File 02-I-81-AOFG-7.C

JAY S. HAMMOND, Governor

ESTES

STATE

DEPARTMENT OF FISH & GAME

May 12, 1981

Mr. Jeff Weltzin
Fairbanks Environmental Center
218 Driveway
Fairbanks, Alaska 99701

The Department of Fish and Game has reviewed the "Susitna Hydroelectric Mid Report" to Governor Hammond and the Alaska Legislature, prepared by the Alaska Power Authority (APA) with special attention to the conclusions section starting on page 7-6 which you questioned in your March letter to me.

To be fair to the preparers of the Mid Report, we have looked at the total text of the Task 7 environmental studies, pages 7-1 through 7-9 of that report. The overall discussion of the environmental implications on fisheries (p. 7-1 to 7-2), Wildlife (p. 7-2 to 7-5), land use analysis (p. 7-5), cultural resources (p. 7-5), recreation planning (p. 7-5), and plant ecology (p. 7-6) presents a generally even-handed presentation of the issues. There are some points, however, which require clarification pertaining to our evaluation of the environmental section.

p. 7-1 para. 3

The Alaska Power Authority states:

"The 30 month feasibility study currently underway (identified as Phase I) will provide sufficient data for a license application to the Federal Energy Regulatory Commission (FERC). However, it will not provide all the data ultimately needed, because the study period is too short to observe a substantially complete life cycle of certain species. Also, Phase I develops only preliminary mitigation measures. Accordingly, Phase II is planned to run concurrent with the FERC license application processing. Phase II studies will continue field investigations initiated during Phase I and will fully develop mitigation plans. During the FERC license processing, results of these Phase II studies will be integrated into the original license application. The amplified application will then form the basis for license approval or disapproval by FERC. The investigations comprising the Phase I program include fisheries, wildlife, plant ecology, land use analysis, cultural resources, recreation planning and socio-economic analysis."

With respect to the above statements, I would like to reiterate a comment made to you by my office in a letter on March 19, 1981. This comment is as follows:

11-K8LH

"The Department has some difference of opinion with the APA regarding total adequacy of the Phase I information which will be submitted to the Federal Energy Regulatory Commission (FERC) to initiate the license application process in 1982 (refer also to the ADF&G October 1979 Plan of Study). However, APA has indicated their committment to the continuation of the aquatic studies into Phase II to continue answering these impact issues. In the end, the determination as to the adequacy of the data at the time of the preliminary license submission is essentially the FERC's to make. Our difference with the APA concerns the ability of their consultant group to evaluate the potential project impacts with basically one year's data on fisheries. FERC may, however, find that the data and preliminary evaluations given to that agency are sufficient to begin the licensing and EIS development process provided that the APA and the Acres American and TES consultant groups provide a strong qualification of unresolved issues, and a plan and budget for continuing aquatic studies to assess the substance of these issues before the final decision to approve or disapprove the project is made."

The commentary by APA in paragraph 3 of page 7-1 is basically consistent with our understanding of the Phase I and Phase II processes which they have portrayed to this Department and other state and federal resource agencies. I've restated my former comment to you to specifically point out our prior understanding of the committment which APA has made to continuation of studies into Phase II, and which is explicitly outlined in the APA statements of the Mid Report. But, I reemphasize, that project feasibility from the environmental standpoint will not be determined in the opinion of this Department by April 1982.

I understand that some statements made in presentations to special interest groups by APA representatives have construed that the feasibility study process will terminate in April 1982, and that sufficient information will be available at that time to make a decision to construct the project. For example, in the Mid Report it is stated in the letter to Governor Hammond signed by the APA Board of Directors that, "While the Board is confident in making this recommendation to continue the feasibility studies, our conclusions regarding project feasibility will not be reached until April 1982." (Emphasis added)

This Department believes the above statement reflects a contradictory and misleading representation of the Phase I and Phase II processes. A consistent definition of the process to public, special interest groups, agencies, individuals, and project contractor's needs to be understood by everyone.

We believe that APA's representation to the ADF&G and Su Hydro Steering Committee on the Phase I/Phase II break is that it is 1) a milepost at which a license application to FERC will be made, and 2) a decision point for redirection and continuation of the studies, as necessary, to make final resolution of project feasibility and define mitigation alternatives. In the context presented to us by APA, the Phase II decision point is not to determine to initiate project construction, nor to end the feasibility studies as some of the statements seem to indicate.

Since judgement of impacts is a necessary and integral facet of determination of project feasibility, and since this Department does not believe that project impacts will be reasonably known by April 1982, I would agree that the Mid Report appears to be counter to past reports and positions of this Department regarding the Su Hydro Project and the assessment of impacts as you suggested in your March letter.

On P. 7-6, para. 6 sentences 1 and 2 the Mid Report states:

"It must be firmly stated that insufficient data exists as of the date of this report to definitively predict the overall impact of the Susitna Basin development. From that inability follows a corresponding inability to judge the acceptability or lack thereof of the probable impact.2/ "2/ These conclusions are based on discussions with members of the Acres study team (p. 7-9)."

The Department of Fish and Game agrees with these statements. Yet, the text following these sentences seems to depart into a series of statements based on conjecture and speculation. For example, line 5 continues:

"The Susitna project will result in a change in stream flow, but there is as much evidence to indicate that these alterations would create a positive overall fisheries impact as there is to suggest the opposite."

My staff indicates the question of positive impact potentials has often been posed to them by APA and Acres American staff in discussions of the research needed to determine project impacts. In responding, the ADF&G staff has indicated that such potentials do exist provided the flows, water quality, spawning substrates and rearing areas below the project meet the specific requirements of the fish species present such as chinook salmon. However, it has been pointed out as well, that the water quality studies downstream of the project, and in the impoundment itself, may not be adequately examining information on this aspect of the physical environment important to fish. If they are not, we will be unable to determine with reasonable scientific objectivity whether the impact of the project on fisheries will be positive or negative.

The remainder of the conclusions section cites certain impressions and interpretations. The Department hopes that the conjecture expressed: "Whether positive or negative the overall change in the Cook Inlet salmon fishery will probably be slight," proves true.

Unfortunately, it is to early, based on current understanding of the distribution of anadromous stocks in the Susitna River and their contribution to the Cook Inlet fishery, to make this statement with any positive assurance.

Cumulative indirect impacts from a hydroelectric project may have a substantial affect on total fisheries production. Impacts on the fisheries populations of the important spawning tributaries may be very direct, if the juveniles rear for a significant portion of the year in the mainstem Susitna River. Preliminary data collected by the ADF&G Su Hydro Aquatic studies team from January 1981 to the present shows, for example, that

juvenile chinook salmon are distributed in the mainstem, sloughs and side channels from the vicinity of Alexander Creek on the Susitna just above the mouth of the Susitna River on Cook Inlet to Portage Creek the last tributary on the mainstem just below the Devil Canyon site.

Studies by May (1981) and D'oust and Clark (1980) indicate that the potential for dissolved nitrogen entrainment may be influenced more by the design of a dam and the rate of spill rather than the number of dams which are built. Based upon a preliminary operational scheme of 400 MW, the Devils Canyon Dam mean spill for the months of August has been projected at 5,964 cfs (Acres 1981). We believe that this spill rate may have the potential for the formation of dissolved gas supersaturation below Devils Canyon, and could therefore negatively impact the fishery resource. It is our hope that studies of the potential for dissolved gas supersaturation will be conducted and dam and operational designs be evaluated for eliminating this potential impact.

We appreciate your interest, please keep this Department informed of concerns the Fairbanks Environmental Center has regarding the Su Hydro Project.

Sorry for the delayed response.

Sincerely,

Ronald O. Skoog
Commissioner
(907) 465-4100

Enclosure

cc: E. Yould
R. Andrews
S. Pennoyer

Fairbanks Environmental Center
218 DRIVEWAY
FAIRBANKS, ALASKA 99701
(907) 452-5021

Dear Commissioner Skoog,

Per our discussion, enclosed is a copy of the APA's report concerning environmental assessment hich will be submitted March 30, 1981 to the Governor nd Legislature. As you will note, there are several strongly worded statements in the conclusion ge. 7-6) that indicate impacts to the Cook Inlet ishery will be minor.

This statement is misleading and is clearly ounter to ADF&G's past reports and position hich state that your agency will not be able o assess impacts until several years of study. I feel these statements will be used by certain terests ~~and will~~ to disreguard the importantance ' the Susitna fisheries and F&G studies.

In light of the Governor's statements on the tikine River, it seems that the Governor ould be aware of the parallel impacts that ight or might not occur on the Susitna

Thank you,
[illegible]

SECTION VII

ENVIRONMENTAL IMPLICATIONS

VII. ENVIRONMENTAL IMPLICATIONS

A substantial portion of the feasibility study is being directed to environmental considerations. Objectives are (1) to assess the probable environmental effects that would be caused by development of the Susitna Basin for hydroelectric purposes, and (2) to insure that any schemes devised for the hydroelectric development of the basin fully consider and integrate environmental considerations.

During the first year of the study, a comprehensive review of existing literature was made, and field studies were initiated. Existing data were used in the preliminary planning of the basin development. Findings derived from the continuing field investigations will be used to modify those initial development plans, leading by the end of the study to a sound project configuration and to identification of mitigative actions as needed.

The 30 month feasibility study currently underway (identified as Phase I) will provide sufficient data for a license application to the Federal Energy Regulatory Commission (FERC). However, it will not provide all the data ultimately needed, because the study period is too short to observe a substantially complete life cycle of certain species. Also, Phase I develops only preliminary mitigation measures. Accordingly, Phase II is planned to run concurrent with the FERC license application processing. Phase II studies will continue field investigations initiated during Phase I and will fully develop mitigation plans. During the FERC license processing, results of these Phase II studies will be integrated into the original license application. The amplified application will then form the basis for license approval or disapproval by FERC. The investigations comprising the Phase I program include fisheries, wildlife, plant ecology, land use analysis, cultural resources, recreation planning and socio-economic analysis.

The literature search provided a base line for predicting some probable effects of developing the Susitna Basin. That literature survey suggested that while there might be both gains and losses from the environmental viewpoint, none were of sufficiently major or irretrievable effect as to unequivocally rule out the project concept. New field data being collected are tending to reinforce the initial literature suggestions. Conclusions evolving from the first year of field investigations will not be available until April/May 1981. However, indications and tentative expectations are emerging. They are discussed below, together with expanded details of the various areas of investigation.[1/]

FISHERIES

Although it is generally known that the Susitna River has heavy anadromous runs, relatively little is known about the contribution of the Susitna Basin to the total Cook Inlet fisheries, the capacity of the basin to rear fish, or the distribution of fish by species and season. The initial objective of the fisheries studies is, via field surveys, to answer these points. The principal field investigator (the Alaska Department of Fish and Game) is conducting an extensive program of sampling, mapping and

assessment to determine the relative abundance and distribution of adult anadromous fish populations within the Susitna drainage, determine the distribution and abundance of selected juvenile anadromous fish populations, and delineate the seasonal habitat requirements of the anadromous and the resident fish species during each stage of their life histories. A related outcome of the field investigations will be an assessment of the economic, recreational, social and aesthetic values of the existing resident and anadromous fish stocks and habitat. These investigations are directed at the entire basin, from the Tyone River confluence down into the Cook Inlet. Hydroelectric development of the Susitna River will change the nature of the river below the dam sites. The normal flow regime will change from the present flow pattern of high flows in the summer and very low flows in the winter to a more or less uniform discharge below Devil Canyon dam. Also, the sedimentation characteristics, temperature and chemical balance of the river might be affected. Extensive hydrologic investigations are presently underway to assess present river conditions and to predict conditions after development. These predictions will then be integrated with data from the fish studies to provide an impact assessment on fisheries.

Because of a late start of the ADF&G field investigations, few field data have been gathered to date. However, information from the literature search together with first year hydrologic data suggests several possible effects after development.

The upper Susitna River, whose flow would be regulated by the proposed dams, contributes about 40 percent of the total annual Susitna River flow passing the Parks Highway Bridge and approximately 17 percent of the total Susitna River flow entering Cook Inlet. Seasonal flow changes will be greatest immediately below the dam with increasing attenuation downstream towards Cook Inlet as tributaries augment the volume of the river. According to preliminary indications there are no anadromous fish above Devil Canyon because fast-moving rough water at that location poses a natural barrier to their migration. If true, the dams will not cut off any traditional spawning migration. However, changes in the character of the river below the dams may alter the habitat for survival of young salmon spawned in lower tributaries. These changes may be deleterious (or perhaps beneficial) to salmon fry. Additional hydrologic data are needed to better judge the changes in flow that may be anticipated.

It is suspected that resident fish species in the upper reaches of the Susitna are very limited. The creation of an extensive reservoir behind Devil Canyon dam suggests that resident fish populations might be developed through increasing existing species or introduction of new species. However, the annual draw down cycle of the Watana reservoir will be sufficiently great to preclude any meaningful resident population there. Much more work needs to be done before these points can be answered.

WILDLIFE

The wildlife studies are subdivided into a number of components and are discussed below. Extensive interrelation exists between the various wildlife studies and complimentary studies of plant ecology, recreation planning,

land use analysis, socio-economic analysis, access road location, and design development.

Wildlife investigations are being pursued by the Alaska Department of Fish and Game and the University of Alaska, Fairbanks. The primary objective is to define the types and extent of wildlife habitats in the study area, and the utilization of those habitats by wildlife. These data will serve to predict the probable effects on wildlife of river impoundments. They likewise will be a basis for planning mitigation measures.

Wildlife Studies: Caribou

First year investigations concentrated on estimation of numbers, composition of sub-herds, delineation of calving areas, determination of migratory routes, and timing of movements. Particular emphasis was placed on evaluating potential impacts of the proposed impoundments on movements and sub-herd isolation of the caribou. Study techniques used included radio collaring, aerial tracking, and photography.

The Nelchina caribou population is estimated to number about 17,000 animals, divided into several sub-heards. The bulk of the animals summer in the Talkeetna Mountains and foothills, with others occupying several localities on the north side of the Susitna River. During the rut in autumn most of the caribou congregate on the Lake Louise Flat. Winter concentrations in 1980 occurred from the Maclaren River east to the Chistochina River, and in the Slide-Mountain-Little Nelchina River area. These seasonal movements involve crossings of the Susitna River in the sector to be inundated by the Watana dam. The impoundments will be something of an impediment to migration, but because it is relatively narrow caribou can swim across it readily provided that the shorelines are not blocked by ice shelves, frozen mud banks, or floating timber. Crossings undertaken during spring break-up would appear to be the most troublesome. At that time the animals are in weakened condition and ice flows are treacherous.

Development of access roads, air fields, and transmission lines may prove disruptive to caribou movements and general welfare. Particular concern should be directed to minimizing disturbance of the animals on their traditional calving grounds in the Talkeetna Hills and Oshetna/Kosina hills, which lie just south and north of the Watana impoundment. Improved access by hunters would permit increased hunting of the caribou.

Distribution and movement studies and habitat selection studies will continue through Phase I with routine monitoring of radio-collared caribou.

Wildlife Studies: Moose

Major points of investigation concern numbers of moose, seasonal habitat uses, movement patterns, and supplies of forage on winter ranges. Approximately 2,000 moose were estimated to exist on the

upper Susitna basin. Forty of these were captured and fitted with radio collars and their movements monitored. Of 563 observations of marked animals, 6 to 9 percent occurred in areas scheduled to be inundated, largely by the Watana dam. More data are needed, especially in winter, to interpret adverse effects of inundation on riparian moose range. Calf production in this population is high, signifying adequate nutrition at present. Many calves are lost to predators, particularly brown bears.

In the lower Susitna valley 10 moose were collared and their movements traced. Some lived all year close to the river, while others migrated seasonally to adjoining uplands. Willow, cottonwood, rose, and highbrush cranberry were preferred browse foods. An important issue to be further studied is the possible effect on these forage species of changes in river discharge and channel meandering.

Wildlife Studies: Dall Sheep

An aerial survey of sheep ranges was conducted in July, 1980. Three discrete areas of occupied range were identified, namely, Watana Creek hills, Portage-Tsusena, and Mount Watana. All are close to the areas to be impounded, and disturbance may become a factor in sheep welfare. The current population is estimated to be near 300 animals. Aerial surveys will be repeated in 1981.

Wildlife Studies: Black and Brown Bears

Studies are being conducted to determine the distribution and abundance of black and brown bears in the vicinity of the proposed impoundment areas, seasonal ranges, including denning areas, and movement patterns of bears. In 1980, 27 black bears and 27 brown bears were captured and marked using helicopter darting techniques. Adults were radio-collared and their movements traced. Brown bears utilize the proposed impoundment areas in spring but spend summer and autumn at higher elevations; they also den at these upper sites. Black bears drop down in late autumn to select dens near the river at elevations that will be inundated. All summer they frequent the timbered slopes which will be close to the level of flooding. This species probably will be more severely affected by the hydro-development than the brown bear. However, both species are abundant at present and probably will still be present in goodly numbers after development.

Wildlife Studies: Wolf, Wolverine

Five wolf packs were identified in the study area and 23 wolves were captured and fitted with radio collars to trace movements. The average size of a pack's territory was 450 sq. mi. (212 to 821). The five packs constituted at least 40 animals in spring 1980. By fall, the packs had increased to 77 wolves. Moose were the principal prey (52%), with caribou second (38%). Each pack made a kill about every fourth day. The most important potential impact of the Susitna hydro-electric project on wolves would relate to reductions in numbers of prey.

Four wolverines were radio-collared and 86 radio locations were obtained in 1980. Home ranges were large, as would be suspected (100 to 150 sq. mi. for males, 33 sq. mi. for a female). Wolverines prey largely on rodents, hares, and an occasional caribou calf. They seem to be somewhat intolerant of human disturbance but probably would be little affected by hydrodevelopment.

LAND USE ANALYSIS

Land use analysis studies are being conducted by the University of Alaska, Fairbanks. Primary objectives are to evaluate past, present, and future land use trends, describe present and future resource management programs and identify the major changes in land use that could result from the hydroelectric development of the Susitna Basin. Investigative tools have included inventories, review of resource management planning done to date, and assessment of present land use legal constraints such as the recently passed D-2 bill.

Data to date indicates little resource management planning done or proposed for the Susitna area. A complicating factor is the heterogeneous mosaic of land management activities and objectives as a result of the fragmentation brought about through the ANCSA and state land selection events. One of the major concerns relates to access to the area that will result from a basin development. Increased access would bring more opportunity to use the land, leading to more pressure on existing resources. This could force a change in land use, the lifestyle of those who have used and are still using the area, and could alter the ecological system. No assessments are available yet as to the degree of severity of these changes.

CULTURAL RESOURCES

The objectives of this investigation are to identify archaelogical, historical, and paleontological resources in the project area, to test and evaluate these resources, and to propose mitigation measures and lessen the impact of ground disturbing activities. The principal investigator is the University of Alaska Museum. Activities to date have included a literature search, substantial aerial photography, evaluation, and some archealogical excavation.

A number of sites have been identified that contain finds from both historic and prehistoric times. While only limited assessment of the finds has been made, no unexpected data has emerged. If this trend continues, post-basin development impacts will not be extreme. However, this assessment could be substantially qualified by next year's investigations.

RECREATION PLANNING

In addition to assessing the recreational aspects as part of the wildlife, land use and socioeconomic feasibility study subtasks, the principal investigator (University of Alaska, Fairbanks) is coordinating

the preparation of a recreation plan for development of the total project lands and waters associated with the basin development. The objectives of this plan are to provide the most socially acceptable and desirable mix of public recreation opportunities in concert with conservation and preservation objectives.

Considerations include the degree of access generally desired, extrapolating therefrom the amount of utilization of project lands that would result, balancing that degree of utilization against the capability of the project lands to support it and to identify and incorporate unique natural features, recreational opportunities or other unusual characteristics. Techniques used include inventorying, crossfeeding from other feasibility study subtasks, consultation with management agencies at all governmental levels, and seeking public input on the various alternative recreation concepts.

To date, only broad concepts have been developed. Response to these broad scenarios suggest moderate to high development is desired. Substantial further input and refinement to the proposals is necessary before an optimized configuration can result.

PLANT ECOLOGY

The plant ecology studies, being principally investigated by the University of Alaska, Fairbanks, have as their objective the mapping and characterization of the vegetation/habitat types ocurring in the project area. Desired results include identification of rare or endangered types, concentrations or conditions, and support to other investigations such as food source assessment for fauna. Principle investigative tools have been high altitude infra-red photography and landsat imagery.

To date, vegetation types and dispersal have been roughly categorized. Principle vegetation types in the area of inundation are closed mixed conifer and deciduous forest, closed and open conifer forest, tall shrubland and open and closed shrubland. Losses of vegetation/habitat in the area of proposed haul roads and borrow areas will probably consist largely of low shrubland and mat and cushion tundra. It appears that no biologically important types will be lost. Assessment of the impact of loss of habitat remains to be made.

CONCLUSIONS

It must be firmly stated that insufficient data exists as of the date of this report to definitively predict the overall impact of the Susitna Basin development. From that inability follows a corresponding inability to judge the acceptability or lack thereof of the probable impact.[2/] The Susitna project will result in a change in stream flow, but there is as much evidence to indicate that these alterations would create a positive overall fisheries impact as there is to suggest the opposite. Whether positive or negative the overall change in the Cook Inlet salmon fishery will probably be slight. Although the Susitna

may be a major salmon producer for the Cook Inlet the major Susitna contributions are expected to come from tributaries such as the Yentna, Kashwitna, Willow, Deshka, etc. - none of which are affected directly by Susitna development. Some questions for which there is totally inadequate data to even speculate on impacts are - what is the importance of the mainstem Susitna for winter rearing and how important for spawning and rearing are the sloughs and side channels? These questions are being addressed in the Phase I studies. It may be worth noting that some of the aspects of other hydro projects which have created significant impacts on fisheries are not inherent to Susitna. For instance:

1. There is no direct blockage of fish migration or escapement resulting from the dam itself.

2. There are no significant river diversions resulting in subsequent low flows in the diverted river.

3. Regulation is being factored into design to eliminate significant daily fluctuations in flow.

4. Nitrogen entrainment will not be significantly increased because there are not numerous reservoirs in series.

The possibility may exist for enhancing the Susitna River salmon fishery by taking steps to remove the velocity barrier at Devil Canyon and thereby open the upper Susitna River to salmon access. It is not known at this time whether the existence of the Susitna Hydroelectric Project would be an assistance or an impediment to the realization of this concept.

There will, of course, be a reduction in wildlife habitat resulting from inundation. The magnitude of this reduction is a key question which cannot be quantified until more data is available. However, the basin's most sensitive moose, caribou and furbearer areas are upstream of the Watana reservoir area.

Numerous concerns have been raised regarding the potential social impacts of the project. Continual reference is made to the pipeline project. As with any large construction project, there will be unavoidable socioeconomic effects in the local, regional and state areas. However, the pipeline had a large, transient, short-term construction force, much less controllable than a large, central, long-term (10 - 15 years) workforce as would be associated with Susitna. The degree to which this workforce is selfcontained can be controlled.

The influence of people in the area is likely to have a greater impact on the local area than the project itself. If the wildlife and land use disbenefits associated with increased access outweigh the social benefits of increased access, measures can be taken to restrict access. Since total restriction is not realistic, impacts will result from human intrusion into this relatively pristine area.

The absence to date of findings of serious negative impacts suggests studies should continue. Study continuation has the supplemental benefit of substantially increasing the data base of the southcentral Alaska ecological systems, a worthwhile benefit whether the Susitna Basin is developed for its hydroelectric potential or not.

No attempt is made in this report to assess the environmental implications of alternatives to hydroelectric development of the Susitna Basin. When the requirement for this report was established, the Power Authority was responsible for assessing alternatives to Susitna hydroelectric development. However, subsequent legislation removed the study of alternatives from the Power Authority and transferred it to the Governor's office. The Governor's staff, in turn, contracted assessment of alternatives to Battelle Northwest Laboratories. In the absence of alternatives assessment, the Power Authority is unable to effectively evaluate environmental impacts stemming from those alternatives. However, the Battelle Northwest Laboratories contract includes such environmental assessments. Battelle will also independently investigate the projected need for power (which will largely influence the question of timing and degree of future power development) and they will assess the full range of alternatives to meet that projected power need. As noted previously, their assessment of alternatives will include such factors as environmental impact and their social and economic costs. Battelle's efforts are scheduled to be completed by April 1982 so that the decision-making process will have the benefit of both the Battelle findings and the recommendations of the Power Authority.

SECTION VII. ENDNOTES

1/ The discussions of fisheries and wildlife were provided by Dr. Starker Leopold, member of the Susitna External Review Panel. Dr. Leopold based his presentation on his previous knowledge of the project area on interviews with study team members and on the first set of annual reports from the environmental study team. The sections on Land Use, Cultural Resources, Recreation Planning and Plant Ecology were summarized from Subtask 11.01 - Project Overview, Second draft, Acres American Incorporated, February 11, 1981, pages 10-4 through 1-25.

2/ These conclusions are based on discussions with members of the Acres study team.

References

Acres American. 1981. Watana and Devil Canyon Dam operational flow calculations with a plant factor of 0.49. (02/02/81). np.

D'Aoust, B.C. and M.J.R. Clark. 1980. Analysis of supersaturated air in natural waters and reservoirs. TAFS. 109:708-724.

May, B. 1981. Personal communication concerning Libby Dam supersaturation impacts. Montana Department of Fish, Wildlife and Parks. Libby, MT. April 20, 1981.