ensure they will be adopted. Also, we concur with the applicant's proposal to establish an interagency monitoring team which should include monitoring construction activities to ensure compliance. The team should be funded by the project."

RESPONSE:

A. This BLM comment reflects concerns raised by other agencies. The Alaska Power Authority anticipates fully responding to any such other agency which possesses

RESPONSE TO COMMENT A.11 (cont.):

appropriate expertise and/or responsibility (see Response A to Comment A.10).

B. Exhibit E describes potential impacts to the Jay Creek mineral lick in Chapter 3, Section 4.3.1(c), pages E-3-417 through E-3-420. In Chapter 3, Section 4.4.2(a), p. E-3-524, Exhibit E states that "Data on the seasonal use of the Jay Creek lick and the distribution of use within the lick are required prior to inundation of the lower portion of the lick to assess changes in lick availability and value to Dall sheep and moose. In 1983, ground observations of the lick will be conducted. The potential for soil leaching will be addressed by collecting 30 soil samples, 20 from various locations within the lick above and below maximum operating level (2190 feet) and 10 from nearby control soils. These samples will be analyzed in a commercial laboratory for sodium, potassium, calcium, and magnesium. The collections and tests will be repeated three years after inundation to determine whether leaching has occurred. This will provide data to determine the appropriate level of mitigation (Mitigation Plan 13)."

The ground observations and soil analyses referred to in the above excerpt were conducted by the Alaska Department of Fish and Game (ADF&G) in a program sponsored by the Alaska Power Authority during the summer of 1983. The study reports are not yet available. However, a preliminary report (Preliminary Report on Jay Creek and East Fort Licks dated July 27, 1983) was received on December 2, 1983. Results of the soil analyses indicate high concentrations of sodium, calcium and magnesium ions relative to control soils (See October 3, 1983 Response to FERC Request for Supplemental Information 3W-7). Another notable finding is that the mineral lick is really a complex of locations rather than a single site. Dall sheep were observed to use several lick sites along with the approximately 5-mile reach of Jay Creek upstream from its confluence with the Susitna River (Tankersley-Sener, 1983 personal communication). An ADF&G report describing the summer 1983 observations and soil analyses will be available early in 1984 (Tankersley-Sener, 1983 personal communication).

RESPONSE TO COMMENT A.11 (cont.):

The commentor states that "Mitigation by exposing new soil in the area is suggested." The import of this suggestion is unclear, as the Power Authority has already proposed this action as a mitigative measure, if necessary. In Mitigation Plan 13 (Chapter 3, Section 4.4.2(b), p. E-3-534), Exhibit E states that "If monitoring of Dall sheep (described in Section 4.4.2(a)) indicates a population-level effect of partial inundation of the Jay Creek mineral lick, new soil will be exposed to rectify the impact. Monitoring use and comparison of soil samples (Continued Study 5) will allow evaluation of the effectiveness of this mitigation." Tankersley (1983 personal communication) has noted that soil disturbance by human action may not be necessary, as erosion resulting from filling and operation of the reservoir may accomplish this purpose. Wildlife use of the Jay Creek mineral lick complex will be closely monitored during project construction and operation to determine whether mitigative action is necessary and, if so, the appropriate nature of such action.

C. With regard to mitigation planning and options, please see Response C to Comment A.10.

REFERENCES

Tankersley, N., Preliminary Report on Jay Creek and East Fork Licks (July 27, 1983).

Alaska Power Authority, Responses to FERC Schedule B Requests for Supplemental Information on Exhibit E, Chapter 3, No. 7 (1983) previously submitted to the FERC on October 3 and December 29, 1983.

Tankersley, N.G., Alaska Department of Fish and Game, personal communication to Robert Sener, LGL Alaska Research Associates, Inc. (December 9 and 20, 1983).

COMMENT A.12:

"Volume 7, Exhibit E, Chapter 4, Historic and Archeological Resources

"The Advisory Council on Historic Preservation must be given the opportunity to comment on this project and the cultural resource reports.

"The Bureau agrees with the applicant's approach to inventory and systematic testing since we are in the process of developing an agreement with the State Historic Preservation Officer that incorporates an analogous approach.

"It is expressed several times that the project area 'holds excellent potential for addressing many long standing anthropological questions.' What these questions are is not specified. If sites are important for their ability to answer these questions, which sites answer which questions, and why, should be specified."

RESPONSE:

The Power Authority has provided the FERC with all relevant materials and reports regarding the Susitna Hydroelectric Project Cultural Resources Program as requested by the Advisory Council on Historic Preservation (ACHP). This includes Chapter 4 of the License Application and all reports summarizing the results of the University of Alaska Museum's field programs.

The Application and the report comment on the resource questions and the merit of sites with respect to these questions. It is the Power Authority's understanding that the FERC provides the interface with the ACHP.

COMMENT A.13:

"Volume 7, Exhibit E, Chapter 5, Socio Economics

"It appears that Regional-statewide impacts or effects of the project are understated since as the State's oil revenue decreases, a higher percentage of available capital and/or

COMMENT A.13 (cont.):

financing may be concentrated on the project, at the expense of other projects or programs. Other regional energy development may be adversely affected, as an example."

RESPONSE:

While construction of the Susitna Project may effect other statewide programs, the Project has been developed within the guidelines of the "Energy Program for Alaska" (see Response to Comment C.1). Within the context of this State policy commitment, the Authority does not believe that these effects have been "understated" or that they are necessarily adverse. Construction of the Susitna Project would significantly reduce the need for investment in electrical energy development and would provide long term economic benefit to the state. As a direct offset to short term impact on other programs, the economic multiplier effects of the Susitna Project will be greater than the effects that would stem from most other state funds allocations (See Exhibit B, Table B.103 and Exhibit E, Chapter 5, Sections 3.2 and 3.3)

Under the "Energy Plan for Alaska" the State has either developed or is investigating the development of electrical energy for other regions of the State. While development in other regions is expected to continue, it should be recognized that the major portion of the population is located in the Railbelt.

COMMENT A.14:

"<u>Volume 7, Exhibit E, Chapter 5, Socio Economics</u>

"The effects of in-migration on the economy are understated. Migration may include individuals travelling to speculate on employment, especially if employment or economic conditions in other parts of the State or nation are unfavorable. A large in-migration affects the demand for road maintenance and public works expenditures, for example."

RESPONSE:

The effects of speculative in-migration on the economy were not specifically addressed in the FERC License Application. Because the Susitna Project could attract job seekers who are not successful in obtaining work on Susitna, speculative

RESPONSE TO COMMENT A.14 (cont.):

in-migration is possible and it may increase job displacement and unemployment and impact services and facilities.

In order to address this issue, the Power Authority will incorporate the effects of speculative in-migration into the socioeconomic impact model, depending upon the results of:

(a) A comparison of the with- and without-Trans-Alaska Pipeline Project (TAPS) ratios of population to employment will yield an estimate of the magnitude of speculative in-migration for TAPS. While this estimate will provide an indicator of potential impacts of speculative in-migration resulting from the Susitna project, it will be used with caution for the following reasons. The characteristics of the work force size and schedule for the TAPS project were dramatically different from those of the proposed Susitna project. For example, the work force requirements for TAPS rose to 22,000 workers within two years as compared to a peak work force of 3,500 for Susitna. Additionally, while wages offered by TAPS were substantially greater than the wages in the Lower 48, the real wage differential between Alaskan and Lower 48 wages has decreased significantly since TAPS. As a result, the impacts due to speculative in-migration are expected to be considerably smaller for the Susitna project than they were for TAPS.

(b) The Power Authority is contacting B.C. Hydro and other utilities that have constructed large-scale hydro-electric power plants in remote areas to obtain information on their experience with speculative in-migration. This information may prove to be a more reliable indicator of speculative in-migration effects with the Susitna Project, since other large-scale hydroelectric developments will be more comparable to Susitna than the TAPS project.

(c) Consultation with the Alaska Department of Labor and the Alaska Department of Community & Regional Affairs, which has a statutory duty to plan for, study and aid in cushioning communities (impacted by large scale construction projects) by utilizing sophisticated socioeconomic techniques.

The Power Authority anticipates that the DEIS will utilize a similar analysis of this possible factor.

COMMENT A.15:

"Volume 7, Exhibit E, Chapter 5, Socio Economics

"The cost of bringing the existing Alaska Railroad up to the operating level and line capacity which would be required for project use is not discussed. There is additional uncertainty surrounding railroad operation costs or charges due to the uncertain status of rail ownership."

RESPONSE:

The costs of bringing the existing Alaska Railroad up to the operating level and line capacity which would be required for project use was not presented because the impact of project construction would only have about a 10% increase on the present average freight loading.

At present the average daily freight tonnage is about 5,000 tons over the Anchorage-Healy subdivision line.

During the peak construction activity it is estimated that incoming freight would be 875 tons per day. In a "worst case scenario" assuming the unlikely situation of no highway transport of freight to Cantwell, 12 to 15 cars would be required. Present daily runs are composed of 55 to 60 cars.

In light of the above it is believed that there is no need for an upgrading of the operating level or line capacity of the Alaska Railroad.

COMMENT A.16:

"Volume 7, Exhibit E, Chapter 5, Socio Economics

"Access will be opened to private lands when the State purchases the rights to build the necessary roads. The cost of access could perhaps be mitigated by landowner participation, being a potential recipient of economic benefit of the roads themselves. The cost of access road construction may not be 100% related or attributable to the Hydro project alone."

RESPONSE:

The Alaska Power Authority had not considered the financial participation of adjacent landowners in constructing access roads into the project area. The United States Bureau of

RESPONSE TO COMMENT A.16 (cont.):

Land Management (BLM), the Alaska Department of Natural Resources and the native corporations are the principal landowners in the area. As land acquisition and access planning proceed, these landowners will be queried as to their desire or obligation to bear part of the development costs.

COMMENT A.17:

"Volume 7, Exhibit E, Chapter 5, Socio Economics

"Access development, if exaggerated, will cause development of the region in general, not only development of a powersite. The effects of increased use and development, cannot be underestimated in effect upon the existing resident human population and local living conditions."

RESPONSE:

The Alaska Department of Natural Resources and the Matanuska/Susitna Borough have been jointly preparing over the last several years a Susitna Area Plan, a comprehensive land use plan covering the area in which the proposed project lies. The Bureau of Land Management intends to coordinate federal land use plans with the Susitna Area Plan. Four alternative development scenarios were presented to the public for consideration and comment. After analysis of public comment, a draft plan is scheduled for release and comment in January. When a Susitna Area Plan is adopted, it should provide guidelines for project development and management of project lands, recreation and access, based upon a thorough analysis of all appropriate social, economic, environmental and political factors.

Access has been a major concern of the Alaska Power Authority. Numerous studies of alternative access corridors, and their effects, are referenced in the Response to Comment F.7 (see also Response to Comment A.3).

COMMENT A.18:

"Volume 8, Exhibit E, Chapters 7, 8, 9 Recreation, Aesthetics, Land Use

"The transmission line rights-of-way may eventually be used as access corridors for ORV or other unplanned uses."

RESPONSE TO COMMENT A.18:

It is the Alaska Power Authority's intention to use construction trails for access to and within all transmission line corridors rather than standard construction roads, except where roads already exist or where project access roads will be built for other purposes. Construction trails will require the removal of tall vegetation, but will not require fill placement or removal of the organic layer except in local situations. In general, access along construction trails will be limited to flat-tread or balloon-tire vehicles. This mode of construction will not accommodate the unauthorized use of street vehicles in the right-of-way. Limited access to the ROW will discourage the use of off-road vehicles, but not eliminate it.

Investigations reveal that, when compared to other recreational opportunities associated with the project, recreational use of the transmission line right-of-way is expected to be low. One element of the corridor and route selection process was avoidance of potential impacts to existing and planned recreational areas. A significant portion of the corridor would be located in areas with existing or planned recreation alternatives, such as off-road-vehicles and foot trails. However, use of the corridors must be balanced with other land use management objectives. The Power Authority will continue to work with agencies and the public to develop an access policy for the transmission corridors, and to identify specific sites or areas along the corridors where unauthorized use might require special management actions.

COMMENT A.19:

"Volume 9, Exhibit E, Chapter 10, Alternatives

Transmission

"The transmission corridors are acceptable if state of the art siting and construction practices are employed."

RESPONSE:

State of the art siting and construction practices will be employed for the transmission line corridors. As stated in the License Application (page E-10-54), each corridor was

RESPONSE TO COMMENT A.19 (cont.):

carefully scrutinized and evaluated based on economic, technical and environmental considerations. Mitigation will be used in the siting and construction of the transmission line corridor particularly in sensitive areas. Some of these measures may include but are not limited to the following: the paralleling of existing rights-of-way to reduce access construction; using existing access points and construction roads; feathering the right-of-way to reduce visual impacts; minimizing ground disturbance and therefore erosion in sensitive areas by winter construction; minimizing stream crossings; leaving a buffer zone along stream banks; use of a "weathered" steel for aesthetic purposes; pile foundations will be used in ice-rich, thaw unstable soils; etc. Many of these measures will be applied as appropriate to specific locations in the final design/ construction stage.

COMMENT A.20:

"Energy Alternatives - Natural Gas

"Section 4.3.1 infers that there is a supply of natural gas far exceeding expected demand in Cook Inlet. This source of fuel for energy generation was abruptly discussed and insufficiently weighed as an alternative."

RESPONSE:

The supply of natural gas from Cook Inlet is adequate to meet all currently forecasted demands, including electricity generation as an alternative to the Susitna Project, between the years 1997 and 2006. The year through which Cook Inlet supplies will be sufficient depends upon the quantity of undiscovered reserves. These natural gas supply estimates are discussed in detail in Exhibit D, Section 4.5(c) and in Appendix D-1, Sections 1.1 through 1.3. Exhibit D also demonstrates that, while North Slope natural gas supplies are very large, these supplies are not now available to the Railbelt nor can it anticipated when it will be made economically available as a source of supply to the Railbelt.

The economic attractiveness of the Susitna Hydroelectric Project was evaluated against the use of Cook Inlet natural gas as a fuel for generating electricity for the Railbelt, using the assumptions presented in Exhibit D and Appendix D-1, including assumptions concerning the future availability of undiscovered natural gas reserves. Applying the assumption that these sufficient quantities of undiscovered reserves will be available for generating electricity and meeting other demands, including home heating, introduces some risk into the reliance on this power alternative. If undiscovered reserves are found to be substantially less than estimated, and/or more expensive to recover than assumed, the "natural gas alternative" to the Susitna Project would prove to be much less attractive than it is currently represented to be in the License Application. Furthermore, if natural gas is to be utilized in home heating beyond the year 2006, other uses, such as electric power generation, would have to be curtailed prior to that time to assure adequate future supply. Natural gas supply estimates are discussed in detail in Exhibit D, Section 4.5(c) (page D-4-12) and in Appendix D-1, Section 1.1 through 1.3 (page D1-1).

COMMENT A.21:

"<u>Volume 7, Exhibit E, Chapter 6, Geology and Soils</u>

"Section 2.1 - Regional geology, seismic geology, and geologic conditions appear to be well written, accurate, and concise."

RESPONSE:

No response necessary.

COMMENT A.22:

"<u>Volume 7, Exhibit E, Chapter 6, Geology and Soils</u>

"Sections 2, 5, 8 and 3.7 - Borrow pits and quarry sites - planning for eventual inundation of borrow pits, or their rehabilitation is sufficient unless the impoundment area is altered due to a change in project design. It is unclear where the borrow sites or material sources for the entire Denali access roadway are located."

RESPONSE:

Reference is made to FERC License Application Volumes 6A and 6B for discussion of borrow site locations for the Denali access roadway. The anticipated locations of the individual borrow areas are outlined on Figure E.3.37 and will be further refined during final road design. During this process, alternative sites will be studied and investigated by subsurface explorations. Emphasis will be given to sites adjacent or contiguous to the access roadway. Selection of sites, which will be specified in the contract documents, will be made in the interest of minimizing ground or habitat disturbance. Reviewing agencies will have an opportunity to comment on anticipated effects resulting from the final design of the borrow areas and short access paths.

Bibliography
For
Response Of
Alaska Power Authority To
November 4, 1983 License Application Comments
Of
United States Department of the Interior,
Bureau of Land Management

REFERENCE TITLE:	COMMENT/RESPONSE CODE NOS.
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Arctic Environmental Information and Data Center (AEIDC), AEIDC Response to August 9, 1983 Harza-Ebasco Comments on AEIDC's June 30, 1983 Draft Report, Stream Flow and Temperature Modeling in the Susitna Basin, Alaska (September 21, 1983).	A.9
___________, Susitna Hydroelectric Project, Draft Aquatic Impact Assessment: Effects of Project-Related Changes in Temperature, Turbidity, and Stream Discharge on Upper Susitna Salmon Resources During June through September (1983), previously submitted to the FERC on October 31, 1983.	A.9

REFERENCE TITLE:	COMMENT/RESPONSE CODE NOS.
Bureau of Land Management, Associate District Manager-Anchorage District, Letter on Pioneer Road Route (April 15, 1982).	A.1
Imberger, J. and J.C. Patterson, A Dynamic Reservoir Simulation Model - DYRESM:5, Proc. Symposium on Predictive Ability of Surface Water Flow and Transport Models (1980).	A.9
Tankersley, N., Preliminary Report on Jay Creek and East Fork Licks (July 27, 1983).	A.11
Tankersley, N.G., Alaska Department of Fish and Game, personal communication to Robert Sener, LGL Alaska Research Associates, Inc. (December 9 and 20, 1983).	A.11

B

FEDERAL ENERGY REGULATORY COMMISSION

SUSITNA HYDROELECTRIC PROJECT

PROJECT NO. 7114

RESPONSE OF

ALASKA POWER AUTHORITY

TO

NOVEMBER 7, 1983 LICENSE APPLICATION COMMENTS

OF

UNITED STATES DEPARTMENT OF COMMERCE,

NATIONAL MARINE FISHERIES SERVICE

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
Office of General Counsel
P.O. Box 1668
Juneau, Alaska 99802
Telephone (907) 586-7414

B

November 7, 1983

RECEIVED
NOV 14 1983
Pillsbury, Madison & Sutro

Honorable Kenneth F. Plumb
Secretary, Federal Energy Regulatory
Commission
825 North Capitol Street, N.E.
Washington, D.C. 20426

RE: Project No. 7114-000

Dear Mr. Plumb:

Enclosed for filing in the referenced proceeding are comments on the subject license application, which comments supplement and should be appended to our Motion to Intervene in this matter. Copies have been served on the applicant and other parties.

Sincerely,

Michael A.D. Stanley
Staff Attorney, Office of General Counsel

Encl.: Original + 14 copies

cc: William C. Wakefield, Susitna Project Manager, Washington, D.C.
Robert A. Mohn, Alaska Power Authority, Anchorage, Alaska
D. J. Drennan, Pillsbury, Madison & Sutro, Washington, D.C.
Director, Office of Management and Budget, Pouch AM, Juneau, AK 99811

UNITED STATES OF AMERICA

FEDERAL ENERGY REGULATORY COMMISSION

State of Alaska - Alaska Power Authority	)	Project No. 7114-000
	)	Comments of Intervenor
Application for License	)	National Marine Fisheries
	)	Service

The National Marine Fisheries Service (NMFS) has received the Federal Energy Regulatory Commission (FERC) License Application for the Susitna Hydroelectric Project, February 1983. We have reviewed this document at length and are providing our comments regarding the impact of the proposed two-dam project on fishery resources. In support of these comments, FERC is referred to NMFS comments on draft License Exhibit E. These comments, and the response of the applicant, appear within Chapter 11 of License Exhibit E. While many of the concerns identified by our agency have now been satisfactorily addressed, the following major data gaps or deficiencies remain:

1. Failure to provide a specific flow release schedule;
2. Failure to provide a predictive model which evaluates fish habitat gain/loss with incremental flows;
3. Failure to define the relationship between mainstem Susitna flows and the slough groundwater system;
4. Failure to fully describe many post-project physical changes, and
5. Failure to present an adequate fisheries mitigation plan.

These items are discussed further in the following comments.

We do not believe a license can be issued for the Susitna Project until these deficiencies are addressed and cured. Furthermore, each of these concerns should be specifically addressed within the Draft Environmental Impact Statement (DEIS) being prepared by the FERC. At this time its does not appear that information presented within the license application would support preparation of a DEIS fully in compliance with National Environmental Policy Act.

We look forward to assisting your staff throughout the licensing process and hope the following comments will assist with preparation of the draft and final environmental impact statements, and with establishment of necessary and appropriate license conditions.

General Comments

The NMFS has been actively involved in the planning and study of the Susitna Hydroelectric Project for several years. During this time, we have attempted to coordinate extensively with the Alaska Power Authority (APA) and its contractors. Prior to finalization of the development scheme proposed in the February 1983 License Application, many different
[B.1] scenarios and project features were discussed. Our agency has consistently voiced concern over the premature nature of plan development necessitated by what we consider to be an ambitious and unreasonably brief development schedule. Economic conditions within Alaska have changed dramatically since the beginning of the planning process for the Susitna Project. In response to these changes, the APA and its contractors have considered various design revisions and development scenarios.

Among these changes are possible revisions to the load forecast and reservoir operations rule curves, alterations in dam height, different mode of operation; e.g., load following or peaking, re-regulation dam construction, and design revisions to the dam structure and outlet facilities. At this time, the APA has not officially announced any revisions or amendments to the existing development plans, and we are therefore limiting our review to that information presented in the
[B.2] February 1983 License Application. However, we cannot ignore these potential developments, as they could have vital impacts on the economic and biological feasibility of this project. Despite the two dam
[B.3] scenario proposed today, it appears probable that power demands and economics may cause significant delays or changes to this plan. Delay in bringing Devil Canyon on line would present a suite of biological and physical impacts which differ significantly from the present plan. More radical plan revisions would create correspondingly differing impacts.
[B.4] Flow stability, in-stream temperatures, down-stream fishery flow releases, sediment transport, ice conditions, and many other factors would require further analysis. Mitigative measures would have to be developed for new impacts, necessitating changes to the mitigation plan.

Because we feel there currently exists a high potential for this project to change from what is proposed in the License Application, we expect the DEIS to present a worst-case analysis which considers these even-
[B.5] tualities. This analysis should identify the type of revisions and alterations which might be anticipated, the events or situations that would direct these changes, the probability of these events occurring, and the biological impact of these revisions. Again, no information on

this subject is presented in the application. Should any of these [B.5] changes be requested by the APA or directed by FERC, an amended license application and/or statement should be prepared and distributed for comment.

The environmental study program is continuing, and data output is providing valuable information regarding impact identification and analysis. However, several concerns exist which we have previously identified as data gaps or deficiencies; i.e., temperatures, flow regimes, lower river changes, and mitigation.

Temperatures

Post-project reservoir and down-stream temperatures will affect the degree of impact this project will present to fishery resources. Modeling efforts have been limited. The reservoir temperature model DYRESM was run on Watana reservoir for the months of June through December for water year 1981. This was an atypical year, presenting a "worst case" according to the license application. Thus, this important [B.6] model was developed using limited data from a water year that was not representative. Synthesized data from this model were used to input the downstream temperature model HEATSIM, which in turn drove the ice model, ICESIM. The potential for this process to magnify error appears to be significant. We understand that the Arctic Environmental Information and Data Center (AEIDC) has been contracted to analyze flow releases and is using another riverine temperature model, SNTEMP, which allows for certain factors (such as shading and tributary input) which HEATSIM does not. Harza-Ebasco informs us that a new ice model, developed by the Cold Regions Research and Environmental Laboratories, will be used to re-analyze ice conditions. This model reportedly accounts for shelf ice formation, as well as frazil ice, and should more precisely predict post-project ice formation. The reservoir operations model and the reservoir temperature model may also be modified in the near future. Thus, the accuracy of the modeling efforts depicted in the license

[B.6] (cont.) application must be questioned. We consider this to be a serious problem which will interfere with our ability to identify impacts and recommend proper mitigation measures. Additional modeling should be done which considers the full year, both reservoirs, and can be input with more than a few months data. Additionally, the results of this improved modeling effort will direct the need for future work. For example, should the temperature model project 0°C water above Talkeetna for Watana/Devil Canyon operation, this reach should be modeled for ice formation. Similarly, if temperature changes are predicted below Talkeetna, some analysis of this impact will be necessary.

Flow Regimes

The license application does not present a specific flow release schedule that protects anadromous fishery resources. We understand that the AEIDC is developing a predictive model which will compare habitat

[B.7] value over a range of project flows. This process is not yet complete. In fact, much of the studies and data which would allow for a particular flow regime to be evaluated are not available at this time. The draft and final license Exhibits suggest that flow releases may be designed to accommodate fishery resources in several ways, such as spiking flows for a brief period to allow adults access to sloughs or establishing maximum winter flow limits. However, the releases proposed in the application do not contain such a flow schedule, nor does the application present a

[B.7] (cont.) precise description of how the final flow regime would be developed. Although agency coordination is planned in the future flow decisions, our agency has had little contact with the APA or its contractors regarding this issue. The NMFS commented extensively on this matter in our response to the Draft Exhibit E, and we feel much of that comment remains valid. We believe it is essential that the fisheries habitat and flow relationships be adequately investigated, and that a detailed release schedule which fully protects the fishery be established prior to licensing. Such a release schedule must be incorporated as a license condition.

Lower River

The majority of the biological investigations have dealt with those reaches of the Susitna Basin above Talkeetna. Unquestionably, impact magnitude will be far greater for the upper Susitna, as the distance from the dam sites and influence of several large tributaries will

[B.8] dampen the effect of many physical changes such as temperature, flow, and turbidity. The lower river system, however, supports the vast majority of anadromous fish migration, rearing, and spawning habitats. Recent work suggests that downstream effects may occur and may be significant (AEIDC, 1983). At Susitna Station, River Mile (RM) 25.5, July flows would be reduced by 12 percent and March flows increased by 127 percent. Temperatures and ice conditions below Talkeetna have not been modeled. Considering the resource value of the lower river and the

[B.8] (cont.) potential for the proposed project to create changes to this reach of the Susitna, we believe that further work may be necessary to fully identify project impacts. The license application does not adequately convey the potential for these impacts to occur, nor does it discuss any future investigations. We feel such study may be needed; not only to further identify the habitat use of this reach, but to establish a program whereby post-project changes in habitat may be documented. A potential for improved over-wintering habitat exists with the Susitna Project, and it will be important to assess this impact in the long-term, particularly as any such improvement may help mitigate adverse impacts in the upper Susitna.

Mitigation

The applicant has stated that specific mitigation measures to avoid or minimize impacts have been added to Exhibit E. However, no real plan is presented here; only a gathering of conceptual measures for which no testing has occurred or is currently planned. According to the license

[B.9] application "... the mitigation plan will be refined and detailed plans specifying number, location, and design of mitigation features will be prepared. The Power Authority will provide details of these studies and plans as they become available." At this time, we are concerned that the proposed plan cannot adequately mitigate impacts. The development of mitigative measures is not proceeding at a pace equal to other project studies, and coordination on this vital issue has not been adequate. For example, while the license application states that an analysis of candidate areas for mainstem spawning bed improvement sites is being conducted, we are not aware of any on-going work on this issue. A demonstration project for these mitigation features is necessary, yet to date no such program has been conducted. Several documents which were to assist in the decision-making process have not been received, including the design criteria manual, construction practices manual, and the analysis of minimum flows related to fish habitat.

Presently, the mitigation and monitoring efforts seem to focus solely on the Susitna River above Talkeetna. As such, the mitigation "plan" not only presents an inadequate approach to those impacts above Talkeetna, but fails completely in providing for those resources within the lower one hundred miles of river.

It will be necessary for effective, specific, and implementable mitigation measures to be developed and approved before any license can be issued for this work.

Specific Comments

Exhibit E, Chapter 2

E-2-58 Timing of Flow Releases

The stated flows do not provide access to all sloughs for adult salmon. Acute access problems are anticipated with releases at 12,000 cfs. The
[B.10] project operational flow does not satisfy the requirement of providing access, and the paragraph should reflect this fact. The reference to consideration of alternative release modes (short-term augmented flows) is noted. How will this alternative be considered?

E-2-60 Tributary Fishery Impacts

The three tributaries which may become perched and which support salmon
[B.11] or salmon "spawning potential" should be identified. Monitoring efforts for these tributaries should be discussed in Chapter 3.

E-28-83 Testing and Commissioning

This discussion should be expanded. How long will this process take? What determines the time of year for this process; i.e., winter or
[B.12] summer? How much water would have to be spilled during testing and commissioning during average and wet years? What would be the implications of such spills on dissolved gases downstream of the damsite?

2-84 para. 2

[B.13] How long will it take for those tributaries which will not become perched to degrade to the new mainstem flow levels? Would this occur immediately, over several months, or be dependent on high flow events within the tributaries?

2-84 para. 4

[B.14] The results of on-going study on this issue should be presented in the DEIS. Sediment and bedload transport of the Susitna, Chulitna, and Talkeetna Rivers must be better understood. Obviously, at present this impact is poorly described.

2-85 (i) Water Temperature

15] Please refer to our general comments regarding the temperature modeling efforts.

2-88 Talkeetna to Cook Inlet

[B.16] The statement that no temperature changes will occur below the Yentna may be correct, however the discussion should note that this reach of the Susitna was not modeled for temperatures.

2-90 (iii) Suspended Sediments/Turbidity/Vertical Illumination

[B.17] The impact of thawing permafrost within the reservoir contributing to high sediment and turbidity levels may be considerable. Newbury, Bealy, and McCullough (1977), in a study involving a permafrost affected reservoir in Canada found that erosion and sloughing of permafrost contributed large amounts of suspended sediments to the waterbody. The statement that these effects will "quickly dissipate" is not supported. We believe more consideration of this potential impact is warranted.

2-97 (ii) Sloughs

[B.18] We cannot agree that because the ground water gradient will remain the same during filling, the upwelling rate within the sloughs will not change. The relationship between groundwater, mainstem, and upwelling is not adequately described by existing data. Areal extent of upwelling could easily change, or upwelling areas may be re-distributed in areas of unsuitable substrate.

2-98 para. 2

[B.19] The attempt to quantify the reduction in slough flow is unsupported and presents an impression of minimal impact to the sloughs and fisheries which, we believe, is inaccurate. As stated, no data exist which describe the areal extent of upwelling. The supposition that upwelling is evenly distributed throughout the slough is likewise unsupported. The 10 percent reduction could just as easily be 70 percent, if the right numbers are input. Even by accepting the 10 percent figure, this does not imply a 10 percent reduction in fish habitat, as the salmon may select for a certain area within the slough.

2-102 Minimum Downstream Target Flows

[B.20] The concept of establishing maximum flow criteria for winter months was identified in our comments to the APA on draft Exhibit E. According to the applicant's response, maximum winter flow limits should be established, based upon the results of continuing studies. The application should discuss this issue and present the framework for developing such limits.

2-104 Daily Operation

[B.21] It is unclear in this discussion whether the 2000 cfs daily variation in flow would occur only during summer or year round. If such flow changes may occur during winter, the impacts of such flows should be discussed.

2-118 Watana Reservoir Modeling

[B.22] Please reference our general comments regarding reservoir temperature modeling. Present data do not permit a range of temperatures to be projected, and no confidence limits can be established at this time. It would seem that modeling into the winter months would be important, as ice formation and break-up would affect reservoir temperatures and stratification.

2-123 Talkeetna to Cook Inlet

23] Recent study by the AEIDC indicates post project temperature change below Talkeetna.

2-127 Talkeetna to Cook Inlet

[B.24] The impact of increased water elevations should be discussed here. Fish habitat may be beneficially or detrimentally affected by higher winter flows. As only limited fishery data exist for this reach, additional study is needed to describe potential impact.

2-148 Watana Operation/Devil Canyon Impoundment

[B.25] This section should present a discussion of the testing and commissioning of the Devil Canyon facility, if such would occur, similar to 4.1.2(c). Again, this section should discuss the impact of testing on flows (spills), dissolved gasses, and fisheries.

2-150 Water Quality

[B.26] As the operation of Watana in combination with Devil Canyon will differ significantly from Watana alone, it seems reasonable to assume that temperatures will also differ. The effect of peaking versus base load operation on outlet water temperatures should be considered. During filling of Devil Canyon, release for the second year will be near 4°C. This conflicts with the statement that little change in temperature will occur.

2-154 (i) Project Operation

3.27] We understand that Harza-Ebasco, the prime contractor for Susitna

Licensing, has revised the load demand and reservoir operating rule curves. New firm energy demand figures have been set at approximately 5900 GWL, down from the 7000 figure used in this application. The impact of this change is significant. Maximum releases for wet years may be drastically increased. Flows of 12,000 to 14,000 cfs during summer which were alleged to be marginal from an economic standpoint, may now be attractive.

The impacts of this revision should be discussed at length, both here and in Exhibit B, Chapter 4. This change would appear to invalidate many of the constraints on fishery flow releases, and re-consideration of minimum flows would also be necessary.

2-164 <u>River Morphology</u>

[B.28] The impact of the two dam operational scenario on bed load movement and riverbed stability should be discussed. Should this impact severely degrade spawning habitat over time, mitigative measures will be necessary. What studies have been done or are being done to analyze this impact?

2-166 para. 4

[B.29] The projected temperature decrease attributed to hypolimnitic releases through the cone valves are based upon the 2010 power demand simulation. Using the 2002 power simulation, project releases and spills would occur more frequently and with greater magnitude. Therefore, downstream temperature changes would be more pronounced. Additionally, revised rule curves (see comment on 2-154 (i) Project Operation) would increase the amount of water spilled or released in some years, and would further increase this impact. These considerations should be discussed.

2-167 para. 2

[B.30] We understand it is desirable to minimize the elevation of the cone valve outlet above the tailpool in order to minimize dissolved gas supersaturation. However, could the cone valve intakes be placed higher within the dam, as at Watana, to allow warmer epilmnitic waters to be accessed? This could reduce temperature impacts during releases.

2-167 Mainstem

[B.31] The discussion of temperature impacts presented in this section is based upon the model HEATSIM. Again, confidence in this model is low, as it does not allow for tributary input and was based upon data from water year 1981. This year was very unusual in that a relatively warm June was followed by a cool July. Results from HEATSIM show that maximum upstream movement of 0°C water would occur near RM 119 in mid-January. This front would remain there too briefly for significant ice formation to occur. This assessment should be re-evaluated in light of the new modeling efforts.

2-169 (ii) Ice; Reservoir

[B.32] Formation and degradation of an ice cover on the Devil Canyon reservoir

[B.32] would seem to have important implication on reservoir temperatures, stratification, and downstream temperatures. This implies a need for temperature modeling of the reservoir beyond December 31.

Ice modeling deficiencies have been discussed previously. Accordingly, we believe it is appropriate to re-evaluate the need for this modeling in light of the new riverine temperature model SNTEMP.

2-170 Talkeetna to Cook Inlet

[B.33] At this time, ice conditions have not been modeled below Talkeetna and these statements remain unsupported. The impact of increased staging should be discussed here and the length of time ice formation could be delayed should be presented.

2-171 (v) Total Dissolved Gas Concentration

[B.34] We do not agree that "no supersaturated conditions will occur downstream from the Devil Canyon Dam." Spills will occur periodically, for which no gas mitigation is proposed. The cascade spillway design, which would reduce gas supersaturation during spills, was rejected. Additionally, the cone valves remain untested in their proposed size and configuration. At best, they will prevent any increase in gas concentration from occurring. In a report on nitrogen supersaturation (Acres, 1983) investigating the impact of eliminating cone valves at Watana, the author notes "Determination of the initial saturation level below Watana has not been finalized due to uncertainties in the effect on dissolved gas saturation of powerhouse operations, outflow water temperatures, and distance of fall and depth of water plunge below the dam. High volume spills falling over the spillway could cause significant scour in the plunge pool below the dam. Supersaturation levels resulting from entrained air bubbles going into solution as water plunges through the depth of this scour hole could yield the (supersaturation) values on the upper end of this range." Should such values occur, supersaturated water is likely to be passed through Devil Canyon.

2-181 6-Mitigation, Enhancement, and Protective Measures

B.35] The key mitigation feature concerning anadromous fisheries impacts is the establishment of a downstream release schedule which avoids or minimizes habitat loss. We do not feel that the suggested minimum flows will meet this objective, nor do we believe that a satisfactory range of potential flows has been considered. It is apparent that several significant project modifications are imminent, and that these may change the economics of the project and, in turn, the availability of water for in-stream uses. The DEIS should present a complete analysis of potential flows comparing their effect on both fish habitat and economics.

2-186 para. 3

B.36] The concept of providing a low-level portal to reduce temperature impacts during the second year of filling was being considered by the APA. What was the outcome? This paragraph implies that this mitigation feature has been dropped.

Exhibit E, Chapter 3

The discussions of Species Biology and Habitat Utilization would be greatly improved by inclusion of the 1982 and 1983 fisheries research done by the Alaska Department of Fish and Game (ADFG), AEIDC, and others. Information on juvenile salmonids is limited, particularly for the lower river. Future study emphasis should be directed below, as [B.37] well as above Talkeetna. The use of this reach by salmonids is poorly studied, other than for migrations. For example, recent ADFG studies have shown juvenile chum salmon may spend as much as three months in freshwater prior to outmigration, and that sloughs within the upper and lower river may provide important rearing habitat. This rearing would take place following emergence from mid April to June, a period when significant reductions in flow will occur in the lower Susitna. Today, we have no data which quantify this use, or from which we can identify impacts to habitat brought on by lowered flows and water levels.

3-101 para. 3

[B.38] Recent modeling by the AEIDC indicates that temperature changes may exist below Talkeetna. Turbidities would likely increase in winter.

3-102 para. 3

[B.39] The statement that (flow) reductions less than 10 percent are not

expected to impact fish is not supported in the absence of any data regarding habitat value changes with incremental flow. Significant flow
[B.39] changes will exist in the lower river for at least seven months of the year.

3-131 Mainstem Habitats

The statement that the ice front is expected to form between Talkeetna
[B.40] and Sherman conflicts with the statement on page 2-169 which projects open water during winter for the Devil Canyon to Talkeetna reach.

3-149 2.4 - Mitigation Issues and Mitigating Measures

The NMFS has reviewed those evaluation species proposed by the U.S. Fish and Wildlife Service and concur with their selection. We believe it is
[B.41] important to include sockeye here, as this species is important within the lower river. Its elimination from the evaluation species list exemplifies the lack of concern over lower river impacts.

3-150 2.4.3 Mitigation of Construction Impacts Upon Fish and Aquatic Habitats

As previously stated, we have not received a design criteria manual or a
[B.42] construction practices manual and are not aware that either document is presently being developed.

3-161 (ii) Measures to Avoid Impacts.

[B.43] We question the conclusion that, of the three factors contributing to access, the project will only affect the stage at the mainstem. Post-project changes may include vegetative encroachment, high velocity scouring, diminished flood flows, and altered ice processes; any of which could impact channel geometry. Slough flow could be altered by decreased groundwater flow attributable to lowered mainstem stage.

3-162 Winter Flow Regime (October-April)

[B.44] "Productive sloughs that will be overtopped more frequently than once every five years will be protected." How would these sloughs be identified? It would seem that this determination would require precise knowledge of the ice front location and the effect of ice staging on water elevations. Is this information available?

Limited winter flows could be considered to reduce the potential of overtopping.

3-163 para. 1

[B.45] We cannot find slough 8 within the other license documents or supporting literature.

3-165 para. 1

Are short-term augmented flows during the spawning season being proposed here? Again, it is difficult to understand exactly what flow releases are being considered. We would appreciate reviewing the criteria by which the referenced sloughs were selected for rectifying measures. The DEIS should state which measures each slough is to receive, the reasoning behind each measure, and the expected impacts to those sloughs not

[B.46] receiving this treatment. Sloughs 16 B, 20, and 22 all are expected to have acute access problems at project flows. Why have these not been included? Conversely, no access problems are foreseen for slough 11, yet it is to be modified. To our knowledge most of these sloughs have not been sufficiently examined to allow for identification of specific impacts; e.g., berm overtopping, access problems, and reduced upwelling.

3-165 Access Mitigation

[B.47] Which eight sloughs are being proposed for access depth modification? Why were these sloughs selected?

3-165 para. 3

[B.48] What slough(s) was examined for the design criteria presented? What is the depth of excavation required for each slough?

3-166 Spawning Habitat Mitigation

Again, the design criteria presented here concern us. What is the source of these data and how were they derived? At this time we are

[B.49] unsure as to the probability or magnitude of this impact, yet four (4) sloughs are to be modified, producing 48,240 square feet of spawning habitat. More discussion is necessary and should await the results of further analysis of the interaction of groundwater and the mainstem.

3-167 Scarifying Side-Channels

[B.50] The criteria by which four (4) sites were selected for this mitigation should be presented and the sites identified.

3-168 Slough Gravel Cleaning

[B.51] Why are three sloughs to be cleaned per year?

3-168 Mainstem Spawning Beds

[B.52] The criteria by which two (2) sites for this work were selected should be presented, and the sites identified.

3-169 para. 1

[B.53] We are not aware of an on-going project to analyze candidate areas for mainstem spawning bed creation. Who is performing this study?

3-170 Measures to Minimize Impacts

[B.54] It is not clear when this paragraph is discussing Watana or Devil Canyon.

3-178 para. 1

[B.55] What is meant by the term "enhanced slough?" Would only these sloughs be bermed?

3-182 (a) Impact Monitoring of Salmon Populations

[B.56] Would continuation of existing fisheries programs also meet the need of a long-term monitoring program? It may be desirable to establish a specific study which is tailored to these needs, and is more sensitive to changes within fish populations.

3-183 (i) Monitoring Slough Modifications

[B.57] What monitoring efforts would be expended on those slough (and side channels) not receiving any modification? These areas will continue to offer some fish habitat and should also be provided for in the monitoring program. Periodic removal of beaver dams, vegetation, or silts/debris may be desirable. We are concerned with the apparent narrow scope of this program, as it seems to consider only certain areas above Talkeetna.

3-185 Monitoring of Fixed-Cone Valves

[B.58] This monitoring program is either poorly described or inadequately designed. A "one-time evaluation" of its effectiveness is insufficient for any analysis. Would the dissolved gas concentration of the reservoir waters near the cone valve intake be measured at this time? Will the valves operational impacts on downstream temperatures be monitored?

3-180 2.6 Monitoring Studies

[B.59] Regarding the interagency monitoring team, at this time there can be no assurance that such a team could exist. Budget and manpower constraints are likely to limit participation, and long-term agency involvement could not be assured due to changing priorities and budgets. This concept would require considerably more detailed refinement before it can be seriously proposed as an integral part of any mitigation effort.

3-182 2.6.2 Operational Monitoring

[B.60] It appears that all monitoring effort will take place above Talkeetna. This program would not be able to identify any impact to the rest of the Susitna River, or to develop appropriate mitigative measures. Specific discussion is needed here which outlines the monitoring effort below Talkeetna.

Exhibit E, Chapter 10

[B.61] As previously stated, we believe those design changes being considered and/or requested by the APA should be described here. At this time we are not sure which of these modifications will become part of the design proposed for licensing and which are potential alternatives. During the Susitna scoping session held in Anchorage this year, a request was made for the full range of project alternatives to be presented within a matrix allowing for direct comparison of impacts with the proposed plan. We support this request.

10-31 2.1.1 Diversion/Emergency Release Facilities

[B.62] The proposed release levels do not avoid adverse affects on the downstream salmon fishery.

10-32 2.1 Watana Facility Design Alternatives

[B.63] It is not clear why the cascade spillway was dropped from consideration. How were the economic costs evaluated against the biological gains created by reduced gas saturation levels? We understand that the APA is considering eliminating the emergency spillway, combining it with the main spillway. This feature is not addressed. How would such a modification affect spillway operation and gas supersaturation?

10-35 2.2.1 Installed Capacity

Devil Canyon is to be operated primarily as a base loaded facility.
[B.64] When would any other mode of operation occur? What would be the conditions/events necessary to require a different operational mode at Devil Canyon?

10-105 3 Alternative Operating Scenarios

Much of the discussion within this section would seem to be invalidated by recent developments. Energy demand forecasts have changed significantly since this selection process occurred. New reservoir
[B.65] operations model and reservoir rule curves are, apparently, being considered. Minimum downstream flow requirements which minimize adverse impact to fishery resources have yet to be established. The results of the AEIDC modeling effort, expected in 1984, would allow for these recommendations to be developed. We believe this discussion should be revised in light of these events.

Literature Cited

Acres American Inc., January 1983. Susitna Hydroelectric Project Nitrogen Supersaturation Study. 13 pp.

Alaska Environmental Information and Data Center, 1972. Examination of Discharge and Temperature Changes Due to the Proposed Susitna Hydroelectric Project. Draft Report. 29 pp. + Appendix.

Alaska Department of Fish and Game, 1983. Susitna Hydro Aquatic Studies Phase II Report. Synopsis of the 1982 Aquatic Studies and Analysis of Fish and Habitat Relationships. 151 pp. + Appendix.

Newbury, R.W., K.G. Beaty and G.K. McCullough, 1977. Initial Shoreline Erosion in a Permafrost Affected Reservoir, Southern Indian Lake, Canada. Dept. Environ., Fish and Marine Serv. Winnipeg, Manitoba. 6 pp.

FEDERAL ENERGY REGULATORY COMMISSION
PROJECT NO. 7114
RESPONSE OF ALASKA POWER AUTHORITY TO COMMENTS OF
UNITED STATES DEPARTMENT OF COMMERCE,
NATIONAL MARINE FISHERIES SERVICE

COMMENT B.1:

"The NMFS has been actively involved in the planning and study of the Susitna Hydroelectric Project for several years. During this time, we have attempted to coordinate extensively with the Alaska Power Authority (APA) and its contractors. Prior to finalization of the development scheme proposed in the February 1983 License Application, many different scenarios and project features were discussed. Our agency has consistently voiced concern over the premature nature of plan development necessitated by what we consider to be an ambitious and unreasonably brief development schedule."

RESPONSE:

The Alaska Power Authority is pleased that NMFS recognizes that, through the Power Authority's efforts, NMFS has been involved in the study of the Susitna Hydroelectric Project.

This detailed involvement has provided the NMFS with information prior to finalization which may give NMFS staff the impression that the "plan development" is of a "premature nature." The Power Authority's intent has been to keep the various agencies informed as to how the studies are proceeding. The plan development of the project has been evolving since late 1979; therefore, we do not feel the project is on an unreasonably brief development schedule. A number of significant new developments have naturally evolved over the years. Minor new developments will continue to occur through the proposed construction phase. The Power Authority does not envision these future developments will be major changes to the License Application but rather revisions of the details. We intend to fully disclose these details as they occur in order to coordinate properly with the various agencies and insure they are aware of what is occurring. We continue to solicit the active and constructive involvement of all concerned agencies.

COMMENT B.2 (underlined text):

"Economic conditions within Alaska have changed dramatically since the beginning of the planning process for the Susitna Project. In response to these changes, the APA and its contractors have considered various design revisions and development scenarios. Among these changes are possible revisions to the load forecast and reservoir operations rule curves, alterations in dam height, different mode of operation; e.g., load following or peaking, re-regulation dam construction, and design revisions to the dam structure and outlet facilities. At this time, the APA has not officially announced any revisions or amendments to the existing development plans, and we are therefore limiting our review to that information presented in the February 1983 License Application. However, we cannot ignore these potential developments, as they could have vital impacts on the economic and biological feasibility of this project. Despite the two dam scenario proposed today, it appears probable that power demands and economics may cause significant delays or changes to this plan. Delay in bringing Devil Canyon on line would present a suite of biological and physical impacts which differ significantly from the present plan. More radical plan revisions would create correspondingly differing impacts. Flow stability, in-stream temperatures, down-stream fishery flow releases, sediment transport, ice conditions, and many other factors would require further analysis. Mitigative measures would have to be developed for new impacts, necessitating changes to the mitigation plan."

RESPONSE:

The Alaska Power Authority is presently considering refinement of design details which offer substantial construction cost savings and could be instituted without material effect on the project configuration as presented in the FERC License Application. These refinements are of the type normally expected during the development of a project as increased field data and engineering study reduce the amount of "worst-case" planning required. Their implementation would provide some enhancement of project economics while not adversely impacting biological feasibility.

See also Responses to Comments B.1, B.5 and B.61.

COMMENT B.3 (underlined text):

"Economic conditions within Alaska have changed dramatically since the beginning of the planning process for the Susitna Project. In response to these changes, the APA and its contractors have considered various design revisions and development scenarios. Among these changes are possible revisions to the load forecast and reservoir operations rule curves, alterations in dam height, different mode of operation; e.g., load following or peaking, re-regulation dam construction, and design revisions to the dam structure and outlet facilities. At this time, the APA has not officially announced any revisions or amendments to the existing development plans, and we are therefore limiting our review to that information presented in the February 1983 License Application. However, we cannot ignore these potential developments, as they could have vital impacts on the economic and biological feasibility of this project. Despite the two dam scenario proposed today, it appears probable that power demands and economics may cause significant delays or changes to this plan. Delay in bringing Devil Canyon on line would present a suite of biological and physical impacts which differ significantly from the present plan. More radical plan revisions would create correspondingly differing impacts. Flow stability, in-stream temperatures, down-stream fishery flow releases, sediment transport, ice conditions, and many other factors would require further analysis. Mitigative measures would have to be developed for new impacts, necessitating changes to the mitigation plan."

RESPONSE:

Re-analysis and refinement of the financial and economic aspects of the project have been undertaken both in support of the FERC License Application and to provide the widest possible information base for state financial planners and decision makers. There is presently no indication that significant delays or changes will result (see Response to Comment B.1).

COMMENT B.4 (underlined text):

"Economic conditions within Alaska have changed dramatically since the beginning of the planning process for the Susitna Project. In response to these changes, the APA and its

COMMENT B.4 (cont.):

contractors have considered various design revisions and development scenarios. Among these changes are possible revisions to the load forecast and reservoir operations rule curves, alterations in dam height, different mode of operation; e.g., load following or peaking, re-regulation dam construction, and design revisions to the dam structure and outlet facilities. At this time, the APA has not officially announced any revisions or amendments to the existing development plans, and we are therefore limiting our review to that information presented in the February 1983 License Application. However, we cannot ignore these potential developments, as they could have vital impacts on the economic and biological feasibility of this project. Despite the two dam scenario proposed today, it appears probable that power demands and economics may cause significant delays or changes to this plan. Delay in bringing Devil Canyon on line would present a suite of biological and physical impacts which differ significantly from the present plan. More radical plan revisions would create correspondingly differing impacts. Flow stability, in-stream temperatures, down-stream fishery flow releases, sediment transport, ice conditions, and many other factors would require further analysis. Mitigative measures would have to be developed for new impacts, necessitating changes to the mitigation plan."

RESPONSE:

Existing plans for the Susitna Project, including engineering design, timing of construction, operation and all other aspects have been thoroughly reviewed by Harza-Ebasco and the Power Authority. At the present time, there are no formal or informal plans to make major changes in design, schedule construction or operation (see Response to Comment B.1).

As economic needs and flow requirements necessary to protect downstream habitats become better defined and are selected, the project, as are all hydro projects, will be "tuned" appropriately. Environmental consequences of any change will be considered and mitigation programs will be updated and sent to all participants as necessary to consider any new developments.

RESPONSE TO B.4 (cont.):

Agency personnel and the FERC will be formally notified if a potential change under evaluation becomes an official Power Authority change (e.g., approved by the Board of Directors). There are, at present, no plans to delay Devil Canyon construction; therefore, this BLM Comment is rhetorical.

COMMENT B.5:

"Worst Case Analysis

"Because we feel there currently exists a high potential for this project to change from what is proposed in the License Application, we expect the DEIS to present a worst-case analysis which considers these eventualities. This analysis should identify the type of revisions and alterations which might be anticipated, the events or situations that would direct these changes, the probability of these events occurring, and the biological impact of these revisions. Again, no information on this subject is presented in the application. Should any of these changes be requested by the APA or directed by FERC, an amended license application and/or statement should be prepared and distributed for comment."

RESPONSE:

There are no changes presently being considered by the Power Authority which would materially alter the project as proposed in the FERC License Application (see Responses to Comments B.1-B.4). Possible changes have been examined in the past to insure that all options open to the State of Alaska have been considered.

In addition, the Power Authority anticipates that the DEIS will utilize all such analytical techniques, and investigate all such alternatives, as are required by the regulations of the Council on Environmental Quality (CEQ) under the National Environmental Policy Act (NEPA) (40 C.F.R., Part 1500).

COMMENT B.6:

"Temperatures

"Post-project reservoir and down-stream temperatures will affect the degree of impact this project will present to fishery resources. Modeling efforts have been limited. The reservoir temperature model DYRESM was run on Watana reservoir for the months of June through December for water year 1981. This was an atypical year, presenting a "worst case" according to the license application. Thus, this important model was developed using limited data from a water year that was not representative. Synthesized data

COMMENT B.6 (cont.):

from this model were used to input the downstream temperature model HEATSIM, which in turn drove the ice model, ICESIM. The potential for this process to magnify error appears to be significant. We understand that the Arctic Environmental Information and Data Center (AEIDC) has been contracted to analyze flow releases and is using another riverine temperature model, SNTEMP, which allows for certain factors (such as shading and tributary input) which HEATSIM does not. Harza-Ebasco informs us that a new ice model, developed by the Cold Regions Research and Environmental Laboratories, will be used to re-analyze ice conditions. This model reportedly accounts for shelf ice formation, as well as frazil ice, and should more precisely predict post-project ice formation. The reservoir operations model and the reservoir temperature model may also be modified in the near future. Thus, the accuracy of the modeling efforts depicted in the license application must be questioned. We consider this to be a serious problem which will interfere with our ability to identify impacts and recommend proper mitigation measures. Additional modeling should be done which considers the full year, both reservoirs, and can be input with more than a few months data. Additionally, the results of this improved modeling effort will direct the need for future work. For example, should the temperature model project 0°C water above Talkeetna for Watana/Devil Canyon operation, this reach should be modeled for ice formation. Similarly, if temperature changes are predicted below Talkeetna, some analysis of this impact will be necessary."

RESPONSE:

For the FERC License Application, reservoir and stream temperature studies and instream ice process studies were made for the period June to December 1981, which represents a wet year in which reservoir releases would be expected to be high relative to the mean. It is the Power Authority's general practice, as in other hydrological investigations, to include the dry, average and wet water years in order to obtain a range of flow temperatures that would provide a spectrum of information as desired. Additional temperature simulations are being carried out utilizing data from water years 1974 and 1982 (dry and average years) representing

RESPONSE TO COMMENT B.6 (cont.):

conditions of minimum and average reservoir releases. The years selected are as follows:

Dry year	-	1974
Average year	-	1982
Wet year	-	1981

All years were checked and were expanded, where necessary, to include input data for the entire water year. These water years are included in the DYRESM simulation. The following cases will be studied for each water year:

1. Filling of Watana reservoir;

2. Watana in operation;

3. Watana/Devil Canyon in operation.

Ice process simulations will be carried out for warm, cold and average winter conditions.

The purpose of these simulations is to provide an additional data base for evaluating potential project related impacts on the ecosystem. The reservoir and stream temperature simulations will consider both reservoirs, will consider the entire water year and will not be limited to the period June through December. Descriptions of the studies and schedules for carrying out these simulations are given in the Alaska Power Authority's Response to FERC Schedule B Requests for Supplemental Information Nos. 2.28 and 2.41. The results of these simulations will be provided to the FERC as they become available.

Reservoir temperature simulations are being carried out using the Dynamic Reservoir Simulation Model (DYRESM). The same model was utilized for the FERC License Application studies and is described therein (page E-2-115). The current study includes simulation of the reservoir ice cover and consideration of frazil ice which may be influent to the reservoir. For the FERC License Application, calibration of the model was limited to the available data from Eklutna Lake for the period June 1, 1982 to December 31, 1982. The most recent effort on reservoir temperature and ice studies has been concentrated on model calibration applying to Eklutna Lake. Additional data are now available and the calibration is being refined using a full year of data for Eklutna Lake.

RESPONSE TO COMMENT B.6 (cont.):

The parameter values related to various physical processes as suggested by Imberger and Patterson (1981) have been used. Some modifications have been made for the Eklutna Lake study to take into account the effects of the mild sloping bottom at the intake area and the horizontal intake structure. Better agreements have been obtained on computed and measured outflow temperatures and lake temperature profiles. Since both Watana and Devil Canyon reservoirs will not have mild sloping bottom near the intake area and horizontal intakes, these effects will not be considered in Watana and Watana/Devil Canyon studies. Therefore, the degree of accuracy one may expect from the DYRESM simulations on Watana and Watana/Devil Canyon reservoirs will not change significantly.

Power Authority Responses to FERC Schedule B Requests for Supplemental Information Nos. 2.39 and 2.40 describe in detail the estimate of error/uncertainty for Lake Eklutna DYRESM simulations and parameter values used in the DYRESM/HEATSIM simulation.

AEIDC has been retained by the Power Authority to provide instream temperature simulation using the Stream Network Temperature Simulation Model (SNTEMP) developed by the U.S. Fish and Wildlife Service and described in the report "Stream Flow and Temperature Modeling in the Susitna Basin, Alaska" (AEIDC, 1983). This model simulates some physical characteristics which HEATSIM, used in the License Application (Appendix A, Hydrological Studies, Susitna Hydroelectric Project Feasibility Report) does not. These include topographic shading and tributary inflow temperatures. The SNTEMP model has been calibrated to the Susitna River for the period June 1981 through September 1981, and June, 1982 through September 1982. Mainstem temperatures for this period were predicted within approximately 1°C at the 90 percent confidence level. The HEATSIM model was calibrated to data for the period July 1981 through September 1981. Monthly average predicted temperatures for this period were also within approximately 1°C. Both HEATSIM and SNTEMP appear capable of simulating with-project Susitna River temperatures reasonably well. Since SNTEMP was calibrated to an additional summer of data, confidence in this calibration may be greater. For a further discussion of the temperature models, refer to the response to Comment A.9.

The ICESIM model is described in the FERC License Application (page E-2-124). ICESIM is considered a

RESPONSE TO COMMENT B.6 (cont.):

state-of-the-art ice process simulation model. The model could not be calibrated to the 1980 Susitna River freeze-up conditions due to numerous critical or near critical velocity reaches of the river at low flows. The model has been calibrated for Canadian rivers with higher winter flow, but has not been verified for sleep rivers with low flows. However, with-project simulations were considered satisfactory as described in the FERC License Application.

The foregoing discussion indicates that there is no sufficient reason to question the accuracy of the FERC License Application modeling efforts (see also Response to Comment A.9).

REFERENCES

Alaska Power Authority, Response to FERC Schedule B Requests for Supplemental Information on Exhibit E, Chapter 2, Nos. 28, 39, 40, 41 (1983), previously submitted to the FERC on September 1, 1983.

Imberger, J. and J. C. Patterson, A Dynamic Reservoir Simulation Model - DYRESM:5, Transport Models for Inland and Coastal Waters (1981).

AEIDC, Stream Flow and Temperature Modeling in the Susitna Basin, Alaska (1983), previously submitted to the FERC on December 19, 1983.

Acres American, Inc., Susitna Hydroelectric Project Feasibility Report, Vol. 4, Appendix A Hydrological Studies (1982), pages A-4-5 through A-4-8, previously submitted to the FERC on March 15, 1982.

COMMENT B.7:

"Flow Regimes

"The license application does not present a specific flow release schedule that protects anadromous fishery resources. We understand that the AEIDC is developing a predictive model which will compare habitat value over a range of project flows. This process is not yet complete. In fact,

COMMENT B.7 (cont.):

much of the studies and data which would allow for a particular flow regime to be evaluated are not available at this time. The draft and final license Exhibits suggest that flow releases may be designed to accommodate fishery resources in several ways, such as spiking flows for a brief period to allow adults access to sloughs or establishing maximum winter flow limits. However, the releases proposed in the application do not contain such a flow schedule, nor does the application present a precise description of how the final flow regime would be developed. Although agency coordination is planned in the future flow decisions, our agency has had little contact with the APA or its contractors regarding this issue. The NMFS commented extensively on this matter in our response to the Draft Exhibit E, and we feel much of that comment remains valid. We believe it is essential that the fisheries habitat and flow relationships be adequately investigated, and that a detailed release schedule which fully protects the fishery be established prior to licensing. Such a release schedule must be incorporated as a license condition."

RESPONSE:

The Power Authority anticipates that the DEIS will describe a reasonable range of flow regimes and mitigation measures relating to stream flow.

The flow release schedule presented in the FERC License Application, in combination with the mitigation plan, was designed to protect anadromous fish resources. The proposed flows are not designed for maximum power production, but rather reflect consideration of biological needs. While the flows do not avoid all impacts to the anadromous fish resources, the mitigation options described in the FERC License Application and in the Response to Comment B.9 are expected to effectively offset the habitat losses associated with reduced flows.

The proposed flows reflect the best available analysis at the time the FERC License Application was submitted. The Power Authority, through its technical contractors, has continued to develop additional detailed information on habitat and flow relationships in order to further refine the flow schedule and mitigation options that will best balance power and habitat needs.

Basic data necessary to produce reasonably detailed flow regimes are available. Much of this was presented in the

RESPONSE TO COMMENT B.7 (cont.):

FERC License Application. Thus far, the Power Authority, following both formal and informal consultations, has only received non-specific and generic questions from the resource agencies.

The flow schedules considered in the License Application and three additional schedules considered in response to FERC comments on the License Application (submitted on July 29, 1983) examined a range of flows from existing natural flows to flows that would provide maximum power production. Within this range, flows that accommodated fisheries were considered (e.g., the Case C scenario incorporated increased flows (12,000 cfs) to allow access for adults to sloughs). When it was not economically feasible to accommodate impacts to fisheries resources through flow regulations, mitigation measures were proposed (e.g., where 12,000 cfs may be inadequate to ensure access, the lower ends of specific sloughs would be modified to provide sufficient flows and conditions for access).

The final flow regime will result from the negotiation process outlined in the workshop on July 18, 1983, and by letter of October 7, 1983. This negotiation process will provide the National Marine Fisheries Service and other resource agencies with the further opportunity to make specific, constructive comments and suggestions.

The NMFS has had numerous opportunities to comment on flow and other project related issues. These opportunities have included: a three-day workshop on the Draft Application (NMFS was in attendance), where flows were extensively discussed and comments elicited; another workshop in July 1983 (previously mentioned) where the proposed approach and status of the aquatic ecology studies, especially instream flows, were discussed and specific agency input requested; and various other smaller meetings correspondence, and discussions with NMFS personnel. Comments by the NMFS at these meetings were extensive, but were general in nature.

The Power Authority believes that it is essential that fisheries habitat and flow relationships be adequately investigated, and that a release schedule which reasonably protects the fishery be established. Accordingly, the Power Authority has expended extensive time and effort over the past three years supporting studies (primarily by ADF&G) that are designed to resolve the flow relationship issue. The Power Authority is pursuing a schedule that incorporates agency input and consultation designed to establish a negotiated flow release schedule.

COMMENT B.8:

"Lower River

"The majority of the biological investigations have dealt with those reaches of the Susitna Basin above Talkeetna. Unquestionably, impact magnitude will be far greater for the upper Susitna, as the distance from the dam sites and influence of several large tributaries will dampen the effect of many physical changes such as temperature, flow, and turbidity. The lower river system, however, supports the vast majority of anadromous fish migration, rearing, and spawning habitats. Recent work suggests that downstream effects may occur and may be significant (AEIDC, 1983). At Susitna Station, River Mile (RM) 25.5, July flows would be reduced by 12 percent and March flows increased by 127 percent. Temperatures and ice conditions below Talkeetna have not been modeled. Considering the resource value of the lower river and the potential for the proposed project to create changes to this reach of the Susitna, we believe that further work may be necessary to fully identify project impacts. The license application does not adequately convey the potential for these impacts to occur, nor does it discuss any future investigations. We feel such study may be needed; not only to further identify the habitat use of this reach, but to establish a program whereby post-project changes in habitat may be documented. A potential for improved over-wintering habitat exists with the Susitna Project, and it will be important to assess this impact in the long-term, particularly as any such improvement may help mitigate adverse impacts in the upper Susitna."

RESPONSE:

Although the assessment of project-related impacts on aquatic resources has emphasized the middle and upper segments of the Susitna River (i.e., upstream of Talkeetna), certain information collected is useful in evaluating impacts in the lower river. Please refer to the Data Index which has been included in the Response to Comment B.37.

Changes in downstream temperature regimes during operations have been assessed using one year of meteorological conditions (1981) as far downstream as Sunshine Station; temperature changes that occur during initial reservoir filling have been adequately considered by AEIDC (1983).

RESPONSE TO COMMENT B.8 (cont.):

Some predictions of changes in bedload and suspended sediment discharge have been made for the lower river in the FERC License Application (e.g., pages E-2-82 to E-2-94). Changes in sediment will depend to a considerable degree on flow changes. Sediment discharge data (both suspended and bedload) for the lower river at Sunshine were collected by the USGS for 1981-1982 (USGS unpublished). Ice processes in the lower river have thus far been qualitatively evaluated.

Fish habitat, resident fish, and anadromous fish studies have provided information on fish resources in the lower river. Please refer to ADF&G's 1978 Preliminary Environmental Assessment of Hydroelectric Development on the Susitna River. ADF&G Data Reports for the 1981 and 1982 field seasons also contain data on both fish habitat and fish populations in the lower river. In addition, the 1983 ADF&G Data Report will be available in June 1984.

The major impact issues in the lower river have been identified as:

1. Access of adult fish to spawning habitats, in particular tributaries.

2. Changes in the availability of spawning habitat.

3. Impacts on eggs incubating in stream gravels.

4. Changes in the availability of rearing and overwintering habitat.

5. Altered juvenile outmigration patterns.

Please refer to the 1983 ADF&G Synopsis Report, Appendix F for a quantitative evaluation of the relationship between mainstem discharge and availability of rearing habitat for the following:

1. Chinook in Goose Creek side channel, Rabideux Creek and slough, and Birch Creek and slough;

2. Coho in Sunshine Creek and side channel and Birch Creek and slough;

RESPONSE TO COMMENT B.8 (cont.):

3. Sockeye in Birch Creek and slough; and

4. Chum in Birch Creek and slough.

REFERENCES

ADF&G, Preliminary Environmental Assessment of Hydroelectric Development on the Susitna River (1978).

ADF&G, Susitna Hydro Aquatic Studies & Phase II Report, Synopsis of the 1982 Aquatic Studies and Analysis of Fish and Habitat Relationships, previously submitted to the FERC on October 31, 1983.

AEIDC, Susitna Hydroelectric Project, Draft Aquatic Impact Assessment: Effects of Project-Related Change in Temperature, Turbidity, and Stream Discharge on Upper Susitna Salmon Resources During June through September (1983), previously submitted to the FERC on October 31, 1983.

COMMENT B.9:

"Mitigation

"The applicant has stated that specific mitigation measures to avoid or minimize impacts have been added to Exhibit E. However, no real plan is presented here; only a gathering of conceptual measures for which no testing has occurred or is currently planned. According to the license application "...the mitigation plan will be refined and detailed plans specifying number, location, and design of mitigation features will be prepared. The Power Authority will provide details of these studies and plans as they become available." At this time, we are concerned that the proposed plan cannot adequately mitigate impacts. The development of mitigative measures is not proceeding at a pace equal to other project studies, and coordination on this vital issue has not been adequate. For example, while the license application states that an analysis of candidate areas for mainstem spawning bed improvement sites is being

COMMENT B.9 (cont.):

conducted, we are not aware of any on-going work on this issue. A demonstration project for these mitigation features is necessary, yet to date no such program has been conducted. Several documents which were to assist in the decision-making process have not been received, including the design criteria manual, construction practices manual, and the analysis of minimum flows related to fish habitat. "Presently, the mitigation and monitoring efforts seem to focus solely on the Susitna River above Talkeetna. As such, the mitigation "plan" not only presents an inadequate approach to those impacts above Talkeetna, but fails completely in providing for those resources within the lower one hundred miles of river.

"It will be necessary for effective, specific, and implementable mitigation measures to be developed and approved before any license can be issued for this work."

RESPONSE:

The mitigation plan presented in the FERC License Application is directed toward the goal of maintaining existing levels of salmon production in or near habitats presently used by the salmon. The mitigation plan consists of two principal methods to achieve this goal, primarily in the reach between Devil Canyon and Talkeetna (see Response to Comment B.60).

The first method is to provide sufficient flows in the river at critical times to maintain utilization of existing habitats. Further detailed studies to define these flows and their relationship to the habitats presently utilized by salmon are on-going. Considerable data analyses and modeling efforts, including IFG-type analyses of three sloughs and four side channels, are part of this method. In addition, hydraulic and biological data have been collected at tributary mouth habitats (Fourth of July Creek, Indian River and Portage Creek) and are currently being analyzed. Results of these analyses will allow further definition of the instream flow requirements and will be used to evaluate alternative discharge regimes and to select appropriate regimes.

If flow regulation is inadequate for maintaining existing production levels, the second method to achieve this goal will either be to provide annual maintenance of existing habitats or provide physical modification of sloughs and side channels.

RESPONSE TO COMMENT B.9 (cont.):

The mitigation plan presented in the FERC License Application included a hatchery to maintain the numbers of salmon expected to be lost even under a worst case scenario. Artificial propagation of salmonids through hatchery techniques is routinely performed throughout the Pacific Northwest, Canada and Alaska and it is apparent that this mitigation alternative would successfully achieve this goal.

Based on the apparent utilization of specific habitats by each key species and the number of representative habitat types known to provide spawning habitat, modification and enhancement techniques were proposed as part of the overall mitigation plan. It was determined that some type of habitat modification would be applied to eight sloughs which would provide sufficient habitat to replace the maximum lost due to project operation. Under present conditions, Sloughs 8A, 9, 11 and 21 provide spawning habitat for approximately 80 percent of the chum salmon which spawn in sloughs in the upper river or about 11 percent of the chum salmon escapement upstream of the Curry Fishwheel Station. These sloughs also provide spawning habitat for over 95 percent of the sockeye salmon using slough habitats in the upper river or approximately 75 percent of the total sockeye escapement past the Curry Station. Therefore, the determination that habitat modification at as many as eight sloughs might be required is a conservative estimate of the number of sloughs which would need some type of modification, assuming a "worst case" scenario in which these four sloughs would all be impacted by the project and no other sloughs would become available for spawning. Possible habitat modifications include: providing adequate access by excavation in critical passages, gravel cleaning, or upstream berm restructuring through placement of appropriate spawning gravels in the slough, and restructuring of the slough to provide adequate water depths, velocities and spawning gravels.

Modification of spawning habitats to enhance salmonid production (salmon and trout) has been performed in various ways at numerous sites in the Pacific Northwest and Canada. It is from this background that experience has been developed that can be directly applied to potential slough modifications in the Susitna.

The Washington Department of Fisheries (WDF) has an extensive program of stream side channel rehabilitation (King, personal communication). This often has been directly targeted at chum salmon. Efforts have included:

RESPONSE TO COMMENT B.9 (cont.):

1. Gravel cleaning by various machines;

2. Structural modification such as widening and deepening of some sloughs;

3. Gravel replacement in some sloughs; and

4. Modification of upstream end to prevent flood damage.

The intent of the gravel cleaning in sloughs has been to remove or reduce the concentration of fine sediment (less than 0.8 mm). This has been accomplished by turning the gravel over by use of bulldozers and allowing fine materials to flush out or by machines that physically remove the sediment. In some sloughs, this method has been shown to be highly successful in rehabilitating habitat. The process can be ineffective, however, if (1) fines continue to invade the system, (2) flushing does not carry the fines out of the rehabilitated area, and (3) if the fines are redeposited on some good spawning areas downstream. According to Reeves and Roelofs (1982), the WDF is looking more towards using a gravel cleaning device if possible. These devices are in an advanced experimental stage, with some modifications continually being made (Allen, et al., 1981). They have been shown to provide the ability to significantly remove fine sediments. In the Susitna River, the reservoirs will act as large settling basins and, therefore, the need for additional cleaning after the initial cleaning may be minimal. A program will be developed by the Power Authority to monitor the need for continued cleaning of the sloughs by ADF&G.

Structural modifications such as widening and deepening of sloughs have been used by WDF to provide more area and to increase flows (Allen, et al., 1981). Because most of these sloughs are fed by groundwater, the deeper cut channels often enhance flow. Various structures such as gabions have been placed in the bed of side channels to provide better gradients and pool-riffle ratios. Gabions and other devices have been used on the banks to add stability and to prevent bank erosion due to spawner activity. Placement of structures at the lower end of sloughs has been used to facilitate the entry of fish into the slough (King, personal communication).

Gravel replacement has been successful in some areas but apparently the gravel must undergo a period of stabilization

RESPONSE TO COMMENT B.9 (cont.):

("weathering") before fish will utilize the new materials. Using gravel replacement and newly planted eggs, the WDF has had up to 75% egg-to-fry survival at some locations (Allen et al., 1981).

The WDF (Gerke, personal communication) has tried to keep flood flows out by preventative structures, such as dikes at the upstream end of the slough. These structures have flow control gates installed in case supplemental flow is needed. It has been suggested that a settling basin be used just downstream of the inflow to reduce fines if possible. This may not be necessary on the Susitna due to the settling of particles in the reservoir. The upstream structures are also used to prevent flows that could wash overburden from adjacent streambanks into the slough and thus fill it in or decrease its use.

The British Columbia Department of Fisheries and Oceans (BCDFO) has also performed numerous enhancement programs on sloughs (Lister, et al., 1980). These programs have included gravel replacement, slough modification (widening, deepening, gradient changes) and installation of structures to maintain spawning depths. Also, they have included evaluation programs to see if these modifications have been worthwhile. They have found that egg-to-fry survival rates and fry production, on the average, were doubled over natural conditions. However, the range of success was wide with some series of modifications being highly successful and others having a very low success rate. The factors for these wide ranges are not apparent.

The BCDFO has made recommendations on various schemes for slough development (BCDFO 1980). These include ways to enhance streamflow in the channels, improve groundwater contributions and modify streamside vegetation. Bachen (1983) described the construction of a groundwater-fed side channel within the drainage of a large glacial system in southeast Alaska. Although still in its early phase of operation, chum salmon have successfully returned to this channel.

RESPONSE TO COMMENT B.9 (cont.):

It was estimated that modification of four side channels to provide spawning habitat would be comparable to the relative utilization of side channel habitats by salmon under existing conditions. Few side channels upstream of Talkeetna are utilized under existing conditions (ADF&G, 1983). It is likely that some existing side channel habitats may become slough-like under post-project operational regimes. Additionally, some minor modification of the side channels which may revert to side sloughs would provide additional spawning habitats.

As part of the slough or side channel enhancement program, scarification (mechanical disruption of the substrate) and gravel cleaning would initially be necessary. Scarification may initially be required to disrupt the armoring of the substrate. It was assumed that to maintain the spawning areas, some repetition of the scarification (gravel cleaning) process would be made on a rotational basis, approximately three sites per year.

Presently, only 12 mainstem sites in the area above Talkeetna have been identified at which spawning of chum salmon has been demonstrated. Modification of two sites to provide spawning habitats for salmon was determined to provide equivalent area to that which currently exists in this area.

The proposed mitigation plan focuses on the anadromous fish resources and the more vulnerable habitats (sloughs) upstream from Talkeetna since that is where the main impacts are anticipated. <u>Less than 10% of the total adult salmon escapement migrates to areas on the Susitna upstream of Talkeetna</u>. Of these, 90% spawn in tributaries and probably will not be affected by the project flow changes. Impacts on salmon resources downstream from Talkeetna have not been clearly identified, but if continuing studies indicate the likelihood of significant impacts, then the mitigation plan will be expanded to these areas as well. It is likely that if significant impacts to the salmonid resources of the entire river are demonstrated, the hatchery option will be implemented in place of or in addition to the proposed habitat maintenance procedures.

Although it is preferred that maintenance of natural production of salmon be the primary goal of the mitigation

RESPONSE TO COMMENT B.9 (cont.):

plan, the provision of hatchery facilities to replace any lost productivity of the Talkeetna to Devil Canyon reach remains a viable option. Provision of a hatchery would be economical and would effectively replace all potential lost salmon production.

This Comment (B.9) by the National Marine Fisheries Service refers to several documents (the design criteria manual, construction practices manual and an analysis of minimum flows related to fish habitat) that they have not received. The first two documents have not been completed at this time. The Power Authority believes that the detailed mitigation planning process must proceed in parallel with the detailed development of these documents because of the necessary interaction between the Power Authority and the resource agencies. The content of the third document is part of an ongoing analysis to determine the relationship between flows and fish habitat. The resource agencies will be informed of the progress and results of these analyses on a continuing basis (see also Response to Comment B.42).

REFERENCES

ADF&G, Susitna Hydro Aquatic Studies Phase II Report, Synopsis of the 1982 Aquatic Studies and Analysis of Fish Habitat and Relationships (1983), previously furnished to the FERC on October 31, 1983.

Allen, R. L., K. L. Bauersfeld, T. J. Burns, L. R. Cowan, S. P. Jenks, D. King, J. Seeb, A. Bergh and D. Stuckey, Salmon Natural Production Enhancement Program, Wash. Dept. of Fish Progress Report No. 149 (1981).

Bachen, B., Construction of a Groundwater-Fed Spawning Channel Near Haines, Alaska (1983), Paper presented to the Alaska Chapter of American Fisheries Society at Soldotna, Alaska, November 14-17, 1983.

British Columbia, Department of Fisheries and Oceans, Stream Enhancement Guide (1980), 82 pages.

Gerke, R., Washington State Department of Fisheries Biologist, personal communication (1983).

RESPONSE TO COMMENT B.9 (cont.):

King, D., Washington State Department of Fisheries Biologist, personal communication (1983).

Lister, D. B., D. E. Marshall and D. G. Hickey, Chum Salmon Survival and Production at Seven Improved Groundwater-Fed Spawning Areas (1980), British Columbia Department of Fisheries and Oceans.

Reeves, G. H. and T. D. Roelofs, Rehabilitating and Enhancing Stream Habitat, Two Field Applications (1982), USDA Forest Service, Gen.Tech.Rept. PNW-140.

COMMENT B.10:

"<u>Exhibit E, Chapter 2</u>

"E-2-58 <u>Timing of Flow Releases</u>

"The stated flows do not provide access to all sloughs for adult salmon. Acute access problems are anticipated with releases at 12,000 cfs. The project operational flow does not satisfy the requirement of providing access, and the paragraph should reflect this fact. The reference to consideration of alternative release models (short-term augmented flows) is noted. How will this alternative be considered?"

RESPONSE:

The Power Authority concurs that a flow of 12,000 cfs may not provide access to all sloughs for adult salmon. As stated in Section 2.4.4(a) of Chapter 3, Exhibit E (E-3-165), "The project flows during August may not create sufficient backwater effects at the mouths of some sloughs to permit free access by returning adult salmon." The flows at which access problems occur in 9 sloughs between Talkeetna and Portage Creek are presented below in Table B.10.A. A flow of 12,000 cfs provides unrestricted access into Slough 6A, Slough 11 and Whisker's Creek Slough. Access into Slough 8A is acute at 7860 cfs and unrestricted at 12,500 cfs, implying that access into Slough 8A is almost unrestricted at 12,000 cfs Sloughs 9, 16B, 20, 21 and 22 require 20,000 cfs or more for unrestricted access.

In 1982, the chum salmon escapement in Slough 11 was 375. This represented 20.7 percent of the 1982 chum salmon escapement which utilizes slough habitats for spawning upstream from Talkeetna, or 3 percent of the total 1982 chum salmon escapement past Curry Station. Only a few adult chum salmon utilized Slough 6A or Whisker's Slough in 1982.

As Table B.10.B indicates, at Slough 8A, the chum salmon slough escapement was 911 or 21.6 percent of the total slough escapement (3.1 percent of chum salmon escapement past Curry Station). Assuming unrestricted access conditions to Slough 8A at 12,000 cfs, 42 percent of the chum salmon utilizing slough habitats in 1982 would have adequate access conditions to slough spawning habitats. This would account for 6.1 percent of the total chum salmon escapement past Curry Station. It is important to note

RESPONSE TO COMMENT B.10 (cont.):

that, of the chum salmon escapement upstream from Curry Station, only 14.4 percent utilize slough habitats.

Table B.10.A
Discharge Versus Access Relationships for Upper Susitna Side Sloughs and Relative Utilization by Three Salmon Species
(License Application Appendix A8)

Slough	ACCESS		PEAK ESCAPEMENT COUNTS				
	Acute	Unrestricted	Sockeye 1981	Sockeye 1982	Pink[1] 1982	Chum 1981	Chum 1982
Whiskers Creek	8,000 cfs	10,000 cfs	0	0	138	0	0
6A	-	8,000 cfs	0	0	35	11	2
8A	7,860 cfs	12,500 cfs	177	68	28	620	336
9	18,000 cfs	20,000 cfs	6	10	12	260	300
11	-	6,700 cfs	214	893	131	411	459
16B	18,000 cfs	26,400 cfs	0	0	0	0	0
20	20,000 cfs	21,500 cfs	2	0	64	14	30
21	20,000 cfs	23,000 cfs	38	53	64	274	736
22	20,000 cfs	22,500 cfs	0	0	0	0	0

[1] 1982 data only as even year runs dominate in the Susitna.
- Data unavailable.

RESPONSE TO COMMENT B.10 (cont.):

Table B.10.B

1982 Chum Salmon Slough Escapements Between RM 98.6 and 161.0
As Determined With 1983 Preliminary Stream Life Data,
Adult Anadromous Investigations,
Susitna Hydro Aquatic Studies, 1983

1982 Chum Salmon Slough Escapements						
Slough[1]	River Mile	Total Number[2] of Fish/Days	Mean Stream[3] Life/Days	Escape-ment[4]	Percent of Total Slough Escapement	Percent of 1982[5] Curry Station Escapement
5	107.5					
6A	112.3			4	.1	.0
8D	121.8			41	1.0	.1
8C	121.9	744.0	8.5	88	2.1	.3
8B	122.2	683.4	8.5	80	1.9	.3
Moose	123.5	571.1	8.5	67	1.6	.2
8A	125.1	7,745.5	8.5	911	21.6	3.1
B	126.3	717.6	8.5	84	2.0	.3
9	128.3	4,163.5	8.5	490	11.6	1.7
9B	129.2			9	.2	.0
9A	133.8	894.5	8.5	105	2.5	.4
10	133.8			4	.1	.0
11	135.3	7,437.0	8.5	875	20.7	3.0
15	137.2					
17	138.9	158.1	8.5	19	.5	.1
20	140.0	194.9	8.5	23	.6	.1
21	141.1	11,982.0	8.5	1,410	33.5	4.8
			TOTAL	4,210	100.0	14.4

1 Slough 5 and 15 were not considered due to observations of only milling activity with no spawning by chum salmon.

2 Total number of fish days is determined by the area under the curve of a graph of chum salmon slough surveys vs. date for all sloughs with more than one survey.

3 Determined from 1983 preliminary stream life data collected at Slough 11.

4 For sloughs with peak survey counts ±15 chum salmon, escapement is defined as the quotient of the total number of fish/days and mean stream life days. For sloughs that had single surveys and/or surveys in which the peak count was -15 escapement is defined as the peak live and dead survey count corrected by multiplying the quotient of peak survey counts and escapement. The correction value used was 1.8 and represents a mean value of sloughs having peak survey counts of 100 or greater.

5 The 1982 Curry Station chum salmon escapement was approximately 29,400 fish.

RESPONSE TO COMMENT B.10 (cont.):

As Table B.10.C indicates, for sockeye salmon in 1982, the escapement in Slough 11 was 835 or 83.8 percent of the total slough escapement (64.2 percent of the Curry Station escapement). In Slough 8A, the sockeye escapement was 56 or 5.6 percent of the total slough escapement (4.3 percent of the Curry Station escapement). Hence, a flow of 12,000 cfs would provide access for 89 percent of the slough escapement, assuming the sockeye distribution in 1982 was representative of average conditions. Peak escapement counts in 1981 also indicated that 12,000 cfs would provide access for 89 percent of the sockeye.

Based on 1982 escapement data for pink salmon, 12,000 cfs would provide unrestricted access for 70 percent of the slough escapement.

As stated in Chapter 3 of Exhibit E, for selected sloughs having acute access problems, "access * * * will be facilitated by restructuring the entrance of the slough to convey the majority of the slough discharge and thus provide a greater passage depth (Figure E.3.27). The mitigation plan provides for eight restructured slough mouths" (page E-3-165). Therefore, a flow of 12,000 cfs, coupled with these mitigation measures, will provide slough access for virtually all of the natural slough escapement. For those sloughs fed by small tributary streams, access will also be enhanced during periods of higher tributary flows.

Environmental releases (i.e., flows in excess of those necessary for system power generation) may be reallocated to provide adequate habitat conditions for specific purposes. Such allocations will be considered as part of the development of the Recommended Flow Regime for operating the Susitna Project. The APA anticipates that the DEIS will describe these impacts and reasonable alternative flow regimes.

RESPONSE TO COMMENT B.10 (cont.):

Table B.10.C

1982 Sockeye Salmon Slough Escapements Between RM 98.6 and 161.0
As Determined With 1983 Preliminary Stream Life Data,
Adult Anadromous Investigations,
Susitna Hydro Aquatic Studies, 1983

1982 Chum Salmon Slough Escapements						
Slough	River Mile	Total Number of Fish/Days[1]	Mean Stream Life/Days[2]	Escapement[3]	Percent of Total Slough Escapement	Percent of 1982 Curry Station Escapement[4]
8C	121.9	2.6	17.4	3	.3	.2
8B	122.2	37.9	17.4	8	.8	.6
Moose	123.5	75.2	17.4	13	1.3	1.0
8A	125.1	980.5	17.4	56	5.6	4.3
B	126.3	102.6	17.4	12	1.2	.9
9	128.3	49.6	17.4	8	.8	.6
11	135.3	14,505.0	17.4	835	83.8	64.2
21	141.1	1,078.3	17.4	62	6.2	4.8
			TOTAL	997	100.0	76.6

1 Total number of fish days is determined by the area under the curve of a graph of sockeye salmon slough surveys vs. date for all sloughs with more than one survey.

2 Determined from 1983 preliminary stream life data collected at Slough 11.

3 For sloughs with peak survey counts ±15 chum salmon, escapement is defined as the quotient of the total number of fish days and mean stream life/days. For sloughs that had single surveys and/or surveys in which the peak count was -15 escapement is defined as the peak live and dead survey count corrected by multiplying the quotient of peak survey counts and escapement. The correction value used was 1.5 and represents a mean value of sloughs having peak survey counts of 100 or greater.

4 The 1982 Curry Station sockeye salmon escapement was approximately 1,300 fish.

REFERENCES

Alaska Power Authority, Susitna Hydroelectric Project FERC License Application Project No. 7114-000, Appendix 8A (1983), previously submitted to the FERC on July 11, 1983.

COMMENT B.11:

"Exhibit E, Chapter 2

"E-2-60 Tributary Fishery Impacts

"The three tributaries which may become perched and which support salmon or salmon 'spawning potential' should be identified. Monitoring efforts for these tributaries should be discussed in Chapter 3."

RESPONSE:

The discussion on tributary perching is in error. Of the eight tributaries which show a potential for perching, only three are used by adult salmon:

Jack Long Creek (RM 144.8), Sherman Creek (RM 130.9) and Deadhorse Creek (RM 121.0) (R&M Consultants, 1982). Of these three tributaries, it is questionable whether successful salmon spawning occurs in Sherman Creek or Deadhorse Creek (ADF&G comments on the November 15, 1982 Draft Exhibit E). If Jack Long Creek or any other tributary which provides some spawning potential does become perched, the entrance to the stream will be re-graded so that salmon can gain access to traditional spawning areas.

REFERENCES

R&M Consultants, Susitna Hydroelectric Project, Tributary Stability Analysis (December 1982), previously submitted to the FERC on July 11, 1983.

Alaska Department of Fish and Game, Comments on the November 15, 1982 Draft Exhibit E (License Application Chapter 11, Volume 10B) (1983), previously submitted to the FERC on January 13, 1983.

COMMENT B.12:

"Exhibit E, Chapter 2

"E-28-83 Testing and Commissioning

"This discussion should be expanded. How long will this process take? What determines the time of year for this

COMMENT B.12 (cont.):

process; i.e., winter or summer? How much water would have to be spilled during testing and commissioning during average and wet years? What would be the implications of such spills on dissolved gases downstream of the damsite?"

RESPONSE:

Project releases that result during testing and commissioning will not exceed releases resulting from normal operation.

As outlined on page E-2-83 of the FERC License Application, the time interval for testing the individual units may take several months depending on the circumstances. Testing of the units will be conducted at various times consistent with completion of generating units, reservoir elevation and required downstream water conditions outlined in the FERC License Application.

At Watana, testing of the first unit requiring intermittent turbine discharges is scheduled to start when reservoir filling reaches the minimum operating level of El. 2065. As equipment installation and impoundment progresses, units two and three are also scheduled for testing before the reservoir reaches the normal maximum operating level. The outlet facility will be operated in conjunction with unit testing to maintain required downstream releases. Use of the spillway is anticipated only when the reservoir level rises approximately eight feet above the maximum normal elevation of 2185 which would correspond to a flood exceeding the 50-year return frequency.

The procedure at Devil Canyon will be similar except that the time required for impoundment will be shorter because of the smaller reservoir volume.

The Susitna operational flow process is outlined in Exhibit E, Chapter 2, Section 6. The primary concerns during Watana operation are identical to those identified in Exhibit E for filling:

RESPONSE TO COMMENT B.12 (cont.):

From May through September, the minimum downstream flows at Gold Creek will be the same as those provided during reservoir filling. However, from October through April, the flow at Gold Creek will be increased from pre-project natural flows to a minimum of 5000 cfs. The minimum flows were selected to provide a balance between power generation and instream flow requirements, particularly in the Devil Canyon to Talkeetna reach of the river (E-2-186).

Turbine discharge and the additional required releases by the outlet facility will preclude gas supersaturation. The avoidance of gas supersaturation will be achieved by the inclusion of fixed cone valves in the outlet facility which discharge to the river.

As outlined above, using the reservoir storage capacity, coupled with the minimum summer powerhouse flow and the fixed cone valve discharge, all flow releases with a recurrence interval of up to once in 50 years will be discharged with minimum potential for nitrogen supersaturation.

To minimize the potential change of downstream temperature regime, multi-level intakes have been incorporated into the power plant intake structures so that water can be drawn from various depths. By selectively withdrawing water, an acceptable temperature for the downstream fishery can be maintained at the powerhouse outlet and downstream throughout the year.

COMMENT B.13:

"<u>Exhibit</u> <u>E</u>, <u>Chapter</u> <u>2</u>

"2-84 para.2

"How long will it take for those tributaries which will not become perched to degrade to the new mainstem flow levels? Would this occur immediately, over several months, or be dependent on high flow events within the tributaries?"

RESPONSE TO COMMENT B.13:

The degradation process at the mouth of a tributary will depend upon a number of factors, such as the shape of the tributary cross section, size of bed material, increase in the hydraulic gradient due to lowering of water surface elevation in the mainstem under post-project conditions, magnitude and frequency of high flows in the tributary and the size of sediment transportable by the mainstem flow. The interaction of these factors is not completely understood and it is difficult to estimate precisely how long the tributaries will take to stabilize to the new mainstem water levels. However, the fine material deposited near the mouth of the tributary will be dislodged first under the influence of increased hydraulic gradient and down cutting will start immediately. Major down cuttings will occur when high flows occur in the tributary and the mainstem is under normal-or low-flow conditions. Therefore, depending on the occurrence of high flows in the tributary and their combination with the mainstem flows, a tributary may degrade to the new mainstem levels in a single wet season or it may take a number of years to degrade to the new levels.

COMMENT B.14:

"<u>Exhibit E</u>, <u>Chapter 2</u>

"2-84 para. 4

"The results of on-going study on this issue should be presented in the DEIS. Sediment and bedload transport of the Susitna, Chulitna, and Talkeetna Rivers must be better understood. Obviously, at present this impact is poorly described."

RESPONSE:

The suspended sediment and bedload transport characteristics of the Susitna, Chulitna and Talkeetna rivers near their confluence and the Susitna River at Sunshine have been studied. A draft report is presently available. Finalization of the report will be completed by the end of March, 1984. The Power Authority anticipates that the results of the analyses will be incorporated in the DEIS.

The analyses are based on suspended sediment, bedload and bed material samples collected by the U.S. Geological Survey (USGS) in the summer of 1982. The USGS report "Sediment Discharge Data For Selected Sites In The Susitna River

Basin, Alaska, 1981-82," was supplied to the FERC on December 19, 1983. Results of the analyses show that it is likely that under with-project conditions there will be a long-term aggradation near the confluence of the Susitna and the Chulitna rivers because the Chulitna River is estimated to contribute about 79 percent of the total load (suspended sediment plus bedload). The eventual magnitude of aggradation cannot be properly predicted with the available data. However, the aggradation is unlikely to cause significant impacts on either fish migration or navigation in the reach below the confluence because the much more stable flows under with-project conditions will eventually develop a river channel which will be much better defined than that under existing conditions.

REFERENCES

USGS, Sediment Discharge Data for Selected Sites in the Susitna River Basin, Alaska, 1981-82 (1983), previously submitted to the FERC on December 19, 1983.

COMMENT B.15:

"Exhibit E, Chapter 2

"2-85 (i) Water Temperature

"Please refer to our general comments regarding the temperature modeling efforts."

RESPONSE:

Please refer to Response to Comment B.6.

COMMENT B.16:

"Exhibit E, Chapter 2,

"2-88 Talkeetna to Cook Inlet

"The statement that no temperature changes will occur below the Yentna may be correct, however the discussion should note that this reach of the Susitna was not modeled for temperatures."

RESPONSE:

The FERC License Application (page E-2-88) does not state that there will be "no temperature changes" downstream of the Yentna. Rather, it states that "there will be no significant temperature differences from natural conditions."

It is correct that no modeling was done below the Yentna. In fact, no modeling was done downstream of Talkeetna. The Power Authority does not believe that temperature modeling of the lower river is necessary because the major impacts to the river are expected to occur upstream of Talkeetna. Temperature differences in the lower river are mitigated by the increased warming effect of lower summer flows, and relatively large tributary flows from the Chulitna, Talkeetna and Yentna Rivers.

Further support for the lack of impact below the Yentna is contained in the AEIDC draft report on the effects of project-related changes in temperature, turbidity and stream discharge.

RESPONSE TO COMMENT B.16 (cont.):

For example, Figures 8, 9 and 10 of that report show that with-project summer temperatures downstream of Talkeetna are generally no more than 1°C lower than natural conditions. In addition, since the with-project summer flows downstream of Talkeetna are somewhat less than natural flows (see statistical tables at end of referenced report), the warming rate with-project will be greater than natural, which is expected to self-correct the tendency for any temperature differences below the Yentna confluence.

During winter, the water temperature downstream of Talkeetna is essentially 0°C, and therefore, no temperature change is expected below Yentna in winter (R&M reports, "Susitna River Ice Studies," 1980-81, 81-82 and 82-83.)

REFERENCES

AEIDC, Susitna Hydroelectric Project, Draft Aquatic Impact Assessment: Effects of Project-Related Changes in Temperature, Turbidity and Stream Discharge on the Upper Susitna Salmon Resources During June through September (October, 1983), previously submitted to the FERC on October 31, 1983.

R&M reports, Susitna River Ice Studies, 1980-81, 1981-82 and 1982-83; 1980-81 and 1981-82 reports previously submitted to the FERC on July 11, 1983.

COMMENT B.17:

"Exhibit E, Chapter 2

"2-90(iii) Suspended Sediments/Turbidity/Vertical Illumination

"The impact of thawing permafrost within the reservoir contributing to high sediment and turbidity levels may be considerable. Newbury, Bealy, and McCullough (1977), in a study involving a permafrost affected reservoir in Canada found that erosion and sloughing of permafrost contributed large amounts of suspended sediments to the water body. The statement that these effects will "quickly dissipate" is not supported. We believe more consideration of this potential impact is warranted."

RESPONSE TO COMMENT B.17:

Total sediment inflow in Watana Reservoir is estimated to be about 210,000 acre-feet (af) over a period of 50 years, which is about 2.2 percent of the total gross reservoir volume of 9,470,000 af. The additional sediment to be contributed by the slope due to erosion and sloughing of permafrost soils cannot be estimated quantitatively, but this contribution is not expected to cause significant increase in the suspended sediment concentration and turbidity in the reservoir except in the vicinity of the erosion and sloughing. This is because the reservoir storage is so large compared to the flow through the reservoir that most sediments will settle to the bottom of the reservoir before being transported far into the reservoir.

The study of Indian Lake made by Newbury, Beaty and McCullough (1977), referred to in the Comment indicates that fine-grained frozen shoreline materials exhibit the highest susceptibility to erosion. Since the shoreline materials of Watana Reservoir are primarily glacial till consisting of only about 35 percent silt and clay, the erosion rate will not be as severe as in Indian Lake. Additionally, the drawdown in Indian Lake is small and this promotes thermal niche erosion. For Watana Reservoir, the normal drawdown would be on the order of 100 feet each year. The relatively warm water will not be in contact with the shoreline at any given water level for a time sufficient to develop a thermal niche. This would also limit erosion.

REFERENCES

Newbury, R. W., K. G. Beaty and G. K. McCullough, Initial Shoreline Erosion in a Permafrost Affected Reservoir, Southern Indian Lake Canada, in Proceedings of the Third International Conference on Permafrost, Volume I (1977).

COMMENT B.18:

"Exhibit E, Chapter 2

"2-97(ii) Sloughs

"We cannot agree that because the ground water gradient will remain the same during filling, the upwelling rate within the sloughs will not change. The relationship between

COMMENT B.18 (cont.):

groundwater, mainstem, and upwelling is not adequately described by existing data. Areal extent of upwelling could easily change, or upwelling areas may be re-distributed in areas of unsuitable substrate."

RESPONSE:

In general, groundwater flow in the Susitna River valley is parallel to the river and in a downstream direction. Based upon bench marks along the Alaska Railroad, land surface elevations in the primary study area range from 717 feet at Gold Creek, above Slough 11, to 587 feet at Slough 8A (USGS topographic quadrangle maps Talkeetna Mountains C-6 and D-6). Groundwater levels have generally been measured at a few feet below land surface at Sloughs 8A and 9 (R&M, 1982), suggesting that the groundwater level gradient between Sloughs 11 and 8A is approximately equal to the land surface gradient (130 feet in 10 miles, or .0025). This is also the approximate water surface gradient on the mainstem Susitna, as inferred from predicted water surface profiles (Harza-Ebasco, 1983). Consequently, the downstream groundwater gradient is approximately equal to the river water surface gradient. Since the river water surface gradient remains approximately the same for different flows, the general groundwater gradient within valley-fill materials should also remain approximately the same. Furthermore, the saturated thickness of valley-fill sediments has been measured at in excess of 35 feet (R&M, 1982) in the vicinity of Slough 9. Consequently, since the volumetric rate of groundwater flow is proportional to the product of the water level gradient and the thickness of valley-fill sediments, a change in river stage of only a few feet should result in approximately the same groundwater gradient, a slightly reduced saturated thickness of valley-fill materials, and thus a slightly reduced rate of downstream groundwater flow within the valley.

The above results, which should be generally true for the valley-fill materials on an inter-slough scale, could of course be modified by more local groundwater flow regimes in the immediate vicinity of an individual slough. However, available groundwater level data (R&M, 1982) tend to indicate general groundwater flow parallel to the river, in a downstream direction, with a gradient of approximately 0.003 in the vicinity of each of Sloughs 8A and 9.

RESPONSE TO COMMENT B.18 (cont.):

Consequently, local groundwater flow conditions are in general agreement with more regional conditions.

REFERENCES

R&M Consultants, Slough Hydrology Interim Report (December 1982).

Harza-Ebasco, Water Surface Profiles and Discharge Rating Curves for Middle and Lower Susitna River (Draft Report - October 1983), previously submitted to the FERC on December 19, 1983.

COMMENT B.19:

"Exhibit E, Chapter 2

"2-98 para. 2

"The attempt to quantify the reduction in slough flow is unsupported and presents an impression of minimal impact to the sloughs and fisheries which, we believe, is inaccurate. As stated, no data exist which describe the areal extent of upwelling. The supposition that upwelling is evenly distributed throughout the slough is likewise unsupported. The 10 percent reduction could just as easily be 70 percent, if the right numbers are input. Even by accepting the 10 percent figure, this does not imply a 10 percent reduction in fish habitat, as the salmon may select for a certain area within the slough."

RESPONSE:

Based on the general considerations discussed in the Response to Comment B.18, the rate of groundwater discharge within the valley-fill sediments should be affected relatively little by a small decline in groundwater levels, since the water level gradient would generally remain the same, and the saturated thickness of the sediments would be reduced only slightly.

It should be noted that subsequent to preparation of the FERC License Application, additional data regarding the distribution of upwelling within the sloughs have become available. Observed areas of upwelling and seepage, along with substrate types and salmon spawning areas, have been

RESPONSE TO COMMENT B.19 (cont.):

mapped by the Susitna Hydro Aquatic Studies project (ADF&G, 1983) for Sloughs 8A, 9, 11 and 21. Copies of these maps are contained in the ADF&G Susitna Hydro Aquatic Studies Phase II Report, Vol. 4, Aquatic Habitat and Instream Flow Studies, Appendix F at: Figure 4-F-27 (Slough 8A); Figure 4-F-32 (Slough 9); Figure 4-F-46 (Slough 11); and Figure 4-F-62 (Slough 21). Although observed upwelling and seepage in Slough 8A are concentrated near the upper reaches of the slough, the upwelling and seepage in the other three sloughs are located predominantly in the middle and lower reaches. Furthermore, although the observed upwelling is not uniformly distributed along the entire reach of a slough, this does not preclude upwelling occurring in areas where it cannot be readily observed.

Additional data on the distribution of upwelling within sloughs can be inferred from seepage meter data collected during 1983 (R&M, 1983) in Sloughs 8A, 9, 11 and 21. Preliminary indications are that seepage measurements vary more strongly with mainstem discharge than with location with a slough at a given discharge, although there is considerable variation in measured seepage rates at different points within a given slough.

In summary, it appears that upwelling is widely distributed throughout a given slough, although perhaps not uniformly distributed.

REFERENCES

ADF&G, Susitna Hydro Aquatic Studies Phase II Report, Volume 4: Aquatic Habitat and Instream Flow Studies, 1982 (1983), previously submitted to the FERC on October 31, 1983.

R&M Consultants, Letter from R. Butera to D. Beaver (November 9, 1983).

COMMENT B.20:

"Exhibit E, Chapter 2

"2-102 Minimum Downstream Target Flows

"The concept of establishing maximum flow criteria for winter months was identified in our comments to the APA on draft Exhibit E. According to the applicant's response, maximum winter flow limits should be established, based upon the results of continuing studies. The application should discuss this issue and present the framework for developing such limits."

RESPONSE:

The Power Authority anticipates that maximum winter flow limits will be established during 1984. The framework for developing such limits is presented in the Response to Comment B.7. Essentially, the ice modeling studies and the results of the open water incremental analysis will be used to develop a qualitative relationship between discharge and potential impacts on the fishery. This relationship will then be used to establish the maximum winter flow limits.

The Power Authority anticipates that the maximum winter flow limits will be within, or reasonably comparable to, the range of flows described and analyzed in the DEIS.

COMMENT B.21:

"Exhibit E, Chapter 2

"2-104 Daily Operation

"It is unclear in this discussion whether the 2000 cfs daily variation in flow would occur only during summer or year round. If such flow changes may occur during winter, the impacts of such flows should be discussed."

RESPONSE:

The daily variation of not more than 2,000 cfs applies to summer operation to take advantage of the tributary flow contribution downstream from Watana to meet the flow requirements at Gold Creek. A 2,000 cfs flow variation from 6,000 cfs to 8,000 cfs would correspond to a water surface

RESPONSE TO COMMENT B.21 (cont.):

elevation change of 0.7 feet at Gold Creek. At higher flows, say 10,000 cfs to 12,000 cfs, a 2,000 cfs change in flow would result in a water surface elevation change of 0.5 feet at Gold Creek.

As stated in the FERC License Application (Volume 5A, page E-2-104), there will be a gradual change in daily flow to adjust to the changing seasonal and weekend energy demand. The magnitude of this change in flow and the impacts are currently under investigation.

Once minimum flow requirements have been established and agreed upon, <u>it is our opinion that a daily flow variation of 2,000 cfs at Gold Creek is not significant</u>, provided that the Gold Creek flow is always in excess of the established minimum flow requirement. In addition, if maximum winter flows are established, a 2,000 cfs daily variation should not be significant, provided that the maximum flows are not exceeded. The 2,000 cfs flow change is believed not to be significant because a 2,000 cfs daily change in flow often occurs naturally when Gold Creek flows are in the range of 8,000 to 15,000 cfs (i.e., the anticipated range of with-project flows). The associated stage change should be small enough that fish will not likely be stranded when flows are decreased.

COMMENT B.22:

"<u>Exhibit E, Chapter 2</u>

"2-118 <u>Watana Reservoir Modeling</u>

"Please reference our general comments regarding reservoir temperature modeling. Present data do not permit a range of temperatures to be projected, and no confidence limits can be established at this time. It would seem that modeling into the winter months would be important, as ice formation and break-up would affect reservoir temperatures and stratification."

RESPONSE:

Please refer to the Response to Comment B.6 for a description of the ongoing calibration and simulation studies. These studies will refine prediction of stream

RESPONSE TO COMMENT B.22 (cont.):

temperatures for extreme and average weather conditions as represented by air temperatures. As is indicated in the Response to Comment B.6, temperature simulations will be carried out throughout the year and will include simulation of ice formation and deterioration.

The expected accuracy of the model is explained in the License Application (page E-2-119) and more detailed results of the calibration process are contained in the Response to FERC Schedule B Request for Supplemental Information Nos. 39 and 40, referenced in the Response to Comment B.6.

REFERENCES

Alaska Power Authority, Response to FERC Schedule B Request for Supplemental Information on Exhibit E, Chapter 3 Nos. 39, 40 (1983), previously submitted to the FERC on September 1, 1983.

COMMENT B.23:

"Exhibit E, Chapter 2

"2-123 Talkeetna to Cook Inlet

"Recent study by the AEIDC indicates post project temperature change below Talkeetna."

RESPONSE:

The discussion on with-project temperatures downstream from Talkeetna in the License Application is not in conflict with the recent post-project temperature study by the AEIDC. As stated in the License Application, temperatures downstream from the confluence during summer will reflect the temperatures of the Talkeetna and Chulitna Rivers. Because the natural temperatures of the combined flows of the

RESPONSE TO COMMENT B.23 (cont.):

Chulitna and Talkeetna Rivers are cooler than the Susitna River, (License Application Figure E.2.75) summer temperatures will be cooler than natural conditions. This is verified by the AEIDC study. The Response to Comment B.38 presents a comparison of simulated pre-project temperatures and with project temperatures at the confluence and downstream at Sunshine. Summer temperatures in June and July are about 1°C lower than natural temperatures. August temperatures are approximately the same. In September the with-project temperature becomes warmer than the natural temperature. This is consistent with what is stated in the License Application.

REFERENCES

AEIDC, Susitna Hydroelectric Project, Draft Aquatic Impact Assessment: Effects of Project-Related Changes in Temperature, Turbidity, and Stream Discharge on Upper Susitna Salmon Resources During June Through September (1983), previously submitted to the FERC on October 3, 1983.

COMMENT B.24:

"Exhibit E, Chapter 2

"2-127 Talkeetna to Cook Inlet

"The impact of increased water elevations should be discussed here. Fish habitat may be beneficially or detrimentally affected by higher winter flow. As only limited fishery data exist for this reach, additional study is needed to describe potential impact."

RESPONSE:

Assessment of project-related impacts on aquatic resources has emphasized the middle and upper segments of the Susitna River (i.e., upstream of Talkeetna), as these areas would be subjected to the largest variation in discharge. Data do exist that are useful in evaluating impacts on the lower river, however (see License Application pages E-3-117 and E-3-122). To a large extent, such lower river data indicate that fish habitat in the river should not be significantly adversely impacted and, in fact, may be enhanced. Enhancement of lower river (i.e., Talkeetna to Cook Inlet fisheries is indicated by the following factors:

RESPONSE TO COMMENT B.24 (cont.):

(a) The increase in water flow is expected to increase the wintering habitat because of increased water depth and wider perimeter in the mainstem, side channel, side slough and tributary habitats.

(b) Since the water flow will remain fairly constant in the mainstem, increased fish and embryo survival may result from reduction of mortality associated with freezing.

(c) Increased surface flow in the side channels may also result in increased intergravel flow, which coupled with greater depths would benefit embryo development in overwintering juveniles.

(d) The effects of higher discharge in the mainstem should increase the areal extent of the backwater at the slough mouth creating greater water depth within the slough which may prevent a portion of the slough from freezing. This should likewise result in an increase in the availability of overwintering habitat associated with both slough and tributary mouths.

The increase in overwintering habitat will benefit both resident and anadromous species. The reduction of flow variability, peakflows, turbidity, and sediment load in the mainstem during summer, combined with increased winter flow, may lead to increases in the populations of some resident species, such as rainbow trout and Dolly Varden, and rearing anadromous species, such as chinook and coho salmon. A discussion of potential impacts on fish of higher winter flows in the Talkeetna to Cook Inlet reach of the Susitna River can be found in the License Application, pages E-3-117 and E-3-122. A summary of major downstream impacts, both beneficial and adverse, is presented in FERC License Application Table E.3.31, and is included below for your information.

Also, please refer to the Response to Comment B.8 for a more detailed discussion of the lower river, including existing information and future investigations which will address changes in habitats that may be caused by the proposed flow regime.

RESPONSE TO COMMENT B.24 (cont.):

License Application Table E.3.31

Major Impact Issues During Operation of Watana Reservoir Regarding Salmonids in the Talkeetna-to-Devil Canyon Reach[1]

Species	Passage Into Sloughs	Passage Into Tributaries	Reduced Slough Spawning Habitat	Reduced Ground Water Upwelling	Rearing in Mainstem	Over Wintering Habitat	Increased Winter Water Temp.	Decreased Mainstem Turbidity	Decreased Mainstem Scouring	Downstream Passage in Mainstem	Downstream Passage from Sloughs
Chum											
-Adult	-	o	-	-			-				
-Embryo				-			-		+		
-Juvenile								o		o	-
Sockeye											
-Adult	-		-	-							
-Embryo				-			-				
-Juvenile	-				o		-	+		o	-
Chinook											
-Adult		o	o								
-Juvenile	o	o			+	+	+	+	o	o	o
Coho											
-Adult		o	o								
-Juvenile	o	o			+	+	+	+	o	o	o
Pink											
-Adult	-	o	-	o							
-Embryo				o			-	+			
-Juvenile				o			-		o	-	-
Rainbow Trout											
-Adult	-	o	o	o		+	+	+	o	o	o
-Juvenile	o	o		o	+	+	+	+	o	o	o

Note: o = no impact
+ = beneficial impact
- = adverse impact
Blank = not present in the habitat considered.

COMMENT B.25:

"Exhibit E, Chapter 2

"2-148 Watana Operation/Devil Canyon Impoundment

"This section should present a discussion of the testing and commissioning of the Devil Canyon facility, if such would occur, similar to 4.1.2(c). Again, this section should discuss the impact of testing on flows (spills), dissolved gasses, and fisheries."

RESPONSE:

Please refer to Response to Comment B.12.

COMMENT B.26:

"Exhibit E, Chapter 2

"2-150 Water Quality

"As the operation of Watana in combination with Devil Canyon will differ significantly from Watana alone, it seems reasonable to assume that temperatures will also differ. The effect of peaking versus base load operation on outlet water temperatures should be considered. During filling of Devil Canyon, release for the second year will be near 4°C. This conflicts with the statement that little change in temperature will occur."

RESPONSE:

The referenced section refers to the filling of Devil Canyon reservoir. During the initial stage of filling and for the approximately one year period that the diversion tunnel is being plugged by concrete, mean weekly flows will be essentially unchanged from those that occur when Watana is operated alone since it is anticipated that minimal use will be made of the drawdown potential offered by Devil Canyon. This is because the total storage volume to elevation El. 1135 ft. (the maximum allowed level) is only 76,000 acre-feet (a total of 9 days of storage) and it is also necessary to maintain an appropriate depth of submergence at the outlet facilities at El. 930 ft. and El. 1050 ft. There may be some potential to release some water from storage during the month of August if it is necessary to provide

RESPONSE TO COMMENT B.26 (cont.):

environmental releases above the Watana powerhouse flow. However, the difference in Watana flow would likely not be much more than 1,000 cfs and this should not significantly impact the outlet temperature.

A partially full Devil Canyon reservoir affords the opportunity to use Watana for peaking and still maintain a constant flow release at Devil Canyon. Therefore, the Power Authority concurs that the effect of peaking versus base load operation on outlet water temperatures should be considered. However, we do not anticipate that the effects will differ significantly, for several reasons:

(a) Because the average daily flow should remain fairly constant, all variables affecting reservoir and outlet temperatures (other than the flow distribution at the powerhouse intake) will not be affected. That is, because of the great surface of Watana reservoir, the reservoir water surface will not fluctuate on a daily basis.

(b) As a result, net heat input or output to the reservoir and wind mixing will be unchanged.

(c) The only change from baseload operation will be the varied mixing caused by powerhouse operation. Since most of the intake water comes from the horizontal layer of water at the intake, there should be little effect on the oulet water temperature.

(d) If there are measurable effects, they will be buffered by the Devil Canyon reservoir.

During the five to eight weeks allowed for final filling of the reservoir from El. 1135 ft. to El. 1455 ft., the outlet temperatures from Watana may be affected because of the increased power flows. Approximately two million acre-feet of storage will be transferred from Watana reservoir to Devil Canyon reservoir, corresponding to about a 25 foot decrease in the Watana reservoir water surface elevation. Since the 5-8 week filling period will occur in the fall or winter (page E-2-149), Watana reservoir temperatures should be above 4°C (39°F) at the surface in early fall, near isothermal at 4°C (39°F) in late fall and below 4°C (39°F) near the surface in winter. Watana outflow temperatures during this period may be altered slightly (either above or below what would have resulted from pre-Watana powerhouse

RESPONSE TO COMMENT B.26 (cont.):

operation). However, by selecting the appropriate intake level it would be possible to provide outlet temperatures close to 4°C throughout the 5-8 week filling period. If filling is in early fall it may not be possible to provide as warm a temperature as during Watana operation, but in any event temperatures would be warmer than the existing temperatures. Conversely in filling in winter, it may not be possible to provide temperatures as low as would be provided by Watana alone. However, the winter temperature would be less than 4°C.

We do not agree that during filling of Devil Canyon, release for the second year will be near 4°C. We can find no reference to this statement in the Application. Therefore there is no conflict with the statement in the Application that little change in temperature will occur. Because the reservoir elevation will be at approximately El. 1135 ft. during the second year of filling, the retention time would only be about 4 days. Thus the opportunity for atmospheric heat exchange will be limited. This will be unlike the operation of the Devil Canyon fixed cone valves during project operation. Then, Devil Canyon reservoir will be at El. 1455 ft. The temperature at the cone valves will then be at or near 4°C. However, this will not be be the case during filling.

COMMENT B.27:

"Exhibit E, Chapter 2

"2-154 (i) Project Operation

"We understand that Harza-Ebasco, the prime contractor for Susitna Licensing, has revised the load demand and reservoir operating rule curves. New firm energy demand figures have been set at approximately 5900 GWL, down from the 7000 figure used in this application. The impact of this change is significant. Maximum releases for wet years may be drastically increased. Flows of 12,000 to 14,000 cfs during summer which were alleged to be marginal from an economic standpoint, may now be attractive.

"The impacts of this revision should be discussed at length, both here and in Exhibit B, Chapter 4. This change would appear to invalidate many of the constraints on fishery flow

COMMENT B.27 (cont.):

releases, and re-consideration of minimum flows would also be necessary."

RESPONSE:

The Power Authority has reviewed many aspects of the project, one of which is the load demand. To date, neither Harza-Ebasco nor the Power Authority have changed their estimation of the demand figures which are presented in the FERC License Application. Over the long term, the Power Authority anticipates that the 7,000 GWH figure will be a reality. Therefore, there is no need to require any revision in the Application.

COMMENT B.28:

"Exhibit E, Chapter 2

"2-164 River Morphology

"The impact of the two dam operational scenario on bed load movement and riverbed stability should be discussed. Should this impact severely degrade spawning habitat over time, mitigative measures will be necessary. What studies have been done or are being done to analyze this impact."

RESPONSE:

Riverbed aggradation and degradation problems in the Susitna River below Devil Canyon Dam have been studied and a draft report is presently available. The final report is expected in March 1984.

The results of these analyses indicate that channel degradation under post-project conditions will range from zero to 0.3 feet between Devil Canyon Dam and the confluence of the Susitna and Chulitna rivers, depending on the sub-reach. This is based on the assumptions that bedload inflow to a sub-reach would be negligible and that an armoring layer will develop on the streambed as small particles are sorted out and transported downstream. In the actual situation, there will be some bedload inflow from the tributaries and actual degradation would be even less significant.

The degradation analysis was made by using the mean annual flood as the dominant discharge. Since the dominant discharge for the cases of Watana-only and Watana-Devil

RESPONSE TO COMMENT B.28 (cont.):

Canyon are not significantly different, the long-term degradation for the two cases is expected to be about the same. The impact of the two dam scenario on bedload movement and riverbed stability will be approximately as described in the FERC License Application Sections 4.1.2(b) and 4.1.3(b).

REFERENCES

Harza-Ebasco, Susitna Hydroelectric Project, Reservoir and River Sedimentation, Draft Report (December 1983).

COMMENT B.29:

"Exhibit E, Chapter 2

"2-166 para. 4

"The projected temperature decrease attributed to hypolimnitic releases through the cone valves are based upon the 2010 power demand simulation. Using the 2002 power simulation, project releases and spills would occur more frequently and with greater magnitude. Therefore, downstream temperature changes would be more pronounced. Additionally, revised rule curves (see comment on 2-154 (i) Project Operation) would increase the amount of water spilled or released in some years and would further increase this impact. These considerations should be discussed."

RESPONSE:

Project releases and spills would occur more frequently and with greater magnitude at lower energy demands than used in the "2010" power demand simulation (7791 GWH demand). This is illustrated in Table E.2.58 of the FERC License Application where flow releases early in the project (year 2002, 5748 GWH demand) are compared with releases later in the project (year 2010).

In most cases the increased frequency and magnitude of releases would result in more pronounced downstream temperature changes (i.e., outflow temperatures lower than natural temperatures). The lower limit of these releases

RESPONSE TO COMMENT B.29 (cont.):

would be 4°C, since this will be the reservoir temperature at the depth where the fixed cone valves are located. This lower limit would occur if there is no powerhouse flow or no spillway flow. As powerhouse flows or spills are increased, the composite outlet temperature would be higher. See also, Responses to Comments B.22, B.23, and B.30.

The more pronounced temperature changes caused by the increased frequency and magnitude of releases may be significant in terms of the temperature changes. With a higher energy demand, there would be no releases during dry and average flow years, and therefore, summer outlet temperatures during the year may, for example, approximate 8°C. With a lower energy demand such as may occur in the early years after Devil Canyon powerhouse comes on-line, releases will occur about seven years in 10, instead of about the four years in 10 expected later in the life of the Project. In the years where releases would not occur with a higher energy demand, but would with a lower energy demand, releases will approximate powerhouse flows (see FERC License Application Table E.2.58). Using this as an example and assuming 4°C water is released from the cone valves and 8°C water is discharged through the powerhouse, the resultant outlet temperature would approximate 6°C. This would be significantly different from the 8°C outlet temperature example cited above.

During wet years, when releases occur irrespective of energy demand with higher energy demand levels, 6°C outlet or possibly 4°C outlet temperatures may occur (see FERC License Application Figure E.2.315). Therefore, the difference in outlet temperatures between higher and lower energy demand levels is that with a lower energy demand level, the frequency of occurrence of releases and, hence, potentially lower outlet temperatures is increased.

In comparing the year "2010" energy simulation with the year "2002" energy simulation, assuming 1981 flow data, it is not clear whether the downstream temperature change would be more pronounced. The 2010 simulation indicates a flow release of 26,900 cfs through the cone valves and of 8100 cfs through the powerhouse during the period of maximum release (August 19-25). The 2002 simultation indicates a release of 31,600 cfs through the cone valves and a powerhouse flow of 12,400 cfs through the powerhouse during the period of maximum release (August 12-18). Although the release through the cone valves is greater in the 2002 simulation, the powerhouse flow is also increased. Since the powerhouse flow is drawn from near the surface, the

RESPONSE TO COMMENT B.29 (cont.):

temperature will be higher. The net outlet temperature in the 2002 simulation is not calculable, but would probably be near the 4.7°C temperature predicted by the DYRESM model for the 2010 simulation. The temperature would probably be slightly warmer, but in any case, it would not be less then 4°C.

Rule curves revised because of the lower energy demand would not increase the amount of water spilled or released. The increased releases occur because of the decreased energy demand. The rule curves serve to optimize energy production based on historical flow information by minimizing flow releases and maintaining a high head. When the reservoir water surface elevation increases above the rule curve elevation, energy production is increased until either system energy demand is met or the reservoir elevation is lowered to the rule curve elevation. Therefore, with a lower system energy demand, the reservoir will tend to fill sooner if system energy needs are met by the project and more releases will occur.

COMMENT B.30:

"Exhibit E, Chapter 2

"2-167 para. 2

"We understand it is desirable to minimize the elevation of the cone valve outlet above the tailpool in order to minimize dissolved gas supersaturation. However, could the cone valve intakes be placed higher within the dam, as at Watana, to allow warmer epilmnitic waters to be accessed? This could reduce temperature impacts during releases."

RESPONSE:

The fixed cone valves at Devil Canyon serve three functions as indicated in the FERC License Application (page A-7-8):

1. To provide acceptable nitrogen supersaturation levels for releases resulting from floods having recurrence intervals of less than 50 years;

2. To provide an emergency drawdown for the reservoir should maintenance be necessary on the dam or appurtenant facilities; and

3. To act as a diversion facility during the latter part of the construction period.

The latter two of these uses require low-level intakes to the outlet works.

It would be possible to place additional intakes at a higher level at additional cost. For example, these intakes might be placed at El. 1365, 40 feet below the operating Devil Canyon water level. The temperature of the water at this level during the period July through October, when the majority of releases through the valves would occur, would be approximately 1.5°C warmer than at the current low intake level (Figures E.2.213, E.2.214). The License Application indicates the simulated project operation for year 2010 load forecasts and water year 1981 hydrologic and meteorologic conditions would give the lowest outflow temperatures of approximately 5°C. Based on the information contained in Table E.2.58, raising the temperature of the cone valve discharge by 1.5°C would raise the net outflow temperature to approximately 6°C, an increase of approximately 1°C.

COMMENT B.31:

"Exhibit E, Chapter 2

"2-167 Mainstem

"The discussion of temperature impacts presented in this section is based upon the model HEATSIM. Again, confidence in this model is low, as it does not allow for tributary input and was based upon data from water year 1981. This year was very unusual in that a relatively warm June was followed by a cool July. Results from HEATSIM show that maximum upstream movement of 0°C water would occur near RM 119 in mid-January. This front would remain there too briefly for significant ice formation to occur. This assessment should be re-evaluated in light of the new modeling efforts."

RESPONSE:

Please refer to Response to Comment B.6. The program for reservoir and stream temperature and ice studies is given therein.

COMMENT B.32:

"Exhibit E, Chapter 2

"2-169 (ii) Ice; Reservoir

"Formation and degradation of an ice cover on the Devil Canyon reservoir would seem to have important implication on reservoir temperatures, stratification, and downstream temperatures. This implies a need for temperature modeling of the reservoir beyond December 31.

"Ice modeling deficiencies have been discussed previously. Accordingly, we believe it is appropriate to re-evaluate the need for this modeling in light of the new riverine temperature model SNTEMP."

RESPONSE:

As discussed in the Power Authority's Response to FERC Schedule B Requests for Supplemental Information No. 28, a work plan is being implemented to refine the calibration of the DYRESM model using additional data obtained from the Eklutna Lake.

RESPONSE TO COMMENT B.32 (cont.):

An ice subroutine developed by Hamblin and Patterson (in preparation) has been incorporated in the DYRESM model and the model is being calibrated using Eklutna ice measurements from December 1982 to March 1983. (The ice subroutine has been extensively tested and improved by Hamblin on several Canadian lakes such as Kootenay Lake and Babine Lake in British Columbia and Char Lake on Cornwallis Island in Northwest Territories.) The calibrated model will be used in the temperature modeling for Watana and Devil Canyon beyond December 31 to take into account formation and melting of ice in the reservoirs.

REFERENCES

Alaska Power Authority, Response to FERC Schedule B Requests for Supplemental Information on Exhibit E, Chapter 2, No. 28 (1983), previously submitted to the FERC on September 1, 1983.

Hamblin, P. F. and J. C. Patterson, Modeling of Temperature Profiles in Lakes and Reservoirs Subject to Winter Ice Cover (in preparation).

COMMENT B.33:

"Exhibit E, Chapter 2

"2-170 Talkeetna to Cook Inlet

"At this time, ice conditions have not been modeled below Talkeetna and these statements remain unsupported. The impact of increased staging should be discussed here and the length of time ice formation could be delayed should be presented."

RESPONSE:

It is correct that ice conditions have not been modeled below Talkeetna. The Power Authority believes that the major change in ice regime will be in the reach from Watana to Talkeetna and therefore studies have been concentrated in this reach.

RESPONSE TO COMMENT B.33 (cont.):

However, ice conditions in the Lower Reach are discussed on pages E-2-90, E-2-127, and E-2-170 of the FERC License Application.

Because of the higher winter flows in the Lower River, the progress of the ice front upstream from the mouth is expected to be slower. This is likely to lead to thicker ice near the mouth and somewhat thinner ice near Talkeetna. The thicker ice near the mouth is not expected to produce large stage increases because of the large number of channels in the lower river and the high discharge capacity.

The total volume of ice delivered to the Lower River is expected to be reduced with-project because the large contribution of ice from upstream of Watana will be eliminated with the Project in place.

Please also refer to Response to Comment B.6.

COMMENT B.34:

"<u>Exhibit</u> <u>E</u>, <u>Chapter</u> <u>2</u>

"2-171 (v) <u>Total</u> <u>Dissolved</u> <u>Gas</u> <u>Concentration</u>

"We do not agree that "no supersaturated conditions will occur downstream from the Devil Canyon Dam." Spills will occur periodically, for which no gas mitigation is proposed. The cascade spillway design, which would reduce gas supersaturation during spills, was rejected. Additionally, the cone valves remain untested in their proposed size and configuration. At best, they will prevent any <u>increase</u> in gas concentration from occurring. In a report on nitrogen supersaturation (Acres, 1983) investigating the impact of eliminating cone valves at Watana, the author notes "Determination of the initial saturation level below Watana has not been finalized due to uncertainties in the effect on dissolved gas saturation of powerhouse operations, outflow water temperatures and distance of fall and depth of water plunge below the dam. High volume spills falling over the spillway could cause significant scour in the plunge pool below the dam. Supersaturation levels resulting from entrained air bubbles going into solution as water plunges through the depth of this scour hole could yield the (supersaturation) values on the upper end of this range."

COMMENT B.34 (cont.):

Should such values occur, supersaturated water is likely to be passed through Devil Canyon."

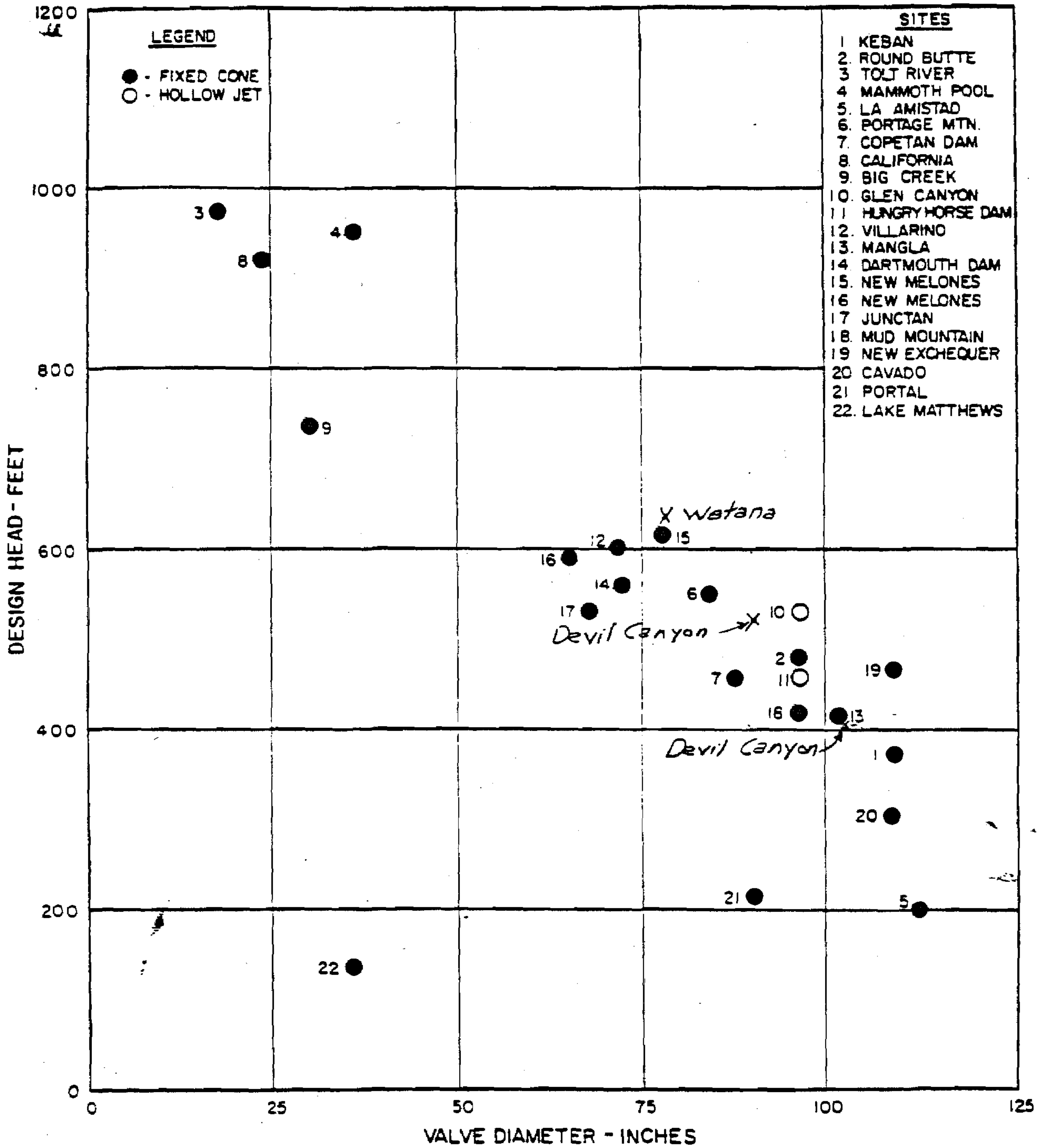
RESPONSE:

The FERC License Application (page E-2-171) indicates that for floods having a recurrence interval of greater than 50 years, the spillway would be operated, in addition to the powerhouse and fixed cone valves. In this case, the discharge passing over the spillway flip bucket would enter the river and may become supersaturated. The amount of supersaturation of the total release from Devil Canyon Dam would depend on the ratio of the spillway flow to the flow through the cone valves and powerhouse.

The FERC License Application indicates that for floods having a recurrence interval of less than 50 years, releases from Devil Canyon Reservoir would be made with the powerhouse and fixed cone valves, thus minimizing the potential for nitrogen supersaturation (page E-2-187). The expected performance of the cone valves with respect to preventing downstream nitrogen supersaturation was verified through prototype tests at Lake Comanche as documented in the Lake Comanche Dissolved Nitrogen Study, by Ecological Analysts, Inc., incorporated by reference in the FERC License Application (page E-2-188). The performance of the fixed cone valves with regard to minimizing downstream nitrogen supersaturation is expected to be similar to that reported in this study. Hydraulic computations documented in a memorandum prepared by Acres American, Inc. for the FERC License Application indicate that the jet issuing from the cone valves would plunge less than one foot into the tailwater. The expected supersaturation from this plunge would be less than 3 percent based on the rule of thumb of 3 percent supersaturation for every foot of plunge below tailwater level.

The characteristics of the fixed cone valves at Watana Dam (78-inch diameter, maximum head 625 feet) and Devil Canyon Dam (102 inch diameter, maximum head 405 feet and 90-inch diameter, maximum head 525 feet) are plotted on a graph of world experience with fixed cone and hollow jet valves (see Figure B.34.1). Note the valves proposed for the Susitna Project do not represent significant departures from the world experience. However, experience with large valves at high loads is somewhat limited. In addition, the manifold

Figure B.34.1



FREE DISCHARGE VALVE
EXPERIENCE PLOT

FIGURE 1

ACRES

RESPONSE TO COMMENT B.34 (cont.):

arrangement at Watana is not common. In order to provide conservatism in design to minimize the potential for vibration induced damage to the valves, they are designed to operate at approximately 80 percent of their capacity. This is similar to a restriction on valves at New Melones. During detailed design of the valves, careful consideration of vibration will be included in determining valve component strengths and in designing the manifold at Watana.

The cascade type spillway considered for Watana Dam was rejected in the Feasibility Report for technical and economic reasons. A summary of the Watana layout selection is given in Volume 1, Section 9, of the Susitna Hydroelectric Project Feasibility Report. The cascade spillway, which would be expected to reduce nitrogen supersaturation, was rejected in favor of the fixed cone valve, and conventional spillways. Although it is generally thought that the cascade spillway does not produce excessive nitrogen supersaturation, we know of no conclusive evidence that this is true.

The report which is quoted in this Comment was supplied to the FERC as part of its Request for Supplemental Information dated April 12, 1983 (page 31, Item 1). The passage cited is incomplete and represents the expected conditions if fixed cone valves are not utilized at Watana Dam. The full quote is given below:

> Determination of the initial saturation level below Watana has not been finalized due to uncertainties in the effect on dissolved gas saturation levels of powerhouse operations, outflow water temperatures, and distance of fall and depth of water plunge below the dam. An expected range of supersaturation values has been tested and the results shown on Table 1. Review of limited available literature indicates that levels could exceed 155 percent; for the Watana dam 110 and 155 percent represents the expected range assuming no fixed-cone valves are used. High volume spills falling over the spillway could cause significant scour in the plunge pool below the dam. Supersaturation levels resulting from entrained air bubbles going into solution as water plunges through the depth of this scour hole could yield the values on the upper end of this range.

The quoted report provided the basis for maintaining the fixed cone valves in the project layouts. The use of fixed

RESPONSE TO COMMENT B.34 (cont.):

cone valves to minimize nitrogen supersaturation at Watana Dam is given in the FERC License Application (page E-2-132).

REFERENCES

Ecological Analysts, Inc., Lake Comanche Dissolved Nitrogen Study (1982).

Acres American, Inc., Nitrogen Supersaturation Studies Memorandum (September 13, 1982).

Acres American, Inc., Susitna Hydroelectric Project Feasibility Report, Volume 1, Section 9 (1982), previously submitted to the FERC on March 15, 1982.

COMMENT B.35:

"Exhibit E, Chapter 2

"2-181 6-Mitigation, Enhancement, and Protective Measures

"The key mitigation feature concerning anadromous fisheries impacts is the establishment of a downstream release schedule which avoids or minimizes habitat loss. We do not feel that the suggested minimum flows will meet this objective, nor do we believe that a satisfactory range of potential flows has been considered. It is apparent that several significant project modifications are imminent, and that these may change the economics of the project and, in turn, the availability of water for in-stream uses. The DEIS should present a complete analysis of potential flows comparing their effect on both fish habitat and economics."

RESPONSE:

Suggested minimum flows are subject to negotiation pending the results of present and future environmental impact studies. Proposed minimum flows were selected according to criteria listed on pages E-2-55 through 64, and were selected from a range of seven flow scenarios. Three additional scenarios were considered in responses to FERC comments that were submitted to the FERC in July 1983 as supplemental information to the License Application. For additional responses to flow regime comments, please refer to Responses to Comments F.2 and F.3.

For responses to comments on project changes, see Responses to Comments B.1-B.4.

COMMENT B.36:

"Exhibit E, Chapter 2

"2-186 para. 3

"The concept of providing a low-level portal to reduce temperature impacts during the second year of filling was being considered by the APA. What was the outcome? This paragraph implies that this mitigation feature has been dropped."

RESPONSE TO COMMENT B.36:

The consideration of a low-level outlet portal has been dropped from further consideration. The consideration of the low-level portals were an option to mitigate potential impacts of altered water temperature to fish populations downstream of the proposed project which could occur only during certain periods of the second year of initial reservoir filling. However, the costs for including the structure were considered excessive for the low potential for impact suggested by the predicted temperatures and the extremely brief period involved.

COMMENT B.37:

"Exhibit E, Chapter 3:

"The discussions of Species Biology and Habitat Utilization would be greatly improved by inclusion of the 1982 and 1983 fisheries research done by the Alaska Department of Fish and Game (ADFG), AEIDC, and others. Information on juvenile salmonids is limited, particularly for the lower river. Future study emphasis should be directed below, as well as above Talkeetna. The use of this reach by salmonids is poorly studied, other than for migrations. For example, recent ADFG studies have shown juvenile chum salmon may spend as much as three months in freshwater prior to outmigration, and that sloughs within the upper and lower river may provide important rearing habitat. This rearing would take place following emergence from mid-April to June, a period when significant reductions in flow will occur in the lower Susitna. Today, we have no data which quantify this use, or from which we can identify impacts to habitat brought on by lowered flows and water levels."

RESPONSE:

To the extent possible, data collected in the 1982 field season were included in the FERC License Application. Additional data and analyses, including quantification of the response of juvenile rearing habitats to flow variation upstream and downstream of Talkeetna, are presented in the ADF&G 1982 Phase II Reports, 1983; ADF&G 1982 Synopsis Report, 1983; and the AEIDC Preliminary Aquatic Habitat Assessment Report all of which were submitted to FERC October 31, 1983.

RESPONSE TO COMMENT B.37 (cont.):

Reduction and analysis of the data collected in the 1983 field season is currently being performed. Since these data had not been collected at the time the FERC License Application was submitted, they could not be incorporated in the discussion. For the most part, the 1983 data will enable a refinement of the information and analysis presented in the FERC License Application.

Data pertaining to juvenile salmon rearing habitats both upstream and downstream of Talkeetna are presented in the ADF&G 1982 Synopsis Report. Habitat relationships (i.e., habitat quality indices vs. mainstem flow) are presented for sloughs, tributary mouths and side channels in Appendix F of the Synopsis Report. The relationships are presented for the following study areas:

Species	Sites Upstream of Talkeetna	Sites Downstream of Talkeetna
Chinook	Whisker's Creek and Slough	Goose Creek and Side Channel Rabideoux Creek and Slough Birch Creek and Slough
Coho	Lane Creek and Slough 8	Sunshine Creek and Side Channel Birch Creek and Slough
Sockeye	Slough 8A Slough 19	Birch Creek and Slough
Chum	Lane Creek and Slough 8 Slough 6A	Birch Creek and Slough

It is obvious that the use of the reach of the Susitna River downstream from Talkeetna has been studied extensively for aspects other than migration.

These studies have not been directed toward specific species of juvenile salmon. However, results of the studies seem to place considerable emphasis on chinook salmon juveniles. Chum salmon do not appear to be emphasized principally because they were not present in these habitats in sufficient numbers to allow analysis. One could infer then that chum salmon are not particularly prone to using these

RESPONSE TO COMMENT B.37 (cont.):

habitat types. In fact, it appears from the discussion of the results presented in Appendix F of the 1982 Synopsis Report (1983) that chum salmon juveniles use a broader range of habitats than the other three species.

Results of the 1983 field studies will determine to what extent chum juvenile rearing does occur in fresh water and will provide additional information on the types of habitats in which the juvenile chum are found and how these habitat types respond to changes in mainstem discharge.

As demonstrated in the ADF&G Phase II Reports, considerable information is available to quantify the use of the lower river habitats by salmon and how these habitats will respond to changes in mainstem discharge.

REFERENCES

ADF&G, Susitna Hydro Aquatic Studies Phase II Report, Synopsis of the 1982 Aquatic Studies and Analysis of Fish and Habitat Relationships (1983), previously submitted to the FERC on October 31, 1983.

AEIDC, Susitna Hydroelectric Project Draft Aquatic Impact Assessment: Effects of Project-Related Changes in Temperature, Turbidity, and Stream Discharge on Upper Susitna Salmon Resources During June Through September (1983), previously submitted to the FERC on October 31, 1983.

COMMENT B.38:

"<u>Exhibit</u> <u>E</u>, <u>Chapter</u> <u>3</u>

"3-101 para. 3

"Recent modeling by the AEIDC indicates that temperature changes may exist below Talkeetna. Turbidities would likely increase in winter."

RESPONSE TO COMMENT B.38:

A comparison of simulated Susitna River temperatures for natural conditions and one- and two-dam operational cases as developed by the AEIDC for the Power Authority is given below for locations downstream of the confluence with the Chulitna River. These numbers are scaled off of Figures 10 and 11 of the preliminary report on the effects of project-related changes in temperature, turbidity, and stream resources during June through September (AEIDC, 1983) which was transmitted to the FERC on 10/31/83. (The final version of this report, incorporating agency comments, should be available by March, 1984.)

Table 1

Location	Month	Natural Condition Temperature (°C)	Operational Temperatures One Dam (°C)	Operational Temperatures Two Dam (°C)
Chulitna	June	9.1	8.0	7.9
Confluence	July	9.0	8.4	8.0
	August	8.4	8.4	7.6
	September	5.9	6.8	6.7
Sunshine	June	9.0	8.2	7.9
	July	8.8	8.2	8.0
	August	8.3	8.2	7.6
	September	5.9	6.7	6.6

The Response to Comment B.16 summarizes natural temperature ranges and Susitna River temperatures downstream of the Susitna-Chulitna confluence during Watana filling, as taken

RESPONSE TO COMMENT B.38 (cont.):

from the above referenced report, is given below. A preliminary estimate of the impact on salmon of these temperature changes is given in the previously referenced report.

Table 2

MONTH	SIMULATED PRE-PROJECT TEMPERATURE RANGE		SIMULATED TEMPERATURE RANGE SECOND YEAR OF FILLING		
	MAXIMUM	MINIMUM	COLD	AVERAGE	WARM
JUNE	10.3	8.2	7.8	7.9	9.2
JULY	11.2	9.0	8.4	9.5	10.2
AUGUST	10.2	7.9	7.1	8.0	9.0
SEPTEMBER	6.1	4.3	4.3	5.5	5.7

As can be noted from Table 1, the maximum differences between natural and with-project conditions are 1.1°C and 1.2°C for the month of June for one-dam and two-dam operational cases.

The context of the referenced paragraph (page E-3-101, paragraph 3) apparently refers to the open-water season. During the open-water season, the high suspended sediment concentration of the Chulitna River will dominate the turbidity downstream of the confluence. Even though Susitna River turbidity is expected to decrease upstream of the confluence, the FERC License Application indicates (page E-3-101) that "* * * high turbid flows in the Lower Susitna River may still inhibit fish passage at times as well as limit benthic production * * *." The expected increase in winter turbidity levels is discussed in the License Application (E-2-129 to E-2-131). The AEIDC report discusses the potential impacts of changes in turbidity levels.

REFERENCES

AEIDC, Susitna Hydroelectric Project, Draft Aquatic Impact Assessment: Effects of Project-Related Changes in Temperature, Turbidity, and Stream Discharge on Upper Susitna Salmon Resources During June Through September (1983), previously submitted to the FERC on October 31, 1983.

COMMENT B.39:

"Exhibit E, Chapter 3

"3-102 para. 3

"The statement that (flow) reductions less than 10 percent are not expected to impact fish is not supported in the absence of any data regarding habitat value changes with incremental flow. Significant flow changes will exist in the lower river for at least seven months of the year."

RESPONSE:

The statement of no significant impact to fish habitat as a result of a nine percent decrease in flows must be put into perspective with respect to the context in which the statement is made. First of all, the statement was made in reference to flow at the Sunshine Gaging Station at the Parks Highway Bridge and it was made in reference to flow reductions which are anticipated during October in the first and second years of the Watana Reservoir.

Under existing conditions, the mean monthly average flow at the Sunshine Station is 13,966 cfs as shown for October in Table E.2.9 of the FERC License Application. Monthly average flows for October at the Sunshine Station varied from 18,555 cfs to 9,416 cfs during the 32-year period of records used for the analysis. Based on this range and mean of the monthly averages, the habitats in this reach of the river encounter as much as a 32 percent increase or as much as a 33 percent decrease in flow from year to year. A 10 percent reduction in the mean monthly average flow is well within the range experienced at the Sunshine Station under natural conditions as is a 26 percent reduction.

Further analysis using discharge rating curves (R&M Consultants, Figure B.39.1; USGS, Table B.39.2) indicates that a 10 percent reduction in the mean monthly average flows (13,966 cfs reduced to 12,570 cfs) translates to a water surface elevation change of approximately 0.25 feet or 3 inches. Similarly, a 10 percent reduction of the highest recorded monthly average flow (18,555 cfs reduced to 16,700 cfs) translates to a water surface elevation change of approximately 0.3 feet or 3.6 inches and a 10 percent reduction of the minimum recorded monthly average flow (9,416 cfs reduced to 8,475 cfs) translates to a water surface elevation change of approximately 0.2 feet or 2.5 inches. A similar analysis can be performed for other months in which decreases will be expected with somewhat similar results.

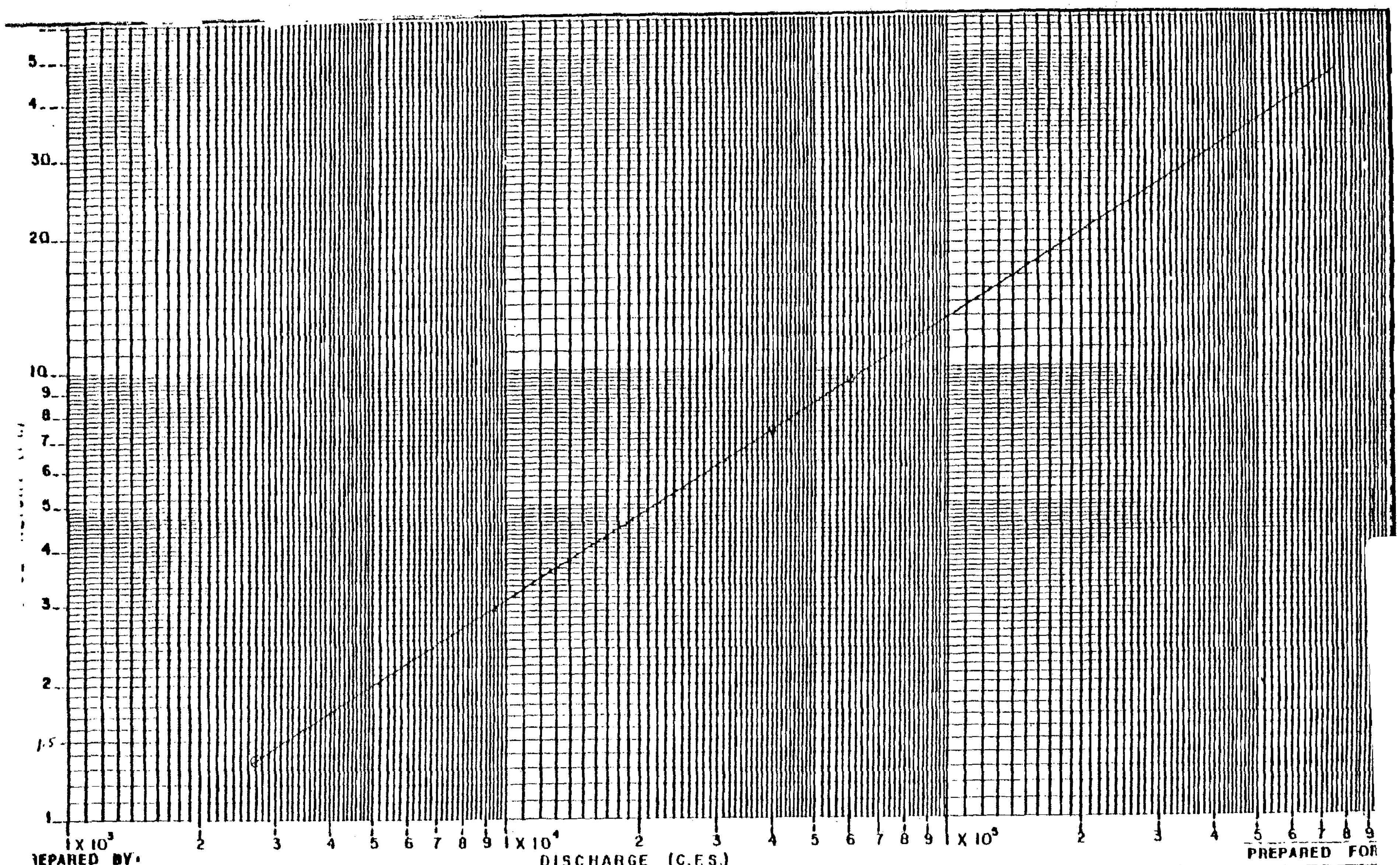


Figure B.39.1

PREPARED BY:

PREPARED FOR

R&M CONSULTANTS, INC.

RATING CURVE FOR SUSITNA RIVER AT SUNSHINE

FIG. A.2

ACRES

9-210
(Rev. 2-67)

UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY (WATER RESOURCES DIVISION)

Sta. No. 15292780

Table No. 01

Begin __ __ __ __ (YR. MO. D. HR.)

Rating table for SUSITNA RIVER @ SUNSHINE, ALASKA

from ______ to ______, from ______ to ______, from ______ to ______

Gage height	Discharge	Difference	Gage height	Discharge	Difference	Gage height	Discharge	Difference	Gage height	Discharge	Difference	Gage height	Discharge	Difference	Gage height	Discharge	Difference	Gage height	Discharge	Difference
Feet	Cfs	Cfs	Feet	Cfs	Cfs	Feet	Cfs	Cfs	Feet	Cfs	Cfs	Feet	Cfs	Cfs	Feet	Cfs	Cfs	Feet	Cfs	Cfs
.00			3.00	9640	500	5.00	21,900	700	7.00	37,200	800	9.00	55,900	1000	11.00	77,000		13.00	99,700	1200
.10			.10	10,100		.10	22,600		.10	38,000	900	.10	56,700		.10	78,100		.10	101,100	
.20			.20	10,600	500	.20	23,300		.20	38,960		.20	57,900		.20	79,200		.20	102,300	
.30			.30	11,100	600	.30	24,000		.30	39,600		.30	58,700		.30	80,300		.30	103,500	
.40			.40	11,700		.40	24,700		.40	40,900		.40	59,900		.40	81,900		.40	104,600	
.50			.50	12,300		.50	25,400		.50	41,600		.50	60,960		.50	82,500		.50	105,900	
.60			.60	12,960		.60	26,100	700	.60	42,300		.60	61,100		.60	83,600		.60	107,100	
.70			.70	13,560		.70	26,800	800	.70	43,000		.70	62,200		.70	84,100		.70	108,300	
.80			.80	14,100		.80	27,600		.80	44,300		.80	63,960	1000	.80	85,600		.80	109,500	
.90			.90	14,700		.90	28,400		.90	45,200		.90	64,960	1100	.90	86,900		.90	110,700	1200
.00			4.00	15,300		6.00	29,200		8.00	46,100		10.00	66,000		12.00	88,000	1100	14.00	111,900	1310
.10			.10	15,700		.10	30,000		.10	47,900		.10	67,100		.10	89,100	1200	.10	113,800	
.20			.20	16,500		.20	30,800		.20	47,460		.20	68,200		.20	90,300		.20	114,660	
			.30	17,100		.30	31,600		.30	48,900	1100	.30	69,300		.30	91,500		.30	115,680	
			.40	17,760		.40	38,401		.40	49,100		.40	70,400		.40	92,800		.40	117,100	
			.50	18,400		.50	33,260		.50	50,950		.50	71,500		.50	93,900		.50	118,700	
			.60	19,100		.60	34,500		.60	51,900		.60	72,600		.60	95,100		.60	119,700	
			.70	19,800		.70	34,900		.70	52,900		.70	73,700		.70	96,300		.70	121,000	
			.80	20,000		.80	36,600		.80	53,100		.80	74,800		.80	97,500		.80	132,300	
.90			.90	21,200	700	.90	36,800	800	.90	54,100	1000	.90	76,900	1100	.90	98,100	1200	.90	123,600	1300

From
River Hydrology
R+M

6 Jan.
TJd.

Table B.39.2

This table is applicable for open-channel conditions. It is based on 5 discharge measurements made during 1981

and is FAIRLY well defined between 14,000 cfs and 100,000 cfs.

$Q = 1723 (G - 0)^{1.59}$

Comp. by ____ date ____

Ckd. by ____ date 11-19-81

RESPONSE TO COMMENT B.39 (cont.):

It must further be noted that these water surface elevation changes in this reach are maximized since the river at the gaging station is restricted relative to the river channel upstream and downstream of the station.

Habitat relationship curves for juvenile salmonids are available for this reach of the river (ADF&G, Phase II Synopsis Report (1982)).

REFERENCES

ADF&G, Susitna Hydro Aquatic Studies Phase II Report, Synopsis of the 1982 Aquatic Studies and Analysis of Fish and Habitat Relationships (1983), previously submitted to the FERC on October 31, 1983.

COMMENT B.40:

"Exhibit E, Chapter 3

"3-131 Mainstem Habitats

"The statement that the ice front is expected to form between Talkeetna and Sherman conflicts with the statement on page 2-169 which projects open water during winter for the Devil Canyon to Talkeetna reach."

RESPONSE:

FERC License Application Section 2.3.2(c)[ii] (page E-3-131) paragraph 3 is in error. The correct description of the ice front is found in FERC License Application Section 4.2.3 (c)[ii] Devil Canyon to Talkeetna (page E-2-169). FERC License Application Figures E.2.218 to E.2.222 show the expected Susitna River temperatures for the reach between Devil Canyon Dam and the Chulitna River confluence for the period October 15 to April 30. Impacts resulting from the altered ice conditions are discussed under Operation of Watana Dam (FERC License Application Section 2.3.1(c)[ii] page E-3-106).

Operation Impacts (FERC License Application Section 2.3.2(d)[iii]) should also be corrected. The first paragraph on page E-3-134 should read:

> "The most significant downstream impact resulting from the addition of Devil Canyon Dam will be the change in winter water temperature, which will cause the Susitna River between Devil Canyon and Talkeetna (RM 99) to be ice-free. The river stage in this reach will be lower than the stage present under an ice cover. This change will reduce available habitat in areas that previously formed an ice cover, as was discussed for impacts associated with Watana Dam (Section 2.3.1(c))."

Current studies of ice and temperatures are described in the Response to Comment B.6. These studies will allow a better representation of potential ice-related impacts downstream of Devil Canyon Dam.

COMMENT B.41:

"Exhibit E, Chapter 3

"3-149 2.4 - Mitigation Issues and Mitigating Measures

"The NMFS has reviewed those evaluation species proposed by the U.S. Fish and Wildlife Service and concur with their selection. We believe it is important to include sockeye here, as this species is important within the lower river. Its elimination from the evaluation species list exemplifies the lack of concern over lower river impacts."

RESPONSE:

Sockeye salmon are an important species within the Susitna Basin and have been extensively studied in conjunction with other species. For example, sockeye are sampled by fishwheels and outmigrant traps, during spawning ground surveys, and during rearing studies. As a result, a considerable amount of information has been developed on this species, primarily from ADF&G 1982 and 1983 field studies (ADF&G 1983). Continuing studies will refine this information. Therefore, the noninclusion of sockeye on the evaluation species list should not be interpreted as evidence of a lack of concern for this species.

As part of their life cycle, sockeye require a lake for rearing and generally spawn in nearby inlet or outlet streams of these lakes. The vast majority of the sockeye in the Susitna Basin are found to spawn and rear in these types of habitat. None of these types of habitat are expected to be potentially impacted by the project.

Existing information indicates that sockeye utilize the mainstem downstream from Talkeetna primarily as a migratory corridor, moving to spawning areas and outmigrating from rearing areas. Sockeye salmon that are found in the Talkeetna to Devil Canyon reach utilize sloughs for spawning. These fish comprise less than approximately two percent of the total escapement to the Susitna Basin (see FERC License Application Figure E.3.8 of Exhibit E, Chapter 3). According to ADF&G, it is probable that these fish are strays from the Chulitna and Talkeetna watersheds rather than being a separate stock.

The fry produced from these spawners either move down to the Lower Susitna River to overwinter or do not currently survive in the upper river (ADF&G 1983).

RESPONSE TO COMMENT B.41 (cont.):

Since other species, primarily chum salmon, are more numerous and spawn in areas (sloughs, side-channels and mainstem) potentially affected by the project, the sockeye were not selected as one of the evaluation species. It is anticipated, however, that mitigations proposed to maintain productivity of the other species (again, primarily chum salmon) should allow sockeye to be maintained as well (see FERC License Application Exhibit E, Chapter 3, page E-3-149).

REFERENCES

Alaska Department of Fish and Game, Susitna Hydro Aquatic Studies Phase II Report, Vol. 2, Appendix 2-H (1983), previously submitted to the FERC on October 31, 1983.

COMMENT B.42:

"Exhibit E, Chapter 3

"3-150 2.4.3. Mitigation of Construction Impacts Upon Fish and Aquatic Habitats

"As previously stated, we have not received a design criteria manual or a construction practices manual and are not aware that either document is presently being developed."

RESPONSE:

Exhibit E, Chapter 3, Section 2.4.3 of the License Application discusses a Design Criteria Manual as it would address protection of natural resources.

The FY 1985 budget includes funding for preparation of a design criteria manual. No design activity is planned until, after July, 1985 (FY 1986 budget). Thus, the Design Criteria Manual can be completely reviewed and commented upon by agencies prior to any design activity.

The intent of the Deisgn Criteria Manual is to draw together into a single volume design criteria which incorporate inputs from environmental analysts. Treating these criteria

RESPONSE TO COMMENT B.42 (cont.):

early in the process and in a generic manner will enable the Power Authority to establish a standard of performance over many project activities that would otherwise be dealt with by numerous case by case decisions. It is anticipated that resource agencies will review and comment on appropriate portions of the Manual through their permitting role or because of their expertise. Exhibit E, Chapter 3, Section 2.4.3 of the License Application identifies a number of activities that would be treated by the Design Criteria Manual. For example: stream crossings, culvert design and installation, erosion control, material removal and site reclamation.

In a comparable manner, the Construction Practices Manual would address various construction or operational activities. For example: spill prevention and control, hazardous waste storage and control.

The Power Authority intends to have a Construction Practices Manual prepared prior to any construction activity. This manual would be the joint product of the Design Consultant and a yet to be selected Construction Manager. Current planning envisions selection of a Construction Manager at least one year before construction begins. It is anticipated that resource agencies will have the opportunity to review and comment on the Construction Practices Manual prior to any construction activities, and that construction specifications would include by reference both the Design Criteria and Construction Practices Manuals.

The Design Criteria Manual, the Construction Practices Manual and, as required, contract specifications will define performance standards and facilities specifications for the protection of environmental resources that bidders must incorporate into their bids.

COMMENT B.43:

"Exhibit E, Chapter 3

"3-161 (ii) Measures to Avoid Impact

"We question the conclusion that, of the three factors contributing to access, the project will only affect the stage at the mainstem. Post-project changes may include vegetative encroachment, high velocity scouring, diminished flood flow, and altered ice processes; any of which could

COMMENT B.43 (cont.):

impact channel geometry. Slough flow could be altered by decreased groundwater flow attributable to lowered mainstem stage."

RESPONSE:

The FERC License Application (pages E-2-112 and E-2-113) discusses the potential for impacts on channel geometry and slough flow resulting from project operation including those resulting from aggradation at the entrance of sloughs and vegetation encroachment. The FERC License Application (page E-3-165) also discusses access mitigation measures which will be employed if the access is adversely impacted and project flows in August do not create sufficient water depth to affect these impacts.

The Power Authority anticipates that the DEIS will discuss these factors based on reasonably available data.

COMMENT B.44:

"Exhibit E, Chapter 3

"3-162 Winter Flow Regime (October-April)

"Productive sloughs that will be overtopped more frequently than once every five years will be protected." How would these sloughs be identified? It would seem that this determination would require precise knowledge of the ice front location and the effect of ice staging on water elevations. Is this information available?

"Limited winter flows could be considered to reduce the potential of overtopping."

RESPONSE:

The License Application (page E-3-163) indicates that productive sloughs designated 8, 8A, 8B, 8C, Moose, A[1], B, 9, 9A and II would need protective berms to prevent overtopping by ice induced water stage increases in the winter. This determination was based on the ice simulations carried out for the FERC License Application and provided a conservative estimate for the purpose of estimating the cost of this mitigation measure. A more accurate determination of the sloughs requiring protective berms can be made when

RESPONSE TO COMMENT B.44 (cont.):

the results of current instream ice studies are available. These studies are described in the Response to Comment B.6. Briefly, these studies will simulate ice front progression and water surface staging for cold, average and warm winters. Based on results of these studies and flood frequencies under post project conditions, sloughs subject to berm overtopping more frequently than once in five years can be determined. Monitoring of slough conditions during project operation also will provide additional information which may indicate where sloughs for which protective berms should be constructed.

Please refer to the Response to Comment B.20 for a discussion on the establishment of maximum winter flows.

COMMENT B.45:

"<u>Exhibit</u> <u>E</u>, <u>Chapter</u> <u>3</u>

"3-163 para. 1

"We cannot find slough B within the other license documents or supporting literature."

RESPONSE:

Slough B is a minor slough associated with the upstream berm complex of Slough 8A between rivermiles 126 and 127. The location is identified on Figure E.3.15 from Volume 6B, Exhibit E, Chapter 3 of the FERC License Application.

A more detailed map with the location of Slough B can be found in the ADF&G Phase II Final Report, referenced below, Appendix Figure 2-G-3, page A-251.

REFERENCES

ADF&G, Susitna Hydro Aquatic Studies Phase II Report, Volume 2, Adult Anadromous Fish Studies, 1982 (1983), Appendix Figure 2-G-3, page A-251, previously submitted to the FERC on October 31, 1983.

COMMENT B.46:

"<u>Exhibit</u> <u>E</u>, <u>Chapter</u> <u>3</u>

"3-165 para. 1

"Are short-term augmented flows during the spawning season being proposed here? Again, it is difficult to understand exactly what flow releases are being considered. We would appreciate reviewing the criteria by which the referenced sloughs were selected for rectifying measures. The DEIS should state which measures each slough is to receive, the reasoning behind each measure, and the expected impacts to

COMMENT B.46 (cont.):

those sloughs not receiving this treatment. Sloughs 16 B, 20, and 22 all are expected to have acute access problems at project flows. Why have these not been included? Conversely, no access problems are foreseen for slough 11, yet it is to be modified. To our knowledge most of these sloughs have not been sufficiently examined to allow for identification of specific impacts; e.g., berm overtopping access problems, and reducing upswelling."

RESPONSE:

Short-term augmented flows are not presently proposed in the FERC License Application. The Power Authority has proposed to mitigate impacts to salmon spawning areas by measures that will maintain access (see page E-3-165 of License Application) and spawning habitat (page E-3-166). As part of the on-going analysis of flows required to maintain aquatic habitats (see Response to Comment B.7), the Power Authority will identify the necessity, for magnitude and duration of such short-term augmented flows.

The criterion used for selection of sloughs to be maintained was the level of use by spawning salmon (see FERC License Application Table E.3.12). As stated in the application, Sloughs 8, 8A, 8B, 8C, Moose, A, B, 9, 9B, 9A, 11, 17 and 21 supported over 97 percent of the chum and over 98 percent of the sockeye that spawned in sloughs in 1981 and 1982. Sloughs 16B, 20 and 22 were not considered for maintenance as spawning areas because of the present low escapement of spawning salmon (see Table B.46.A).

At the time the FERC License Application was submitted, the analysis of access into Slough 11 had not been performed. The results of the analysis are presented in Appendix B of the ADF&G 1982 Synopsis Report. Based on this analysis, it is likely that Slough 11 will not need modification to assure accessibility to spawning habitat by adult salmon. This, as well as other information resulting from ongoing studies, will be used to continually refine the environmental assessment and the mitigation plan.

At this time, data necessary to determine some of the types of modification described in the License Application exists and could be utilized to modify most of the side sloughs and some of the upland sloughs (see Volume 4 of the ADF&G 1982 Phase II Basic Data Report and the ADF&G 1982 Synopsis Report). For example, on a tentative basis, modifications

RESPONSE TO COMMENT B.46 (cont.):

to maintain access will most likely be necessary for Sloughs 9, 20 and 21. Specific identification of modifications to be made for each potentially impacted slough is dependent upon the quantification of the response of these sloughs to flow and temperature changes in the mainstem and results of the ice modeling and groundwater upwelling studies.

Table B.46.A

Peak Counts of Adult Salmon Observed in Sloughs 16B, 20B, and 22B in 1981 and 1982

	Chum		Sockeye		Pink	
	81	82	81	82	81	82
Slough 16B	0	0	0	0	0	0
Slough 20B	14	30	2	0	0	64
Slough 22B	NI[1]	NI	NI	NI	NI	NI

[1]NI - No information

Source: ADF&G 1981 (Anadromous Adult Report of 1981 Data).
ADF&G 1983 (Anadromous Adult Report of 1982 Data).

REFERENCES

ADF&G, Susitna Hydro Aquatic Studies Phase II Basic Data Report, Volume 4, 1982 (1983), previously submitted to the FERC on October 31, 1983.

ADF&G, Susitna Hydro Aquatic Studies Phase II Report, 1982 Synopsis (1983), previously submitted to the FERC on October 31, 1983.

COMMENT B.47:

"Exhibit E, Chapter 3

"3-165 Access Mitigation

"Which eight sloughs are being proposed for access depth modification? Why were these sloughs selected?"

RESPONSE:

As discussed in the Response to Comment B.9, it was determined that depth modification or some other type of habitat modification at eight sloughs would provide sufficient spawning habitat to mitigate for the anticipated loss of spawning habitat due to project operation. Specific sloughs targeted for habitat modification have not as yet been assigned.

COMMENT B.48:

"Exhibit E, Chapter 3

"3-165 para. 3

"What slough(s) was examined for the design criteria presented? What is the depth of excavation required for each slough?"

RESPONSE:

As discussed in the Responses to Comments B.9 and B.47, specific sloughs have not been selected for habitat modification. The design criteria presented stem from our understanding of habitat conditions which provide suitable spawning habitats. This understanding is derived from detailed studies conducted at Sloughs 8A, 9, 11 and 21, and from literature pertaining to habitat modifications performed in the U.S. and Canada.

COMMENT B.49:

"Exhibit E, Chapter 3

"3-166 Spawning Habitat Mitigation

"Again, the design criteria presented here concern us. What is the source of these data and how were they derived? At this time we are unsure as to the probability or magnitude of this impact, yet four (4) sloughs are to be modified, producing 48,240 square feet of spawning habitat. More discussion is necessary and should await the results of further analysis of the interaction of groundwater and the mainstem."

RESPONSE:

As stated previously in the Response to Comment B.9, the mitigation plan provides for as many as four systems to augment groundwater upwelling. These systems may be placed in sloughs or in other habitat types as necessary. The four systems are designed to provide as much as 48,240 sq. ft. of upwelling area if this is necessary. The assumption of four systems was made to evaluate the potential costs of this type of modification option.

COMMENT B.50:

"Exhibit E, Chapter 3

"3-167 Scarifying Side-Channels

"The criteria by which four (4) sites were selected for this mitigation should be presented and the sites identified."

RESPONSE:

The mitigation plan as presented in the License Application provides for scarification of four side channels. Designation of which side channels will be scarified depends on which side channels might provide suitable depth and velocity characteristics for spawning by salmon. Again it was determined that by scarifying approximately four side channels, additional suitable spawning areas could be provided. Specific selection of sites to be scarified may occur prior to construction of the dam. However, it may be preferable to await regulation of the river to decide which side channels would benefit most from scarification. Please refer to the Response to Comment B.9.

COMMENT B.51:

"Exhibit E, Chapter 3

"3-168 Slough Gravel Cleaning

"Why are three sloughs to be cleaned per year?"

RESPONSE:

The cleaning of each slough on a yearly basis will probably not be necessary to maintain spawning habitats. If eight sloughs are selected for habitat modification and it is determined that possibly four additional sloughs would be benefited simply through cleaning, then cleaning three sloughs each year would provide the desired frequency of cleaning (once every four years for each slough). Please refer to the Response to Comment B.9.

COMMENT B.52:

"Exhibit E, Chapter 3

"3-168 Mainstem Spawning Beds

"The criteria by which two (2) sites for this work were selected should be presented, and the sites identified."

RESPONSE:

Few spawning sites have been identified in the mainstem Susitna upstream of Talkeetna. Thus, it was determined that, if maintenance of spawning habitat were performed at two sites, sufficient habitat would be provided to maintain existing levels of mainstem spawning by adult salmon. The selection of the specific sites to be maintained depends on preferred habitat characteristics of the salmon and the condition available in the mainstem. Please reference the discussion presented in the Response to Comment B.9 for further details on the application of the maintenance procedures.

COMMENT B.53:

"Exhibit E, Chapter 3

"3-169 para. 1

"We are not aware of an ongoing project to analyze candidate areas for mainstem spawning bed creation. Who is performing this study?"

RESPONSE:

During the 1983 field season a reconnaissance study was performed to identify potential mainstem sites for maintenance of spawning habitats. This study was done by E.W. Trihey & Assoc., R&M and Harza-Ebasco. These sites consisted of locations downstream of islands in the main channel. Substrate samples were collected by R&M and Harza-Ebasco for analysis of particle size distributions. Additionally, preliminary bed load and suspended sediment analyses were performed to evaluate the stability of the river bed under with-project conditions. A report of these analyses is currently in preparation and will be provided to the FERC when finalized. Please refer to the Response to Comment B.9.

COMMENT B.54:

"Exhibit E, Chapter 3

"3-170 Measures to Minimize Impacts

"It is not clear when this paragraph is discussing Watana or Devil Canyon."

RESPONSE:

The entire paragraph refers to both the Watana and Watana/Devil Canyon. Watana will have a four-level structure while Devil Canyon will have a two-level structure (see FERC License Application Chapter 2, section 4.2.3 (c)(i), page E-2-166). As stated, the two-level structure does not allow as much flexibility as that at Watana, but the stable water surface at Devil Canyon precludes the need for additional intakes.

COMMENT B.55:

"Exhibit E, Chapter 3

"3-178 para. 1

"What is meant by the term 'enhanced slough'? Would only these sloughs be bermed?"

RESPONSE:

The term "enhanced slough" refers only to those sloughs that are structurally protected or altered to maintain production, as discussed in the FERC License Application on pages E-3-177-178. Either enhanced or unaltered sloughs may be bermed if it is determined this would help maintain productivity.

COMMENT B.56:

"Exhibit E, Chapter 3

"3-182(a) Impact Monitoring of Salmon Populations

"Would continuation of existing fisheries programs also meet the need of a long-term monitoring program? It may be desirable to establish a specific study which is tailored to these needs, and is more sensitive to changes within fish populations."

RESPONSE:

The complexity and extensiveness of the existing fisheries programs is greater than necessary for a project-related, long-term monitoring program. Appropriate elements of the existing programs will be incorporated into proposed long-term monitoring programs. Additionally, results of the existing programs, including data gathered for the evaluation of impacts, will be used to design an efficient monitoring program.

As outlined in FERC License Application Chapter 3, Section 2.6.2(a) and (b) (page E-3-182), proposed monitoring programs will be sensitive to changes in fish populations. Continuous reevaluation and redirection of the proposed study will be necessary to ensure proper utilization of those study elements best designed to reflect fish sensitivity and to produce study efficiency. Extensive agency input will be requested and will be considered at every step in designing the with-project fish monitoring program.

COMMENT B.57:

"Exhibit E, Chapter 3

"3-183 (i) Monitoring Slough Modifications

"What monitoring efforts would be expended on those slough (and side channels) not receiving any modifications? These areas will continue to offer some fish habitat and should also be provided for in the monitoring program. Periodic removal of beaver dams, vegetation, or silts/debris may be desirable. We are concerned with the apparent narrow scope of this program, as it seems to consider only certain areas above Talkeetna."

RESPONSE:

The monitoring of unmodified sloughs would be a portion of the post-project monitoring program discussed in FERC License Application Section 2.6.2(a), page E-3-182. This monitoring program will be designed primarily to estimate the adult escapement into the reach upstream from Talkeetna. Maintenance of all sloughs and side channels is not envisioned because (1) it is anticipated that alternative habitats will become available lower in the floodplain, and (2) the mitigation features proposed are expected to provide sufficient habitat to maintain the present level of spawning.

Also, details of the monitoring program are not final and unmodified sloughs and side channels could be included in the program, if warranted. Certainly this monitoring program will not consider only the area above Talkeetna.

The issue of beaver control illustrates the potential for conflicting objectives which need to be addressed by resource managers. For example, should sloughs be managed for beaver habitat or fishery purposes? The Power Authority's intent, as outlined in the Application, has been to manage for the fisheries resource in the more productive sloughs and to allow the natural course of events to continue in the less productive sloughs. This approach may be modified as the mitigation details are refined and agencies determine their management goals. Removal of silt

RESPONSE TO COMMENT B.57 (cont.):

and debris was considered in Exhibit E (pages E-3-167, 168) of the FERC License Application.

COMMENT B.58:

"Exhibit E, Chapter 3

"3-185 Monitoring of Fixed-Cone Valves

"This monitoring program is either poorly described or inadequately designed. A 'one-time evaluation' of its effectiveness is insufficient for any analysis. Would the dissolved gas concentration of the reservoir waters near the cone valve intake be measured at this time? Will the valves' operational impacts on downstream temperatures be monitored?"

RESPONSE:

A detailed plan to monitor the effectiveness of the cone valves in reducing or eliminating potential supersaturation conditions will be developed and coordinated through consultation with the various resource agencies. The one-time evaluation referred to in the FERC License Application will be performed during a period that will encompass various sets of conditions (e.g., various combinations of releases from cone valves and the powerhouse will be tested). The evaluation will be performed just after the Watana Dam valves become operational and will be repeated when the Devil Canyon valves are completed.

The monitoring during this evaluation period will include determinations of dissolved gas concentrations in reservoir waters near the cone valve intake to determine baseline saturation conditions and measurements at various sites downstream. Tentatively these downstream sampling sites would be located:

(a) Immediately downstream of the valves;

(b) At the downstream end of Devil Canyon;

(c) At Gold Creek; and

(d) At Talkeetna.

Although water temperatures are not expected to be altered due to passage through the valves, measurements of

RESPONSE TO COMMENT B.58 (cont.):

temperature will be made at each sampling site, primarily for calculating the percent saturation of dissolved gasses in the water (dissolved gas saturation varies in relation to temperature and pressure).

COMMENT B.59:

"Exhibit E, Chapter 3

"3-180 2.6. Monitoring Studies

"Regarding the interagency monitoring team, at this time there can be no assurance that such a team could exist. Budget and manpower constraints are likely to limit participation, and long-term agency involvement could not be assured due to changing priorities and budgets. This concept would require considerably more detailed refinement before it can be seriously proposed as an integral part of any mitigation effort."

RESPONSE:

Working details for the interagency monitoring team would have to be clearly established before becoming a formal part of mitigation plans. This refinement of the team concept would appropriately be negotiated as part of the settlement process and would be premature at this time.

COMMENT B.60:

"Exhibit E, Chapter 3

"3-182 2.6.2 Operational Monitoring

"It appears that all monitoring effort will take place above Talkeetna. This program would not be able to identify any impact to the rest of the Susitna River, or to develop appropriate mitigative measures. Specific discussion is needed here which outlines the monitoring effort below Talkeetna."

RESPONSE:

With-project monitoring will be conducted to evaluate salmon population and production levels both above and below Talkeetna to the extent necessary to ensure that the level of predicted impact is not exceeded. Additional monitoring will be conducted to evaluate the effectiveness of mitigation programs. With-project monitoring will, at a minimum, consist of enumerating returning adults at mainstem stations and performing index surveys of population in key tributaries. Monitoring will also evaluate whether any changes in population size, species composition, and habitat use have occurred and whether the required level of mitigation is being attained.

This program will probably include a periodic evaluation of the effectiveness of the habitat modification and fish production programs that may be adopted. The mitigation and monitoring program will be updated on a yearly basis as additional data are available. The preliminary monitoring program presented in the FERC License Application will be updated by summer of 1984. Agency input will be solicited and pertinent aspects will be incorporated into this program.

The Alaska Department of Fish and Game typically has a variety of monitoring programs ongoing in the lower river (between Talkeetna and Cook Inlet), especially in the key tributaries such as the Deshka and Alexander sloughs. The Department also periodically conducts users' surveys of Susitna community harvest and use of fish and game. Results of these ongoing data-gathering efforts will be used to set up an appropriate monitoring program. The program established will be coordinated with ongoing ADF&G efforts in the lower river. See Response to Comment B.8 for additional information.

COMMENT B.61:

"Exhibit E, Chapter 10

"As previously stated, we believe those design changes being considered and/or requested by the APA should be described here. At this time we are not sure which of these modifications will become part of the design proposed for licensing and which are potential alternatives. During the Susitna scoping session held in Anchorage this year, a request was made for the full range of project alternatives to be presented within a matrix allowing for direct comparison of impacts with the proposed plan. We support this request."

RESPONSE:

The Power Authority has been reviewing the possibility of proposing some design refinements which would not materially change the development of the project. In our opinion these potential refinements are only refinements of the details and could not be considered as major alternatives. The proposed matrix could not provide a direct comparison of impacts since each alternative has its own characteristics. The existing FERC License Application Exhibit E, Chapter 10, provides an indication of environmental effects for alternative hydroelectric sites and various thermal plants which can be compared to the effects of the Susitna Hydroelectric Project. Please also refer to Response to Comment B.2.

The Power Authority anticipates that the DEIS will describe and analyze all reasonable project alternatives (see Response to Comment F.39).

COMMENT B.62:

"Exhibit E, Chapter 10

"10-31 2.1.1. Division/Emergency Release Facilities

"The proposed release levels do not avoid adverse affects on the downstream salmon fishery."

RESPONSE TO COMMENT B.62:

For additional information on this topic, please refer to FERC License Application Exhibit E, Chapter 2, pages E-2-57 through 65, plus the Response to Comment B.7.

COMMENT B.63:

"Exhibit E, Chapter 10

"10-32 2.1 Watana Facility Design Alternatives

"It is not clear why the cascade spillway was dropped from consideration. How were the economic costs evaluated against the biological gains created by reduced gas saturation levels? We understand that the APA is considering eliminating the emergency spillway, combining it with the main spillway. This feature is not addressed. How would such a modification affect spillway operation and gas supersaturation?"

RESPONSE:

The cascade spillway at Watana Dam was eliminated from further consideration for technical and economic reasons as documented in the "Susitna Hydroelectric Project Feasibility Report," Volume 1, Section 9. Minimization of nitrogen supersaturation downstream of Watana and Devil Canyon Dams is to be accomplished with fixed cone valves as documented in the FERC License Application (pages E-2-132, E-2-171, E-2-187) and the Feasibility Report (pages 9-45, 10-24). More information on the fixed cone valves is provided in the Response to Comment B.34.

The use of fixed cone valves in conjunction with the powerhouse to pass floods is expected to result in acceptable nitrogen supersaturation levels for floods with recurrence intervals of less than 50 years as documented in the FERC License Application (page E-2-187) and as shown by prototype tests at Lake Comanche referenced in the FERC License Application (page E-2-188). A cascade spillway might provide acceptable nitrogen supersaturation levels for floods having recurrence intervals of greater than 50 years. However, as noted in the Response to Comment B.34, we know of no conclusive evidence that the cascade spillway will not produce excessive nitrogen saturation. The cost of the cascade spillway scheme is at lease $110,000,000 more than the scheme with the cone valves (Feasibility Report,

RESPONSE TO COMMENT B.63 (cont.):

Volume 1, Section 9, pages 9-44) and there are potential problems concerning the geotechnical aspects of the cascade spillway (as documented in the Feasibility Report). It was judged that the potential biological impacts from nitrogen supersaturation occurring at a frequency of less than once in 50 years would not justify the expenditure of $110,000,000.

The Power Authority is considering eliminating the fuse plug emergency spillway and increasing the capacity of the main spillway. A decision to implement this change and reflect it in the FERC License Application has not yet been made. The main spillway discharge would not change for any flood having a recurrence interval of less than 10,000 years. In particular, the function of the fixed cone valves would not change. Therefore, there would be no expected increase in nitrogen supersaturation for any flood of less than one in a 10,000-year frequency.

<u>REFERENCES</u>

Acres American, Inc., Susitna Hydroelectric Project Feasibility Report, Volume 1, Section 9 (1982), previously submitted to the FERC on March 15, 1982.

COMMENT B.64:

"<u>Exhibit E, Chapter 10</u>

"10-33 3.2.1 <u>Installed Capacity</u>

"Devil Canyon is to be operated <u>primarily</u> as a base loaded facility. When would any other mode of operation occur? What would be the conditions/events necessary to require a different operational mode at Devil Canyon?"

RESPONSE:

Devil Canyon will be operated within the confines of a range of acceptable downstream flow regimes. Under the project plan as presented in the FERC License Application, this will dictate that the plant be operated primarily as a base-loaded facility. The Power Authority anticipates that the full range of flow regimes will be analyzed in the DEIS prepared under applicable NEPA guidelines.

COMMENT B.65:

"Exhibit E, Chapter 3

"10-105 3 Alternative Operating Scenarios

"Much of the discussion within this section would seem to be invalidated by recent developments. Energy demand forecasts have changed significantly since this selection process occurred. New reservoir operations model and reservoir rule curves are, apparently, being considered. Minimum downstream flow requirements which minimize adverse impact to fishery resources have yet to be established. The results of the AEIDC modeling effort, expected in 1984, would allow for these recommendations to be developed. We believe this discussion should be revised in light of these events."

RESPONSE:

While refinements in acceptable flow regimes versus operating economy are being and will continue to be considered, the Power Authority is confident that the Susitna Project can be operated in a manner consistent with both economic and environmental goals without major changes in project configuration. The Power Authority anticipates that the DEIS and FEIS will analyze a full reasonable range of alternative operating scenarios.

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Response Of
Alaska Power Authority To
November 7, 1983 License Application Comments
Of
United States Department of Commerce,
National Marine Fisheries Service

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FEDERAL ENERGY REGULATORY COMMISSION

SUSITNA HYDROELECTRIC PROJECT

PROJECT NO. 7114

RESPONSE OF

ALASKA POWER AUTHORITY

TO

OCTOBER 31, 1983 LICENSE APPLICATION COMMENTS

OF

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY,

REGION X

U.S. ENVIRONMENTAL PROTECTION AGENCY

REGION X

1200 SIXTH AVENUE

SEATTLE, WASHINGTON 98101

P 7114

REPLY TO ATTN OF: M/S 443

October 31, 1983

Kenneth F. Plumb, Secretary
Federal Energy Regulatory Commission
825 No. Capitol Street, N.E.
Washington, D.C. 20426

RE: Susitna Hydroelectric Project--FERC #7114
Final EIS Scoping Recommendations

Dear Mr. Plumb:

We have completed reviewing the final application for license submitted by the Alaska Power Authority for its proposed Susitna Hydroelectric Project. Based on this review, we have developed detailed scoping recommendations for the Draft EIS which FERC is preparing on the license application. These recommendations are enclosed as our Final Scoping Report.

Although we received Scoping Document II (SDII) during our review of the license application, we did not have time to conduct a detailed review of it because we had to concentrate our resources on the voluminous license application. However, we did note, in our brief review of the document, that our previous recommendation that the effects of water quality changes on salmon migration be treated as a primary issue has been ignored. SDII provides no explanation of this non-response. As you will see from the water quality and fisheries sections of the enclosed report, we still consider this to be a primary issue and, absent an explanation from FERC, assume that it will receive correspondingly thorough treatment in the EIS.

In addition to fisheries related questions, our Scoping Report discusses several other important aspects of the EIS. First, it notes several ways in which the economic analysis of the Susitna Project, and the alternatives to it, could be refined and improved. Second, it discusses our recommendations regarding the make-up of the alternative generating scenarios that should be evaluated in the EIS.

Third, it contains detailed recommendations regarding modeling water quality changes in the proposed reservoirs. Although no such detailed recommendations are provided for modeling of downstream water quality changes, such modeling is equally important for a project of this size and complexity.

We appreciate this additional opportunity to participate in the development of this EIS. Should the FERC staff have any questions about our scoping recommendations, they should contact Daniel Steinborn, Chief, EIS & Energy Review Section, at (FTS) 399-1754.

Sincerely,

Daniel Steinborn, for

Richard R. Thiel, P.E., Chief
Environmental Evaluation Branch

Enclosure

cc: J. Mark Robinson, OEPR (FERC)
EPA, AOO
U.S. FWS, Anchorage

SUSITNA HYDROELECTRIC PROJECT
FERC PROJECT # 7114

ENVIRONMENTAL IMPACT STATEMENT SCOPING REPORT

U.S. Environmental Protection Agency
1200 Sixth Avenue, M/S 443
Seattle, Washington 98101
October 31, 1983

Susitna EIS--EPA Scoping Recommendations

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Susitna EIS--EPA Scoping Recommendations

This report presents EPA's final scoping recommendations for the EIS which the Federal Energy Regulatory Commission (FERC) is developing on the license application for the proposed Susitna Hydroelectric Project (FERC No. 7114). It is based on a detailed review of the license application conducted for EPA by Jones & Stokes Associates and Tetra Tech. Topics not mentioned have not been reviewed in detail. An absence of comments or recommendations on a subject should not be interpreted as acceptance of its proposed treatment in the EIS.

1. PURPOSE and NEED

This section presents our detailed comments and recommendations on the objectives of the project and the magnitude of the need for additional generating capacity within the project's service area. The definition of project objectives and the estimation of capacity requirements is critical to a NEPA environmental review, because, taken together, they define the range of feasible project alternatives which should be evaluated in the EIS.

1.1 Project Objectives

[C.1] The EIS should set forth a clear, concise and comprehensive statement of project objectives. Since the Susitna Project has been set forth as a preferred alternative by APA, the objectives should clearly reflect the basis for that preference. For instance, an objective appears to be to remove most existing thermal power sources from baseload production; another may be to provide the least costly power supply possible. APA's objectives should be clearly stated. A clear statement of objectives is essential if the EIS is to evaluate the degree to which each alternative will meet project goals. A matrix-type display would present an excellent summary of such an evaluation.

1.2 Load Forecasts

[C.2] The four functionally interrelated models used to forecast electricity demand provide a comprehensive framework for energy planning. The variables selected for modeling future economic conditions and electricity consumption appear appropriate and generally complete.

[C.3] For the most part, economic assumptions appear reasonable and are sufficiently substantiated with data. Certain assumptions and conclusions, however, which affect results of the analysis are questionable. These concerns are addressed below.

1.2.1 Scope and Application of Sensitivity Tests

[C.4] Although the values selected to test results of the economic forecasting (MAP) (Table B.126) and Railbelt Electricity Demand (RED) (Tables B.127-B.131) models appear to be representative of likely high and low limits, the application of the test results to impact analysis is limited. While the effect from fluctuations in the value of any one variable may not be significant when compared to variations in oil prices, the cumulative effect from changes in several of these variables could be significant. Scenarios in which the values of key economic and electricity use assumptions differ from the Reference Case values should be explored in more depth. Identification of the different magnitudes of impact between oil prices and other factors (e.g., annual real wage growth, annual price level growth) is needed to justify exclusion of variables other than oil prices in developing alternative load forecasts.

[C.5] Additionally, it is probable that variations in world oil prices would affect some of the other key factors which are assumed to be constant under all world oil price scenarios. For example, alternative world oil price scenarios would probably result in different values for employment in certain industries (e.g., petroleum) and for model parameters (e.g., labor force participation rate). The impact of alternative world oil prices on factors assumed to be constant should be discussed.

[C.6] The time period used for the sensitivity analysis of results of the MAP Model (Table B.126) should be extended at least to the year 2010. This would provide consistency with the sensitivity analyses on the RED model results and also would provide a more complete assessment of potential variability in model results.

1.2.2 Labor Force Participation Rate

[C.7] For the MAP model, the labor force participation rate identified in Table B.92 (.9338) does not agree with the rate identified in Table J.1 (.78) as the "most likely" rate. Because of the significance of this rate to model results, it is important that the correct rate be used consistently.

1.2.3 Program-Induced Conservation

[C.8] The decision to exclude estimates of program-induced conservation impacts from the RED model in the study is not sufficiently supported with data. Several reasons are given for not including program-induced conservation impacts, including: existing conservation programs are being phased out; there are many uncertainties in long-term government conservation programs; and reliable data to estimate additional electricity savings beyond that which would be induced by market forces alone are limited for the Railbelt area.

Although these reasons (as well as additional information presented in Appendix B, Volume 2C) may be valid for some energy planning projects, the significant and long-term implications of the Susitna Project to energy planning in Alaska warrant a detailed examination of potential energy impacts from ambitious (i.e., program-induced) conservation programs.

[C.9] As identified, program-induced conservation is projected to account for 40 percent of all electricity savings between 1981 and 1987 within the Anchorage Municipal Light & Power service area. This suggests that similar savings may be achieved elsewhere within the Susitna market area. Consequently, similar, but longer term, projections should be developed for all service areas. Lack of reliable data, considerable uncertainty, and noncomparability with conservation programs elsewhere do not mean that potentially important program-induced conservation impacts may be excluded from the analysis. The analysts preparing the EIS must use the best data available to develop a reasonable estimate of the potential for cost-effective conservation. The EIS should include this estimate and a discussion of the uncertainties associated with it.

1.2.4 World Oil Price Forecasts

[C.10] The world oil price scenarios used to develop alternative load forecasts all assume a continuous increase in price (with the exception of the first few years) at relatively stable rates for long periods. Based on the pattern of world oil prices over the past 10 years, a more cyclical growth in world oil prices could be expected. This type of growth in world oil prices could significantly affect load forecasts and also economic feasibility. The impact on load forecasts from a world oil price scenario based on cyclical growth (e.g., Sherman H. Clark Associates' base case) should be examined.

2. ECONOMIC EVALUATION

[C.11] The economic assumptions used in the evaluation of the Susitna Project and the best thermal alternative generally appear reasonable. Values for key factors such as the discount rate and the cost and fuel escalation rates appear to be appropriate, given current economic conditions.

[C.12] The evaluation relies on a "net economic benefit" approach to determine economic feasibility. The net economic benefit approach, as used in this analysis, depends on certain implicit conditions. First, all relevant costs associated with the two projects (i.e., "with Susitna" and "without Susitna") are assumed to be included. Because project objectives (e.g., least cost energy, minimal economic impacts) are not clearly specified, identification of all relevant costs is difficult. The second implicit assumption is that the benefits resulting from the two projects are equivalent, since only present worth costs are considered. These two necessary conditions provide the analytical framework for the specific concerns discussed below.

2.1 Sensitivity of Present Worth Costs to Project Delays

[C.13] Based on alternative load forecasts, the Devil Canyon Project could be delayed up to 5 years under the -2 percent case. It is stated in Sections 4.8 and 4.9 (Exhibit D, Volume 1) that sensitivity analyses indicate that such a delay would not significantly affect the economic analysis of Susitna. The results of the sensitivity analyses should be presented in the EIS to support this conclusion.

2.2 Sensitivity of Susitna Net Benefits

[C.14] Under Reference Case assumptions, net economic benefits of the Susitna Project exceed $1.8 billion. As indicated in the sensitivity tests, the project results in net costs only when the Department of Revenue and the -2 percent oil price forecasts are assumed. Analyses of the project under all other conditions assumed in the sensitivity tests result in net benefits.

Although net benefits result when different values of individual variables are tested, the cumulative effect from simultaneous adjustments to economic parameters is not examined. Based on the
[C.15] results in Table D.28, it appears that a net cost scenario has a relatively high probability of occurring if different values are assumed for several variables. Because different oil prices would be likely to have some effect on other factors, a discussion of the relationship between variable oil prices and other key economic factors is needed.

2.3 Opportunity Cost of State Financial Subsidy

If a $1.8 billion state appropriation is used to finance the Susitna Project, the opportunity cost of these state funds should be included as a cost to the project. As stated (Section 6, Exhibit D, Volume 1), the
[C.16] Susitna Project is a long-life, capital-intensive project which means a sizable "inflationary financing deficit." Unless state equity is included to meet the "inflationary financing deficit," consumers may be burdened with unacceptably high early-year costs.

The need for or use of an equivalent state appropriation to finance development of the "best thermal alternative" does not appear likely
[C.17] because of reliance on smaller, less capital-intensive plants over a longer period of time. Consequently, the opportunity cost (e.g., foregone uses of these public funds) of the state appropriation potentially included in the Susitna Project should be evaluated.

2.4 Long Term Production Costs

To estimate long term (year 2021 to year 2051) production costs, the analysis assumes that the production costs for the final study year (2020) would simply recur, with the exception of fuel escalation for the subsequent 31 years. This assumption is made because the development of future load forecasts and generation alternatives necessary to model the system for this additional period is "beyond the extent of normal
[C.18] projections."

While this statement may be valid, some additional discussion is needed on the relative production costs of large-scale hydroelectric projects versus smaller thermal plants. Cost data on past and currently operating hydroelectric and thermal plants should be presented to support the assumption that final year production costs associated with each system are representative, in relative cost terms, for subsequent years.

[C.18] (Cont.) This analysis seems particularly important in light of the assumption that fuel prices will continue to escalate after the year 2020, an assumption which increases the present worth cost of the hermal alternative.

2.5 Decommissioning Costs

[C.19] The net costs (or net revenues) associated with decommissioning existing plants are not identified. The replacement function of the Susitna Project suggests that decommissioning costs would be more significant under the "with Susitna" plan. Further evaluation is needed.

2.6 Centralized and Decentralized Power Systems

20] The "Net Economic Benefit" approach used in the economic evaluation implicitly assumes that benefits resulting from the two projects are equivalent. Two areas in which project-related benefits are unequal are flexibility to adapt to changing conditions and system performance under unusual conditions. The resource commitment associated with the Susitna Project clearly provides less flexibility to adapt to new technologies or economic conditions than does reliance on the more decentralized thermal alternative. Also, production costs associated with a more centralized system, such as the Susitna Project, are more susceptible to low probability, high risk occurrences (e.g., sabotage, mechanical break-down) than a decentralized system. Thus the EIS should contain a thorough evaluation of electrical supply system reliability which accounts for these differences in generating system reliability, as well as any differences in transmission system reliability that would result from developing a distributed decentralized system. Additionally, the impact of unusual climatic conditions on the cost of electricity from Susitna should be discussed.

The flexibility issue is of central importance. The Pacific Northwest Power Planning Council selected an "options strategy" in which the Bonneville Power Administration would obtain options on future generating plants in order to maintain flexibility. This flexibility allows the utility to adjust to changing future conditions, which alter capacity requirements, with ease and at minimal cost because capital is not locked up in project construction until the utility is much more certain about its needs.

2.7 Loss of Recreation Benefits

The development of the Susitna Project is projected to increase the number of annual recreation days within the project area. A recreation mitigation plan has been developed to accommodate the increased demand for recreation.

[C.21]

Although an increase in the amount of recreation as expressed in recreation days can be assumed from the analysis, the net economic effect associated with the project and mitigation plan is not examined. Because whitewater raft trips and salmon fishing are commonly recognized to result in more net benefits per recreation day than boating or fishing in a reservoir, the total net economic effect from development of the project should include recreation costs.

3. PROPOSED ACTION and ALTERNATIVES

[C.22] The application presents a broad range of alternatives to the Susitna Project. The alternatives are evaluated in relatively shallow depth, however, and deficiencies exist in the sections on alternative hydroelectric sites and alternative electrical energy sources. Additional alternative evaluation work is needed for the EIS. The EIS should include identification of alternatives comparable to the Susitna Project and should evaluate them in an even-handed manner.

[C.23] The application lacks a range of comparable electrical generation scenarios to be evaluated. The EIS should present a series of complete generation scenarios reflecting a full range of possible electrical demands and a realistic mix of alternative generating technologies. Graphics for each scenario similar to Figure E.10.3 would be most helpful. The scenarios, including the Susitna Project, should be evaluated environmentally to equal depth. The evaluation should include testing the ability of each scenario to meet the objectives of the project.

[C.24] The Susitna Project should be compared side-by-side with other alternatives in these analyses. Such an evaluation will assist the reader in comparing a range of choices and understanding the implications of each choice.

3.1 Conservation

[C.25] Meaningful conservation should be included in selected generating scenarios, including at least one Susitna scenario. In addition to evaluation on an equal footing with other scenarios, an evaluation should be provided to show the effects of conservation on the need for and phasing of the Watana and Devil Canyon units.

3.2 Alternative Hydroelectric Sites/Systems

[C.26] The EIS should evaluate hydroelectric alternatives of comparable magnitude to Susitna. The application identifies alternative hydroelectric development plans yielding a maximum of 778 MW installed capacity (Plan A.5, Table E.10.12). This is less than half the total installed capacity of the Susitna Project, and only three-quarters of the Watana Project alone.

27] The screening used in the application should be reevaluated in the EIS to identify whether the criteria used to eliminate candidate hydroelectric sites in the application document are comparable to criteria used to evaluate the Susitna site.

[C.28] The results of screening the candidate hydroelectric sites imply that not only does the Susitna Project represent the sole acceptable project of its scale within the railbelt area, but that all other acceptable hydroelectric projects combined would equal only half of the Susitna Project's installed capacity. These implications merit solid verification.

3.3 Alternative Electrical Energy Sources

[C.29] Nonhydroelectric alternatives of a magnitude similar to the Susitna Project should be evaluated. Scenarios incorporating both natural gas and coal would seem to provide a basis for comparative analysis to the Susitna Project. These generation sources should be presented as elements in scenarios meeting a variable range of electrical demands. At least one of the alternatives should include a combination of hydroelectric and thermal systems.

3.4 Licensing Delays

[C.30] The EIS should disclose the effects on electrical demand and generating capacity should the Susitna Project be delayed. The analysis could be in the form of a full scenario representing a variant of the Susitna Project.

4. WATER QUALITY and QUANTITY

4.1 General Comments

[C.31] A development as large as the Susitna Hydroelectric Project will inevitably alter the hydrologic regime of a major drainage system. The factors affected will include flows, groundwater levels, sediment transport, morphology, temperature, and water quality parameters. The manner in which the project is designed, constructed, and operated can minimize the impacts on such environmental concerns as fish and wildlife and transportation. The EIS should demonstrate that the hydrologic regime of the river system and the effects of the project on it are clearly understood. Similarly, the EIS must clearly demonstrate that the project will not cause or contribute to violations of the applicable water quality standards.

[C.32] Nearly a dozen federal and state agencies have reviewed the draft license application and provided comments. Extensive comments and concerns have been raised by three of these agencies, the National Marine Fisheries Service, the Alaska Department of Fish and Game, and the U. S. Fish and Wildlife Service. Many of the comments and subsequent responses by APA refer to documents that are not part of the application. It is therefore not possible to gauge the adequacy of some of the responses. The EIS should clearly address and respond to all concerns of these agencies. The results or progress of ongoing studies and data acquisition programs should be described.

[C.33] Construction of the Devil Canyon Dam may be significantly delayed or cancelled. The EIS should consider the expected impacts of operations for both the "Watana only" and the two reservoir scenarios.

[C.34] A project of this size demands a combination of study techniques which should incorporate predictive methodologies (including standard

[C.34] (cont.) analytical methods and numerical models), data (both historical data and data collection programs), comparisons with existing similar systems or facilities, and judgment. These factors must be combined, sometimes in innovative ways, to achieve an adequate understanding of a complex hydrologic system. In general, this approach has been used in the application. All environmental impacts should be considered in the EIS; where FERC believes that specific topics have been adequately addressed in the application, specific reports or passages should be cited.

4.2 Stream Morphology

4.2.1 Borrow Sites E & I

[C.35] The possible impacts from excavation of borrow sites E and I on channel morphology should be addressed in the EIS. Alteration of channel geometry at these sites will affect downstream velocity and subsequent sediment movement patterns.

[C.36] Areas downstream from the borrow sites which could be subject to scour should be identified by streambed and bank sampling. An attempt should be made to identify those areas which may undergo significant velocity changes. Calculations should include the sediment-trapping effectiveness of instream borrow pits over a range of possible flows throughout the life of the project. Evaluation should include the possibility of significant amounts of deposition occurring in the pits as a result of large storms. Analysis should consider the possibility that the Devil Canyon site may not be developed.

[C.37] By understanding the role these borrow sites would play in the sediment movement patterns of the river, changes in channel geometry both downstream and at the sites could be evaluated [1].

4.2.2 Chulitna-Susitna Confluence

[C.38] A more comprehensive explanation of the possible channel changes likely to occur at the Chulitna-Susitna rivers' confluence should be included in the EIS. Due to the reduced regulated flows of the Susitna and the

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1. Chapter 2 of the application does not consider the possibility of large storm events or a delay in the construction of the Devil Canyon Dam.

heavy bedload carried by the Chulitna, extension of the Chulitna's
[C.38] alluvial deposits to the east is probable. The impact of this extension
(cont.) on the course of the Susitna during an extreme high water event should be investigated.

Studies needed to assess this event would include monitoring of the progression and composition of the Chulitna alluvial fan on a regular basis. Sampling to determine the erosivity of deposits along the east bank of the Susitna should also be undertaken.

This sampling would help determine the possibility of migration of the Susitna to the east during a high water event, which could cause extensive erosion of the east bank or the islands and bars downstream [2].

4.2.3 Downstream of Chulitna-Susitna Confluence

The possible changes in slough morphology below the Chulitna-Susitna confluence should be addressed in the EIS. Slough alteration in this region could affect fish habitat and the riparian ecosystem. Aerial photographic interpretation, ground truthing, and cross sectional surveys should be used to determine current slough conditions below the Chulitna-Susitna confluence. Possible project-related changes in slough morphology could be estimated by using probable water surface elevations, sediment and ice movement patterns, and vegetation
[C.39] succession rates.

Overall slough conditions and possible changes may be adequately understood by monitoring a sample set of sloughs which represent the entire slough population. This approach has already been used for sloughs above Chulitna River.

4.2.4 Downstream of Talkeetna

The project effects on the morphology of sloughs downstream from
[C.40] Talkeetna should be discussed. No discussion has been provided for the area downstream from Talkeetna.

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2. This issue is addressed briefly in Chapter 2 of the application. Due to the potentially severe consequences of large-scale erosion at the confluence, however, a more complete understanding of the region is needed.

[C.40] (cont.) The project effects downstream from Talkeetna are expected to be moderated by the contributions of the Chulitna and Talkeetna Rivers and other tributaries. However, some effects are expected.

[C.41] An inventory of sloughs and side channels below Talkeetna should be performed. Also, a comparison of pre-project and post-project flows should be provided for the river.

4.3 Ice Coverage--Formation

[C.42] The effects of ice formation processes on the channel characteristics between Devil Canyon and the confluence of the Chulitna and Susitna Rivers should be addressed in the EIS. Operational winter river stage increases of 3-4 feet over existing conditions would be expected when ice formation occurs, causing possible scouring of the streambank. Results from the ICESIM ice simulation model, vegetation mapping, and streambank substrate sampling should be integrated to estimate the following:

1. type and volume of bank material removed
2. subsequent changes in channel dimensions
3. type and quantity of riparian vegetation removed.

Scour could remove significant amounts of riparian vegetation as well as increase suspended sediments. This process could adversely affect river navigation and salmon spawning areas downstream.

4.4 Ice Coverage--Spring Breakup

[C.43] The mechanism for spring ice breakup should be discussed. Target releases on the order of 10,000 cfs for either the "Watana only" or two reservoir scenarios will be significantly less than pre-project spring runoff.

[C.44] Section 4.2.3 suggests that significant ice formation downstream of Devil Canyon will be unlikely. If formation does occur, how will the breakup occur? What will be the breakup mechanism if the Devil Canyon reservoir is not constructed?

4.5 Channel Stability & Sediment Transport

The effects of the change in sediment regime downstream from both dams
[C.45] should be discussed. The sediment transport analysis suggests that post-project flows will generally be insufficient to cause movement of the gravel bed. The formerly dynamic bed will now be stabilized. Coupled with lower stages, this effect may lead to the deterioration of the side channels and sloughs by beaver dams and other mechanisms.

The releases from the dams will be essentially clear water, containing particles of 4 microns or less. Under pre-project conditions, high suspended sediment concentrations have been observed. The impact of the
[C.46] loss of this material to berm formation at the slough entrances should be considered. An analysis of the composition of typical berms should be presented [3].

4.6 Downstream Temperatures/Nitrogen Concentrations

Downstream temperatures will be a function of the stratification in the reservoirs and the withdrawal mechanism. Temperature stratification appears to have been carefully modeled. However, no hydraulic analysis
[C.47] of withdrawal has been presented.

A detailed hydraulic analysis of withdrawal should be presented in the EIS for the design releases. The potential for supersaturation of nitrogen at the intake structures during reservoir withdrawal should be reexamined [4]. This evaluation should confirm the effectiveness of the multi-level outlet structure.

4.7 Chemical Changes

Possible pH changes in the impoundment area and, therefore, in the
[C.48] release, should be clearly defined.

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3. While significant effort has been expended in defining baseline sediment transport conditions in Chapter 2, only minimum discussion of project impacts has been presented.

4. The existing analysis apparently uses spurious data.

[C.48] (cont.) Inundation of acidic bogs may increase reservoir acidity. It may also alter heavy metal and nutrient levels. The EIS should quantify these water quality changes.

4.8 Downstream Turbidity

[C.49] Projected seasonal downstream turbidity levels should be specified. A comparison with baseline turbidity levels should also be presented.

[C.50] Post-project levels are expected to be much lower than baseline conditions. This effect is not only expected to increase primary productivity of fish, but to increase predation as well.

4.9 Nutrient Levels

[C.51] Nutrient levels in the reservoirs and wells are expected to rise as a function of oil spills and/or wastewater contamination.

[C.52] The contingency plan for oil spills and the treatment plan should be described in detail in the EIS.

4.10 Mathematical Modeling

4.10.1 Application Content

[C.53] Chapter 2 of the permit application contains only a summary of the water quality study performed by Peterson and Nichols (1982). Extensive references are made to this report. Nutrient loadings will be minimized by burning and clearing the impoundment area. This plan should be seriously reviewed since the Watana impoundment area is 48 miles long and covers 38,000 acres.

In Chapter 11, responses to the questions of control of hazardous materials, wastewater discharge, and concrete production are as follows:

[C.54]
- "Federal law requires that as part of the management procedures there will be an oil spill contingency plan (40 CFR 102.F). This is discussed in Chapter 3, Section 2.4.3(c)(ii)."

[C.55]
- "All wastewater discharges from the treatment facilities will meet permit requirements. Chlorine will be utilized, if deemed

[C.55] (cont.) appropriate, to ensure discharge water will meet fecal coliform standards."

[C.56]
- "Potential impacts associated with concrete wastewater and preliminary mitigative measures are discussed in Chapter 2, Sections 4.1.1(c)(vi), 4.2.1(c)(vi), and 6.2."

4.10.2 Recommendations

[C.57] 1. The report by Peterson and Nichols (1982) should be reviewed to determine the level of effort undertaken to analyze water quality in the reservoirs. Only a summary of the results of this report are presented in the application. Water quality modeling efforts appear to be confined to the DYRESM (Imberger et al., 1978) 1-D temperature model, which is usually applied to smaller reservoirs, and the Vollenweider (1976) approach to determining order-of-magnitude estimates of phosphorus concentrations.

58] 2. If after reviewing the Peterson and Nichols report it is determined that more sophisticated modeling approaches are required, we recommend a two-phase modeling approach. Simulations of flows and temperature profiles can be accomplished with a model such as LARM2 (Laterally Averaged Reservoir Model) (Reference 1). This two-dimensional segmented reservoir model is appropriate for flow simulations in long reservoirs, where the longitudinal and vertical components are of interest. This model can be used in conjunction with a model such as EAM (Ecosystem Assessment Model) (Reference 2) to predict levels of a wide range of water quality parameters. The model can be used in either a 1-D, 2-D, or 3-D mode. The model has the capability to handle the following constituents:

- oxygen and BOD;
- four phytoplankton groups;
- three zooplankton groups;
- benthic organisms;
- attached algae;
- four fish groups with 5 life stages;
- Full nutrient cycles for phosphorus, nitrogen, silica, and carbon;
- pH/alkalinity/carbonate system;
- detrital compartments for suspended organic detritus and organic sediment; and
- total dissolved solids.

4.10.3 Modeling References

1. Users Guide for LARM2: Longitudinal-Vertical, Time-Varying Hydrodynamic Reservoir Model, J. E. Edinger and E. M. Buchak, October 1982, EWQOS TR E-82-Draft, U. S. Army Corps of Engineers, WES, Vicksburg, Mississippi.

2. Methodology for Evaluation of Multiple Power Plant Cooling System Effects, Vol. 4 Users Guide to Mode Operation, Tetra Tech, Inc., August 1980, EPRI-EA-1111.

4.11 Salinity in Cook Inlet

[C.59] The effects of the project on salinity at Cook Inlet should be clearly stated. A comparison of baseline and project flows at the mouth should be provided to determine the possible impacts on saltwater intrusion.

4.12 Groundwater Interaction in Sloughs

Flows in sloughs and side channels occur as a result of the combination of mainstem flows, local inflows, and groundwater flows. During low mainstem flows, local inflows dominate. The APA has stated that local inflows as small as 1 cfs are sufficient to permit outmigration of fry. However, such small flows may pass through the downstream berms rather than over them, thus blocking outmigration of fry.

[C.60]

An analysis of four sloughs has been presented in the Attachment to Appendix E.2.A. This analysis should be expanded to consider the possibility of flow through the downstream berms.

4.13 Navigation

A discussion of the impacts on navigation has been presented in Application Section 2.6.3. The discussion should be expanded.

[C.61]

The range of depths and velocities for navigability at key cross sections should be indicated. The expected number of days that these conditions would occur in a given year should be included for both baseline conditions and project conditions. The discussion should also include impacts on snowmobile travel during freezeup.

4.14 Catastrophic Failures

[C.62] The effects of catastrophic failure of one or both of the dams should be addressed in the EIS. Even though a remote risk, catastrophic failure could have profound effects on human life, wildlife, vegetation, fisheries, and transportation facilities.

Analysis should include catastrophic failure of either dam, and should include failure of the upper dam causing subsequent catastrophic failure of the lower dam.

The extent of inundation due to catastrophic failure should be mapped on a scale equivalent to that used for Figures E.2.12 through E.2.20, and should cover the entire affected area to Cook Inlet.

Information should be provided on the height and velocity of the wave front, and the time, duration and velocity characteristics of the released water.

Descriptive data should be provided on vegetation destruction, wetland loss, debris accumulation, debris volume discharged to Cook Inlet, sediment movement, fish habitat losses, and wildlife impacts.

5. FISHERY RESOURCES

5.1 General Comments

[C.63] The EIS should be more quantitative throughout the assessment of impacts on the fish resources of the Susitna River Basin. The application provides general information on nearly all foreseeable impacts (both positive and negative); however, there is no discussion of the number of fish expected to be affected within each habitat type and the cumulative net effect of dam construction and the subsequent dam operations.

[C.64] Substantially more information is required before quantitative assessments of fish resources and the affect of dam construction and operation in the Susitna Basin can be made. For example, the presence of fish in a specific habitat should be correlated with environmental variables such as river flow, water velocity, habitat type, and other appropriate variables that may be used in the assessment of impacts

[C.64] (cont.) associated with the projected flow regime. Also, difficulties in sampling of the mainstem river may have influenced the relatively low estimate of salmon spawners in the mainstem. Corrective factors or alternative methods should be devised to solve this problem.

[C.65 When quantitative information is available, these data should be presented in the text (as well as in tables and figures). The accuracy and precision of these data should be discussed.

[C.66] Comments by Alaska Department of Fish and Game and Alaska Department of Environmental Conservation (both letters dated 13 January 1983) state that the present fish resources data base is often insufficient. The Alaska Power Authority response was that the data are adequate for evaluating the magnitude (worst case) of potential impacts to the selected evaluation species. However, the application developed a worst-case scenario for only those salmon that use the slough habitats and not those juvenile and adult fish that use the mainstem and side channel habitats. Total loss of these fish would severely affect the fish resources of the Susitna River. Additional quantitative information could provide a basis for a predictive assessment of impacts short of a total loss estimate.

5.2 Sampling Effectiveness

[C.67] The EIS should evaluate the effectiveness of the sampling techniques and sampling program in relation to the goal of providing an accurate assessment of impacts on the fishery resource. For example, the adequacy and accuracy of data collection within each habitat type should be discussed. This information would provide the reader with a better understanding of the data base and the precision of the statements and conclusions that follow. Also, such statements would identify data gaps and sampling difficulties and would enhance the collection of data during subsequent years [5].

5.3 Data Insufficiencies Below Talkeetna

[C.68] Additional fish habitat preference data and flow characteristic data are

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5. The discussion of methodology in the application identified a few sampling programs that did not provide accurate data (primarily sonar counts). This type of discussion and evaluation should extend to each sampling program.

[C.68] (cont.) needed to assess impacts downstream from Talkeetna. A greater proportion of the Susitna River fishery resources use this downstream reach, but insufficient information is available to characterize fish habitat usage and other ecological relationships. These data are needed because of the potential effect of even a small change in the flow regime on this proportionately larger resource base.

[C.69] Field studies are needed to characterize the use of habitats by fish (e.g., correlate environmental variables with the habitat characteristics of each life stage) and to describe the changes in these habitats that may be caused by the proposed flow regime (e.g., changes in water velocity, food availability, and habitat structure).

5.4 Habitat Changes During High Winter Flows

[C.70] The effect of high winter flows during dam operation on overwintering fish in the mainstem and side channels should be addressed in the EIS. An incremental analysis of water flow and fish habitat quality is needed to describe how available habitat will change with increased winter flows.

[C.71] Water velocities through a variety of habitat types should be projected for expected winter flow volumes. The effect of these winter water velocities on overwintering fish and life stages should be determined.

This analysis would require water velocity data through several habitat types and correlation of these data with fish habitat characteristics obtained from field data collection or literature review [6].

5.5 Effect of Lower Turbidity on Fish

[C.72] Fish species that are adapted to turbid waters may be affected by the reduction in summer turbidity levels. The Alaska Department of Fish and Game suggests that burbot may be such a fish and, if so, the EIS should address this in the impact analysis.

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6. The application has noted that increased winter flows will inundate side channels and provide more habitat, but it does not describe the type of new habitat in terms of water velocities and species utilization. It is possible that the projected winter flows may cause water velocities that are too great for some overwintering fish species or life stages.

5.6 Food Habitat of Fish

The food habits of Dolly Varden char, rainbow trout, sculpins, burbot, round whitefish, and other fish should be described in the EIS. Analysis of fish food habits is important to the understanding of trophic level interactions, population dynamics, and the impact of the hydroelectric projects on fish resources. For example, Dolly Varden char, rainbow trout, and sculpins may consume juvenile salmonids and their eggs. Predation by these fish may increase because of the less turbid waters [C.73] after dam construction. If more food is available, then predator population levels could increase.

A review of the literature may provide the needed information on the food habits of these fish during residence in turbid and clear water streams. If data are lacking in the literature, then food habits of fish collected from the Susitna River should be analyzed. All relevant life stages should be investigated.

5.7 Changes In Slough Habitat Morphology

The probability of modifying slough habitat morphology, or severely altering its capacity as a fish habitat as a result of stabilized [C.74] post-construction flows, should be discussed in the EIS. Present summer flows are relatively great and serve to flush accumulated materials from the sloughs. Projected stabilized flows and construction of berms at the upstream entrance of sloughs may allow eroded bank soil and debris to accumulate and vegetation to colonize the slough habitat. If no actions are taken, then these slough habitats may lose their value to fish.

Studies are needed to examine the rate of sediment and debris [C.75] accumulation in slough areas and the resultant effects on fishes [7].

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7. The potential for change in slough morphology above the Chulitna-Susitna confluence has been addressed in Chapter 2 of the application; however, these conclusions have not been discussed as possible impacts on the fishery resources.

5.8 Mitigation Measures in Slough Areas

[C.76] Mitigation measures to protect slough habitats that are important to spawning salmon (as well as rearing fish) should be evaluated further in the EIS. This evaluation should assess the probability of creating usable spawning habitat of high quality through modification of the slough habitat and gravel cleaning. This evaluation should assess the effect of greater turbidity during winter months (post-construction) on embryo and alevin survival in relation to restructured slough habitats that admit backwater flows. Also, the probability of successfully enhancing embryo and alevin survival by gravel cleaning should be determined (e.g., review the literature and identify why previous applications were or were not successful). The accessibility of the proposed "Gravel Gertie" to slough areas and the effect of its operation on existing fish should be addressed. Also, the frequency of gravel cleaning should be estimated from sediment accumulation studies in the slough areas [8].

5.9 Population Levels of Fish Near Access Roads and Transmission Line Corridors

[C.77] The population level of fish inhabiting the streams near the access road and transmission line corridors have not been established. Studies should establish point population estimates in the nearby stream channels that will be affected.

These estimates would provide a basis for the assessment of impacts and the success of resulting mitigation measures that may occur because of activities related to dam construction.

An electroshocker and block seines could be used to quantify the species and number of fish within a given reach. The sampling period should correspond to the period of juvenile salmon availability, if they are suspected to inhabit the stream.

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8. The application has proposed restructuring of sloughs and gravel cleaning as mitigation measures, but it has not evaluated the probability of success of these techniques. Further literature review is needed to ensure that these measures will be successful or at least to provide an estimate of their likelihood to succeed.

6. WILDLIFE RESOURCES

6.1 General Comments

The application presents extensive data on wildlife habitat and wildlife species within the basin. Studies have been conducted on all major vertebrate wildlife groups:

[C.78]

- Big game (e.g., moose, caribou, brown bear, black bear, dall sheep).
- Furbearers (e.g., marten, beavers)
- Raptors (e.g., bald eagles, golden eagles).
- Waterbirds (e.g., swans).
- Nongame birds and mammals (e.g., warblers, voles).

The information contained in the application is generally adequate to evaluate impacts within the middle and upper basin for all wildlife groups except big game. Additional quantitative data are required on big game habitat use in the upper and middle basin, especially during severe winters.

[C.79] Further evaluation of project impacts on wildlife in the lower basin is needed. Adequate wildlife data for such an evaluation are available only for raptors and nongame birds and mammals.

[C.80] Wildlife information in the application should be supplemented with results of studies performed since publication of the application.

[C.81] Potential impacts on threatened or endangered species are low. The application adequately addresses such issues.

[C.82] Additional documentation of the feasibility and effectiveness of proposed mitigation measures is needed.

Specific comments on the wildlife chapter follow.

6.2 Habitat Use During Severe Winters

[C.83] Habitat use by wildlife, especially moose, during severe winters must be quantified, and project effects on critical wintering areas should be addressed in the EIS. Critical winter ranges for moose should be identified and mapped; moose populations on such ranges should be described in terms of population levels and period of use. The carrying capacity for such areas should be calculated. Migratory movements for wildlife during severe winters should be described. The number of animals of each high-priority species potentially affected should be included.

[C.84] Most of the detailed wildlife studies were conducted during two consecutive mild winters. The application states (page E-3-317) that due to the mild winters, "it has not been possible to obtain site-specific information on the influence of severe winter conditions on (moose) population productivity, habitat use, or browse utilization." Because the ability of a population to endure severe winters is crucial for survival, these topics should be addressed in the EIS.

6.3 Incorporation of Quantitative Data From Recent Studies and Modeling

[C.85] Results of on-going studies and research completed since publication of the application should be included in the EIS. Included are moose home range studies in the lower basin, a study of dall sheep use of the Jay Creek mineral lick, and determination of elevations of raptor nests near the impoundment zones.

[C.86] APA is developing a complex moose habitat simulation model. The model should be able to provide quantitative impact data that are currently lacking. Preliminary results from the model are expected in 1983, and complete results by 1986. The EIS should include the most recent quantitative impact estimates available from the model.

6.4 Lower Basin Impacts

[C.87] Impacts to wildlife due to habitat changes induced in the lower basin by post-project flow regimes should be addressed. Acreage of habitat changes (e.g., deterioration or improvement of calving areas; reduction in acreage of suitable nesting habitat) and subsequent wildlife impacts

[C.87] (cont.) (e.g., changes in productivity or recruitment) should be identified. Habitat use and population data should be collected for most species inhabiting the lower basin. Such data are lacking for bears and furbearers.

Predictions of induced habitat changes should be compared with wildlife population and habitat use data to identify impacts. If the analysis indicates that impacts will not be significant, sufficient information should be included in the EIS to document the conclusion.

6.5 Feasibility of Mitigation

[C.88] The feasibility of mitigation proposals should be clearly demonstrated. Proposals must be feasible from a technical standpoint such as, will a controlled burn provide the desired increase in browse production, and can the equipment necessary for the burn be used where the program is planned. The ability of the proposals to satisfy biological objectives (e.g., maintain herd populations by increasing browse availability) should be evident. Where proposals involve large-scale habitat manipulation (e.g., a 6,400-acre controlled burn; page E-3-528), an evaluation of potential negative impacts (e.g., increased erosion, decline in some nontarget wildlife populations) should be included.

The effectiveness of the proposals for the life of the project should be evaluated.

7. BOTANICAL RESOURCES

[C.89] The descriptions of vegetation and floristics, including rare plants, as contained in the application, are adequate for the purposes of an EIS. All foreseeable impacts to botanical resources have been identified and measures to mitigate these impacts have been discussed in detail. No additional botanical investigations appear to be necessary, other than the ongoing field studies discussed in the application.

[C.90] There is, however, the need for a single, comprehensive summary of the Botanical Resources section. At present, some of this information is summarized in various locations through the text of the application. Nevertheless, a reviewer of the EIS wishing to become quickly familiar with important facts and conclusions would find it difficult to do so from the existing text.

[C.90] (cont.) The summary of the botanical section should bring together principal conclusions regarding resources, impacts, and mitigation in a single discussion only a few pages long. Existing summaries in the application are too scattered and therefore are difficult to review quickly. Supporting data should be clearly referenced and available in appendices.

8. AIR QUALITY

8.1 Nonattainment Area Issues

[C.91] The effect of the Susitna Project and alternative electrical sources on air quality in Anchorage and Fairbanks should be evaluated. The extent that possible changes in generating capacity will affect carbon monoxide and particulate emissions and resulting air quality in attainment areas should be quantified.

92] The possibility that total emissions may be influenced by electricity costs should be quantitatively assessed. The role of electrical energy for space heating as an alternative to wood consumption in fireplaces (a significant source of carbon monoxide) should be described, for instance. Cost comparisons of alternate energy source costs to residential and industrial users under different scenarios would assist in this analysis.

8.2 Local Emissions

[C.93] An air quality analysis should be performed for the construction camps. The analysis should contain an evaluation of carbon monoxide and particulate emissions from diesel generating facilities and vehicles to predict whether local violations of carbon monoxide or particulate levels are likely to occur.

8.3 Thermal Power Plant Effects

[C.94] Power generation scenarios involving the use of thermal power plants should include a detailed evaluation of project effects on ambient air quality. At least a screening level analysis should be completed to determine whether the individual plants would cause or contribute to

[C.94] (cont.) violations of ambient air quality standards or Prevention of Signficant Deterioration (PSD) program increment limits. Plants located in or near urban areas, or lands that are within PSD Class I regions, will require a more detailed evaluation which:

1. In urban areas confirms that the plant(s) will not aggravate any existing air quality problems.

2. In PSD Class I regions confirms that the project will not significantly affect visibility or the "values" which caused the region to be designated "Class I."

FEDERAL ENERGY REGULATORY COMMISSION
PROJECT NO. 7114
RESPONSE OF ALASKA POWER AUTHORITY TO COMMENTS OF UNITED STATES ENVIRONMENTAL PROTECTION AGENCY, REGION X

COMMENT C.1:

"1.1 Project Objectives

"The EIS should set forth a clear, concise and comprehensive statement of project objectives. Since the Susitna Project has been set forth as a preferred alternative by APA, the objectives should clearly reflect the basis for that preference. For instance, an objective appears to be to remove most existing thermal power sources from baseload production; another may be to provide the least costly power supply possible. APA's objectives should be clearly stated. A clear statement of objectives is essential if the EIS is to evaluate the degree to which each alternative will meet project goals. A matrix-type display would present an excellent summary of such an evaluation."

RESPONSE:

The Alaska Power Authority is charged under state law with the responsibility "to promote, develop and advance the general prosperity and economic welfare of the people of Alaska by providing a means of constructing, acquiring, financing and operating power production facilities", including hydroelectric projects (Alaska Statutes, Section 44.83.070 (1982 Supp.). The Power Authority, in cooperation with other agencies and the Office of the Governor, has conducted extensive studies of alternative means for meeting electric power demands for the Railbelt. The overall goal of these studies has been to identify alternative plans for meeting electric power demands in the Railbelt, focusing on minimizing power costs, providing a stable and reliable long-range power supply, and minimizing adverse environmental impacts. The results of these efforts are provided in three primary documents, the Railbelt Electric Power Alternatives Study by the Battelle Pacific Northwest Laboratories (17 volumes), the Acres Feasibility Report and the Susitna Hydroelectric Project License Application.

By meeting its long-range power needs through renewable, rather than non-renewable resources, Alaska will promote

RESPONSER TO COMMENT C.1 (cont.):

greater efficiency and economy in power operation than would its continued dependence upon fossil fuel burning facilities. With Susitna, Alaska can husband its fossil fuel resources for utilization in projects and programs that would maximize their yield to the overall State economy.

REFERENCES

Acres American, Inc., Susitna Hydroelectric Project Feasibility Report (1982) previously submitted to the FERC on March 15, 1982.

Battelle Pacific Northwest Laboratories, Railbelt Electric Power Alternatives Study (1982), previously provided to the FERC on July 11, 1983.

COMMENT C.2:

"1.2 Load Forecasts

"The four functionally interrelated models used to forecast electricity demand provide a comprehensive framework for energy planning. The variables selected for modeling future economic conditions and electricity consumption appear appropriate and generally complete."

RESPONSE:

The Alaska Power Authority concurs with this Comment.

COMMENT C.3:

"1.2 Load Forecasts

"For the most part, economic assumptions appear reasonable and are sufficiently substantiated with data."

RESPONSE:

The Alaska Power Authority concurs with this Comment.

COMMENT C.4:

"<u>1.2.1 Scope and Application of Sensitivity Tests</u>

Although the values selected to test results of the economic forecasting (MAP) (Table B.126) and Railbelt Electricity Demand (RED) (Tables B.127-B.131) models appear to be representative of likely high and low limits, the application of the test results to impact analysis is limited. While the effect from fluctuations in the value of any one variable may not be significant when compared to variations in oil prices, the cumulative effect from changes in several of these variables could be significant. Scenarios in which the values of key economic and electricity use assumptions differ from the Reference Case values should be explored in more depth. Identification of the different magnitudes of impact between oil prices and other factors (e.g., annual real wage growth, annual price level growth) is needed to justify exclusion of variables other than oil prices in developing alternative load forecasts."

RESPONSE:

Analyses described in Exhibit B, Section 5.3-5.4 demonstrate that oil is, by a considerable extent, the most important single factor affecting the Alaskan economy and the demand for electric power. The world oil price is also an important factor in assessing the cost of power from alternatives to the Susitna Hydroelectric Project. While the cumulative effect of changes in other variables might, in some cases, produce changes in economic and load forecast changes greater than relatively small movement in world oil prices, postulating such scenarios requires careful examination of the behavior of all variables. Conducting such an analysis to produce statistically relevant results would require a probabilistic modeling effort well beyond the capabilities of the existing models and will not be justified due to the dominant role played by world oil prices.

COMMENT C.5:

"<u>1.2.1 Scope and Application of Sensitivity Tests</u>

"Additionally, it is probable that variations in world oil prices would affect some of the other key factors which are assumed to be constant under all world oil price scenarios. For example, alternative world oil price scenarios would probably result in different values for employment in certain industries (e.g., petroleum) and for model parameters (e.g., labor force participation rate). The impact of alternative world oil prices on factors assumed to be constant should be discussed."

RESPONSE:

In the modeling system the Alaska Power Authority used to evaluate the Susitna Project in the July 11, 1983 FERC License Application, world oil prices directly influence the level of state petroleum revenues and gas prices. One model parameter, estimates of coal prices, was developed partially independent of oil prices. Coal price escalation was related to oil price scenarios, but not in direct proportion, for the economic analysis. While oil prices may have some bearing on other factors used in the MAP and other models, the functional relationships are not as definite as is the relationship between oil prices and the three factors which were linked to oil prices in the modeling system.

Early in the project analysis, the relationship between world oil prices and activity in the oil and gas industry in Alaska, represented in the MAP model as employment, was assessed. While it was recognized that higher oil prices might result in additional employment in the oil and gas industry in Alaska, a clear, quantitative functional relationship between these factors could not be established. There are numerous factors other than world oil prices, such as exploration and production costs, geological conditions, technological developments, market expectations, transportation costs and tax considerations that influence oil exploration and production activity. Assumptions concerning employment in the petroleum sector, which are exogenous to the MAP model, were, therefore, entered into the MAP model at the same level for all oil price scenarios.

Most factors other than state revenues and employment in the petroleum sector have an even less direct relationship to

RESPONSE TO COMMENT C.5 (cont.):

world oil prices. For example, in the question as posed, the suggestion was made that the labor force participation rate might be affected by world oil prices. While there is no doubt some relationship between these factors, the nature and direction of that relationship are not clear. For example, while in the short term, higher oil prices might cause employment in the petroleum and other sectors to rise, perhaps contributing to a rise in the labor force participation rate, the net impact on the labor participation rate could actually be negative due to higher rates of speculative in-migration of workers and rising inflation rates. Because of these uncertainties, model parameters were not altered on the basis of different forecasts of world oil prices.

For the RED Model, the major variables and assumptions other than oil price are shown in FERC License Application Exhibit B, Volume 2A, Table B.94. Among these, the following are obtained from the MAP Model and vary with each oil price scenario:

1. Regional Household Forecast;

2. State Households by Age Group; and

3. Total Regional Employment.

Other than the fuel price forecast assumptions which are linked to the oil price scenario, the variables and assumptions used in the RED model have no direct linkages with oil factors and prices. Although some economic, demographic, and behavioral aspects such as family income, type of housing and efficiency of appliances influence the values of the other RED model parameters. The quantitative effects of the variation of oil price have no clear definition, but all indications are that such effects are small and difficult to assess with any degree of certainty.

For the OGP Model, the major variables and assumptions other than the price of oil which are to be linked to oil price are fuel costs and load forecasts. The costs directly related to the consumption of fuel oil in the thermal and hydro construction costs are very small. They were estimated at about 6 percent for the Susitna Project. In addition, the real price of oil is expected to remain below the 1983 price until 1991 for the Reference Case. As a result, the construction costs are not expected to change due to oil prices.

COMMENT C.6:

"1.2.1 Scope and Application of Sensitivity Tests

"The time period used for the sensitivity analysis of results of the MAP Model (Table B.126) should be extended at least to the year 2010. This would provide consistency with the sensitivity analyses on the RED model results and also would provide a more complete assessment of potential variability in model results."

RESPONSE:

The primary purpose of conducting sensitivity tests was to confirm (1) that a modeling system using world oil prices as the principal basis for defining alternative economic scenarios was valid, and (2) that other factors were relatively less important in explaining the behavior of electric power demand in the Railbelt and the cost of thermal generation alternatives to Susitna. The sensitivity tests conducted, using the year 2000 as the test year, accomplished this purpose.

The value of providing comparable results from each of the models used in the evaluation of the Susitna Project is recognized by the Alaska Power Authority. Accordingly, in future sensitivity analyses, the period of analysis will be extended to the year 2010. However, it should be recognized that completely rigorous comparability between all of the models used in the analysis is not possible. The petroleum revenue forecasting model extends 17 years into the future, and modification of this model to extend its forecast period could only be performed by the Department of Revenue. The generation expansion planning model and project economic analysis extend to the year 2051, in order to accommodate the need to assess the project's economics during its full 50-year economic life.

COMMENT C.7:

"1.2.2 Labor Force Participation Rate

"For the MAP model, the labor force participation rate identified in Table B.92 (.9338) does not agree with the rate identified in Table J.1 (.78) as the "most likely" rate. Because of the significance of this rate to model results, it is important that the correct rate be used consistently."

RESPONSE TO COMMENT C.7:

The labor force participation rate given in Table B.92, Exhibit B, Vol. 2A (.9338) is in error. The figure actually used, as shown in the parameter list on page G-52 of Volume 2B of the License Application as LFPART, was .78045.

COMMENT C.8:

"<u>1.2.3</u> <u>Program Induced Conservation</u>

"The decision to exclude estimates of program-induced conservation impacts from the RED model in the study is not sufficiently supported with data. Several reasons are given for not including program-induced conservation impacts, including: existing conservation programs are being phased out; there are many uncertainties in long-term government conservation programs; and reliable data to estimate additional electricity savings beyond that which would be induced by market forces alone are limited for the Railbelt area.

"Although these reasons (as well as additional information presented in Appendix B, Volume 2C) may be valid for some energy planning projects, the significant and long-term implications of the Susitna Project to energy planning in Alaska warrant a detailed examination of potential energy impacts from ambitious (i.e., program-induced) conservation programs."

RESPONSE:

Estimates of program-induced conservation impacts were excluded from the RED model primarily because it was believed that most significant conservation savings would be achieved through market forces. The impacts of market forces on energy consumption are taken into account in the RED model through the price elasticity equations.

This assumption of low electric energy savings from conservation programs is based on the following considerations. First, the most promising area for energy conservation is the space heating market, in which insulation, blanketing of water heaters and weatherization can be implemented.

RESPONSE TO COMMENT C.8 (cont.):

Electricity, however, accounts for a relatively small share of this market. Most thermal energy in the Railbelt is currently supplied by fossil fuels and, therefore, most programmatic conservation efforts would affect only fossil fuel consumption.

Second, because conservation measures have been implemented and have been ongoing in the Railbelt area for some time, through State and utility sponsored programs and out of necessity due to Alaska's harsh climate, significant benefits from these programs have been realized. The Railbelt utilities have experienced a significant decline in electricity consumption per household from 1974 to 1982. As a result, the utilities have phased out their conservation programs and have not announced new programs.

COMMENT C.9:

"1.2.3 Program Induced Conservation

"As identified, program-induced conservation is projected to account for 40 percent of all electricity savings between 1981 and 1987 within the Anchorage Municipal Light & Power service area. This suggests that similar savings may be achieved elsewhere within the Susitna market area. Consequently, similar, but longer term, projections should be developed for all service areas. Lack of reliable data, considerable uncertainty, and noncomparability with conservation programs elsewhere do not mean that potentially important program-induced conservation impacts may be excluded from the analysis. The analysts preparing the EIS must use the best data available to develop a reasonable estimate of the potential for cost-effective conservation. The EIS should include this estimate and a discussion of the uncertainties associated with it."

RESPONSE:

The Power Authority believes that programmatic conservation savings achievable by other Railbelt utilities will be significantly less than that achieved by AML&P. Because electrical costs have been higher for other utilities than for AML&P (AML&P current average 50 mil/Kwh vs. average 80 mil/Kwh in other service areas) the others have already had

RESPONSE TO COMMENT C.9 (cont.):

in place conservation programs analogous to AML&P's more recently instituted measures. For example, AML&P has recently recaptured waste heat by converting to steam driven feedwater pumps, and has begun heating city water so that individual hot water heaters will consume less energy. FMUS has been, for some time, providing district heat in the forms of steam and hot water using steam exhausted from turbines, and has been heating the water treatment system with heat exhausted from the Chena power station. Similarly, GVEA has been operating its North Pole generating station in a cogeneration mode, supplying steam to an oil refinery. Consequently, it too has been already making use of its heat exhausted from power generators. Further, blanketing of hot water heaters, an ongoing program for AML&P, has already been accomplished at FMUS and GVEA. Thus most significant, achievable, programmatically induced conservation savings have been realized in service areas outside of AML&P.

COMMENT C.10:

"1.2.4 World Oil Price Forecasts

"The world oil price scenarios used to develop alternative load forecasts all assume a continuous increase in price (with the exception of the first few years) at relatively stable rates for long periods. Based on the pattern of world oil prices over the past 10 years, a more cyclical growth in world oil prices could be expected. This type of growth in world oil prices could significantly affect load forecasts and also economic feasibility. The impact on load forecasts from a world oil price scenario based on cyclical growth (e.g., Sherman H. Clark Associates' base case) should be examined."

RESPONSE:

The growth in world oil prices has been cyclical in the past and may well continue to be in the future; however, the trend has been undeniably upward. In selecting the particular world oil price scenarios used to develop the alternative load forecasts shown in the FERC License Application, the Power Authority was attempting to demonstrate the effects on demand under a representative range of projected world oil prices. It did not believe it necessary for the analysis to program its MAP and RED Models to run under each and every pricing scenario reflected in the July 11, 1983 filing. It thought the representative range would be sufficient. If FERC deems such an analysis to be necessary for its review, the Power Authority would assist FERC in programming the MAP-RED Models to develop load forecasts under the Sherman H. Clark Associates (SHCA) base case world oil price scenario (Supply Disruption Case). The Power Authority believes, however, that the load forecast resulting from such a program would not differ markedly from the forecast developed under the DRI world oil price scenario shown in the License Application. Certainly any difference in demand between that resulting from the SHCA base case and the DRI scenario would not be significant enough to alter the conclusion that there is a need for Watana at its present planned capacity.

Under the SHCA base case, per household consumption by 1995 would be slightly less than the projected demand for 1995 under the DRI scenario. This would result because the SHCA base case assumes higher oil prices by 1995 than does DRI.

RESPONSE TO COMMENT C.10 (cont.):

Higher oil prices would contribute to higher power generating costs for fossil fuel fired plants, which will in turn result in higher retail rates. This lowered per household demand, however, would be offset by an increase, under the SHCA base case, in overall demand due to an increase in the number of households and the number of industrial consumers. Under the SHCA base case, the state would have slightly higher oil royalty revenues at its disposal than it would under the DRI scenario, which might result in higher state spending and increased economic growth.

COMMENT C.11:

"2. ECONOMIC EVALUATION

"The economic assumptions used in the evaluation of the Susitna Project and the best thermal alternative generally appear reasonable. Values for key factors such as the discount rate and the cost and fuel escalation rates appear to be appropriate, given current economic conditions."

RESPONSE:

The Alaska Power Authority concurs with this Comment.

COMMENT C.12:

"2. Economic Evaluation

"The evaluation relies on a "net economic benefit" approach to determine economic feasibility. The net economic benefit approach, as used in this analysis, depends on certain implicit conditions. First, all relevant costs associated with the two projects (i.e., "with Susitna" and "without Susitna") are assumed to be included. Because project objectives (e.g., least cost energy, minimal economic impacts) are not clearly specified, identification of all relevant costs is difficult. The second implicit assumption is that the benefits resulting from the two projects are equivalent, since only present worth costs are considered. These two necessary conditions provide the analytical framework for the specific concerns discussed below."

RESPONSE TO COMMENT C.12

The Comment implies that all relevant costs for each alternative ("with Susitna" and "without Susitna") might not have been included in the economic evaluations. All known and quantifiable costs have been included in the comparison. The objectives for the Susitna Hydroelectric Project, addressed in the Response to Comment C.1, have been implicit in all of the analyses, and are consistent with accepted federal and private utility project planning practices.

The Comment errs in stating that the Power Authority has assumed the benefits resulting from both the "with Susitna" and "without Susitna" alternatives to be "equivalent". In fact, the evaluation demonstrates the Susitna alternative to be superior to the next best alternative, i.e. gas-fired generation. The evaluation method used in the License Application did, however, assume that benefits of the alternatives could be stated in comparable terms. Without such a statement of benefits on a comparable basis, no meaningful analysis of alternatives would be possible. The method used, that is, discounting present worth benefits and costs for comparing the economic attractiveness of alternative energy projects, is also a generally accepted method for conducting such comparisons and for estimating net economic benefits and benefit-cost ratios.

COMMENT C.13:

"2.1 Sensitivity of Present Worth Costs to Project Delays

"Based on alternative load forecasts, the Devil Canyon Project could be delayed up to five years under the -2 percent case. It is stated in Sections 4.8 and 4.9 (Exhibit D, Volume 1) that sensitivity analyses indicate that such a delay would not significantly affect the economic analysis of Susitna. The results of the sensitivity analyses should be presented in the EIS to support this conclusion."

RESPONSE TO COMMENT C.13

Project files contain OGP data for Devil Canyon delayed until 2005 for the Reference Case. OGP runs were not made for Devil Canyon timing under other oil price forecasts. The information provided in the License Application was deduced from the results of the Reference Case run mentioned above.

An OGP file with Devil Canyon delayed to 2007 for the -2 forecast could be established and the present worth of the cost be computed. The FERC could perform these studies with the OGP files that are contained in a special account established in November 1983 for License Application support, provided they open a GE-OGP user account.

COMMENT C.14:

"2.2 Sensitivity of Susitna Net Benefits

"Under Reference Case assumptions, net economic benefits of the Susitna Project exceed $1.8 billion. As indicated in the sensitivity tests, the project results in net costs only when the Department of Revenue and the -2 percent oil price forecasts are assumed. Analyses of the project under all other conditions assumed in the sensitivity tests result in net benefits."

RESPONSE:

None.

COMMENT C.15:

"2.2 Sensitivity of Susitna Net Benefits

"Although net benefits result when different values of individual variables are tested, the cumulative effect from simultaneous adjustments to economic parameters is not examined. Based on the results in Table D.28, it appears that a net cost scenario has a relatively high probability of occurring if different values are assumed for several variables. Because different oil prices would be likely to have some effect on other factors, a discussion of the relationship between variable oil prices and other key economic factors is needed."

RESPONSE:

The cumulative effects of simultaneous adjustments to economic parameters were not analyzed with the OGP model in the economic analyses of the energy plans for the Susitna and Non-Susitna alternatives for reasons previously explained in the Alaska Power Authority's Response to Comment C.5. Single variable sensitivity analyses were performed; the results are shown on Table C.15.1 (taken from the July 11, 1983 License Application, Table D.28, Exhibit D).

Studies involving multi-variate analyses were included in the initial Application (Exhibit D, Section 4.8 - Probability Assessment, Feb. 1983). However, during the revision of the Application in response to FERC's April 12, 1983 letter, Section 4.8 was not updated and was therefore removed from Exhibit D, as submitted July 11, 1983.

Under the Reference Case forecast (Sherman H. Clark Associates - No Supply Disruption Case) the probability of a net cost scenario is not a likely occurrence. A detailed review of oil price forecasts is contained in FERC License Application Exhibit B, Section 5.4.

RESPONSE TO COMMENT C.15 (cont.):

TABLE C.15.1
SUMMARY OF SENSITIVITY ANALYSIS INDEXES
OF NET ECONOMIC BENEFITS

(LICENSE APPLICATION TABLE D.28)

	Index Values
BASE REFERENCE CASE ($1,827 MILLION)	100
Oil Price Forecast	
DRI	100
DOR	-5
-2 Percent	-106
Discount Rates	
High (5%)	4
Low (2%)	192
Watana Capital Cost	
+20 Percent	61
-20 Percent	134
Fuel Price	
+20 Percent	146
-20 Percent	58
Real Fuel Price Escalation	
No Escalation after 2020	87[1]

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1 Real fuel price escalation index revised from 53 to 87 based on revised computations (12/8/83).

COMMENT C.16:

"2.3 Opportunity Cost of State Financial Subsidy

"If a $1.8 billion state appropriation is used to finance the Susitna Project, the opportunity cost of these state funds should be included as a cost to the project. As stated (Section 6, Exh. D, Vol. 1), the Susitna Project is a long-life, capital-intensive project which means a sizable inflationary financing deficit. Unless state equity is included to meet the inflationary financing deficit, consumers may be burdened with unacceptably high early-year costs."

RESPONSE TO COMMENT C.16:

The opportunity cost to the State of Alaska, or the return the State would receive on an investment other than an equity investment in the Susitna Hydroelectric Project, would depend upon a comparison of Susitna to the State's alternative uses of its funds. This exercise would be highly speculative, in that the State's alternate use of funds might change over time due to modifications of State policies.

The problems associated with developing opportunity costs for public investments are manifold. The notion of an "opportunity cost" in a corporate capital-budgeting content is sensible, since the corporation is concerned solely (at least in financial management theory) with comparative dollar returns per unit of investment input. In contrast, a public sector investment seldom yields identifiable dollar returns. Clearly, such dollar returns to "society" do exist: State spending on health care improves industrial productivity by improving worker health, as well as directly generating jobs, income and tax revenues with attendant multiplier effects. It is, however, extremely difficult to quantify such dollar returns. The problem is made much more difficult by the fact that an opportunity cost for public investments should also include some notion that there are non-monetary returns on state investments. The satisfaction of citizens arising from parks and recreation facilities, for example, constitute an example of this sort of non-monetary return on state investment.

Consideration of the State's "opportunity cost" for the Susitna Project has been, and will continue to be made, by the legislative and executive branches of the State government. It is only via the interplay of competing policy interests within the State government that all of the factors involved in calculating an opportunity cost for these State funds can adequately be taken into account. (Also see Response to Comment A.13.)

COMMENT C.17:

"2.3 Opportunity Cost of State Financial Subsidy

"The need for or use of an equivalent state appropriation to finance development of the best thermal alternative does not appear likely because of reliance on smaller, less capital-intensive plants over a longer period of time. Consequently, the opportunity cost (e.g., foregone uses of

COMMENT C.17 (cont.):

these public funds) of the state appropriation potentially included in the Susitna Project should be evaluated."

RESPONSE:

Alaska does not enjoy the flexibility provided by connection to interstate power grids. Therefore, faced with growing load demand, either Susitna or the best thermal alternative must be developed and State equity is involved in either case. Inclusion of opportunity cost associated with the State's equity contribution is not considered appropriate in view of the economic benefits clearly gained by the investment, the subjective nature of opportunity costs in the context of public investment and the dependence of such cost on the financing plan ultimately selected. (See also Response to Comments A.13 and C.16)

COMMENT C.18:

"2.4 Long Term Production Costs

"To estimate long term (year 2021 to year 2051) production costs, the analysis assumes that the production costs for the final study year (2020) would simply recur, with the exception of fuel escalation for the subsequent 31 years. This assumption is made because the development of future load forecasts and generation alternatives necessary to model the system for this additional period is beyond the extent of normal projections.

"While this statement may be valid, some additional discussion is needed on the relative production costs of large-scale hydroelectric projects versus smaller thermal plants. Cost data on past and currently operating hydroelectric and thermal plants should be presented to support the assumption that final year production costs associated with each system are representative, in relative cost terms, for subsequent years.

"This analysis seems particularly important in light of the assumption that fuel prices will continue to escalate after the year 2020, an assumption which increases the present worth cost of the thermal alternative."

RESPONSE TO COMMENT C.18:

A discussion of the relative costs of large scale hydroelectric projects versus small scale thermal plants is not needed. The production costs associated with the plants used in the analysis were developed for the specific generation type and size using published data on plant characteristics and cost from the following publications:

1. U.S. Department of Energy, Federal Energy Regulatory Commission, Hydroelectric Power Evaluation (August 1979), DOI/FERC-0031; and

2. Electric Power Research Institute, Technical Assessment of Guide EPRI-PS-1201-SR (1979).

The published reference data was not furnished to the FERC; however, those publications are readily available.

The economic analysis was performed using the life-cycle approach which compares the production costs of alternative plans over the economic life of generation alternatives under consideration. The length of the economic evaluation period extends to the year that the longest-lived project that is installed during the planning period reaches by the end of its economic life. The evaluation period was set by the 50-year useful life of Devil Canyon, terminating in the year 2051.

A basic assumption in the life cycle approach is the concept of perpetuity. The perpetuity concept assumes that electric demand will continue after the end of the useful life of the existing plant. Therefore, the existing facilities will have to be replaced by a new generating capacity of the same type, or of a type not yet commercialized. The generation alternative used for replacement could result from technological change and/or environmental constraint. The production costs associated with the replacement facilities are assumed to be equal to the existing generation facility costs. It is not likely that they will be less.

The study methodology is linked with oil price projections because the state's economy and, therefore, its electric power demand respond to oil prices. For that reason a long-term oil price forecast (Reference Case, 1983-2040) was used as the basis for the studies and to estimate fuel costs over the long term (2021-2051). The following tabulation shows the effect of relaxing the thermal fuel price escalation assumption.

RESPONSE TO COMMENT C.18 (cont.):

Reference Case Forecast	Present Worth of System Cost (1982 - $ million) With Fuel Escalation 1993-2020	2021-2051	1993-2051	Net Benefit	Without Fuel Escalation 2021-2051	1993-2051	Net Benefit
Non-Susitna	3930	3386	7316	-	3113	7043	-
Susitna	3396	2093	5489	1,827	2053	5449	1,594

This comparison demonstrates that eliminating real fuel price escalation for the period 2021 to 2051 reduces the net benefits of the Susitna project from $1,827 million to $1,594 million or about 13 percent.

REFERENCES

U.S. Department of Energy, Federal Energy Regulatory Commission, Hydroelectric Power Evaluation (August 1979), DOI/FERC-0031.

Electric Power Research Institute, Technical Assessment of Guide EPRI-PS-1201-SR (1979).

COMMENT C.19:

"2.5 Decommissioning Costs

The net costs (or net revenues) associated with decommissioning existing plants are not identified. The replacement function of the Susitna Project suggests that decommissioning costs would be more significant under the 'with Susitna' plan. Further evaluation is needed."

RESPONSE:

Decommissioning of existing units is not related to the timing of new generation selected and added in the Optimized Generation Planning (OGP) simulation. Older, less efficient generation is maintained and is available for peak demand periods and reserve duty.

RESPONSE TO COMMENT C.19 (cont.):

The production costs for the expansion planning analysis include all costs of fuel and operation and maintenance of all generating units. In addition, the production costs include the annualized investment costs of any plants and transmission facilities added during the period. Costs common to all the alternatives are excluded. These would be investment costs of facilities in service prior to 1993, decommissioning costs (salvage value) of retired generation units and administrative and customer services of the utilities.

The OGP Model was used to develop the with- and without-Susitna Plans. Within the generation expansion framework is a Generation Model (GM) which contains a user-furnished data base representing in-service, under construction and planned generating units for the Railbelt area.

In the GM the data are stored by individual units. The following is a list of the characteristics that are specified for each existing or planned unit type:

1. Station name, unit type;

2. MW Ratings;

3. Heat Rates;

4. Installation year and month;

5. Retirement year and month;

6. Fuel data;

7. Fixed and Variable O&M;

8. Outage Rates.

When an OGP case is analyzed, the expansion planning logic first creates "standard tables" that characterize the existing and planned system. Unit replacement or decommissioning of the individual units occur in the year specified by the GM data. Generation units that are not used to serve load incur fixed O&M charges.

COMMENT C.20:

"2.6 Centralized and Decentralized Power Systems

"The 'Net Economic Benefit' approach used in the economic evaluation implicitly assumes that benefits resulting from the two projects are equivalent. Two areas in which project-related benefits are unequal are flexibility to adapt to changing conditions and system performance under unusual conditions. The resource commitment associated with the Susitna Project clearly provides less flexibility to adapt to new technologies or economic conditions than does reliance on the more decentralized thermal alternative. Also, production costs associated with a more centralized system, such as the Susitna Project, are more susceptible to low probability, high risk occurrences (e.g., sabotage, mechanical breakdown) than a decentralized system. Thus the EIS should contain a thorough evaluation of electrical supply system reliability which accounts for these differences in generating system reliability, as well as any differences in transmission system reliability that would result from developing a distributed decentralized system. Additionally, the impact of unusual climatic conditions on the cost of electricity from Susitna should be discussed.

"The flexibility issue is of central importance. The Pacific Northwest Power Planning Council selected an "options strategy" in which the Bonneville Power Administration would obtain options on future generating plants in order to maintain flexibility. This flexibility allows the utility to adjust to changing future conditions, which alter capacity requirements, with ease and at minimal cost because capital is not locked up in project construction until the utility is much more certain about its needs."

RESPONSE:

System reliability analysis constituted a major part of system planning for the Susitna Hydroelectric Project. Expected outage rates, both planned and unplanned, were taken into account in system planning studies for both the Susitna Project and the thermal and hydroelectric alternatives to Susitna. These studies are described in the License Application, at Section 4 of Exhibit D, and in Section 3 of Exhibit B. Table D.18 of Exhibit D provides outage assumptions used for thermal alternatives. These assumptions are based on industry averages. Sections 3.3 through 3.5 of Exhibit B describe the key role of

RESPONSE TO COMMENT C.20 (cont.):

reliability criteria in scheduling the operation of the Susitna Project. These sections also describe the reliability criteria and operational assumptions relating to project transmission facilities. (See also Acres Feasibility Report, Vol. 1, Section 18.)

Extreme climatic conditions, in the form of severe low flows in the Upper Susitna Basin, are taken into full account in the determination of the Susitna Project's dependable capacity. The 50 year low flow was utilized as the basis for establishing dependable capacity, a method commonly used in planning large hydroelectric projects. Analyses of the cost of power generated by the Susitna Project take into account the likelihood of such low flows as well as the variation of flows that have historically occurred.

REFERENCES

Acres American, Inc., Susitna Hydroelectric Project Feasibility Report (1982), previously submitted to the FERC on March 15, 1982.

COMMENT C.21:

"2.7 Loss of Recreation Benefits

"The development of the Susitna Project is projected to increase the number of annual recreation days within the project area. A recreation mitigation plan has been developed to accommodate the increased demand for recreation.

"Although an increase in the amount of recreation as expressed in recreation days can be assumed from the analysis, the net economic effect associated with the project and mitigation plan is not examined. Because whitewater raft trips and salmon fishing are commonly recognized to result in more net benefits per recreation day than boating or fishing in a reservoir, the total net economic effect from development of the project should include recreation costs."

RESPONSE TO COMMENT C.21:

To the best of our knowledge, whitewater rafting does not occur on the Susitna River and recreational salmon fishing does not occur in the proposed impoundment areas. Therefore, the loss of whitewater rafting and recreational salmon fishing in the proposed reservoir areas would not be included in a cost-benefit analysis for the Susitna Project.

Specifically, the Project is not expected to have an appreciable impact on salmon fishing in the project area. Salmon migrate up the Susitna to Portage Creek just below Devil Canyon (FERC License Application page E-7-21), a couple of dozen proceed upstream pass Portage to the next few small tributaries. Several popular salmon fishing spots exist in the area (e.g., Stephan Lake, Prairie Creek, lower Portage Creek, Chunilna Creek and Indian River) but will not be adversely affected by the Project. Further, it is anticipated that the Susitna salmon fishery, downstream from Watana Dam, may be improved by the Project (page E-7-28).

The Project would produce reservoir fishing opportunities (however they may be valued) <u>in addition to</u>, <u>not in place of</u>, any supposedly higher-valued salmon fishing. There would, therefore, be no net loss of recreational benefits related to fishing other than the loss of grayling fish at the mouths of tributaries and along the lower reaches of streams entering the proposed reservoir.

Whitewater rafting and kayaking are highly specialized. Because of the small number of users in the project area, the user day value would have to be extraordinarily high to produce a significant economic value for the lost opportunities. Devil Canyon Rapids, for example, has been tried by fewer than 40 kayakers (page E-7-22). Such limited use suggests that the economic value of the resource is not large enough to receive extensive analysis or weight in the permitting process.

COMMENT C.22:

"3. <u>PROPOSED ACTION AND ALTERNATIVES</u>

"The application presents a broad range of alternatives to the Susitna Project. The alternatives are evaluated in relatively shallow depth, however, and deficiencies exist in the sections on alternative hydroelectric sites and alternative electrical energy sources. Additional alternative evaluation work is needed for the EIS. The EIS should include identification of alternatives comparable to the Susitna Project and should evaluate them in an even-handed manner."

RESPONSE TO COMMENT C.22

The Power Authority anticipates that the DEIS will reasonably evaluate alternatives and that such evaluation will incorporate alternative analyses previously completed.

The Power Authority objects to the characterization that its discussion on alternative hydroelectric sites and alternative electrical energy sources is "shallow."

During the feasibility and License Application phases of Susitna project planning, two studies proceeded in parallel which addressed the alternatives for generating power in the Alaska Railbelt. These studies were the Susitna Hydroelectric Project Feasibility Report sponsored by the Alaska Power Authority and the Railbelt Electric Power Alternative Study sponsored by the Office of the Governor, State of Alaska.

The objective of the Susitna Feasibility and License Study was to evaluate the feasibility of the proposed project and prepare the FERC License Application. The Railbelt study focused on the feasibility of all possible generating and conservation alternatives.

FERC License Application Exhibit B, Chapter 1 - Damsite selection, contains a review of previous hydroelectric alternative studies, a technical, economic and environmental evaluation of hydroelectric sites within the upper Susitna Basin and formulation of the Susitna Development Plan.

FERC License Application Exhibit E, Chapter 10, Section 1 - Alternative Hydroelectric Site, contains a technical, economic and environmental evaluation of hydroelectric sites outside the upper Susitna Basin and selection and evaluation of the preferred non-Susitna hydroelectric alternative. The results of the study are also summarized in FERC License Application Exhibit D, Section 4.4 Hydroelectric Alternatives. The Chakachamna Hydroelectric Project was identified and the Alaska Power Authority sponsored a feasibility study of the project. The results of the studies were submitted to the FERC on July 11, 1983 in the following reports:

1. Bechtel, Chakachamna Hydroelectric Report, Interim Report (1981) prepared for Alaska Power Authority.

2. Bechtel, Chakachamna Hydroelectric Interim Feasibility Assessment Report (1983), prepared for Alaska Power Authority.

RESPONSE TO COMMENT C.22 (cont.):

To assist in this planning process, the Office of the Governor, State of Alaska, Division of Policy Development and Planning and the Governor's Policy Review Committee contracted with Battelle, Pacific Northwest Laboratories to investigate potential strategies for future electric power development in the Railbelt region of Alaska.

The overall approach taken on this study involved five major tasks or activities that led to the results of the project, a comparative evaluation of electric energy plans for the Railbelt. Five tasks were conducted as part of the study to evaluate the following aspects of electrical power planning:

1. Fuel supply and price analysis;

2. Electrical demand forecasts;

3. Generation and conservation alternatives evaluation;

4. Development of electric energy themes or "futures" available to the Railbelt; and

5. Systems integration/evaluation of electric energy plans.

The studies of alternative electric energy sources are summarized in FERC License Application Exhibits B and E. Table C.22.A lists candidate electric energy sources identified and considered in the study. A detailed technical, economic and environmental assessment of these alternatives was performed. The results of the studies, included in seventeen volumes, were submitted to the FERC on July 11, 1983 in the following report:

Battelle Pacific Northwest Laboratories, Railbelt Electric Power Alternatives Study (1982), prepared for the Office of the Governor, State of Alaska.

RESPONSE TO COMMENT C.22 (cont.):

TABLE C.22.A. Candidate Electric Energy Alternatives (a)

Baseload Generating Alternatives	Electric Energy Alternative	Selection Criteria: Commercial Availability	Selection Criteria: Technical Feasibility
Coal-Fired Steam-Electric	Yes	Available	Yes
Natural-Gas/Distillate-Fired Steam-Electric	Yes	Available	Yes
Biomas-Fired Steam-Electric	Yes	Available	Yes
Peat-Fired Steam-Electric	Yes	Available	Yes
Combined-Cycle Plants	Yes	Available	Yes
Magnetohydrodynamic Generators	No	2005-2025	Yes
Fission Reactors	Yes	Available	Yes
Fast Breeder Fission Reactors	No	2005-2025	Yes
Geothermal Electric	Yes	Available	Yes
Fusion Reactors	No	2025	Yes
Ocean Current Energy Systems	No	Beyond 2000	No (Resource Limited)
Ocean Thermal Energy Conversion Systems	No	2000	No (Resource Limited)
Space Power Satellites	No	Beyond 2000	No (Resource Limited)
Baseload/Load-Following Generating Alternatives			
Combustion Turbines	Yes	Available	Yes
Diesel Generation	Yes	Available	Yes
Conventional Hydroelectric	Yes	Available	Yes
Small-Scale Hydroelectric	Yes	Available	Yes
Fuel Cells	Yes	Available	Yes

RESPONSE TO COMMENT C.22 (cont.):

TABLE C.22.A. Candidate Electric Energy Alternatives (a)

Baseload Generating Alternatives	Electric Energy Alternative	Selection Criteria: Commercial Availability	Selection Criteria: Technical Feasibility
Fuel-Saver (Intermittent) Generating Alternatives			
Ocean Wave Energy Systems	No	1990s	No (Resource Limited)
Tidal Electric	Yes	Available	Yes
Large Wind Energy Conversion Systems	Yes	Available	Yes
Small Wind Energy Conversion Systems	Yes	Available	Yes
Solar Photovoltaic Systems	Yes	Available	Yes
Solar Central Receiver Systems	Yes	Available	Yes
Cogeneration	Yes	Available	Yes
Energy Storage Alternatives			
Pumped Hydroelectric	Yes	Available	Yes
Storage Batteries	Yes	Available	Yes
Compressed Air Energy Storage	Yes	Available	Yes
Load-Shaping Alternatives			
Direct Load Control	Yes	Available	Yes
Passive Load Control	Yes	Available	Yes
Incentive Pricing	Yes	Available	Yes
Education and Public Involvement	Yes	Available	Yes
Dispersed Thermal Energy Storage	Yes	Available	Yes
Electric Energy Conservation			
Building Energy Conservation			
Building Conservation	Yes	Available	Yes

RESPONSE TO COMMENT C.22 (cont.):

TABLE C.22.A. Candidate Electric Energy Alternatives (a)

Baseload Generating Alternatives	Electric Energy Alternative	Selection Criteria: Commercial Availability	Selection Criteria: Technical Feasibility
Electric Energy Substitutes			
Passive Solar Space Heating	No	Available	Yes
Active Solar Space and Hot Water Heating	No	Available	Yes
Wood-Fired Space Heating	No	Available	Yes

(a) Battelle Pacific Northwest Laboratories. Candidate Electric Energy Technologies for Future Application in the Railbelt Region of Alaska, Volume IV (1982) page 3.3.

The Application and the Battelle report provide an adequate basis to discuss and compare any reasonable energy sources.

REFERENCES

Acres American, Inc., Susitna Hydroelectric Project Feasibility Report (1982), previously submitted to the FERC on March 15, 1982.

Battelle Pacific Northwest Laboratories, Railbelt Electric Power Alternatives Study (1982), prepared for the Office of the Governor, State of Alaska, previously submitted to the FERC on July 11, 1983.

Bechtel, Chakachamna Hydroelectric Report, Interim Report, prepared for Alaska Power Authority (1981), previously submitted to the FERC on July 11, 1983.

Bechtel Civil and Minerals, Chakachamna Hydroelectric Project Interim Feasibility Assessment Report, prepared for Alaska Power Authority, Volumes I-III (March, 1983), previously submitted to the FERC on July 11, 1983; Volume IV (Addendum, October, 1983), previously submitted to the FERC on November 29, 1983.

COMMENT C.23:

"3. Proposed Action and Alternatives

"The application lacks a range of comparable electrical generation scenarios to be evaluated. The EIS should present a series of complete generation scenarios reflecting a full range of possible electrical demands and a realistic mix of alternative generating technologies. Graphics for each scenario similar to Figure E.10.3 would be most helpful. The scenarios, including the Susitna Project, should be evaluated environmentally to equal depth. The evaluation should include testing the ability of each scenario to meet the objectives of the project."

RESPONSE:

The Power Authority anticipates that the DEIS will evaluate a reasonable range of comparable electric generation scenarios and will incorporate prior scenario analyses.

The Application focuses on a comparison between the Susitna Project and an optimum all-thermal generation plan where primary consideration was given to gas, coal, and oil-fired generation sources which are the most readily developable alternatives in the Railbelt from the standpoint of technical and economic feasibility. Development and comparison of the broader perspectives of other alternative generation scenarios are summarized in the Application, but are not presented in detail.

The electrical generation scenarios are presented in FERC License Application Exhibit D, Section 4 - Evaluation of Alternative Energy Plans and Exhibit E, Chapter 10, Section 1.2 (page E-10-7). Exhibit D, Section 4 describes the Railbelt systemwide generation planning studies performed to develop and compare the Susitna and non-Susitna alternatives. Section 4.10 - Battelle Railbelt Alternatives Study summarizes the results of the Railbelt Electric Power Alternatives Study, which the Alaska Power Authority referred to in the Response to Comment C.22.

A major task of the Railbelt Electric Power Alternatives Study was to identify electric power generating alternatives that are potentially applicable to the Railbelt region and to examine their technical and economic feasibility, as well as environmental and socioeconomic effects. Technologies that appeared best suited for future application in the

RESPONSE TO COMMENT C.23 (cont.):

region were subject to additional study and incorporated into alternative electric power plans for the Railbelt region.

A set of alternatives was selected for consideration in each of the four Railbelt Electric Energy Plans. The four plans included the Present Practices Plan, the High Conservation and Renewables Plan, the High Natural Gas Plan and the High Coal Plan.

The selection of alternatives for each plan was based on the following considerations:

1. Energy resource availability;
2. Available unit sizes of candidate alternatives;
3. Operating characteristics of candidate alternatives;
4. Commercial availability of candidate alternatives;
5. Estimated cost of power from candidate alternatives;
6. Likely environmental effects of candidate alternatives;
7. Public acceptance; and
8. Ongoing studies of specific alternatives.

Alternatives selected for each plan are listed in Table C.23.A, below.

In FERC License Application Exhibit E, Chapter 10, Section 1.1 (page E-10-1) - Alternative Hydroelectric Sites, an alternative to the Susitna Project was developed that included the Chakachamna, Keetna and Snow sites for hydroelectric power. Exhibit D, Section 4.4 Hydroelectric Alternatives also discusses the Chakachamna, Keetna and Snow alternatives.

The Application and the Battelle report provide an adequate basis to discuss and compare any reasonable electric generation scenarios.

RESPONSE TO COMMENT C.23 (cont.):

TABLE C.23.A Alternatives Selected for Each Plan (b)

Alternative	Plan: Present Practice	High Renewable	High Coal	High Natural Gas
Coal Steam Electric	X	X	X	
Coal Gasification-Combined-Cycle			X	
Natural Gas Combined-Cycle	X	X	X	X
Natural Gas Combustion Turbines	X		X	
Natural Gas Fuel Cell Station				X
Natural Gas Fuel Cell - Combined-Cycle				X
Natural Gas Cogeneration				X
Distillate Combined-Cycle Retrofit	X	X		
Distillate Fuel Cell Station				X
Diesel Electric	X	X	X	X
Bradley Lake Hydro	X	X	X	X
Grant Lake Hydro	X	X	X	X
Chakachamna Hydro	X	X	X	X
Allison Hydro	X	X	X	X
Browne Hydro		X		
Snow Hydro		X		

RESPONSE TO COMMENT C.23 (cont.):

TABLE C.23.A Alternatives Selected for Each Plan (b)

Alternative	Plan: Present Practice	High Renewable	High Coal	High Natural Gas
Keetna Hydro		X		
Strandline Lake Hydro		X		
Refuse Fired Steam Electric		X		
Large Wind Energy Conversion Systems		X		
Tidal Power		X		
Upper Susitna	X (a)	X (a)		

(a) Assessed as specific variations to the Present Practices and High Renewable plans.

(b) Battelle Pacific Northwest Laboratories, Railbelt Electric Power Alternatives Study: Selection of Electric Energy Generation Alternatives for Consideration in Railbelt Electric Energy Plans, Volume II (1982) pg. vi.

COMMENT C.24:

"3. Proposed Action and Alternatives

"The Susitna Project should be compared side-by-side with other alternatives in these analyses. Such an evaluation will assist the reader in comparing a range of choices and understanding the implications of each choice."

RESPONSE:

The Power Authority anticipates that the DEIS will present all alternatives clearly.

RESPONSE TO COMMENT C.24 (cont.):

FERC License Application Exhibit D, Section 4 - Evaluation of Alternative Energy Plans focuses on a comparison between the Susitna Project and an optimum all-thermal generation plan where primary consideration was given to gas, coal, and oil-fired generation sources which are the most readily developable alternatives in the Railbelt from the standpoint of technical and economic feasibility. Development and side-by-side comparison of the broader perspectives of other non-Susitna hydroelectric and thermal generation scenarios are summarized in Section 4, but not presented in detail. Alternative generation scenarios are discussed in detail in FERC License Application Exhibit E, Chapter 10 and the Railbelt Electric Power Alternatives Study performed by Battelle and sponsored by the Office of the Governor. For a discussion of these studies, refer to Alaska Power Authority's Responses to Comments C.22 and C.23.

COMMENT C.25:

"3.1 Conservation

"Meaningful conservation should be included in selected generating scenarios, including at least one Susitna scenario. In addition to evaluation on an equal footing with other scenarios, an evaluation should be provided to show the effects of conservation on the need for and phasing of the Watana and Devil Canyon units."

RESPONSE:

Conservation is a factor in the State's overall power planning, including Susitna. The encouragement of electric power conservation through the establishment of definite conservation programs has been the subject of considerable study. In the Railbelt Electric Power Alternatives Study two of the six scenarios fully evaluated assumed a high level of programmatic conservation (Battelle 1982). The opportunity for substantial programmatically induced energy conservation savings may be limited and would not have a significant impact on the phasing of these units (see Response to Comment C.8).

REFERENCES

Battelle Pacific Northwest Laboratories, Railbelt Electric Power Alternatives Study (1982), previously provided to the FERC on July 11, 1983.

COMMENT C.26:

"3.2 Alternative Hydroelectric Sites/Systems

"The EIS should evaluate hydroelectric alternatives of comparable magnitude to Susitna. The application identifies alternative hydroelectric development plans yielding a maximum of 778 MW installed capacity (Plan A.5, Table E.10.12). This is less than half the total installed capacity of the Susitna Project and only three-quarters of the Watana Project alone."

RESPONSE TO COMMENT 26:

From the analysis of alternative sites in the Upper Susitna Basin and non-Susitna hydropower developments, the Power Authority concluded that the Susitna project was the most attractive from a technical, economic and environmental standpoint and was the only plan capable of meeting the energy demands in the range forecasted for the Railbelt region.

The hydroelectric alternative studies followed the plan formulation and selection methodology discussed in FERC License Application Exhibit B. Numerous studies of hydroelectric potential in Alaska have been undertaken. A significant amount of the identified potential is located in the Railbelt region. Review of the studies, and in particular the various published inventories of potential sites, identified a total of 12 potential sites in the Upper Susitna Basin (FERC License Application Exhibit B, Vol. 2, Table B.1) and 91 potential non-Susitna sites (FERC License Application Exhibit E, Chapter 10, Table E.10.1). All of the sites are technically feasible and were included in the screening exercise.

The results of the Upper Susitna Basin site screening process indicate that the Susitna basin development plan could incorporate a combination of several major dams and powerhouses located at one or more of the following sites:

1. Devil Canyon;

2. High Devil Canyon;

3. Watana;

4. Susitna III; and

5. Vee Canyon.

The three most attractive solutions from combinations of the sites are as follows (FERC License Application Exhibit B, Vol. 2, Table B.5).

1. For annual energy requirements of up to 1750 GWh, the High Devil Canyon, Devil Canyon or the Watana sites individually provide the most economic energy. The difference between the costs shown on Table B.5 is around 10 percent, which is similar to the accuracy that can be expected from the screening model.

RESPONSE TO COMMENT 26 (cont.):

2. For energy requirements of between 1750 and 3500 GWh, the High Devil Canyon site is the most economic.

3. For energy requirements of between 3500 and 5250 GWh, the combinations of either Watana and Devil Canyon or High Devil Canyon and Vee Canyon are most economic.

4. The total energy production capability of the Watana/Devil Canyon development is larger than that of the High Devil Canyon/Vee Canyon alternative is the only plan capable of meeting energy demands in the 6000 GWh range.

The Watana/Devil Canyon plan was selected as the preferred basin development plan because it is the only plan capable of meeting energy demands in the range forecast for the Railbelt region.

The results of the non-Susitna hydroelectric alternatives site screening process established five development plans containing various combinations of the ten most attractive sites from the original 91 sites (FERC License Application Exhibit E, Chapter 10, Table E.10.12). These plans could develop combined capabilities ranging from 600 MW to 778 MW. The method of analysis and summary results are contained in FERC License Application Exhibit D, Section 4.4 Hydroelectric Alternatives.

On the basis of these evaluations, the most attractive alternative to the Susitna project was found to be a 650 MW hydroelectric development including the Chakachamna, Keetna, and Snow sites supplemented with thermal generating facilities. The studies indicated that it was not economically justifiable (FERC License Application, Exhibit D, Table D.17) to develop increasing numbers of alternative hydroelectric sites in an attempt to develop a scenario with the same capability of the Susitna project.

COMMENT C.27:

"<u>3.2 Alternative Hydroelectric Sites/Systems</u>

"The screening used in the application should be reevaluated in the EIS to identify whether the criteria used to eliminate candidate hydroelectric sites in the application document are comparable to criteria used to evaluate the Susitna site."

RESPONSE TO COMMENT C.27:

The screening process for candidate hydroelectric sites and evaluation of the Susitna Project included consideration of economic and environmental criteria. The environmental criteria began with broad criteria to eliminate obviously undesirable sites and retain candidate sites that were screened with more stringent criteria. The development of the stringent criteria evolved from data collection efforts during the study period, and resulted in elimination of other sites and provision of a thorough evaluation of the Susitna Project.

The economic criteria included necessary cost data to analyze the comparative present worth of costs of alternative combinations of generation in conjunction with the interconnected Railbelt load forecasts. Since the studies were conducted over a two year period and the Alaskan economy was experiencing change, three estimates of production costs and load forecasts were used in the studies. The data are not directly comparable because fuel price and escalation and load forecasts changed; however, the data were applied consistently within each of the study iterations.

The environmental criteria for the screening process are summarized in FERC License Application Exhibit E, Chapter 10, Tables E.10.3 and E.10.4. Other Chapters of Exhibit E documented the Susitna Project environmental studies. The economic criteria used for the screening process are included in FERC License Application Exhibit B, Tables B.13, B.14 and B.71. The initial License Application filed in February 1983 contains economic data in Exhibit D Tables D.11, D.19, D.27, and D.29. The economic data used in the final July 1983 License Application is in Exhibit D Tables D.12, D.18 and D.23. Fuel pricing studies are documented in FERC License Application Appendix D.1.

COMMENT C.28:

"3.2 Alternative Hydroelectric Sites/Systems

"The results of screening the candidate hydroelectric sites imply that not only does the Susitna Project represent the sole acceptable project of its scale within the railbelt area, but that all other acceptable hydroelectric projects combined would equal only half of the Susitna Project's installed capacity. These implications merit solid verification."

RESPONSE TO COMMENT C.28 (cont.):

Technical, economic and environmental studies of the hydroelectric potential in Alaska over the last forty years have shown that the Susitna Project is the most attractive hydroelectric development in the Railbelt area.

The screening of candidate hydroelectric sites is described in Exhibit B, Chapter 1 of the FERC License Application. The results of previous studies of the Susitna Basin and the plan formulation and selection methodology used in the License Application are presented, followed by an overall evaluation of the various schemes of similar size based on economic, environmental, energy and social comparisons. As the result of these analyses, the proposed Watana/Devil Canyon scheme was selected as the preferred scheme.

The screening of the non-Susitna hydroelectric alternatives is presented in FERC License Application Exhibit E, Chapter 10. Ten non-Susitna hydroelectric projects were selected and the overall evaluation of these sites showed that the Chakachamna, Snow and Keetna hydroelectric sites offered the most suitable schemes for development. These three sites would have a maximum capability of 650 MW. Refer to the Response to Comment C.26.

Engineering and stream flow data utilized to evaluate these projects were sent to the FERC on August 18, 1983 in response to additional data requests contained in the FERC's July 29, 1983 letter.

REFERENCE

Alaska Power Authority, Susitna Hydroelectric Project, Responses to FERC Exhibits B and D Additional Data Requests of July 29, 1983, previously submitted to the FERC on August 18, 1983.

COMMENT C.29:

"3.2 Alternative Electrical Energy Sources

"Nonhydroelectric alternatives of a magnitude similar to the Susitna Project should be evaluated. Scenarios incorporating both natural gas and coal would seem to provide a basis for comparative analysis to the Susitna Project. These generation sources should be presented as elements in scenarios meeting a variable range of electrical

RESPONSE TO COMMENT C.29:

demands. At least one of the alternatives should include a combination of hydroelectric and thermal systems."

The non-hydroelectric alternative plant sizes were selected based on the forecast interconnected load and from the viewpoint of system reliability. Although thermal electric plants can be designed for load-following, most large, modern units have design limitations on rapid changes in load and are consequently base-loaded. Since the Railbelt system load in the off-peak periods is small, plant sizes of 200-MW were selected for the study. In addition, incorporating a large thermal plant in the Railbelt system, rather than a six-unit hydroelectric project, would require significant reserve capacity to provide generating capacity during scheduled and unscheduled outages.

The following tabulation lists the unit sizes of the generation alternatives included in the Susitna and non-Susitna expansion plans.

Alternative	Unit Capacity MW
Watana	170 (6 units)
Devil Canyon	150 (4 units)
Coal-fired	200
Gas-fired combined cycle	200
Combustion turbine	70

The screening of the non-Susitna hydroelectric alternatives is presented in Exhibit E, Chapter 10. Ten non-Susitna hydroelectric projects were selected and the overall evaluation of these sites also shows that the Chakachamna, Snow and Keetna hydroelectric sites offer the most suitable schemes for development. These three sites would have a maximum power production of 650 MW. The remaining capacity requirements were met by thermal generation.

Engineering and stream flow data utilized to evaluate these projects were sent to the FERC on August 18, 1983 in response to additional data requests contained in the FERC's July 29, 1983 letter.

RESONSE TO COMMENT C.29 (cont.):

REFERENCE

Alaska Power Authority, Susitna Hydroelectric Project, Responses to FERC Exhibits B and D Additional Data Requests of July 29, 1983, previously submitted to the FERC on August 18, 1983.

COMMENT C.30:

"3.4 Licensing Delays

"The EIS should disclose the effects on electrical demand and generating capacity should the Susitna Project be delayed. The analysis could be in the form of a full scenario representing a variant of the Susitna Project."

RESPONSE:

The analysis of the delay of the Watana project was not presented in the FERC License Application. The assumptions and variables used in the MAP and RED Models would not be affected by a delay of Watana because the effects of the construction of Susitna or the thermal alternative were not included in the portion of the analysis by these models. The effects on generating capacity of a lengthy delay of Susitna are reflected in the thermal alternative scenario.

COMMENT C.31:

"4.1 General Comments

"A development as large as the Susitna Hydroelectric Project will inevitably alter the hydrologic regime of a major drainage system. The factors affected will include flows, groundwater levels, sediment transport, morphology, temperature, and water quality parameters. The manner in which the project is designed, constructed, and operated can minimize the impacts on such environmental concerns as fish and wildlife and transportation. The EIS should demonstrate that the hydrologic regime of the river system and the effects of the project on it are clearly understood. Similarly, the EIS must clearly demonstrate that the project will not cause or contribute to violations of the applicable water quality standards."

RESPONSE:

The purpose of the hydrologic studies undertaken for the FERC License Application is to provide the clearest understanding of the hydrologic regime necessary for

RESPONSE TO COMMENT C.31 (cont.):

determining the project related impacts to that regime. The License Application, particularly Exhibit E, Chapter 2 indicates that a considerable effort has been expended to achieve this understanding and to quantify the beneficial and adverse impacts. A more thorough response to this question is provided in the Power Authority's response to the U.S. Fish and Wildlife Service's General Comments No. 6 and No. 10 of January 14, 1983.

In order to assure compliance with all applicable water quality standards, the Power Authority will secure the following permits:

1. Environmental Protection Agency, National Pollutant Discharge Elimination System (NPDES), 33 U.S.C. 1342;

2. Department of the Army, Corps of Engineers, Section 404, 33 U.S.C. 1344; and

3. State of Alaska, Department of Environmental Conservation, Section 401 Certification of Reasonable Assurance, 33 U.S.C. 466, et seq.

In addition, the Power Authority will conform with the requirements of the State of Alaska, Department of Environmental Conservation, Water Quality Standards, Alaska Admin. Code, tit.18, § 70.

REFERENCES

Alaska Power Authority, Response to U.S. Fish and Wildlife Service General Comments, No. 6 and No. 10 (January 14, 1983), Vol. 10B, Appendix 11J of the License Application.

COMMENT C.32:

"4.1 General Comments

"Nearly a dozen federal and state agencies have reviewed the draft license application and provided comments. Extensive comments and concerns have been raised by three of these agencies, the National Marine Fisheries Service, the Alaska Department of Fish and Game, and the U.S. Fish and Wildlife Service. Many of the comments and subsequent responses by APA refer to documents that are not part of the application. It is therefore not possible to gauge the adequacy of some

COMMENT C.32 (cont.):

of the responses. The EIS should clearly address and respond to all concerns of these agencies. The results or progress of ongoing studies and data acquisition programs should be described."

RESPONSE:

The Power Authority has, all throughout the FERC licensing process, attempted to address all concerns about the project with comprehensive and accurate responses. In responding to comments, the Power Authority attempts to reference all documents accurately so that interested persons may obtain and use them in gauging the Power Authority's responses. The results and progress of ongoing studies and data acquisition programs is reported to the FERC for inclusion in the EIS.

Please see the Response to Comment B.6 (NMFS comment on temperature) and our Response to FERC Request for Supplemental Information Schedule B, No. 2-34 for further information.

Recently available studies include Harza-Ebasco, Susitna Hydroelectric Project Lower Susitna River Water Surface Profiles and Discharge Rating Curves, Draft Report (October 1983), submitted to the FERC December 5, 1983; and USGS, Sediment Discharge Data for Selected Sites in the Susitna River Basin, Alaska, 1981-82 (1983), submitted to the FERC on December 19, 1983.

The Power Authority anticipates that the DEIS and FEIS will rely upon, and incorporate, all reasonably available data.

REFERENCES

Alaska Power Authority, Response to FERC Schedule B Requests for Supplemental Information on Exhibit E, No. 2-34, previously submitted to the FERC on September 1, 1983.

Harza-Ebasco, Susitna Hydroelectric Project Lower Susitna River Water Surface Profiles and Discharge Rating Curves, Draft Report (October 1983), previously submitted to the FERC on December 5, 1983.

USGS, Sediment Discharge Data for Selected Sites in the Susitna River Basin, Alaska, 1981-82 (1983), previously submitted to the FERC on December 19, 1983.

COMMENT C.33:

"4.1 General Comments

"Construction of the Devil Canyon Dam may be significantly delayed or cancelled. The EIS should consider the expected impacts of operations for both the '"Watana only"' and the two reservoir scenarios."

RESPONSE:

The impacts of "Watana only" would remain essentially the same as those already established for the interim between initial operation of Watana and completion of Devil Canyon. Thus, such impacts are already included in the License Application and, the Power Authority anticipates, will be fully described in the DEIS prepared under NEPA.

Also, please see Response to Comments B.1-B.5.

COMMENT C.34:

"4.1 General Comments

"A project of this size demands a combination of study techniques which should incorporate predictive methodologies (including standard analytical methods and numerical models), data (both historical data and data collection programs), comparisons with existing similar systems or facilities, and judgment. These factors must be combined, sometimes in innovative ways, to achieve an adequate understanding of a complex hydrologic system. In general, this approach has been used in the application. All environmental impacts should be considered in the EIS; where FERC believes that specific topics have been adequately addressed in the application, specific reports or passages should be cited."

RESPONSE:

Where FERC believes that specific topics have been adequately addressed in the License Application, it is empowered by the Council on Environmental Quality NEPA regulations (40 C.F.R. § 1500, et seq.) to incorporate those License Application sections by reference into the EIS (40 C.F.R. § 1502.21). The Power Authority agrees that such action would be proper and beneficial in this case, as it would eliminate needless duplication of effort and EIS bulk without impeding agency and public review of the proposed project.

COMMENT C.35:

"4.2.1 Borrow Sites E & I

"The possible impacts from excavation of borrow sites E and I on channel morphology should be addressed in the EIS. Alteration of channel geometry at these sites will affect downstream velocity and subsequent sediment movement patterns."

RESPONSE:

The Power Authority anticipates that potential impacts of excavation from borrow sites E and I on the channel morphology will be addressed in the EIS. A brief discussion on these impacts is provided below.

Impact During Watana Construction

Borrow sites E and I will develop as the construction of Watana Dam continues. The diversion tunnels are designed to pass a flow of 50-year flood without much attenuation. Therefore, it is expected that sediment carried down from upstream during major flood events will pass through the tunnels. As the flow would enter the borrow sites, two scenarios may occur depending upon the depths of the borrow pits. If the pits are deep enough to sufficiently reduce the velocity of the flow, the bedload and a portion of the suspended load may deposit in the pits. Otherwise, the flow would pick up sediment from the borrow area because loose material will be available due to excavation activities.

In the first scenario, since the bedload of the Susitna River is a small fraction of the total sediment load of the river (estimated to be about 3 percent based on U.S. Geological Survey data collected at various stream-gaging stations in the basin), the flow leaving the borrow area will have only slightly smaller sediment concentration and is not likely to cause any increased scouring downstream of the borrow areas.

In the second scenario, the quantity of material picked up by the flow will depend upon the sediment-carrying capacity of the flow. Because of the widening and deepening of the river reach by excavation, the carrying capacity of the flow is likely to be less than that under pre-project conditions. Therefore, it is unlikely that a large amount of coarse material will be picked up by the flow which would cause significant aggradation downstream of the borrow area.

RESPONSE TO COMMENT C.35 (cont.):

Impact After Watana Construction

Borrow pits are unlikely to fill up after the construction of Watana because nearly all of the sediment inflow will be trapped by the reservoir. The sediment-free flow from the reservoir may cause some degradation of the channel downstream of the borrow area but this will be rather limited because a large percent of the bed materials are greater than the armoring size.

The maximum powerhouse release is about 14,000 cfs. Hydraulic data (depth, velocity, hydraulic gradient and depth) are available for the discharge of 18,000 cfs in the reach just downstream of borrow pits. Based on these data, the armoring size is estimated to be about 69 mm.

The particle size distribution of bed materials in this reach is expected to be nearly the same as that of the material below the Devil Canyon site based on a field reconnaissance. Using similar size distributions, the degradation would be in the order of 0.1 to 0.6 feet.

COMMENT C.36:

"4.2.1 Borrow Sites E&I

"Areas downstream from the borrow sites which could be subject to scour should be identified by streambed and bank sampling. An attempt should be made to identify those areas which may undergo significant velocity changes. Calculations should include the sediment- trapping effectiveness of instream borrow pits over a range of possible flows throughout the life of the project. Evaluation should include the possibility of significant amounts of deposition occurring in the pits as a result of large storms. Analysis should consider the possibility that the Devil Canyon site may not be developed."

RESPONSE:

Please refer to Response to Comment C.35.

COMMENT C.37:

"<u>4.2.1 Borrow Sites E&I</u>

"By understanding the role these borrow sites would play in the sediment movement patterns of the river, changes in channel geometry both downstream and at the sites could be evaluated [1].

"1. Chapter 2 of the application does not consider the possibility of large storm events or a delay in the construction of the Devil Canyon Dam."

RESPONSE:

Please refer to Response to Comment C.35.

COMMENT C.38:

"<u>4.2.1 Chulitna-Susitna Confluence</u>

"A more comprehensive explanation of the possible channel changes likely to occur at the Chulitna-Susitna rivers' confluence should be included in the EIS. Due to the reduced regulated flows of the Susitna and the heavy bedload carried by the Chulitna, extension of the Chulitna's alluvial deposits to the east is probable. The impact of this extension on the course of the Susitna during an extreme high water event should be investigated.

"Studies needed to assess this event would include monitoring of the progression and composition of the Chulitna alluvial fan on a regular basis. Sampling to determine the erosivity of deposits along the east bank of the Susitna should also be undertaken.

"This sampling would help determine the possibility of migration of the Susitna to the east during a high water event, which could cause extensive erosion of the east bank or the islands and bars downstream [2].

"[2] This issue is addressed briefly in Chapter 2 of the application. Due to the potentially severe consequences of large-scale erosion at the confluence, however, a more complete understanding of the region is needed."

RESPONSE TO COMMENT C.38:

Potential changes in channel morphology downstream from the confluence of the Susitna and Chulitna Rivers will be addressed based on a study using suspended sediment, bedload and bed material data collected by the U.S. Geological Survey (USGS) in cooperation with the Power Authority. These data were collected in the summers of 1981, 1982 and 1983 at four stream-gaging stations--Susitna River near Talkeetna and at Sunshine, Chulitna River near Talkeetna and Talkeetna River near Talkeetna. FERC requested and was supplied on December 19, 1983, the USGS report, Sediment Discharge Data For Selected Sites in the Susitna River Basin, Alaska, 1981-1982. The collection of sediment data at these stations is being continued and another station located on the Susitna River about one mile downstream of its confluence with the Chulitna River has been selected to initiate collection of similar data. This will allow a better definition of deposition pattern near the Chulitna alluvial fan.

Samples have been taken at the four existing stations twice a month in the water years 1981-82 and 1982-83. Samples will be taken on a monthly basis during 1983-84. Periodic bed material samples also will be collected at other locations in the Susitna River upstream and downstream of the confluence. These data will be useful in evaluating potential aggradation and degradation in the river.

Results of the analyses show that it is likely that there will be a long-term aggradation near the confluence of the Chulitna and Susitna Rivers because of the reduced flows in the Susitna River under regulated with-project conditions and the heavy sediment load carried by the Chulitna River. Although the eventual magnitude of aggradation cannot be precisely predicted with the available data, the aggradation is unlikely to cause severe navigational or fish access problems in the reach below the confluence because much more stable flows under post-project conditions will develop a river channel which will be much better defined than that under existing conditions. It is also unlikely that it will cause flood problems more severe than under natural conditions because such high flows from the upper Susitna River will be regulated and attenuated by the reservoirs.

RESPONSE TO COMMENT C.38 (cont.):

The 1983-84 data collection program of the USGS includes a new station below the confluence as discussed above. These data will be used to study the potential shifting of the main channel of the Susitna River toward the east bank and potential erosion of the bank. Potential problems of aggradation near the confluence also will be further analyzed when the 1983 and 1984 data collected by the USGS become available.

REFERENCES

USGS, Sediment Discharge Data for Selected Sites in the Susitna River Basin, Alaska, 1981-82 (1983), previously submitted to the FERC on December 19, 1983.

COMMENT C.39:

"4.2.3 Downstream of Chulitna-Susitna Confluence

"The possible changes in slough morphology below the Chulitna-Susitna confluence should be addressed in the EIS. Slough alteration in this region could affect fish habitat and the riparian ecosystem. Aerial photographic interpretation, ground truthing, and cross sectional surveys should be used to determine current slough conditions below the Chulitna-Susitna confluence. Possible project-related changes in slough morphology could be estimated by using probable water surface elevations, sediment and ice movement patterns, and vegetation succession rates.

"Overall slough conditions and possible changes may be adequately understood by monitoring a sample set of sloughs which represent the entire slough population. This approach has already been used for sloughs above Chulitna River."

RESPONSE:

Please refer to the Response to Comment B.8. This Response outlines the ongoing Lower River Morphological Assessment and the plan of study for the Lower River between the Chulitna River-Susitna River confluence and Cook Inlet.

RESPONSE TO COMMENT C.39 (cont.):

Comparisons of natural and with project discharges at the Sunshine and Susitna Station gaging stations are presented in FERC License Application Figures E.2.161 and E.2.162 respectively, for the Watana only development and in Figures E.2.209 and E.2.210 respectively, for the Watana/Devil Canyon development. These comparisons are presented as flow duration curves and identify the percent of time specific discharges are equalled or exceeded based on the period of records available.

The ongoing Lower River Morphological Assessment includes aerial photographic reconnaissance, ground truthing and cross-sectional surveys to identify and assess representative aquatic habitats. Aerial photography is available from four flights as indicated below:

Date	Flow, Susitna River at Sunshine (cfs)
August 27, 1983	56,500
September 6, 1983	37,500
September 16, 1983	22,000
October 25, 1983	13,600

Locations where habitat will be assessed include:

Chulitna-Susitna-Talkeetna confluence areas,
Trapper Creek,
Birch Creek/Slough,
Sunshine Creek/Slough,
Whitefish Slough,
Montana Creek,
Goose Creek/Slough
Sheep Creek/Slough,
Kashwitna River Mouth,
197-Mile Creek,
Little Willow and Willow Creeks,
Delta Islands Slough (RM 48),
Deshka River Mouth,
Head of Kroto Slough,
Anderson Creek,
Alexander Creek/Slough, and
Fish Creek.

RESPONSE TO COMMENT C.39 (cont.):

Aquatic habitats will be identified using definitions utilized by the ADF&G as follows:

Dewatered,
Mainstem,
Side channel,
Side slough,
Upland slough,
Tributary,
Tributary mouth, and
Lake.

Flow duration curves for Susitna Station and Sunshine, for natural and post-project conditions will be presented. The report will be available in the spring of 1984. Qualitative and semi-quantitative data on ice processes are also being collected in the areas where habitat assessments are being made.

The License Application notes that project-related effects downstream from the Chulitna-Susitna-Talkeetna confluences would be moderated due to the influences of the inflows of the Chulitna and Talkeetna Rivers. This is particularly true of temperature as noted on FERC License Application pages E-2-88, E-2-123 and E-2-169.

Sediment and ice processes will also reflect the influences of the Chulitna and Talkeetna Rivers and thus impacts in the reach between the confluence area and Cook Inlet will be less pronounced than upstream of the confluence area.

COMMENT C.40:

"4.2.4 Downstream of Talkeetna

"The project effects on the morphology of sloughs downstream from Talkeetna should be discussed. No discussion has been provided for the area downstream from Talkeetna.

"The project effects downstream from Talkeetna are expected to be moderated by the contributions of the Chulitna and Talkeetna Rivers and other tributaries. However, some effects are expected."

RESPONSE:

Please refer to Responses to Comments B.8 and C.39.

COMMENT C.41:

"4.2.4 Downstream of Talkeetna

"An inventory of sloughs and side channels below Talkeetna should be performed. Also, a comparison of pre-project and post-project flows should be provided for the river."

RESPONSE:

Please refer to Response to Comment B.8 which describes the preparation of an inventory of sloughs and side channels which occur downstream of Talkeetna. Comparisons of natural and with project discharges at the Sunshine and Susitna Station gaging stations are presented in FERC License Application Figures E.2.161 and E.2.162 respectively, for the Watana only development and in Figures E.2.209 and E.2.210 respectively, for the Watana/Devil Canyon development. These comparisons are presented as flow duration curves and identify the percent of time specific discharges are equalled or exceeded based on the period of records available.

COMMENT C.42:

"4.3 Ice Coverage--Formation

"The effects of ice formation processes on the channel characteristics between Devil Canyon and the confluence of the Chulitna and Susitna Rivers should be addressed in the

COMMENT C.42 (cont.):

EIS. Operational winter river stage increases of 3-4 feet over existing conditions would be expected when ice formation occurs, causing possible scouring of the streambank. Results from the ICESIM ice simulation model, vegetation mapping, and streambank substrate sampling should be integrated to estimate the following:

"1. type and volume of bank material removed

"2. subsequent changes in channel dimensions

"3. type and quantity of riparian vegetation removed.

"Scour could remove significant amounts of riparian vegetation as well as increase suspended sediments. This process could adversely affect river navigation and salmon spawning areas downstream."

RESPONSE:

With Watana only, ice formation in the reach from Teslkeetna to Devil Canyon is expected to reduce ice thicknesses and "staging" of generally to increase about 5 feet, but as much as 10 feet in some locations. This is about the same as presently occurs.

The with-project stages during freeze-up are expected to be as much as 3 feet higher than existing stages because of the higher discharges during freeze-up (10,000 cfs± versus 3,000 cfs±). (R&M "Hydraulic and Ice Studies," March 1982 outlines stage discharge ratings at various river sections.) However, the increased stages during freeze-up do not in themselves lead to increased bank scouring. In fact, bank scouring and other changes to river morphology occur primarily during break-up (License Application page E-2-25, and R&M Consultants, "Susitna River Ice Studies" 1980-81, 1981-82, and 1982-83.) The freeze-up under natural conditions is a much more gradual, controlled phenomenon than break-up. Therefore, no significant additional bank scouring is expected with-project in this reach. Even with break-up, ice flows will be controlled by the Project.

The increased winter river water level and ice stage may remove some existing vegetation above the normal level, resulting in a net loss of vegetation cover. This may occur within the first several years of operation. The width of

RESPONSE TO COMMENT C.42 (cont.):

the unvegetated channel may increase and the amount of vegetation on river islands may decrease. The majority of vegetation removed could probably consist of early successional plants including horsetails and other herbaceous plants, balsam poplar, willow, and alder.

With Watana and Devil Canyon dams, only ice cover is not expected to form in this reach.

REFERENCES

R&M Consultants, Hydraulic and Ice Studies (March 1982), previously submitted to the FERC on April 12, 1982.

R&M Consultants, Ice Observations 1980-1981 (August 1981), previously submitted to the FERC on July 11, 1983.

R&M Consultants, Winter 1981-1982 Ice Observations Report (December 1982), previously submitted to the FERC on July 11, 1983.

R&M Consultants, Winter 1982-1983 Ice Observations Report (in preparation).

COMMENT C.43:

"4.4 Ice Coverage--Spring Breakup

"The mechanism for spring ice breakup should be discussed. Target releases on the order of 10,000 cfs for either the "Watana only" or two reservoir scenarios will be significantly less than pre-project spring runoff."

RESPONSE:

The mechanism for spring break-up is discussed on page E-2-126 of the License Application. The target minimum discharge at Gold Creek during the normal break-up month of May is 6,000 cfs. License Application Table E.2.45 indicates that the actual mean releases for Watana or Devil Canyon are substantially greater than this minimum. The mean monthly natural flow at Gold Creek is 13,240 cfs, versus 10,405 with Watana only, and 8,706 cfs with Watana and Devil Canyon. The lower releases in May with-project are expected to produce a more gradual, controlled break-up than occurs naturally, particularly in the reach from Talkeetna to Devil Canyon.

RESPONSE TO COMMENT C.43 (cont.):

License Application Table E.2.45

Monthly Maximum, Minimum, and Mean Flows at Gold Creek (cfs)

MONTH	PRE-PROJECT			POST-PROJECT					
				WATANA OPERATION			W/DC OPERATION		
	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
OCT	8212.0	3124.0	5770.8	11782.5	6221.8	8014.0	10983.0	6453.2	7764.9
NOV	4192.0	1215.0	2577.1	11979.9	6741.5	9185.7	11848.8	7103.9	9630.8
DEC	3264.0	866.0	1807.2	13380.4	7678.9	10693.3	13134.1	8040.5	11270.9
JAN	2452.0	824.0	1474.1	11342.5	7179.3	9797.8	12045.8	7423.9	10596.7
FEB	2028.0	768.0	1249.1	10344.5	6437.0	8951.1	11452.8	6457.3	10190.9
MAR	1900.0	713.0	1123.7	9411.7	6576.7	8323.7	10604.2	6618.1	9285.6
APR	2650.0	745.0	1361.7	9353.6	5811.1	7740.1	9759.4	5950.4	8100.4
MAY	21890.0	3745.0	13240.0	18134.9	6061.3	10404.9	12380.0	6000.0	8706.3
JUN	50580.0	15530.0	27814.9	26091.6	6000.0	11419.5	13305.2	6000.0	9882.9
JUL	34400.0	18093.0	24445.1	15151.9	6484.0	9184.6	11846.2	6484.0	8387.3
AUG	38538.0	16220.0	22228.1	26494.0	12000.0	13378.4	21146.2	12000.0	12633.5
SEP	21240.0	6881.0	13320.9	13506.1	8050.5	9839.6	18330.0	9300.0	10510.3
ANNUAL	11565.2	7200.1	9753.3	11468.8	7831.3	9745.4	11473.3	7776.4	9745.4

COMMENT C.44:

"4.4 Ice Coverage--Spring Breakup

"Section 4.2.3 suggests that significant ice formation downstream of Devil Canyon will be unlikely. If formation does occur, how will the breakup occur? What will be the breakup mechanism if the Devil Canyon reservoir is not constructed?"

RESPONSE:

The ice break-up mechanism in the Talkeetna to Devil Canyon reach and Talkeetna to Cook Inlet reach are discussed on pages E-2-89, E-2-126, E-2-169 and E-2-170 of the FERC License Application, for Watana only and also for Watana and Devil Canyon.

FERC License Application page E-2-169 states that with Devil Canyon, little ice will exist between Devil Canyon and Talkeetna. Any ice which does exist will likely melt in place because of the controlled powerhouse releases.

COMMENT C.45:

"4.5 Channel Stability & Sediment Transport

"The effects of the change in sediment regime downstream from both dams should be discussed. The sediment transport analysis suggests that post-project flows will generally be insufficient to cause movement of the gravel bed. The formerly dynamic bed will now be stabilized. Coupled with lower stages, this effect may lead to the deterioration of the side channels and sloughs by beaver dams and other mechanisms."

RESPONSE:

Potential aggradation and degradation in the Susitna River below Devil Canyon Dam has been analyzed and a draft report is being prepared. The results of these analyses indicate that channel degradation under with-project conditions will range from zero to 0.3 feet between Devil Canyon Dam and the confluence of the Susitna River with the Chulitna River depending on the sub-reach. This is based on the assumptions that bedload inflow to a sub-reach would be negligible and that an armoring layer will develop on the streambed as small particles are sorted out and transported downstream. In the actual situation, there will be some bedload inflow from the tributaries and actual degradation would be less.

The degradation analyses were made using the mean annual flood as the dominant discharge.

Bed material samples were collected in side channels and slough berms. These data indicate that under the natural conditions, erosion of the berms occurs during high flows in the river. Under with-project conditions, erosion of the berms will be less and some aggradation may be expected near the berms. This is because the main river channel will become more confined and any occasional higher flows may deposit bedload near the entrance of sloughs. This, in

RESPONSE TO COMMENT C.45 (cont.):

conjunction with attenuation of high flows by the reservoirs, will reduce the frequency of mainstem flows overtopping the slough berms.

REFERENCES

Harza-Ebasco, Draft Report on Analysis of Potential Aggradation and Degradation in the Susitna River (in preparation).

COMMENT C.46:

"4.5 Channel Stability & Sediment Transport

"The releases from the dam will be essentially clear water, containing particles of 4 microns or less. Under pre-project conditions, high suspended sediment concentrations have been observed. The impact of the loss of this material to berm formation at the slough entrances should be considered. An analysis of the composition of typical berms should be presented.[3]

"[3] While significant effort has been expended in defining baseline sediment transport conditions in Chapter 2, only minimum discussion of project impacts has been presented."

RESPONSE:

Please refer to Response to Comment C.45.

COMMENT C.47:

"4.6 Downstream Temperatures/Nitrogen Concentrations

"Downstream temperatures will be a function of the stratification in the reservoirs and the withdrawal mechanism. Temperature stratification appears to have been carefully modeled. However, no hydraulic analysis of withdrawal has been presented.

"A detailed hydraulic analysis of withdrawal should be presented in the EIS for the design releases. The potential for supersaturation of nitrogen at the intake structures during reservoir withdrawal should be reexamined.[4] This

COMMENT C.47 (cont.):

evaluation should confirm the effectiveness of the multi-level outlet structure.

"[4] The existing analysis apparently uses spurious data."

RESPONSE:

The cone valves are expected to avoid gas supersaturation. These valves, in combination with the power house flows, will discharge all flood flows up to the 1:50-year flow without causing supersaturation. A prototype test of cone valves showed them to be effective in preventing supersaturation (see attached report by Ecological Analysts). During the final design stage of this project, prototype testing will be further studied through mathematical and physical modeling.

At this point, additional analyses or investigations do not seem justified. The cone valves are designed to avoid gas supersaturation. Previous studies have shown that gas supersaturation can be avoided. The "fine tuning" to assure the agencies that the cone valves will work will continue through the design stage and into the testing period. The Power Authority is cognizant of this matter and has incorporated a method to address it that has a high probability of achieving that goal.

REFERENCES

Ecological Analysts, Inc., Lake Comanche Dissolved Nitrogen Study (June, 1982), prepared for Milo Bell.

COMMENT C.48:

"<u>4.7</u> <u>Chemical</u> <u>Changes</u>

"Possible pH changes in the impoundment area and, therefore, in the release, should be clearly defined.

"Inundation of acidic bogs may increase reservoir acidity. It may also alter heavy metal and nutrient levels. The EIS should quantify these water quality changes."

RESPONSE TO COMMENT C.48:

Flooding of acidic bogs is not anticipated to cause pH changes in the proposed reservoir system. The Susitna River drains thousands of square miles of mountain and tundra highlands underlain by glacial till and covered by acidic, saturated, peaty soils. Acidic bogs (Sphagnum bogs commonly have pH less than 4.5) are common. However, the bicarbonate buffering system in the river basin maintains moderate to high (46-88 mgl^{-1} $CaCo_3$) alkalinity during runoff. The alkalinity of the reservoirs will reflect the biogeochemistry of the entire drainage system, not just the relatively small, relatively insignificant and newly flooded area.

Leaching processes and the degradation of vegetable materials in the reservoirs are expected to accompany temporary increases in total dissolved solids including important plant nutrients and metals. The increases in important plant nutrients and metals are not quantifiable at present; however, neither is expected to be detrimental to water quality in the reservoirs or in downstream flows (Peterson and Nichols, 1982). Please refer to page E-2-96; pages E-2-135, 136; and page E-2-172 of the License Application. The DEIS should incorporate all of these prior findings.

REFERENCES

Peterson, L. A. and G. Nichols, Water Quality Effects Resulting From Impoundment of the Susitna River (1982), previously submitted to the FERC on July 11, 1983.

COMMENT C.49:

"4.8 Downstream Turbidity

"Project seasonal downstream turbidity levels should be specified. A comparison with baseline turbidity levels should also be presented."

RESPONSE:

Please see FERC License Application Exhibit E, page E-2-30, pages E-2-129-131 and page E-2-170. The project application predicts turbidity ranges of 10-20 NTU under winter ice

Comment C.49
Fig. 1

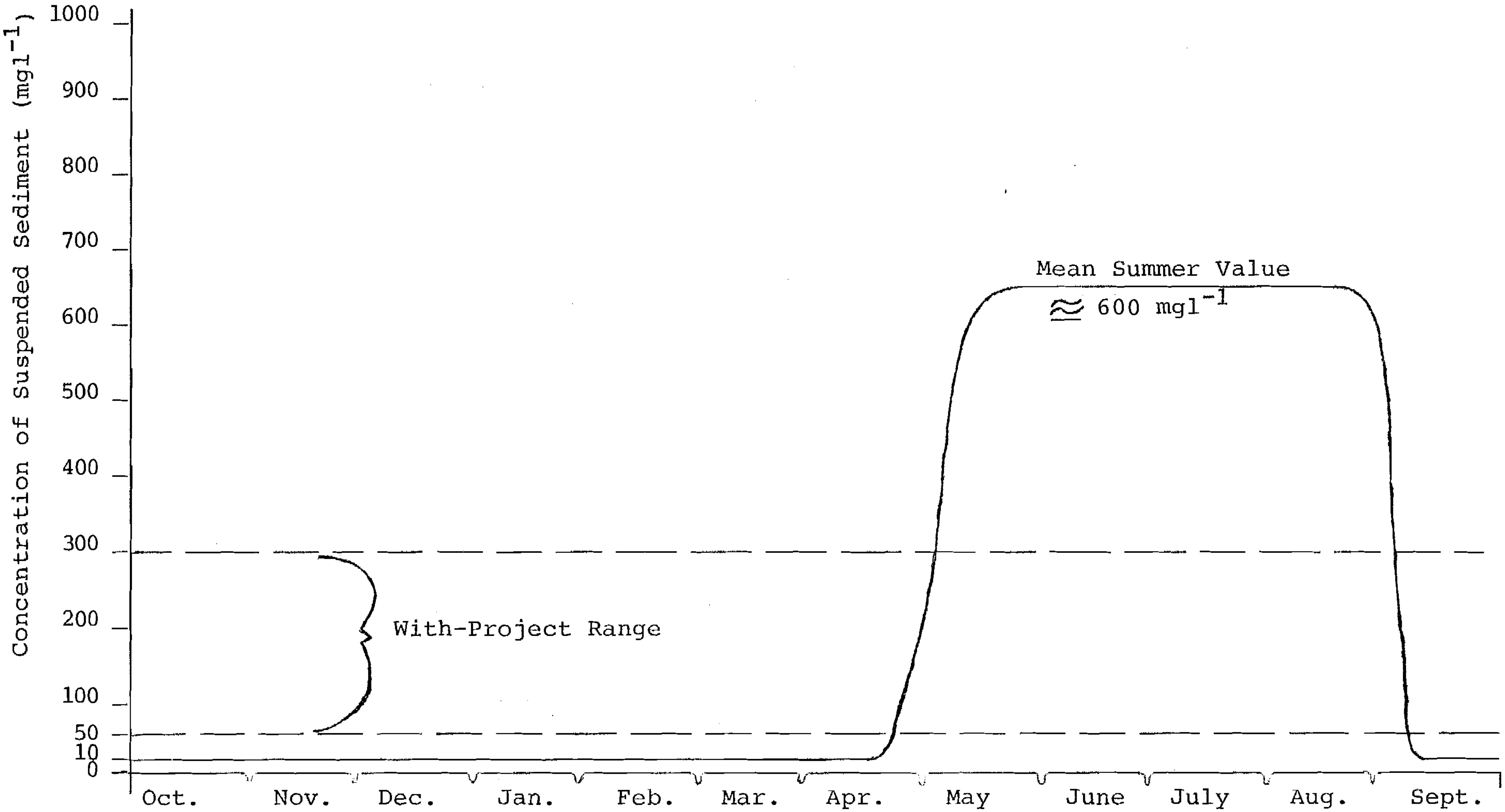

Figure 3. Natural and Predicted With-Project Concentrations of Susitna River Suspended Sediment

RESPONSE TO COMMENT C.49 (cont.):

cover and 20-50 NTU during summer. Efforts are continuing to refine estimates of seasonal turbidity in the reservoirs and downstream river flows.

The present suspended sediment regime has very high concentrations in summer and low concentrations in winter. Predicted concentrations of suspended sediment with the project are 50-300 mg per liter. Euphotic zones are expected to be between one and five meters deep with very limited primary and secondary productivity in areas continuously inundated by mainstem flows. Particle size distributions for suspended sediments in the middle river reach are expected to shift to being predominantly (70+ percent) less than 4 microns in nominal diameter under project conditions.

The Kenai and Kasilof Rivers of the Kenai Peninsula both drain natural lakes which are turbid from "glacial flour" suspended sediment. For purposes of comparison, suspended sediment concentrations near the glacial lake origins of the Kenai and Kasilof Rivers vary from 2-72 mgl^{-1} and 15-45 mgl^{-1}, respectively (Scott, 1982). Predicted concentrations of suspended sediment to be discharged from the project are higher than either of the previously discussed rivers which have large glacial lake settling basins at their origins.

REFERENCES

Scott, K.M., Erosion and Sedimentation in the Kenai River, Alaska, Geological Survey Professional Paper (1982).

COMMENT C.50:

"4.8 Downstream Turbidity

"Post-project levels are expected to be much lower than baseline conditions. This effect is not only expected to increase primary productivity of fish, but to increase predation as well."

RESPONSE:

Lower turbidity, in general, might be expected to allow an increase in phytoplankton and phytobenthos photosynthesis, resulting in increased micro- and macro-invertebrate secondary productivity and possibly fish productivity. Altered turbidity may inhibit or enhance predation by certain species at any consumer level because it typically alters behavior. It may provide additional cover for both predator and prey alike or it may make certain fish species more vulnerable and their predators more abundant. Turbidity and productivity are generally inversely correlated and their relationships are very complex. The overall effect of an altered turbidity regime will depend on the chemical (nutrient), physical and biological reaction to the reduced summer and increased winter turbidity, as well as the ecology of each affected organism.

No plans exist, at present, to mitigate for changes in turbidity due to the project, since expected impacts are primarily positive in nature. Predation will be considered as part of the anticipated with-project monitoring program.

COMMENT C.51:

"4.9 Nutrient Levels

"Nutrient levels in the reservoirs and wells are expected to rise as a function of oil spills and/or wastewater contamination."

RESPONSE:

Please refer to FERC License Application Exhibit E, page E-2-183, for a brief discussion of requirements of EPA and ADEC regarding petroleum product spills. Refer also to FERC License Application Exhibit E, pages E-3-156-159 for a discussion of planned and required mitigative measures

RESPONSE TO COMMENT C.51 (cont.):

regarding petroleum product spills and wastewater contamination.

An increase in nutrient concentrations is not expected to occur in response to incidental oil spills. Reservoir limnological conditions should be oligotrophic and very resistant to trophic status or water quality changes to nutrient concentrations from either significant amounts of wastewater or anything but huge petroleum product spills, neither of which is reasonably expected to occur.

COMMENT C.52:

"4.9 Nutrient Levels

"The contingency plan for oil spills and the treatment plan should be described in detail in the EIS."

RESPONSE:

As is indicated in the License Application Volume 6A, page E-3-156, pursuant to federal regulation (40 C.F.R. § 112.7), APA will develop a Spill Prevention, Containment and Countermeasure (SPCC) Plan. The SPCC Plan could be discussed in the EIS as a mitigation plan. The EIS could discuss the SPCC's mitigative benefits.

COMMENT C.53:

"4.10.1 Application Content

"Chapter 2 of the permit application contains only a summary of the water quality study performed by Peterson and Nichols (1982). Extensive references are made to this report. Nutrient loadings will be minimized by burning and clearing the impoundment area. This plan should be seriously reviewed since the Watana impoundment area is 48 miles long and covers 38,000 acres."

RESPONSE:

No plans exist nor are any such plans included in the FERC License Application for clearing and burning of impoundment zone vegetation. No mention of clearing and burning is found in the Peterson and Nichols study.

RESPONSE TO COMMENT C.53 (cont.):

Tentative plans have been discussed to cut timber (greater than 4 inches in base diameter) from the reservoir zones of inundation. No specific plans have been made as to the disposal of these trees as yet. Because reservoir vegetation clearing activities are several years in the future, no detailed analysis of mechanisms has been made at this stage of planning. In order to protect terrestrial wildlife and botanical resources, clearing of impoundment zone trees greater than four inches base diameter will be delayed until just prior to inundation. Present considerations do not anticipate clearing of vegetation down to mineral soil as might be considered for small reservoirs in temperate or subtropical latitudes. Nutrient liberation from soil leaching and vegetation decay is expected to be minimal (please refer to License Application pages E-2-133 through E-2-135) and of little significance with respect to nutrient loading and reservoir trophic status. Plans for vegetation removal will be seriously reviewed before the Watana reservoir is inundated and a plan suitable to resource agencies will be formulated for clearing the reservoir area.

REFERENCES

Peterson, L.A. and G. Nichols, Water Quality Effects Resulting from Impoundment of the Susitna Rever (1982), previously submitted to the FERC on July 11, 1983.

COMMENT C.54:

"<u>4.10.1</u> <u>Application</u> <u>Content</u>

"In Chapter 11, response to the questions of control of hazardous materials, wastewater discharge, and concrete production are as follows:

o Federal law requires that as part of the management procedures there will be an oil spill contingency plan (40 C.F.R. 102.F). This is discussed in Chapter 3, Section 2.4.3(c)(ii)."

RESPONSE TO COMMENT C.54:

The above referenced language is contained in Volume 10B, Appendix E11J of the License Application as the Power Authority's response to a January 21, 1983 letter from the Alaska Department of Environmental Conservation (in Volume 10B, Appendix E11I of the License Application) commenting on the Draft License Application. The following corrections should be made to the citations referenced above:

(a) The oil spill contingency plan is required pursuant to 40 C.F.R. § 112, et seq., and

(b) The License Application discussion can be found in the February 1983 application in Exhibit E, Chapter 3, § 2.4.3(e)(ii), page E-3-156.

In addition, the License Application discussion Section 2.4.3(e)(ii) should be corrected to reflect state code-referenced language to 18 Alaska Admin. Code 75. The reporting of hazardous waste spills and spills to surface waters are further regulated on the Project by the Environmental Protection Agency (40 C.F.R. § 110) and the Coast Guard (33 C.F.R. §§ 153-156).

Please also refer to Response to Comment C.52.

COMMENT C.55:

"<u>4.10.1</u> <u>Application</u> <u>Content</u>

"In Chapter 11, responses to the questions of control of hazardous materials, wastewater discharge, and concrete production are as follows:

"All wastewater discharges from the treatment facilities will meet permit requirements. Chlorine will be utilized, if deemed appropriate, to ensure discharge water will meet fecal coliform standards."

RESPONSE:

The above referenced language is contained in Volume 10B, Appendix E11J of the License Application as the Power Authority's response to a January 21, 1983 letter from the Alaska Department of Environmental Conservation (in Volume 10B, Appendix E11I of the License Application) commenting on the Draft License Application. The Power Authority has no reason to disagree with the statement.

COMMENT C.56:

"<u>4.10.1</u> <u>Application</u> <u>Content</u>

In Chapter 11, responses to the questions of control of hazardous materials, wastewater discharge, and concrete production are as follows:

"Potential impacts associated with concrete wastewater and preliminary mitigative measures are discussed in Chapter 2, Section 4.1.1.(c)(vi), 4.2.1.(c)(vi), and 6.2."

RESPONSE:

The above referenced language is contained in Volume 10B, Appendix E11J of the License Application as the Power Authority's response to a January 21, 1983 letter from the Alaska Department of Environmental Conservation (in Volume 10B, Appendix E11I of the License Application) commenting on the Draft License Application. The Power Authority has no reason to disagree with the statement.

COMMENT C.57:

"4.10.2 Recommendations

"1. The report by Peterson and Nichols (1982) should be reviewed to determine the level of effort undertaken to analyze water quality in the reservoirs. Only a summary of the results of this report are presented in the application. Water quality modeling efforts appear to be confined to the DYRESM (Imberger et al., 1978) 1-D temperature model, which is usually applied to smaller reservoirs, and the Vollenweider (1976) approach to determining order-of-magnitude estimates of phosphorous concentrations."

RESPONSE:

The Peterson and Nichols (1982) report has been reviewed. It analyzes some principle limnological variables governing the trophic status of temperate latitude lakes and reservoirs (Rast and Lee, 1978) and was judged adequate for assessing the trophic status of the Susitna Hydroelectric Project reservoirs. The report also examines additional predicted characteristics of the project reservoirs which should influence the trophic status of Alaskan reservoirs but which are not included in the Vollenweider modeling effort (see FERC License Application pages E-2-133 through 136).

DYRESM is designed for simulating the dynamics of medium size reservoirs, and, in particular, to provide daily predictions of the temperature and salinity variations with depth and the temperature and salinity of the water released from the reservoir.

The validity of DYRESM for use on a small shallow reservoir, Wellington Reservoir in Western Australia, and a deep montain lake of intermediate scale, Kootenay Lake in British Columbia, has been demonstrated (Patterson, Hamblin and Imberger).

REFERENCES

Patterson, J. C., P. F. Hamblin, and J. Imberger, The Application of a Dynamics Simulation Model to Lakes and Reservoirs (undated).

RESPONSE TO COMMENT C.57 (cont.):

Rast, W. and G. F. Lee, Summary Analysis of the North American (U.S. Portion) OECD Eutrophication Project: Nutrient Loading - Lake Response Relationships and Trophic Status Indices, Corvalis, Oregon (1978), EPA-600/3-78-008.

Peterson, L. A., and G. Nichols, Water Quality Effects Resulting From Impoundment of the Susitna River (1982), previously submitted to the FERC on July 11, 1983.

COMMENT C.58:

"4.10.2 Recommendations

"2. If after reviewing the Peterson and Nichols report it is determined that more sophisticated modeling approaches are required, we recommend a two-phase modeling approach. Simulations of flows and temperature profiles can be accomplished with a model such as LARM2 (Laterally Averaged Reservoir Model) (Reference 1)). This two-dimensional segmented reservoir model is appropriate for flow simulations in long reservoirs, where the longitudinal and vertical components are of interest. This model can be used in conjunction with a model such as EAM (Ecosystem Assessment Model) (Reference 2) to predict levels of a wide range of water quality parameters. The model can be used in either a 1-D, 2-D, or 3-D mode. The model has the capability to handle the following constituents:

"- oxygen and BOD;
- four phytoplankton groups;
- three zooplankton groups;
- benthic organisms;
- attached algae;
- four fish groups with 5 life stages;
- full nutrient cycles for phosphorus, nitrogen, silica, and carbon;
- pH/alkalinity/carbonate system;
- detrital compartments for suspended organic detritus and organic sediment; and
- total dissolved solids.

"4.10.3 Modeling References

"1. Users Guide for LARM2: Longitudinal-Vertical, Time-Varying Hydrodynamic Reservoir Model, J. E. Edinger and E. M. Buchak, October 1982, EWQOS TR E-82-Draft, U.S. Army Corps of Engineers, WES, Vicksburg, Mississippi."

COMMENT C.58 (cont.):

"2. Methodology for Evaluation of Multiple Power Plant Cooling System Effects, Vol. 4 Users Guide to Mode Operation, Tetra Tech, Inc., August 1980, EPRI-EA-1111."

RESPONSE:

No additional or more sophisticated modeling of the reservoir is deemed necessary at this time. Relevant limnological data have been evaluated with respect to the need for sophisticated modeling. All indications are that the reservoir will be cold, turbid and nutrient-limited much of the time.

Primary production may be higher than predicted and the reservoir may be capable of maintaining a larger fish population, but all of these are plusses and extensive modeling is not necessary to predict them.

Sophisticated reservoir modeling is typically employed when excessive algal growth and resulting taste and odor problems are anticipated or significant toxins are expected to build up. None of these conditions apply.

The suggested models would be quite appropriate in some instances, but were not thoroughly evaluated since additional modeling is not considered necessary in this case.

COMMENT C.59:

"4.11 Salinity in Cook Inlet

"The effects of the project on salinity at Cook Inlet should be clearly stated. A comparison of baseline and project flows at the mouth should be provided to determine the possible impacts on saltwater intrusion."

RESPONSE:

The License Application contains a fairly thorough discussion of the effects of the project on upper Cook Inlet's salinities. Analyses were conducted via computer modeling to assess the change of salinities in Cook Inlet due to reservoir filling and project operation. According to the results of this effort, no substantial salinity changes are expected to occur in upper Cook Inlet (see FERC License Application Exhibit E, Volume 5A, pages E-2-100, E-2-140, E-2-154 and E-2-174).

COMMENT C.60:

"4.12 Groundwater Interaction in Sloughs

"Flows in sloughs and side channels occur as a result of the combination of mainstem flows, local inflows, and groundwater flows. During low mainstem flows, local inflows dominate. The APA has stated that local inflows as small as 1 cfs are sufficient to permit outmigration of fry. However, such small flows may pass through the downstream berms rather than over them, thus blocking outmigration of fry.

"An analysis of four sloughs has been presented in the Attachment to Appendix E.2.A. This analysis should be expanded to consider the possibility of flow through the downstream berms."

RESPONSE:

It is possible that flows less than 1 cfs may occur in sloughs. It is also possible that minimal flows may flow entirely through, rather than over, the downstream substrates of slough mouths. Natural stranding of juvenile salmonids by this mechanism is not uncommon.

Estimates of the number of fry in the Susitna River which might be expected to be affected by this phenomenon are not presently feasible.

Mitigation is possible, and may be accomplished in several ways. Regulation of mainstem discharge sufficient to provide a backwater effect to elevate water levels at the slough mouth could alleviate this possibility. Low level weirs could be placed in sloughs suspected of experiencing this type of phenomenon. Additionally, accumulations of gravel at the mouth of a slough could be removed to allow discharge from the slough to flow on the surface. The dynamic nature of slough hydrology and morphology, as well as the ongoing studies of riverine habitat and mitigation techniques, will further address this subject.

COMMENT C.61:

"4.13 Navigation

"A discussion of the impacts on navigation has been presented in Application Section 2.6.3. The discussion should be expanded.

"The range of depths and velocities for navigability at key cross sections should be indicated. The expected number of days that these conditions would occur in a given year should be included for both baseline conditions and project conditions. The discussion should also include impacts on snowmobile travel during freezeup."

RESPONSE:

Figures E.2.63 and E.2.64 of the FERC License Application present maximum water depths at 63 cross section locations in the Devil Canyon to Talkeetna reach for selected discharges. These depths were determined from water surface profile simulations. An update of these water surface elevations was recently undertaken and is presented later in this discussion.

Based on depth-discharge relationships obtained from the simulation presented in the License Application, a discharge of 6,500 cfs would be required to maintain a navigable depth of 2.5 feet throughout the Deveil Canyon to Talkeetna reach. Using this flow as a minimum criterion for navigation, Table C.61.A below presents the percent of time that navigation in this reach would be restricted under natural conditions. In May, navigation problems would be encountered 31 percent of the time. However, these low flows would normally occur in early to mid-May when the Susitna River is ice covered and not used for navigation. In June or July, there would not be restrictions to navigation due to low flow. In August navigation is seldom restricted, but during September navigation problems could be expected about 9 percent of the time.

RESPONSE TO COMMENT C.61 (cont.):

Table C.61.A
Frequency of Non-Navigability of
Devil Canyon - Talkeetna Reach Resulting From
Low Flow Conditions

Percent of time flow less than 6,500 cfs

Month	Natural Conditions		Watana Alone	Watana - Devil Canyon
May[1]	31.0[2]	10[3]	10[3]	10[3]
June	0[2]	0[3]	3[3]	10[3]
July	0[2]	0[3]	0[3]	0[3]
August	1.5[2]	0[3]	0[3]	0[3]
September	8.6[2]	5[3]	0[3]	0[3]

1 Includes both ice cover and ice free conditions.

2 Based on duration table of daily values for each month for the Susitna River at Gold Creek. See License Application Figure E.2.39.

3 Based on 32 years of monthly simulations. Values represent percent of time mean monthly flow is less than 6,500 cfs. For with-project conditions, flow during the month would be expected to show considerably less variation than during natural conditions because of the regulation provided by Watana. However, some natural variability will be introduced because of the contributing drainage area downstream from Watana/Devil Canyon.

The effect of high velocities on navigation was not addressed in the FERC License Application. If it is assumed that the limiting velocity for navigability is approximately 10 feet per second, based on the HEC-2 simulations (RM 1982), velocities would only restrict navigation at flows above 40,000 cfs. The percentage of time that high natural flows would restrict summer navigation is presented below:

RESPONSE TO COMMENT C.61 (cont.):

Month	Percent of Time Natural Flows of 40,000 cfs Exceeded
May	0.9
June	10
July	3
August	4.4
September	.2

The effect on navigation of the filling of Watana Reservoir is discussed in the License Application (page E-2-99). A minimum flow of 6,000 cfs at Gold Creek will be provided in May, June, July and September 20 to 27. Because this flow is less than the 6,500 cfs suggested as a navigation requirement, some navigational difficulties could occur. However, appropriate mitigation measures including dredging and channel marking could be undertaken to ensure that the navigation problems do not occur. From July 27 through September 19, flow will always be greater than 6,500 cfs, thereby maintaining an adequate depth for navigation.

Because the maximum discharge of Watana during filling will be 30,000 cfs, navigation problems caused by high velocities will not occur (local inflow will rarely be greater than 10,000 cfs).

The percent of time that navigability will be affected by depth during project operation is discussed on pages E-2-138 and E-2-173 of the FERC License Application. The analyses are based on the assumption that navigation problems resulting from inadequate depth occur at discharges of 6,500 cfs or less. These analyses are based on monthly averages and thus would vary slightly from a daily analysis. The frequency at which navigation problems will occur is presented above in Table C.61.A.

During Watana operation, the analyses indicate that although navigational difficulties due to depth restrictions will occur more often in June, the navigability during August and September would be improved. If navigation limitations due to high flow are considered, there would rarely be limitations to navigation during Watana operation. A discharge of greater than 40,000 cfs will occur at a frequency of one in 50 years.

RESPONSE TO COMMENT C.61 (cont.):

For Watana/Devil Canyon operations, navigation restrictions due to low flow will occur 10 percent of the time in May and June but will not occur in July, August, or September. Because of the potential for greater release flows in the early years of Devil Canyon operation, there may be a greater frequency of navigation difficulties due to high flows (i.e., about one year in ten for a period of one or two weeks). However, the frequency of occurrence will be less than under natural conditions.

As previously mentioned, a refinement of water surface profiles was undertaken in the fall of 1983. These updated water surface profile simulations were based on staff gauge data collected by the Alaska Department of Fish and Game (ADF&G 1983, and ADF&G unpublished data) and on additional cross sections. The results of these studies indicate that the mainstem Susitna is navigable at a flow of 5,000 cfs. At this flow, a minimum depth of 2.66 feet is provided for mainstem navigation. Therefore, since a summer flow of at least 6,000 cfs will be provided during project operations, mainstem navigation would not be a problem. Under natural conditions, if 5,000 cfs is assumed to be the limiting flow for navigation, navigation would be restricted 2 percent of the time during the month of September. Therefore, the percent of time the mainstem is navigable would be slightly improved during project operation.

Because of the regulation provided by Watana reservoir, summer water levels will be reduced an average of two to four feet (FERC License Application page E-2-106). Therefore, although conditions will be suitable for mainstem navigation almost all of the time, it may be necessary for boaters to dock their boats a further distance from their destination point than would otherwise be necessary under natural conditions. For example, an angler or hunter wishing to go to a specific location may find that he/she must travel an extra distance by foot.

Downstream from Talkeetna, mainstem water depths are expected to be adequate for navigation during the May through September period (see page E-2-139 of the FERC License Application).

Winter transportation, including snowmobile travel may be delayed at all locations downstream from Watana due to possible delay in freeze-up. Depending on the severity of

RESPONSE TO COMMENT C.61 (cont.):

the winter and the downstream location, the delay in freeze-up could range from several days to months.

REFERENCES

Harza-Ebasco, Susitna Hydroelectric Project Lower Susitna River, Water Surface Profiles and Discharge Rating Curves, Draft Report (October 1983), previously submitted to the FERC on November 3, 1983.

COMMENT C.62:

"4.14 Catastrophic Failures.

The effects of catastrophic failure of one or both of the dams should be addressed in the EIS. Even though a remote risk, catastrophic failure could have profound effects on human life, wildlife, vegetation, fisheries, and transportation facilities.

"Analysis should include catastrophic failure of either dam, and should include failure of the upper dam causing subsequent catastrophic failure of the lower dam.

"The extent of inundation due to catastrophic failure should be mapped on a scale equivalent to that used for Figures E.2.12 through E.2.20, and should cover the entire affected area to Cook Inlet.

"Information should be provided on the height and velocity of the wave front, and the time, duration and velocity characteristics of the released water.

"Descriptive data should be provided on vegetation destruction, wetland loss, debris accumulation, debris volume discharged to Cook Inlet, sediment movement, fish habitat losses, and wildlife impacts."

RESPONSE:

Hypothetical dam failure scenarios due to simultaneous occurence of an earthquake and the probable maximum flood were developed during feasibility studies for Watana Dam, for Devil Canyon Dam, and for a domino-type failure of the two dams. Also included was a dam break hydrograph for the Watana Cofferdam. This investigation utilized the National Weather Service Flood Forecasting Model, DAMBRK (Susitna

RESPONSE TO COMMENT C.62 (cont.):

Hydroelectric Project Hypothetical Dam-Break Analyses, 1982).

The study analyzes cases of floodwaves routed approximately 5 river miles downstream from Talkeetna. Information is provided on wave height and velocity along with the duration characteristics of the released water.

The United States Committee on Large Dams, known as "USCOLD" has drafted a "Model Law for state Supervision of Safety of Dams and Reservoirs". Federal dams and reservoirs also have dam safety plans including measures for advising the public of downstream flooding resulting from a catastrophic failure. These emergency operation plans are prepared after final design and prior to reservior operation. Similar procedures will be considered for the Susitna Project.

REFERENCES

Acres American, Susitna Hydroelectric Project Hypothetical Dam-Break Analyses, Task 3 - Hydrology (March, 1982).

COMMENT C.63:

"5.1 General Comments

"The EIS should be more quantitative throughout the assessment of impacts on the fish resources of the Susitna River Basin. The application provides general information on nearly all foreseeable impacts (both positive and negative); however, there is no discussion of the number of fish expected to be affected within each habitat type and the cumulative net effect of dam construction and the subsequent dam operations."

RESPONSE:

The Power Authority has a stated policy that there will be no net loss of fisheries' resources as a result of this Project.

To achieve this policy, the Power Authority has expended extensive time and resources on the study of existing conditions and on the development of potential impact scenarios. Also, they have developed mitigation plans to avoid or minimize these impacts.

RESPONSE TO COMMENT C.63 (cont.):

Much of the information on these studies was presented in the FERC License Application. Ongoing studies will continue to refine the analyses already completed and are designed to develop final mitigation plans that will have a high likelihood for success.

Each habitat can be given a specific potential for impact. This can range from habitats that are expected to have no impact (e.g., tributary habitat) to potentially significant impacts (e.g., slough, side-channel and mainstem habitats). These potential impacts were extensively described in the License Application.

The ability to precisely determine a fixed value for numbers of fish within each habitat is not completely achievable nor is it practical to develop such a number. The reason for this is that the numbers of fish in each habitat show extensive variation in response to natural (e.g., freshwater and marine survival) and man-caused (e.g., sport and commercial fishing) conditions in an extremely dynamic environment. The goal of past and future studies is to determine the relative magnitudes of fish numbers in the various habitats, the habitat requirements of the fish, the degree to which the project will change this habitat and the mitigative measures to avoid or minimize those impacts.

Several data reports of quantitative and qualitative aquatic effects related to the project have been forwarded to the FERC. The Alaska Department of Fish and Game's Basic Data Report for the 1983 field season and the comprehensive instream flow assessment of project effects will be completed in the normal course, as have similar reports for prior years. Both of these reports will be forwarded to the FERC and resource agencies. They will provide additional refinement of similar data from prior years concerning the number of fish expected to be impacted.

A preliminary assessment of aquatic impacts, which included some data on the number of fish expected to be affected in each habitat type, has been assembled and forwarded to the FERC. This report was compiled by the Arctic Environmental Information and Data Center (1983) and contains additional information about the number of fish expected to be affected in some habitat types. Specific spawning sites and/or study areas are identified in Figure A5; commercial salmon catch figures are listed in Figure A3; temporal utilization of mainstem, slough and tributary habitats is addressed in Figure A4; salmon species counts in tributaries are listed in Figure A6; fish wheel, tag/recapture and sonar estimates

RESPONSE TO COMMENT C.63 (cont.):

of salmon escapements are listed in Figure A7; and slough escapement counts for the middle river are listed in Figure A8.

REFERENCES

AEIDC, Susitna Hydroelectric Project Aquatic Impact Assessment: Effects of Project-Related Changes in Temperature, Turbidity, and Stream Discharge on Upper Susitna Salmon Resources During June Through September (1983), previously submitted to the FERC on October 31, 1983.

COMMENT C.64:

"5.1 General Comments.

"Substantially more information is required before quantitative assessments of fish resources and the affect of dam construction and operation in the Susitna Basin can be made. For example, the presence of fish in a specific habitat should be correlated with environmental variables such as river flow, water velocity, habitat type, and other appropriate variables that may be used in the assessment of impacts associated with the projected flow regime. Also, difficulties in sampling of the mainstem river may have influenced the relatively low estimate of salmon spawners in the mainstem. Corrective factors or alternative methods should be devised to solve this problem."

RESPONSE:

A. Additional quantitative and qualitative data are being collected and analyzed to refine current information. A summary of relevant fisheries information was presented in Appendix A of the Arctic Environmental Information and Data Center Report dated October 1983 (AEIDC, 1983). Alaska Department of Fish and Game Basic Data Reports for 1983 and a summary instream flow assessment of project impacts are expected in 1984. These past and future reports will specifically address the habitat relationships between fish and flow for existing and with-project conditions.

B. Mainstem spawning is difficult to identify in any glacial river with high concentrations of suspended

RESPONSE TO COMMENT C.64 (cont.):

sediments that restrict visibility in the river to zero throughout the sampling period. Four methods have been used to identify mainstem salmon spawning: electroshockers, drift gill nets, egg deposition pumps and visual assessment. Following extensive efforts over a widespread area from Cook Inlet to Devil Canyon, twelve mainstem spawning sites were observed in 1981 between river mile [RM] 68.3 and RM 135.2 (see Table E.3.13 of the License Application), of which six were above the Chulitna River confluence. These sites were observed to be utilized by chum and coho salmon. In 1982 eleven mainstem spawning sites were observed between RM 114.4 and RM 148.2. These sites were observed to be predominantly utilized by chum salmon.

Based on information gathered thus far, it seems reasonable to assume that the extent of mainstem spawning is rather limited. The reasons for this would potentially include: unsuitable and unstable substrates, poorer water quality (higher sediment transport), lack of groundwater upwelling and associated temperatures that are greater than 0°C, scouring action due to ice processes, and flow and velocity conditions that are unsuitable or not utilized by fish for spawning and incubation.

REFERENCES

AEIDC, Susitna Hydroelectric Project Aquatic Impact Assessment: Effects of Project-Related Changes in Temperature, Turbidity, and Stream Discharge on Upper Susitna Salmon Resources During June through September (1983), previously submitted to the FERC on October 31, 1983.

COMMENT C.65:

"5.1 General Comments

"When quantitative information is available, these data should be presented in the text (as well as in tables and figures). The accuracy and precision of these data should be discussed."

RESPONSE:

The Alaska Power Authority agrees that any quantitative data presented in the EIS should be both in the text and in appropriate tables or charts. The accuracy and precision of the data, as well as the accuracy of the data base and/or model used, should also be thoroughly discussed in the EIS.

COMMENT C.66:

"5.1 General Comments

"Comments by Alaska Department of Fish and Game and Alaska Department of Environmental Conservation (both letters dated 13 January 1983) state that the present fish resources data base is often insufficient. The Alaska Power Authority response was that the data are adequate for evaluating the magnitude (worst case) of potential impacts to the selected evaluation species. However, the application developed a worst-case scenario for only those salmon that use the slough habitats and not those juvenile and adult fish that use the mainstem and side channel habitats. Total loss of these fish would severely affect the fish resources of the Susitna River. Additional quantitative information could provide a basis for a predictive assessment of impacts short of a total loss estimate."

RESPONSE:

The FERC License Application contains no worst-case scenario for any fish species. It does specifically address expected project related impacts to slough spawning salmon and proposes specific mitigative measures for attempting to aid them (FERC License Application pages E-3-148 through 178). The License Application does not ignore other fish species which use the river, but proposes that they will be less seriously impacted by the project than slough spawning species. At present, a total loss of juvenile and adult fish that use the mainstem and side channel habitats is not

RESPONSE TO COMMENT C.66 (cont.):

expected. In fact, the Power Authority has a stated policy that there will be no net loss of production. To assure that this will be achieved, the Power Authority has proposed the mitigative measures in the License Application that are designed to avoid or minimize any potential losses. In addition, the Power Authority has been and will continue to fund studies designed to refine the quantification of impacts to the aquatic system. From these studies, the detailed final design for mitigative techniques will be made.

The worst-case scenario developed in the License Application consists of an assumption that all habitat which is directly affected by the mainstem discharge might become unsuitable. In terms of adult salmon spawning habitats, if all salmon spawning habitats in the Devil Canyon to Talkeetna reach become unsuitable, only a small fraction of the total escapement to the Susitna Basin would be affected. All Chinook salmon which enter the reach spawn in tributaries which will not be affected by project induced changes. This escapement is only about 6-7 percent of the escapement past the Sunshine Station as shown in License Application Figure E.3.9. Most, if not all, of the pink salmon and coho salmon escaping to the reach upstream of Talkeetna also used tributary habitats for spawning. ADF&G has estimated that less than 20 percent of the chum salmon escapement into this reach spawn in side slough, side channel or mainstem habitats, the remainder spawn in tributaries. The escapement of chum into the upper reach is only about five to seven percent of the chum escapement past Sunshine. All of the sockeye salmon utilizing the reach upstream of Talkeetna utilize side slough habitats which could be affected. However, based on the 1981 and 1982 escapement estimates (License Application Figures E.3.8 and E.3.9), the escapement of sockeye into the upper reach constitutes less than one percent of the escapement past the Sunshine Station. Based on these numbers, a worst case scenario affects only a small fraction of the total escapement of salmon into the Susitna River.

COMMENT C.67:

"5.2 Sampling Effectiveness

"The EIS should evaluate the effectiveness of the sampling techniques and sampling program in relation to the goal of providing an accurate assessment of impacts on the fishery

COMMENT C.67 (cont.):

resource. For example, the adequacy and accuracy of data collection within each habitat type should be discussed. This information would provide the reader with a better understanding of the data base and the precision of the statements and conclusions that follow. Also, such statements would identify data gaps and sampling difficulties and would enhance the collection of the data during subsequent years [5]."

"5. The discussion of methodology in the application identified a few sampling programs that did not provide accurate data (primarily sonar counts). This type of discussion and evaluation should extend to each sampling program."

RESPONSE:

The evaluation of sampling techniques and sampling programs are generally described in supporting project documents (e.g., the ADF&G reports and analyses on field studies, ADF&G procedures manuals, methodology reports by AEIDC, etc.). These sampling techniques and sampling programs have been developed through extensive discussions among various members of the Susitna aquatic studies team. Members of this team include representatives from the Power Authority, Alaska Department of Fish and Game (ADF&G) Suhydro Study Team, E. Woody Trihey and Associates, Harza-Ebasco Joint Venture, Arctic Environmental Information and Data Center, Woodward-Clyde Consultants, and R&M Consultants. Also, the input of various resource agencies has been elicited through correspondence, consultation and workshops. The actual studies are developed through identification of potential impact, need for study and level of study possible with existing resources. In general, standard procedures that utilized state-of-the-art techniques have been used to the extent possible.

The License Application has not provided extensive detail on techniques used, primarily because of the large amount of materials that would need to be added. Thus, the commentor is referred to the supporting documents (e.g., reports by various study team members) for additional detail.

The reference to the inaccuracy of the sonar data is not completely correct. While the sonar counts at some locations were inappropriate to use for estimating

RESPONSE TO COMMENT C.67 (cont.):

escapement, these counts did provide accurate data on escapement timing and durations.

COMMENT C.68:

"<u>5.3</u> <u>Data</u> <u>Insufficiencies</u> <u>Below</u> <u>Talkeetna</u>

"Additional fish habitat preference data and flow characteristics data are needed to assess impacts downstream from Talkeetna. A greater proportion of the Susitna River fishery resources use this downstream reach, but insufficient data is available to characterize fish habitat usage and other ecological relationships. These data are needed because of the potential effect of even a small change in the flow regime on this proportionately larger resource base."

RESPONSE:

Refer to Response to Comment B.8.

COMMENT C.69:

"<u>5.3</u> <u>Data</u> <u>Insufficiencies</u> <u>Below</u> <u>Talkeetna</u>

"Field studies are needed to characterize the use of habitats by fish (e.g., correlate environmental variables with the habitat characteristics of each life stage) and to describe the changes in these habitats that may be caused by the proposed flow regime (e.g., changes in water velocity, food availability, and habitat structure)."

RESPONSE:

Refer to Response to Comment B.8.

COMMENT C.70:

"5.4 Habitat Changes During High Winter Flows

"The effect of high winter flows during dam operation on overwintering fish in the mainstem and side channels should be addressed in the EIS. An incremental analysis of water flow and fish habitat quality is needed to describe how available habitat will change with increased winter flows."

RESPONSE:

We agree that the EIS should discuss the effect of high winter flows on overwintering fish in the mainstem and side channels. However, we question whether an incremental analysis of winter flows and fish habitat quality is necessary or possible. The with-project winter flow will likely alter existing overwintering habitats and provide at least as much habitat for overwintering fish.

Winter flow will be a function of the availability of water and energy demand and will necessarily vary between the established maximum and minimum flow limits. Thus, the need for an incremental analysis may not be as important as during summer when it may be desirable to minimize flow from an economic standpoint as well as to increase flow because of fishery considerations.

The Power Authority anticipates that a qualitative analysis of habitat and winter discharge should be sufficient.

COMMENT C.71:

"5.4 Habitat Changes During High Winter Flows

"Water velocities through a variety of habitat types should be projected for expected winter flow volumes. The effect of these winter water velocities on overwintering fish and life stages should be determined.

"This analysis would require water velocity data through several habitat types and correlation of these data with fish habitat characteristics obtained from field data collection or literature review[6].

"6. The application has noted that increased winter flows will inundate side channels and provide more habitat, but it does not describe the type of new habitat in terms of water

COMMENT C.71 (cont.):

velocities and species utilization. It is possible that the projected winter flows may cause water velocities that are too great for some overwintering fish species or life stages."

RESPONSE:

The Power Authority is not of the opinion that projected winter flows will cause water velocities that are too great for some overwintering fish species or life stages. We expect that the maximum average velocities will be less than the 3 feet per second. Ice covers tend to reduce velocities, not increase them.

Mainstem, side channel and side slough water velocities in the Devil Canyon to Talkeetna reach for expected winter flows may be determined through ice simulation modelings. Ice modeling could provide the mainstem velocities directly. The velocities in the side channels and side sloughs for these winters flows could be obtained in the following manner. The mainstem stage at the upstream berms could be computed through the ice simulation modeling. The mainstem stage could then be used in conjunction with the slough or side-channel discharge versus mainstem stage relationships determined by the Alaska Department of Fish and Game to compute the discharge and velocities in these habitats. Once these winter water velocities have been computed, the effect on overwintering fish and life stage could be examined. This could be accomplished using a correlation of the velocity data with fish habitat characteristics obtained from field data collection and literature review.

COMMENT C.72:

"5.5 Effect of Lower Turbidity on Fish

"Fish species that are adapted to turbid waters may be affected by the reduction in summer turbidity levels. The Alaska Department of Fish and Game suggests that burbot may be such a fish and, if so, the EIS should address this in the impact analysis."

RESPONSE:

Fish species which are adapted to turbid waters are probably often adapted to darkness or low light conditions. The burbot is found to be active in low light (but not turbid)

RESPONSE TO COMMENT C.72 (cont.):

conditions in many places (Scott and Crossman, 1973). The night active burbot even shows an adversion to a day active pattern during winter (Schwasserman, 1980).

Although summer turbidity levels in the Susitna River will decline significantly due to the proposed project (down to a range of 10 to 50 NTUs), light penetration through the water column will still be substantially reduced in areas affected by mainstem discharge. As a result, it is not likely that fish species such as burbot will be affected.

REFERENCES

Scott, W. B. and E. J. Crossman, Freshwater Fishes of Canada, Bulletin 184, Fisheries Research Board of Canada (1973).

Schwassermann, H.O., Biological Rhythms: Their Adaptive Significance, in Environmental Physiology of Fishes M. A. Ali, ed. (1980).

COMMENT C.73:

"5.6 Food Habitat of Fish

"The food habits of Dolly Varden char, rainbow trout, sculpins, burbot, round whitefish, and other fish should be described in the EIS. Analysis of fish food habits is important to the understanding of trophic level interactions, population dynamics, and the impact of the hydroelectric projects on fish resources. For example, Dolly Varden char, rainbow trout, and sculpins may consume juvenile salmonids and their eggs. Predation by these fish may increase because of the less turbid waters after dam construction. If more food is available, then predator population levels could increase.

"A review of the literature may provide the needed information on the food habits of these fish during residence in turbid and clear water streams. If data are lacking in the literature, then food habits of fish collected from the Susitna River should be analyzed. All relevant life stages should be investigated."

RESPONSE TO COMMENT C.73:

FERC License Application Exhibit E does not discuss fish food habits in the Susitna River. Analysis of the food habits of selected fish have been addressed in other studies for the Susitna Project (Riis and Friese (1978); and ADF&G Susitna Hydro Aquatic Studies Phase II Reports (1983)).

Primary productivity or secondary productivity (and thus fish food) may be beneficially affected in areas continuously inundated by mainstem discharges. Although there will be a major reduction in solids in the reservoirs due to settling, the turbidities anticipated in the mainstem will range from 10 to 50 NTUs during the spring through fall period. Within this range, it is difficult to determine if light penetration will increase and there will be a corresponding increase in productivity. Additional studies are continuing to help refine the estimates on this range. At present, it is anticipated that concentrations of "glacial flour" sized suspended sediments will remain substantial in the mainstem areas of the middle river and may continue to retard fish food production. Riverine areas scoured of fine sediments (clays, silts and sands) but subsequently influenced by water that has few, if any, sediments that will settle out, may experience increased fish food production. The reason for this is that water discharged from the reservoir will primarily have particles of less than 5 microns in size. These particles should not readily settle out in areas below the dams. They will continue to maintain the turbidity between 10 and 50 NTUs but will readily pass through the system. Some of the existing sediments below the dams will be scoured away and new interstices between the gravel and cobble should become available. This should provide additional benthic habitat and potentially enhance fish productivity through increased benthic production (see Response to Comment C.50).

If the reduction in turbidities does not result in a substantial increase in water clarity, then predator/prey interactions may not be changed. If clarity is significantly improved, these interactions may change. These potential changes are largely unpredictable at

RESPONSE TO COMMENT C.73 (cont.):

present, particularly for a large glacial system such as the Susitna River.

REFERENCES

Riis, J.C. and N.V. Friese, Fisheries and Habitat Investigations of the Susitna River - A Preliminary Study of Potential Impacts of the Devil Canyon and Watana Hydroelectric Projects (1978).

Alaska Department of Fish and Game, Susitna Hydro Aquatic Studies Phase II Reports (1983), previously submitted to the FERC on October 31, 1983.

COMMENT C.74:

"<u>5.7 Changes in Slough Habitat Morphology</u>

"The probability of modifying slough habitat morphology, or severely altering its capacity as a fish habitat as a result of stabilized post-construction flows, should be discussed in the EIS. Present summer flows are relatively great and serve to flush accumulated materials from the sloughs. Projected stabilized flows and construction of berms at the upstream entrance of sloughs may allow eroded bank soil and debris to accumulate and vegetation to colonize the slough habitat. If no actions are taken, then these slough habitats may lose their value to fish."

RESPONSE:

It is anticipated that slough habitat morphology will be modified as a result of the Susitna Project (License Application page E-2-113). Lower summer flows may result in debris jams and beaver dams and these blockages may lead to ponding of sloughs. The projected stabilized flows and construction of berms at the upstream entrance of sloughs may allow eroded bank soil and debris to accumulate and vegetation to colonize the slough habitat. However, as discussed in the License Application (page E-3-168), the mitigation plan provides for cleaning gravel in three sloughs per year. This gravel cleaning will also entail removing vegetation, debris and beaver dams. Therefore,

RESPONSE TO COMMENT C.74 (cont.):

productivity of the sloughs will be maintained as part of the fisheries mitigation program, and is not expected to be adversely affected over the long run. See also Response to Comment B.9 for a discussion of proposed slough modification and mitigation activities.

COMMENT C.75:

"5.7 Changes in Slough Habitat Morphology

"Studies are needed to examine the rate of sediment and debris accumulation in slough areas and the resultant effects on fishes [7]."

"7. The potential for change in slough morphology above the Chulitna-Susitna confluence has been addressed in Chapter 2 of the application; however, these conclusions have not been discussed as possible impacts on the fishery resources."

RESPONSE:

Because the upstream berms in the side sloughs will seldom be overtopped during project operation, the side sloughs should become similar in character to the upland sloughs. The rate of debris and sediment accumulation in existing side sloughs should then become similar to the rate of debris and sediment accumulation now occurring in the upland sloughs. We are not able to quantify the rate that these upland sloughs are accumulating sediment and debris other than to say that this process will occur over a long period.

We are not aware of any methodology to determine the rate of debris accumulation. However, studies are planned to determine the rate of sediment erosion and deposition in the sloughs. Hand calculations will be prepared to determine whether erosion or deposition will occur. The resultant effects on fish will be investigated after these calculations have been prepared.

If the effects of debris and sediment accumulation are significant, they will be mitigated as per the discussion on slough gravel cleaning on page E-3-168 of the License Application. It is anticipated that maintenance of all productive sloughs will be accomplished on a 4- to 5-year cycle (see Responses to Comments B.9 and B.51). The annual cost for this mitigation measure is expected to be $600,000.

COMMENT C.76:

"5.8 Mitigation Measures in Slough Areas

Mitigation measures to protect slough habitats that are important to spawning salmon (as well as rearing fish) should be evaluated further in the EIS. This evaluation should assess the probability of creating usable spawning habitat of high quality through modification of the slough habitat and gravel cleaning. This evaluation should assess the effect of greater turbidity during winter months (post-construction) on embryo and alevin survival in relation to restructured slough habitats that admit backwater flows. Also, the probability of successfully enhancing embryo and alevin survival by gravel cleaning should be determined (e.g., review the literature and identify why previous applications were or were not successful). The accessibility of the proposed "Gravel Gertie" to slough areas and the effect of its operation on existing fish should be addressed. Also, the frequency of gravel cleaning should be estimated from sediment accumulation studies in the slough areas[8].

"8. The application has proposed restructuring of sloughs and gravel cleaning as mitigation measures, but it has not evaluated the probability of success of these techniques. Further literature review is needed to ensure that these measures will be successful or at least to provide an estimate of their likelihood to succeed."

RESPONSE:

Measures to protect or enhance the spawning habitats currently utilized by adult salmon in side sloughs are dicussed in the License Application in Exhibit E, Chapter 3, Section 2.4, page E-3-141. Additional information on the feasibility of measures to protect the slough spawning habitats is presented in the Response to Comment B.9. As described in both of these, the creation of usable spawning habitat of high quality through modification of slough habitat and gravel cleaning has been successful on other stream systems (Allen, et al., 1981; British Columbia, Department of Fisheries, 1980; Gerke, R., personal communication; King, D., personal communication; Lister, et al., 1980; Reeves and Roelofs, 1982; Bachen, 1983). Based on these reports and communications, there is no reason to believe that these same techniques cannot be applied to sloughs on the Susitna River or that they should not be similarly successful.

Increased turbidity during winter months is not expected to cause any changes to embryo or alevin survival in slough habitats that admit backwater flows because (1) both of these life stages are expected to be present upstream of these backwater areas; (2) turbidity is not the causative factor of mortalities to these life stages--it is the sediment related to turbidity that generally causes the problem; (3) the reservoirs will act as settling basins, thus significantly decreasing the amount of settleable solids (studies are currently continuing to determine if any materials will settle downstream of the dams or if they will be passed through the system); and (4) the goal of the slough modification program will be to restrict entrance of mainstem waters into the sloughs (through the use of berms) and utilize clear groundwater (the reason for the restriction is to maintain stable flows in the slough by excluding potentially damaging overtopping flows).

The probability of successfully enhancing embryo and alevin survival by gravel cleaning was clearly demonstrated by Andrew (1960). Andrew states that "to obtain high egg-to-fry survival in salmon spawning areas, it is necessary to provide and maintain high gravel permeability and this can be achieved by removal of fine particles from the gravel substrate."

The "Gravel Gertie" or a similar device to clean fine sediments from the gravels can be transported to any of the sloughs by any one of several potential means including boat, railroad or helicopter. The device will be operated following emergence and out-migration of the salmonids so as to minimize direct effects on fish. The frequency of cleaning was estimated to be every 4 to 5 years (License Application page E-3-168). However, careful monitoring during initial years of operation will better define this need. See also Response to Comment B.51.

REFERENCES

Allen, R.L., K.L. Bauersfeld, T.J. Burns, L.R. Cowan, S.P. Jenks, D. King, J. Seeb, A. Bergh and D. Stuckey, Salmon Natural Production Enhancement Program, Wash. Dept. of Fish Progress Report No. 149 (1981).

RESPONSE TO COMMENT C.76 (cont.):

Andrew, F.J. and G.H. Green, Sockeye and Pink Salmon Production in Relation to Proposed Dams in the Fraser River System, International Pacific Salmon Fishery Commission Bulletin 11 (1960).

Bachen, B., Construction of a Groundwater-Fed Spawning Channel Near Haines, Alaska (1983), Paper presented to the Alaska Chapter of American Fisheries Society at Soldotna, Alaska, Nov. 14-17, 1983.

British Columbia, Department of Fisheries and Oceans, Stream Enhancement Guide (1980).

Gerke, R., Washington State Department of Fisheries Biologist, personal communication (1983).

King, D., Washington State Department of Fisheries Biologist, personal communication (1983).

Lister, D.B., D.E. Marshall and D.G. Hickey, Chum Salmon Survival and Production at Seven Improved Groundwater-Fed Spawning Areas (1980), British Columbia Department of Fisheries and Oceans.

Reeves, G.H. and T.D. Roelofs, Rehabilitating and Enhancing Stream Habitat, Two Field Applications (1982), USDA Forest Service, Gen. Tech. Rept. PNW-140.

COMMENT C.77:

"5.9 Population Levels of Fish Near Access Roads and Transmission Line Corridors

"The population level of fish inhabiting the streams near the access road and transmission line corridors have not been established. Studies should establish point population estimates in the nearby stream channels that will be affected.

"These estimates would provide a basis for the assessment of impacts and the success of resulting mitigation measures that may occur because of activities related to dam construction.

"An electroshocker and block seines could be used to quantify the species and number of fish within a given reach. The sampling period should correspond to the period of juvenile salmon availability, if they are suspected to inhabit the stream."

RESPONSE TO COMMENT C.77:

Please refer to Volume 6A, Chapter 3, page E-3-70 of the License Application for a general description of streams and fish species of the transmission corridor. See License Application Tables E.3.21, E.3.22, and E.3.23 for lists of the species present in the streams to be crossed by the transmission corridors. Also, it is anticipated additional survey work will be conducted during the summer of 1984 to confirm or supplement the list of fish species and their relative abundances in the streams that will be crossed by either the access road or the transmission line corridors. In addition, basic stream morphological characteristics will be determined to facilitate the use of appropriate design criteria and generation of an acceptable construction practices manual. Proper construction techniques will result in very little impact to the fish resources of the streams. Therefore, probably no mitigation will be necessary.

Also, please see Exhibit E, section 2.3.4, page E-3-141, of the License Application for a thorough discussion of anticipated impacts to fish in streams of the transmission line corridor. 1982 population estimates of fish inhabiting some of the streams near the access road are available in the ADF&G 1982 Final Data Reports, Volume 5. (See Data Index provided in Response to Comment B.37.) Studies of the key streams near the access road were conducted by AFD&G in the summer of 1983. Results of these studies should be available in the spring of 1984.

The use of an electroshocker and block seines is appropriate if the stretch to be sampled is salmonid rearing habitat or if it is the right period for juvenile salmon or resident species to be present.

REFERENCES

Alaska Department of Fish and Game, Susitna Hydro Aquatic Studies Phase II Basic Data Report, Volume 5: Upper Susitna River Impoundment Studies, 1982 (1983), previously submitted to the FERC on October 31, 1983.

COMMENT C.78:

"6.1 General Comments

"The application presents extensive data on wildlife habitat and wildlife species within the basin. Studies have been conducted on all major vertebrate wildlife groups:

- o Big game (e.g., moose, caribou, brown bear, black bear, dall sheep).
- o Furbearers (e.g., marten, beavers).
- o Raptors (e.g., bald eagles, golden eagles).
- o Waterbirds (e.g., swans).
- o Nongame birds and mammals (e.g., warblers, voles).

"The information contained in the application is generally adequate to evaluate impacts within the middle and upper basin for all wildlife groups except big game. Additional quantitative data are required on big game habitat use in the upper and middle basin, especially during severe winters."

RESPONSE:

Exhibit E of the License Application contained all data on wildlife habitat and wildlife species within the Susitna Hydroelectric Project study area that was available at the time of preparation of the Application.

Supplemental information on the ongoing big game studies was provided to the FERC by letter dated May 31, 1983. This material consisted of the 9-volume annual report from the Alaska Department of Fish and Game (ADF&G) dated April 1983 covering work performed during 1982. The annual report from ADF&G covering 1983 work will be provided in spring 1984.

Big game studies are presently ongoing as described in the Fiscal Year 1984 ADF&G Plan of Study. Contingency plans are included for concentrated efforts to gather additional pertinent data should a "severe winter" occur during 1983-1984 (see pages 23-24 of ADF&G Plan of Study).

Two reports to be prepared deserve particular attention. These are an Impact Assessment Update and Refinement Report (due in April-May 1984) and a Mitigation Plan Update Report

RESPONSE TO COMMENT C.78 (cont.):

(due in May-June 1984). Copies of these reports will be provided to the FERC upon completion.

Upon completion of the Fiscal Year 1984 big game field studies, more than four full years of intensive site-specific data will be available for most big game species. Several additional years of less-intensive, but site-specific field data are also available for some species. The Power Authority anticipates that the DEIS will evaluate the adequacy of all available data.

REFERENCES

Alaska Department of Fish and Game, Phase II Progress Report: Big Game Studies, Volumes 1-9 (1983), previously submitted to the FERC on May 31, 1983.

Alaska Department of Fish and Game, Fiscal Year 1984 Plan of Study - Big Game Studies (May 1983).

COMMENT C.79:

"6.1 General Comments

"Further evaluation of project impacts on wildlife in the lower basin is needed. Adequate wildlife data for such an evaluation are available only for raptors and nongame birds and mammals."

RESPONSE:

Please refer to Response to Comment C.87.

COMMENT C.80:

"6.1 General Comments

"Wildlife information in the application should be supplemented with results of studies performed since publication of the application."

RESPONSE:

Results of wildlife studies that have become available since publication of the License Application have been transmitted to the FERC. Additional results will be transmitted as they become available (refer to Response to Comment C.78). Preliminary results of a recent beaver cache survey along the Susitna River between Talkeetna and Portage Creek are also available.

REFERENCES

Gipson, Philip, letter from Alaska Cooperative Wildlife Research Unit to Randy Fairbanks, Harza-Ebasco (November 10, 1983).

COMMENT C.81:

"6.1 General Comments

"Potential impacts on threatened or endangered species are low. The application adequately addresses such issues."

RESPONSE:

For additional information on the relationship between the Healy-Fairbanks transmission line route and historic peregrine falcon eyries, see the Response to Comment D.1.

COMMENT C.82:

"6.1 General Comments

"Additional documentation of the feasibility and effectiveness of proposed mitigation measures is needed."

RESPONSE TO COMMENT C.82:

Additional documentation of the feasibility and predicted effectiveness of proposed mitigation measures is currently in preparation. The Alaska Power Authority is presently refining the proposed mitigation measures through systematic review and incorporation of recent information not available at the time of the FERC License Application submittal. This information is contained primarily in reports of 1982 and 1983 field studies sponsored by the Alaska Power Authority and prepared by the Alaska Department of Fish and Game (ADF&G).

As noted in the Response to Comment C.78, the Alaska Power Authority provided the 1982 field study reports to the Federal Energy Regulatory Commission (FERC) in June 1983, to allow incorporation of the most current available data into the Draft Environmental Impact Statement (DEIS).

Information from 1982 field programs and in ADF&G unpublished field documents is being used to update impact assessments and derivative mitigation planning through the incorporation of more detailed quantification concerning population size, habitat use, distribution and limiting factors of wildlife species within and around the project area. In addition, ADF&G annual reports on 1983 studies now in preparation will be structured, where possible, to emphasize information directly pertinent to the ongoing refinement of impact assessment and mitigation planning. Frequent meetings are being held between Alaska Power Authority consultants and ADF&G Game Division representatives to facilitate review and incorporation of appropriate material.

Progress on the refinement of impact assessments and further development of proposed mitigation measures is being tracked and documented through a continually updated report in matrix format. A preliminary draft of this tracking document is being provided to assist preparation of the DEIS. Periodic revisions will be submitted at quarterly intervals or as appropriate.

RESPONSE TO COMMENT C.82 (cont.):

Please also refer to Responses to Comments C.88, F.50 and F.51 for further discussion relative to this Comment.

REFERENCES

LGL Alaska, Inc., Alaska Power Authority, Susitna Hydroelectric Project: Wildlife and Botanical Resources, Impact Assessment and Mitigation Planning Summary (1983), unpublished report to Harza-Ebasco Susitna Joint Venture.

COMMENT C.83:

"6.2 General Comments

"Habitat use by wildlife, especially moose, during severe winters must be quantified, and project effects on critical wintering areas should be addressed in the EIS. Critical winter ranges for moose should be identified and mapped; moose populations on such ranges should be described in terms of population levels and period of use. The carrying capacity for such areas should be calculated. Migratory movements for wildlife during severe winters should be described. The number of animals of each high-priority species potentially affected should be included."

RESPONSE:

We agree that the EIS should include a thorough discussion of habitat use by wildlife, especially moose, during severe winters. As noted in the Response to Comment F.37, the importance of winter habitat use by moose, particularly during severe winters, was explicitly recognized and discussed in the License Application (Exhibit E, Chapter 3, Section 4.3.1(a)(i), pages E-3-399 and E-3-400). Since July 1982, the Alaska Power Authority has budgeted funds to support a study of impoundment area use by wildlife, particularly moose, during a severe winter. This contingency is currently included in the scope of work for Susitna Project-related field studies conducted by the Alaska Department of Fish and Game (ADF&G). (See pages 23 and 24 of the ADF&G FY 1984 Plan of Study.)

RESPONSE TO COMMENT C.83 (cont.):

Since the Alaska Power Authority contracted with ADF&G in early 1980 to conduct baseline wildlife studies of the Susitna River basin, a severe winter has not occurred in the area, although the winter of 1982-83 was more severe than the two previous ones. It should be recognized that actual data on severe winters can only be collected if one occurs during our field study period. However, as noted in the preceding paragraph, the contingency is funded, and a study of wildlife use of the impoundment areas will be conducted by ADF&G at the first opportunity if severe winter conditions occur. This work will quantify and map observed wildlife use of the impoundment areas, including apparent moose critical winter range and the period of use, number of individuals representing high-priority species observed to be present and migratory movements.

As discussed in License Application Exhibit E, Chapter 3, Section 4.3.1(a)(iii), pages E-3-412 through E-3-414, a state-of-the-art habitat-based carrying capacity model for moose is being developed in coordination with planned browse vegetation mapping and quantification of browse biomass and nutritive characteristics in middle basin areas which previous studies have indicated to be important as moose winter range (Ballard, et al., 1982, 1983). Input of results from the browse mapping and quantification studies will allow preliminary calculation in 1985 of moose carrying capacity for identified severe winter range with the project area.

REFERENCES

Ballard, W.B., C.L. Gardner, J.H. Westlund and J.R. Dau, Susitna Hydroelectric Project Phase I Final Report: Big Game Studies, Volume III, Moose - Upstream (1982), Alaska Dept. of Fish and Game.

Ballard, W.B., J.S. Whitman, N.G. Tankersley, L.D. Aumiller and P. Hessing, Susitna Hydroelectric Project Phase II Progress Report: Big Game Studies, Volume III, Moose - Upsteam (1983), Alaska Dept. of Fish and Game, previously submitted to the FERC on May 31, 1983.

COMMENT C.84:

"6.2 Habitat Use During Severe Winters

"Most of the detailed wildlife studies were conducted during two consecutive mild winters. The application states (page E-3-317) that due to the mild winters, "it has not been possible to obtain site-specific information on the influence of severe winter conditions on (moose) population productivity, habitat use, or browse utilization." Because the ability of a population to endure severe winters is crucial for survival, these topics should be addressed in the EIS."

RESPONSE:

We concur that the draft and final EIS to be prepared for the Susitna Hydroelectric Project should appropriately address the effects of severe winter conditions on moose. The importance of winter habitat availability to moose, particularly during severe winters, is discussed in License Application Exhibit E, Chapter 3, Section 4.3.1(a)(i), pages E-3-399 and E-3-400, and in the Response to Comment C.83.

The text referred to on License Application page E-3-317 correctly states that "it has not been possible to obtain site-specific information on the influence of severe winter conditions on population productivity, habitat use, or browse utilization" by moose. The reason for this is that a severe winter (i.e., significantly above-mean snowfall and below-mean temperatures) has not occurred in the project area since project-related wildlife studies were initiated by the Alaska Power Authority in 1980. Unless the winter of 1983-84 proves to be severe in the Susitna River basin, it will clearly not be possible to include information from the direct study of severe winter conditions in the project area as part of the draft or final EIS as currently scheduled.

Nevertheless, the Power Authority anticipates that the EIS may contain a thorough and informed discussion of moose winter and early spring bioenergetic (and thus nutritional) requirements, movements, habitat use, browse utilization, predation, mortality and other mechanisms influencing population size and productivity. Information on various aspects of moose ecology and physiology pertinent to effects of severe winter conditions are found in the sources cited in License Application Exhibit E, Chapter 3,

RESPONSE TO COMMENT C.84 (cont.):

Sections 4.2.1(a) (page E-3-296), 4.3.1(a) (E-3-396) and 4.4.2(b) (page E-3-527). Additional information on wintering moose is provided by Ballard, et al., (1983) and by Modafferi (1983).

REFERENCES

Ballard, W.B., J.S. Whitman, N.G. Tankersley, L.D. Aumiller, and P. Hessing, Susitna Hydroelectric Project Phase II Progress Report: Big Game Studies, Volume III, Moose - Upstream (1983), Alaska Department of Fish and Game, previously submitted to the FERC on May 31, 1983.

Modafferi, R.D., Susitna Hydroelectric Project Phase II Progress Report: Big Game studies, Volume II, Moose - Downstream (1983), Alaska Department of Fish and Game, previously submitted to the FERC on May 31, 1983.

COMMENT C.85:

"6.3 Incorporation of Quantitative Data from Recent Studies and Modeling

"Results of on-going studies and research completed since publication of the application should be included in the EIS. Included are moose home range studies in the lower basin, a study of dall sheep use of the Jay Creek mineral lick, and determination of elevations of raptor nests near the impoundment zones."

RESPONSE:

Please refer to the Responses to Comments C.78 and C.80 for the status of information that has become available since publication of the License Application. This includes the first two studies mentioned in this Comment. In addition, results of recently completed soil sample analyses collected at the Jay Creek lick and other locations in the Watana Hills were sent to FERC on October 3, 1983 and December 29, 1983. Field studies desgined to more accurately determine the elevations of raptor nests near the impoundment zones will be conducted in spring and summer 1984.

COMMENT C.86:

"6.2 Habitat Use During Severe Winters

"APA is developing a complex moose habitat simulation model. The model should be able to provide quantitative impact data that are currently lacking. Preliminary results from the model are expected in 1983, and complete results by 1986. The EIS should include the most recent quantitative impact estimates available from the model."

RESPONSE:

The moose modeling effort underway will help further quantify moose carrying capacity in the study area and impacts resulting from loss or alteration of moose habitat. These efforts are continuing but full results are not yet available. A pilot browse study was completed during the summer of 1983 and results are being analyzed. Based on this pilot study, a browse inventory will be conducted during summer 1984 for incorporation into the modeling effort. Preliminary outputs will be available from the model following analysis of next summer's browse inventory results and incorporation of the results into the model. Final model results should be available in late 1985 or early 1986 following completion of the bioenergetics model

RESPONSE TO COMMENT C.86 (cont.):

testing in mid-1985 by the Alaska Department of Fish and Game (ADF&G) at the Kenai Moose Research Center (please refer to pages 20-22 of the ADF&G FY 1984 Plan of Study).

Please also refer to Responses to Comments C.83 and C.84.

REFERENCES

Alaska Department of Fish and Game, Fiscal Year 1984 Plan of Study (1983).

COMMENT C.87:

"6.4 Lower Basin Impacts

"Impacts to wildlife due to habitat changes induced in the lower basin by post-project flow regimes should be addressed. Acreage of habitat changes (e.g, deterioration or improvement of calving areas; reduction in acreage of suitable nesting habitat) and subsequent wildlife impacts (e.g., changes in productivity or recruitment) should be identified. Habitat use and population data should be collected for most species inhabiting the lower basin. Such data are lacking for bears and furbearers.

"Predictions of induced habitat changes should be compared with wildlife population and habitat use data to identify impacts. If the analysis indicates that impacts will not be significant, sufficient information should be included in the EIS to document the conclusion."

RESPONSE:

Lower basin wildlife impacts following the construction of Watana dam are discussed on License Application pages E-3-407 to 409, 429, 435 and 438. Wildlife impacts downstream of Devil Canyon are discussed on License Application pages E-3-462 to 476. Additional discussions of downstream impacts, relative to the mitigation plan, are presented on License Application pages E-3-426, 436, 489, 490, 500-507, 509-511, 515 and 518. The downstream impacts of regulated flows on botanical resources, one of the major components of wildlife habitat, are addressed on License Application pages E-3-231 to 235.

RESPONSE TO COMMENT C.87 (cont.):

Further evaluation of project impacts on wildlife in the lower basin is being conducted. A number of studies are currently underway or planned which will refine the evaluation of impacts to habitat and wildlife. Studies are continuing, for example, on moose, black bear and beaver. These species are being studied because of their recreational and economic importance and because of the potential for project related impacts on them. The Power Authority anticipates that the EIS will contain sufficient information to adequately document all conclusions, whether they are conclusions of "significant impact" or "no significant impact."

We agree that, as indicated in Comment C.79, adequate wildlife data for lower basin impact evaluation is available for raptors, nongame birds and nongame mammals. Other wildlife species such as big game (caribou, Dall sheep, and brown bear), furbearers (wolf, wolverine, muskrat, mink, otter, coyote, red fox, marten, lynx and weasels), and waterfowl, are not being studied further because the existing information obtained from previously completed studies and other evidence indicates that the effects of the proposed project will not cause significant negative impacts to these species.

The potential impacts of the project on moose habitat downstream at Devil Canyon to Cook Inlet are being assessed by modeling physical proceses (e.g. flooding and ice scouring), modeling the changes in downstream moose habitat resulting from the modification of the hydrologic regime, and determining the magnitude, distribution, habitat selection, and timing of moose use of these flood plain habitats.

An important emphasis of continuing black bear studies is to determine the significance of salmon in the diet of black bears that congregate around salmon spawning areas between Devil Canyon and Talkeetna. Home range, habitat, and movement data are also being collected.

Studies to identify the number of beavers and to help determine beaver limiting factors are also being conducted in the area between Devil Canyon and Cook Inlet. This information will be used to refine the beaver carrying capcity model.

COMMENT C.88:

"6.5 Feasibility of Mitigation.

"The feasibility of mitigation proposals should be clearly demonstrated. Proposals must be feasible from a technical standpoint such as, will a controlled burn provide the desired increase in browse production, and can the equipment necessary for the burn be used where the program is planned. The ability of the proposals to satisfy biological objectives (e.g, maintain herd populations by increasing browse availability) should be evident. Where proposals involve large-scale habitat manipulation (e.g., a 6,400-acre controlled burn; page E-3-528), an evaluation of potential negative impacts (e.g., increased erosion, decline in some nontarget wildlife populations) should be included.

"The effectiveness of the proposals for the life of the project should be evaluated."

RESPONSE:

As noted in the Response to Comment C.82, refinement and documentation of proposed mitigation measures for moose and other species is continuing. Refinement efforts include additional field studies, literature review, simulation modeling and other analyses of species/habitat relationships. In the case of moose, these efforts are directed towards a better understanding of how artificial browse production can be used to increase local moose populations. Impacts (both beneficial and detrimental) to other wildlife within moose habitat compensation areas will be included in refined mitigation plans.

Mitigation measures will be designed to be effective for the life of the Project. For example, monitoring and periodic maintenance of browse production areas are included in long-range mitigation plans (License Application Exhibit E, pages E-3-525 and E-3-527 through E-3-530). Please also refer to Responses to Comments F.50 and F.51.

COMMENT C.89:

"7. Botanical Resources

"The descriptions of vegetation and floristics, including rare plants, as contained in the application, are adequate for the purposes of an EIS. All foreseeable impacts to botanical resources have been identified and measures to mitigate these impacts have been discussed in detail. No additional botanical investigations appear to be necessary, other than the ongoing field studies discussed in the Application."

RESPONSE:

No response necessary.

COMMENT C.90:

"7. Botanical Resources.

"There is, however, the need for a single, comprehensive summary of the Botanical Resources section. At present, some of this information is summarized in various locations through the text of the application. Nevertheless, a reviewer of the EIS wishing to become quickly familiar with important facts and conclusions would find it difficult to do so from the existing text.

"The summary of the botanical section should bring together principal conclusions regarding resources, impacts, and mitigation in a single discussion only a few pages long. Existing summaries in the application are too scattered and therefore are difficult to review quickly. Supporting data should be clearly referenced and available in appendices."

RESPONSE:

The Power Authority is preparing a summary of the License Application Botanical Resources Section and anticipates making it available once refinements are complete.

REFERENCES

Alaska Power Authority, Summary of Botanical Resources Section Exhibit E, Chapter 3 of the Susitna Hydroelectric Project FERC License Application (1983).

COMMENT C.91:

"8.1 Nonattainment Area Issues

"The effect of the Susitna Project and alternative electrical sources on air quality in Anchorage and Fairbanks should be evaluated. The extent that possible changes in generating capacity will affect carbon monoxide and particulate emissions and resulting air quality in attainment areas should be quantified."

RESPONSE:

Emissions from construction and operation of the Susitna Project would have an insignificant direct impact on either the Anchorage or Fairbanks areas. The project site is

RESPONSE TO COMMENT C.91 (cont.):

located far from either area, so air emissions from the Susitna site would cause negligible increases in ambient pollutant concentrations in Anchorage and Fairbanks.

Possible energy alternatives to the Susitna Project were presented in the February 1983 FERC License Application. These possible alternatives included primarily thermal power plants, which will emit air pollutants. However, the exact locations of the alternative thermal plants have not been established. Without knowing the complex terrain around the thermal plants, the site specific air quality impacts of those plants cannot be determined. By law, the emissions from any alternative energy sources would be less than the limits specified by the applicable federal New Source Performance Standards or by the Alaska emissions standards (18 ACC, Chapter 50). Also by law, the ambient air quality impacts of the alternative energy sources would be less than the allowable impacts specified by the Alaska Department of Environmental Conservation (ADEC), in order to obtain an ADEC Permit to Operate (18 AAC 50.300) for the alternative thermal facilities.

It must be noted that the air quality impacts of the alternative energy sources, although probably minor, would be greater than those caused by the Susitna Hydroelectric Project, which has minimal operational air emissions. The Power Authority anticipates that the DEIS will describe such benefits of hydroelectric power when compared to thermal alternatives.

COMMENT C.92:

"8.1 Nonattainment Area Issues

"The possibility that total emissions may be influenced by electricity costs should be quantitatively assessed. The role of electrical energy for space heating as an alternative to wood consumption in fireplaces (a significant source of carbon monoxide) should be described, for instance. Cost comparisons of alternate energy source costs to residential and industrial users under different scenarios would assist in this analysis."

RESPONSE:

The role of wood as an alternative for space heating in the Anchorage-Cook Inlet region was not addressed in the License Application because of its high cost when compared to natural gas. In the future, although the real price of natural gas is expected to increase rapidly, natural gas is expected to remain the main source for space heating.

As shown in License Application Table B.99 of Exhibit B, Vol. 2A, the percentage of housing units using electricity for space heat was reduced for all new housing stock built after 1980. For the Fairbanks-Tanana Valley area, fuel oil is the main source for space heating. Wood is also used as a supplemental source. The percentage of housing units using electricity is presented in Table B.99 of Exhibit B of the FERC License Application.

COMMENT C.93:

"8.2 Local Emissions

"An air quality analysis should be performed for the construction camps. The analysis should contain an evaluation of carbon monoxide and particulate emissions from diesel generating facilities and vehicles to predict whether local violations of carbon monoxide or particulate levels are likely to occur."

RESPONSE:

The emission rates of particulate matter (PM) and carbon monoxide (CO) from the diesel generator and commute vehicles, and the air quality impacts of those emissions, were estimated using worst case assumptions. Emissions from the temporary diesel generators or from commute vehicles would cause slight increases in ambient concentrations of particulate matter and carbon monoxide in the vicinity of the construction camp and access road. However, these concentration increases would be well below the allowable limits specified by ADEC and EPA.

The emission rates of PM and CO were estimated using worst case assumptions. As a worst case assumption and based on information presented in Exhibit E of the February 1983 FERC License Application, the diesel generators were assumed to operate continuously at the maximum rated 16 MW capacity. The volume of commute vehicles, if any, associated with the project has not been established. However, as a worst case assumption for determining air quality impacts, commute vehicle emissions were estimated based on a 2,000 vehicles

RESPONSE TO COMMENT C.93 (cont.):

per hour load, assuming cold vehicle operating conditions. Based on these worst case conditions, the estimated PM and CO emission rates were as follows:

	Diesel Generators	Commute Vehicles
Particulate matter	163 tons/yr	2.94 g/m/hr
Carbon monoxide	1,220 tons/yr	477 g/m/hr

The air quality impacts caused by diesel generator and commute vehicle emissions were also estimated using worst case assumptions. The EPA-approved COMPLEX and HIWAY computer models were used to estimate ambient PM and CO concentrations near the generators and access road. The estimated worst case air quality impacts are compared with the allowable Alaska standard in the following table:

	Diesel Generator Impact (micrograms/m^3)	Commute Vehicle Impact (micrograms/m^3)	Alaska Standard (micrograms/m^3)
Particulates			
a. 1-hour	29.6	55.2	No standard
b. 24-hour	7.4	13.8	150
c. Annual	___	___	___
Carbon Monoxide			
a. 1-hour	400	8,920	40,000 (same as EPA)

From this table, it is apparent that the air quality impacts caused by diesel generation and commute vehicle emissions would be insignificant.

COMMENT C.94:

"<u>8.3 Thermal Power Plant Effects</u>.

"Power generation scenarios involving the use of thermal power plants should include a detailed evaluation of project effects on ambient air quality. At least a screening level analysis should be completed to determine whether the individual plants would cause or contribute to violations of ambient air quality standards or Prevention of Significant

COMMENT C.94 (cont.):

Deterioration (PSD) program increment limits. Plants located in or near urban areas, or lands that are within PSD Class I regions, will require a more detailed evaluation which:

1. In urban areas confirms that the plant(s) will not aggravate any existing air quality problems.

2. In PSD Class I regions confirms that the project will not significantly affect visibility or the values which caused the region to be designated Class I."

RESPONSE:

Electrical generating alternatives to the Susitna Project include the construction of thermal power plants. These plants would likely be large enough to be classified as "major sources" and would therefore be subject to PSD review by ADEC and/or EPA prior to their construction. However, it was beyond the scope of the FERC License Application to specify the exact locations of the alternative thermal plants. Without knowing the complex terrain adjacent to each power plant, the site-specific air quality impacts of the power plants cannot be quantified.

However, to obtain a Permit to Operate from ADEC under 18 AAC 50.300, it would have to be demonstrated for each individual power plant that:

1. The thermal plant emissions would not create significant impacts in the urban nonattainment areas, as specified by 18 AAC 50.021 and 400.

2. The thermal plant emissions would not cause visibility impairment or increases in ambient pollutant concentrations above those allowed in either PSD Class I or Class II areas, as specified under 18 AAC 50.021, 300 and 400.

It must be noted that air quality impacts of the alternative thermal plants, although minor, would be greater than the air quality impacts of the proposed Susitna Hydroelectric Project, which has minimal operational air emissions.

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FEDERAL ENERGY REGULATORY COMMISSION

SUSITNA HYDROELECTRIC PROJECT

PROJECT NO. 7114

RESPONSE OF

ALASKA POWER AUTHORITY

TO

OCTOBER 12, 1983 LICENSE APPLICATION COMMENTS

OF

UNITED STATES DEPARTMENT OF THE INTERIOR,

FISH AND WILDLIFE SERVICE

P-7114

United States Department of the Interior

FISH AND WILDLIFE SERVICE
1011 E. TUDOR RD.
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IN REPLY REFER TO:
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1983 OCT 17 PM 1:54
FEDERAL ENERGY REGULATORY COMMISSION

12 OCT 1983

Lawrence R. Anderson
Director, Office of Electric Power Regulation
Federal Energy Regulatory Commission
Washington, D. C. 20426

Dear Mr. Anderson:

This responds to your September 19, 1983 request for information on listed or proposed threatened or endangered species that may be present near the proposed Susitna Hydroelectric Project, Federal Energy Regulatory Commission (FERC) Project No. 7114 - Alaska. The proposed dam sites are located on the Susitna River, 180 miles northeast of Anchorage. From our review of Alaska Power Authority's February 28, 1983 application to your agency, it is our understanding that the project also includes the construction of a transmission line from Fairbanks to Healy and from Healy to Willow (intertie).

The only listed or proposed, threatened or endangered species potentially present in the project area is the endangered Peregrine Falcon (Falco peregrinus anatum). Recent surveys and historical data provide no evidence that peregrine falcons nest or have ever nested at or near the proposed dam sites or along the Willow-Healy intertie.

The Healy-Fairbanks recommended transmission line route boundary, as described in Alaska Power Authority's March 1982 final draft, passes in close proximity to the following three historic[1] peregrine falcon eyries (nest sites):

1. The recommended route boundary passes directly through a peregrine eyrie five miles east of Nenana.

2. Proceeding in a northerly direction, the recommended route boundary passes within three miles of a historic peregrine eyrie near Whiskey Island, at Crescent VABM.

3. Lastly, and closer to Fairbanks, the recommended route boundary and proposed substation occur within four miles of a historic eyrie at Chena Ridge.

[1] A historic eyrie is a nest site with documented past use but which has not been recently active.

Although these sites have not been recently used by peregrines (see attached report), the Service believes this nesting habitat may be reoccupied as peregrine populations increase to levels preceding their decline. We therefore urge continued consultation on this aspect of the project.

Questions concerning FERC's Endangered Species Act obligations can be directed to Dennis Money at (907) 786-3435.

Sincerely,

Jon M. Nelson

Assistant Regional Director

cc: ARD/HR
WAES
NAES

Peregrine Falcon Survey of the Lower Tanana River, Fairbanks to Nenana, Alaska, 1982

Michael J. Amaral
Division of Endangered Species
U. S. Fish and Wildlife Service
1011 East Tudor Road
Anchorage, Alaska 99503

The Tanana River valley from Tetlin to Nenana was historically a major nesting area for Peregrine Falcons (Falco peregrinus anatum) in Alaska. As many as 18 nesting locations have been identified on this reach of the river (U. S. Dept. of the Interior 1982). All historic and probable peregrine nesting areas along the upper Tanana River between the Tetlin Bridge crossing and Fairbanks were surveyed from 1970-75 by Haugh (Fyfe et. al. 1976) and annually since 1979 by Roseneau or Ritchie (Ritchie and Craighead 1982). However, peregrine habitat along the lower Tanana River from Fairbanks to Nenana has not been examined since 1976 when Haugh searched for possible eyrie sites from a Helio Courier. The last successful nesting of peregrines along the Tanana below the Salcha River was documented in 1970 at a site four miles below the mouth of the Chena River (Haugh and Halperin 1976).

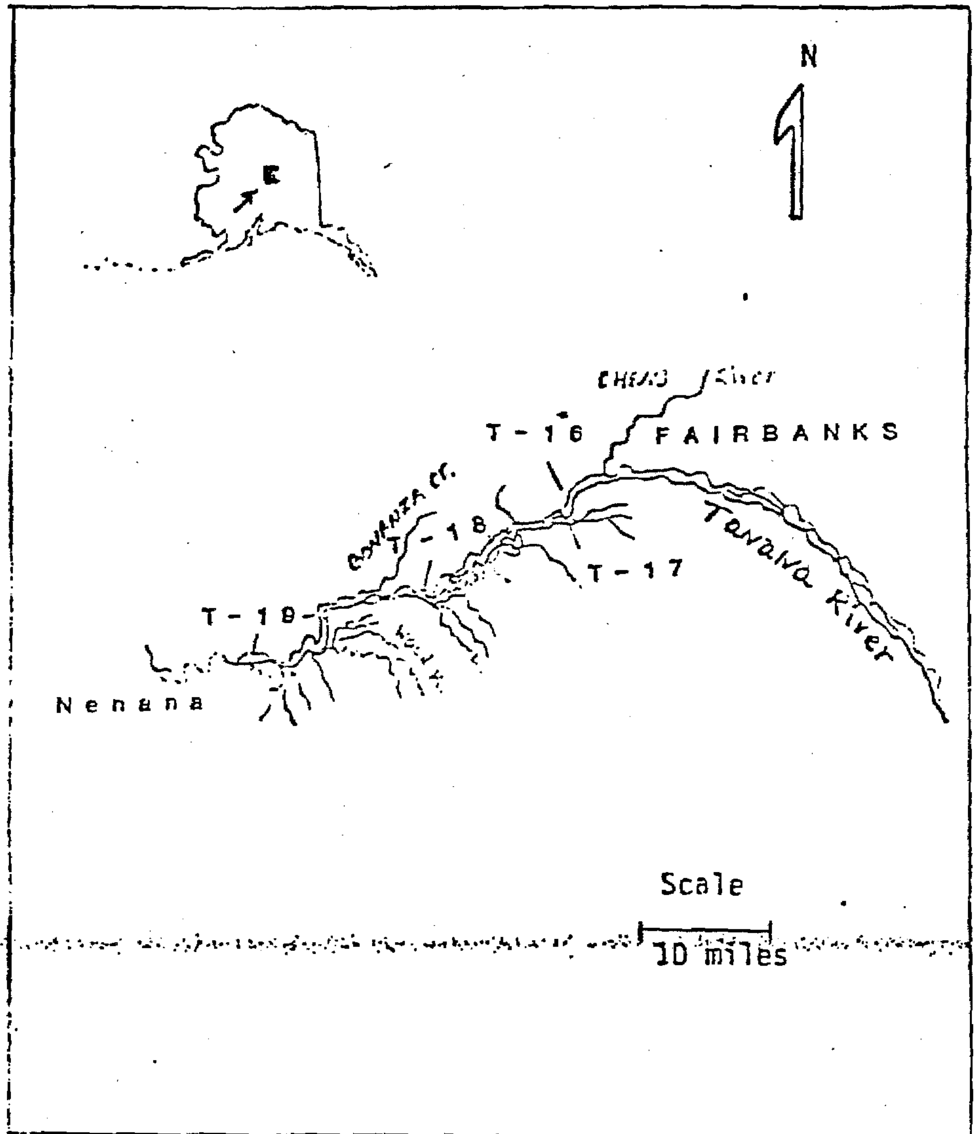
During the past several years, populations of Peregrine Falcons elsewhere in interior Alaska have been increasing and formerly inactive nesting territories are once again being occupied (Haugh 1973; Ambrose and Riddle 1982; and Ritchie 1982). This fact, combined with several state proposals to conduct oil and gas lease sales and agricultural and homesite land disposals within the river corridor, highlighted the need to survey the historical peregrine habitat along the Tanana River from Fairbanks to Nenana.

Study Area The study area included all historical and possible nesting habitat along the Tanana River from Byers Island, Fairbanks to Nenana, a distance of approximately 56 river miles (Figure 1).

Methods The river was surveyed briefly by riverboat on 18 May by Skip Ambrose. An overflight of the study area was conducted prior to the main survey on the morning of 30 June with a 185 amphibeous aircraft and two observers. The study area was again surveyed from 30 June to 3 July using a motorized, 19' aluminum canoe. Travel by canoe also made possible the access of many of the sloughs and backwater areas. All cliffs 10 meters or more in height were examined for nesting raptors. Observations were made with variable power spotting scopes and binoculars. The few larger cliffs were examined more closely. Technical climbing equipment was used to repel the face of the structure and search all possible ledges and nest locations. Distances given for the location of raptor sightings were determined using an Alvin Map measure and U. S. Geological Survey topographical maps, scale 1:63,360.

Results and Discussions No nests or raptor activity were observed during the flight on June 30. No peregrine falcons or signs of recent occupancy were noted at any of the cliffs examined. The only observation of a Peregrine Falcon in the study area was made by Bernie Stack in early June near the mouth of Rosie Creek (Bob Ritchie, pers. comm.). Table 1 summarizes all raptor observations made during the survey.

Figure 1. Location of historic Peregrine Falcon eyries along the lower Tanana River, Alaska.



In general, more human activity than raptor activity was prevalent during the course of the survey. The construction of residential dwellings has encroached upon the peregrine habitat at site T-16 which was last reported active in 1967 (White and Cade 1975). At site T-17, which was last active in 1970 (White and Cade 1975), gunfire from a rifle range across the river could be heard echoing off the face of the cliff. This, noise disturbance from the Fairbanks airport, and human use of cliff top trails may continue to discourage peregrine use.

Human activity observed at T-18 included boat traffic and a fish wheel. Considering the generally small size of the cliffs along the Tanana, even this seemingly benign presence could disturb potential breeding pairs. Observations and castings collected from a cave-like ledge on this cliff suggest that the site was used by Great Horned owls in 1982. At cliff T-19, located within three miles of Nenana, a pair of ravens fledged two young in 1982. Although the structure was of considerable size (300-400'), there appeared to be few ledges or other suitable places for nesting by raptors. Nesting by peregrines was last confirmed at T-18 and T-19 in 1963 (White and Cade 1975).

Organochlorine contamination has no doubt been a factor in the decline of the Tanana River falcons but with the Porcupine and Yukon River populations approaching and perhaps, even exceeding historical population levels, the question arises - why haven't the lower Tanana River eyries been similarly recolonized?

As others have postulated (Haugh and Halperin 1976; Fyfe et al 1976), human activity between Fairbanks and Nenana and the relatively small and accessible nature of the cliffs has probably contributed to the rapid decline and slow recovery of this population. Yet, specific cliffs have a history of repeated use by falcons for reasons which are not fully understood. With peregrine populations recovering elsewhere in interior Alaska, I believe it would be premature to conclude that since peregrines are absent now, they will never reoccupy these sites. It therefore remains important to periodically survey these historical eyries and to continue to provide this habitat a level of protection which will retain its availability for future use by nesting peregrines.

Table 1. Summary of Raptor Observations on the Lower Tanana River, 1982.

Date	Location	Species	Description	Source
June 30	2 mi. above Rosie Creek	Harlan's Hawk	Pair with 1 young	This study
June 30	0.8 mi. above Rosie Creek	Red-tailed Hawk	Single adult hunting	This study
Early June	Near mouth of Rosie Creek	Peregrine Falcon	Single adult feeding	Bernie Stack, pers. comm. to Bob Ritchie
May 18	Whiskey Island	Bald Eagle (nest only)	no birds seen	Ambrose pers. comm.
May 18	4.25 mi. below Whiskey Is.	Great Horned Owl	Single adult on cliff	Ambrose pers. comm. This study
July 1	7.3 mi. below Whiskey Is.	Northern Raven	Pair with 2 fledged young	This study
July 1	Near mouth of Wood River	American Kestrel	Adult female	This study
May 18	10.5 mi. above Nenana Bridge	Northern Raven	Pair with young	Ambrose pers. comm.
July 2	9.5 mi. above Nenana Bridge	American Kestrel	Flying	This study
July 2	6.5 mi. above Nenana Bridge	Harlan's Hawk	Hunting	This study
July 3	4.5 mi. above Nenana Bridge	American Kestrel	Adult male, hunting	This study

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ACKNOWLEDGEMENTS: I extend my thanks to Skip Ambrose, Mike Smith, Terry [illegible], Bob Ritchie, and Dawnelle Sheaver for their contributions to this study.

Appendix A. Birds and Mammals Observed During the Survey, June 30 - July 3, 1982.

Birds

Raptors

American Kestrel *Falco sparverius*
Red-tailed Hawk *Buteo jamaicensis*
Harlan's Hawk *Buteo jamaicensis harlani*
Northern Raven *Corvus corax*
Great Horned Owl *Bubo virginianus*

Shorebirds, Gulls, and Waterfowl

Semipalmated Plover *Charadrius semipalmatus*
Spotted Sandpiper *Actitis macularia*
Common Snipe *Gallinago gallinago*
Lesser Yellowlegs *Tringa flavipes*
Herring Gull *Larus argentatus*
Mew Gull *Larus canus*
Bonaparte's Gull *Larus philadelphia*
Arctic Tern *Sterna paradisaea*
Common Merganser *Mergus merganser*
American Wigeon *Anas americana*
Common Goldeneye *Bucephala clangula*
Mallard *Anas platyrhynchos*

[illegible]

Cliff Swallow *Petrochelidon pyrrhonota*
Violet-green Swallow *Tachycineta thalassina*
Yellow-rumped Warbler *Dendroica coronata*
Yellow Warbler *Dendroica petechia*
White-crowned Sparrow *Zonotrichia leucophrys*
Black-capped Chickadee *Parus atricapillus*
Dark-eyed Junco *Junco hyemalis*
Alder Flycatcher *Empidonax alnorum*
American Robin *Turdus migratorius*
Swainson's Thrush *Catharus ustulatus*
Northern Flicker *Colaptes auratus*
Bohemian Waxwing *Bombycilla garrulus*

Mammals

Red Fox *Vulpes fulva*
Wolverine *Gulo luscus*
Coyote *Canis latrans*
Moose *Alces alces*
Beaver *Castor canadensis*
Red Squirrel *Tamiasciurus hudsonicus*
Porcupine *Erithizon dorsatum*
Black Bear (sign) *Ursus americanus*
Snowshoe Hare (prey)[1] *Lepus americanus*

[1] Great Horned Owl casting

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COMMENT D.1:

See preceeding comment letter.

RESPONSE:

Comments provided to the Federal Energy Regulatory Commission (FERC) by the U.S. Fish and Wildlife Service (USFWS) (letter of John M. Nelson, USFWS, to Lawrence P. Anderson, FERC, dated October 12, 1983) were in response to a FERC request for information on taxa listed or proposed as threatened or endangered under provisions of the Endangered Species Act of 1973, as amended. The comments were based on a review by Michael J. Amaral, USFWS Region 7 Office of Endangered Species, of the proposed Healy-to-Fairbanks transmission route in relation to documented peregrine falcon nest sites (Amaral, 1983 personal communication). As stated in the letter cited above, this review was based on an early version of the proposed route produced during the feasibility study phase of the project (Amaral, 1983 personal communication). This proposed route (reviewed by Amaral) will be shown on a Biological Constraints Map which the Power Authority has developed, and is in the process of refining. It will be made available when complete.

The proposed Healy-to-Fairbanks transmission route presented in FERC License Application Exhibit G differs from that reviewed by the USFWS, and distances from the route to documented peregrine falcon nest sites are different in certain cases from those discussed in the October 12, 1983 letter cited above. The following Response is intended to identify these discrepancies and review the distances of the proposed transmission line as presented in the License Application from known peregrine falcon nest sites. The USFWS reviewer, Mr. Michael Amaral, was contacted by telephone and provided clarification on which the following discussion is in part based (Amaral, 1983 personal communication).

The proposed Healy-to-Fairbanks transmission route shown in License Application Exhibit G, Plate G-50, and in Figures E.3.49 and E.3.50 (Vol. 6B, Exhibit E, Chap. 3), passes within 1 mile of two historical peregrine falcon nest sites

RESPONSE TO COMMENT D.1 (cont.):

located about 3.5 miles northeast of Nenana (Biological Constraints Map, Sites 1 and 2).

In order to assure that major projects will not affect peregrine falcons, the U.S. Fish and Wildlife Service often recommends that the following restrictions apply (D. Money, personal communication, 1984)::

--All ground level activity is restricted within 1 mile of the nesting location from April 15 through August 31, unless specifically authorized. (Note: A nesting location may include 1 nest site or several alternative nest sites established by a mated pair.)

--All aircraft flights must maintain 1500 feet altitude above nest elevation within 1 horizontal mile of the nesting location from April 15 through August 31.

--Construction of new permanent facilities and long-term habitat alterations (e.g., material sites, roads, airstrips) are restricted within 1 mile of the nesting location, unless specifically authorized.

--Use of explosives, and other activities or facilities having sustained levels of human activity and/or high noise levels (e.g., blasting, rock crushing, gravel screening) are restricted within 2 miles of the nesting location, unless specifically authorized.

--Application of pesticides (with the exception of non-aerial application of approved, non-persistent insecticides within approved fixed boundaries) is restricted within 15 miles of the nesting location.

--Alteration of limited, high-quality peregrine falcon prey habitat is restricted within 15 miles of the nesting location.

Note: Some of the above restricted activities within the 1-mile and 2-mile buffer zones are permitted if nesting locations are shown to be unoccupied by June 1 of any year. Such activities may include aircraft flights lower than 1500 feet and closer than 1 mile, blasting, and certain other ground-level activities.

The proposed Healy-to-Fairbanks transmission route presented in the License Application passes within 2 miles of a third historical peregrine falcon nest site located approximately

RESPONSE TO COMMENT D.1 (cont.):

5 miles northeast of Nenana. This site (Biological Constraints Map, Site 3) is the first one referred to in the USFWS comments (letter by J. M. Nelson, October 12, 1983), i.e., the eyrie which "the recommended route boundary passes directly through." Although documentation is poor, current knowledge of the nesting requirements of peregrines, and the recent selection of "new" (not previously documented) nesting locations by peregrines in Alaska, support the supposition that peregrines have probably nested at this site in the past. Since the transmission route centerline shown in the License Application passes within 2 miles of this site, USFWS restrictions pertaining to activities within 2 miles and 15 miles of nesting locations, as listed above, may apply.

The proposed Healy-to-Fairbanks transmission route presented in the License Application passes within 3.5 miles of an historical peregrine falcon nesting location near Whiskey Island, at VABM Crescent (the second eyrie referred to in the USFWS letter by J. M. Nelson, October 12, 1983). As stated above, current USFWS recommended restrictions in regard to peregrines prohibit most actions within a three-dimensional zone 1 mile horizontal from and 1500 feet over nesting locations. They also restrict certain other actions within 2 horizontal miles of nesting locations. Moreover, they restrict alteration of limited, high quality peregrine falcon prey habitat, and the application of most pesticides within 15 horizontal miles of nesting locations. Therefore, the only USFWS recommended restrictions that may apply to the VABM Crescent nesting location are those regarding alteration of important, limited peregrine prey habitat and application of pesticides within 15 miles (see listed restrictions above). The occurrence of limited, high quality peregrine falcon prey habitat in the proposed transmission corridor in the vicinity of this nesting location is unlikely.

The proposed Healy-to-Fairbanks transmission route presented in the License Application passes about 4.5 miles from an historical peregrine falcon nesting location at the southwest end of Chena Ridge (Rosie Creek). This nesting location is probably the third one referred to in the USFWS letter of October 12, 1983. The only USFWS restrictions that may apply to this nesting location (i.e., Rosie Creek) are those regarding alteration of important, limited peregrine falcon prey habitat and pesticide application within 15 miles (see listed restrictions above). The occurrence of limited, high quality peregrine falcon prey habitat in the proposed transmission corridor in the vicinity of this nesting location is unlikely.

RESPONSE TO COMMENT D.1 (cont.):

The proposed Healy-to-Fairbanks transmission route presented in the License Application passes within 4 miles of another historical peregrine falcon nesting location farther upstream along Chena Ridge, specifically at Chena Bluff. The only USFWS restrictions that may apply to this nesting location (i.e., Chena Bluff) are those regarding alteration of important, limited peregrine falcon prey habitat and application of pesticides within 15 miles (see listed restrictions above).

It is not clear that restrictions will apply in the case of the Chena Bluff nesting location because the top of the nesting cliff is privately owned and has a large residence constructed on it, in addition to a major roadside vehicle pull-off and public viewpoint. It is doubtful that peregrines will successfully reoccupy this nesting location unless significant changes occur in patterns of existing human use in the immediate vicinity.

The occurrence of limited, high quality peregrine falcon prey habitat in the proposed transmission corridor in the vicinity of this nesting location is unlikely.

The proposed expansion of the Ester Substation (see License Application Exhibit G, Plate G-52) is roughly 4 miles north of the above historical peregrine falcon nesting location at Chena Bluff. The only USFWS restrictions that may apply to this nesting location are those regarding alteration of important, limited peregrine falcon prey habitat, and application of pesticides within 15 miles (see listed restrictions). The occurrence of limited, high quality peregrine falcon prey habitat in the proposed transmission corridor in the vicinity of this nesting location is unlikely.

There is sound evidence that peregrine falcon populations are increasing throughout Alaska and parts of northwestern Canada. In the Yukon River drainage, these increases began by about the mid-1970's. Since that time, numbers of occupied nesting locations and numbers of pairs have about doubled, and annual production of young has essentially tripled (as of the 1983 breeding season surveys) (see, for example, Ambrose 1979; Springer, et al. 1979; Roseneau, et al. 1980; Mindell and Craighead 1981; Roseneau, et al. 1981; Ambrose and Riddle 1982; Bente, et al. 1982; Hayes and Mossop 1982; Ritchie 1982; Ritchie and Craighead 1982; USFWS Region 7 Office of Endangered Species file reports and unpublished data). Similar increases, albeit at slower rates, are also apparent on the Arctic Coastal Plain of

RESPONSE TO COMMENT D.1 (cont.):

Alaska (e.g., Colville and Sagavanirktok river drainages) (see, for example, Ritchie and Craighead 1982; Swein, et al. 1982; USFWS Region 7 Office of Endangered Species file reports and unpublished data).

During final engineering design and construction planning for the transmission line, the Alaska Power Authority and its contractors anticipate working closely with the USFWS and other state and federal agencies in final siting of the line, placement of towers and construction procedures and timing, so as to minimize impacts on raptors as well as other resources in the transmission corridor.

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It is not clear that restrictions will apply in the case of the Chena Bluff nesting location because the top of the nesting cliff is privately owned and has a large residence constructed on it, in addition to a major roadside vehicle pull-off and public viewpoint. It is doubtful that peregrines will successfully reoccupy this nesting location unless significant changes occur in patterns of existing human use in the immediate vicinity.

The occurrence of <u>limited</u>, <u>high quality</u> peregrine falcon prey habitat in the proposed transmission corridor in the vicinity of this nesting location is unlikely.

The proposed expansion of the Ester Substation (see License Application Exhibit G, Plate G-52) is roughly 4 miles north of the above historical peregrine falcon nesting location at Chena Bluff. The only USFWS restrictions that may apply to this nesting location are those regarding alteration of important, limited peregrine falcon prey habitat, and application of pesticides within 15 miles (see listed restrictions). The occurrence of <u>limited</u>, <u>high quality</u> peregrine falcon prey habitat in the proposed transmission corridor in the vicinity of this nesting location is unlikely.

There is sound evidence that peregrine falcon populations are increasing throughout Alaska and parts of northwestern Canada. In the Yukon River drainage, these increases began by about the mid-1970's. Since that time, numbers of occupied nesting locations and numbers of pairs have about doubled, and annual production of young has essentially tripled (as of the 1983 breeding season surveys) (see, for example, Ambrose 1979; Springer, et al. 1979; Roseneau, et al. 1980; Mindell and Craighead 1981; Roseneau, et al. 1981; Ambrose and Riddle 1982; Bente, et al. 1982; Hayes and Mossop 1982; Ritchie 1982; Ritchie and Craighead 1982; USFWS Region 7 Office of Endangered Species file reports and unpublished data). Similar increases, albeit at slower rates, are also apparent on the Arctic Coastal Plain of

RESPONSE TO COMMENT D.1 (cont.):

Alaska (e.g., Colville and Sagavanirktok river drainages) (see, for example, Ritchie and Craighead 1982; Swein, et al. 1982; USFWS Region 7 Office of Endangered Species file reports and unpublished data).

During final engineering design and construction planning for the transmission line, the Alaska Power Authority and its contractors anticipate working closely with the USFWS and other state and federal agencies in final siting of the line, placement of towers and construction procedures and timing, so as to minimize impacts on raptors as well as other resources in the transmission corridor.

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E

FEDERAL ENERGY REGULATORY COMMISSION

SUSITNA HYDROELECTRIC PROJECT

PROJECT NO. 7114

RESPONSE OF

ALASKA POWER AUTHORITY

TO

AUGUST 25, 1983 LICENSE APPLICATION COMMENTS

OF

ADVISORY COUNCIL ON HISTORIC PRESERVATION

Council On
Historic
Preservation

1522 K Street, NW
Washington, DC 20005

P-7114

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FILED
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FEDERAL ENERGY
REGULATORY COMMISSION

Mr. Lawrence R. Anderson
Director
Office of Electric Power Regulation
Division of Hydropower Licensing
Federal Energy Regulatory Commission
Washington, D.C. 20426

REF: Susitna Hydroelectric Project
FERC No. 7114 Review of Appendix
Chapter 4, SHP, Application for License
1982 Cultural Resource Survey
Phase I Report

Dear Mr. Anderson:

As outlined in our earlier correspondence, we have been concerned about some aspects of the Susitna Hydroelectric Project (FERC No. 7114) as they relate to the requirements of Section 106 of the National Historic Preservation Act. As you know, our concern has focused on the identification of historic and archeological resources affected by the Project, on the procedures used to evaluate and treat these resources, on the apparently excessive costs of the survey and mitigation process, and on the concepts and methods which justify the strategies employed in performing this work.

We have reviewed the materials referenced above; unfortunately, our concerns are not allayed by the information presented. Enclosed is a review that elaborates our concerns, which should be addressed as compliance with Section 106 proceeds. Your early response will be helpful in resolving these matters in a timely manner. If we can provide anything further at this time, please contact Dr. Dean Shinn at 234-4946 in Denver, an FTS number.

Sincerely,

Robert Garvey

Robert R. Garvey, Jr.
Executive Director

RECEIVED
AUG 31 1983
DIVISION OF HYDROPOWER
LICENSING

FEDERAL ENERGY REGULATORY COMMISSION
PROJECT NO. 7114
RESPONSE OF ALASKA POWER AUTHORITY TO COMMENTS OF
ADVISORY COUNCIL ON HISTORIC PRESERVATION

COMMENT E.1:

See attached comment letter.

RESPONSE:

Pending receipt of the ACHP report submitted to the FERC, no response is possible.

F

FEDERAL ENERGY REGULATORY COMMISSION

SUSITNA HYDROELECTRIC PROJECT

PROJECT NO. 7114

RESPONSE OF

ALASKA POWER AUTHORITY

TO

NOVEMBER 18, 1983 LICENSE APPLICATION COMMENTS

OF

STATE OF ALASKA,

OFFICE OF MANAGEMENT AND BUDGET

(F)

BILL SHEFFIELD, GOVERNOR

OFFICE OF THE GOVERNOR

OFFICE OF MANAGEMENT AND BUDGET

DIVISION OF GOVERNMENTAL COORDINATION

POUCH AW
JUNEAU, ALASKA 99811
PHONE: (907) 465-3568

November 18, 1983

Mr. Larry Crawford
Alaska Power Authority
34 West Fifth Avenue
Anchorage, AK 99501

Dear Mr. Crawford:

SUBJECT: SUSITNA HYDROELECTRIC PROJECT APPLICATION
STATE I.D. NO. AK830824-55

The Division of Governmental Coordination has reviewed the consistency certification and supporting information you submitted for our concurrence under Section 307(c)(3)(A) of the Federal Coastal Zone Management Act as per 15 CFR 930, Subpart D.

The information reviewed was the Alaska Power Authority's (APA) application for a Major License for the proposed Susitna Hydroelectric Project No. 7114 located on the Susitna River between Anchorage and Fairbanks.

The proposed project would consist of two developments with a total installed capacity of 1,620 MW and would provide an average of 6910 GWH of energy annually upon completion in the year 2002.

The upstream Watana Development would include an 885-foot high earthfill dam with a crest length of 4,100 feet forming a 48-mile long reservoir with a surface area of 38,000 acres and a usable storage capacity of 3.7 million acre-feet at normal maximum water surface elevation 2,185 feet. Two chute spillways would be provided on the right abutment. A concrete, gated intake structure on the right abutment would lead to six 17-foot diameter penstocks terminating in an underground powerhouse containing six 170 MW generating units. The first four units would come on line in January 1994, followed in July 1994 by the final two units. The Watana Development would produce an average annual energy output of 3460 GWh.

The Devil Canyon Development would include a 645-foot high, double-curved, concrete thin arch dam forming a 26-mile long reservoir with a surface area of 7,800 acres and a usable storage capacity of 350,000 acre-feet at normal maximum water surface elevation 1,4[illegible] feet. A [illegible]-foot high, rock fill saddle dam would be located on the left abutment. A spillway would be provided on each abutment. A concrete, gated intake structure on the right abutment would lead to four 20-foot diameter penstocks terminating in an underground powerhouse

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containing four 150 MW generating units. The Devil Canyon Development would become operational in 2002 and would produce an average annual energy output of 3450 GWh.

Two 26-mile long, 345 kV transmission lines would be constructed from Watana to Devil Canyon. From Devil Canyon, two 195-mile long, 345 kV transmission lines would extend to Anchorage. An access road would be constructed from the Denali Highway south to Watana and then west to Devil Canyon. A 6,000-foot long airstrip and a permanent town for operation and maintenance personnel would be constructed at Watana. The Susitna Hydroelectric Project is estimated to cost 5.1 billion dollars (January 1982 dollars).

The Division's review of this permit application primarily concentrated on the adequacy of the information to identify and quantify coastal resources affected by the project, the impacts to those resources as a result of the proposal and the adequacy of specific mitigation measures to offset the impacts.

[F.1] Based on our review, the Division agrees that the proposal is consistent with the Alaska Coastal Management Program (ACMP) provided, however, that the following measure is adopted:

> Information on the outstanding issues and major areas of concern shall be provided to reviewing State agencies and the Division for review and subsequent concurrence that the proposed activity meets criteria of the ACMP standards and approved District program. A list of the major areas of concern and specific information needs required for further review is enclosed. This list is not inclusive, but should be used as a guide.

This finding is based on the determination that there are outstanding issues which have not been completely resolved and that at this time, there is not sufficient information to adequately and completely assess the impacts to coastal resources.

Adoption of the measure which shall provide the Division with additional information and concurrence authority is established in 15 CFR 930.64 and would allow the Federal Energy Regulatory Commission (FERC) authorization to proceed in a manner consistent with the Alaska Coastal Management Program.

It is our intention to work cooperatively with the APA in assessing additional information needed and reviewing forthcoming materials in an expeditious manner. To that end, existing mechanisms such as the new interagency review group (IARG) and the APA Board's new subcommittee on resources can be utilized by reviewing agencies to deal with unresolved issues. However, this finding of consistency is conditional upon the Division's concurrence that sufficient information has been provided by APA to insure consistency with the ACMP.

If you disagree with this decision, and you wish to consult informally about its terms, please contact this office as soon as possible pursuant to 15 CFR 930.124. If informal discussions do not resolve your concerns, you may appeal this decision to the U.S. Secretary of Commerce in Washington, D.C., as provided in 15 CFR 930.125, Subpart H. Grounds for this appeal are limited to:

1. a claim that the proposal, while inconsistent with the Alaska Coastal Management Program, is consistent with the objectives or purposes of the Federal Coastal Zone Management Act, 15 U.S.C. 1451-1462, 15 CFR 930.121; or

2. a claim that the proposal is necessary in the interest of national security, 15 CFR 930.122.

Your appeal to the Secretary of Commerce must be filed within 30 days of your receipt of this letter. Please contact this office if you need further information about these procedures.

By a copy of this letter we are informing FERC of the results of our review effort. Thank you for your cooperation with the Alaska Coastal Management Program.

Sincerely,

Robert L. Grogan

Robert L. Grogan
Associate Director

cm/1072

Enclosure

cc/enc: Kenneth Plumb, FERC, Washington, D.C.
The Honorable Esther Wunnicke, DNR, Juneau
The Honorable Don Collinsworth, DFG, Juneau
Carl Laird, DCED, Juneau
Bob Martin, DEC, Anchorage
The Honorable Richard Lyon, DCED, Juneau
Carl Yanagawa, DFG, Anchorage
Jim Ayers, DGC, Juneau

MAJOR ISSUES

[F.2] 1. A major concern remains the flow regime for the proposed project. The range of possible project flows is not adequate, nor does the information provide for analysis of potential impacts of various flow schedules. We understand that data collection and modeling efforts are still underway, however, with settlement negotiations on flow due to begin shortly, additional information is essential. Flow scenarios should reflect concerns with impacts to fisheries, habitat, wildlife, water quality, navigation and transportation. The selected flow schedule will undoubtedly affect the project's economics.

[F.3] 2. Instream flow is another major concern. The Department of Natural Resources has recently promulgated regulations governing instream flow rights generally for: fish and wildlife; recreation; navigation; and, water quality. The APA has submitted applications for water appropriation permits as required, but the information accompanying the application is not sufficient for processing the permits. Since the application for instream flow reservations are anticipated from other organizations and agencies, instream flow should be a major concern of APA. Instream flows necessary to maintain fisheries resources downstream from the proposed impoundments must be identified. Operational flow scenarios should be developed that consider the requirements of fisheries as well as the economics of power generation and anticipated project demand.

[F.4] 3. Land tenure in the Susitna must be addressed including, access planning and permitting with acceptable stipulations on construction and use. Land classifications, materials sites and disposals (including timber, gravel, etc.) and planning for recreation, settlement and other activities are also necessary. Other concerns are the transmission line routing, location and design of construction facilities and cultural resource protection.

[F.5] 4. A more comprehensive assessment of downstream fish and wildlife resources of the Susitna River and the impacts to those resources and uses is necessary. Information on downstream impacts, water temperature, ice formation, sediment loading and fisheries should be provided. Requisite data for decisions on monthly flow requirements and minimum downstream flow requirements are not available at this time. The continuity between the water temperature and ice formation models is also a concern. Winter conditions habitats, tributaries, sloughs, and side channels of the lower river need attention. Possible use of spring flooding in mitigation planning should be considered.

[F.6] 5. The identification of the full range of important impacts to wildlife and the establishment of mechanisms for approaching mitigation of those impacts, must be achieved. This should include better definition of anticipated impacts to fish and wildlife populations and their habitats, a process for agreeing on the magnitude of impacts, and the assessment of habitat enhancement techniques to be used in determining the replacement habitats required to offset impacts.

[F.7] 6. The impacts to fish and wildlife resources caused by access to the project area must be more fully evaluated. This includes the effects of access to the project area for project construction and operation as well as the increases in accessibility to surrounding lands to the general public.

[F.8] 7. Socioeconomic impacts on commercial, recreational and subsistence use of affected resources and supporting industries require further assessment. This should include the identification of resources used; the quantification of use levels; the description of use patterns, including seasonality and its context within local communities; and, descriptions of geographic areas of use.

[F.9] 8. Mitigation planning must be further developed. This is a high priority issue. The impacts to fish and wildlife species must be better identified. The APA needs to show how impacts to fish and wildlife resources will be mitigated through project design or through compensatory measures. A comprehensive evaluation of impacts and applicable mitigation alternatives needs to be conducted to evaluate environmental costs, the feasibility of mitigation, or the tradeoffs of fish and wildlife resources and habitat that may be involved.

FISHERIES

1. Flow Regime

[F.10] Review of information regarding flows in the Susitna River after the project is in place indicates that data are insufficient to predict the effects of an altered flow regime in the river on fisheries. Therefore, we are not able at this time, to recommend instream flows that would reduce impacts to an acceptable level. Until sufficient

[F.10] (cont.) data is available to recommend flow levels to protect fisheries, it is not possible to adequately assess project related impacts or formulate appropriate mitigation measures.

[F.11] The definition of an acceptable flow regime to protect fish and wildlife resources during project operation is one of the major issues of the Susitna Hydroelectric Project yet to be resolved. Resolution of this issue will form the basis for further mitigation planning for fishery impacts. To this extent, the Exhibit E should identify those habitats potentially affected by altered flows, the resources that utilize those habitats for any life stage, the mechanisms for potentially impacting those resources, and methods to sufficiently mitigate the impacts identified.

[F.12] Those aquatic habitats receiving the most attention in Exhibit E are sloughs and the mainstem downstream from Devil Canyon to Talkeetna. Other habitats within this reach that are of importance to fishery resources include tributaries, tributary mouths, upland sloughs and side channels. These habitats need to be evaluated in more detail so that impacts to fisheries in this reach can be more fully understood.

[F.13] The Alaska Department of Fish and Game (DFG) has recommended a more thorough analysis of the fisheries and aquatic habitats downstream from Talkeetna. The impacts of the altered flows in this reach may be more significant than those upstream. Below its confluence with the Chulitna River, the Susitna River is broad and relatively shallow. Therefore, an altered flow regime may affect relatively more aquatic habitat downstream than upstream. We again recommend that additional emphasis be directed toward study of the resources and potential impacts downstream of the Talkeetna River.

2. General Resource Values

[F.14] Review of Chapters 2, 3 and 7 shows that there is no discussion of the fish and wildlife resources in the Susitna Basin that are potentially affected by the project and how these resources compare to those in the remainder of the State. This is important because an analysis of project options, impacts, and appropriate mitigatory measures should be viewed in part within the context of the value of resources that may be affected by any project option. An intensive land use planning effort for the Susitna area is currently being undertaken jointly by various State, Borough and Federal Agencies. This study looks at the regional significance of fish and wildlife resources. As a part of the study, various alternatives for land use have been selected and presented at numerous public meetings. It appears that the alternative receiving the most support is the one that emphasizes fish and

[F.14] (cont.) wildlife, recreation, and forest resources. Facts presented in the public information brochure for the Susitna Area Plan emphasized the importance of fish and wildlife in the Susitna basin. It is stated in the brochure that ". . .'the Susitna Basin is the most important fish and wildlife production and harvest area in Alaska." This statement was based on the 1980 National Survey of Fishing, Hunting and Wildlife-Associated Recreation Report. This report revealed that more than 69,000 recreational fishermen and 19,000 hunters spent over 700,000 days in the area and spent an estimated $44 million for equipment and services including guide and taxidermy fees, merchandise and services. In addition, commercial fishermen received over $7 million from Susitna Basin fish, which generated over $32 million for processors and retailers.

3. Recreational Fisheries

To understand the potential impacts of the project on the recreational fishery that occurs downstream from Talkeetna, it is necessary to understand how these fisheries function.

[F.15] On the Susitna River from Talkeetna down to its confluence with the Yentna River there are nine tributaries flowing into the east side of the Susitna and one flowing in from the west that contain significant fish populations. Most of these streams support major salmon runs and jointly support up to 100,000 man-days of fishing effort each year. Access plays a major role in limiting growth of the recreational fisheries that occur on these streams. Much of the land adjacent to these streams is in private ownership and public land that is available is relatively undeveloped or inaccessible. Other than in the Talkeetna area there are no public boat launches that allow anglers access to the Susitna River. The State has recognized the problem and has spent over a million dollars to buy back lands at the mouths of Montana and Sheep Creeks. The State has also initiated a road construction project that will provide access directly to the Susitna River at the mouth of Willow Creek. This project is expected to exceed $5 million and result in a substantial increase in angler access to the Susitna River and Willow Creek.

[F.16] An important aspect of the recreational fisheries is that they are located primarily at confluences of tributaries to the Susitna River. Recreational activity in these confluence areas is directly related to the large number of salmon that are present at these sites. As all five salmon species migrate up the Susitna River they tend to congregate at the mouths of virtually all of the clear water tributaries flowing into the Susitna River. During the open water season the areas around the mouths of tributaries provide ideal resting or staging areas for all adult fish species as well as rearing areas for juvenile

[F.16] (cont.) fish. The extent to which these areas are used is dependent on the depth of the water at the tributary mouths which in turn is sensitive to changes in mainstem flow. At high flows, the mainstem creates backwater areas at the tributary mouths, thus increasing water depth. At low mainstem flows, the backwater areas are eliminated, resulting in shallower water and increased flow velocities at the mouth. When these backwater areas are eliminated, their attractiveness to fish is significantly reduced and fish will be displaced to other areas more suitable. This could have significant effects on a recreational fishery since the fish may be displaced from a tributary mouth that is easily accessible to anglers to one that has very limited access. In the Susitna River, natural low water conditions which affect recreational fisheries do occasionally occur. When they do, it is primarily during May and June during the chinook salmon migration.

[F.17] Chinook salmon are the most highly prized sport fish in Alaska and as such they attract large numbers of anglers to the limited areas that are opened for fishing. The Susitna River chinook salmon is a limited resource that has been intensively managed and has a long history of allocation conflicts between various user groups. Sport fishing for chinook salmon is allowed on only five Susitna River tributaries in the Talkeetna to Cook Inlet reach. In addition the Yentna and Talkeetna River drainages are open to chinook salmon fishing. Three of these streams, Willow, Caswell and Montana Creeks, are east side tributaries that are open to chinook salmon fishing only on weekends while the other two, the Deshka River and Alexander Creek which flow in from the west side, are open to chinook salmon fishing seven days per week. The weekend-only fishing streams receive extremely heavy fishing pressure during the chinook salmon fishery. Since those areas that are opened for chinook salmon fishing are extremely limited, any physical changes in backwater areas on these streams which may reduce holding areas for chinooks could be particularly damaging to the recreational fishery.

[F.18] It is also important to note that salmon utilizing tributary confluence areas are not necessarily migrating into those tributaries. All five salmon species migrating to the upper Susitna, Chulitna, and Talkeetna Rivers enter, in varying degrees, the sport fisheries that occur at the confluence areas of the lower Susitna tributary streams. Any impact that occurs to salmon species that utilize the Susitna River in the Devil Canyon to Talkeetna has the potential to impact the recreational sport fishery which harvests those fish in downstream confluence areas.

[F.19] On Page E-3-105 it is stated that flow reductions under the proposed filling schedule may alter the physical characteristics of the tributary mouths in the upper portion of the

[F.19] (cont.) Talkeetna to Cook Inlet reach. These are the areas where the major fisheries occur. It is further stated that during the open-water season, mainstem discharge reductions of 34 percent in June and 28 percent in July may reduce the areal extent of these backwaters. It was previously mentioned in the application that water depths in these areas will also be reduced. The Susitna River below Talkeetna is moderately to extensively braided, with the river channels wide and shallow. Therefore, this reach is more sensitive to flow reductions than deeper more incised channels, which occur further upstream. Reductions in discharge during and after filling of the reservoir could result in substantial changes in the habitat at tributary mouths which may seriously impact existing recreational fisheries. Since the tributaries flow into a variety of habitat types the impacts of reduced flows will vary.

[F.20] There has been minimum effort, especially in tributaries, to quantify adult salmon escapement in the Susitna River below Talkeetna. It is very likely that adult salmon escapement in this portion of the Susitna River far exceeds those estimates available for the river above Talkeetna. This would mean that the reach below Talkeetna is especially important to rearing juveniles. Here again, there is very little quantitative information. Information is needed on juvenile rearing in the reach below Talkeetna. Large numbers of juvenile chinook salmon and adult resident species are migrating out of numerous east side Susitna tributaries in the reach below Talkeetna. They are dependent on overwintering habitat in the Susitna River. There are no quantitative data presented that indicate their abundance or which habitats they are dependent upon. There is almost certainly going to be an impact on juvenile fish rearing in this reach with post-project winter flows changing by over 200 percent. There are no data which show how winter habitat will change with the dramatic increase in flow.

[F.21] Assumptions of current sport fishing effort made from the Alaska Department of Fish and Game Statewide Harvest Study (1981 data) appear to have been made by someone who is not familiar with factors affecting sport fishing effort and harvest trends (E-7-42/32 Indirect Impacts). Although the data indicate an apparent decline in the number of anglers residing in the upper Copper/Susitna Rivers, this is not indicative of a general decline in numbers of resident anglers. The 1,885 number in 1977 is directly related to the temporary increase in the Glennallen area population during construction of the pipeline. It would be correct to state that since 1978 the number of resident anglers has remained relatively unchanged in the upper Copper/Susitna River area (1982 figure is 1,254 anglers).

[F.22] Assumptions are also made that fishing effort is declining in the westside and eastside Susitna drainages when it is actually increasing. Instead of using angler's residence to show fishing trends in the westside and eastside Susitna drainages, as was used for the Copper/Susitna River area, the writer reverts to using angler days fished to attempt to document declining fishing trends on the Susitna River. If angler's residence was used for the west Cook Inlet-lower Susitna drainage it would be apparent that there was a steady increase in number of anglers from 1977 through 1979 and a rapid increase since 1979 (Appendix 7.C). The assumption, using angler days that fishing effort is declining in the westside and eastside Susitna drainages is primarily based on the 1981 harvest study data which show a dramatic decline in effort (Appendix 7.C).

This assumption is incorrect because in 1981, natural phenomena may have affected angler participation in the recreational fishery and because there was an 11 percent increase in licensed angler's Statewide, 20 percent of which occurred in the west Cook Inlet-lower Susitna drainage. Furthermore, 1982 data are available and show a 34 percent additional increase in anglers in this drainage area, a record high. The narrative in the Department's 1981 Statewide Harvest Study indicated that 1981 was not a typical year and as such should not have been used to determine trends in effort and harvest. The following is an excerpt from the 1981 DFG study:

> "In 1981 the number of angler-days fished statewide decreased from the previous year for the first time since the Sport Fish Survey was initiated. This decrease in effort took place primarily in fisheries serving the Juneau, Anchorage and Fairbanks areas. An unusual combination of coincidental circumstances, including inclement weather, high and muddy waters, and off-year or unexpected salmon run cycles occurred in conjunction with these fisheries in 1981. With the 11% or almost 25,000 angler increase in the angler population base in 1981, the largest annual increase since the Sport Fish Survey was initiated, normal conditions in 1982 would very likely produce record high fishing effort in Alaska's waters."

[F.23] Description of sport fishing in the Susitna River (E-3-15) omitted an analysis of chum salmon which contributes significantly to the sport fishery. The 1978 and 1981 Susitna harvest of chum salmon represented about 71 and 57 percent respectively of the total estimated harvest for southcentral Alaska. From 75 to 98 percent of the chums harvested in the Susitna River were harvested from the confluence areas of the eastside Susitna tributaries.

4. Mitigation

[F.24] The mitigation plan for fisheries contained in Exhibit E requires further development. It does, however, provide the basis for further mitigation planning. This is expected to occur as additional resource information is collected and anticipated impacts are better quantified.

[F.25] A major issue with respect to fisheries is the establishment of an acceptable flow regime downstream from the impoundments. Resolution of this issue requires that the impacts to fisheries, habitat and the public use of the fisheries be better defined downstream and that alternative flow scenarios for fisheries be evaluated. Once this has been done and an acceptable flow regime agreed upon, then development of additional measures to mitigate impacts such as slough modifications not ameliorated by the flow regime can be evaluated.

[F.26] Concepts for mitigating those downstream impacts which are not offset by the flow regime are too general to be thoroughly evaluated, and the probabilities of success are not presented. Furthermore, there are no specific plans for types of mitigation, such as slough modification. Plans should be provided and should include engineering drawings, operational and maintenance plans and realistic costs. Without these, the evaluation of mitigation proposals cannot be carried out with any degree of confidence that adequate mitigation will actually occur, and that the mitigation actions themselves are in harmony with the overall development and conservation of resources in the area.

[F.27] Losses of resident species and habitats within the impoundments can only be mitigated through compensatory habitat replacement or enhancement elsewhere. Resolution of this issue must be accomplished jointly between the applicant and the resource agencies in the context of presently feasible propagation technology and the benefits to the resource and user groups of artificial stocking of waters in the project area. Therefore, it is not appropriate to make a decision on this tradeoff until a process for addressing the overall mitigation plan is implemented.

[F.28] The applicant should utilize a forum for addressing mitigation planning such as the recently established APA Board of Directors Resources Subcommittee. This subcommittee could identify conflicts and the mechanisms, information, and decisions needed to resolve those conflicts, thus improving mitigation planning.

WILDLIFE

F.29] The following review is limited to general comments on aspects of the license application that require major revision before the document can be considered to have adequately assessed wildlife resources and mitigation planning. While some examples

[F.29] are used, no attempt has been made to make a complete list of
(cont.) specific comments.

1. Incompleteness

[F.30] Baseline descriptions of wildlife resources are based primarily on data collected before fall 1981, approximately 1.5 years after studies began. Data collected prior to 1980 derive mostly from peripheral areas and not from within the project area. Data available after fall 1981 are not presented in their entirety and occur only as isolated pieces of information, devoid of any structured approach. Subsequent reports by APA's contractors not included in Exhibit E but available to the APA, make many of the statements included in Exhibit E obsolete. For example, the estimated maximum number of moose wintering in the Watana impoundment zone is double that presented.

[F.31] The list of potential impacts is incomplete. There appears to be a belated attempt to systematically list impacts in the tables. Many are omitted or not clearly identified in the text. This problem is greatly aggravated by the inconsistencies from one section to another.

2. Inadequate Treatment of Major Issues

[F.32] A number of major issues, such as habitat alteration below Talkeetna and secondary development, are dismissed with very little comment. It may be that these issues are complicated and cannot be precisely quantified. However, there is not even a reasonably qualitative discussion or attempt to put outer bounds on the magnitude of the issue.

3. Incomplete Consideration of Scenarios

[F.33] Because many issues have been only partially investigated, it is possible to construct a wide range of equally plausible scenarios with respect to impacts to populations of wildlife. Exhibit E generally presents a single scenario per issue. Rarely are these the worst case. On the contrary, they tend to be optimistic. Often they are stated in terms that would suggest to an uninformed reader that alternative scenarios do not exist. When a range of predictions can be supported by available information the full range, or at least the worst case, should be presented.

4. Weighting of Impacts

[F.34] While criteria for ranking impacts are presented, these criteria are not employed consistently. The same impact may be given different weight in different sections. Relatively minor impacts often receive more emphasis than potentially major impacts.

Rarely is any quantification presented to support ranking of impacts. Often, a supporting qualitative rationale is not even provided. For example, ranking the killing of nuisance brown bears ahead of spring habitat loss in terms of significance of impact is a completely subjective judgment not likely to stand scrutiny. The lumping of classes of impacts causes confusion and disallows a examination of actual effects and their relative values. Temporary habitat loss is lumped with permanent habitat alteration. This problem reflects a failure to clearly evaluate how an impact is likely to influence a population of animals, and frustrates any attempt to address different effects and to put some outer bounds on the magnitude of the impacts. For example, habitat loss from increased off-road vehicle use receives equal or greater attention than other forms of loss and alteration near the impoundment. Questions that need to be answered are: Is the acreage lost significant? How much similar habitat has been lost in nearby accessible areas? Within the acreages affected, what vegetation types are most susceptible? What species of wildlife use these vegetation types? Is the population likely to be limited by the availability of these types? By answering similar questions for the various types of project related alterations to lands and waters, the potential scope of a problem can be determined even when precise quantification is impossible. At the very least, impacts can be more realistically weighted so that the need for further study or specific mitigation measures can be assessed. [F.35]

5. Misinterpretations

In many instances, information from sources independent of APA funded studies is used improperly. In some cases, such as the relationship between water and mineral licks and the movement patterns of moose in portions of interior Alaska, statements cited have no relevance to the Susitna area. In other cases, such as the reference to the dispersal of moose as observed in two studies to the south of the project area, certain conclusions are drawn even though the studies were not designed in a manner that would test the hypothesis against which the conclusion is made. Isolated papers are cited when other more appropriate literature is not used. [F.36]

Other statements demonstrate a poor understanding of the current state of knowledge of certain areas of wildlife biology. For example, mortality of moose during a moderate winter is implied to be a rarely observed event. [F.37]

The history of management [illegible] and objectives in the project area is sometimes completely misunderstood. For example, Game Management Unit 13 is not a trophy moose area [F.38]

[F.38] (cont.) and bear populations have not historically been managed to benefit moose populations.

6. Inadequate Consideration of Alternatives

[F.39] Alternative design features and the analysis of impacts to fish and wildlife resources associated with alternative designs are usually not considered. When they are, they are often presented in a manner that places most emphasis on the basis of cost or engineering considerations. For example, there is no incremental analysis of the impacts to resources of different dam heights, even though the APA has considered different dam heights. Methods of transmission line construction and maintenance described in the draft Exhibit E have been deleted. The justification presented does not allow an objective and independent analysis of the alternatives.

[F.40] The mitigation plan is deficient in a discussion of consequences and does not consider a range of avoidance and minimization options. For example, the routing of the Denali access route was only adjusted slightly to minimize impacts on caribou. No range of alternatives to that alignment are presented. Only a "no project" option is presented, and the consequences of such an option are given only as the avoidance of this impact. Alternative access routes to the Alaska Railroad and Parks Highway are feasible, would greatly reduce the impact, and should be displayed.

7. Failure to Consider the Dynamic Nature of Populations, Habitat and Management Goals

[F.41] Impacts are usually stated in terms of the current populations, current habitat conditions and current management goals. In some cases, they focus only on the fate of currently living individuals rather than populations. This approach may be adequate for short-term impacts. It is not adequate when the duration of an impact is likely to span a period during which populations, habitats or management goals or regulations may change significantly. Management regulations may change every two or three years, populations can certainly change significantly over a decade and habitat over two or three decades. These changes are well within the life of many of the impacts of the project.

[F.42] Changes brought about by the project may have widely different effects on different population sizes or under different environmental conditions. Mortality induced by the project might be insignificant at high population levels, but significant at low population levels. In some instances, the project might permit continued existence of a population of the current size but preclude growth to its current potential. In other cases pre- and post-project

[F.42] cont.) populations might be the same size, but the post-project population might have less capacity to sustain hunter harvest and predation or to recover from periodic environmental perturbations, such as severe winters. While Exhibit E occasionally alludes to changes in productivity, it tends to focus on whether the current population level can be maintained. The simulation modeling effort initiated by APA is designed to show changes in a more dynamic manner, yet these models were not used in preparation of Exhibit E and there is no clear indication of when, if, or how they will be used.

8. <u>Cumulative Impacts</u>

[F.43] Closely related to the preceding discussion is consideration of cumulative impacts. Many different impacts will work together to produce a cumulative effect which is greater than any of the individual impacts. This fact is recognized in the summary of impacts. However, throughout the bulk of the text, impacts are usually discussed with respect to single, specific actions with little reference to the cumulative effects of the total set of actions.

9. <u>Lack of Quantification</u>

[F.44] Exhibit E is almost entirely qualitative. What quantification there is, often tends to be misleading. For example, it states that 300 moose occur in the Watana impoundment area during moderate winters and estimates that sufficient forage to support 301 moose for 180 days exists there. The first figure was simply the largest number of moose estimated in the impoundment area during a mild winter. The following year, when snow depths were greater but not unusually deep, twice that number were estimated. The estimate of carrying capacity amounts to an educated guess. The data and vegetation maps used were deemed inadequate for estimating carrying capacity and were scheduled to be upgraded. Until this is done, any estimate should be considered extremely tentative. Selection of 180 days is completely arbitrary. Available data suggest that most moose use the area for a shorter period. In severe winters, moose might use more than the current annual growth. Therefore, the estimate on animal numbers and carrying capacity can easily be different from that presented.

[F.45] There are numerous cases where vegetation loss is expressed as a percent of that type occurring in the basin or a subunit of the basin. These estimates have little meaning for wildlife. Such estimates should be based on areas meaningful for the population of animals being considered. In the case of the Nelchina caribou herd, a much larger area is appropriate. In the case of most other species, a smaller area should be used. An impact zone based on the

[F.45] (cont.) range of each population or group of animals should be delineated and losses from that area examined.

[F.46] It is indicated that some estimates will be refined in the future, although it is not always clear how or when. A large number of issues seem to be set aside simply because they cannot be precisely quantified. Clearly it is not possible to precisely quantify all of the impacts. However, it is difficult to see how reasonable and responsible mitigation decisions can be made unless there is some indication of the magnitude of the impact. Many of these issues can at least be narrowed to an order of magnitude. They should be thoughtfully examined and outer bounds placed on the problem. For example, a maximum possible level of habitat loss and alteration adjacent to the impoundment and downstream can certainly be determined. These estimates can be narrowed by developing more logical scenarios. The effects of several of the scenarios on wildlife population can be examined to identify a worst case situation. If this worst case shows an unacceptably high impact, further studies can be designed to narrow the range of possibilities.

10. Further Studies

[F.47] There are numerous references to continuing studies to further refine the impact assessment. Many of these references are vague with no indication of what these studies are and what information they will produce. Other studies are more specific but no dates for completion are indicated. Of those studies that are specifically identified with dates, many are not currently funded.

11. Mitigation Plan

[F.48] This section is much better organized than the baseline and impact sections. As a result, it is a reasonable starting point for mitigation planning. The following paragraphs present some areas that need attention.

[F.49] First, a mitigation plan cannot be fully developed until the impact assessment is greatly improved. This does not mean, however, that the current plan cannot be substantially improved in the interim. It suffers from many of the problems listed above. Most of all, it needs to present a systematic overview of how the project will impact a population. If mitigation planning and measures are not aimed specifically at limiting factors, they will fail. For example, if brown bear are limited by loss of spring foraging habitat, it will do little good to enhance habitat to produce more berries, a late summer food. It is important to ensure that mitigation actions are developed in a manner and location to benefit populations, and therefore result in usable products. Habitat enhancement north of the Watana impoundment, as described in Exhibit E, will be of

[F.49] (cont.) little value to moose south of the impoundment. Production of fish downstream for bears will be of little value to bears if the fish are not available in an area where bears can utilize them. It is not meaningful to promote transmission corridors as habitat enhancement unless it can be shown that there is an increase in browse in areas where moose can use it. In addition, there may be overriding considerations negating a proposed mitigation measure such as attraction of animals to roads and railroads where accidental mortality will be greater. This, too, represents a factor which should be considered when planning for mitigation and evaluating the capabilities of a proposed action.

[F.50] The mitigation plan states that habitat enhancement will be emphasized more than the use of replacement lands will be. This approach is extremely risky and tends to assume that more information is known about how to enhance habitat than actually exists. In order to succeed, enhancement must produce appropriate quantities of forage of proper quality and digestibility. It must be provided at the proper time in areas where animals are capable of using it. There have been a number of successful enhancement efforts in which a satisfactory quantity of forage was produced, made available and actually used. There have also been failures where the area reverted to other-than-forage conditions.

There has been little experience with the enhancement of habitat types similar to those near the impoundments. There have been enhancement efforts where moose have immediately used enhanced areas and responded with increased productivity. There are also examples where abundant forage was produced but the moose population failed to make use of them. Habitat enhancement is a valid tool for mitigation but it must be applied with careful thought to ensure a reasonable probability of success.

[F.51] If the mitigation plan relies too heavily on habitat enhancement, there is a substantial risk of irreversible failure of the mitigation objectives. It is likely that 20 years will pass before initial habitat enhancement efforts can be fully evaluated. Land classification and disposal programs will be far advanced by that time, and may preclude some options that are now available. If enhancement measures are found to be inadequate, it may be too late or too expensive to find suitable replacement lands. The mitigation plan should emphasize retention of State lands either for wildlife habitat or in a category that preserves future options. Habitat enhancement should be applied cautiously on some of the lands where there is a high probability of success, and then carefully evaluated.

[F.52] Some concepts in the mitigation plan are unacceptable. Reduction of bear populations is promoted as mitigation for

[F.52] (cont.) moose and caribou losses. The plan should also avoid reliance on the Board of Game to mitigate for impacts. While there may be a need to regulate hunters and trappers as a consequence of the project, and the Board of Game is the appropriate authority to do this, APA first should take all steps to avoid or minimize actions that would require restrictive regulation. Furthermore, enhancement of one species at the expense of another is not a legitimate approach to mitigation.

This is not to say that the effects of mitigation measures for one species on another species should not be considered. They should. This is adopted where a positive benefit is perceived, but again not always clearly thought out. For example, habitat enhancement measures for moose are promoted as beneficial to bears. There is evidence from Alaska which was not considered that suggests that such measures may be detrimental to bears.

SOCIOECONOMIC IMPACTS

[F.53] The projection of socioeconomic conditions with and without the project should provide information needed to develop an impact management program. This objective is simply not accomplished by the material presented. Deficiencies exist in both the data presented and the methodologies used. Examples which follow are not intended to be complete, but they are repeated here because their importance is sufficient to, in most cases, invalidate the analysis.

1. Commercial Fishery

[F.54] An invalid assumption is made that the commercial fishery for salmon produced in the Susitna River system occurs only in upper Cook Inlet. In comments on the draft Exhibit E provided by DFG, it was pointed out that the Susitna River salmon stocks are harvested throughout Cook Inlet, including the lower district. Therefore, the discussion of impacts and related values of Susitna River stocks must include the entire Cook Inlet fishery.

[F.55] Data regarding commercial fishing impacts (P. E-5-98/2) do not represent the percentage of catch to total run. The methodology is in error in that ratios of harvest to escapement are used to estimate losses to the commercial fishery, whereas the correct measure is the ratio of total run to escapement. Catch as a percentage of total run generally ranges very widely year by year. On one well studied system, the Kvichak River, values over the period 1956-1981 range from 5 to 75 percent and averaged 45 percent. Therefore more than half the value of the harvestable resource to the commercial fishery is ignored in the present analysis.

2. Sport Fishery

The discussion of the value of sport fishing (P. E-5-99 to 100) needs to be supplemented. With high economic value's already demonstrated for sport fishing Statewide by joint DFG--University of Alaska Studies (See eg. Workman, Wm. G. 1/1983. Valuing Outdoor Recreation Opportunities. Agroborealis, P. 29-31), it is surprising that no data have been developed for the study area. The data presented for use of the lower Susitna River, from the DFG harvest statistics, should be supplemented with information on recreational fishing use of the river upstream from Talkeetna. This is necessary to adequately identify and quantify impacts to recreational use. [F.56]

3. Subsistence Fishery

[F.57] The ease with which subsistence (or local) fisheries are dispatched with is disturbing. It is incorrect to say that "Subsistence fishing within the Susitna Basin is not a recognized fishery by DFG." (Para. 1) While salmon fishing for local use does not currently take place under subsistence fishing regulations (which are established by the Board of Fisheries, not the DFG), fish harvests for home consumption may be significant for the residents of portions of the Basin. This has been demonstrated for the Upper Yentna area by a Division of Subsistence project entitled, the Susitna Basin Resource Use Study, (see Fall, James A., et al. 3/1983.) The Use of Moose and Other Wild Resources in the Tyonek and Upper Yentna Areas: A Background Report. DFG, Anchorage, Alaska.)

[F.58] Local use of fishery resources remains to be quantified. There are a number of approaches to quantifying the value of this use including surveys of local populations. Another approach includes use of non-priced values to quantify local use of fish and wildlife resources. As pointed out by numerous studies (Langford, Wm. A. and Donald J. Cocheba. 1978. The wildlife valuation problem: A critical review of economic approaches. Canadian Wildlife Service, Occasional Paper No. 37.), non-priced values derive from a number of sources such as recreational hunting; non-hunting, wildlife-based activities (photography, hiking, camping canoeing, etc.); existence value; bequest value; option value; breeding stock capital value; meat value; and research and genetic values. These commonly used sources of value are not addressed in the study.

4. Game

[F.59] While much more complete than the treatment of fish, deficiencies in the data and methodologies employed for game (E-5-101/102) persist. The approach utilized to define user groups and use patterns would be useful if

[F.59] cont.) applied specifically to the study region, and if linked to an impact methodology.

[F.60] Commercial Users--This discussion would serve were it part of a sector analysis, as is usually done, and were it complete. However, as it is, treatment of commercial users has excluded indirect users such as taxidermists, air taxi operators, equipment suppliers and others, and is, therefore, incomplete. The contribution of these users should be included in the discussion.

[F.61] Non-Commercial Use--The analysis of non-commercial uses has no guiding methodology and therefore remains general. Two types of data must be included if the economic aspects of this use are to be defined: harvests attributable to specific land areas; and, access and transportation modes used. This information is available from the DFG General File Harvest Statistics data base and should be used to help quantify non-commercial use.

[F.62] Furbearers--The discussion of trapping should be part of, and supported by, a commercial sector analysis.

RECREATIONAL RESOURCES

1. Phase One

[F.63] The APA is apparently committed to "Phase One" development of recreational opportunities only, which includes 25 units added to an existing campsite, three shelters, one boat launch, 45 miles of primitive trail, one portal sign, and Watana townsite facilities. It appears as they would develop subsequent phases as needed. Costs for phase one are shown as $565,836 in Table E.7.17 and $752, 436 in Table E.7.18. Obviously, these figures are conflicting. In fact, none of the total cost figures in these tables agree.

2. Alaska Department of Fish and Game

[F.64] In this section, conjectures are made regarding the objectives of the DFG for project-related recreation. These objectives should be further refined after consultation with the DFG.

3. Existing Activities

[F.65] It is inaccurate to classify hunting, fishing, food gathering, rock hounding, camping, hiking, cross-country skiing, and photography as non-site specific activities. "Site" is a geographically flexible term. The areal extent of an activity depends primarily upon physical conditions and access opportunities. One should not dismiss the need for

[F.65] cont.) recreational development with such statements as ". . . because of their inherent mobility and non-site specificity, these activities can for the most part be absorbed in surrounding landscapes." (P.E-7-25, Sec. 3.1).

4. Travel Cost Method

[F.66] The application of the travel cost method and assumed participation rates, yield very general results which ignore known specific effects. For example, opening road access to an area normally brings in a flood of new hunters and fishermen. The Petersville road in the Susitna drainage is an excellent example. Use of a maximum increase in demand of 0.2 percent (P.E.-7-43) is quite low when experience has shown increases as high as 100 fold.

5. Recreation in Plan for Camps and Townsite

[F.67] It is the view of DFG that every effort should be made to provide the best possible recreational facilities for residents of the construction camp and townsite. These efforts, we believe, would tend to relieve the surrounding landscape from excessive use pressures.

LAND USE

1. Introduction

[F.68] This section recognizes that hunting, fishing, and trapping constitute the primary land uses of the area, yet, nowhere in the chapter are these uses substantiated.

2. Purpose

[F.69] Data on areas used by the residents of Cantwell for hunting, fishing, and trapping are available from the Division of Subsistence in Anchorage. The mapped data for this community should be augmented with similar maps for other communities in the project area.

[F.70] The purposes to be served by this chapter are not clearly stated. Proposed FERC regulations require a report on land use as part of Exhibit E (Proposed regulations, 4.41(f)(g)), and specify that the following items be included:

a. description of existing uses of proposed project and adjacent lands;

b. uses that would occur if the project were constructed;

[F.70] (cont.)

c. consultation with local, State and Federal agencies with management authority over project lands;

d. identification of wetlands, floodlands and farmlands;

e. identification of lands owned or controlled by government agencies; and,

f. photographs, maps and graphics sufficient to show the nature, extent and location of land uses.

3. Land Use Changes

[F.71] Discussions of "induced land use changes" and "mitigation" are so limited by the lack of information on existing conditions as to make comment difficult. A methodology needs to be established which allows a quantified approach to the topic and products useful to the project.

DOCUMENT ORGANIZATION

[F.72] Review of the documents, specifically Exhibit E, was difficult, partially due to the volume of materials and partially due to the quality and organization of the application. Sections of Exhibit E require extensive editing before a meaningful review can be accomplished. There are numerous typographical errors, some of which may affect the meaning of passages. Blocks of text are missing, making it impossible to tell if omissions of key points are intentional. Other factual errors seem to stem from failure to check sources. There are improper citations, making it difficult to check facts.

[F.73] Particularly confusing is the inconsistency among sections. Frequently a topic is covered in three or four different sections. In some cases, one section will completely contradict another. In these situations, one section will suggest that an impact is of minor significance or even beneficial to a species while another will suggest serious negative impacts. These inconsistencies suggest that the writers may have had incompletely formed views that changed as the document was written. For example, the summaries of impacts section reflects DFG comments on the draft more clearly than do some other sections which also comment on project related impacts. These inconsistencies reflect a failure to edit and cross check different sections thoroughly. This makes it impossible to determine APA's actual view of the significance of key issues. The document should be edited extensively to make its meaning clear and consistent.

[F.74] The environmental studies for the Susitna project were designed to be accomplished over a five-year period. Approximately three years of data are available at this time, however, the level of

information contained in the licence information does not reflect the data presently available to APA. Inclusion of available data would facilitate identification of areas re-
[F.74] quiring more study. Specific studies could then be designed to collect information needed to made decisions regarding project impacts and preliminary consideration could be given to possible mitigation considerations. Review of all available data may have also helped with the resolution of the outstanding issues identified earlier. Presently, the documents do not contain sufficient resource data on which to determine project feasibility. Comments regarding additional specific information needed to help determine the project's feasibility are enclosed.

cm/1072

COMMENT F.1 (cont.):

"If you disagree with this decision, and you wish to consult informally about its terms, please contact this office as soon as possible pursuant to 15 CFR 930.124. If informal discussions do not resolve your concerns, you may appeal this decision to the U.S. Secretary of Commerce in Washington, D.C., as provided in 15 CFR 930.125, Subpart H. Grounds for this appeal are limited to:

1. a claim that the proposal, while inconsistent with the Alaska Coastal Management Program, is consistent with the objectives or purposes of the Federal Coastal Zone Management Act, 15 U.S.C. 1451-1462, 15 CFR 930.121; or

2. a claim that the proposal is necessary in the interest of national security, 15 CFR 930.122.

"Your appeal to the Secretary of Commerce must be filed within 30 days of your receipt of this letter. Please contact this office if you need further information about these procedures."

RESPONSE:

The Alaska Power Authority recognizes the view that outstanding issues and major areas of concern exist. Toward the goal of addressing issues and concerns, the Power Authority is proceeding with an ambitious settlement program. This program seeks to work cooperatively with state, federal and local government as well as intervenors to develop the project in a manner consistent with the standards and guidelines of the Alaska Coastal Management Program.

COMMENT F.2:

"MAJOR ISSUES

"1. A major concern remains the flow regime for the proposed project. The range of possible project flows is not adequate, nor does the information provide for analysis of potential impacts of various flow schedules. We understand that data collection and modeling efforts are still underway, however, with settlement negotiations on flow due to begin shortly, additional information is essential. Flow scenarios should reflect concerns with impacts to fisheries, habitat, wildlife, water quality, navigation and transportation. The selected flow schedule will undoubtedly affect the project's economics."

RESPONSE TO COMMENT F.2:

The possible project flows in the FERC License Application range from natural flows to those that optimize project economics. Within this range, there are major considerations of flows that will maintain the existing productivity of the system, including flow objectives for fisheries, wildlife, navigation and transportation. A primary fishery concern was the provision of flows for fish between Devil Canyon and Talkeetna that:

- Allow adult salmon access to tributary spawning areas;
- Allow adult salmon access to slough spawning habitat;
- Maintain a suitable water depth on the spawning beds throughout the spawning period;
- Maintain flow through the spawning gravels during the incubation and pre-emergence period; and
- Provide a flow-related stimulus to stimulate the out-migration of fry.

Additional fisheries concerns related to instream flow objectives of resident and juvenile anadromous fishes included the objectives to:

- Maintain overwintering and summer feeding habitat; and
- Maintain access to tributary spawning and rearing habitat.

Additional information on flow regimes was added to the License Application on July 29, 1983 in response to a FERC request.

Detailed ongoing studies are designed to further refine and quantify the potential impacts of various flow regimes. Results of these studies will be made available to the resource agencies upon completion. Major studies that have been completed since the submittal of the License Application are reports by the Alaska Department of Fish and Game (1983), and the Arctic Environmental Information and Data Center (1983). The next major series of results will be presented in reports starting in late winter to late summer, in a report by the Power Authority that will detail

RESPONSE TO COMMENT F.2 (cont.):

the quantification of impacts of various flow regimes. Results of these studies will be made available prior to flow negotiations.

REFERENCES

Alaska Department of Fish and Game, Susitna Hydro Aquatic Studies Phase II Report (1983), previously submitted to the FERC on October 31, 1983.

AEIDC, Susitna Hydroelectric Project Draft Aquatic Impact Assessment: Effects of Project-Related Changes in Temperature, Turbidity, and Stream Discharge on Upper Susitna Salmon Resources During June Through September (1983), previously submitted to the FERC on October 31, 1983.

COMMENT F.3:

"MAJOR ISSUES

"2. Instream flow is another major concern. The Department of Natural Resources has recently promulgated regulations governing instream flow rights generally for: fish and wildlife; recreation; navigation; and, water quality. The APA has submitted applications for water appropriation permits as required, but the information accompanying the application is not sufficient for processing the permits. Since the application for instream flow reservations are anticipated from other organizations and agencies, instream flow should be a major concern of APA. Instream flows necessary to maintain fisheries resources downstream from the proposed impoundments must be identified. Operational flow scenarios should be developed that consider the requirements of fisheries as well as the economics of power generation and anticipated project demand."

RESPONSE:

The Power Authority does have a major concern for the relationships between instream flow and fisheries resources on the Susitna River that could potentially be impacted by the proposed project. As a result, a variety of flow scenarios that consider fisheries resources and power generation economics have already been analyzed and were presented in the License Application (Exhibit E, Chapter 2,

RESPONSE TO COMMENT F.3 (cont.):

Sections 3.1 through 3.8) and, the Power Authority anticipates, will be described in the DEIS and FEIS.

Ongoing environmental studies are continuing to further refine these analyses. The results of these studies, to date, are presented in reports by the Alaska Department of Fish and Game (1983) and the Arctic Environmental Information and Data Center (1983). A further refinement and quantification of impacts will be available in another report scheduled for completion in summer 1984. Please also refer to Responses to Comments F.2 and B.35.

REFERENCES

Alaska Department of Fish and Game, Susitna Hydro Aquatic Studies Phase II Report (1983), previously submitted to the FERC on October 31, 1983.

AEIDC, Susitna Hydroelectric Project Draft Aquatic Impact Assessment: Effects of Project-Related Changes in Temperature, Turbidity, and Stream Discharge on Upper Susitna Salmon Resources During June Through September (1983), previously submitted to the FERC on October 31, 1983.

COMMENT F.4:

"MAJOR ISSUES

"3. Land tenure in the Susitna must be addressed including, access planning and permitting with acceptable stipulations on construction and use. Land classifications, materials sites and disposals (including timber, gravel, etc.) and planning for recreation, settlement and other activities are also necessary. Other concerns are the transmission line routing, location and design of construction facilities and cultural resource protection."

RESPONSE:

With respect to land tenure in the project area and project requirements for lands and materials, the Power Authority has done the following:

RESPONSE TO COMMENT F.4 (cont.):

1. Identified ostensible owners and encumbrances.

2. Conducted systematic cultural resources surveys.

3. Identified state, federal and local permits required for project development, construction and operation.

4. Extensively investigated access and transmission routing.

5. Located material sites on the basis of surficial geology and conducted varying degrees of subsurface investigations.

It must be kept in mind that the project has not yet entered the detailed design phase. In that phase, specific location of project features and support facilities will be finalized as will material site development plans. However, general permitting may continue, including development of appropriate permit conditions and mitigation plans.

Also, please see Response to Comment A.17 concerning the Susitna Area Plan, the comprehensive area plan covering the project area and addressing the factors mentioned in this Comment.

COMMENT F.5:

"MAJOR ISSUES

"4. A more comprehensive assessment of downstream fish and wildlife resources of the Susitna River and the impacts to those resources and uses is necessary. Information on downstream impacts, water temperature, ice formation, sediment loading and fisheries should be provided. Requisite data for decisions on monthly flow requirements and minimum downstream flow requirements are not available at this time. The continuity between the water temperature and ice formation models is also a concern. Winter conditions habitats, tributaries, sloughs, and side channels of the lower river need attention. Possible use of spring flooding in mitigation planning should be considered."

RESPONSE:

The Power Authority anticipates that the DEIS will reasonably describe downstream impacts, alternatives and mitigation. The Power Authority also anticipates that the DEIS will incorporate results of prior relevant investigations (see Responses to Comments B.7 and B.8).

COMMENT F.6:

"MAJOR ISSUES

"5. The identification of the full range of important impacts to wildlife and the establishment of mechanisms for approaching mitigation of those impacts, must be achieved. This should include better definition of anticipated impacts to fish and wildlife populations and their habitats, a process for agreeing on the magnitude of impacts, and the assessment of habitat enhancement techniques to be used in determining the replacement habitats required to offset impacts."

RESPONSE:

The Power Authority anticipates that the full range of Project impacts and mitigation will be reasonably analyzed in the DEIS and FEIS.

Regarding the decision-making process, an iterative process has been developed for fisheries resources:

RESPONSE TO COMMENT F.6 (cont.):

(a) An aquatic modeling effort has been undertaken. This model (really an aggregation of models) will be used to relate different Project operation scenarios to changes in sediment transport, stage, discharge, water temperature and ice formation. These outputs in turn can be related to changes in fisheries habitat.

(b) To reach an acceptable flow regime, water resource managers, fisheries managers, and interested fishing and recreation organizations will participate in workshops where investigation of alternative flow regimes will be presented. These alternative regimes will be tested against project economics.

This iterative modeling-testing effort will include a number of workshops in which the participants will become familiar with the modeling technique and develop reasonable expectations of its capabilities. We envision that after a reasonable, intensive effort, the process will have established a fairly narrow envelope of flows from which the final flow regime will have to be negotiated. This modeling effort is described in more detail in Responses to Comments B.6, B.7, B.8, B.9 and C.37 as well as responses to other comments.

Wildlife issues will be addressed in a similar manner. Predictive models have been developed for some of the species in the Project area. With these models, and working with the settlement participants, the Power Authority will refine the impact assessment and investigate alternative scenarios to achieve an acceptable level of mitigation.

The moose model, for example, is both a habitat and population based model. The significance of this model is that it may be used to estimate the amount of habitat replacement lands or the level of habitat enhancement required to mitigate loss of moose habitat in the Project area.

For species where models cannot be developed, mitigation will have to be based on other criteria (such as quantification of impact based on population), but the process will still include interaction between settlement participants to reach common understandings on impact assessment and mitigation.

COMMENT F.7:

"MAJOR ISSUES

"6. The impacts to fish and wildlife resources caused by access to the project area must be more fully evaluated. This includes the effects of access to the project area for project construction and operation as well as the increases in accessibility to surrounding lands to the general public."

RESPONSE:

Nine technical studies or reports have been prepared on the project access issue. Summaries of these reports are set out below. All of the reports identify three major corridor options--from the Denali Highway, from the Parks Highway on the north bank and from the Parks Highway on the south bank. Within these three corridors, more than 30 detailed alignments have been analyzed. The last two reports listed below (i.e., Studies 8 and 9) incorporate most of the analyses from the reports that preceded them, and included comments from agencies and adjacent land owners.

These documents provide a sufficient basis for decision-making on access routes though they do not identify a universally acceptable route. Please also refer to the Responses to Comments A.3 and A.6.

<u>Study 1 - 1975 - Corps of Engineers</u>

Proposed route departing Parks Highway near Hurricane, thence Indian River to crossing of Susitna near Gold Creek, up South Bank of Susitna to Devil Canyon, thence by South Bank to Watana.

<u>Study 2 - February 1981 - R&M Consultants for Acres American</u>
"Preliminary Report," Access Plan

Establishes design criteria. Identifies three principal corridors:

1. South Bank Susitna from west;

2. North Bank Susitna from west;

3. Watana to Denali Highway.

RESPONSE TO COMMENT F.7 (cont.):

Two primary modes:

1. Highway/truck;

2. Railroad.

Thirty-three (33) alternatives were identified and given preliminary analysis and three were examined in detail with respect to design criteria, length, construction and operating costs. Modest environmental assessment was included. No consideration of land use implications was made.

Recommends--Highway from Denali to Watana, Watana to Devil Canyon on South Bank, and a rail spur from Devil Canyon to Gold Creek.

<u>Study 3 - September 1981 - Acres American</u>
Draft Summary of Environmental Report: Access Road

Brought into the process consideration of habitats and wildlife impacted and the general question of improved access into a remote area. Identified potential for socioeconomic impacts.

Concluded that access via Devil Canyon would have the fewest detrimental effects.

Included some public opinion surveys and feed-back from workshops. Examination of results of mail survey indicated preference for moderate access to area. Workshop did not provide clear signal because of the Fairbanks workshop preferring no access, and Anchorage preferring modest access.

<u>Study 4 - October 1981 - TES for Acres American</u>
Environmental, Socioeconomic, Land Use, Analysis of Alternative Access Plans for the Susitna Hydroelectric Project

Advances tabulation of environmental impacts--recommends rail only from Gold Creek as having least impact on remote ecosystems.

Does not identify the potential for impacts in Talkeetna.

RESPONSE TO COMMENT F.7 (cont.):

Study 5 - January 1982 - R&M Consultants for Acres American
Access Planning Study

Tabulation of design information, logistic requirements for projects, corridor analysis.

No recommended route.

Study 6 - March 1982 - Acres American
Access Roads, Close-out Report
Access Route Selection Report

Anticipates the Access Chapter (11) of the Feasibility Report.

Study 7 - March 1982 - Acres American
Feasibility Report
Susitna Hydroelectric Project
Volume 1, Engineering and Economic Aspects,
Section 11, Selection of Access Plan

The most complete assessment to date.

Recommendation includes prelicensing construction of Pioneer Road. The recommendation was deemed inappropriate.

Recommends highway from Hurricance down Indian River to bridge across Susitna River to Gold Creek, Railhead at Gold Creek, South Bank to Devil Canyon, bridge to north side and road from Devil Canyon to Watana on north side.

Study 8 - August 1982 - Acres American
Access Plan Recommendation Report

Reassesses earlier reports, updates cost and schedule information, documents agency and native views.

Road from Denali Highway south to Watana, west on North Bank a few miles to a crossing of the Susitna River, thence South Bank to Devil Canyon. Rail extension from Devil Canyon west to Gold Creek.

RESPONSE TO COMMENT F.7 (cont.):

Study 9 - April 1983 - Acres American
Supplement to the Feasibility Report. Chapter 4, Access Plan

Incorporates analysis of August 1982, Access Report and documents the selection of a different route by the Board of Directors.

Road from Denali Highway south to Watana, thence west on the North Bank to Devil Canyon, bridge crossing the Susitna River and a rail spur, thence to Gold Creek.

These latter two studies provide summaries and analysis of the seven preceeding studies.

REFERENCES

Acres American, Inc., Access Plan Recommendation Report (August 1982).

Acres American, Inc., Supplement to the Feasibility Report (April 1983).

COMMENT F.8:

"MAJOR ISSUES

"7. Socioeconomic impacts on commercial, recreational and subsistence use of affected resources and supporting industries require further assessment. This should include the identification of resources used; the quantification of use levels; the description of use patterns, including seasonality and its context within local communities; and, descriptions of geographic areas of use."

RESPONSE:

The Power Authority anticipates that the DEIS will reasonably assess all socioeconomic impacts of the Project.

Meanwhile, the Power Authority continues to refine information about the Project's potential impacts on fish and wildlife resource users. Recently completed household and business surveys of Talkeetna, Trapper Creek and Cantwell residents will help supplement the information

RESPONSE TO COMMENT F.8 (cont.):

presented in the License Application. The household survey included questions on the number of persons in each household who hunt, fish and trap; where and how often they hunt, fish and trap; what species they hunt, fish and trap; and the importance of hunting, fishing and trapping for recreation, food, income and cultural pursuits. The business survey included questions on the percent of gross annual revenues attributable to hunting, fishing and trapping activities; what areas are important to those activities; and what species are hunted, fished and trapped as part of their business. The results of the surveys are being tabulated, and a general report will be available in January 1984. More specific analysis of the hunting, fishing and trapping-related questions will begin in mid-January.

REFERENCES

Alaska Power Authority, Household and Business Survey Results (in preparation).

COMMENT F.9:

"MAJOR ISSUES

"8. Mitigation planning must be further developed. This is a high priority issue. The impacts to fish and wildlife species must be better identified. The APA needs to show how impacts to fish and wildlife resources will be mitigated through project design or through compensatory measures. A comprehensive evaluation of impacts and applicable mitigation alternatives needs to be conducted to evaluate environmental costs, the feasibility of mitigation, or the tradeoffs of fish and wildlife resources and habitat that may be involved."

RESPONSE:

Refer to Responses to Comments F.44, F.45, F.46 and A.10(C).

Also, the Power Authority anticipates that the DEIS will address these matters pursuant to applicable guidelines under NEPA.

COMMENT F.10:

"FISHERIES

"1. Flow Regime

"Review of information regarding flows in the Susitna River after the project is in place indicates that data are insufficient to predict the effects of an altered flow regime in the river on fisheries. Therefore, we are not able at this time, to recommend instream flows that would reduce impacts to an acceptable level. Until sufficient data is available to recommend flow levels to protect fisheries, it is not possible to adequately assess project related impacts or formulate appropriate mitigation measures."

RESPONSE:

As more data become available, the Power Authority will continue to refine and quantify its assessment of fisheries effects caused by an altered flow. However, the Power Authority considers the fisheries assessment presented in the License Application valid even though studies are continuing. The Power Authority also maintains that the mitigation measures remain reasonably sufficient. Having the requisite information to recommend instream flows that would reduce impacts to a level considered acceptable by the Office of Management and Budget does not preclude an assessment of project-related impacts or the formulation of appropriate mitigation measures. See also Response to Comment B.7.

COMMENT F.11:

"FISHERIES

"1. Flow Regime

"The definition of an acceptable flow regime to protect fish and wildlife resources during project operation is one of the major issues of the Susitna Hydroelectric Project yet to be resolved. Resolution of this issue will form the basis for further mitigation planning for fishery impacts. To this extent, the Exhibit E should identify those habitats potentially affected by altered flows, the resources that utilize those habitats for any life stage, the mechanisms for potentially impacting those resources, and methods to sufficiently mitigate the impacts identified."

RESPONSE TO COMMENT F.11:

In FERC License Application Exhibit E, the Power Authority has attempted to identify those habitats potentially affected by altered flows. These include mainstem, side-slough, upland slough, side channel and tributary mouth habitats. The Power Authority has also identified the fish that utilize these habitats for any life stage and is quantifying the mechanisms by which the habitats may affect the fishery resources.

Methods to sufficiently mitigate the impacts are identified in the FERC License Application. Once the effects are identified, application of the various mitigation options will proceed through the more detailed planning and design process.

The Power Authority anticipates that the DEIS will reasonably evaluate alternative flow regimes and mitigation.

COMMENT F.12:

"FISHERIES

"1. <u>Flow Regime</u>

"Those aquatic habitats receiving the most attention in Exhibit E are sloughs and the mainstem downstream from Devil Canyon to Talkeetna. Other habitats within this reach that are of importance to fishery resources include tributaries, tributary mouths, upland sloughs and side channels. These habitats need to be evaluated in more detail so that impacts to fisheries in this reach can be more fully understood."

RESPONSE:

Since tributary habitats downstream from Devil Canyon will not be affected by the project other than access to these habitats, tributary habitats are not being evaluated. However, detailed evaluations of tributary mouth, upland slough and side channel habitats are being conducted. A discussion of these analyses is presented in the Responses to Comments B.8, B.9 and B.37.

COMMENT F.13:

"SPECIFIC INFORMATION NEEDS

"1. Flow Regime

"The Alaska Department of Fish and Game (DFG) has recommended a more thorough analysis of the fisheries and aquatic habitats downstream from Talkeetna. The impacts of the altered flows in this reach may be more significant than those upstream. Below its confluence with the Chulitna River, the Susitna River is broad and relatively shallow. Therefore, an altered flow regime may affect relatively more aquatic habitat downstream than upstream. We again recommend that additional emphasis be directed toward study of the resources and potential impacts downstream of the Talkeetna River."

RESPONSE:

The Power Authority anticipates that the DEIS will incorporate available information on this subject.

For a more complete description of the available information, see the Response to Comment B.8.

The Power Authority does not agree that an altered flow regime may affect relatively more aquatic habitat downstream than upstream. In the months of June, August and September, with-project flows in the upper portion of the Talkeetna to Cook Inlet reach are within the natural flow regime at least 90 percent of the time (see License Application Figures E.2.161 and E.2.209). During these same months, in the Devil Canyon to Talkeetna reach, with-project flows are almost always less than the natural regime in June and August. In September, with-project flows are similar to those of the natural regime (see License Application Figures E.2.160 and E.2.208). Therefore, because the with-project flows in the Talkeetna to Cook Inlet reach will be similar to the naturally occurring flows in the important fishery months of June, August and September, whereas upstream from Talkeetna, the with-project flows will generally be much less, impacts in the Devil Canyon to Talkeetna reach will be greater than in the Talkeetna to Cook Inlet reach. Please refer to Response to Comment F.16 for a more detailed discussion of anticipated flow changes. Please note that the Response to Comment F.19 compares water level changes filling in the reach upstream from Talkeetna with those in the reach downstream.

COMMENT F.14:

"FISHERIES

"2. General Resource Values

"Review of Chapters 2, 3 and 7 shows that there is no discussion of the fish and wildlife resources in the Susitna Basin that are potentially affected by the project and how these resources compare to those in the remainder of the State. This is important because an analysis of project options, impacts, and appropriate mitigatory measures should be viewed in part within the context of the value of resources that may be affected by any project option. An intensive land use planning effort for the Susitna area is currently being undertaken jointly by various State, Borough and Federal agencies. This study looks at the regional significance of fish and wildlife resources. As a part of the study, various alternatives for land use have been selected and presented at numerous public meetings. It appears that the alternative receiving the most support is the one that emphasizes fish and wildlife, recreation, and forest resources. Facts presented in the public information brochure for the Susitna Area Plan emphasized the importance of fish and wildlife in the Susitna basin. It is stated in the brochure that ". . . the Susitna Basin is the most important fish and wildlife production and harvest area in Alaska." This statement was based on the 1980 National Survey of Fishing, Hunting and Wildlife- Associated Recreation Report. This report revealed that more than 69,000 recreational fishermen and 19,000 hunters spent over 700,000 days in the area and spent an estimated $44 million for equipment and services including guide and taxidermy fees, merchandise and services. In addition, commercial fisherman received over $7 million from Susitna Basin fish, which generated over $32 million for processors and retailers."

RESPONSE:

A. The Alaska Power Authority has provided an assessment of project related impacts and proposed mitigation measures for the broad area of the project. If appropriate, the Power Authority anticipates that the DEIS will address such factors.

RESPONSE TO COMMENT F.14 (cont.):

Our understanding of Alaska Statute Title 16.05.020 is that it is the responsibility of the Commissioner of Fish and Game to use that information, combined with his knowledge of fish and wildlife resources and management regulations and policies, in order to make an assessment of the project, including its statewide significance.

B. Project development and mitigation will be developed in concert with the Susitna Area Plan, due out in draft form early in 1984. Technical discussions are in progress between the Alaska Department of Natural Resources and Mat/Su Borough, the authors of the Plan, the Alaska Department of Fish and Game and the Power Authority to coordinate project plans and the Susitna Area Plan (see Response to Comment A.17).

Extensive candidate mitigation lands have been identified that are compatible with the draft Susitna Area Plan.

COMMENT F.15:

"FISHERIES

"3. Recreational Fisheries

"To understand the potential impacts of the project on the recreational fishery that occurs downstream from Talkeetna, it is necessary to understand how these fisheries function.

"On the Susitna River from Talkeetna down to its confluence with the Yentna River there are nine tributaries flowing into the east side of the Susitna and one flowing in from the west that contain significant fish populations. Most of these streams support major salmon runs and jointly support up to 100,000 man-days of fishing effort each year. Access plays a major role in limiting growth of the recreational fisheries that occur on these streams. Much of the land adjacent to these streams is in private ownership and public land that is available is relatively undeveloped or inaccessible. Other than in the Talkeetna area there are no public boat launches that allows anglers access to the Susitna River. The State has recognized the problem and has spent over a million dollars to buy back lands at the mouths of Montana and Sheep Creeks. The State has also initiated a road construction project that will provide access directly to the Susitna River at the mouth of Willow Creek. This project is expected to exceed $5 million and result in a substantial increase in angler access to the Susitna River and Willow Creek."

RESPONSE:

The Power Authority is aware of the pressure placed on the sport fishing resources available in the Susitna River. At the present time, no major adverse effects are anticipated to the sport fishery. As a matter of Power Authority policy, a goal of the project is that there be no net loss to the fishery due to the project. The utilization of tributary fisheries along the Susitna River is limited not only because of limited availability of access to the tributary mouths, but also as part of the management plan for the fishery as implemented by the Alaska Department of Fish and Game (refer to Response to Comment F.17). Provision of additional access routes to the sport fishery could lead to impairment of the fishery which would not necessarily be a result of the proposed project. Studies are currently being developed to enlarge the data base and refine the analyses of the effects to the lower river due to

RESPONSE TO COMMENT F.15 (cont.):

the project (refer to Response to Comment B.8). Careful consideration of management policy of the ADF&G as well as the potential effects of the proposed project must be developed to assure causative factors leading to any observed reduction in the sport fishery are extremely well defined. If appropriate, measures to mitigate any adverse effects attributable to the project will be developed.

COMMENT F.16:

"FISHERIES

"3. Recreational Fisheries

"An important aspect of the recreational fisheries is that they are located primarily at confluences of tributaries to the Susitna River. Recreational activity in these confluence areas is directly related to the large number of salmon that are present at these sites. As all five salmon species migrate up the Susitna River they tend to congregate at the mouths of virtually all of the clear water tributaries flowing into the Susitna River. During the open water season the areas around the mouths of tributaries provide ideal resting or staging areas for all adult fish species as well as rearing areas for juvenile fish. The extent to which these areas are used is dependent on the depth of the water at the tributary mouths which in turn is sensitive to changes in mainstem flow. At high flows, the mainstem creates backwater areas at the tributary mouths, thus increasing water depth. At low mainstem flows, the backwater areas are eliminated, resulting in shallower water and increased flow velocities at the mouth. When these backwater areas are eliminated, their attractiveness to fish is significantly reduced and fish will be displaced to other areas more suitable. This could have significant effects on a recreational fishery since the fish may be displaced from a tributary mouth that is easily accessible to anglers to one that has very limited access. In the Susitna River, natural low water conditions which affect recreational fisheries do occasionally occur. When they do, it is primarily during May and June during the chinook salmon migration."

RESPONSE:

As mainstem flows and water levels decrease, the tributary mouth habitat will not disappear, but may be reduced in area to some extent, if the backwater area is the principal resting area for salmon. Often, the resting areas (the best fishing areas) are in the clear water plume. Therefore, there may be a displacement of the resting areas for adult salmon but these areas will certainly not be eliminated entirely and may in fact increase the accessibility of these areas by anglers. It is not anticipated that the tributary mouth habitat will be eliminated completely, forcing adult salmon to other areas.

As discussed in the Response to Comment F.19, the major sport fishing areas are found at the mouths of tributaries which are located in the upper portion of the Talkeetna to Cook Inlet reach of the Susitna River. The following discussion of the relationship between river discharge and the tributary mouth habitat therefore concentrates on these areas. It assumes that water surface elevation and discharge changes in the area downstream of Talkeetna are represented by the changes anticipated at the USGF gaging station at Sunshine.

During the project operation, flows in this reach on the average will be reduced by 10,000 cfs to 20,000 cfs during the months of June, July and August and by up to 10,000 cfs in September. The principal result of this reduction at the Sunshine station is that similar variations in flow will be observed through the summer months with the exception that the high discharge will be eliminated or drastically reduced which will change the frequency with which lower discharge levels are met or exceeded. This change in frequency is shown below in Table F.16.A which is extracted from the flow duration curves shown in the License Application at Figure E.2.161.

The reduced occurrence of high flows automatically will change the average flows for the summer months since the high flows will not be included in the calculations of the means. It is not expected that the reduction in the frequency of high flows will seriously adversely affect the tributary mouth habitats and associated sport fishing. This is because, under natural conditions, fishermen generally experience less success during periods of high flow. Under with-project operation conditions, appropriate conditions for fishing may in fact increase in the frequency of occurrence since high discharge, unfavorable conditions will not occur as frequently.

RESPONSE TO COMMENT F.16 (cont.):

TABLE F.16.A

COMPARISON OF NATURAL AND WITH PROJECT FLOWS IN THE UPPER PORTION OF THE TALKEETNA TO COOK INLET REACH

Percent of timeflow is within stated range

	Flow (cfs)	June Natural	June With Project	July Natural	July With Project	August Natural	August With Project
High	80,000	10	0	8	0	10	0
	79,000-80,000	10	5	17	0	15	0
Average	48,000-70,000	60	45	75	20	60	45
	40,000-48,000	15	30	0	50	15	35
Low	40,000-48000	5	20	0	30	0	15

	Flow (cfs)	September Natural	September With Project
High	50,000-60,000	10	0
	40,000-50,000	15	10
Average	30,000-40,000	35	30
	20,000-30,000	35	50
Low	20,000	5	10

*Based on monthly flow duration curves, Susitna River at Sunshine (Figure E.2.161).

COMMENT F.17:

"FISHERIES

"3. Recreational Fisheries

"Chinook salmon are the most highly prized sport fish in Alaska and as such they attract large numbers of anglers to the limited areas that are opened for fishing. The Susitna River chinook salmon is a limited resource that has been intensively managed and has a long history of allocation conflicts between various user groups. Sport fishing for chinook salmon is allowed on only five Susitna River tributaries in the Talkeetna to Cook Inlet reach. In addition the Yentna and Talkeetna River drainages are open to chinook salmon fishing. Three of these streams, Willow, Caswell and Montana Creeks, are east side tributaries that are open to chinook salmon fishing only on weekends while the other two, the Deshka River and Alexander Creek which flow in from the west side, are open to chinook salmon fishing seven days per week. The weekend-only fishing streams receive extremely heavy fishing pressure during the chinook salmon fishery. Since those areas that are opened for chinook salmon fishing are extremely limited, any physical changes in backwater areas on these streams which may reduce holding areas for chinooks could be particularly damaging to the recreational fishery."

RESPONSE:

The Power Authority agrees that chinook salmon are the most prized sportfish in Alaska and the Susitna drainage basin provides some chinook fishing opportunities. The management of the chinook populations in the Susitna River consists primarily of the limiting of the sport harvest throughout the drainage by limiting the number of streams which can be fished and limiting the time during which fishermen may harvest chinook. To determine these limitations, ADF&G has conducted surveys of the streams to obtain index counts of the escapement of chinook salmon to the tributaries. The results of these surveys conducted over several years are summarized in the FERC License Application, Tables E.3.6, E.3.7 and E.3.8.

The important aspect of the tributary mouth habitat for maintaining chinook salmon holding areas is the extent of the clear water plume which extends out into the Susitna mainstem. The extent of the clear water plume is defined as the area between the morphological mouth of the tributary

RESPONSE TO COMMENT F.17 (cont.):

and where clear tributary water mixes with the turbid mainstem water. The area of this plume is affected by mainstem discharge, tributary discharge, channel geometry and substrate. At higher tributary discharges, the plume extends further into and along the mainstem than at lower tributary discharges. In some circumstances, high mainstem discharges may reduce the area of the plume. This occurs when backwater from the mainstem reduces the tributary velocity, thereby limiting the distance the plume extends into the mainstem.

It is anticipated that, in general, under with-project flows, the extent of the clear water tributary plumes in the mainstem will not significantly decrease relative to natural conditions even though mainstem discharges will be lower during the summer months when sportfishing pressure is highest.

Based on this evaluation, the adverse effects, if any, to the chinook sportfishing should not be significant. It should be noted that under existing natural conditions, the clear water plumes from tributaries fluctuate extensively in relation to tributary and mainstem flows. As a result, there already exists a large variation in the potential recreation opportunities at these sites.

COMMENT F.18:

"FISHERIES

"3. <u>Recreational Fisheries</u>

"It is also important to note that salmon utilizing tributary confluence areas are not necessarily migrating into those tributaries. All five salmon species migrating to the upper Susitna, Chulitna, and Talkeetna Rivers enter, in varying degrees, the sport fisheries that occur at the confluence areas of the lower Susitna tributary streams. Any impact that occurs to salmon species that utilize the Susitna River in the Devil Canyon to Talkeetna has the potential to impact the recreational sport fishery which harvests those fish in downstream confluence areas."

RESPONSE TO COMMENT F.18:

We agree that salmon utilizing tributary confluence areas are not necessarily migrating into those tributaries. In fact, as indicated in the ADF&G 1982 Phase II Basic Data Reports, considerable milling and/or resting of the adult salmon does occur in these areas and as such enter the sport fisheries in the lower Susitna River. The existing sport fisheries at the confluence areas of the lower Susitna tributary streams are already extensively affected by numerous factors. Highly significant factors can include:

1. Sport, commercial and other fisheries in marine waters;

2. Marine survival;

3. Freshwater survival;

4. Predator/prey relationships;

5. Weather and stream flow conditions;

6. Opening and closing of sport fish seasons.

A typical example of one of these factors affecting sport fishing is that an extensive commercial fishery in Cook Inlet could decrease escapement to the Susitna and, in turn, extensively decrease the sport fishery. These factors will continue whether or not the proposed project is built and the success of the sport fisheries would be expected to fluctuate considerably in relation to changes in these factors.

The proposed mitigation plans in the FERC License Application are designed to maintain existing or similar habitat in the upper river areas that may potentially be impacted. As a result, the impacts due solely to the project are expected to be negated by these mitigation techniques.

REFERENCES

ADF&G, Susitna Hydro Aquatic Studies Phase II Report (1983), previously submitted to the FERC on October 31, 1983.

COMMENT F.19:

"FISHERIES

"3. Recreational Fisheries

"On Page E-3-105 it is stated that flow reductions under the proposed filling schedule may alter the physical characteristics of the tributary mouths in the upper portion of the Talkeetna to Cook Inlet reach. These are the areas where the major fisheries occur. It is further stated that during the open-water season, mainstem discharge reductions of 34 percent in June and 28 percent in July may reduce the areal extent of these backwaters. It was previously mentioned in the application that water depths in these areas will also be reduced. The Susitna River below Talkeetna is moderately to extensively braided, with the river channels wide and shallow. Therefore, this reach is more sensitive to flow reductions than deeper more incised channels, which occur further upstream. Reductions in discharge during and after filling of the reservoir could result in substantial changes in the habitat at tributary mouths which may seriously impact existing recreational fisheries. Since the tributaries flow into a variety of habitat types the impacts of reduced flows will vary."

RESPONSE:

The statements referred to in the FERC License Application regarding the reduction of mainstem discharge in the Talkeetna to Cook Inlet reach and the reduction of areal extent and depth of the backwater at the tributary mouths are correct. The Power Authority also agrees that the tributary mouths in the upper portion of the Talkeetna to Cook Inlet reach are the areas where the major fisheries occur. We do not agree that flow reduction during filling will have a greater impact on the Talkeetna to Cook Inlet reach.

Examination of filling flows indicates that the greatest change will occur during the second year of filling in the month of June.

At Sunshine, flow will decrease from a median natural flow of 63,500 cfs to a flow of 42,000 cfs. This 34 percent decrease in flow corresponds to a water level change of 1.9 feet at the Sunshine gage. Note that a flow of 42,000 cfs at Sunshine is within the natural variation of flow.

RESPONSE TO COMMENT F.19 (cont.):

Ten percent of the time, natural flows at Sunshine are less than 42,000 cfs during June.

The Power Authority acknowledges that the reduction in discharge during and after filling could result in changes in habitat at tributary mouths. The effect during project operation is discussed in the Responses to Comments F.16 and B.8.

COMMENT F.20:

"FISHERIES

"3. Recreational Fisheries

"There has been minimum effort, especially in tributaries, to quantify adult salmon escapement in the Susitna River below Talkeetna. It is very likely that adult salmon escapement in this portion of the Susitna River far exceeds those estimates available for the river above Talkeetna. This would mean that the reach below Talkeetna is especially important to rearing juveniles. Here again, there is very little quantitative information. Information is needed on juvenile rearing in the reach below Talkeetna. Large numbers of juvenile chinook salmon and adult resident species are migrating out of numerous east side Susitna tributaries in the reach below Talkeetna. They are dependent on overwintering habitat in the Susitna River. There are no quantitative data presented that indicate their abundance or which habitats they are dependent upon. There is almost certainly going to be an impact on juvenile fish rearing in this reach with post-project winter flows changing by over 200 percent. There are no data which show how winter habitat will change with the dramatic increase in flow."

RESPONSE:

The License Application indicates (page E-3-106, Section 2) that: "Because there will be no reduction in mainstem discharge during the ice covered season, winter conditions are expected to remain the same as pre-project conditions."

Studies to develop quantified information on adult escapement in the lower river have purposely received a relatively smaller effort than studies for the Talkeetna to Devil Canyon reach. The rationale for this is that the potential impacts to the lower river are expected to be much less significant than the upper river and any impacts that could reasonably be postulated, will be overshadowed by the extensive variation that occurs due to the natural conditions.

Adult salmon escapement studies on the lower river have focused on two areas. First, extensive effort has been placed on estimating numbers of fish escaping to the Yentna River (see License Application Figure E.3.8). (A similar effort was made at Susitna Station but due to sampling

RESPONSE TO COMMENT F.20 (cont.):

difficulties escapement counts could not be made.) Results from the Yentna studies have thus far shown that this tributary alone has more escapement (except for chums) than the upper river. Secondly, the Alaska Department of Fish and Game has performed both creel censuses (on most sport fish species) and spawning ground counts (primarily on adult chinook salmon) on most of the tributaries below Talkeetna (see Tables E.3.5, E.3.6, E.3.7 and E.3.8 in Chapter 3, Exhibit E of the License Application). Based on these studies, the majority of adult salmon escapement occurs in the tributaries of the lower river not in the lower river itself. In addition, the adult salmon escapement in the lower river tributaries exceeds the escapement above Talkeetna (License Application Figures E.3.8 and E.3.9).

It is unclear how the commentor determined that "large numbers of juvenile chinook and resident species are migrating out of numerous east side Susitna tributaries in the reach below Talkeetna" when just prior to that, it is stated that "there is very little quantitative information (on this reach)." The Power Authority would appreciate the reference that shows "large numbers." At present, it is assumed that these statements are based on studies by Riis and Friese (1978).

The Power Authority has funded and is continuing to fund studies that address potential impacts to the lower river. Studies by the Alaska Department of Fish and Game (1981) did show that chinook and coho juveniles were found in sampling sites in the lower river in the winter. Their study indicates that the majority of juvenile chinook salmon captured during winter between Cook Inlet and Devil Canyon occurred at slough and mainstem Susitna River sites and also suggests that the majority of juvenile coho salmon captured between Cook Inlet and Talkeetna during winter and summer occurred at tributary mouth sites. Therefore, it can be assumed that both species are present during the winter period. It can also be assumed that increased winter flows will result in a change in existing conditions. Although it is difficult to precisely assess exactly what this impact will mean (primarily because post-project winter conditons are not available for sampling, winter sampling has been potentially hazardous and difficult, and efforts thus far have been extensive but have shown relatively little in the way of results except that large numbers of overwintering salmon are difficult to locate), it presently seems most reasonable to assume that increased flow will either

RESPONSE TO COMMENT F.20 (cont.):

maintain or improve habitat for overwintering. The reasons for this are: (1) low flow periods are generally limiting to productivity because habitat is much reduced (e.g., Riis and Friese (1978) suggested that the reduction in population density of juvenile chinook salmon in Willow Creek can be attributed to extremely low water conditions encountered at that time, and further, that the reduced flow eliminated required rearing habitat and forced the juvenile salmonids into the mainstem Susitna River); (2) the flows predicted will not be in the range of high or flood flows that would potentially decrease or destroy habitat; and (3) the increased winter discharges should cause hydraulic barriers and backwater areas in tributaries (including sloughs) which would create more microhabitats for rearing fish.

For additional discussion on potential impacts on the lower river, see Response to Comment B.8.

REFERENCES

ADF&G, Susitna Hydro Aquatic Studies Juvenile Anadromous Fish Study Phase I Final Draft Report, (1981).

Riis, J. C. and N. V. Friese, Fisheries and Habitat Investigations of the Susitna River - A Preliminary Study of Potential Impacts of the Devils Canyon and Watana Hydroelectric Projects (1978).

COMMENT F.21:

"FISHERIES

"3. Recreational Fisheries

"Assumptions of current sport fishing effort made from the Alaska Department of Fish and Game Statewide Harvest Study (1981 data) appear to have been made by someone who is not familiar with factors affecting sport fishing effort and harvest trends (E-7-42/32 Indirect Impacts). Although the data indicate an apparent decline in the number of anglers residing in the upper Copper/Susitna Rivers, this is not indicative of a general decline in numbers of resident anglers. The 1,885 number in 1977 is directly related to

COMMENT F.21 (cont.):

the temporary increase in the Glennallen area population during construction of the pipeline. It would be correct to state that since 1978 the number of resident anglers has remained relatively unchanged in the upper Copper/Susitna River area (1982 figure is 1,254 anglers)."

RESPONSE:

Please refer to Responses provided for Comments F.15, F.17 and F.22.

COMMENT F.22:

"FISHERIES

"3. Recreational Fisheries

"Assumptions are also made that fishing effort is declining in the westside and eastside Susitna drainages when it is actually increasing. Instead of using angler's residence to show fishing trends in the westside and eastside Susitna drainages, as was used for the Copper/Susitna River area, the writer reverts to using angler days fished to attempt to document declining fishing trends on the Susitna River. If angler's residence was used for the west Cook Inlet-lower Susitna drainage it would be apparent that there was a steady increase in number of anglers from 1977 through 1979 and a rapid increase since 1979 (Appendix 7.C). The assumption, using angler days that fishing effort is declining in the westside and eastside Susitna drainages is primarily based on the 1981 harvest study data which show a dramatic decline in effort (Appendix 7.C).

"This assumption is incorrect because in 1981, natural phenomena may have affected angler participation in the recreational fishery and because there was an 11 percent increase in licensed angler's Statewide, 20 percent of which occurred in the west Cook Inlet-lower Susitna drainage. Furthermore, 1982 data are available and show a 34 percent additional increase in anglers in this drainage area, a record high. The narrative in the Department's 1981 Statewide Harvest Study indicated that 1981 was not a typical year and as such should not have been used to determine trends in effort and harvest. The following is an excerpt from the 1981 DFG study:

COMMENT F.22 (cont.):

In 1981 the number of angler-days fished statewide decreased from the previous year for the first time since the Sport Fish Survey was initiated. This decrease in effort took place primarily in fisheries serving the Juneau, Anchorage and Fairbanks areas. An unusual combination of coincidental circumstances, including inclement weather, high and muddy waters, and off-year or unexpected salmon run cycles occurred in conjunction with these fisheries in 1981. With the 11% or almost 25,000 angler increase in the angler population base in 1981, the largest annual increase since the Sport Fish Survey was initiated, normal conditions in 1982 would very likely produce record high fishing effort in Alaska's waters."

RESPONSE:

Documentation of fishing pressure on fishery resources is often quite difficult and results may depend considerably on the assumptions used in the analysis and the data base from which the conclusions are reached. For the evaluation presented in the FERC License Application it was assumed that the most direct estimate of fishermen use for discussion of trends would be an estimate of the angler-days expended on the system as provided by the ADF&G Statewide Harvest Study. The fact that a dramatic increase in number of fishing licenses issued in the Cook Inlet region does <u>not</u> correlate well with the reduced number of angler-days expanded is quite indicative of the difficulty in estimating 1) angler use based on number of licenses issued and 2) any trends of fishing pressure from year to year. A more likely correlation is that if escapement to the system is high, angler use will be high. However, this too must be moderated by the actual fishing conditions in the river which may change from year to year.

Based on the available information, the conclusion reached by the Power Authority was that a general decrease in fishing pressure along the east side tributaries was apparent during the period of records. Use of the numbers of registered fishermen as an indication of fishing pressure can lead to erroneous conclusions unless correlated with actual fisherman use of the resource.

REFERENCES

Mills, M.J., Alaska Statewide Sport Fish Harvest Studies - 1980 Data, ADF&G Federal Aid in Fish Restoration and Anadromous Fish Studies, Volume 22, F-9-13, SW-I (1981), previously submitted to the FERC on July 11, 1983.

COMMENT F.23:

"FISHERIES

"3. Recreational Fisheries

"Description of sport fishing in the Susitna River (E-3-15) omitted an analysis of chum salmon which contributes significantly to the sport fishery. The 1978 and 1981 Susitna harvest of chum salmon represented about 71 and 57 percent respectively of the total estimated harvest for southcentral Alaska. From 75 to 98 percent of the chums harvested in the Susitna River were harvested from the confluence areas of the eastside Susitna tributaries."

RESPONSE:

In the discussion of recreational fishing, only the contribution of a representative group of fish commonly recognized as sport fish to the south-central sport fishery was presented. Table F.23.A, below, is a more complete presentation of the information. The significant contribution of chum salmon from the clearwater systems downstream from Talkeetna to the total south-central sport harvest of chum salmon is apparent from this information and License Application Table E.3.6. Also, see Response to Comment B.37.

RESPONSE TO COMMENT F.23 (cont.):

Table F.23.A

Contribution of Susitna Basin Sport Fisheries to the South-central Alaska Recreational Harvest, 1978-1981[1]

	1978		1979		1980		1981	
Species	Susitna Catch	% of SCA	Susitna Catch	% of SCA	Susitna Catch	% of SCA	Susitna Catch	% of SCA
Chinook	2,843	10.8	6,910	20.3	7,389	30.6	7,576	21.1
Coho	15,072	22.2	12,893	15.7	16,499	12.9	9,391	9.8
Sockeye	845	0.7	1,586	2.0	1,304	1.2	1,283	1.7
Pink	55,418	38.6	12,516	19.8	56,621	36.8	8,660	13.5
Chum	15,667	66.0	4,072	50.1	4,759	55.0	4,207	53.9
Rainbow Trout	14,925	13.9	18,354	14.1	15,488	12.2	13,757	9.2
Dolly Varden	6,165	6.0	4,200	2.6	4,127	3.2	3,238	2.2
Lake Trout	3,435	31.5	3,099	22.3	2,876	18.3	4,399	28.4
Grayling	13,532	28.3	13,342	19.0	22,083	31.8	21,216	33.3
Burbot	3,263	40.3	3,171	60.9	7,203	62.2	5,666	59.4

FOOTNOTES

1 Mills, M. J., Alaska Statewide Sport Fish Harvest Studies, ADF&G Federal Aid in Fish Restoration, Volume 20, F-9-11, SW-I (1979).

Mills, M. J., Alaska Statewide Sport Fish Harvest Studies 1980, Alaska Department of Fish and Game, Federal Aid in Fish Restoration, Volume 21, F-9-12, SW-I, 65 pp. (1980).

Mills, M. J., Alaska Statewide Sport Fish Harvest Studies - 1980 Data, ADF&G Federal Aid in Fish Restoration and Anadromous Fish Studies, Volume 22, F-9-13, SW-I (1981).

Mills, M. J., Alaska Statewide Sport Fish Harvest Studies, ADF&G Federal Aid in Fish Restoration, Volume 23, F-9-14, SW-I (1982).

COMMENT F.24:

"FISHERIES

"4. Mitigation

"The mitigation plan for fisheries contained in Exhibit E requires further development. It does, however, provide the basis for further mitigation planning. This is expected to occur as additional resource information is collected and anticipated impacts are better quantified."

RESPONSE:

The Mitigation Plan, as presented in the FERC License Application, provides the basis for specific planning and will be further refined as information develops. Minimization of potential adverse effects will be accomplished to the extent possible through allocation of flow. The balancing of power generation/economic requirements and requirements to maintain existing aquatic resources will lead to the quantification of all adverse effects. Specific mitigation flows can then be developed for the Project. The results of this analysis will also provide specific data from which structural mitigation elements can be applied. An updated mitigation plan will be available by August of 1984. Please refer to Response to Comment B.9 for further detail.

COMMENT F.25:

"FISHERIES

"4. Mitigation

"A major issue with respect to fisheries is the establishment of an acceptable flow regime downstream from the impoundments. Resolution of this issue requires that the impacts to fisheries, habitat and the public use of the fisheries be better defined downstream and that alternative flow scenarios for fisheries be evaluated. Once this has been done and an acceptable flow regime agreed upon, then development of additional measures to mitigate impacts such as slough modifications not ameliorated by the flow regime can be evaluated."

RESPONSE:

The Power Authority has proposed an operating flow regime for the Susitna Project in Exhibit E of the License Application. The acceptability of that flow regime by the resource agencies has yet to be established since resource agencies have not made specific comments on the proposed flow regime. Studies to define the required instream flows for protecting aquatic resources have been conducted since 1981, were continued during 1983 and will continue during 1984. Results of these studies will be used to evaluate the proposed flow regime versus the other flow regimes presented in the License Application or those eventually recommended by agency personnel.

The process of negotiation of suitable flow regimes will begin early in 1984. Appropriate mitigation alternatives will be finalized to protect those fish resources not ameliorated by the flow regime established.

Please refer to Response to Comment B.7 for additional detail.

The Power Authority anticipates that the DEIS will evaluate all reasonable alternative flow regimes.

COMMENT F.26:

"FISHERIES

"4. Mitigation

"Concepts for mitigating those downstream impacts which are not offset by the flow regime are too general to be thoroughly evaluated, and the probabilities of success are not presented. Furthermore, there are no specific plans for types of mitigation, such as slough modification. Plans should be provided and should include engineering drawings, operational and maintenance plans and realistic costs. Without these, the evaluation of mitigation proposals cannot be carried out with any degree of confidence that adequate mitigation will actually occur, and that the mitigation actions themselves are in harmony with the overall development and conservation of resources in the area."

RESPONSE:

Since the effects of the flow regime presented in the FERC License Application and other flow regimes have yet to be finally quantified, specific details of what habitat modifications are to be implemented at what locations must be conceptual in nature. As discussed in the Response to Comment B.9, specific types of mitigation options have been defined and the feasibility of some of them has been demonstrated in Alaska. The lack of specificity in the plan is only to the level of what modifications are to be implemented to what habitats.

It is important to note here that while many comments the Power Authority received from the resource agencies indicate the need for further studies to quantify impacts, they also present many comments which request specific final mitigation plans. Mitigation planning is an ongoing process and cannot be finalized until agreement on the flow régime is achieved and quantification of any resulting adverse effects is accomplished.

At this time, the mitigation plan presented in the License Application is at a level commensurate with this stage in the licensing process. Final design of the overall mitigation program will proceed as the final design of the Project proceeds.

The Power Authority anticipates that the DEIS/FEIS will address a reasonable range of impacts and mitigation.

COMMENT F.27:

"FISHERIES

"4. Mitigation.

"Losses of resident species and habitats within the impoundments can only be mitigated through compensatory habitat replacement or enhancement elsewhere. Resolution of this issue must be accomplished jointly between the applicant and the resource agencies in the context of presently feasible propagation technology and the benefits to the resource and user groups of artificial stocking of waters in the project area. Therefore, it is not appropriate to make a decision on this tradeoff until a process for addressing the overall mitigation plan is implemented."

RESPONSE:

The stated mitigation objective of the Alaska Power Authority is no "net loss of in kind resources." Thus the Power Authority's first goal has been to maintain in kind resources at, or in proximity to, the project area. If this proves not to be technically feasible, or if alternative management plans are recommended by management agencies, then alternative mitigation options are available and have been discussed in the FERC Application. Mitigation plans will also be discussed in the DEIS.

COMMENT F.28:

"FISHERIES

"4. Mitigation

"The applicant should utilize a forum for addressing mitigation planning such as the recently established APA Board of Directors Resources Subcommittee. This subcommittee could identify conflicts and the mechanisms, information, and decisions needed to resolve those conflicts, thus improving mitigation planning."

RESPONSE:

The Power Authority, as part of its formal settlement process, proposes to conduct a number of fisheries mitigation workshops. These workshops will provide state

RESPONSE TO COMMENT F.28 (cont.):

and federal resource agencies, intervenors and local governments the opportunity to participate in interactive, iterative mitigation planning forums. Additionally, the Power Authority will (and must) be responsive to the direction provided by its Board of Directors. The Power Authority staff has already been working with the Resource Committee on conflict resolution, mitigation policy and planning.

COMMENT F.29:

"WILDLIFE

"The following review is limited to general comments on aspects of the license application that require major revision before the document can be considered to have adequately assessed wildlife resources and mitigation planning. While some examples are used, no attempt has been made to make a complete list of specific comments."

RESPONSE:

No response necessary.

COMMENT F.30:

"WILDLIFE

"1. Incompleteness

"Baseline descriptions of wildlife resources are based primarily on data collected before fall 1981, approximately 1.5 years after studies began. Data collected prior to 1980 derive mostly from peripheral areas and not from within the project area. Data available after fall 1981 are not presented in their entirety and occur only as isolated pieces of information, devoid of any structured approach. Subsequent reports by APA's contractors not included in Exhibit E but available to the APA, make many of the statements included in Exhibit E obsolete. For example, the estimated maximum number of moose wintering in the Watana impoundment zone is double that presented."

RESPONSE:

The draft Exhibit E in the FERC License Application was prepared in October 1982, prior to release of 1982 baseline studies from primary subcontractors such as the Alaska Department of Fish and Game (ADF&G) and the University of Alaska. Therefore, results from the winter, spring, and summer of 1982 were not available for review, except for findings based on personal communications with agency and university personnel. ADF&G baseline reports containing winter 1981-1982 and spring and summmer 1982 data were not available for review until April 1983, following submittal of the final FERC License Application in February 1983. The April 1983 reports were submitted to the FERC in May 1983 and are cited in the Response to Comment C.82.

Whenever possible, efforts were made to obtain unpublished data while reports were still in preparation. For example, Exhibit E (License Application page E-3-400) states that "A census of the Watana impoundment on March 25, 1982 (a time when most moose that used the impoundment area in that year would be found there) determined that 260 moose were present in the Watana impoundment area (ADF&G unpublished data)." Since that statement, the March 25, 1982 census analysis was further refined by the ADF&G and presented in the April 1983 Phase II progress report as 290 moose (Ballard, et al., 1983).

On March 28, 1983, an aerial census was made of the Watana impoundment area from the proposed damsite to the upper

RESPONSE TO COMMENT F.30 (cont.):

reaches of the high-pool level (elevation 2200 feet) between the mouths of the Oshetna and Tyone Rivers. The survey area included the impoundment zone below 2200 feet and an adjacent 0.25-mile-wide area bordering the high-water level. An estimate of the total number of moose in the census area was developed using a sightability correction factor calculated from a more intensive survey of a smaller area. The sightability correction factor was necessary to compensate for poor observational conditions (i.e., a paucity of fresh snow reduced background contrast and thus visibility of moose).

Analysis of the census data using the sightability correction factor produced an estimate of about 580 moose for the entire survey area, or six moose per square mile. This estimate was exactly double that presented in the ADF&G April 1983 Phase II progress report, and more than twice the number provided in Exhibit E.

On March 31, 1983, a census of the Devil Canyon impoundment area was attempted by ADF&G personnel, employing techniques similar to those used in the March 28, 1983 census. However, turbulence and poor sighting conditions prevented definitive observation and analysis.

ADF&G file reports of a preliminary nature are available (Schneider (1983), personal communication). These describe more fully the March 28, 1983 and March 31, 1983 surveys discussed above.

The Power Authority anticipates that the DEIS will summarize all available data and reasonably analyze it.

REFERENCES

Ballard, W.B., J.S. Whitman, N.G. Tankersley, L.D. Aumiller and P. Hessing, Susitna Hydroelectric Project Phase II Progress Report-Big Game Studies, Volume III, Moose-Upstream (1983), Alaska Department of Fish and Game, previously submitted to the FERC on May 31, 1983.

Whitman, J. S. and P. Hessing, Watana and Devil Canyon Impoundment Moose Census (March 1983).

RESPONSE TO COMMENT F.30 (cont.):

Schneider, K., Research Coordinator, South-Central Region, Alaska Department of Fish and Game, Division of Game, personal communication to Robert Sener, LGL Alaska Research Associates, Inc., (December 20, 1983).

COMMENT F.31:

"WILDLIFE

"1. Incompleteness.

"The list of potential impacts is incomplete. There appears to be a belated attempt to systematically list impacts in the tables. Many are omitted or not clearly identified in the text. This problem is greatly aggravated by the inconsistencies from one section to another."

RESPONSE:

An attempt has been made to systematically list and assess all potentially important impacts of the Susitna Hydroelectric Project on wildlife and botanical resources as conceived by project contractors and resource managers. This list is designed as a tracking and documentation system for the refinement of impact assessment and mitigation planning. A preliminary draft of this document (LGL Alaska, Inc., (1983)) is being developed and the Power Authority anticipates making it available when it is finalized. The list of impact mechanisms which will be contained therein is being assembled from Exhibit E of the February 1983 FERC License Application, including agency comments on the November 1982 draft application. Additional impact mechanisms raised as issues since the submittal of the application will also be documented and cited.

REFERENCES

LGL Alaska, Inc., Alaska Power Authority, Susitna Hydroelectric Project: Wildlife and Botanical Resources, Impact Assessment and Mitigation Planning Summary (1983), unpublished report to Harza-Ebasco Susitna Joint Venture, Anchorage, Alaska.

COMMENT F.32:

"WILDLIFE

"2. <u>Inadequate Treatment of Major Issues</u>.

"A number of major issues, such as habitat alteration below Talkeetna and secondary development, are dismissed with very little comment. It may be that these issues are complicated and cannot be precisely quantified. However, there is not even a reasonably qualitative discussion or attempt to put outer bounds on the magnitude of the issue."

RESPONSE:

This Comment consists of two parts: effects of habitat alteration below Talkeetna; and effects of the Project on secondary development. Please refer to the Response to Comment C.87 for a discussion regarding the effects of habitat alteration below Talkeetna.

Discussions of qualitative and quantitative impacts due to secondary development were not presented in the License Application because, as stated on page E-3-396, "The acceleration of secondary development on the basin is an indirect impact which can be neither predicted nor controlled by the Alaska Power Authority and is therefore excluded from this discussion."

The inherent difficulty in predicting secondary impacts can be visualized by examining the status of the Susitna Area Plan (see Response to Comment A.17). This state-sponsored, basin-wide land use plan has not yet been finalized and extensive differences exist among the alternatives under consideration. Since many of these developments (such as Beluga coalfields, agricultural land development and the Pt. McKenzie Bridge) would be decided upon outside of strictly economic tests, it is extremely difficult to predict the course of future developments. This unpredictability of future basin development makes prediction of secondary impacts due to the Susitna Project conjectural at best.

COMMENT F.33:

"WILDLIFE

"3. <u>Incomplete Consideration of Scenarios</u>.
"Because many issues have been only partially investigated, it is possible to construct a wide range of equally

COMMENT F.33 (cont.):

plausible scenarios with respect to impacts to populations of wildlife. Exhibit E generally presents a single scenario per issue. Rarely are these the worst case. On the contrary, they tend to be optimistic. Often they are stated in terms that would suggest to an uninformed reader that alternative scenarios do not exist. When a range of predictions can be supported by available information the full range, or at least the worst case, should be presented."

RESPONSE:

For most issues, neither an "optimistic" nor "worst-case" scenario was presented; rather, a realistic prediction of effects on wildlife was attempted. This is not to say that other plausible scenarios do not exist. However, the approaches discussed in Exhibit E are considered realistic in light of past development projects and information from wildlife and habitat studies in the published and unpublished literature. Because there are relatively few hydroelectric projects in Alaska, and none comparable in size to the proposed Susitna facilities, the preparers visited the Revelstoke and W. C. Bennett hydroelectric projects in British Columbia to observe firsthand from the air and ground the impacts of large, northern dams and impoundments during construction and operation, respectively.

In many cases, a conservative, worst-case position was intentionally presented. For example, the zone of impact was extended to 2,400 moose, based on the number of moose with home ranges that overlap a 5-mile zone surrounding the impoundment area. This undoubtedly overstates any decrease in moose carrying capacity. Likewise, a conservative approach in estimating artificially increased browse production (i.e., a three-fold increase as opposed to a realistic five- to ten-fold increase) was presented to ensure that sufficient numbers of moose will be provided for during mitigation planning.

Providing analysis for a broad range of impact scenarios would lead to a more cumbersome impact assessment with little increment in value for decision making. For many issues, the worst realistic case is attempted (i.e., a conservative approach) to aid in focusing mitigation planning on issues of primary importance to the wildlife

RESPONSE TO COMMENT F.33 (cont.):

resource. For the important impacts that can be minimized, a realistic assessment is necessary for mitigation planning to proceed.

COMMENT F.34:

"WILDLIFE

"4. Weighting of Impacts.

"While criteria for ranking impacts are presented, these criteria are not employed consistently. The same impact may be given different weight in different sections. Relatively minor impacts often receive more emphasis than potentialy major impacts."

RESPONSE:

This comment cannot be fully addressed because specific examples have not been provided. An effort was made to quantify impacts based on potential changes in the size and productivity of existing wildlife populations and the duration of the probable effects (e.g., permanent habitat loss versus temporary alterations). If reasonable approaches to impact assessment were not feasible because of insufficient data, worst-case scenarios were usually applied. For most impacts, however, a realistic scenario of effects was considered, based on current population data and management goals, and impacts were assessed accordingly.

The Alaska Power Authority has produced an impact assessment and mitigation planning summary document to be updated periodically as predictive assessments are further developed and mitigation plans are refined (see Response to Comment F.31). This summary document is being submitted to the FERC, and successive revisions will also be provided.

COMMENT F.35:

"WILDLIFE

"4. Weighting of Impacts.

"Rarely is any quantification presented to support ranking of impacts. Often, a supporting qualitative rationale is not even provided. For example, ranking the killing of nuisance brown bears ahead of spring habitat loss in terms of significance of impact is a completely subjective judgment not likely to stand scrutiny. The lumping of classes of impacts causes confusion and disallows a examination of actual effects and their relative values. Temporary habitat loss is lumped with permanent habitat alteration. This problem reflects a failure to clearly evaluate how an impact is likely to influence a population of animals, and frustrates any attempt to address different effects and to put some outer bounds on the magnitude of the impacts. For example, habitat loss from increased off-road vehicle use receives equal or greater attention than other forms of loss and alteration near the impoundment. Questions that need to be answered are: Is the acreage lost significant? How much similar habitat has been lost in nearby accessible areas? Within the acreages affected, what vegetation types are most susceptible? What species of wildlife use these vegetation types? Is the population likely to be limited by the availability of these types? By answering similar questions for the various types of project related alterations to lands and waters, the potential scope of a problem can be determined even when precise quantification is impossible. At the very least, impacts can be more realistically weighted so that the need for further study or specific mitigation measures can be assessed."

RESPONSE:

In the absence of specific agency guidelines on impact prioritization, the preparers used their own professional judgment in ranking impacts. Further impact analysis and mitigation planning are proceeding in close cooperation with the Alaska Department of Fish and Game. Attention is being given to the appropriate ranking of impacts and the prioritization of mitigation techniques. The Power Authority anticipates that the DEIS will provide an independent check of the Power Authority analyses.

RESPONSE TO COMMENT F.35 (cont.):

As stated in the Comment, ranking the destruction of nuisance brown bears ahead of spring habitat loss is a subjective assessment. Destruction of nuisance bears was an important impact during construction and operation of the Trans-Alaska Pipeline (Follman, et al., 1980) and some mortality should be expected on the present project, particularly during construction phases. Loss of spring foraging habitat due to the impoundments is also likely to impact brown bears, but again, for lack of predictive abilities concerning future project effects on brown bear populations, it becomes purely a subjective decision as to how impacts should be prioritized. As mentioned above, impact prioritization will undergo refinement with the continued involvement of resource agencies.

To organize impacts of the Susitna Hydroelectric Project on wildlife resources, combinations of similar impact mechanisms were used on occasion, resulting in the "lumping of classes of impacts" referred to by the commentor.

Many of the suggested questions that need to be answered to refine impact assessments were considered during the impact prioritization process. However, some of the suggested questions necessitate subjective answers or "best guess" responses due to the nature of the question (e.g., "significance of habitat loss") or the state of knowledge concerning wildlife and habitat relationships (e.g., "are populations limited by certain habitat types?"). Impact assessment and weighting will be refined as the project development continues (please refer also to Response to Comment F.31) and as specific guidance is provided by resource agencies with respect to their management criteria and practices.

REFERENCES

Follmann, E. H., R. A. Dietrick and J. L. Hechtel, Recommended Carnivore Control Program for the Northwest Alaskan Gas Pipeline Project, Including a Review of Human-Carnivore Encounter Problems and Animal Deterrent Methodology (1980), Final Report for Northwest Alaskan Pipeline Co.

COMMENT F.36:

"WILDLIFE

"5. <u>Misinterpretations</u>

"In many instances, information from sources independent of APA funded studies is used improperly. In some cases, such as the relationship between water and mineral licks and the movement patterns of moose in portions of interior Alaska, statements cited have no relevance to the Susitna area. In other cases, such as the reference to the dispersal of moose as observed in two studies to the south of the project area, certain conclusions are drawn even though the studies were not designed in a manner that would test the hypothesis against which the conclusion is made. Isolated papers are cited when other more appropriate literature is not used."

RESPONSE:

Without more specific information, this comment cannot be addressed. Information on the relationship between water and mineral licks was included because erosion of the lick and inundation of portions of its surface may affect its value to ungulates (License Application page E-3-419). If improper interpretations of the information provided were made, these should be specifically identified so corrective measures can be made prior to EIS completion. In a similar fashion, information on the movements of moose in other portions of interior Alaska (pages E-3-297 through E-3-299; pages E-3-409 through E-3-410) was provided for comparative purposes. The most pertinent available information was used. If these data are not viewed as relevant to the Susitna River basin, these discrepancies should be specifically noted and reasons provided.

COMMENT F.37:

"<u>WILDLIFE</u>

"5. <u>Misinterpretations</u>.

"Other statements demonstrate a poor understanding of the current state of knowledge of certain areas of wildlife biology. For example, mortality of moose during a moderate winter is implied to be a rarely observed event."

RESPONSE TO COMMENT F.37:

FERC License Application Exhibit E was prepared by a team of professional wildlife biologists who researched and prepared portions of the application closest to their own fields of specialization. Wherever appropriate, current scientific reports dealing with aspects of wildlife and their habitats were cited within the text.

The comment regarding misunderstandings related to winter mortality of moose is difficult to address because no specific page or phrase within the application is referenced. The third full paragraph on License Application page E-3-316 and its continuation on page E-3-317 discuss the relationship of winter severity and moose survival as referenced from ADF&G research reports. As stated, correlations of snow depths with moose population health indices (i.e., cow/calf ratios) are statistically significant. If the text in another location can be interpreted to suggest that little moose mortality occurs during moderate winters, re-reading of the paragraph referenced above should help clarify understanding of the impact. That is, the extent of winter severity "is likely an important factor in determining [moose] productivity and survival." Some moose mortality can be expected during moderate winters, less during mild winters, and more during severe winters.

COMMENT F.38:

"WILDLIFE

5. Misinterpretations

The history of management actions and objectives in the project area is sometimes completely misunderstood. For example, Game Management 13 is not a trophy moose area and bear populations have not historically been managed to benefit moose populations.

RESPONSE:

The License Application includes two inaccurate statements regarding wildlife management objectives in the project area. In Section 4.4.1(b)(i) it states that "GMU 13 is a trophy management area for moose (only bull moose with racks 36" across may be taken), a strategy designed to protect the resource in an area with poor recruitment." Although the size restriction and latter part of this statement are

RESPONSE TO COMMENT F.38 (cont.):

correct, GMU 13 is not specifically a trophy management area.

The statement on License Application page E-3-502 that brown bear have historically been sacrificed to the benefit of ungulate species more desirable to subsistence users is also inaccurate. To our knowledge, this has never been a practice employed or approved by resource management agencies in Alaska. However, experimental reduction of bear populations has been conducted to examine its effects on moose populations in Alaska (Miller and Ballard, 1982).

REFERENCES

Miller, S. B. and W. B. Ballard (1982) Homing of Transplanted Alaskan Bears, Journal of Wildlife Management Volume 46, No. 4, pages 869 - 876.

COMMENT F.39:

"WILDLIFE

"6. Inadequate Consideration of Alternatives

"Alternative design features and the analysis of impacts to fish and wildlife resources associated with alternative designs are usually not considered. When they are, they are often presented in a manner that places most emphasis on the basis of cost or engineering considerations. For example, there is no incremental analysis of the impacts to resources of different dam heights, even though the APA has considered different dam heights. Methods of transmission line construction and maintenance described in the draft Exhibit E have been deleted. The justification presented does not allow an objective and independent analysis of the alternatives."

RESPONSE:

The Power Authority anticipates that the DEIS will evaluate reasonable alternatives and that such evaluation will incorporate prior discussions of alternatives.

RESPONSE TO COMMENT F.39 (cont.):

Sections 2 and 3 of the FERC License Application Exhibit E Chapter 10 (pages E-10-31 to E-10-113) present extensive discussions on alternative design features and of the environmental constraints that ultimately resulted in the final project design as presented in the FERC License Application. These discussions cover:

1. Watana Facility Design;

2. Devil Canyon Facility Design;

3. Access;

4. Transmission;

5. Borrow Sites; and

6. Project Operation

In addition, both alternative dam locations and alternative dam heights have been considered for hydroelectric development of the Middle Basin of the Susitna River. Environmental comparisons of the High Devil Canyon plus Vee Canyon developments as opposed to the Devil Canyon plus Watana developments are presented in the License Application on pages E-10-26 through 29 and Table E.10.19. The conclusion is that the Watana Devil Canyon alternative is judged to be best for moose, caribou and furbearers and the High Devil Canyon/Vee Project is best for birds and bears. Overall, the Watana/Devil Canyon plan was judged to be superior. The differences were basically in the increased inundation of the highly productive lowland wildlife habitat at the upper end of the proposed Vee reservoir, which would not be impacted by the Watana development at its reservoir elevation of 2185 feet.

In response to the last two sentences of this Comment regarding transmission line construction and maintenance, the following responses are offered. Section 3.4(d)(i) (page E-3-193) of the draft Exhibit E (November 15, 1982) states that "All transmission-related construction between Watana and the Intertie junction at Gold Creek will occur during winter months when an adequate snow pack exists to support ground equipment and vehicles. Only flat-tread Nodwell-type or balloon-tired Rolligon-type vehicles will be used. Where winter access is not feasible or snow-free conditions are required, helicopter-supported construction

RESPONSE TO COMMENT F.39 (cont.):

will be used." This section also states that "winter construction procedures will be followed for transmission line additions routed through previously undisturbed areas. Where winter access is not feasible or snow-free conditions are required, helicopter-supported construction will be used."

In Section 3.4.2 (Option Analysis) of the Botanical Resources Mitigation Plan presented in Exhibit E of the License Application (February 1983), the following statement is made:

> "The Power Authority intends that ground access be used for construction and maintenance of the transmission corridors. The use of helicopters for these purposes has been carefully considered, because it is recognized that this option would reduce requirements for access-related clearing of vegetation and thus serve a significant mitigation function. However, the limitations of helicopter use include high cost, limited load-carrying capacity, weather-related restrictions, daylight use only (particularly during winter months), and unacceptable safety risks in the vicinity of high-voltage lines and guyed towers.

As shown by the preceding paragraphs, winter procedures and helicopter support were initially proposed for building and maintaining the transmission corridors. However, further consideration of construction and maintenance requirements demonstrated that year-round, ground-supported procedures would be safer.

Although the original approach was superseded by the procedures outlined in the final draft of the License Application, the reasons for this change were clearly stated in the Botanical Resources Mitigation Option Analysis quoted above. The commentor does not explain why the justification presented, based on cost and limited load safety risks, does not allow "an objective and independent analysis of the alternatives."

As noted in the FERC License Application, the decision to rely on year-round ground access for construction and maintenance of the transmission corridors will require some additional clearing of trees and brush for equipment access to rights-of-way along access trails from the nearest points on existing roads (License Application page E-3-272).

RESPONSE TO COMMENT F.39 (cont.):

However, Exhibit E does state that "Construction and maintenance contractors will be required to prepare access plans acceptable to the Power Authority and controlling agencies or landowners. Minimizing requirements for clearing of vegetation will be an important criterion for the evaluation and approval of these plans" (License Application pages E-3-271 and E-3-272). Exhibit E further states that Power Authority stipulations will require that "construction trails be established only after thorough onsite assessment of alternative routes and procedures to ensure minimal environmental disturbance, including avoidance wherever feasible of dense vegetation, stream crossings, wetland and floodplain areas (identified with the concurrence of the COE and USFWS), and extensive switchbacks on steep, erosion-prone terrain" (page E-3-272).

Hence, although the decision to favor ground access over the winter construction/helicopter support option was made with personnel safety and cost-effectiveness as foremost considerations, environmental concerns have been included and mitigative measures are discussed at some length in the FERC License Application Section 3.4.2 of Exhibit E (pages E-3-270 through E-3-274). The Alaska Power Authority affirms that the supporting rationale for this decision is objectively presented in the License Application and does allow independent analysis.

COMMENT F.40:

"WILDLIFE

"6. Inadequate Consideration of Alternatives

"The mitigation plan is deficient in a discussion of consequences and does not consider a range of avoidance and minimization options. For example, the routing of the Denali access route was only adjusted slightly to minimize impacts on caribou. No range of alternatives to that alignment are presented. Only a "no project" option is presented, and the consequences of such an option are given only as the avoidance of this impact. Alternative access routes to the Alaska Railroad and Parks Highway are feasible, would greatly reduce the impact, and should be displayed."

RESPONSE:

An extensive analysis of access routing has been completed. Over 30 corridors were considered and nine reports have been prepared (see Responses to Comments A.3, A.6 and F.7). Within the design and selection criteria, all practical routes were considered, and the selected route represents an effort to meet project objectives and balance other land management objectives.

The Power Authority anticipates that the DEIS will reasonably analyze impacts and mitigation regarding access.

COMMENT F.41:

"WILDLIFE

"7. Failure to Consider the Dynamic Nature of Population, Habitat and Management Goals

"Impacts are usually stated in terms of the current populations, current habitat conditions and current management goals. In some cases, they focus only on the fate of currently living individuals rather than populations. This approach may be adequate for short-term impacts. It is not adequate when the duration of an impact is likely to span a period during which populations, habitats or management goals or regulations may change significantly. Management regulations may change every two or three years, populations can certainly change

COMMENT F.41 (cont.):

significantly over a decade and well within the life of many of the impacts of the project."

RESPONSE:

The impact assessments included in FERC License Application Exhibit E, Chapter 4, are intended to reflect the most likely response of wildlife populations to various project actions. To the extent possible, the Power Authority has tried to develop a habitat-based mitigation program as contrasted to a population-based program. See U.S. Fish & Wildlife Service "Notice on Mitigation Policy, Federal Register Vol. 46, No. 15, January 23, 1981, page 7644, for the basis of this strategy. Population studies have provided back up or alternative studies. Current population levels and management policies provide a realistic basis for predicting future scenarios, and they are therefore used in most of the assessments. In instances where it is reasonable to do so, the application makes predictions based on future population sizes and/or habitat conditions [for example, see Section 4.3.3(b)]. The Alaska Power Authority has no means of predicting non-project-related changes in management policy or habitat conditions (e.g., because of fires, floods, or additional public or private developments) throughout the life of the Project, and scenarios based on speculated future conditions have been avoided.

Please also refer to the Response to Comment F.42 discussing the current effort to quantify certain impacts through the use of computer simulation models.

COMMENT F.42:

"WILDLIFE

"7. <u>Failure to Consider the Dynamic Nature of Population, Habitat and Management Goals</u>

"Changes brought about by the project may have widely different effects on different population sizes or under different environmental conditions. Mortality induced by the project might be insignificant at high population levels, but significant at low population levels. In some instances, the project might permit continued existence of a population of the current size but preclude growth to its current potential. In other cases pre- and post-project

COMMENT F.42 (cont.):

populations might be the same size, but the post-project population might have less capacity to sustain hunter harvest and predations or to recover from periodic environmental preturbations, such as severe winters. While Exhibit E occasionally alludes to changes in productivity, it tends to focus on whether the current population level can be maintained. The simulation modeling effort initiated by APA is designed to show changes in a more dynamic manner, yet these models were not used in preparation of Exhibit E and there is no clear indication of when, if, or how they will be used."

RESPONSE:

The effects of various project actions and changes in natural conditions on certain wildlife species and their habitat are being assessed through the use of computer simulation models. These models are being continually modified as new information from field studies and other efforts becomes available. Model outputs were not included in the License Application because the models were still in an early stage of development, and certain key model inputs were unavailable.

A report updating and refining the impact assessment based on new data and input from project technical consultants will be available in April 1984.

Also, please see Response to Comment F.41.

COMMENT F.43:

"WILDLIFE

"8. Cumulative Impacts

"Closely related to the preceding discussion is consideration of cumulative impacts. Many different impacts will work together to produce a cumulative effect which is greater than any of the individual impacts. This fact is recognized in the summary of impacts. However, throughout the bulk of the text, impacts are usually discussed with respect to single, specific actions with little reference to the cumulative effects of the total set of actions."

RESPONSE TO COMMENT F.43:

The effects of cumulative project-induced impacts on wildlife are considered in the Impact Summary (4.3.5) and Mitigation Plan (4.4) sections of Exhibit E. Throughout the remainder of the text, specifically identified project effects are discussed individually in order to facilitate accurate assessment of each impact mechanism for each species or group. Without prior consideration and quantification, where feasible, of individual impact mechanisms, subsequent assessment of cumulative impacts of the entire Project cannot be accomplished.

As noted by the commentor, Section 4.3.5, Impact Summary, does address cumulative impacts of the entire project on populations and species communities. Cumulative impacts on wildlife are also considered in mitigation options presented in Section 4.4 of the License Application.

COMMENT F.44:

"WILDLIFE

"9. Lack of Quantification

"Exhibit E is almost entirely qualitative. What quantification there is, often tends to be misleading. For example, it states that 300 moose occur in the Watana impoundment area during moderate winters and estimates that sufficient forage to support 301 moose for 180 days exists there. The first figure was simply the largest number of moose estimated in the impoundment area during a mild winter. The following year, when snow depths were greater but not unusually deep, twice that number were estimated. The estimate of carrying capacity amounts to an educated guess. The data and vegetation maps used were deemed inadequate for estimating carrying capacity and were scheduled to be upgraded. Until this is done, any estimate should be considered extremely tentative. Selection of 180 days is completely arbitrary. Avialable data suggest that most moose use the area for a shorter period. In severe winters, moose might use more than the current annual growth. Therefore, the estimate on animal numbers and carrying capacity can easily be different from that presented."

RESPONSE TO COMMENT F.44:

Quantitative data have been provided, where possible, throughout Exhibit E. For example, the botanical resources section includes estimates of the number of acres within various vegetation types based on vegetation mapping (more accurate mapping of vegetation will be conducted in 1984), and estimates of the amount of each type that will be lost to each project action. Baseline wildlife descriptions present detailed quantitative data obtained during project-related studies as well as from relevant studies outside the project area. The impact assessments also provide considerable quantification. Exhibit E includes over 200 tables and figures presenting detailed quantitative data on botanical and wildlife resources. Thus, the comment that "Exhibit E is almost entirely qualitative" is inaccurate.

The moose carrying capacity estimate for the Watana impoundment area is clearly identified in Exhibit E as "preliminary," and is based on the best available data (see pages E-3-307 and E-3-308, page E-3-397, and Appendix E3H). The steps being taken to refine this estimate are specifically and explicitly stated in Section 4.3.1(a)(iii), pages E-3-412 through E-3-414. The time frame of 180 days used in the carrying capacity estimate is included only as an example. The estimate of 54,100 moose-days for the impoundment zone (see License Application Table E.3.92) is itself being refined and can be used with any time frame to estimate the carrying capacity for the period selected. Please also refer to the Response to Comment F.30.

The Power Authority anticipates that the DEIS will reasonably quantify significant impacts.

COMMENT F.45:

"WILDLIFE

"9. Lack of Quantification

"There are numerous cases where vegetation loss is expressed as a percent of that type occurring in the basin or a subunit of the basin. These estimates have little meaning for wildlife. Such estimates should be based on areas meaningful for the population of animals being considered. In the case of the Nelchina caribou herd, a much larger area is appropriate. In the case of most other species, a smaller area should be used. An impact zone based on the range of each population or group of animals should be delineated and losses from that area examined."

RESPONSE:

The presentation of habitat type loss as a percentage of that occurring within the basin was useful as a means of standardizing impact assessment across species boundaries. It also provided a measure whereby one could simultaneously consider the amount of habitat lost in absolute terms and view the relative importance of this type as a component of the entire basin, furthering comparisons of relative impacts to various wildlife species. In addition, percentage of habitat loss of larger or smaller ranges are also provided where appropriate. For example, item (1) in Table E.3.147 of the FERC License Application documents a permanent habitat loss of 0.3 percent of the total range of the Nelchina caribou herd.

In the impact assessment of any development project, it is important to consider primarily the effects in the immediate area of the project itself (e.g., the middle Susitna Basin). If local effects on wildlife populations are considered and mitigated on a development-by-development basis, then cumulative impacts on regional population levels will be minimized. Attention to regional population levels should always be maintained, however, particularly if unavoidable adverse impacts to local populations occur. Expressing percentage habitat loss against basin-wide availability furthers these important assessments of local effects on area wildlife populations. Please also refer to Responses to Comments F.44 and F.46.

COMMENT F.46:

"WILDLIFE

"9. Lack of Quantification

"It is indicated that some estimates will be refined in the future, although it is not always clear how or when. A large number of issues seem to be set aside simply because they cannot be precisely quantified. Clearly it is not possible to precisely quantify all of the impacts. However, it is difficult to see how reasonable and responsible mitigation decisions can be made unless there is some indication of the magnitude of the impact. Many of these issues can at least be narrowed to an order of magnitude. They should be thoughtfully examined and outer bounds placed on the problem. For example, a maximum possible level of habitat loss and alteration adjacent to the impoundment and downstream can certainly be determined. These estimates can be narrowed by developing more logical scenarios. The effects of several of the scenarios on wildlife population can be examined to identify a worst case situation. If this worst case shows an unacceptably high impact, further studies can be designed to narrow the range of possibilities."

RESPONSE:

Refer to Responses to Comments F.6, F.44 and F.45.

The Power Authority anticipates that the DEIS will reasonably quantify all impacts and specify all reasonable mitigation.

COMMENT F.47:

"WILDLIFE

"10. Further Studies

"There are numerous references to continuing studies to further refine the impact assessment. Many of these references are vague with no indication of what these studies are and what information they will produce. Other studies are more specific but no dates for completion are indicated. Of those studies that are specifically identified with dates, many are not currently funded."

RESPONSE TO COMMENT F.47:

The Board of Directors of the Alaska Power Authority, at their meeting of November 30, 1983, authorized environmental funding at a level that will allow mitigation studies, vegetation mapping and other proposed work to continue at a vigorous pace. Proposed FY 85 budgets, also approved by the Board of Directors, would maintain this pace.

The Power Authority anticipates that all impacts will be reasonably assessed in the DEIS and FEIS.

REFERENCES

Alaska Power Authority, Minutes of the Meeting of the Board of Directors (November 30, 1983).

COMMENT F.48:

"WILDLIFE

"11. Mitigation Plan

"This section is much better organized than the baseline and impact sections. As a result, it is a reasonable starting point for mitigation planning. The following paragraphs present some areas that need attention."

RESPONSE:

No response necessary.

COMMENT F.49:

"WILDLIFE

"11. Mitigation Plan

"First, a mitigation plan cannot be fully developed until the impact assessment is greatly improved. This does not mean, however, that the current plan cannot be substantially improved in the interim. It suffers from many of the problems listed above. Most of all, it needs to present a systematic overview of how the project will impact a

COMMENT F.49 (cont.):

population. If mitigation planning and measures are not aimed specifically at limiting factors, they will fail. For example, if brown bear are limited by loss of spring foraging habitat, it will do little good to enhance habitat to produce more berries, a late summer food. It is important to ensure that mitigation actions are developed in a manner and location to benefit populations, and therefore result in usable products. Habitat enhancement north of the Watana impoundment, as described in Exhibit E, will be of little value to moose south of the impoundment. Production of fish downstream for bears will be of little value to bears if the fish are not available in an area where bears can utilize them. It is not meaningful to promote transmission corridors as habitat enahncement unless it can be shown that there is an increase in browse in areas where moose can use it. In addition, there may be overriding considerations negating a proposed mitigation measure such as attraction of animals to roads and railroads where accidental mortality will be greater. This, too, represents a factor which should be considered when planning for mitigation and evaluating the capabilities of a proposed action."

RESPONSE:

The Power Authority has incorporated this guidance into project planning.

COMMENT F.50:

"WILDLIFE

"11. Mitigation Plan

"The mitigation plan states that habitat enhancement will be emphasized more than the use of replacement lands will be. This approach is extremely risky and tends to assume that more information is known about how to enhance habitat than actually exists. In order to succeed, enhancement must produce appropriate quantities of forage of proper time in areas where animals are capable of using it. There have been a number of successful enhancement efforts in which a satisfactory quantity of forage was produced, made avaiable and acutally used. There have also been failures where the area reverted to other-than-forage conditions.

"There has been little experience with the enhancement of habitat types similar to those near the impoundments. There have been enhancement efforts where moose have immediately used enhanced areas and responded with increased productivity. There are also examples where abundant forage was produced but the moose population failed to make use of them. Habitat enhancement is a valid tool for mitigation but it must be applied with careful thought to ensure a reasonable probability of success."

RESPONSE:

The Power Authority disagrees that planned measures to offset project-related loss of moose carrying capacity through increasing the availability of browse vegetation are necessarily "extremely risky." Review of the sources cited in License Application Exhibit E, Section 4.4.2, pages E-3-527 through E-3-530, does indeed indicate that browse vegetation can greatly increase in biomass as a result of burning, crushing or clearing established vegetation. For example, Viereck and Schandelmeier (1980) indicate that browse biomass may increase ten times or more following burning. An approach based on increasing the amount of vegetation available as food for moose through altering a later, forest-type stage of plant succession, with relatively little browse available as shrub understory, to an earlier, shrubland stage certainly has merit from the standpoint of demonstrated mechanisms which are known to effect this type of change (see, for example, Wolff 1978 and Wolff and Zasada 1979). Moreover, the estimate of expected browse production increase used in

RESPONSE TO COMMENT F.50 (cont.):

Exhibit E to provide a preliminary determination of required acreages of compensation lands, i.e., a three-fold increase, is, as stated, "a very conservative estimate and a 5- to 10-fold increase may be possible in some vegetation types" (page E-3-529). The commentor has not provided evidence to refute this statement. Nor has the commentor refuted the underlying rationale of the approach as derived from the studies of, for example, Wolff (1978), Wolff and Zasada (1979), Viereck and Schandelmeier (1980).

Studies of the effects of vegetation alteration techniques on browse production are conducted in south-central Alaska by wildlife management agencies and supported by budgets established for this purpose. For example, the Alaska Department of Fish and Game conducted a chaining program near Palmer, Alaska, in 1983; the U.S. Bureau of Land Management, in cooperation with the U.S. Forest Service Institute of Northern Forestry, has planned a controlled burn in the Alphabet Hills, a portion of the Susitna River basin immediately east of the project area, for the past two years; and mechanical crushers are regularly used on the Kenai National Moose Range, administered by the U.S. Fish and Wildlife Service, as a management tool for increasing browse production and, at the Moose Research Center near Soldotna, Alaska, as a research tool for producing and studying changes in estimated carrying capacity. The budgeted expenditures supporting personnel and equipment dedicated to these programs demonstrate that the mitigation approach established in Exhibit E is taken seriously by state and federal resource management agencies. An "extremely risky" management approach would not receive the funded support which continues to maintain these and other similar programs in Alaska.

We agree that the success of any measure to increase browse production will depend on many factors, including characteristics of the vegetation to be changed and contributory physical attributes such as soil pH and moisture, slope, aspect, elevation and climate. We also agree that such measures must be conducted in areas where they will be used by local moose populations and that the browse must be accessible under severe winter conditions with above-mean snow depth. However, we are aware of no statement in Exhibit E indicating that measures to increase browse production will not "be applied with careful thought to ensure a reasonable probability of success."

RESPONSE TO COMMENT F.50 (cont.):

The Alaska Power Authority is working closely with the Alaska Department of Fish and Game to develop preliminary mitigation implementation planning which will identify more specifically the locations, vegetation types, and acreages to be selected for browse compensation.

Exhibit E explains that, based on the preliminary analysis presented (pages E-3-527 through E-3-530), about 72 percent by land area of the proposed vegetation alteration will be conducted in downstream locations where substantial data on seasonal moose distribution and dependence on floodplain habitats have been collected since early 1980 through studies supported by the Alaska Power Authority (Modafferi 1982, 1983). These studies have demonstrated that certain identified sites along the Susitna River which were cleared and abandoned in the past are now used intensively by moose during the winter. There is variation in moose utilization among such formerly cleared sites, ranging from heavy to nil (see, for example, Modafferi (1983), pages 97-100; and Exhibit E, page E-3-528). Modafferi's work clearly shows that if the locations are properly selected relative to vegetation type and moose distribution, measures to increase browse availability for moose, and moose utilization of the increased browse, will be successful.

Exhibit E states that "[a] monitoring program will be implemented and continued throughout the license period to document the browse production of the lands enhanced for moose" (page E-3-529). The monitoring program will be coordinated with Alaska Department of Fish and Game studies to determine moose utilization relative to increased browse production at specific sites, and to identify the appropriate times for repetition of compensation measures on a site-by-site basis (see Response to Comment F.51). Thus, mitigation implementation will be observed on a continuing basis by wildlife biologists to evaluate its success. If changes in moose population density or distribution occur during the license period, and these changes appear to offset the implemented measures, additional available land areas will be selected for mitigation.

A land retention approach incorporating demonstrated areas of, for example, prime winter moose habitat could be successful if such areas were guaranteed to be protected from development. The State of Alaska can provide such protection through legislative designation, an option supported by the Alaska Department of Fish and Game (Yanagawa, personal communication, 1983). Although the Alaska Power Authority is currently reviewing the possibility of supporting this option, the Power Authority's position is that compensation through controlled, monitored habitat alteration procedures remains a more dependable approach than dependence on unforeseen contingencies of future land development. The Power Authority is working closely with the Alaska Departments of Natural Resources and Fish and Game to identify lands likely to be available in the future for application of browse augmentation or other habitat compensation measures. A major source of input to this process is the draft Susitna Area Plan now in preparation by the Alaska Department of Natural Resources. Power Authority consultants meet frequently with representatives of both of the above agencies to evaluate lands with respect to potential for habitat improvement and compatibility with land use designations as identified in the draft Susitna Area Plan. Compensation land options reviewed in this process will be identified on a preliminary basis in the Power Authority's Impact Assessment Update and Refinement Report to be issued in April 1984.

REFERENCES

Viereck, L. A. and L. A. Schandelmeier, Effects of Fire in Alaska and Adjacent Canada - A Literature Review (1980), Bureau of Land Management Technical Report 6, BLM/AK/TR-80/06.

Wolff, J. O., Burning and Browsing Effects on Willow Growth in Interior Alaska, Journal of Wildlife Management, Vol. 42 (1978).

Wolff, J. O. and J. C. Zasada, Moose Habitat and Forest Succession on the Tanana River Floodplain and Yukon-Tanana Upland, in Proceedings of the North American Moose Conference and Workshop No. 15, Kenai, Alaska (1979), submitted to the FERC on December 5, 1983.

Modafferi, R. D., Susitna Hydroelectric Project Phase I Final Report - Big Game Studies, Volume II, Moose - Downstream (1982), Alaska Department of Fish and Game.

Modafferi, R. D., Susitna Hydroelectric Project Phase II Progress Report - Big Game Studies, Volume II, Moose - Downstream (1983), Alaska Department of Fish and Game, submitted to the FERC on May 31, 1983.

RESPONSE TO COMMENT F.50 (cont.):

Yanagawa, C., Supervisor, South-Central Region, Habitat Protection Division, Alaska Department of Fish and Game, personal communication to Robert Sener, LGL Alaska Research Associates, Inc. (November 18, 1983).

COMMENT F.51:

"WILDLIFE

"11. <u>Mitigation Plan</u>

"If the mitigation plan relies too heavily on habitat enhancement, there is a substantial risk of irreversible failure of the mitigation objectives. It is likely that 20 years will pass before initial habitat enhancement efforts can be fully evaluated. Land classification and disposal programs will be far advanced by that time, and may preclude some options that are now available. If enhancement measures are found to be inadequate, it may be too late or too expensive to find suitable replacement lands. The mitigation plan should emphasize retention of State lands either for wildlife habitat or in a category that preserves future options. Habitat enhancement should be applied cautiously on some of the lands where there is a high probability of success, and then carefully evaluated."

RESPONSE:

Mitigation is planned for moose land with high potential for enhancing browse production. The existing vegetation on selected compensation lands must be likely to produce at least a threefold increase in browse biomass upon alteration by crushing, clearing, controlled burning or other means. The rationale underlying this approach is discussed in the Response to Comment F.50.

Draft criteria for the preliminary selection of compensation land options have been developed in close coordination with the Alaska Department of Fish and Game (ADF&G). Approximately 500,000 acres of land mapped by the ADF&G Habitat Protection Division as including large proportions with high "existing carrying capacity" have been provisionally identified with the assistance of ADF&G representatives (R. Cannon and D. Bader (1983) personal communications). Each identified tract of land consists of a complex mosaic of areas with high, moderate and low probable habitat value for moose. In most cases, the

RESPONSE TO COMMENT F.51 (cont.):

portions of these areas mapped as having moderate or low "existing carrying capacity" for moose are contiguous with portions mapped as having high "existing carrying capacity," and may represent later successional stages of the same basic vegetation communities. Most of the selected areas mapped as having low or moderate "existing carrying capacity" for moose are mapped separately by ADF&G as having "high potential carrying capacity."

We regard carrying capacity as a theoretical construct which cannot adequately be mapped without further quantification of the type being supported by the Alaska Power Authority in coordination with ADF&G (see Exhibit E, Chapter 3, Section 4.3.1(a)(iii), pages E-3-412 through E-3-414; and Appendix E-3-H). A draft Moose Compensation Land Options Report with accompanying maps will be available in January 1984.

The mosaic quality of mapped moose habitat values on the provisionally identified lands is created by variations in soils, drainage patterns, elevation, slope, aspect and fire history. Acquisition of any of these lands will provide substantial retention of high-quality winter browse, because the lands have been identified in accordance with this criterion. Browse production enhancement measures will be applied in areas where less browse is present, generally because these areas are in a later, post-shrubland successional stage where shrubs occur primarily as a relatively light understory. Even in some mature forests, however, the shrub understory may be dense and of high value to moose. Such lands would not necessarily be altered.

The commentor states that "[i]t is likely that 20 years will pass before initial habitat enhancement efforts can be fully evaluated." We disagree. As explained in the Response to Comment F.50, the browse production enhancement approach presented in Exhibit E is based on findings which indicate that browse biomass can increase rapidly following vegetation alteration. Wolff and Zasada (1979), for example, found in interior Alaska that willow species, probably the primary browse group for moose, reach peak availability within about nine years following disturbance when reproducing vegetatively, and within about 11 years through seed reproduction (see License Application Exhibit E, Chapter 3, Figure E.3.117). Interior birch species, also utilized as browse, reach peak availability within ten years following disturbance when reproducing

RESPONSE TO COMMENT F.51 (cont.):

vegetatively, and within 13 years when reproducing by seed (Wolff and Zasada (1979)). Browse production and seasonality of use by moose will be carefully monitored to determine whether the enhancement measures are successful in terms of benefit to moose (Exhibit E, Chapter 3, page E-3-525). An approach is currently being considered to assess population size and productivity relative to browse production increase and utilization.

Most browse production enhancement proposed to compensate for moose habitat loss in the middle Susitna basin would be implemented in the lower basin (downstream from Devil Canyon) through vegetation crushing, chaining or logging. Preparation of a new seed bed will not be required, as remnant shrubs will propagate through vegetative reproduction. The comment implies that it will be necessary to wait until browse production has peaked before success can be appraised. This is not the case; the relative extent of browse production increase will be quantified yearly and will most likely be evident as a trend well before its peak (see Wolff and Zasada (1979)).

Planning for browse production enhancement to compensate for loss of moose habitat in the middle basin is in its early stages. We believe that the approach is sound and support the necessity for additional careful planning with respect to procedures to be employed and lands to be acquired for their implementation. The approach is cautious and based on continuing study, including site-specific assessments of enhancement potential. Development of preliminary criteria for land selection, and preliminary identification of acquisition options, has been conducted in close coordination with ADF&G personnel. Every effort is being made to ensure not only that land options have high browse production enhancement potential, but that the identified lands are in areas occupied by moose populations likely to benefit from enhancement measures.

REFERENCES

Cannon, R. and D. Bader, Habitat Protection Division, South-Central Region, Alaska Department of Fish and Game, Anchorage, personal communications to Robert Sener, LGL

RESPONSE TO COMMENT F.51 (cont.):

Alaska Research Associates, Inc., (November 10, 18, 23 and 28, December 1, 1983).

Wolff, J. O. and J. C. Zasada, Moose Habitat and Forest Succession on the Tampa River Floodplain and Yukon-Tanana Upland, in Proceedings of the North American Moose Conference and Workshop No. 15, Kenai, Alaska (1979), submitted to the FERC on December 5, 1983.

COMMENT F.52:

"WILDLIFE

"11. Mitigation Plan

"Some concepts in the mitigation plan are unacceptable. Reduction of bear populations is promoted as mitigation for moose and caribou losses. The plan should also avoid reliance on the Board of Game to mitigate for impacts. While there may be a need to regulate hunters and trappers as a consequence of the project, and the Board of Game is the appropriate authority to do this, APA first should take all steps to avoid or minimize actions that would require restrictive regulation. Furthermore, enhancement of one species at the expense of another is not a legitimate approach to mitigation.

"This is not to say that the effects of mitigation measures for one species on another species should not be considered. They should. This is adopted where a positive benefit is perceived, but again not always clearly thought out. For example, habitat enhancement measures for moose are promoted as beneficial to bears. There is evidence from Alaska which was not considered that suggest that such measures may be detrimental to bears."

RESPONSE:

We disagree with the stated assumptions supporting the comment. The Alaska Power Authority does not promote reduction of bear populations as mitigation for moose and caribou losses. To the contrary, potential adverse impacts to brown bear and black bear are stated in Exhibit E to be major issues of concern, and mitigation approaches have been established to minimize these impacts (Exhibit E, Chapter 3, Section 4.4.2(a), page E-3-524; Section 4.4.2(b), pages E-3-534 through E-3-536). We are not aware of any statement in the License Application which promotes predator control of any

RESPONSE TO COMMENT F.52 (cont.):

kind, from "reduction of bear populations" to aerial hunting of wolves. The Power Authority is not responsible for game management in Alaska and therefore has no policy on this issue.

The mitigation approach established by the Alaska Power Authority does not rely on actions which may or may not be taken by the Alaska Board of Game. Exhibit E recognizes that the Power Authority will not have jurisdiction over hunting and trapping activities on public or private lands surrounding the Watana and Devil Canyon developments and states (Chapter 3, Section 4.4.2(b), pages E-3-534 and E-3-535):

> "During the operation phase, the Power Authority will have no control over harvest activities but will continue to provide any pertinent data to the ADF&G and assistance in their management activites.
>
> "Studies will provide information on the bear population and the distribution of bear harvest which will indicate the need to recommend restrictions on bear hunts to the ADF&G to protect brown and black bears. Concentrations of bears may occur in some project areas which will also receive regular human access and presence. Regulations on either the season or the location of the hunt could be used to protect bear populations from overharvest.
>
> "The Power Authority will recommend hunting and trapping restrictions to protect wolves within the project area and allow the formation of new home ranges and hunting patterns. This would minimize the secondary impact of social strife and upheaval caused by the alteration of historical pack boundaries. Further restrictions may be recommended for other furbearers if data from ongoing investigations indicate a need for protection."

These statements should not be construed to indicate reliance on the Alaska Board of Game to implement mitigation measures on behalf of the Power Authority. Rather, the Power Authority acknowledges that it has no jurisdiction over hunting or trapping on lands surrounding the Susitna Project. Such jurisdiction is solely the prerogative of the Alaska Board of Game. Furthermore, all statements are intended to support protection for predators, not "enhancement of one species at the expense of another."

RESPONSE TO COMMENT F.52 (cont.):

The Alaska Board of Game and Department of Fish and Game are responsible for setting statewide game management objectives. The Alaska Power Authority wishes to ensure that substantial costs are not invested in mitigation programs which are counter to these objectives.

The Power Authority continues to support the position, stated on License Application page E-3-529, that:

> "The controlled burns described above will also enhance habitat for bears. However, it (sic) will not fully compensate for loss of early spring foods for bears, particularly not in years of berry crop failure. It (sic) will increase the availability of fall foods for fattening."

We are not aware of "evidence from Alaska which was not considered that suggest (sic) that such measures may be detrimental to bears."

COMMENT F.53:

"SOCIOECONOMIC IMPACTS

"The projection of socioeconomic conditions with and without the project should provide information needed to develop an impact management program. This objective is simply not accomplished by the material presented. Deficiencies exist in both the data presented and the methodologies used. Examples which follow are not intended to be complete, but they are repeated here because their importance is sufficient to, in most cases, invalidate the analysis."

RESPONSE:

The Power Authority anticipates that the DEIS and FEIS will reasonably and fully analyze socioeconomic impacts, incorporating all prior studies and analyses to avoid duplication.

COMMENT F.54:

"SOCIOECONOMIC IMPACTS

"1. Commercial Fishery.
"An invalid assumption is made that the commercial fishery for salmon produced in the Susitna River system occurs only

RESPONSE TO COMMENT F.54:

in upper Cook Inlet. In comments on the draft Exhibit E provided by DFG, it was pointed out that the Susitna River salmon stocks are harvested throughout Cook Inlet, including the lower district. Therefore, the discussion of impacts and related values of Susitna River stocks must include the entire Cook Inlet fishery."

The assumption is based on available information. The primary source of the information is the following passage from the ADF&G Su Hydro Stock Separation Feasibility Report (1982), which cites another internal ADF&G document as an additional source:

> "Cook Inlet is divided into two management areas. The region north of the latitude of Anchor Point is Upper Cook Inlet and the area between the latitudes of Anchor Point and Cape Fairfield on the Kenai Peninsula is defined as Lower Cook Inlet. Commercial fisheries in Lower Cook Inlet are primarily terminal, occurring in small bays. Therefore, few salmon migrating to Upper Cook Inlet are intercepted in the lower inlet area (Middleton 1981). Upper Cook Inlet (Commercial) fisheries harvest stocks bound for river systems north of Anchor Point. These systems account for 78% of the salmon produced in the Cook Inlet area."

Because of the small contribution of Upper Cook Inlet stocks to Lower Cook Inlet catches, the impacts of Susitna River salmon changes in abundance to Lower Cook Inlet fishermen will be very low, probably undetectable.

REFERENCES

Alaska Department of Fish and Game, Su Hydro Stock Separation Feasibility Report, Adult Anadromous Fisheries (1982).

Middleton, K., Stock Status Report, Cook Inlet, Alaska (1981), Alaska Department of Fish and Game.

COMMENT F.55:

"SOCIOECONOMIC IMPACTS

"1. Commercial Fishery.

"Data regarding commercial fishing impacts (p. E-5-98/2) do not represent the percentage of catch to total run. The methodology is in error in that ratios of harvest to escapement are used to estimate losses to the commercial fishery, whereas the correct measure is the ratio of total run to escapement. Catch as a percentage of total run generally ranges very widely year by year. On one well sampled system, the Kvichak River, values over the period 1976-1980 range from 5 to 75 percent and averaged 45 percent. Therefore more than half the value of the harvestable resource to the commercial fishery is ignored in the present analysis."

RESPONSE:

The Comment is correct in pointing out that the ratio is total run to escapement. Use of such a ratio in the FERC License Application, however, leads to an over-estimate of the lost harvest, not an under-estimate. The 45,837 fish would represent the total run size rather than the harvest. The lost harvest would be 45,837 minus 20,835, or 25,002. It is recognized that the 2.2:1 run to escapement ratio for chum salmon varies considerably from year-to-year for a number of reasons. The intent of the analysis is to indicate the relative magnitude of potential loss, i.e., tens of thousands of fish, not hundreds of thousands and not millions.

COMMENT F.56:

"SOCIOECONOMIC IMPACTS

"2. Sport Fishery.

"The discussion of the value of sport fishing (p. E-5-99 to 100) needs to be supplemented. With high economic values already demonstrated for sport fishing Statewide by joint DFG--University of Alaska Studies (See e.g., Workman, Wm. G. 1/1983. Valuing Outdoor Recreation Opportunities. Agroborealis, p. 29-31), it is surprising that no data have been developed for the study area. The data presented for use of the lower Susitna River, from the DFB harvest

COMMENT F.56 (cont.):

statistics, should be supplemented with information on recreational fishing use of the river upstream from Talkeetna. This is necessary to adequately identify and quantify impacts to recreational use."

RESPONSE:

The project is not expected to have an appreciable impact on salmon fishing in the project area (see Response to Comment C.21).

The Power Authority is refining information about the Project's potential impacts on sport fishing. Recently completed household and business surveys of Talkeetna, Trapper Creek and Cantwell residents will help supplement the information presented in the FERC License Application. The household survey included questions on the number of persons in each household who fish; where and how often they fish; what species they catch; and the importance of fishing for recreation, food, income and cultural activities. The business survey included questions on what percentage of a business' gross annual revenues are from fishing, where those fish are caught and what species are caught. The results of these surveys are being tabulated.

REFERENCES

Alaska Power Authority, Household and Business Survey Results (in preparation)

COMMENT F.57:

"SOCIOECONOMIC IMPACTS

"3. <u>Subsistence</u> <u>Fishery</u>.

"The ease with which subsistence (or local) fisheries are dispensed with is disturbing. It is incorrect to say that Subsistence fishing within the Susitna Basin is not a recognized fishery by DFG (Para. 1). While salmon fishing for local use does not currently take place under subsistence fishing regulations (which are established by the Board of Fisheries, <u>not</u> the DFG), fish harvests for home consumption may be significant for the residents of portions

COMMENT F.57 (cont.):

of the Basin. This has been demonstrated for the Upper Yentna area by a Division of Subsistence project entitled, the Susitna Basin Resource Use Study, (see Fall, James A., et al., 3/1983.) The Use of Moose and Other Wild Resources in the Tynek and Upper Yentna Areas: A Background Report. DFG, Anchorage, Alaska.)"

RESPONSE TO COMMENT F.57:

The Power Authority is refining its assessment of the Project's potential impacts on the local use of fishery resources. Recently completed household and business surveys of Talkeetna, Trapper Creek and Cantwell residents will help supplement the information presented in the License Application. The household survey included questions on the number of persons in each household who fish; where and how often they fish; what species they catch; and the importance of fishing for recreation, food, income and cultural activities. The business survey included questions on what percentage of a business' gross annual revenues are from fishing, where those fish are caught and what species are caught. The results of these surveys are being tabulated.

REFERENCES

Alaska Power Authority, Household and Business Survey Results (in preparation)

COMMENT F.58:

"SOCIOECONOMIC IMPACTS

"3. Subsistence Fishery

"Local use of fishery resources remains to be quantified. There are a number of approaches to quantifying the value of this use including surveys of local populations. Another approach includes use of non-priced values to quantify local use of fish and wildlife resources. As pointed out by numerous studies (Langford, Wm. A. and Donald J. Cocheba. 1978. The wildlife valuation problem: a critical review of economic approaches. Canadian Wildlife Service, Occasional Paper No. 37.), non-priced values derive from a number of

COMMENT 58 (cont.):

sources such as recreational hunting; non-hunting, wildlife-based activities (photography, hiking, camping canoeing, etc.); existence value; bequest value; option value; breeding stock capital value; meat value; and research and genetic values. These commonly used sources of value are not addressed in the study."

RESPONSE:

Recently completed household and business surveys of Talkeetna, Trapper Creek and Cantwell residents will supplement the information presented in the License Application. The household survey included questions on the number of persons in each household who fish; where and how often they fish; what species they catch; and the importance of fishing for recreation, food, income and cultural activities. The business survey included questions on what percentage of a business' gross annual revenues are from fishing, where those fish are caught and what species are caught. The results of these surveys are being tabulated.

REFERENCES

Alaska Power Authority, Household and Business Survey Results (in preparation).

COMMENT F.59:

"SOCIOECONOMIC IMPACTS

"4. Game

"While much more complete than the treatment of fish, deficiencies in the data and methodologies employed for game (E-5-101/102) persist. The approach utilized to define user groups and use patterns would be useful if applied specifically to the study region, and if linked to an impact methodology."

RESPONSE:

Recently completed household and business surveys of Talkeetna, Trapper Creek and Cantwell residents will supplement the information presented in the License

RESPONSE TO COMMENT F.59 (cont.):

Application. The household survey included questions on the number of persons in each household who hunt; where and how often they hunt; what species they hunt; and the importance of hunting for recreation, food, income and cultural activities. The business survey included questions on the percent of gross annual revenues attributable to hunting activities what areas are important to their hunting activities, and what species are hunted as part of their business activities. The results of these surveys are being tabulated, and a general report will be available in early spring of 1984. More specific analysis of the game-related questions will begin in mid-January.

REFERENCES

Alaska Power Authority, Household and Business Survey Results (in preparation).

COMMENT F.60:

"SOCIOECONOMIC IMPACTS

"Commercial Users

"This discussion would serve were it part of a sector analysis, as is usually done, and were it complete. However, as it is, treatment of commercial users has excluded indirect users such as taxidermists, air taxi operators, equipment suppliers and others, and is, therefore, incomplete. The contribution of these users should be included in the discussion."

RESPONSE:

We concur that indirect commercial users of game may be considered in a refinement of the discussion of project impacts. In order to refine the assessment of project impacts to commercial users of game, additional baseline data have been collected through household and business surveys conducted in November 1983 in Trapper Creek, Talkeetna, and Cantwell. The results of these surveys are being tabulated, and a general report will be available in early spring 1984. More specific analysis of impacts to commercial users of game will begin in mid January. Additionally, the Power Authority has proposed a Fiscal Year 1985 Social Science Program Work Scope that includes a regional fish and wildlife users survey as well as a survey of lodge operators and guides who utilize the project area. Through this additional baseline information, the magnitude and significance of the project-related direct and indirect impacts to commercial use of game can be determined. Whether or not a sector analysis will be used in this determination will be decided at the appropriate time in the assessment process.

REFERENCES

Alaska Power Authority, Household and Business Survey Results (in preparation).

COMMENT F.61:

"SOCIOECONOMIC IMPACTS

"<u>Non-Commercial Use</u>

"The analysis of non-commercial uses has no guiding methodology and therefore remains general. Two types of data must be included if the economic aspects of this use are to be defined: harvests attributable to specific land areas; and, access and transportation modes used. This information is available from the DFG General File Harvest Statistics data base and should be used to help quantify non-commercial use."

RESPONSE:

The Power Authority anticipates refining information concerning non-commercial use of game. This will be accomplished by examining baseline data collected through household and business surveys conducted in November 1983 in Trapper Creek, Talkeetna and Cantwell. The results of these surveys are being tabulated, and a general report will be available in early spring of 1984.

<u>REFERENCES</u>

Alaska Power Authority, Household and Business Survey Results (in preparation).

COMMENT F.62:

"SOCIOECONOMIC IMPACTS

"<u>Furbearers</u>

"The discussion of trapping should be part of, and supported by, a commercial sector analysis."

RESPONSE:

The Power Authority anticipates refining information concerning the potential impact of the project on users of furbearers. Recently completed household and business surveys of Talkeetna, Trapper Creek and Cantwell residents will help supplement the information presented in the

RESPONSE TO COMMENT F.62 (cont.):

License Application. The household survey included questions on the number of persons in each household who trap; where and how often they trap; what kinds of animals they harvest; and the importance of trapping for recreation, income and cultural activities. The business survey included questions on what percentage of a business' gross annual revenues are from trapping, where animals are harvested and what kinds of animals are caught. The results of these surveys are being tabulated, and a general report will be available in early spring of 1984.

REFERENCES

Alaska Power Authority, Household and Business Survey Results (in preparation).

COMMENT F.63:

"RECREATIONAL RESOURCES

"1. <u>Phase One</u>

"The APA is apparently committed to "Phase One" development of recreational opportunities only, which includes 25 units added to an existing campsite, three shelters, one boat launch, 45 miles of primitive trail, one portal sign, and Watana townsite facilities. It appears as they would develop subsequent phases as needed. Costs for phase one are shown as $565,836 in Table E.7.17 and $752,436 in Table E.7.18. Obviously, these figures are conflicting. In fact, none of the total cost figures in these tables agree."

RESPONSE TO COMMENT F.63:

Tables E.7.17 and E.7.18 (originally submitted to the FERC on July 11, 1983 in response to an April 12, 1983 request from the FERC), have been revised to reconcile cost figures, and are reprinted below.

REVISED TABLE E.7.17 (December 1983)
TABLE E.7.17: ESTIMATED CAPITAL COSTS FOR THE SUSITNA HYDROELECTRIC PROJECT RECREATION PHASES

Phase	Capital Costs 1982 Dollars
Phase One	$ 673,866
Phase Two	843,209
Phase Three	127,432
Phase Four	880,585
Total Facilities	$2,525,092*

*These estimates are based upon January 1, 1982 cost figures.

RESPONSE TO COMMENT F.63 (cont.):

Recreation Setting	Facilities	1982 Unit Cost	1982 Total Cost	Facility Total	Phase Total
PHASE THREE					
G Mid-Chulitna/ Deadman Mountain	10 parking spaces	1,810	18,100	$	$
	15 miles trial	7,238	108,570		
	1 trailhead	762	762		
	2-4 primitive campsites	NA	NA	127,432	
					127,432
PHASE FOUR					
Q Devil Creek	1 trailhead	762	762		
	5 parking spaces	1,810	9,050		
	1 bench	320	320		
	Signage	300	300		
	9 miles of trail	7,238	65,142		
				75,574	
					75,574
S Devil Canyon Damsite	1 shelter	17,920	17,920		
	5,000 sq.ft. bldg.	120/sq ft	600,000		
	8 picnic sites	2,027	16,216		
	1 single vault latrine	9,157	9,157		
	15 parking spaces	1,810	27,150		
	0.5 mile of trail	7,238	3,619		
	Signage	1,000	1,000		
	3 benches	320	960		
				676,022	
					751,596
R Mermaid Lake	8 campsites	9,047	72,376		
	1 shelter	17,920	17,920		
	2 single vault latrines	9,157	18,314		
	1 water well	19,040	19,040		
	1 bulletin board	439	439		
	5 garbage cans	140	700		
	Signage	200	200		
				128,989	
					880,585
TOTAL					$2,525,092

*Estimated costs, which are in 1982 dollars, are for only Phases 1-4. The potential development of Phase 5 and future additions are not included.

Note: Assumes no land acquisition costs for unappropriated state or federal lands nor land acquisition costs for private land.

RESPONSE TO COMMENT F.63 (cont.):

Recreation Setting	Facilities	1982 Unit Cost	1982 Total Cost	Facility Total	Phase Total
PHASE TWO					
O Watana Damsite Visitor Center	20 parking spaces	$ 1,810	36,200	$	$
	3,000 sq.ft. building	$120/sq ft	360,000		
	2 single vault latrines	9,157	18,314		
	1 interpretive trail	$5/sq ft	50,000		
	4 picnic sites	2,027	8,108		
	1 bulletin board	439	439		
				473,061	
					473,061
U Watana Townsite	Not included in Recreation Program Costs	NA	NA		
H Tsusena Creek	20 miles of trail	7,238	144,760		
	2 shelters	17,920	35,840		
	1 trailhead	762	762		
	3 parking spaces	1,810	5,430		
				186,792	
					659,853
I Tsusena Butte	4 miles trail	7,238	28,952		
	1 trailhead	762	762		
	6 parking spaces		10,860		
	2-4 undesignated campsites	NA	NA		
				40,574	
					700,427
L Deadman/Big Lake	1 trailhead	762	762		
	4 miles of trail	7,238	28,952		
	6 parking spaces	1,810	10,860		
	5-6 primitive campsites	NA	NA		
				40,574	
					741,001
J Clarence Lake	9 miles of trail	7,238	65,142		
	signage	300	300		
				65,442	
					806,443
K Watana Lake	3 miles of trail	7,238	21,714		
	1 footbridge	15,052	15,052		
	2-3 primitive campsites	NA	NA		
				36,766	
					843,209

RESPONSE TO COMMENT F.63 (cont.):

REVISED TABLE E.7.18 (December 1983)

TABLE E.7.18: ESTIMATED COSTS OF PROPOSED RECREATION PLAN PROJECT FEATURES*

Recreation Setting	Facilities	1982 Unit Cost	1982 Total Cost	Facility Total	Phase Total
PHASE ONE					
E Brushkana Camp	0.25 miles of road	$386,400/mi	$ 96,600	$	$
	25 campsites	9,047	226,175		
	3 single vault latrines	9,157	27,471		
	1 bulletin board	762	762		
	8 trash cans	157	1,256		
	1 water well	19,040	19,040	371,304	
					371,304
D Tyone/Susitna	1 shelter	17,920	17,920		
				17,920	
					389,224
B Butte Creek/ Susitna River	1 boat launch	44,800	44,800	44,800	
					434,024
A Middle Fork - Chulitna River	2 shelters	17,920	35,840		
	25 miles of trail	7,238	180,950		
	6 auto parking	1,810	10,860		
	1 trailhead (Trash cans, bulletin board, signs)	762	762	228,412	
					662,436
C Watana Townsite	Not included in Recreation Costs	NA	NA	NA	
F Portal Entry	Entry sign	6,000	6,000		
	2-3 car pull-out	1,810	5,430		
				11,430	
					673,866

COMMENT F.64:

"RECREATIONAL RESOURCES

"2. Alaska Department of Fish and Game

"In this section, conjectures are made regarding the objectives of the DFG for project-related recreation. These objectives should be further refined after consultation with the DFG."

RESPONSE:

The Alaska Power Authority regards the management objectives suggested in License Application Exhibit E, Chapter 7, Section 4.1.3 as preliminary, but certainly not conjectural. It is the Power Authority's intent to continue working with all resource management agencies to refine and formalize management objectives. We continue to be receptive to any specific comment the Alaska Department of Fish and Game has to offer in this regard.

COMMENT F.65:

"RECREATIONAL RESOURCES

"3. Existing Activities

"It is inaccurate to classify hunting, fishing, food gathering, duck hounding, camping, hiking, cross-country skiing, and photography as non-site specific activities. "Site" is a geographically flexible term. The areal extent of an activity depends primarily upon physical conditions and access opportunities. One should not dismiss the need for recreational development with such statements as '. . . because of their inherent mobility and non-site specificity, these activities can for the most part be absorbed in surrounding landscapes.' (P.E-7-25, Sec. 3.1)."

RESPONSE:

Within the context of Section 3.1 of Chapter 7, Exhibit E of the FERC License Application, the phrase "non-site specificity" was used to contrast the characteristics of developed recreational facilities to those of recreational activities. Since recreational facilities are constructed on a specific site and are not easily moved, impacts to that site will directly impact the facility. Activities, on the other hand, while not completely disassociated with specific sites, are capable of occurring in many places in the Susitna study area. Therefore, an impact to a particular site which provides opportunities for recreational activities will not necessarily directly impact the activity itself.

The concentration of recreational activities within the study area is determined by a number of factors, including the availability of access, wildlife distribution and scenic quality. (See License Application Section 5.2, Recreation Opportunity Inventory, and Section 5.3, Recreation Opportunity Evaluation for a more detailed discussion of these factors and the recreational activity selection process.) The flexibility in the concentration of recreational activities is what is meant by "non-site specificity."

The intent of the Application statement was not to dismiss the need for recreational development directed towards non-site specific activities. Rather, the intent was to point out that, because of their characteristics, impacts caused by project improvements to current or potential

RESPONSE TO COMMENT F.65 (cont.):

activity areas will not be as significant as they would be to a developed facility, and that roads opened as part of the Project will increase the accessibility to other attractive opportunities which will absorb the recreation/demand for the activities mentioned. This redirection of non-site specific activities is carefully considered in the recreation plan described in Chapter 7 of the License Application. Having identified the areas which would be most attractive to recreationists and which would cause the least impact on the environment through their development, the plan provides for access and other improvements to those sites. The new opportunities will not only accommodate and enhance the projected demands for these activities, but they may also improve the quality of the recreational experience.

COMMENT F.66:

"RECREATIONAL RESOURCES

"4. Travel Cost Method

"The application of the travel cost method and assumed participation rates, yield very general results which ignore known specific effects. For example, opening road access to an area normally brings in a flood of new hunters and fishermen. The Petersville road in the Susitna drainage is an excellent example. Use of a maximum increase in demand of 0.2 percent (P.E.-7-43) is quite low when experience has shown increases as high as 100 fold."

RESPONSE:

The travel cost method and per capita participation method yield general results. However, these calculations constitute only the first part of a more specific and complex demand study which takes into account the detailed site data and similar situations mentioned.

The per capita participation calculation discussed on page E.7.39 in Chapter 7, Exhibit E of the License Application generates numbers of people (based on a percentage of population) who participate in the eight activity categories analyzed. Estimates were generated for 1980 and 2000 (see License Application Tables E.7.10 and E.7.11). The travel cost method discussed on License Application page E.7.40 utilizes the "participation" results to estimate how many people are willing to travel the distance it takes to get to Susitna in order to recreate.

RESPONSE TO COMMENT F.66 (cont.):

(This tells us how many people would travel a given distance in any direction, not just specifically to Susitna.)

In the third step (see License Application pages E.7.41 and E.7.42), the estimated numbers of people who actually use the site are generated. Based on available data, observed site conditions and similar situations, these numbers are stated in terms of the percentage of total available recreationists who would be attracted to the area (i.e., the percent of capture) (see License Application Table E.7.12). For example, in 1990, fishing is estimated to capture 2 percent of the total available recreationists attracted to the Susitna area.

The Commentor's concern for specificity is most directly answered in the fourth step. This step estimates how many people in the year 2000 would participate in each activity, assuming that the Project is built. It also examines how many people would be there if nothing were built (see License Application Table E.7.13). Again, while the estimates take into account general factors such as increased population and increased desire to recreate, they are based on basic data concerning each activity (see pages E.7.43 and 3.7.44). Specifically, with regard to the activities referred to in the Comment:

> "For big game hunting, increased road access will lead to increased activity. The 1981 Geowonderland data base indicates that most hunters currently fly into the area. Because the game resource is limited and regulated, a maximum increase of 0.2 percent is assumed. Today's capture rate is 0.3 percent of total demand. The year 2000 is assumed to have a capture rate of 0.5 percent of total demand (see Tables E.7.12 and E.7.13).
>
> "Presently, freshwater fishing is very limited due to lack of automobile access. Most existing fishing sites are used principally by fly-in fishermen. It is assumed that this demand, like hunting, will increase 0.2 percent, attracting approximately double the number of fishermen as in the base case and triple the current use."

In other words, the 2 percent increase constitutes a 2 percent greater "capture rate" of the total number of fishermen who will be willing to travel this far from their homes in the year 2000, not 2 percent more fishermen on site. In fact, this number represents a 200 percent increase over existing conditions and a 100 percent increase over projections for the year 2000 without the Project. Yet, the absolute increase in numbers of fishermen will be very small relative to the total number of fishermen willing to travel so far.

Thus, the estimates given for Susitna are consistent with the increases which have apparently occurred at Petersville Road. Nonetheless, it is important to note that because the Petersville Road lies within a much closer travel distance radius of major fishing populations, it cannot necessarily be directly compared to assumptions about the Susitna Project area.

COMMENT F.67:

"RECREATIONAL RESOURCES

"5. <u>Recreation in Plan for Camps and Townsite</u>

"It is the view of DFG that every effort should be made to provide the best possible recreational facilities for residents of the construction camp and townsite. These efforts, we believe, would tend to relieve the surrounding landscape from excessive use pressures."

RESPONSE:

We concur that every effort should be made to provide the best possible recreational facilities for residents of the construction camp and townsite. We also agree that such efforts would tend to relieve the surrounding landscape from excessive use pressures. As stated on page E-7-60 of Exhibit E of the FERC License Application, the recreation concept at the construction worker camps and permanent worksite "... is intended to provide a variety of highly developed recreational facilities, both indoor and outdoor, which will satisfy demands without overtaxing the area's limited primitive recreational capacity."

COMMENT F.68:

"LAND USE

"1. Introduction

"This section recognizes that hunting, fishing, and trapping constitute the primary land use of the area, yet, nowhere in the chapter are these uses substantiated.

RESPONSE:

Hunting, fishing, trapping and other low-intensity, dispersed land uses are described on pages E-9-16 through E-9-19 of Chapter 9, Exhibit E, of the FERC License Application. This material is generally qualitative because the level of these activities is too low to warrant the extensive monitoring effort required to quantify such uses.

General sources for the hunting, fishing and trapping discussions in Chapter 9 are included within the text. As noted on pages E-9-13 through E-9-15 of the License Application, the information on these activities was developed primarily from field reconnaisance, review of literature, maps and aerial photographs, and interviews with land management agency personnel and people who live near the project area. Additional information on which agencies and local residents were interviewed can be obtained from the Phase I Report on Subtask 7.07 of the Susitna Hydroelectric Project Environmental Studies (1981). Agencies contacted for land use information are listed in Section 6 of Chapter 9 and include the Bureau of Land Management, Alaska Department of Natural Resources and Alaska Department of Fish and Game.

Hunting, trapping, and fishing in the project area are also discussed in Chapter 7, Recreation Resources, and in Chapter 5, Socioeconomic Impacts. Chapter 7 includes a detailed discussion of existing recreation use on pages E-7-16 through E-7-22, as well as an assessment of anticipated project impacts on hunting and fishing. Chapter 5 includes a discussion of impacts on natural resource-dependent businesses (page E-5-79) and on fish and wildlife user groups (pages E-5-95 through E-5-124).

RESPONSE TO COMMENT F.68 (cont.):

Sources for information in these chapters are largely the agencies and reports cited above.

REFERENCES

University of Alaska Museum, Draft Final Report 1983 Field Season, Cultural Resources Investigation for the Susitna Hydroelectric Project (1983), previously submitted to the FERC on January 3, 1984.

COMMENT F.69:

"LAND USE

"2. Purpose

"Data on areas used by the residents of Cantwell for hunting, fishing, and trapping are available from the Division of Subsistence in Anchorage. The mapped data for this community should be augmented with similar maps for other communities in the project area."

RESPONSE:

In late September 1983, Harza-Ebasco contacted the Alaska Department of Fish and Game (ADF&G) in order to allow ADF&G the opportunity to comment on draft household and business surveys being developed for use in Cantwell, Talkeetna and Trapper Creek. These surveys, which were administered in November 1983, included questions about hunting, fishing and trapping. Unfortunately, Harza-Ebasco was not informed at that time that the Division of Subsistence was already conducting (or had completed) a survey of Cantwell residents that focused on hunting, fishing and trapping. Following completion of the ADF&G survey report in February 1984, the results will be examined by Harza-Ebasco and any appropriate information will be included in the Susitna Project information base.

REFERENCES

Alaska Power Authority, Household and Business Survey Results (in preparation).

COMMENT F.70:

"LAND USE

"2. Purpose.

"The purposes to be served by this chapter are not clearly stated. Proposed FERC regulations require a report on land use as part of Exhibit E (Proposed regulations, 4.41(f)(g)), and specify that the following items be included:

a. description of existing use of proposed project and adjacent lands;

b. uses that would occur if the project were constructed;

c. consultation with local, State and Federal agencies with management authority over project lands;

d. identification of wetlands, floodlands and farmlands;

e. identification of lands owned or controlled by government agencies; and,

f. photographs, maps and graphics sufficient to show the nature, extent and location of land uses."

RESPONSE:

The purposes of Chapter 9 (Land Use) are clearly stated on page E-9-2. These include:

- Describe past, present and future land use;
- Identify potential changes in land use resulting from the development of the project;
- Describe past, present and potential future land status;
- Identify potential changes in land status resulting from the project development;
- Evaluate the project's impacts on land use and land status; and
- Identify mitigative measures to minimize impacts.

RESPONSE TO COMMENT F.70 (cont.):

All requirements of the Proposed Regulations (4.41(f)(g)), as listed in the above comment, are met as follows:

a. Description of existing use of proposed project and adjacent lands - This description appears in Chapter 9, Section 2, Description of Existing Land Use.

b. Uses that would occur if the project were constructed - This discussion appears in Chapter 9, Section 3, Description of Land Use Changes.

c. Consultation with local, state and federal agencies with management authority over project lands - Agencies contacted are listed in Chapter 9, Section 6, along with a notation on the person contacted, the date of contact, and the subject discussed. Agency contacts were an important source of land status and land use information used in the land use evaluation process.

d. Identification of wetlands, floodlands and farmlands - Wetlands are discussed in Chapter 9, Section 2.2.4(a), pages E-9-21 through E-9-25. The discussion references wetland maps in Chapter 3, Fish, Wildlife and Botanical Resources.

   Floodlands are discussed in Chapter 9, Section 2.2.4(b), pages E-9-25 through E-9-27. Figure E-9-13 illustrates the 100-year floodplain on the Susitna River at Talkeetna. The discussion references Chapter 2, Figures E.2.12 through E.2.20, for floodplain maps of the area between Talkeetna and Devil Canyon.

   As stated in Chapter 9, Section 2.2.4(c), page E-9-27, there are no prime or unique farmlands within the Middle Susitna Basin.

e. Identification of lands owned or controlled by government agencies - A description of land ownership status appears in Chapter 9, Section 2, Description of Existing Land Use. Table E.9.1 gives the ownership of each parcel in the study area.

f. Photographs, maps and graphics sufficient to show the nature, extent and location of land uses - Chapter 9 includes 17 maps of the study area, such as a general location map for the project, land status maps, land use maps and facilities maps.

COMMENT F.71:

"3. Land Use Changes

"Discussions of 'induced land use changes' and 'mitigation' area are so limited by the lack of information on existing conditions as to make comment difficult. A methodology needs to be established which allows a quantified approach to the topic and products useful to the project."

RESPONSE:

A substantial amount of information regarding "induced land use changes" and "mitigation" is presented in the FERC License Application. For example, Section 2 of Chapter 9 includes a detailed discussion of land status and existing land uses, while Section 3 discusses induced land use changes resulting from the construction and operation of the Project.

The phrase "induced land use changes" as used in the License Application incorporates a variety of project-related impacts, including the inundation of land, increased recreational activity resulting from improved road and water access, and land subdivision and development attributable to project-related access and growth. These land use changes are a function of physical and socioeconomic changes. Physical factors, such as the inundation of land by a new reservoir, are simplest to quantify, while land use changes, such as those brought about by increased population and access, are more difficult to quantify. Population dynamics and the impact of changes in population on surrounding communities are discussed in License Application Sections 3.1 through 3.5 of Chapter 5, Socioeconomic Impacts. Pages E-9-43 through E-9-45 discuss the effects of the Project's proposed access system on the distribution of population growth identified in Chapter 5. Population and access-related impacts on recreational land uses is discussed in Section 3.2 of Chapter 7, Recreation, and in Section 3 of Chapter 9, Land Use.

Further quantification of induced land use changes would require a more definitive forecast not only of land management policies, but also of the response of current and future landowners to changing socioeconomic conditions, both with and without the Project. These changes will involve land use activity and development associated with the provision of access. Both land management policies and the

RESPONSE TO COMMENT F.71 (cont.):

response of landowners are highly dependent upon broad, policy-level actions that are currently unknown.

One of the most significant uncertainties at this point is whether or not the Project's access system will be open to the public. Once that decision is made by the Power Authority, a more clear assessment can be made about associated induced land use changes. Future land management in the project area, aside from the access question, is also a major unknown. As stated in Section 1 of Chapter 9, there continues to be very little active management by current landowners, primarily the federal and state governments and native corporations. If public access is allowed into the project area, the degree of impact of increased land use activity will still be dependent upon management programs that are yet undeveloped. There is no existing comprehensive land management plan to use as a baseline for determining future use. Thus, the extent to which induced land use development is permitted, and the location of such development, will depend largely upon the actions of state agencies and local governments. As indicated on License Application page E-9-44 of Chapter 9, these organizations have exhibited divergent positions or opinions concerning such development. See also Response to Comment A.17.

There are also many unresolved questions of land ownership that go beyond the current transitional land status situation. For example, state land disposal plans, which may have a dramatic effect on future land use in the project area, are rather short-term and subject to change. If the amount of lands currently planned for disposal is significantly more or less than the demand for the land, the Department of Natural Resources could shift disposal activity into or away from the project area. Similar circumstances apply to potential development of native lands. Native corportions owning land in the area have been asked by the Power Authority for their land management and development plans. To date, the corporations have not responded.

The Power Authority anticipates that these conditions of uncertainty will be reasonably considered in the DEIS and FEIS.

In short, the precise nature and magnitude of induced land use changes resulting from the construction and operation of the Project will be dependent upon action and circumstances that are beyond the ability of the Power Authority to predict or determine. Any attempt to develop a more

RESPONSE TO COMMENT F.71 (cont.):

detailed and quantitative assessment of induced land use changes would require so many assumptions about future actions by other decision makers as to be of questionable value. Rather than attempt such a methodology, the Power Authority is continuing to work with decision makers to determine and implement appropriate land use and land management policies. As these issues are settled, information on induced land use changes and mitigation programs will be updated and refined as necessary.

COMMENT F.72:

"DOCUMENT ORGANIZATION

"Review of the documents, specifically Exhibit E, was difficult, partially due to the volume of materials and partially due to the quality and organization of the application. Sections of Exhibit E require extensive editing before a meaningful review can be accomplished. There are numerous typographical errors, some of which may affect the meaning of passages. Blocks of text are missing, making it impossible to tell if omissions of key points are intentional. Other factual errors seem to stem from failure to check sources. There are improper citations, making it difficult to check facts."

RESPONSE:

In the FERC License Application the Power Authority followed the basic FERC outline for a major unlicensed project. The specific outline that evolved attempted to systematically examine the project on a number of parameters. These include:

1. Baseline information, impact analysis, mitigation planning, agency consultation, references cited.

2. Disciplines - hydrology, aquatic and terrestrial biology, archeology, recreation, socio-economic, etc.

3. Natural or pre-project conditions, construction, river diversion, reservoir filling, operation.

4. Watana Phase, Devil Canyon Phase.

5. Geographic breakdown - lower river, Talkeetna to Devil Canyon Reach, Devil Canyon to Watana, Watana to Tyone River, etc.

RESPONSE TO COMMENT F.72 (cont.):

Unfortunately, there is no simple, linear way through such a matrix of considerations. While only the germane cells of the matrix were discussed, the nature of an application document such as the Susitna License Application is that it becomes ponderous, complex and possibly confusing at times. The document seldom efficiently serves the needs of any specific reviewer because it anticipates the needs of a host of different reviewers. We have attempted to improve the editing of the Application and to provide assistance in finding specific analysis in the Application and/or support documents. We appreciate the patience and perseverance with which resource agencies have dealt with the Application.

COMMENT F.73:

"DOCUMENT ORGANIZATION

"Particularly confusing is the inconsistency among sections. Frequently a topic is covered in three or four different sections. In some cases, one section will completely contradict another. In these situations, one section will suggest that an impact is of minor significance or even beneficial to a species while another will suggest serious negative impacts. These inconsistencies suggest that the writers may have had incompletely formed views that changed as the document was written. For example, the summaries of impacts sections reflects DFG comments on the draft more clearly than do some other sections which also comment on project related impacts. These inconsistencies reflect a failure to edit and cross check different sections thoroughly. This makes it impossible to determine APA's actual view of the significance of key issues. The document should be edited extensively to make its meaning clear and consistent."

RESPONSE:

See Response to Comment F.72.

The Power Authority has provided guidance and/or clarification on specific points when requested but did not feel a re-editing and republishing of the Application and its support material was justified. More than 7000 pages of text and tables are now in the Application with about 1000 pages of supplementary material. Rather than re-edit this material into a "second edition," we feel it would be more efficient for attention to shift to the upcoming FERC DEIS, which will address the environmental concerns raised by DFG.

COMMENT F.74:

"DOCUMENT ORGANIZATION

"The environmental studies for the Susitna project were designed to be accomplished over a five-year period. Approximately three years of data are available at this time, however, the level of information contained in the license information does not reflect the data presently available to APA. Inclusion of available data would facilitate identification of areas requiring more study. Specific studies could then be designed to collect information needed to made decisions regarding project impacts and preliminary consideration could be given to possible mitigation considerations. Review of all available data may have also helped with the resolution of the outstanding issues identified earlier. Presently, the documents do not contain sufficient resource data on which to determine project feasibility. Comments regarding additional specific information needed to help determine the project's feasibility are enclosed."

RESPONSE:

As technical reports have been prepared, they have been provided to the FERC, resource agencies and public libraries. In addition, workshops have been held and are planned to review the scope of proposed studies and to review the product of ongoing analysis.

The Power Authority believes that sufficient information is available to reasonably assess the impacts of the proposed project and to plan mitigation measures. Additional studies are underway to refine impact analysis and mitigation plans. The product of these investigations will be made available to the FERC, the resource agencies and the public. The Power Authority anticipates that available information will be reasonably described and analyzed in the DEIS.

Regarding the length of the study plan, when dealing with anadromous fisheries in which there are pronounced differences between odd and even years, it is probably necessary to have at least two years of data. In all other cases, the data base will continue to improve over the next five or fifty years and confidence in the analysis will improve accordingly. But, there will be no "phase change" at five years that will change suddenly either the data base or our confidence in the data and analysis.

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Response Of
Alaska Power Authority To
November 18, 1983 License Application Comments
Of
State of Alaska,
Office of Management and Budget

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G

FEDERAL ENERGY REGULATORY COMMISSION

SUSITNA HYDROELECTRIC PROJECT

PROJECT NO. 7114

RESPONSE OF

ALASKA POWER AUTHORITY

TO

NOVEMBER 21, 1983 LICENSE APPLICATION COMMENTS

OF

UNITED STATES OF AMERICA,

DEPARTMENT OF THE AIR FORCE

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS ALASKAN AIR COMMAND
ELMENDORF AIR FORCE BASE, ALASKA 99506

(G)

1983 NOV 21

REGULATORY

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SUBJECT: Susitna Hydroelectric Project, Federal Energy Regulatory Commission License Application, ~~Docket #7114~~

TO: Secretary, Federal Energy
Regulatory Commission
Washington, D.C. 20426

1. The Alaskan Air Command has reviewed the documentation received from the Alaska Power Authority concerning the Federal Energy Regulatory Commission license application for the Susitna Hydroelectric Project, Docket #7114.

[G.1] 2. We have concern over the lack of information presented on routing of the transmission lines through the military reservations, but most specifically with the impact of the proposed corridor through Sections 9 and 10 of Township 14 North, Range 3 West, Seward Merridian. We require data on the exact routing, height and type of pole structure, width of easement, line voltages utilized, marking of the poles and lines for aircraft, and any additional construction proposed for the Air Force controlled lands in these sections. [G.2] Additionally, the impact of the proposed construction activities in the suggested corridor must be addressed with reference to the facilities presently in place on the installation, flight activities, communications and flight control transmission facilities and the physical security of the base. [G.3] The preceeding concerns are in addition to the impact on the ecological, physiological and natural resources in the proposed corridor.

[G.4] 3. In addition, the information of the line crossing through the Army lands at Fort Richardson was not addressed. Their impact would be the same as the Air Force, with the addition of the impact of the corridor crossing of the training and maneuver lands present on the installation. Their input is to be seriously considered as the major portion of the military lands crossing lies on their reservation.

4. Please add us to the mailing list for any future correspondence on this subject. The project officers are Mrs C.A. Wickstrom, HQ AAC/DEP and Mr James W. Hostman, HQ AAC/DEEV, Elmendorf AFB, Alaska 99506.

Ralph L. Hodge

RALPH L. HODGE, Colonel, USAF
DCS/Engineering and Services

cc: 172d Inf Bed (AK)/AFZT-EH
Alaska Power Authority
334 West 5th Avenue
Anchorage, Alaska 99501

8311230499

NOV .

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FEDERAL ENERGY REGULATORY COMMISSION
PROJECT NO. 7114
RESPONSE OF ALASKA POWER AUTHORITY TO COMMENTS OF
UNITED STATES OF AMERICA,
DEPARTMENT OF THE AIR FORCE

COMMENT G.1 (underlined text):

"2. We have concern over the lack of information presented on routing of the transmission lines through the military reservations, but most specifically with the impact of the proposed corridor through Sections 9 and 10 of Township 14 North, Range 3 West, Seward Merridian. We require data on the exact routing, height and type of pole structure, width of easement, line voltages utilized, marking of the poles and lines for aircraft, and any additional construction proposed for the Air Force controlled lands in these sections. Additionally, the impact of the proposed construction activities in the suggested corridor must be addressed with reference to the facilities presently in place on the installation, flight activities, communications and flight control transmission facilities and the physical security of the base. The preceding concerns are in addition to the impact on the ecological, physiological and natural resources in the proposed corridor."

RESPONSE:

The location of the proposed transmission line route in the section stated can be referenced in the FERC License Application Exhibit G, Plate G-30. Descriptions of the transmission facilities can be referenced in the FERC License Application Exhibit B (pages B-2-116 to B-2-121) and in the FERC License Application Exhibit A (pages A-4-1 to A-4-11).

Final line routing and procedures for construction through the Military Reservations will be accomplished through close coordination with military personnel during the engineering design phase of the project.

The following information describes the proposed transmission system located in Sections 9 and 10 of Township 14 North, Range 3 West, Seward Meridian, as described in the License Application:

RESPONSE TO COMMENT G.1 (cont.):

TRANSMISSION SYSTEM CHARACTERISTICS

Routing Voltage - Two 345 V Circuits (separate towers) adjacent and to the north of the existing 230 DV Chugach line.

Substation - Approximately an 1100 by 550 foot site (see License Application Exhibit F, Plate F-78) located in the southeast corner of section 9 and the southwest corner of section 10. Maximum height of structures in the substation will not exceed 120 feet.

Access - Access to the substation is proposed as a good road along the transmission line right-of-way. Existing access will be utilized where possible.

Right-of-Way - The ROW easement proposed is 250 feet or 300 feet from the center line of the existing transmission line.

Towers - Tower designs proposed at this time are two separate compact single pole structures (License Application Exhibit F, Plate F-80). Pole heights are approximately 120 feet. Lower (approximately 100 feet), "X" structure towers could be used but they would require more right-of-way. Tower designs will be finalized in the design phase of the project in coordination with Military Authority and when specific detail on locations is collected.

Line/Tower Marking - All FAA regulations will be complied with as a requirement of construction (specifically 14 C.F.R. § 77.11-77.19). At this time, no special marking of the poles or conductors for aircraft is anticipated. However, any specific concerns not known at this time will be addressed in the final design of the line.

Additional Construction - Construction in addition to the substation and towers will include a gravel access road on

RESPONSE TO COMMENT G.1 (cont.):

the right-of-way, and work related to the submarine cables on the shore of the Knik Arm in Section 9.

COMMENT G.2:

"2. We have concern over the lack of information presented on routing of the transmission lines through the military reservations, but most specifically with the impact of the proposed corridor through Sections 9 and 10 of Township 14 North, Range 3 West, Seward Merridian. We require data on the exact routing, height and type of pole structure, width of easement, line voltages utilized, marking of the poles and lines for aircraft, and any additional construction proposed for the Air Force controlled lands in these sectins. Additionally, the impact of the proposed construction activities in the suggested corridor must be addressed with reference to the facilities presently in place on the installation, flight activities, communications and flight control transmission facilities and the physical security of the base. The preceding concerns are in addition to the impact on the ecological, physiological and natural resources in the proposed corridor."

RESPONSE TO COMMENT G.2:

The only known facility presently in place or close to the proposed transmission line and substation is the 230 KV Chugach transmission line. Flight activities are not expected to be affected by the proposed lines.

Based on the preliminary studies and evaluation of RI (radio interference), TVI (television interference) and electromagnetic fields from the new lines, no undue influence is expected over those allowed by present codes and regulations.

Before construction begins, the methods, planning and security measures necessary will be closely coordinated with the appropriate military authorities.

COMMENT G.3 (underlined text):

"2. We have concern over the lack of information presented on routing of the transmission lines through the military reservations, but most specifically with the impact of the proposed corridor through Sections 9 and 10 of Township 14 North, Range 3 West, Seward Merridian. We require data on the exact routing, height and type of pole structure, width of easement, line voltages utilized, marking of the poles and lines for aircraft, and any additional construction proposed for the Air Force controlled lands in these sectins. Additionally, the impact of the proposed construction activities in the suggested corridor must be addressed with reference to the facilities presently in place on the installation, flight activities, communications and flight control transmission facilities and the physical security of the base. The preceding concerns are in addition to the impact on the ecological, physiological and natural resources in the proposed corridor."

RESPONSE:

Impacts of the transmission line on the natural resources were discussed in the FERC License Application chapters referenced below. Assessment of impacts in specific locations was not discussed unless investigations determined that significant impact would occur.

No significant impacts to the natural resources are expected to occur as a result of construction of the transmission line across military lands. The most prevalent environmental impact will be the removal of vegetation associated with clearing the right-of-way.

General mitigation measures to reduce or avoid adverse impacts were identified in the License Application. Detailed mitigation measures applicable in specific locations are being developed based on additional studies planned in the future for the transmission line routes. This is an ongoing process that will continue into the detailed engineering design and construction planning stages. Specific measures applied to the route through military lands will be developed in coordination with

RESPONSE TO G.3 (cont.):

military authorities in compliance with their general and specific environmental requirements.

REFERENCES

Alaska Power Authority, Susitna Hydroelectric Project FERC License Application Project No. 7114-000 (1983), Exhibit E, Chapter 3 (pages 244, 247, 248, Section 3.4), Chapter 4 (pages 64, 126), Chapter 7 (page 34), Chapter 8 (pages 10, 55, 58), Chapter 9 (pages 46-51), previously submitted to the FERC on July 11, 1983.

COMMENT G.4:

"3. In addition, the information of the line crossing through the Army lands at Fort Richardson was not addressed. Their impact would be the same as the Air Force, with the addition of the impact of the corridor crossing of the training and maneuver lands present on the installation. Their input is to be seriously considered as the major portion of the military lands crossing lies on their reservation."

RESPONSE:

Characteristics of the transmission line through Fort Richardson military lands are the same as those listed in the Response to Comment G.1. Routing of the transmission line adjacent to the existing Chugach transmission line is expected to result in the minimum impact possible through the military reservation.

Although the Department of the Army filed no comments on the FERC License Application for the proposed project, measures to reduce or avoid routing or construction related impact to specific military operations will be developed in the future in consultation with military authority.

H

FEDERAL ENERGY REGULATORY COMMISSION

SUSITNA HYDROELECTRIC PROJECT

PROJECT NO. 7114

RESPONSE OF

ALASKA POWER AUTHORITY

TO

AUGUST 23, 1983 LICENSE APPLICATION COMMENTS

OF

ALASKA DEPARTMENT OF NATURAL RESOURCES,

DIVISION OF PARKS

BILL SHEFFIELD, GOVERNOR

DEPARTMENT OF NATURAL RESOURCES

DIVISION OF PARKS

619 WAREHOUSE AVE. SUITE 210
ANCHORAGE, ALASKA 99501
PHONE (907) 276-2653

FILED

August 23, 1983

Re: 1130-13

Kenneth Plumb
Secretary
Federal Energy Regulatory Commission
825 N. Capitol Street, N.E.
Washington, D.C. 20426

Dear Mr. Plumb:

We have reviewed the proposed Susitna License Application Project No. 7114-000 project and would like to offer the following comments:

STATE HISTORIC PRESERVATION OFFICER [H.1]

We have no objection to the issuance of this permit and look forward to continued consultation on the cultural resources in the project area.

Ty L. Dilliplane
State Historic Preservation Officer

STATE PARK PLANNING [H.2]

No comment.

LAND AND WATER CONSERVATION FUND GRANT PROGRAM [H.3]

No comment.

Sincerely,

for

Neil C. Johannsen
Director

cc: William Wakefield, II, FERC

9080208

ALASKA STATE PARKS --
Let's Put Them on the Map!

FERC - DOCKETED
SEP 6 1983

FEDERAL ENERGY REGULATORY COMMISSION
PROJECT NO. 7114
RESPONSE OF ALASKA POWER AUTHORITY TO COMMENTS OF
ALASKA DEPARTMENT OF NATURAL RESOURCES

COMMENT H.1:

"STATE HISTORIC PRESERVATION OFFICER

"We have no objection to the issuance of this permit and look forward to continued consultation on the cultural resources in the project area."

RESPONSE:

None.

COMMENT H.2:

"STATE PARK PLANNING

"No comment."

RESPONSE:

None.

COMMENT H.3:

"LAND AND WATER CONSERVATION FUND GRANT PROGRAM

"No comment."

RESPONSE:

None.