SUSITNA HYDROELECTRIC PROJECT
CULTURAL RESOURCES - IMPACT ASSESSMENT

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1. - INTRODUCTION

At the request of the Alaska Power Authority the Museum's assessment of the impact of the Susitna Hydroelectric Project on cultural resources is being presented as a report separate from the final Cultural Resources Investigations 1979 - 1985 report (Dixon et al. 1985). This report is designed to be used in conjunction with two additional reports requested by APA: Susitna Hydroelectric project, Cultural Resources - Significance (Saleeby et al. 1985) and Susitna Hydroelectric Project, Cultural Resources - Mitigation Recommendations (Smith and Dixon 1985).

All 270 sites documented in the Museum's final report are addressed in this report. Chapter 2 provides a summary of the proposed development associated with the Susitna Hydroelectric Project. Chapter 3 discusses the effects (events, activities, and processes) associated with planning, construction, and inundation and operation. Information concerning mechanical and biological impacts of inundation are summarized from the National Reservoir Inundation Study (Lenihan et al. 1981). Impacts of the Susitna Project on cultural resources are discussed in chapter 4. Chapter 5 is the Museum's site-specific impact assessment. References cited are included in the bibliography. The Appendix contains full-size USGS 1:63,360 scale maps depicting the location of cultural resources with respect to proposed features and facilities, and slope instability and permafrost areas in and adjacent to both reservoirs.

2 - SUMMARY OF PROPOSED DEVELOPMENT

In the proposed plan for full basin development, two major reservoirs will be formed. The larger Watana Reservoir will extend 48 miles upstream of the Watana Dam site and will have an average width of about 1 mile and a maximum width of 5 miles (Figure 1). The Watana Reservoir will have a surface area of ca. 38,000 acres and a maximum depth of about 680 feet at normal operating level.

The Devil Canyon Reservoir (Figure 2) will be about 26 miles long and one-half mile wide at its widest point. The reservoir will have a surface area of ca. 7,800 acres and a maximum depth of about 550 feet at normal operation level.

Staged development is planned. The Watana Dam will be completed first. If energy demands warrant the Devil Canyon Dam will be constructed later. If the Devil Canyon Dam is constructed the Watana Dam Construction Camp will be moved to the Devil Canyon area to house construction personnel. The Watana construction camp/village will provide housing for up to ca. 3,300 people and the Devil Canyon facilities up to ca. 1,800 people during the construction phase. During the operation phase, approximately 130 staff members and their families will be located at the Watana site.

The Watana Dam will be an earthfill structure with a maximum height of 885 feet, a crest length of 4100 feet, and a total volume of about 62,000,000 cubic yards. During construction, the river will be diverted through two concrete-lined diversion tunnels in the north bank of the river. Upstream and downstream cofferdams will protect the dam construction area. The power intake includes an approach channel in rock on the north bank. A multilevel, reinforced concrete, gated intake structure capable of operating over a full 140-foot drawdown range will be constructed.

The Devil Canyon Dam will be a double-curved arch structure with a maximum height of about 645 feet and a crest elevation of 1463 feet asl.

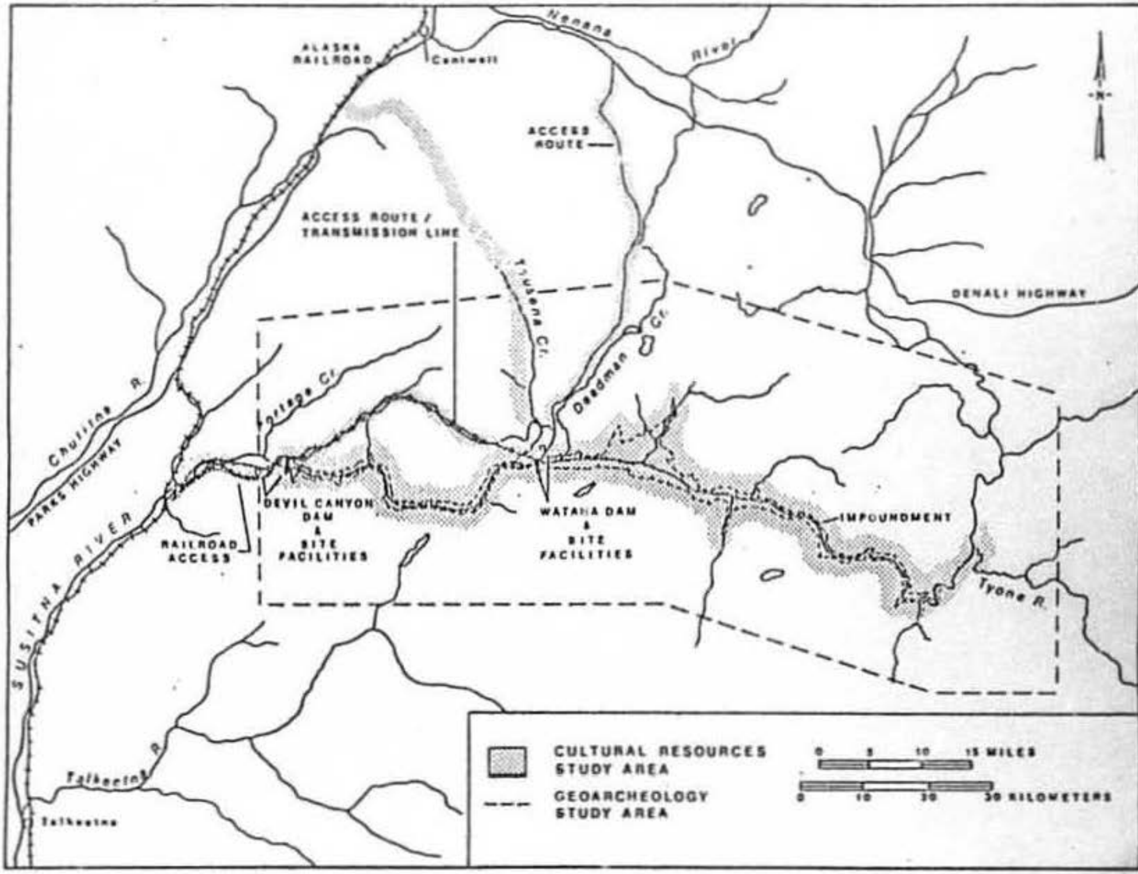

Figure 1. Location of Dams, Access Routes, Transmission Lines and Study Area Bounderies in the Middle Susitna River area.

The crest will be a uniform 20 foot width and the maximum base width will be 90 feet. A rock-fill saddle dam on the south bank of the river will be constructed to a maximum height of about 245 feet above foundation level. The power intake on the north bank will include an approach channel in rock leading to a reinforced concrete gate structure which will accommodate a maximum drawdown of 55 feet. Flow during construction will be diverted through a single concrete-lined pressure tunnel in the south bank. Cofferdams and the diversion tunnel are proposed to provide protection against floods during construction.

About 2½ years of average streamflow will be required to fill the Watana reservoir. Filling will commence after dam construction proceeds to a point where impoundment concurrent with continued construction can be accommodated. Postproject downstream flow will be lower in summer and higher in winter than current conditions. Downstream of the project, differences between pre- and postproject flow conditions become less pronounced, as the entire upper basin contributes less than 20% of the total discharge into Cook Inlet.

The selected access plan consists of a railroad from Gold Creek to Devil Canyon on the south side of the river (Figure 1). The plan also included access by road from the Denali Highway to the Devil Canyon Dam site via the Watana Dam site (Figure 1).

The selected transmission line route (Figure 2) which will carry power from the Susitna Project roughly parallels, but is not adjacent to, the access route of railroad and road between Gold Creek and the Watana Dam site. At Gold Creek, it connects with the Railbelt Intertie. Between Willow and Anchorage, the route extends in a southerly direction to a point west of Anchorage, where undersea cables will cross Knik Arm. Between Willow and Healy, the route would utilize the transmission corridor previously selected by the Alaska Power Authority for the Railbelt Intertie.

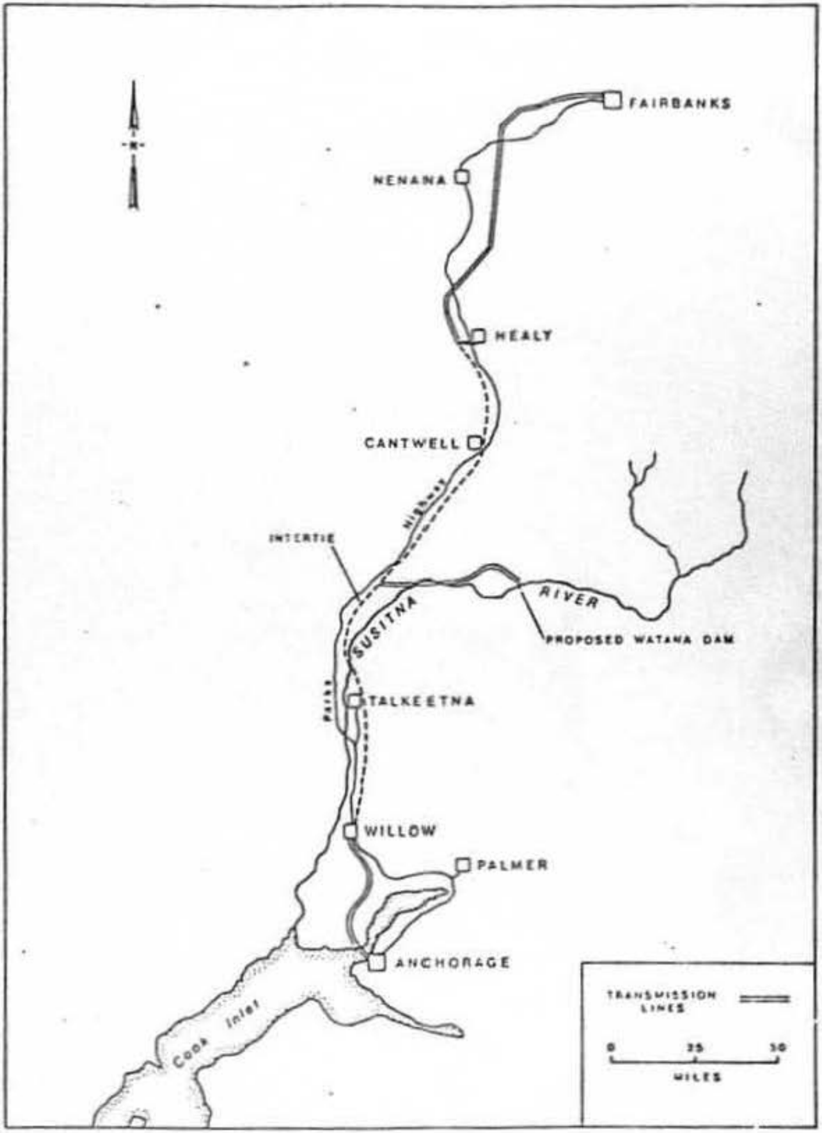

Figure 2. Transmission Routes and Study Area Boundaries.

The location of project features and facilities are also shown on full-scale U.S.G.S. maps located in the Appendix -- Figures 8 through 48.

3 - EFFECTS OF PLANNING, CONSTRUCTION, AND INUNDATION AND OPERATION

3.1 Introduction

Effects considered in this chapter are events, activities, and processes that will occur during the planning, construction, and inundation and operation stages of the Susitna Hydroelectric Project. When they occur these events, activities, and processes will impact cultural resources as various stages of the project proceed. At present (1985), the Susitna Project is in the planning stage. General impact is discussed in chapter 4 and site specific impact in chapter 5.

Inundation and associated reservoir processes as they apply to the Devil Canyon and Watana reservoirs are considered with respect to information contained in the National Reservoir Inundation Study (Lenihan et al. 1981) and Conservation Archeology: A Guide to Cultural Resource Management Studies (Schiffer and Gumerman 1977). General reservoir processes are summarized from the National Reservoir Inundation Study. Planning, construction, and operation effects of the Susitna Hydroelectric Project, as well as other project-specific information, were extracted from the following documents: Susitna Hydroelectric Project Draft Environmental Impact Statement (May 1984), Susitna Hydroelectric Project Supplemental Responses (October 1983), and Susitna Hydroelectric Project FERC License Application (February 1983).

3.2 Planning

During the planning stage of the Susitna Project, studies associated with assessing project feasibility could have impacted cultural resources. For example, engineering studies designed to assess the underlying geologic strata in the Susitna Project area through ground disturbing activities (drilling bore and auger holes, digging test trenches, and conducting seismic studies) could have impacted cultural resources. Environmental studies in the project area, although less ground disturbing in nature, could also have impacted cultural resources if personnel collected or disturbed cultural material (including its context) during the course of their investigations. In addition to planning studies themselves the construction and operation of the Watana Base Camp, which served as a base of operation for all studies in the project area, could have impacted cultural resources.

The above mentioned activities did not impact cultural resources because cultural resource survey was conducted in 1978 prior to the construction of the Watana Base Camp (Bacon 1978) and no sites were found in the immediate camp area. In addition, beginning in 1980 University of Alaska personnel conducted cultural resource investigations for all ground disturbing activities associated with feasibility studies. If cultural resources were located in these areas the activity was moved to an area determined not to contain cultural resources. Reports and recommendations on these investigations were submitted to the State Historic Preservation Officer and work proceeded upon receipt of clearance from the SHPO.

In addition to cultural resource investigations for ground disturbing activities conducted during the planning stage, project personnel were informed of procedures for reporting cultural resources that may be encountered during their studies or related activities. As a result, several sites were located and reported by non-archeological personnel. Based on work conducted by Bacon (1978) and the University of Alaska (1980-1985), no known sites were impacted during this portion of the planning stage.

3.3 Construction

During the construction stage of the Susitna Project, building of project features and facilities, including support facilities, and the resulting increase in the number of personnel in the area will impact cultural resources. Effects of constructing individual features and facilities are discussed below. Construction and operation of support facilities, land use and recreational use of the area by project personnel are effects that all features and facilities have in common and are therefore not mentioned individually. Project features and facilities are depicted in Figures 8 through 48 which are located in the Appendix.

(a) Access Routes

Effects associated with the construction of the access route consist of the removal of ground cover, road clearing and grading, and cut and fill associated with the construction of the road bed.

(b) Access Route Borrow Areas

Effects associated with the use of access route borrow areas consist of the removal of ground cover, rock and gravel extraction, and the construction of staging areas and temporary roads to borrow sources.

(c) Devil Canyon Construction Area

Effects associated with the Devil Canyon Construction Area include construction of the thin arch concrete Devil Canyon Dam, earth-filled saddle dam, main spillway, emergency spillway, powerhouse, tunnels, switchyard, cofferdam, access road, bridge, and a temporary camp and village.

(d) Devil Canyon Reservoir

Effects associated with the Devil Canyon reservoir include clearing timber within the reservoir (possible), bank stabilization, and filling and regulating the reservoir. Effects of inundation are discussed in section 3.4.

(e) Recreation Areas

Effects associated with recreational use of the area consist of construction of visitor centers at the Devil Canyon and Watana dam sites, shelters, semideveloped camp sites, primitive camp sites, developed trails, primitive trails, trailheads, scenic vistas and road pull-offs.

(f) Railroad Route

Effects associated with construction of a railroad include clearing ground cover, grading the right-of-way, cut and fill associated with the rail bed, extraction of rock and gravel, construction of an engine turnaround, fuel storage areas, loading dock, and temporary access routes.

(g) Transmission Routes

Effects associated with construction of the transmission lines include clearing ground cover, constructing tower pads, erecting towers, construction an all-weather road under the lines, building access roads and trails, and rock and gravel extraction for pads, roads and trails.

(h) Watana Construction Area

Effects associated with the Watana Construction Area include clearing ground cover, construction of an earth-filled dam, main spillway, powerhouse, power intake structures, penstocks, dike, switchyard, cofferdam, access roads, permanent town, and a temporary camp and village.

(i) Watana Reservoir

Effects associated with the Watana Reservoir include clearing timber within the reservoir (possible), bank stabilization, and filling and regulating the reservoir.

3.4 Inundation and Operation

(a) Inundation (Reservoir Processes)

The Middle Susitna River Canyon area will be inundated by reservoirs formed behind the proposed Watana and Devil Canyon Dams. As a result, two large freshwater lakes will be formed. During the inundation process and after inundation mechanical, biochemical, and human/other factors will effect the terrain within, and to varying degrees, areas adjacent to the reservoirs. Mechanical processes which include physical erosion, deposition, wave action, saturation, slumping, and [illegible]tation will act upon the Watana and Devil Canyon reservoirs and adjacent areas. Impounding of these freshwater reservoirs will also result in a uniqu biochemical environment due to superimposing a riverine aquatic ecosystem on a terrestrial ecosystem. Hydrologic processes that will influence the reservoirs' chemical processes include inflow and outflow, sedimentation, thermal stratification, density current formation, and frequency and amplitude of reservoir drawdown cycles. Biological activities within the reservoirs will be regulated by water temperature, dissolved oxygen, and reservoir pH. Changes in the water level of the Susitna River and its tributaries caused by filling the reservoirs will raise the ground water table in the area.

(i) Mechanical Processes

Fluid forces within the Watana and Devil Canyon reservoirs generated by water motion will result in deposition, erosion, and transportation processes. In descending order of magnitude, water motion will occur in the form of waves, currents, and tides. Waves will most often be generated by winds b[illegible] may also be generated by boat and float plane activity. Currents (resulting from differences in water elevation from density flows resulting from differences in water temperature, salini[illegible] or turbidity) will cause wave action in the near-shore areas. Tides will be caused by attractions of sun, moon, and earth.

Waves will be the single most destructive fluid force determining the slope and configuration of the reservoir shorelines. The size and extent of waves will depend on wind speed, duration, direction, and surface area over which the wind blows (fetch). In deep water waves will have less effect on the reservoir morphology than waves in shallow areas which dissipate their energy on the shorelines. Breaking waves in the shallow areas will erode or deposit material on shorelines along the margins of both reservoirs.

In all of the Devil Canyon Reservoir and most of the Watana Reservoir (the exception being the Watana Creek area) where the sides are relatively narrow (small fetch), steep, and composed of bedrock, wave action will have little effect on shoreline morphology. In those areas of the Watana Reservoir where the reservoir is wide (allowing wave build-up), gently sloping, and composed of deposits susceptible to erosion, beaching, flows, and slides (Figures 49-54 in the Appendix), wave action will have more of an effect on shoreline configuration. The widest part of the Watana Reservoir is in the area of Watana Creek (ca. 5 miles). Due to this and the fact that the predominant winds are from the northeast the south bank of the Watana Reservoir in this area will be subject to the greatest wave action although wave action will impact, to a lesser degree, other portions of the reservoirs as well.

Currents within the deeper portions of reservoirs will produce little mechanical impact while nearshore currents will alter shoreline conditions. Currents running parallel to the shoreline will transport sediments and cause erosion or deposition on them. Effects of currents altering shoreline conditions will be more pronounced in portions of the reservoir where storm waves are more commonplace. Currents will have less effect on shorelines of the Devil Canyon Reservoir due to its relatively small fetch. The Watana Reservoir in the Watana Creek area will have more pronounced shoreline erosion due to currents because of its larger fetch.

Fluid force within the reservoirs will be the greatest in the nearshore (high-energy) area, particularly in the portion of the reservoirs subject to drawdown. Shorelines will erode when the amount of material transported is greater than the amount of material taken away. The opposite will be true for accreting shorelines. When the reservoir pools remain relatively stable, the areas near the shorelines and the shoreline themselves will tend to stabilize, reaching an equilibrium profile. After stabilization, wind and wave erosion will gradually erode the formed shorelines, transporting material into the reservoirs and resulting in the formation of shoals. Off-shore shoals in time will assist in stabilizing the shorelines by dissipating wave energy that would otherwise impact them. With a drop in water level during drawdown, the offshore shoals will be subject to erosion which will interfere with shoreline equilibrium when the water level again rises by allowing wave energy to dissipate against the stabilized shorelines causing a resurgence of shoreline formation processes.

Drawdown in the Devil Canyon Reservoir will be less than that in the Watana Reservoir (Devil Canyon ca. 50 feet, Watana ca. 130 feet). Therefore, shoreline fluctuation will be more extensive in the Watana Reservoir than in the Devil Canyon Reservoir.

Mechanical processes away from the high-energy, nearshore area in the reservoir basins will consist of two forms of offshore deposition: submarine slope failure and reservoir sedimentation. During initial inundation, slopes within the Devil Canyon and Watana reservoirs will be drastically altered, changing basin morphology. As water saturates soil/sediments the shear strength across any plane of failure will decrease, a process which will be accelerated by the presence of permafrost. Devil Canyon and Watana reservoir permafrost areas are depicted in Figures 49 through 54. As a result, soil/sediments will shift and continue to change until a new angle of repose is established. Submarine slope failure will be most pronounced during the initial submergence in unconsolidated talus deposits and plastic soil/sediments such as silty or sandy units including fine-grained tephra deposits. Areas within the Devil Canyon and Watana reservoirs susceptible to slope failure are depicted on Figures 49 through 54. Sudden drawdown will accelerate slope failure due to the rapid change from an aquatic to a terrestrial environment. Since the drawdown is greater in the Watana reservoir than the Devil Canyon reservoir, slope failure will be more pronounced in the Watana reservoir.

With a decrease in velocity, which will occur when fast moving water enters the calm reservoirs, the carrying capacity of the water will decrease and sediments carried in the water will be deposited. As a result sediments within the reservoir basins will begin to build up. The amount of load deposited will for the most part depend on the amount of material in suspension. The higher the amount of material in suspension the higher the sedimentation rate will be within the reservoirs. Unless these sediments are removed they will continue to build up within the reservoirs until the capacity of the reservoirs to hold sediments is decreased due to the decreased volume of stil. water for sediment entrapment.

All tributaries of the Susitna River between Tyone River and Devil Canyon are clearwater rivers and streams (Figure 1). Sedimentation within the Devil Canyon and Watana reservoirs will come mainly from the glacial-fed Susitna River itself. Although tributaries to the Susitna River will experience a decrease in velocity when they enter the reservoirs, the amount of sediments in these waters is low compared to the Susitna River and therefore will contribute little sediment to the reservoirs. One exception, however, would be episodes of increased sediment load in these waters due to submarine and terrestrial slides or flows that may be accelerated as a result of changes in water levels, including ground water levels and wet/dry and freeze/thaw cycles. The highest occurrence of these tributary slope failures are expected in the Watana, Jay and Kosina Creek areas which are presently experiencing slope failure (terrestrial).

It is unclear at this time how clear-cutting the reservoirs, if utilized, would effect the amount of sediment deposited within the reservoirs, but is it likely that it will contribute to sediment deposition.

(ii) Biological Processes

Biological processes within the reservoirs will consist of hydrologic and chemical processes, and biological activities determining the ecosystem of the reservoirs. Chemical processes which will change river chemistry in the reservoirs will be influenced by climate, geology, topography, biota, and time. Although published data on reservoir chemical systems is limited, general trends can be characterized. Basically, chemical concentrations will have the most effect on cultural resources. Therefore, areas of highest chemical concentration will be the areas of greatest impact. Chemical concentration will display vertical and horizontal variability. Deep water near the Devil Canyon and Watana dams will have the highest concentrations of chemicals because 1) because it is furthest downstream from the inlet evaporation will have taken place for the longest time, 2) the bottom soil and strata will be the last to be sealed off by silt, and 3) the deeper waters below the thermocline will favor the concentration of most dissolved solids. In contrast, the shallow portions of the reservoir near inflow streams, will likely have the least chemical impacts. Levels of pH will tend to be lower in deeper portions of the reservoir and higher in shallow areas where light penetration and photosynthesis will occur. In addition, areas continuously submerged will receive more chemical impact than areas that are only occasionally submerged.

Chemical processes within the reservoirs will vary seasonally due to the time available for water to absorb soil minerals. During the spring and summer, water will move faster and will have less time to absorb soil minerals. However, winter runoff will be slower which will increase the concentration of soil minerals in the water by the time it reaches the reservoirs.

Biological systems within reservoirs will be influenced by and will contribute to the aquatic chemical system. The interrelationship of chemical and physical parameters of the reservoirs as well as the entire watershed will determine the distribution of the aquatic biological community.

Biological systems within the reservoirs prior to initial filling will be dramatically altered when a riverine ecosystem is superimposed over a terrestrial one, creating a new still-water ecosystem. During this rapid transition period there will be a mass mortality of riverine ecosystem plants and animals, a migration of terrestrial organisms to new habitats, and development of plankton populations. The initial nutrient release from newly submerged soils, plants, and animals will increase heterotrophic activity. Eventually the new chemical, biological and hydrological regimes will stabilize. However, due to the regulation of water within the reservoirs, it will be difficult to achieve full equilibrium.

Regulation of the reservoirs will also affect the physical, chemical and hydrologic aspects of the reservoirs which in turn will affect the biological system. Water will be discharged from the reservoirs from the deeper portions of the reservoir pools, which can be the coldest and most nutrient-rich portions. Discharging this water .ill affect both upstream and downstream ecosystems. Water temperature within the reservoirs as well as downstream from the dams will be affected by this discharge resulting in increased evaporation loss and reduced productivity within the reservoirs and increased salinity, all of which will affect biological systems.

Within reservoirs density currents will carry silt in suspension and create turbid conditions. These currents will contribute to sedimentation in the reservoirs which in turn will influence the distribution and diversity of biological communities.

Thermal stratification will divide the reservoirs into at least two zones. Temperatures within these zones will determine chemical and biological activities. Near the top of the pools, warm temperatures and increased light penetration will encourage photosynthetic activity while bacterial activity will predominate in deeper, cooler, less illuminated portions of the pools. These temperature systems will be the major limiting factor in aquatic ecosystems because of the narrow tolerance range of some aquatic organisms. Temperature will also be an important feature in the solubility of various gases, particularly oxygen (a requirement for respiration for many aquatic organisms). As a result aerobic and anaerobic zones will exist within the reservoirs' submerged sediments.

The growth of organisms within the reservoirs will depend on the supply of nutrients. These nutrients will provide material necessary for synthesis of protoplasm, supply the energy necessary for cell growth, and serve as electron acceptors in reactions that provide energy to the organisms.

Within the reservoirs three life zones will be established: 1) the zone that receives light penetration to the bottom and contains root plants, 2) the open water zone extending from the surface to the effective depth of light penetration, and 3) deep water zone beyond the effective light penetration. Within each of these zones various assemblages of organisms will exist. At the sediment water interface aerobic organisms will predominate. Below the sediment water interface anaerobic organisms will prevail.

(b) Operation

After the initial process of filling both the Watana and Devil Canyon reservoirs the dams will be regulated for the production of hydroelectric power. Personnel operating and maintaining the facilities will be housed in quarters near the dam sites. Both dams will experience drawdown and refilling as part of facility operation, this drawdown will continue disrupting basin stabilization. Effects will also result from land use and recreational use of the area by project personnel and the public actively using constructed recreational facilities. The availability of large amounts of electricity could stimulate private and industrial growth, in, near, and/or some distance from the project area.

Impacts of project-related events, activities, and processes on cultural resources are discussed in the following chapters.

4 - IMPACTS TO CULTURAL RESOURCES

4.1 Introduction

Data concerning cultural resources is derived from the analysis and evaluation of artifacts, artifact classes, and their attributes (artifact level, small-scale archeological resources); the spatial-formal relationships of cultural remains within a site (site level, medium-scale archeological resources); and the relationship of the site(s) to the environmental setting (regional level, large-scale archeological resources). The loss of data resulting from Susitna Project-related impacts to any level of data retrieval will affect the type, quality, and quantity of information obtainable from cultural resources in the Middle Susitna River area. This in turn will affect the evaluation and interpretation of this resource base and ultimately the prehistory and history of interior Alaska.

On the regional data level, cultural resources and the cultural systems they represent are assessed as part of the larger ecosystem. By utilizing environmental and ecological data it is possible to address questions that cannot be addressed with site-specific information alone. This level of data will be lost or affected through covering, obscuring, modifying, changing, or destroying the area's geomorphology, hydrology, vegetational communities, and faunal populations. This would affect the environmental data base of the region, regional intersite and site-environmental patterns, and large-scale features such as trails (Lenihan et al. 1981).

Within sites cultural material exhibits a spatial-formal relationship that represents the spatial operation of the past inhabitants. Information derived from the analysis of the depositional context of cultural remains may reflect nonmaterial or organizational aspects of the cultural system that may not be possible from the examination of the material remains alone. The destruction or alteration of the spatial and stratigraphic context of cultural material will result in the loss of much of the scientific value of this material.

At the site level of data retrieval it was the relationship between artifacts that constituted the level of inquiry. At the artifact level it is the individual artifacts, artifact classes, and their specific attributes that are examined to provide insight into human behavior. Destruction or alteration of any of them or their differen al preservation will result in the loss of much cultural and behavioral information.

Information concerning cultural resources is also derived from various analytical techniques applicable to one or more levels of scientific inquiry. These techniques, some of which are applied to the artifacts themselves and others to various environmental aspects of the site or region, contribute much to understanding cultural resources. Destruction or alteration of the medium to which these techniques are applied will result in the loss of data.

4.2 Large-Scale Archeological Resources and Impacts

Susitna Project-related impacts will not only destroy or alter the visible element of the cultural resource base (surface lithic scatters, house pits, cache pits, historic structures, etc.) but entire environmental and cultural systems that extend beyond site limits.

In addition to site-specific data, information relevant to cultural resources resides in the immediate and surrounding environment as reflected in the distribution of plants and animals, soils/sediments, and geomorphological features. Evaluation of these elements provides a basis for interpretation with respect to the modern environmental setting, and forms the basis for paleoenvironmental reconstruction.

The basis for paleoenvironmental reconstruction lies in an understanding of the present environment. Susitna Project impacts related to construction, inundation and operation will obscure or destroy ecological and physiographic aspects of the modern environment. Construction activities will remove or modify terrain features, and inundation will destroy or alter the distribution of present terrestrial and riverine ecosystems. The geomorphology of the area will also be destroyed or altered due to construction activities associated with building dams, camps, roads and the extraction of borrow material. Changes in drainage patterns brought about by stream diversion or alteration and water impoundment, and erosion and burial, caused by processes within the reservoirs, will also effect the modern geomorphology.

Intersite and site-to-environment relationships are expressed within spatial, temporal, and organizational aspects of cultural and environmental systems. At the macro-level sites are part of a larger settlement system, analysis of which provides insight into past social and economic behavior. Destruction or alteration of the environmental setting will effect this type of analysis.

Large-scale cultural elements such as trails extend beyond the site and may extend a considerable distance into the surrounding area. With few exceptions, trails lack cultural remains making them difficult to discern with infrequent use. As a result, this important aspect of the regional human exploitation pattern is usually under-represented in cultural resource inventories (no trails were documented by this study). The further obscuring, or destroying of trails or other large-scale elements that may exist in the project area by construction and inundation process will effect a portion of the data base dealing with regional patterns such as site location, regional interaction patterns, resource exploitation, etc.

The loss of large-scale environmental and archeological resources and the data they contain precludes a broad range of cultural/environmental analyses that could be used to address broad regional questions concerning settlement and subsistence patterns, population dynamics, human ecology, and cultural processes.

4.3 - Medium-Scale Archeological Resources and Impacts

Medium-scale archeological resources consist of the context of various entities within a site and is measured on three principal dimensions:

time, space, and human behavior (Lenihan et al. 1981). Elucidation of the time dimension within and between sites provides the temporal correlation which forms the basis for dating and comparing sites and site components. This in turn is the basis for constructing cultural chronologies. The majority of inter- and intra-site questions are time-specific. Temporal context depends on the ability to date items within a site and/or elements of the site. The context necessary for reliable dating depends on an undisturbed stratigraphic context. Stratigraphic contexts will be altered or destroyed by construction-related ground disturbing activities and/or mechanical and biological processes associated with the Devil Canyon and Watana reservoirs.

The spatial relationship of artifacts and features within a site is the basis for intrasite analysis aimed at discovering behavioral patterns. Spatial correlations of site elements not only define behavioral patterns but may shed light on problematic artifacts by inference from the known functions of artifacts or features found in close proximity. Because spatial patterning is dependent on precise locational information any disturbance or destruction of this information either through ground disturbing activities, or mechanical or biological reservoir-related processes will severely affect this type of analysis and the questions that it can address.

4.4 - Small-Scale Archeological Resources and Impacts

Artifacts themselves and their specific attributes (wear, cut marks, material type, etc.) are not only the basis for data concerning interrelationships within and between sites, but in and of themselves or as classes of artifacts provide data about human behavior. When artifacts or their analytical attributes are altered or destroyed by ground disturbing activities and/or mechanical or biochemical process associated with inundation the critical base of the data pyramid is drastically altered.

All classes of artifacts will be impacted by ground disturbing activities associated with the construction stage of the Susitna Project through destruction or alteration. Within the reservoirs, with the exception of lithic material, all material categories (bone, wood, shell, seeds, pollen and other organics, and ceramics) will be impacted to varying degrees depending on the interrelation of the physical, chemical, and biological components of the Devil Canyon and Watana reservoir ecosystems. The degree of deterioration will depend on the effects of initial inundation, length of inundation, specific chemical environment and the material type. Bone material will suffer alteration or complete deterioration due to attack by micro-organisms. Although wood has been reported to be preserved in a submerged context, varying degrees of chemical and biological deterioration are possible within the reservoirs resulting in changes in the composition and quantities of vegetal and mineral components of the wood. Charcoal, a wood by-product, appears to suffer little from the effects of inundation with the exception of loss of the material itself through mechanical processes.

Shell material that may exist within the reservoir will be altered due to calcium leaching resulting in deterioration. Seeds, pollen, and other organic material will suffer the effects of microbiological activity resulting in deterioration or destruction. Ceramics will deteriorate due to calcium leaching, weakening of the clay body, and increased porosity. Other than mechanical impact causing breakage and horizontal and vertical movement, lithic material is not likely to be impacted by inundation.

Mechanical and biological processes as they affect cultural material can result in morphological and compositional differences (differential preservation) in the cultural assemblage which will in turn affect site and regional interpretation and the application of analytical techniques.

4.5 - Impacts to Dating and Analytical Techniques

Various dating and analytical techniques have great utility in archeological research. A loss of, or decrease in the material on which analytical techniques are applied, or compromise of the validity of test results by various possible alterations of the material will severely affect archeological interpretation. Dating techniques include: carbon-14, obsidian hydration, archeomagnetic, fission track and alpha-recoil tract, and thermoluminescence. Analytical techniques includes: soil chemistry (pH, phosphate, nitrate, potassium, organics, calcium, magnesium, and sodium), source identification, microscopic analysis of artifacts, survey techniques and remote sensing, and qualitative data relative to strata and features.

In terms of soil chemistry, responses will be mixed with respect to inundation. While pH will be lowered (more acidic) the relative inter- and intra-site results should still be comparable. Phosphate values will be lowered (possibly due to a homogenizing effect), although like pH relative results should still be useful. Similarily, nitrate and potassium values will be lowered. It is possible that the amount of organic matter in the soil matrix may also be reduced. Calcium content will decrease while magnesium content and sodium levels will remain stable.

Analytical techniques that identify the constituent elements of artifacts such as neutron activation, optical emission spectroscopy, X-ray fluorescence and X-ray diffraction will not likely be affected by inundation.

Although additional research needs to be carried out it appears that source identification analysis of artifact minerals using various techniques such as neutron-activation analysis, optical emission spectroscopy, X-ray fluorescence and X-ray diffraction to identify constituent elements will not be substantially impacted by inundation. It is also possible that microscopic analysis of lithic artifacts to identify plant and animal residue may not be affected by inundation, although there is the possibility that mechanical abrasion may occur which could obscure wear and residue analysis.

Due to the accumulation of silt, changes in morphology, and changes in vegetation within the reservoirs, survey techniques including remote sensing will be affected with respect to relocating buried sites or conducting additional survey (underwater survey or survey during draw-down) within the reservoirs because of the obscuring of these resources. Qualitative data in terms of non-removable aspects of the site such as soil color and texture will be significantly impacted by inundation.

5 - IMPACT ASSESSMENT

5.1 Methods

(a) Impact Areas

Impact assessment is based on the relationship of cultural resources to impact areas. Impact areas include the following features and facilities: access routes, access route borrow areas, borrow areas A through L, Devil Canyon construction areas, Devil Canyon Reservoir, geotechnical testing areas, recreation areas, railroad route, transmission routes, Watana construction area, and the Watana Reservoir. The relationship of cultural resources to project features and facilities is defined within the context of a three zone system (zones A, B, and C, Figure 3). Impact assessment relates to the cultural resources located and/or documented during the course of the University of Alaska Museum's cultural resource program (Dixon et al. 1985).

(b) Zone System

The three zones (Figure 3) developed for impact assessment take into consideration construction, inundation, and operation of the Susitna Hydroelectric Project as well as available data on permafrost and slope instability associated with the reservoirs. Zone A consists of the area within all project features and facilities, such as the reservoirs, access routes, borrow areas, construction areas, etc. For the reservoirs, zone A is subdivided into four subzones -- A1, A2, A3, and A4 . These subzones are modified from reservoir zones defined in the National Reservoir Inundation Study (Lenihan et al. 1981). Zone A and its subzones are defined as follows:

Zone A Area within project features and facilities

Zone A1 Permanent conservation pool (Watana 2065 feet asl, Devil Canyon reservoir 1405 feet asl) including ice formation zone.

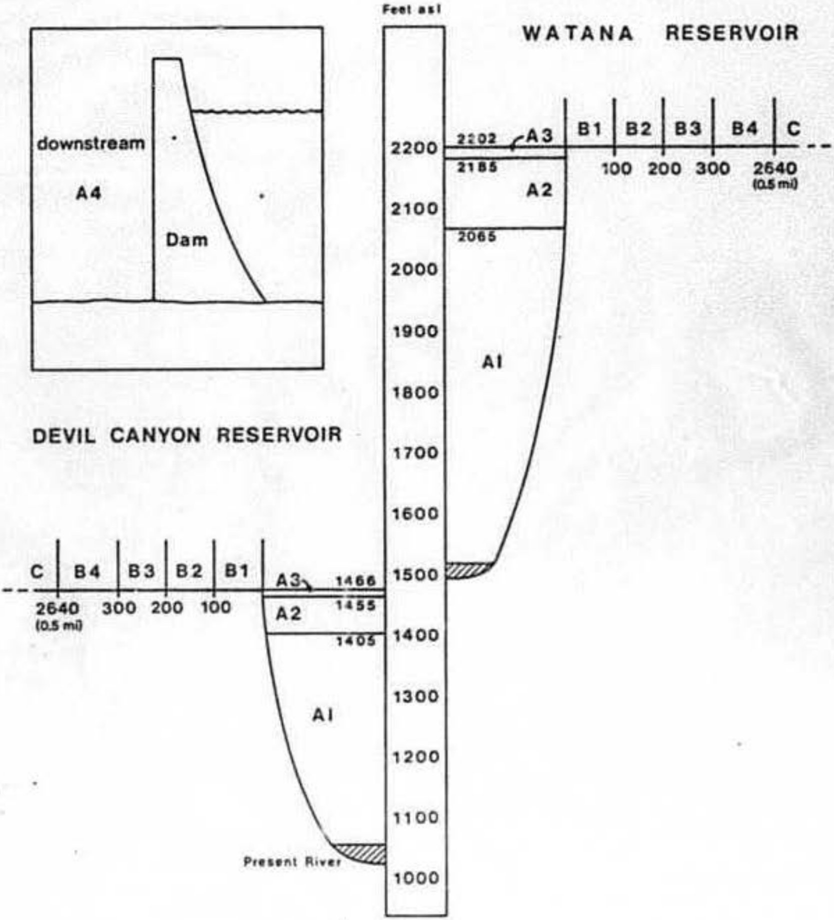

Figure 3. Zones and Subzones

Zone A2 Shoreline fluctuation zone, drawdown zone (normal operating zone, Watana 2065 to 2195 feet asl, Devil Canyon 1405 to 1455 feet asl).

Zone A3 Upper floodpool (Maximum water surface, Watana 2202 feet asl, Devil Canyon 1466 feet asl).

Zone A4 Downstream zone (downstream from Watana and Devil Canyon dams).

Areas not within project features or facilities but adjacent (within 0.5 miles) to them are defined as zone B. Zones B is subdivided into four subzones based on horizontal distance from the reservoir (Figure 3) and/or other project features or facilities and are defined as follows:

Zone B1 Area between a feature or facility and 100 feet.

Zone B2 Area between 100 feet and 200 feet of a feature or facility.

Zone B3 Area between 200 feet and 300 feet of a project feature or facility.

Zone B4 Area between 300 feet and and 2640 feet (0.5 miles) of a feature or facility.

The third zone in this system, zone C, represents the area beyond 0.5 miles of any project feature or facility including the reservoir.

(c) Cultural Resources and Zones

Figures 8 through 47 in the Appendix show the location of cultural resources in relation to project features and facilities (Dixon et al. 1985). Based on these maps, cultural resources have been assigned to the appropriate zone or zones. The assignment of cultural resources to a zone or zones is based on the two dam proposal as outlined in the FERC application. Cultural resources assigned to zones within the reservoirs is based on full impoundment of the reservoirs. Zones within the reservoirs, as well as backshore zones (B1, B2, B3 and B4), will fluctuate with respect to filling and drawdowns of the reservoirs. Cultural resources and the zone(s) in which they fall are listed at the end of this chapter in Tables 1, 2, and 3 and graphically displayed in Figures 4, 5 and 6. Because cultural resources can fall within or adjacent to more than one feature or facility they can be listed in multiple zones, for example, site TLM 022 is located in borrow E and is also adjacent to the Devil Canyon reservoir and therefore is listed in zones A and B1. As a result of multiple listing the total number of sites by zones in Table 1 is 346 while the total number of cultural resources located and documented as a result of the Museum's cultural resource program is 270. Fifty-six cultural resources fall in more than one zone (Table 3). Of these 51 fall in two zones and five fall in three zones. Cultural resources that fall within the same zone but for different features or facilities are listed in Table 2 only once, for example, site TLM 016 is in zone B3 with respect to the permanent airstrip and zone B3 with respect to the Watana construction camp. As a result of listing cultural resources only once if they fall in the same zone more than once Table 2 shows 331 cultural resources by zones. Cultural resources in this category are as follows: TLM 016 (B3, B3), TLM 018 (B4, B4, B4), TLM 078 (A, A), TLM 088 (A, A), TLM 098 (B4, B4), TLM 106 (B4, B4), TLM 107 (B4, B4), TLM 110 (B4, B4) TLM 112 (B4, B4) TLM 117 (B4, B4), TLM 160 (B4, B4), TLM 165 (B4, B4), TLM 166 (B4, B4), and TLM 192 (B4, B4).

Of the 331 cultural resources by zones as shown in Table 2, the following numbers and percentages represent each zone (Figure 4):

Within Project Features and Facilities Exclusive of Reservoirs		
	Number	%
Zone A	45	13.5
	Within Reservoirs	
Zone A1	61	19.1
Zone A2	18	5.4
Zone A3	2	.6
Zone A4	8	2.4

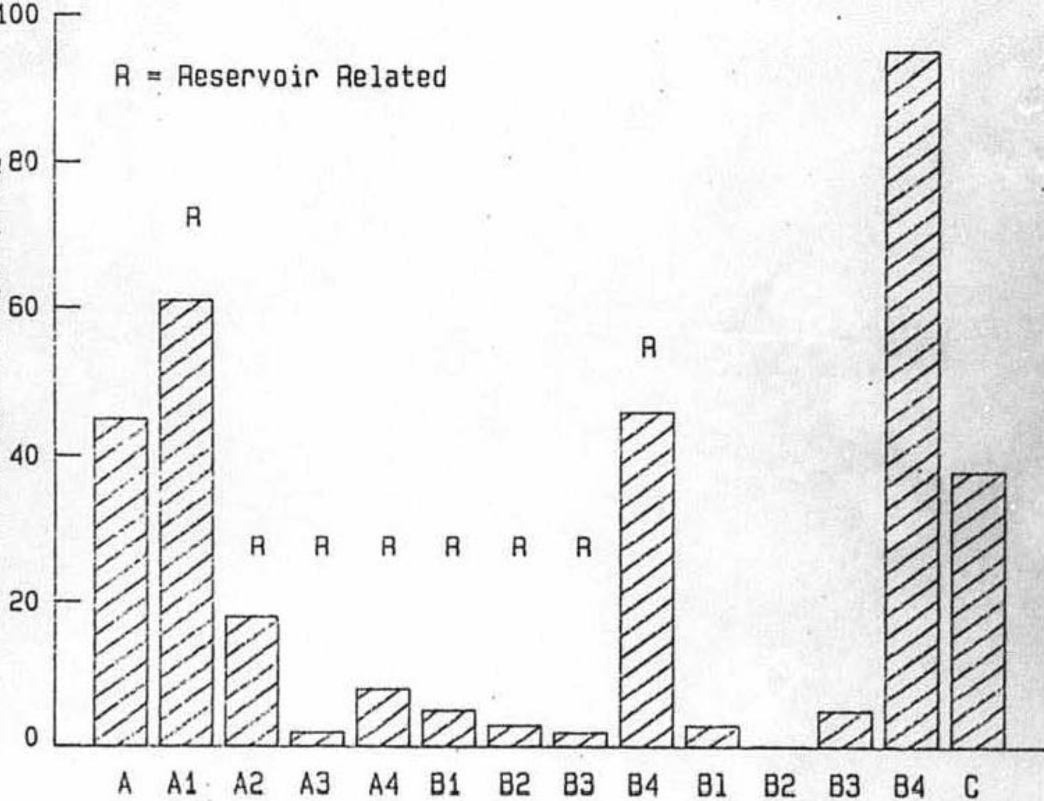

Figure 4. Cultural Resources by Zones.

Adjacent To Reservoirs		
	Number	%
Zone B1	5	1.5
B2	3	.9
B3	2	.6
B4	46	13.9
Adjacent to Project Features and Facilities Exclusive of Reservoirs		
Zone B1	3	.9
Zone B2	0	0
Zone B3	5	1.5
Zone B4	95	28.7
Not Adjacent to Project Features or Facilities		
Zone C	38	11.5

The number of cultural resources by zone is as follows: A zones (126), B zones (167), and zone C (38) (Figure 5).

Cultural resources can also be organized into those that fall within project features and facilities (zone A), those that fall within the reservoirs (zones A1, A2, A3 and A4), those that fall adjacent to the reservoirs (zones B1, B2, B3, and B4), those that fall adjacent to project and facilities exclusive of the reservoir (zones B1, B2, B3, B4) and those that do not fall adjacent to any features or facilities (zone C). The number of cultural resources and percentages for cultural

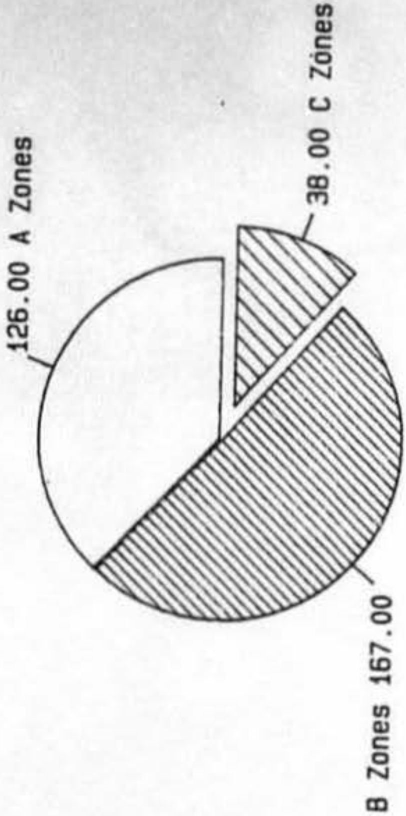

Figure 5. Cultural Resources, Zones A, B, and C.

resources organized in this fashion as depicted in Figure 6 are as follows:

	Number	%
Within features and facilities (zone A)	45	13.5
In reservoirs (zones A1, A2, A3 and A4)	81	24.5
Adjacent to reservoirs (zones B1, B2, B3, and B4)	64	19.3
Adjacent to project features and facilities exclusive of reservoirs (zones B1, B2, B3 and B4)	103	31.1
Not adjacent to features or facilities (zone C)	38	11.5

Cultural resources by zones within features and facilities including the reservoir total 126 (38%). A total of 167 cultural resources by zones are located adjacent to features and facilities including the reservoir (50.5%). A total of 293 (88.5%) cultural resources by zones are located within or adjacent to features and facilities. The remaining 38 (11.5%) cultural resources by zones are not adjacent to any features or facilities.

(d) Impacts Within Zones

Large, medium, and small scale cultural resources and their impacts were discussed in chapter 4. Impacts as they relate to the zone system developed for this project are discussed in this section.

Zone A (area within features and facilities exclusive of the reservoir) will be directly impacted by ground disturbing activities associated with construction of access roads, camps, removal of borrow material, the construction of dams, and associated facilities, and construction of recreation facilities, etc. as outlined in section 3.3.

Zone A1 (permanent conservation pool): After initial inundation cultural resources in this zone will remain under a permanent column of water except in cases of severe drawdown. Initial soil saturation during filling will accelerate erosion in portions of the reservoirs

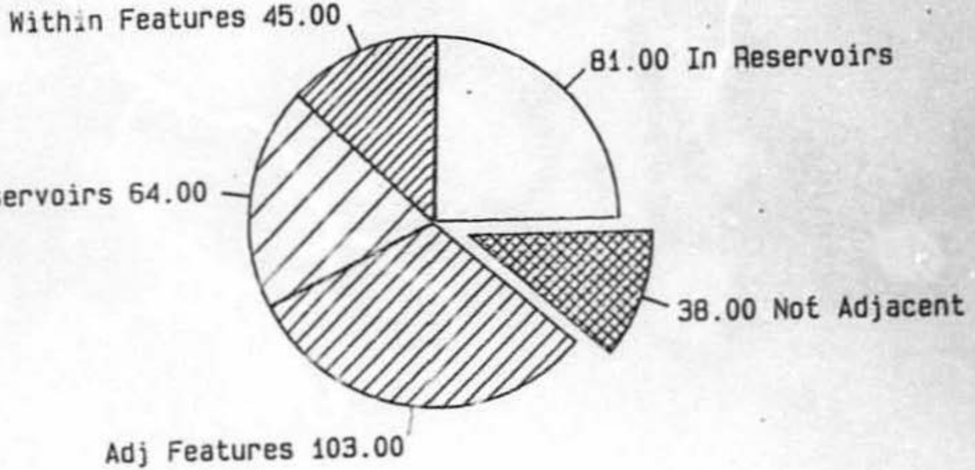

Figure 6. Cultural Resources in Relation to Features and Facilities.

already actively slumping as well as areas susceptible to this process (Figures 49-54 in Appendix). Depending on the fill rate and reservoir geomorphology, shoreline-related erosion will impact the fluctuating shorelines as it moves with the filling process. With the exception of wet/dry cycling this is the same process that will occur in the fluctuating shoreline zone (zone A2). Once the filling process is complete zone A1 will be under a permanent column of water comprising the reservoir pools. After the reservoir basin has reached equilibrium erosion and slumpage will decrease and depositional activities will predominate. Cultural resources that survive the initial episode of reservoir filling will eventually be buried under layers of accumulated silt which may warp cultural deposits and cause the loss of data due to lack of accessibility. Biochemical processes that will impact cultural resources during and immediately after filling should drop off once the reservoir ecosystems stabilize and once silt deposits accumulate. One of the most destructive activities that will occur in zone A1 will take place prior to inundation when borrow material is removed from borrow areas within the reservoirs, banks of the reservoirs are stabilized, trees are clear cut (possible activity), and areas are prepared for dam construction. After the initial construction phase, human and animal activity within this zone should be minimal with the possible exception of severe drawdown when humans and animals may disturb stabilized reservoir margins as a result of land and recreational use by humans and foraging activities by animals.

Zone A2 (shoreline fluctuation zone): This portion of the reservoir is subject to seasonal drawdown which drastically curtails geological and biological stabilization. This zone is by far the most destructive zone for cultural resources within the reservoirs due to processes that contribute to shoreline formation. Impact to cultural resources will result from wind-generated wave action, near-shore currents, erosion (wind and water), wind deflation of seasonally exposed silt deposits with little vegetation protection, variable water runoff patterns, and invader plant and animal communities. All these processes will be accelerated and/or prolonged by one of the major destructive factors in this zone: wet/dry and freeze/thaw cycles. Biochemical activity will also be greater in this zone and have a greater impact on cultural resources than in other reservoir zones due to increased light penetration, higher dissolved O_2, and elevated water temperature. All these conditions will increase biochemical and biological activities associated with the life and death cycle of organisms, resulting in an impact on organic cultural remains. Impact by humans and animals will also be the highest in this zone due to recreation use, which centers along shorelines, and exploitation of the area by animals for subsistence purposes. Boat and floatplane activity will produce waves that will impact the already susceptible shoreline, further increasing destruction. The seasonal drawdown will also adversely affect plant communities that tend to stabilize the soil resulting in greater susceptibility to erosion and destruction of cultural resources.

Zone A3 (maximum flood pool): This portion of the reservoirs will be subject to periodic flooding during episodes or heavy runoff. This zone can be considered as a transitional zone between the direct impact of reservoir process and indirect impacts associated with areas adjacent to the reservoir (B zones). Although only flooded occasionally, this zone will be impacted to the extent that slumping and erosion, accelerated by wet/dry and freeze/thaw cycling, extends into these area. The raising of the water table that will result from filling the reservoirs, will affect permafrost in this zone either directly, or as a result of capillary action from the drawdown zone (A2). Melting permafrost will contribute to erosion and mass wasting processes. The extent to which this will occur has not been determined but judging from present slumping in the area (e.g. Watana Creek area) it could extend several hundred feet beyond the top of the drawdown zone (A2). Stable vegetation in this area would serve to decrease small-scale erosion but will not protect the area from flows and slumping resulting from conditions within the reservoir that carry over into this zone. Short term flooding during high water periods should have little effect on vegetation cover which should quickly stabilize afterwards. As a result, erosion due to the destruction of ground cover should be minimal. However, if the duration of inundation in this zone is prolonged the effects would be similar to those in zone A2. Recreation activities within this zone brought about by access afforded by the higher water level, and animal subsistence activity stimulated by changes in the ecosystem, will also result in impacts to cultural resources.

Zone A4 (downstream zone): This zone will be directly affected by construction planning i.e. building one or two dams. Trapping of silt within a reservoir will result in a shift downstream from an aggrading to an eroding channel which will impact cultural resources through erosion. In the absence of the Devil Canyon dam cultural resources downstream from the Watana dam could be impacted by this process, depending on their location. With construction of the Devil Canyon dam sites downstream from the Watana dam but above the Devil Canyon dam would be subject to reservoir processes associated with that dam. Cultural resources downstream from the Devil Canyon dam would be subject to the same impacts as those downstream from the Watana dam. Changes in the quality of downstream water due to decrease in water temperature, changes in water chemistry, decreased sediment load, etc, will impact cultural resources due to changes in downstream ecology and the impacts that this would have on cultural resources. If downstream activities such as settlement, industry, farming, etc., increase as a result of the availability of electrical power then cultural resources in areas associated with these activities would also be impacted.

Zone B with its subzones B1, B2, B3, and B4 (adjacent to features and facilities including the reservoir). Zones B1, B2, B3, and B4 as they relate to the reservoirs will be impacted somewhat differently from these zones as they apply to other project features and facilities (access roads, transmission lines, borrow area, etc.) due to the nature of the impact agent of the former (the reservoir). When in association with the reservoir these zones will be indirectly impacted by reservoir processes that extend beyond the limits of the reservoirs. As such they are similar to impacts as discussed in zone A3 (maximum flood pool). Zones B1, B2, and B3 will be indirectly impacted by erosion and mass wasting associated with wet/dry and freeze/thaw cycles within the reservoir zones. As a result of increased ground water levels, erosion within the reservoir (submarine slope failure), and thawing of permafrost adjacent to the reservoir resulting in slope instability, cultural resources in these zones will be indirectly impacted. Areas of current slope instability are present along the Susitna River and several of its tributaries. Zones B1 through B3, as defined, take into consideration the maximum horizontal distance presently exhibited by active slumps and flows in an effort to address this problem as it applies to full reservoirs. Based on existing data present slumps and flows have reached their angle of repose within 300 feet of the leading edge. Due to the increased accessibility afforded by access routes into the project area, indirect impact will occur as a result of project personnel and the public collecting artifacts and/or disturbing their context.

Zone B4 is the area beyond 0.5 miles of the reservoir which is not associated with zones for other project features and facilities. Based on available data, impact prediction is difficult in this zone, however, it is expected that no impact will result from construction, inundation, or operation of the hydroelectric facilities. Although recreation activity can extend some distance away from designated recreation areas this is not a factor here because of the 0.5 mile criteria is applied to the individual planned recreation facilities (trails, camps, overlook, etc.) for the Susitna Project. Zone B as it applies to other project features and facilities including recreation areas are discussed below.

Zone B1 through B3 (0 - 300 feet away), as they apply to non-reservoir features and facilities (access roads, access road borrow areas, Devil Canyon construction area, recreation areas, the railroad, transmission routes, and the Watana construction area), will be indirectly impacted by construction spill-over, engineering modification (increasing the size of borrow areas, or realigning access routes) and the collection of artifacts or other site-disturbing activities by project personnel (construction stage) or public use (operation stage) and recreation activities (hunting, camping, hiking and ATV and snow machine activity). Some indirect impact will also result from altered stream drainage or runoff pattern changes brought about by destruction or modification in the area geomorphology. The closer the zone to project features and facilities, the more susceptible it is to indirect impacts. Zone B4 (greater than 0.5 miles away) is not expected to receive indirect impact from the Susitna Project, however, impact prediction in this zone is difficult based on present data.

(e) Impact Categories

Three impact categories are used in this assessment -- Direct Impact, Indirect Impact, and No Impact. Direct impact is the immediately demonstrable effects of the Susitna Hydroelectric Project on the resource base. Indirect impact will result from adverse effects that are secondary but clearly brought about by the project and which would not result without it, at least in a predictable time (McGimsey and Davis 1977). No impact is the lack of demonstrable or predictable project-related impact on the resource base.

5.2 - Site Specific Impact

Based on expected impacts as they apply to the three zone system, and the location of cultural resources in relation to these zones it is possible to assess impact at the site-specific level. Table 4 indicates expected impact for all sites in the project area. Table 5 lists sites by impact category -- direct, indirect, and no impact. Based on this assessment 120 sites will be subject to direct impact, 152 sites to indirect impact, and 38 sites are expected not to be impacted by the Susitna Hydroelectric Project (Figure 7). Sites in both tables 4 and 5 reflect the fact that a site can be in a direct impact zone(s) for one or more feature or facility and also an indirect impact zone(s) with respect to other features and facilities. This approach was taken to facilitate the construction schedule and possible changes in project plans.

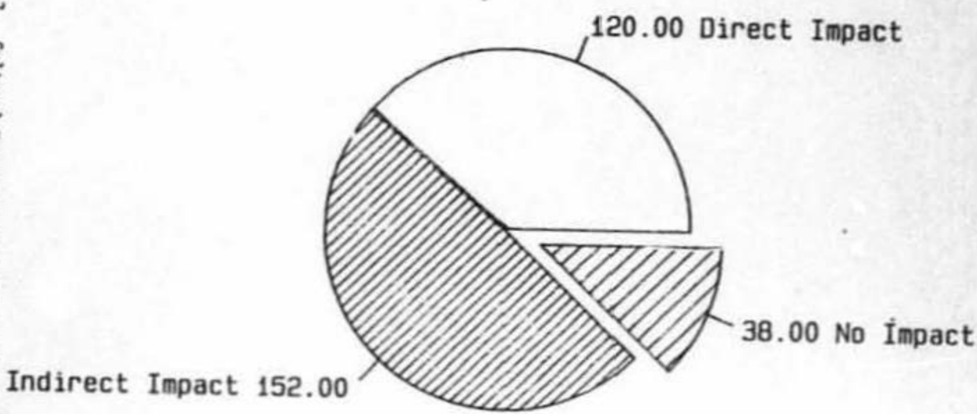

Figure 7. Cultural Resources by Impact Categories.

KEY TO TABLES 1 THROUGH 5

General

AHRS	Alaska Heritage Resource Survey
H	Historic
P	Prehistoric

Location

AJ		Adjacent to project facilities or features, i.e., within ¼ mile
AR		Access Route
ARB		Access Route Borrow
B		Borrow Area
DR		Devil Canyon Reservoir
GT		Geotechnical Area
O		Site not within ¼ mile of project facilities or feature
	01	Site found by non-archeology personal
	02	Site found in association with a project feature, facility or receation area that has since been modified, relocated or deleted.
	03	Site documented near the project area prior to the present study area
	04	Site found during geoarcheology studies
	05	Site found by archeology personnel but not within ¼ mile of project facilities or features
RA		Recreation Area
RR		Railroad
T		Transmission Route
	H-F	Healy to Fairbanks
	W-A	Willow to Anchorage
	W-I	Watana Dam to Intertie
WC		Watana Construction Area
	PAS	Permanent Airstrip
	WCC	Watana Construction Camp
	WCV	Watana Construction Village

WD Watana Dam

WR Watana Reservoir

If a site is located in association with more than one facility or feature, both are listed.

Land Status

AK	State of Alaska
BA	Borough Approved or Patented
FE	Federal
PR	Private
SP	State Patented
SSS	State Selected Suspended
VS	Village Selection
KN	Knik
TY	Tyone

Zones

Zone A — Area within project features and facilities.

- Zone A1 — Permanent conservation pool (Watana 2065 feet asl, Devil Canyon reservoir 1405 feet asl) including ice formation zone.
- Zone A2 — Shoreline fluctuation zone, drawdown zone (normal operating zone, Watana 2065 to 2195 feet asl, Devil Canyon 1405 to 1455 feet asl).
- Zone A3 — Upper floodpool (maximum water surface, Watana 2202 feet asl, Devil Canyon 1466 feet asl).
- Zone A4 — Downstream zone (downstream from Watana and Devil Canyon dams).

Areas not within project features or facilities but adjacent (within 0.5 miles) to them are defined as zone B. Zone B is subdivided into four subzones based on horizontal distance from the reservoir (Figure 3) and/or other project features or facilities and are defined as follows:

Zone B1	Area between a feature or facility and 100 feet.
Zone B2	Area between 100 feet and 200 feet of a project feature or facility.
Zone B3	Area between 200 feet and 300 feet of a project feature or facility
Zone B4	Area between 300 feet and 2640 feet (0.5 miles) of a feature or facility.

The third zone in this system, zone C, represents the area beyond 0.5 miles of any project feature or facility including the reservoir.

Slope Instability

I	Beaching
II	Flows
III	Sliding (unfrozen)
IV	Sliding (frozen)
I-(IV)	Primary beaching instability with some potential sliding (primary and potential would apply to any combination)
I-II	Beaching and flows possible (would apply to any combination)
CI	Current slope instability

Impact

DI	Direct Impact
II	Indirect Impact
NI	No impact

TABLE 1

Cultural Resources by Location, Land Status, Elevation, Horizontal Distance from Features and Facilities, and Zone(s)

AHRS#	LOCATION	LAND STATUS	ELEVATION (ft. above sea level)	HORIZONTAL DISTANCE	ZONE(S)
TLM 005 (H)	AJ(RR)	AK	750	450	B4
TLM 006 (H)	AJ(RR)	AK	700	1400	B4
TLM 007 (P)	O3	PR	1870	17,600 (RA-P)	C
TLM 009 (P)	RA-D	FE?	2250	0	A
TLM 015 (P)	AJ(AR)	SS	2275 *	1760	B4
TLM 016 (P)	AJ(WC-PAS)	SS	2425 *	250	B3
	AJ(WC-WCC)	" "	" "	250	B3
	AJ(AR)	" "	" "	1600	B4
TLM 017 (P)	AJ(DR)	SS	2147 *	2630	B4+
TLM 018 (P)	AJ(WC-WD)	KN	2352 *	600	B4
	AJ(T W-I)	" "	" "	350	B4
	AJ(AR)	" "	" "	600	B4
TLM 020 (H)	O3	KN	900	5550 (T W-1)	A4
TLM 021 (P)	AJ(RA-K)	SP	2800	3100	C
TLM 022 (P)	B-E	TY	1477 *	0	A
	AJ(DR)	" "	" "	11	B1+
TLM 023 (H)	DR	TY	1454 *	0	A2, A4
	B-E	" "	" "	0	A
TLM 024 (P)	AJ(DR)	TY	1568 *	600	B4+
	AJ(B-E)	" "	" "	700	B4
TLM 025 (P)	O4	VS	2600	5300 (WR)	C
TLM 026 (P)	AJ(WR)	SSS	2275 *	100	B1+
TLM 027 (P)	AJ(DR)	KN	1598 *	350	B4+
TLM 028 (P)	O4	FE	2300	10,100 (WR)	C
TLM 029 (P)	AJ(DR)	KN	1521 *	350	B4+
TLM 030 (P)	AJ(DR)	KN	1581 *	250	B3+
	AJ(B-H)	" "	" "	1250	B4

TABLE 1 (Continued)

AHRS#	LOCATION	LAND STATUS	ELEVATION (ft. above sea level)	HORIZONTAL DISTANCE	ZONE(S)
TLM 031 (P)	AJ(WR)	VS	2700	2450	B4+
TLM 032 (P)	AJ(WR)	VS	2700	2500	B4+
TLM 033 (P)	WR	VS	1843 *	0	A1
TLM 034 (P)	DR	KN	1451 *	0	A2, A4
	B-I	" "	" "	0	A
TLM 035 (P)	AJ(B-E)	VS	1600	800	B4
TLM 036 (P)	02	SSS	2800	3100	C
TLM 037 (P)	02	VS	3000	6000 (WR)	C
TLM 038 (P)	AJ(WR)	SS	2500	950	B4+
TLM 039 (P)	WR	SS	2131 *	0	A2
TLM 040 (P)	WR	VS	1689 *	0	A1
TLM 041 (P)	AJ(B-H)	VS	2450	2400	B4
TLM 042 (P)	AJ(WR)	SSS	2325 *	250	B3+
TLM 043 (P)	WR	VS	1684 *	0	A1
	AJ(B-J)	" "	" "	700	B4
TLM 044 (P)	02	SSS	2900	5200 (WR)	C
TLM 045 (P)	02	SP	2900	5700 (WR)	C
TLM 046 (P)	02	SP	2900	6200 (WR)	C
TLM 047 (P)	AJ(WR)	SSS	2800	1600	B4+
TLM 048 (P)	WR	SS	2090 *	0	A2
TLM 049 (P)	AJ(WR)	SSS	2400	600	B4+
TLM 050 (P)	WR	VS	1635 *	0	A1
TLM 051 (P)	AJ(B-F)	SS	2300	2000	B4
TLM 052 (P)	05	SSS	2900	6000 (WR)	C
TLM 053 (P)	05	SSS	3200	3100 (WR)	C
TLM 054 (P)	B-C	SS	2465 *	0	A
	AJ(RA-H)	" "	" "	250	B3
TLM 055 (P)	B-C	SS	2479 *	0	A
	AJ(R H)	" "	" "	700	B4

TABLE 1 (Continued)

AHRS#	LOCATION	LAND STATUS	ELEVATION (ft. above sea level)	HORIZONTAL DISTANCE	ZONE(S)
TLM 056 (H)	B-C	SS	2404 *	0	A
	AJ(RA-H)	" "	" "	550	B4
TLM 057 (P)	AJ(RA-L)	SS	3100	2000	B4
TLM 058 (P)	WR	VS	1682 *	0	A1
	AJ(B-I)	" "	" "	700	B4
TLM 059 (P)	WR	SS	2177 *	0	A2
TLM 060 (P)	WR	SS	2176 *	0	A2
TLM 061 (P)	WR	SS	2062 *	0	A1
TLM 062 (P)	WR	VS	1836 *	0	A1
TLM 063 (P)	WR	VS	1656 *	0	A1
	AJ(B-J)	" "	" "	450	B4
TLM 064 (P)	AJ(WR)	VS	2213 *	100	B1+
TLM 065 (P)	WR	SSS	1959 *	0	A1
TLM 066 (P)	04	SS	3000	6900 (WR)	C
TLM 067 (P)	04	VS	3588	86,200 (WR)	C
TLM 068 (P)	GT	SS	2750	30,800 (DR)	C
TLM 069 (P)	05	SSS	2600	2400	B4
TLM 070 (P)	GT	SS	3000	32,500 (DR)	C
TLM 071 (H)	01	SSS	2375	2900 (RA-J)	C
TLM 072 (P)	WR	SSS	1830 *	0	A1
TLM 073 (P)	AJ(WR)	SSS	2257 *	150	B2+
TLM 074 (P)	AJ(WR)	SSS	2300	150	B2+
TLM 075 (P)	WR	SSS	1956 *	0	A1
TLM 076 (P)	AJ(WR)	SSS	2325	900	B4+
TLM 077 (P)	WR	SSS	1768 *	0	A1
TLM 078 (P)	B-C	SP	2479 *	0	A
	RA-H	" "	" "	0	A
TLM 079 (H)	WR	SSS	1739 *	0	A1

TABLE 1 (Continued)

AHRS#	LOCATION	LAND STATUS	ELEVATION (ft. above sea level)	HORIZONTAL DISTANCE	ZONE(S)
TLM 080 (H)	WR	VS	1581 *	0	A1
-	B-J	""	" "	0	A
TLM 081 (P)	B-C	SS	2407 *	0	A
	AJ(RA-H)	""	" "	350	B4
TLM 082 (P)	GT	SS	3600	52,800 (WR)	C
TLM 083 (P)	AJ(RA-H)	SP	2503 *	100	B1
TLM 084 (P)	B-C	SP	2447 *	0	A
	AJ(RA-H)	""	" "	700	A
TLM 085 (P)	B-C	SP	2438 *	0	A
	AJ(RA-H)	""	" "	950	B4
TLM 086 (P)	B-C	SS	2438 *	0	A
	AJ(RA-H)	""	" "	800	B4
TLM 087 (P)	B-C	SP	2455 *	0	A
	AJ(RA-H)	""	" "	800	B4
TLM 088 (P)	B-C	SS	2418 *	0	A
	RA-H	""	" "	0	A
TLM 089 (P)	AJ(RA-H)	SS	2650	1750	B4
TLM 090 (P)	AJ(RA-H)	SS	2800	1950	B4
TLM 091 (P)	AJ(RA-H)	SS	2900	2400	B4
TLM 092 (P)	OS	SS	2700	3350 (B-C)	C
TLM 093 (P)	OS	SS/PR	2700	3100	C
TLM 094 (P)	B-C	SS	2447 *	0	A
	AJ(RA-H)	""	" "	2300	B4
TLM 095 (P)	B-C	SS	2442 *	0	A
	AJ(RA-H)	""	" "	1950	B4
TLM 096 (P)	B-C	SS	2441 *	0	A
TLM 097 (P)	B-C	SS	2462 *	0	A
	AJ(RA-H).	""	" "	600	B4
TLM 098 (P)	AJ(AR)	SP	3050	1300	B4
	AJ(RA-L)	""	" "	2500	B4

TABLE 1 (Continued)

AHRS#	LOCATION	LAND STATUS	ELEVATION (ft. above sea level)	HORIZONTAL DISTANCE	ZONE(S)
TLM 099 (P)	AJ(AR)	SP	3100	2100	B4
TLM 100 (P)	AJ(RA-J)	SSS	2875	1500	B4
TLM 101 (P)	AJ(RA-Q)	SS	2499 *	100	B1
TLM 102 (P)	WR	VS	1701 *	0	A1
TLM 103 (P)	AJ(RA-Q)	SS	2520 *	450	B4
TLM 104 (P)	WR	VS	1817 *	0	A1
TLM 105 (P)	AJ(RA-J)	SS	2875	2300	B4
TLM 106 (P)	ARB	SS	3105 *	0	A
	AJ(AR)	""	" "	1300	B4
	AJ(T W-I)	""	" "	1500	B4
TLM 107 (P)	ARB	SS	3165 *	0	A
	AJ(AR)	""	" "	1500	B4
	AJ(T W-I)	""	" "	1750	B4
TLM 108 (P)	ARB	SS	3193 *	0	A
	AJ(AR)	""	" "	1950	B4
TLM 109 (P)	ARB	SS	3336 *	0	A
	AJ(AR)	""	" "	2200	B4
TLM 110 (P)	ARB	SS	3420 *	0	A
	AJ(AR)	""	" "	1300	B4
	AJ(T W-I)	""	" "	1750	B4
TLM 111 (P)	ARB	SS	3343 *	0	A
	AJ(AR)	""	" "	2500	B4
TLM 112 (P)	AJ(T W-I)	SS	3300	700	B4
	AJ(AR)	""	" "	1150	B4
TLM 113 (P)	ARB	SS	2475 *	0	A
	AJ(AR)	""	" "	700	B4
TLM 114 (P)	ARB	SS	2520 *	0	A
	AJ(AR)	""	" "	2200	B4
TLM 115 (P)	WR	SSS	1968 *	0	A1
TLM 116 (P)	AJ(RA-I)	SS	2800	1300	B4

TABLE 1 (Continued)

AHRS#	LOCATION	LAND STATUS	ELEVATION (ft. above sea level)	HORIZONTAL DISTANCE	ZONE(S)
TLM 117 (P)	AJ(AR)	SP	3100	600	B4
	AJ(RA-L)	" "	" "	2200	B4
TLM 118 (P)	AJ(DR)	TY	1750	800	B4+
TLM 119 (P)	WR	VS	2172 *	0	A2
TLM 120 (P)	AJ(WR)	VS	2250	450	B4+
TLM 121 (P)	AJ(WR)	VS	2250	100	B1+
TLM 122 (P)	AJ(WR)	VS	2250	1050	B4+
TLM 123 (P)	AJ(WR)	VS	2250	900	B4+
TLM 124 (P)	AJ(WR)	VS	2250	700	B4+
TLM 125 (P)	AJ(WR)	VS	2250	1000	B4+
TLM 126 (P)	WR	VS	2078 *	0	A2
TLM 127 (P)	AJ(WR)	VS	2250	350	B4+
TLM 128 (P)	AJ(WR)	SSS	2750	1750	B4+
TLM 129 (P)	AJ(WR)	VS	2300	1500	B4+
TLM 130 (P)	WR	VS	2200	0	A3
TLM 131 (P)	AJ(WR)	VS	2220	450	B4+
TLM 132 (P)	AJ(WR)	VS	2250	700	B4+
TLM 133 (P)	AJ(WR)	VS	2220	350	B4+
TLM 134 (P)	AJ(WR)	SSS	2625	950	B4+
TLM 135 (P)	AJ(WR)	SSS	2625	1000	B4+
TLM 136 (P)	AJ(WR)	SSS	2580	1100	B4+
TLM 137 (P)	AJ(T W-I)	SSS	2120 *	2300	B4
TLM 138 (P)	OS	SSS	2650	1200	B4
TLM 139 (P)	AJ(WR)	SSS	2530	700	B4+
TLM 140 (P)	AJ(WR)	SSS	2475	850	B4+
TLM 141 (P)	AJ(WR)	SSS	2450	1000	B4+
TLM 142 (P)	AJ(WR)	SSS	2450	1300	B4+
TLM 143 (P)	AJ(WR)	SSS	2580 *	500	B4+
TLM 144 (P)	OS	SSS	2725	1850 (WR)	B4
TLM 145 (P)	AJ(WR)	SSS	2350	450	B4+

TABLE 1 (Continued)

AHRS#	LOCATION	LAND STATUS	ELEVATION (ft. above sea level)	HORIZONTAL DISTANCE	ZONE(S)
TLM 146 (P)	05	SSS	2750	1900 (WR)	B4
TLM 147 (P)	AJ(WR)	SSS	2410	1350	B4+
TLM 148 (P)	AJ(WR)	SSS	2400	750	B4+
TLM 149 (P)	05	SSS	2650	2650 (WR)	C
TLM 150 (P)	05	SSS	2630	2650 (WR)	C
TLM 151 (P)	05	SSS	2400	1750 (WR)	B4
TLM 152 (P)	05	SSS	2630	4150	C
TLM 153 (P)	ARB	SS	2621 *	0	A
	AJ(WR)	" "	" "	700	B4
TLM 154 (P)	05	SSS	2650	3700	C
TLM 155 (P)	AJ(AR)	SP	3200	700	B4
TLM 159 (P)	AJ(WR)	SS	2400	1150	B4+
TLM 160 (P)	AJ(WC-WCV)	SS	2300	1950	B4
	AJ(AR)	" "	" "	1950	B4
TLM 164 (P)	AJ(B-F)	SS	2200	250	B3
TLM 165 (P)	AJ(DR)	SS	2344 *	1750	B4+
	AJ(T W-I)	" "	" "	1950	B4
	AJ(WC-WD)	" "	" "	2100	B4
TLM 166 (P)	AJ(WR)	SS	2330 *	2500	B4+
	AJ(T W-I)	" "	" "	2100	B4
	AJ(WC-WD)	" "	" "	2100	B4
TLM 167 (P)	AJ(WR)	SS	2273 *	2400	B4+
	AJ(WC-WD)	" "	" "	2500	B4
TLM 168 (P)	AJ(AR)	SS	3100	800	B4
TLM 169 (P)	WR	SS	2140 *	0	A2
TLM 170 (P)	AJ(WR)	SS	2400	1050	B4+
TLM 171 (P)	WR	TY	2160 *	0	A2
TLM 172 (P)	AJ(WC-WCV)	SS	2240 *	450	B4
TLM 173 (P)	WR	SSS	2104 *	0	A2
TLM 174 (P)	WR	SS	2065 *	0	A1

TABLE 1 (Continued)

AHRS#	LOCATION	LAND STATUS	ELEVATION (ft. above sea level)	HORIZONTAL DISTANCE	ZONE(S)
TLM 175 (P)	WR	SS	2061 *	0	A1
TLM 176 (P)	B-F	SS	2407 *	0	A
TLM 177 (P)	AJ(WR)	SS	2228 *	100	B1+
	AJ(B-J)	" "	" "	700	B4
TLM 178 (H)	DR	KN	1400 *	0	A1, A4
	B-I	" "	" "	0	A
TLM 179 (P)	AJ(RA-K)	SSS	2600	450	B4
TLM 180 (P)	02	TY	1824 *	2900 (DR)	C
TLM 181 (P)	AJ(ARB)	SS	2400	2200	B4
TLM 182 (P)	WR	SSS	2147 *	0	A2
	AJ(RA-J)	" "	" "	900	B4
TLM 183 (P)	AJ(WR)	SSS	2500	1300	B4+
TLM 184 (P)	WR	SS	2014 *	0	A1
TLM 185 (P)	AJ(WR)	SSS	2500	900	B4+
TLM 186 (P)	AJ(RA-K)	SSS	2400	600	B4
TLM 187 (P)	AJ(RA-J)	SSS	2500	3100	C
TLM 188 (P)	B-F	SS	2178 *	0	A
TLM 189 (P)	AJ(WR)	SSS	2550	1750	B4+
TLM 190 (P)	AJ(WR)	SSS	2550	550	B4+
TLM 191 (P)	AJ(ARB)	SS	2450	1300	B4
TLM 192 (P)	AJ(WC-WCV)	KN	2200	450	B4
	AJ(AR)	" "	" "	1750	B4
TLM 193 (P)	AJ(ARB)	SS	2400	1950	B4
TLM 194 (P)	WR	SSS	1860 *	0	A1
TLM 195 (P)	AJ(WR)	SS	2500	2300	B4+
TLM 196 (P)	WR	SSS	2172 *	0	A2
TLM 197 (P)	AJ(WC-PAS)	SS	2400	250	B3
TLM 198 (P)	AJ(WR)	SS	2400	700	B4+
TLM 199 (P)	WR	VS	1679 *	0	A1
	AJ(B-J)	" "	" "	1400	B4

TABLE 1 (Continued)

AHRS#	LOCATION	LAND STATUS	ELEVATION (ft. above sea level)	HORIZONTAL DISTANCE	ZONE(S)
TLM 200 (P)	WR	VS	1804 *	0	A1
	AJ(B-J)	" "	" "	900	B4
TLM 201 (P)	B-C	SS	2402 *	0	A
	AJ(RA-H)	" "	" "	1250	B4
TLM 202 (P)	B-F	SS	2357 *	0	A
	AJ(RA-H)	" "	" "	1400	B4
TLM 203 (P)	B-F	SS	2374 *	0	A
	AJ(RA-H)	" "	" "	1300	B4
TLM 204 (H)	WR	SSS	2012 *	0	A1
TLM 205 (P)	O1	SSS	3300	38,700 (WR)	C
TLM 206 (P)	WR	SSS	2160 *	0	A2
TLM 207 (P)	AJ(WR)	SSS	2252 *	150	B2+
TLM 208 (P)	AJ(RA-K)	SSS	3396	1850	B4
TLM 209 (P)	B-F	SS	2422 *	0	A
	AJ(RA-H)	" "	" "	250	B3
TLM 210 (P)	B-F	SS	2458 *	0	A
	AJ(RA-H)	" "	" "	350	B4
TLM 211 (P)	B-C	SS	2444 *	0	A
	AJ(RA-H)	" "	" "	350	B4
TLM 212 (H)	B-F	SS	2093 *	0	A
TLM 213 (P)	B-C	SS	2386 *	0	A
	AJ(RA-H)	" "	" "	800	B4
TLM 214 (P)	B-F	SS	2618 *	0	A
	AJ(AR)	" "	" "	1400	B4
TLM 215 (P)	WR	SS	2010 *	0	A1
TLM 216 (P)	WR	SS	1970 *	0	A1
TLM 217 (P)	WR	SS	2080 *	0	A2
TLM 218 (P)	WR	SS	2200	0	A3
TLM 219 (P)	AJ(WR)	SS	2350	2000	B4+
TLM 220 (P)	WR	SS	1967 *	0	A1

TABLE I (Continued)

AHRS#	LOCATION	LAND STATUS	ELEVATION (ft. above sea level)	HORIZONTAL DISTANCE	ZONE(S)
TLM 221 (P)	WR	SS	1981 *	0	A1
TLM 222 (P)	WR	SS	1930 *	0	A1
TLM 223 (P)	WR	SS	1947 *	0	A1
TLM 224 (P)	WR	SS	1966 *	0	A1
TLM 225 (P)	WR	SS	1956 *	0	A1
TLM 226 (P)	WR	SS	1974 *	0	A1
TLM 227 (P)	WR	SS	1981 *	0	A1
TLM 228 (P)	WR	VS	1826 *	0	A1
TLM 229 (P)	WR	VS	1843 *	0	A1
	AJ(B-J)	" "	" "	1950	B4
TLM 230 (P)	WR	VS	1659 *	0	A1
	AJ(B-J)	" "	" "	550	B4
TLM 231 (P)	WR	SS	1990 *	0	A1
TLM 232 (P)	WR	SS	1768 *	0	A1
TLM 233 (P)	WR	SS	1660 *	0	A1
	AJ(B-J)	" "	" "	450	B4
TLM 234 (P)	WR	SS	1908 *	0	A1
TLM 235 (P)	WR	SS	1845 *	0	A1
TLM 236 (P)	WR	SS	1860 *	0	A1
TLM 237 (P)	WR	SS	2011 *	0	A1
TLM 238 (P)	WR	SS	1748 *	0	A1
TLM 239 (P)	WR	SS	1742 *	0	A1
TLM 240 (P)	WR	SS	1771 *	0	A1
TLM 241 (P)	WR	SS	1741 *	0	A1
TLM 242 (P)	WR	SS	1745 *	0	A1
TLM 243 (P)	WR	SS	1938 *	0	A1
TLM 244 (P)	WR	SS	2070 *	0	A2
TLM 245 (P)	AJ(ARB)	SS	2400	1950	B4
	AJ(WR)	" "	" "	2200	B4+
TLM 246 (P)	WR	SS	1943 *	0	A1

TABLE 1 (Continued)

AHRS#	LOCATION	LAND STATUS	ELEVATION (ft. above sea level)	HORIZONTAL DISTANCE	ZONE(S)
TLM 247 (P)	WR	SS	1795 *	0	A1
TLM 248 (H)	WR	SS	1840 *	0	A1
TLM 249 (P)	WR	SS	1745 *	0	A1
TLM 250 (P)	WR	SS	1682 *	0	A1
TLM 251 (P)	WR	SS	2165 *	0	A2
TLM 252 (P)	DR	KN	1308 *	0	A1, A4
TLM 253 (P)	DR	KN	1303 *	0	A1, A4
TLM 256 (P)	WR	SS	1699 *	0	A1
TLM 257 (P)	WR	VS	1675 *	0	A1
TLM 258 (P)	DR	VS	1453 *	0	A2 A4
	B-E	"	" "	0	A
TLM 259 (P)	DR	VS	1404 *	0	A[illegible], A4
	B-I	"	" "	0	A
HEA 007 (P)	AJ(T H-F)	?	1450	2100	B4
HEA 012 (P)	AJ(T H-F)	SP	1500	700	B4
HEA 033 (P)	AJ(T H-F)	SP	1500	2400	B4
HEA 035 (P)	AJ(T H-F)	SP	1500	2000	B4
HEA 038 (P)	AJ(T H-F)	SP	1500	1300	B4
HEA 081 (H)	AJ(T H-F)	AK	1250	2200	B4
HEA 091 (H)	T(H-F)	AK	1400	0	A
HEA 137 (P)	AJ(T H-F)	SP	1350	1950	B4
HEA 174 (P)	O2	FE	3150	1100 (AR)	B4
HEA 175 (P)	O2	FE	3300	58,000	C
HEA 176 (P)	AJ(RA-L)	FE	3175	113,000	C
HEA 177 (P)	GT	FE	4100	72,200 (AR)	C
HEA 178 (P)	GT	FE	3400	81,400 (AR)	C
HEA 179 (P)	GT	FE	3000	79,200	C
HEA 180 (P)	AJ(AR)	FE	3200	900	B4
HEA 181 (P)	ARB	FE	3074 *	0	A
	AJ(AR)	""	" "	2200	B4

TABLE 1 (Continued)

AHRS#	LOCATION	LAND STATUS	ELEVATION (ft. above sea level)	HORIZONTAL DISTANCE	ZONE(S)
HEA 182 (P)	ARB	FE	3106 *	0	A
.	AJ(AR)	""	" "	2200	B4
HEA 183 (P)	AJ(RA-L)	FE	3500	2500	B4
HEA 184 (P)	AJ(RA-L)	FE	3100	2300	B4
HEA 185 (P)	02	FE	3300	4300 (AR)	C
HEA 186 (P)	02	FE	3445	24,100 (AR)	C
HEA 210 (P)	02	SP	1400	4400	C
HEA 211 (P)	AJ(ARB)	FE	3126 *	7650	C
FAI 070 (H)	AJ(T H-F)	AK?	950	1150	B4
FAI 089 (H)	AJ(T H-F)	AK?	1000	2500	B4
FAI 090 (H)	AJ(T H-F)	AK?	1100	2660	B4
FAI 169 (H)	AJ(T H-F)	AK?	1000	2000	B4
FAI 213 (P)	02	SP	750	3100 (T H-F)	C
FAI 214 (P)	02	PR	1200	15400 (T H-F)	C
TYO 014 (P)	AJ(T W-A)	BA	100	100	B1

* Altimeter measurement

+ Adjacent to reservoir

TABLE 2

Cultural Resources by Zone(s)

ZONES													
Within Features and Facilities					Adjacent to Features or Facilities								Not Adjacent
	Reservoir												
A	A1	A2	A3	A4	B1	B2	B3	B4	B1	B2	B3	B4	C
TLM 009	TLM 033	TLM 023+	TLM 130	TLM 020	TLM 022-	TLM 073	TLM 030-	TLM 017	TLM 083	--	TLM 016-	TLM 005	TLM 007
TLM 022-	TLM 040	TLM 034+	TLM 218	TLM 023+	TLM 026	TLM 074	TLM 042	TLM 020-	TLM 101		TLM 054-	TLM 006	TLM 023
TLM 023+	TLM 043-	TLM 039		TLM 034+	TLM 064	TLM 207		TLM 027			TLM 164	TLM 015	TLM 025
TLM 034+	TLM 050	TLM 049		TLM 178+	TLM 121			TLM 029	TYD 014		TLM 197	TLM 016-	TLM 028
TLM 054-	TLM 058+	TLM 059		TLM 252-	TLM 177-			TLM 031			TLM 209-	TLM 018	TLM 036
TLM 055-	TLM 061	TLM 060		TLM 253-				TLM 032				TLM 074-	TLM 037
TLM 056-	TLM 062	TLM 119		TLM 258+				TLM 038				TLM 080-	TLM 044
TLM 078	TLM 063-	TLM 126		TLM 259+				TLM 047				TLM 035	TLM 045
TLM 080-	TLM 065	TLM 169						TLM 049				TLM 041	TLM 046
TLM 081-	TLM 072	TLM 171						TLM 076				TLM 043-	TLM 052
TLM 084-	TLM 074	TLM 173						TLM 118				TLM 051	TLM 053
TLM 085-	TLM 075	TLM 182-						TLM 120				TLM 055-	TLM 066
TLM 086-	TLM 077	TLM 196						TLM 122				TLM 056-	TLM 067
TLM 087-	TLM 079	TLM 206						TLM 123				TLM 057	TLM 068
TLM 088	TLM 080-	TLM 217						TLM 124				TLM 058-	TLM 070
TLM 094-	TLM 102	TLM 244						TLM 125				TLM 063-	TLM 071
TLM 095-	TLM 104	TLM 251						TLM 127				TLM 069	TLM 082
TLM 096	TLM 115	TLM 258+						TLM 128				TLM 081-	TLM 092
TLM 097-	TLM 175+							TLM 129				TLM 084-	TLM 093
TLM 106-	TLM 178							TLM 131				TLM 085-	TLM 149
TLM 107-	TLM 184							TLM 132				TLM 086-	TLM 150
TLM 108-	TLM 194							TLM 133				TLM 087-	TLM 152
TLM 109-	TLM 199-							TLM 134				TLM 089-	TLM 154
TLM 110-	TLM 200-							TLM 135				TLM 090	TLM 180
TLM 111-	TLM 204							TLM 136				TLM 091	TLM 187
TLM 113-	TLM 215							TLM 139				TLM 094-	TLM 205
TLM 114-	TLM 216							TLM 140				TLM 095-	
TLM 153-	TLM 220							TLM 141				TLM 097+	
TLM 176	TLM 221							TLM 142				TLM 098	HEA 175
TLM 178+	TLM 222							TLM 143				TLM 099	HEA 176
TLM 188	TLM 223							TLM 145				TLM 100	HEA 177
TLM 201-	TLM 224							TLM 147				TLM 103	HEA 178
TLM 202-	TLM 225							TLM 148				TLM 105	HEA 179
TLM 203-	TLM 226							TLM 159				TLM 106-	HEA 185
TLM [illegible]-	TLM 227							TLM 165-				TLM 107-	HEA 186
TLM 210-	TLM 228							TLM 166-				TLM 108-	HEA 210
TLM 211-	TLM 229-							TLM 167-				TLM 109-	HEA 211
TLM 212	TLM 230-							TLM 170				TLM 110-	
TLM 213-	TLM 231							TLM 183				TLM 111-	
TLM 214-	TLM 232-							TLM 185				TLM 112	FAI 090
TLM 218+	TLM 233							TLM 189				TLM 113-	FAI 213
TLM 259+	TLM 234							TLM 190				TLM 114-	FAI 214
	TLM 235							TLM 195				TLM 116	
	TLM 236							TLM 198				TLM 117	
HEA 091	TLM 237							TLM 219				TLM 137	
HEA 181-	TLM 238							TLM 245-				TLM 138	
HEA 182-	TLM 239											TLM 144	
	TLM 24[illegible]											TLM 146	

TABLE 2 (Continued)

ZONES													
	Within Features and Facilities				Adjacent to Features or Facilities								Not Adjacent
	Reservoir												
A	A1	A2	A3	A4	B1	B2	B3	B4	B1	B2	B3	B4	C
	TLM 241												TLM 151
	TLM 242												TLM 153-
	TLM 243												TLM 155
	TLM 246												TLM 160
	TLM 247												TLM 165-
	TLM 248												TLM 166-
	TLM 249												TLM 167-
	TLM 250												TLM 168
	TLM 252-												TLM 172
	TLM 253-												TLM 177-
	TLM 256												TLM 179
	TLM 257*												TLM 181
	TLM 258*												TLM 182-
													TLM 186
													TLM 191
													TLM 192
													TLM 193
													TLM 199-
													TLM 200-
													TLM 201-
													TLM 202-
													TLM 203-
													TLM 208
													TLM 210-
													TLM 211-
													TLM 213-
													TLM 214-
													TLM 229-
													TLM 230-
													TLM 232-
													TLM 245-
													HEA 007
													HEA 012
													HEA 033
													HEA 035
													HEA 038
													HEA 081
													HEA 137
													HEA 174
													HEA 180
													HEA 181-
													HEA 182-
													HEA 183
													HEA 184
													FAI 070
													FAI 089
													FAI 169

- Listed twice

* Listed three times

TABLE 3

Cultural Resources Listed in More than One Zone

SITE	ZONES
2 ZONES	
TLM 016	B3, B4
TLM 022	A, B1*
TLM 024	B4*, B4
TLM 030	B3*, B4
TLM 043	A1, B4
TLM 054	A, B3
TLM 055	A, B4
TLM 056	A, B4
TLM 058	A1, B4
TLM 063	A1, B4
TLM 080	A1, B4
TLM 081	A, B4
TLM 084	A, B4
TLM 085	A, B4
TLM 086	A, B4
TLM 087	A, B4
TLM 094	A, B4
TLM 095	A, B4
TLM 097	A, B4
TLM 106	A, B4
TLM 107	A, B4
TLM 108	A, B4
TLM 109	A, B4
TLM 110	A, B4
TLM 111	A, B4

TABLE 3 (Continued)

SITE	Zones
2 ZONES	
TLM 113	A, B4
TLM 114	A, B4
TLM 153	A, B4
TLM 165	B4*, B4
TLM 166	B4*, B4
TLM 167	B4*, B4
TLM 177	B1*, B4
TLM 182	A2, B4
TLM 199	A1, B4
TLM 200	A1, B4
TLM 201	A, B4
TLM 202	A, B4
TLM 203	A, B4
TLM 209	A, B3
TLM 210	A, B4
TLM 211	A, B4
TLM 213	A, B4
TLM 214	A, B4
TLM 229	A1, B4
TLM 230	A1, B4
TLM 233	A1, B4
TLM 245	B4*, B4
TLM 252	A1, A4
TLM 253	A1, A4
HEA 181	A, B4
HEA 182	A, B4

TABLE 3 (Continued)

SITE	ZONES
3 ZONES	
TLM 023 *	A, A2, A4
TLM 034	A, A2, A4
TLM 178	A, A1, A4
TLM 258	A, A2, A4
TLM 259	A, A1, A4

* Adjacent to Reservoir

TABLE 4 Cultural Resources and Expected Impact

AHRS NUMBER	LOCATION	ZONE	RESERVOIR GEOLOGY AND SOIL		EXPECTED IMPACT
			PERMAFROST	SLOPE INSTABILITY**	
TLM 005	AJ(RR)	B4	-	NA	II
TLM 005	AJ(RR)	B4	-	NA	II
TLM 007	03	C	-	NA	NI
TLM 009	RA-D	A	-	NA	DI
TLM 015	AJ(AR)	B4	-	NA	II
TLM 016	AJ(WC-PAS)	B3	X	NA	II
	AJ(WC-WCC)	B3	X	NA	II
	AJ(AR)	B4	X	NA	II
TLM 017	AJ(DR)	B4*	X	NA	II
TLM 018	AJ(WC-WD)	B4	X	NA	II
	AJ(T W-E)	B4	X	NA	II
	AJ(AR)	B4	X	NA	II
TLM 020	03	A4	-	NA	II
TLM 021	AJ(RA-K)	C	-	NA	NI
TLM 022	B-E	A	0	I	DI
	AJ(DR)	B1*	0	I	II
TLM 023	DR	A2, A4	0	I	DI
	B-E	A	0	I	DI
TLM 024	AJ(DR)	B4*	-	NA	II
	AJ(B-E)	B4	-	NA	II
TLM 025	04	C	-	NA	NI
TLM 026	AJ(WR)	B1*	0	I-II	II
TLM 027	AJ(DR)	B4*	0	NA	II
TLM 028	04	C	-	NA	NI
TLM 029	AJ(DR)	B4*	-	NA	II

TABLE 4 (Continued)

AHRS NUMBER	LOCATION	ZONE	RESERVOIR GEOLOGY AND SOIL		EXPECTED IMPACT
			PERMAFROST	SLOPE INSTABILITY**	
TLM 030	AJ(DR)	B3*	X	NA	II
	AJ(B-H)	B4	X	NA	II
TLM 031	AJ(WR)	B4*	-	NA	II
TLM 032	AJ(WR)	B4*	-	NA	II
TLM 033	WR	A1	0	IV	DI
TLM 034	DR	A2, A4	0	I	DI
	B-I	A	0	I	DI
TLM 035	AJ(B-E)	B4	-	NA	II
TLM 036	02	C	-	NA	NI
TLM 037	02	C	-	NA	NI
TLM 038	AJ(WR)	B4*	-	CI, IV	II
TLM 039	WR	A2	X	I	DI
TLM 040	WR	A1	X	IV	DI
TLM 041	AJ(B-H)	B4	-	NA	II
TLM 042	AJ(WR)	B3*	0	I-III	II
TLM 043	WR	A1	0	I	DI
	AJ(B-J)	B4	0	I	II
TLM 044	02	C	-	NA	NI
TLM 045	02	C	-	NA	NI
TLM 046	02	C	-	NA	NI
TLM 047	AJ(WR)	B4*	-	I-IV	II
TLM 048	WR	A2	X	I	DI
TLM 049	AJ(WR)	B4*	-	IV-II	II
TLM 050	WR	A1	-	IV	DI
TLM 051	AJ(B-F)	B4	-	NA	II
TLM 052	05	C	-	NA	NI

TABLE 4 (Continued)

AHRS NUMBER	LOCATION	ZONE	RESERVOIR GEOLOGY AND SOIL		EXPECTED IMPACT
			PERMAFROST	SLOPE INSTABILITY**	
TLM 053	05	C	-	NA	NI
TLM 054	B-C	A	-	NA	DI
	AJ(RA-H)	B3	-	NA	II
TLM 055	B-C	A	-	NA	DI
	AJ(RA-H)	B4	-	NA	II
TLM 056	B-C	A	-	NA	DI
	AJ(RA-H)	B4	-	NA	II
TLM 057	AJ(RA-L)	B4	-	NA	II
TLM 058	WR	A1	0	I	DI
	AJ(B-I)	B4	0	I	II
TLM 059	WR	A2	X	I	DI
TLM 060	WR	A2	X	I	DI
TLM 061	WR	A1	X	I	DI
TLM 062	WR	A1	X	I (IV)	DI
TLM 063	WR	A1	0	IV	DI
	AJ(B-J)	B4	0	IV	II
TLM 064	AJ(WR)	B1*	X	IV	II
TLM 065	WR	A1	X	I	DI
TLM 066	04	C	-	NA	NI
TLM 067	04	C	-	NA	NI
TLM 068	GT	C	-	NA	NI
TLM 069	05	B4	-	NA	II
TLM 070	GT	C	-	NA	NI
TLM 071	01	C	-	NA	II
TLM 072	WR	A1	0	I	DI
TLM 073	AJ(WR)	B2*	X	IV-II	DI

TABLE 4 (Continued)

AHRS NUMBER	LOCATION	ZONE	RESERVOIR GEOLOGY AND SOIL		EXPECTED IMPACT
			PERMAFROST	SLOPE INSTABILITY**	
TLM 074	AJ(WR)	B2*	-	NA	II
TLM 075	WR	A1	X	IV	DI
TLM 076	AJ(WR)	B4*	X	NA	II
TLM 077	WR	A1	X	I	DI
TLM 078	B-C	A	-	NA	DI
	RA-H	A	-	NA	DI
TLM 079	WR	A1	0	I	DI
TLM 080	WR	A1	0	IV	DI
	B-J	A	0	IV	DI
TLM 081	B-C	A	-	NA	DI
	AJ(RA-H)	B4	-	NA	II
TLM 082	GT	C	-	NA	NI
TLM 083	AJ(RA-H)	B1	-	NA	II
TLM 084	B-C	A	-	NA	DI
	AJ(RA-H)	B4	-	NA	II
TLM 085	B-C	A	-	NA	DI
	AJ(RA-H)	B4	-	NA	II
TLM 086	B-C	A	-	NA	DI
	AJ(RA-H)	B4	-	NA	II
TLM 087	B-C	A	-	NA	DI
	AJ(RA-H)	B4	-	NA	II
TLM 088	B-C	A	-	NA	DI
	RA-H	A	-	NA	DI
TLM 089	AJ(RA-H)	B4	-	NA	II
TLM 090	AJ(RA-H)	B4	-	NA	II
TLM 091	AJ(RA-H)	B4	-	NA	II

TABLE 4 (Continued)

AHRS NUMBER	LOCATION	ZONE	RESERVOIR GEOLOGY AND SOIL		EXPECTED IMPACT
			PERMAFROST	SLOPE INSTABILITY**	
TLM 092	05	C	-	NA	NI
TLM 093	05	C	-	NA	NI
TLM 094	B-C	A	-	NA	DI
	AJ(RA-H)	B4	-	NA	II
TLM 095	B-C	A	-	NA	DI
	AJ(RA-H)	B4	-	NA	II
TLM 096	B-C	A	-	NA	DI
TLM 097	B-C	A	-	NA	DI
	AJ(RA-H)	B4	-	NA	II
TLM 098	AJ(AR)	B4	-	NA	II
	AJ(RA-L)	B4	-	NA	II
TLM 099	AJ(AR)	B4	-	NA	II
TLM 100	AJ(RA-J)	B4	-	NA	II
TLM 101	AJ(RA-Q)	B1	-	NA	II
TLM 102	WR	A1	0	IV	DI
TLM 103	AJ(RA-Q)	B4	-	NA	II
TLM 104	WR	A1	0	I	DI
TLM 105	AJ(RA-J)	B4	-	NA	II
TLM 106	ARB	A	-	NA	DI
	AJ(AR)	B4	-	NA	II
	AJ(T W-I)	B4	-	NA	II
TLM 107	ARB	A	-	NA	DI
	AJ(AR)	B4	-	NA	II
	AJ(T W-I)	B4	-	NA	II
TLM 108	ARB	A	-	NA	DI
	AJ(AR)	B4	-	NA	II

TABLE 4 (Continued)

AHRS NUMBER	LOCATION	ZONE	RESERVOIR GEOLOGY AND SOIL		EXPECTED IMPACT
			PERMAFROST	SLOPE INSTABILITY**	
TLM 109	ARB	A	-	NA	DI
	AJ(AR)	B4	-	NA	II
TLM 110	ARB	A	-	NA	DI
	AJ(AR)	B4	-	NA	II
	AJ(T W-I)	B4	-	NA	II
TLM 111	ARB	A	-	NA	DI
	AJ(AR)	B4	-	NA	II
TLM 112	AJ(T W-I)	B4	-	NA	II
	AJ(AR)	B4	-	NA	II
TLM 113	ARB	A	-	NA	DI
	AJ(AR)	B4	-	NA	II
TLM 114	ARB	A	-	NA	DI
	AJ(AR)	B4	-	NA	II
TLM 115	WR	A1	0	I	DI
TLM 116	AJ(RA-I)	B4	-	NA	II
TLM 117	AJ(AR)	B4	-	NA	II
	AJ(RA-L)	B4	-	NA	II
TLM 118	AJ(DR)	B4*	-	NA	II
TLM 119	WR	A2	0	IV	DI
TLM 120	AJ(WR)	B4*	X	I-IV	II
TLM 121	AJ(WR)	B1*	X	I-IV	II
TLM 122	AJ(WR)	B4*	X	I-II	II
TLM 123	AJ(WR)	B4*	X	I-II	II
TLM 124	AJ(WR)	B4*	X	I-II	II
TLM 125	AJ(WR)	B4*	X	I-IV	II
TLM 126	WR	A2	X	I	DI

TABLE 4 (Continued)

AHRS NUMBER	LOCATION	ZONE	RESERVOIR GEOLOGY AND SOIL		EXPECTED IMPACT
			PERMAFROST	SLOPE INSTABILITY**	
TLM 127	AJ(WR)	B4*	X	I-IV	II
TLM 128	AJ(WR)	B4*	-	II, IV	II
TLM 129	AJ(WR)	B4*	X	I-IV	II
TLM 130	WR	A3	X	I-IV	DI
TLM 131	AJ(WR)	B4*	X	I-IV	II
TLM 132	AJ(WR)	B4*	X	I-IV	II
TLM 133	AJ(WR)	B4*	X	I-II	II
TLM 134	AJ(WR)	B4*	-	II, IV	II
TLM 135	AJ(WR)	B4*	-	II, IV	II
TLM 136	AJ(WR)	B4*	-	II, IV	II
TLM 137	AJ(T W-I)	B4	X	NA	II
TLM 138	05	B4	-	NA	II
TLM 139	AJ(WR)	B4*	-	II, IV	II
TLM 140	AJ(WR)	B4*	-	II, IV	II
TLM 141	AJ(WR)	B4*	-	II, IV	II
TLM 142	AJ(WR)	B4*	-	II, IV	II
TLM 143	AJ(WR)	B4*	-	II, IV	II
TLM 144	05	B4	-	NA	II
TLM 145	AJ(WR)	B4*	-	II, IV	II
TLM 146	05	B4	-	NA	II
TLM 147	AJ(WR)	B4*	-	II, IV	II
TLM 148	AJ(WR)	B4*	-	II, IV	II
TLM 149	05	C	-	NA	NI
TLM 150	05	C	-	NA	NI
TLM 151	05	B4	-	NA	II
TLM 152	05	C	-	NA	NI

TABLE 4 (Continued)

AHRS NUMBER	LOCATION	ZONE	RESERVOIR GEOLOGY AND SOIL		EXPECTED IMPACT
			PERMAFROST	SLOPE INSTABILITY**	
TLM 153	ARB	A	-	NA	DI
	AJ(AR)	B4	-	NA	II
TLM 154	05	C	-	NA	NI
TLM 155	AJ(AR)	B4	-	NA	II
TLM 159	AJ(WR)	B4*	-	NA	II
TLM 160	AJ(WC-WCV)	B4	X	NA	II
	AJ(AR)	B4	X	NA	II
TLM 164	AJ(B-F)	B3	-	NA	II
TLM 165	AJ(DR)	B4*	X	NA	II
	AJ(T W-I)	B4	X	NA	II
	AJ(WC-WD)	B4	X	NA	II
TLM 166	AJ(WR)	B4*	X	NA	II
	AJ(T W-I)	B4	X	NA	II
	AJ(WC-WD)	B4	X	NA	II
TLM 167	AJ(WR)	B4*	X	NA	II
	AJ(WC-WD)	B4	X	NA	II
TLM 168	AJ(AR)	B4	-	NA	II
TLM 169	WR	A2	X	I	DI
TLM 170	AJ(WR)	B4*	X	NA	II
TLM 171	WR	A2	X	I	DI
TLM 172	AJ(WC-WCV)	B4	X	NA	II
TLM 173	WR	A2	0	CI, I (II)	DI
TLM 174	WR	A1	X	I	DI
TLM 175	WR	A1	X	I	DI
TLM 176	B-F	A	-	NA	DI

TABLE 4 (Continued)

AHRS NUMBER	LOCATION	ZONE	RESERVOIR GEOLOGY AND SOIL		EXPECTED IMPACT
			PERMAFROST	SLOPE INSTABILITY**	
TLM 177	AJ(WR)	B1*	X	IV	II
	AJ(B-J)	B4	X	IV	II
TLM 178	DR	A1, A4	0	I	DI
	B-I	A	0	I	DI
TLM 179	AJ(RA-K)	B4	-	NA	II
TLM 180	02	C	X	NA	NI
TLM 181	AJ(ARB)	B4	X	NA	II
TLM 182	WR	A2	0	IV	DI
	AJ(RA-J)	B4	0	IV	II
TLM 183	AJ(WR)	B4*	-	IV	II
TLM 184	WR	A1	X	I	DI
TLM 185	AJ(WR)	B4*	-	CI, IV-II	II
TLM 186	AJ(RA-K)	B4	-	NA	II
TLM 187	AJ(RA-J)	C	-	NA	NI
TLM 188	B-F	A	-	NA	DI
TLM 189	AJ(WR)	B4*	-	CI, IV-II	II
TLM 190	AJ(WR)	B4*	-	CI, IV-II	II
TLM 191	AJ(ARB)	B4	X	NA	II
TLM 192	AJ(WC-WCV)	B4	X	NA	II
	AJ(AR)	B4	X	NA	II
TLM 193	AJ(ARB)	B4	X	NA	II
TLM 194	WR	A1	X	I (IV)	DI
TLM 195	AJ(WR)	B4*	-	NA	II
TLM 196	WR	A2	0	IV	DI
TLM 197	AJ(WC-PAS)	B3	X	NA	II
TLM 198	AJ(WR)	B4*	-	NA	II

TABLE 4 (Continued)

AHRS NUMBER	LOCATION	ZONE	RESERVOIR GEOLOGY AND SOIL		EXPECTED IMPACT
			PERMAFROST	SLOPE INSTABILITY**	
TLM 199	WR	A1	0	I	DI
	AJ(B-J)	B4	0	I	II
TLM 200	WR	A1	0	I	DI
	AJ(B-J)	B4	0	I	II
TLM 201	B-C	A	-	NA	DI
	AJ(RA-H)	B4	-	NA	II
TLM 202	B-F	A	-	NA	DI
	AJ(RA-H)	B4	-	NA	II
TLM 203	B-F	A	-	NA	DI
	AJ(RA-H)	B4	-	NA	II
TLM 204	WR	A1	0	CI, II	DI
TLM 205	01	C	-	NA	NI
TLM 206	WR	A2	0	IV-II	DI
TLM 207	AJ(WR)	B2*	X	IV-II	II
TLM 208	AJ(RA-K)	B4	-	NA	II
TLM 209	B-F	A	-	NA	DI
	AJ(RA-H)	B3	-	NA	II
TLM 210	B-F	A	-	NA	DI
	AJ(RA-H)	B4	-	NA	II
TLM 211	B-C	A	-	NA	DI
	AJ(RA-H)	B4	-	NA	II
TLM 212	B-F	A	-	NA	DI
TLM 213	B-C	A	-	NA	DI
	AJ(RA-H)	B4	-	NA	II
TLM 214	B-F	A	-	NA	DI
	AJ(AR)	B4	-	NA	II

TABLE 4 (Continued)

AHRS NUMBER	LOCATION	ZONE	RESERVOIR GEOLOGY AND SOIL		EXPECTED IMPACT
			PERMAFROST	SLOPE INSTABILITY**	
TLM 215	WR	A1	X	I	DI
TLM 216	WR	A1	0	I	DI
TLM 217	WR	A2	X	I	DI
TLM 218	WR	A3	X	II-III	DI
TLM 219	AJ(WR)	B4*	-	NA	II
TLM 220	WR	A1	X	I	DI
TLM 221	WR	A1	X	I	DI
TLM 222	WR	A1	0	I	DI
TLM 223	WR	A1	X	I	DI
TLM 224	WR	A1	X	I	DI
TLM 225	WR	A1	X	I	DI
TLM 226	WR	A1	0	I	DI
TLM 227	WR	A1	X	I	DI
TLM 228	WR	A1	0	I	DI
TLM 229	WR	A1	0	I	DI
	AJ(B-J)	B4	0	I	II
TLM 230	WR	A1	0	I	DI
	AJ(B-J)	B4	0	I	II
TLM 231	WR	A1	X	I	DI
TLM 232	WR	A1	0	I	DI
TLM 233	WR	A1	0	I	DI
	AJ(B-J)	B4	0	I	II
TLM 234	WR	A1	0	I	DI
TLM 235	WR	A1	0	I	DI
TLM 236	WR	A1	0	I	DI
TLM 237	WR	A1	X	I	DI

TABLE 4 (Continued)

AHRS NUMBER	LOCATION	ZONE	RESERVOIR GEOLOGY AND SOIL		EXPECTED IMPACT
			PERMAFROST	SLOPE INSTABILITY**	
TLM 238	WR	A1	X	I	DI
TLM 239	WR	A1	X	I	DI
TLM 240	WR	A1	0	I	DI
TLM 241	WR	A1	X	I	DI
TLM 242	WR	A1	0	I	DI
TLM 243	WR	A1	X	I	DI
TLM 244	WR	A2	X	I	DI
TLM 245	AJ(ARB)	B4	X	NA	II
	AJ(WR)	B4*	X	NA	II
TLM 246	WR	A1	0	I	DI
TLM 247	WR	A1	0	I	DI
TLM 248	WR	A1	0	II, IV	DI
TLM 249	WR	A1	0	I	DI
TLM 250	WR	A1	0	I	DI
TLM 251	WR	A2	0	CI, I (II)	DI
TLM 252	DR	A1, A4	0	I	DI
TLM 253	DR	A1, A4	0	I	DI
TLM 256	WR	A1	0	I (IV)	DI
TLM 257	WR	A1	0	I	DI
TLM 258	DR	A2, A4	0	I	DI
	B-E	A	0	I	DI
TLM 259	DR	A1, A4	0	I	DI
	B-I	A	0	I	DI
HEA 007	AJ(T H-F)	B4	-	NA	II
HEA 012	AJ(T H-F)	B4	-	NA	II

TABLE 4 (Continued)

AHRS NUMBER	LOCATION	ZONE	RESERVOIR GEOLOGY AND SOIL		EXPECTED IMPACT
			PERMAFROST	SLOPE INSTABILITY**	
HEA 033	AJ(T H-F)	B4	-	NA	II
HEA 035	AJ(T H-F)	B4	-	NA	II
HEA 038	AJ(T H-F)	B4	-	NA	II
HEA 081	AJ(T H-F)	B4	-	NA	II
HEA 091	T(H-F)	A	-	NA	DI
HEA 137	AJ(T H-F)	B4	-	NA	II
HEA 174	02	B4	-	NA	II
HEA 175	02	C	-	NA	NI
HEA 176	AJ(RA-L)	C	-	NA	NI
HEA 177	GT	C	-	NA	NI
HEA 178	GT	C	-	NA	NI
HEA 179	GT	C	-	NA	NI
HEA 180	AJ(AR)	B4	-	NA	II
HEA 181	ARB	A	-	NA	DI
	AJ(AR)	B4	-	NA	II
HEA 182	ARB	A	-	NA	DI
	AJ(AR)	B4	-	NA	II
HEA 183	AJ(RA-L)	B4	-	NA	II
HEA 184	AJ(RA-L)	B4	-	NA	II
HEA 185	02	C	-	NA	NI
HEA 186	02	C	-	NA	NI
HEA 210	02	C	-	NA	NI
HEA 211	AJ(ARB)	C	-	NA	NI
FAI 070	AJ(T H-F)	B4	-	NA	II
FAI 089	AJ(T H-F)	B4	-	NA	II

TABLE 4 (Continued)

AHRS NUMBER	LOCATION	ZONE	RESERVOIR GEOLOGY AND SOIL		EXPECTED IMPACT
*			PERMAFROST	SLOPE INSTABILITY**	
FAI 090	AJ(T H-F)	C	-	NA	NI
FAI 169	AJ(T H-F)	B4	-	NA	II
FAI 213	02	C	-	NA	NI
FAI 214	02	C	-	NA	NI
TYO 014	AJ(T W-A)	B1	-	NA	II

* Adjacent to reservoir

** Applies to areas within 300 feet of the upper floodpool (A3)

X Permafrost present

0 Permafrost not present

\- Site in area not covered by permafrost mapping

NA Not applicable

TABLE 5

Cultural Resources by Impact Category and Zone

Expected Impact					
Direct Impact	Zone(s)	Indirect Impact	Zone(s)	No Impact	Zone
TLM 009	A	TLM 005	B4	TLM 007	C
TLM 022-	A	TLM 006	B4	TLM 021	C
TLM 023	A, A2, A4	TLM 015	B4	TLM 025	C
TLM 033	A1	TLM 016	B3, B4	TLM 028	C
TLM 034	A, A2, A4	TLM 017	B4*	TLM 036	C
TLM 039	A2	TLM 018	B4	TLM 037	C
TLM 040	A1	TLM 020	A4	TLM 044	C
TLM 043-	A1	TLM 022-	B1*	TLM 045	C
TLM 048	A2	TLM 024	B4*, B4	TLM 046	C
TLM 050	A1	TLM 026	B1*	TLM 052	C
TLM 054-	A	TLM 027	B4*	TLM 053	C
TLM 055-	A	TLM 029	B4*	TLM 066	C
TLM 056-	A	TLM 030	B3*, B4	TLM 067	C
TLM 058-	A1	TLM 031	B4*	TLM 068	C
TLM 059	A2	TLM 032	B4*	TLM 070	C
TLM 060	A2	TLM 035	B4	TLM 071	C
TLM 061	A1	TLM 038	B4*	TLM 082	C
TLM 062	A1	TLM 041	B4	TLM 092	C
TLM 063-	A1	TLM 042	B3*	TLM 093	C
TLM 065	A1	TLM 043-	B4	TLM 149	C
TLM 072	A1	TLM 047	B4*	TLM 150	C
TLM 075	A1	TLM 049	B4*	TLM 152	C
TLM 077	A1	TLM 051	B4	TLM 154	C
TLM 078	A	TLM 054-	B3	TLM 180	C
TLM 079	A1	TLM 055-	B4	TLM 187	C

TABLE 5 (Continued)

Direct Impact	Zone(s)	Indirect Impact	Zone(s)	No Impact	Zone
TLM 080	A, A1	TLM 056-	B4	TLM 205	C
TLM 081-	A	TLM 057	B4	HEA 175	C
TLM 084-	A	TLM 058-	B4	HEA 176	C
TLM 085-	A	TLM 063-	B4	HEA 177	C
TLM 086-	A	TLM 064	B1*	HEA 178	C
TLM 087-	A	TLM 069	B4	HEA 179	C
TLM 088	A	TLM 073	B2*	HEA 185	C
TLM 094-	A	TLM 074	B2*	HEA 186	C
TLM 095-	A	TLM 076	B4*	HEA 210	C
TLM 096	A	TLM 081-	B4	HEA 211	C
TLM 097-	A	TLM 083	B1	FAI 090	C
TLM 102	A1	TLM 084-	B4	FAI 213	C
TLM 104	A1	TLM 085-	B4	FAI 214	C
TLM 106-	A	TLM 086-	B4		
TLM 107-	A	TLM 087-	B4		
TLM 108-	A	TLM 089	B4		
TLM 109-	A	TLM 090	B4		
TLM 110-	A	TLM 091	B4		
TLM 111-	A	TLM 094-	B4		
TLM 113-	A	TLM 095-	B4		
TLM 114-	A	TLM 097-	B4		
TLM 115	A1	TLM 098	B4		
TLM 119	A2	TLM 099	B4		
TLM 126	A2	TLM 100	B4		
TLM 130	A3	TLM 101	B1		
TLM 153-	A	TLM 103	B4		
TLM 169	A2	TLM 105	B4		
TLM 171	A2	TLM 106-	B4		
TLM 173	A2	TLM 107-	B4		
TLM 174	A1	TLM 108-	B4		

TABLE 5 (Continued)

Direct Impact	Zone(s)	Indirect Impact	Zone(s)	No Impact Zone
TLM 175	A1	TLM 109-	B4	
TLM 176	A	TLM 110-	B4	
TLM 178-	A, A1, A4	TLM 111-	B4	
TLM 182-	A2	TLM 112	B4	
TLM 184	A1	TLM 113-	B4	
TLM 188	A	TLM 114-	B4	
TLM 194	A1	TLM 116	B4	
TLM 196	A2	TLM 117	B4	
TLM 199-	A1	TLM 118	B4*	
TLM 200-	A1	TLM 120	B4*	
TLM 201-	A	TLM 121	B1*	
TLM 202-	A	TLM 122	B4*	
TLM 203-	A	TLM 123	B4*	
TLM 204	A1	TLM 124	B4*	
TLM 206	A2	TLM 125	B4*	
TLM 209-	A	TLM 127	B4*	
TLM 210-	A	TLM 128	B4*	
TLM 211-	A	TLM 129	B4*	
TLM 212	A	TLM 131	B4*	
TLM 213-	A	TLM 132	B4*	
TLM 214-	A	TLM 133	B4*	
TLM 215	A1	TLM 134	B4*	
TLM 216	A1	TLM 135	B4*	
TLM 217	A2	TLM 136	B4*	
TLM 218	A3	TLM 137	B4	
TLM 220	A1	TLM 138	B4	
TLM 221	A1	TLM 139	B4*	
TLM 222	A1	TLM 140	B4*	
TLM 223	A1	TLM 141	B4*	

TABLE 5 (Continued)

Direct Impact	Zone(s)	Indirect Impact	Zone(s)	No Impact	Zone
TLM 224	A1	TLM 142	B4*		
TLM 225	A1	TLM 143	B4*		
TLM 226	A1	TLM 144	B4		
TLM 227	A1	TLM 145	B4*		
TLM 228	A1	TLM 146	B4		
TLM 229-	A1	TLM 147	B4*		
TLM 230-	A1	TLM 148	B4*		
TLM 231	A1	TLM 151	B4		
TLM 232	A1	TLM 153-	B4		
TLM 233-	A1	TLM 155	B4		
TLM 234	A1	TLM 159	B4*		
TLM 235	A1	TLM 160	B4		
TLM 236	A1	TLM 164	B3		
TLM 237	A1	TLM 165	B4*, B4		
TLM 238	A1	TLM 166	B4*, B4		
TLM 239	A1	TLM 167	B4*, B4		
TLM 240	A1	TLM 168	B4		
TLM 241	A1	TLM 170	B4*		
TLM 242	A1	TLM 172	B4		
TLM 243	A1	TLM 177	B1*, B4		
TLM 244	A2	TLM 179	B4		
TLM 246	A1	TLM 181	B4		
TLM 247	A1	TLM 182-	B4		
TLM 248	A1	TLM 183	B4*		
TLM 249	A1	TLM 185	B4*		
TLM 250	A1	TLM 186	B4		
TLM 251	A2	TLM 189	B4*		
TLM 252	A1, A4	TLM 190	B4*		
TLM 253	A1, A4	TLM 191	B4		

TLM 256 A1 TLM 192 B4

TABLE 5 (Continued)

Direct Impact	Zone(s)	Indirect Impact	Zone(s)	No Impact Zone
TLM 257	A1	TLM 193	B4	
TLM 258	A, A2, A4	TLM 195	B4*	
TLM 259	A, A1, A4	TLM 197	B3	
HEA 091	A	TLM 198	B4*	
HEA 181-	A	TLM 199-	B4	
HEA 182-	A	TLM 200-	B4	
		TLM 201-	B4	
		TLM 202-	B4	
		TLM 203-	B4	
		TLM 207	B2*	
		TLM 208	B4	
		TLM 209-	B3	
		TLM 210-	B4	
		TLM 211-	B4	
		TLM 213-	B4	
		TLM 214-	B4	
		TLM 219	B4*	
		TLM 229-	B4	
		TLM 230-	B4	
		TLM 233-	B4	
		TLM 245	B4*, B4	
		HEA 007	B4	
		HEA 012	B4	
		HEA 033	B4	
		HEA 035	B4	
		HEA 038	B4	
		HEA 081	B4	
		HEA 137	B4	
		HEA 174	B4	

HEA 180 B4

TABLE 5 (Continued)

Direct Impact	Zone(s)	Indirect Impact	Zone(s)	No Impact	Zone
		HEA 181-	B4		
		HEA 182-	B4		
		HEA 183	B4		
		HEA 184	B4		
		FAI 070	B4		
		FAI 089	B4		
		FAI 169	B4		
		TYO 014	B1		

* Adjacent to Reservoir

- Listed under more than one impact category

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IN REPLY REFER TO:

H22(ARO-OCR)

SEP 10 1985

Dr. E. James Dixon, Curator of Archeology
University of Alaska Museum
Fairbanks, Alaska 99701

Dear Dr. Dixon:

I have reviewed your draft report entitled "Susitna Hydroelectric Cultural Resources -- Impact Assessment" and find it a very fine piece of work. Recognizing that this draft is but one section of a larger report dealing with site significance analysis and a proposed mitigation and preservation plan for the project area, it is a detailed and well thought out impact analysis. I have the following general suggestions for you that may prove useful in succeeding revisions (I have left minor editing to your devises):

--The impact assessment section of the report should explicity identify that it is one section of a larger report covering site significance and mitigation planning. Otherwise, professionals and managers alike could, seeing this document by itself, perceive of the impact assessment as incomplete for federal preservation planning purposes.

--When the assessment of site significance is done, evaluate the sites in the project area using defensible, professional significance criteria identifying research potentials, and tie these to requirements of the National Register of Historic Places. It is important to identify which properties are important, individually, for potential National Register listing, and those groups of sites that may qualify as a district or districts.

I look forward to seeing your draft report sections for site significance analysis and recommendations for mitigation/preservation planning.

Sincerely,

Craig Davis

Craig Davis
Regional Archeologist

APPENDIX - MAPS

(Figures 8 through 54)