

LIST OF SUPPLEMENTAL INFORMATION AND
CLARIFICATION NEEDS

Draft Susitna Application
Exhibit E

SUS
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CLARIFICATION NEEDS

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Exhibit E

December 21, 1982

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1. GENERAL DESCRIPTION OF THE LOCALE

1. p. E-1-2, ¶ 4

Provide information on ambient air quality and on air quality regulations pertinent to the project region and locale. In addition, provide data on wind speed, wind direction, and inversion depth and duration in the project area.

2. WATER USE AND QUALITY

1. p. E-2-5, ¶ 3 to
p. E-2-10, ¶ 2
Provide river morphology data including: channel cross-sections, slope as a function of reach, and photographs, including an estimate of the changes from 1950 to 1980, concentrating on River Miles 149 to 184. Provide slough cross-sections, depth profiles and water surface profiles.
2. p. E-2-15, ¶ 3
Identify sloughs and side channels that do not form winter ice cover.
3. p. E-2-15, ¶ 5;
p. E-2-42, ¶ 3-5;
p. E-2-55, ¶ 7 to
p. E-2-56, ¶ 4;
p. E-2-91, ¶ 5
Provide analysis supporting conclusions regarding impacts on river morphology.
4. p. E-2-16, ¶ 1-5
Provide mainstem bedload data.
5. p. E-2-17, ¶ 4
p. E-2-24, ¶ 1-2
Provide data supporting the effect of groundwater on sloughs. Provide data to support conclusions regarding hydraulic connections between mainstem and sloughs.
6. p. E-2-39, ¶ 1
Provide data supporting estimate of flow required to maintain minimum 2 ft. river stage.
7. p. E-2-33, ¶ 1;
p. E-2-86, ¶ 1
Quantify projected increase in the ice-free extent of the river.
8. p. E-2-3, ¶ 1-2
Include in Table E.2.1 all the gaging stations identified in Figure E.2.1. Make data given in Table E.2.1, Table E.2.2, and Figure E.2.1 consistent.
9. p. E-2-3, ¶ 3
Include baseline monthly flows at each location (as shown in the heading of Table E.2.2) from 32-year simulated streamflows.
10. p. E-2-4, ¶ 1
Discuss skewness of logarithmic flow data. Discuss why log-normal distribution rather than Log Pearson III distribution was used for fitting data. Discuss basis for selecting flood peaks presented. Include daily flood hydrographs for low, average, and high flow years. Provide frequency and duration of flows over 20,000 cfs.

11. p. E-2-4, ¶ 2 Explain the methodology used to obtain the flood frequency curves for Watana and Devil Canyon. Indicate how the estimated 10,000-yr floods for these two locations were determined.
12. p. E-2-4, ¶ 4 Include a reference and the methodology used to estimate PMF. Include the water surface profile of the Susitna River associated with PMF.
13. p. E-2-4, ¶ 5 to
p. E-2-5, ¶ 2 Include flow duration curves for the Chulitna River. Include comparable data (Figures E.2.18-E.2.25) for November through April. Include daily hydrographs for high and low flow years of record.
14. p. E-2-23, ¶ 4 Include potentiometric maps for the major confined and unconfined aquifers in the Susitna River Basin, and a description of groundwater occurrence and movement in the basin. Provide a cross-section profile showing major aquifers with associated hydraulic conductivities (particularly in the area of the relict channel about 2600 ft upstream of the Watana Dam).
15. p. E-2-24, ¶ 4 Provide more data on the 63-acre lake, e.g., volume, maximum depth, mean depth, shoreline length, and area-capacity curve.
16. p. E-2-25, ¶ 2 Include the USGS map with the stream names presented in Tables E.2.10 and E.2.11 identified.
17. p. E-2-25, ¶ 3 Identify all sloughs that will be inundated.
18. p. E-2-31 Include the thalweg profile between Watana to Talkeetna. Provide water surface profiles between Watana and Talkeetna for Susitna River releases of 1,000, 6,000, 12,000, 14,000, 18,000, 20,000 and 32,000 cfs. Provide water surface elevation of the Susitna River, during the discharge events specified above, at stream flow control points between Watana and Talkeetna. Further, provide water surface profiles of representative sloughs and side channels during 1,000 cfs mainstem releases, assuming September low flow slough conditions.
19. p. E-2-35, ¶ 1
p. E-2-70, ¶ 5;
p. E-2-76, ¶ 2;
p. E-2-85, ¶ 3 Provide sufficient supporting data to predict impacts to major confined and unconfined aquifers in the Susitna River Basin. Include changes in groundwater flow and water tables.
20. p. E-2-35, ¶ 3 Describe anticipated impacts for flows greater than the 50-yr event.

21. p. E-2-39, ¶ 5 to
p. E-2-40, ¶ 5 Explain how flow data for 1991-1993 were obtained and developed. Include details of reservoir filling simulation and rationale for flow data selected for this study. Describe testing and commissioning criteria.
22. p. E-2-41, ¶ 3 Provide Figure E.2.77.
23. p. E-2-51, ¶ 4 Include the monthly operating rule curve for the reservoir and monthly minimum energy demands with associated average discharges through the powerhouse for reservoir modeling study. Explain why only 32-year simulated flow data were used for monthly energy simulation, why the extreme drought of the period of record was modified to reflect a drought with recurrence interval of one in 32 years, and how this alteration of the data set affects projected flows.
24. p. E-2-52, ¶ 1 Include the constraints considered in the optimization study. Is this study for the Watana development only?
25. p. E-2-52, ¶ 3 Explain the relationship between the constant daily flows and variable downstream monthly flow requirements at Gold Creek during May through September. Provide estimates and supporting data on projected changes in daily average flows.
26. p. E-2-52, ¶ 5 Indicate initial reservoir conditions for the post-project reservoir simulation.
27. p. E-2-55, ¶ 5-6 Indicate the order of priority for these three criteria if they cannot be satisfied simultaneously. Discuss the basis used to select these three criteria. Include legible copies of Figures E.2.85 through E.2.88. Provide comparable analyses based on daily flows.
28. p. E-2-78, ¶ 3 Explain the relationship between daily operation levels and monthly reservoir operating rule curves. Provide estimates and supporting data on projected changes in daily average flows.
29. p. E-2-81, ¶ 1 Indicate how many outlets there are for each reservoir. Is the outlet capacity equal to 11,600 cfs (31,000 minus 19,400)? Provide the capacity of the powerhouse and outlet facilities for Watana and Devil Canyon reservoirs.
30. p. E-2-82, ¶ 2 Provide comparable analyses based on daily flows and include flow duration curves for pre-project and project conditions. Provide legible copies of Figures E.2.97 through E.2.10J.

31. p. E-2-92, ¶ 2 Provide support for the conclusion that ice jams will be reduced under base loading conditions.
32. Describe project-related activities, including construction activities, for the relict channel in sufficient detail to assess potential groundwater problems, including seepage.
33. Describe the Phase I Recreation Plan, including the trail, in sufficient detail to assess potential impacts to water resources (water quantity).
34. p. E-2-13, ¶ 1 Provide additional seasonal (monthly) and diurnal slough water temperature (intergravel and water column) data of representative sloughs.
35. p. E-2-25, ¶ 6, to
p. E-2-26, ¶ 2;
p. E-2-28, ¶ 2-5 Provide additional water use data (surface water and groundwater). Identify, characterize, and quantify current discharges to the Susitna River Basin (project area). Discuss the water rights policies in the State of Alaska and the state's responsibility to apportion rights to use water among competing users. Discuss the Alaska Department of Natural Resources water rights appropriation doctrine.
36. p. E-2-26, ¶ 4, to
p. E-2-27, ¶ 6;
p. E-2-66, ¶ 5 to
p. E-2-67, ¶ 3 Quantify water use (navigation and transportation).
37. p. E-2-28, ¶ 6, to
p. E-2-29, ¶ 2;
p. E-2-67, ¶ 4 Supply background salinity data on a monthly basis for the center of Cook Inlet and mouth of the Susitna River. Include uncertainties in these estimates. Provide program manual and user's manual for the RMA salinity modeling.
38. p. E-2-29, ¶ 4-5;
p. E-29, ¶ 6 to
p. E-30, ¶ 6 Provide water resources data (summary which includes identification and characterization of existing water bodies) for access routes and transmission corridors (including Knik Arm of Cook Inlet).
39. p. E-2-32, ¶ 5, to
E-2-34, ¶ 5;
p. E-2-37, ¶ 3-7;
p. E-2-38, ¶ 1;
p. E-2-69, ¶ 2, to
E-2-70, ¶ 3;
p. E-2-71, ¶ 4, to
E-2-72, ¶ 1;
p. E-2-72, ¶ 2;
p. E-2-75, ¶ 8, to
E-2-76, ¶ 1;
p. E-2-85, ¶ 2 Characterize and quantify project-related discharges (e.g., suspended solids, metals, petroleum products, concrete contamination and nutrients) for all phases of activity (construction-operation). Include uncertainties in these estimates. Discuss discharge treatment/control measures. Specify required discharge permits.

40. p. E-2-42, ¶ 6, to E-2-47, ¶ 2;
p. E-2-56, ¶ 5, to E-2-65, ¶ 2;
p. E-2-73, ¶ 6, to E-2-76, ¶ 1;
p. E-2-82, ¶ 3, to E-2-85, ¶ 1
- Include additional quantification of changes in water quality parameters (e.g., temperature, suspended solids, turbidity, dissolved oxygen, and nutrients) for the project area (reservoirs and downstream, including sloughs and Upper Cook Inlet) on a daily and monthly basis. Uncertainties in these estimates should be indicated. Specifically:
- Provide additional information on the behavior of suspended solids and on vertical illumination in the reservoirs in sufficient detail to determine distribution profiles in the reservoirs and downstream loading of suspended solids.
 - Provide quantification of valley wall slumping and resulting increases in suspended solids within the reservoir and downstream.
 - Provide additional information on reservoir operations (intake levels versus thermal profiles) to achieve desired downstream temperatures on monthly basis.
 - Provide downstream temperature and suspended solids changes (main channel and slough, including intergravel and water column) on a daily and monthly basis at streamflow control points and representative sloughs.
 - Provide similar information on impacts to water quality (temperature and suspended solids) during drought and flood years of 50-year recurrence interval.
 - Provide information on modeling efforts (program and users manuals) for technical evaluation (e.g., DYRESM and suspended solid/turbidity relationship).
41. p. E-2-49, ¶ 3, to E-2-50, ¶ 1;
p. E-2-66, ¶ 5, to E-2-67, ¶ 3;
p. E-2-76, ¶ 5
- Provide navigation and transportation changes due to altered flows and altered open-water or winter-ice conditions.
42. p. E-2-50, ¶ 4-6;
p. E-2-67, ¶ 4;
p. E-2-86, ¶ 2
- Provide additional quantification of salinity changes for the center of Cook Inlet and mouth of the Susitna River on a monthly basis. Include uncertainties in these estimates.
43. p. E-2-87, ¶ 2-6;
p. E-2-88, ¶ 1-7
- Quantify water quantity and quality changes associated with all access routes and transmission corridors, including the submarine cable. Include

details of construction/operation that will be used to minimize impacts.

44. p. E-2-90, ¶ 1, to
E-2-93. ¶ 2

Include elements of the Aquatic Studies Program relevant to water use and quality. Provide the refined conceptual mitigation plan based on the Aquatic Studies Program and consultation with appropriate agencies.

- 45.

Describe project-related activities including construction activities, for the relict channel in sufficient detail to assess potential impacts to water use and quality.

- 46.

Describe the Phase I Recreation Plan including the trail, in sufficient detail to assess potential impacts to water use and quality.

3. FISH, WILDLIFE, AND BOTANICAL RESOURCES

AQUATIC RESOURCES

1. p. E-3-9 to
p. E-3-11
Provide, on a monthly basis, the historical commercial catch of the five salmon species in the Upper and Lower Cook Inlet and other subregions as available. The data should include, by species, catch, effort, age, and sex.
2. p. E-3-11 to
p. E-3-12
Provide, on a monthly basis, the historical sport catch of the five salmon species in the Upper Cook Inlet and in the Susitna River. The data should include, by species, catch, effort, age, and sex. Provide similar data for Arctic grayling and rainbow trout in the Susitna River and in the project area. Describe how fisheries impacts will be incorporated in the applicant's plans for mitigation, aquatic studies, and monitoring studies.
3. p. E-3-12
Provide data on the geographic distribution for the sport fishing harvests listed at the top of p. E-3-12.
4. p. E-3-12 to
p. E-3-34
Provide the 1980-1982 ADF & G investigations of the Susitna for salmon, Bering cisco, and eulachon, and rainbow trout and Arctic grayling.
5. p. E-3-15, ¶ 1
Provide the percentage of rearing habitats from Devil Canyon to Talkeetna represented by tributary mouths and clearwater sloughs.
6. p. E-3-17, ¶ 3
Provide data to support the statements concerning age composition of sockeye.
7. p. E-3-18, ¶ 3
Comment on the extent to which Morrow's (1980) results can be extrapolated to the Susitna.
8. p. E-3-20, ¶ 2
Indicate to what extent this description is applicable to salmon in the Susitna River.
9. p. E-3-29, ¶ 4
Assuming the spawning habitat is not a limiting factor for grayling, indicate what factor (or factors) does control grayling populations.
10. E-3-29, ¶ 4
Indicate whether gillnets were used in Deadman Lake as they were in Sally Lake.

11. E-3-34
section title Provide a breakdown by percentage of the habitat types and the effects of flow changes on each type from Devil Canyon to Talkeetna.

12. p. E-3-35 to
p. E-3-36 Indicate whether 1982a, 1982b, or 1982c is appropriate for each Trihey citation. Also, provide information on habitat areas (e.g., number and surface area of sloughs), uniqueness of habitat types, and changes experienced under various flow regimes.

13. p. E-3-35, ¶ 3 Provide the data to support the statement that tributary and groundwater inflows are not necessary for side-channel habitats to exist.

14. p. E-3-37, ¶ 3 Provide data on how many chinook salmon reach the impoundment area, the flow conditions under which they reach this area, and the estimated importance of this area to chinook salmon populations in Cook Inlet.

15. p. E-3-38, ¶ 2 Provide a breakdown by percentage of the year-round habitats of rainbow trout.

16. p. E-3-39, ¶ 2 Discuss the existence and significance of nitrogen supersaturation as a natural condition in the Devil Canyon to Talkeetna Reach as indicated in Chapter 2 (p. E-2-20).

17. p. E-3-39, ¶ 2,
1st item Provide information on the occurrence and extent of oxygen supersaturation in this and other reaches of the Susitna River.

18. p. E-3-40, ¶ 3 Provide data to show that 1981 data for pink salmon, which is a 2-year species, are applicable in terms of determining whether or not this species utilizes the mainstem Susitna for spawning.

19. p. E-3-42, ¶ 5 Provide the preliminary observations of the source of the upwelling waters.

20. p. E-3-45, ¶ 3 Describe and quantify, where possible, the use of sloughs in the Talkeetna to Devil Canyon Reach by resident fish.

21. p. E-3-46, ¶ 1 Identify the tributaries capable of moving delta materials under regulated flow conditions and provide the velocities maintained in these tributaries under regulated flows.

22. p. E-3-46, ¶ 2 Provide the data on spawning counts for individual tributaries.

23. p. E-3-46, ¶ 3 Provide the data on species occurrence and relative abundance of juvenile salmon in tributaries or at tributary mouths by season and by species.
24. p. E-3-47, ¶ 5 Provide a copy of the study, including a map locating the study sites.
25. p. E-3-48, ¶ 3-4 Provide details on the effects of flow changes on channel width and physical habitat in the main channel and side channels.
26. p. E-3-49, ¶ 6 Provide data showing the relationship between salmon movement during migration periods and river discharge.
27. p. E-3-50, ¶ 6 Provide the basis for the statement that sloughs below Talkeetna appear to be less dependent on the mainstem Susitna River than the sloughs located in the Talkeetna to Devil Canyon Reach.
28. p. E-3-51, ¶ 5;
p. E-3-53, ¶ 6 Describe the use of sloughs and tributaries in the Cook Inlet to Talkeetna Reach for spawning habitat by eulachon and Bering cisco (utilize maps where appropriate).
29. p. E-3-54, section heading Provide additional detail on stream crossings in road corridors and on the habitats and fish species likely to be affected by these crossings.
30. p. E-3-54, ¶ 6 Reference the appropriate figure in discussing sloughs 19 and 20; these sites should be located on a map. Reference to appropriate tables and figures would greatly facilitate use and evaluation.
31. p. E-3-55, section heading Provide locations of stream crossings in transmission line corridors and the effect of these crossings on habitats and fish species likely to be affected by these crossings.
32. p. E-3-56, ¶ 3 Provide a work plan of the data collecting and analysis programs currently planned or in progress.
33. p. E-3-58, ¶ 3 Quantify the area to be dewatered by installation of the two cofferdams.
34. p. E-3-58, ¶ 4,
line 5 Clarify use of the word "may."
35. p. E-3-59, ¶ 2 Include Taff et al. (1975) in the reference list.
36. p. E-3-59, ¶ 3 Explain why few fish are expected to occupy the area in front of the diversion tunnels in the summer. Quantify what is meant by "few fish."

37. p. E-3-60, ¶ 2 Describe the holding ponds in terms of location, size, and flow.
38. p. E-3-62, ¶ 1 Clarify the statement that fish motility and ability to clean up spills is increased in winter.
39. p. E-3-62, ¶ 3 Provide the guidelines set forth in Joyce, Rundquist and Moulton (1980).
40. p. E-3-64, ¶ 3 Quantify the excavated areas that will be permanently lost as fish habitat and the areas that will be temporarily altered.
41. p. E-3-65, ¶ 4 Provide data on the physical, chemical, and biological characteristics of the lake the village is to be built around.
42. p. E-3-67, ¶ 1 Reference the detailed description of the diversion tunnels and their operation.
43. p. E-3-67, ¶ 3 Provide data on the resident fish populations inhabiting the impoundment area.
44. p. E-3-68, ¶ 2,
line 4 Clarify the use of the word "probably."
45. p. E-3-68, ¶ 3,
lines 9-12 Support the claim that "turbidity levels of the impoundment are expected to be suitable for ...Susitna River."
46. p. E-3-68, ¶ 3,
lines 16-19 Clarify this sentence.
47. p. E-3-69, ¶ 2 Provide results from the "aquatic studies in progress" as soon as they are available.
48. p. E-3-69, ¶ 3 Characterize and quantify the possible loss of spawning areas in tributary habitats as the reservoir fills.
49. p. E-3-70, ¶ 3 Specify (a) how turbidity levels in lakes are correlated with the absence of grayling or (b) the carrying capacity of tributaries for grayling and how this capacity varies with size of the grayling.
50. p. E-3-70, ¶ 7 Provide a map identifying all lakes to be inundated by Watana Reservoir and the results of any population studies conducted on each lake.
51. p. E-3-71, ¶ 2 Reference other parts of Exhibit E, especially Chapter 2; this is a generic problem with Section 3.2.

52. p. E-3-71, ¶ 3 Clarify the apparent conflict between the statement that "anadromous fish are prevented from using habitats upstream of the canyon" and the statement on p. E-3-37, ¶ 3, that "adult chinook salmon were documented to RM 158.2."
53. p. E-3-71, ¶ 4, Clarify the intent of the word "likely."
54. p. E-3-72, ¶ 1 Reference the appropriate subsection in Chapter 2.
55. p. E-3-72, ¶ 2 Describe the water surface profile model. Include data showing channel cross sections and water surface elevations.
56. p. E-3-72, ¶ 3 Provide a quantitative analysis of the availability of these holding areas as a function of flow.
57. p. E-3-73, ¶ 2 Provide a quantitative analysis of the availability of these spawning areas as a function of flow.
58. p. E-3-73, ¶ 3 Correct the Figure E.2.19 reference. Quantify the effect of rapidly decreasing fall flows during the filling schedule on various habitat characteristics.
59. p. E-3-74, ¶ 1 Provide the supporting data and analysis for the statement that releases from the reservoir will be near 10 C during July, August, and early September during the third year of filling.
60. p. E-3-74, ¶ 2 Provide the unpublished and cited reports investigating the effects of temperature on salmon behavior, spawning, and development.
61. p. E-3-74 to
p. E-3-76,
Side-Channel
Habitats Provide a quantitative analysis of how the physical characteristics and suitability of these side-channel habitats change as a function of flow.
62. p. E-3-76, Slough
Habitats Provide a quantitative analysis of how the physical characteristics and suitability of the sloughs change as a function of flow.
63. p. E-3-76, ¶ 5 Correct the reference to [Section 2.2(b)(iii)].
64. p. E-3-77, ¶ 3 Provide the supporting data and analysis on the minimum flows required to ensure easy passage of salmon adults into slough habitats.
65. p. E-3-78, ¶ 1 Quantify the additional rearing habitat that may become available in mainstem and side-channel habitats.
66. p. E-3-79, ¶ 1 Provide a breakdown by percentage of the habitats receiving salmon escapement.

67. p. E-3-79, ¶ 3 Clarify the comments concerning how the rearing areas associated with tributary habitats will be affected by lower mainstem flows.
68. p. E-3-79, ¶ 4 Include additional data and analyses to support the statement on down cutting of tributaries.
69. p. E-3-79, ¶ 4, lines 9-13 Clarify this sentence.
70. p. E-3-79, ¶ 4, lines 15-22 Provide the report of the study of possible perched tributaries.
71. p. E-3-80, Cook Inlet to Talkeetna Reach Provide a quantitative analysis of how the physical characteristics and suitability of mainstem habitats (p. E-3-80 to E-3-83), side-channel habitats (p. E-3-83 to E-3-84), slough habitats (p. E-3-84), and tributary habitats (p. E-3-85) will change with changes in flow.
72. p. E-3-81, ¶ 4-5 Provide stage-discharge relationships or representative cross sections for these mainstem habitats.
73. p. E-3-82, ¶ 2 Correct the reference to Table E.e.18.
74. p. E-3-82, ¶ 4, lines 5-6 Provide support for the statement that "the most critical time for fish occurs when flows are lowest."
75. p. E-3-82, ¶ 4, lines 9-11 Reference the appropriate subsection in Chapter 2.
76. p. E-3-83, ¶ 3 Provide detail on the limited rearing of juvenile salmon in side-channel habitats.
77. p. E-3-84, ¶ 5 Provide a quantitative analysis of how the slough habitats in the Cook Inlet to Talkeetna Reach may be affected by changes in flow.
78. p. E-3-87, Talkeetna to Watana Dam Provide a quantitative analysis of how the physical characteristics and suitability of the four habitat types (mainstem, side-channel, slough, and tributary) may change as a function of changes in flow.
79. p. E-3-87, ¶ 4 Indicate that the ability of chinook salmon to pass through Devil Canyon and utilize spawning habitat available in tributaries upstream from Devil Canyon and below Watana Dam is only temporary.
80. p. E-3-88, ¶ 4 Clarify whether sediments less than or greater than 5 microns in size would be trapped by the reservoir.

81. p. E-3-89, ¶ 2 Include additional data and analyses to support the statements on rearing habitat in the mainstem.
82. p. E-3-90, ¶ 2 Support the statement that particles greater than 5 microns would remain in suspension in the reservoir.
83. p. E-3-90, ¶ 3, line 5 Clarify the reference to RM 14.
84. p. E-3-91, ¶ 1, line 3 Clarify the use of the word "if."
85. p. E-3-91, ¶ 3 Include additional detail on this USFWS study.
86. p. E-3-93, ¶ 5 Include additional data and analyses to support the statements concerning the benefits of increased flows for overwintering habitats in side channels.
87. p. E-3-94, ¶ 4 Quantify the effects of ice on the slough habitats as early nursery areas for emerging fry.
88. p. E-3-96, ¶ 3 Quantify the increase in depth and wetted perimeter under post-project flows for mainstem habitats.
89. p. E-3-96, ¶ 5 Quantify the increase in wetted perimeter resulting from greater winter discharge for side-channel habitats.
90. p. E-3-101, Inundation of Upstream Habitats Estimate the loss of habitat for chinook salmon above Devil Canyon Dam and below Watana Dam that would temporarily be made more available during the filling of Watana Reservoir.
91. p. E-3-102, ¶ 4 Quantify the loss of tributary habitats.
92. p. E-3-106, ¶ 2 Define "sheet flow" and clarify the sentence describing what happens when a road bisects a wetland.
93. p. E-3-107, ¶ 1, line 6 Clarify the use of the word "can."
94. p. E-3-107, ¶ 3 Describe the species of fish known to be in Tsusena Creek and Devil Creek.
95. p. E-3-107, ¶ 4 Provide detail on the manner of construction of the road between Watana and Devil Canyon.
96. p. E-3-108, ¶ 3 Indicate whether the option of building on trestles rather than fill is preferable or how the decision concerning this option will be made.
97. p. E-3-110, ¶ 1, line 8 Clarify the use of the word "productivity."

98. p. E-3-113, ¶ 3 Provide additional information on the anadromous species utilizing Knik Arm as a migration route.
99. p. E-3-114, ¶ 4 Describe how "the vegetation is usually limited to grasses and shrubs."
100. p. E-3-116;
p. E-3-117 Provide the work plan for the Aquatic Studies Program during the preconstruction phase, the construction phase, and the filling and operation phases.
101. p. E-3-117 Provide the monitoring plan proposed during construction and operation.
102. p. E-3-121, ¶ 2 Provide information on locations of stream crossings and important fish habitats likely to be impacted by these crossings.
103. p. E-3-124, ¶ 5 Provide information on rehabilitation methods and on the effectiveness of these proposed methods in preventing impacts in aquatic systems with respect to grading, contouring, shaping, and revegetation of disturbed stream banks, abandoned settling ponds, and borrow sites.
104. p. E-3-126, ¶ 6 Provide details on blasting guidelines that are to be followed to protect fish.
105. p. E-3-127, ¶ 1 Provide documentation to support the statement that "relatively few fish are present in the tunnel entrance vicinity."
106. p. E-3-127, ¶ 2 Provide the reason why fish lost in the diversion tunnel would have been lost during reservoir filling.
107. p. E-3-129, ¶ 5 Quantify the effect of flow reductions on access of salmon to spawning sloughs.
108. p. E-3-130, ¶ 1 Include data and analyses to support the statement on flows at Gold Creek needed to avoid impacts on adult salmon.
109. p. E-3-130, ¶ 3 Clarify the apparent conflict between the statement "winter flow regimes will be reduced during filling flow regimes" with information in Table E.3.17.
110. p. E-3-130, ¶ 3 Clarify the last sentence of the first paragraph under "Winter Flow Regime."
111. p. E-3-131, ¶ 1 Provide details of ongoing studies of potential impacts to slough habitats.

112. p. E-3-131, ¶ 5 Provide details of planned or ongoing studies to evaluate the effects of spring breakup on fry migration.
113. p. E-3-132, ¶ 4 Provide data and analyses to support the statement on proposed operational flows from July 25 to September.
114. p. E-3-133, ¶ 2 Provide the level and duration of flows to be provided to minimize impacts, and the study identifying how these flows were derived.
115. p. E-3-133, ¶ 3 Provide results of previous efforts designed to modify sloughs.
116. p. E-3-134, ¶ 1 Provide details of baseline (i.e., pre-project) studies on outmigration of fry in the Susitna River or in adjacent unregulated streams.
117. p. E-3-135, ¶ 4 Provide details of candidate sites in which sub-states would be added, cleaned, or otherwise modified in order to improve spawning habitat for salmon. Provide documentation of the effectiveness of such mitigation techniques.
118. p. E-3-137, ¶ 4 Clarify the phrase "preventing temperature regulation."
119. p. E-3-138, ¶ 1 The sentence implies that there is doubt as to whether a layer of 8 to 12 C water will exist in the top 100 feet of the reservoir. Explain the uncertainty.
120. p. E-3-138, ¶ 3 Provide information on alternate food sources that would be available to salmon fry in late winter/early spring in the Susitna River and Cook Inlet. Expand on the topic of food resources by reference to the published literature on feeding by juvenile salmon.
121. p. E-3-138, ¶ 4 Provide a breakdown by percentage of the spawning and rearing habitats in the project area that will be inundated by the reservoir. Provide an estimate of the potential additional alternative habitat made available when the reservoir is filled.
122. p. E-3-139, ¶ 1 Provide a breakdown by percentage of the grayling spawning habitat in the project area that will be inundated by the reservoirs.
123. p. E-3-139, ¶ 3 Under measures to minimize impacts, one mitigation procedure (lowering the surface elevation during the incubation period of grayling) is mentioned. The paragraph concludes that "neither measure

would be feasible." Explain what the other mitigation approach would be.

124. p. E-3-141, ¶ 3 Provide a discussion on the effects of access restriction and harvest regulations on harvestable fish populations in Alaskan streams, such as those in the Susitna drainage.
125. p. E-3-142, ¶ 1 Provide a description of the type of grayling compensation program planned, the location of the anticipated releases, and the proposed schedule of program implementation and operation.
126. p. E-3-143, ¶ 1 Quantify the effect of cone valves on dissolved oxygen levels downstream.
127. p. E-3-144, ¶ 5 Provide a map locating the sloughs to be modified. Provide reports of the studies identifying applicable slough modification techniques, and provide the proposed schedule of program implementation and operation. Provide results of previous experience with similar artificial spawning channels.
128. Table E.3.6 Determine the accuracy of helicopter surveys for estimating the relative abundance of escaping chinook salmon, as opposed to other salmon species.
129. Table E.3.13 Provide estimates of density in terms of number per unit area of stream and the total area of each stream occupied by grayling.
130. Table E.3.14 Provide details on cleaning and what the mechanism of potential effects on fish will be.
131. Table E.3.16 Clarify the column heading for this table.
132. Table E.3.16a Explain why increased winter water temperatures and increased summer water temperatures are listed as major impact issues in this table and not in Table E.3.21.
133. Table E.3.20 The values of river miles to be inundated do not agree with values in Table E.3.16. Include information for Deadman Creek in this table.
134. Tables E.3.27, 28, & 29 Provide pre-project streamflows for comparison. Provide the percentage change from pre-project flows resulting from operation of the Watana/Devil Canyon dams for each month.
135. Chapter 7 Provide an analysis of the impact of the Phase 1 Recreation plan on the fisheries resources of the project area.

TERRESTRIAL BOTANICAL RESOURCES

1. p. E-3-146, ¶ 6 Provide a complete floristic survey for the Willow to Cook Inlet and Healy to Fairbanks transmission corridors.
2. p. E-3-148, ¶ 4, to
p. E-3-149, ¶ 5 Describe the methodology used to select sites surveyed for endangered or threatened species.
3. p. E-3-148, ¶ 4 Provide justification as to why Borrow Site A was the only borrow site searched for endangered and threatened species, given that other borrow sites (e.g., D, H, F, and C) will also not be inundated.
4. p. E-3-150, ¶ 2 Provide results of surveys for the presence of proposed endangered and threatened plant species along the transmission corridors from Healy to Fairbanks and Willow to Cook Inlet.
5. p. E-3-151, ¶ 4 Provide a quantitative estimate of the likelihood that forests within several kilometers of the Susitna River may be harvested for merchantable timber.
6. p. E-3-151, ¶ 5, to
p. E-3-165, ¶ 3 Resolve conflicts in the definition and designation of vegetation types between the map (Figure E.3.W1), the tables (Tables E.3.W4, E.3.W20, and E.3.W24-E.3.W26) and the text; for example, communities listed in the tables are not all located on the map and communities discussed in the text are not all listed in the tables.
7. p. E-3-151, ¶ 5 Provide additional vegetation maps that use a smaller scale (on the order of 1:24,000 for the impoundment area and 1:63,400 for other project areas) for areas affected by project facilities and other operation. The reproduction of Figure E.3.W1 and other maps to be provided should be of better quality than used for the draft Exhibit E. Locate landmarks (e.g., damsites, impoundment outlines) on the maps as appropriate to the scale.
8. p. E-3-152, ¶ 4 Clearly indicate the location of wetlands and herbaceous community types in Figure E.3.W1.
9. p. E-3-153, ¶ 4 Check Table E.3.W6 to ensure that the average cover percentages listed for the overstory are correct; the table now implies (1) that there is a great deal of overlap between the black and white spruce canopies in the overstory layer, and (2) that total black spruce cover (22%) and white spruce cover (17%) are relatively equal rather than black spruce truly dominating.

10. p. E-3-153, ¶ 6 Resolve the conflict between this paragraph and Table E.3.W7; prickly rose is identified in the text as one of the two most important ground layer species but it is shown in the table to have only 5% cover in the ground layer.

11. p. E-3-154, ¶ 1 Resolve the conflict between this paragraph and Table E.3.W7; crowberry, northern Labrador tea, bog blueberry, and mountain cranberry are identified as accounting for much of the woody ground layer in both black and white spruce forests but none of these species is listed in Table E.3.W7.

12. p. E-3-154, ¶ 3, to
p. E-3-155, ¶ 2 Resolve the conflict between community type designations in this section and those in Table E.3.W4 and Figure E.3.W1; the text describes three types of deciduous forest communities (balsam poplar, birch, and aspen) whereas the table and map identify only one type (birch).

13. p. E-3-156, ¶ 4
and ¶ 5 Identify the major species characteristic of herbaceous alpine tundra (including a table for the herb-sedge type that is similar to Tables E.3.W14 through E.3.W16).

14. p. E-3-157, ¶ 4, to
p. E-3-158, ¶ 2 Resolve the numerous conflicts between the text of this section and Tables E.3.W18 and E.3.W19, if these tables are meant to represent willow and birch stands, respectively.

15. p. E-3-158, ¶ 3
and ¶ 5, to
p. E-3-159, ¶ 6 Clearly identify in Table E.3.W4 and Figure E.3.W1 herbaceous and wetland vegetation types that are discussed in the text.

16. p. E-3-158, ¶ 3 Provide the names of major species that comprise herbaceous pioneer communities on gravel and sand bars.

17. p. E-3-159, ¶ 6 Describe the studies that are being conducted to classify and map wetlands. Provide the classification system being used and results of the studies currently being conducted.

18. p. E-3-160, ¶ 1 Resolve conflicts between this paragraph and Table E.3.W20: (1) according to the text, balsam poplar stands cover 18% of the Devil Canyon area, notably on the floodplain, yet these stands are not identified in the table; and (2) the table indicates that no deciduous or birch stands occur in the Devil Canyon area, but the text states that deciduous (mostly birch) stands do occur on the slopes.

19. p. E-3-162, ¶ 2 Resolve the conflict between this paragraph and Table E.3.W23; the text indicates that white spruce cover is 42%, whereas the table shows white spruce cover as 12% and birch cover as 42%.
20. p. E-3-164, ¶ 7, to
p. E-3-165, ¶ 2 Include a table similar to Tables E.3.W24 through E.3.W26 for the Willow to Healy corridor.
21. p. E-3-165,
last line Provide the missing information.
22. p. E-3-166, ¶ 1 Correct the typographical error omitting the proportion of open birch stands.
23. p. E-3-166, ¶ 3;
p. E-3-177, ¶ 2 Provide an estimate of the number of hectares of each vegetation type vulnerable to vegetation loss through erosion of canyon slopes for both the Watana and Devil Canyon sites.
24. p. E-3-166, ¶ 4 Provide the depth to permafrost or bedrock as well as representative rooting depths for major species found to occur near the proposed Watana impoundment.
25. p. E-3-166, ¶ 4 Since the spillway is to be located on the north (not the south) side of the damsite (see Exhibit F, Plate F4), correct ¶ 4 to reflect this and provide any changes this may have on the area of greatest blowdown potential.
26. p. E-3-166, ¶ 5 Estimate the amount of fugitive dust generated due to the construction. What are the anticipated air quality and terrestrial impacts as a result of the fugitive dust and emissions from construction equipment, camps, and the permanent village?
27. p. E-3-167, ¶ 2 Correct the typographical error omitting a word or words from the first line of the paragraph.
28. p. E-3-168, ¶ 6, to
p. E-3-169, ¶ 2 Provide information (for forests and shrublands) as to the nature of natural revegetation and how much longer it may take when soils are removed either on purpose or due to erosion.
29. p. E-3-170, ¶ 2-4 Provide the following information: (1) the number of hectares affected by drawdown, (2) the effects of ice shelving on vegetation, and (3) the likelihood of revegetation taking place in areas affected by drawdown.
30. p. E-3-171, ¶ 4 Include, in the evaluation of vegetation encroachment speed for the Watana to Devil Canyon reach, a consideration of reduced sediment loads below Watana dam as explained in ¶ 1 of p. E-3-171, in addition to the already mentioned factors of reduced summer peak flows and ice scour elimination.

31. p. E-3-174, ¶ 3 and ¶ 4
In the evaluation of spring and fall temperature moderation near the Watana impoundment and its effect on plant communities, include whether or not this local climatic change will (1) affect the length of the growing season, and/or (2) shift the period of optimum temperatures, causing temperatures to be out of phase with the period of optimum light and thereby potentially affecting plant production.
32. p. E-3-178, ¶ 3
Correct the typographical error in the fourth line of this paragraph; in this case a word or words are either missing or incorrect.
33. p. E-3-179, ¶ 3
Modify the information in this paragraph and ¶ 3 on p. E-3-172 to clarify whether or not Devil Canyon is included in the post-project flows and water surface areas presented on p. E-3-172. If Devil Canyon is not included in the data on p. E-3-172, then include water flows and surface areas with Devil Canyon in operation on p. E-3-179, or clearly state that they will not change as a result of Devil Canyon.
34. p. E-3-179, ¶ 4, to ¶ 6
Estimate the number of hectares of each vegetation type that will be cleared due to access road construction.
35. p. E-3-180, ¶ 3
Provide Table E.3.W29 as called out in this paragraph; currently Table E.3.W29 contains wildlife data.
36. p. E-3-186, ¶ 3, to p. E-3-194, ¶ 2
Provide a more detailed description of planned mitigation measures for wetlands and floodlands. For example, construction methods used specifically for wetland areas should be described.
37. p. E-3-186, ¶ 3, to p. E-3-194, ¶ 2
Provide maps showing the location and extent of areas expected to require revegetation as a result of the proposed project construction or operation. Also, identify the existing vegetative communities surrounding areas to be revegetated.
38. p. E-3-186, ¶ 3, to p. E-3-194, ¶ 2
Provide detailed information, such as a description and map of soil types, data on soil physical and chemical characteristics, and maps showing the location of permafrost outside the impoundment areas. In addition, provide a general characterization of subsoils, especially for areas where topsoil removal or erosion is likely.
39. p. E-3-186, ¶ 3
Provide specific information on the methodology that will be used to deter off-road vehicle use (e.g., notice signs or fences).

40. p. E-3-187, ¶ 1 Provide information to support the desirability of placing fill for the construction camp, etc. directly over vegetative ground cover and organic soils. The following questions should be answered: (1) What are the chances that the organic material will decompose, causing subsidence? (2) Will permafrost be affected? (3) After being covered by gravel fill for a period of years, will the soil that remains when the gravel is removed really offer any advantage over soil replacement using stockpiled soils?
41. p. E-3-187, ¶ 2
p. E-3-191, ¶ 4 Provide information on the effect of long-term soil storage under the conditions of the Susitna Basin.
42. p. E-3-188, ¶ 2 Provide specific information to describe how the pit excavation in Borrow Site E will be rehabilitated.
43. p. E-3-189, ¶ 3-6 Provide specific information about the planned revegetation methodology along with documentation to indicate the feasibility and potential success of the plan. For example, the following types of questions should be addressed: (1) Will soil that has been stockpiled contain enough viable propagules to establish adequate vegetation without seeding? (2) How quickly will unseeded areas develop a sufficient plant cover to prevent erosion? (3) Is there a feasible source for native species seed of the proper ecotypes? (4) Does the time of seeding (fall or spring) make a difference? (5) What is the rationale to support the planned fertilizer applications (i.e., are they based on actual fertilizer trials for revegetation conditions in Alaska)? (6) Will any other soil amendments (e.g., lime, organic materials) be incorporated into the soil? In addition, describe the planned revegetation strategy for each area identified in the maps requested by Comment 35 (e.g., return to community that existed prior to disturbance, replacement with introduced grasses).
44. p. E-3-190, ¶ 1 Provide detailed information to permit evaluation of the plan to maintain early successional stages in the active floodplain. For example, information is needed on the general location of vegetation areas to be monitored, how they will be monitored, the criteria that will be used to determine the necessity of controlled flooding, and the cost, amount, and potential effects to electrical generation capacity as a result of controlled flooding.

45. p. E-3-190, ¶ 3 Describe in detail the planned methods for rehabilitation of the areas and structures discussed in this paragraph.
46. p. E-3-191, ¶ 4 See Comment 42.
47. p. E-3-191, ¶ 5, to
p. E-3-192, ¶ 1 Correct the typographical error that eliminated the line or lines at the end of p. E-3-191 and beginning of p. E-3-192.
48. p. E-3-192, ¶ 3 Provide information describing how erosion will be mitigated where access cuts leave unvegetated slopes.
49. p. E-3-192, ¶ 4 Provide a plan describing proposed rehabilitation measures that would be implemented in the event that management provisions fail and off-road vehicles are driven onto tundra from the access route.
50. p. E-3-192, ¶ 5 Describe implementation of possible management options for limiting off-road vehicle use (e.g., signs, gates, fences, security patrols).
51. p. E-3-194, ¶ 1 Describe the methods that will be employed, if any, to discourage off-road vehicle access to transmission corridors where access roads already exist. In addition, provide information as to what rehabilitation measures, if any, will be implemented should the transmission corridor be subjected to repeated use via existing access roads.
52. Describe project-related activities, including construction activities, for the relict channel in sufficient detail to assess potential impacts to botanical resources.
53. Describe details of development of the Phase I Recreation Plan, including the trail, in sufficient detail to assess potential impacts to botanical resources.

TERRESTRIAL WILDLIFE RESOURCES

1. p. E-3-195, ¶ 2 Explain the discrepancy between Appendix EG and the text regarding the number of bird species occurring along the Susitna River floodplain below Devil Canyon.
2. p. E-3-195 to p. E-3-381 Clearly identify on maps geographical features and wildlife considerations being discussed (e.g., population concentrations, migration routes) in relation to project features.
3. p. E-3-195, ¶ 3 Indicate the presence in the study region of any wildlife on a state list of "protected" (i.e., endangered, threatened, rare) or controlled species. If no such species occur in the Susitna region, this fact should be noted.
4. p. E-3-197 to p. E-3-278 Provide quantification, where possible, of proportions, numerical estimates, or data (in tables or in the narrative text) to document or substantiate qualitative statements. Baseline narrative descriptions frequently lack data support for qualitative statements such as "more," "most," "few," and "many."
5. p. E-3-198, ¶ 4 Show, on a map, major seasonal movement patterns of moose, clearly relating moose movements to areas proposed for project use.
6. p. E-2-200, ¶ 1;
p. E-3-201, ¶ 3;
p. E-3-204, ¶ 3;
p. E-3-205, ¶ 3;
p. E-3-207, ¶ 5 Provide the number of radio-collared moose and the average number of relocations per animal for each study year.
7. p. E-3-200, ¶ 2;
p. E-3-201, ¶ 3 Show important breeding and calving areas on one or more maps, directly relating these areas to areas proposed for project use.
8. p. E-3-204, ¶ 3 Quantify black spruce size and density classes.
9. p. E-3-204, ¶ 4;
p. E-3-205, ¶ 4 Quantify moose use of habitat by cover type (or riparian/non-riparian community) on a monthly basis.
10. p. E-3-205, ¶ 2;
p. E-3-205, ¶ 4;
p. E-3-205, ¶ 5;
p. E-3-207, ¶ 2;
p. E-3-207, ¶ 5 Quantify such phrases as "most commonly", "most often", "frequently", "greatest", "a number of", and "less frequently", and to more completely describe the habitat (e.g., "sparse-to-medium-density, medium-height spruce").
11. p. E-3-206, ¶ 6 Provide the analysis of browse data documenting moose food habits in this area.

12. p. E-3-209, ¶ 4 Clarify the relationship between moose density (moose/km²) in the narrative text and the data in Table W30 (referenced as Table W31).
13. p. E-3-210 Provide the basis for the "rough estimate" of moose numbers (¶ 2), and the basis for the assumptions that moose stratum densities in CA7 and CA14 are equivalent (¶ 3).
14. p. E-3-211, ¶ 3 Statements in the narrative text are inconsistent with data in the tables cited.
15. p. E-3-211, ¶ 4 Estimate the magnitude (or range) of the discrepancy and the probable consequences of an inaccurate estimate.
16. p. E-3-213, ¶ 2 Provide a basis for the assumption that snow depth is an adequate index of winter severity.
17. p. E-3-215, ¶ 6;
p. E-3-216, ¶ 3;
p. E-3-216, ¶ 4-5 Quantify phrases such as the following: "main portion of the herd", "many animals", "number of Nelchina bulls", "high country" (elevations).
18. p. E-3-222, ¶ 4;
p. E-3-222, ¶ 5 Specify what other "studies were conducted" on Dall sheep, besides distribution, and their relevance to an assessment of potential project impacts. Provide a map to locate sightings or areas of apparent Dall sheep concentrations.
19. p. E-3-228 Substantiate in Table W41 the statement "bears tended to move to shrublands at higher elevation later in the summer".
20. p. E-3-229, ¶ 7 Provide the basis for the information presented on brown bear diets.
21. p. E-3-233, ¶ 7 Include information provided by the "studies now underway".
22. p. E-3-235, ¶ 7 Specify the number of different bears represented by the 908 observations.
23. p. E-3-235, ¶ 2 Quantify habitat use and include a brief statement of the analytical methodology (e.g., "A chi-square analysis of habitat use by black bears shows. . .").
24. p. E-3-240, ¶ 4 For what years are data for the April to November period that were used as a basis for estimating wolf habitat use?
25. p. E-3-241, ¶ 6 Clarify the term "short and long yearling moose".
26. p. E-3-253, ¶ 7 Specify the type of data collected from the aerial marten transect flights (e.g., animals sighted, track counts).

27. p. E-3-256, ¶ 5 Specify the average number of animals considered to comprise a fox "family".
28. p. E-3-257, ¶ 3 Provide the basis for the estimates of lynx population levels.
29. p. E-3-258 to E-3-366 Several tables in these sections and elsewhere in the text were incorrectly referenced (e.g., Table W61 should have been Table W59). Also, some tables and figures were provided that were never referenced in the text. Correct these errors. Cross-referencing within Exhibit E and to other Exhibits of the application, where appropriate should be included.
30. p. E-3-258;
p. E-3-259 Provide information on the bird surveys as follows:
- Habitat maps delineating areas surveyed by air.
 - Habitat maps delineating areas surveyed on the ground.
 - Maps showing all cliffs and tree habitats in the vicinity of the project suitable for raptor nesting.
 - Maps showing all known raptor rests in the vicinity of the project.
- (Above maps should be of sufficient scale and detail so that survey areas can be transcribed easily to a map of areas to be affected by the proposed project including borrow areas, access roads, transmission lines, etc.)
- Description of census methods for all ground and aerial surveys.
 - Altitude of the aerial surveys.
 - Effective area of ground/water surveyed by air (i.e., size of plot).
 - Number of times each ground and aerial study plot was surveyed.
 - Dates of each survey.

In addition, resolve discrepancy regarding the time that raptor surveys were conducted, i.e., p. E-3-259 ¶ 3, calls out a survey in fall 1982, not mentioned on the previous page.

31. p. E-3-260, ¶ 1 Describe the "prey base" for raptors in the upper Susitna basin and lower Susitna floodplain.
32. p. E-3-260, ¶ 4 Document the statement that the "density of bald eagles nesting in the Lower Susitna River floodplain is slightly higher than that calculated for the Tanana River."
33. p. E-3-262, ¶ 3 Describe the use of the lower Susitna floodplain by spring and fall migratory waterfowl. Special emphasis should be given to that section of the floodplain between Devil Canyon dam and the confluence of the Susitna and Chulitna Rivers.
34. p. E-3-262, ¶ 4 Provide bird survey data relative to sections of the Susitna River from Cook Inlet to the proposed Devil Canyon dam.
35. p. E-3-262 Estimate the importance of the islands in the lower Susitna River to nesting waterfowl.
36. p. E-3-263, ¶ 1 Provide data to support the statement that "the main reasons for the low [waterfowl] use of the lower river appear to be its rapid flow and heavy silt load."
37. p. E-3-264, ¶ 1 Provide 1981 waterfowl data (average densities of adults and broods) for the Tanana River valley.
38. p. E-3-264, ¶ 3 Provide the method of calculating the Importance Values of water bodies and give the results.
39. p. E-3-268, ¶ 4 Correct the discrepancy between the text and Table W66 regarding the number of bird territories identified on the mat-cushion tundra.
40. p. E-3-280, ¶ 2 Include results of "current studies" of moose.
41. p. E-3-281, ¶ 3 Describe the technique of measuring moose habitat quality.
42. p. E-3-281, ¶ 3 Justify the use of "forest cover units to determine the . . . effects of habitat loss on moose" if "forest cover types are poor measures of moose habitat quality".
43. p. E-3-281, ¶ 3 Provide results of the planned studies on forage quality, critical winter range, and calving habitat.
44. p. E-3-282, ¶ 3 Clarify the statement ". . . browse resources in bottomland areas may presently be at, or near, their carrying capacity". Does this refer to moose density in relation to available browse, or the density of browse plants in relation to the amount of browse that could be supported?

45. p. E-3-285, ¶ 2 Explain how hunting and harassment of moose can be prohibited effectively and document the efficacy of the procedure.
46. p. E-3-291, ¶ 3 Include a consideration of human disturbances that moose would encounter at the mineral lick mentioned on p. E-3-224, ¶ 6.
47. p. E-3-292, ¶ 2 Provide evidence for the statement that the number of accidental moose deaths during filling or operation of the Wataana impoundment would be small and the effect on population minimal.
48. p. E-3-292, ¶ 3 Quantify moose-carrying capacity and provide a description of the bioenergetics model.
49. p. E-3-292, ¶ 4 Justify the statements, (1) "Forage quality can be assured by measuring available nitrogen and energy", and (2) "Other nutritional entities. . . are seldom the limiting factor".
50. p. E-3-292 On p. E-3-292, ¶ 2, highway and railroad kills of moose are considered to be potentially "substantial", but are not mentioned in the summary of impacts.
51. p. E-3-295, ¶ 2 Provide evidence to support the assertion that "hunting mortality can be easily regulated".
52. p. E-3-295, to Provide some quantification as to the extent of potential impacts on caribou, including additional information on the frequency with which caribou cross the Susitna River during migration.
53. p. E-3-299 to p. E-3-317 Quantification should be provided, as possible, to aid in evaluating the extent of potential impacts on Dall sheep (pp. E-3-299 to E-3-303), brown bear (pp. E-3-303 to E-3-308), black bear (pp. E-3-308 to E-3-311), wolf (pp. E-3-311 to E-3-312), wolverine (pp. E-3-312 to E-3-314), and beaver (pp. E-3-314 to E-3-317).
54. p. E-3-318 to p. E-3-356 Provide some quantification, particularly of habitat losses, as an aid to evaluating the extent of potential impacts on mink, otter, red fox, marten, moose, brown bear, beaver, and caribou.
55. p. E-3-323, ¶ 1 Provide the data and assumptions to support the statement that "the upper Susitna River basin population of golden eagles will be reduced by 3-5 pairs as a result of the construction and filling of the Wataana Reservoir."

56. p. E-3-330, ¶ 2 and 3 Describe the specific safeguards to protect the eagle nests in sufficient detail to demonstrate the effectiveness of the plan.
57. p. E-3-331, ¶ 4 and E-3-349, ¶ 4 Provide an estimate of the number of nest sites for cavity-nesting waterbirds that will be affected by the proposed project?
58. p. E-3-332, ¶ 3 Describe the effect that year-round open water below the dam will have on spring and fall migratory waterfowl. Describe how the open water affect the abundance and distribution of bald eagles.
59. p. E-3-334, ¶ 1 Provide a summary of roadside bird count data (i.e., average of pre-1981 data vs. 1981) relative to habitat of transects.
60. p. E-3-349, ¶ 5 Resolve the discrepancy between the data in sentence four of this paragraph and those in Table W79a.
61. p. E-3-350, ¶ 1 Provide information to support the statement that no feeding habitat for shorebirds will be created.
62. p. E-3-363, ¶ 1 Provide an explanation of how the applicant plans to re-route the access road to avoid destruction of bald eagle nest number BE-6.
63. p. E-3-363, ¶ 3 and 5 Provide an explanation of how the Applicant plans to avoid construction in the vicinity of nests GE-18, R-21, and BE-8 during the nesting period.
64. p. E-3-368, ¶ 6 Provide results of any studies or single-incident reports of bird collisions with transmission lines in the vicinity of the proposed project.
65. p. E-3-373 to p. E-3-375 Quantify, as possible, the efficacy of mitigation proposed for moose, caribou, Dall's sheep, brown and black bears, and beaver and marten.
66. p. E-3-375, ¶ 2 Expand the discussion of regulating hunting pressure to provide sufficient information for evaluation of the efficacy of such measures.
67. p. E-3-380, ¶ 3, 4, and 5 Provide justifications for (1) sensitive time periods (text doesn't always agree with data in Table W60), and (2) minimum distances to avoid disturbances to raptor nesting activity.
68. p. E-3-381, ¶ 2 Define limiting ground and air activities" and "near those water bodies."
69. p. E-3-381, ¶ 2 Provide the number of nest boxes that will be set up, for what species, and in what general areas of the project.

70. Table W27 Explain the 250% figure in the last column.
71. Table W30 Indicate the source or basis for the "moose density per stratum" values and the method for determining the "population estimate per stratum" entries.
72. Table W31 Clarify the use of moose per km of river as an index of relative abundance rather than as a population density.
73. Table W41 Clarify the terms "% of months" and "% of habitats".
74. Table W55,
Table W56 Provide Figure S, cited in footnotes to both tables.
75. Table W72 Clarify whether muskrat "pushups" refers to the total numbers for lakes with pushups observed within the borrow areas and impoundment or to the average number of pushups per lake within the borrow areas and impoundment.
76. Table W61,
Footnote 1 Clarify the reference to "Table Bird Impacts 2" since no such table exists in Exhibit E.
77. Table W80,
last column Provide an example of how the percent loss of breeding pairs was calculated. Provide all acreages and population densities required to calculate the percent loss for each species.
78. Appendices EA
to ED; Section A,
Item 7 Provide rationale for the minimum distance of 1/2 mile between any facility and a bald or golden eagle nest.
79. Appendix EF Provide all missing information in the Tables for the following: Brant, Harlequin duck, Surf scoter, Black scoter, Pine grosbeak, Eastern kingbird, and Violet-green swallow.
80. Appendix EF,
Footnote 2 Provide data by which relative abundance was determined.
81. Appendix EG Define all codes used.
82. Describe project-related activities, including construction activities, for the relict channel in sufficient detail to assess potential impacts to wildlife.
83. Assess impacts to wildlife attributable to development of the Phase I Recreation Plan use of proposed hiking trail.

4. HISTORIC AND ARCHAEOLOGICAL RESOURCES

The following archaeological field work must be undertaken during the 1983 field season. The order of the list indicates the priorities that should be placed on the completion of each task.

1. Completion of the reconnaissance survey of the proposed access roads, railroad, Watana and Devils Canyon dam sites, construction camp areas, associated impact areas, and reservoirs, including the resurvey of defined locales that have potential for containing sites.
2. Completion of aerial reconnaissance survey and on-ground reconnaissance survey as necessary to complete sensitivity maps of all proposed transmission corridors and recreation facility sites as may have been defined indicating the potential of these areas for containing archaeological and historical sites.
3. Completion of reconnaissance survey of any additional direct-impact areas that may be defined prior to the 1983 field season.
4. Completion of systematic testing of archaeological and historical sites in the direct-impact areas of the access roads and railroad, and the vicinity of the construction camp areas and the proposed sites of the Watana and Devils Canyon dams and associated facilities.

The following field work should be undertaken in the 1984 field season and according to the following priorities.

1. Completion of systematic testing of sites in the reservoirs.
2. Completion of reconnaissance survey along the proposed transmission corridors, recreation facility sites, and indirect and potential impact areas.
3. Completion of systematic testing of sites in these areas as may be necessary.

A preliminary report on the results of the 1983 field season should be filed at the conclusion of field work no later than September 1, 1983. A draft final report on the 1983 field season must be provided by December 1, 1983, followed by the final report by January 1, 1984. The final report on the 1984 season should be filed after completion of all field work, no later than January 1, 1985. The 1984 report should contain a site-specific cultural resources management plan prepared in consultation with the Alaska State Historic Preservation Officer, the National Park Service, and appropriate federal land-managing agencies.

SUPPLEMENTAL INFORMATION AND CLARIFICATION NEEDS

1. p. E-4-1, ¶ 3 Provide a general percentage estimate of the number of sites that have been inventoried within project impact areas (percentage of the total number of sites that likely exist within the project impact areas).
2. p. E-4-4, ¶ 1 Follow this paragraph by a paragraph providing quantitative data concerning the percentages of (a) sites, (b) direct impact areas, and (c) indirect potential impact areas that have likely been inventoried. Provide the percent coverage of impact areas at the reconnaissance level and other levels of survey.
3. p. E-4-4, ¶ 4 Include FERC in this statement with the reference to the State Historic Preservation Officer (SHPO).
4. p. E-4-4, ¶ 5 Replace the reference to the Advisory Council with the "appropriate land-managing agencies".
5. p. E-4-5, ¶ 1 Include the SHPO in the reference with the land-managing agency.
6. p. E-4-5, ¶ 4 Provide the approximate percentages of the direct impact areas and indirect-potential impact areas which have been surveyed at the reconnaissance level, and a percentage estimate of the number of sites inventoried within project impact areas.
7. p. E-4-6, ¶ 1 Indicate the number of known sites that require testing, and the probable number of sites that would be located in unsurveyed portions of the project and require testing.
8. p. E-4-7, ¶ 5 Correct the references to 1982 as necessary (the first reference to this date appears to be incorrect).
9. p. E-4-9, ¶ 4 Include a statement that (1) the FERC, the SHPO, and the appropriate land-managing agencies would be notified and consulted about the definition of new project impact areas, and the modifications of the location of existing areas, and consulted about appropriate cultural resources inventory measures, and that (2) appropriate inventory measures would be implemented, and cultural resources management plan developed, in consultation with these agencies as soon as possible after the identification of these areas.
10. p. E-4-10, ¶ 3 Give the percentage estimates of the impact areas and the number of sites inventoried.

11. p. E-4-15, ¶ 2 Indicate the permitting agencies, the kinds of archaeological activities authorized by the permits, the expiration dates of each permit, and the survey and testing undertaken with each permit.
12. p. E-4-18, ¶ 1 Provide evidence of the success of this strategy. The percentage estimates of impact areas and sites inventoried of the total likely existing in the project should be repeated.
13. p. E-4-18, ¶ 2 Discuss the potential of this strategy for inventorying a high percentage of sites in direct impact areas in a timely and cost-effective manner.
14. p. E-4-30, ¶ 2 Provide a statement indicating whether additional reconnaissance testing is necessary at locales where sites have not been inventoried (i.e., whether the inventory can be considered as completed at these locations).
15. p. E-4-30, ¶ 3 Mark the location of defined survey locales (surveyed and unsurveyed), other survey locations, and areas proposed for survey on Exhibit G maps. Five copies of these maps should be filed with the archaeological reports separately from the application. Indicate that such maps will be provided in a separate filing with the application, and that periodic updates would be filed as surveys and testing are completed.
16. p. E-4-108, ¶ 2 The number 231 appears to be incorrect. Correct or clarify as necessary.
17. p. E-4-108, ¶ 3 Revise this statement to include the FERC in addition to the SHPO.
18. p. E-4-110, ¶ 2 This discussion contradicts the earlier statement on p. E-4-4, ¶ 1, that 17 sites would be directly impacted. Corrections should be made as necessary.
19. p. E-4-113, ¶ 3, to
p. E-4-114, ¶ 3 Include a statement indicating that a detailed site-specific management plan would be prepared at the completion of the cultural resources inventory in consultation with the FERC, the SHPO, and the appropriate land-managing agencies, and filed with these agencies.
20. p. E-4-114, ¶ 3 The number 53 may be incorrect. Seventeen additional sites are noted as being directly impacted on p. E-4-4 ¶ 1.
21. p. E-4-116, ¶ 4 The number 53 appears incorrect. It should be corrected if necessary.

22. p. E-4-117, ¶ 1 The meaning of 38 sites in this statement is unclear. The reference appears to refer to the number of known sites requiring systematic testing. The statement should be clarified as necessary.
23. p. E-4-117, ¶ 1 The number 20 may be incorrect. It contradicts a number of 15 given on p. E-4-114, ¶ 3. Corrections should be made as necessary.
24. p. E-4-117, ¶ 1 The number 26 contradicts the number 25 given on pp. E-4-115, ¶ 2, and E-4-116, ¶ 4. Corrections in these numbers should be made as necessary.
25. p. E-4-114, ¶ 1 Provide the general cost breakdown for the eight million dollar figure.
26. p. E-4-118, ¶ 3 Attach copies of the stipulations in the antiquities permits to this report.

5. SOCIOECONOMICS

1. p. E-5-4 through p. E-5-18
Provide a discussion of the cultural setting (including the Native American Alaskans and other long-term residents), political organization, commercial facilities, cost of living, and sources of power for the existing environment.
2. p. E-5-4, ¶ 4, through p. E-5-5, ¶ 5
Provide population data that show distributions of age, sex, and ethnicity, as a baseline for comparison with immigrating populations.
3. p. E-5-6, ¶ 2
Provide data on the distribution of temporary and rental housing or lodging units.
4. p. E-5-7, ¶ 2
Provide information on sources and capacity of power suppliers.
5. p. E-5-7, ¶ 4
Provide a brief discussion of the problem of insufficient water in Talkeetna during dry spells (as noted on p. E-5-27).
6. p. E-5-8, ¶ 7
Provide data on traffic counts and vehicle mix on highways and roads in the project area.
7. p. E-5-11, ¶ 3
Provide information on the standard of beds-per-capita used.
8. p. E-5-12, ¶ 4
Provide discussion of other recreational facilities and opportunities (e.g., theaters, community organizations).
9. p. E-5-15, ¶ 4
Provide information on: the uses allowed for funding to Ahtna, Inc.; the relationship of Ahtna, Inc., to Community of Cantwell, Inc.; the region controlled by Ahtna, Inc.; and how Ahtna, Inc.'s, region is related to the large Cook Inlet Native Corporation or Association.
10. p. E-5-16, ¶ 2
Provide recent unemployment rates in this section.
11. p. E-5-17, ¶ 3, 4
See Comment 3.
12. p. E-5-19, ¶ 1, through p. E-5-36, ¶ 4
Provide a discussion of impacts related to development of the proposed project on Native Alaskans.

13. p. E-5-20, ¶ 2 Provide a list of the assumptions underlying the population projections and distributions, as well as the specific family and support-to-direct multipliers used. Include annual population projections.
14. p. E-5-20, ¶ 3 Include onsite construction workers in these estimates.
15. p. E-5-22, ¶ 2 Because the standard ratio of 1:1000 is for rural areas, provide an explanation of the use of this standard to rural and Anchorage suburban areas.
16. p. E-5-24, ¶ 3-6 Provide estimates of additional truck, equipment, and personal and other vehicle traffic volume to compare with baseline counts, and information on the plowing and maintenance of Denali Highway.
17. p. E-5-24, ¶ 6 In case the state does not assume responsibility for the maintenance of the project access road, provide a discussion of an alternative plan.
18. p. E-5-25, ¶ 2-4 See Comment 17. Provide yearly projections to identify periods of greatest growth.
19. p. E-5-26, ¶ 6, 7 Discuss the conditions under which "a strain on this informal system" will be defined as occurring, as well as a plan or alternatives for who will provide these services.
20. p. E-5-27, ¶ 4 See Comment 13.
21. p. E-5-27, ¶ 6, 7 Provide a specific projection of who would provide this supervision as well as a discussion of the likelihood of and basis for installing central water and sewage systems.
22. p. E-5-28, ¶ 4 Provide a discussion of the likelihood of incorporation and the basis for such an occurrence to permit development of alternative fiscal impact scenarios, estimates of the availability of qualified workers, and mitigation plans.
23. p. E-5-28, ¶ 5 Provide data on the adequacy of water supply for projected growth and a prediction of the likelihood of Talkeetna's installing a community water system and a discussion of the basis for this action.
24. p. E-5-29, ¶ 1, 2 See Comment 19.
25. p. E-5-29, ¶ 5 Provide a plan for resolving any potential conflict that may arise with the Ahtna Corporation over development of this land for housing, as noted here and on p. E-5-51, ¶ 2.

26. p. E-5-29, ¶ 6,
through
p. E-5-30, ¶ 1 See Comment 13. Additionally, include information on the population to be housed in a construction camp at Cantwell (p. E-5-47) and where this population is included in the scenarios.
27. p. E-5-32, ¶ 2 See Comment 23.
28. p. E-5-32, ¶ 3, 4 See Comment 19.
29. p. E-5-33, ¶ 3, 4 See Comment 13.
30. p. E-5-35, ¶ 1 See Comment 13.
31. p. E-5-35, ¶ 5 For Cantwell in particular, provide a discussion of changes in the Native population to permit characterization of impacts.
32. p. E-5-37, ¶ 5 Provide a discussion of where workers will be and whether they will be paid during the off-season months.
33. p. E-5-38, ¶ 6 Provide information on whether the payroll figures include payments for worker housing.
34. p. E-5-39, ¶ 3 Discuss the basis for the assumptions underlying the distribution of the work force to housing onsite and offsite and to local communities.
35. p. E-5-40, ¶ 5,
through
p. E-5-42, ¶ 1 See Comment 34. To assess long-term growth and impacts on the region's communities, provide justification for the assumptions made about the permanent relocation to the region of a portion of the workforce and the temporary relocation of another portion.
36. p. E-5-42, ¶ 3, 5 Provide the actual location-specific multipliers used and a justification for them.
37. p. E-5-43, ¶ 2 Provide projections of how workers will be employed and whether they will remain in the area between 1990 and 1999. See Comment 32.
38. p. E-5-43, ¶ 4 See Comments 13 and 35.
39. p. E-5-44, ¶ 2 Provide a discussion of whether the Alaska state average household size is different from the average construction worker household size.
40. p. E-5-44, ¶ 5 See Comments 13 and 34.
41. p. E-5-45, ¶ 2 Provide a discussion of where the other workers (included in the high case scenario but not the moderate case for Cantwell) will be distributed and an explanation of which scenarios include the

- proposed railhead construction camp (p. E-5-47).
See Comment 26.
42. p. E-5-45, ¶ 6 See Comments 32, 34, 35, and 37.
43. p. E-5-47, ¶ 1, ¶ 2 Provide information on how many and what kind of units will be provided. See Comment 26. Also provide justification of reducing the population-per-household measure over time.
44. p. E-5-49, ¶ 3 Include the capacity of lodges, other temporary lodging units, and trailer parks should be included in the Existing Environment section. See Comment 3.
45. p. E-5-50, ¶ 1 See Comment 44.
46. p. E-5-50, ¶ 3 Discuss the role of Ahtna, Inc. in the entrepreneurial housing activity, given the statement on p. E-5-7, ¶ 1, that this Corporation owns most of the land around Cantwell.
47. p. E-5-51, ¶ 2 See Comment 25.
48. p. E-5-52, ¶ 4 See Comment 46.
49. p. E-5-54, ¶ 2 Provide information on the location and numbers of these isolated residences.
50. p. E-5-54, ¶ 3 Provide information on housing and business impacts along the proposed rail line and on the ongoing study of land improvements.
51. p. E-5-54, ¶ 5, through
p. E-5-57, ¶ 2 Provide data on the availability of alternative areas for the ten-year construction period and possible conflicts with other guides and subsistence residents in the alternative areas.
52. p. E-5-55, ¶ 4 Provide estimates of project-related subcontracting expenditures and spending patterns of construction workers.
53. p. E-5-55, ¶ 4 Discuss the assumptions used in estimating the number of secondary jobs. See Comments 13 and 36.
54. p. E-5-56, ¶ 4 Discuss whether secondary jobs will be created in Cantwell, and whether they will be seasonal.
55. p. E-5-57, ¶ 2 Discuss impacts and projections of inflation and shortage of inventories as well as difficulties of businesses in getting financing to begin or expand.
56. p. E-5-58, ¶ 1
and ¶ 4 Provide justification for assumptions on which revenue and expenditure projections in this section are based. See Comment 13.

57. p. E-5-61, ¶ 4 Discuss the role of Ahtna, Inc., in Cantwell and the share of state revenue (if any) it currently receives and could expect to receive in the future.
58. p. E-5-68, ¶ 1, through
p. E-5-86, ¶ 4 Discuss potential impacts on Native use and on Native corporations and associations because of the particular reliance of these groups on fish and wildlife for subsistence and employment (e.g., guide services, lodging facilities).
59. p. E-5-71, ¶ 4 Provide information on whether local guide businesses, Native and other, rely on fish resources in the project area.
60. p. E-5-71, ¶ 5, through
p. E-5-72, ¶ 2 Provide a discussion of whether subsistence catch for Natives differs from that for non-Natives, whether Natives require permits, and the value of the catch to Natives relative to non-Natives.
61. p. E-5-74, ¶ 2 Provide a description of the analysis being done to permit evaluation of its adequacy for impact identification.
62. p. E-5-75, ¶ 2 See Comment 61.
63. p. E-5-79, ¶ 3 Provide projections of baseline and project impacts on moose hunting, as well as information on permits required or other regulations on moose hunting.
64. p. E-5-81, ¶ 1 and ¶ 4 See Comment 61.
65. p. E-5-81, ¶ 2 and ¶ 3 See Comment 60.
66. p. E-5-81, ¶ 5, through
p. E-5-86, ¶ 4 See Comment 58.
67. p. E-5-83, ¶ 2 Because it is stated that inaccessibility to the area has kept the number of trappers low, discuss probable impacts to trapping activity because of increased accessibility provided by project roads and structures.
68. p. E-5-86, ¶ 3 See Comment 58.
69. p. E-5-86, ¶ 4 Include projections on project impacts to recreational trappers.
70. p. E-5-87, ¶ 1, through
p. E-5-96, ¶ 4 Indicate specific applicant-proposed monitoring and mitigation plans to permit precise evaluation of the reduction in impacts intended by the applicant.

71. p. E-5-89, ¶ 3,
through
p. E-5-95, ¶ 2 Specify the role of local community and regional officials.
72. p. E-5-90, ¶ 2 Provide specific plans for adjusting project schedules with reference to other projects and to reduce impacts.
73. p. E-5-90, ¶ 5 Provide a discussion of any disadvantages of construction camps that have been identified in similar large-scale project situations.
74. p. E-5-91, ¶ 1-4 Indicate specific applicant-proposed mitigation plans on transportation.
75. p. E-5-92, ¶ 4 See Comment 61.
76. p. E-5-93, ¶ 3 Provide plans for the railhead construction camp in Cantwell, the role of Ahna, Inc., and specifics on financial aid for relocating workers and for shortfalls in community finances.
77. p. E-5-93, ¶ 4 Projections in Tables E-5-36 through E-5-37 indicate that shortages will occur. Include specific plans for studying and mitigating these problems. See Comment 71.
78. p. E-5-93, ¶ 5;
p. E-5-94, ¶ 1-4 See Comment 70.
79. p. E-5-94, ¶ 2 Provide details on methods being used in ongoing monitoring and other studies of impacts. See Federal Register, Vol. 46, No. 219, Friday, November 13, 1981, p. 55929 on FERC response to comments on 18 CFR 4.41(f)(2)(v).
80. p. E-5-96, ¶ 1 See Comment 61.
81. p. E-5-96, ¶ 3-5 Provide more specific information on the monitoring plan. See Comments 61 and 80.
82. pp. E-5-102
through E-5-144,
tables Describe assumptions used in making projections and all sources of projections and data. See Comment 13. Specific examples follow.
83. p. E-5-103 Provide age, sex, and ethnic distributions in these communities to permit identification of potential conflicts with the immigrating population.
84. p. E-5-109 Provide unemployment statistics to complete the description of the employment setting and to provide data on the available local labor pool.

85. pp. E-5-113 through E-5-118;
p. E-5-120;
p. E-5-125
Provide assumptions, calculations, and multipliers used in making these projections in the tables and/or in the text. See Comments 13, 34, 36, 37 and 39.
86. p. E-5-122;
pp. E-5-124 through
E-5-136
Identify sources for these tables.
87. pp. E-5-125, E-5-126, and E-5-128 through E-5-131
Provide the bases for distributions to the communities in the Borough and the region.
88. pp. E-5-135 and E-5-136
Identify the multipliers used to generate the projections of secondary jobs and indicate whether the multipliers were applied to the entire project work force or only to those not expected to live in the onsite facilities.
89. pp. E-5-138
Identify the per-capita multiplier used in making these revenue forecasts as well as the basis for its use.
90. Appendix E.5A, Section (c) (iii)
See Comments 13 and 88.

6. GEOLOGICAL AND SOIL RESOURCES

1. p. E-6-2, ¶ 1 Provide the names and a generic discussion of the stratigraphic units in the area.
2. p. E-6-4, ¶ 5 Provide supporting data on the configuration of the Quaternary surface.
3. p. E-6-4,
general comment Provide a tabulation of significant seismic events and their intensity at the site. Also provide a plot showing cumulative magnitude-recurrence frequency for each seismic source area identified in the study. Discuss the effects of seismically induced seiches and predicted water level fluctuations due to seiches.
4. p. E-6-5, ¶ 3 Last sentence in the section is misworded.
5. p. E-6-6, ¶ 7 Describe the "length-distance criteria" methodology used to select the significant faults. Discuss any assumptions used in the methodology.
6. p. E-6-7, ¶ 3 Provide a map showing locations of significant features, and a written description of the features.
7. p. E-6-9, ¶ 4 Identify the "13 features" and discuss their origin and any effect they may have on the project (i.e., higher-than-anticipated permeability in shear zones, etc.).
8. p. E-6-10, ¶ 6 Correct the mean peak acceleration of 8.35 g at the Watana site.
9. p. E-6-11, ¶ 7 Provide the attitude of the contact between the diorite and andesite in the discussion.
10. p. E-6-12, ¶ 1 Provide rose diagrams or stereonet plots showing orientations of joints, fracture zones, and shears.
11. p. E-6-13, ¶ 3 Discuss the coincidence of "the Fins" feature with the western portion of the relict channel.
12. p. E-6-14, ¶ 3 Discuss the origin of "the Fins" feature. This feature was apparently important in erosion at the west end of the relict channel zone - are there other unidentified shear zones beneath the other incised portions of the relict channel?

13. p. E-6-15, ¶ 1 Provide evidence of identification of sufficient quantities of each type of soil required.
14. p. E-6-16, ¶ 3 Provide rose diagrams or stereonet plots showing orientations of joints, fracture zones, and shears.
15. p. E-6-16, ¶ 5 Clarify "spacing and tightness of the joints increase with depth."
16. p. E-6-18, ¶ 4 Discuss the area of potential permafrost in the south abutment of the Devils Canyon site shown in Figure E.6.25.
17. p. E-6-18, ¶ 5 Table E6.28 is called out but was not provided in the review copy.
18. p. E-6-20, ¶ 7 Discuss the potential impacts of the several shears and fractures which may intersect the tailrace tunnel shown in Figure E.6.19.
19. p. E-6-21, ¶ 1 Provide a figure showing surficial geology including glacial deposits in the reservoir area.
20. p. E-6-24,
general comment Discuss the impacts of tectonic seismicity on the dam. Discuss the potential impacts of dam failure.
21. p. E-6-25, ¶ 5 Discuss how the previous substantial glacial loading of the region may affect the probability and magnitude of anticipated RIS.
22. p. E-6-27, ¶ 3 Provide an estimate of the geographic area RIS likely to be felt. Estimate how many people RIS would affect.
23. p. E-6-27, ¶ 2 Identify the plan for additional study of the Fog Lakes relict channel.
24. p. E-6-27, ¶ 5 Provide additional data on the soil and bedrock conditions in the Watana relict channel.
25. p. E-6-27,
general comment Provide estimates of acreages expected to be affected by each type of slope failure for each reservoir.
26. p. E-6-28, ¶ 6 Document the statement that liquefaction susceptible soils are not extensive in the reservoir areas.
27. p. E-6-33, ¶ 6 Discuss the impact of seismically induced failure of the Watana relict channel under full pool conditions?
28. p. E-6-35, ¶ 3 Add bedrock testing in Watana relict channel and add study of seepage to the Fog Lakes area. Discuss further study of the shear under the saddle dam at the Devils Canyon site.

29. p. E-6-35, ¶ 5 Discuss the impacts of reservoir slope failures on the land and biota.
30. p. E-6-35, ¶ 6 Provide an analysis of the effects of seismically induced seiches.
31. General comment Provide the criteria whereby the mitigation measures to reduce the leakage through the relict channel will be chosen. Provide an analysis of the impacts of each of the alternative measures.

7. RECREATION RESOURCES

1. p. E-7-4, ¶ 3;
p. E-7-5, ¶ 1
Verify the dimensions of the proposed Watana impoundment; e.g., a 54-mile-long reservoir as opposed to approximately 48 miles reported in Exhibit A (p. 1-1) of the application. Also verify the dimensions of the proposed Devil Canyon impoundment; e.g., a 32-mile-long reservoir as opposed to the approximately 26 miles reported in Exhibit A (p. 7-1) of the application.
2. p. E-7-8, ¶ 3
Characterize visitor interpretation and related facilities at dam and powerhouse sites in detail compatible with levels of development implied on pages E-7-93 and E-7-94, and Table 7.20.
3. p. E-7-10, ¶ 4
Provide Figure E.7.4 showing "Existing and Proposed Regional Recreation Areas" (cf "List of Figures, Figure 7-4 - Later"). The figure should include sufficient place names and identified landmarks to facilitate overall orientation and provide for points of reference.
4. p. E-7-11, ¶ 2
In view of the greater size and popularity of Denali National Park and Preserve, clarify the greater 1981 attendance or visitations at Denali State park.
5. p. E-7-12, ¶ 2
Clarify the following: The Kenai Peninsula Parks (page E-7-11, ¶ 5) do not appear to be listed in Appendix E.7.A. Is the "region" referred to here (p. E-7-12, ¶ 2) the same region depicted in Figure 7.4 (to be provided "later" as indicated in Chapter 7 "List of Figures)? If not, the region identified on this page (E-7-12) should be depicted by mapping or should be otherwise described.
6. p. E-7-14, ¶ 5,
¶ 6; p. E-8-15,
¶ 1-4
Clarify the discussion presented in relation to the following:
 - Figure E.7.4 is not available; thus, the locations of several future regional facilities listed in Table E.7.7 are not identifiable.
 - High-priority development sites established by the State Parks Division are not "listed" in Figure E.7.6. Further, Figure E.7.6

depicts "existing recreation" as opposed to "Future Facilities", the title of this subsection.

- The colon following paragraph 2 of Subsection 2.1(f) implies that all subsequent named areas are apparent in Figure E.7.6. If Denali State Park is shown in the figure, it is not identified, nor is the Tokositna Resort site as well as other proposed development sites within the State Park, as identified on p. E-7-15.
- The Lake Louise Recreation Area is well removed from the area shown in Figure E.7.6. It is not clear how expansion of this heavily used recreation area would significantly influence recreation development in the project area. Further, Lake Louise is accessible from the Glenn Highway.
- The significance of boating at, and the location of, Tangle and Kepler Lakes is not apparent in Figure E.7.6.

7. p. E-7-15, ¶ 6 Document studies and/or information sources indicating the Upper Susitna River are not suitable for establishment of dedicated areas such as National Parks (Preserves), Wild and Scenic Rivers (including recreation) and State Parks. Discuss Alaska DNR's designation of areas listed in Appendix E7B as "Future Regional Recreational Opportunities" (p. E-7-15, ¶ 5).
8. p. E-7-17, ¶ 2 Verify that Table E.7.6 is a complete listing of the existing public and commercial developments within and adjacent to the study area; e.g., Denali State Park is not listed.
9. p. E-7-17, ¶ 6 Verify that there are 11 existing structures at the High Lake Lodge. Figure E.7.7 indicates the presence of three structures at High Lake, whereas only two structures are indicated in Figure E.9.6. Also indicate whether the Lodge at High Lake and the structures along Portage Creek are operated as a unit or complex.
10. p. E-7-18, ¶ 2 Clarify that Table E.7.8 and Figures E.7.5, E.7.6, and E.7.7 include a complete listing of trail locations, condition, and use. Also, the trails listed in Table E.7.8 (and other important trails) must be keyed to and identified (by name or number) in figures such as E.7.6, E.7.7, and E.7.8.

11. p. E-7-18, ¶ 3 Provide copies of any regulations developed by BLM for management of public trails located on local lands selected by Native corporations. Also identify trail easements obtained by BLM in Figures E.7.6, E.7.7, and E.7.8 as proposed for existing trails.
12. p. E-7-20, ¶ 2 Provide a base map depicting boundaries of the recreation study area, including identified places and landmarks.
13. p. E-7-22, ¶ 1 Identify the "several major projects within the region" that could significantly affect future recreation.
14. p. E-7-22, ¶ 2 Identify the unnamed "...river and along Portage Creek and Talkeetna River."
15. p. E-7-22, ¶ 6 Identify the "Denali Planning Block" by reference or description.
16. p. E-7-32, ¶ 2 Provide an explanation of the basis for anticipating that all game hunting by project personnel would be prohibited, and provide a rationale as to how such a prohibition would be justified and enforced.
17. p. E-7-33, ¶ 2 Specify objectives, methodology, and timing of future studies planned by APA to develop a recreation plan for mitigating recreation impacts related to transmission line corridors.
18. p. E-7-45, ¶ 1 (Item 2) Provide details as to how the calculated recreation demand [(Sec. 3.5(c))] was factored into the development of the Recreation Plan, as presented in Section 5.
19. p. E-7-66(A);
p. E-7-68(H) Provide information, as indicated, relative to Phase 1 development of the trailhead facility at Summit, the 25-mile trail along the Middle Fork of the Chulitna River, and the 20-mile extension into the Tsussna Creek watershed. Indicate all pertinent design specifications, anticipated level of use, and the trail rating for hikers. Also indicate the potential for ORV use; whether the trail would be patrolled; and managing agency(ies) involved.
20. pp. E-7-84, ¶ 4, to
E-7-89, ¶ 2 Delete discussion presented in Section 5.5, and Tables E.7.17 and E.7.18 from Volume 4, Chapter 7 (Recreation Resources) and incorporate this information into Volume 3, Chapter 5 (Socioeconomic Impacts). See also: Items C and U, p. E-7-62; Item C, p. E-7-69; Item U, p. E-7-70; and Phase 1, Item C, p. E-7-93.

21. p. E-7-91, ¶ 1
(Item 2) Identify the "various parties" that will participate with APA in scheduling recreation developments. Also, provide details concerning procedures whereby all affected parties may contribute to decisions relative to scheduling development.
22. p. E-7-92, ¶ 5 Clarify the discrepancies in the number and kinds of recreation facilities to be provided at the various development sites; e.g., compare facility inventories on this and following pages E-7-93 and E-7-94 with those listed on pages E-7-62 to E-7-84, those shown in Figures 7.12, 7.13 and 7.14, and those shown in Table 7.20.
23. p. E-7-93
(Phase 2, Item 0);
p. E-7-94
(Phase 4, Item 5) Characterize the Watana and Devil Canyon Dam Site visitors centers in terms of physical composition, dimensions, and general configuration, and indicate whether the visitor center facilities are subject to scheduling decisions as are other phased developments that are dependent on periodic review of perceived recreation needs.
24. p. E-7-95, ¶ 3 Verify whether the State Division of Parks and APA will have total authority for controlling the level of recreation development in the project area, and whether this situation contradicts arrangements discussed in Comment 19.

8. AESTHETIC RESOURCES

1. p. E-8-8, ¶ 5 Describe in detail Step 1 of the methodology to produce the report on Aesthetic Resources.
2. p. E-8-15,
Plate 8.6 Describe the designated "Talkeetna Lowlands" and "Talkeetna River" landscape character types in the text, and include photographs. Clarify the areas designated "Chalitra Moist Tundra Uplands" and the "Tundra Uplands" and describe in detail the 14 "Exceptional Natural Features" listed on Plate 8.6.
3. p. E-8-16 to
p. E-8-33 Define the slope terminology (steep, moderately steep, gentle, flat, etc.) according to a degree of slope (e.g., gentle slope = 10° to 20°).
4. p. E-8-34 Append a detailed discussion of the methods, assumptions, and analysis used in developing the viewer sensitivity categories and viewer types.
5. p. E-8-37 Append a detailed discussion of the methods, assumptions, and analysis used in developing the aesthetic value and absorption capability rating system.
6. p. E-8-39 to
p. E-8-42 The "aesthetic value" and "absorption capability" rating columns do not appear to agree with the "comments" column for the "Landscape Character Types" of Wet Upland Tundra, Talkeetna Uplands, Susitna Upland Terrace, and Tanana Ridge. Clarify these discrepancies.
7. p. E-8-43 to
p. E-8-44 Append a detailed discussion of the methods, assumptions, and analysis used in developing the composite rating system.
8. p. E-8-45, ¶ 3 Append further definition of compatible and incompatible aesthetic impact ratings.
9. p. E-8-46, ¶ 4 to
p. E-8-50, ¶ 6 Discuss significant viewpoints and viewshed areas of the proposed dam and reservoir and the transmission line corridor.
10. p. E-8-97 to
p. E-8-106 Append detailed discussion of the four aesthetic mitigation categories. Types of studies, development practices, engineering and architectural designs, landscaping, etc., should be described.

11. Describe project-related activities, including construction activities, for the relict channel in sufficient detail to assess potential impacts to aesthetics.
12. Describe details of development of the Phase I Recreation Plan, including the trail, in sufficient detail to assess potential impacts to aesthetics.

9. LAND USE PATTERNS

1. p. E-9-8 to
p. E-9-22 Discuss existing land values in the proposed project study area and along the entire transmission line corridor.
2. p. E-9-8 to
p. E-9-22 Discuss future land status, future land use, and future land management of the lands without the project within the project study area and the entire transmission line corridor.
3. p. E-9-23 to
p. E-9-35 Discuss potential change in land values resulting from the construction and operation of the dam and reservoir, access roads, and transmission lines.
4. p. E-9-23 to
p. E-9-35 Specifically address the effects of projected land uses in wetlands and floodlands that would be impacted by the development and operation of the project.
5. p. E-9-23 to
p. E-9-35 Discuss the potential for induced land use changes (development and activity) resulting from the development of a permanent town site near the Watana dam.
6. p. E-9-29, ¶ 6 Clarify the term "profound alterations" and discuss such impacts in detail.
7. p. E-9-30, ¶ 4, to
p. E-9-31, ¶ 4 Quantify to the the extent and type of land use change and land value change to lands within the project area and surrounding population centers.
8. p. E-9-34, ¶ 5 Quantify the amount of acreage of agricultural land affected.
9. p. E-9-35, ¶ 6 Discuss transmission line mitigation measures further to include the types of measures that will be employed, including specific U.S. Fish and Wildlife right-of-way management plan techniques that will be used.
10. p. E-9-37, ¶ 3 Locate proposed agricultural land sales within the project area, including transmission line corridors.
11. p. E-9-37, ¶ 8 Discuss, in detail, the types of land use controls applicable to the project lands and surrounding study area.

12. Describe project-related activities, including construction activities, for the relict channel in sufficient detail to assess potential impacts to land use.
13. Describe details of development of the Phase I Recreation Plan, including the trail, in sufficient detail to assess potential impacts to land use.

10. ALTERNATIVE LOCATIONS, DESIGNS, AND ENERGY SOURCES

1. p. E-10-5, ¶ 3 Explain the technique used to adjust the criteria weights.
2. p. E-10-8, ¶ 1, to
p. E-10-12, ¶ 5 Provide a brief description of land use and aesthetic resources for the Chakachamna, Snow, and Keetna sites.
3. p. E-10-11, ¶ 1 Provide an estimate of the importance of the Chakachamna River salmon spawning areas to the commercial fisheries of Cook Inlet.
4. p. E-10-12, ¶ 6, to
p. E-10-13, ¶ 4 Provide a brief discussion of land use impacts for the Chakachamna, Snow, and Keetna sites and aesthetic impacts for the Chakachamna and Snow sites.
5. p. E-10-13, ¶ 2-3 Estimate the magnitude of the impacts of development of the Chakachamna site, at the level of development likely to occur.
6. p. E-10-30, ¶ 3 Provide the data and analysis used to determine the minimum flows that will mitigate salmon spawning impacts.
7. p. E-10-31, ¶ 6 Provide the data and analysis that support the requirement of no significant daily variations in flow.
8. p. E-10-31, § (c) Provide a recommended action. The section should also serve as a guide as to how the proposed action was determined. Alternatives should be presented in a comparable format, with the important issues clearly defined.
9. p. E-10-31, ¶ 8 Discuss the techniques used to give prime consideration to cost and schedule control.
10. p. E-10-32, ¶ 3, to
p. E-10-36, ¶ 7 Provide a brief discussion of land use and aesthetic impacts for proper assessment of the significance of the impacts.
11. p. E-10-34, ¶ 3 Provide an objective rating scheme and sufficient data to determine the importance of the fisheries resource in each alternative route.
12. p. E-10-42, ¶ 2 Describe the analysis scheme used to rate the fisheries, streams, and stream vicinities for each alternative.

13. p. E-10-43, ¶ 1 Describe the surveys conducted along each alternative transmission corridor.
14. p. E-10-62, § (e) Present the environmental data and rating scheme for each of the alternatives.
15. p. E-10-81, ¶ 3, to
p. E-10-138, ¶ 2 Provide a brief discussion of land use and aesthetic resource issues for each alternative electrical energy source for adequate evaluation of the alternatives.
16. p. E-10-83, ¶ 1, to
¶ 5 Because the four major vegetation communities described in the text only cover 65% of the region according to the text, clarify the data to account for the vegetation types occurring on the rest of area (percentages should be given). Specifically, the vegetation types occurring over 35% of the region are not identified, yet two of the four major types together account for only 10% of the region (i.e., wet tundra occupies 7% and alpine tundra occupies 3%).
17. p. E-10-86, ¶ 2 Clarify the discrepancy between the 700-MW facility stated here and the assumption of a 400-MW facility earlier in the section.
18. p. E-10-87, ¶ 4 Provide an estimate of the number of hectares that would be removed annually as a result of mining along with an estimate of time required for reclamation.
19. pp. E-10-106
and E-10-116 Provide information on the socioeconomic environment (e.g., employment, economics, population, land values, accident preparedness of local services).

11. LIST OF LITERATURE

Include adequate reference information for the following:

1. p. E-2-25, ¶ 4 R&M (1982).
2. p. E-2-25, ¶ 6 Dwight (1981).
3. p. E-3-23, ¶ 5 Freethey and Scully (1980).
4. p. E-3-60, ¶ 5 Wandard Stanford (1979).
5. p. E-3-74, ¶ 2 Reingold (1968).
6. p. E-3-176, ¶ 2;
p. E-3-180, ¶ 5;
p. E-3-188, ¶ 2;
p. E-3-192, ¶ 2 References omitted from the list of literature, as specifically indicated in the mark-up copy of Exhibit E.
7. p. E-3-255, ¶ 7 Miller and McAllister (1982).
8. p. E-3-292, ¶ 4;
p. E-3-293, ¶ 1;
p. E-3-293, ¶ 2 The seven citations in these paragraphs.
9. p. E-5-97 Stephen R. Brauad & Associates (1982), cited on p. E-5-89.
10. p. E-7-36, ¶ 7 The study attributed to John O'Neill (1978).
11. p. E-7-38, ¶ 1 The River Basin Cooperative Study.
12. p. E-7-40, ¶ 5 The BLM Denali Block Management Plan.
13. p. E-7-42, ¶ 2 The Alaska Public Survey (1982).
14. p. E-7-43, ¶ 1 "A 1975 University of Alaska outdoor recreation study" and "1975 Outdoor Recreation Survey, L. Johnson, 1976."
15. p. E-7-52, ¶ 4 The Matanuska-Susitna Borough Coastal Management Plan, Draft, 1982.
16. p. E-7-54, ¶ 5 The University of Alaska Concept Plan Survey.
17. p. E-7-56, ¶ 1 Division of Parks Priority Trails standard.
18. p. E-7-87, ¶ 1 National Recreation & Park, Open Space Standards.

19. Table E.7.1 Acres American, Inc., Oct., 1982.
20. Table E.7.8 Susitna Hydroelectric Project, Land Use Report.
21. Table E.7.9 Frank Orth & Assoc., 4/82.
Borough Planning Department, 10/21/82.
22. Table E.7.10 1970 Alaska Outdoor Recreation Plan.
23. Table E.7.11 Susitna River Basin Study, J. McNeill, 11/78.
24. p. E-8-7, ¶ 5 The cited study, Wahrhaftig (1965), should be
referenced in the Aesthetic References Section of
the application.
25. p. E-8-116;
p. E-8-117 All references listed in the Aesthetic Resources
References Section should be appropriately cited
within the written text of the application.
26. p. E-9-39 to
p. E-9-40 All references listed in the Land Use References
Section should be appropriately cited within the
written text of the application.
27. Table 10.6 Cite references for information in this table.