9. BOTANICAL RESOURCES

9.1. Introduction

The botanical resources section describes the studies proposed to collect necessary baseline data to evaluate the potential impacts to vegetation, wildlife habitat, wetland, and vascular-plant resources in the Project area. Five proposed study plans are presented in this section. Two of these studies will involve the mapping of vegetation, wildlife habitats, and wetlands in the upper and middle Susitna basin where the Project dam, reservoir, supporting infrastructure, transmission lines, and access road are proposed to be built. A third study involves the mapping of successional vegetation, wildlife habitats, and wetlands in riparian areas along the Susitna River downstream of the proposed dam site, and also will involve modeling efforts to predict the potential changes in downstream riparian areas from Project development. A fourth study will involve surveys for rare vascular plant populations in those portions of the Project area where fill, inundation for the reservoir, or disturbance to plant populations would occur, and a fifth study will involve surveys for invasive vascular plants in currently disturbed areas that could serve as source areas for the spread of invasive plants in the Project area.

9.2. Nexus Between Project Construction / Existence / Operations and Effects on Resources to be Studied

Project construction and operations activities would directly and indirectly affect vegetation, wildlife habitats, and wetlands in and adjacent to those areas where physical alteration of the landscape would occur (the site of the proposed dam, the reservoir, and in those areas where supporting infrastructure, the access road, and transmission-lines are proposed). Project development also would indirectly affect vegetation, wildlife habitats, and wetlands downstream of the proposed dam in riparian areas because of alterations in patterns of river flow, sediment transport and ice scour, and subsequent changes in riverine geomorphology. In addition to direct and indirect effects, development of the Project also would contribute to cumulative effects on vegetation, wildlife habitats, and wetlands in the region surrounding the Project. Three of the botanical resources studies (the vegetation and wildlife habitat mapping study, wetland mapping study, and riparian study) will provide the information necessary to:

- Quantify the potential direct loss and alteration of vegetation types, wildlife habitats, and wetlands (including alterations in wetland functions) from development of the proposed Project;
- Evaluate the potential indirect and cumulative effects of Project development on vegetation, wildlife habitats, wetlands, and wetland functions; and
- Prepare a Clean Water Act Section 404 wetlands permit application for the Project, which will include proposed measures to avoid and minimize impacts to wetlands as much as practicable.

Project development could directly or indirectly result in the loss or degradation of habitats that support rare vascular plant species through the clearing of areas for fill and through disturbance to habitats adjacent to areas within the Project footprint. Similarly, disturbance to habitats from Project construction and operations activities could create opportunities for invasive vascular plant species to become established in the Project area. Project construction and operations activities also could provide vectors for the movement of invasive plant propagules into the Project area (e.g., construction equipment, vehicles, worker's boots, plant seed mixes). Two of the botanical resources studies (the rare plant study and invasive plant study) will provide the information necessary to:

- Quantify the potential direct loss or disturbance to habitats supporting individuals or populations of rare plants from development of the proposed Project;
- Evaluate the potential indirect and cumulative effects of Project development on individuals or populations of rare plants; and

Evaluate the potential for invasive plant species to become established in the Project area and the level of ecological threat from establishment.

9.3. Resource Management Goals and Objectives

There are no specific management goals for vegetation and wildlife habitats in Alaska. Federal and state management goals for bird and mammal species in Alaska are described in Section 8.3 of this study plan, and most of those management goals have a habitat component, in which the maintenance of habitats for the species or species group in question is part of the overall management goal(s).

Wetlands in Alaska are regulated under jurisdiction of the Environmental Protection Agency (EPA) 40 CFR Part 230 Section 404(b)(1) and Section 10 of the Rivers and Harbors Act of 1899 33 USC 403 regulations under the Clean Water Act. These regulations were developed "…to restore and maintain the chemical, physical, and biological integrity of waters of the United States through the control of discharges of dredged or fill material." The Section 404 program is designed to minimize the loss or negative impact to the nation's waters and wetlands. Mitigation for the loss of wetlands in Alaska must be done in compliance with the compensatory mitigation regulations of the U.S. Army Corps of Engineers (USACE) 33 CFR Parts 325 and 332 and EPA 40 CFR Part 230 ruling, Compensatory Mitigation for Losses of Aquatic Resources. The compensatory mitigation rule was enacted to improve the planning, implementation, and management of compensatory mitigation projects by requiring measurable, ecosystem-based performance standards and effective monitoring for all types of compensation.

The Aleutian shield fern (*Polystichum aleuticum*) in the only plant species listed as endangered under the federal Endangered Species Act (ESA) (USFWS 2010), and it is restricted to two islands (Adak and Atka) in the central Aleutian Island chain. The State of Alaska does not list any plant species as threatened or endangered (ADF&G 2010). Portions of the Project area, however, are managed by the Bureau of Land Management (BLM), and the BLM maintains a Special Status Species list, which was created from the Alaska Natural Heritage Program's Rare Vascular Plant List (AKNHP 2012). The BLM list is designed to identify species requiring special management consideration to promote their conservation and reduce the likelihood and need for future listing under the ESA.

Resource agencies have become increasingly concerned about invasive plants in Alaska because of their potential to negatively impact wildlife habitat, recreational values, rare plant populations, and native plant species diversity. In addition, they can greatly increase land management costs as financial resources are diverted from other resource management needs to control the spread of invasive species. As a result, the Alaska Department of Natural Resources, in cooperation with the Division of Agriculture, has been developing plans to help with prevention, regulation, and enforcement of policies for the prevention and control of the spread of invasive species (Herbert 2001, Graziano 2011). Planning tools already in place include the authority to declare pests, conduct inspections, quarantine infested areas, and control (eradicate) infested areas.

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9.4. Summary of Consultation with Agencies, Alaska Native Entities and Other Licensing Participants

Consultation efforts to date include discussions with agency representatives, Alaska Native entities, and other licensing participants at the Project Technical Workgroup Meetings and other meetings with agencies and interested parties held in between January and June 2012 (Table 9.4-1). Documentation of these meetings are found in Attachment 9-1 of this PSP.

Table 9.4-1. Summary of consultation on Botanical Resources study plans.

Comment Format	Date	Stakeholder	Affiliation	Subject
Letter	01/12/2012	P. Bergman	USDOI	Comments regarding wetlands methodology and consideration of BLM-Alaska Sensitive Animal and Plant Lists (Filed with FERC)
Terrestrial and Aquatic Resources Workgroup Meeting Notes	01/26/2012	Various	ADF&G, ADNR, BLM, FERC, NHI, NMFS, NPS, USFWS	Botanical study plans (See Attachment 1-1.)
Letter	02/10/2012	A. Rappoport	USFWS	Request USACE and Alaska Regional Supplement wetland methodology and Cook Inlet Classification system.
Cultural and Terrestrial Resources Workgroup Meeting Notes	02/28/2012	Various	ADF&G, ADHSS-HIA, ADNR, ADNR_OHA, BLM, EPA, FERC, NPS, USFWS	Botanical study plans (See Attachment 1-1.)
Terrestrial Resources Workgroup Meeting Notes	04/02/2012	Various	ADF&G, BLM, NHI, NPS, USFWS	Wetland delineation and functional assessment methodology (See Attachment 1-1.)
Wetland Technical Group Agency Meeting Notes	04/18/2012	Various	EPA, USACE, USFWS	Wetland delineation and functional assessment methodology
Telephone Call	04/19/2012	M. Gracz	Kenai Watershed Forum/University of Minnesota	Use of the Cook Inlet Wetland Classification for mapping the Susitna-Watana study area
E-mail	04/27/2012	M. Gracz	Kenai Watershed Forum/University of Minnesota	Information on the Cook Inlet Wetlands Classification System field methods
Wetland Technical Group Agency Meeting Notes	05/02/2012	Various	EPA, USACE, USFWS	Wetland delineation and functional assessment methodology
E-mail	05/02/2012	M. Gracz	Kenai Watershed Forum/University of Minnesota	Information on the Cook Inlet Wetlands Classification System
Letter	05/24/2012	J. Darnell	NPS	Comments on botanical study plans (E-filed with FERC P-14241-001)
Study Requests, Letters	05/30/2012, 05/31/2012	Various	Various	Comments on botanical study plans (Filed with FERC.)
Terrestrial Resources Workgroup Meeting Notes	06/06/2012	Various	ADF&G, Ahtna Native Corporation, BLM, ADNR OPMP, EPA, NHI, NPS, USFWS, Kenai Watershed Forum	Wetland delineation and functional assessment methodology Study Plan (See Attachment 1-1.)

9.5. Vegetation and Wildlife Habitat Mapping Study

9.5.1. General Description of the Proposed Study

In the vegetation and wildlife habitat mapping study, AEA will update the vegetation mapping prepared for the Alaska Power Authority's Susitna Hydroelectric Project (APA Project) in the 1980s, and identify and map current vegetation and wildlife habitat types in the Project area using current, high-resolution aerial photography and remote-sensed imagery. The study will involve field surveys to collect ground-reference data to "tag" the photosignatures in the Project area to known vegetation and wildlife habitat types, and in the office, the boundaries for the identified vegetation and wildlife habitat types will delineated by on-screen digitizing in GIS using the aerial photography and remote-sensed imagery for the Project area as the base data layers.

9.5.1.1. Study Goals and Objectives

The overall goals of the vegetation and wildlife habitat mapping study are to prepare baseline maps of the existing vegetation and wildlife habitats in the Project area. This mapping information will be used in assessing impacts to both vegetation and wildlife resources from the proposed Project, and to develop any necessary protection, mitigation, and enhancement (PM&E) measures. The wildlife habitat maps will be used to quantitatively assess the impacts of habitat loss and alteration for all bird and mammal species evaluated during the FERC licensing process. This is the primary basis for evaluating impacts to wildlife species.

The specific objectives of the vegetation and wildlife habitat mapping study are to:

- Identify, delineate, and map vegetation and wildlife habitat types in the Project area using the vegetation map prepared in the 1980s for the APA Project by Kreig and Associates (1987) as a starting point, and updating that mapping to reflect current conditions as indicated on recent aerial imagery for the Project area; and
- Quantify the potential direct, indirect, and cumulative impacts to vegetation and wildlife habitats from Project construction and operations.

This multi-year study is being initiated in 2012 and will be re-initiated, and continued in 2013 and 2014 follow this study plan as approved by the FERC. Results from the 2012 work will be used to: (1) fine-tune the field investigations and mapping efforts for the existing conditions found in the Project area, and (2) customize the mapping work (e.g., study area) to reflect further refinements in the design of the Project.

9.5.2. Existing Information and Need for Additional Information

Wildlife habitats were not specifically mapped in the 1980s, although information on vegetation types important for moose browse was incorporated in the vegetation mapping data prepared by Kreig and Associates (1987; see below). All vegetation mapping for the APA Project was based on field ground-reference data, and vegetation types were delineated by aerial photo interpretation based on aerial photography acquired in the early 1980s; map polygons were hand-drawn on mylar or acetate over aerial photos and topographic maps.

During 1980–1982, researchers from the University of Alaska Agricultural Experiment Station (UAAES) mapped vegetation communities classified to the Level III of the first version of the Alaska Vegetation Classification (AVC; Viereck and Dyrness 1980); this mapping made use of field ground-reference data collected in 1980 (McKendrick et al. 1982). The UAAES mapping covered a narrow corridor confined to the Susitna River floodplain upstream from Talkeetna, expanded outward to the river basin level at Devils Canyon, and continued upstream from there at the river basin level (AEA 2011). Map scales were 1:24,000 for the areas that would have been affected directly and 1:250,000 for the remainder of the Susitna basin. In addition, the area extending 10 miles in all directions from the upper Susitna River between Gold Creek and the mouth of the Maclaren River was mapped at a scale of 1:63,360. A 1:24,000-scale map of “apparent wetlands” also was prepared, as well as two other 1:63,360-scale maps for two of the three proposed APA Project transmission-line corridors: the northern (Healy to Fairbanks) and the southern (Willow to Cook Inlet) corridors. Both of the northern and southern transmission-line corridors are outside of the current Project area. The 1:63,360-scale vegetation map encompassed the APA Project central transmission-line corridor, which ran along both sides of the Susitna River between the originally proposed Watana Dam site to Gold Creek.

Additional vegetation mapping prepared by Kreig and Associates (1987) covered parts of the upper and middle Susitna basin, from near the mouth of the Oshetna River (upstream of the Watana Dam site) to just downstream of the Devils Canyon Dam site. The Kreig and Associates mapping effort was focused, in part, on vegetation types important for moose browse. Vegetation types with high forage values for moose (mainly shrub and forest types) were mapped to the AVC Level IV (vegetation structure combined with dominant plants). In addition, each map polygon was assigned values for understory cover of willows, shrub birch, and alder; a limited ground-truth survey was conducted to verify understory shrub cover values. Mapping was performed at the 1:63,360 scale and incorporated the previous vegetation mapping prepared by McKendrick et al. (1982). Existing ground data and photography provided by the Alaska Department of Fish & Game (ADF&G), Bureau of Land Management (BLM), and U.S. Forest Service (USFS), as well as newly obtained ground and aerial data also were used in the mapping effort. A relational database of attributes for each polygon was developed and exported in digital format to floppy disk; those data were provided to ADF&G. The mapping data of Kreig and Associates (1987), in ArcGIS format, will updated to reflect current conditions in the Project area (see Section 9.5.4).

Although the vegetation mapping conducted for the APA Project in the 1980s provides an overview of the vegetation types that occur in the Project area, the map polygons delineated in the 1980s are likely to be outdated in some areas because of changes in landscape characteristics over the intervening 25-plus years. Vegetation and habitat changes may have occurred in response to fire, insect outbreaks, development, and climate change. In particular, increases in woody shrub habitats, reductions in forest cover from fires and insect outbreaks, and permafrost degradation have been documented in recent decades in interior Alaska. In this study, recent aerial imagery will be used to update the vegetation mapping developed in the 1980s.

In addition, the vegetation maps from the 1980s do not include landscape context and physical habitat information necessary to adequately describe wildlife habitats. The vegetation and wildlife habitat mapping study proposed here will involve an integrated approach to the mapping of wildlife habitats and will include the mapping of several different terrain units in addition to vegetation (see Section 9.5.4).

As described below in Study Methods (Section 9.5.4), the vegetation mapping of Kreig and Associates (1987) will be overlain on recent aerial imagery and the vegetation polygon boundaries will be updated to reflect the current extent of each vegetation type in the study area (mapped to the Level IV of the AVC; Viereck et al. 1992). The 1980s vegetation mapping will also be used as a planning tool to develop a list of vegetation types to survey in the field.

9.5.3. Study Area

The final study area for the mapping of vegetation and wildlife habitats will be defined in consultation with resource agencies, FERC staff, Alaska Natives, and other licensing participants during 2012. In the interim, a working proposed study area is based upon using a 5-mile buffer zone surrounding those areas that would be directly altered or disturbed by Project construction and operations (Figure 9.5-1). The affected areas include the proposed reservoir impoundment zone, areas for infrastructure of the dam and powerhouse and supporting facilities, the proposed access route and transmission-line corridors, and materials sites.

The alteration of successional vegetation and wildlife habitats downstream of the dam (due to changes in instream flow, ice processes, and riverine geomorphology in the Susitna River) will be specifically addressed in the Riparian Study, which will be developed in coordination with the proposed studies of riverine physical processes, most notably instream flow, ice processes, and riverine geomorphology (see Section 9.6).

9.5.4. Study Methods

AEA proposes an integrated approach to the mapping of vegetation and wildlife habitats based on methods developed for Ecological Land Surveys (ELS) studies conducted in tundra, boreal forest, and coastal regions in Alaska (see Jorgenson et. al. 2002 for an example study in Southcentral Alaska). This integrated mapping approach involves mapping terrain units such as vegetation type, physiography, surface form, and disturbance type, and then combining them into units with ecological importance (in this case wildlife habitats).

The method of combining various ITUs allows for the preparation of a number of thematic maps depending on the specific study needs. For the Project, a vegetation map at Level IV of the Alaska Vegetation Classification (Viereck et al. 1992), and a wildlife habitat map based on the best combination of ITUs will be produced to yield a habitat map that accurately reflects use by wildlife. A concerted effort will be made to use data from existing vegetation maps prepared for the APA Project (e.g., McKendrick et. al. 1982, but especially Kreig and Associates 1987 because the latter incorporates the mapping of McKendrick et al., and is available in digital form).

9.5.4.1. Develop Mapping Materials from Historical and Current Data

All available historical and current data layers that can be used to facilitate the mapping of vegetation and wildlife habitats have been compiled and are being managed in an ArcGIS geodatabase. These data include existing high-resolution aerial photography (for part of the study area), National Wetland Inventory (NWI) mapping, and existing (1987) vegetation mapping for the Project area. The existing vegetation map layer produced by Kreig and Associates (1987) has been updated to ArcGIS 10.0 format for review and updating (see below). Additional, fine-scale, recent imagery will be needed to complete the mapping of vegetation and wildlife habitats in this multi-year study, and it is expected that imagery will be available in late 2012.

9.5.4.2. ITU Mapping and Derivation of Wildlife Habitats

The existing vegetation map data (Kreig and Associates 1987) will be assessed for accuracy within the portions of the study area for which there is recent, high-resolution digital imagery, and map polygons will be updated to reflect Level III or IV vegetation types as defined by Viereck et al. (1992). The assignment of Level III (largely reflecting vegetation structure) or Level IV (vegetation structure plus dominant species) vegetation types will depend on how accurate the 1987 mapping is when compared to recent imagery. The accuracy assessment will focus on the extent of registration errors, match-line errors between adjoining mapping blocks, and on accuracy of map polygon vegetation codes in comparison to recent imagery. As much as possible, the 1987 vegetation mapping will be used initially during the 2012 field studies as a planning tool to develop a list of target vegetation types to document during the field work. The 1987 mapping, if not highly accurate at the Level IV of Viereck et al. (1992), may be modified (aggregated) into broader-scale vegetation types (Level III). These broad-scale vegetation map polygons would then serve as the basis from which finer-scale map polygons would be developed. When modifying the 1987 vegetation map layer, a minimum mapping size of 1.0 acre for vegetated areas and 0.25 acres for waterbodies will be used. Each vegetation map polygon will be updated and coded with preliminary Level III or IV vegetation types (Viereck et al. 1992), as well as preliminary physiography, surface form, and disturbance types.

After the field season in 2012, the preliminary mapping will be revised so that it accurately reflects the field-verified occurrences of Level IV vegetation types, physiography, surface form, and disturbance types. This process of revising preliminary map polygons is expected to be repeated after the field seasons in 2013 and 2014 until the mapping is completed and finalized for the full study area. Once substantial progress has been made on the ITU mapping, a preliminary set of vegetation and wildlife habitat types will be prepared and presented for comment in the Initial Study Report and Updated Study Report.

To derive wildlife habitat types, the ITU attributes assigned to each map polygon (vegetation, physiography, surface form, and disturbance type) will be combined to produce a large number of multivariate habitat types. These initial multivariate habitats then will be aggregated into a smaller set of derived habitat types that share similar characteristics considered important to the wildlife species that occur in the Project area, such as the expected levels of available (plant) food sources and cover for escape and/or shelter. These factors can be directly related to the quantity and quality of vegetation, physiographic position, surface form, microtopography, soils, hydrology, and/or microclimates present. In the derivation of wildlife habitats, vegetation, physiography, surface form, and disturbance types will be used as the primary factors representing wildlife habitat quality, but information on soil drainage will be added as needed.

9.5.4.3. Field Surveys

Ground-reference plots to be surveyed during summers of 2012–2014 will be selected to cover the range of mapped types identified during the preliminary mapping (above). During the 2012 field season, if the 1987 vegetation mapping proves to be accurate only at the Level III of Viereck et al. (1992), ground-reference plots will be selected based initially upon the Level III map polygons and then finer-scale photosignatures will be selected to sample within the Level III polygons, to acquire the field data necessary to map vegetation to the Level IV of Viereck et al. (1992). In 2013 and 2014, ground-reference plots will be allocated directly to map polygons representing Level IV vegetation types and the aggregated set of preliminary wildlife habitat types.

Since high-resolution imagery for the entire mapping study area will not be available in 2012 for either the preliminary mapping phase or the field season, field sampling will be focused on the Project footprint areas that are currently covered by 1-foot pixel resolution imagery (obtained by the Matanuska-Susitna Borough LIDAR mapping project and publicly available on AlaskaMapped.org). Areas not covered by preliminary mapping or high-resolution digital imagery also will be sampled during summer 2012, but on a more limited basis. In such areas, the plot sampling will be focused on the prominent land cover types identifiable on moderate-resolution imagery. After high-resolution imagery is obtained during summer 2012, field sampling will be expanded to adequately sample all regions in the study area in 2013 and 2014.

Ground-reference plots will be sampled along transects that will be located within major physiographic types, including riverine, lacustrine, lowland, and upland areas. If possible, plots for which vegetation data were collected in the 1980s will be resampled (these data will be valuable for assessing the extent to which landscape characteristics have changed in the intervening 25-plus years). To maximize efficiency in data collection, at each ground-reference plot data will be collected as necessary for vegetation and wildlife habitat mapping as well as wetlands mapping. Wetlands data collection efforts will be consistent with U.S. Army Corps of Engineers (USACE) requirements for wetland delineations (Environmental Laboratory 1987, USACE 2007; see Section 9.7). Vegetation and wildlife habitat data elements will be recorded digitally in the field on an Android tablet computer using a customized data entry form designed to link directly to a relational database (Microsoft Access). At each ground-reference plot, visual cover estimates will be made for all vascular plant species present. Site characteristics to be recorded will include: plant community structure (for vascular and nonvascular plants), physiography, surface form, microtopography, site disturbances, and plant phenological observations. The USACE wetlands determination methodology requires a 10-meter (33-foot) radius plot size in which visual cover estimates are made for individual plant species. During field visits, the locations of all incidental observations of rare plants, invasive plants, wildlife species, or significant wildlife habitat features (e.g., raptor nests) will be documented and communicated to the Botanical and Wildlife Resources Program leads. At each plot, a small soil pit will be dug to evaluate soil characteristics.

9.5.4.4. Impact Assessment

Direct impacts to vegetation and wildlife habitats are expected to occur in the form of initial and possibly long term habitat loss from the placement of fill and from the conversion of vegetation and terrestrial wildlife habitats to lacustrine habitats in the proposed reservoir. Indirect impacts could occur from erosion, fugitive dust accumulation, permafrost degradation, landslides, and off-road vehicle use. Indirect impacts are also anticipated to riparian vegetation and wildlife habitats downstream of the proposed dam due to some changes in instream flow, ice processes, and riverine geomorphology in the Susitna River. These downstream effects will be addressed in the Riparian Study (see Section 9.6).

The fundamental impact assessment for vegetation and wildlife habitats will be conducted in GIS by overlaying the project footprint on the final map polygons to determine which specific patches of vegetation and wildlife habitats would be affected directly by fill or ground disturbance. The determination of which polygons could be indirectly affected will be conducted similarly by overlaying disturbance buffers (surrounding the proposed Project infrastructure) to identify which areas are likely to be affected by ancillary impacts associated with Project construction, operations, and maintenance. The size and number of disturbance buffer(s) to be used will be determined based upon the updated specifications for Project construction, operations, and maintenance activities, which will be updated throughout 2013-14.

The potential impacts to vegetation and wildlife habitats will be assessed by quantifying the acreage of each vegetation and wildlife habitat type that would be lost from the development of the Project.

The wildlife habitat types identified in this study also will be used to quantitatively assess the impacts of habitat loss and habitat alteration for each bird and mammal species of concern evaluated for impacts during the FERC licensing process (see Section 8.19). The first step in conducting impact assessments for habitat loss and alteration for wildlife species will be to conduct wildlife habitat-use evaluations for the bird and mammal species of concern. In that effort, each wildlife habitat type mapped in the study area will be categorically ranked for habitat value for each of the bird and mammal species of concern (see Section 8.19).

9.5.4.5. Reporting and Data Deliverables

The reports and data deliverables for this study include:

- **Electronic copies of field data.** A geospatially-referenced relational database of historic (APA Project) data and data collected during the 2012–2014 field seasons, including representative photographs of vegetation and wildlife habitat types will be prepared. Naming conventions of files and data fields, spatial resolution, map projections, and metadata descriptions will meet the data standards to be established for the Project.
- **Vegetation and wildlife habitat maps in ArcGIS and PDF formats.** The preliminary and final maps of vegetation and wildlife habitats will be developed and delivered according to the schedule indicated below. Naming conventions of files and data fields, spatial resolution, map projections, and metadata descriptions will meet the data standards to be established for the Project.
- **Initial Study Report and Updated Study Report.** The vegetation and wildlife habitat mapping study results will be presented to licensing participants in the Initial and Updated study reports, according the schedule indicated below. The reports will include descriptions of the vegetation and wildlife habitats identified, a summary table (acreages) of the vegetation and wildlife habitats represented in the mapping effort, and descriptions of the potential impacts to vegetation and wildlife habitats from development of the Project. In the Initial Study Report, recommendations will be made for the 2014 field survey effort. Both reports also will include field plot photos including site, ground, and soil photographs for each plot surveyed.

9.5.5. Consistency with Generally Accepted Scientific Practice

The vegetation and wildlife habitat mapping study will be conducted using standard methods for the mapping of vegetation and terrain features (onscreen digitizing in GIS over digital aerial imagery). The mapping will be based on intensive ground-reference information, focused especially in the Project footprint areas where most impacts will occur. A multivariate, ITU mapping approach (following Jorgenson et al. 2002) will be used for the mapping of wildlife habitats, and the derivation of wildlife habitats will be conducted follow the methods successfully used for the mapping of wildlife habitats for other recent projects in Alaska (e.g., ABR 2008, Schick and Davis 2008, PLP 2011).

9.5.6. Schedule

2013:

- Vegetation/habitat mapping and field plot selection: January–May
- Field surveys: June 20–30 and July 20–30 (four 2-person crews each survey)
- Vegetation/habitat map revisions: August–October
- Initial Study Report: December
- Delivery of field data and preliminary vegetation and habitat maps: December

2014:

- Vegetation/habitat mapping and field plot selection for remaining unmapped areas: January–May
- Field surveys: June 20–30 and July 20–30 (one 2-person crew in June and two 2-person crews in July)
- Final vegetation/habitat map revisions: August–October
- Updated Study Report: December
- Delivery of final field data and final vegetation and habitat maps: December

9.5.7. Level of Effort and Cost

The vegetation and wildlife habitat mapping study is planned as a three-year effort; work will begin in 2012 with initial work before this study plan is finalized and will continue in 2013 and 2014. Field sampling will be conducted each year during the growing season by four to eight observers (working in crews of two). Surveys will be conducted for approximately 20 days in each year. The level of effort for 2013 is expected to be considerably greater than in 2012, because the 2012 effort will be focused only on those portions of the study area that have aerial photography coverage of sufficient resolution for preliminary mapping and field sampling. In 2013, high-resolution imagery should be available for the entire project area, so the number of person-days dedicated to the field effort will be doubled. The mapping effort also is expected to be much greater in 2013 relative to 2012. In 2014, less extensive field surveys and mapping may be needed as the mapping of the study area progresses. Field surveys will be conducted in conjunction with the wetland mapping study to maximize efficiency and reduce costs. The study will involve extensive, office-based activities to delineate the boundaries of various ITUs (vegetation, physiography, surface form, disturbance type) in a GIS and to prepare study reports.

Total costs in 2013 are estimated to be on the order of $500,000. The more limited 2014 field survey, which will be focused on problem areas or areas where the field survey coverage is insufficient, is estimated to cost approximately $300,000.

9.5.8. Literature Cited

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9.5.9. Figures

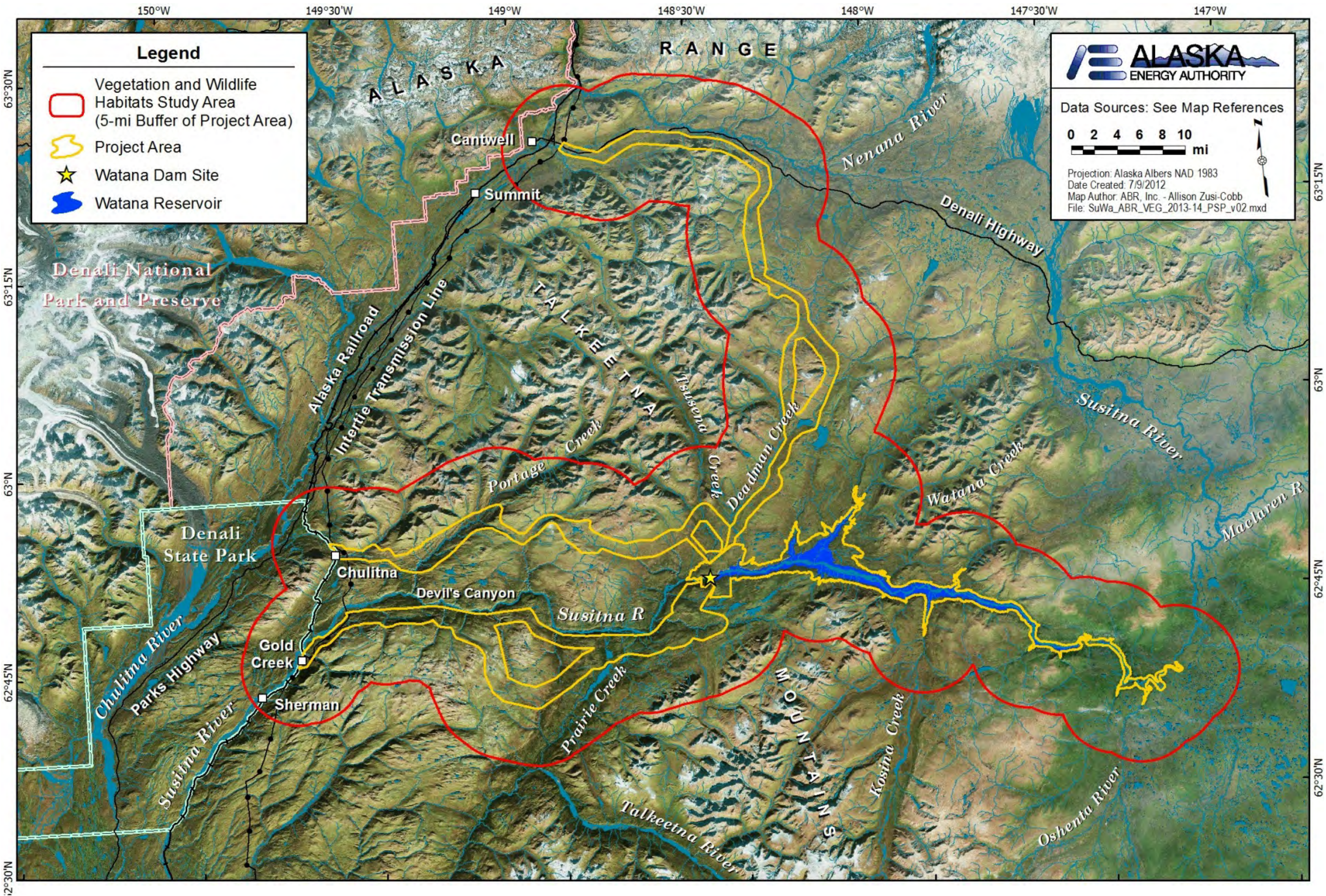

Figure 9.5-1. Study area for vegetation and wildlife habitat mapping for 2013 and 2014 in the Susitna-Watana Hydroelectric Project area.

9.6. Riparian Study

9.6.1. General Description of the Proposed Study

The riparian study involves two primary activities. First, AEA will identify and map current riparian (successional) vegetation, wetlands, and wildlife habitat types in riparian areas along the Susitna River downstream from the proposed Project dam site. This activity will involve both a field effort (to ground-truth the photosignatures on the aerial photography and remote-sensed imagery to be used in the mapping), and an office-based effort to map riparian vegetation, wetlands, and wildlife habitats digitally in GIS. Secondly, the riparian study will be coordinated with studies of physical processes in downstream areas of the Susitna River (primarily the instream flow, ice processes, and riverine geomorphology studies) so as to collect the necessary data to enable predictions of how development of the Project could alter downstream riparian areas. This second activity will involve resurveying, if possible, sites that were studied for successional vegetation along the Susitna River in the 1980s and 1990s, and collecting current information on successional dynamics at sites that also will be studied for physical processes (as above). In the riparian study, AEA will use both biological and physical data to predict and assess the extent to which riparian vegetation, wetlands, and wildlife habitats could be affected in areas downstream from the proposed dam.

9.6.1.1. Study Goals and Objectives

The overall goals of the riparian study are to prepare baseline maps of local-scale riparian ecosystems (riparian ecotypes), wetlands, and wildlife habitat types in areas downstream from the proposed for the Project dam site, and to assess the extent to which the Project will alter vegetation succession, wetlands, and wildlife habitats in riparian areas of the Susitna River. The riparian study will be closely coordinated with other studies of downstream effects (instream flow, ice processes, and riverine geomorphology) to enable predictions of change in riparian areas. The mapping prepared in this study will be used in assessing impacts to riparian ecotypes, wetlands, and wildlife resources (see Section 8.19) in areas downstream from the proposed dam, and in considering any possible protection, mitigation, and enhancement (PM&E) measures to address the expected effects.

The specific objectives of the riparian study are to:

- Identify, delineate, and map riparian ecotypes, wetlands, and wildlife habitats downstream from the Watana Dam site;
- In coordination with the instream flow, ice processes, and riverine geomorphology studies, characterize the physical and ecological processes downstream from the Watana Dam site that are likely to affect vegetation succession in riparian areas; and
- Predict potential changes in riparian areas due to Project construction and operations, including changes to vegetation successional pathways, riparian ecotypes, wetlands, and wildlife habitats, which could result from alterations in instream flow, ice processes, and riverine geomorphology.

This multi-year study in being initiated in 2012 and will re-initiated and continue in 2013 and 2014. Results from the 2012 work will be used to: (1) fine-tune the field investigations and mapping efforts for the existing conditions found in the Project area, and (2) customize the mapping work (e.g., study area) and change-prediction models to reflect further refinements in the design of the Project.

9.6.2. Existing Information and Need for Additional Information

Several riparian and vegetation mapping resources for the Project area were identified in the Pre-Application Document (PAD) (AEA 2011). Of primary importance to the riparian study are the previous vegetation mapping and vegetation successional dynamics studies by McKendrick et al. (1982), UAFAFES (1985), Collins and Helm (1997), and Helm and Collins (1997), which provide information on vegetation successional processes in areas downstream of the two dams proposed in the APA Project in the 1980s. Summary information on riparian processes in those downstream areas, derived from McKendrick et al. (1982) and UAFAFES (1985), is found in APA (1985). These previous studies will serve as a baseline for developing a sampling scheme for the riparian study proposed here (study plots from the 1980s and 1990s will be resampled if possible; see Section 9.6.4), and will provide a conceptual framework upon which to build a vegetation succession classification and develop predictive models for assessing the downstream effects of the proposed Project on riparian habitats.

Wetlands were mapped for the APA Project in the 1980s through a cooperative agreement between U.S. Fish and Wildlife Service (USFWS) and the APA to produce a preliminary wetlands map for the APA Project area. Those wetlands map data were based on the vegetation mapping completed by McKendrick et al. (1982), with some additional modification using stereoscopic photo-interpretation, and are now a part of the National Wetlands Inventory (NWI; USFWS 1984). The Alaska Vegetation Classification (AVC; Viereck and Dyrness 1980) vegetation classes that were mapped in the early 1980s were cross-referenced and converted into wetlands classes using the classification scheme of Cowardin et al. (1979). The NWI data from the 1980s cover the current Project area and are expected to be available in digital format sometime in 2012. Those NWI data will help in understanding the types of wetlands that occur in the riparian study area, but the mapping is coarse-scale (1:63,360 scale) and will not be sufficient for determining effects on wetland resources (e.g., when mapping at the 1:63,360 scale, small drainages and other small wetland habitats are often overlooked). Because those NWI data are nearly 30 years old, and because riparian conditions have almost certainly changed in specific areas over that period, an updated map of riparian wetlands will be needed for the current Project.

Current, high-resolution orthophoto imagery, which will be used for the on-screen mapping work, is available for most of the riparian study area. Moderate-resolution imagery (to support the allocation of transects and study plots during field studies in 2012) will fill the remaining gaps in the study area. Additional high-resolution aerial photography or satellite imagery for the Project area, which will be needed for the mapping of riparian ecotypes and wildlife habitats, is expected to be acquired in summer 2012, and that imagery likely will be available in late 2012.

9.6.3. Study Area

The riparian study area will overlap with the vegetation, wildlife habitat, and wetlands mapping study areas near the proposed dam site, but the main focus for the riparian study will be on riparian areas along the Susitna River and its tributaries below the dam site, which are expected to be altered by changes in stream flow, ice processes, and riverine geomorphology from construction and operation of the proposed dam.

The final study area for the mapping of riparian ecotypes, wetlands, and wildlife habitats in the riparian study will be defined in consultation with licensing participants over the course of developing this study plan in 2012. It is anticipated that the study area will include those riparian areas downstream of the proposed dam site to a point at which the effects of altered flow regimes expected in the Susitna River would not be measureable or would be overridden by the effects of tidal fluctuations from Cook Inlet. This downstream location will be determined following analysis of the results of the 2012 instream flow studies. In 2012, the riparian study will focus on those downstream areas in which altered flow regimes are most likely to occur, including from the proposed dam site downstream to the town of Willow (Figure 9.6-1). At this time, AEA proposes that the width of the riparian study area will cover all riverine areas in the active floodplain of the Susitna River. In 2012, the interim study area for the riparian study will extend laterally from approximately the edge of flowing waters in the Susitna River to 200 meters into adjacent upland terrain. In 2013, the width of the study area will be expanded to encompass the areas of hydrologic influence in the floodplain (the areas of hydrologic influence will be determined based on the results of the 2012 instream flow studies).

9.6.4. Study Methods

An integrated approach to the mapping of riparian ecotypes, wetlands, and wildlife habitats will be used based on methods developed for Ecological Land Surveys (ELS) studies conducted in tundra, boreal forest, and coastal regions in Alaska over the past 15 years (see Jorgenson et. al. 2002 for an example study in Southcentral Alaska). This integrated mapping approach involves mapping terrain units such as vegetation type, successional stage, geomorphology, and surface-form type, and then combining them into units with ecological importance (in this case riparian ecotypes, wetlands, and wildlife habitats, see below).

The method of combining various ITUs allows for the preparation of a number of thematic maps depending on the specific study needs. For the Riparian Study, a riparian ecotype map, a wetlands map, and a wildlife habitat map, each based on the best combinations of ITUs, will be prepared. The mapping of wildlife habitats in the riparian study will be conducted in coordination with the vegetation and wildlife habitat mapping study (see Section 9.6) to derive a seamless map of wildlife habitats that apply project-wide. Similarly, the mapping of wetlands will be conducted in coordination with the wetland mapping study so that wetlands in the riparian study can be classified in the same manner as those in the Wetland Mapping Study (see Section 9.8), resulting in a single Project-wide wetland map. In the mapping of riparian ecotypes and in the study of riparian vegetation succession, the vegetation succession study plots studied in the 1980s and 1990s by McKendrick et al. (1982), UAFAFES (1985), Collins and Helm (1997), and Helm and Collins (1997) will be relocated where possible and sampled. The sampling of previously studied sites will help inform our interpretation of successional dynamics in the Susitna River floodplain.

9.6.4.1. Develop Mapping Materials from Historical and Current Data

Data sources that may be used for the mapping of riparian ecotypes and wildlife habitats include vegetation mapping and vegetation succession studies conducted in the Susitna River drainage by McKendrick et al. (1982), UAFAFES (1985), Collins and Helm (1997), Helm and Collins (1997). For wetlands, NWI data for the Project area, which was developed in the 1980s, should be available sometime in 2012. Additional data include soil surveys, digital elevation data, the National Hydrography Dataset (USGS 1999), and other map products that may have been produced for the area as part of other studies. These data will be compiled and reviewed and, if possible, included as a map layer in ArcGIS to assist the mapping efforts.

The available, high- and moderate-resolution aerial imagery for the project area will be acquired and evaluated for quality and geodetic control. As noted above, for those portions of the study area that are not covered by high-resolution aerial imagery (needed for mapping), moderate-scale imagery will be used to support the field sampling efforts in summer 2012. Additional, fine-scale, recent imagery will be needed to complete the mapping in this multi-year study, and it is expected that imagery will be available in late 2012.

9.6.4.2. Field Surveys

Ground-reference plots to be surveyed during summer 2012 will be selected to cover the range of riparian habitats identified by photointerpretation of aerial imagery signatures on the high- and moderate-resolution imagery noted above. For the 2013 and 2014 field seasons, the preliminary mapping of riparian ecotypes, wetlands, and wildlife habitats (see Section 9.7.4.3) will be used to design a stratified random sampling scheme to preselect potential study plots within riparian habitats. The objective will be to sample multiple map polygons for each riparian, wetland, and wildlife habitat type, incorporating as much replication as possible within the time and funding constraints for this work. Study plot selection will also be coordinated with researchers conducting the instream flow, ice processes, and riverine geomorphology studies to try to co-locate study plots, as much as possible, so that the measured riparian habitat parameters can be related to existing conditions for instream flow, ice processes, and geomorphology on a site-by-site basis. These coordinated baseline data will help in the prediction of changes in riparian habitats due to construction and potential Project operations. Additionally, when selecting study plots, as many of the historical (1980s and 1990s) vegetation succession study plots will be relocated and sampled as possible (see below).

In 2012, the field ground-reference work will be completed in two phases. In Phase 1, a helicopter-assisted reconnaissance of the Susitna River from Talkeetna to Willow will occur in mid-June. The primary objective of the reconnaissance survey is to determine the feasibility of relocating the vegetation succession study plots originally established by McKendrick et al. (1982) and Collins and Helm (1997) for potential resampling, and to identify new study plots for additional sampling. Based on the results of the reconnaissance survey, the sampling scheme will be adjusted, as needed, and the second phase of field sampling prepared.

Phase 2 of the 2012 field sampling will occur in late June–early July and will include sampling of preselected study plots in conjunction with the data collection efforts for the Instream Flow Study. Riparian habitats will be sampled using two types of transects: ITU mapping transects and intensive successional study transects. When sampling ITU transects, the data necessary to describe the ecosystem components used in the subsequent ITU mapping will be collected. ITU transects will be located so as to cross patches of riparian vegetation in different successional stages, and circular plots of 10-meter (33-foot) radii will be sampled along each transect. The following variables will be recorded at each ITU plot:

- Geo-referenced plot location (<3-m accuracy);
- Site variables, including physiography, geomorphic unit, surface form, elevation, aspect, and slope;
- Vegetation structure and plant community composition to classify vegetation types to Level IV of the AVC (Viereck et al. 1992);
- Ages (cross section cuttings or cores) and height of dominant woody plants (three representative samples from the modal size class of the dominant species in the stand);
- Shallow soil pits will be dug to categorize drainage and soil moisture; soil hydrologic variables, including depth of water above or below ground surface, depth to saturated soil, pH, and electrical conductivity (EC); and soil depositional profiles; and
- Wildlife sign such as winter or summer browse marks, nests, dens, droppings, singing birds, carcasses, tracks, and burrows.

In 2012, the adequacy of the intensive successional study transects for collecting the data necessary to describe vegetation successional stages will be tested. In late 2012/early 2013, the intensive successional study transects methods will be modified, as needed, and will be implemented in full in 2013 and 2014 at each of the intensive study stream reaches to be sampled by the instream flow and riverine geomorphology studies. The intensive successional study transects will be located so as to cross patches of riparian vegetation in different successional stages, and circular plots will be sampled along each transect. Circular study plots will be a minimum of 500 m^2 in forested areas and 50 m^2 in non-forest areas. On intensive successional study plots, all of the information collected at each ITU plot (above) plus detailed data on vegetation structure, successional dynamics, plant phenology, and soils will be collected. The following variables will be recorded at each intensive successional study plot:

- Geo-referenced plot location (<3-m accuracy);
- Site variables, including physiography, geomorphic unit, surface form, elevation, aspect, and slope;
- Vegetation structure and plant community composition to classify vegetation types to Level IV of the AVC (Viereck et al. 1992); vegetation type will be determined in each distinct geomorphic unit that encompasses ≥25 percent of the plot area;
- Vegetation cover by species in each of 7 height categories (0.0–0.1 m, 0.4–1 m, 1–2 m, 2–4 m, 4–8 m, 8–16 m, and >16 m) based on point-intercept sampling along intra-plot transects;
- Density by size class for woody species (<4 cm, <0.4 m, 0.4–2 m, 2–4 m, and >4 m DBH); and size-class groupings (<4 m and >4 cm DBH; and >4 m and <4 cm DBH);
- Ages (cross section cuttings or cores) and height of dominant woody plants (three representative samples from the modal size class of the dominant species in the stand);
- Crown dominance for each woody species;
- Phenological attributes for selected plant species;
- Shallow soil pits will be dug to categorize drainage and soil moisture; soil hydrologic variables, including depth of water above or below ground surface, depth to saturated soil, pH, and electrical conductivity (EC); and soil depositional profiles;
- Additional soils data to be collected includes dominant soil texture in upper 40 cm, thickness of surface organics, cumulative thickness of organic material in upper 40 cm, depth to water table, and thaw depth; and

- Wildlife sign such as winter or summer browse marks, nests, dens, droppings, singing birds, carcasses, tracks, and burrows.

The shape of the study plots on both the ITU and intensive successional study transects may vary depending on the shape of the vegetation stand being sampled. Field methods provided by McKendrick et al. (1982), Collins and Helm (1997), and Helm and Collins (1997) will be followed. All field data will be recorded digitally in the field using a standardized data entry form on an Android tablet computer designed to link directly to a relational database (Microsoft Access).

9.6.4.3. ITU Mapping of Downstream Riparian Areas

Following the field surveys in 2012, preliminary mapping of local-scale riparian ecosystems (riparian ecotypes) will be conducted by photointerpretation of the current aerial imagery available for the study area, and by making use of the ground-reference data collected in summer 2012. As noted above, riparian ecotypes are proposed to be mapped using an ITU approach. A minimum mapping size of 1 acre for terrestrial polygons and 0.25 acres for waterbodies is proposed. ITU map polygons will be attributed with geomorphology (e.g., Braided Active Overbank Deposit); surface form (e.g., Mid-channel Bar); vegetation class (e.g., Open Balsam Poplar Forest), and successional stage (e.g., young poplar, old poplar). Riparian vegetation in this study will be mapped to the Level IV of the AVC (Viereck, et al. 1992) with adjustments, as needed, for early successional riparian stages following Helm and Collins (1997). Following the mapping, the ITU codes will be aggregated into a set of preliminary riparian ecotypes based on the combination of ITUs that best represents the local-scale riparian habitats in the areas mapped.

Preliminary mapping of local-scale wetland ecosystems (wetland ecotypes) also will be mapped using the ITU approach in late 2012, but wetland ecotypes will be delineated separately, if needed, by photointerpretation so as to fit the wetland classification that will be used for the rest of the Project area (see Section 9.8). In particular, if there are wetlands in the floodplain of the Susitna River downstream of the proposed dam that are not represented in the wetlands mapping conducted in the upper Susitna basin, the existing wetlands mapping for lower elevations in the Matanuska-Susitna Borough (see http://cookinletwetlands.info/) will be consulted so as to map similar wetland types.

The objective of the wetlands mapping in the riparian study is to prepare a map of wetlands for downstream riparian areas following the same classification system used in the upper Susitna basin, and which can be cross-walked to the existing wetlands mapping for other areas in the Matanuska-Susitna Borough (see Section 9.7 for more information). During consultation with resource management agencies (see Section 9.4 and Attachment 9.1), AEA agreed to map wetlands as part of the riparian study, but does not propose to conduct formal field wetland determinations. The U.S. Army Corps of Engineers has determined that no wetlands will be filled in the riparian areas downstream of the dam; therefore, wetlands mapping will not be needed for the Clean Water Act Section 404 dredge and fill permit. The wetlands mapping in the riparian study will be prepared to help in understanding how the downstream effects of alterations in instream flow, ice processes, and riverine geomorphology may affect wetlands in the floodplain of the Susitna River.

In late 2012, preliminary wildlife habitat types in downstream riparian areas will be mapped based on the ITU mapping described above, but will be derived using a separate aggregation of

ITU parameters that specifically addresses the important elements of wildlife habitat use (see Section 9.6 for more information).

All the mapping of riparian areas will be conducted on-screen in GIS and will make extensive use of the field ground-reference data so that photosignatures are accurately interpreted. This mapping will be an on-going process and is expected to occur in 2012, 2013, and 2014. It is possible that the mapping of the full study area may not be completed until 2014. Once substantial progress has been made on the ITU mapping, however, a preliminary set of riparian ecotypes, wetland ecotypes, and wildlife habitat types will be prepared for review. This review will occur in both 2013 and 2014, and the preliminary set of riparian ecotypes, wetland ecotypes, wildlife habitat types will be presented in the Initial Study Report and Updated Study Report for review before being finalized.

9.6.4.4. Impact Assessment: Predicting Changes in Riparian Areas

Impacts in riparian areas are expected to occur in the form of spatial and temporal changes in riparian habitats because of changes in instream flow, ice processes, and riverine geomorphology in the floodplain of the Susitna River downstream of the proposed dam. Potential impacts could include alterations in hydrology (reduced or increased flooding), reduced or increased sediment deposition/erosion, and reduced or increased ice scour during buildup and breakup. These effects could then result in changes in geomorphic features, plant species diversity, vegetation composition, and vegetation succession. These effects would all be considered indirect impacts of the construction and operation of the dam.

In the riparian study, AEA proposes to sample intensive successional study plots in the same stream reaches in which intensive sampling will occur in both the instream flow and riverine geomorphology studies. In sampling these co-located study plots, a multidisciplinary data set will be established that will be used to correlate existing conditions of flow and geomorphology with riparian habitats. These data will provide the baseline from which predicted changes in flow, ice processes, and riverine geomorphology can be used to predict changes in riparian habitats. In large measure, the prediction of changes in riparian habitats will involve determining, from the expected patterns of change in flooding and ice scour, how much of the riparian zone will transition from one successional stage to another. For example, with reduced flooding and ice scour (which are possible from moderated flows below the dam during the summer), the proportion of the river floodplain in the early stages of plant succession would be expected to be reduced while areas in the mid and late successional stages would increase in occurrence. In the riparian study, data will be collected in those portions of the Susitna River in which changes in flow, ice processes, and riverine geomorphology are expected to occur, and this information will be used to map the predicted changes in vegetation successional stages by river segment. This same approach will be used to map the predicted changes in wetlands and wildlife habitat types due to changes in flow, ice processes, and riverine geomorphology. The timing of these changes also will be predicted based on the intensity of the expected physical alterations in riparian areas and the time periods for persistence of the various vegetation successional stages.

9.6.4.5. Reporting and Data Deliverables

The reports and data deliverables for this study include:

- **Electronic copies of field data.** A geospatially-referenced relational database of historic data and data collected during the 2012–2014 field seasons, including representative photographs of riparian ecotypes, wetland ecotypes, and wildlife habitat types will be prepared. Naming conventions of files and data fields, spatial resolution, map projections, and metadata descriptions will meet the data standards to be established for the Project.
- **Vegetation and wildlife habitat maps in ArcGIS and PDF formats.** The preliminary and final maps of riparian ecotypes, wetland ecotypes, and wildlife habitat types will be developed and delivered according to the schedule indicated below. Naming conventions of files and data fields, spatial resolution, map projections, and metadata descriptions will meet the data standards to be established for the Project.
- **Initial Study Report and Updated Study Report.** The riparian study results in the Initial and Updated study reports will be presented according the schedule indicated below. The reports will include descriptions of the riparian ecotypes, wetland ecotypes, and wildlife habitat types identified; a summary table (acreages) of the riparian ecotypes, wetland ecotypes, and wildlife habitat types represented in the mapping effort; and predictions of the expected changes in riparian areas due to Project development. The Initial Study Report will include recommendations for the 2014 field survey effort. Both reports also will include field plot photos including site, ground, and soil photographs for each plot surveyed.

9.6.5. Consistency with Generally Accepted Scientific Practice

The riparian study will be conducted using standard methods for the mapping of vegetation, wetlands, and terrain features (onscreen digitizing in GIS over digital aerial imagery). The mapping will be based on intensive ground-reference information, and the field data will be collected using the same methods used in the 1980s and 1990s so that the current data are comparable. These field methods are still appropriate for classifying successional vegetation types. A multivariate, ITU mapping approach (following Jorgenson et al. 2002) will be used for the mapping of wildlife habitats, and the derivation of wildlife habitats will be conducted follow the methods successfully used for the mapping of wildlife habitats for other recent projects in Alaska (e.g., ABR 2008, Schick and Davis 2008, PLP 2011). The prediction of change in riparian areas will be done in coordination with other studies of physical processes in riverine areas to help determine accurate relationships between physical changes and alterations in riparian habitats.

9.6.6. Schedule

2013:

- Riparian/wetland/habitat mapping and field plot selection: January–May
- Field surveys: June 25–July 12 (two 2-person crews)
- Riparian/wetland/habitat map revisions: August–October
- Initial Study Report: December
- Delivery of field data and preliminary riparian/wetland/habitat maps: December

2014:

- Riparian/wetland/habitat mapping and field plot selection for remaining unmapped areas: January–May
- Field surveys: June 25–July 8 (two 2-person crews)
- Final riparian/wetland/habitat map revisions: August–October
- Updated Study Report: December
- Delivery of final field data and final riparian/wetland/habitat maps: December

9.6.7. Level of Effort and Cost

The riparian study is planned as a three-year effort, with field sampling conducted each year by four observers (two crews of two each) during the summers of 2012, 2013, and 2014. Surveys would be conducted for 14 to 18 days in each year, depending on the needs for additional ground-verification data (less extensive field surveys may be needed in 2014 as the mapping of the study area progresses). The riparian study will involve extensive, office-based activities to delineate the boundaries of various ITUs (e.g., vegetation, geomorphic type, surface form, disturbance type) in a GIS and to prepare study reports.

Total costs in 2013 are estimated to be on the order of $500,000. In 2014, a more limited field survey is expected, to focus on complex areas or areas where the field survey coverage is insufficient. Total costs in 2014 are estimated to be roughly $400,000.

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9.6.9. Figures

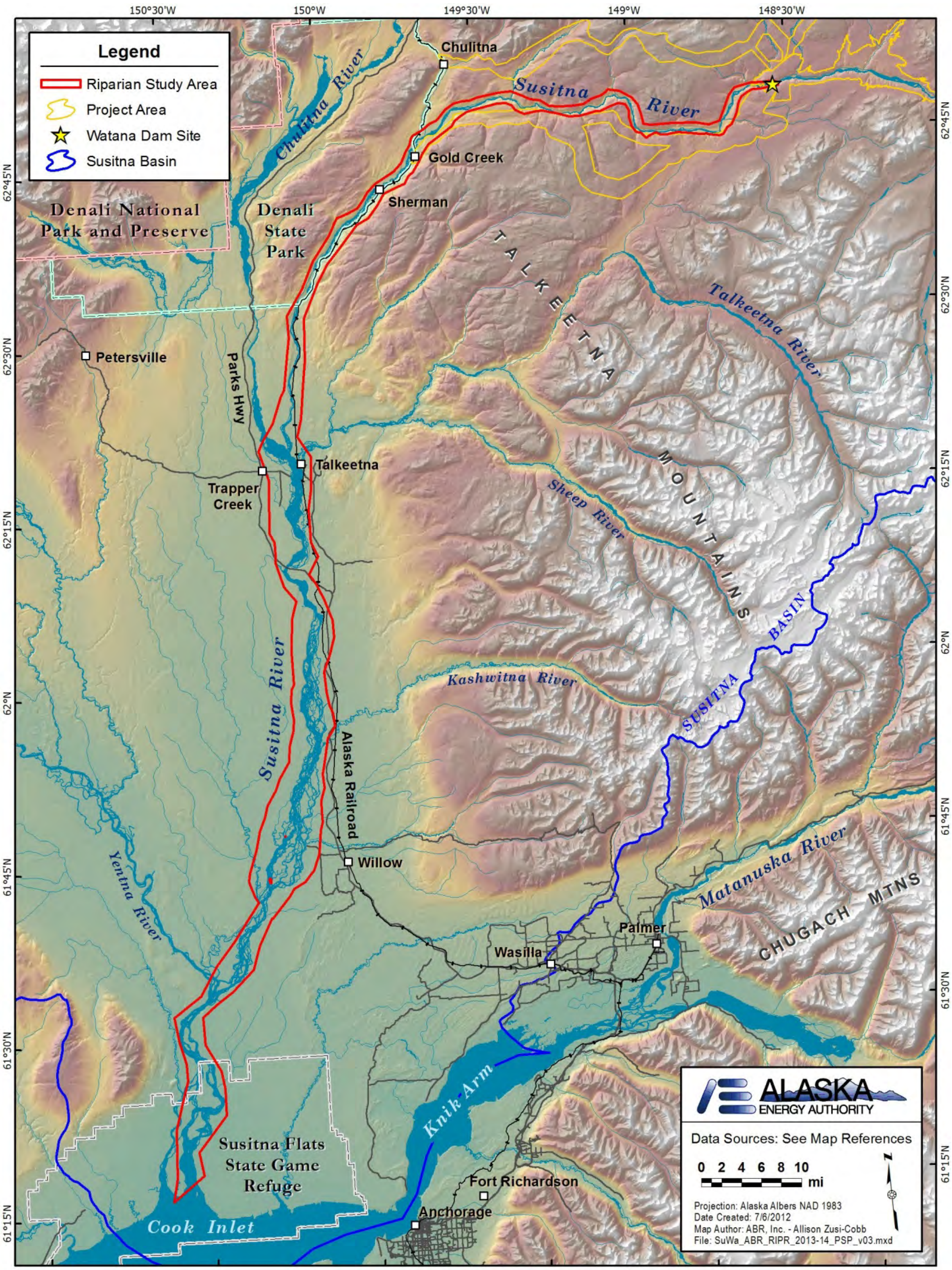

Figure 9.6-1. Riparian study area for 2013 and 2014 in the Susitna basin.

9.7. Wetland Mapping Study

9.7.1. General Description of the Proposed Study

In the wetland mapping study, AEA will identify and map the extent of wetlands in the Project area using current, high-resolution aerial photography and remote-sensed imagery. The study will involve field surveys to collect ground-reference data to "tag" the photosignatures in the Project area to known wetland types, and in the office, the boundaries for the identified wetland types will delineated by on-screen digitizing in GIS using the aerial photography and remote-sensed imagery for the Project area as the base data layers. The wetland classification to be used in the study will be a hybrid classification specific to the wetlands in the Project area, but it will be compatible with existing wetland classification systems used elsewhere in Alaska, especially the system used by the Matanuska-Susitna Borough. A wetland functional assessment also will be conducted in the study to determine the specific functions that the wetlands in the Project area provide.

9.7.1.1. Study Goals and Objectives

The overall goal of the wetland mapping study is to prepare a baseline map of the existing wetland habitats in the Project area. This mapping information will be used to assess impacts to wetland resources from the proposed Project, and to develop any protection, mitigation, and enhancement (PM&E) measures to address the expected impacts.

The specific objectives of the wetland mapping study are to:

- Identify, delineate, and map wetlands in the Project area in GIS;
- Determine functional values for the mapped wetland types; and
- Quantify the potential direct, indirect, and cumulative impacts to wetlands and wetland functions from Project construction and operations activities, which will include any new wetlands that may be created by the proposed reservoir.

This multi-year study is being initiated in 2012 and will be continued in 2013 and 2014. Results from the first year of work in 2012 will be used to update future versions of this study plan, as needed, to (1) fine-tune the field investigations and mapping efforts for the existing conditions found in the Project area, and (2) customize the mapping work (e.g., study area) to reflect further refinements in the design of the Project.

9.7.2. Existing Information and Need for Additional Information

Wetlands were mapped for the Alaska Power Authority's Susitna Hydroelectric Project (APA Project) in the 1980s through a cooperative agreement between U.S. Fish and Wildlife Service (USFWS) and the APA to produce a preliminary wetlands map for the APA Project area at a scale of 1:63,360. Those wetlands map data were based on the vegetation mapping completed by McKendrick et al. (1982), with some additional modification using stereoscopic photo-interpretation, and are now a part of the National Wetlands Inventory (NWI; USFWS 1984). The Alaska Vegetation Classification (AVC; Viereck and Dyrness 1980) vegetation classes that were mapped in the early 1980s were cross-referenced and converted into wetlands classes using the classification scheme of Cowardin et al. (1979).

Existing NWI data, which were developed in the 1980s (above) and cover the current Project area, are expected to be available in digital format sometime in 2012. Those NWI mapping data will help in understanding the types of wetlands that occur in the study area, but the mapping was not conducted at a scale sufficient for determining Project impacts on wetland resources. When mapping at the 1:63,360 scale, small drainages and other small wetland habitats are often overlooked. Additionally, ground verification of NWI wetlands maps typically is fairly limited. Because those NWI data are nearly 30 years old, and because vegetation, hydrology, and soil conditions likely have changed over that period (see below), an updated map of wetlands will be needed for the current proposed Project. NWI maps from the 1980s will not reflect recent landscape changes due to fire, insect outbreaks, development, and climate change. In particular, increases in woody shrub habitats, reductions in forest cover from fires and insect outbreaks, and permafrost degradation have been documented in recent decades in interior Alaska. These recent landscape changes will not be represented in wetlands mapping data from the 1980s.

9.7.3. Study Area

The study area for wetlands mapping will be formally defined in consultation with resource management agency personnel over the course of developing this study plan in 2012. In the interim, a working study area is proposed which includes a 2-mile buffer surrounding those areas that would be directly altered or disturbed by development of the Project (Figure 9.7-1). All direct and indirect effects of the proposed Project on wetlands are expected to be encompassed in a 2-mi buffer surrounding the Project infrastructure. The area to be used to evaluate cumulative impacts for the Project license application may be substantially larger, but it would be infeasible to map wetlands for an area of the size needed to assess cumulative impacts. This interim study area includes three possible alternatives for road and transmission lines, the proposed reservoir inundation area, and supporting facilities. The Chulitna Corridor includes east-west running transmission lines and a road north of the Susitna River connecting to the Alaska Intertie and the Alaska Railroad near the Chulitna station. Another east-west configuration would follow a corridor south of the Susitna River running to Gold Creek station. A third corridor, the Denali Corridor, runs north, and would connect the dam site to the Denali Highway by road over a distance of about 44 mi. If transmission lines are run north up the Denali corridor, they would need to also run west along the existing Denali Highway to connect to the Anchorage-Fairbanks Intertie Transmission lines near Cantwell.

The alteration of wetland habitats downstream of the dam (due to changes in instream flow, ice processes, and riverine geomorphology in the Susitna River) will be addressed in the riparian study (see Section 9.6). No placement of fill in wetlands is expected to occur downstream from the proposed dam; thus, a wetlands map will not be needed for the Clean Water Act Section 404 wetlands permit application for the Project (this has been confirmed by the U.S. Army Corps of Engineers [USACE]; see Section 9.4 and Attachment 9-1). In the riparian study, successional vegetation, wetlands, and wildlife habitats will be mapped and, mapping and prediction of changes in riparian habitats from construction of the Project will be developed in collaboration with the AEA study teams for riverine physical processes, most notably instream flow, ice processes, and riverine geomorphology (see Section 9.6).

9.7.4. Study Methods

In general, the wetlands mapping for the Project area will follow the protocols for preparing wetland maps that have been developed by the USFWS NWI program (National Wetlands Inventory Center 1995, Dahl et al. 2009), but wetlands will be classified using the elements of three different wetland classification systems: NWI, hydrogeomorphic (HGM) classes, and a regional system developed for lowlands in the Cook Inlet basin. The use of these three wetland classification systems was agreed to during meetings with resource management agencies regarding the wetland mapping study in spring 2012 (see Section 9.4 and Attachment 9-1). Wetland types will be defined based on a number of landscape, geomorphic, hydrological, and biological variables, including the wetland classification systems above, and will be categorized as local-scale wetland ecosystems (wetland ecotypes).

In addition to the wetlands mapping needed for supporting a Clean Water Act Section 404 dredge and fill permit application, a wetland functional assessment for the mapped wetland ecotypes will be prepared to (1) evaluate the functional significance of wetland impacts that may occur as a result of the Project, and (2) use in compensatory mitigation planning for unavoidable wetland losses. As agreed to with resource management agencies (see Attachment 9-1), the set of wetland functions to be assessed will be tailored to those expected to be of most importance in remote regions of Alaska in which landscape disturbances are few. The wetland functional assessment will be based on hydrogeomorphic (HGM) principles. Although draft HGM guidebooks have been prepared for the Cook Inlet basin (Hall et al. 2003) and Interior Alaska (Alaska Department of Environmental Conservation and USACE 1999), the models are confined to a small set of HGM classes and are regionally specific; thus, they are unlikely to be applicable to the Susitna basin, which lies in the transition zone between Interior Alaska and Cook Inlet and includes montane environments. As a result, the rapid assessment procedure developed by Magee and Hollands (1998) is proposed to be used as the basis for assessing wetland functions, but the procedure (and parameters measured) will be modified as needed to evaluate wetland functions unique to the Project area. The functional assessment method to be used is currently under discussion with resource management agencies, and will be finalized during the development of this study plan in 2012.

At a minimum, the wetland mapping study will include the following components:

- Revise 2012 wetlands mapping as needed using data collected during field surveys in summer 2012 and begin preliminary mapping of wetlands that will be verified with field surveys in 2013 and 2014;
- Preselect 2013 and 2014 field sampling locations and conduct field wetland determination and functional assessment surveys;
- Resample any vegetation field plots from the 1980s studies that were identified during the 2012 field study effort;
- Incorporate data from the Vegetation and Wildlife Habitat Mapping Study and available data on natural fire patterns along the reservoir reach of the Susitna River into the mapping of wetland ecotypes; and
- Reports on the 2013 study results (Initial Study Report), 2014 study results (Updated Study Report).

9.7.4.1. Wetlands Classification and Mapping

Prior to the 2013 field season, the preliminary map of wetland and upland boundaries prepared in 2012 will be updated using ArcGIS 10.0 and on-screen digitizing. The ground-reference survey data collected in 2012 will be used to facilitate the revisions to the preliminary wetland mapping. Although suitable high-resolution imagery is not yet available for the entire study area, the imagery needed is expected to be acquired during the 2012 field season. The goal of the preliminary mapping is to map a reasonable set of characteristic wetland ecotypes that occur in the mapping study area. This information will then be used to guide the field wetland-determination and ground-verification survey efforts in 2013 and 2014.

Classification and mapping of the Project area will follow the protocols for preparing wetland maps that have been developed by the USFWS National Wetland Inventory (NWI) program (National Wetlands Inventory Center 1995, Dahl et al. 2009). These protocols describe requirements for boundary delineation, polygon size, classification, and NWI annotation. The minimum mapping polygon size for most upland and wetland habitats will be 0.5 acres, with smaller polygons (0.1 acre) delineated for water bodies and other wetlands of ecological importance. Wetland and upland boundaries will be delineated based on color signature, plant canopy, and surface relief, along with hydrological indicators such as drainage patterns and surface water connections. As noted above, the classification of wetlands will incorporate elements of three different wetland classification systems: NWI, hydrogeomorphic (HGM) classes, and a regional classification for the Cook Inlet basin sponsored by the Kenai Watershed Council (http://cookinletwetlands.info/). The Cook Inlet system, developed by Mike Gracz, improves on the Cowardin system (Cowardin 1979) by incorporating region-specific landscape, geomorphic, and wetland function features into the classification. In the mapping of wetlands for the Project, wetland ecotypes will be defined specifically for the Susitna basin using methods consistent with the Cook Inlet lowlands wetland classification system. Wetlands also will be classified into Viereck Level IV vegetation types (where possible) using The Alaska Vegetation Classification (Viereck et al. 1992), which includes canopy classes for shrub, dwarf tree, and tree lifeforms.

Final wetlands mapping will be completed in 2013 and 2014 following completion of the field surveys. The mapping will undergo a rigorous QA/QC review using tools developed by ABR and the Wetlands Data Verification Toolset developed by the NWI program to identify incorrect codes, digital anomalies, unattributed (null) polygons, adjacent polygons with the same coding, and digital slivers (<0.01 acre). The NWI toolset was created using Environmental Systems Research, Incorporated's (ESRI) ModelBuilder (http://www.fws.gov/wetlands/Data/Tools-Forms.html).

9.7.4.2. Field Surveys

The wetland field surveys will be organized to collect data from as many wetland ecotypes as possible in a way that maximizes safety and efficiency. The preliminary mapping effort described above will be used to preselect sampling transects and wetland-determination plots, although additional plots may be established in the field when additional field data are needed for a given area or a particular wetland ecotype. Field plots will be sampled along transects that will be located within major physiographic types, including riverine, lacustrine, lowland, and upland areas. If possible, plots for which vegetation data were collected in the 1980s will be resampled (these data will be valuable for assessing the extent to which landscape characteristics have changed in the intervening 25-plus years).

Wetland determinations will be made using the standard three-parameter approach described in the 1987 Corps of Engineers Wetlands Delineation Manual (Environment Laboratory 1987) and Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Alaska Region (Version 2.0) (USACE 2007). Field surveys will be conducted between June 15 and September 15, which is well within the median dates of the onset of vegetation green-up in spring and vegetation senescence in fall, as specified in the 2007 Regional Supplement for the Project area. To be classified as a wetland, a site must be dominated by hydrophytic plants, have hydric soils, and show evidence of a wetland hydrologic regime. At each wetland determination plot, percent areal cover of plant species within each stratum (herb, shrub, and tree) will be visually estimated, generally within a 10-m (33-ft) radius of relatively homogeneous vegetation as specified in the 1987 Manual. The size and dimensions of the plots may be modified, however, depending on the site characteristics of the plant community (e.g., narrower plots in riparian fringe habitats). Additional documentation at each plot will include observations of wildlife use (stick nests, dens) and other site characteristics that reflect habitat quality and wetland function. Additional vegetation structure information for both vascular and nonvascular plants will be recorded to assist in evaluating use of the wetland ecotypes by birds and mammals.

In addition to wetland determination plots, ground-verification plots will be established for improving the accuracy of the overall mapping effort. At these plots, the dominant plant species will be recorded, and wetland ecotype and Viereck Level IV vegetation classes (Viereck et al. 1992) will be assigned. These verification assessments will be performed in areas where the wetland or upland status has been well documented in determination plots elsewhere, and will be used to improve map accuracy by increasing the number of documented wetland ecotypes tagged to particular aerial photosignatures.

A mobile Trimble® Nomad™ series GIS unit will be used to record the field wetlands data (using the WetForm database), record GPS location (as back-up to handheld GPS receivers), and provide field access to aerial imagery and the preliminary mapping performed prior to the field survey. WetForm is a proprietary relational database used to enter wetlands site data in the field, and it facilitates the preparation of electronic copies of the USACE 2007 Regional Supplement dataform for each wetland determination plot. Additional data will be collected to support the wetland classification and functional assessment efforts electronically at each plot using an Android tablet computer.

9.7.4.3. Wetland Functional Assessment

Based on discussions with resource management agencies while planning the 2012 Wetlands Mapping Study (see Attachment 9.1), wetland functions in the study area will be assessed using HGM principles. The rapid assessment procedure developed by Magee and Hollands (1998) provides a means for collecting field data within a time frame compatible with the schedule for the Project. The procedure also has several key elements that make it suitable for use in this Project:

- It provides the flexibility needed for developing HGM models that are relevant to the Susitna basin;

- The rule-based, qualitative approach to assessing wetland function is important because due to its remoteness, virtually no multi-year, quantitative data on wetland ecosystem parameters are available for the Susitna basin;
- Incorporates landscape, hydrologic, soil, and vegetation variables into the model;
- The method has a high degree of repeatability, which helps ensure consistency in recording field observations by multiple observers; and
- New functional assessment parameters can be added as needed

Similar to formal HGM methodologies, the six HGM classes (categories) that define the various wetland ecosystems (depressional, slope, lacustrine fringe, extensive peatland, flat, and riverine) will be used. In 2012, the set of wetland functions to be evaluated will be finalized in consultation with the resource management agencies. Currently, evaluation of the following functions is proposed:

- Modification of groundwater discharge;
- Modification of groundwater recharge;
- Storm and flood-water storage;
- Modification of stream flow;
- Modification of water quality;
- Export of detritus;
- Contribution of abundance and diversity of wetland vegetation;
- Contribution of abundance and diversity of wetland fauna;
- Consumptive uses; and
- Uniqueness.

Functional indices will be developed to identify the level of function each HGM class provides in the study area, and the scores derived for each function for each HGM class will be compared to other wetlands in the same class. This information will help guide the analysis of wetland impacts anticipated by the project and the development of PM&E measures for protecting wetland resources.

9.7.4.4. Wetland Impact Assessment

Direct impacts to wetlands and water bodies are expected to occur in the form of habitat loss from the placement of fill and from the conversion of palustrine wetlands to lacustrine habitats in the proposed reservoir. Indirect impacts could occur from erosion, fugitive dust accumulation, permafrost degradation, landslides, and off-road vehicle use. Indirect impacts to riparian habitats (including wetlands) are also anticipated downstream of the proposed dam due to changes in instream flow, ice processes, and riverine geomorphology in the Susitna River (hydrology, plant species diversity, and vegetation composition have the potential to be altered). These downstream effects, however, will not be addressed in this study; instead they will be treated in the riparian study (see Section 9.6).

The wetland impact assessment will be conducted in GIS by overlaying the project footprint on the final wetland map polygons to determine which wetland polygons would be affected directly by fill. The determination of which wetland polygons could be indirectly affected will be conducted similarly by overlaying disturbance buffers (surrounding the proposed Project infrastructure) to identify which areas are likely to be affected by ancillary impacts associated with Project construction, operations, and maintenance. The size and number of disturbance buffer(s) to be used will be determined based upon the final specifications for Project construction, operations, and maintenance activities, which will be provided in the Project description.

In the wetlands impact assessment, the potential impacts to wetlands and wetland function will be evaluated by quantifying the direct loss of wetlands (measured in acres) and identifying the acreage of high-value (high-function) wetlands that would be lost for each development alternative. The assessment will also identify which alternatives have the greatest potential for indirect impacts (acreages of wetlands in the disturbance buffers noted above) and identify which wetland ecotypes are particularly sensitive to disturbance. Other Project study teams for permafrost and hydrology will be consulted to help identify sensitive wetland terrain.

Lastly, cumulative effects on wetlands in the region of the proposed Project will be assessed by evaluating the extent of the direct and indirect wetland impacts expected from the Project in conjunction with the existing wetland impacts in the region and the impacts that could occur from other projects anticipated to occur in the reasonably foreseeable future.

9.7.4.5. Reporting and Data Deliverables

The reports and data deliverables for this study include:

- **Electronic copies of field data.** A geospatially-referenced relational database of historic (APA Project) data and data collected during the 2012–2014 field seasons, including representative photographs of wetland ecotypes will be prepared. Naming conventions of files and data fields, spatial resolution, map projections, and metadata descriptions will meet the data standards to be established for the Project.
- **Wetland map in ArcGIS and PDF formats.** The preliminary and final wetland maps will be developed and delivered according to the schedule indicated below. Naming conventions of files and data fields, spatial resolution, map projections, and metadata descriptions will meet the data standards to be established for the Project.
- **Initial Study Report and Updated Study Report.** The wetland mapping study results will be presented in the Initial and Updated study reports, according the schedule indicated below. The reports will include descriptions of the wetland ecotypes identified; a summary table (acreages) of the wetland ecotypes and upland areas represented in the wetlands mapping effort; a description of the vegetation, hydrology, and soils of the wetland functional groups identified; the model used for the functional assessment; and descriptions of the potential impacts to wetland ecotypes from development of the Project. The Initial Study Report will include recommendations for the 2014 field survey effort. Both reports also will include field wetland dataforms for each plot surveyed, and field plot photos including site, ground, and soil photographs.

9.7.5. Consistency with Generally Accepted Scientific Practice

Wetlands in the Project area will be identified using standard and accepted methods for the determination of wetlands in Alaska (Environment Laboratory 1987, USACE 2007). Similarly, the mapping of wetlands will follow standard procedures for mapping wetlands across broad areas (onscreen digitizing in GIS over digital aerial imagery). The mapping will be based on intensive ground-reference information, focused especially in the Project footprint areas where most impacts will occur. The classification of wetlands in the Project area will be done using a customized procedure based on several different wetland classification systems. The procedure to be used has been agreed to by licensing participants interested in wetlands mapping for the Project, and will provide data compatible with the mapping of wetlands in other areas surrounding the Project area.

9.7.6. Schedule

2013:

- Wetland mapping and field plot selection: January–May
- Field surveys: June 20–30 and July 20–30 (four 2-person crews each survey)
- Wetland map revisions: August–October
- Initial Study Report: December
- Delivery of field data and preliminary wetland map: December

2014:

- Wetland mapping and field plot selection for remaining unmapped areas: January–May
- Field surveys: June 20–30 and July 20–30 (one 2-person crew in June and two 2-person crews in July)
- Final wetland map revisions: August–October
- Wetland functional analysis: August–October
- Updated Study Report: December
- Delivery of final field data and final wetland map: December

9.7.7. Level of Effort and Cost

The wetland mapping study is planned as a three-year effort; work began in 2012 and will continue in 2013 and 2014. Field sampling will be conducted each year during the growing season by four to eight observers (working in crews of two). Surveys will be conducted for approximately 20 days in each year. The level of effort for 2013 is expected to be considerably greater than in 2012, because the 2012 effort is focused only on those portions of the study area that have aerial photography coverage of sufficient resolution for preliminary mapping and field sampling. In 2013, high-resolution imagery should be available for the entire project area, so the number of person-days dedicated to the field effort will be doubled. The mapping effort also is expected to be much greater in 2013 relative to 2012. Then in 2014, less extensive field surveys and mapping may be needed as the mapping of the study area progresses. Field surveys will be conducted in conjunction with the vegetation and wildlife habitat mapping study to maximize efficiency and reduce costs. The study will involve extensive, office-based activities to delineate wetland boundaries in a GIS and to prepare study reports.

Total costs in 2013 are estimated at $500,000. A more limited field survey will be conducted in 2014 focusing on problem areas or areas where the field survey coverage to date is insufficient. Additional field data needed to support the wetland functional analysis will also be collected in 2014. Total costs in 2014 are estimated at $300,000.

9.7.8. Literature Cited

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9.7.9. Figures

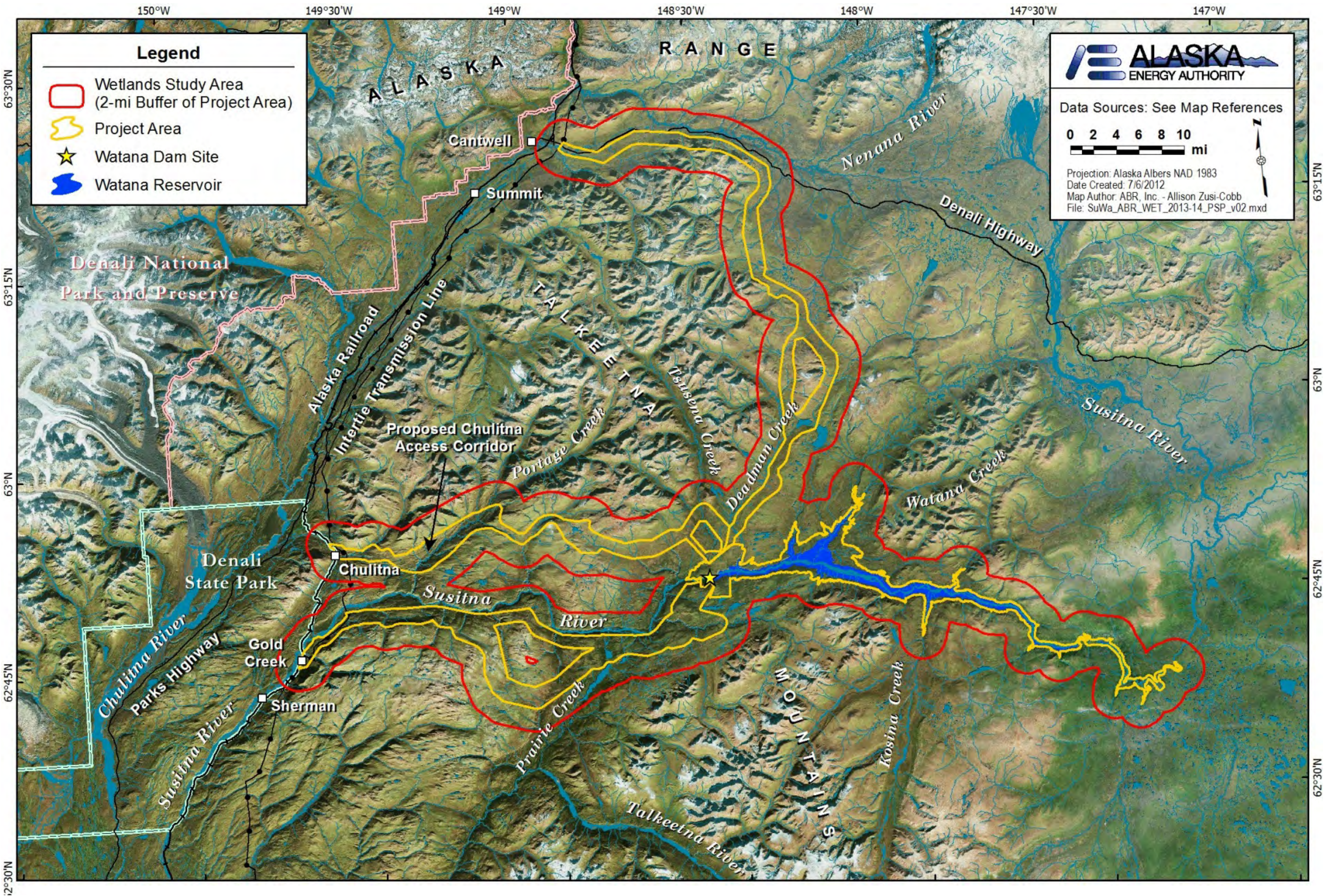

Figure 9.7-1. Study area for wetlands mapping in 2013 and 2014 in the Susitna-Watana Hydroelectric Project area.

9.8. Rare Plant Study

9.8.1. General Description of the Proposed Study

The rare plant study is a field-based investigation in which AEA will identify appropriate habitats for a set of rare vascular species likely to occur in the Project area, and will conduct field surveys to search for any populations of rare plants that may occur. The focus of the surveys will be limited to those areas in which rare plant populations could be directly or indirectly affected by Project development activities.

9.8.1.1. Study Goals and Objectives

The primary goal of the rare plant study is to locate populations of rare vascular plant species that may occur in the Project area and which may be affected by the Project. Rare vascular plant species in Alaska currently are being tracked in a database maintained by the Alaska Natural Heritage Program (AKNHP 2012a); this database will be used as the source list for possible rare species in the Project area. The rare plant study is designed so that habitats where rare plants may occur are identified and then surveyed to locate any rare plant populations present. These data then would be used to facilitate project design, construction, and operations planning to help avoid and minimize impacts to the rare plant populations found.

The specific objectives of the rare plant study are to:

- Locate populations of the more rare vascular plant species that may occur in those portions of the Project area that would be disturbed by project construction and operations activities;
- Estimate population sizes for rare species and map their current distributions; and
- Quantify the potential direct, indirect, and cumulative impacts to rare plants from Project construction and operations activities.

The rare plant study is planned as a two-year study (2013–2014) and will be formally initiated in 2013. However, any rare species found during the field surveys in 2012 for the Vegetation and Wildlife Habitat Mapping, Riparian, and Wetland Mapping studies (see Sections 9.5, 9.6, and 9.7) will be documented, and those records of rare species will be used in planning the field surveys for rare species in 2013 and 2014. This study plan will be updated as necessary, including fine tuning of the field survey methods and areas, based on the results from the first year of work in 2013 and comments on the Initial Study Report by FERC, resource agencies, and other interested licensing participants.

9.8.2. Existing Information and Need for Additional Information

The AKNHP maintains a geospatial database, called BIOTICS, with collection locality and habitat information for rare and/or endemic vascular plants in Alaska (AKNHP 2012a). The species list from that database, known as the Rare Vascular Plant List, currently includes 306 taxa (AKNHP 2012b). In a review of rare plant collection locations from the BIOTICS database—selected from within a broad region surrounding the Project area (AEA 2011)—19 species with state rankings of S1 (critically imperiled) and S2 (imperiled) were identified (Table 9.8-1). These species were selected from the previous Rare Vascular Plant Tracking List

(AKNHP 2008), which was the most up to date list available during 2011. Species that are very rare in the state (5 or fewer occurrences or very few remaining individuals) or that are especially vulnerable to extirpation from the state are given a S1 ranking, whereas species with 6 to 20 collections in the state are and that are somewhat less vulnerable to extirpation are given a S2 ranking (Lipkin and Murray 1997). A larger number species in the search area are ranked as S3 (rare or uncommon; 21 to 100 collections in the state), but in this study, the focus will be on those species with the rarer state rankings (S1, S2, S1S2, and S2S3).

An aquatic species known as flatleaf pondweed or Robbins pondweed (*Potamogeton robbinsii*) was recorded in the APA Project area in the 1980s, in Watana Lake (McKendrick et al. 1982). That collection represents a second recorded observation for the species in the search area (the only other record was near the Summit airstrip in 1953). *P. robbinsii* is listed as S1S2 (critically imperiled or imperiled in Alaska) and as G5 (demonstrably secure globally), indicating that populations are more numerous outside Alaska. Characteristic of most rare species, many of the 19 listed rare plant taxa identified in the data review in AEA (2011) often occur in a narrow range of habitats (e.g., *Artemisia dracunculus* on exposed bluffs). Given the wide array of habitats present in the Project area (e.g., alpine, subalpine, forest, meadows, bogs, fens), it is possible that other rare plant taxa besides *P. robbinsii* may occur in the Project area.

Field surveys for rare plants will be needed for the proposed Project to document any populations of rare species occurring areas which would be disturbed by Project construction and operations activities. This information will be used to develop avoidance and mitigation options to minimize the impacts to rare plant species from development of the proposed Project.

9.8.3. Study Area

Because rare plant species typically occur in specific habitats, the study area for the survey of rare plants will be defined primarily by the locations of suitable habitats for the species that have been determined to have some potential to occur in the Project area (see Section 9.8.4). Field surveys will be conducted only in areas in and adjacent to those portions of the Project area in which habitat loss, alteration, and/or disturbance will occur (the reservoir impoundment zone, areas for infrastructure of the dam and powerhouse and supporting facilities, the proposed access route and transmission-line corridors, and materials sites). These features all occur within the preliminary Project area boundary (Figure 9.8-1), and it is within this boundary that the surveys for rare plants will be conducted. Habitats for rare species will be identified from the preliminary mapping of vegetation, wildlife habitats, and wetlands (see Sections 9.5 and 9.7), and from photointerpretation of plant habitats on aerial photos or remote-sensed imagery. To prioritize the field survey efforts, areas to be searched will be categorized as having low, moderate, or high potential for supporting rare plants (see Section 9.8.4). Surveys for rare plants downstream of the proposed dam in riparian habitats currently are not being planned because disturbance-inducing construction and operations activities associated with the Project, which could affect rare plant populations, will not occur in downstream areas. This approach may be altered, however, if it is found that one or more rare species are possible in riparian habitats and that those species are also dependent on periodic (natural) disturbances and successional habitats, both of which could be affected indirectly in downstream riparian areas by Project development.

9.8.4. Study Methods

9.8.4.1. Field Surveys

The list of 19 rare species identified in AEA (2011), which have the rarer state rankings (S1, S2, S1S2, and S2S3; Table 9.8-1), will serve as the initial list of rare species to survey for. Species that are less rare in the state (S3 and S3S4 rankings) will be recorded if encountered in the field, but the focus of the survey work will be on the rarer species. The search area used for rare plants in AEA (2011) was a large rectangular area encompassing the entire drainage of the Susitna River from the headwaters in the Alaska Range to the mouth at Cook Inlet. Over the course of finalizing this study plan in 2012, AEA, with the help of resource management agencies and the AKNHP, will refine this search area so that it encompasses, as much as possible, areas with landscape features and habitats similar to those occurring in the Project area. Then a formal request will be made to the AKNHP for a listing of rare vascular plant species from the BIOTICS database that have been recorded in the updated search area. These species will be selected from the recently updated Rare Vascular Plant List (AKNHP 2012b). Using the collection-area information for the list of rare species from the BIOTICS database, the suitable habitats for each rare species will be identified. In cases in which the habitat information from the collected specimen(s) is sparse, additional information on the habitats for rare species will be obtained from the scientific literature. These habitat types will serve as the primary focus for the field survey efforts.

Prior to the field surveys in 2013 and 2014, the preliminary mapping of vegetation, wildlife habitats, and wetlands, which is to be conducted in 2012 and 2013 (see Sections 9.5 and 9.7), as well as current, high-resolution aerial photography and remote-sensed imagery will be reviewed to identify suitable habitats for the rare plant species within the Project area.

No standardized protocols have been developed for conducting rare plant surveys in Alaska, but the reconnaissance sampling methodology used by the AKNHP (Carlson et al. 2006; modified from Caitling and Reznicek 2003) provides a template for use in this study. To maximize the potential of encountering rare species, in the reconnaissance methodology researchers identify survey areas based on site-specific criteria, including regional or locally unique geological features, suitable habitats for the species of concern, logistical feasibility, and areas with high environmental gradients. For this study, the most emphasis will be placed identifying and surveying suitable habitats for each species that has some potential to occur in the Project area (see above), as well as unique geological and terrain features and areas with high environmental gradients (numerous transitions in habitats). By combining these landscape elements, regions will be categorized within the study area that have low, moderate, or high potential for supporting rare plants, and survey efforts will be prioritized in those areas with high and moderate potential.

Field surveys, will be conducted by botanists skilled in the identification of vascular plants, who have extensive field experience in Alaska (including previous experience surveying for rare plants), and who also are competent using local, statewide, and national-level taxonomic keys. Most identifications of rare plants will be made initially using the Flora of Alaska (Hultén 1968) and the Alaska Rare Plant Field Guide (Lipkin and Murray 1997). In some cases, the Flora of North America North of Mexico (FNAEC, 1993–2012) will be used, for those plant families that have been revised by the FNAEC. Final nomenclature for rare plant taxa will follow that used in

AKNHP (2012). In cases where the field crew determines that the collection of several plants will not significantly impact the population, voucher specimens will be collected for verification of identifications. The confirmation of plant identifications will be made by the University of Alaska Herbarium.

The habitat-specific surveys for rare plants will be conducted multiple times during the summers of 2013 and 2014, as needed, to coincide with the flowering times of the particular species being sought (the timing of these surveys will depend on which plant taxa are determined to have the potential of occurring in the Project area). When encountered, rare plant observations also will be recorded during the field surveys for Vegetation and Wildlife Habitat Mapping and Wetland Mapping studies in 2012, 2013, and 2014.

9.8.4.2. Impact Assessment

Direct impacts to rare plant species and their habitats from development of the Project could occur in the form of habitat loss from the placement of fill and from the conversion of terrestrial vegetation to lacustrine habitats in the proposed reservoir. Indirect impacts could occur from erosion, fugitive dust accumulation, permafrost degradation, landslides, and off-road vehicle use.

The impact assessment for rare plant species will be conducted in GIS by overlaying the project footprint on the locations of rare plant populations to determine which populations would be affected directly by fill. The determination of which populations could be indirectly affected will be conducted similarly by overlaying disturbance buffers (surrounding the proposed Project infrastructure) to identify which areas are likely to be affected by ancillary impacts associated with Project construction, operations, and maintenance. The size and number of disturbance buffer(s) to be used will be determined based upon the final specifications for Project construction, operations, and maintenance activities, which will be provided in the Project description.

In the impact assessment, the potential impacts to rare plant species will be evaluated by quantifying the reductions in populations (0 to 100 percent) that could occur directly from fill associated with the development of each Project alternative. Potential for indirect impacts (percentage reductions in populations in the disturbance buffers noted above) will also be assessed.

Cumulative effects on rare plant species in the region of the proposed Project will be assessed by evaluating the extent of the direct and indirect impacts expected from the Project, while taking into account the locations of other existing rare plant populations in the region and the potential for other possible projects to be developed in the reasonably foreseeable future.

9.8.4.3. Reporting and Data Deliverables

The reports and data deliverables for this study include:

- **Electronic copies of field data.** A geospatially-referenced relational database of the rare plant locations found during the 2013 and 2014 field seasons, including representative photographs of the rare plant populations, will be prepared. If permission is granted from the AKNHP, the records of rare plants from the BIOTICS database, which occur near the Project area, will also be included in the database. Naming conventions of files and data fields, spatial resolution, map projections, and metadata descriptions will meet the data standards to be established for the Project.

- **Rare plant maps in ArcGIS and PDF formats.** The preliminary and final maps of the locations of rare plant populations will be developed and delivered according to the schedule indicated below. Naming conventions of files and data fields, spatial resolution, map projections, and metadata descriptions will meet the data standards to be established for the Project.
- **Initial Study Report and Updated Study Report.** The rare plant study results will be presented in the Initial and Updated study reports, according the schedule indicated below. The reports will include descriptions of the rare plant populations found including detailed site characteristics, survey methodology, and the names and experience of the surveyors. The Initial Study Report will include recommendations for the 2014 field survey effort. Both reports also will include copies of site photographs.

9.8.5. Consistency with Generally Accepted Scientific Practice

The rare plant study will be conducted using the most up to date information on the previous locations of rare plants near the project area, from the BIOTICS database maintained by the AKNHP (2012a, b). The field protocols for the rare plant surveys will follow those outlined in the reconnaissance sampling methodology used by the AKNHP (Carlson et al. 2006; modified from Caitling and Reznicek 2003) for rare plant surveys in Alaska. These methods are the current standards for field surveys of rare plants in Alaska and were developed by the AKNHP, which is the state authority on rare plants and field surveys for rare plants.

9.8.6. Schedule

2013:

- Review of BIOTICS data and field survey site selection: April–May
- Field survey: June 26–July 2 and July 26–August 1 (two 2-person crews each survey); survey timing may need to be modified depending on which set of rare species are to be surveyed for, and it is possible that three surveys of shorter duration may be needed
- Data analysis: September–October
- Initial Study Report: December
- Delivery of preliminary field data and rare plant population maps: December

2014:

- Review of 2013 data and field survey site selection: April–May
- Field survey: June 26–July 2 and July 26–August 1 (two 2-person crews each survey); survey timing may need to be modified as noted above
- Data analysis: September–October
- Updated Study Report: December
- Delivery of final field data and rare plant population maps: December

9.8.7. Level of Effort and Cost

The rare plant study is planned to be conducted over two years (2013–2014). Field sampling will be conducted each year during the growing season by a crew of two observers. It is anticipated that the level of effort in 2013 and 2014 would be roughly the same (14 days each year). The rare plant study will be coordinated with the other botanical studies being performed for the Project to help facilitate the field surveys for rare plants and minimize costs. The field crews for the Vegetation and Wildlife Habitat Mapping, Riparian, and Wetland Mapping studies will document the locations of any rare plant species encountered during their field surveys in 2012 and 2013, and this information will be used to help prioritize the field surveys for the rare plant study. The total projected cost for this study for 2013 and 2014 combined is on the order of $220,000.

9.8.8. Literature Cited

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9.8.9. Tables

Table 9.8-1. Rare vascular plant taxa that have been collected in a broad region surrounding the Susitna River drainage (see AEA 2011).1

Scientific Name	Common Name	No. of Collections	State Rank[2]	Global Rank[3]
Arnica diversifolia	Sticky arnica	1	S1	G5
Arnica lessingii ssp. *norbergii*	Norberg arnica	1	S2	G5T2Q
Arnica mollis	Hairy arnica	1	S1	G5
Artemisia dracunculus	Dragon wormwood	2	S1S2	G5
Blysmopsis rufa	Red clubrush	1	S1	unranked
Botrychium ascendens	Upward-lobed moonwort	1	S2	G2G3
Carex athrostachya	Slender beak sedge	1	S1S2	G5
Carex parryana	Parry sedge	2	S1	G4
Ceratophyllum demersum	Common hornwort	1	S1	G5
Chamaerhodos erecta ssp. *nuttallii*	Nuttall's ground-rose	1	S1S2	G5T4T5
Cicuta bulbifera	Bulb-bearing water-hemlock	1	S2	G5
Eleocharis kamtschatica	Kamchatka spike-rush	1	S2S3	G4
Eriophorum viridicarinatum	Green-keeled cottongrass	1	S2	G5
Erysimum asperum var. *angustatum*	Wallflower	1	S1S2	unranked
Glyceria striata var. *stricta*	Fowl mannagrass	3	S2	G5T5
Maianthemum stellatum	Starry solomon-plume	4	S2	G5
Potamogeton obtusifolius	Blunt-leaf pondweed	2	S2S3	G5
Potamogeton robbinsii [4]	Flatleaf pondweed	1	S1S2	G5
Potentilla drummondii	Drummond cinquefoil	1	S2	G5

Notes:

1 Data from the Rare Vascular Plant Tracking List (AKNHP 2008), as represented in 2011 in the BIOTICS database of rare species (AKNHP 2012a).
2 State rarity rankings: S1 = critically imperiled, S2 = imperiled, and S3 = rare or uncommon.
3 Global rarity rankings: G2 = imperiled, G3 = rare or uncommon, G4 = apparently secure, G5 = demonstrably secure, T = rank of subspecies or variety, Q = indicates uncertainty about taxonomic status which may affect global rank.
4 A second record of this species was made by McKendrick et al. (1982) in the upper Susitna River basin (Watana Lake) (see AEA 2011).

9.8.10. Figures

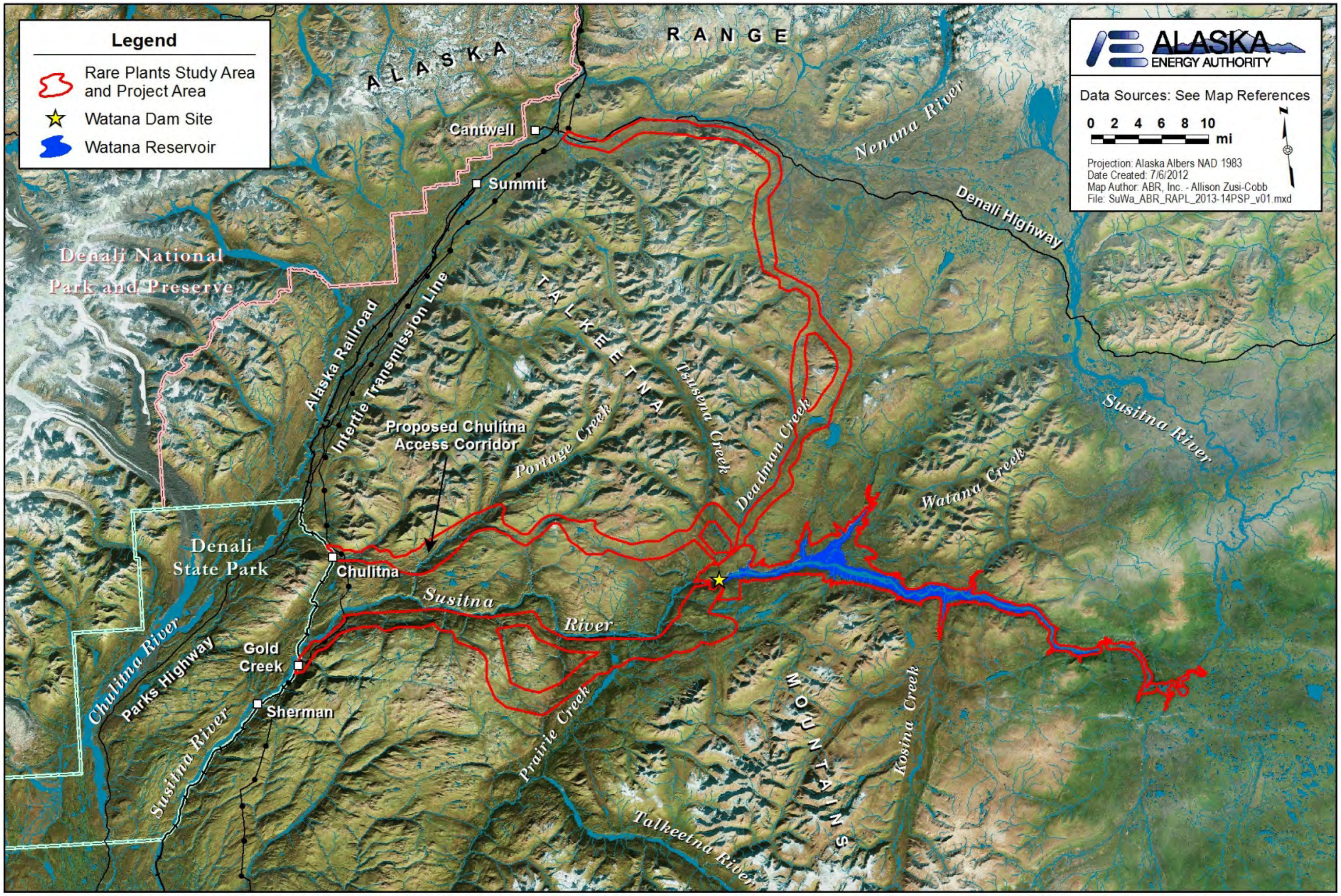

Figure 9.8-1. Study area for rare plant surveys in 2013 and 2014 in the Susitna-Watana Hydroelectric Project area.

9.9. Invasive Plant Study

9.9.1. General Description of the Proposed Study

The invasive plant study is a field-based investigation in which AEA will identify disturbed habitats in and near the Project area that could serve as sources of invasive vascular plant species. Field surveys will then be conducted in those disturbed areas to locate populations of invasive species that have some potential to spread into, or farther into, the Project area associated with development activities. An ecological risk assessment will be conducted for the invasive species located to evaluate the risk of the continued spread of those species because of Project development activities.

9.9.1.1. Study Goals and Objectives

The overall goals of the invasive plant study are to determine the current prevalence of invasive vascular plants in the Project area and nearby disturbed areas and to assess the risk of the continued spread of invasive species as a result of Project development.

The specific objectives of the invasive plant study are to:

- Identify the locations at which invasive plant species have already become established in the Project area and in nearby disturbed areas;
- Estimate population sizes for invasive species and map their current distributions; and Determine whether any of the species present could pose a substantial ecological threat.

The invasive plant study is planned as a two-year study (2013–2014) and will be formally initiated in 2013. However, any invasive species found during the field surveys in 2012 for the Vegetation and Wildlife Habitat Mapping, Riparian, and Wetland Mapping studies (see Sections 9.5, 9.6, and 9.7) will be documented, and those records of invasive species will be used in planning the field surveys for invasive species in 2013 and 2014. Results from the first year of work in 2013 will be used to update this study plan, as needed, and to fine-tune the field survey methods and survey areas for invasive species, in consultation with licensing participants.

9.9.2. Existing Information and Need for Additional Information

No surveys of invasive vascular plants were conducted as part of the APA Project in the 1980s, primarily because the risk of invasive species was not considered a major concern at the time (AEA 2011). Resource management agencies have since become increasingly concerned, however, about the potential for invasive plant species to become established in Alaska as a result of construction activities associated with new development projects. As a result, the U.S. Forest Service, National Park Service, Bureau of Land Management, U.S. Fish and Wildlife Service, Department of Natural Resources Plant Material Center, and Alaska Natural Heritage Program work in cooperation to support the Alaska Committee for Noxious and Invasive Plants Management (CNIPM) and the Strategic Plan for Noxious and Invasive Plants Management in Alaska (Hebert 2001). An outcome of the strategic plan was the development of the Alaska Exotic Plant Information Clearinghouse (AKEPIC) database. This geospatial database is used to store invasive species occurrence and location information recorded in field surveys conducted throughout Alaska. The CNIPM provides updates regularly to the AKEPIC database as new surveys are conducted; the database is maintained by the AKNHP and can be accessed online (http://aknhp.uaa.alaska.edu/maps/akepic/).

Based on a search of collection localities in the AKEPIC database (AEA 2011), which included data from invasive plant surveys conducted along road systems in and near the Susitna basin and other regional plant surveys, it was found that 22 invasive plant species occur in areas relatively near the proposed Project (Table 9.9-1). These 22 species have some potential to establish in the project area (e.g., if seeds or reproductive shoots were brought in on construction equipment). Areas particularly vulnerable to the establishment of invasive plants include quarry sites, road edges, work pads, and gravel river bars (which are naturally disturbed by flooding and ice scouring). A species of particular concern is *Melilotus alba* (white sweetclover), which establishes readily and often forms monotypic stands along roadsides, trails, and river bars. The ability of this species to colonize linear features on the landscape is especially problematic because such features can act as corridors for dispersal and speed its establishment in new areas. *M. alba* already has been documented colonizing riparian areas along several of Alaska's glacially fed rivers, and low to moderate densities may promote the establishment of other exotic species, while high densities can negatively affect the establishment of both native and non-native species (Conn et al. 2011).

Field surveys for invasive vascular plants will be needed to document the specific locations of invasive species in and near the Project area in order to assess the likelihood that Project development will further aid the spread of invasive species.

9.9.3. Study Area

Since invasive vascular plant species are generally confined to disturbed areas and the Project area is mostly undeveloped, the field surveys for this study will be focused initially on those areas that can act as potential pathways for invasive species to enter and establish in the Project area. Sections of the Parks and Denali Highways that are relatively close to the alternative alignments for the access road and transmission lines, primitive roads or trails that currently provide access into the Project area, and other disturbed areas (see Section 9.9.4) would be surveyed. The specific locations and lengths of the highway segments to be surveyed will be defined during the finalization of this study plan in 2012, based on the locations of the final alternatives for the access road and transmission lines, and in consultation with licensing participants. The primitive roads and trails and other disturbed areas to be surveyed will be identified from high-resolution aerial photography and remote-sensed imagery for the Project area. Some of this imagery exists now and additional imagery for those areas that are currently not covered will be acquired during summer 2012. The area for which high-resolution imagery will be searched for primitive roads and trails and other disturbed areas occurs within a 5-mile buffer surrounding the proposed Project infrastructure areas that would be directly altered or disturbed by construction and operations activities (see Section 9.5, Figure 9.5-1). As engineering design for the Project proceeds and final alternatives are developed, potential gravel material sources will be identified and any existing gravel mine sites being considered for support of Project construction and operations also will be surveyed to assess the extent to which invasive plant species are present. Surveys for invasive plants downstream of the proposed dam in riparian habitats currently are not being planned because disturbance-inducing construction and operations activities associated with the Project will not occur in downstream areas; hence development of the Project will not result in an increase in potential disturbance vectors for the spread of invasives in downstream riparian areas.

9.9.4. Study Methods

9.9.4.1. Field Surveys

Prior to the field surveys in and near the Project area in 2013, recent aerial photography and remote-sensed imagery will be reviewed (see Section 9.9.3) to identify potential "hot spots" for invasive species. These include off-road vehicle trails, gravel roads, quarry sites, and other disturbances that may harbor invasives or are at risk for invasive plant colonization in association with the construction and operation of the proposed Project. The current records in the AKEPIC database will also be reviewed to determine what species have been recorded in the vicinity of the Project area. The areas where invasives have been recorded will be surveyed again to determine if the invasive species are still present and to assess whether the populations (in cases in which population estimates area available) are contracting, expanding, or are relatively unchanged since the previous surveys.

Surveys for invasive vascular plants will be conducted in 2013 and 2014 following guidelines in the AKEPIC User Manual (AKNHP 2008). Suspected invasive species will be collected and the locations of populations recorded with a hand-held GPS receiver. Non-native species that are not considered invasive also will be noted. If possible, population estimates will be made by visually enumerating or estimating the number of plants in the area. If population estimates are not possible, the degree of infestation at each location will be ranked qualitatively as low (1–10 percent cover of assessment area), medium (10–40 percent cover), or high (>40 percent cover). The distribution and size of areas where invasive species are present are likely be highly variable, therefore use of a standard assessment area size (e.g., a 10-meter [33-foot] radius plot) will not be appropriate for evaluating the degree of infestation. Thus, the geographic limits of an infested area will be used to define the assessment area boundaries (these areas may be as small as 0.01 acre or as large as 2 acres). Species will be identified using Hultén (1968) and Identification of Non-native Plants in Alaska (AKNHP 2010). Collected specimens of selected species will be submitted to the University of Alaska Herbarium for confirmation of identifications. All field data will be made available for entry into the AKEPIC database. As engineering design and construction plans for the Project are further developed, the invasive plant work conducted in 2014 likely will be focused more on sources of invasive species that could be accessed during construction activities, such as gravel material sites.

9.9.4.2. Ecological Risk Assessment

To assess the ecological risk of the invasive plant species found in and near the Project area to expand their distributions farther into the Project area, the U.S. Department of Agriculture (USDA) invasiveness rankings developed for selected species in Alaska (Carlson et al. 2008) will be used. The overall invasiveness scores for each species are based on sub-scores for ecological impact, biological characteristics (e.g., life history, potential for spread, allelopathy), distribution, and feasibility of control. The higher the overall score (ranging from 1–100), the greater the risk that a species will have negative ecological effects and the lower the likelihood it can be controlled effectively. The invasiveness scores for each invasive species found during the field surveys will be considered along with the number and size of the population(s) found, their proximity to proposed Project infrastructure and construction areas, and the species' dispersal mechanism(s) to rank the local ecological risk of spread and further infestation from development of the Project. The data gathered in this study (i.e., local ecological risk rankings for each species) will be used to develop PM&E measures, to be submitted in the license application, including introduction/prevention and management plans for minimizing the establishment and spread of invasive species in the Project area.

9.9.4.3. Reporting and Data Deliverables

The reports and data deliverables for this study include:

- **Electronic copies of field data.** A geospatially-referenced relational database of relevant records from the AKEPIC database and data collected during the 2013 and 2014 field seasons, including representative photographs of infested areas, will be prepared. Naming conventions of files and data fields, spatial resolution, map projections, and metadata descriptions will meet the data standards to be established for the Project.
- **Invasive species maps in ArcGIS and PDF formats.** The preliminary and final maps of the locations of invasive species populations will be developed and delivered according to the schedule indicated below. Naming conventions of files and data fields, spatial resolution, map projections, and metadata descriptions will meet the data standards to be established for the Project.
- **Initial Study Report and Updated Study Report.** The invasive plant study results will be presented in the Initial and Updated study reports according to the schedule indicated below. The reports will include descriptions of the invasive species populations found including estimated population sizes or degree of infestation, site characteristics, and the local ecological risk rankings for each species. The Initial Study Report will include any AEA recommendations for the 2014 field survey effort. Both reports also will include copies of field dataforms and field plot photographs.

9.9.5. Consistency with Generally Accepted Scientific Practice

The invasive plant study will be conducted following the protocols described for invasive plant surveys in Alaska in the AKEPIC User Manual (AKNHP 2008). These methods are the current standards for field surveys of invasive plants in Alaska. The AKEPIC database of invasive plant records, which is maintained by the AKNHP, will be used as the primary source of current records of invasive species in and near the Project area. The AKEPIC database was developed by the CNIPM, which is a working group of six state and federal agencies organized specifically to address the ecological threat of invasive plant species in Alaska.

9.9.6. Schedule

2013:

- Review of AKEPIC data and field survey site selection: April–May
- Field survey: June 25–July 4 (two-person crew); survey timing may need to be modified depending on plant phenological findings during the 2012 field surveys for other botanical studies in the Project area
- Data analysis: September–October

- Initial Study Report: December
- Delivery of preliminary field data and invasive species maps: December

2014:

- Review of 2013 data and field survey site selection: April–May
- Field survey: June 28–July 3 (two-person crew); survey timing may need to be modified as noted above
- Data analysis: September–October
- Updated Study Report: December
- Delivery of final field data and invasive species maps: December

9.9.7. Level of Effort and Cost

The invasive plant study is planned to be conducted over two years (2013–2014). Field sampling will be conducted each year during the growing season by a crew of two observers. The level of effort in 2013 is expected to be greater (10 days) than in 2014 (6 days). The goal in 2013 will be to survey the prominent disturbed habitats in and near the Project area, and work in 2014 likely will be focused on gravel material sites and other disturbed sites that may have been missed in the 2013 sampling. The invasive plant study will be coordinated with the other botanical studies being performed for the Project to help facilitate the field surveys for invasive plants and minimize costs. The field crews for the Vegetation and Wildlife Habitat Mapping, Riparian, and Wetland Mapping studies will document the locations of any invasive species encountered during their field surveys in 2012 and 2013, and this information will be used to help prioritize the field surveys for the invasive plant study. The projected cost for this study in 2013 is on the order of $100,000. For 2014, the approximate cost is $50,000.

9.9.8. Literature Cited

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9.9.9. Tables

Table 9.9-1. Invasive vascular plant species recorded on road-system surveys in and near the Susitna basin and in other plant surveys in the region of the proposed Project.

Scientific Name	Common Name	Invasiveness Rank[1]
Phalaris arundinacea	Reed canarygrass	83
Melilotus alba	White sweetclover	81
Cirsium arvense	Canada thistle	76
Prunus padus	European bird cherry	74
Sonchus arvensis	Perennial sowthistle	73
Vicia cracca	Bird vetch	73
Hordeum jubatum	Foxtail barley	63
Bromus inermis ssp. inermis	Smooth brome	62
Trifolium repens	White clover	59
Taraxacum officinale ssp. officinale	Common dandelion	58
Trifolium hybridum	Alsike clover	57
Crepis tectorum	Narrowleaf hawksbeard	54
Poa pratensis	Kentucky bluegrass	52
Poa annua	Annual bluegrass	46
Polygonum aviculare	Prostrate knotweed	45
Plantago major	Common plantain	44
Capsella bursa-pastoris	Shepherd's purse	40
Poa compressa	Flat-stem bluegrass	39
Chenopodium album	Lambsquarters	37
Cerastium glomeratum	Sticky chickweed	36
Matricaria discoidea	Pineapple weed	32
Brassica napus	Rapeseed mustard rutabaga	NR

Notes:

1 Assigned according to the Invasiveness Ranking System for Non-native Plants of Alaska (Carlson et al. 2008). Species are ranked on a scale of 0 to 100, with 100 being an extremely invasive species; NR = not ranked.

9.10. Attachments

ATTACHMENT 9-1. DOCUMENTATION OF CONSULTATION ON BOTANICAL RESOURCES STUDY PLANS

ATTACHMENT 9-1

DOCUMENTATION OF CONSULTATION ON BOTANICAL RESOURCES STUDY PLANS

United States Department of the Interior

FISH AND WILDLIFE SERVICE

Anchorage Fish and Wildlife Field Office
605 West 4th Avenue, Room G-61
Anchorage, Alaska 99501-2249

IN REPLY REFER TO:
AFWFO

February 10, 2012

Ms. Sara Fisher-Goad
Executive Director
Alaska Energy Authority
813 W Northern Lights Blvd
Anchorage, AK 99503

Re: 2012 pre-licensing draft study plans for the Susitna-Watana Hydroelectric Project, FERC Project No. 14241-0000

Dear Ms. Fisher-Goad:

The U.S. Fish and Wildlife Service (Service) is responding to the Alaska Energy Authority's (AEA) request for comments on 2012 pre-licensing draft study plans for the Susitna-Watana Hydroelectric Project. The Service provided some initial comments on the draft study plans during the work group meetings January 24-26, 2012, and had anticipated providing additional comments after receiving revised and more thorough descriptions of the proposed studies. Since that meeting, we have conducted an initial review of the Instream Flow, Aquatic Resource, Water Resource, and Eagle and Raptor Nest draft 2012 study plans provided at the January 24-26, 2012, meetings. Due to the short turnaround time requested for feedback (11 business days) on the study plans and their ongoing evolution, our comments should be consider cursory. The following represents our overall issues and concerns with the study plans and the enclosure provides a more detailed accounting of our comments and recommendations for each specific study plan.

Expanded Study Framework and Timeframe: The Service and other resource agencies have frequently expressed concerns about the limited temporal and spatial scale, and limited timeframe, for proposed studies in a dynamic basin such as the Susitna River. We have also raised concerns over the lack of proposed studies in the lower reaches (as defined by AEA) of the Susitna River for the proposed Susitna-Watana project. As part of the hierarchical framework, an ecologically meaningful space-timing scale should be identified related to project studies. As the spatial scale of studies increases, the time scale of important processes such as ice, sedimentation, and channel formation also increases, because they operate at slower rates, time lags increase, and indirect effects become increasingly important. Studies related to these dynamic fish habitat forming processes need to be adequate (i.e., 5 years or more) to begin to understand mechanistic linkages (Wiens et al 1986; Wiens 2007). For this purpose, the Service recommends conducting fish habitat forming process studies on the minimum temporal scale of 5 years. This temporal scale equates to the typical life cycle of Chinook salmon, an Alaska Department of Fish and Game designated stock of concern.

To address these concerns, the Service expects that the 2012 studies and future project-related studies will be conducted on a hierarchical framework (Urban et al 1987; Frissell et al 1986) at a variety of scales including meso-habitat, reach, and basin wide. The Service also expects that the 2012 studies will not only help fill data gaps identified in the Preliminary Application Document (PAD), but will also be integrated between each other and with future project-related studies. This framework and integration is necessary to understand existing conditions and predicted changes to fish habitat in relation to changes in physical processes from proposed regulated flows. We recommend you establish a schedule for analysis of data obtained in 2012 and a framework for how to incorporate the 2012 data into 2013-2014 study plans. This is necessary for resource agencies to adequately assess potential project impacts to Alaska's fish and wildlife resources.

Winter Flow Regimes: At the January 24-26 work group meetings, and in the PAD, winter operations were described as load-following with flows ranging from 3,000 to 10,000 cfs in a 24-hour period. Regulated flows, including load-following operation, result in substantial changes to the natural hydrograph of a river. Dam construction and operation globally has resulted in adverse effects to anadromous and resident fish, macroinvertebrates, and their habitats. The Service is particularly concerned with the lack of study focus on Susitna River winter flows under natural and proposed flow operations. We recommend that winter base flows be assessed beginning in 2012 under the Instream Flow 2012 Study Planning, Water Resources Study Planning, and in the Aquatic Resources Study Planning. During colder winter months, glacial river base flows, such as those in the Susitna River, are derived entirely from groundwater inputs resulting in reduced habitat availability. We recommend assessing base flows as they relate to mainstem winter habitats (including adult spawning and juvenile fish overwintering locations, and the potential for stranding or increased mortality or condition related to changes in flow and water temperature), water quality conditions, ice-processes, and habitat and geomorphic processes in the Susitna River under current conditions and underthe proposed operation.

Temperature: In our December 30, 2011, letter we recommended thermal imagery (Torgerson et al. 1999) be conducted in 2012 throughout the Susitna River mainstem to identify important thermal habitats that may be utilized for spawning, refugia, or as overwintering areas. It is important to characterize the Susitna River water temperature profile as it relates to habitat because the proposed dam is expected to significantly alter the water temperatures downstream of the dam. Please review this letter as a reference for this study, as well as other Service recommendations.

Modeling Design: There is currently a lack of information in the draft study plans related to overall modeling approaches that will be used for the Susitna-Watana project. When identifying instream flow model(s) the purpose and assumptions must be compared to Water Resources and Aquatic Resources study objectives. Model assumptions and model inputs need to be clearly stated and available for review. Spatial pattern should be one of the independent variables in the model analysis. At a minimum, we recommend using 2D hydrodynamic model(s) at a mesohabitat, reach, and basin wide scale (Crowder and Diplas 2000). We specifically recommend a 2D model be included to predict physical processes to spatially represent variation in input variables, and how those variables change temporally and spatially under differing flows. Selected model(s) should also include a sensitivity analysis (Turner et al. 2001). This information is critical to the general project understanding of existing ecological spatial patterns, and predicted spatial patterns under proposed regulated flows from the Susitna-Watana dam.

Mercury: Since the January meetings, it was brought to our attention that fish mercury concentrations frequently increase after impoundment of a reservoir, particularly boreal reservoirs. Soil flooding releases organic matter and nutrients, providing food to bacterial communities that methylate inorganic mercury. Methylation and bioaccumulation are the primary pathways for mercury accumulation in fish (Therriault, 1998). Although not identified in the 2012 draft studies, future studies should include pre- and post-impoundment mercury concentration studies.

Thank you for the opportunity to provide comments on the 2012 draft study plans for this proposed project. We look forward to continued coordination with AEA regarding resource appropriate studies. If you have any questions regarding these comments, please contact project biologist, Mike Buntjer at (907) 271-3053, or by email at michael_buntjer@fws.gov.

Sincerely,

Ann G. Rappoport
Field Supervisor

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Enclosure

The following comments and recommendations are based on our review of the 2012 pre-licensing draft study plans for the Susitna-Watana Hydroelectric Project provided at the January 24-26, 2012, work group meetings.

Synthesis of Existing Fish Population Data (F-S1)

Recommend including information on seasonal distribution and abundance of anadromous and resident fish species among riverine habitat types and river reaches. As part of the spawning and incubation period for resident and anadromous species, studies need to include fry emergence periods and time (of day) information to determine potential impacts from fluctuating winter/spring flows. Potential issues include stranding of fish (by life stage and species) and downstream displacement relative to potential ramp rates. This study needs to integrate with instream flow and geomorphic studies to look at effects of daily flow fluctuations, particularly in winter, in the middle and lower river reaches.

For clarity, we recommend referring to river "reaches" as defined in the PAD rather than river "segments."

Fish persistence should be evaluated relative to spatial and temporal availability of fish habitat under existing and proposed flows. The Service recommends fish habitat studies be developed concurrent with the water resource studies to interface and characterize fish habitat as it relates to physical (hydrologic, sedimentation, and geomorphic) processes. Fish habitat metrics should be developed and integrated with modeling efforts related to physical processes and fish presence.

Chinook Salmon Presence above Devil's Canyon Study (F-S4)

Chinook salmon presence above Devil's Canyon study should include an upstream and downstream fish passage component. This 2012 study should include fish passage relative to all life stages of Chinook salmon. There is the potential to include Dolly Varden and Humpback whitefish pending results of an otolith/anadromy analysis by the Service for these species.

The Service supports the genetic component of the study (F-S4) which is necessary to determine whether the Chinook salmon meta-population in the vicinity of the proposed dam is a distinct population.

Wetland Mapping Study (B-S3)

The draft wetland study states that the methods used will be consistent with guidance in the Alaska Regional Supplement (USACE 2007), the U.S. Army Corps of Engineers (USACE) Manual (Environmental Laboratory 1987), and Classification of Wetlands and Deepwater Habitats of the United States (Cowardin et al. 1979). Therefore, the Service recommends the use of the Cook Inlet Classification (CIC) developed by Mike Gracz. The CIC is an HGM-based wetland ecosystem classification scheme analogous to Cowardin. The Service supports the use of CIC for wetland mapping in the Cook Inlet Basin over Cowardin because CIC is regionally specific and indicative of function (e.g., a spring fen always receives groundwater discharge; whether a palustrine emergent wetland does is unknown). CIC can be cross-walked with Cowardin if necessary. CIC methodologies and Mike Gracz' mapping protocols are described on www.cookinletwetlands.info.

In terms of compensatory mitigation related to a site that will be monitored over time using site-specific, precise functional attribution, the best functional assessment method available is the use of the HGM Regional Guidebooks. The citation for slope/flat wetlands is as follows:

- Hall, J.V., J. Powell, S. Carrick, T. Rockwell, G.G. Hollands, T. Walter and J. White. 2003. Wetland Functional Assessment Guidebook, Operational draft guidebook for assessing the functions of slope/flat wetland complexes in the Cook Inlet Basin Ecoregion, Alaska, using the HGM approach. State of Alaska, Department of Environmental Conservation, Juneau, Alaska.

Eagles and Raptor Nest Study (W-S3)

The Service's Migratory Bird branch is evaluating the potential for an eagle study that would compare productivity/behavior of golden eagles in disturbed areas (such as the Golden Valley Wind project, Usibelli Coal Mine, and the Susitna-Watana dam) versus undisturbed areas (Denali Park). We would like to explore the option of partnering with Watana projects to complete eagle nesting surveys. The Service could potentially provide experienced biologists to conduct the surveys. The benefits to this partnership include: 1) assistance to the project sponsors to conduct an eagle nesting survey; 2) provide cost savings to project sponsors by eliminating the need to hire a consultant to complete the survey; and 3) allow the Service to collect information valuable for our study. These surveys would not be considered compensatory mitigation, but would help meet eagle nest survey requirements. The Service generally recommends a pre-project survey with a follow-up survey just prior to construction.

Since 2009, compensatory mitigation is required for "take" or disturbance of active and inactive bald eagle nests. For golden eagles, there is a "no net loss" policy. Identifying ways to offset compensatory mitigation requirements early in the project development process can help the resource and the project sponsors. For example, a 2-year pre-construction eagle tracking study could help minimize required compensatory mitigation if the study demonstrated a "disturbance" rather than a "loss of territory."

Riparian (B-S2)

In addition to comments provided previously, we recommend riparian studies be integrated with other 2012 studies and with future project-related studies.

Beluga Prey Species Study (F-S6)

This study should identify components that specifically interface with the water resource and fish habitat studies. Anadromous prey species such as eulachon, Pacific and Arctic lamprey have been documented as present in the lower reach of the Susitna River and may be impacted by the proposed regulated flows. Relationships between natural flows and existing habitats should be developed to best predict changes during proposed regulated flows that may impact beluga whale prey species.

Instream Flow Planning Study (F-S5)

1) Selection of a model or series of models of 1D or 2D nature will drive the type of data needs for the field studies. This discussion and selection must be made prior to finalizing habitat studies.
2) The habitat suitability curve development is a useful product. Conduct the studies in such a manner as to ensure the development uses actual suitability data and is not dominated by best professional consensus.
3) Need a better understanding of how the instream flow study relates to the routing model or uses its own calibrated flow model. Concern is that the overall routing model may have significant variation in water level between cross-sections depending on their placement in relation to the habitat cross-sections. Location in pools or riffles and within these features or braided section will vary the water level of a certain flow and may not correctly interpret the water level of a habitat cross-section.
4) Anticipate that the habitat study will have its own cross-sections and flow analysis separate from the routing model. Realize that some selected locations may not be adequate once fieldwork is performed so flexibility is needed to select new spots as needed for 2013 and 2014.
5) Desire to have a large map with the routing and habitat cross-sections on it over recent aerial imagery.
6) In review of 1980s studies, were there any groundwater/surface water exchange studies?
7) Need to confirm whether the 1980s studies included mapping of groundwater upwelling areas along the river for gaining and losing reaches. We recommend at least a large-scale thermal temperature study along the river to note locations and relate it to the habitat study areas and cross-section surveys.

Reservoir and Flow Routing Model Transect Data Collection (WR-S1)

1) We recommend that the cross-section re-surveys in 2012 go beyond the forest limit but stay within the floodprone area, as there may be key floodplain elements not captured in the LIDAR data.
2) Need to evaluate appropriate model to consider ice effects as ice is a significant factor, not only for habitat but also for recreational use. We highly recommend utilizing one model that is fully dynamic and can deal with both floods and ice dynamics during winter low flows for routing. A model was recommended in the January work group discussion, created in Canada that may be appropriate. Model selection will drive data needs so this needs to be selected soon and with a full idea of the types of available models out there to select the best one.
3) Given the discussion of ice dynamics, cross-sections are likely needed in the lower reach to adequately assess ice dynamics as ice forms and slowly freezes upstream. We recommend that these cross-sections be identified and obtained in 2012 to maximize utilization of the model and potentially correlated to lower river habitat studies to reduce redundancy of effort.

4) Instream flow and habitat study cross-sections are assumed to be different than the routing cross-sections. We recommend creating a map for distribution that overlays the original routing and habitat cross-sections to begin to understand their spatial location and orientation and begin discussing 2012 study locations. Realize that some selected locations may not be adequate once fieldwork is performed so flexibility is needed to select new sampling locations as needed for 2013 and 2014.
5) Flows need to be measured to calibrate routing as much as possible. We recommend that water surface and flow be captured at key cross-sections while in the field to calibrate the routing model results and to verify Manning's n assumptions.

Determine Bedload and Suspended Sediment Load by Size Fraction at Tsusena Creek, Gold Creek, and Sunshine Gage Stations (G-S1)

1) For locations obtaining bedload data need to also do a bed pebble count to compare to transported load to calibrate for shear stress and other calculations.
2) Recommend that gravel bar sampling be part of the study to compare to transport load data obtained. This methodology must be well documented.
3) Evaluate the Chulitna and Talkeetna as well as other key tributary deltas for sediment distribution and load into the system.
4) Recommend attempting to get high flow values near bankfull stage at both Gold Creek and Watana sites to add to data.
5) Recommend sediment sampling at the Susitna-Watana dam site to demonstrate correlation to Gold Creek and/or model changes in sediment loading between the sites.
6) Evaluate 3-inch versus 6-inch bedload sampler use for 2012 field season to try to capture large fractions of bedload movement as able.

Geomorphic Assessment of Middle River Reach using Aerial Photography (G-S2)

1) Include a listing and evaluation of flood and ice conditions during and between aerial photography events, especially during breakup periods to help correlate differences to significant events in the watershed.
2) Does not address winter flows and habitat use under winter conditions; needs to come up with a plan to address this beginning winter 2012/13.
3) For geomorphic analysis and comparison to habitat studies, cross-section locations for substrate classification, large woody debris counts in floodprone width, and categorization of fluvial process (Montgomery and Buffington, Rosgen) should be determined and fieldwork performed. If location agrees with an old cross-section, it will help verify any changes over time and with flow to help determine stability and shear stress equations.

Geomorphic Assessment of Project Effects on Lower River Channel (G-S4)

1) There is a need to evaluate the hydrology and habitat use of the lower river to evaluate change over time from dam operations:
    a. Winter operations are a major concern given the need to evaluate daily flow fluctuations of 3,000-10,000 cfs in the winter. This effect must be modeled into

the lower reach to see if the magnitude of fluctuating flows in the winter extends further downstream than spring and summer flow periods. Additionally, ice and open water effects will be extended into the downstream area so modeling will need to address this by extending it downstream.

b. In the January work group meetings it was pointed out that ice is generated upstream and flows down the river to the lower reaches, beginning to form in the lower reach and slowly ice up the river upstream. This also needs modeling from a thermal standpoint, hence again, the need for cross-sections in the lower reaches.
c. Recommend that the gage at Su Station be turned on by the U.S. Geological Survey (USGS) and maintained by USGS to help calibrate lower reach modeling efforts over the next 5 years, especially for ice effects and dynamics modeling.
d. Cross-sections need to be made in the lower reach to add to an ice dynamics model as well as habitat studies – recommend selecting locations and getting these cross-sections in 2012 to facilitate modeling efforts.

2) Re-do all cross-sections at existing and past gage sites in the middle and lower reaches (including Su Station) to evaluate hydraulics, assess stability by comparing to old cross-section data and give an initial assessment of stability or changes in rating curve information. Also, it would be beneficial to do an initial evaluation of these gage sites at winter flows and with ice dynamics to begin to understand the impact winter flows will have. This will help with evaluating changes over the last 30 years in the lower reaches to determine whether additional work in 2013-2014 is needed.

Documentation of Sustina River Ice Breakup and Formation (G-S3)

1) Key elements to identify are: where ice generation occurs (production zones) and where ice lodges and begins the process of ice formation in the river.
2) Recommend that flights include an ice scientist, fishery biologist, riparian specialist and fluvial geomorphologist so that multiple observations can be made at the same time and can be stitched together to understand the processes taking place.
3) Recommend video be taken during all river flights for later reference.
4) Documentation of frazil ice generation is very important – current thought is that 80% is generated upstream of Devil's Canyon in the middle reach.
5) Daily flights might be needed during the height of breakup or freeze-up.
6) Is CRREL involved with the ice research?
7) Highly recommend utilizing our Canadian neighbors and their research and models for ice issues.

Review of Existing Water Temperature Data and Models (WQ-S1)

1) Identify appropriate temperature models to use based on new technology and understanding.
2) Evaluate MET station locations and strongly consider an additional station around the Deshka or Yentna which could help with ice studies.

3) Discuss MET station locations with NOAA Weather Forecast Center to access experts as well as potentially help with storing data.
4) Perform large-scale thermal study of the river for groundwater exchange areas over different flows.
5) At old, existing, and new gage sites, include continuous temperature monitoring; consider a water quality study at gage sites for 2012, 2013, and 2014 seasons with parameters agreed to by all parties and performed by USGS.
6) Evaluate past assumptions for temperature modeling (at least our understanding of it), i.e., summer analysis of surface water temperatures only, as this dominates habitat use, versus winter analysis of intergravel temperature only. Provide quantification of the hypothesis and assumptions made and determine if they are still relevant.
7) 2012 fieldwork in the work group meeting was discussed to primarily show how mainstem temperatures influence side channel habitat. This should be expanded to do a thermal analysis up and down the river (#4).
8) Discussed in the work group meetings that 2013-2014 work will deal with upwelling water temperatures. A thermal analysis in 2012 can help determine these sites.
9) Fieldwork needs to be performed that can help calibrate heat transfer coefficients and other assumptions in selected temperature models between mainstem and other waters.
10) Analysis of temperature effects on ice formation was not discussed and needs to be part of the scope in coordination with ice and habitat studies.
11) Ensure that solar radiation information will be collected at all MET sites as it is crucial to modeling efforts (ice, etc.) and evaluate other metrics that are needed for calibrating models.

Meeting Summary
Susitna-Watana Hydroelectric Project Licensing
Wetlands Delineation and Mapping
2012/2013-2014 Study Plan Development
April 18, 2012 9:00 am
AEA Project Offices, First Floor Conference Room
411 W 4th Avenue, Anchorage, AK

Attendees:

Organization	Name
EPA	Matt LaCroix (on phone)
USACE	Mary Leykom (on phone)
USFWS	Mike Buntjer (on phone)
USFWS	Bob Henzley (on phone)
AEA	Betsy McGregor
ABR, Inc	Terry Schick
ABR, Inc.	Janet Kidd
ABR, Inc.	Wendy Davis
Solstice Alaska Consulting, Inc.	Robin Reich

Terry Schick (ABR) opened meeting and said that the primary goal of the meeting was to come to a consensus on a wetland classification system and wetland functional assessment methods for the Susitna-Watana Hydroelectric Project. Terry said that the interim goal was to determine what additional data to collect in the field in 2012 to support the wetland classification and functional assessment approaches selected. Terry said that the mapping effort would run through 2014. Terry said that the team needs to consider what the agencies' goals are for using the wetlands mapping and functional assessment information for this particular project. He said that if we know those goals, we can choose an appropriate set of methods to use.

Janet Kidd (ABR) presented *Susitna-Watana Hydroelectric Project—Wetland Classification and Functional Assessment Methodology*, a PowerPoint presentation attached to these notes.

Questions/Discussion

Janet said that the wetlands mapping work would focus on transmission corridors, potential reservoir, and access road locations. Janet said that they would use existing broad-scale NWI mapping to get an overview of the area. Janet said that there would be a 2-mile mapping buffer around project corridors and that LIDAR imagery would be used as the map base.

Mike Buntjer (USFWS) asked how the 2-mile buffer was selected. Janet said that for the immediate area of the project's footprint, the wetlands mapping would be conducted at a fine scale. Janet said that ABR wanted to establish a larger buffer in which wetlands would be mapped at a broader scale, so that the wetlands to be affected by the project could be compared to those in the surrounding area, this to provide a landscape context for the wetland ecosystems in the area. Janet said that it may be decided that we can reduce that mapping buffer size some if the agencies agree. Terry said that the study area boundary is a separate topic, isn't final, and would be defined during the FERC study plan development process.

Janet said that for the Susitna Basin there are not many wetland classification system methods to choose from. Janet said that the methods are the Cowardin classification (NWI) and the Cook Inlet Classification. Mike Gracz developed the Cook Inlet Classification, which is specific to the lowland areas in that region.

Bob Henzley (USFWS) asked whether Viereck's Alaska Vegetation Classification would be used. Janet said that Viereck is a vegetation classification system, not a wetland classification method, but that ABR would map vegetation using the Alaska Vegetation Classification as one of the steps in mapping wetlands.

Mike Buntjer said that Mike Gracz was asked about applicability of the Cook Inlet Classification in the project area. Mike Buntjer said that Mike Gracz said that if the method were to be used, it would have to be expanded because wetland types in the upper Sustina Basin have not been analyzed. Janet said that ABR would contact Mike Gracz. Robin Reich (Solstice) said that she thought that Mike Gracz was going to map wetlands north on the Parks Highway this summer in areas where you would expect to see future development. Janet said that the wetlands team would need to use a different approach, but could use some aspects of Gracz's work.

Janet said that the wetland team's goal is to characterize the wetlands in the project area as an integrated ecosystem, not as many separate polygons. Janet said that with the Cowardin system it is difficult to distinguish some wetland types.

Janet said that ABR's proposed approach includes using HGM methods (because they are used for many projects), Viereck level IV, and NWI because this would allow flexibility of defining wetland classes or wetland ecotypes. Janet said that in using this method, the team could assign wetland functional groups to the maps. She said that the team would get basic information from previous maps (e.g., NWI), and then add Viereck Level IV and HGM classes. She said that this method is more suitable to a variety of groups and useful for a wetlands functional assessment.

Matt LaCroix (EPA) asked whether Janet could describe in more detail the wetland functional groups that would be used. Janet Kidd said that the team could use life form (vegetation structure), scrub classes, hydrology, and HGM. Wendy Davis (ABR) said that instead of attributing each map polygon with several different wetland functions, groups of wetland classes that share the same wetland functions, based on the field data, could be grouped together in order to more quickly derive an interim functional assessment.

Matt said that he would like to point the team towards the Cook Inlet Classification, which does start with ecosystem types. Wendy Davis (ABR) said that they would be trying to emulate Mike Gracz's goal with his characterization. Wendy said that they were trying to pull this together with the riparian and habitat mapping studies. Janet confirmed that the ecosystem groups can be viewed as habitat types. Janet said that protocols that ABR developed for Ecological Land Classification are similar to the techniques proposed to be used for this project. Janet said that the wetland team's goals and desired outcomes are the same as the Cook Inlet Classification method..

Janet said that one of the issues with following the wetlands functional assessment methodology used in the Cook Inlet Classification for the Watana project is that the Cook Inlet Classification is designed for a different regional area (Cook Inlet lowlands) with different conditions. Janet said that ABR would need to come up with a new method by extracting from the Cook Inlet Classification methodology.

Mary Leykom (USACE) said that the USACE would be satisfied with the classification developed by Mike Gracz because the Corps has funded much of his work. Mary said that the team should examine areas for potential wetland impacts mitigation. Mary said that she didn't know the location of these areas. Mary said that the wetlands team needs to consider and examine areas where access to maintenance activities would occur.

Janet asked whether Mary was referring to areas (to consider for mitigation) that are disturbed or areas of importance for protection. Mary said that there might be areas not directly impacted by the project but vulnerable to development that the USACE could evaluate for mitigation. Matt said that Great Land Trust should be consulted because they may have looked at potential lands in the project area.

Mary asked for the deadline for comments on project documents. Betsy McGregor (AEA) said that the deadline was May 31, 2012 and that agencies should focus on the study plans and study requests instead of comments on the PAD. Betsy said that she would send Mary the wetlands mapping study presentation.

Bob said that he had looked at the MSB's Wetland Functional Analysis. Bob said that he was impressed by the ability to use GIS to give consistency for the evaluation, but that he didn't see the data basis. Robin said that that Gracz's Cook Inlet model was the basis for the analysis.

Matt said that the Watana project would need to use a new wetland classification for this new region (upper Susitna Basin). Matt said that the team would need to start out with landscape position in the office, gather field data that has functional characterizations, and from the data get an idea of wetland functions. Matt said that the GIS exercise is simply an attribution of the work done. Matt said that the project could have data that are collected outside of the wetlands work that could help with the functional assessment. He said that the functional attribution is a value-added product on top of the classification at a landscape level and is not as data intensive as it appears.

Janet said that the team needs to make sure that gathering field data doesn't take too long. Janet said that determining how to make inferences of sites that aren't visited could be tricky. Janet said that they usually visit representative wetland types, then use aerial photointerpretation to classify wetland types and determine wetland functions at sites that are not visited.

Matt said that Gracz collected field data at about 15 to 20 percent of the wetlands in the MSB's project area.

Matt said that coring the wetlands has been important procedure in the Cook Inlet model because the depth of the wetlands helps to determine many functional aspects of the wetlands including water storage. Matt said that coring is a key piece of info that is not typically collected during wetland delineation or functional assessment work in field. Matt said that the Cook lnlet Classification has been in place for many years.

Bob said that he didn't see any wetland functions concerning wildlife or wildlife habitat as well as abundance or rarity of a particular wetland type. Matt said that the Cook Inlet Classification method and the South Coastal Riverine Guidebook focus on vegetation structure (as a component of wildlife habitat). Matt said that there is an issue with the HGM Regional Guidebook because it is based on a gradient of disturbance, which doesn't make sense for many remote and undeveloped areas in Alaska. Matt said that in the Cook Inlet Classification, there is a focus on known habitat characteristics (e.g., for the three Cs: caribou, cranes, and coho [salmon]). Matt said that this methodology could be used for the Watana project, but it would need other attributions if we know the habitat requirements for various wildlife species. Matt said that right now, there isn't good enough information for wildlife to determine areas of importance. Janet said that ABR will be doing a wildlife habitat evaluation and information on wetland wildlife habitat characteristics could be obtained.

Matt said that the key to the habitat evaluation in the functional assessment is making linkages between wetland characteristics and habitat requirements of certain species. Matt said that ADF&G could provide limited data on the most important wetland characteristics. Matt said that ABR's work on Chuitna could be a model for this work. Terry said that there will be attributed habitat needs for wildlife in the project area and that it is possible to do similar a thing using wetland types. Matt said that this is the best model to figure out wildlife use of habitats.

Janet asked whether she could get information on projects that have received a permit using the Cook Inlet method because she was trying to understand how the method was used for determining compensatory mitigation for a project. Matt said that they have used the Cook Inlet wetland maps for defining wildlife habitat, but that he didn't know whether it had been used for permitting. Matt said to contact Dave Casey at the USACE Kenai Field Office. Matt said that the USACE was initiating a project to assign debits to relative ecological values 'and that there is data available that can be used to make decisions regarding compensatory mitigation.

Matt said that from what he has seen around the state, functional assessment methods are based on best professional judgment with limited field data. Matt said that he is requesting that the project decide on protocols in advance. Matt said that the standard now for determining wetland mitigation compensation is arm waving because there isn't site specific or landscape level data. Matt said that translating data to a compensatory ratio comes down to subjective decision. He wants to determine whether processes are important to certain wetlands based on as much data as possible.

Matt said that he did not think that a system like Anchorage's debit/credit methodology was needed. Matt discussed the Anchorage wetland debit/credit system. Matt said that the Mat-Su methodology determines wetland functions and values, but doesn't rank the function as high, moderate, or low. Matt said that the importance of each function is left to the person doing the analysis. Bob asked how the project would get from the compensatory mitigation ratio from the data. Janet said that the Anchorage methodology is useful in the Anchorage Bowl, but it would be difficult to use for the Susitna-Watana study area. Matt said that the key is to collect the information so that decisions can be made. Matt said that it could be basic information whether just a mapping layer or functional attributes. Matt said that agencies can come up with some list of functions and then assign a mitigation ratio based on data.

Janet said that they have considered functions based on certain development threats like the Anchorage debit/credit system; however, this might not make sense if the area isn't threatened with development impacts or if the functions would not be degraded by the impacts of the project.

Matt said that the team should look at the Cook Inlet mapping protocols because the field data collected is comparable to other methods. Matt said that the methodology requires coring and taking water YSI chemistry, but it doesn't require spending half of a day at each site. Matt said that the functional work wasn't the focus when the mapping protocols were developed and that opportunity or threat wasn't discussed. Matt said that the Anchorage method is focused on opportunities. . Matt said prefers a data driven protocol focusing on actual wetland functional values regardless of the potential specific threats to individual wetlands.

Matt said that the project has the potential for downstream effects. Matt said that the alteration of the hydrograph would affect downstream wetlands. Betsy said that riparian modeling will consider wetlands. Betsy said that the Corps has told AEA that downstream effects won't be within the Corps' permitting scope. Matt said that the EPA disagrees and that the 404 (b)(1) (of the Clean Water Act) guidelines need to be considered. Matt said that he understood that there would be riparian work, but that the same wetland mapping and functional assessment methodology should be used downstream. Janet said that they would be working with the riparian team on consistent methodology. Terry said that there would be an assessment and prediction of riparian vegetation change based on a change of flow and that downstream effects would be studied in detail. Betsy said that the modeling would be interactive and that changes to magnitude and duration of flow will be put back into the model. Betsy said that AEA is trying to reduce the potential impacts of the project through consideration of modeling.

Bob asked whether all riparian habitats would be considered wetlands. Terry said that wetlands would be a subset of the riverine system. Terry said that the combined ABR and R2 riparian team would use an integrated mapping system. Terry said that general wetland types (as classified using the ITU method proposed for the riparian study) and upland types of riparian vegetation would be mapped. Wendy said that the work would result in one product and that it would be part of one GIS system.

Bob asked how hard it would be to modify the method to meet the needs of the project area if the USACE strongly prefers the Cook Inlet method. Janet said that her main concern was that the landscape processes are very different and that many of them don't apply to the project area. Janet said that there are fundamental difference in geomorphology, climate, and precipitation between the Susitna basin and the Cook Inlet basin. Bob asked whether they would be able to develop a crosswalk between the two areas. Janet said that because they have not done fieldwork in the area, it is difficult to determine. Janet said that she could put together a matrix table showing where there are holes between the Cook Inlet method and the Watana project area wetlands.

Betsy said that it didn't make sense to try and apply a protocol that is specific to a different region. Wendy said that they could try and use Gracz's field methodology on the different wetland types. Janet said that the method would have to change a bit. Wendy asked whether there was a document that describes the Cook Inlet field methods. Bob said that he would check to see whether Betsy McCracken (USFWS) might know.

Terry asked whether Matt strongly supported using the Cook Inlet method for the Watana project because it would likely involve creating new wetland types nomenclature. Terry said that there might need to be some collaboration with Mike Gracz, which could change the scope of work significantly. Matt said that from the EPA's perspective, the Cook Inlet classification is good and he encourages its use. Matt said there could be development of different ecosystem types for the project area. Matt said that the field protocol is not documented and that the team should contact Mike Gracz to obtain the field protocols.

Matt said that the EPA wants regionally specific mapping that can have attributed functions.

Bob said that he was a little hesitant about using one method to come up with another region's method. Terry said that the Alaska Range is a transitional region. Bob said that there would be different kinds of wetlands because of higher elevation sites with landcover more typical of Interior Alaska.
Janet confirmed that there was no Interior Alaska classification system that could be used. Bob said that wetland functional assessment methods weren't that important until the Corps' Mitigation Rule came out.

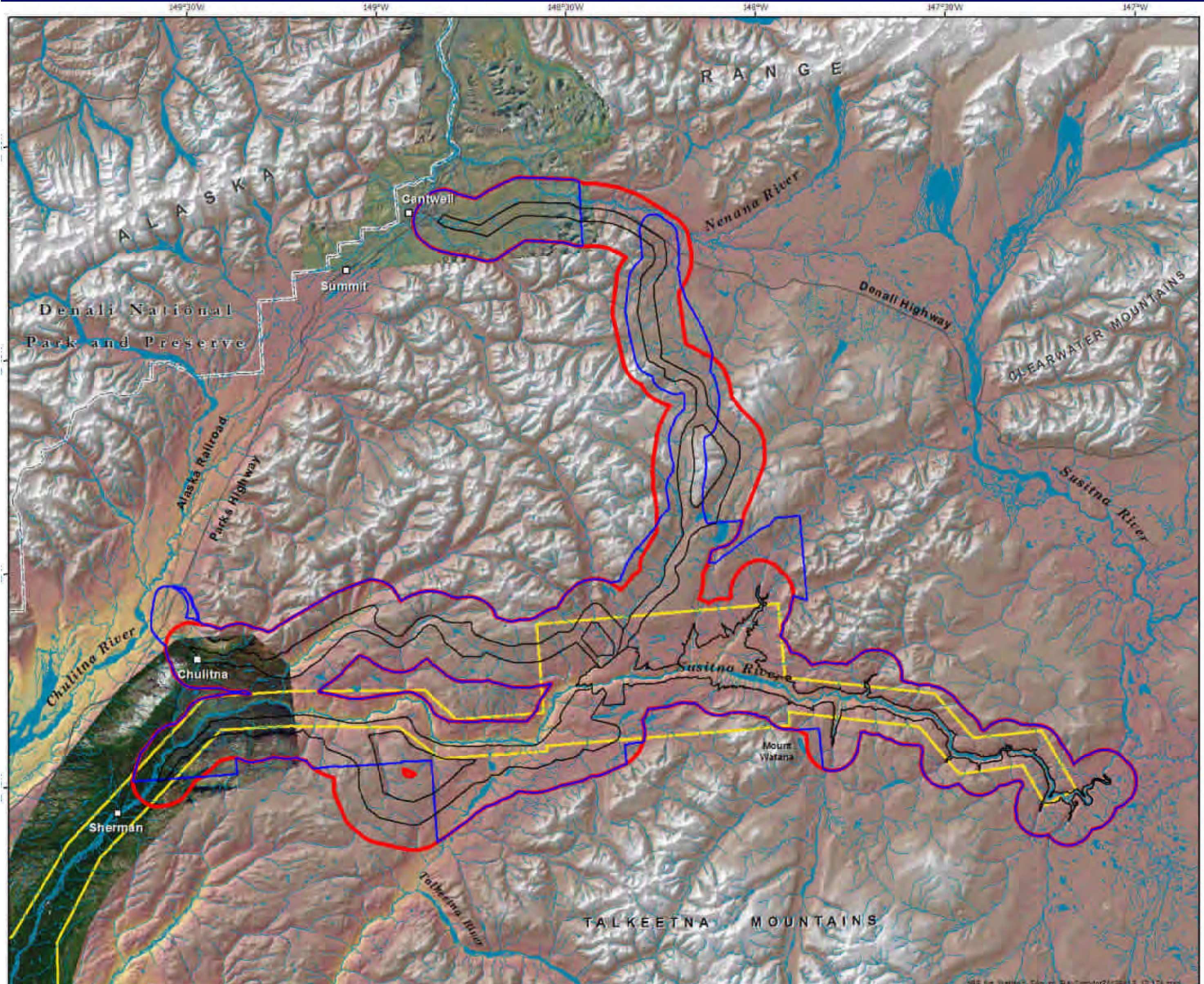
Bob said that the EPA is concerned with the downstream indirect effects and asked whether the mapping existed already in the lower watershed. Terry said that there are no jurisdictionally mapped wetlands in the area. Terry said that there will be significant amount of study downstream. Betsy said that the riparian work would be done below three rivers and that AEA never intended for studies to end at middle river.

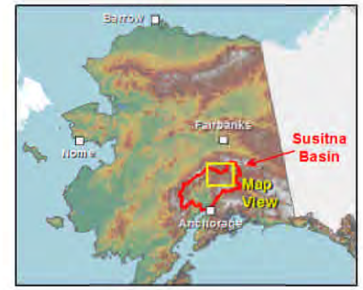
Terry said that the study area has not been defined. Terry said that they have proposed study areas for the study plans, but that the parties need to come to a consensus. Terry said that Willow is the proposed downstream study area limit for the riparian vegetation study, but this isn't set in stone. Bob said that the farther you move downstream, the harder it is to see project impacts. Betsy said the project is installing pressure transducers out to figure out flow and ice processes are being studied.

Susitna–Watana Hydroelectric Project—Wetland Classification and Functional Assessment Methodology

Wetlands Mapping Goals

- Classify and map wetland types to determine current baseline conditions in the project area
- Determine functional value of each mapped functional wetland type
- Quantify the potential direct and indirect impacts to wetlands and wetland function from Project construction
- Provide data that satisfies Section 404 wetland permitting requirements
- Facilitate the development of protection, mitigation, and enhancement (PME) measures to minimize project impacts to wetlands and wetland function





Preliminary Project Area (4/13/2012)

Wetlands Study Area (2-mi Buffer of Project Area)

National Wetlands Inventory Footprint (Clipped)

MatSu LiDAR/Imagery Acquisition Footprint

Map notes: Wetlands mapping is from draft digital conversion of NWI maps produced by USFWS in 1984 from vegetation mapping conducted in 1982 for the original Susitna Hydroelectric Project. Draft data were provided courtesy of the USFWS NWI office in Anchorage, AK, for presentation purposes only.

Imagery from WMS-compliant map server provided by the Alaska Mapped program (http://www.alaskamapped.org) and UAF-GINA (http://www.gina.alaska.edu).

Cantwell area imagery is Denali 2006 Orthophotography; Chulitna River corridor imagery is summer 2010–2011 RapidEye; Matsu LiDAR and associated imagery will become available in 4–6 weeks.

Projection: Alaska Albers NAD 1983
Date Created: 4/17/2012
Map Author: ABR, Inc. - Allison Zusi-Cobb

0 5 10 15 mi
0 5 10 15 20 25 km

ABR inc.

ALASKA ENERGY AUTHORITY

SUSITNA-WATANA HYDROELECTRIC PROJECT

Wetlands Mapping Study Area and Available and Pending Imagery in the Susitna-Watana Project Area

Figure 1

Wetland Classification Protocol Comparisons

Cook Inlet Classification

Hierarchical, ecosystem-based system combining vegetation and hydrogeomorphic properties (geomorphic setting, water source, and hydrologic flow)

Intended as a regional wetland management tool for the Kenai and Mat-Su boroughs

Cowardin Classification (NWI notation)

Hierarchical system that includes landscape setting, vegetation structure, and limited hydrologic characteristics, with the option of providing modifiers to further distinguish wetland classes

Intended as a standardized nationwide wetland classification system for general comparisons

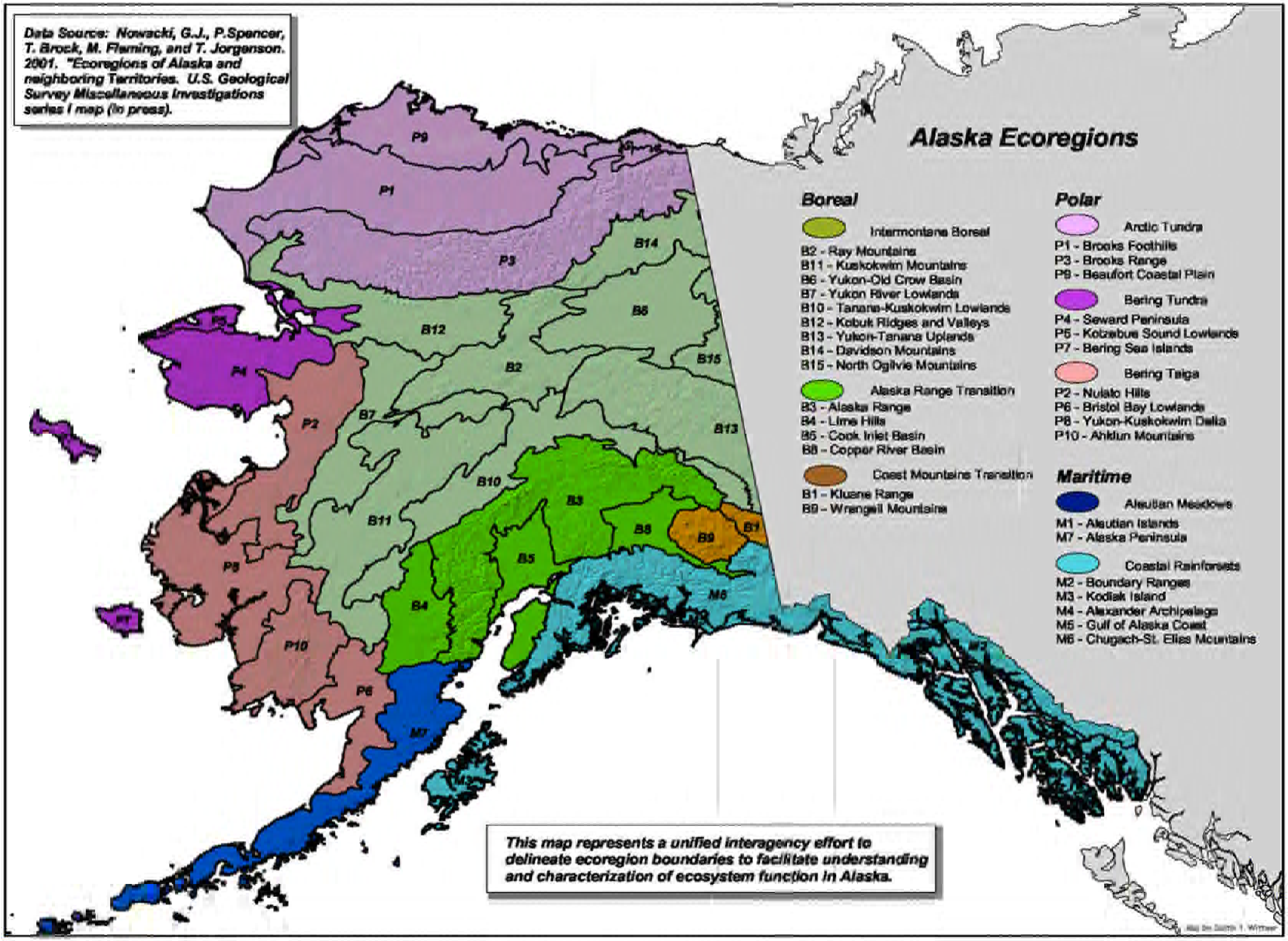
Cook Inlet Classification System

Advantages

- An ecosystem-based model for classifying wetlands that reflects wetland landscape position and water controls
- Allows for more site-specific analysis of wetland form and function than Cowardin system, and for developing plant species-habitat associations.

Disadvantage

- The Cook Inlet classification method is confined to wetlands occurring in the Cook Inlet Basin ecoregion. The Susitna-Watana project area falls within the Alaska Range and Tanana-Kuskokwim Lowlands ecoregions. Origins of the surficial deposits within these three ecoregions vary greatly.



Data Source: Nowacki, G.J., P.Spencer, T. Brock, M. Fleming, and T. Jorgenson. 2001. "Ecoregions of Alaska and neighboring Territories. U.S. Geological Survey Miscellaneous Investigations series I map (in press).
Alaska Ecoregions
Boreal
Intermontane Boreal
B2 - Ray Mountains
B11 - Kuskokwim Mountains
B6 - Yukon-Old Crow Basin
B7 - Yukon River Lowlands
B10 - Tanana-Kuskokwim Lowlands
B12 - Kobuk Ridges and Valleys
B13 - Yukon-Tanana Uplands
B14 - Davidson Mountains
B15 - North Ogilvie Mountains
Alaska Range Transition
B3 - Alaska Range
B4 - Lime Hills
B5 - Cook Inlet Basin
B8 - Copper River Basin
Coast Mountains Transition
B1 - Kluane Range
B9 - Wrangell Mountains
Polar
Arctic Tundra
P1 - Brooks Foothills
P3 - Brooks Range
P9 - Beaufort Coastal Plain
Bering Tundra
P4 - Seward Peninsula
P5 - Kotzebue Sound Lowlands
P7 - Bering Sea Islands
Bering Taiga
P2 - Nulato Hills
P6 - Bristol Bay Lowlands
P8 - Yukon-Kuskokwim Delta
P10 - Ahklun Mountains
Maritime
Aleutian Meadows
M1 - Aleutian Islands
M7 - Alaska Peninsula
Coastal Rainforests
M2 - Boundary Ranges
M3 - Kodiak Island
M4 - Alexander Archipelago
M5 - Gulf of Alaska Coast
M6 - Chugach-St. Elias Mountains
P9
P1
P3
B14
B6
B12
B2
B15
B7
B13
B10
B3
B11
B8
B9
B1
B5
B4
M6
P2
P4
P8
P10
P6
M7
This map represents a unified interagency effort to delineate ecoregion boundaries to facilitate understanding and characterization of ecosystem function in Alaska.

Cowardin Classification System

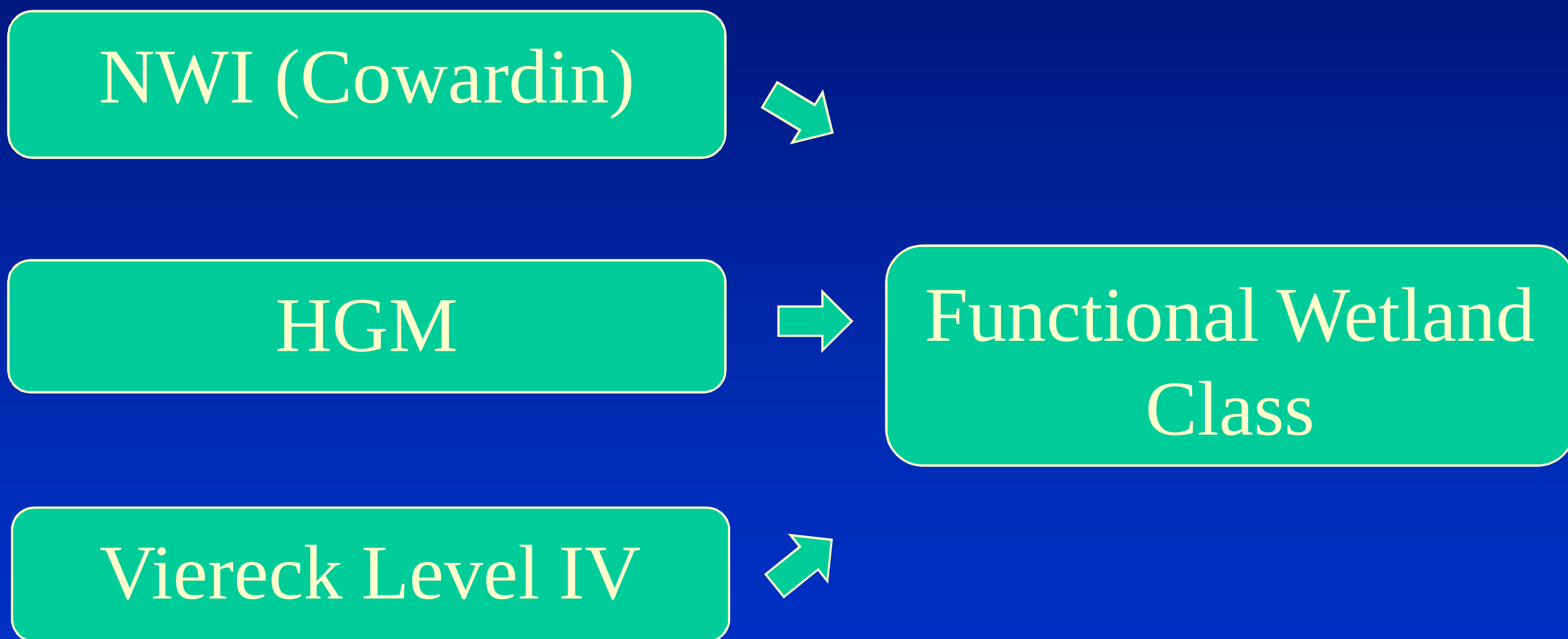
Advantages

- System that is commonly used and understood by resource agencies
- Provides quick synopsis of landscape setting, vegetation structure, and hydrology for wetland type
- Can limit the number of classes generated by combining wetland classes into Cowardin functional groups.

Disadvantages

- Classification is so general that one class can include several wetland habitats with contrasting plant community composition and soil characteristics
- Does not include regional influences on wetland function

Proposed Approach to Susitna – Watana Wetland Classification



Susitna-Watana Wetland Classification

- Incorporates regional wetland characteristics unique to the Susitna watershed
- Includes wetlands naming conventions that are familiar to resource agencies
- Provides link to habitat classification
- Allows for more meaningful wetland functional assessment

Wetland Functional Assessment as Part of the Section 404 Process

- Identify development alternatives that result in the lowest impacts to wetlands in terms of functional value
- Determine the magnitude of the effects of potential impacts
- Develop mitigation plans to compensate for losses in wetland function

Wetland Functional Assessment Methodology Requirements (from Smith et al. 1995)

- Standardized methods
- Applicable across study area
- Inclusive of all wetland types and functions
- Compatible with time and resources available
- Sensitive to potential impacts
- Addresses agency and other stakeholder concerns
- Capable of incorporating new data or changing project requirements

Functional Assessment Methodologies

- **Corps Regulatory Guidance Letter (2009)—**relatively rapid assessment method that allows for flexibility in classification method and relative rankings useful for determining the wetland category but is fairly subjective;
- **HGM methodology—**semi-quantitative with detailed field assessment protocols designed to increase repeatability, but
  - ❖ typically region specific or limited to a subset of HGM wetlands classes (e.g., slope and organic flats)
  - ❖ Impractical for a project of this size and would require developing impact analysis models to assess changes in function for reference wetlands (the Susitna-Watana study area comprises predominantly undisturbed, reference wetlands).

Functional Assessment Methodologies – Continued

Mat-Sue Wetland Functions and Values—GIS based methodology recently developed for the Mat-Su Borough

- designed to be repeatable and would be suitable for this project, where limited wetlands field data exists currently.
- Allows for better integration with other GIS layers (e.g., DEM, wetland and wildlife habitat classes, hydrography, project footprints)
- Main concern is need to consolidate function maps into layers that can be used to develop categories of wetland value for mitigation planning
- Need to develop limited set of functions that reflect Susitna-Watana landscape and stakeholder interests

Wetland Functions

2009 Alaska Regulatory Guidance

- Flood flow alteration
- Sediment removal
- Nutrient and toxicant removal
- Erosion control and shoreline stabilization
- Production of organic matter and its export
- General habitat suitability
- General fish habitat
- Native plant richness
- Educational or scientific value
- Uniqueness and heritage

HGM (Slope/Flat Wetlands)

Cook Inlet Basin

- Discharge of water to downgradient systems
- Surface and shallow subsurface water storage
- Particulate retention
- Organic carbon export
- Cycling of elements and compounds
- Maintenance of characteristic plant communities
- Maintenance of characteristic habitat structures
- Interspersion and connectivity

Interior Alaska

- Soil Profile Integrity
- Characteristic Soil Thermal Regime
- Surface and Near Surface Water Storage
- Cycling of elements and compounds
- Organic carbon export
- Plant Community
- Faunal Habitat Components
- Interspersion and connectivity

Mat-Su Wetlands Functions and Values

- Contribution to groundwater
- Transmission of groundwater
- Streamflow moderation
- Floodflow alteration
- Sediment/Toxicant/Pathogen retention
- Sediment shoreline stabilization
- Nutrient removal/Retention/Transformation
- Foodchain support
- Anadromous fish habitat
- Habitat and maintenance of biodiversity
- Habitat for species of interest
- Recreation
- Consumptive uses
- Education
- Visual quality/Aesthetics
- Cultural and historical significance
- Uniqueness

SUSITNA–WATANA HYDROELECTRIC PROJECT

COMMUNICATION RECORD

Meeting or Phone call (underline)

Date / Time: 4/19/2012, 2:00pm

Participants: Wendy Davis ABR, Inc. (907)344-6777 X 203
Mike Gracz, Kenai Watershed Forum (907) 235-2218

Subject(s): Use of the Cook Inlet Wetland Classification for mapping the Susitna-Watana study area.

Conclusions: We discussed the general applicability of the existing Cook Inlet protocol for the entire Susitna-Watana study area. Mike thought that much of the surficial geology of the study area was composed of quaternary deposits in lowland settings and had a high probability of containing peatlands and other lowland wetland types featured in the existing classification. However he expressed reservations about its applicability to areas of discontinuous permafrost in particular. I asked him if he thought that the classification could be expanded to include all areas in question but because of the general lack of data for the area he couldn't really confirm one way or another if his methods could be expanded to work in areas where the wetland genetic processes are different from the Cook Inlet. He reserved comment until he could see the area. I also asked if he had any documentation on his methodology beyond what is available on Cookinletwetland.info. As of yet there is no fully compiled methodology for the comprehensive field methods and classification scheme. We discussed the possibility of him participating in our next wetland meeting with agency participation. Mike was willing to participate in one meeting. I also clarified that we have no set mechanism in place to compensate him at this point and we would have to pursue that if further collaboration with Mike was requested.

Action Items: Contact Mike for participation at the next Susitna-Watana agency meeting, not currently scheduled but tentatively planned before the 1st week of May.

Prepared by: Wendy Davis

Wendy Davis <wdavis@abrinc.com>

USACE meeting next week

Michael Gracz <mike@kenaiwatershed.org> Fri, Apr 27, 2012 at 1:20 PM
To: Wendy Davis <wdavis@abrinc.com>

Hi Wendy,
OK I should be around on Wednesday, and near a reasonably fast connection to the internet

Let me know the urls of the broken links and I'll fix them, although there are now more "Ecosystems" than in the original key (i'm starting to refer to them as "Geomorphic Components"), and I haven't updated the key yet. When I get closer to finishing the mapping I plan on re-writing all of what is written on those pages. This project started as a Kenai Peninsula project, and I did not anticipate that it would carry further. The plant community classification was never a big priority, it just a way to organize the data from the start, during the pilot years of the project, before the wetland classification had been invented.

The respective keys are near the bottoms of these pages:
Geomorphic components: http://www.kenaiwetlands.net/EcosystemDescriptions/Intro.htm
Plant communities: http://www.kenaiwetlands.net/plant_community_classification_i.htm

The text is pretty outdated on these pages, so please read with generosity! But the keys should work, at least for what I mapped on the Kenai.

The mapping sheet: "Wetlands and Climate" on this page is a more recent effort: http://www.cookinletwetlands.info/Downloads/Downloads.htm

I think that the primary objective should be to have a wetland classification and mapping that could be relatively seamless with what is being/already mapped, because anything that you do may someday become contiguous with what I've been working on. I have been mapping the MatSu at 1:18,000.

I use the data sheets from the 2007 Alaska Regional Supplement to the delineation manual. I don't fill that data form out exactly, but lots of it. For example, I never calculate Plant Prevalence Index in the field, I do that in MSAccess. I use the soil profile section on that data sheet to describe the peat profile generally: the thicknesses of organic layers when they change among the basic classes that NRCS uses (Fibric/Hemic/Sapric), and then the presence and thickness of observable tephra layers, and the texture of the underlying mineral soil. Most sites are peat, but I'll describe the soil profile when it's mineral.

I do record some mapping info on a separate sheet, which changes year-to-year (most current version attached). For example, some years I have collected lots of water samples. Other years I have done a more rigorous mapping accuracy assessment. Other years have focused on rapid mapping. Lately I have settled on collecting at least a photo, plant cover, pH, specific conductance (the latter two with a YSI 63 meter calibrated each sample), along with the correct mapping unit name, and notes. Additionally, I almost always describe the peat profile and underlying mineral substrate (unless the latter is more than 5 meters below the surface). I record both the mapping unit of the polygon and the composition of the area around the plot (hole)- for example the entire polygon may be mapped as an LB24, but perhaps I'll be sampling in an LB4 area of that polygon. I'll also carry along aerial photos printed from ArcView at 1:12,000, which I use for field navigation and to edit my linework. Those photos have the provisional wetland linework, with all of the polygons numbered. The polygon numbers are the unique identifiers that tie the data together. Especially when collecting lots of water samples, data sheet management in the field sure becomes an issue!

Occasionally I'll titrate alkalinity in the field with a Hach "Digital Titrator", especially when collecting a water sample, or if I find an especially interesting or under-represented site. I also usually have a few bottles in a

Meeting Summary
Susitna-Watana Hydroelectric Project Licensing
Wetlands Delineation and Mapping
2012/2013-2014 Study Plan Development
May 2, 2012 9:00 am
AEA Project Offices, First Floor Conference Room
411 W 4th Avenue, Anchorage, AK

Attendees:

Organization	**Name**
EPA	Matt Lacroix
Kenai Watershed Forum	Mike Gracz (on phone)
USACE	Estrella Campellone (on phone)
USACE	Mike Holley (on phone)
USACE	Mary Leykom (on phone)
USFWS	Mike Buntjer (on phone)
USFWS	Bob Henzley (on phone)
AEA	Wayne Dyok
AEA	Betsy McGregor
ABR, Inc	Terry Schick
ABR, Inc.	Janet Kidd
ABR, Inc.	Wendy Davis
MWH	Kirby Gilbert
Solstice Alaska Consulting, Inc.	Robin Reich
VanNess Feldman	Matt Love

Janet Kidd (ABR) said that this is the second meeting to talk about the wetland classification methodology and functional assessment strategy for the Watana-Susitna Hydroelectric Project. She talked from a PowerPoint presentation attached to these notes.

Wetlands Classification System Questions/Discussion

Janet discussed the Susitna-Watana Hydroelectric Project wetland mapping goals and the proposed study area for the work. Janet said that the ABR Team reviewed a number of wetland mapping methods for the project, including the Cowardin Wetland Classification System and the Cook Inlet Wetland Classification System. She discussed the advantages and disadvantages of using the Cook Inlet Classification System on the project. Janet said that after talking with Mike Gracz and understanding the project area, ABR determined that some of the Project area wetlands are likely different from the wetlands described in the Cook Inlet Classification System. She said that other wetland classification methods don’t fit the Project area perfectly either.

Mike Gracz (Kenai Watershed Forum) asked at what scale the on-screen mapping would be completed. Janet said that for the detailed wetland mapping, 1 to 3,000 would be used. For the broader wetland mapping effort, 1 to 10,000 or 15,000 would be used. Mike Gracz said that was a fine scale and said that for the Cook Inlet Wetland Classification effort in the Matanuska-Susitna area, he used 1:18,000.

Janet said that the ABR Team is proposing to use a system that combines the Cowardin classification (National Wetland Inventory [NWI]), Hydrogeomorphic (HGM) classifications, Cook Inlet Classification, and Viereck Alaska Vegetation Classification Level IV to come up with wetland functional classifications. Janet said that this system would incorporate wetland characteristics which are unique to the Susitna watershed. She said that it would include wetlands naming conventions that are familiar to agencies and would provide a link to habitat classification occurring on the project. Wendy Davis (ABR) said that ABR used this wetlands classification for a successful delineation in the Frog Lake area of the Mat-Su.

Matt LaCroix (EPA) said that as long as the Cook Inlet Classification code could be applied, the proposed wetlands classification methodology would be acceptable. Wendy said that there might be some wetlands where the Cook Inlet code would not apply. Mike Gracz said that he would be willing to prepare a cheat sheet comparing the two systems' codes based on aerial photography.

Janet said the field effort would include more vegetation delineation to Viereck Level IV to assist with the wildlife habitat map. She said for ecosystem level map production, the team would have to combine wetland types. Mike Gracz said that he had combined ecosystem levels to a dozen or so geomorphic types, which is the top level, but that the vegetation component of the classification are broad categories of species assemblages not focused on plant community structure.

Matt said that for habitat types, he would need more details. Matt said that the team might be able to cross attribute the wetlands boundaries together with the wildlife/vegetation habitats boundaries. Terry Schick (ABR) said that the team would map fine scale geomorphology, physiography, and vegetation types then aggregate the fine scale mapping components into wildlife habitats that could then be linked to species use data collected by the wildlife biologists.

Mike Gracz said that it would be good if the Cook Inlet Classification codes were included in the Project area shape files, so the Matanuska-Susitna Borough (MSB) could combine it with their existing mapping. Janet said that was the plan. She said that for wildlife habitat map production, the Cook Inlet classes might be aggregated.

Matt said that from his perspective, the exact classification in the wetland coding isn't as important as the meaning. He said that beyond the requirements Section 404 of the Clean Water Act, there is the National Environmental Policy Act (NEPA) and Federal Energy Regulatory (FERC) process. He said that we need to understand functions for each wetland ecotype. He said that the Cook Inlet Classification has data and rationale that can explain wetland functions.

Janet said that the study methodology needs to be able to document the delineation and classification process and make inferences about functions. Matt said that the wetland team will be collecting plenty of data. He said to make sure there are no sweeping characterizations of wetland functions without supporting data.

Mary Leykom (USACE) said that the U.S. Corps of Engineers (USACE) is fine with the wetland delineation methodology that AEA is proposing. Mary said that the USACE's focus is on wetland delineation and functions crosswalks to other classifications or wildlife habitat mapping.

Mike Gracz said that bogs are a very specific landform with specific characteristics. He said that there are likely few bogs in the Project area, and the team should make sure delineated bogs are in fact bogs.

Betsy McGregor (AEA) asked if determining wetland functions and values would be tied to the wetland classification system. Janet said that the goal would be to collect enough data to determine functions using the proposed classification system.

Wetland Functional Assessment Methods Discussion

Janet discussed wetland functional assessment methodologies that were considered for the Project including HGM (Slope/Flat Wetlands), Mat-Su Wetlands Functional Assessment, and the Magee-Hollands Wetland Functional Capacity. Janet said HGM method is not well-suited for the Project. She said that the Mat-Su method hasn't been field tested. She said that the Magee-Hollands method makes the most sense because it fits the Project area well.

Matt said that agencies looked into a number for functional assessment methodologies for the Mat-Su Wetlands Functional Assessment effort. He said that the issue is that Alaska doesn't have reference wetlands because most sites are considered pristine (or reference sites). He said that peatlands are common in Cook Inlet and the functional assessment assumptions don't work well for them. Matt said that he was concerned that functional models might not be well calibrated for types of wetlands in the Project area.

Mike Gracz said that the Magee-Hollands Wetlands Functional method is HGM based and was meant to work on a level of disturbance gradient. He said that without the disturbance gradient, we are left with developing a new model.

Matt said that the team needs to think about and be sure to identify wetlands with rare plants or wetlands that are extreme diverse or support high populations of breeding birds. Janet said that the ABR team is doing those types of studies.

Mike Gracz said that he was very involved in the Mat-Su Wetlands Functional Assessment and the Regional Guidebook for sloped/flat wetlands. He said that none of the functional assessment methods have been field tested. He said that the Mat-Su Functional Assessment was intended to be used on the landscape level for planning purposes.

Matt said the Mat-Su Functional Assessment findings have not been ground-truthed to determine how well the assessment methodology works; however, it helps agencies and developers make informed decisions. He said that when a project is planned, an onsite wetlands functional assessment would be required. Matt said that a certain percentage of the wetland sites would need to be visited for the Susitna-Watana Hydroelectric Project effort.

Matt said that he liked Magee-Hollands data form. Janet said that the Magee-Hollands method requires 2 to 3 hours at each site.

Matt said that one downfall of functional assessment methodologies is that there may be less variation between than within the functional classes. He said that the team needs to take care that the input wetland classifications for a functional assessment method be representative of distinct functioning wetland types..

Mike Gracz said that HGM classification was was not intended to measure natural variability. He said that the method is intended to measure human impacts on wetlands. Matt added that all undisturbed wetlands do not function at the same level.

Matt said that the key was to decide what variables to measure and what data to collect in the field. He said that the team should not collect a bunch of information and then not use it. He said that whatever assessment is developed should be used for the NEPA document and permitting. He said that the team should determine what information to collect, why it is important to collect, and what it says about the wetland functions at the site. He said that ABR’s wildlife habitat assessment methodology is a good example of the appropriate use of data in a NEPA analysis..

Matt said that he agreed that the Mat-Su Functional Assessment Method considers too many functions. He said that the team should consider the potential project impacts and what is important to the area to determine which functions to measure. He suggested developing the functions list first and using that to develop the list of field variables to be measured.

Mike Holley (USACE) said that the Project could drop the HGM from further consideration. He said that the USACE would like to expand on the Mat-Su Functional Assessment methods that have been developed rather than develop a new method. He said that he was not familiar with the Magee-Hollands method. Mary said that she agreed with Mike Holley.

Mike Gracz said that it would be nice to have an area on the data forms were the Cook Inlet wetland type would be documented.

Betsy McGregor (AEA) asked whether there were other field measurements needed. Matt said that for the NEPA analysis, information regarding wetland functions is important to document direct, indirect, and cumulative impacts. He said that for the functional assessment, wetland functions are being scored to offset impacts to functions and guide mitigation decisions.

Janet said that the next steps are to come up with a list of function list and look at the Magee-Hollands method to see whether it could be used to determine those functions. Mary said that the strategy seemed reasonable to the USACE.

Matt said that it is tough to develop a functional assessment method there is not a good model or good data for the Project area. He said it is important that the functional assessment method is repeatable. He said that the key is collecting the correct information to determine wetland functions.

Wendy said that it would be good to put Cook Inlet Method's geomorphic components on the form.

Matt said that the Magee-Hollands data form is good to use as a base and Mike Gracz agreed. Mike Gracz said that a finer resolution might be needed. Mike Gracz said that as a starting place, it would be helpful to look at some of the variables that have been measured with the Cook Inlet Classification method and have been used to determine wetland functions. He said that pH, conductance, and temperature were measured in the field using a meter.

Janet said that the various other Project studies, including hydrology, will help to fill in gaps in some of the areas.

Matt said the modification of stream flow is an important wetland function. He said that there is a much greater storage capacity outside the floodplain within wetlands.

Mike Gracz said that water chemistry data may be important to collect. He said that isotope data will help to understand wetland geo/hydro functions. He said that this information can be collected from peat column layers. Matt said that the outputs within the peat profile have been very helpful in understanding peat hydrology. Janet asked how the data would help understand wetland functions. Matt said the information was collected to understand specific trends and more research is needed to understand the overall relevance to wetland function.

Matt suggested that if we see discontinuous permafrost, we should do coring to figure out whether there are an ice lenses (ice rich permafrost) or frozen soil. He said that the ice depth probably can't be determined using this method. He said understanding permafrost is important, especially if a road is planned in the area. Janet said that ABR had done this in the past. Betsy said that geomorphology information is being collected for this purpose. Wayne said that AEA was doing geotechnical work within the road corridor/road design to help with avoiding permafrost areas.

Wayne said that the Alaska Department of Transportation and Public Facilities (ADOT&PF) is drafting a report detailing the permafrost along the Project alignment. He said that ADOT&PF has identified kettle lakes within the Project alignment.

Wayne said that the USACE has stated that they are focused on the dam and upstream areas of disturbance. He asked whether AEA should be doing the same level of wetland mapping downstream.

Matt said that the USACE and FERC will have to figure out direct, indirect, and cumulative impacts to comply with NEPA. He said that the flow modeling and riparian assessments will help to understand the downstream indirect and cumulative impacts. He said that the locations of downstream wetlands need to be documented. Matt said that Mike Gracz has riparian wetland classifications that could be applicable in the lower Susitna. He said that the functions of many of the riparian wetlands have been determined using the Mat-Su Functional Assessment method.

Janet said that the riparian study will capture downstream wetlands information. Matt said that he would like to know what percent of the riparian area are wetlands.

Janet confirmed that Viereck Level IV information would be collected at all sites. Terry said that for vegetation mapping effort, successional vegetation types would be mapped at a more detailed level. He said that species percent cover would be collected for all plant community types, including wetlands.

Bob Henzley (USFWS) said that the riparian community has the potential to be impacted by the Project causing a different flow regime. Terry said that wildlife habitats and successional riverine habitat types would be determined in the riparian area. Janet said the goal of the riparian vegetation study was to revisit previously studied riparian sites if they can be located. Matt said that at a fine scale, changes in vegetation might look like major changes, but at a larger scale it might not mean much. Wayne said that the Team will look at the 1980s data and look at the larger scale using aerial photographs. He said that there is value in looking at the 1980s data.

Janet said that there is existing broad scale NWI mapping and there was some vegetation mapping that could be used from the past; however, most of the mapping was done in the upper basin, and there could be issues with matching up lines in GIS. Terry said that the Team must determine whether the information can be used within GIS. He said that the ADF&G has continued to collect moose habitat data in the upper basin which could be brought into GIS pretty easily.

Betsy asked whether the wetlands classification and functional assessment methodology designed for the upper basin would be required in the lower basin. Matt said that if there are wetlands in the lower basin, the same ecotypes that are used for the vegetation mapping could be used. He said that the same data sheet could be used in the lower basin.

Janet said that ABR was not planning on filling out the Corps' Wetlands Regional Supplement data forms in the lower basin. Matt said that whether areas are jurisdictional wetlands not at issue, and that it was not important to do the jurisdictional wetlands determinations. He said that the Team should just assume the all the wetlands areas are jurisdictional.

Betsy said that the USACE stated that they were only interested in classifying wetlands within the directly impacted area. Matt said that the USACE will need to identify downstream indirect effects to wetlands whether or not the wetlands are jurisdictional.

Betsy asked how far out of the riparian zone the wetlands would need to be mapped. Matt said that all of the floodplain zone should be mapped. Matt said that the river corridor area should be mapped with a buffer because the floodplain boundary is difficult to determine unless there is a distinct terrace.

Betsy said that AEA was proposing to map vegetation within the 100 year floodplain. Matt asked whether the floodplain area had been determined and said that it was always good to buffer areas of study. Terry said that the riparian vegetation study area had not been determined and would probably have a study area buffer. Matt said that the downstream vegetation mapping limit should be established from questions about project impacts. He said that, for example, there may be questions regarding whether the Project would impact the State Game Refuge, and if the answer can't determine with existing information, AEA would need to collect the data. Wayne said that the study area would need to be large enough to assist with modeling. He said that AEA did not want to have data gaps that would lead to additional studies.

Janet said that it sounded like there was flexibility in the wetlands functional assessment method as long as the wetland team correlated the information back to the Cook Inlet Classification System. She asked whether the proposed Magee-Hollands Data forms were acceptable. Matt said that the EPA did not have a data form that they used or preference. Betsy said that the form might be changed after the first year.

Bob asked whether there would be any overlap between wetlands classification systems. Janet said that the focuses of the classifications are different, but that it would not be hard to come up with a crosswalk between the methods. She said that the Cowardin Wetland Classification System is good at a higher scale or a national level and should be included in the methodology. Wendy said that the crosswalk between systems was tested, and it works because ABR would be collecting much of the needed information for the habitat mapping effort. Matt said that the two studies (wetlands and habitat mapping) would reinforce each other. Janet said that it would increase their field effort, but that they should be able to make inferences about sites that aren't visited.

Mike Gracz asked whether AEA would consider isotope measurements. He said that measuring isotopes would show how much evaporation might be dominating the system on the day you collect the data.

Other/General Discussion

Betsy asked about project impacts to salinity and how they could be determined. Wayne said that in the 1980s, we determined that initial filling of the Susitna Flats could have impacts to salinity. Betsy said that the water quality people would need to determine salinity impacts. Matt said that a common effect of similar projects is the loss of intertidal area. He said that sometimes you will see subsidence of river deltas because there is less sediment transport downstream; however, modeling would be needed to determine the impacts. Wayne said that the sediment transport study would be completed. Matt said that the Project could cause the blocking of (decreased) sediment from upstream and increased sediment loads from winter flow; therefore it is possible that there could be no net effect. Wayne cautioned that the additional winter flows added to the existing flows might not have an effect, but that modeling would help to determine the impacts.

Matt said that the EPA will not be submitting study requests. Betsy said that AEA's goal is to have the study requests close to final by May 4th for submission to FERC on May 15. She said that some agencies have said that they will references the AEA-produced study requests and other agencies are planning on submitting their own study requests. Mike Buntjer (USFWS) said that the USFWS was pulling together study requests. Terry said that the agencies' study requests did not need to be extremely detailed. Wayne said that he thought that most of AEA's study requests were close to agencies' expectations. He said that the only issue he saw was the number of years of data collection proposed by AEA.

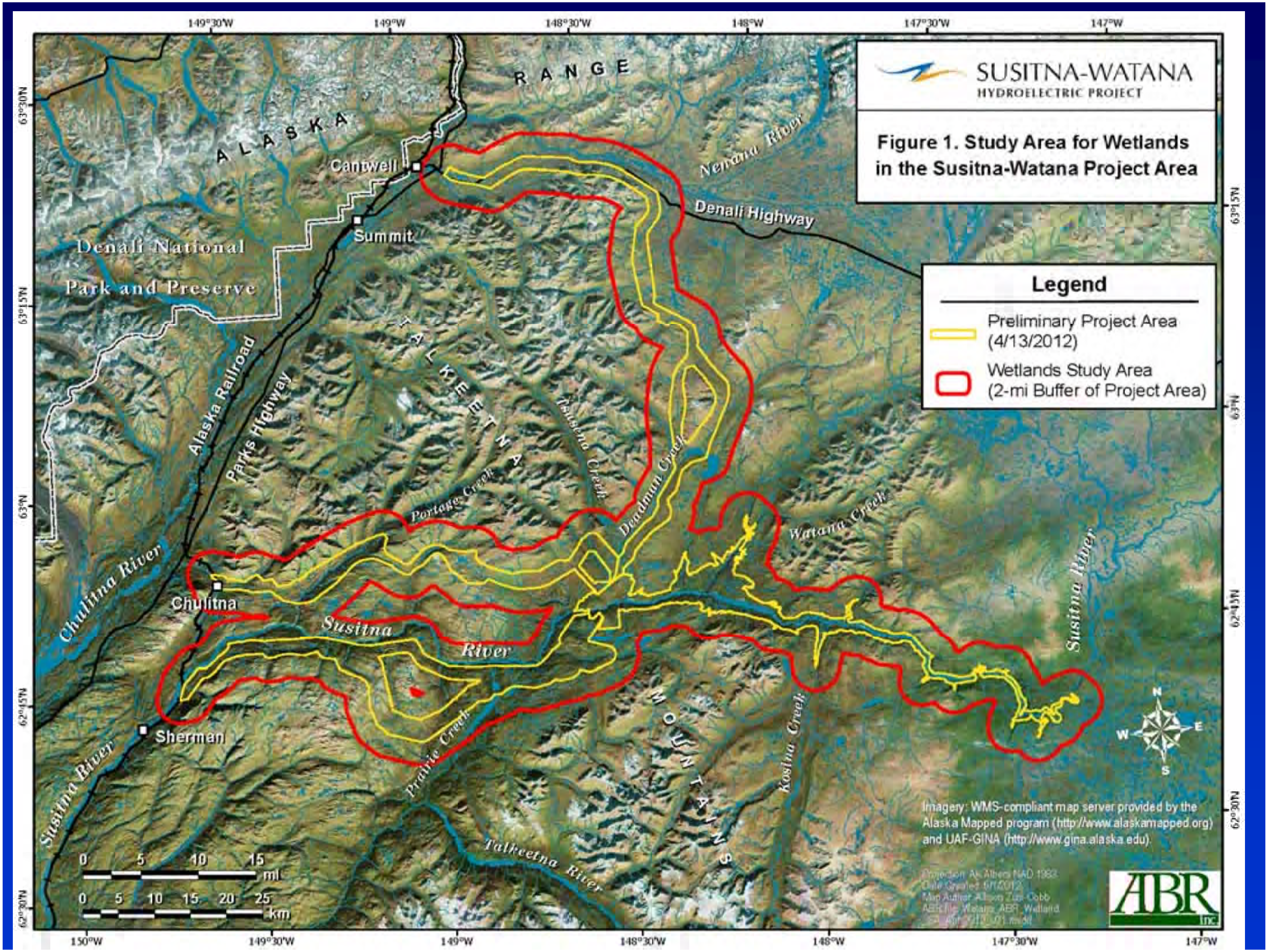
Betsy said that questions remained about the study area and the size of buffer areas. Betsy said that FERC would like to see the study area in the study requests. Terry asked whether the study areas could be modified pending the results in the 2012/13 studies. Betsy said that the study areas could be modified later as long the decision making process was documented. Wayne said that the year-end study reports could end up justifying the study plan modifications.

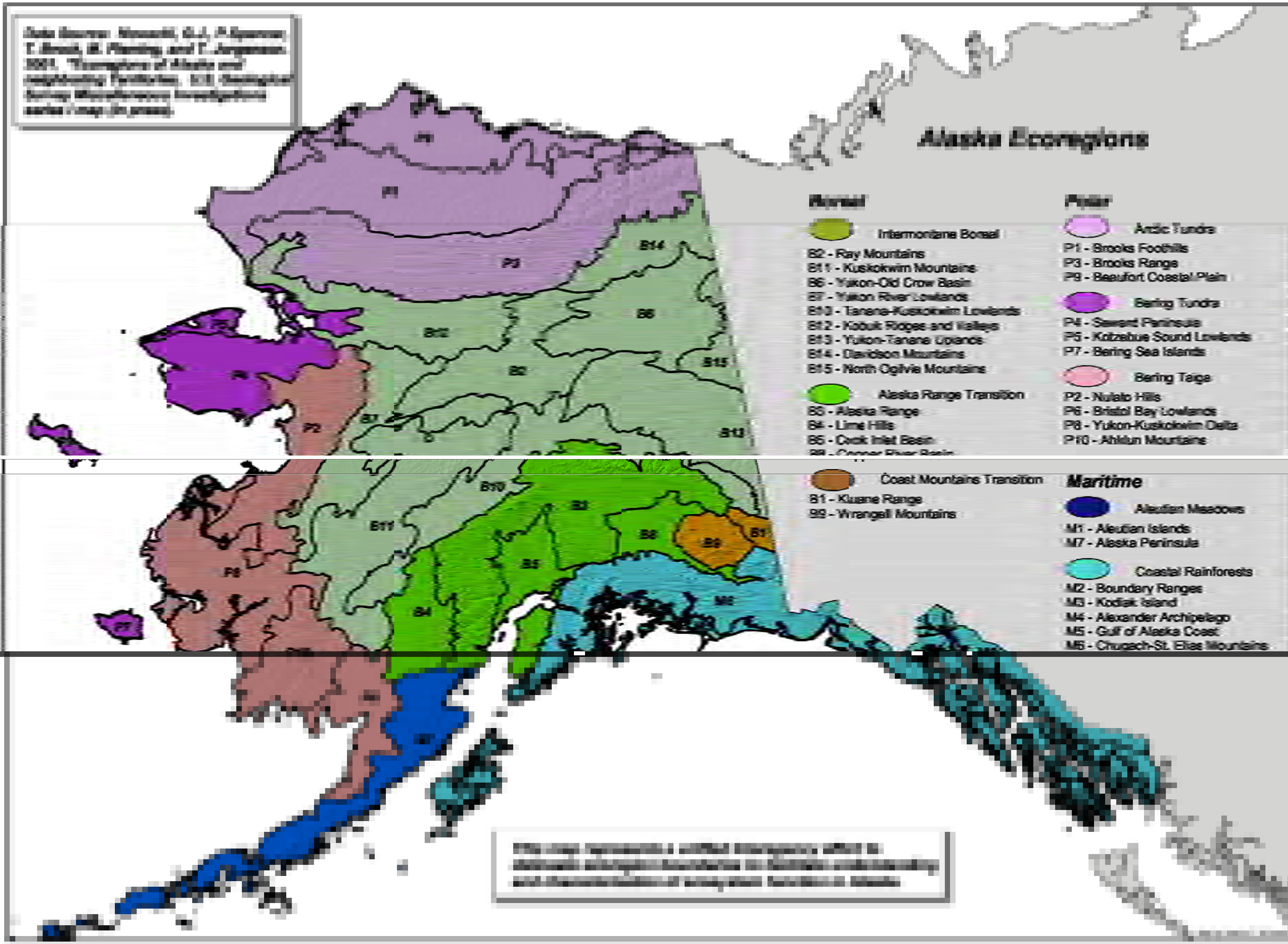
Bob said that the USFWS agreed in general with the study requests, but there may be difference on proposed methods. Betsy said that the AEA study requests would be posted on behalf of AEA, but agencies can reference them. Betsy confirmed that studies proposed in AEA study requests would occur even if agencies did not request the studies.

Susitna–Watana Hydroelectric Project—Wetland Classification and Functional Assessment Methodology

Wetlands Mapping Goals

- Classify and map wetland types to determine current baseline conditions in the project area
- Determine functional value of each mapped functional wetland type
- Quantify the potential direct and indirect impacts to wetlands and wetland function from Project construction
- Provide data that satisfies Section 404 wetland permitting requirements
- Facilitate the development of protection, mitigation, and enhancement (PME) measures to minimize project impacts to wetlands and wetland function


SUSITNA-WATANA
HYDROELECTRIC PROJECT
Figure 1. Study Area for Wetlands in the Susitna-Watana Project Area
Legend
Preliminary Project Area (4/13/2012)
Wetlands Study Area (2-mi Buffer of Project Area)
ALASKA RANGE
TALKEETNA
MOUNTAINS
Denali National Park and Preserve
Cantwell
Summit
Chulitna
Sherman
Denali Highway
Parks Highway
Alaska Railroad
Nenana River
Chulitna River
Susitna River
Talkeetna River
Tsusena Creek
Deadman Creek
Portage Creek
Watana Creek
Kosina Creek
Prairie Creek
N
E
S
W
0 5 10 15 mi
0 5 10 15 20 25 km
Imagery: WMS-compliant map server provided by the Alaska Mapped program (http://www.alaskamapped.org) and UAF-GINA (http://www.gina.alaska.edu).
ABR Inc
150°W
149°30'W
149°W
148°30'W
148°W
147°30'W
147°W
62°30'N
62°45'N
63°N
63°15'N
63°30'N


Alaska Ecoregions
Boreal
Intermontane Boreal
B2 - Ray Mountains
B11 - Kuskokwim Mountains
B6 - Yukon-Old Crow Basin
B7 - Yukon River Lowlands
B10 - Tanana-Kuskokwim Lowlands
B12 - Kobuk Ridges and Valleys
B13 - Yukon-Tanana Uplands
B14 - Davidson Mountains
B15 - North Ogilvie Mountains
Alaska Range Transition
B3 - Alaska Range
B4 - Lime Hills
B5 - Cook Inlet Basin
Coast Mountains Transition
B1 - Kluane Range
B9 - Wrangell Mountains
Polar
Arctic Tundra
P1 - Brooks Foothills
P3 - Brooks Range
P9 - Beaufort Coastal Plain
Bering Tundra
P4 - Seward Peninsula
P5 - Kotzebue Sound Lowlands
P7 - Bering Sea Islands
Bering Taiga
P2 - Nulato Hills
P6 - Bristol Bay Lowlands
P8 - Yukon-Kuskokwim Delta
P10 - Ahklun Mountains
Maritime
Aleutian Meadows
M1 - Aleutian Islands
M7 - Alaska Peninsula
Coastal Rainforests
M2 - Boundary Ranges
M3 - Kodiak Island
M4 - Alexander Archipelago
M5 - Gulf of Alaska Coast
M6 - Chugach-St. Elias Mountains

Proposed Approach to Susitna – Watana Wetland Classification

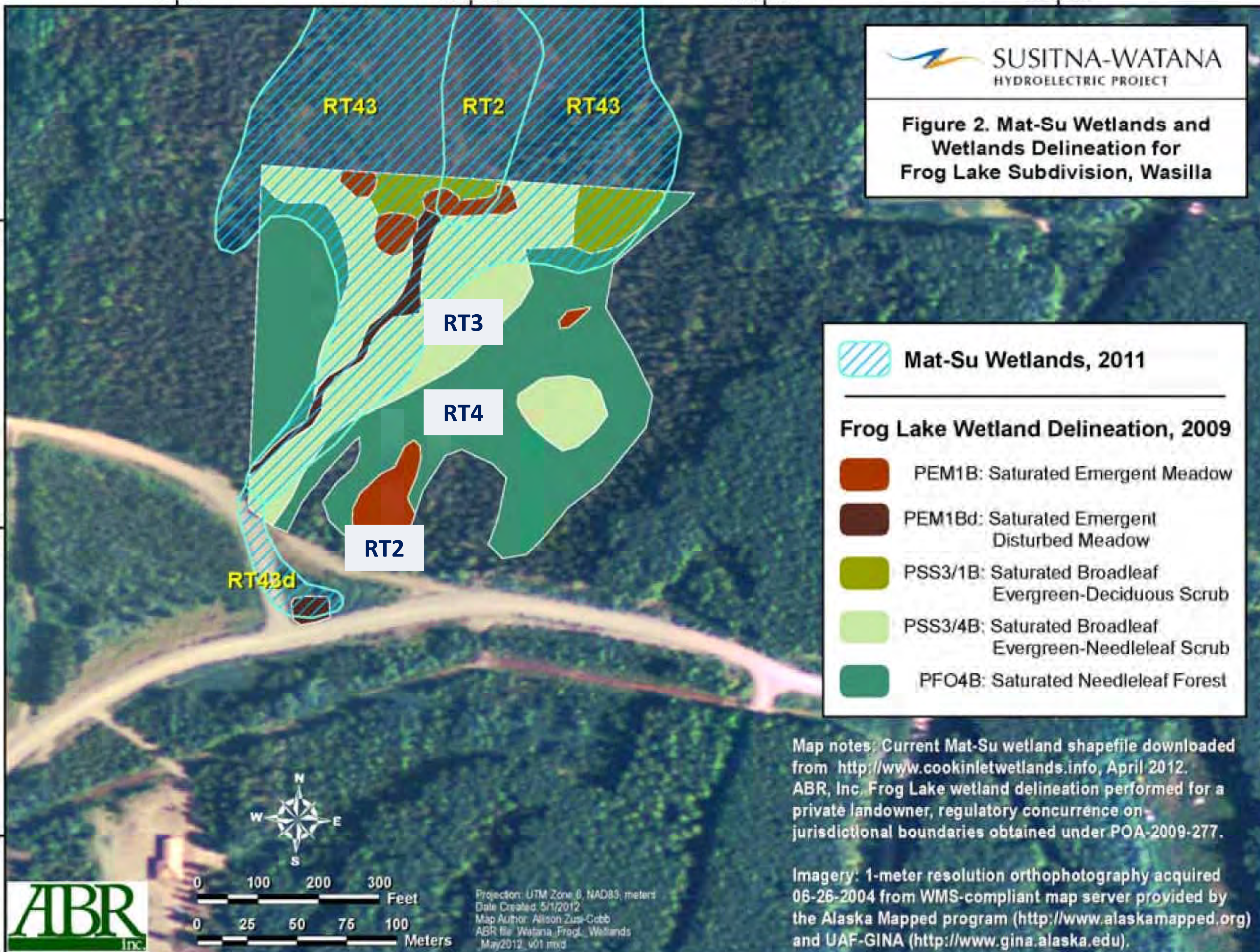
NWI (Cowardin)

Cook Inlet Classification

Viereck Level IV

ABR Wetland Ecotype

ABR Physiography	HGM (Tiner 2003)	Cook Inlet Geomorphic	Surface form	Cowardin Class	Viereck Level IV	Cook Inlet Classification	ABR Wetland Ecotype (Proposed)
Lowland	Terrene Slope/Flat groundwater-dominated throughflow headwater wetlands	VLD trough	Toeslope	PFO4B	Open Black Spruce Forest	RT4: Forested Ripple Trough	Lowland Saturated Forest
			Depression	PSS3/4B	Open Low Ericaceous Shrub Bog	RT3: Shrubby Ripple Trough	Lowland Saturated Shrub Bog
				PEM1B	Subartic Lowland Sedge Bog Meadow	RT2: Sedge Dominated Ripple Trough	Lowland Saturated Sedge Bog
				PEM1Bd	Disturbed Wet Meadow	RT43d: Highly Disturbed Ripple Trough with Shrubby Areas	Lowland Disturbed Wet Meadow
				PSS4B	Dwarf Open Black Spruce Forest	RT43: Forested Ripple Trough with Shrubby Areas	Lowland Saturated Forested Scrub


SUSITNA-WATANA
HYDROELECTRIC PROJECT
Figure 2. Mat-Su Wetlands and Wetlands Delineation for Frog Lake Subdivision, Wasilla
Mat-Su Wetlands, 2011
Frog Lake Wetland Delineation, 2009
PEM1B: Saturated Emergent Meadow
PEM1Bd: Saturated Emergent Disturbed Meadow
PSS3/1B: Saturated Broadleaf Evergreen-Deciduous Scrub
PSS3/4B: Saturated Broadleaf Evergreen-Needleleaf Scrub
PFO4B: Saturated Needleleaf Forest
Map notes: Current Mat-Su wetland shapefile downloaded from http://www.cookinletwetlands.info, April 2012. ABR, Inc. Frog Lake wetland delineation performed for a private landowner, regulatory concurrence on jurisdictional boundaries obtained under POA-2009-277.
Imagery: 1-meter resolution orthophotography acquired 06-26-2004 from WMS-compliant map server provided by the Alaska Mapped program (http://www.alaskamapped.org) and UAF-GINA (http://www.gina.alaska.edu).
RT43
RT2
RT43
RT3
RT4
RT2
RT43d
N
W
E
S
0 100 200 300 Feet
0 25 50 75 100 Meters
Projection: UTM Zone 6, NAD83, meters
Date Created: 5/1/2012
Map Author: Allison Zusi-Cobb
ABR file: Watana_FrogL_Wetlands_May2012_v01.mxd
ABR Inc.
149°43'W
149°42'50"W
149°42'40"W
149°42'30"W
61°37'15"N
61°37'10"N
61°37'5"N

Susitna-Watana Wetland Classification

- Incorporates regional wetland characteristics unique to the Susitna watershed
- Allows for smaller mapping scale (1:3,000 vs. 1:15,000) needed for wetland impact assessment for project footprint
- Provides link to habitat classification (includes vegetation structure)
- Will provide more seamless connection to the Cook Inlet Basin mapping

Wetland Functional Assessment as Part of the Section 404 Process

- Identify development alternatives that result in the lowest impacts to wetlands in terms of functional value
- Determine the magnitude of the effects of potential impacts
- Develop mitigation plans to compensate for losses in wetland function

Wetland Functional Assessment Methodology Requirements (from Smith et al. 1995)

- Standardized methods
- Applicable across study area
- Inclusive of all wetland types and functions
- Compatible with time and resources available
- Sensitive to potential impacts
- Addresses agency and other stakeholder concerns
- Capable of incorporating new data or changing project requirements

Wetland Functional Assessment Methods

HGM (Slope/Flat Wetlands)

Cook Inlet Basin

- Discharge of water to downgradient systems
- Surface and shallow subsurface water storage
- Particulate retention
- Organic carbon export
- Cycling of elements and compounds
- Maintenance of characteristic plant communities
- Maintenance of characteristic habitat structures
- Interspersion and connectivity

Interior Alaska

- Soil Profile Integrity
- Characteristic Soil Thermal Regime
- Surface and Near Surface Water Storage
- Cycling of elements and compounds
- Organic carbon export
- Plant Community
- Faunal Habitat Components
- Interspersion and connectivity

Mat-Su Wetlands Functions and Values

- Contribution to groundwater
- Transmission of groundwater
- Streamflow moderation
- Floodflow alteration
- Sediment/Toxicant/Pathogen retention
- Sediment shoreline stabilization
- Nutrient removal/Retention/Transformation
- Foodchain support
- Anadromous fish habitat
- Habitat and maintenance of biodiversity
- Habitat for species of interest
- Recreation
- Consumptive uses
- Education
- Visual quality/Aesthetics
- Cultural and historical significance
- Uniqueness

Magee-Hollands Wetland Functional Capacity

- Modification of groundwater discharge
- Modification of groundwater recharge
- Storm and flood-water storage
- Modification of stream flow
- Modification of water quality
- Export of detritis
- Contribution of abundance and diversity of wetland vegetation
- Contribution of abundance and diversity of wetland fauna

Possible additional functions:

- Consumptive uses
- Cultural significance
- Uniqueness

Magee–Hollands Wetland Functional Capacity

- Step-by-step procedure that is not region specific
- Field form can be tailored to include criteria unique to a project area
- Incorporates landscape, hydrologic, soil, and vegetation variables into the model
- Could add variables relating to recreation, subsistence, special aquatic sites

ECOLOGICAL LAND CLASSIFICATION (ELS) PROCEDURES

Definitions and Abbreviations
(Modified for wetland classification for Susitna-Watana Hydroelectric Project—2012)

The document provides the sampling protocols proposed for the Susitna-Watana wetland classification system. The field methodology is based on the standard USACE wetland determination form provided in the 2007 Alaska Regional supplement (USACE 2007) and ELS classification methodology used to define ecotypes. Additional data will be collected to accurately define the landscape position and water source of the wetland for subsequent classification and mapping.

GENERAL DESCRIPTIONS

SiteID: Unique alphanumeric identifier
Date:
Time:
Name of observer:
PhotoNo.: Site and soil profile photo number.

LOCATION

USGS Quad:
Nearest Geographic Landmark: Common name for nearby geographic location.
Latitude and longitude: For georeferencing purposes a field GPS position should be taken;
Elevation:
Aerial photo No.: If applicable

GEOLOGY

Geomorphic Unit: Refer to current ABR's GU classification scheme and use alpha code. Surface layer must be 30 cm or more thick to be identified as a geomorphic unit.
Slope (deg.) or Class (below):

0- N: nearly level (0-2%;<1°)	20- T: steep (24- 45%; 14-24°)
2- G: gently sloping (2-6%; 1-3°)	30- V: very steep (45-100%; 24-45°)
5- S: strongly sloping (6-12%; 3-7°)	50 –E: extremely steep (>100%; >45°)
10- M: moderately sloping (12-24%; 7-14°)	

Slope Aspect (deg.): 8 cardinal points (e.g. 0, 45, 90, 135) or finer
Surface Form Class: (was slope position: see Surface Form (macrotopography) codes). classification appended.
Microtopography class: Refer to current microtopography classification scheme and use code. Classification appended
Microrelief: Give mode (typical) trough to crest height (cm).

HYDROLOGY

Hydrology at the site will be documented primarily using the 2007 Alaska Regional supplement data form parameters and augmented by the following criteria:

Origin of water: Precipitation (P), Groundwater (G), Stream (S), Lacustrine (L)

NWI Water Regime:

0 - Upland

1 - Tidal:		10	Nontidal
2 - Ts	Subtidal	11 - Np	Permanently flooded
3 - Te	Irregularly exposed	12 - Nei	Intermittently exposed
4 - Tr	Regularly flooded	13 - Nsm	Semipermanently flooded
5 - Ti	Irregularly flooded	14 - Nse	Seasonally flooded
		15 - Nsa	Saturated (S)
		16 - Nt	Temporarily flooded
		17 - Ni	Intermittently flooded
		18 - Na	Artificially flooded

Water pH (WatPH): ND if no water or no data

Water EC (WatEC) Electrical Conductivity: use units in µS/cm to avoid units confusion. Enter ND if no data or no water present.

Water Temperature (WatTemp): in deg. Celcius.

SOIL

Soil pit description follows procedures outlined in the 1987 USACE wetland delineation manual and the 2007 USACE Alaska Regional supplement, including depth of organic matter, mottling. . Depth of the active layer is described in the "Restrictive layer" section of supplement data form.

Test for soil reducing conditions: Alpha-alpha-Dipyridyl solution to confirm the presence of ferrous (Fe^{++}) iron.

VEGETATION SAMPLING

Vegetation sampling is done following the procedures outlined in the 1987 USACE wetland delineation manual and the 2007 Alaska Regional supplement. Cover is based on visual estimate within each stratum.

Additional variables will be collected to provide a full species list beyond the dominants list required by the standard wetland delineation form:

Structure (Level IV): Viereck et al. (1992) level III

Floristic Class (V): Viereck et al. (1992) level IV

Cover %: Estimate cover visually for all additional species not recorded on the standard form, trace = 0.1.

ABR's MICROTOPOGRAPHY CLASSIFICATION SYSTEM

(Microsite features; <0.1 ha)

00	**N**	**NONPATTERNED**
01	**POLYGONS (ice aggradation)**	
02	Pr	Polygon rim
03	Pc	Polygon center
04	Pt	Polygon trough
06	Pd	Disjunct polygon rims
07	Pf	Flat-centered (usually Phl)
10	Pl	Low-centered
11	Plll	Low relief, low-density
12	Pllh	Low relief, high-density
13	Plhl	High relief, low density
14	Plhh	High relief, high density
15	Pm	Mixed high and low polygons
16	Ph	High-centered polygons
17	Phl	low-relief (and flat centered)
18	Phh	high-relief
20	**THERMOKARST**	
21	Tp	Pits (small features)
22	Tm	Mixed pits and polygons
24	Tc	Collapse scar (large, rounded features)
26	Tm	Moats (linear, water filled)
28	Tk	Kettle (glacial)
30	**FROST FEATURES**	
31	Fh	Hummocks (mineral cored)
32	Fr	Reticulate
33	Ff	Frost Scars and Boils
34	Fc	Circles (non-sorted, sorted)
36	Fs	Stripes (non-sorted, sorted)
38	Fn	Nets (non-sorted, sorted)
39	Fs	Steps (non-sorted, sorted)
40	**MOUNDS (ice and peat related)**	
41	Mi	Ice-cored mounds
44	Mpm	Peat mounds
45	Mt	Tussocks
47	Ms	String (strang)
48	Mg	Gelifluction lobes (saturated flow)
50	**MOUNDS (Misc.)**	
51	Mu	Undifferentiated mounds (distinct)
52	Mir	Ice-shoved ridge
53	Mid	Ice-rafted debris
55	Mrb	Rocks, Blockfields
56	Mrm	Rocky Mounds (soil covered rocks)
57	Mt	Tree mounds (downded logs and root balls)
58	Mw	Mounds caused by wildlife
59	Mh	Mounds caused by humans
60	**DRAINAGE or EROSION RELATED**	
61	Dt	Water tracks (non-incised drainages)
64	Df	Feather pattern (in fens)
66	Dr	Ripples
68	Dd	Flow dunes
70	**EOLIAN RELATED**	
71	Es	Small dune
74	Eb	Scour depression
99	**WATER (W)**	
100	**X**	**COMPLEXES**
101	Xb	Basin Complex

ABR's SURFACE FORM CLASSIFICATION SYSTEM
Macrotopographic Features (meso to macro site; 0.1-100 ha)

01 SUMMIT OR RIDGE

02 PLATEAU (high flats)

03 SHOULDER

04 PINGO

05 STEEP SLOPES
06 Sb Bluff (unconsolidated or with soil)
07 Sc Cliff (rocky)
08 St Streambanks

10 UPPER SLOPE (Su)(convex, creep dominated)
11 Sus South Facing (135-225^{o})
12 Sue East-West Facing (45-135:225-315^{o})
13 Sun North Facing (315-45^{o})
15 **Concave** (water gathering; gullies)
16 Sucs South Facing Concave Upr Slp (135-225^{o})
17 Suce East-West Facing (45-135:225-315^{o})
18 Sucn North Facing (315-45^{o})
19 Such Nivation hollows, Snowbanks,
20 **Convex** (water shedding)
21 Suvs South Facing (135-225^{o})
22 Suve East-West Facing (45-135:225-315^{o})
23 Suvn North Facing (315-45^{o})
25 Plane
26 Sups South Facing (135-225^{o})
27 Supe East-West Facing (45-135:225-315^{o})
28 Supn North Facing (315-45^{o})

30 LOWER SLOPE (Sl)(concave, wash dominated)
31 Sls South Facing (135-225^{o})
32 Sle East-West Facing (45-135:225-315^{o})
33 Sln North Facing (315-45^{o})
35 Slc **Concave** (water gathering; gullies)
36 Slcs South Facing (135-225^{o})
37 Slce East-West Facing (45-135:225-315^{o})
38 Slcn North Facing (315-45^{o})
39 Slch Nivation hollows, Snowbanks,
40 Slv **Convex** (water shedding)
41 Slvs South Facing (135-225^{o})
42 Slve East-West Facing (45-135:225-315^{o})
43 Slvn North Facing (315-45^{o})
45 Slp **Plane**
46 Slps South Facing (135-225^{o})
47 Slpe East-West Facing (45-135:225-315^{o})
48 Slpn North Facing (315-45^{o})
50 **TOE**

55 BASINS OR DEPRESSIONS
56 Bk Kettle
57 Bt Thermokarst
58 Bc Basin Complex
59 Bd Drained Basin

60 FLAT OR FLUVIAL RELATED
61 Fn Nonpatterned
62 Fpp Permafrost plateau (mineral soil,<5 m high)
63 Fpa Palsa
66 Fm Flats margins (transition, e.g. tidal flats)
69 Fw Water tracks or feather pattern
70 Fc Channel, swale or gut,
71 Fi Interfluv or flat bank
72 Fl Levee
73 Fb Bar (point, lateral, mid-channel)
74 Fbp Point Bar
75 Fbl Lateral Bar
76 Fbm Mid-channel Bar
77 Fs Crevasse splay
78 Ft Terrace
79 Ff Flood Basin (behind levee, “backswamp”)

80 LAKES AND OCEAN
81 Li Islands Present

85 LAKE MARGINS
86 Ls Smooth Flat Margin
87 Lp Polygonized Pond Margins (incl. islands)
88 Fwb Wave cut bench (lakeshore or ocean)
89 Fwt Wave cut terrace (lakeshore or ocean)

90 RIVER OR STREAM
91 Rp Deep Pools (>1.5 m)
92 Rs Shallow Runs (<1.5 m)
94 Ri Riffles,
95 Rr Rapids
97 Rc Cascades
98 Rf Falls

100 COMPLEX PATTERNS

110 CHANNEL COMPLEX ON FLATS (CC)
111 Braided channels and interfluvs
115 Meander scrolls

120 RIDGE AND SWALE COMPLEX (CR)

130 EOLIAN COMPLEX PATTERNS (E)
131 Ek Streak
133 Ed Dome-shaped
134 Ec Crescent (barchan, barchanoid ridge)
135 Ep Parabolic
136 El Linear
137 Er Reversing
138 Et Star
139 Eb Blowout

Wendy Davis <wdavis@abrinc.com>

Probable CIC mapping codes in Watana area

1 message

Mike Gracz <mike@kenaiwatershed.org> Wed, May 2, 2012 at 10:06 AM
To: Janet Kidd <jkidd@abrinc.com>, wdavis@abrinc.com

Share the attached, it should help with attributing most wetland polygons with a CIC code

Mike

From: Janet Kidd [mailto:jkidd@abrinc.com]
Sent: Tuesday, May 01, 2012 6:05 PM
To: Leykom, Mary F POA; Sandie T. Hayes; Betsy McGregor; Charles "Terry" Schick; Ross, Victor O POA; Matthew LaCroix (LaCroix.Matthew@epamail.epa.gov); William Ashton (william.ashton@alaska.gov); Bob Henszey (bob_henszey@fws.gov); Michael Buntjer (michael_buntjer@fws.gov); robin@solsticeak.com; Wendy Davis (wdavis@abrinc.com); mike@kenaiwatershed.org; Michiel.E.Holley2@usace.army.mil
Subject: Re: AEA SuWa Wetland Meeting May 2, 9:00 am

Hi folks. Attached is an e-mail version (so the resolution is a little rough) of my presentation for tomorrow morning's meeting. It is brief, mainly designed to hopefully generate a good discussion, especially given the time constraints of some of the participants. I also have attached a summary of the field parameters we would measure/collect to give you an idea of how we would try and capture the data needed to develop a classification scheme that is seamless with the Cook Inlet system.

I looked forward to meeting with you tomorrow and I appreciate everyone taking the time out to get together. Best regards, Janet.

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Probable CIC Codes in Watana Project Area.docx
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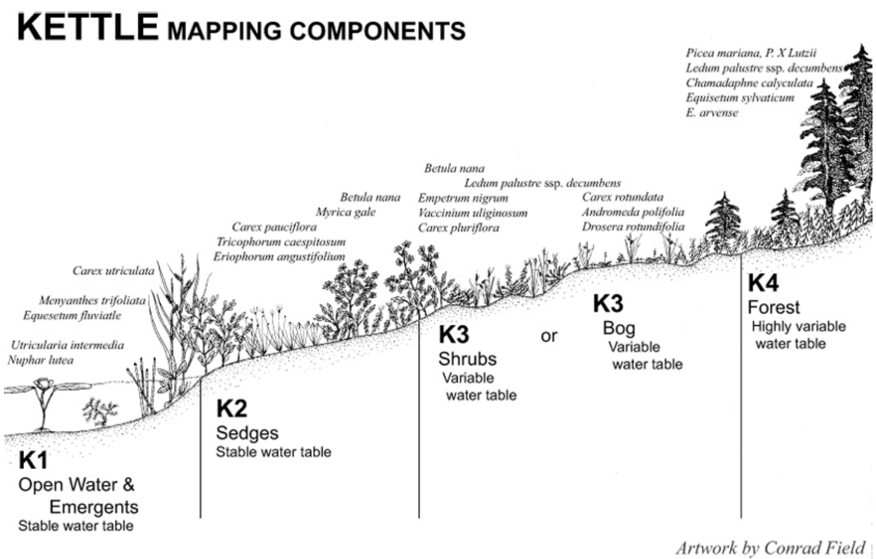
<u>Probable CIC Codes in Watana Project Area</u>

<u>RIVERINE</u>
Rib- River islands and bars
RB- Rosgen's B stream (Susitna River and larger tributaries)
<u>E STREAMS: in underfit valleys on glacial deposits:</u>
Rel- linear "e" stream (modified- Rosgen's E streams are sinuous)
Res- Sinuous "e" stream.

LAKE- >20 acres

D- Depressions- Peat (surrounded by uplands). Hydro code: 1-4, 1- open water…4= forest (figure below)
K- Kettles- Peat (surface or wetland cnx to navigable water). Same hydro codes as D's (figure below)
S- Discharge slopes- mineral soil at slope breaks. Plant dominants- up to two (A= Alnus, S= Salix, Z= High elevation diverse herbaceous meadow)



10. RECREATION AND AESTHETIC RESOURCES

10.1. Introduction

The Alaska Energy Authority (AEA) proposes a Recreation Resources Study, a Recreational River Flow Study, and an Aesthetic Resources Study in order to document baseline conditions and help assess potential impacts on recreation and aesthetic resources from construction and operation of the proposed Susitna-Watana Project (Project). The proposed Recreation Resources Study has been prepared in consultation with agencies and licensing participants.

The Recreation Resources Study (Section 10.5) will research, describe, and quantify recreation demand and capacity of facilities, and assess reasonably foreseeable recreation needs associated with development of the proposed Susitna–Watana Hydroelectric Project.

River-based activities, including boating and fishing, are largely dependent on river flow levels, river access points, and seasonal resource availability conditions. The Recreation River Flow Study (Section 10.6) will identify and document flow-dependent recreational opportunities in the proposed Project area, identify flow preference curves for relevant river-related recreational activities, and help establish the relationships between river flow levels and river uses.

The Aesthetic Resources Study (Section 10.7) will research, inventory, and describe visual and auditory resources in the Project area and identify potential impacts to these resources from construction and operation of the proposed Project.

10.2. Nexus Between Project Construction / Existence / Operations and Effects on Resources to be Studied

The Susitna River valley is currently largely undeveloped. The Project, including a dam and associated facilities and access infrastructure, may affect current recreational opportunities and uses, and the aesthetic character of the Project area. For example, the Project may affect a number of forms of public recreation such as fishing, boating, hiking, camping, birdwatching, hunting, scenic touring, skiing, snowshoeing and other activities by affecting river flows, altering wildlife habitat, and changing recreation access conditions. Operation and construction of the Project also may affect visual and auditory experiences. More specifically, potential effects may include, among others:

- Temporary and/or permanent disruption or displacement of current recreational activities;
- Availability of new recreational facilities and opportunities;
- Changes in public access;
- Temporary and/or permanent changes in demand and levels of use; and
- Other changes to the recreational and aesthetic experience.

The Recreation Study will identify existing and foreseeable future recreation uses, levels of use, spatial use patterns, means of access, and facilities inventory and capacity that occur in the proposed Project area. The study will provide a basis for development of a Recreation Management Plan (RMP).

The Aesthetics Study will identify existing viewsheds and soundscapes, and describe changes that could occur as a result of Project construction and operation.

This documentation will provide an information base on which to establish recreation conditions for the license consistent with the Federal Energy Regulatory Commission's (FERC's) policies regarding development of public recreation at licensed projects.

10.3. Resource Management Goals and Objectives

In addition to providing information needed to characterize the potential Project effects, the Recreation and Aesthetic Resources Studies will provide information to help agencies and Alaska Native entities in the study area identify appropriate conditions for the Project license pursuant to their respective mandates. Project studies are designed to meet FERC licensing requirements, but also to be relevant to recent, ongoing, and/or planned resource management activities by other agencies. Part of the Project Area is within BLM lands administered through policies and management consideration of the Glennallen BLM Resource Area East Alaska Resource Management Plan (EARMP). The BLM management policies in the EARMP include those related to recreation and aesthetic resources. The Alaska Statewide Outdoor Recreation Plan, 2009-2014 also provides some resource management considerations through its assistance to recreation providers, advisory boards, user groups and the public in making outdoor recreation decisions.

10.4. Summary of Consultation with Agencies, Alaska Native Entities and Other Licensing Participants

AEA has consulted with federal and state agencies, Alaska Native entities, and other licensing participants at Project Technical Workgroup meetings held in February, April, and June 2012. The following Table 10.4-1 provides a summary of these meetings. Previous consultation regarding recreation and aesthetic studies are documented in the PAD.

Table 10.4-1. Summary of consultation on Recreation and Aesthetic Resources study plans.

Comment Format	Date	Stakeholder	Affiliation	Subject
Letter	01/12/2012	P. Bergmann	USDOI	Comments regarding outdoor recreation and aesthetics; sport fishing and sport hunting; recreational boating; land-based recreation; aesthetics; and visual resources. (Filed with FERC.)
Technical Workgroup Meeting Notes	02/27/2012	Variety of Stakeholders	Agencies, Alaska Native Entities, and Interested Individuals	Discussion of social science outlines (See Attachment 10-1).
Letter	03/07/2012	G. Yankus	USDOI NPS	Comments on draft study plans (See Attachment 10-1).
Technical Workgroup Meeting Notes	04/03/2012	Variety of Stakeholders	Agencies, Alaska Native Entities, and Interested Individuals	Discussion of planned study objectives and methods (See Attachment 10-1).
E-mail	04/05/2012	C. Thomas	USDOI NPS	Comments on draft study plans (See Attachment 10-1).
Technical Workgroup Meeting Notes	06/07/2012	Variety of Stakeholders	Agencies, Alaska Native Entities, and Interested Individuals	Discussion of licensing participant comments and study requests (See Attachment 10-1).

10.5. Recreation Resources Study

10.5.1. General Description of the Proposed Study

The Recreation Resources Study is designed to identify recreation resources and activities that may be affected by the construction and operation of the proposed Susitna-Watana Project (Project), and to help assess the potential impacts of Project construction and operation on those resources and activities. The specific goals of the study are to:

- Identify and document recreation resources and facilities that support both commercial and non-commercial recreation in the Project area;
- Identify the types and levels of current recreational uses and future reasonably foreseeable future uses based on surveys and interviews, consultation with licensing participants, regional and statewide plans, and other data;
- Evaluate the potential impacts of Project construction and operation on recreation resources, needs, and uses in the Project area; and
- Use the results of analyses to develop an RMP for the Project.

10.5.2. Existing Information and Need for Additional Information

Existing information was compiled in the Recreation Data Gap Analysis (AEA 2011a) and recreation resource descriptions and inventory presented in AEA's Pre-application Document (PAD) (AEA 2011b). A recreation study was initiated in 2012 to gather data to inform the 2013-2014 study plan, including the following elements:

— Interviews with key representatives of agencies and organizations, including Alaska Native entities knowledgeable about regional and state recreation management and issues

— A compilation of existing recreation inventory and capacity information

— An inventory of Project area access

— Incidental Observation Survey Data (completed by field crews)

— Coordination with other study disciplines and incorporation of data

— Geo-referenced mapping

— Field reconnaissance

— Identification of future trends and issues

— A description of the management framework

Available information from the 2012 data gathering efforts will be used to develop the Revised Study Plan.

10.5.3. Study Area

The Project area is shown in Figure 1.2-1. The study area includes the Susitna River watershed, focusing on recreation opportunities and use patterns in and around the immediate Project area.

10.5.4. Study Methods

Both water-based and land-based recreation uses and access will be analyzed. Seasonal uses that relate to ice and snow conditions will also be analyzed. Specialized study of river flow-dependent activities will also be conducted, as described in Section 10.7. The Recreation Resources Study is interdependent with analyses conducted in other disciplines, both biophysical (e.g., aquatics and hydrology) and social (e.g., transportation and socioeconomics), and systematic coordination of data with those study groups will be required.

Methods for the components of the proposed Recreation Resources Study Plan for 2013-14 are described below.

<u>Regional Recreation Analysis</u>

The regional recreation resources context will be defined in coordination with agencies, technical workgroups, and other participants, including Alaska Native entities. Regional and local data related to recreation use will be collected and analyzed, including examination of various land management regimes within the area. Existing resource management plans relevant to the recreational resources of the study area will be reviewed and compiled. The analysis will be conducted in accordance with existing and proposed community and regional plans, and private sector plans. Plans that will be incorporated include

- Alaska's Outdoor Legacy Statewide Comprehensive Outdoor Recreation Plan (SCORP) 2009–2014 (Alaska Department of Natural Resources [ADNR] 2009)
- Alaska Recreational Trails Plan (ADNR 2000)
- Chase Comprehensive Plan (MSB 1993)
- Cultural Resource Management Plan for the Denali Highway Lands (VanderHoek 2005)
- Denali State Park Management Plan (Alaska Division of Parks and Outdoor Recreation [DPOR] 2006)
- DPOR Ten Year Strategic Plan 2007–2017 (DPOR 2007)
- East Alaska Resource Management Plan (Bureau of Land Management [BLM] 2006)
- MSB Comprehensive Development Plan (MSB 2005)
- MSB Trails Plan (MSB 2008)
- MSB Comprehensive Economic Development Strategy (TIP Strategies Inc. 2010)
- MSB Parks and Recreation Open Space Plan (MSB 2000)
- South Denali Implementation Plan and Environmental Impact Statement (National Park Service [NPS] 2006)
- Susitna Area Plan (ADNR 1985)
- Susitna Basin Recreation Rivers Management Plan (ADNR 1991)
- Susitna Matanuska Area Plan (ADNR 2011)
- Talkeetna Comprehensive Plan (MSB 1999)

Trails leading into and within the Project area will be identified using aerial imagery. These include multiple formal and informal trails and routes, several formally identified Revised Statute (RS) 2477 trails, and Alaska Native Claims Settlement Act (ANCSA) 17(b) trails. The trails will then be mapped, and "ground-truthed." This will identify trails that have historical use, and are legal under State "generally allowed uses," but have not been named or identified by ADNR. Management responsibilities for 17(b) easement trails will also be clarified wherever possible.

Recreation Activity Areas (per SCORP planning) and the Recreation Opportunity Spectrum (USFS 1979) "primitive" class will also be described as they relate to the study area. Scenic Byways, Wild and Scenic Rivers (WSR), and other special resource use designations will be identified and described. There are two river segments within the Project area that have been identified by BLM as eligible for inclusion into the WSR System: Brushkana Creek and the portion of the Susitna River from the headwaters to the confluence of Kosina Creek. BLM has stated that they will conduct a suitability determination for these eligible river segments (Social Sciences Technical Workgroup Meeting, April 3, 2012). The George Parks Highway between MP 132 and 248 is designated as an Alaska State Scenic Byway (ADOT&PF 2008; 2012).

Recreation Use and Demand

Currently, the recreation uses of the Project area are widely dispersed. Visitors to the area participate in a wide variety of activities; including sport hunting, sport fishing, recreational boating, skiing, snowshoeing, and snow-machining. The amount, extent, and potential impact of Project-related dispersed recreation use on the proposed Project area's land and water resources is currently unquantified.

A baseline of developed and dispersed recreation uses, including types, levels, and access will be determined and described. High use locations will be identified by activity, along with daytime and overnight visits, and seasonal patterns. User preferences and opinions about the quality of recreation resources will also be described. Data will be collected through a literature review and a comprehensive survey and interview program. Salient existing data will also be incorporated.

Future recreation demand will be estimated, based on socioeconomic indicators, foreseeable non-Project recreation developments, and identified issues and trends. Effects of the Project features (e.g., reservoir and access roads) on hunting and trapping opportunities and on non-consumptive uses (bird-watching, hiking, camping, boating, etc.) in the vicinity and downstream of the proposed Project reservoir will be assessed. Additionally, the recreation effects of any Project-induced changes in ice formation the Susitna River will be evaluated. There are also potential effects of induced recreation along the Denali Highway and downstream from the Susitna River bridge on the Denali Highway to the proposed Watana Reservoir. The effects of Project construction and operational activities (e.g. noise, dust, limitations on access, and recreation activities of construction workers) on recreation will also be analyzed. Recreation demand within the study will be estimated within the study area in the reasonably foreseeable future.

Survey results and an inventory of current and projected recreation opportunities, commercial services, and facilities will inform the Socioeconomic Resource Study in regard to the economic contribution of recreation in the study area.

Recreation Carrying Capacity

There are no existing developed recreation facilities on the Susitna River at the Watana Dam site. In the broader Project area, both public and private recreation facilities exist. These are primarily located along the road system.

The existing physical carrying capacity of recreation resources in the Project area will be estimated. Public facilities will be inventoried and described as to condition, capacity, adequacy and operational cost. Private facilities will also be inventoried to the extent practicable. Public access to recreation sites will also be described, including Americans with Disabilities Act (ADA) compliance, if appropriate.

The need for and capacity of additional reasonably foreseeable recreational facilities will be forecast. Carrying capacity guidelines and standards will be applied in order to develop recommendations for future recreation facilities and sites.

Data Collection

The collection of recreation user data will be accomplished through multiple survey processes. The study design will describe target respondents, geographic locations, target days and months, and questionnaire content; survey methods, in the context of consultation with agencies, workgroups, Alaska Natives, and others Survey instruments will be designed to collect information typical of and compatible with other FERC efforts. This includes the survey conducted for the 1985 studies **(**Harza-Ebasco 1985b) and other surveys such as the SCORP (DNR 2009) and the Alaska Visitor Statistic Program (AVSP) (McDowell 2012).

Identification and Analysis of Salient Data from Existing Survey Research

Recreation supply and demand data from other recreation planning sources applicable to the region will be synthesized. Existing data can inform estimates of levels (e.g., “recreation days”) and types of participation in recreation uses. The estimates will include a discussion and comparison of participation rates in activities regionally, statewide, and nationally. Recreation trends, as forecast in other studies, will also be described.

The AVSP Survey (McDowell 2012) is a statewide research program commissioned by the Alaska Department of Commerce, Community and Economic Development that included 6,747 visitors to Alaska in the summer of 2011 and 1,361 visitors in the Fall/Winter 2011/2012. The SCORP (ADNR 2009) survey database will also be used quantify recreation uses and demand. In addition, Alaska Travel Industry Association research (GMA 2011) about nonresident travel to Alaska will be reviewed and summarized as it pertains to recreation and aesthetic appeal of Alaska’s visitor market.

These data will be utilized to describe year-round nonresident (non-Alaskan) experiences by visitors in three major communities in the MSB (Palmer, Wasilla, and Talkeetna), passengers on the Alaska Railroad, and cruise passengers (visiting McKinley Princess Lodge).

The existing data include

- Lodging types
- Activities
- Length of stay
- Purpose of trip

- Previous travel to Alaska
- Modes of transportation used within the State
- Trip spending
- Communities visited (overall and overnight)
- Demographics (origin, age, income, party size)

This nonresident data will be evaluated along with existing data relating to recreation use by Alaska Resident, in the context of the overall study plan.

Incidental Observation Survey

The purpose of the incidental observation survey is to capture information from field researchers about dispersed recreational use. The survey will gather information on the date and time of day the activity was observed, the type of activity observed, number of people recreating, and the location of observed activity. This survey will not have statistical value, but will help identify types of recreational use in the study area. A protocol will accompany the survey to inform field crews how to complete and submit the survey. The survey will be used throughout the study.

Telephone Surveys of Railbelt Residents

The purpose of this survey is to interview a sample of residents about their recreation use in the area and to collect perspectives about recreational opportunities. The survey will be administered to a statistical sample of 600-900 randomly-selected Railbelt residents within a four-hour drive of the study area (Fairbanks, Denali Borough, Mat-Su Borough, and Anchorage). This survey will be central to the estimation of resident recreation demand. The SCORP survey instrument will be reviewed for any benchmark questions to be considered in the survey design. The overall sample size will be refined after considering desired subgroup samples.

The survey instrument design will capture

- Past and current recreation use within the study area
- Year-round seasonal, and day/night recreation use in the study area
- Nature of use or recreational interest, including, but not limited to, fishing, boating, camping, picnicking, hiking, off-roading, snowmachining, snowshoeing, skiing, horseback riding, biking, rock/ice climbing, dogsledding, photography, mushroom/berrypicking, scenic touring, wildlife viewing, and hunting
- Guided or unguided uses
- Recreation preferences (such as pristine, primitive, semi-primitive, or developed)
- Expected future recreation use within the study area, including how use may change with Project development and operational alternatives
- Means of access to the study area
- Quality of the recreational opportunity
- Importance of and satisfaction with current recreation facilities (such as boat launches and trails)
- Attractiveness of the study area for recreational activities
- Accessibility and conditions/availability
- Visual quality of the scenery in the study area
- Distance that users are willing to travel for weekend recreational opportunities
- Demographics of household and respondents.

Questions that elicit information central to related disciplines, such as the Regional Economic Evaluation Study, may also be included.

Intercept Surveys and Structured Observation Visitor Counts

The purpose of these surveys would be to capture specific recreation use data from users accessing the area by boat, rail, air, snowmachine, or other modes. The survey would be conducted in person based on a sampling plan that captures peak seasonal uses.

Access points may include, but are not limited to, boat launches (e.g., Susitna Landing, Willow Creek, Talkeetna, Deshka Landing), railroad whistle stops, trail heads (e.g., East-West snowmachine trail head on the Parks Highway, along the Denali Highway), air strips, and campgrounds (e.g., Brushkana Creek).

The survey instrument design would capture, but would not be limited to

- Number in party and demographics
- Community of residence
- Participation in type and location of recreation activity
- Rating of quality of recreation experience
- Level of satisfaction with facilities/recreation activities, including aesthetics
- Guided or unguided use
- Past use and intention for future use
- Trip expenses
- Means of access to the recreation area
- Accessibility, conditions, and availability
- Other opportunities within same distance that offers similar experiences
- Preferences
- Interest in potential new recreation facilities and opportunities.

On sample days, the survey crews will observe key characteristics of recreation use (e.g., the number of people present, the number of vehicles entering/exiting the access site, types of recreation activities evident) and record this information on pre-printed forms. Users to be surveyed in person will be selected by availability and willingness to participate.

Executive Interviews

The purpose of the executive interviews is to gather specific information about commercial (e.g., guides, tours, etc.) and private recreation use the study area. It is anticipated that between 50 and 70 private sector recreation businesses, associations, and other entities will be interviewed.

These interviews will be conducted by telephone. The executive interview process will be necessary to develop trust with businesses and organizations with recreation-related interests in the study area, in order to collect proprietary economic data for use in the Regional Economic Evaluation Study. The process of developing a list of potential respondents includes the identification of organizations, associations, government agencies, and businesses with recreation-related interests in study area. This list will be developed through existing and referred contacts, internet searches, and interviews. Contacts may include, but will not be limited to

- Mat-Su Borough Convention and Visitors Bureau
- Federal Agencies, such as BLM, NPS, etc.

- State Agencies, such as DNR, Alaska Department of Fish and Game (ADF&G), etc.
- Alaska Railroad
- Regional governments
- ANCSA corporations and tribal organizations
- Community councils
- Alaska Outdoor Council and other recreation organizations
- Alaska Outdoors Bulletin Board
- Citizen groups
- Environmental organizations

Business representatives to be interviewed may include those associated with

- Remote lodges/cabin rentals/accommodations/campgrounds
- Restaurants
- Airstrips and flying services/flightseeing
- Guide services
- Whitewater rafting/boat trips
- Tour operators (all modes)
- Recreational mining operations
- Transportation services, including buses and Alaska Railroad

The interview protocol (guide) may include, but is not limited to the following topics:

- Nature of business/service (e.g., guide, tour operator, accommodations, etc.)
- Employment
- Season of operation (e.g., year-round, summer, winter, hunting, etc.)
- Means of access to destination (e.g., fly-in, boat, road, etc.)
- Specific areas of operation within the study area
- Years of operation
- Estimated number of clients per year
- Client/membership information, including origin, party size, general perceptions of age, or other demographic features
- Fees charged
- Ways that use might change under the various operational alternatives identified and potential impacts on area image, fishing, hunting, and other recreation activities
- Past and current plans, programs, business operations, membership, activity, etc.
- Geographic areas of highest recreational interest (and reasons why)
- Recreation infrastructure used or needed
- Identification of any trends (anecdotal and data sources) in recreational use levels or patterns
- Information about other projects proposed in the study area that could directly or indirectly affect recreation, tourism, or access to the previously inaccessible areas
- Suggestions for prioritizing the highest potential recreation demand in the area
- Other data needed for socioeconomic baseline or other social science research

GIS Maps and Figures

Recreational sites, facilities, and access routes (RS 2477 rights-of-way, 17(b) easements, and other recreation use trails) will be identified and digitized in a GIS using existing agency and licensing participant datasets and aerial photography. These recreation features will be “ground-truthed” (via ground- and air-based observations) and geo-referenced where possible. Focus group interviews, discussions with licensing participants, coordination with other resource study disciplines, and user intercept surveys will augment recreation facilities and trails mapping. Significant recreation facilities and access points will be photographed for inclusion in the Recreation Resources Report.

10.5.5. Consistency with Generally Accepted Scientific Practice

The methods and work efforts outlined in this Study Plan are the same or consistent with analyses used by applicants and licensees and relied upon by the Commission in other hydroelectric licensing proceedings. The proposed methodology for analysis for demand and capacity estimates and survey sampling are commonly employed in the development of hydroelectric project license applications.

10.5.6. Schedule

Upon approval for implementation, it is estimated that the term of the study would be approximately two years.

Table 10.5-1. Recreation Resources Study Schedule.

Description	Start Date	Completion Date
Data Collection (including seasonal field visits and surveys)	January 2013	November 2014
Inventory	January 2013	October 2014
Analysis	November 2013	November 2014
Initial Study Report		December 2013
Updated Study Report		December 2014

10.5.7. Level of Effort and Cost

The estimate of the two-year recreation study is $570,000.

10.5.8. Literature Cited

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10.6. Aesthetics Resources Study

10.6.1. General Description of the Proposed Study

The goals and objectives for the Aesthetic Resources Study are to inventory and document baseline aesthetic (e.g., visual, auditory) conditions in the Project area and evaluate the potential effects on aesthetic resources, beneficial or adverse, that may result from construction and operation of the proposed Project.

10.6.2. Existing Information and Need for Additional Information

Existing information was compiled in the Recreation Data Gap Analysis (AEA 2011a) and recreation resource descriptions and inventory presented in AEA's Pre-application Document (PAD) (AEA 2011b). A recreation study was initiated in 2012 to gather data to inform the 2013-2014 study plan, including the following elements:

- Interviews with key representatives of agencies and organizations, including Alaska Native entities, knowledgeable about regional and state recreation management and issues
- A compilation of existing recreation inventory and capacity information
- An inventory of Project area access
- Incidental Observation Survey Data (completed by field crews)
- Coordination with other study disciplines and incorporation of data
- Geo-referenced mapping
- Field reconnaissance
- Identification of future trends and issues
- A description of the management framework
- Interviews with key representatives of agencies and organizations
- Assessment of management frameworks for pertinent agencies
- Identification of broad Project area viewsheds and preliminary KOPs using those identified in the 1985 license application
- Photography
- Field reconnaissance
- Description of Project area soundscape

Through the prior processes, the FERC scoping process and incorporation of work group and other licensing participant recommendations, study methods for 2013-2014 were developed. Issues, trends, original data collection strategies, and items for detailed analysis are incorporated into the 2013-2014 Study Plan.

10.6.3. Study Area

The overall Project area is shown in Figure 1.2-1. The specific study area for Aesthetic Resources will be developed as part of the analysis and in coordination with information from other disciplines, such as hydrology. It will be based on a viewshed model of proposed Project features, including the dam structure, transmission and road corridors, and the resulting Watana reservoir. The study area will also include portions of the Susitna River located downstream of the Watana Dam site down to Talkeetna.

10.6.4. Study Methods

The visual resource impact analysis will follow methods developed by the BLM (BLM 1986). Specific methodology will be augmented with relevant portions of the USFS Visual Management System (VMS) / Scenery Management System (SMS) (USFS 1995) methods, as consideration of this approach will be an important aspect of bridging data collected during the 1985 PAD (Harza-Ebasco 1985) and that collected during the current study effort. It is also expected that the Visual Sensitivity Analysis will be expanded beyond what is used by the BLM at the planning level to incorporate surveys, focus groups, and information collected through the scoping process. Data collection and analysis will be completed across all four seasons. The Aesthetic Resources Study is interdependent with analyses conducted in other disciplines, both biophysical (e.g., hydrology) and social (e.g., transportation), and coordination of data with other study groups will be significant.

<u>Define Study Area</u>

The preliminary study area identified as part of the 2012 work will be refined based on updated Project design and siting. The viewshed will be generated for all Project features, including roads and transmission lines, and refined in coordination with federal, state, and local agencies. The study area will be sufficient in size to address all established indicators of change, including potential indirect effects to recreation, cultural resources, subsistence, and socioeconomics. It is expected that this area will include the Susitna River drainage and upland areas where views of the basin are expected to change based on construction and/or operation of the proposed Project. Viewshed models will be developed for pre-and post-Project conditions to depict expected changes in viewshed areas (i.e., creation of new views, loss of others). The study area will also include common air transportation routes used for transportation and recreational air tours. Maps displaying the viewsheds and geographic boundary of the analysis area will be created. Important views and vistas identified through other resource reviews will be identified and placed on the viewshed map.

<u>Establish Key Observation Points</u>

A final list of KOPs will be developed using information from the 1985 license application (Harza-Ebasco 1985), field observations in 2012, ongoing interdisciplinary/interagency coordination, and Project scoping. It is expected that KOPs will differ by landscape analysis factors, such as their distance from the Project, predominant angle of observation, dominant use (i.e., recreation or travel), and average travel speed at which the Project could be viewed. KOPs may represent views experienced across all seasons or may be specific to a particular season.

<u>Baseline Data Collection</u>

Field data collection will include a combination of site visits by helicopter and travel of upstream segments of the Susitna River by boat. Additional information describing access, existing lighting, and movement will be recorded. Baseline photography will be collected at a resolution sufficient for use in computer-generated visual simulations.

Data on existing aesthetic resource values will be collected using the BLM's Visual Resource Inventory (VRI) methodology (BLM 1986). Data collection efforts will include an inventory of scenic quality, visual sensitivity, and distance zones within the Study Area. All areas will be evaluated within the context of viewer experiences. For example, views from roadways or from the perspective of a boater traveling downriver will be established as “linear” or “roving” KOPs. Data collection methods are described below.

Scenic Quality

Scenic quality of the Project area will be determined through the VRI process (BLM 1986). This process entails dividing the landscape into Scenic Quality Rating Units (SQRUs) based on conspicuous changes in physiography or land use and ranking scenic quality within each SQRU based on the assessment of seven key factors: landform, vegetation, water, color, adjacent scenery, scarcity, and cultural modification. Each key factor is scored, and the value of each is added to derive an overall score for the unit. Based on these results, each SQRU is assigned a scenic quality rating of A, B, or C, with A representing the highest scenic quality and C representing the lowest scenic quality.

Visual Sensitivity

Viewer sensitivity will be classified using the BLM Visual Sensitivity Level Analysis (SLA) (BLM 1986). The SLA will be completed in two steps: (1) delineation of Sensitivity Level Rating Units (SLRUs), and (2) rating visual sensitivity within each SLRU. By definition, SLRUs represent a geographic area where public sensitivity to change of the visual resources is shared amongst constituents. The unit boundaries may be defined by a single factor driving the sensitivity consideration, or factors driving sensitivity may extend across numerous SLRUs. Units are thus derived, in part, by the consideration of factors analyzed in the SLA. Visual sensitivity within each SLRU is estimated as high, medium, or low, based on the types of users, amount of use, public interest, adjacent land use, and land use designations. Information required for this analysis will be obtained through land use plan review, data collected by other resource disciplines, and surveys and/or focus groups. The data collected through surveys and focus groups will be coordinated with the set conducted for the Recreation Resources Study. Respondents will be asked about their place-based visual preferences.

Visual Distance Zones

Distance zones represent the distance from which the landscape is most commonly viewed. These zones will be established by buffering common travel routes and viewer locations at distances of 3 miles, 5 miles, and 15 miles using GIS (BLM 1986).

Photo Simulations

To support the visual resource impact analysis and to disclose expected visibility of Project components from various vantage points, photo simulations will be prepared. Simulations will be produced by rendering Project components (turbines, substations, access roads, etc.) with 3-dimensional (3D) computer models and superimposing these images onto photographs taken from KOPs. Model parameters will account for environmental factors, such as seasons, viewing angle, and light conditions, resulting in an accurate virtual representation of the appearance of the proposed Project. Simulations will be produced to illustrate (1) the structure, (2) downriver landscape characteristics, (3) reservoir landscape characteristics, (4) access roads and transmission lines, (5) views of reservoir from upland areas, and (6) views of potential construction-related impacts. Additional simulations and/or videography will be produced as needed in key areas. Simulations will be completed by seasons and under daylight and nighttime conditions.

Visual Resources Analysis

BLM contrast rating procedures will be used (BLM 1986). The visual resource impact analysis focuses on established indicators of change. Indicators will include, but will not be limited to, the following:

- Impacts to visual resources, measured by the degree of visual contrast created by the Project
- Change in existing VRI values of scenic quality, visual sensitivity, and distance zones
- Introduction of new sources of light and glare
- Change in the viewshed area, including both the elimination and creation of views and vistas
- Change in the mechanism of view (e.g., transition from mobile view traveling downriver to a static view when situated on the reservoir)
- Change in visibility that may result from Project-related dust

Methodology used to address each indicator is described below.

Contrast Rating Analysis

The BLM Contrast Rating procedure will be used to determine visual contrast that may result from the construction and operation of the Project based on photo simulations depicting Project features. This method assumes that the extent to which the Project results in adverse effects to visual resources is a function of the visual contrast between the Project and the existing landscape character. Impact determinations will be based on the identified level of contrast and are not a measure of the overall attractiveness of the Project (BLM 1986).

At each KOP, Project features will be evaluated using photo simulations and described using the same basic elements of form, line, color, and texture used during the baseline evaluation. The level of perceived contrast between the proposed Project and the existing landscape will be classified using the following definitions:

- None: The element contrast is not visible or perceived.
- Weak: The element contrast can be seen but does not attract attention.
- Moderate: The element contrast begins to attract attention and begins to dominate the characteristic landscape.
- Strong: The element contrast demands attention, would not be overlooked, and is dominant in the landscape.

The level of contrast will be assessed for all Project components used during construction, operations and maintenance, and decommissioning of the proposed Project.

Visual Resource Inventory Analysis

The VRI analysis will be used to identify expected change to VRI classes based on changes to the visual resource values of scenic quality, visual sensitivity, and/or distance zones that may result from operation of the proposed Project. This analysis will be completed within the framework study area, with the goal of understanding how visual resource values and resulting VRI class may shift based on operation of the proposed Project (including the dam, access roads, and transmission lines). Impacts to VRI components will be evaluated by ranking each key factor used to classify scenic quality, visual sensitivity, and distance zones under operational conditions, and comparing those values to that determined through the established pre-Project VRI.

Light and Glare

The impact analysis for light and glare will focus on potential impacts that may result from nighttime artificial lighting and/or daytime glare. The analysis of artificial lighting will identify potential impacts to human activity at nearby off-site locations that may result from the proposed Project. Photo simulations will be produced to demonstrate views of the proposed Project at night from selected KOPs.

Change in Viewshed Area and Mechanism of View

Viewshed analysis performed for both pre- and post-Project conditions will be compared to identify the changes in viewshed and mechanism of view. These data will quantify the extent of changes in views, and the degree to which access to views changes with the development of roads and the elevation of the viewer within the inundated portions of the reservoir.

Change in Visibility

Data generated by the Air Quality Resource discipline will be used to determine the potential for changes in visibility that may result from construction and/or operation of the proposed Project and related recreation resource values. Results from the air quality dust analysis will be incorporated in this study.

Sound Analysis

A systematic sound study will be conducted to characterize the existing ambient sound environment in the vicinity of the proposed Project and estimate the potential impact associated with construction and operational activities.

The steps in the sound analysis are described below.

Review Documentation and Develop Data Needs

Relevant Project data will be reviewed, including the most current Project description, operating and construction equipment rosters, construction schedules. Ambient sound data recorded in the area or in a similar area will be obtained. Based upon this review, itemized data requirements will be developed that would be needed to perform predictive sound emission modeling. Based on this review a set of outdoor ambient sound level surveys in the vicinity of the Project area will be obtained. The data requirements will include anticipated categories of stationary and mobile construction equipment and their frequency of operation, locations of nearest representative noise-sensitive receivers (NSR), recreation sites (RS), and sound data or specifications associated with intended operating dam systems and processes. Laws, ordinances, regulations, and standards that may influence the sound impact assessment for this study will also be inventoried.

Seasonal Surveys of Ambient Sound Levels

Ambient sound level measurements will be collected in the Project vicinity. These will include unattended long-term ([LT]", a minimum of 24 continuous hours, up to a single week) sound level monitoring at up to a total of four representative NSR or RS locations and up to a total of

16 attended short-term ([ST], e.g., 15-20 minutes duration each) daytime and nighttime sound measurements to help characterize the affected environment. Observations of perceived and identifiable sources of sound contributing to the ambient sound environment and the conditions during which they occur will be documented as part of the field survey. This survey will be conducted up to four times, associated with up to four distinct seasons (e.g., summer, fall, winter, spring) but for a minimum of two seasons consistent with NPS Natural Sounds Program (NSP) published guidelines (NPS 2012). To the extent practicable, the survey locations will be the same for each surveyed season.

Modeling of Project Sound Levels.

Up to three scenarios or alternatives of future Project operational sound levels will be estimated with System for the Prediction of Acoustic Detectability (SPreAD). Computer Aided Noise Abatement (CADNA/A), an industry-accepted outdoor sound propagation modeling program, could also be used (Sound Advice Acoustics Ltd, 2012). Predicted sound level isopleths or "sound contours" will be superimposed on suitable aerial photographs or maps of the Project vicinity and will include specific sound level prediction at selected measurement and/or assessment locations from the ambient sound field surveys of Task 2. Predicted sound emissions associated with both Project construction and operation using different transportation route options will also be assessed.

<u>GIS Maps and Figures</u>

Viewsheds, KOPs, and soundscapes will be mapped as GIS layers according to Project standards. Mapping will also identify relevant management standards within the study area. Significant visual features will be photographed for inclusion in the Aesthetic Resources Report. Visual simulations depicting the appearance of the proposed Project will be produced for a subset of KOPs, and used to inform the impact analysis.

10.6.5. Consistency with Generally Accepted Scientific Practice

The methods and work efforts outlined in this Study Plan are the same or consistent with analyses used by applicants and licensees and relied upon by the Commission in other hydroelectric licensing proceedings. The Aesthetics studies are based on the BLM's visual resources methodology. The sound analysis is consistent with National Park Service Guidelines.

10.6.6. Schedule

Upon implementation, it is estimated that the term of the studies will be approximately two years.

Table 10.6-1. Aesthetic Resources Study Schedule.

Description	Start Date	Completion Date	Duration (months)
Data Collection (including seasonal field visits and sound monitoring)	January 2013	November 2013	11
Inventory	January 2013	October 2013	10

Initial Study Report	October 2013	December 2013	3
Analysis	November 2013	March 2014	5
Updated Study Report	April 2014	December 2014	8

10.6.7. Level of Effort and Cost

The estimate of $500,000 includes the following components over two full years of study.

10.6.8. Literature Cited

AEA (Alaska Energy Authority). 2011a. Susitna-Watana Hydroelectric Project, Socioeconomic, Recreation, Air Quality and Transportation Data Gap Analysis. Prepared by HDR, Inc., Anchorage.

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10.7. Recreational Boating / River Access Study

10.7.1. General Description of the Proposed Study

This study incorporates and contributes to data and analysis conducted as part of the Recreation Resources Study (Section 10.5). In the overall recreation study, recreational boating uses and river access points will be identified. Current and future use of the river by both motorized and non-motorized boat users will also be estimated therein. Because the Project will affect river flow regimes, including the inundation of about 39 miles of the river, and because changes in river flow regimes may directly impact boating and other flow-dependent recreation activities, a specific methodology of recreational flow analysis is also proposed.

Study Goals and Objectives

- The goal of the Recreational Boating / River Access Study is to contribute data to the Recreation Resource Study concerning recreational boating and access.

The goal and objective of the study is to contribute to the Recreation Resource Study concerning the relationship between river flows and recreation opportunities and uses, by:

- developing flow preference curves for each major river reach by type of use and equipment;
- describing the potential effects of altered river flows on existing and potential boating activity and other recreational uses of the Susitna River; and
- describing any new boating or other flow-dependent recreational opportunities that may be created by Project construction and operation.

10.7.2. Existing Information and Need for Additional Information

Existing information was compiled in the Recreation Data Gap Analysis (AEA 2011a) and recreation resource descriptions and inventory presented in AEA's Pre-application Document (PAD) (AEA 2011b). A recreation study was initiated in 2012 to gather data to inform the 2013-2014 study plan, including the following elements:

- Interviews with key representatives of agencies and organizations, including Alaska Native entities, knowledgeable about regional and state recreation management and issues
- A compilation of existing recreation inventory and capacity information
- An inventory of Project area access
- Incidental Observation Survey Data (completed by field crews)
- Coordination with other study disciplines and incorporation of data
- Geo-referenced mapping
- Field reconnaissance
- Identification of future trends and issues
- A description of the management framework

- compilation of existing baseline boating recreation information and access;
- hydrology data review;
- field reconnaissance and photography;
- identification of future trends and issues; and
- description of the management framework and special river designations.

- compilation of existing baseline boating recreation information and access;
- hydrology data review;
- field reconnaissance and photography;
- identification of future trends and issues; and
- description of the management framework and special river designations.

Available information from the 2012 data gathering efforts will be used to develop the Revised Study Plan.

Through the consultation events including the FERC scoping process and work group meetings, other licensing participant recommendations including input on study methods were used for development of the 2013-2014 study plans.

10.7.3. Study Area

The reaches of the Susitna River, shown in Figure 10.7-1, will be subdivided into smaller units as a result of physical studies in other disciplines and field observations conducted in the Recreational River Flow Study. Areas of concentration will include areas where the proposed reservoir would create the most flow changes.

The Recreation River Flow Study will focus on those reaches of the Susitna River directly affected by the Project. These include the section of river that would be inundated by the proposed reservoir, Devils Canyon, and the reach downstream of Devils Canyon to the confluence with the Talkeetna River.

10.7.4. Study Methods

The Recreation River Flow Study is interdependent with analyses conducted in other disciplines, especially physical (e.g., hydrology) and social (e.g., transportation), and input of data from those study groups will be significant.

This Study is designed to identify the minimum and optimum instream flow needed for motorized, non-motorized, and whitewater boating, as well as other flow-dependent recreational activities, on the Susitna River.

Using accepted practices for recreational flow study design, as described in Whittaker et al. (1993, 2005), a progressive sequence of levels of study will be undertaken. These include: Level 1, desktop analysis; Level 2, limited reconnaissance; and Level 3, intensive field studies. This process maximizes study efficiency by characterizing recreation activities for respective river segments in the desktop phase, confirming assessments in the reconnaissance phase, and then focusing intensive field studies to those activities and river segments warranting detailed study and analysis. This process also contributes to early identification of potential Project effects and user conflicts, and information needed to evaluate potential Project effects on river-based recreation.

Level 1: Desktop analyses integrate existing information about channel characteristics, hydrology, river recreational opportunities, access points, and flows in order to determine what recreational boating resources are present that could be affected by the potential Project.

Level 2: Reconnaissance efforts gather first-hand information on the river resource, types of recreation opportunities, and associated attributes as well as the recreational user groups accessing the river. The reconnaissance also provides valuable information on access sites, logistics, travel to and from the site, local resources and people, and, lastly, potential safety concerns. Motorized and non-motorized watercraft may be used during the reconnaissance to better understand recreation opportunities on the river.

Level 3: Intensive field studies will document the existing flow-dependent recreation opportunities (motorized and non-motorized watercraft) and the associated attributes for the respective opportunities, and will quantify the flow preferences (minimum acceptable and optimum) for each opportunity. This is done through a combination of field observations, interviews with licensing participant groups, focus group sessions, and an instream flow recreation survey targeting recreation opportunities for a given river segment. The survey work will be conducted in coordination with surveys associated with the overall Recreation Study.

Elements of recreational boating flow research include:

- *Data collection* - Water recreation attributes for discrete sections on the Susitna River will be described, including types of river recreation, reach length, gradient, character, whitewater difficulty classification, and recommended range of flows for respective recreation activities. Activities will be identified by type of motorized and non-motorized water craft, including whitewater kayaks and packrafts; commercial and non-commercial uses; and trip purposes, trip length, frequency of use, and seasonal considerations.
- *Reconnaissance* – River recreation opportunities and associated instream flow attributes will be observed and described. Existing and potential sites for recreational boating access along the river corridor and the area inundated by the proposed reservoir will also be described.
- *Consultations* - Boaters, land and resource managers, guides, user groups and others will be interviewed to determine the types and locations of boating activity occurring on the Susitna River. Interviews will be conducted with boaters and other experts with experience on the Susitna River to determine a range of conditions generally acceptable to various types of watercraft and skill levels.

Consultation methods include the following:

- Interviews will be conducted with river recreation users with previous experience on the Susitna, including motorized, non-motorized, and whitewater boaters.
- Focus group sessions will contribute additional information about flow preferences, recreation use patterns for respective reaches and groups, whitewater difficulty, safety, campsites, significant rapids, and recreational access. The focus group sessions will be coordinated with national, regional, or local water recreation clubs.

Outcomes of the process include the following:

- Motorized and non-motorized boating opportunities and associated attributes for the range of flows will be examined. This includes, where applicable, the level of whitewater difficulty, portage requirements, length of trip, and characterization of experiences. Includes tourism boating up to Devils Canyon.
- Flow preference curves for each reach will be developed for respective river recreation opportunities.
- The frequency for the range of preferred flows for respective opportunities will be quantified for existing conditions and likely proposed Project operations.
- Put-in and take-out sites and related needs (e.g., scouting and remote camping) that may be associated with respective recreation opportunities in a particular river segment will be identified.

10.7.5. Consistency with Generally Accepted Scientific Practice

The methods and work efforts outlined in this Study Plan are the same or consistent with analyses used by applicants and licensees and relied upon by the Commission in other hydroelectric licensing proceedings. The proposed methodology is often used in analysis for development of hydroelectric license applications to fulfill the FERC's Exhibit E requirements for documentation and development of mitigation measures for flow dependent recreation.

10.7.6. Schedule

Upon implementation, it is estimated that the term of the studies will be approximately two years.

Table 10.7-1. Recreational Boating / River Access Study Schedule.

Description	Start Date	Completion Date	Duration (months)
Data Collection (including seasonal field visits and consultations)	January 2013	November 2013	11
Inventory	January 2013	October 2013	10
Initial Study Report		December 2013,	
Analysis	November 2013	March 2014	5
Updated Study Report	April 2013	December 2014	8

10.7.7. Level of Effort and Cost

The estimated cost of the two-year study is $100,000.

10.7.8. Literature Cited

AEA (Alaska Energy Authority). 2011a. Susitna-Watana Hydroelectric Project, Socioeconomic, Recreation, Air Quality and Transportation Data Gap Analysis. Prepared by HDR, Inc., Anchorage.

———. 2011b. Pre-application Document: Susitna-Watana Hydroelectric Project FERC Project No. 14241. December 2011. Prepared for the Federal Energy Regulatory Commission, Washington, DC.

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10.7.9. Figures

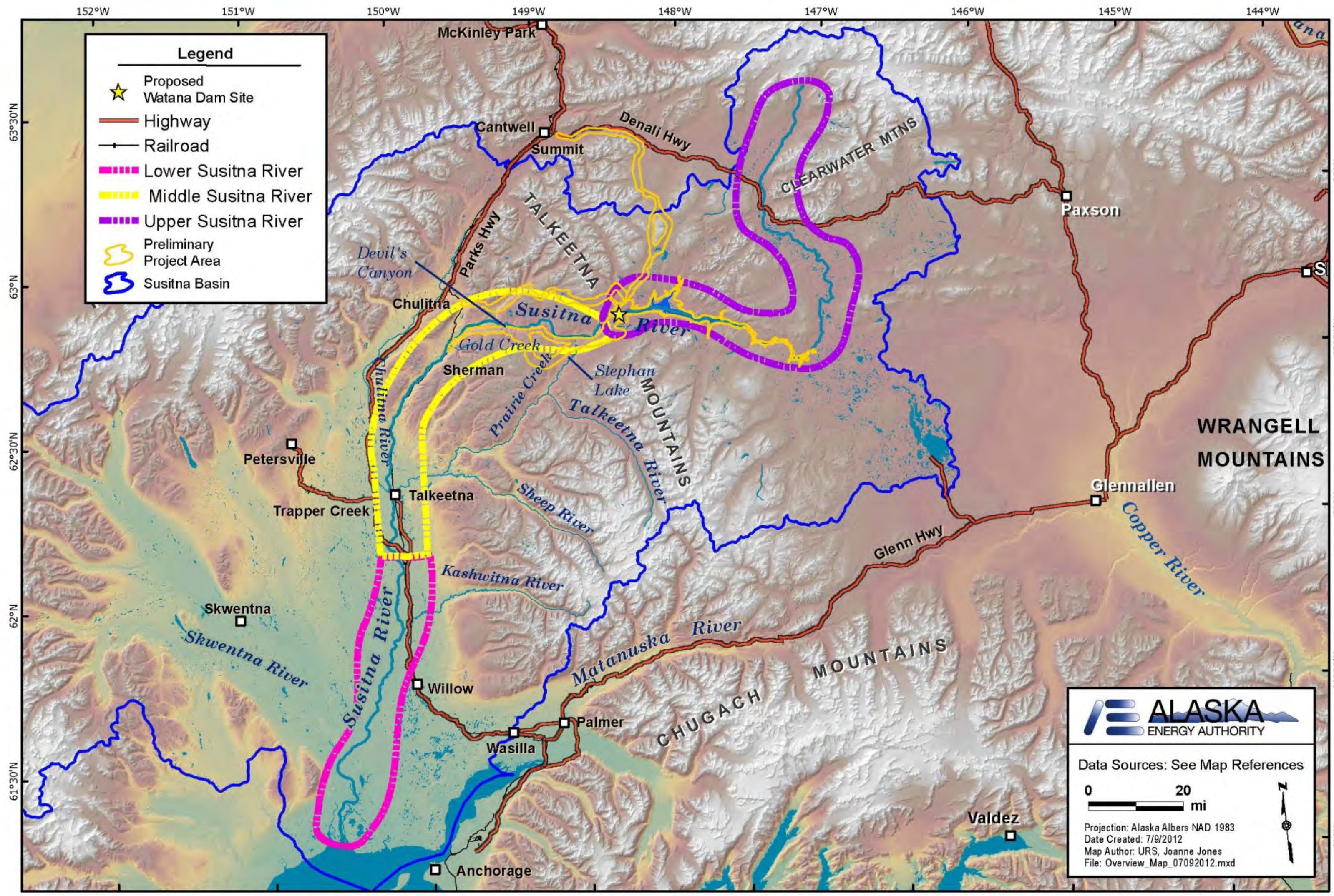

Figure 10.7-1. River Reaches and Key Locations – Recreation and Aesthetic Studies.

10.8. Attachments

ATTACHMENT 10-1. DOCUMENTATION OF CONSULTATION ON RECREATION AND AESTHETIC RESOURCES STUDY PLANS

ATTACHMENT 10-1

DOCUMENTATION OF CONSULTATION ON RECREATION AND AESTHETIC RESOURCES STUDY PLANS

VIA ELECTRONIC MAIL: NO HARD COPY TO FOLLOW (wdyok@aidea.org)

IN REPLY REFER TO:
L7425 (AKRO-EPC)

United States Department of the Interior
National Park Service
Alaska Regional Office
240 W. 5th Avenue
Anchorage, AK 99501

Wayne Dyok
Susitna-Watana Project Manager
Alaska Energy Authority
813 West Northern Lights Boulevard
Anchorage, AK 99503

March 7, 2012

Subject: 2012 pre-licensing draft study plans for the Susitna-Watana Hydroelectric Project, FERC Project No. 14241-0000.

Dear Mr. Dyok:

Representatives of the National Park Service (NPS) have attended a series of recent Technical Working Group meetings on the proposed Susitna-Watana Project (Project), including the 2/27/12 session addressing Social Resources where the proposed 2012 studies of Recreational and Aesthetics resources were presented and discussed. NPS is responding to the Alaska Energy Authority's (AEA) request for comments on 2012 pre-licensing draft study plans for the Susitna-Watana Hydroelectric Project. Our comments, below, are based on our review of the:

1) Pre-Application document (PAD)
2) Scoping Document 1 (SD1)
3) Limited "gap analyses" reports*
4) Request for Proposals (RFP) for Recreation and Aesthetics (released on February 13, 2012)
5) Draft 2012 Study Plans (released on February 16, 2012), including the 2012 Draft Recreation and Aesthetics Study Plan (Study Plan) addressing issues A-S1, A-S2, R-S1, R-S2 & R-S3

NPS has previously provided comments on Recreation, Aesthetics, and Wild and Scenic Rivers included in the Department of Interior's response to the Notice of Application for Preliminary Permit, dated January 12, 2012. These comments are focused on the 2012 draft study plans for recreation and aesthetics, although we also intend to actively participate in the studies planned for future years during the FERC proceeding.

*With regard to item #3, above, NPS notes that the August 2011 Gap analysis for recreation and aesthetics, referred to by AEA as "*HDR Alaska, Inc. 2011. Socioeconomic, Recreation, Air Quality and Transportation Data Gap Analysis Draft Report prepared for the Alaska Energy Authority, August 25, 2011*", has still not been made available for our review. This information was referenced, but not included, in the PAD. NPS participated actively in a series of 2011 Gap analysis meetings that should have informed both this analysis and the PAD. We note that the Gap reports for other resources were distributed to stakeholders some time ago. We have requested a copy of the report by email twice during mid-February (to Emily Ford and Sandie Hayes at AEA), again in person during the 2/27/12 meeting, and again by phone (Cassie Thomas to Betsy McGregor on 3/7/12). At the 2/27 meeting AEA stated that it would soon be posted to the Project website. It is not yet there, and due to the importance of getting our input to AEA prior to the deadline set for your consultants to finalize the 2012 study plans, we are submitting these comments without having had the opportunity to review that document.

In general, we find the approach to conducting recreation resource studies for the current year to be unrealistic in terms of the timing and unlikely to achieve the stated objectives cited in the Draft 2012 Study Plan. We are primarily concerned with a lack of a comprehensive baseline of existing conditions within the project area. In order to proceed with future studies for recreation and aesthetic resources, we believe considerably more time and resources are needed to develop that baseline than what is currently envisioned. We are also concerned about reliance on the study efforts and dated methodology of the mid 1980's, the missing and hence unreviewed gap analysis, and the cursory survey of commercial outfitters conducted in 2010.

We have the following specific comments:

Time Schedule for 2012 Study Plan Development

Based on the very aggressive schedule reflected in the RFP, most notably for the 2012 studies, we have serious reservations about the selected consultants' ability to produce credible study plans within the stated deadlines. This is particularly relevant if the selectee is different from the consultants currently working on the project who, at least, have historic perspective on the proposed project. As an example, the RFP states that "The Program Lead shall use the following assumptions when planning for work efforts in calendar year 2012 (at a minimum)":

- "Participation in two (2) technical work group or other agency meetings in Anchorage (February and March) to finalize the 2012 study plans and present the approach to implementing the study plans."

  We note that the new Program Lead was not selected until Feb. 29, is unlikely to have participated in the first work group meeting (Feb. 27), and will have limited ability to interact and consult with resource agencies to inform preparation of the Final 2012 Study Plans, which are due to AEA on March 20. We find that completion date to be highly unrealistic.

- "Agency Workgroup Meetings on 2012 Final Study Plans - April 3-6, 2012".

We note that this date closely follows the March 23 public distribution date for the Final 2012 Study Plans and permits virtually no time for resource agency review and comment back to AEA. These multi-day workgroup meetings are scheduled shortly before the internal agency deadlines for submission of our final ILP study requests for 2013-14 (due to FERC by 4/27/12), overloading staff at this critical time in the project schedule. The workgroup meetings will follow a week of public scoping meetings, many of which the same agency staff will be attending. Agencies need more than six working days falling during the scoping meetings week to review the 2012 plans before being expected to participate in workgroup meetings. Between the week of scoping meetings and the workgroup meetings, there will be very little time left for agencies to integrate new or modified issues resulting from the 2012 study plans, scoping meetings, or early April workgroup meetings into their ILP requests, due to agency leadership around 4/13.

2012 Recreation Resources Study Plans: The 2012 Recreation studies should focus on establishing a baseline of information relative to existing recreation use (level and activities), supply, and demand. Much of this information was missing from the PAD. Specifically:

- For recreational resources, the study area should include the immediate vicinity of the dam, powerhouse, air strip, construction camp and staging area; the area that would be inundated by the reservoir; all new road and transmission corridors; and downstream areas that would be affected by changes in the Susitna River's flow regime due to project operations. NPS suggests that until shown otherwise, the entire downstream reach of the river be included in the study area, because the combination of the dam's effect on sediment transport, the proposed winter load-following flows, and substantial reduction in late spring breakup flows is likely to have a major impact on channel morphology, woody riparian vegetation, and snow and ice cover. This will affect not only the supply of huntable and fishable species, but also boating access and recreational experience, and winter access to and across the river. Until the results of, e.g., fluvial geomorphology studies and ice process studies are in hand, there is no way to narrow the geographical scope of many other studies, including those of recreational and aesthetic resources.

- The temporal scope of the 2012 study should include an entire year of recreational use.

- The Applicant will need to document the amount and types of sport fishing and hunting currently taking place in the project area.

- The Susitna River is known to offer dispersed recreational opportunities to skilled kayakers and packrafters seeking challenge and solitude. It is also used for sight-seeing by jetboat, for sport fishing access, and as a transportation corridor to access remote cabins and campsites. In order to better understand this use, the Applicant will need to inventory <u>all</u> existing water-borne recreation in the project area.

- In addition to recreational users identified above, current visitors to the project area include backpackers, snowmachiners, ATVers, and backcountry skiers, and may also include mushers, rock and ice climbers, and other categories of users. Many of these users enjoy engaging not only in their primary recreational activity, but in related activities that could be affected by the proposed project, such as berry picking, mushroom hunting, photography and wildlife viewing. As with the preceding categories of recreational use, the applicant will need to characterize the current use, during all seasons, within the area for these activities.

- Many recreational users to the area use informal trails and routes, travelling on foot, via ATV and snowmachine, and, potentially, on horseback, especially for hunting. While the PAD lists several RS 2477 routes, these routes are not identified on any base maps. Nor has the informal network of summer and winter trails and routes that exists in the project area been surveyed or digitized, to NPS's knowledge. To help inform future studies – e.g., to guide the choice of key observation points for aesthetics studies, and the choice of some transects for fluvial geomorphology studies – it is essential that the location of these recreational trails and routes be established as soon as possible.

The information from the mid 1980's, 2010 informal survey, and anecdotal based assumptions from the missing gap analysis do not represent an adequate foundation to characterize the recreation attributes specified above. We maintain that there is a real need for a rigorous reconnaissance effort in 2012 to reach out to current recreation providers and users in the project's region. We suggest that there are several ways to achieve this:

- Outreach to all potential recreation providers – contact by telephone, email, or directly (individually or in focus groups) all known outfitters and guides, air taxi operators, and equipment rental concerns. This inquiry should be guided by an effective survey instrument and appropriate survey protocol developed in consultation with the NPS and other resource agencies.

- A request for data from CIRI regarding permit requests it has received from non-shareholders interested in using Corporation lands for recreational purposes.

- Outreach to user groups – contact any known hiking, boating, fishing, hunting, and snowmachine user organizations to solicit level of use, and characteristics of various activities known to occur in the region. This effort should also be guided by an effective survey instrument and appropriate survey protocol developed in consultation with the NPS and other resource agencies. Again, effective focus group meetings may suffice.

- Direct all survey team members (regardless of discipline or task) working within the project area to document <u>basic</u> observations of recreation activity. They would record number of people seen, apparent activity, location, date and time. This does <u>not</u> involve actual contact of people, simply observation and documentation. We feel that, given the remoteness of this area and with limited access, there is no other way to quantify dispersed recreation use.

Aesthetic Resources:

In the comments of January 12, 2012, it was stated that the Susitna River's natural flow regime, morphology and riparian vegetation have intrinsic aesthetic value, as does the existing landscape upstream of the proposed dam that would be flooded by the proposed project. AEA will need to characterize current/baseline aesthetic conditions generally, and at key observation sites. Note that some of these key sites should be based on the results of the trail and route mapping work we describe above. The geographic and temporal scope of aesthetic resources should be the same as for recreation resources, except that it may be necessary to include more distant locations (e.g. KOPs on surrounding mountains) given that the project's geometric features and large reservoir may significantly alter views from these vantage points.

Observations need to include visual resources as well as auditory resources (natural sounds) in all seasons. We strongly suggest that georeferenced video and still photography be used to document these baseline conditions, and to provide the basis for future simulations of project effects. An effort should be made to video and photograph the Susitna River at a range of flow conditions. This will be particularly important for the section of the river that would be flooded by the reservoir, and the segment within Devil's Canyon, to illustrate the naturally high spring-early summer flows that would presumably be lost unless the Watana Dam is operated as a true run-of-river project.

We are pleased that AEA is adopting the Visual Resource Management (VRM) analysis in accordance with BLM procedures and protocol and suggest that this same methodology be used for all areas potentially affected by the project, not just those that are currently located on lands BLM manages. Given the assembly of this initial baseline data, potential visual and auditory impacts from proposed surface-disturbing activities or developments can be determined in the course of subsequent studies.

Based on review of the draft 2012 study plan for aesthetics, we believe that AEA's approach will adequately address the objectives for this study, provided that an auditory resource component is included and that sufficient information about trails and routes is developed in time to identify key observation points. We are very interested in working with AEA and its consultants to select appropriate KOPs.

Limited Opportunity for Consultation and Collaboration with Resource Agencies

We recognize that under the Integrated License Process, the level of consultation and collaboration is driven by FERC's rigid schedule and by the applicant. We feel that we have had little opportunity to discuss the <u>substance</u> of the 2012 study plans to date. With only the work group meeting on February 27 and another proposed set of meetings in early April before the consultant is expected to have actionable plans, we feel that the schedule is far too aggressive.

Need for Critical Path Analysis

We also note that the studies of highest interest to NPS are in many cases dependent on the results of other studies. We believe it will be essential for AEA and project stakeholders to utilize Critical Path Method (CPM) tools to ensure that studies are not inappropriately conducted simultaneously (in parallel) when the reality is that the results of some studies are needed before certain other study plans can be finalized.

Despite our misgivings about the insufficient time that has been allowed for preparation of the 2012 study plans, and the lack of the Gap analysis report for recreation and aesthetics, we stand ready to engage in the scheduled work group meetings and any other, less formal, opportunities to influence and enhance the 2012 study plans.

NPS appreciates the opportunity to comment on the 2012 Recreation and Aesthetics draft study plans. We intend to remain engaged in this project and look forward to making a valuable contribution to study plan development and future stages of the proceeding. Please contact Cassie Thomas at 907-677-9191 or Harry Williamson at 423-322-4151 with questions regarding these comments.

Sincerely,

/s/ Glen Yankus
SIGNED ORIGINAL ON FILE

For Joan Darnell
Team Manager
Environmental Planning and Compliance

Kirby Gilbert

From:	Cassie_Thomas@nps.gov
Sent:	Thursday, April 05, 2012 4:46 PM
To:	Betsy McGregor
Cc:	bridget.easley@urs.com; donna.logan@mcdowellgroup.net; hbwillia44@gmail.com; Paul_Hunter@nps.gov; j.gangemi@oasisenviro.com
Subject:	NPS Comments on Watana 2012 Study Plan for Recreation and Aesthetics
Attachments:	2012 Rec & Aesthetics Resources Study Draft Final, 4-5-12.docx

Dear Betsy,

NPS appreciates the opportunity to be involved in the development of the informal 2012 Recreation and Aesthetics Resources study plans for the proposed Susitna Watana project. We have reviewed the draft plan posted on the AEA website last week, and would like to offer you and your consultants our revisions to the plan (attached). We are very interested in engaging informally with your team as the project moves forward, and would welcome the opportunity to meet outside AEA's scheduled workgroup meetings.

In addition to our plan revisions, we offer the following comments:

We think there is a need to better describe the "economics" inquiry on page 10, and will continue to request that AEA consider conducting contingent valuation and ecosystem services studies to help quantify the value of the area's recreational and aesthetic resources beyond the direct cash value of tourism

We disagree that adventure film production is in itself a recreational (v. commercial) use of the project area

We agree that all types of user survey methods will be needed, including mail-in surveys, telephone follow-up, field interviews, focus groups, etc., and we are interested in helping design the survey instruments

We think there is a need to include collection of qualitative information (preference, experience, satisfaction, etc.) in the surveys and observations

We are confident that the approach John Gangemi described this Tuesday for evaluating flow-dependent recreation and aesthetics is sound

We are somewhat unclear about which MSB trails you intend to map and ground truth, because the discussion on p. 13 includes conflicting information about the relevance of these trails to the project. We assume all trails that could be affected by altered access, aesthetics, etc. associated with the project will be studied; this does not include all the trails in the borough's trails plan

We understand your intention to integrate auditory aesthetics baseline and study elements in the 2013-14 study plans instead of collecting this data in 2012; we do note, though, that without this baseline acoustic data it will presumably be impossible to evaluate noise detectability using the SPreAd approach

We are interested in helping select appropriate KOPs and KVAs for use in the aesthetic resources assessments (and encourage your use of this

consistent terminology)
Finally, we think it may be advantageous to split Recreation and Aesthetics into subgroups with separate work group meetings

(See attached file: 2012 Rec & Aesthetics Resources Study Draft Final, 4-5-12.docx)

Thanks again for all the work you do, and please feel free to share these comments with other members of your team.

Cassie Thomas

Program Analyst
WASO Park Planning & Special Studies Division AK Coordinator, NPS Hydropower Assistance Program

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11. CULTURAL AND PALEONTOLOGICAL RESOURCES

11.1. Introduction

AEA is undertaking studies to obtain information to determine the effects of the proposed Project on environmental and cultural resources. Information from these studies will be used to assist in identifying appropriate protection, mitigation, and enhancement measures that will be proposed in the AEA license application.

This study plan outlines the purpose and framework for evaluating the potential effects of the Project on “historic properties.” Section 106 of the National Historic Preservation Act (NHPA) requires the Federal Energy Regulatory Commission (FERC) to take into account the effects of licensing a hydropower project on any historic properties in the Project’s Area of Potential Effect (APE) included in or eligible for inclusion in the National Register of Historic Places (National Register) and provide the Advisory Council on Historic Preservation (ACHP) a reasonable opportunity to comment. To help ensure compliance with Section 106, FERC requires license applications to include a report discussing any historical and archeological resources in the proposed Project’s APE.

A cultural resource study plan normally investigates material resources from the past that may lie within the proposed study area. Material cultural resources such as stone tool artifacts are some of the tangible items used to identify and evaluate sites. Non-material cultural resources such as traditional place names and ethnogeography are also important criteria for identification and, especially, evaluation of site significance. Much of the non-material remains of human past are unattainable in vast regions of Alaska. This is not the case however in the proposed study area of the Susitna-Watana Hydroelectric Project. The proposed location of the project encompasses the western portion of the traditional territory of the Ahtna Athabascans including the entire upper Susitna River drainage upstream from Talkeetna and the upper Nenana River. The study area also encompasses the periphery of Dena’ina Athabascans (Talkeetna Mountains and middle Susitna River), (Kari and Fall 2003; de Laguna and McClellan 1981; Kari 2008). Linguistic data from this area have been systematically gathered for over 30 years and can be incorporated into the overall study of cultural resources within this study area.

This plan outlines and describes AEA’s proposal for documenting, recording, identifying, and evaluating cultural resources within the proposed Area of Potential Effect (APE). The 2013-2014 Study Plan for cultural resource investigations begins with discussions of the nexus between cultural resources and FERC’s licensing of the Project (Section 11.2), continues with statements of goals and objectives, identifies laws, regulations, and policies that may apply to the cultural resource investigations (Section 11.3), and states how the proposed work is embedded within accepted archaeological and anthropological perspectives and practices (Section 11.5.5). The record of consultation in the preparation of this study plan is summarized (Section 11.4) and also appended (Attachment 11-1). The plan for cultural resource investigations in 2013 and 2014 is discussed in detail in Section 11.5, and a paleontological study plan is summarized in Section 11.6.

11.2. Nexus Between Project Construction / Existence / Operations and Effects on Resources to be Studied

NHPA Section 106 requires FERC to take into account the effect of licensing a hydropower project on any district, site, building, structure, or object that is included in or eligible for inclusion in the National Register. These historic properties include archaeological sites and isolated finds (both precontact/prehistoric and post-contact/historic); historic properties of religious and cultural significance, including traditional cultural properties (TCPs); and built environment resources (material resources of an architectural nature). Because FERC's licensing of a hydroelectric project is an undertaking that may have an adverse effect on historic properties, FERC requires license applicants to develop a Historic Properties Management Plan (HPMP) to seek to avoid, reduce, or mitigate the any such effects. The Alaska Historic Preservation Act requires similar considerations for historic properties on state land.

The construction and operation of the Project is expected to involve both direct and indirect adverse effects to historic properties within the APE. Changes to the character or use of such resources may occur through ground disturbance associated with construction of the dam and associated linear facilities (e.g., roads and transmission lines); through inundation within the impoundment; and (over the license term) potentially through reservoir shoreline erosion and gradual development of recreational trails. In addition, downstream impacts to historic properties are possible due to Project-induced stream-flow variation. Changing patterns of subsistence and recreational land use brought about by the Project also have the potential to adversely affect historic properties.

Determining whether construction and operation of the proposed Project will adversely affect any historic properties requires systematic inventory of cultural resources within the APE for the Project; National Register eligibility determinations on cultural resources that may be adversely affected by the Project; and assessment of potential Project-related adverse effects on all National Register-eligible cultural resources within the APE. The 2013 and 2014 historic properties investigations will accomplish these objectives by advancing the site inventory effort beyond that of 1978-1985 to include the entire proposed Project's APE. All inventoried cultural resources that may be adversely affected by the proposed Project will be evaluated for National Register eligibility, and eligible historic properties will be analyzed for potential Project-related adverse effects. These investigations will be conducted in consultation with the Alaska State Historic Preservation Officer (SHPO), federal land management agencies, Alaska Native entities, local agencies, and landholders. A restricted service list may be necessary to protect sensitive locational information on cultural resources.

11.3. Resource Management Goals and Objectives

Federal, state, and borough agencies, as well as Alaska Native entities, have formal laws, regulations, and/or policies which may be relevant to analysis of Project impacts on cultural resources and inform the development of a HPMP.

Federal Laws include

- Historic Sites Act of 1935 (16 U.S.C. § 1982)
- National Historic Preservation Act of 1966 (as amended in 2006) (16 U.S.C. § 470)

- National Environmental Policy Act of 1969 (42 U.S.C. § 4321-4347)
- Archaeological Data Preservation Act of 1974 (16 U.S.C. § 469)
- American Indian Religious Freedom Act of 1978 (42 U.S.C. § 1996)
- Archaeological Resources Protection Act of 1979 (16 U.S.C. § 470aa-470ll)
- Native American Graves Protection and Repatriation Act of 1990 (25 U.S.C. § 3001 et seq.)
- Paleontological Resources Preservation Act of 2009 (16 U.S.C § 470aaa)

Federal Regulations include

- 18 CFR 5: FERC Integrated License Application Process
- 18 CFR 380: Regulations Implementing the National Environmental Policy Act
- 36 CFR 60: National Register of Historic Places
- 36 CFR 79: Curation of Federally Owned and Administered Archaeological Collections
- 36 CFR 800: Protection of Historic Properties
- 43 CFR 7: Protection of Archaeological Resources
- 43 CFR 10: Native American Graves Protection and Repatriation Act

Federal Executive Orders (E.O.) include

- E.O. 11593: Protection and Enhancement of the Cultural Environment (1971)
- E.O. 13007: Indian Sacred Sites (1996)

State Laws include

AS 41.35: Alaska Historic Preservation Act

11.4. Summary of Consultation with Agencies, Alaska Native Entities and Other Licensing Participants

A summary of consultation with interested parties used in developing the cultural and paleontological resources study plan is provided in Table 11.4-1. Attachment 11-2 provides documentation of consultation.

Table 11.4-1. Summary of consultation on Cultural and Paleontological Resources study plans.

Comment Format	Date	Stakeholder	Affiliation	Subject
Letter	01/12/2012	P. Bergmann	USDOI	Comments regarding cultural and paleontological resources. (Filed with FERC.)
Technical Workgroup Meeting Notes	04/03/2012	Various	AEA, ADF&G, ADNR, BLM, FERC, Natural Heritage Institute, NPS, and other interested parties	Meeting with agencies and licensing participants to discuss the 2012 Study Plan and Study Request for 2013-2014 prepared by AEA team. (See Attachment 1-1.)
Meeting	05/02/2012	Ahtna, Inc.	Alaska Native Regional Corporation	Ahtna, Inc. officers and linguist Dr. James Kari discussed with NLUR methods and arrangements for a possible Native place name study and Traditional Cultural Property investigation.
Telephone call	05/21/2012	Dr. R. VanderHoek	Representing Alaska State Historic Preservation Officer, Alaska Office of History and Archaeology	VanderHoek and Charles M. Mobley discussed operational aspects of Unanticipated Discoveries protocols.
Telephone call	05/31/2012	Dr. R. King	BLM-Anchorage District Office	Charles M. Mobley called King to discuss Unanticipated Discoveries protocols, tribal review process, and the need to incorporate BLM Glennallen office as primary contact.
Conversation	06/01/2012	Dr. R. VanderHoek	Representing Alaska State Historic Preservation Officer, Alaska Office of History and Archaeology	VanderHoek and Charles M. Mobley discussed operational details of the Plan for Unanticipated Discoveries.
Technical Workgroup Meeting Notes	06/07/2012	Various	AEA, ADF&G/DOS, ADNR-OPMP, AHTNA, BLM, EPA, FERC, HDR Alaska, MSB, Natural Heritage Institute, NOAA Fisheries, NPS, , USFWS, Knik Inc., and other interested parties	Charles M. Mobley presented current status of cultural resources efforts: curation, unanticipated discovery protocols, and survey of 2012 geotechnical sites. Stakeholders raised concerns about definition of study areas for direct and indirect effects, inclusion of Alaska Native Claims Settlement Act 14(h)(1) sites, need for paleontological study, need for Traditional Cultural Property (TCP) study, levels of involvement by Native parties. (See Attachment 1-1.)
Telephone call	06/12/2012	John Jangala	BLM-Glennallen Office	Charles M. Mobley called Jangala; discussion topics included the following: the draft Unanticipated Discoveries protocol is workable; Native consultation is expected to be inclusionary at first, until parties sort out their interests; BLM's role with FERC may be as Intervener or as Cooperator; BLM wishes to coordinate timing of public meetings as much as possible; and the need for FERC documentation limits the degree of information confidentiality that can be assured.

Comment Format	Date	Stakeholder	Affiliation	Subject
Email	06/12/2012	Dr. Robert King	BLM	Verified reporting requirements for cultural resource survey of 2012 geotechnical sites.
Teleconferences	06/13/2012 11am 06/14/2012 - 1pm; 06/15/2012 - 1pm; 06/20/2012 - 10:15am;	Ahtna, Inc.; Dr. James Kari, Dr. William Simeone; URS CR Team	Alaska Native Regional Corporation, Anthropologists	Intensive work sessions to reach agreement on technical method and budget for the TCP - ethnographic study component of the CR PSP. Multiple drafts prepared by URS for review by participants.
Teleconferences	06/14/2012 - 1pm; 06/15/2012 - 1pm; 06/20/2012 - 10:15am;	Ahtna, Inc.; Dr. James Kari, Dr. William Simeone; URS CR Team	Alaska Native Regional Corporation, Anthropologists	Intensive work sessions to reach agreement on technical method and budget for the TCP - ethnographic study component of the CR PSP. Multiple drafts prepared by URS for review by participants.
Telephone call	06/19/2012 – 06/21/2012	Dr. Richard VanderHoek	Representing Alaska State Historic Preservation Officer, Alaska Office of History and Archaeology	Charles M. Mobley talked with VanderHoek in multiple calls to discuss logistics for field visit on June 28, 2012; and cultural resource discussion in draft Watana Transportation Access Study.
E-mail	06/14/2012 – 6:00pm	Dr. Robert King	BLM	Wrote NLUR that he had received ARPA permit application and cc'd John Jangala, BLM, Glennallen.
E-mail	06/12/2012 – 4:19pm	Dr. Richard VanderHoek	Representing Alaska State Historic Preservation Officer, Alaska Office of History and Archaeology	Responded to NLUR inquiry regarding geotechnical borehole documentation and reporting requirements. He agreed that an interim letter report was appropriate as long as the results are in the final draft summary of the 2012 report.
Field trip	06/28/2012	Dr. Richard VanderHoek	Representing Alaska State Historic Preservation Officer, Alaska Office of History and Archaeology	Charles M. Mobley and VanderHoek traveled to Talkeetna and inspected the project area via helicopter.

11.5. Cultural Resources Study

11.5.1. General Description of the Proposed Study

An initial APE study area proposed herein consists of the reservoir impoundment area and three access corridors (Figure 1.2-1). The impoundment area represents a 45,321-acre area below the 2,200 foot contour. The three proposed access routes differ in length and area. The *Chulitna Corridor* is 51.8 miles long and 36,107 acres in area; the *Denali Corridor* is 62 miles long and 45,097 acres in area; and the *Gold Creek Corridor* is 54.7 miles long and 59,750 acres in area.

The Study Area mentioned above includes areas of anticipated direct effects, at least those areas the will be subject to ground disturbance from Project construction. It is anticipated this APE will be refined during summer 2012 in consultation with interested parties to include other areas of potential direct and indirect effects to initiate the Project studies over an area that will encompass the potential direct and indirect Project effect areas. The APE, as updated for the Revised Study Plan, may need further adjustments during the course of conducting the AEA proposed studies and as the engineering feasibility continue refining the Project details. Within the currently defined APE (Figure 1.2-1), 86 known cultural resource sites (80 prehistoric, 4 Euroamerican historic, and 2 Native historic) lie within in the Susitna-Watana impoundment area. The proposed corridors have a combined total of 29 previously-documented sites (all precontact/prehistoric except for one historic). Additional sites could exist in unsurveyed areas within the APE. The known sites will be located in 2013 and 2014 and coordinates will be recorded with a survey-grade, handheld GPS unit. All site data will be recorded and the site conditions verified. Phase I (Inventory) surveys will be conducted in areas of the APE not previously surveyed or in areas within the APE that the 2012 locational model identifies as high potential for the occurrence of cultural resources. Phase II (Evaluation) studies will be conducted to assess eligibility and to analyze the adverse effects to eligible historic properties. "*Historic property* means any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in, the National Register of Historic Places maintained by the Secretary of the Interior. This term includes artifacts, records, and remains that are related to and located within such properties. The term includes properties of traditional religious and cultural importance to an Indian tribe or Native Hawaiian organization and that meet the National Register criteria." (36CFR800.16).

Cultural resources include existing traditional use areas, language, and local knowledge that require the same management considerations as archaeological materials. The ethnogeographic portion of the study is designed as a way to work with Ahtna Elders to integrate Ahtna perspectives on historical land use and cultural values into the cultural resources program. Through a partnership with Ahtna, Inc., the regional corporation for the Ahtna people, this ethnogeographic component of the 2013-2014 Cultural Resources Study Plan will work closely with Ahtna Elders to document Ahtna perspectives and ethnographic context for significance of the cultural resources sites potentially affected by the Project. This work will address the proposed Project area as an ethnographic landscape, documenting traditional Ahtna land use and settlement patterns, seasonal migration, religious and sacred sites, and traditional foot trail systems. There are high quality Ahtna language place name records on file (Kari 2008, 2012). Linguistic analysis of Ahtna place names, including archival taped sources and confirmation interviews with Ahtna Elders, will provide insight into the geographic information, notably hydrology, encoded in the Ahtna terms and narratives for important places.

11.5.1.1. Study Goals and Objectives

The goals of the 2013-2014 cultural resources study plan are to systematically inventory cultural resources within the APE (36CFR 800.4(b)), evaluate the National Register eligibility of inventoried cultural resources that may be adversely affected by the Project (36CFR 800.4(c)), and determine Project-related adverse effects on National Register-eligible historic properties within the APE (36 CFR 800(B).5).

Major objectives are to

- consult with the SHPO and Alaska Native entities throughout implementation of the 2013-14 cultural resources survey;
- inventory cultural resources within the APE;
- evaluate National Register eligibility of cultural resources within the APE that may be adversely affected by the Project;
- determine the potential Project-related adverse effects on National Register-eligible historic properties within the APE; and
- develop information needed to prepare a HPMP for the Project.

The TCP study will be informed through the ethnogeographic study, which has as its goals the identification, inventory, and evaluation of landscape features and resources that have been and continue to be important to the Ahtna people. The objective is to use ethnographic landscape and place name data, to help identify TCPs according to procedures set forth under 36 CFR 800, and determine their significance according to National Register criteria (36 CFR 60.4). Traditional land use patterns of the study area by the Ahtna were based on a migratory cycle that followed the fish, game, and plant harvest opportunities. A complex system of travel and trapping cabins, trails, fish camps, trade routes, portage areas, trap lines, hunting ranges, seasonal camps, and winter villages has been established since time immemorial. Some of these use patterns continue today, incorporating modern subsistence harvest technologies and transportation while maintaining traditional use areas by family and clan. In addition, subsistence activity and land use have also been affected over time by regulations on subsistence, aboriginal land title changes (ANCSA and Alaska National Interest Lands Conservation Act [ANILCA]), schooling, child protection, and medical care laws and regulations. Major activities may include one or more of the following

- document the Ahtna land use patterns in the study area, including the seasonal migration pattern of the late 19th and early 20th centuries, and how they relate to the system of trails, trap lines, hunting and fishing sites, winter villages, and religious sites;
- document types of wild resources exploited and Ahtna Traditional Ecological Knowledge about historic animal and fish populations in the area;
- document traditional stewardship (i.e., traditional management practices);
- document contemporary values associated with the landscape;

- transcribe and translate Ahtna language texts that pertain to the study area;
- document hydrological concepts embedded in place names, directional system, and landscape narratives; and

11.5.2. Existing Information and Need for Additional Information

Cultural resource investigations conducted within the study area between 1978 and 1985 for prior project designs documented almost 300 cultural properties believed to span the last 10,000 years. Site types in the inventory include historic and precontact archaeological sites, historic buildings and ruins, and other cultural features. About one-third of the sites are in or near the location of the proposed Watana Dam and impoundment. Approximately 90 percent have stone tools and other prehistoric artifacts, about 10 percent are historic sites consisting of building ruins and/or scatters of commercially manufactured items (metal cans, bottles, etc.), and less than 1 percent are fossils of animals or plants. The more recent Native sites are from the Athabascan Indians who inhabited the area historically and hold the majority of the area's Native place names in their linguistic dialect (Ahtna); the older sites fade into a more generalized adaptation shared by Alaska's ancient interior peoples. Historic sites in the Susitna-Watana area reflect mining, prospecting, hunting, trapping, fishing, and recreational pursuits, as well as simply remote Alaska living.

11.5.2.1. Archaeological Resources

Between 1978 and 1985, archaeologists conducted cultural resources surveys, testing, and site excavations for the proposed Susitna Hydroelectric project and ancillary facilities (construction camps, transmission lines, access roads). Although the project proposed in the 1980s had a different footprint than the currently proposed Project, much of the areas overlap. For the 1980s project, annual and summary reports described over 270 sites that required some form of analysis and curation of associated artifacts (e.g., Dixon 1985; Dixon et al. 1985; Greiser et al. 1985, 1986). Another 22 previously known sites were revisited and documented. Of the sites found, 111 were located through subsurface testing (resulting from approximately 28,000 shovel tests). Of those known sites, 87 percent have prehistoric/precontact remains, 2 percent have postcontact/protohistoric remains, 10 percent have historic and modern remains, and one site has paleontological remains. Advances in geoarchaeological techniques and current models of the region's stratigraphy, focused especially upon volcanic ash or tephra deposits, prompts re-examination of the conclusions reached in the 1980s regarding site locations and distributions in time and space, the project area's cultural chronology from a locational modeling perspective, and its place in the greater scheme of North American prehistory.

More than a quarter-century of modern archaeological research has been carried out in Alaska since the original Susitna work, aided by new methods and technology, including GPS and GIS, geoarchaeology, geochronology, stratigraphic analysis, lithic and faunal analysis, and ice patch research. Research in Southcentral and Interior Alaska river drainages has demonstrated that the prehistoric cultural chronology and dynamics are far more complex than was previously believed (Dixon 1985). Modern advances in radiometric dating techniques in particular require re-examination of the radiocarbon dates from the project area. Accurate dating is essential to determine site significance which can depend on cultural affiliation, archaeological tradition, and microstratigraphic layers that may represent multiple occupations and/or components spanning hundreds or thousands of years. Only a sample of sites will be prioritized for radiometric dating. Condtions that allow preservation of organic archaeological materials are relatively rare in the study area. Those sites that do contain well-preserved materials, such as animal bone or charcoal, and especially sites that have multiple occupations would be a higher priority than sites containing small flake scatters. Sites that have well-preserved organic features such as buried hearths or buried soils and tephra would also be given higher priority for dating analyses. Sites that represent a culture, archaeological tradition, and/or period in prehistory that is poorly understood would also be given a higher priority. Determining age can be essential for making stie recommendations for inclusion to the National Register.

The cultural resources data gap report (Bowers et al. 2012) reviews and summarizes the cultural resource literature for the Project area prepared during the 1978 to 1985 environmental studies. Data gaps identified include inadequacies in the location information of sites due largely to improvements in field and mapping methods since the 1980s (GIS, portable GPS units, better topographic maps) and advances in survey methodologies compared to those employed during the earlier research. The cultural chronology within the APE warrants re-examination due to more modern dating techniques (e.g., accelerated mass spectrometry [AMS] radiocarbon [^{14}C], optically stimulated luminescence [OSL]) and newer geoarchaeology (in this case tephra) studies. Research into prehistoric land use patterns in interior Alaska has advanced to more sophisticated locational models applicable to the Project's cultural resources field studies. Partial inventories of Alaska Native place names exist that were not available during the "legacy" studies of 1978-1985, and they, too, can now be incorporated into locational models and field survey strategies.

11.5.2.2. Ethnogeographic Resources

Previous studies in the Project area did not identify TCPs, a step that is now required for compliance with Section 106. There were very little data on Alaska Native place names collected during the 1980s Susitna Hydropower legacy studies (e.g., Dixon et al.1985; Greiser et al. 1985, 1986). Information that was collected does not meet current standards for studies such as the one being proposed here, nor are these data in modern geospatial format (see Bowers et al. 2012; Simeone et al. 2011). However, over the past 25 years extensive Ahtna place names research has been conducted by James Kari, William Simeone, and others (e.g., Kari 1983, 1999, 2008, 2010, 2011, and 2012).

Ethnographic data – as defined as interviews, archival documents, and linguistic data (place names) –can help us to determine the value or cultural significance of a site to the Ahtna people, which would better enable us to help identify TCPs. The data will also contribute to the locational model for identifying potential archaeological sites. For example, using ethnographic data to document annual or seasonal activity (including the type of resource used, where harvested, method of harvest, and the season of the year they were harvested) could make it easier to detect the location of archaeological sites. Ethnographic data will also enable us to develop a historical and cultural context for a site, which will help in determining its significance and possible eligibility for the National Register. Furthermore, ethnographic data will aide in the interpretation of a site or artifacts on a variety of levels, for example: (1) how was the site or artifact used, (2) how the site fits into Ahtna history and Alaska history, (3) if the site can be used to explain the cultural history of the area, and (4) if the site has a religious significance not apparent from its physical attributes.

The proposed ethnogeographic study builds on previous research by the two principal investigators, Dr. William Simeone and Dr. James Kari. Models for the research are taken from Simeone and Kari (2002) and Simeone and Valentine (2007)**.** Both studies combined ethnographic, historical, and linguistic research to document traditional Ahtna land use patterns, stewardship practices, and Ahtna Traditional Knowledge for use by the Federal Subsistence Management Program (administered by the U.S. Fish and Wildlife Service) in the management of subsistence fisheries. A third report was used by the State of Alaska to make customary use determinations on non-salmon fish species in the Copper Basin and upper Susitna River (Simeone and Kari 2004). A fourth report, sponsored by the Bureau of Land Management (BLM) as part of the East Alaska Resource Management Plan, analyzed some aspects of Ahtna Traditional Cultural Properties (Kari and Tuttle 2005).

11.5.3. Study Area

The proposed initial direct impacts APE currently encompasses the Watana Reservoir, Watana Construction site, and three potential road and transmission corridors (Chulitna, Denali, and Gold Creek corridors). The Study Area is the first iteration of the proposed APE and may undergo revisions to size and scope in the next several years. (AEA expects to work with the interested parties to refine the APE for the Revised Study Plan.) The APE consists of the geographic area or areas where the character or use of historic properties may be altered (directly or indirectly) by the construction and operation of the Project. The total acreage within the study area is 186,275. Of this area, 63,600 acres near the impoundment area and 19,760 acres near corridors were evaluated in the 1980s. A total of 86 cultural resource sites have been recorded in the project area (OHA 2011). Many were documented during the 1978-1985 surveys before GPS devices were available and therefore must be relocated and described with more accurate geographic coordinates using the correct datum.

11.5.4. Study Methods

The study methods to be implemented in 2013 and 2014 will be focused on cultural resource identification, inventory, and evaluation. The methods described here are the accepted professional practices commonly applied in contemporary archaeological and broader cultural resource investigations. Historic properties to be evaluated encompass precontact/prehistoric archaeological sites, including isolated finds (in Alaska); TCPs; and historic sites, buildings, structures, objects or districts of architectural nature that may be eligible for listing on the National Register.

The field investigations will be executed in two phases. Phase I inventory surveys in 2013 and 2014 to cover the APE, including the proposed Project footprint, corridors, and impoundment area (Figure 1.2.-1). Identification of prehistoric sites requires surface inspection and subsurface testing. TCPs require historic and ethnohistoric interviews, translation, and when possible, field trips. Identification of historic sites is often possible from aerial and ground survey. Surveys may also be needed in areas where access was denied to archaeological crews in 1979 through 1985; and subsurface testing may be required at high-potential areas that were identified but not tested during the previous fieldwork. GIS-modeled locational surfaces of the the APE, which incorporate numerous environmental and cultural variables, are categorized by cumulative numerical values. Higher values are areas of higher site potential, and lower values of lower site potential. The importance of defining and testing areas of *both* lower and higher site potential is fundamental for guiding survey efforts, i.e., confirming areas with higher values as holding most cultural resources, and confirming areas with lower values as having fewer cultural resources via empirical observation. Phase II evaluation surveys (2013 to 2014) will include returns to identified sites for data collection to evaluate each site's eligibility for inclusion in the National Register. Evaluation of known sites requires delineation, establishment, and mapping of site boundary; artifact analysis; and recommendations.

Protocols for the inadvertent discovery of human remains, graves, and/or burial items are described in full detail in the attached Unanticipated Discovery Document. This document outlines the methods; laws; and contact information of affected Alaska Native entities.

Results of the inventory survey will be presented in a Phase I report with recommendations for the Evaluation Phase II site testing and analysis. The Project team will immediately begin processing site evaluation data as they are gathered. Lab analysis and report writing will be conducted concurrent with execution of the field survey. The required Phase II evaluation report will be prepared in 2014 for submittal by AEA to SHPO, BLM, and FERC. The results of this survey will help inform preparation of the HPMP. As is common after the application has been obtained, subsequent seasons will be reserved to developing and implementing strategies for completing evaluations, as necessary, as well as developing management measures for historic properties within the APE, which will be described in the HPMP.

Details of the 2013 and 2014 methods and approaches to be used are listed in the following sections.

11.5.4.1. Mapping-Related Activities

- Map recently identified prehistoric resource locations. Sites will be relocated and mapped with a survey-grade Trimble GeoXT 6000 Series in North American Datum of 1983 (NAD83) with real-time accuracy of 50 centimeters (scheduled for completion in 2013-2014).
- Add to or adjust locational data on prehistoric settlement patterns and land use (scheduled for completion in 2013-2014).
- Add to or adjust locational data on historic settlement patterns and transportation routes (scheduled for completion in 2013-2014).
- Compile additional relevant environmental datasets from the 2012 field season for use in future locational model (scheduled throughout 2013-2014).
- Map TCPs, creating a geodatabase with TCP/sacred sites locations and place names. Locations will be depicted based on historical and cultural information. Depending on the nature of some of the resources, special restrictions may need to be placed on access to information to protect data pertaining to sacred or religious significance (scheduled throughout 2013-2014).
- Prepare maps using the latest GIS files with Ahtna place names (Kari 2012) and expanding and annotating the current Ahtna/Dena'ina place name corpus into the geodatabase currently being developed for cultural resources sites (scheduled throughout 2013-2014).

11.5.4.2. Ethnogeography-Related Activities

- Hold a regional Elders conference to provide a venue to inform the communities of the upcoming research work, including information on other AEA sponsored research, such as fisheries and wildlife studies, subsistence studies, etc. (scheduled throughout 2013-2014).
- Identify, inventory, and compile archival data sources of the Ahtna language, with particular focus on the Jake Tansy recordings on land use and travel, some of which appear in Kari (2010). Recorded stories pertinent to the upper Susitna River from other Ahtna narrators, including Jim Tyone, Jack Tyone, John Shaginoff, Henry Peters, and Fred John will be evaluated, along with the few known Shem Pete recordings and narrative segments that pertain to the Talkeetna Mountains and the upper Susitna River (scheduled throughout 2013-2014).
- Identify and inventory additional data from collections of tapes and transcripts recorded in the English language by the Bureau of Indian Affairs (BIA), the Institute for Social and Economic research (ISER), Ahtna Inc., and other researchers, including Frederica de Laguna and Constance West. Much of this material has never been analyzed with regard to the study area (scheduled throughout 2013-2014).
- Identify knowledgeable Ahtna individuals to interview for current ethnographic information on TCPs in the study area (scheduled throughout 2013-2014).
- Collect interview data on contemporary land use and the cultural landscape (scheduled throughout 2013-2014).
- Develop interview protocol with the assistance of knowledgeable Ahtna individuals in order to guide effective interviewing (scheduled throughout 2013-2014).
- Interview between 30 and 50 Ahtna persons of different ages (estimate 2 hours per interview (scheduled throughout 2013-2014).
- Document the results of interviews, and transcribe tapes. (Scheduled throughout 2013-2014).

11.5.4.3. Synthesis and Analysis Activities

- Develop historic contexts. This task that will be largely dependent on the outcome of 2012 planning studies, fieldwork, analysis, and agency consultation. This task will be implemented in 2014.
- Update cultural chronology: This task will be largely dependent on the outcome of 2012 planning studies and 2013-2014 fieldwork and analysis. For this reason, this work will be deferred until after field studies are complete. This will require collecting and analyzing samples at a number of sites for archaeometric analysis, radiocarbon dating, OSL dating, and tephrochronology (see Bowers et al. 2012).
- Summarize paleontological records and develop site location model. Thomas Bundtzen and Pacific Rim Geological Consulting (Fairbanks) will perform a geologic literature review of the APE, relying as much as possible on the legacy records from the 1980s.

From this, combined with knowledge of regional rock formations and geochronology, a classification system will be developed for the likely location of significant fossils. This effort will be targeted for the 2013 season (see Section 11.6).

- Develop archaeological locational model prior to fieldwork. Compiled digital data will be examined statistically to assess strength of associations between known dependent variables (site locations) and independent variables, such as elevation and other environmental variables (15 to 20 or more variables can be assessed). The derived model output is a map of the study area with negative to positive values depicted in 30 meter (98 feet) by 30 meter (98 feet) units that grade from dark to light; areas with negative or lower values are least likely to hold sites, and areas with higher, positive values are most likely to hold sites. The information generated is instructive for developing survey strategies across the APE prior to fieldwork, particularly for areas previously not surveyed, but also for areas surveyed in the past that appear to need further exploration.
- Transcribe and translate place name terms and narratives, with initial translation performed by Dr. Kari (scheduled throughout 2013-2014).
- Proof-read and correct initial and secondary translations by language specialists or Ahtna Elders (scheduled throughout 2013-2014).
- Develop a synthesis and final report. Combine the archaeological results; locational model; historic and contemporary land use patterns; Ahtna perspectives on the land and resources; Ahtna-language place names; and narratives about important locations. Identify additional studies and reports if needed (scheduled for 2014).

11.5.5. Consistency with Generally Accepted Scientific Practice

The research methods discussed in the proposed Cultural Resources Study (Section 11.5) are consistent with professional practices and FERC's study requirements under the Integrated Licensing Process (ILP). Inventory, evaluation, and determination of effect are well-established steps under NHPA Section 106 and the ACHP's implementing regulations at 36 CFR Part 800. Additionally, the quality of work and qualifications of workers will adhere to the Secretary of the Interior's Standards and Guidelines for Archaeology and Historic Preservation (48 FR 44716).

The Cultural Resources Study for licensing of the proposed Project, as described in this study plan, will be undertaken in accordance with the implementing regulations of NHPA Section 106, FERC's ILP regulations, the Secretary of the Interior's (Secretary) Standards and Guidelines for Archeology and Historic Preservation (48 FR 44716), the Secretary's Professional Qualification Standards (48 FR 22716), and the ACHP's general guidelines for identification and testing procedures as set forth in *Treatment of Archeological Properties, A Handbook*. Unless otherwise specified, field notes, samples, artifacts, and other collected data will be curated with the University of Alaska Museum in Fairbanks in accordance with the requirements set forth in 36 CFR Part 79. Site information, other than the site's Alaska Heritage Resources Survey (AHRS) number and National Register eligibility, will be maintained as confidential as provided for under NHPA Section 304, as amended (16 U.S.C. 470w-3).

11.5.6. Schedule

Fieldwork performed in 2013-2014 would include the following components:

- Site Surveys (Inventory Phase). Applying the GIS-based locational model developed early in the study, the 2013-2014 field efforts will begin within the Watana impoundment area. The survey will take place in the proposed Gold Creek, Chulitna, and Denali Corridors. To the extent possible, the study will make use of the 1978-1985 Phase I survey data (e.g., Bowers et al. 2012; Dixon et al. 1985; Greiser et al. 1985, 1986).
- Site Testing (Evaluation Phase). The 2013-14 field efforts will focus heavily on site systematic testing, with the goal of developing Recommendations of Eligibility to the National Register for each site within direct and indirect impact areas. This will include the Watana impoundment zone, the proposed Gold Creek, Chulitna, and Denali Corridors.

Study products to be delivered in 2013-14 would include

- Interim Reports. Interim reports will be prepared and presented to the Work Group to provide study progress. Reports will include up-to-date compilation and analysis of the data and ArcGIS spatial data products. Reporting schedules will be determined by the AEA and FERC.
- ArcGIS Spatial Products. Shapefiles of the 1980s and current cultural resources data will be compiled into a geodatabase for the study area. All map and spatial data products will be delivered in the two-dimensional Alaska Albers Conical Equal Area projection, and NAD 83 horizontal datum consistent with ADNR standards. Naming conventions of files and data fields; spatial resolution; and metadata descriptions must meet the ADNR standards established for the Project.
- Final Reports. Final Reports will be completed for each field season at the end of 2013 and 2014. Reports will summarize the results of each field season and will be presented to resource agency personnel and other licensing participants along with spatial data products. This will include recommendations regarding additional study needs to be addressed in subsequent field seasons and will cover Identification and Evaluation Phases of the Project studies. Reports will follow FERC and SHPO protocols (36 CFR 800); will follow professionally-accepted standards; and will include site descriptions, site evaluations (Recommendations of Eligibility), and Determinations of Effect. The reports will be filed with FERC to fulfill the study report requirements of 18 CFR section 5.15(c) and (f) of the Commission regulations.

11.5.7. Level of Effort and Cost

The work described above will take place during the 2013 and 2014 field seasons, with evaluations of National Register eligibility completed by the end of 2014. Costs proposed here are in addition to the 2012 reconnaissance effort. For the combined 2013 and 2014 effort, the costs of the cultural resource investigations (including field studies, data collection and mapping, analysis, and reporting) are estimated to cost $7-$8 million.

11.5.8. Literature Cited

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11.6. Paleontological Resources Study

11.6.1. General Description of the Proposed Study

Thomas Bundtzen and Pacific Rim Geological Consulting (Fairbanks) is currently performing a geologic literature review of the Project area, relying as much as possible on the legacy records from the 1980s. With this information the study team is developing a geo-database of the likely location of significant fossils. The results of this review are expected in October 2012 and may help with the final refinements to the study plan or inform some aspects of implementation of this study for 2013 and 2014.

11.6.1.1. Study Goals and Objectives

All work is intended to meet the requirements of the Paleontological Resources Protection Act of 2009 (16 U.S.C. 47Oaaa) and pertinent regulations (see: http://www.blm.gov/wo/st/en/prog/more/CRM/paleontology/paleontological_regulations.html
http://www.reginfo.gov/public/do/eAgendaViewRule?pubId=200910&RIN=1004-AE13).

The existing regulatory framework applies to BLM managed lands; therefore the proposed field survey is currently planned to be limited to those areas.

Following a 2012 literature study, the area will have been classified into five classes, following BLM's classification system (http://www.blm.gov/wo/st/en/info/regulations/Instruction_Memos_and_Bulletins national_instruction/20080/im_2008-009.html).

Areas of BLM land classified as Class 3 (moderate or unknown potential), Class 4 (high potential) and Class 5 (very high potential) may require field survey and testing by a qualified professional paleontologist/geologist. Areas designated as having significant paleontological potential will be revisited and mapped with survey-grade GPS and incorporated into the paleontological geodatabase.

11.6.2. Existing Information and Need for Additional Information

The potential for Pleistocene faunal remains needs to be reviewed, given that Thorson et al. (1981) found approximately 29,000-year-old mammoth remains at the confluence of the Susitna and Tyone Rivers and that significant occurrences of dinosaur (Hadrosaur) fossils have been reported from the Talkeetna Mountains (Pasch and May 1997). During 1973, the State geological Survey (DGGS) discovered a new Tertiary sedimentary basin that contained abundant plant flora in Watana Creek, Talkeetna Mountains D-3 quadrangle (Smith, T.E., Lyle, W.M., and Bundtzen, T.K., in Hartman, 1974). Much of the Permian system at the stage level has been documented by fossil localities in the Clearwater Mountains south of the Denali Highway in the Talkeetna Mountains D-2 quadrangle (Kline, Bundtzen, and Smith (1990) and along the flanks of Mount Watana (Csejtey, 1973; Csejtey et al.,1978).

11.6.3. Study Area

The study area encompasses BLM-managed lands within the Watana Reservoir, Watana Dam Construction site, and three potential road and transmission corridors (Chulitna, Denali, and Gold Creek corridors)(Figure 1.2-1). The APE consists of the geographic area or areas where significant paleontological sites occur as surface outcrops and may be altered (directly or indirectly) by the construction and operation of the Project.

11.6.4. Study Methods

The approach will be to examine mapped rock units systematically and examine archived paleontological records, which exist in the U.S. Geological Survey (USGS) and other documents. Both hard rock paleontological sites and Pleistocene faunal remains may need to be considered on BLM lands in light of the Paleontological Resources Protection Act of 2009 (16 U.S.C. 47Oaaa).

The field investigations will be supported by helicopter and fixed wing support. A team of two geologists will visit existing sites and examine potential new sites using standard geological field methods. Geologists will be aided by all past federal and State geological mapping that exists in the study area.

Sample locations will be located using modern GPS technology, which will enable the geological team to provide very precise location information. To our knowledge nearly all past fossil localities were located before the widespread use of GPS technology. Hence, the existing fossil locales that are imprecisely known will have more accurate location data—at least those that will be visited during this investigation.

Samples will be bagged appropriately to prevent abrasion and damage. Depending on the type and quality of fossil material present, splits of samples will be sent to appropriate University or Private Sector paleontologists for identification and analysis.

11.6.5. Consistency with Generally Accepted Scientific Practice

Field investigations will be consistent with generally accepted scientific practices. During his career with the Department of Natural Resources, Bundtzen made numerous fossil collections during his geological mapping projects. He worked with both scientists from the U.S. Geological Survey as well as those in several universities and in the private sector to obtain fossil identifications, age estimates and their relevance. More than 100 of his fossil locales were eventually archived at the Museum of the North in Fairbanks.

11.6.6. Schedule

Work performed in 2013-2014 would include the following components:

- Applying the GIS-based classification scheme developed in 2012 within the Watana impoundment area and the proposed Gold Creek, Chulitna, and Denali Corridors.
- Systematic testing in areas of high potential indicated by the classification scheme in 2013-14.

Study products to be delivered in 2013-14 would include

- Initial Study Report (December 2013). An Initial Study Report will be prepared and presented to the interested parties to provide initial results and information on study progress. The Report will include up-to-date compilation and analysis of the data and ArcGIS spatial data products.

- ArcGIS Spatial Products. Shapefiles of the 1980s and current paleontological resources data will be compiled into a geodatabase for the study area. All map and spatial data products will be delivered in the two-dimensional Alaska Albers Conical Equal Area projection, and NAD 83 horizontal datum consistent with ADNR standards. Naming conventions of files and data fields; spatial resolution; and metadata descriptions must meet the ADNR standards established for the Project.
- Updated Study Report (December 2014). An Updated Study Report will be completed at the end of 2014. The report will summarize the results of each field season and will be presented to resource agency personnel and other licensing participants along with spatial data products. Reports will follow FERC and BLM protocols and will follow professionally-accepted standards. The reports will be filed with FERC to fulfill the study report requirements of 18 CFR section 5.15(c) and (f) of the Commission regulations.

11.6.7. Level of Effort and Cost

The work described above will take place during 2013 and 2014. The estimated cost of the application of the classification system and field work is an unknown quantity until the results of the 2012 literature review and classification efforts are completed. However, it is estimated that 2013-14 fieldwork and pertinent reporting will cost in the range of $50,000.

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11.7. Attachments

ATTACHMENT 11-1. PLAN FOR UNANTICIPATED DISCOVERIES OF CULTURAL RESOURCES AND HUMAN REMAINS

ATTACHMENT 11-2. DOCUMENTATION OF CONSULTATION ON CULTURAL AND PALEONTOLOGICAL STUDY PLANS

ATTACHMENT 11-1

PLAN FOR UNANTICIPATED DISCOVERY OF CULTURAL RESOURCES AND HUMAN REMAINS

Plan for Unanticipated Discovery of Cultural Resources and Human Remains

Susitna-Watana Hydroelectric Project

FERC No. 14241

Alaska Energy Authority

[Review Draft: 6/20/12]

PLAN FOR UNANTICIPATED DISCOVERY OF CULTURAL RESOURCES AND HUMAN REMAINS DURING THE 2012 SUSITNA-WATANA HYDROELECTRIC PROJECT FIELD INVESTIGATIONS

(Provisional – June 20, 2012)

The first part of this plan (pages 1-3) is addressed to non-cultural resource contractors and other personnel involved with the Susitna-Watana Hydroelectric Project and establishes procedures in the event that unreported or unanticipated cultural resources and/or human remains are found in the field. The field reporting procedures differ depending on: a) whether cultural materials or human remains are encountered; and b) whether the discoverers are involved in a non-destructive effort or whether ground disturbance is involved. Reports of finds will then be forwarded by the Cultural Resources Program or Study Lead as per the remainder of this plan according to c) whether the finds are on federal, state, or private land[1]. Prior to fieldwork, AEA and contracted personnel will receive environmental training including the following guidance for identifying and reporting cultural resources or human remains discovered in the field. This plan briefly describes cultural resources in the study area, how to distinguish them from insignificant items and trash, and what to do if you find them during your fieldwork (all "ifs" are underlined).

Cultural Resources in the Study Area

The general study area contains historic and prehistoric remains going back as much as 10,000 years, and over 250 sites are known from previous studies. Of those, about 90% had stone tools and other prehistoric artifacts, about 10% were historic sites consisting of building ruins or scatters of commercially manufactured items (metal cans, bottles, etc.), and only a couple were fossil discoveries (animal or plant remains). The more recent prehistoric sites are from the Athabascan Indians who inhabited the area historically and hold the majority of the area's Native place names in their linguistic dialect -- Ahtna, while the older sites fade into a more generalized adaptation shared by most of Alaska's ancient interior peoples. Historic sites in the Susitna-Watana area reflect remote land use like mining, prospecting, hunting, trapping, and recreational pursuits, in addition to simple homesteading.

How to Distinguish Cultural Resources

Prehistoric sites most commonly contain stone tools, which are the main indicator for field personnel. Rocks free of flaws that fracture easily and predictably (like flint or obsidian) were typically struck and pressured into form, resulting in tools and discarded flakes with distinctively faceted surfaces – shallow concave scars on tools as well as the corresponding positive bulbs on removed flakes (imagine the rippled conical chunk of glass your son, daughter, – or you – once popped out of a plate glass window with a BB gun). This is the major diagnostic you need to have in mind for prehistoric sites. Discriminating between an artifact and a naturally shattered rock relies a lot on context. A few suspicious stone shards among a rocky talus slope of identical mineralogy are probably not cause for concern. An interesting multi-flaked sharp stone plus a few others nearby (perhaps with detachment bulbs) on a flat overlook would more likely be a cultural

[1] As set forth by the National Historic Preservation Act (NHPA), as amended (16 USC 470) and implementing regulations (36 CFR 800), Archaeological Resources Protection Act (ARPA), Native American Graves Protection and Repatriation Act (NAGPRA) and Alaska Statutes 11.46.482 (a)(3), 12.65.5, 18.50.250, and 41.35.200.

occurrence. Many of these locales have already been found and recorded as formal archaeological sites; likely more remain to be discovered.

Historic sites can have more variability than prehistoric sites in terms of surface and subsurface features and their degree of preservation. Building ruins ranging from roofed examples to those fast entering the archaeological record are part of the cultural resource inventory. Scatters of metal cans and glass bottles legally can be cultural resources, too, if they are 50 or more years old (using that criterion, hypothetically, archaeologist Ivar Skarland's field camp from his 1953 investigations of the then-proposed Devils Canyon dam impoundment could be historically significant). Unvegetated deposits of loose rock at the base of mineralized outcrops – often reddish or yellowish, may indicate historic prospecting, as might the remains of water diversion systems. As with the prehistoric inventory, many of these sites have already been discovered, and likely more remain to be found.

What to Do if You Find Cultural Features or Artifacts

Regardless of whether you are involved in a non-destructive field program or one involving ground disturbance, stop work immediately in the vicinity and don't disturb the features or artifacts further. If you are involved in a ground-disturbing activity then contact immediately either Cultural Resource Program Lead Charles M. Mobley or Study Lead Justin Hays (below). Information you will be requested to provide is primarily description of the finds and location including GPS coordinates. If you are involved in a non-destructive field program, then you are requested to report the description and location of the suspected cultural resource including GPS coordinates to Mobley or Hays within five days. Digital photographs accompanying the report are especially recommended but no photographs or site-specific location information should be released to the press or other individuals other than the Cultural Resource Program or Study Leads. Contact either:

Charles M. Mobley
Cultural Resources Program Lead
(907) 653-1937 office
(907) 632-1933 cell
mobley@alaska.net
Charles M. Mobley & Associates
200 W. 34th Avenue #534
Anchorage, Alaska 99503

OR

Justin Hays
Cultural Resources Study Lead
(907) 474-9684 office
(907) 750-9857 cell
jmh@northernlanduse.com
Northern Land Use Research, Inc.
234 Front Street
Fairbanks, Alaska 99709

How to Distinguish Human Remains

Animal bones are statistically more common than human remains by far, so probabilities favor your find not being human. Ask the biologist or hunter on your crew for an opinion. If the bones are cut or sawn then let's assume they're not human. Human skulls and our all-one-piece jaws are relatively unique and easily identified. For the other bones, try to imagine each one in your body where you think it should fit – does it? If not, it's less likely human.

Context is important. If the bones are scattered around a not-too-old fire ring, for example, then they're likely animal. If they're tumbling out of a rock cairn, they're more likely human.

What to Do if You Find Human Remains

Regardless of whether you are involved in a non-destructive field program or one involving ground disturbance, stop work immediately in the vicinity and don't disturb the bones further. Contact immediately either Cultural Resource Program Lead Charles M. Mobley or Study Lead Justin Hays, by telephone or email (below). Information you will be requested to provide is primarily description of the bones and location including GPS coordinates. Digital photographs accompanying the report are especially recommended but no photographs or site-specific location information should be released to the press or other individuals other than the Cultural Resource Program or Study Leads. Contact either:

Charles M. Mobley Cultural Resources Program Lead (907) 653-1937 office (907) 632-1933 cell mobley@alaska.net Charles M. Mobley & Associates 200 W. 34th Avenue #534 Anchorage, Alaska 99503	**OR**	Justin Hays Cultural Resources Study Lead (907) 474-9684 office (907) 750-9857 cell jmh@northernlanduse.com Northern Land Use Research, Inc. 234 Front Street Fairbanks, Alaska 99709

Forwarding Reports of Discoveries from the Field

After the field report has been made to Mobley or Hays the field finders' responsibilities are over other than to be available for further consultation if necessary. The following steps will then be set in motion:

1. The Cultural Resources Program or Study Lead will compare the find's GPS coordinates and description with the known site inventory to determine if it actually reflects a new discovery or an already-recorded site.

2. If the discovery involves human remains or is determined to be an unrecorded cultural property, the Cultural Resources Program or Study Lead will immediately notify AEA's Environmental Manager of the find and its potential significance.

Betsy McGregor, AEA Environmental Manager
(907) 771-3957 office
(503) 312-2217 cell
BMcGregor@aidea.org
411 W. 4th Avenue, Ste. 1
Anchorage, Alaska 99501

3. AEA's Environmental Manager will coordinate with a cultural resources consultant who will travel to the location and evaluate the find as warranted to determine if indeed human bones have been discovered, or if a new cultural site has been found.

4. If the materials found are human remains, then the protocols outlined in the subsequent two sections entitled **Protection of Human Remains** (distinguished according to land ownership) will be followed. If a cultural site is at imminent risk from a proposed ground-disturbing activity, the procedures specified in the following two sections entitled **Protection of Cultural Remains** (again distinguished according to land ownership) below will be followed. If the materials are already recorded cultural sites and not in jeopardy, no further action will be taken.

Protection of At-Risk Cultural Materials on Private and State-Managed Land

a) AEA's Environmental Manager will promptly notify the Environmental Inspector to flag the at-risk site with a 20-meter buffer as appropriate. This buffer may be larger if there is the possibility of more resources in the area or in the case of slopes or cut-banks where ongoing construction may impact the site.

b) AEA's Environmental Manager will direct the cultural resources consultant to begin a more detailed assessment of the find's significance and the potential effect of construction.

c) AEA's Environmental Manager will promptly notify the Alaska State Historic Preservation Officer (SHPO) or State Archaeologist of the find. Contact either:

Judith Bittner, SHPO (907) 269-8721 judy.bittner@alaska.gov Alaska Dept. of Natural Resources Office of History and Archaeology 550 West 7th Avenue Ste. 1310 Anchorage, Alaska 99501-3565	OR	David McMahan, State Archaeologist (907) 269-8723 dave.mcmahan@alaska.gov Alaska Dept. of Natural Resources Office of History and Archaeology 550 West 7th Avenue Ste. 1310 Anchorage, Alaska 99501-3565

d) The landowner will be promptly notified.

e) The cultural resources consultant will document the site circumstances, potential significance, and risk of harm. If the cultural resources consultant assesses the find as not significant or lacking integrity, then the consultant will notify the AEA Environmental Manager who will then inform the SHPO. Upon SHPO agreement of a finding of no effect, AEA will request approval to resume construction. A brief report of the find will be provided to the SHPO within one week of its recording. If the archaeological consultant recommends that the find may be significant, then the following steps will be implemented.

f) AEA's Environmental Manager will notify other parties, such as appropriate Alaska Native organizations, as directed by the SHPO.

Alaska Native Regional Corporations:

- Ahtna, Incorporated (Ahtna)
  Michelle Anderson, President
  PO BOX 649, Glennallen, Alaska 99588

Glennallen Office: (907) 822-3476
Fax: (907) 822-3495
Anchorage Office: (907) 868-8250
Fax: (907) 868-8285
Email: manderson@ahtna.net

- Cook Inlet Region Incorporated (CIRI)
  2525 C Street Suite 500, Anchorage, Alaska 99503
  P.O. Box 93330, Anchorage, Alaska 99509-3330
  (907) 274-8638
  Fax: (907) 279-8836

- Doyon, Ltd. (Doyon)
  1 Doyon Place, Suite 300
  Fairbanks, Alaska 99701-2941
  (907) 459-2000
  (888) 478-4755 (toll-free)
  (907) 459-2060 (fax)

- Doyon, **Limited - Anchorage Office**
  11500 C Street, Suite 250
  Anchorage, Alaska 99515-2692
  (907) 563-5530 or (907) 375-4220
  (907) 375-4205 (fax)

A more complete contact list is attached as Appendix A.

g) If the find is significant and continuing work may damage more of the site, then AEA's Environmental Manager will request recommendations from the SHPO and other parties regarding appropriate measures for site treatment. These measures may include: formal archaeological evaluation of the site; visits to the site by the SHPO and other parties; preparation of a mitigation plan by AEA for approval by the SHPO; implementation of the mitigation plan; and/or approval to resume construction following completion of the fieldwork component of the mitigation plan.

h) If further analysis indicates that the find lacks significance, then AEA's Environmental Manager will consult with the SHPO and other appropriate parties to request approval for resumption of construction.

i) AEA's Environmental Manager will notify the on-site Field Coordinator who will grant clearance to the Contractor to start construction.

Protection of At-Risk Cultural Materials on Federal Lands

a) AEA's Environmental Manager will promptly notify the Environmental Inspector to flag the at-risk site with a 20-meter buffer as appropriate. This buffer may be larger if there is the possibility of more resources in the area or in the case of slopes or cut-banks where ongoing construction may impact the site.

b) AEA's Environmental Manager will direct the cultural resources consultant to begin a more detailed assessment of the find's significance and the potential effect of construction.

c) AEA's Environmental Manager will promptly notify the appropriate federal land managing agency and Alaska State Historic Preservation Officer (SHPO) of the find. Contact both:

John Jangala, Archaeologist
(907) 822-7303
jjangala@blm.gov
Glennallen Field Office
Bureau of Land Management
P.O. Box 147
Glennallen, Alaska 99588-0147

Judith Bittner, SHPO
(907) 269-8721
judy.bittner@alaska.gov
Alaska Dept. of Natural Resources
Office of History and Archaeology
550 West 7th Avenue Ste. 1310
Anchorage, Alaska 99501-3565

d) The cultural resources consultant will document the site circumstances, potential significance, and risk of harm, and then notify the AEA Environmental Manager who will in turn then inform the Bureau of Land Management (BLM) archaeologist and the SHPO. <u>If</u> the cultural resources consultant assesses the find as not significant or lacking integrity, and the BLM and SHPO agree on a finding of *no effect*, then AEA will request approval to resume construction. A brief report of the find and an AHRS site form will be provided to the BLM and SHPO within two weeks of its recording. <u>If</u> the archaeological consultant recommends that the find may be significant, then the following steps will be implemented.

e) AEA's Environmental Manager will notify other parties, such as appropriate Alaska Native organizations, as directed by the SHPO.

Alaska Native Regional Corporations:

- Ahtna, Incorporated (Ahtna)
  Michelle Anderson, President
  PO BOX 649, Glennallen, Alaska 99588
  Glennallen Office: (907) 822-3476
  Fax: (907) 822-3495
  Anchorage Office: (907) 868-8250
  Fax: (907) 868-8285
  Email: manderson@ahtna.net

- Cook Inlet Region Incorporated (CIRI)
  2525 C Street Suite 500, Anchorage, Alaska 99503
  P.O. Box 93330, Anchorage, Alaska 99509-3330
  (907) 274-8638

- Doyon, Ltd. (Doyon)
  1 Doyon Place, Suite 300
  Fairbanks, Alaska 99701-2941
  (907) 459-2000
  (888) 478-4755 (toll-free)
  (907) 459-2060 (fax)

- Doyon, **Limited - Anchorage Office**
  11500 C Street, Suite 250
  Anchorage, Alaska 99515-2692
  (907) 563-5530 or (907) 375-4220
  (907) 375-4205 (fax)

A more complete contact list is attached as Appendix A.

f) If the find is assessed as significant and continuing work may damage more of the site, then AEA's Environmental Manager will request recommendations from the appropriate federal land managing agency, SHPO, and other parties regarding appropriate measures for site treatment. These measures may include: formal archaeological evaluation of the site; visits to the site by the SHPO and other parties; preparation of a mitigation plan by AEA for approval by the appropriate federal land managing agency and SHPO; implementation of the mitigation plan; and/or approval to resume construction following completion of the fieldwork component of the mitigation plan.

g) If further analysis indicates that the find lacks significance, then AEA's Environmental Manager will consult with the federal land managing agency, SHPO and other appropriate parties to request approval for resumption of construction.

h) AEA's Environmental Manager will notify the on-site Field Coordinator who will grant clearance to the contractor to start construction.

Protection of Human Remains on Private and State-Managed Land

a) AEA's Environmental Manager will promptly notify the Environmental Inspector to flag the at-risk site with a 20-meter buffer as appropriate. This buffer may be larger if there is the possibility of more resources in the area or in the case of slopes or cut-banks where ongoing construction may impact the site.

b) AEA's Environmental Manager will notify a peace officer of the state (police, Village Public Safety Officer, or Alaska State Trooper [AST]) and the Alaska State Medical Examiner (SME) immediately of the discovery, as stipulated in Alaska Statute 12.65.5. In addition to a local peace officer (if in a local jurisdiction), notification should include the AST Criminal Investigation Bureau. If the human remains appear recent (less than 50 years old) in the judgment of the archaeologists, the AST and SME will determine whether the remains are of a forensic nature and/or subject to criminal investigation. The AST and SME contacts are:

Sgt. Kid Chan
(800) 478-9333
(907) 269-5058
choong.chan@alaska.gov
(cc: Stephanie Johnson at steph.johnson@alaska.gov)
Alaska State Troopers
Missing Persons Bureau
5700 East Tudor Road
Anchorage, AK 99507

Talkeetna Post - Alaska State Troopers
(907) 733-2256
HC89 Box 8576
Talkeetna, AK 99676

Dr. Gary Zientek, Deputy Medical Examiner
(907) 334-2200
gary.zientek@alaska.gov
Alaska State Medical Examiner
5455 Dr. Martin Luther King Jr. Ave
Anchorage, Alaska 99507

c) The landowner will be promptly notified.

d) The Alaska SHPO will also be notified of any discovery unless circumstances indicate that the death or burial is less than 50 years old and that there is need for a criminal investigation or legal inquiry by the coroner.

Judith Bittner, State Historic Preservation Officer
(907) 269-8721
judy.bittner@alaska.gov
Alaska Dept. of Natural Resources
Office of History and Archaeology
550 West 7th Avenue Ste. 1310
Anchorage, AK 99501-3565

e) Written authorization in the form of a Burial Transit Permit from the Alaska State Bureau of Vital Statistics (BVS) shall be obtained prior to any excavation or re-interment of any human remains. In addition, clearance from the appropriate Alaska Native organization must be obtained prior to excavation or re-interment of Alaska Native remains. The BVS contact is:

Phillip Mitchell, Section Chief
(907) 465-3391
BVSResearch@alaska.gov
Phillip.mitchell@alaska.gov
Alaska Bureau of Vital Statistics
5441 Commercial Boulevard
P.O. Box 110675
Juneau, AK 99801

f) If the human remains are found to be historic in nature, a qualified professional physical anthropologist with experience in the analysis of human remains will examine them in situ to determine racial identity. The physical anthropologist shall document, analyze, and photograph the remains so that an independent assessment of racial identity can be made. The physical anthropologist shall be afforded no more than 30 days time to conduct his or her analysis.

g) If the unanticipated discovery consists of Alaska Native human remains, AEA will consult with the Alaska SHPO, FERC, and appropriate Alaska Native organizations regarding the appropriate measures to respectfully handle such a discovery. If it can be determined adequately that the identified human remains have affinity to any federally recognized tribe(s), a reasonable effort will be made by AEA to identify, locate, and notify these tribes. The appropriate Alaska Native Regional Corporations also will be contacted by AEA. A comprehensive contact list is attached as Appendix A.

h) AEA's Environmental Manager will notify other parties, as directed by the SHPO.

i) If the human remains are not Native American, and a determination has been made by the AST and Alaska SME that a death investigation is not warranted, then AEA, in consultation with the Alaska SME, will identify, locate and inform descendants of the deceased.

j) After permission to resume construction has been issued by the SHPO, AEA's Environmental Manager will notify the on-site Field Coordinator who will grant clearance to the contractor to restart construction.

Protection of Human Remains on Federal Land

a) AEA's Environmental Manager will promptly notify the Environmental Inspector to flag the at-risk site with a 20-meter buffer as appropriate. This buffer may be larger if there is the possibility of more resources in the area or in the case of slopes or cut-banks where ongoing construction may impact the site.

b) AEA's Environmental Manager will notify a peace officer of the state (police, Village Public Safety Officer, or Alaska State Trooper [AST]) and the Alaska State Medical Examiner (SME) immediately of the discovery, as stipulated in Alaska Statute 12.65.5. In addition to a local peace officer (if in a local jurisdiction), notification should include the AST Criminal Investigation Bureau. If the human remains appear recent (less than 50 years old) in the judgment of the archaeologists, the AST and SME will determine whether the remains are of a forensic nature and/or subject to criminal investigation. The appropriate federal land managing agency will also be contacted in case the human remains are related to a crime scene. The contact of the AST and SME are:

Sgt. Kid Chan
(800) 478-9333
(907) 269-5058
choong.chan@alaska.gov
(cc: Stephanie Johnson at steph.johnson@alaska.gov)
Alaska State Troopers
Missing Persons Bureau
5700 East Tudor Road
Anchorage, AK 99507

Talkeetna Post - Alaska State Troopers
(907) 733-2256
HC89 Box 8576
Talkeetna, AK 99676

Dr. Gary Zientek, Deputy Medical Examiner
(907) 334-2200
gary.zientek@alaska.gov
Alaska State Medical Examiner
5455 Dr. Martin Luther King Jr. Ave
Anchorage, Alaska 99507

John Jangala, Archaeologist
(907) 822-7303
jjangala@blm.gov
Glennallen Field Office
Bureau of Land Management
P.O. Box 147
Glennallen, Alaska 99588-0147

c) The Alaska SHPO will also be notified of any discovery unless circumstances indicate that the death or burial is less than 50 years old and that there is need for a criminal investigation or legal inquiry by the coroner. The SHPO contact is:

Judith Bittner, State Historic Preservation Officer
(907) 269-8721
judy.bittner@alaska.gov
Alaska Dept. of Natural Resources
Office of History and Archaeology
550 West 7th Avenue Ste. 1310
Anchorage, AK 99501-3565

d) Written authorization in the form of a Burial Transit Permit from the Alaska State Bureau of Vital Statistics shall be obtained prior to any excavation or re-interment of any human remains. In addition, clearance from the appropriate Alaska Native organization must be obtained prior to excavation or re-interment of Alaska Native remains. The BVS contact is:

Phillip Mitchell, Section Chief
(907) 465-3391
BVSResearch@alaska.gov
phillip.mitchell@alaska.gov
Alaska Bureau of Vital Statistics
5441 Commercial Boulevard
P.O. Box 110675
Juneau, AK 99801

e) <u>If</u> the human remains are found to be historic in nature, AEA, as directed by the appropriate federal land managing agency, will determine the origin of the human remains. A qualified professional physical anthropologist with experience in the analysis of human remains will examine them in situ to determine racial identity. The physical anthropologist shall document, analyze, and photograph the remains so that an independent assessment of racial identity can be made. The physical anthropologist shall be afforded no more than 30 days to conduct his or her analysis. The appropriate federal land managing agency will follow NAGPRA and the implementing regulations set forth in 43 CFR 10, for Alaska Native remains.

f) For Alaska Native remains, the appropriate federal land managing agency will retain the responsibility for determining and contacting the appropriate Alaska Native groups. In this case, NAGPRA dictates that work in the immediate vicinity of the remains cannot proceed until 30 days after the reply from the federal agency in charge or appropriate Alaska Native group that the documents regarding the finding were received, unless a written and binding agreement is issued from the federal agency in charge and the affiliated Native American group(s) (NAGPRA 25 USC 3002 Sec 3(d)). The remains will then be assessed and treated based on the guidance of the federal agency in charge and the appropriate Alaska Native group as defined by NAGPRA.

g) <u>If</u> the human remains are not Native American, and a determination has been made by the AST and Alaska SME that a death investigation is not warranted, then AEA, as directed by the appropriate federal land managing agency in consultation with the Alaska SME, will identify, locate, and inform descendants of the deceased.

h) AEA’s Environmental Manager will notify other parties, as directed by the appropriate federal land managing agency.

i) After permission to resume construction has been issued by the appropriate federal land managing agency, AEA’s Environmental Manager will notify the on-site Field Coordinator who will grant clearance to the Contractor to restart construction.

Contacts for AEA’s Cultural Resource Program

Charles M. Mobley
Cultural Resources Program Lead
(907) 653-1937 office
(907) 632-1933 cell
mobley@alaska.net
Charles M. Mobley & Associates
200 W. 34th Avenue #534
Anchorage, Alaska 99503

OR

Justin Hays
Cultural Resources Study Lead
(907) 474-9684 office
(907) 750-9857 cell
jmh@northernlanduse.com
Northern Land Use Research, Inc.
234 Front Street
Fairbanks, Alaska 99709

APPENDIX A: CONTACTS FOR ALASKA NATIVE ENTITIES

Though communities potentially affected by the Project have different histories and cultures, they are characterized by strong past and present ties to the land and its resources. The successful completion of the Consultation and Coordination phase of the National Historic Preservation Act (NHPA) Section 106 process requires an efficient and effective consultation process that addresses the laws and regulations within the context of local custom and practice. Several Alaska tribal entities recognized by the U.S. Department of Interior and established through the Alaska Native Claims Settlement Act (ANCSA) of 1971, are broadly located near the study area. In Alaska, consultation typically occurs with the 229 federally-recognized tribes, the 13 Alaska Native Regional Corporations, and some 200 Alaska Native Village Corporations created by the ANCSA (the Regional and Village Corporations are recognized as "Indians tribes" for NHPA purposes).

There are four Regional Native Alaskan corporations that have interests within or near the Project area (see Table 1). In addition, twenty-two tribes recognized by the Bureau of Indian Affairs under 25 CFR 83.6(b) are located within or near the Project area, including those indicated in Table 2. Table 3 includes a list of recognized and non-recognized ANCSA village; group and urban corporations; and village organizations that also have interests.

Table 1. List of Regional Native Corporations with interests within the vicinity of the Susitna-Watana Hydroelectric Project.

Ahtna, Incorporated (Ahtna) Michelle Anderson, President PO BOX 649, Glennallen, Alaska 99588 Glennallen Office: (907) 822-3476 Fax: (907) 822-3495 Anchorage Office: (907) 868-8250 Fax: (907) 868-8285 Email: manderson@ahtna.net	Doyon, Ltd. (Doyon) 1 Doyon Place, Suite 300 Fairbanks, Alaska 99701-2941 (907) 459-2000 (888) 478-4755 (toll-free) (907) 459-2060 (fax)
Cook Inlet Region Incorporated (CIRI) 2525 C Street Suite 500, Anchorage, Alaska 99503 P.O. Box 93330, Anchorage, Alaska 99509-3330 (907) 274-8638	Doyon, Limited - Anchorage Office 11500 C Street, Suite 250 Anchorage, Alaska 99515-2692 (907) 563-5530 or (907) 375-4220 (907) 375-4205 (fax)

Table 2. List of Tribes recognized by the Bureau of Indian Affairs under 25 CFR 83.6(b) within the vicinity of the Susitna-Watana Hydroelectric Project.

Cheesh-Na Tribal Council/Mount Sanford bal Consortium P.O. Box 357 Gakona, Alaska 99586 907-822-5399 Fax 907-822-5810	Knik Tribe P.O. Box 871565 Wasilla, AK 99687 907-373-7991 Fax 907-373-2161 kniktribe@mtaonline.net
Chickaloon Native Village P.O. Box 1105 Chickaloon, AK 99674-1105 907-745-0707 Fax 907-745-7154 cvadmin@chickaloon.org http://www.chickaloon.org	Mentasta Traditional Council P.O. Box 6019 Mentasta Lake, AK 99780-6019 907-291-2319 Fax 907-291-2305 kmartin@tribalnet.com
Native Village of Chitina P.O. Box 31 Chitina, AK 99566-0031 907-823-2215 Fax 907-823-2233 aceak2000@yahoo.com	Native Village of Cantwell P.O. Box 94 Cantwell, AK 99729 907-768-2591 Fax 907-768-1111 hallvc@yahoo.com
Gulkana Village P.O. Box 254 Gakona, AK 99586 907-822-3746 Fax 907-822-3976 lclaw@gulkanacouncil.org http://gulkanacouncil.org/	Eklutna Native Village 26339 Eklutna Village Road Chugiak, AK 99567-6339 907-688-6020 Fax 907-688-6021 nve@eklutna-nsn.gov http://www.eklutna-nsn.gov
Healy Lake Village P.O. Box 74090 Fairbanks, AK 99706-0300 907-876-0638 Fax 907-876-0639 jpolstonhitc@live.com	Native Village of Gakona P.O. Box 102 Gakona, AK 99586 907-822-5777 Fax 907-822-5997 gakonavc@cvinternet.net www.nvgakona.com
Kenaitze Indian Tribe P.O. Box 988 Kenai, AK 99611-0988 907-283-3633 Fax 907-283-3052 kenaitze@alaska.net http://www.kenaitze.org/	Native Village of Kluti-Kaah P.O. Box 68 Copper Center, AK 99573-0068 907-822-5541 Fax 907-822-5130 nvkktops@cvinternet.net

Table 2. List of Tribes recognized by the Bureau of Indian Affairs under 25 CFR 83.6(b) within the vicinity of the Susitna-Watana Hydroelectric Project (continued).

Native Village of Tazlina P.O. Box 87 Glennallen, AK 99588-0087 907-822-4375 Fax 907-822-5865 tazlinajulie@cvinternet.net ▪	Northway Village P.O. Box 516 Northway, AK 99764 907-778-2287 Fax 907-778-2220 dnnvc@yahoo.com
Native Village of Tetlin P.O. Box 797 Tetlin, AK 99779 907-883-2021 tetlin@earthlink.net ▪	Seldovia Village Tribe P.O. Drawer L Seldovia, AK 99663 907-234-7898 Fax 907-234-7865 svt@svt.org http://www.svt.org/
Native Village of Tyonek P.O. Box 82009 Tyonek, AK 99682-0009 Phone 907-583-2271 Fax 907-583-2442 E-mail tyonek@aitc.org ▪	Native Village of Tanacross P.O. Box 76009 Tanacross, AK 99776 907-883-5024 Fax 907-883-4497 jerry_isaac@hotmail.com
Nenana Native Association P.O. Box 369 Nenana, AK 99760 907-832-5461 Fax 907-832-1077 nibor652004@yahoo.com ▪	Village of Dot Lake P.O. Box 2279 Dot Lake, AK 99737-2279 907-882-2695 or 907-322-2694 Fax 907-882-5558 dotlake@aitc.org ▪
Ninilchik Village P.O. Box 39070 Ninilchik, AK 99639 907-567-3313 Fax 907-567-3308 ntc@ninilchiktribe-nsn.gov/ http://www.ninilchiktribe-nsn.gov/ ▪	Village of Salamatoff P.O. Box 2682 Kenai, AK 99611 907-283-7864 Fax 907-283-6470 ▪

Table 3. List of recognized and non-recognized ANCSA village; group and urban corporations; and village organizations that have interests within the vicinity of the Susitna-Watana Hydroelectric Project.

Alexander Creek, Incorporated 8128 Cranberry Anchorage, AK 99502 (907) 243-5428	Knikatnu, Incorporated P.O. Box 872130 Wasilla, AK 99687-2130 907-376-2845 Fax 907-376-2847 knikcorp@gci.net
Caswell Native Association HC 89, Box 83 Willow, AK 99688 (907) 495-1263	Little Lake Louise Corporation (907) 250-2098
Chitina Native Corporation P.O. Box 3 Chitina, AK 99566-0031 907-823-2223 Fax 907-823-2202 chitina_native@cvinternet.net http://www.chitinanative.com	Lower Tonsina Corporation Unavailable
Chickaloon-Moose Creek Native Association, corporated P.O. Box 875046 Wasilla, AK 99687 907-373-1145 Fax 907-373-1142 cmena@alaska.net http://www.chickaloon.org	Kenai Natives Association, Inc. 215 Fidalgo Ave. #101 Kenai, AK 99611-7776 907-283-4851 Fax 907-283-4854
Dot Lake Native Corporation 3500 Wolf Run Fairbanks, AK 99709 907-882-2755 Fax 907-882-2775	Nabesna Native Group, Inc. Unavailable
Eklutna, Incorporated 16515 Centerfield Dr. #201 Eagle River, AK 99577 907-696-2828 Fax 907-696-2845 receptionist@eklutnainc.com http://www.eklutnainc.com	Mendas Cha-ag Native Corporation Gary Lee, President 457 Cindy Dr. Fairbanks, AK 99701

Table 3. List of recognized and non-recognized ANCSA village; group and urban corporations; and village organizations that have interests within the vicinity of the Susitna-Watana Hydroelectric Project (continued).

Gold Creek-Susitna NCI P.O. Box 847 Talkeetna, AK 99676-0847 (907) 733-2329	Seldovia Native Association, Incorporated P.O. Drawer L Seldovia, AK 99663-0250 907-234-7625 Fax 907-234-7637 info@snai.com http://www.snai.com
Montana Creek Native Association P.O. Box 100379 Anchorage, AK 99510	Tanacross, Incorporated P.O. Box 76029 Tanacross, AK 99776 907-883-4130 Fax 907-883-4129 http://www.tanacrossinc.com
Ninilchik Natives Association, Incorporated P.O. Box 39130 Ninilchik, AK 99639 907-567-3866 Fax 907-567-3867 nnai@nnai.net http://www.nnai.net	Tetlin Native Corporation Gary David Sr., President P.O. Box 657 Tok, AK (907) 883-6652 (907) 505-0253
Northway Natives, Incorporated P.O. Box 401 Northway, AK 99764 907-778-2298 Fax 907-778-2266	Toghotthele Corporation P.O. Box 249 Nenana, AK 99760 907-832-5832 Fax 907-832-5834 Toghotthele@hotmail.com
Point Possession, Incorporated Feodoria Pennington, President 1321 Oxford Dr. Anchorage, AK 99503 (907) 563-1848	Twin Lake Native Group, Incorporated Unavailable
Salamatkof Native Association, Incorporated 100 N. Willow Street Kenai, AK 99611 907-283-3745 Fax 907-283-6470 info@salamatof.com http://www.salamatof.com/	Tyonek Native Corporation 1689 C Street, Suite 219 Anchorage, AK 99501 907-272-0707 Fax 907-274-7125 http://www.tyonek.com/
Slana Native Corporation - Unavailable	

ATTACHMENT 11-2

DOCUMENTATION OF CONSULTATION ON CULTURAL AND PALEONTOLOGICAL STUDY PLANS

NLUR Project #:	12-027

NLUR Record of Consultation

Date:	May 2, 2012	**Time:**	5:00-5:45
Contact:		**Project:**	Susitna-Watana
Company:	AEA	**Place:**	NLUR-FAI

Attendees and Affiliation:

NLUR: Pete Bowers, Justin Hays, Carol Gelvin-Reymiller

UAF – Alaska Native Language Center: Jim Kari, Emeritus Professor

AHTNA: Michele Anderson, President

Nick Jackson, Chairman

Karen Linnell, Vice Chair

Joe Bovee, Lands and Resources Manager

Bruce Cain, VP, Admin. and Finance

Purpose:

General discussion of Ahtna Place Names study needs

Summary of Discussion:

Dr. Kari and NLUR have had on-going technical and methodological discussions regarding Native place names and Traditional Cultural Properties in the Susitna Project area (on this subject Dr. Kari is the pre-eminent scholar in the world and has on-going research contracted by Ahtna). Part of the 2012 Study Plan involves developing studies for place names and TCPs to meet the needs of a variety of resource areas, including at minimum: cultural resources, subsistence, trails, transportation, and recreation. The place names study will collect, compile, annotate, and digitize place names relevant to the Susitna Study area. This study directly involves Ahtna since the Native place names are mostly theirs, and it provides data pertinent to a number of land use concerns raised by Native groups at several public meetings. The study would build upon narratives in books and articles published by Dr. Kari and his colleagues.

The meeting occurred on short notice and was expected by NLUR to be attended by NLUR, Dr. Kari, and "a representative or two of Ahtna" who were in Fairbanks for other business. NLUR did not anticipate the participation of Ahtna officers. The informal meeting and discussions were very informative and productive.

Meeting Notes:

- Dr. Kari discussed his interest and availability should a collaborative Place Names Study develop later this year. He indicated that he could possibly spare 25% time on such a project with perhaps one other co-P.I. Dr. William Simeone (who was a primary author of NLUR's subsistence data gap report) was suggested by Kari as another possible co-P.I., and Carol Gelvin-Reymiller was identified as another key participant.
- Dr. Kari mentioned developing the ethnohistory of the Tyonek and/or Lake Louise areas, as part of the Susitna ethnogeography. Very little study has been conducted in these areas relating to Ahtna. Dr. Kari also mentioned that there are existing interview tapes that still need to be transcribed from the Talkeetna Mtns. and other areas. This could be a possible project of local interest and direct relevance to the Susitna planners.
- Names of possible students, mentors, transcribers, etc. were offered around the table regarding local involvement. Cantwell, Fairbanks, Gulkana, Copper Center, and Glennallen were specific communities mentioned that may have individuals interested in some type of collaborative project.
- Ms. Linnell stressed the need that the product of the collaboration should be something the Ahtna can use themselves as opposed to the usual "grey literature" report that sits on a shelf and is not widely distributed. All agreed.

- Other ideas for possible projects and products were offered by several members of the meeting. Products were suggested such as an interactive Place Names Atlas, CD-ROM maps, large display map of the Ahtna region with Place Names, scholarships for Ahtna students, school curricula, and books similar to those already published by Dr. Kari and other scholars at the Alaska Native Language Center.
- Mr. Bovee indicated that Ahtna Inc. could develop a Study Request for AEA (with input from Peter Bowers and Dr. Kari) in the next several weeks. He asked if AEA was interested in developing a collaborative project; Bowers responded that AEA had expressed several times in meetings their interest in closer involvement with native groups in projects such as this.

Signature/Name:

Peter M. Bowers

Notes on a May 21, 2012 telephone conversation between Charles M. Mobley, Cultural Resource Program Lead, and Richard VanderHoek, SHPO's representative, concerning provisions of the Plan for Unanticipated Discoveries, as part of the Susitna-Watana Dam cultural resource program. Submitted to Betsy McGregor, AEA, May 21, 2012, with cc.

I called VanderHoek to discuss details of the Plan for Unanticipated Discoveries and help me edit the current draft into a more user-friendly protocol. One of the main elements discussed was my interest in doing away with immediate notification, shut-down, site flagging, etc. for cultural sites if a field crew is not engaged in a ground-disturbing action. Thus only discovery of human remains or a cultural site in immediate jeopardy from a ground-disturbing action would engage the protocol for immediate notification. Cultural sites not in immediate jeopardy are to be reported within five days, at which point the GPS coordinates will be compared to those of the existing inventory to determine whether it is a known or as-yet-undiscovered site. And onward from there closer to the current draft plan. My goal is to avoid the requirement for immediate notification and action every time a non-disturbing crew sees a building ruin or surface archaeological scatter in the APE, since the more conspicuous sites could very well already be recorded. Richard was favorable to this level of streamlining.

Upon completion of that discussion, Richard mentioned that the Alaska Office of History and Archaeology staff had circulated our Cultural Resource 2013/14 Study Request inhouse for review and would be submitting comments to AEA.

Charles M. Mobley

Notes on a May 31, 2012 telephone conversation between Charles M. Mobley, Cultural Resource Program Lead, and Bob King, BLM State Archaeologist, concerning: a) content and process in the current Plan for Unanticipated Discovery of Cultural Resources and Human Remains; b) tribal review; c) Glennallen field office involvement. Submitted to Betsy McGregor, AEA, June 1, 2012, with cc.

I sent BLM archaeologist Bob King a copy of the current Plan for Unanticipated Discoveries document on Thursday, May 31, and he emailed me right back with the following self-admittedly rushed comments:

1) In terms of discovering NAGPRA materials (e.g., human bones) on BLM land, are there any scenarios where BLM doesn't get informed immediately? I note discussion of an up to 5-day delay, is it? which seems to apply to human bone discoveries if the finds are not in jeopardy of eminent destruction? On whose land does that apply?
2) If there is a delay in notification after encountering human bones on federal land, how does that square with NAGPRA regulation requirements?
3) Have tribes been informed of this policy yet? If so, by whom? And have they been (or will they be?) consulted with in a federal gov-to-gov consultation relationship to agree with this policy?
4) How will this policy come into effect? (part of a PA with the ACHP?)
5) Did this get sent to our Glennallen BLM Field Office for comment?

I called him immediately and we discussed the Plan in particular and BLM expectations in general. My impression that the human remains discovery protocol in the first and subsequent drafts of the Plan had been standardized through previous application was not shared by Bob. I told him that he'd misread it somewhat, that there was not a 5-day lag in human remain reporting – the clock starts ticking as soon as the find is confirmed by a specialist as human.

His comment about the need for tribal review of the document means through other than already-established project review processes. He is thinking this through to an ultimate conclusion of a Programmatic Agreement with multiple agency and tribal and landowner signatories. I told him field crews are going out almost immediately and the time to get to a P.A. would be lengthy. He agreed. He asked about anticipated tribal govt/govt relationships. All I know so far is that Chickaloon Village Traditional Council requested a govt/govt relationship with FERC in their filed letter. Which leads into…

Bob King said he isn't actually to be in the loop on this at all except peripherally, deferring to archaeologist John Jangala at BLM Glennallen Field Office and their jurisdiction (I will change the Plan to read Glennallen contact). I expect Jangala will be attending Thursday's meeting, and he and I have a call scheduled for Tuesday morning. Jangala's email of today indicated BLM has had discussion with FERC about tribal relationships and I expect to learn more soon. Both Bob King and I also expect Jangala to have a better idea of the actual level of tribal review and involvement called for in regard to the Plan for Unanticipated Discoveries and other cultural resource matters.

Charles M. Mobley

Notes on a June 1, 2012 hallway conversation between Charles M. Mobley, Cultural Resource Program Lead, and Richard VanderHoek, SHPO's representative, concerning: a) his official comments on the draft 2013-2014 PSP; b) non-attendance at this Thursday's Susitna-Watana meetings. Submitted to Betsy McGregor, AEA, June 1, 2012, with cc.

I was at AOHA on other business and Richard hailed me from his cubicle to say that he couldn't attend this Thursday's meetings because he was out of town on other business.

He also said that he'd neglected to mention it in his official comments on the draft 2013-14 PSP, but he did have another thought about its content and implementation. That is, whatever inventory or other sorts of work suggested to be done after project construction – like monitoring varying reservoir shoreline elevations to look for archaeological sites eroding out, etc. – will be a responsibility/liability of the State most likely. So be thoughtful about creating long-term responsibilities and consider who will be managing any residual efforts required.

Charles M. Mobley

Notes from AEA's June 7, 2012, Social Science Study Plan Development Meeting (C. Mobley)

Purpose of the meeting was to discuss stakeholders' comments on the draft 2013-14 PSP. About 150 written comments have been filed so far. Some federal agencies' comments are a couple hundred pages long.

About 20 people attended in person, probably more than that by telephone. VanderHoek couldn't be there to represent SHPO. John Jangala attended representing BLM (he mentioned his other appointment option was the Canadian snow-field conference where VanderHoek was). Steve Braun was there to discuss the Traditional Knowledge and other survey work being done under Tracie Krauthoefer's HDR auspices. Fran Seager-Boss for Matsu Borough was there. Social Science subjects: Socioeconomics; Transportation; Recreation & Aesthetics; Subsistence, and Cultural Resources.

I first discussed 2012 matters – the beginning the borehole survey today, curation agreement, and unanticipated discovery protocol. The latter got a question regarding whether state and federal tracks were different, and a little more conversation. I mentioned the WhoYaGonna'Call? Card.

Then into the 2013-14 PSP comments – divided into a) more detail about methods; b) missing study elements; c) APE. Regarding missing or deficient study elements, the first one I mentioned is paleontology, the second is cultural landscapes. Kirby recommends we use specific subheadings by those names in the next PSP draft.

TCP matters drew some comment – mostly the need for integration with other data sets derived from other studies. Bill Simeone contributed and mentioned he/Kari/Ahtna intention to get a Study Request in with a few weeks. Later after the meeting I caught up with him and discussed the immediacy of the need, and the routing from Ahtna to URS, neither of which he was aware of.

The focus of the PSP on inventory and evaluation within the direct APE to the exclusion of indirect APE got much attention in agency comments. When I brought it up it was mostly as a query to AEA, because my impression all along is that AEA has wanted the cultural resource effort to focus on the impoundment area, construction site, any staging areas, and the linear features. That got some response. Kirby made a vague comment about maybe reserving 2014 for investigation of indirect impacts. Wayne Dyak commented that the work to be done in the indirect impact areas wouldn't need to be as comprehensive as that for the direct impact area. Fran shifted in her chair on that one, so I responded to Wayne that I wouldn't necessarily agree that the investigative methods or intensities would automatically be less in the indirect impact zone. It was at that point (after three hours of meeting?) that the speakerphone interrupted and we all learned that Frank Winchell for FERC in D.C. was on the line. He didn't directly clarify matters for us but the end result is that AEA is much more sensitized to the need for the cultural resource program to address indirect impacts thoroughly. Another result is that I reread the Study Area description and it is not clear. The PSP is for the 2013-14 work but its Study Area description only refers to the 2012 areal limitation specified by AEA – impoundment/staging/linearfeatures. So this subsection needs a significant rewrite. Kirby says be specific about the criteria used to define the indirect APE; Bruce Tiedemann said define terms explicitly because Natives in particular may confuse legal/colloquial meanings, etc.

Bruce Tiedemann made a general statement without attribution that Natives want their cultural sites protected. End of Cultural stuff.

Site visits have been moved back, tentatively to around July 25-26.

Important Question: Is there to be any work in 2012 on BLM land? Such that BLM should be expecting an ARPA permit application?

Action Needed: Steve Braun made a plea for each of the Study Programs to submit to him 3-5 specific questions that we want to be included in the Traditional Knowledge survey that they will be conducting. I would think NLUR might want to generate those questions in consultation with Jim Kari, or maybe there are particular places that deserve a question. He didn't give a target for getting these questions to them. Pretty nice opportunity for us.

If I think of another highlight I'll send it around. This is the most of it. Cheers, Chuck

Notes on a June 12, 2012 telephone conversation between Charles M. Mobley, Cultural Resource Program Lead, and John Jangala, BLM – Glennallen Field Office Archaeologist.

Submitted to Betsy McGregor, AEA, June 14, 2012, with cc.

I first called BLM state archaeologist Bob King for a brief confirmation that he would be available this week and next to sign the ARPA permit, if needed (we have confirmed it is needed).

Then I called John Jangala at Glennallen, who will issue the BLM field office's paperwork – a Local Field Authorization – corresponding to the ARPA permit. Bob and John coordinate that between themselves.

Highlights of the conversation:

1) the provisional Unanticipated Discovery document is workable from BLM's perspective.

2) though interested Native groups may differ according to whether they have primarily a cultural interest (ties through occupancy – Ahtna etc.) or a property interest (Tyonek etc.), at this point in time it would be better not to exclude any Native groups when circulating review materials (like the Unanticipated Discovery document). He used the term "winnowing" to describe the subsequent process of determining which Native parties wish to participate in which ways to what degrees.

3) BLM will be sending FERC a letter soon notifying them of their desire to be a supplemental consulter with FERC. BLM has not decided whether they wish to be a Cooperator and sign-on to FERC's EIS, or an Intervener and develop a secondary EIS.

4) **<u>BLM wishes to coordinate their public meeting times with AEA as much as possible, including the interviews and other public meetings that various Study Groups may desire for their respective investigations</u>.** John's concern is simply courtesy to local individuals, who have 8-5 jobs and kids and fish to clean, etc., so that consolidation of their attention into one block of time is good for everybody.

5) Native parties sometimes wish to participate and still keep certain information confidential, which is difficult under the circumstances in which it has to go to FERC and be shared with other agencies or it doesn't get considered in the process.

Charles M. Mobley

NLUR Project #:	12-027

NLUR Record of Consultation

Date:	6/12/12	**Time:**	4:19pm
Contact:	Dr. Richard VanderHoek	**Project:**	Susitna-Watana
Company:	AEA	**Place:**	NLUR-FAI

Attendees and Affiliation:

Richard VanderHoek, Archaeologist, OHA

Justin Hays, Study Lead, NLUR

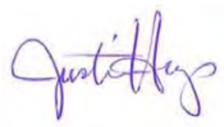
Purpose:

Verify reporting requirements for cultural resources investigations of proposed geotechnical borehole sites.

Summary of Discussion:

I emailed Dr. VanderHoek to inquire if a standard NLUR letter report/interim report was sufficient for reporting requirements to OHA. He responded it was acceptable as long as the results also appear in the end of the year final report draft submitted to OHA. I thanked him for his timely response and assured him both an interim/letter report and the final report would contain the results of all geotechnical survey in addition to the scheduled cultural resources investigations in 2012.

Signature/Name:



Justin M. Hays

NLUR Project #:	12-027

NLUR Record of Consultation

Date:	6/14/12	**Time:**	10:56am; 5:40pm; 6:00pm
Contact:	Dr. Robert King Mr. John Jangala	**Project:**	Susitna-Watana
Company:	AEA	**Place:**	NLUR-FAI

Attendees and Affiliation:

Dr. Robert King, Archaeologist, Anchorage BLM

Mr. John Jangala, Archaeologist, Glennallen BLM

Justin Hays, Study Lead, NLUR

Purpose:

Submit a permit application for archaeological investigations on Bureau of Land Management lands within the proposed study area.

Summary of Discussion:

Initially, I called Mr. Jangala in Glennallen to inquire about whom I should submit my permit application to. He directed me to Dr. King, State Archaeologist at the Anchorage BLM. Mr. Jangala indicated he was the Field Office Manager of this area and he would oversee the permit in the field and to cc him on emails to the BLM.

That day, I emailed my permit application to Dr. King and cc'd Mr. Jangala. Dr. King quickly responded to my email and thanked me for getting the application in early. On June 27, Dr. King sent a copy of the signed permit (# AKAA-093320) back to me. The document still needs to be signed by the Principal Investigator, Peter Bowers and mailed back to Dr. King at BLM. NLUR is in the process of delivering a signed copy.

Signature/Name: Justin M. Hays

Brelsford, Taylor

Subject: Discussion of AEA Cultural Resources Place Names proposal; follow up on other CR items

Location: teleconference

Start: Wed 6/13/2012 11:00 AM
End: Wed 6/13/2012 12:30 PM

Recurrence: (none)

Meeting Status: Meeting organizer

Organizer: Brelsford, Taylor
Required Attendees: Chuck Mobley (mobley@alaska.net); Pete Bowers; Bill Simeone; Justin Hays

In response to e-mail traffic today, let's try for a meeting at

11:am on Wed. Agenda for all:

1. Place names study proposal
   a. Current status of the proposal initiated by Jim Kari and Ahtna
   b. Role of cultural landscapes issue
   c. Role for CIRI
   d. Next steps

Additional Items on Cultural Resources contractors work program -

2. Implementation of the unanticipated discovery protocols
3. Rewrite schedule & parameters for the 2013/14 PSP

Teleconference Info:

Dial in: 1-888-369-1427

Passcode: 2616705

Brelsford, Taylor

Subject:	AEA Cultural Resources - Work session on study proposal for place names, TCP, and ethnographic landscape
Location:	URS office, 700 G St., Suite 500; and teleconference
Start:	Thu 6/14/2012 1:00 PM
End:	Thu 6/14/2012 2:30 PM
Recurrence:	(none)
Meeting Status:	Meeting organizer
Organizer:	Brelsford, Taylor
Required Attendees:	Chuck Mobley (mobley@alaska.net); Pete Bowers; Justin Hays; Bill Simeone; James Kari; Bruce Cain (bcain@ahtna.net)

Friends,

Following a very constructive meeting today, we made homework assignments and agreed to meet for a work session tomorrow. Bruce was kind to distribute a summary of the meeting discussion and assignments.

Teleconference Number: 1-888-369-1427
Passcode: 2616705

Contact Information for the AEA Susitna-Watana Cultural Resources Contractor Team

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Justin Hayes (NLUR)

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James (Jim) Kari, Ph.D., Professor of Linguistics,
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Bruce Cain, Vice President of Administration and Finance, Ahtna,
Incorporated Direct 907-822-8126, Glennallen Receptionist 907-822-3476,
Cell - 907-952-2798 e-mail: Bruce Cain <bcain@ahtna.net>

Brelsford, Taylor

Subject: AEA CR- Ethnographic Landscape, Place Names study plan work session
Location: Teleconf

Start: Fri 6/15/2012 1:00 PM
End: Fri 6/15/2012 2:00 PM

Recurrence: (none)

Meeting Status: Meeting organizer

Organizer: Brelsford, Taylor
Required Attendees: Chuck Mobley (mobley@alaska.net); Pete Bowers; Justin Hays; Bill Simeone; Joe Bovee; Bruce Cain (bcain@ahtna.net); kmartin@ahtna.net; kmaratin@ahtna-inc.com

Purpose:

Update on AEA process for 2013-2014 study plan development
Additional review of draft study plan circulated this morning

Teleconference Info:

Number: 1-888-369-1427
Passcode: 2616705

Brelsford, Taylor

Subject: Review of 6/16 budget and study plan
Location: teleconf

Start: Wed 6/20/2012 10:15 AM
End: Wed 6/20/2012 11:15 AM

Recurrence: (none)

Meeting Status: Meeting organizer

Organizer: Brelsford, Taylor
Required Attendees: Bill Simeone; Bruce Cain (bcain@ahtna.net); Justin Hays; Chuck Mobley (mobley@alaska.net); Pete Bowers

Dial in at: 1-888-369-1427

Passcode: 2616705

(Bruce, if there is trouble getting on-line, please dial Angel as before at 907-562-3366) (Bruce, please forward to Jim Kari, if you like.)

Notes on June 19-21, 2012 telephone and email dialogue between Charles M. Mobley, Cultural Resource Program Lead, and Richard VanderHoek, SHPO's representative, concerning: a) logistics for field visit on June 28, 2012; b) cultural resource discussion in Transportation PSP submitted by B. Carey. Submitted to Betsy McGregor, AEA, June 21, 2012, with cc.

Rich VanderHoek and I exchanged three emails on June 19 and another on the 20th working out the details for the two of us to take a field trip into the project area on Thursday, June 28.

He and I also talked on the telephone twice on June 21 and had two email exchanges regarding the cultural resource discussion in the Transportation PSP that B. Carey sent to him this morning (subsequently forwarded to me) requesting review and comment. VanderHoek and State Archaeologist Dave McMahan conferred and provided comments back to me. (I've circulated them back to B. Carey and the cultural resource team). On the telephone Rich commented that they preferred to handle such consultation through one point of contact and were expecting that would be me. I agreed.

Specific SHPO comments on the Transportation PSP language are not included in this meeting notes document since it is to be included in the PSP, and the comments referred to specific site locational information that they wished deleted.

Charles M. Mobley

Notes on a June 28, 2012 meeting/field trip between Charles M. Mobley, Cultural Resource Program Lead, and Richard VanderHoek, SHPO's representative, concerning provisions of the Plan for Unanticipated Discoveries, as part of the Susitna-Watana Dam cultural resource program. Submitted to Betsy McGregor, AEA, June 29, 2012, with cc.

Rich VanderHoek and I independently drove to Talkeetna, met up with Quicksilver helicopter, and flew the length of the impoundment, part of the Denali corridor up to Deadman Lake, and the Gold Creek corridor. Weather was barely fair and delayed departure from Talkeetna. The work required three tanks of fuel, involving two stops at the tank slung in behind Stephens Lake Lodge.

One archaeological site was inspected on the ground – TLM-143, which has yielded C14 dates of 4500 years ago and overlooks a salt lick that had a flock of sheep ranging over it when we were there.

Of note for implementation of the archaeological fieldwork is the lack of LZs throughout much of the project area inspected. Our pilot said that no trees or bushes were allowed to be cut for helicopter landings, which further limits access. Consequently the field investigations will entail considerable pedestrian access in addition to just the effort for the actual pedestrian archaeological survey.

Additional archaeological observations will be shared with the specialists on the team. Of note, though, is a complex of eskers just (within 1-2 miles) north of the upper reach of the impoundment that would seem to have the same potential as the Tangle Lakes Archaeological District

Charles M. Mobley

Attachment 11.7.2. Plan for Unanticipated Discovery of Cultural Resources and Human Remains During The 2013-2014 Susitna-Watana Dam Field Investigations

(PROVISIONAL – JULY 8, 2012)

The first part of this plan (pages 1-3) is addressed to non-cultural resource contractors and other personnel involved with the Susitna-Watana Hydroelectric Project (Project) and establishes procedures in the event that unreported or unanticipated cultural resources and/or human remains are found in the field. The field reporting procedures differ depending on whether cultural materials or human remains are encountered, whether the discoverers are involved in a non-destructive effort, or whether ground disturbance is involved. Reports of any finds will be forwarded by the Cultural Resources Program or Study Lead as per the remainder of this plan according to whether the finds are on federal, state, or private land[1]. Prior to fieldwork, AEA and contracted personnel will receive environmental training including the following guidance for identifying and reporting cultural resources or human remains discovered in the field. This plan briefly describes cultural resources in the study area, how to distinguish them from insignificant junk and trash, and procedures to follow if[2] cultural resources or human remains are encountered during fieldwork).

Cultural Resources in the Study Area

The general study area contains historic and prehistoric remains dating back as far as 10,000 years, and over 250 sites are known from previous studies. Of those, about 90 percent had stone tools and other prehistoric artifacts, about 10 percent were historic sites consisting of building ruins or scatters of commercially manufactured items (metal cans, bottles, etc.), and only a couple were fossil discoveries (animal or plant remains). The more recent prehistoric sites are from the Athabascan Indians who inhabited the area historically and hold the majority of the area's Native place names in their linguistic dialect (Ahtna); older sites fade into a more generalized adaptation shared by most of Alaska's ancient interior peoples. Historic sites in the Susitna-Watana area reflect remote land use like mining, prospecting, hunting, trapping, and recreational pursuits, in addition to simple homesteading.

How to Distinguish Cultural Resources

Prehistoric sites in the sample most commonly contain stone tools, which are the main indicator for field personnel. Rocks free of flaws that fracture easily and predictably (like flint or obsidian) were typically struck and pressured into form, resulting in tools and discarded flakes with distinctively faceted surfaces,

[1] As set forth by the National Historic Preservation Act (NHPA), as amended (16 USC 470) and implementing regulations (36 CFR 800), Archaeological Resources Protection Act (ARPA), Native American Graves Protection and Repatriation Act (NAGPRA) and Alaska Statutes 11.46.482 (a)(3), 12.65.5, 18.50.250, and 41.35.200.

[2] "ifs" are underlined in this document.

i.e., shallow concave scars on tools as well as the corresponding positive bulbs on removed flakes (imagine the rippled conical chunk of glass your son, daughter, or you once popped out of a plate glass window with a BB gun). This is the major diagnostic feature to keep in mind for prehistoric sites. The process of discriminating between an artifact and a naturally shattered rock depends a lot on context. A few suspicious stone shards among a rocky talus slope of identical mineralogy are probably not cause for concern; an interesting, multi-flaked, sharp stone plus a few others nearby (perhaps with detachment bulbs) on a flat overlook would more likely be a cultural occurrence. Many of these locales have already been found and recorded as formal archaeological sites, but it is likely that more remain to be discovered.

Historic sites can have more variability than prehistoric sites in terms of surface and subsurface features and their degree of preservation. Building ruins ranging from roofed examples to those fast entering the archaeological record are part of the cultural resource inventory. Scatters of metal cans and glass bottles legally can be cultural resources too, <u>if</u> they are 50 or more years old (using that criterion, archaeologist Ivar Skarland's field camp from his 1953 investigations of the then-proposed Devil's Canyon dam impoundment could hypothetically be historically significant). Unvegetated deposits of loose rock at the base of mineralized outcrops, often reddish or yellowish in color, may indicate historic prospecting, as might the remains of water diversion systems. As with the prehistoric inventory, many of these sites have already been discovered, but it is likely that more remain to be found.

What to Do <u>if</u> Cultural Features or Artifacts are Encountered

Regardless of whether the field program is non-destructive or involves ground disturbance, work must be stopped immediately in the vicinity, with no further disturbance of the features or artifacts. <u>If</u> work involves a ground-disturbing activity, either Cultural Resource Program Lead Charles M. Mobley or Study Lead Justin Hays should be contacted immediately (contact information is listed below) and provided information describing of the finds and their location, including GPS coordinates. <u>If</u> work is part of a non-destructive field program, the description and location of the suspected cultural resource, including GPS coordinates, must be reported to Mobley or Hays within five days. Digital photographs accompanying the report are especially recommended, but no photographs or site-specific location information should be released to the press or individuals other than the Cultural Resource Program or Study Leads.

Charles M. Mobley		Justin Hays
Cultural Resources Program Lead		Cultural Resources Study Lead
(907) 653-1937 office	**<u>OR</u>**	(907) 474-9684 office
(907) 632-1933 cell		(907) 750-9857 cell
mobley@alaska.net		jmh@northernlanduse.com
Charles M. Mobley & Associates		Northern Land Use Research, Inc.
200 W. 34th Avenue #534		234 Front Street
Anchorage, Alaska 99503		Fairbanks, Alaska 99709

How to Distinguish Human Remains

Animal bones are statistically much more common than human remains, so probabilities favor the find not being human. A biologist or hunter on the crew should be consulted for a determination. <u>If</u> the bones are cut or sawn, they can be assumed to be non- human. Human skulls and all-one-piece jaws are relatively unique and easily identified. For other bones, imagining where they may fit in a human body is recommended. <u>If</u> they do not appear to fit, they are less likely to be human.

Context is important. <u>If</u> the bones are scattered around a fairly recently used fire ring, for example, then they are likely to be animal bones. <u>If</u> they are tumbling out of a rock cairn, they are more likely to be human.

What to Do <u>if</u> Human Remains are Found

Regardless of whether work is part of a non-destructive field program or one involving ground disturbance, work must be stopped immediately in the vicinity, with no further disturbance of the bones. Either Cultural Resource Program Lead Charles M. Mobley or Study Lead Justin Hays must be contacted immediately by telephone or email (see contact information above) and provided with a description of the bones and their location, including GPS coordinates. Digital photographs accompanying the report are especially recommended but no photographs or site-specific location information should be released to the press or individuals other than the Cultural Resource Program or Study Leads.

Forwarding Reports of Discoveries from the Field

After the field report has been made to Mobley or Hays the field finders' responsibilities are over other than to be available for further consultation <u>if</u> necessary. The following steps will then be set in motion:

1. The Cultural Resources Program or Study Lead will compare the find's GPS coordinates and description with the known site inventory to determine <u>if</u> it actually reflects a new discovery or an already-recorded site.

2. <u>If</u> the discovery involves human remains or is determined to be an unrecorded cultural property, the Cultural Resources Program or Study Lead will immediately notify AEA's Environmental Project Manager of the find and its potential significance.

Betsy McGregor, AEA Environmental Project Manager
(907) 771-3957 office
BMcGregor@aidea.org
411 W. 4th Avenue, Ste. 1
Anchorage, Alaska 99501

3. AEA's Environmental Project Manager will coordinate with a cultural resources consultant who will travel to the location and evaluate the find as warranted to determine if indeed human bones have been discovered or if a new cultural site has been found.

4. If the materials found are human remains, the protocols outlined in the subsequent two sections entitled **Protection of Human Remains** (distinguished according to land ownership) will be followed. If a cultural site is at imminent risk from a proposed ground-disturbing activity, the procedures specified in the following two sections entitled **Protection of Cultural Remains** (again distinguished according to land ownership) below will be followed. If the materials are already recorded cultural sites and not in jeopardy, no further action will be taken.

Protection of At-Risk Cultural Materials on Private and State-Managed Land

a) AEA's Environmental Project Manager will promptly notify the Environmental Inspector to flag the at-risk site with a 20-meter (66-foot) buffer as appropriate. This buffer may be larger if there is the possibility of more resources occurring in the area or in the case of slopes or cut-banks where ongoing construction may impact the site.

b) AEA's Environmental Project Manager will direct the cultural resources consultant to begin a more detailed assessment of the find's significance and the potential effect of construction.

c) AEA's Environmental Project Manager will promptly notify the Alaska State Historic Preservation Officer (SHPO) or State Archaeologist of the find.

Judith Bittner, SHPO (907) 269-8721 judy.bittner@alaska.gov Alaska Dept. of Natural Resources Office of History and Archaeology 550 West 7th Avenue Ste. 1310 Anchorage, Alaska 99501-3565	OR	David McMahan, State Archaeologist (907) 269-8723 dave.mcmahan@alaska.gov Alaska Dept. of Natural Resources Office of History and Archaeology 550 West 7th Avenue Ste. 1310 Anchorage, Alaska 99501-3565

d) The landowner will be promptly notified.

e) The cultural resources consultant will document the site circumstances, potential significance, and risk of harm. If the cultural resources consultant assesses the find as not significant or lacking integrity, the consultant will notify the AEA Environmental Project Manager who will then inform the SHPO. Upon SHPO agreement of a finding of no effect, AEA will request approval to resume construction. A brief report of the find will be provided to the SHPO within one week of its recording. If the archaeological consultant determines that the find may be significant, then the following steps will be implemented.

f) AEA's Environmental Project Manager will notify other parties, such as appropriate Alaska Native organizations, as directed by the SHPO.

Alaska Native Regional Corporations:

- Ahtna, Incorporated (Ahtna)
  Michelle Anderson, President
  PO BOX 649, Glennallen, Alaska 99588
  Glennallen Office: (907) 822-3476
  Fax: (907) 822-3495
  Anchorage Office: (907) 868-8250
  Fax: (907) 868-8285
  Email: manderson@ahtna.net

- Cook Inlet Region, Incorporated (CIRI)
  2525 C Street Suite 500, Anchorage, Alaska 99503
  P.O. Box 93330, Anchorage, Alaska 99509-3330
  (907) 274-8638
  Fax: (907) 279-8836

- Doyon, Limited (Doyon)
  1 Doyon Place, Suite 300
  Fairbanks, Alaska 99701-2941
  (907) 459-2000
  (888) 478-4755 (toll-free)
  (907) 459-2060 (fax)

- Doyon **- Anchorage Office**

11500 C Street, Suite 250
Anchorage, Alaska 99515-2692
(907) 563-5530 or (907) 375-4220
(907) 375-4205 (fax)

A more complete contact list is attached as Appendix A.

g) If the find is significant and continuing work may damage more of the site, AEA's Environmental Project Manager will request recommendations from the SHPO and other parties regarding appropriate measures for site treatment. These measures may include formal archaeological evaluation of the site; visits to the site by the SHPO and other parties; preparation of a mitigation plan by AEA for approval by the SHPO; implementation of the mitigation plan; and/or approval to resume construction following completion of the fieldwork component of the mitigation plan.

h) If further analysis indicates that the find lacks significance, AEA's Environmental Project Manager will consult with the SHPO and other appropriate parties to request approval for resumption of construction.

i) AEA's Environmental Project Manager will notify the Cultural Resource Program Lead or Study Lead who will grant clearance to the Contractor to start construction.

Protection of At-Risk Cultural Materials on Federal Lands

a) AEA's Environmental Project Manager will promptly notify the Environmental Inspector to flag the at-risk site with a 20-meter (66-foot) buffer as appropriate. This buffer may be larger if there is the possibility of more resources in the area or in the case of slopes or cut-banks where ongoing construction may impact the site.

b) AEA's Environmental Project Manager will direct the cultural resources consultant to begin a more detailed assessment of the find's significance and the potential effect of construction.

c) AEA's Environmental Project Manager will promptly notify the appropriate federal land managing agency and Alaska SHPO of the find.

John Jangala, Archaeologist	Judith Bittner, SHPO
(907) 822-7303	(907) 269-8721
jjangala@blm.gov	judy.bittner@alaska.gov
Glennallen Field Office	Alaska Dept. of Natural Resources

Bureau of Land Management
P.O. Box 147
Glennallen, Alaska 99588-0147

Office of History and Archaeology
550 West 7th Avenue Ste. 1310
Anchorage, Alaska 99501-3565

d) The cultural resources consultant will document the site circumstances, potential significance, and risk of harm, and then notify the AEA Environmental Project Manager who will in turn inform the Bureau of Land Management (BLM) archaeologist and the SHPO. If the cultural resources consultant determined the find is not significant or lacking integrity, and the BLM and SHPO agree on a finding of *no effect*, then AEA will request approval to resume construction. A brief report of the find and an Alaska Heritage Resources Survey (AHRS) site form will be provided to the BLM and SHPO within two weeks of its recording. If the archaeological consultant recommends that the find may be significant, then the following steps will be implemented.

e) AEA's Environmental Project Manager will notify other parties, such as appropriate Alaska Native organizations, as directed by the SHPO.

f) If the find is assessed as significant and continuing work may damage more of the site, then AEA's Environmental Project Manager will request recommendations from the appropriate federal land managing agency, SHPO, and other parties regarding appropriate measures for site treatment. These measures may include formal archaeological evaluation of the site; visits to the site by the SHPO and other parties; preparation of a mitigation plan by AEA for approval by the appropriate federal land managing agency and SHPO; implementation of the mitigation plan; and/or approval to resume construction following completion of the fieldwork component of the mitigation plan.

g) If further analysis indicates that the find lacks significance, then AEA's Environmental Project Manager will consult with the federal land managing agency, SHPO, and other appropriate parties to request approval for resumption of construction.

h) AEA's Environmental Project Manager will notify the Cultural Resource Program Lead or Study Lead who will grant clearance to the contractor to start construction.

Protection of Human Remains on Private and State-Managed Land

a) AEA's Environmental Project Manager will promptly notify the Environmental Inspector to flag the at-risk site with a 20-meter buffer as appropriate. This buffer may be larger if there is the possibility of more resources in the area or in the case of slopes or cut-banks where ongoing construction may impact the site.

b) AEA's Environmental Project Manager will notify a peace officer of the state (police, Village Public Safety Officer, or Alaska State Trooper [AST]) and the Alaska State Medical Examiner (SME) immediately of the discovery, as stipulated in Alaska Statute 12.65.5. In addition to a local peace officer (if in a local jurisdiction), notification should include the AST Criminal Investigation Bureau. If the human remains appear recent (less than 50 years old) in the judgment of the archaeologists, the AST and Alaksa SME will determine whether the remains are of a forensic nature and/or subject to criminal investigation. The AST and Alaska SME contacts are

Sgt. Kid Chan
(800) 478-9333
(907) 269-5058
choong.chan@alaska.gov
(cc: Stephanie Johnson at steph.johnson@alaska.gov)
Alaska State Troopers
Missing Persons Bureau
5700 East Tudor Road
Anchorage, AK 99507

Talkeetna Post - Alaska State Troopers
(907) 733-2256
HC89 Box 8576
Talkeetna, AK 99676

Dr. Gary Zientek, Deputy Medical Examiner
(907) 334-2200
gary.zientek@alaska.gov
Alaska State Medical Examiner
5455 Dr. Martin Luther King Jr. Ave
Anchorage, Alaska 99507

c) The landowner will be promptly notified.

d) The Alaska SHPO will also be notified of any discovery unless circumstances indicate that the death or burial is less than 50 years old and that there is need for a criminal investigation or legal inquiry by the coroner.

e) Written authorization in the form of a Burial Transit Permit from the Alaska State Bureau of Vital Statistics (BVS) shall be obtained prior to any excavation or re-interment of any human remains. In addition, clearance from the appropriate Alaska Native organization must be obtained prior to excavation or re-interment of Alaska Native remains. The BVS contact is:

Phillip Mitchell, Section Chief

(907) 465-3391
BVSResearch@alaska.gov
Phillip.mitchell@alaska.gov
Alaska Bureau of Vital Statistics
5441 Commercial Boulevard
P.O. Box 110675
Juneau, AK 99801

f) If the human remains are found to be historic in nature, a qualified professional physical anthropologist with experience in the analysis of human remains will examine them in situ to determine racial identity. The physical anthropologist shall document, analyze, and photograph the remains so that an independent assessment of racial identity can be made. The physical anthropologist shall be afforded no more than 30 days time to conduct his or her analysis.

g) If the unanticipated discovery consists of Alaska Native human remains, AEA will consult with the Alaska SHPO, FERC, and appropriate Alaska Native organizations regarding the appropriate measures to respectfully handle such a discovery. If it can be determined adequately that the identified human remains have affinity to any federally recognized tribe(s), a reasonable effort will be made by AEA to identify, locate, and notify these tribes. The appropriate Alaska Native Regional Corporations also will be contacted by AEA. A comprehensive contact list is attached as Appendix A.

h) AEA's Environmental Project Manager will notify other parties, as directed by the SHPO.

i) If the human remains are not Native American, and a determination has been made by the AST and Alaska SME that a death investigation is not warranted, then AEA, in consultation with the Alaska SME, will identify, locate and inform descendants of the deceased.

j) After permission to resume construction has been issued by the SHPO, AEA's Environmental Project Manager will notify the Cultural Resource Program Lead or Study Lead who will grant clearance to the contractor to restart construction.

Protection of Human Remains on Federal Land

a) AEA's Environmental Project Manager will promptly notify the Environmental Inspector to flag the at-risk site with a 20-meter (66-foot) buffer as appropriate. This buffer may be larger if there is the possibility of more resources in the area or in the case of slopes or cut-banks where ongoing construction may impact the site.

b) AEA's Environmental Project Manager will notify a peace officer of the state (police, Village Public Safety Officer, or AST) and the SME immediately of the discovery, as stipulated in Alaska Statute

12.65.5. In addition to a local peace officer (if in a local jurisdiction), notification should include the AST Criminal Investigation Bureau. If the human remains appear recent (less than 50 years old) in the judgment of the archaeologists, the AST and Alaska SME will determine whether the remains are of a forensic nature and/or subject to criminal investigation. The appropriate federal land managing agency will also be contacted in case the human remains are related to a crime scene. The contact of the AST and Alaska SME are:

Sgt. Kid Chan
(800) 478-9333
(907) 269-5058
choong.chan@alaska.gov
(cc: Stephanie Johnson at steph.johnson@alaska.gov)
Alaska State Troopers
Missing Persons Bureau
5700 East Tudor Road
Anchorage, AK 99507

Talkeetna Post - Alaska State Troopers
(907) 733-2256
HC89 Box 8576
Talkeetna, AK 99676

Dr. Gary Zientek, Deputy Medical Examiner
(907) 334-2200
gary.zientek@alaska.gov
Alaska State Medical Examiner
5455 Dr. Martin Luther King Jr. Ave
Anchorage, Alaska 99507

John Jangala, Archaeologist
(907) 822-7303
jjangala@blm.gov
Glennallen Field Office
Bureau of Land Management
P.O. Box 147
Glennallen, Alaska 99588-0147

c) The Alaska SHPO will also be notified of any discovery unless circumstances indicate that the death or burial is less than 50 years old and that there is need for a criminal investigation or legal inquiry by the coroner

d) Written authorization in the form of a Burial Transit Permit from the Alaska State Bureau of Vital Statistics (see above for contact information) shall be obtained prior to any excavation or re-interment of any human remains. In addition, clearance from the appropriate Alaska Native organization must be obtained prior to excavation or re-interment of Alaska Native remains.

e) If the human remains are found to be historic in nature, AEA, as directed by the appropriate federal land managing agency, will determine the origin of the human remains. A qualified professional physical anthropologist with experience in the analysis of human remains will examine them in situ to determine racial identity. The physical anthropologist shall document, analyze, and photograph the remains so that an independent assessment of racial identity can be made. The physical anthropologist shall be afforded no more than 30 days to conduct his or her analysis. The appropriate federal land managing agency will follow Native American Graves Protection and Repatriation Act (NAGPRA) and the implementing regulations set forth in 43 CFR 10, for Alaska Native remains.

f) For Alaska Native remains, the appropriate federal land managing agency will retain the responsibility for determining and contacting the appropriate Alaska Native groups. In this case, NAGPRA dictates that work in the immediate vicinity of the remains cannot proceed until 30 days after the reply from the federal agency in charge or appropriate Alaska Native group that the documents regarding the finding were received, unless a written and binding agreement is issued from the federal agency in charge and the affiliated Native American group(s) (NAGPRA 25 USC 3002 Sec 3(d)). The remains will then be assessed and treated based on the guidance of the federal agency in charge and the appropriate Alaska Native group as defined by NAGPRA.

g) If the human remains are not Native American, and a determination has been made by the AST and Alaska SME that a death investigation is not warranted, then AEA, as directed by the appropriate federal land managing agency in consultation with the Alaska SME, will identify, locate, and inform descendants of the deceased.

h) AEA's Environmental Project Manager will notify other parties, as directed by the appropriate federal land managing agency.

i) After permission to resume construction has been issued by the appropriate federal land managing agency, AEA's Environmental Project Manager will notify the Cultural Resource Program Lead or Study Lead who will grant clearance to the Contractor to restart construction.

Appendix A: Contacts for Alaska Native Parties

Though communities potentially affected by the project have different histories and cultures, they are characterized by strong past and present ties to the land and its resources. The successful completion of the Consultation and Coordination phase of the Section 106 process requires an efficient and effective consultation process that addresses the laws and regulations within the context of local custom and practice. Several Alaska tribal entities recognized by the U.S. Department of Interior and established through the Alaska Native Claims Settlement Act (ANCSA) of 1971, are broadly located near the study area. In Alaska, consultation typically occurs with the 229 federally-recognized tribes, the 13 Alaska Native Regional Corporations, and some 200 Alaska Native Village Corporations created by the ANCSA (the Regional and Village Corporations are recognized as "Indians tribes" for National Historic Preservation Act [NHPA] purposes).

Regional Native Alaskan corporations that have interests within or near the Project area include:

- Ahtna, Incorporated (Ahtna)
  Michelle Anderson, President
  PO BOX 649, Glennallen, Alaska 99588
  Glennallen Office: (907) 822-3476
  Fax: (907) 822-3495
  Anchorage Office: (907) 868-8250
  Fax: (907) 868-8285
  Email: manderson@ahtna.net

- Cook Inlet Region Incorporated (CIRI)
  2525 C Street Suite 500, Anchorage, Alaska 99503
  P.O. Box 93330, Anchorage, Alaska 99509-3330
  (907) 274-8638

- Doyon, Ltd. (Doyon)
  1 Doyon Place, Suite 300
  Fairbanks, Alaska 99701-2941
  (907) 459-2000
  (888) 478-4755 (toll-free)
  (907) 459-2060 (fax)

- Doyon, Limited - Anchorage Office
  11500 C Street, Suite 250
  Anchorage, Alaska 99515-2692

(907) 563-5530 or (907) 375-4220
(907) 375-4205 (fax)

Twenty-two tribes recognized by the Bureau of Indian Affairs under 25 CFR 83.6(b) are located within or near the Project area including:

- Cheesh-Na Tribal Council/Mount Sanford Tribal Consortium
  P.O. Box 357
  Gakona, Alaska 99586
  907-822-5399
  Fax 907-822-5810

- Chickaloon Native Village
  P.O. Box 1105
  Chickaloon, AK 99674-1105
  907-745-0707
  Fax 907-745-7154
  cvadmin@chickaloon.org
  http://www.chickaloon.org

- Native Village of Chitina
  P.O. Box 31
  Chitina, AK 99566-0031
  907-823-2215
  Fax 907-823-2233
  aceak2000@yahoo.com

- Gulkana Village
  P.O. Box 254
  Gakona, AK 99586
  907-822-3746
  Fax 907-822-3976
  lclaw@gulkanacouncil.org
  http://gulkanacouncil.org/

- Healy Lake Village
  P.O. Box 74090
  Fairbanks, AK 99706-0300
  907-876-0638
  Fax 907-876-0639
  jpolstonhitc@live.com

- Kenaitze Indian Tribe
  P.O. Box 988
  Kenai, AK 99611-0988
  907-283-3633
  Fax 907-283-3052
  kenaitze@alaska.net
  http://www.kenaitze.org/

- Knik Tribe
  P.O. Box 871565
  Wasilla, AK 99687
  907-373-7991
  Fax 907-373-2161
  kniktribe@mtaonline.net

- Mentasta Traditional Council
  P.O. Box 6019
  Mentasta Lake, AK 99780-6019
  907-291-2319
  Fax 907-291-2305
  kmartin@tribalnet.com

- Native Village of Cantwell
  P.O. Box 94
  Cantwell, AK 99729
  907-768-2591
  Fax 907-768-1111
  hallvc@yahoo.com

- Eklutna Native Village
  26339 Eklutna Village Road
  Chugiak, AK 99567-6339
  907-688-6020
  Fax 907-688-6021
  nve@eklutna-nsn.gov
  http://www.eklutna-nsn.gov

- Native Village of Gakona
  P.O. Box 102
  Gakona, AK 99586
  907-822-5777
  Fax 907-822-5997
  gakonavc@cvinternet.net
  www.nvgakona.com

- Native Village of Kluti-Kaah
  P.O. Box 68
  Copper Center, AK 99573-0068
  907-822-5541
  Fax 907-822-5130
  nvkktops@cvinternet.net

- Native Village of Tazlina
  P.O. Box 87
  Glennallen, AK 99588-0087
  907-822-4375
  Fax 907-822-5865
  tazlinajulie@cvinternet.net

- Native Village of Tetlin
  P.O. Box 797
  Tetlin, AK 99779
  907-883-2021
  tetlin@earthlink.net

- Native Village of Tyonek
  P.O. Box 82009
  Tyonek, AK 99682-0009
  Phone 907-583-2271
  Fax 907-583-2442
  E-mail tyonek@aitc.org

- Nenana Native Association
  P.O. Box 369
  Nenana, AK 99760
  907-832-5461
  Fax 907-832-1077
  nibor652004@yahoo.com

- Ninilchik Village
  P.O. Box 39070
  Ninilchik, AK 99639
  907-567-3313
  Fax 907-567-3308
  ntc@ninilchiktribe-nsn.gov/
  http://www.ninilchiktribe-nsn.gov/

- Northway Village
  P.O. Box 516
  Northway, AK 99764
  907-778-2287
  Fax 907-778-2220
  dnnvc@yahoo.com

- Seldovia Village Tribe
  P.O. Drawer L
  Seldovia, AK 99663
  907-234-7898
  Fax 907-234-7865
  svt@svt.org
  http://www.svt.org/

- Native Village of Tanacross
  P.O. Box 76009
  Tanacross, AK 99776
  907-883-5024
  Fax 907-883-4497
  jerry_isaac@hotmail.com

- Village of Dot Lake
  P.O. Box 2279
  Dot Lake, AK 99737-2279
  907-882-2695 or 907-322-2694
  Fax 907-882-5558
  dotlake@aitc.org

- Village of Salamatoff
  P.O. Box 2682
  Kenai, AK 99611
  907-283-7864
  Fax 907-283-6470

ANCSA recognized and non-recognized villages; group and urban corporations; and village organizations may have interests near the Project area. These entities include:

- Alexander Creek, Incorporated
  8128 Cranberry
  Anchorage, AK 99502
  (907) 243-5428

- Caswell Native Association
  HC 89, Box 83
  Willow, AK 99688
  (907) 495-1263

- Chitina Native Corporation
  P.O. Box 3
  Chitina, AK 99566-0031
  907-823-2223
  Fax 907-823-2202
  chitina_native@cvinternet.net
  http://www.chitinanative.com

- Chickaloon-Moose Creek Native Association, Incorporated
  P.O. Box 875046
  Wasilla, AK 99687
  907-373-1145
  Fax 907-373-1142
  cmena@alaska.net
  http://www.chickaloon.org

- Dot Lake Native Corporation
  3500 Wolf Run
  Fairbanks, AK 99709
  907-882-2755
  Fax 907-882-2775

- Eklutna, Incorporated
  16515 Centerfield Dr. #201
  Eagle River, AK 99577
  907-696-2828
  Fax 907-696-2845
  receptionist@eklutnainc.com
  http://www.eklutnainc.com

- Gold Creek-Susitna NCI
  P.O. Box 847
  Talkeetna, AK 99676-0847
  (907) 733-2329

- Knikatnu, Incorporated

P.O. Box 872130
Wasilla, AK 99687-2130
907-376-2845
Fax 907-376-2847
knikcorp@gci.net

- Little Lake Louise Corporation
  (907) 250-2098

- Lower Tonsina Corporation
  Unavailable

- Kenai Natives Association, Inc.
  215 Fidalgo Ave. #101
  Kenai, AK 99611-7776
  907-283-4851
  Fax 907-283-4854

- Nabesna Native Group, Inc.
  Unavailable

- Mendas Cha-ag Native Corporation
  Gary Lee, President
  457 Cindy Dr.
  Fairbanks, AK 99701

- Montana Creek Native Association
  P.O. Box 100379
  Anchorage, AK 99510

- Ninilchik Natives Association, Incorporated
  P.O. Box 39130
  Ninilchik, AK 99639
  907-567-3866
  Fax 907-567-3867
  nnai@nnai.net
  http://www.nnai.net

- Northway Natives, Incorporated

P.O. Box 401
Northway, AK 99764
907-778-2298
Fax 907-778-2266

- Point Possession, Incorporated
  Feodoria Pennington, President
  1321 Oxford Dr.
  Anchorage, AK 99503
  (907) 563-1848

- Salamatkof Native Association, Incorporated
  100 N. Willow Street
  Kenai, AK 99611
  907-283-3745
  Fax 907-283-6470
  info@salamatof.com
  http://www.salamatof.com/

- Slana Native Corporation
  Unavailable

- Seldovia Native Association, Incorporated
  P.O. Drawer L
  Seldovia, AK 99663-0250
  907-234-7625
  Fax 907-234-7637
  info@snai.com
  http://www.snai.com

- Tanacross, Incorporated
  P.O. Box 76029
  Tanacross, AK 99776
  907-883-4130
  Fax 907-883-4129
  http://www.tanacrossinc.com

- Tetlin Native Corporation
  Gary David Sr., President

P.O. Box 657

Tok, AK

(907) 883-6652

(907) 505-0253

- Toghotthele Corporation
  P.O. Box 249

  Nenana, AK 99760

  907-832-5832

  Fax 907-832-5834

  Toghotthele@hotmail.com

- Twin Lake Native Group, Incorporated
  Unavailable

- Tyonek Native Corporation
  1689 C Street, Suite 219
  Anchorage, AK 99501
  907-272-0707
  Fax 907-274-7125
  http://www.tyonek.com/

12. SUBSISTENCE RESOURCES

12.1. Introduction

The purpose of the subsistence resources study is to document traditional and contemporary subsistence harvest and use and to collect baseline data to facilitate the assessment of potential impacts of the Project construction and operation on subsistence harvest and use in the Project area. This study will provide information that will serve as the basis for compliance with FERC's NEPA obligations, along with other required approvals and analyses including those of the Bureau of Land Management (BLM) under Title VIII of the Alaska National Interest Lands Conservation Act (ANILCA), and also address State of Alaska needs regarding subsistence resources management.

For purposes of this study plan, traditional use will be defined as the values and practices related to subsistence that are passed down through generations of subsistence users and that inform and guide contemporary subsistence practices. Contemporary use will be defined as recent harvest and use patterns that characterize the resources and areas that are being utilized by communities.

12.2. Nexus Between Project Construction/Existence/Operations and Effects on Resources to be Studied

Construction and operation of the Project may result in changes to access to subsistence resources or changes in resource abundance or availability that could have potential direct or indirect effects on subsistence harvest and use. Increased human activity in the upper Susitna River basin also may affect subsistence uses, for instance by impacting wildlife behaviors or creating additional competition for subsistence resources. If a portion of a community's subsistence use areas are within the Project area, then a direct effect on subsistence use could occur.

Successful subsistence harvests depend on both continued availability of subsistence resources in adequate numbers and health and on continued access to those resources. Subsistence resource availability is affected by such factors as resource mortality or health changes, displacement from traditional harvest locations, and contamination (including actual and/or perceived contamination of resources and habitat or habituation of resources to development activities). Access to subsistence resources may be affected by such factors as construction of new roads and other infrastructure and establishment of a new reservoir. Changes in access can result in increased access to subsistence resources by harvesters. Increased access to an area may also result in more competition for resources from outsiders and/or from community or nearby community residents who did not previously use the area or who use the area differently as a result of changes induced by Project development. A decrease in access may decrease competition in the potentially affected area and introduce additional competition in new areas because harvesters can no longer access previously used hunting, fishing, or gathering areas (displaced users). A decrease in resource availability may potentially result in increased competition among harvesters as they try to meet their harvest needs from a depleted or displaced resource stock. It is important that these activities and resources are understood along with potential Project impact sources, to adequately assess potential impacts to subsistence uses and, if needed, identify potential protection, mitigation, and enhancement measures.

12.3. Resource Management Goals and Objectives

The results of this subsistence resources study and other related studies will inform FERC's NEPA analysis for the FERC licensing process and other agency approvals, as well as BLM's obligations under Title VIII of ANILCA and State of Alaska needs regarding subsistence resources management.

Alaska and the federal government regulate subsistence hunting and fishing in the state under a dual management system. The federal government recognizes subsistence priorities for rural residents on federal public lands, while Alaska considers all residents to have an equal right to participate in subsistence hunting and fishing when resource abundance and harvestable surpluses are sufficient to meet the demand for all subsistence and other uses. Much of the land occupied by the proposed Project is owned and managed by the ADNR, BLM, and private land owners, including Alaska Native Corporations established under the Alaska Native Claims Settlement Act (ANSCA).

ANILCA recognizes that "the situation in Alaska is unique" regarding food supplies and subsistence practices. Title VIII of ANILCA establishes subsistence protections on federal lands, including land selected by, but not yet conveyed to, the State or Alaska and Native Corporations, for Alaska's rural Alaska Native and other residents. Under section 803 of ANILCA, the term "subsistence uses" is defined as "the customary and traditional uses by rural Alaska residents of wild renewable resources for direct personal or family consumption as food, shelter, fuel, clothing, tools, or transportation; for the making and selling of handicraft articles out of nonedible byproducts of fish and wildlife resources taken for personal or family consumption; for barter, or sharing for personal or family consumption; and for customary trade" (16 USC 3113). Where a "customary or traditional use" is identified for a given resource, the Secretary of the Interior must ensure that "rural residents engaged in subsistence uses shall have reasonable access to subsistence resources on public lands" (16 USC 3113).

Section 810 of ANILCA specifies that before making any decision to withdraw, reserve, lease, or otherwise permit the use, occupancy, or disposition of public lands, a federal land management agency must first evaluate the effects of such a decision on subsistence use and needs (16 USC 3120). If, upon completion of such review, the agency finds that the proposed action may "significantly restrict" subsistence, additional requirements with respect to the proposed withdrawal, reservation, lease, permit or other use of public lands are triggered (16 USC 3120).

In 1990, the U.S. Department of the Interior and the U.S. Department of Agriculture established a Federal Subsistence Board to administer the Federal Subsistence Management Program (55 FR 27114). The Federal Subsistence Board, under Title VIII of ANILCA and regulations at 36 CFR 242.1 and 50 CFR 100.1, recognizes and regulates subsistence practices for rural residents on federal lands. Federal regulations recognize subsistence activities based on a person's residence in Alaska, defined as either rural or nonrural. Only individuals who permanently reside outside federally designated nonrural areas are considered rural residents and qualify for subsistence harvesting on federal lands under federal subsistence regulations. Nonrural residents may harvest fish and game on most federal lands (unless these are closed to non-federally qualified subsistence uses), but these harvests occur under State regulations. Federal subsistence regulations do not apply to certain federal lands, regardless of residents' rural designations. These include lands withdrawn for military use that are closed to general public access (50 CFR Part 100.3). Nonrural areas in Alaska include the areas around Prudhoe Bay, Fairbanks North Star Borough, Wasilla/Palmer, Anchorage, Kenai, Homer, Valdez, Seward, Juneau, and Ketchikan. Nonrural areas in relation to the proposed Project are shown on Figure 12.5-1.

The Alaska Board of Fisheries and the Alaska Board of Game have adopted regulations enforced by the State for subsistence fishing and hunting on all State of Alaska lands (except nonsubsistence areas) and waters, and lands conveyed to ANCSA entities. State subsistence uses are regulated under Alaska Statutes (AS) 16 and Title 5 of the Alaska Administrative Code (AAC)(05 AAC 01, 02, 85, 92, and 99). Under Alaska law, when there is sufficient harvestable surplus to provide for all subsistence and other uses, all Alaskan residents qualify as eligible subsistence users.

Under Alaska State law, subsistence refers to the practice of taking wild fish or game for subsistence uses (AS 16.05.258). Defined under state law as the "noncommercial customary and traditional uses" of fish and wildlife, subsistence uses under State law include:

> "consumption as food, shelter, fuel, clothing, tools, or transportation, for the making and selling of handicraft articles out of nonedible by-products of fish and wildlife resources taken for personal or family consumptions, and for the customary trade, barter, or sharing for personal or family consumption." (AS 16.05.940 33).

The State distinguishes subsistence harvests from personal use, general hunting, sport, or commercial harvests based on where the harvest occurs and the resource being harvested, not where the harvester resides (as is the case under federal law). More specifically, State law provides for subsistence hunting and fishing regulations in areas outside the boundaries of "nonsubsistence areas," as defined in state regulations (5 AAC 99.015). According to these regulations, a nonsubsistence area is "an area or community where dependence upon subsistence is not a principal characteristic of the economy, culture, and way of life of the area of community" (5 AAC 99.016).

Activities permitted in these nonsubsistence areas include general hunting and personal use, sport, guided sport, and commercial fishing. There is no subsistence priority in these areas; therefore, no subsistence hunting or fishing regulations manage the harvest of resources. Nonsubsistence areas in Alaska include the areas around Anchorage, Matanuska-Susitna (Mat-Su) Valley, Kenai, Fairbanks, Juneau, Ketchikan, and Valdez (Wolfe 2000). The Anchorage–Mat-Su–Kenai nonsubsistence area is located closest to the Project area (Figure 12.5-2).

12.4. Summary of Consultation with Agencies, Alaska Native Entities and Other Licensing Participants

Consultation efforts to date include discussions with agency representatives, Alaska Native entities, and other licensing participants at the Project Technical Workgroup Meetings and other meetings with ADF&G held in between December and June 2012 (Table 12.4-1).

Table 12.4-1. Summary of consultation on Subsistence Resources study plans.

Comment Format	Date	Stakeholder	Affiliation	Subject
Technical Workgroup Meeting	12/08/2011	Various	Various	Attendees discussed how to define the study area and the communities needing study, particularly how to deal with communities like Talkeetna that lie in non-subsistence areas but whose residents exhibit a subsistence lifestyle
Letter	01/12/2012	P. Bergmann	USDOI	Comments regarding subsistence resources. (Filed with FERC.)
Technical Workgroup Meeting Notes	02/282012	Various	Various	Attendees questioned why Lake Louise was not included in ADF&G plan; why Chase was and how to get at other, similarly situated and dispersed households along the Railbelt; noted that ADF&G plan was baseline but that it needed to keep impact analysis and next steps in mind; noted that access would play a role in impact analysis; questioned if 1 year of data collection would be sufficient and how that might be augmented by other resource studies
Meeting	03/08/2012	Davin Holen	ADF&G Division of Subsistence	Kickoff meeting with ADF&G to discuss subsistence study planning, particularly HDR technical assistance with ADF&G use of tablets for mapping
Meeting	06/05/2012	Davin Holen, Jamie Van Lanen	ADF&G Division of Subsistence	Meeting to prep for Technical Workgroup meeting and discuss updates to study plan
Technical Workgroup Meeting Notes	06/07/2012	Various	Various	Attendees questioned whether studies would consider and delineate harvest based on regulatory system; AEA noted the need for coordination with harvest survey; BLM noted that the studies need to contain enough information for his agency to be able to complete an ANILCA 810 evaluation, which ultimately would be completed prior to the draft EIS (2014-2015 timeframe)

12.5. Subsistence Baseline Documentation Study

12.5.1. General Description of the Proposed Study

Through a combination of household harvest surveys, mapping interviews, and traditional and local knowledge interviews, the subsistence resources study will collect baseline data and document traditional and contemporary subsistence harvest and use to facilitate the assessment of potential impacts of the Project construction and operation on subsistence harvest and use in the Project area.

12.5.1.1. Study Goals and Objectives

The overall goal of this study is to demonstrate whether and, if so, the extent to which, communities harvest and use subsistence resources within or near the Project area, use Project area lands to access other lands for subsistence harvest and use, or harvest and use resources that migrate through the Project area and are later harvested in other areas

The objectives of the subsistence resources study are as follows:

1. Document whether and, if so, the extent to which communities within the Susitna River watershed, as well as communities outside the Susitna River watershed that have subsistence use areas in the watershed, use areas that are within or near the Project area for subsistence harvests;
2. Document whether and, if so, the extent to which communities within the Susitna River watershed, as well as communities outside the Susitna River watershed that have subsistence use areas in the watershed, use Project area lands to access other lands or waters for subsistence harvest;
3. Document whether and, if so, the extent to which communities within the Susitna River watershed, as well as communities outside the Susitna River watershed that have subsistence use areas in the watershed, use resources that migrate through the Project area and are harvested in other areas;
4. Collect and document traditional and local knowledge of communities within the Susitna River watershed, or who have subsistence use areas within the watershed, to assist in assessing the potential impacts of construction and operation of the proposed Project on subsistence harvest and use. This information will be directly shared with the program leads for other resources, as appropriate;
5. Evaluate Project development plans to identify likely sources of potential impacts on identified subsistence uses; and
6. Provide the necessary information needed to support preparation of an ANILCA 810 valuation.

The data developed through this study will be evaluated along with data from biological and wildlife and cultural resources studies to supplement the subsistence information and put it into context with other related resource conditions.

12.5.2. Existing Information and Need for Additional Information

The intent of subsistence baseline studies is to facilitate the assessment of potential impacts to subsistence uses by providing current and representative data that will characterize the existing environment of subsistence uses in and around the proposed Project area. Critical to this assessment is the establishment of baseline indicators of subsistence use that can be used to assess potential effects of the Project. Existing baseline indicator information that characterizes the subsistence environment is available in the form of harvest data, mapping of subsistence use areas, and traditional knowledge studies. Existing information from harvest data can be used to demonstrate which subsistence resources are harvested by communities either in or outside the Project area or resources that migrate through the Project area and are harvested in other areas. In addition, harvest data provide information about harvest amounts, harvest participation, and other baseline harvest indicators in potentially affected communities. Existing information from subsistence use area mapping studies can be used to identify which communities utilize areas within Project area or use Project area lands to access other lands for subsistence harvests. Traditional knowledge studies will help provide the cultural basis for why and how community residents engage in subsistence activities and how cultural values and practices are incorporated into and inform present-day subsistence activities. Traditional knowledge studies also provide information about resources and the environment, all of which is relevant to identifying potential impacts and, possibly, mitigation measures for a development project. Obtaining pertinent Alaska Natives' statements of subsistence use policy and goals would require identification of each Alaska Native entity potentially involved and documentation and identification of each entity's specific policies or mission statements related to subsistence. This task could be performed during the literature review.

Updated information regarding harvests must be collected for communities lacking current data. Harvest amounts and species that are harvested change over time and are subject to annual variation. Timely data are needed in order to establish baseline conditions and assess what resources are being used by a community in order to assess effects.

ADF&G harvest surveys contain a one-year mapping component and are useful for comparing multiple data sets; however, as a stand-alone study, the one-year mapping component does not take into account annual variation in use areas. Without multiple one-year use area data sets, it is useful to conduct subsistence mapping that covers a more extensive time period (e.g., a mapping interview that documents residents' last 10-year use area) so that some annual variation is accounted for and the assessment of effects to use areas and user access can consider the variability in use over time and varying resource conditions.

Traditional knowledge is relevant regardless of the time period it was collected, as it is information that is intended to be passed down through generations of subsistence users. Traditional knowledge interviews can potentially identify cultural resources and potentially inform the Project design and/or the assessment of impacts and development of mitigation measures.

The information collected in this study will help to support the assessment of environmental impacts under NEPA as well as an ANILCA 810 subsistence evaluation. Section 810 of ANILCA requires certain federal agencies, when determining whether to permit the use, occupancy, or disposition of public lands, to evaluate:

- the effect of use, occupancy, or disposition to be authorized on subsistence uses and needs;
- the availability of other lands for the purposes sought to be achieved; and

- other alternatives that would reduce or eliminate the use, occupancy, or disposition of public lands needed for subsistence purposes (16 USC 3120).

The existing information and additional information collected in the form of harvest surveys, subsistence mapping interviews, and traditional and local knowledge interviews will provide the baseline data that describes the use, occupancy, and disposition of subsistence uses and needs in order to assess effects, and potential effects and alternatives.

Existing information has been summarized in the Subsistence Resources Data Gap Analysis (Simeone, Russell, and Stern 2011). The study team reviewed the communities selected in the data gap and ADF&G scope of work for this Project and documented whether the communities had existing subsistence baseline use area data and recent (within last three years) harvest data. See Attachment 12-1 for the results of the study team's review of the data gap and ADF&G selected communities. After the subsistence study plan and associated study communities have been finalized, the study team will systematically compile existing subsistence data for the selected study communities as part of the baseline description of subsistence uses (see Section 12.5.4.1, Task 1: Compilation of Existing Data).

12.5.3. Study Area

To inform the selection of study communities and create a study area for this Project, the study team reviewed the previous Subsistence Resources Data Gap Analysis (Simeone, Russell, and Stern 2011) and communities reviewed in ADF&G's scope of work for this Project. See Attachment 12-1 for the results of the study team's review of the data gap and ADF&G selected-study communities.

For purposes of this study plan, the study area is based on the Susitna River watershed, because the proposed Project could affect natural resources and access conditions upstream and downstream of the Susitna River as well as its associated tributaries. The study area also includes the proposed reservoir, road and transmission corridors, and other Project facility sites. The study team developed the following criteria for inclusion as a study community:

1. the community is located within the Susitna River watershed;
2. the community is located outside of the Susitna River watershed but has previously documented subsistence use areas that extend into the watershed; and
3. the community is included in ADF&G's 11 communities (Chase, Cantwell, Susitna, Skwentna, Glenallen, Gulkana, Nelchina, Paxson, Tazlina/Copperville, Tolsona and Tonsina) needing updated baseline information

Based on the above criteria, the study team has identified 32 study communities whose subsistence uses could potentially be affected by the proposed Project (Table 12.5-1; Figure 12.5-1).

12.5.4. Study Methods

To meet the study objectives and demonstrate whether and, if so, the extent to which, communities harvest and use subsistence resources within or near the Project area, use Project area lands to access other lands for subsistence harvest and use, or harvest and use resources that migrate through the Project area and are later harvested in other areas, this subsistence study plan proposes to complete the following tasks:

1. Compilation of Existing Subsistence Data
2. ADF&G Household Surveys
3. Household Surveys in State-Designated Nonsubsistence Areas
4. Subsistence Mapping Interviews
5. Traditional and Local Knowledge Interviews
6. Impact Analysis
7. Annual Study Reports

The methods used to implement the above tasks are described in the following sections.

12.5.4.1. Task 1: Compilation of Existing Data

The study team will compile existing data describing the subsistence uses of communities that may be affected by the proposed Project. Communities will include the 32 study communities listed in Table 12.5-1. In addition, to the extent that the ADF&G Winfonet database (i.e., land mammal harvest database for the state) is available, the study team will assess this information to determine whether residents of additional communities use the area for subsistence purposes. Analysis of the Winfonet database will be conducted in coordination with the wildlife resource study. Methods for the compilation of existing data are as follows:

- Use ADF&G's Community Subsistence Information System (CSIS), and identify and compile existing harvest data for the 32 communities listed in Table 12.5-1.
- Compile available subsistence use area data for 32 communities listed in Table 12.5-1.
- Compile available baseline indicator data (e.g., timing of harvest activities) from available sources.
- Request access to ADF&G's Winfonet database. These data can provide the following information:
  - identification of subsistence users and communities in Alaska who travel to the proposed Project area to participate in land mammal harvest activities and
  - Additional information about study communities' (including those located in nonsubsistence areas) subsistence activities in the Project area.
- Create tables and maps describing the information compiled from the CSIS, Winfonet database, and additional sources.
- Incorporate results of the data review and compilation within the context of the proposed Project into Task 7.

12.5.4.2. Task 2: ADF&G Household Surveys

ADF&G's Division of Subsistence will document one year of subsistence harvest and use by households in and around selected census designation place (CDP) communities located in the study area and outside the State-designated nonsubsistence areas (Figure 12.5-2). In its scope of work for this project, ADF&G identified the following 11 communities as needing updated harvest data: Chase, Cantwell, Susitna, Skwentna, Glenallen, Gulkana, Nelchina, Paxson, Tazlina/Copperville, Tolsona, and Tonsina.

The study team conducted a review to determine whether additional study communities located in the Susitna River watershed needed updated harvest data, i.e., if harvest data is not available for those communities from within the past three years. Table 12.5-2 depicts all Susitna River watershed study communities that are located outside State-designated nonsubsistence areas.

Talkeetna and Trapper Creek are located within a nonsubsistence area but are close to the nonsubsistence area boundary. Because of residents' close proximity to the boundary, members of these communities likely travel outside the nonsubsistence area regularly for subsistence purposes; therefore, they are also included in Table 12.5-2. None of the eight communities listed in Table 12.5-2 have harvest data from the last three years. ADF&G listed three of the communities in Table 12.5-2 (Chase, Skwentna, and Susitna) in their scope of work for updated harvest surveys. Two of the communities listed in Table 12.5-2 are not CDPs and were therefore not selected for harvest surveys. Of the three remaining communities, only one (Lake Louise) is outside State designated nonsubsistence areas. Therefore, the study team recommends that ADF&G add Lake Louise to its scope of work for updated harvest surveys. Based on ADF&G's scope of work and the results shown in Table 12.5-2, ADF&G would conduct household harvest surveys in the following 12 communities:

1. Chase
2. Cantwell
3. Glenallen
4. Gulkana
5. Lake Louise
6. Nelchina
7. Paxson
8. Susitna
9. Skwentna
10. Tazlina/Copperville
11. Tolsona
12. Tonsina

The ADF&G Division of Subsistence has prepared a scope of work for this objective. Specific study methods identified in this scope of work include the following:

- Development of a survey instrument to produce updated comprehensive baseline information about subsistence hunting, fishing, and gathering and other topics that address subsistence needs and are compatible with information collected in past household interviews;
- Community consultation to identify community liaisons and seek study support;
- Household surveys to record the following information: demographic information; involvement in use, harvest, and sharing of fish, wildlife, and wild plants in their study year (i.e., 2012 or 2013); estimate of amount of resources harvested in their study year; information about employment and cash income; assessments of changes in subsistence harvest and use patterns based on data available from past study years; and location of fishing, hunting, and gathering activities in their study year;
- Household surveys conducted in each community by community liaisons contracted and trained by ADF&G, with the goal of interviewing a representative of each year-round household in all the study communities. Participation in the surveys will be voluntary and all individual and household level responses will be confidential. ADF&G staff will conduct the harvest mapping component of the survey with each household. Surveys will be timed to avoid seasonal activities to allow for best participation;
- Collaborative review and interpretation of study findings through data analysis, the production of standard tables and figures, and community review meetings;

- Communication of findings to communities through community review meetings and four-page study finding summaries mailed to all households in each community; and
- Addition of final data to the CSIS and production of a final report summarizing the results of the systematic household surveys and mapping for each study year, including long-term trends for communities with harvest data available in the CSIS.

12.5.4.3. Task 3: Household Surveys in State-Designated Nonsubsistence Areas

As discussed above, ADF&G will conduct household harvest surveys in 12 CDP communities that are located outside State-designated nonsubsistence areas; are located in the Susitna River watershed or use the Susitna River watershed for subsistence; and have not had updated subsistence harvest studies within the previous three years (since 2009). In addition, the study team has identified Talkeetna and Trapper Creek for updated household harvest surveys (see Table 12.5-2). These two additional communities are located within a State-designated nonsubsistence area (Figure 12.5-2) and are therefore generally not included in ADF&G Division of Subsistence harvest studies. Because of their proximity to the subsistence/nonsubsistence boundary and to the Project area, agency and public concern raised during technical Workgroup meetings and the lack of recent (last three year) harvest data for these communities, the study team selected Talkeetna and Trapper Creek for household harvest surveys.

ADF&G and the study team will document one year of harvest and use by households in Talkeetna and Trapper Creek. Methods for the nonsubsistence area household surveys will be consistent with ADF&G's methodology for surveys in communities identified under Task 2 and include

- Development and use of a survey instrument and household harvest survey methodology comparable to that used in Task 2 so that data collection, entry, and analysis are compatible with existing ADF&G methodology (see ADF&G survey methods described in Section 12.5.4.2).
- Coordination with communities to seek study support and communicate findings.
- Collaborative review and interpretation of study findings through data analysis, reporting, and community review meetings.
- Incorporation of results of analysis, discussion and reporting of community-level survey, and mapping results within the context of the proposed Project into Task 7.

12.5.4.4. Task 4: Subsistence Mapping

The study team will conduct subsistence mapping interviews in selected study communities to document last 10-year subsistence use areas as well as related baseline indicators. Because a primary application of subsistence use area data in impact analyses is to determine whether a direct impact (i.e., occurring at the same time and place as the Project) may occur, the study plan is focused on selecting communities whose residents conduct activities in or near the Project area (Figure 1.2-1). The study team assumes that the closer a community is to the Project area, the more likely that community is to experience the direct subsistence use area impacts of project construction and operation. Therefore, the study communities closest to the Project area, including the reservoir, reservoir study area, or any of the three potential road options, were selected for inclusion in the subsistence mapping studies.

Eight communities (Cantwell, Chase, Healy, Talkeetna, Lake Louise, McKinley Park, Trapper Creek, and Petersville) were identified for possible inclusion in the subsistence mapping studies due to their proximity to the Project. Four of these communities (Cantwell, Healy, Lake Louise, and McKinley Park) have documented subsistence use area data showing use of the Project area. Available use area data for these four communities are all at least 10 years old. For the remaining four communities (Chase, Talkeetna, Trapper Creek, and Petersville), subsistence use area data are not available. The study team will refine the list of identified subsistence mapping communities based on additional information (e.g., consultation with communities and agencies, adequacy of existing data, need for updated data, or suitability of community for subsistence mapping efforts).

The subsistence mapping studies will use the following methods to document subsistence use areas and related baseline indicators for the selected study communities:

- Coordinate with tribal governments and Alaska Native entities as appropriate to seek community support for the interviews;
- Identify active and knowledgeable harvesters in each study community through consultation with coordinating organizations and by asking study participants to nominate other active and knowledgeable harvesters;
- Work with coordinating organizations or local liaisons to contact respondents and schedule interviews;
- With two staff members present, conduct subsistence mapping interviews with active and knowledgeable harvesters to document resource-specific 10-year subsistence use areas within the last 10 years, along with related indicators (e.g., harvest timing, transportation method) on a U.S. Geological Survey (USGS) 1:250,000 map;
- Conduct post-field data processing, including editing of notes, data entry, digitizing of mapped data, and quality control checks of all data entry and digitizing;
- Conduct analysis and prepare community and resource-specific maps of subsistence use areas and related indicators;
- Conduct analysis and prepare tables and figures describing baseline indicators;
- Review findings with study communities; and
- Incorporate results of analysis from the subsistence mapping interviews, supplemented by respondent observations, within the context of the proposed Project, into Task 7.

12.5.4.5. Task 5: Traditional and Local Knowledge Interviews

The study team will conduct workshops with knowledgeable residents in selected study communities to document traditional and local knowledge about the physical, biological, and social environment as it relates to the proposed Project. To select study communities for the traditional and local knowledge research, the study team considered the following criteria:

- the study community is located within the Susitna River watershed, OR
- the study community’s use area is located within the Susitna River watershed, AND
- at least 50 percent of the community is Alaska Native, OR
- a federally recognized tribe is affiliated with the community.

The study team’s criteria were based on consideration of the likelihood that the community has knowledge about the Project area (proximity of community or use area to the Susitna River watershed), as well as consideration of the presence of long-term knowledge held by at least a portion of the community (Alaska Native population or affiliation of a federally recognized tribe). As depicted in Table 12.5-3, the following eight communities meet the criteria for inclusion in the traditional and local knowledge studies:

- Cantwell
- Chickaloon
- Chitina
- Copper Center
- Eklutna
- Gakona
- Gulkana
- Tyonek

The traditional and local knowledge studies will use the following methods to document knowledge of the physical, biological, and social environment with the selected study communities:

- Coordinate with tribal governments and Alaska Native entities as appropriate to seek community support for conducting the interviews.
- Consult with program leads for other resources (e.g., cultural resources, wildlife, fish, vegetation, water quality, air quality, socioeconomics) to identify key topics and questions for the traditional and local knowledge workshops.
- Develop a workshop protocol, incorporating input from program leads for other resources, that covers the following basic topics:
    - Physical Environment;
    - Biological Environment;
    - Social Environment; and
    - Issues and Concerns.
- Work with coordinating organizations in each community to schedule and arrange workshops and to identify knowledgeable residents to participate in the workshops.
- With two staff members present, conduct multiple traditional and local knowledge workshops in each selected community to document knowledge about the physical, biological, and social environment.
- Conduct post-field data processing by editing notes and compiling and organizing quotes by topic and subtopic.
- Review findings with study communities.
- Incorporate results of the traditional and local knowledge workshops in each selected community, supplemented by respondent observations, within the context of the proposed Project into Task 7.

12.5.4.6. Task 6: Impact Analysis

Based on the data collected and compiled throughout the subsistence program study tasks (Sections 12.5.4.1 through 12.5.4.5), the study team will conduct an analysis of the potential impacts of the proposed Project on subsistence uses. The analysis will include assessment of potential impacts to subsistence use areas, user access, resource availability, resource competition, costs and time associated with subsistence activities, and culture. The study team will review other resource impact analyses as appropriate (e.g., wildlife, fish, and vegetation) to inform the analysis of potential changes to the environment that might yield insight into the types and levels of potential impacts on subsistence uses. In addition, information provided by community residents during the traditional and local knowledge workshops will inform the impact analysis.

12.5.4.7. Task 7: Study Report Preparation

The study team will prepare study reports at the end of each calendar year that document yearly progress to date and describe the methodology and field results of Tasks 1-5. The final report will contain the methodology, analysis, and synthesis of all data collected for Tasks 1-5, as well as an analysis of potential impacts and mitigation measures associated with the proposed Project that will be useful for preparation of the Project license application.

12.5.5. Consistency with Generally Accepted Scientific Practice

The ADF&G) Division of Subsistence will conduct harvest and use studies using standard Division of Subsistence methodology involving systematic household surveys conducted by community-based survey technicians in cooperation with Division of Subsistence resource specialists. Methods for subsistence mapping and undertaking traditional and local knowledge interviews will be similar to those employed on other recent projects involving federal approvals. These include traditional knowledge interviews to support the EPA's National Pollutant Discharge Elimination System (NPDES) permit (SRB&A 2011); subsistence mapping and traditional knowledge interviews to support the NEPA EIS for the Red Dog Mine Extension, Aqqaluk Project (EPA 2009); and subsistence mapping for Bureau of Ocean Energy Management (BOEM) oil and gas leases on the Outer Continental Shelf (SRB&A 2009). Related to projects under FERC's purview, traditional knowledge interviews were recently conducted in 2012 for the Alaska Pipeline Project and it is proposed that the subsistence interview process for the Susitna-Watana Hydroelectric Project would employ similar methods as those accepted for use for the Alaska Pipeline Project.

AEA will be guided by the research principles adopted by the Interagency Arctic Research Policy Committee (1990). These principles include informing community organizations of planned research in their communities, gaining community consent, informing all project participants of all positive and negative implications of participating in the study, and protecting the anonymity of study participants. The study team will coordinate with each community to conduct research and provide each study participant with an informed consent form to read and sign. The informed consent will note the risks and benefits of the study, agree to protect the anonymity of participants, and agree to show data only in an aggregated form.

12.5.6. Schedule

Tables 12.5-4 through 12.5-6 present the anticipated schedule for the subsistence study plan by primary tasks. Key dates (e.g., meetings, deadlines) are also presented for each calendar year. Also, Initial and Updated Study Reports will document actions taken and data collected to date will be issued in December 2013 and 2014, respectively.

12.5.7. Level of Effort and Cost

For information related to level of effort, see Tables 12.5-4 through 12.5-6 for a description of tasks that will occur by month. Section 12.5.4, “Study Methods,” provides additional information regarding the level of effort for each task. The estimated effort to implement this study plan, including field studies, data collection**,** analysis**,** and reporting over the two year study period for Tasks 1-7 is approximately $1.5 million..

12.5.8. Literature Cited

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12.5.9. Tables

Table 12.5-1. Study Communities.

Number	Study Community	Community in Watershed	Use Area in Watershed	ADF&G Study Community
1	Beluga		X	
2	Cantwell		X	X
3	Chase	X	No Data	X
4	Chickaloon		X	
5	Chitina		X	
6	Copper Center		X	
7	Copperville		No Data	X
8	Denali Hwy Households	X	No Data	
9	Eklutna		X	
10	Gakona		X	
11	Glennallen		X	X
12	Gulkana		X	X
13	Healy		X	
14	Kenny Lake		X	
15	Lake Louise	X	X	
16	McCarthy		X	
17	McKinley Park		X	
18	Nelchina		No Data	X
19	Parks Hwy Households (Chulitna, Gold Creek, Hurricane/Broad Pass)		No Data	
20	Paxson		X	X
21	Petersville	X	No Data	
22	Skwentna	X	X	X
23	Susitna	X	No Data	X
24	Talkeetna	X	No Data	
25	Tazlina		No Data	X
26	Tolsona		No Data	X
27	Tonsina		X	X
28	Trapper Creek	X	No Data	
29	Tyonek		X	
30	Wasilla[1]	X	No Data	
31	Western Susitna Basin		X	
32	Willow	X	No Data	

[1]Wasilla includes the outlying CDPs of Big Lake, Buffalo-Soapstone, Fishhook, Houston, Knik-Fairview, Meadow Lakes, Point MacKenzie, and Tanaina.

Stephen R. Braund & Associates, 2012.

Table 12.5-2. Household Harvest Survey Study Communities.

Study Community[1]	Census Designated Place	Existing ADF&G Study Community	Additionally Selected for ADF&G Household Surveys	Selected for Nonsubsistence Area Household Surveys
Chase	X	X		
Denali Hwy Households				
Lake Louise	X		X	
Parks Hwy Households (Chulitna, Gold Creek, Hurricane/Broad Pass)				
Skwentna	X	X		
Susitna	X	X		
Talkeetna[2]	X			X
Trapper Creek[2]	X			X

[1]Table includes only communities located within the Susitna River watershed outside of a State designated nonsubsistence area, with the exception of Talkeetna and Trapper Creek.
[2]Talkeetna and Trapper Creek, while located in a State Designated nonsubsistence area, are included in this table because of their proximity to the nonsubsistence area boundary. Residents from these communities are presumed to travel outside the nonsubsistence area regularly to participate in subsistence activities.

Stephen R. Braund & Associates, 2012.

Table 12.5-3. Traditional Knowledge Criteria and Selected Study Communities.

Study Community	Community in Watershed	Documented Use Area in Watershed	50 Percent or more Alaska Native Population	Federally Recognized Tribe	Selected Traditional Knowledge Study Community
Beluga		X			
Cantwell		X		X	X
Chase	X	No Data			
Chickaloon		X		X	X
Chitina		X		X	X
Copper Center		X	X	X	X
Denali Hwy Households	X	No Data	No Data		
Eklutna		X	No Data	X	X
Gakona		X		X	X
Glennallen		X			
Gulkana		X	X	X	X
Healy		X			
Kenny Lake		X			
Lake Louise	X	X			
McCarthy		X			
McKinley Park		X			

Study Community	Community in Watershed	Documented Use Area in Watershed	50 Percent or more Alaska Native Population	Federally Recognized Tribe	Selected Traditional Knowledge Study Community
Parks Hwy Households (Chulitna, Gold Creek, Hurricane/Broad Pass)	X	No Data	No Data		
Paxson		X			
Petersville	X	No Data			
Skwentna	X	X			
Susitna	X	No Data			
Talkeetna	X	No Data			
Tonsina		X			
Trapper Creek	X	No Data			
Tyonek		X	X	X	X
Wasilla[1]	X	No Data			
Western Susitna Basin		X	No Data		
Willow	X	No Data			
[1]Wasilla includes the outlying CDPs of Big Lake, Buffalo-Soapstone, Fishhook, Houston, Knik-Fairview, Meadow Lakes, Point MacKenzie, and Tanaina.					

Stephen R. Braund & Associates, 2012.

Table 12.5-4. Schedule of Subsistence Study Plan Tasks in 2012.

	2012											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Subsistence Study Plan												
Task 2: ADF&G Household Surveys Pre-field Planning - Year 1												
Key Dates												
July 16, 2012 - AEA Files Proposed Study Plan with FERC												
August 9, 2012 – Formal Social Sciences Study Plan Meeting												
November 14, 2012 - AEA Files Revised Study Plan with FERC												
December 14, 2012 - FERC Issues Study Plan Determination												

Table 12.5-5. Schedule of Subsistence Study Plan Tasks in 2013.

	2013											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Task 1: Compilation of Existing Data												
Task 2: ADF&G Household Survey - Year 1												
Task 2: ADF&G Reporting and Community Review - Year 1												
Task 2: ADF&G Household Surveys Pre-field Planning - Year 2												
Task 3: Household Surveys in Nonsubsistence Areas												
Task 4: Subsistence Mapping Interviews												
Task 1, 3-4: Prepare 2013 Study Report and Community Reviews												
Revise Study Plans (as needed)												►
Consultation												►
Key Dates												
► Task continues into next calendar year												

Table 12.5-6. Schedule of Subsistence Study Plan Tasks in 2014.

	2014											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Task 2: ADF&G Household Survey - Year 2												
Task 2: ADF&G Reporting and Community Review - Year 2												
Revise 2013/2014 Study Plans (as needed)												
Task 5: Traditional and Local Knowledge Interviews												
Task 3-4: Additional 2014 Subsistence Data Collection as needed												
Task 3-5: Prepare 2014 final updated Study Report and Community Reviews												
Consultation (as needed)												

12.5.10. Figures

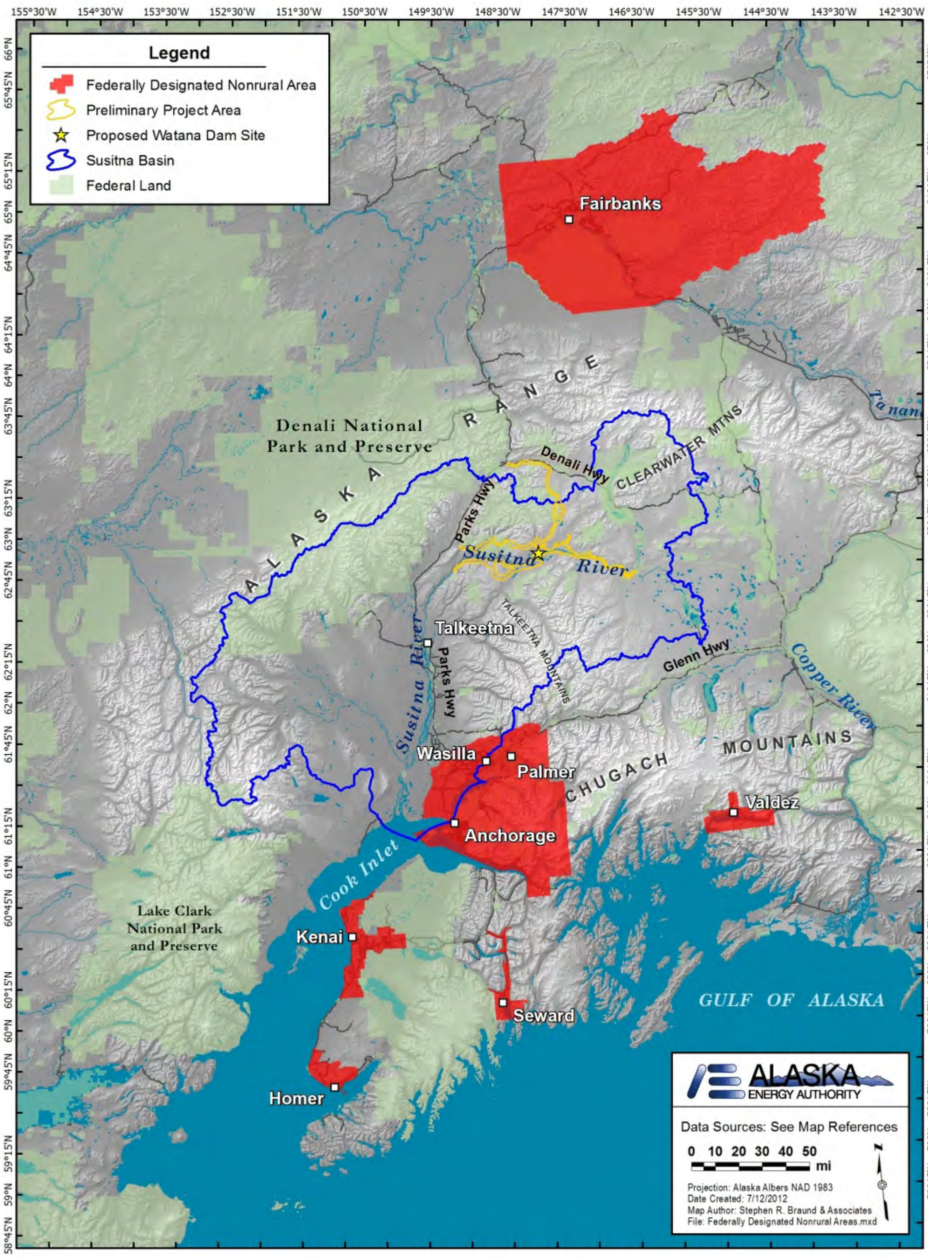


Figure 12.5-1. Federally Designated Nonrural Areas

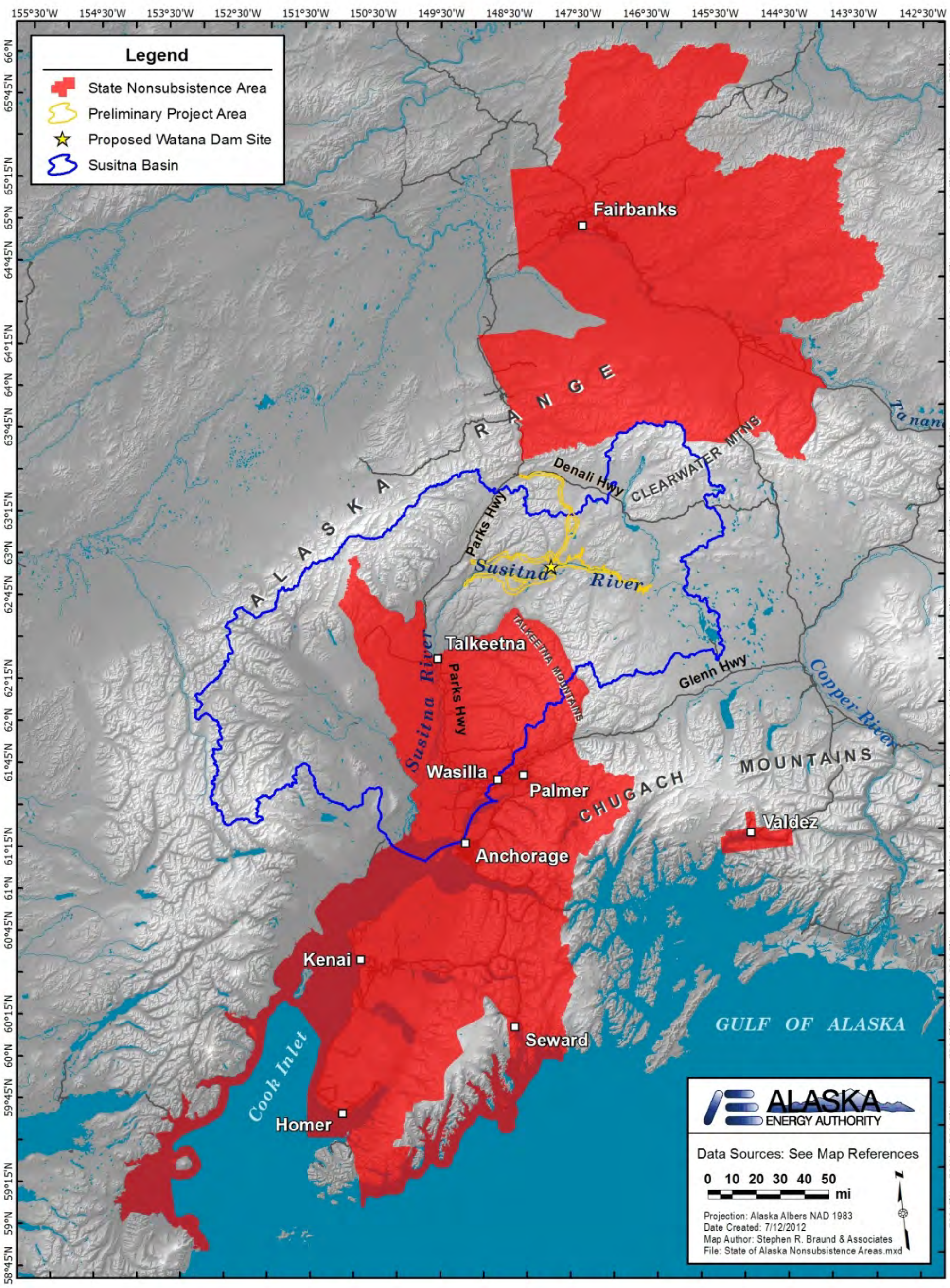


Figure 12.5-2. State of Alaska Designated Nonsubsistence Areas

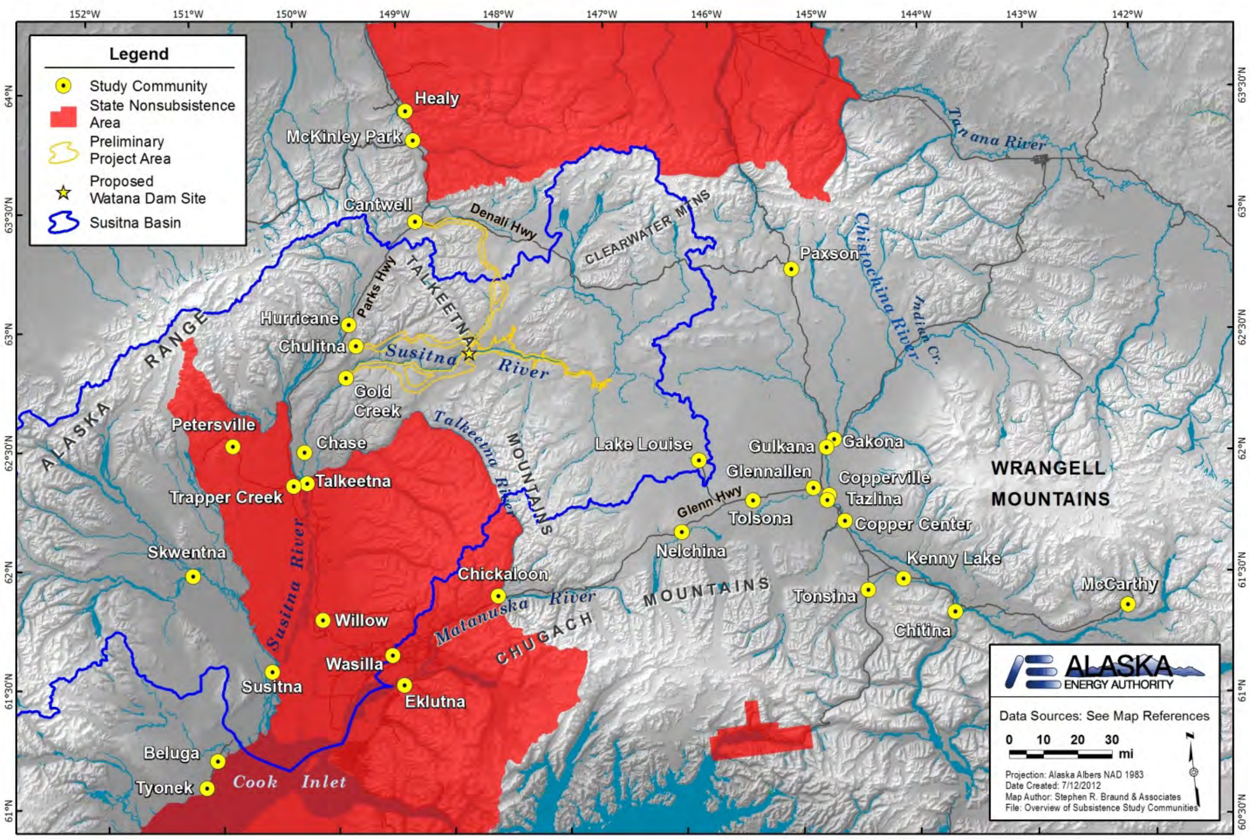


Figure 12.5-3. Overview of Subsistence Study Communities

12.6. Attachments

ATTACHMENT 12-1. REVIEW OF COMMUNITIES AND SUBSISTENCE USE AREAS IN THE SUSITNA RIVER WATERSHED

ATTACHMENT 12-1. REVIEW OF COMMUNITIES AND SUBSISTENCE USE AREAS IN THE SUSITNA RIVER WATERSHED

The study team reviewed the communities included in the Alaska Department of Fish and Game (ADF&G) scope of work and in the subsistence data gap analysis prepared by Northern Land Use Research, Inc. (NLUR). In addition, the study team identified four other communities that are located, or whose use areas are located, in the Susitna River watershed. These include Chickaloon, Eklutna, Healy, and Lake Louise. Because subsistence use area study is available for the Western Susitna Basin (communities not specified), this region was included in the review. The study team reviewed a total of 42 communities (including a regional use area for the Western Susitna Basin and dispersed households along the Parks Highway and Denali Highway). These communities are listed in Table 1 and depicted on Map 1. The study team reviewed each community for its proximity to the Susitna River watershed, and for the proximity of the community’s subsistence use areas (if available) to the Susitna River watershed. In addition, the study team identified whether recent (last three year) harvest data are available for each community. As noted in Table 1, harvest data as collected by ADF&G do not provide all subsistence baseline indicators that are important for characterizing baseline subsistence uses or assessing potential impacts on subsistence uses. Additional baseline indicators not generally available through ADF&G harvest data include multi-year subsistence use areas, comprehensive seasonal round, transportation methods, trip duration, trip frequency, and traditional knowledge including harvester observations of resource change.

As shown in Table 1, the study team identified 14 communities located within the Susitna River watershed, and 18 communities whose use areas are located within the Susitna River watershed. Subsistence use area data are not available for 19 communities. A total of 30 communities are either located within the Susitna River watershed or have use areas that are located within the Susitna River watershed. Map 1 counts do not include the Western Susitna Basin use areas, Denali Highway dispersed households, and Parks Highway dispersed households.

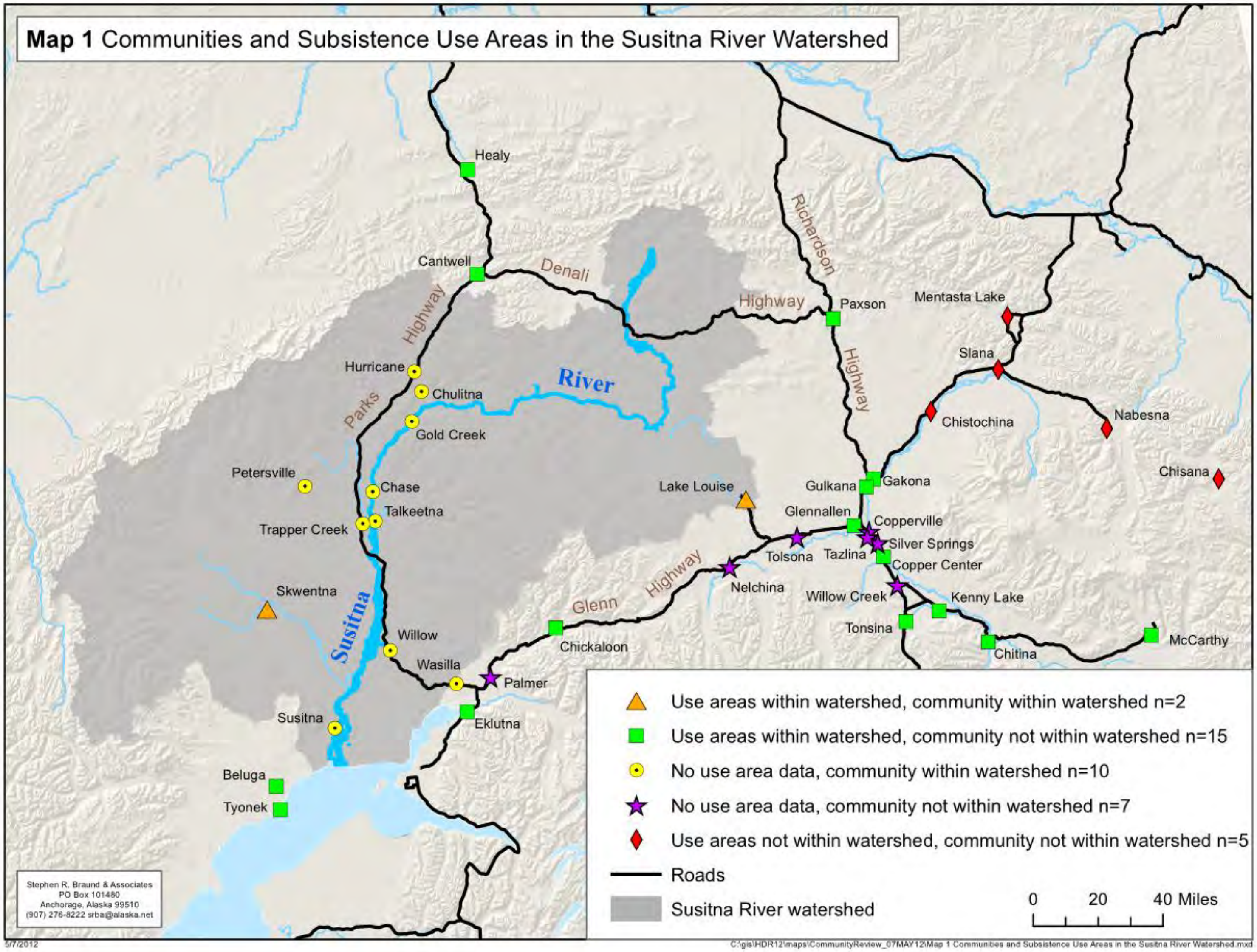
Recent (last three year) harvest data are currently available for only 11 of the 42 communities in Table 1. In their scope of work, ADF&G included communities that are not located in the Susitna River watershed and whose use areas are not included in the Susitna River watershed. These include Chistochina, Mentasta, Nabesna, and Slana. In addition, ADF&G included communities that are not located in the Susitna River watershed for which no use area data are available. These include Copperville, Nelchina, Silver Springs, Tazlina, Tolsona, and Willow Creek.

In their subsistence data gap analysis, NLUR included communities that are not located in the Susitna River watershed and whose use areas are not included in the Susitna River watershed. These include Chisana, Chistochina, Mentasta, and Slana. In addition, NLUR included communities that are not located in the Susitna River watershed for which no use area data are available. These include Copperville, Palmer, Silver Springs, and Tazlina.

Table 1. Communities and Subsistence Use Areas in the Susitna River Watershed

		Reason for Study Community Consideration			Proximity to Susitna River Watershed						
	Community	ADF&G SOW	NLUR Data Gap	Added Based on Community or Use Area in Watershed	Community in Watershed	Approximate Distance (in Miles) of Community from Watershed	Use Area in Watershed	Approximate Distance (in Miles) of Use Area from Watershed	Community and/or Use Area in Watershed	Harvest Data Last 3 Years (2009 or Later)[1]	Notes
1	Beluga	x				11	x	0	x		
2	Cantwell	x	x			5	x	0	x		
3	Chase	x	x		x	0	No Data	No Data	x		
4	Chickaloon			x		14	x	0	x		
5	Chisana		x			143		95			
6	Chistochina	x	x			53		25		x	
7	Chitina	x				85	x	0	x	x	
8	Chulitna		x		x	0	No Data	No Data	x		
9	Copper Center	x	x			45	x	0	x	x	
10	Copperville	x	x			35	No Data	No Data	No Data		
11	Denali Hwy Households & Lodges		x		x	n/a	No Data	No Data	x		Portion of Denali Highway is in watershed.
12	Eklutna			x		9	x	0	x		
13	Gakona	x	x			35	x	0	x	x	
14	Glennallen	x	x			30	x	0	x		
15	Gold Creek		x		x	0	No Data	No Data	x		
16	Gulkana	x	x			35	x	0	x		
17	Healy			x		32	x	0	x		
18	Hurricane/Broad Pass		x		x	0	No Data	No Data	x		
19	Kenny Lake	x				62	x	0	x	x	
20	Lake Louise			x	x	0	x	0	x		
21	McCarthy	x	x			127	x	0	x	x	
22	Mentasta	x	x			71		52		x	
23	Nabesna	x				107		52		x	
24	Nelchina	x				10	No Data	No Data	No Data		
25	Palmer		x			8	No Data	No Data	No Data		
26	Parks Hwy Dispersed Households		x		x	n/a	No Data	No Data	x		Parks Highway transects watershed
27	Paxson	x	x			23	x	0	x		
28	Petersville		x		x	0	No Data	No Data	x		
29	Silver Springs	x	x			37	No Data	No Data	No Data	x	
30	Skwentna	x			x	0	x	0	x		Use Areas for Upper Yentna
31	Slana	x	x			70		42		x	
32	Susitna	x			x	0	No Data	No Data	x		
33	Talkeetna		x		x	0	No Data	No Data	x		
34	Tazlina	x	x			37	No Data	No Data	No Data		
35	Tolsona	x				14	No Data	No Data	No Data		
36	Tonsina	x				56	x	0	x		
37	Trapper Creek		x		x	0	No Data	No Data	x		
38	Tyonek	x				17	x	0	x		
39	Wasilla		x		x	0	No Data	No Data	x		
40	Western Susitna Basin			x	n/a	n/a	x	0	x		Use area data are not provided at a community-specific level
41	Willow		x		x	0	No Data	No Data	x		
42	Willow Creek	x				48	No Data	No Data	No Data	x	

[1] Includes harvest data collected during ADF&G household harvest surveys. Harvest data generally include subsistence baseline indicators related to harvest amounts, harvest effort, harvest success, harvest participation, harvest sharing, and harvest diversity. Additional subsistence baseline indicators not generally available through ADF&G harvest data include subsistence use areas, seasonal round, transportation methods, trip duration, trip frequency, and traditional knowledge including harvester observations of resource change. This document does not review the availability of additional subsistence baseline indicators for the potential study communities.



Map 1 Communities and Subsistence Use Areas in the Susitna River Watershed
Healy
Cantwell
Denali
Highway
Parks
Highway
Richardson
Highway
Paxson
Mentasta Lake
Slana
Nabesna
Chistochina
Chisana
Hurricane
Chulitna
River
Gold Creek
Petersville
Chase
Talkeetna
Trapper Creek
Lake Louise
Gulkana
Gakona
Glennallen
Copperville
Silver Springs
Tolsona
Tazlina
Copper Center
Nelchina
Willow Creek
Kenny Lake
Skwentna
Susitna
Glenn
Highway
Tonsina
Chitina
McCarthy
Willow
Chickaloon
Wasilla
Palmer
Eklutna
Susitna
Beluga
Tyonek
Use areas within watershed, community within watershed n=2
Use areas within watershed, community not within watershed n=15
No use area data, community within watershed n=10
No use area data, community not within watershed n=7
Use areas not within watershed, community not within watershed n=5
Roads
Susitna River watershed
0
20
40 Miles
Stephen R. Braund & Associates
PO Box 101480
Anchorage, Alaska 99510
(907) 276-8222 srba@alaska.net
5/7/2012

13. SOCIOECONOMIC AND TRANSPORTATION RESOURCES

13.1. Introduction

This section outlines the study plans for socioeconomic issues, transportation, health impacts, and air quality. The socioeconomic sections will address evaluation of regional economic effects as well as effects on social conditions and public goods and services.

13.2. Nexus Between Project Construction / Existence / Operations and Effects on Resources to be Studied

The construction and operation of the Project has the potential to affect social resources, including the local and regional economies; provision of public services by local, state and federal governments; air emissions and local and regional air quality; community health and safety; and traffic levels and capacity of transportation resources including roads, airports, rail, and local river transportation. The type, intensity, and extent of effects on these social resources need to be understood during the licensing process so that appropriate measures to address or mitigate the effects can be considered for incorporation into the Project license.

Some of the potential socioeconomic effects of the Project during the construction phase are related to the large number of construction workers that would build the Project and their potential impact on communities, public services, infrastructure and temporary housing. The construction workforce is likely to be drawn from a broad region of Southcentral and Interior Alaska. The number of certain skilled occupations required for the Project may exceed the number of workers available within the state, which could lead to some in-migration of out-of-state workers and their families for some occupations, or such workers might commute from their current residences in other states.

Additional socioeconomic effects that could occur during the construction phase include increased job opportunities and income associated with local employment and through local expenditures by AEA, contractors, other utilities, and non-local construction workers. Also during construction, local government taxes (e.g., sales tax, hotel/motel occupancy tax) would be generated on items and services purchased in communities in the vicinity of the Project.

Project construction will also require the transportation of people, equipment, and materials to and from the construction worksite, which could result in increased rail, air, and road traffic volumes, disruption of normal traffic patterns and associated noise and congestion effects. Such conditions may disrupt the transportation patterns of tourists and local travelers, especially in summer, and may require additional police and emergency response calls for traffic accidents and other incidents.

Project construction and operation would also result in new air emission sources in the vicinity of the Project and could have effects on local community health.

The development of a major new energy source would affect the economy of the Railbelt area. The economic literature suggests that benefits accrue to regional economies from electric utility system improvements. The Project will generate electricity for a significant portion of the state's residents. While the final capital cost, financing, and other information needed to estimate the cost of this electricity is still uncertain, it is known that the cost will be relatively stable for the life of the Project. In contrast, the cost of electricity generated from fossil fuels may rise over time. Therefore, at some point in time, savings may accrue to residential and industrial consumers of the electricity generated by the Project. These savings in energy costs could expand the regional economy by stimulating business activity and creating more disposable income for consumers to spend on purchases of other goods and services.

Project construction and operation may change the level of production of commercial farming, grazing, logging, mining, and fishing operations in the study area. In addition, Project operation, together with Project features (i.e., reservoir and access roads), could change fishing, hunting, and other recreation and subsistence opportunities, including availability of recreational and subsistence resources, access, and quality of experience. In turn, these changes have an impact on tourism and other sectors of the local and regional economies. Project features that stimulate residential location, tourism and other types of economic development may affect surrounding property uses and values.

New residents may be attracted to the study area by the Project features (i.e., reservoir and access roads). This immigration could affect the demand for both housing and municipal and state services, such as police, fire protection, medical facilities and schools. Local government could see additional expenditures for these services and additional revenues based on increased property taxes from new land development.

Project construction activities and operations are likely to result in increased transportation demands that could affect local roadways, the Alaska Railroad Corporation (ARRC), and airports. Air emissions during both construction and operations could change air quality locally, or in the event that the Project affects operations levels at other regional power plants, regionally. Project-related changes in water levels and ice formation could affect local use of the river for winter transportation. Project-related changes in water temperatures and levels, along with development of the dam and reservoir complex and transmission and road system, could alter some of the bio-physical attributes of the Susitna River system that many residents of the Matanuska-Susitna valley have adapted lifestyles around.

13.3. Resource Management Goals and Objectives

The proposed Project would occupy federal lands currently administered by the U.S. Bureau of Land Management (BLM) but selected by the State of Alaska under the Alaska Statehood Act, state lands administered by the Alaska Department of Natural Resources (ADNR), and private lands owned by Alaska Native Corporations and others. The Project site is within the Matanuska-Susitna Borough (MSB), which has adopted an Economic Development Strategic Plan that contains policies designed to support economic growth in the area. The MSB plan will be reviewed and BLM, ADNR and Alaska Native entities will be contacted to determine their socioeconomic goals and objectives for the lands in the vicinity of the Project. These goals and objectives will be incorporated into the socioeconomic studies.

Local government provision of public services is regulated under Title 29 of Alaska Statutes as well as a variety of city and borough codes and management plans. The goals and objectives for management and use of state and federal lands are documented in area management plans. These plans are designed to allow use of public lands for public use that is compatible with the intent identified for the lands in the management plans.

Surface and aviation transportation resources in Project area are managed under the MSB Long-Range Transportation Plan, as well as under Alaska Department of Transportation & Public Facilities (ADOT&PF) Statewide Transportation Policy Plan. Rail facilities are managed under Federal Railroad Administration regulations and the state code. All of these agencies work together to ensure that appropriate types and levels of transportation facilities are available to provide for the safe and efficient movement of people and goods to support the state's economy and quality of life.

Air quality is regulated by the Alaska Department of Environmental Conservation (ADEC) and the Environmental Protection Agency (EPA). These regulations are designed to maintain air quality to support public health.

13.4. Summary of Consultation with Agencies, Alaska Native Entities and Other Licensing Participants

Consultation efforts to date have been limited to discussions with agency representatives, Alaska Native entities, and other licensing participants at the Project Technical Workgroup Meetings held in February, April, and June 2012 (Table 13.4-1). Documentation of these meetings are found in Attachment 1-1 of this PSP.

Table 13.4-1. Summary of consultation on Socioeconomic and Transportation Resources study plans.

Comment Format	Date	Licensing participant	Affiliation	Subject
Work Group Meeting	2/27/2012	Variety of Licensing participants	Variety of Agencies, Tribal Entities, and Interested Individuals	Brief discussion of social science outlines.
Work Group Meeting	04/03/2012	Variety of Licensing participants	Variety of Agencies, Tribal Entities, and Interested Individuals	Discussion of planned study objectives and methods.
Work Group Meeting	06/06/2012	Variety of Licensing participants	Variety of Agencies, Tribal Entities, and Interested Individuals	Discussion of licensing participant comments and study requests.

13.5. Regional Economic Evaluation Study

13.5.1. General Description of the Proposed Study

13.5.1.1. Study Goals and Objectives

The goal of the regional economics study plan is to assess potential changes in regional economic conditions in the study area resulting from the operation of the proposed Project and the power generated by the Project. Changes in regional economic conditions resulting from the non-power effects of the Project are included in the social conditions and public goods and services study plan.

The objectives of the study are listed below.

- Describe the effects of the Project on the regional economy resulting from improvements in the reliability of the electrical power grid.
- Describe the effects of the Project on the stability of electric prices over time.
- Determine the economic effects of the Project’s power over time.

13.5.2. Existing Information and Need for Additional Information

A data gap analysis report of socioeconomics, recreation, air quality and transportation was prepared in August 2011 (HDR 2011). That report along with the Alaska Energy Authority’s (AEA’s) 2011 Pre-Application Document (PAD) provides substantial information about the Project and socioeconomic resources in the Project vicinity. Information collected for the socioeconomic conditions and public goods and services component of the socioeconomic analysis will provide a portion of the data needed for the regional economic model to conduct the regional economic analysis. However, information regarding electric utility rates, power outages, and other data required for this regional economic analysis is not addressed in the other socioeconomic study, and is lacking in the data gap analysis and the PAD. Additional information needed for the regional economic modeling effort includes the following.

- Historical data on electric utility rates for Railbelt utilities
- System Average Interruption Duration Index reliability minutes for Railbelt utilities
- Information on the cost of power disturbances in the commercial and residential sectors within the study area
- Information on how the cost and reliability of power may affect creation of new businesses or expansion of existing businesses

A review of relevant published documents and information from public scoping meetings will be useful to further inform the study inputs and information collection. In addition, it is anticipated that interviews will be conducted with businesses in the Railbelt to ascertain the potential for changes in business opportunities as a result of the new energy source provided by the Project.

13.5.3. Study Area

The regional economic impacts of the new energy source provided by Project operations will be concentrated in the area collectively referred to as the Railbelt, which includes the Fairbanks

North Star Borough (FNSB), Denali Borough, MSB, Municipality of Anchorage (MOA), and Kenai Peninsula Borough (KPB).

13.5.4. Study Methods

The study methods discussed below are consistent with methods used for economic analysis completed during the licensing proceedings for other hydroelectric projects.

13.5.4.1. Data Collection and Analysis

The proposed Project would not start operations until 2023 under the current schedule. In addition, the Project is anticipated to continue operations for more than 50 years. Given the long timeframe for construction of the Project and its operations, the effects of the power produced by the Project on the regional economy will be estimated by comparing future socioeconomic conditions with and without the Project.

The forecast of socioeconomic conditions with and without the Project will be based in part on estimates derived from a data and software program called REMI (Regional Economic Models, Inc.). The REMI model incorporates aspects of four major modeling approaches: input-output, general equilibrium, econometric and economic geography. Changes in supply, demand and prices are entered into the REMI model in order to identify the iterative economic and demographic effects of these changes. While the REMI model provides a wide range of output variables, the variables of interest in the socioeconomic impact analysis for the proposed Project are population, employment, labor income, output (sales), and housing. The REMI model extends economic and demographic forecasts through 2060, which is consistent with the time frame of the temporal scope of the socioeconomic impact analysis. The REMI model can provide projections for all of the boroughs and census areas within the Railbelt, including the MOA, FNSB, KPB, MSB and Denali Borough. The current REMI model also includes the Yukon-Koyukuk Census Area and Valdez-Cordova Census Area.

The forecast analysis performed by the REMI model will be guided by assumptions about reasonably foreseeable future actions that would have an important and measurable effect on Alaska’s economy. These actions will be identified through interviews conducted with individuals knowledgeable about the state’s economy. In addition, it is anticipated that interviews will be conducted with business representatives in the Railbelt area to ascertain the potential for changes in business opportunities as a result of the new energy source provided by the Project.

Forecasts for the With-Project condition will be compared to the Without-Project condition. Under the Without-Project case, the mix of electrical generation sources will be based on production cost modeling with Railbelt utilities and an appropriate alternative that does not include a large hydroelectric project. The With-Project condition will be based on the large hydroelectric alternative in the RIRP, adjusted as necessary to fit with the current Project description.

13.5.4.2. Documentation of Regional Economic Analysis

The results of the regional economic analysis will be documented in the initial and updated study report. The report will include study objectives, study area, methods, and tabulated results.

13.5.5. Consistency with Generally Accepted Scientific Practice

Much of the socioeconomic background information will come from published sources, including local governments, boroughs, state agencies, and the federal government. The REMI model being used to forecast future economic conditions has been calibrated for Alaska and has recently been used in work completed for the Alaska Pipeline Project. The REMI model is used by federal, state, and local governments as well as universities and consulting firms.

13.5.6. Schedule

It is anticipated that completion of the work described above would require about six or seven months of effort in 2013 to provide the Initial Study Report. The process described above should provide sufficient information for the licensing and environmental review of the Project. There could be some additional analyses or model runs in 2014 to update input parameters that perhaps have changed as a result of changes to the Project plans or other changes as determined by AEA in collaboration with licensing participants. Any additional work in 2014 will be reported in the Updated Study Report.

13.5.7. Level of Effort and Cost

Conducting this analysis and preparing the report sections is estimated to require about 1,200 to 1,500 person-hours in 2013. This effort would occur over a six to seven month period required to prepare the Initial Study Report. The estimated cost could range from about $250,000 to $400,000.

13.5.8. Literature Cited

Alaska Energy Authority (AEA) 2011. Pre-Application Document, Susitna-Watana Hydroelectric Project, FERC No. 14241.

HDR, Inc. (HDR) 2011. Susitna-Watana Hydroelectric Project, Socioeconomic, Recreation, Air Quality, and Transportation Data Gap Analysis. Unpublished, by the Alaska Energy Authority.

13.6. Social Conditions and Public Goods and Services Study

13.6.1. General Description of the Proposed Study

13.6.1.1. Study Goals and Objectives

The study goal for the social conditions and public goods and services section of the socioeconomics study plan is to assess potential changes in population, housing, public goods and services, and other quality of life factors resulting from the construction and operation of the proposed Project and potential changes in regional economic conditions resulting from the non-power effects of the Project. Coordination with the other social resource analyses (e.g., recreation, transportation, and subsistence) from the outset is an essential component of the socioeconomic study plan.

The objectives of the study are listed below.

- Describe, using text and appropriate tables and graphics, existing socioeconomic conditions within the study area.
- Evaluate the effects of on-site manpower requirements, including the number of construction personnel who currently reside within the study area, who would commute to the site from outside the study area, or who would relocate temporarily within the study area.
- Estimate total worker payroll and material purchases during construction and operation.
- Evaluate the impact of any substantial immigration of people on governmental facilities and services, and describe plans to reduce the impact on local infrastructure.
- Determine whether existing housing within the study area is sufficient to meet the needs of the additional population.
- Describe the number and types of residences and businesses that might be displaced by the Project access road and transmission corridors.
- Describe the non-power effects on the local or regional economy, including commercial opportunities related to fishing, logging, mining, and recreational activities.
- Describe based on other studies what bio-physical attributes of the Susitna River system may change as a result of the Project and what those changes might mean to recreation and subsistence use values, quality of life, community use patterns, and social conditions of the area.

13.6.2. Existing Information and Need for Additional Information

A data gap analysis report of socioeconomics, recreation, air quality, and transportation was prepared in August 2011 (HDR 2011). That report along with AEA’s 2011 PAD provides substantial information about the Project and socioeconomic resources in the Project vicinity.

Information provided for communities within the study area by the U.S. Census Bureau, the Alaska Department of Labor and Workforce Development (ADLWD), the Alaska Department of

Commerce, Community and Economic Development (DCCED), MSB, Denali Borough, and other secondary sources includes the following:

- Current population and population density statistics
- Per capita income
- Number and composition of workforce (e.g., manufacturing; transportation and public utilities; wholesale trade; retail trade; finance, insurance, and real estate; and services)
- Current unemployment rate (latest year of record)
- Number of units and vacancy rates for temporary housing (e.g., apartment rentals, hotels/motels, and campgrounds)
- Location and availability of local government public services (e.g., police, fire protection, medical services, utilities, and schools)
- Local tax revenues and sources of funding (e.g., personal property, sales, hotel/motel occupancy, etc.)

Information that will be needed to complete the analysis includes the following:

- Final location of the Project components
- Length of construction phase
- Cost of materials and supplies during construction
- Approximate cost of materials and supplies during construction that will be spent locally, versus non-locally
- Number of total workforce, including how many workers will be hired locally versus non-locally (data from the ADLWD on employment by occupation will be used to estimate the percent of out-of-state workers)
- Total number of construction workforce by month, or peak number of workers and when that peak would occur
- Summary of construction workforce by craft or discipline
- Total construction wages or average construction pay, including benefits
- Total number of workers required for operation and maintenance of the Project, and total wages including benefits
- Approximate cost of materials, supplies, and services during operation that will be spent locally versus non-locally
- For trucks that would be used, estimated number and size, number of trips per day and week to and from the Project site, travel route, and capacity of the roads on which the trucks will be traveling
- The number of residences or businesses that could be removed by construction of the Project
- Number of acres of agricultural/pasture land or timberland that will be removed from production

Information on recreation use values will be obtained from a travel cost survey that will be conducted in the study area. The survey will collect information on participation in recreational fishing, hunting, boating, wildlife viewing, hiking, and camping in the study area, related expenditures, travel distance, site quality, and substitute recreational opportunities.

Information on subsistence use values will be obtained from a subsistence survey that will be conducted in the study area. The survey will collect information on participation in subsistence fishing, hunting, and gathering in the study area.

There is little published information on non-economic, socio-cultural values and needs of study area residents; therefore, the intent is to use informal interviews with community residents, MSB officials, and other knowledgeable people to help provide additional information that could be useful in evaluating social impacts in the study area.

13.6.3. Study Area

Based on the current Project description, the principal study area for the analysis of impacts on social conditions and public goods and services includes communities in the Denali Borough and MSB that are located in relatively close proximity to the proposed Project, including the hydroelectric facility, access road and transmission lines. Most of the effects specific to these communities during the construction phase are related to the transportation and supply of construction materials, the number of construction workers that would work on the Project and their potential impact on population, public services and infrastructure, and temporary housing during construction. Within the Denali Borough, the principal community under consideration is Cantwell, as this is the closest community to the proposed Project. In the MSB, the closest communities are Trapper Creek, Chase, and Talkeetna.

A wide range of occupations are needed to construct and operate a large hydroelectric facility, and it is likely that workers in many regions of Alaska would benefit from the additional employment opportunities created by the Project. However, the largest concentration of workers with the required occupational skills is in highly populated Southcentral Alaska. The concentration of major engineering, construction, and manufacturing firms in the MOA makes it probable that this city would be most affected by construction period expenditures.

Transportation effects during the construction phase of the Project would occur in ports of entry for freight and along the subsequent transportation routes for supplies, equipment and labor. Boroughs and census areas through which potential overland transportation routes pass include the MOA, FNSB, Valdez-Cordova Census Area, KPB, Yukon-Koyukuk Census Area, MSB, and Denali Borough.

During Project construction there may be additional requirements for law enforcement and health and human services. The Alaska Department of Public Safety (ADPS) provides law enforcement in the unorganized areas of the state (census areas) and in areas of municipalities without police powers. State and Alaska Native programs provide most health and human services in Alaska.

Effects of Project operations and features (i.e., reservoir and access roads) on the local or regional economy, including changes in commercial opportunities related to fishing, hunting, boating, wildlife viewing, mountaineering, and other recreation, are likely to be concentrated in those communities in the Denali Borough and MSB that are located in relatively close proximity to the Project.

13.6.4. Study Methods

The study methods discussed below are consistent with the socioeconomic analysis completed during the licensing proceedings for other hydroelectric projects.

13.6.4.1. Data Collection and Analysis

The proposed Project would not start operations until 2023 under the current schedule. The Project is anticipated to operate for more than 50 years, similar to other large hydroelectric developments around the world. Given the long time frame for construction and operation of the Project, the Project's socioeconomic effects will be estimated by comparing future socioeconomic conditions with and without the Project.

The forecast of socioeconomic conditions with and without the Project will be based in part on estimates derived from the REMI model described for the Regional Economic Evaluation study. While the REMI model provides a wide range of output variables, the variables of interest in the socioeconomic impact analysis for the proposed Project are population, employment, labor income, output (sales), and housing. The REMI model extends economic and demographic forecasts through 2060, which is consistent with the temporal scope of the socioeconomic impact analysis. The REMI model can provide projections for all of the boroughs and census areas within the Railbelt, including the MOA, FNSB, KPB, MSB, and Denali Borough. The current REMI model also includes the Yukon-Koyukuk Census Area and Valdez-Cordova Census Area.

The forecast analysis performed by the REMI model will be guided by assumptions about reasonably foreseeable future actions that would have an important and measurable effect on Alaska's economy. These assumptions will be developed based on information received from the Department of Commerce, Community and Economic Development.

As the Project design becomes more developed, specific requirements for the types of construction specialties (e.g., firms with roller-compacted concrete experience) will be identified and compared with current expertise of regional construction companies to see which opportunities can be filled by Alaska firms. This evaluation would improve the model estimates of future economic activity and provide recommendations to increase the percentage of these opportunities captured by Alaska businesses.

The effect of potential immigration during Project construction and operations on municipal and state services, such as police, fire protection, medical facilities, and schools, will be assessed. For schools, the effect of the influx of additional school-age children on teacher-pupil ratios will be determined. In an attempt to identify changes to quality of life and overall natural resource uses trends and potential changes resulting from the Project, some survey questions will be added to the public survey proposed in the Recreation and Aesthetics Study Plan. The survey questions will be oriented toward identifying how the Susitna River corridor and upper basin is used and valued by local residents and to identify the importance of the various bio-physical aspects important to area residents. Once the types of Project-induced changes in riverine and basin resources is known, a further analysis will be undertaken to identify how such changes might alter the resources used and valued by the area residents. The results of the Project effects on subsistence, recreation, and transportation can be used to further evaluate the overall effects on the residents of the region.

A fiscal impact analysis will be conducted to evaluate incremental local government expenditures in relation to incremental local government revenues that would result from construction and operation of the Project. Incremental expenditures include, but are not limited to, school operating costs, road maintenance and repair, public safety, and public utility costs.

Incremental revenues include, but are not limited to, property taxes and hotel/motel occupancy taxes.

Transportation of construction equipment and materials through communities on the transportation routes to and from the Project could result in increased traffic volumes, with associated noise and congestion effects. Such conditions might require additional police and emergency response calls for traffic accidents and other incidents. These impacts will be assessed based on the results of the Transportation Resources study. For example, estimates of changes in vehicle miles traveled can be converted into estimates of traffic accidents and injuries, which could place additional demands on police, emergency response, and medical care services.

The economic impact of the Project on local tourism establishments (e.g., river sport fishing, whitewater boating) and the regional economy will be estimated using the results of the Recreation and Aesthetics study. Calculations will be based on information obtained from the recreation survey, including the estimated recreation-related expenditures per recreational day or trip and changes in the number of days or trips per year. The regional economic impact of changes in subsistence-related expenditures due to the proposed Project will be estimated using the results of the Subsistence study. Approximate cash expenses to generate each pound of subsistence harvest will be based on published information (Goldsmith 1998).

The Project, including access roads, could affect surrounding property uses and values. These effects will be described by identifying the properties that are on or in close proximity to the Project area, including the access road(s) that will be built; determining the degree to which the use of the properties would change as a result of the Project; and estimating to the extent practicable, the extent that properties' values will change as a result of the change in use.

If Project features (i.e., reservoir and access roads) stimulate residential development, spending by new residents in the local economy will generate new economic activity, including additional jobs and labor income. Interviews will be conducted with regional businesses to identify potential opportunities for residential development and estimate the economic impacts should this development occur.

To the extent that Project construction and operations will change the level of production of commercial farming, grazing, logging, mining, and fishing operations, these effects will be approximated by the change in production multiplied by the current price of the resource in question. Information on the quantity and value of market-based natural resources is available through state and federal resource management agencies.

Changes that result in increases or decreases in economic activity such as production of commercial resource extraction (e.g., commercial fishing), or changes in spending for recreational goods and services will become inputs to the REMI model to calculate the regional economic impacts. The annual incremental change (i.e., from the No Action Alternative) in dollars for each activity with the Project will be estimated and then added or subtracted from the No Action Alternative to arrive at the With-Project condition.

The travel cost method or random utility model will be used to estimate changes in recreational use values associated with sport fishing, sport hunting, boating, wildlife viewing, hiking, and camping in the study area. The travel cost method estimates the number of recreational trips an average person takes to a specific site as a function of the cost of travelling to that site, the comparative costs of travelling to substitute sites, and the quality of the recreational experience at the sites (Black et al. 1998). The basis of the method is the assumption that the recreational experience is enhanced by high quality sites (e.g., clean water, abundant recreational fisheries), hence the net willingness to pay for, and hence the value of, recreational trips depends on site quality. Different model specifications can be used to value specific qualities of the resource and attributes of the recreational experience. To value these types of amenities, economists typically rely on a variant of the basic travel cost model referred to as a discrete choice or random utility model. Whereas basic travel cost models are most appropriate in analyzing the number of trips people make to a site, random utility models can be used to assess how people choose between multiple sites based on the qualities of the sites. Travel cost approaches require data on site visitation, place of residence, substitute sites, and user characteristics (such as income) (Black et al. 1998). These data will be obtained from the recreation survey conducted for the Recreation and Aesthetics Study.

In addition, the benefits transfer approach will be used to supplement or compare unit values (e.g., value per-day of sport fishing) for recreational goods and services obtained from primary valuation methods. Benefits transfer involves the application of unit value estimates, functions, data, and/or models from one or more previously conducted valuation studies to estimate benefits associated with the resource under consideration (Black et al. 1998). For example, an extensive number of previously conducted studies estimated the value of sport fishing in various regions of Alaska. Similarly, several existing reports estimated the value of Alaska wildlife. It also may be possible to obtain information from a study currently being conducted by ECONorthwest, in consultation with DHM Research, ADF&G, and others. The study is assessing the economic importance of wildlife to Alaska and will include the value of non-market goods of services, e.g., ecosystem services and wildlife's contributions to Alaskans' quality of life.

The value of changes in subsistence activities in the study area will be estimated by applying a wage compensating differential model that examines tradeoffs between time spent on subsistence and cash employment (Duffield 1997). The advantage of this method is that it captures the cultural and social value of participating in subsistence activities as well as the product value. It requires community-specific per capita income levels and subsistence harvest per capita data, both of which will be obtained from the subsistence survey conducted for the Subsistence study.

Following the methodology of Braund and Lonner (1982), information on the values, attitudes, and lifestyle preferences of residents in the Talkeetna, Trapper Creek, and Cantwell areas will be collected through informal interviews with community residents, MSB officials, and other knowledgeable people. Interview questions will be oriented toward identifying how the Susitna River corridor and upper basin is used and valued by local residents to identify the importance of the various bio-physical aspects important to area residents. Once the types of Project-induced changes in riverine and basin resources are known, a further analysis will be undertaken to identify how such changes might alter the resources used and valued by area residents. The results of the Project effects on subsistence, recreation, and transportation can be used to further evaluate the overall effects on the residents of the region.

13.6.4.2. Work Products

The results of the social conditions and public goods and services study will be documented in initial and updated study reports. The report will include study objectives, study area, methods, and tabulated results.

13.6.5. Consistency with Generally Accepted Scientific Practice

Much of the socioeconomic background information will come from published sources, including local governments, boroughs, state agencies, and the federal government. The REMI model being used to forecast future economic conditions has been calibrated for Alaska and has recently been used in work completed for the Alaska Pipeline Project. The REMI model is used by federal, state, and local governments as well as universities and consulting firms.

13.6.6. Schedule

It is anticipated that completion of the work described above would require about six or seven months of effort in in 2013 and would be summarized in an Initial Study Report in December 2013. There may be additional analyses or model runs in 2014 to incorporate information from the 2013 studies. These will be addressed in the Updated Study Report in December 2014. The process described above should provide sufficient information for the licensing and environmental review of the Project.

13.6.7. Level of Effort and Cost

Conducting this analysis and preparing the report sections for the seven boroughs and census areas, and the associated communities, is estimated to require about 2,400 to 2,800 person-hours in 2013 and 2014. Limited secondary data for many of the communities in the study area will require telephone calls and personal interviews to develop sufficient information to evaluate the effects of the Project on each community. This effort would occur over an eight to nine month period required to prepare the final deliverables. The estimated cost could range from about $400,000 to $500,000.

13.6.8. Literature Cited

AEA 2011. Pre-Application Document, Susitna-Watana Hydroelectric Project, FERC No. 14241.

Black, R., B. McKenney and R. Unsworth. 1998. Economic Analysis for Hydropower Project Relicensing: Guidance and Alternative Methods. Prepared for U.S. Fish and Wildlife Service. Washington, D.C.

Braund, S.R. and T.D. Lonner. 1982. Alaska Power Authority Susitna Hydroelectric Project Sociocultural Studies. Submitted to Acres American Inc. Duffield, J. 1997. Nonmarket Valuation and the Courts: The Case of the Exxon Valdez. *Contemporary Economic Policy* 15 (4):98-110

Goldsmith, S. et al. 1998. Economic Assessment of Bristol Bay Area National Wildlife Refuges: Alaska Peninsula/Becharof, Izembek, Togiak. Institute of Social and Economic Research, University of Alaska Anchorage. Anchorage, AK.

HDR 2011. Susitna-Watana Hydroelectric Project, Socioeconomic, Recreation, Air Quality, and Transportation Data Gap Analysis. Unpublished, by the Alaska Energy Authority.

13.7. Transportation Resources Study

13.7.1. General Description of the Proposed Study

13.7.1.1. Study Goals and Objectives

The Transportation Resources Study will assess the current conditions of the Project area and evaluate the Project's impact against capacity and safety requirements for road, railroad, aviation, port, and river traffic. The analysis will evaluate short-term (construction) and long-term (operational) impacts from the Project, as well as the cumulative impacts of the Project and other significant infrastructure projects. The transportation effects of the Project (With-Project) will be compared to a Without-Project scenario.

The public will benefit from the Transportation Resources Study by having transportation infrastructure capacity near the Project evaluated. Identifying traffic demands during Project construction and operation will allow the Project team and regulatory agencies to identify needed local and regional transportation operational requirements and infrastructure improvements to accommodate Project-related traffic transportation demands and mitigate potential negative impacts on transportation capacity and public safety. Potential effects of the Project on local river use for winter transportation will also be evaluated.

Jurisdiction over public transportation infrastructure and operations is shared by ADOT&PF, ARRC, local governments, and federal transportation agencies. These entities all have similar management goals: for roads, railroads, ports, and aviation facilities to have sufficient capacity to safely and efficiently meet transportation demands during Project construction and operations; and to provide transportation facilities and services that support economic development and general public safety.

The Project team will use information from this study to identify and coordinate needed transportation infrastructure improvements with ADOT&PF, ARRC, MSB, the Denali Borough, and others. This report will also provide valuable information for the multidisciplinary analysis of the Project required under the National Environmental Policy Act (NEPA).

13.7.2. Existing Information and Need for Additional Information

The existing transportation resources in the Project area are well documented and studied. Included in this documentation are studies conducted by AEA and ADOT&PF specifically for the Project; reports developed for the Alaska Power Authority (APA) Project in the 1980s; and other documents publicly available from the MSB, the Denali Borough, ADOT&PF, ARRC, and the Federal Aviation Administration (FAA).

Tables 13.7-1 through 13.7-5 identifies some key reports that will help provide a foundation for the Transportation Resources Study.

Table 13.7-1. General Resources for Transportation Resources Study.

Report Title	Year Published	Publishing Agency[1]	Area Covered
Susitna-Watana Hydroelectric Project, Socioeconomic, Recreation, Air Quality and Transportation Data Gap Analysis (Draft)	2011	AEA	MSB
Pre-Application Document: Susitna-Watana Hydroelectric Project FERC Project No. 14241	2011	AEA	MSB
Mat-Su Long Range Transportation Plan	2009	MSB	MSB
Mat-Su Long Range Plan	2013; in progress	MSB	MSB
Talkeetna Comprehensive Plan	1999	MSB	MSB
Big Game Guides and Transporters	2011	DCCED	Statewide
Susitna-Matanuska Area Plan	2010	ADNR	MSB
Railbelt Large Hydro Evaluation Preliminary Decision Document	2010	AEA	MOA, MSB, Denali Borough
Matanuska-Susitna Borough Comprehensive Development Plan	2005	MSB	MSB
Railbelt Electrical Grid Authority Study	2008	AEA	MOA, MSB, Denali Borough
Susitna Basin Recreation Rivers Management Plan	1991	ADNR, ADF&G	Susitna Basin Recreation Rivers Management Plan

Notes:

1 ADNR: Alaska Department of Natural Resources; ADF&G: Alaska Department of Fish and Game; DCCED: Department of Commerce, Community and Economic Development; MOA: Municipality of Anchorage.

Table 13.7-2. Road Resources for Transportation Resources Study.

Report Title	Year Published	Publishing Agency[1]	Area Covered
Access Corridor Evaluation	2012; in progress	ADOT&PF	MSB
Annual Traffic Volume Report, Northern Region, 2008-2010	2011	ADOT&PF	MSB, Denali Borough
Annual Traffic Volume Report, Central Region, 2007-2009	2010	ADOT&PF	MOA, MSB
State of Alaska Annual Vehicle Miles of Travel	2010	ADOT&PF	Statewide
Parks Highway Visioning Document	2008	ADOT&PF	MSB, Denali Borough
The George Parks Highway Scenic Management Byway Corridor Partnership Plan	2008	ADOT&PF	MSB, Denali Borough
Alaska's Scenic Byways: Parks Highway	2006	ADOT&PF	MOA, MSB, Denali Borough
Alaska Denali Highway Points of Interest	2008	BLM	Denali Borough
Memorandum on the Economic and Demographic Impacts of a Knik Arm Bridge	2005	KABATA	MOA, MSB

Notes:

1 BLM: Bureau of Land Management; KABATA: Knik Arm Bridge and Toll Authority.

Table 13.7-3. Rail Resources for Transportation Resources Study.

Report Title	Year Published	Publishing Agency	Area Covered
Alaska Statewide Rail Plan	2013; in progress	ADOT&PF	MOA, MSB, Denali Borough
Alaska Railroad 2011 Program of Projects	2011	ARRC	MOA, MSB, Denali Borough

Table 13.7-4. Aviation Resources for Transportation Resources Study.

Report Title	Year Published	Publishing Agency[1]	Area Covered
Alaska Aviation System Plan	2011	ADOT&PF	Statewide
Mat-Su Regional Aviation System Plan	2009	MSB	MSB
Ted Stevens Anchorage International Airport 2008 Master Plan Study Report (Draft)	2009	TSAIA	MOA
Wasilla Airport Master Plan Update 2010	2010	City of Wasilla	MSB
Palmer Municipal Airport Master Plan Update	2009	City of Palmer	MSB

Notes:

1 TSAIA: Ted Stevens Anchorage International Airport.

Table 13.7-5. Port Resources for Transportation Resources Study.

Report Title	Year Published	Publishing Agency	Area Covered
Port MacKenzie Master Plan	2012	MSB	MSB (Port MacKenzie)
Port of Anchorage Master Plan	1999	MOA	MOA (Port of Anchorage)

Additional information needed to complete the Transportation Resources Study is discussed below.

- Project Information

    Proposed access corridor alternatives
    Approximate volumes of construction materials, construction equipment, and personnel that need to access the Project area during construction and operation
    Expected modes of transportation for various materials, supplies, and personnel
    Information on any other proposed Project transportation infrastructure, such as airstrips

- Existing Operations Information

    Existing operations data for all modes of transportation
    Information on existing operating and maintenance costs for all modes of transportation
    Existing capacity and any capacity issues

- Future Operations Information

  Forecasts of operations for all modes of transportation
  Information on planned or proposed non-Project transportation infrastructure improvements

13.7.3. Study Area

The proposed study area for the Transportation Resources Study extends north from Anchorage to Fairbanks and east to the Susitna River to cover all relevant traffic sources, traffic nodes (points where travelers or shippers may select different routes), and destinations for each mode of transportation. The primary sources and destinations of road and railroad traffic will be the Project site, the Port of Anchorage, Port MacKenzie, and local material sources. The majority of the aviation traffic will originate in populated areas at primary and smaller general aviation airports. As preliminary design progresses and local material sites are identified the transportation study area may change.

The proposed study area includes the roadways listed below.

- New access roads to the Project site
- The Denali Highway, Mile Post (MP) 78-133, from the Susitna River crossing to the Parks Highway
- The Parks Highway, MP 35 to 356, from the Glenn Highway to Fairbanks (the junction with the Denali Highway is at MP 210)
- The Glenn Highway, MP 0 to 35, from downtown Anchorage to the Parks Highway
- MSB roads to access Port MacKenzie: Point MacKenzie Road, Knik Goose Bay Road, Burma Road (after completion of realignment and upgrade currently being designed), Big Lake Road, and Vine Road
- MOA streets that access the Port of Anchorage: A Street, C Street, 3rd Avenue, 4th Avenue, 5th Avenue, and 6th Avenue
- Other state highways and local roads near the Project site

The study area also includes the ARRC main line from MP 113 (Anchorage) to MP 478 (Fairbanks), giving consideration to the following areas:

- MP 113, Anchorage Yard (Ship Creek Intermodal Transportation Center)
- MP 173, Port MacKenzie branch line (under construction – roughly 40 miles long)
- MP 248, Curry Quarry
- Access corridor alternatives identified by the Project design team

  MP 263, Gold Creek
  MP 274, Chulitna
  MP 319, Cantwell

- MP 478, Fairbanks Yard

For aviation facilities, the study area contains two primary airports (Ted Stevens Anchorage International Airport and Fairbanks International Airport), plus several smaller general aviation airports (Lake Hood and Merrill Field in Anchorage, plus public airports in the MSB).

For river transportation the study will evaluate non-recreation or subsistence transportation uses in the Susitna River corridor from the Denali Highway to the river mouth.

13.7.4. Study Methods

The proposed methodology consists of the five steps described below.

13.7.4.1. Collect and Review Data

The first step is developing a bibliography of existing documents including recent transportation reports from AEA and the items mentioned in Section 13.8.2. The bibliography will evaluate the relevance of each document to the overall study. The study team will also compile information regarding transportation planning projects, design projects, and any scheduled construction projects near the Project site; these projects may already address potential impacts from the Project, but this will need to be verified.

13.7.4.2. Inventory Assets and Conduct Any Field Studies

The study team will develop a transportation asset inventory for the Project area focused on roads, railroads, bridges, ports, air infrastructure, traffic levels, capacities, and crash and accident statistics. Some traffic data are available; depending upon the type and the age of the data, traffic counters may need to gather current data. Information on use of the river for winter transportation will be obtained by interviewing knowledgeable sources.

13.7.4.3. Document Existing Conditions

Existing transportation infrastructure and traffic levels will be documented to establish baseline conditions for the various transportation resources. Much of this information is available from existing sources, but the information will be supplemented and updated with field collection or interviews if needed.

In particular, surveys of and interviews with knowledgeable individuals and property owners in the area will be used to collect data on the types, levels, areas, and seasons of river transportation uses in the study area. The timing, location, questionnaire content, and survey methods will be developed in consultation with agencies and other interested parties, including the work groups. These surveys will likely include a combination of in-person surveys and mail-out surveys and will be supplemented with information from field crews that encounter people in the study area. These surveys may be conducted coincidentally with the recreation use surveys proposed. Results of the surveys will be used to document river transportation uses, relationships to flow levels and ice conditions, and any feasible access alternatives to use of the river.

13.7.4.4. Forecast Future Conditions

Future traffic forecasts, including Project-related construction and operations traffic, will be developed. These forecasts will address the following issues:

- Proposed transportation/transmission corridors
- Railroad loading and unloading facilities
- Proposed airport facilities
- Other facilities to support fueling, maintenance, and operations
- Possible staging areas
- Temporary improvements for construction
- Any scheduled improvements, such as improvements proposed for the Denali Highway

The study will use *Trip Generation, 8th Edition* (ITE 2008) to forecast future roadway traffic levels. *SimTraffic 8, Synchro 8,* and *HCS 2010* may be used to simulate and evaluate the current and future capacity of the road system. Existing aviation forecasts for existing public airports will be modified if needed, and forecasts for proposed new airports would be developed in accordance with FAA Advisory Circular 150/5070-6B and Forecasting Aviation Activity by Airport (July 2001). These methods of evaluating and predicting traffic levels are consistent with the standard practices of the transportation engineering community. For railroad and port traffic, the study team will work with ARRC operations staff and MSB and MOA port staff to project future activity levels and evaluate future capacity.

13.7.4.5. Evaluate Impacts

The study team will identify the direct, indirect, and cumulative transportation capacity and safety concerns based on projected future road, railroad, port, aviation, and river traffic levels. All modes of transportation will be evaluated before, during, and after Project construction. After identifying and evaluating the effectiveness of scheduled improvements on projected future traffic levels, the team will evaluate solutions to avoid, minimize, and mitigate any remaining capacity and safety problems. Some mitigation measures may consist of general best management practices, such as widening shoulders and adding guardrails on roadways to improve safety. Other mitigation measures may apply to a particular mode of transportation at a specific site and location. Examples include adding additional lanes or passing lanes along the Parks Highway; adding apron space, improving navigation aids, or improving runway surfaces at existing airports; and improving or adding siding tracks along the existing ARRC mainline.

River transportation effects will be assessed based on expected changes in flow levels and ice formation using data from the hydrology and ice processes studies proposed. Measures to mitigate potential effects on river transportation will be identified.

13.7.5. Consistency with Generally Accepted Scientific Practice

Transportation forecasts will be developed using standard forecasting tools for highway and aviation operations. Forecasts of roadway traffic levels will be based on the Institute of Transportation Engineers (ITE) *Trip Generation, 8th Edition* (ITE 2008). Other generally accepted models, including *SimTraffic 8, Synchro 8,* and *Highway Capacity Software* (HCS) can be used if needed to evaluate road capacity. Forecasts for aviation traffic will be in accordance with FAA *Advisory Circular 150/5070-6B Airport Master Plans* and *Forecasting Aviation Activity by Airport* (July 2001).

13.7.6. Schedule

The initial transportation study would be carried out over 12 months, with an initial study report issued in December 2012. An Updated Study Report would be issued in December 2014 to incorporate any new or changed information that becomes available based on other studies conducted in 2013 or changes in the proposed Project.

Table 13.7-6. Transportation Resources Study Schedule

Description	Start Date	Completion Data	Duration	Cost
Data Collection and Review	January 2013	March 2013	2 months	$12,000
Asset Inventory and Field Studies	April 2013	June 2013	3 months	$35,000
Document Existing Conditions	July 2013	August 2013	2 months	$10,000
Forecast Future Conditions	September 2013	November 2013	3 months	$40,000
Evaluate Impacts	December 2013	December 2013	1 month	$15,000
Initial Study Report	October 2013	December 2013	3 months	$15,000
Updated Study Report (if updates needed)	October 2014	December 2014	3 months	$10,000

13.7.7. Level of Effort and Cost

The research into local and regional transportation will require professional engineers and planners with experience relevant to each mode of transportation to conduct the field investigations and data analyses identified in Section 13.8.4 (Study Methods). Total study costs are estimated to be approximately $137,000.

13.7.8. Literature Cited

Center for Microcomputers in Transportation (McTrans). Highway Capacity Software (HCS) 2010, Release 6.3 [computer software]. University of Florida, Gainesville, Florida.

Federal Aviation Administration (FAA). 2001. Forecasting Aviation Activity by Airport.

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Institute of Transportation Engineers (ITE). 2008. Trip Generation, 8th edition: An ITE Informational Report. Washington, DC.

Trafficware. 2011. SimTraffic 8 [computer software]. Sugarland, Texas.

Trafficware. 2011. Synchro 8 [computer software]. Sugarland, Texas

13.8. Health Impact Assessment Study

13.8.1. General Description of the Proposed Study

13.8.1.1. Study Goals and Objectives

Health Impact Assessment (HIA) is a structured planning and decision-making process for analyzing the potential positive and negative impacts of programs, projects, and policies on health of residents in communities impacted by the Project. In particular, three aspects of the Project may impact community health:

- The physical size of this prospect will likely require a protracted and large influx of non-resident construction personnel which could impact the residents in nearby communities.
- The development of the Project could lead to increased rail traffic and additional traffic on the Parks and Denali Highways, potentially impacting communities and individuals using these transportation resources.
- If construction and operation of the Project is shown to cause the release of naturally occurring mercury, which then could be ingested by humans of harvestable resources, then evaluate the potential health implications to local communities.

Potential health impacts on construction and operational staff will be discussed in the Occupational Medicine and Safety sections of the Project Description.

The HIA will use the methods and guidelines in the Alaska Department of Health and Human Service's (DHSS's) "Technical Guidance for HIA in Alaska," July 2011 (www.epi.hss.state.ak.us/hia/AlaskaHIAToolkit.pdf).

The goals and objectives of the HIA include the following:

- Identify public issues and concerns about how community health might be affected during construction and operation of the Project.
- Collect baseline health data at the state, borough or census area, and potentially affected community, as possible.
- Identify data gaps and determine the most efficient method to fill those gaps, including coordinating with other field studies, including subsistence studies and social and demographic surveys.
- Evaluate the baseline data against the Project description to determine potential impacts, both positive and negative.
- Prepare an HIA document which is scientifically rigorous and understandable to the public.

13.8.2. Existing Information and Need for Additional Information

A variety of existing information sources will be useful to the HIA analysis. These information sources include reports from various Alaska state agencies including:

- Alaska Department of Health and Social Services

Bureau of Vital Statistics
Alaska Behavioral Risk Factor Surveillance Survey (BRFSS)
Youth Risk Behavior Study (YRBS)
Section of Epidemiology bulletins
Alaska Trauma Registry (ATR)
Cancer Registry

- State of Alaska Department of Labor and Work Force Development

  Employment reports

- Alaska Department of Transportation and Public Facilities

  Highway traffic statistics, particularly on large loads vehicles
  Alaska State Trooper annual reports

- Alaska Department of Fish & Game

  Harvest studies
  Community Information System

The Alaska Native Tribal Health Consortium (ANTHC) prepares health status reports on a statewide and regional basis. The HIA team will use these reports as baseline data:

- Alaska Native Health Status Report, August 2009
- Regional Health Profile for Interior Alaska, July 2011
- Regional Health Profile for Anchorage and Matanuska-Susitna, December 2011

In addition, pertinent reports from the U.S. Centers for Disease Control and Prevention and annual reports, such as County Health Rankings, prepared by the University of Wisconsin are important resources that will be reviewed.

Review of the above data sources allows identification of data gaps which require additional information. Study Area

13.8.3. Study Area

The proposed HIA study area includes those communities potentially directly affected, such as Cantwell and Talkeetna, as well as those communities further away but potentially affected by the movement of workers, materials, and supplies by using the criteria available in the Technical Guidance for HIA in Alaska (DHSS 2011). The study will develop a set of clear criteria which will allow the HIA team to identify PACs in a systematic way and facilitate the development of zones of impact for the Project. Some sample criteria are communities with

- Close geographic proximity to the Project
- Potential changes to water sources and quantities
- High likelihood for worker influx
- Intense work force recruitment potential
- High likelihood for change in key subsistence resources
- High likelihood for change in transportation infrastructure
- Potential for economic change including regional staging centers

- Existing large burden of diseases or health problems
- Existing high level of exposure to an environmental hazard

13.8.4. Study Methods

The HIA would be divided into the following phases to accommodate the possible need for field studies to address data gaps identified during the overview process**.**

13.8.4.1. Project Overview and Issues Summary

The Project overview process is designed to

- develop Project-specific criteria for establishing potentially affected communities (potentially affected communities for health may not be the same as for other social sciences and must be established);
- coordinate through other social study areas and AEA licensing participant engagement programs to ensure there will be enough information to meet health impact assessment needs; and,
- identify potential key health concerns and issues related to the Project.

The result of this effort will be a "Project Overview and Issues Summary" that will set the geographical, time scale, and population boundaries of the assessment. The report will follow the overall strategies and methodologies presented in the "Technical Guidance for HIA in Alaska." For example, the State of Alaska HIA Program has identified the following eight health effect categories (HECs) that should be used to categorize the issues and concerns:

- Social Determinants of Health (SDH)
- Accidents and Injuries
- Exposure to Potentially Hazardous Materials
- Food, Nutrition, and Subsistence Activity
- Infectious Disease
- Water and Sanitation
- Non-communicable and Chronic Diseases
- Health Services Infrastructure and Capacity

These HECs are fully described in the "Technical Guidance for HIA in Alaska." An HIA cannot address every conceivable health effect or effects that are primarily nuisance impacts and rarely observed. Instead, the initial Project review process highlights health effects that produce intense impacts with persistent duration and broad geographical scope that are highly likely to occur. There must also be a clearly defined causal link between the Project and the anticipated health effect.

13.8.4.2. Phase 2: Baseline Data Collection

After the "Project Overview and Issues Summary" report is complete, it will be necessary to perform an analysis of available federal/state/regional/tribal/community/household level health data. Data collected by other Project study teams' studies would also be included where such studies will produce baseline data that may be useful to the HIA. For example, the HIA team will use information from the air quality study concerning existing and future air quality levels, and from the socioeconomic studies for population projections and household characteristics, which have been shown to be key determinants of health. Coordination between study teams will avoid unnecessary duplication of effort and community ‘survey fatigue.’

Subsistence issues and existing available community / household consumption and nutritional data are often critical for local communities. The HIA team will coordinate with the subsistence study team to address how subsistence issues interact with the proposed Project location, size, linear features, and number and variety of communities in reasonably close proximity to the Project. Subsistence baseline data will be used to identify those subsistence foods that are vital to residents of the area, and data from the subsistence studies will be used to identify potential impacts to the quality, quantity, and access to subsistence resources. Direct, indirect, and cumulative impacts to subsistence must be considered during HIA baseline data evaluation.

After the key baseline data have been assembled and reviewed, the HIA team should assess whether there are significant data gaps remaining. This is a crucial exercise required to create a coherent and cost-effective plan for closing data gaps.

Field studies will be designed to fill data gaps. If needed, the HIA team will visit relevant communities during the field studies phase of the baseline data collection to document community food sources and make observations on critical community services, such as water, sanitation, and health care facilities. Field studies would be coordinated with other Project study efforts in the area to provide the information in an efficient manner.

The output of the baseline data review, data gaps analysis, and field studies will be a “Baseline Community Health Data Assessment” chapter in the HIA.

13.8.4.3. Phase 3: Impact Assessment

The specific health impacts for the Project will be identified when all components of the Project have been fully defined and evaluated against the baseline data. The HIA team will rate and rank the health impacts using a semi-quantitative model described in detail in the HIA Toolkit. The point of rating and ranking impacts is to enable interested parties to construct a health impact management framework.

The HIA should include impacts that have beneficial or detrimental consequences to communities or individuals. Each health impact has several different dimensions, listed below.

- Significance
- Nature
- Timing and duration
- Extent
- Magnitude (intensity)
- Frequency

The HIA process may include the following components.

- An in-depth review of available state, regional, and local health data
- Comparison of study area data to state and regional health data
- Analysis of special at-risk subpopulations (such as children under the age of five years, pregnant women, elderly, or other previously defined vulnerable groups)

- Consideration of key Project-specific toxicology issues, e.g., mercury loading associated with reservoir development and impacts on subsistence resources
- Field survey visit by an HIA study team. Consultation with local health representatives, particularly from tribal organizations, if present
- Seasonality considerations, i.e., summer versus winter differences in subsistence practices, water use, and associated disease-transmission dynamics
- Variability of existing health care infrastructure across different affected areas
- Coordination and alignment with existing State disease-control programs and strategies (e.g., TB, HIV/AIDS, hypertension, diabetes, substance abuse, etc.)

The information developed in this study may be used to prepare a Health Management Plan (HMP) which may include:

- Types of health protection processes that may be needed
- Strategies available to lessen impacts and the timescales relating to health impacts
- Temporary measures which can be put in place
- Local capacity to put the proposed strategies into practice

13.8.4.4. Phase 4: HIA Document Preparation

An HIA document, with technical appendices as needed, written in accordance with the DHHS HIA guidelines will be issued as an Initial Study Report in December 2013. The HIA will be updated to include relevant results from 2013 field studies and reissued as an Updated Study Report in December 2014

13.8.5. Consistency with Generally Accepted Scientific Practice

The HIA uses rigorous scientific methods to determine potential impacts and appropriate mitigation, and the assessment will follow the ADHHS technical guidance for HIAs (ADHSS 2011).

13.8.6. Schedule

The HIA could be completed by the end of the 2014.

Table 13.8-1. HIA Study Schedule

Description	Start Date	Completion Data	Duration	Cost
Project Overview and Issues Summary	January 2013	March 2013	2 months	$20,000
Baseline Data Collection	February 2013	August 2013	5 months	$85,000
Impact Assessment	June 2013	August 2013	3 months	$15,000
Initial Study Report	October 2013	December 2013	3 months	$10,000
Updated Study Report	October 2014	December 2014	3 months	$10,000

13.8.7. Level of Effort and Cost

Based on past HIA experiences in Alaska, the HIA is expected to cost approximately $140,000.

13.8.8. Literature Cited

AEA 2011. Railbelt Large Hydroelectric, Presentation to the Alaska Senate Resources Committee and the House Energy Committee, by the Alaska Energy Authority, January 25, 2011.

DHSS 2011. Technical Guidance for Health Impact Assessment in Alaska, Alaska Department of Health and Human Services, Section of Epidemiology, Health Impact Assessment Program, July 2011

13.9. Air Quality Study

13.9.1. General Description of the Proposed Study

The air quality study will assess the current conditions of the area against applicable state and national air quality standards and evaluate the Project's air quality impact against these standards. The analysis will evaluate both short-term (construction) and long-term (operational) impacts from the Project and how Project emissions compare to the Without-Project alternative. The analysis will also include an assessment of the indirect impact of the Project on existing fossil-fuel electricity generators in the area, which could result in improvements to regional air quality to the extent that Project generation replaces fossil fuel generation.

The primary benefit to the public of this analysis will be the assurance of clean air and public safety. The identification of potential emission sources and levels can be used to identify recommendations to reduce emissions during construction and operations.

This report would also provide valuable information for the multidisciplinary analysis need for the NEPA analysis.

13.9.1.1. Study Goals and Objectives

The primary goal and objective of the air quality analysis is to ensure the proposed action does not violate state air quality standards in Alaska Administrative Code (AAC) 18 AAC 50. The national and state air quality regulations are designed to maintain and/or improve air quality by controlling or reducing emissions of air pollutants. The air quality impact analysis is subject to the state and national ambient air quality standards and state and national attainment designations (i.e. attainment, non-attainment, maintenance).

The following are the primary objectives of the air quality study:

- Assess the current conditions of the area against applicable state and national air quality standards.
- Review and summarize existing air monitoring data in the area.
- Determine attainment status of the study area (i.e. attainment, non-attainment, maintenance, and unclassifiable).
- Quantify short-term (construction) and long-term (operational) emissions.
- If applicable, analyze ground level impacts using air dispersion models.
- If applicable, evaluate indirect mobile source emissions from additional traffic generated.
- Compare Project emissions to the Without-Project alternative.
- Evaluate potential emission reductions from nearby Railbelt fossil-fuel utility plants if the Project is implemented.
- Evaluate and recommend mitigation measures to reduce emissions during construction.
- Ensure the Project does not violate any state air quality standards (18 AAC 50).

13.9.2. Existing Information and Need for Additional Information

There is little existing ambient monitoring data available in the vicinity of the Project site. The nearest state monitoring sites are located in the MSB urban core. The primary air quality concern in the area is particulate matter (PM_{10} and $PM_{2.5}$) from fugitive dust, volcanic ash, and wildfire smoke. There have been supplemental monitoring projects conducted by ADEC within the MSB over the past several years which will also be reviewed. These supplemental studies mainly pertain to particulate matter. There are some limited data available from a site in Denali National Park. The team will investigate whether the state has any other project-specific data that may be available and will summarize any available data to support the existing conditions section.

Existing data will be compared to applicable standards for criteria pollutants in a table. The study assumes ambient air monitoring will not be required. If site specific monitoring data is required, it is anticipated that at least one year's worth of data will be collected consistent with methods outlined in 18 AAC 50.035. The area is likely considered unclassifiable under 18 AAC 50.015, as there may be insufficient data to determine whether it is in attainment with respect to all criteria pollutants. EPA maintains a list of non-attainment areas for all six criteria pollutants on their Green Book website: (http://www.epa.gov/oar/oaqps/greenbk/index.html).

An emissions inventory of other Railbelt fossil-fuel utility plants will be generated and categorized by type (i.e. coal, oil, gas, etc.) to evaluate the potential emissions reductions from such facilities if the Project is implemented. This inventory will be based on existing information in the RIRP or updated information, if available.

Detailed information on Project construction and operations will be needed to estimate and evaluate the Project emissions for criteria pollutants for comparison to national and state standards. This would include levels of traffic by various modes and timeframes, construction equipment and activities, and operations equipment and schedules. A table comparing the Project emission with Without-Project alternative emissions will be generated.

13.9.3. Study Area

The Project study area for the air quality analysis will mainly comprise the immediate vicinity of the Project Study Area (Figure 1.2-1) and the greater Railbelt region

While preparing the air quality analysis, particular attention will be made to the following:

- Environmentally sensitive areas
- Nearby dense population areas
- Issues raised by ADEC and other agencies such as the National Park Service (NPS) or other licensing participants

13.9.4. Study Methods

EPA and ADEC have air quality standards that must be met for new sources of emissions of criteria pollutants. The study team will estimate emissions generated by the Project, including construction and operation emissions. The emissions, along with the type and size of equipment, will be compared to appropriate ADEC thresholds as outlined in 18 AAC 50 to determine the type of license and air dispersion modeling required, if any. Denali National Park is designated as a Class I area through the federal Prevention of Deterioration (PSD) program. The study assumes emission estimates from the Project are expected to be below major source thresholds, therefore a PSD and Title V permit are not anticipated for the Project.

The air quality study will assess the existing conditions of the area against applicable state and national air quality standards and evaluate the Project's air quality impacts against these standards. The analysis will include evaluation of both short-term and long-term impacts from the Project and a comparison of Project emissions to the no-action alternative. An emissions inventory of other Railbelt fossil fuel utility plants will be generated and categorized by type (i.e. coal, gas, oil, etc.) to evaluate the potential emissions reduction from these facilities if the Project is implemented.

13.9.4.1. Document Existing Conditions

Air monitoring reports prepared by ADEC will be reviewed to assess the existing conditions of the area for comparison to applicable standards. There is little existing ambient monitoring data available in the vicinity of the Project site. The team will investigate whether the state has other project-specific monitoring data that may be available to help characterize the air quality within the Project area. ADEC data and any other available data will be summarized to support the existing conditions section. The monitoring data will be compiled and compared to applicable standards for criteria pollutants in a table. Criteria pollutants as defined by EPA are nitrogen dioxide (NO_2), sulfur dioxides (SO_2), carbon monoxide (CO), PM_{10}/$PM_{2.5}$, lead (Pb) and ozone (O_3).

The attainment status of the area will be determined based on the latest EPA designations. If the air quality in a geographic area meets or exceeds the national standard, it is designated an attainment area. Areas that do not meet the national standard are designated non-attainment areas. If there is insufficient information to classify an area as attainment or non-attainment for a particular air pollutant, the area is designated unclassifiable for that pollutant. Once a non-attainment area meets the standards, the EPA will re-designate the area as a "maintenance area".

The area is likely considered attainment or unclassifiable under 18 AAC 50.015 and EPA Green Book, as there may be insufficient data available to ADEC and EPA to determine whether it is in attainment with respect to all criteria pollutants.

13.9.4.2. Estimate Project Emissions

Emissions from construction equipment and related activities will be estimated for comparison to appropriate state licensing criteria. Construction equipment emission factors will be obtained from the EPA's NONROAD model or similar model. Fugitive particle matter emissions from the handling and storage of raw materials and wind erosion during construction will be quantified according to methodologies specified in EPA's Compilation of Air Pollutant Emission Factors (AP-42) or similar source of emission factors. Typical construction activities could include, but are not limited to, construction equipment, earth moving activities, construction worker commutes, material deliveries, earth hauling, and operation and maintenance activities. Detailed information on Project construction and operations will be needed to estimate and evaluate the Project emissions. This will include levels of traffic by various modes and timeframes, construction equipment and activities, and operations equipment and schedules. The temporary air quality impacts from construction activities associated with the proposed Project are not expected to be significant. If a state license is required, air quality dispersion modeling may also be required and will be performed consistent with 18 AAC 50 dispersion modeling guidelines.

The Project is likely not located in an EPA designated non-attainment area; therefore, General Conformity and Transportation Conformity is not anticipated. If the Project generates average daily traffic volumes that exceed a state mobile source threshold for CO, PM_{10}/$PM_{2.5}$, or mobile source air toxics (MSATs) analyses, then a mobile source evaluation may be required. This will be determined after consultation with appropriate state personnel and a review of the transportation study.

13.9.4.3. Summarize Baseline Fossil Fuel Generation Emissions

The study will also include a summary of the baseline fossil fuel generation emissions in the area. The team will use the source data and references identified by HDR in the Section 7.3.1.2 of the Data Gap Analysis along with other applicable source data for generating the emissions inventory. It is assumed that no additional monitoring or data collection will be required at existing power generation sites.

13.9.4.4. Analyze and Compare With-Project Emissions to Without-Project Emissions

The study will include a comparison of future With-Project emissions to emissions estimated for future Without-Project emissions. The Without-Project case emissions will be estimated as the potential emissions from other Railbelt fossil fueled facilities to provide the equivalent annual generation power as the Project if the Project is not implemented, or the installation of new generation facilities for the future using a similar fuel mix to the current Railbelt facilities.

13.9.4.5. Identify Best Management Practices

Best management practices to reduce air emissions related to construction and operation of the Project will be identified, including evaluating dust mitigation measures based on studies conducted by ADEC and the Alaska University Transportation Center.

13.9.5. Consistency with Generally Accepted Scientific Practice

Air quality study estimates and forecasts will be developed using EPA's NONROAD model or EPA's Compilation of Air Pollutant Emission Factors (AP-42) for construction equipment and other non-automotive sources. If needed, EPA-approved methods would be used to estimate mobile source emissions.

13.9.6. Schedule

The anticipated schedule for the air quality analysis would be six to seven months as shown in the table below.

Table 13.9-1. Air Quality Study Schedule

Description	Start Date	Completion Date	Duration
Review Existing Information, Identify Needs	January 2013	February 2013	One month
Document Existing Conditions	February 2013	March 2013	One month
Estimate Project Emissions	March 2013	April 2013	One month
Summarize Baseline Fossil Fuel Emissions and No-Action Alternative Emissions	April 2013	May 2013	One month
Initial Air Quality Study Report	June 2013	August 2013	Three months
Updated Air Quality Study Report	October2014	December 2014	Three months

13.9.7. Level of Effort and Cost

Given the lack of nearby existing monitoring data, existing monitoring data may not be representative of the area. If this is determined to be the case, a program of air quality monitoring would need to be implemented to gather baseline data. Details regarding equipment to be used for construction and operations and operational information should be sufficient to perform an analysis of Project emissions. Information on emissions from other Railbelt power sources that may be offset by this Project would be needed to allow for a full analysis of potential costs and benefits.

Completion of the work described above would require seven to ten months of effort, assuming that no air monitoring is required at an estimated cost of $100,000.

13.9.8. Literature Cited

18 AAC 50, Alaska Administrative Code, Air Quality Control.

EPA 40 CFR Part 50, National Ambient Air Quality Standards.

EPA Green Book Non-Attainment Areas for Criteria Pollutants.

HDR 2011. Susitna-Watana Hydroelectric Project, Socioeconomic, Recreation, Air Quality, and Transportation Data Gap Analysis. Unpublished, by the Alaska Energy Authority.

42 U.S.C. 7401, The Clean Air Act.

14. PROJECT SAFETY

14.1. Introduction

The Project, as currently envisioned, is likely to include a dam constructed using roller compacted concrete (RCC) construction methods. The Project works will also include a large reservoir, a spillway, cofferdams, diversion tunnels, integrated penstocks and powerhouse, railhead improvements, temporary construction housing and maintenance facilities, borrow and quarry areas, transmission lines, access roads, staging and stockpile areas, etc. The public safety studies will provide information and analysis to demonstrate that proposed structures are safe and adequate to fulfill their stated functions.

14.2. Nexus Between Project Construction / Existence / Operations and Effects on Resources to be Studied

Among the basic studies required to verify the design criteria for and the design of a large dam are the seismic hazard evaluation and the Probable Maximum Flood (PMF) studies.

Project construction, operation, and maintenance activities have the potential to be affected by, and to affect, seismic activity in the Project area, and extreme floods can also affect Project operations. Thus, the ability to safely pass extreme floods and safely survive a regional or local seismic event is of paramount importance in dam development. These studies will verify the design criteria to be used for the PMF inflow and the routing of the PMF and also verify the condition or nature of the seismic hazard such that appropriate design criteria are formulated.

14.3. Resource Management Goals and Objectives

The capability of Watana Dam to safely pass the most extreme floods is a FERC requirement, and the ability of the dam to survive a seismic event are basic elements of a comprehensive dam safety program under FERC's 18 CFR Part 12 regulations. Dam safety is a fundamental design criterion for the Watana Dam.

Additionally, The DNR's Alaska Division of Geological and Geophysical Surveys (DGGS) evaluates potential geologic hazards to buildings, roads, bridges, and other installations and structures as part of its mission statement.

14.4. Summary of Consultation with Agencies, Alaska Native Entities and Other Licensing Participants

Many residents of the upper Susitna Valley expressed concerns about the stability of the proposed dam during and after a seismic event. They have also expressed concern about the dam's ability to withstand extreme flood events.

AEA has informally consulted with the Alaska Division of Geological and Geophysical Surveys.

14.5. Probable Maximum Flood (PMP) Study

14.5.1. General Description of the Proposed Study

14.5.1.1. Study Goals and Objectives

The general goals and objectives of the PMF study are as follows:

- develop a site-specific Probable Maximum Precipitation (PMP) to be used for the derivation of the PMF including both a temporal and spatial distribution of rainfall;
- model the runoff through the project drainage basin to produce the PMF inflow, including snowmelt considerations for the Project reservoir;
- route the PMF inflow through the Project to obtain the PMF outflow and maximum flood elevation at the dam; and
- use the Board of Consultants (BOC) for technical review during development and performance of the site-specific studies.

The FERC PMF study request (FERC 2012) contains references to assessing the stability of Project facilities during flood loading conditions. which will be addressed in detailed design documents, and requirements for several geologic and geotechnical assessments that relate to dam safety, which will be addressed in the Geology and Soils study plan. Geology and soils considerations would only be included in the PMF study to the extent that they affect flood runoff. Structural aspects of Project facilities will not be included in the PMF study.

14.5.1.2. Selection of the Inflow Design Flood

The Inflow Design Flood (IDF) is used in the design of the spillways and other structures that are affected by maximum flood levels. The adequacy of a spillway is evaluated by considering the hazard potential that would result from failure of the Project works during passage of flood flows. For dams of different sizes and hazard potentials, the IDF may range anywhere from the 100-year flood up to the PMF. Because of its size and downstream hazard potential, the selected IDF for Watana Dam will be the PMF.

The PMF is the flood that may be expected from the most severe combination of critical meteorological and hydrologic conditions that are reasonably possible in the drainage basin under study. The PMF is generated by the PMP, which is defined as theoretically the greatest amount of precipitation for a given duration that is physically possible for a given size storm area at a particular geographic location at a certain time of year.

14.5.2. Existing Information and Need for Additional Information

A PMF study was developed about 30 years ago for the Watana Dam site (Acres 1982) at the time that feasibility reports were being prepared for the then proposed APA Susitna Hydroelectric Project. Although the PMF study report from the previous study is available, no calculations, model input, or model output are included. This means that preparation of an updated PMF study is required. In addition to the availability of more years of meteorological and streamflow data since the time of the previous PMF study, new PMF guidelines have been developed (FERC 2001) and additional data and more advanced methods are available for development of site-specific PMP.

Development of the PMP and PMF are based on a variety of historical data, including streamflow data, meteorological data, watershed data, and far-field information such as sea surface temperatures and storm patterns. Data availability is anticipated to be adequate for development of the PMP and PMF for Watana Dam.

14.5.3. Study Area

The study area will be the entire watershed tributary to the Watana Dam site, plus the additional drainage area between Watana Dam and the USGS gaging station at Gold Creek. The watershed drainage area is 5,180 square miles at the Watana Dam site and 6,160 square miles at the Gold Creek USGS gage. Extension of the study area to the Gold Creek USGS gage is necessary because this is where a long-term streamflow record is available for calibration and verification of hydrographs for the entire watershed tributary to the Watana Dam site.

14.5.4. Study Methods

The following sections describe the study methods and major tasks necessary to develop the PMP and PMF for Watana Dam.

14.5.4.1. Board of Consultants Review

A BOC will be established for technical review of many aspects of the dam design. The BOC review of the subject studies will be primarily focused on the development of the site-specific PMP but may include other aspects of the PMF study. The BOC will meet and review design progress at appropriate intervals and, if appropriate, will co-opt specialists for particular topic review. The study methods and tasks described herein may be subject to suggested alteration by the BOC.

14.5.4.2. Data Acquisition

A variety of historical recorded meteorological and hydrologic data are necessary to develop the PMP and PMF. Data acquisition should begin at the earliest possible time as some data (e.g., streamflow data on a time increment less than daily) could take months to retrieve. Additionally, the availability and area extent of next-generation radar (NEXRAD) data must be determined for use in a site-specific PMP. The types of data to be collected for storm periods at stations in the vicinity of the study area include, but are not limited to streamflow, precipitation, dry-bulb and wet-bulb temperature, snowpack and snow water equivalent, wind speed, and humidity. Relevant watershed data will also be collected including the drainage area of sub-basins, the area within elevation bands for snowpack and snowmelt estimation, channel slopes, vegetation cover, lake area, and soil types. For the site-specific PMP, information far from the study area may be collected including sea-surface temperatures and synoptic storm information.

14.5.4.3. Historical Data Analysis

Historical data analysis will contribute to the PMP and PMF analysis in several ways, including being used to perform the following tasks:

- determine the major historic storms by analysis of total storm precipitation, intensity, duration, and areal extent;

- summarize historic peak flows for selection of major flood events for model calibration and verification;
- estimate flood frequency up to at least the 100-year flood from historical peak flow data;
- determine the 100-year snowpack and snow water equivalent for various elevation bands;
- develop a basis for antecedent watershed conditions prior to the PMP;
- summarize maximum seasonal temperature conditions; and
- summarize coincident data availability for major storm events.

14.5.4.4. Review of Previous PMF Study Report

In support of the previous design and licensing effort for the APA Susitna Hydroelectric Project, a PMF study was performed (Acres 1982). The 1982 PMF study included developing a site-specific PMP and used generally accepted methods at the time. It is notable that although many new data have become available in the 30-year interim since the previous PMF study, all of the five largest floods of record at the Gold Creek USGS gaging station were available for calibration and verification studies in 1982. Although no calculations or model input and output are available, the 1982 study does contain useful information regarding final results and conclusions of the analysis, including numerous tables and figures. The 1982 PMF study report will be thoroughly reviewed to gain applicable insights to be used in the current PMF study.

14.5.4.5. Field Visit

A field visit is a recommended part of the PMF study (FERC 2001). Observations made during the field visit would include

- Manning's "n" and general hydrologic and hydraulic characteristics of river channels;
- special features within the drainage basin such as marshes, lakes, and closed basins that may delay or reduce runoff;
- constrictions such as bridge abutments that may influence flood routing characteristics;
- large natural constrictions that could act as hydraulic control structures; and
- areas that could result in locally different infiltration rates, including rock exposures, dense forest, or high altitude meadows.

14.5.4.6. Flood Hydrology Model Selection

At least three flood hydrology models are available, and a key task will be to select which to use to develop the PMF. These models include:

- Streamflow Synthesis and Reservoir Routing (SSARR). This model was developed by the U.S. Army Corps of Engineers (USACE), North Pacific Division. The SSARR model was used for the 1982 Susitna PMF study. In addition to its use by the USACE, the SSARR model was used occasionally by consultants for flood simulation on major watersheds, particularly in the Pacific Northwest. The SSARR model is no longer in general use. The latest version of SSARR was modified in 1991 to run on IBM-compatible personal computers. The USACE has noted that there will be no further program updates or modifications to the SSARR files by the USACE, and no user support is available.

- Flood Hydrograph Package (HEC-1). This model was developed by the Hydrologic Engineering Center (HEC) of the USACE and was (possibly still is) the most widely used model in PMF studies. HEC-1 is one of the two rainfall-runoff models recommended for PMF studies (FERC 2001). Compared to other models, HEC-1 has the advantage of including the recommended energy budget snowmelt method as well as fully documented equations for calculating snowmelt in the model.
- Hydrologic Modeling System (HEC-HMS). This model was also developed by the HEC and is the Windows-based successor to HEC-1. HEC-HMS contains many of the same methods as HEC-1 and is the other model recommended for PMF studies (FERC 2001). Snowmelt in the HEC-HMS model is based on a method that uses temperature data only.

Flood hydrology model selection will be reviewed with the BOC. Following input from that review, AEA will propose to use one of the three models.

14.5.4.7. Flood Hydrology Model Initial Setup

The flood hydrology computer model initial setup will include sub-basin delineation, areas in elevation bands for use in snowmelt calculations, lake areas, areas in various soil groups, coincident baseflow, and initial estimates of infiltration rates. Sub-basin delineation will be aligned with USGS stream-gaging station locations whenever possible to facilitate model calibration and verification. River channel geometry will be checked for areas that may warrant special consideration for storage-outflow routing. Topographic mapping will be developed using ArcGIS software.

14.5.4.8. Flood Hydrology Model Calibration and Verification

This task would include calibration and verification of the sub-basin unit hydrographs to the extent that available recorded streamflow and meteorological data allow. Calibration provides the important adjustments to hydrograph parameters that are initially estimated from standard equations or based on experience in similar watersheds. Two of the largest floods on record will be selected for calibration, with a third large historical flood used for verification. The calibration points at the outlets of the sub-basins will coincide with USGS stream-gaging stations to the extent possible. Activities under this task will also include estimating ungaged local runoff as necessary, baseflow separation, and a final estimate of infiltration loss rates.

14.5.4.9. Development of the Site-Specific PMP

The applicable available U.S. Weather Bureau PMP guidance document is *Probable Maximum Precipitation and Rainfall-Frequency Data for Alaska*, Technical Paper No. 47 (Miller 1963). Technical Paper No. 47 is applicable to areas up to 400 square miles and durations up to 24 hours. Because the drainage area at the Watana Dam site is 5,180 square miles and current standards call for the PMP to have a duration of at least 72 hours, development of a site-specific PMP is necessary. The existing PMP studies can be used to make comparisons to the 1982 Susitna site-specific PMP and the Technical Paper No. 47 PMP at the highest-intensity central 400-square-mile area of the new site-specific PMP. Development of the site-specific PMP for the watershed tributary to the proposed Watana Dam site will require a substantially greater effort than is necessary for most other dams in the USA.

The site-specific PMP study will follow many of the methods used to develop the current National Weather Service PMP hydrometeorological reports (HMR). The basic techniques for storm maximization and transposition are well-established. An additional 30 years of data and more advanced models and recent adjustments to methods are now available for development of site-specific PMP. Results will include both a temporal and spatial distribution of the PMP for durations up to 72 hours and guidance for alternative centering of the PMP. NEXRAD data will be used, if available. The site-specific PMP task will also include development of the 100-year precipitation temporal and spatial distribution during a season coincident with the probable maximum snowpack. It is anticipated that a consultant with recent experience in developing site-specific PMP will be retained to perform this task.

14.5.4.10. Coincident Conditions for the PMF

Developing coincident conditions would include the 100-year snowpack, the probable maximum snowpack, necessary temperature sequences, and data for energy budget method as necessary. The 100-year seasonal precipitation will also be developed, because one of the potential combinations of coincident conditions that can result in the PMF is the probable maximum snowpack combined with the seasonally appropriate 100-year precipitation. A determination of the maximum reservoir level during the 50-year flood is also required, as this will become the starting reservoir elevation for spillway operation.

14.5.4.11. Development of the PMF Inflow Hydrograph

The PMF will be developed at the proposed Watana Dam site by combining sub-area runoff and performing channel and reservoir routings for various cases and months. Routing of the PMF through the reservoir will account for use of the fixed-cone outlet valves for discharges up to the 50-year flood and use of the spillway only after the expected maximum level of the 50-year flood has been exceeded. This task also includes a sensitivity analysis to test the effects of variation in parameters with relatively high uncertainty that could potentially have more significant effects on the results. The PMF channel routing would be performed using the selected flood hydrology model.

14.5.4.12. Reservoir Routing of the PMF

Spillway capacity should be determined as part of the economical combination of spillway capacity and surcharge storage. Surcharge storage is defined as the storage between the maximum normal pool level (still water) and the maximum design flood water storage level. Determining the economical combination of surcharge storage/spillway capacity requires evaluation of the cost of increasing spillway capacity versus the cost of raising the dam height to provide the required freeboard (routed maximum flood level plus any required allowance for wind setup and wave run-up). Reservoir flood routing is used to determine the temporal and water level variation of the hydrograph as the flood passes through the reservoir. Increasing the spillway capacity will reduce the necessary surcharge storage (determined by flood routing), thereby lowering the required height of the dam. Alternatives analysis will be performed to optimize spillway capacity and flood surcharge. The PMF reservoir routing would be performed the using the selected flood hydrology model.

14.5.4.13. Freeboard Analysis

Freeboard provides a margin of safety against the potential for overtopping of dams. Freeboard and flood control storage are required to provide the capacity to store and/or route the design storm through the reservoir considering inflows, precipitation on the reservoir basin, and wind generated waves without hazardous overtopping of the dam. Although freeboard selection involves more than simply the PMF water level, the freeboard selection will be made as part of the subject study, based on wind setup, wave action, uncertainties in analytical procedures, and uncertainties in Project function in combination with the most critical pool elevation (USACE 1991). The freeboard determination will be based on site-specific conditions that can be reasonably expected to occur simultaneously. Design criteria will be developed for logical combinations of reservoir levels/precipitation and wind conditions for freeboard determination. Wind setup and wave run-up would be determined with standard methods (USACE 1984 and USACE 2003).

Normal freeboard is defined as the difference in elevation between the top of the dam and the normal maximum pool elevation. Minimum freeboard is defined as the difference in pool elevation between the top of the dam and the maximum reservoir water surface that would result from routing the PMF through the reservoir. It is generally not necessary to prevent splashing or occasional overtopping of a dam by waves under extreme conditions particularly for a concrete dam. If studies demonstrate that the RCC dam can withstand wave overtopping without erosion of foundation or abutment material, then minimum (or no) freeboard will be selected for the PMF condition. In that case, only normal freeboard would be required. The study of freeboard will take into account unusual circumstances.

14.5.4.14. Reporting

Two reports will be prepared, one covering the development of the site-specific PMP, the other an overall PMF report for all aspects of the PMF study, including a summary of the site-specific PMP. The sections of the PMF report would generally follow the outline suggested by FERC for PMF studies (FERC 2001). AEA proposes to submit all reports and supporting information for this study only to the Commission and the Alaska Department of Geological and Geophysical Surveys pursuant to FERC’s Critical Energy Infrastructure Information (CEII) regulations, which are designed to ensure that critical energy infrastructure is protected from security threats. Licensing participants who wish to review this information can request it from FERC pursuant to FERC’s CEII regulations.

14.5.5. Consistency with Generally Accepted Scientific Practice

Accepted standard practices for PMF studies are available in the FERC *Engineering Guidelines*, Chapter 7, “Determination of the Probable Maximum Flood” (FERC 2001). Exceptions taken from these guidelines, if any, will be noted and justified. Hydrologists performing the studies will have prior experience using the FERC guidelines in preparation of other recent previous PMF studies.

Hydrometeorological reports are available and applicable for determining the PMP for most PMF studies in the USA. Because of this, the FERC *Engineering Guidelines*, Chapter 7 do not provide methods for preparation of the site-specific PMP that is necessary for the Watana Dam PMF. A consultant that is experienced in preparation of site-specific PMP under FERC jurisdiction will perform the necessary study. Methods used in preparation of the site-specific PMP are very similar to those used in preparation of the most recent NOAA PMP hydrometeorological reports. The BOC will review the PMF Study with an emphasis on the site-specific PMP.

14.5.6. Schedule

A PMF study is typically a part of the Feasibility Report for a new dam. It is anticipated that the site-specific PMP and PMF study would begin on January 2013 and be completed in December 2013.

14.5.7. Level of Effort and Cost

The estimated level of effort for the study is as follows:

Activity	Effort
Site-Specific Probable Maximum Precipitation	3 full-time person months
Probable Maximum Flood	7 full-time person months
Total	10 full-time person months

This study is estimated to cost up to $700,000.

14.5.8. Literature Cited

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14.6. Site Specific Seismic Hazard Evaluation Study

14.6.1. General Description of the Proposed Study

14.6.1.1. Study Goals and Objectives

The goals of this study are to conduct deterministic and probabilistic seismic hazard evaluations to estimate earthquake ground motion parameters at the Project site, assess the risk at the site and the loads that the Project facilities would be subject to during and following seismic events, and propose design criteria for Project facilities and structures considering the risk level. The intent of the study is to fulfill the following specific objectives including, but not limited to the following:

- identify the seismic sources along which future earthquakes are likely to occur, including the potential for reservoir-triggered seismicity;
- characterization of the degree of activity, style of faulting, maximum magnitudes, and recurrence information of each fault;
- develop maps and tables depicting the spatial and geometric relations of the faults and seismic source zones together with specific distance parameters to evaluate ground motion parameters from each source;
- assemble available historical and instrumental seismicity data for the region, including maximum and minimum depth of events;
- determine the distance and orientation of each fault with respect to the site;
- estimate the earthquake ground motions at the proposed dam site, updating previous studies to include changes in practice and methodology since the 1980s;
- propose the seismic design criteria for the site;
- prepare a supporting design report that include the seismic criteria and results of dam stability analysis under seismic loading (this will be addressed as part of the dam analysis, not as part of the initial seismic characterization); and
- use a BOC for independent technical review and guidance during development of site-specific studies.

The FERC study request (FERC 2012) refers to assessing the stability of Project facilities during seismic events and performing a dynamic analysis that identifies any damage caused by the earthquake and shows that the dam can continue to resist applied static loading in the damaged condition with any possible resulting loading changes. This aspect of dam engineering will be carried out during the ongoing analytical phase and design process; it is not proposed that that such dam analyses form part of the initial seismic hazard analysis studies. While the seismic studies are in progress, dam engineering analyses and design will also be in progress and the requirements and initial dam analysis results will be incorporated into the seismic study to the extent necessary before final designs are completed using the results of the seismic studies.

14.6.2. Existing Information and Need for Additional Information

Several geology and seismic characterization studies were conducted for the APA Project in the 1980s. The most important studies relating to the seismic characterization were

- site-specific seismic hazard evaluations, including fault trenching, geologic mapping and age-dating, microseismic network operations, and ground motion evaluations (Woodward Clyde Consultants 1980; and Woodward Clyde Consultants 1982); and
- evaluation of reservoir induced seismicity (RIS) (Harza-Ebasco 1985).

Other associated geological studies of the region and site have included

- regional mapping of surficial deposits (rock and soil) using aerial photography and geologic reconnaissance (Acres 1982a);
- studies of reservoir slope stability (Acres 1982a);
- subsurface explorations through geophysics, borings, test pits, and trenches (USACE 1975; USACE 1979; Acres 1982a; Acres 1982b; Harza-Ebasco 1983, Harza-Ebasco 1984;); and
- laboratory testing of physical and strength properties of rock and soil (USACE 1979; Acres 1981; Acres 1982, Harza-Ebasco 1983; Harza-Ebasco 1984).

These previous studies and site investigations represent a dataset of substantial magnitude that will be beneficial to the proposed studies.

Despite the large amount of data, it is acknowledged that there are data gaps, and thus the proposed studies essentially are an update and expansion of the studies carried out in the 1980s by Woodward Clyde Consultants.

The following examples indicate topics or aspects of the region that will be addressed in the proposed studies:

- Since the 1980s there has been a magnitude 7.9 earthquake on the Denali fault.
- Regional probabilistic seismic hazard maps by the USGS (e.g., Wesson 2007) and the 2008 probabilistic seismic hazard analysis were prepared for the Port of Anchorage.
- The USGS has opined that the Denali fault is fairly well studied, but the Broad Pass fault, a major active thrust fault in the project area, has not been studied. The USGS recommends that information be gathered to verify its existence and characterize its history.

14.6.3. Study Area

The study area for the seismic hazard evaluation is necessarily large in order to include potentially significant seismic sources throughout the region. The study area encompasses subduction-related sources (plate interfaces between the North American and Pacific Plates, which were the source of the 1964 earthquake, and intraslab sources within the down-going Pacific Plate) and all applicable Quaternary crustal seismic sources within about 125 miles (200 kilometers) of the site (Figure 14.6-1). Crustal seismic sources beyond these distances are not expected to provide significant ground motion contributions at the dam site relative to nearby sources. A more focused study area will include the dam site and reservoir areas, and a minimum area defined by an approximately 62-mile (100-kilometer) radius around the proposed dam location. The focused study area will therefore include much of the Talkeetna block and surrounding fault zones such as the Denali; Castle Mountain; Northern Foothills fold and thrust fault zone; Chugach-St Elias Thrust fault; Bruin Bay Fault; and Broad Pass Fault.

14.6.4. Study Methods

14.6.4.1. General

The study methods shall generally be in accordance with Chapter 13 of the FERC Engineering Guidelines for the Evaluation of Hydropower Projects. The site-specific seismic hazard evaluation for assessing the seismic risks and developing the seismic design criteria in support of licensing and detailed design will include of the following tasks:

- update the understanding of geologic conditions and seismo-tectonic setting for the dam site area;
- identify and characterize the seismic source, including detailed geologic studies and lineament analyses;
- perform a deterministic and probabilistic seismic hazard assessment in order to define earthquake ground motions for structural analyses;
- evaluate the potential for Reservoir Triggered Seismicity (RTS) or RIS;
- assess risks to Project structures and operation associated with seismic loading conditions; and
- select appropriate seismic design criteria.

These tasks and the associated study methods will generally be as presented below.

14.6.4.2. Board of Consultants Review

As requested by FERC (FERC 2012), a BOC will be established for technical review of the dam analyses and design. The BOC review will be primarily focused on appropriate aspects of the Seismic Hazard Evaluation, the determination of response spectra, and the crafting of design criteria. The BOC will meet and review study progress at appropriate intervals. The study methods and tasks described herein may be subject to suggested modification by the BOC.

14.6.4.3. Review of Project Documentation

A review will be conducted of the existing documentation, including all available previous applicable Project reports, to characterize the geologic, geotechnical, and seismic conditions in support of feasibility and licensing studies and detailed design so as to take maximum advantage of the large body of knowledge that already exists for the site. Documentation will include work from the studies performed in the 1970s and 1980s. A geologic and geotechnical database will be developed in order to build upon the earlier studies as they pertain to the current Project development.

14.6.4.4. Seismic Hazard Analysis

A deterministic and probabilistic seismic hazard evaluation will be undertaken to update the seismic hazard studies from the 1980s in order characterize the seismic sources, to define the earthquake ground motion parameters, and to develop seismic design criteria for the Project structures. The methods follow general guidance defined according to Chapter 13 of the Federal Energy Regulatory Commission’s Engineering Guidelines. Subtasks will include the following:

- Update evaluations of geologic, seismologic, and seismotectonic literature for the Project study area to identify data gaps and uncertainties that may require further evaluations.

- Update seismicity catalogue for evaluation of seismicity rates, depths, magnitudes, and focal mechanisms. This will include evaluation of recent and ongoing data collected by the Alaska Seismographic Network and augmented by the additional seismic stations installed in the Project area as part of the long term earthquake monitoring program.
- Develop a seismotectonic model that identifies and characterizes seismic sources of significance to the Project.
- Conduct geologic studies using newly acquired Light Detection and Ranging (LiDAR) and Interferometric Synthetic Aperture Radar (IFSAR) datasets to aid in the identification and evaluation of potential seismic sources and geohazards.
- Perform Surface Faulting and Geohazard Analysis to evaluate the potential significance of surface faulting and geologic hazards in the area of the Project.
- Conduct Ground Motion Analyses and Assessment to estimate the expected ground motions at the Project facilities using a probabilistic seismic hazard analysis (PSHA) and deterministic seismic hazard analyses (DSHA) based on the seismic source characterization, and FERC guidelines.
- Develop seismic design criteria to develop appropriate seismic design parameters for use in dam analyses and considerations for construction.
- Perform Dynamic Analysis of the dam (in other studies).

Ground motion estimates from the PSHA and DSHA will be developed for a number of critical seismic sources using weighted ground motion prediction equations (GMPE's) appropriate for each source in the analyses. Results from the PSHA analyses will consist of hazard curves for a range of spectral response frequencies, uniform hazard spectra (UHS) for a range of return periods, and deaggregation of seismic source contributions for design-specific return periods and spectral frequencies. The purpose of the deaggregation is to provide parameters for the development of Conditional Mean Spectra (CMS). CMS will be generated using the methodology of Baker (2011). As recommended in FERC guidelines, the CMS will be extended so that the envelope of the CMS for a given return period equals the UHS. Following procedures in FERC guidelines, DSHA results will be compared to the total uniform hazard spectra for use in developing the final design earthquake motions and criteria.

Results of the site-specific seismic hazard assessment studies will documented with Project reports.

14.6.4.5. Long-Term Earthquake Monitoring System

A long-term earthquake monitoring system will be installed for the purpose of continuously monitoring earthquakes that occur in the Project area, both pre- and post-construction, and to record strong shaking of the ground at the Project site during moderate to strong earthquakes. The long-term monitoring system will consist of one 6-component strong motion and broadband seismograph station at the Watana Dam site area and two or three 3-component broadband seismograph stations in the vicinity of the proposed dam site and reservoir area. The seismograph stations will be operated as part of the Alaska Seismographic Network by the University of Alaska. These stations will provide additional resolution on the seismicity rates and characteristics of earthquakes in the Project area.

14.6.4.6. Reservoir Triggered Seismicity

The potential for RTS to occur during and after, filling of the reservoir will be evaluated. This examination of the potential for RTS will include information from the seismic hazard analysis including the potential possibility of “unknown” faults capable of generating strong or major earthquakes close to the site. The attributes that will be considered in evaluating the probability of RTS include reservoir depth; reservoir volume; the tectonic stress state; and the rock type and structure underlying the reservoir. The probabilities that are considered are conditional and represent the total chance for RTS to occur as a result of reservoir filling and operation. Conditional probabilities will be developed for each attribute, as well as for all attributes combined. For the multi-attribute analysis, each attribute will be considered independently and also in a discrete-dependent model focusing on depth and volume.

Additionally, a literature review, case study, and statistical analysis will be performed of RTS based on other projects with large, deep reservoirs in order to develop an understanding of the potential of RTS at the Susitna-Watana site.

The long-term earthquake monitoring system will provide a baseline of the rates and seismological characteristics of local seismic events prior to the impoundment of the reservoir. Seismicity data collected before and after installation of the long-term monitoring system will be used to perform seismological analyses to help define local seismotectonic characteristics. Such analyses would include activities such as development of local velocity models, focal mechanism and regional stress analysis, analysis of spatial patterns, and relationship of seismicity to reservoir operation. The ultimate purpose of this study is to assure that possible RTS earthquakes are accounted for by the dam seismic design parameters.

14.6.4.7. Reservoir Slope Stability Study

An assessment will be made of the reservoir rim stability based on the geologic conditions in the reservoir area, particularly in the reservoir drawdown zone. Geologic information from the previous study on reservoir slope stability (1982), as well as mapping, geotechnical investigations, and instrumentation monitoring will be used to assess the stability concerns of the reservoir rim not only under drawdown but also from seismic loads. Key factors in this study are the planned reservoir level and anticipated range of drawdown, soil conditions, presence of permafrost, topography and slope conditions.

14.6.4.8. Engineering Analysis

A dynamic analysis will be performed (separately under the engineering studies and design) to identify the performance of the major hydraulic structures under earthquake loading conditions. The analyses will optimize the design of the structures, assessing the potential damage that may occur during an earthquake event, and verify that the dam can continue safe operation in a damaged state until any necessary repairs are performed.

14.6.4.9 Reporting

Several technical reports will be prepared for each stage for the study for the BOC. A summary report will be prepared for the Initial Study Report and Updated Study Report. . AEA proposes to submit technical reports and all supporting information for this study only to the BOC, Commission and the Alaska Department of Geological and Geophysical Surveys pursuant to

FERC's Critical Energy Infrastructure Information (CEII) regulations, which are designed to ensure that critical energy infrastructure is protected from security threats. Licensing participants who wish to review this information can request it from FERC pursuant to FERC's CEII regulations.

14.6.5. Consistency with Generally Accepted Scientific Practice

The seismic hazard analyses and development of seismic design criteria will be performed in accordance with general industry accepted scientific and engineering practices, following the guidance and procedures outlined in FERC Chapter 13. Each task will be performed by technical experts in their field of study. To further check that each task complies with accepted scientific practice, each task will be peer reviewed by senior technical experts, reviewed by external reviewers (e.g., BOC) and approved by an appropriate AEA representative.

Independent senior technical staff and industry consultants will review the appropriateness of the field investigations and testing, seismic source characterization, deterministic and probabilistic seismic hazard assessment, selection of appropriate ground motions at the site and determination of critical seismic design criteria and decisions. Several working sessions and site visits will be scheduled to review the results of the field investigations and testing, characterize the seismic source, assess seismic hazards, select earthquake ground motions, perform a dynamic analysis, and determine design criteria and assumptions.

14.6.6. Schedule

The proposed study plan includes a limited field investigation program in 2012 for aerial photographic interpretation, reconnaissance geologic mapping, lineament analysis, installation of a long-term earthquake monitoring system, assessment of slope stability for the reservoir rim, and reservoir triggered seismicity study. For 2013-14, a field program is envisioned for investigating significant seismic sources or features and continuing collection of microseismic and strong motion data with the long-term earthquake monitoring system.

Deterministic and probabilistic seismic hazard assessment and engineering analysis will be performed through the 2012-2014 time period. A summary of the studies and results will be provided in the Initial Study Report in December 2013 and Updated Study Report in December 2014.

14.6.7. Level of Effort and Cost

The level of effort for the studies outlined in this document, using a phased multiple year approach is estimated to be in excess of 50 person-months or approximately $1.5 million.

14.6.8. Literature Cited

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14.6.9. Figures

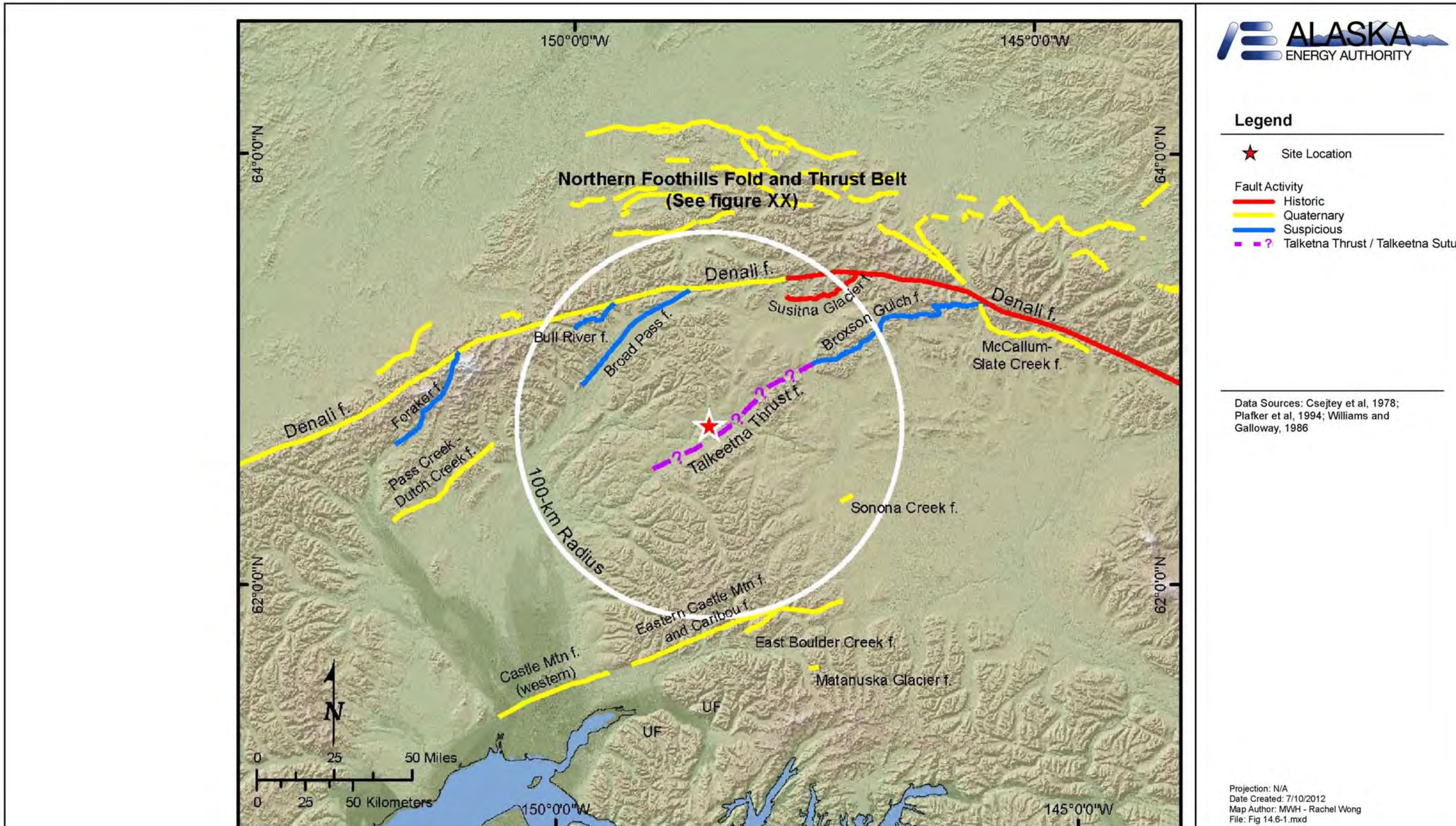

Figure 14.6-1. Regional Faults (Csejtey et al, 1978; Plafker et al, 1994; Williams and Galloway, 1986).