

**Susitna-Watana Hydroelectric Project
(FERC No. 14241)**

Initial Study Report Meetings

October 22, 2014

Part B – Agenda and Presentations

**Alaska Energy Authority - Board Room
813 West Northern Lights Blvd.
Anchorage, Alaska 99503**

Filed November 15, 2014





SUSITNA-WATANA HYDRO

Agenda and Schedule Initial Study Report (ISR) Meetings

Geology and Soils (Study 4.5), Probable Maximum Flood (Study 16.5), Site-Specific Seismic Hazard Study (Study 16.6), Subsistence (Study 14.5), Cultural Resources (Study 13.5) and Paleontology (Study 13.6)
October 22th, 2014

LOCATION: Alaska Energy Authority – Board Room
813 West Northern Lights Blvd.
Anchorage AK, 99503

TIME: 8:30am to 2:30 pm AKDT

SUBJECT: ISR Meetings

GoTo MEETING: <https://www4.gotomeeting.com/register/373433671>
1-888-585-9008 CODE: 810-056-852

Goal Describe the status of Study Plan Implementation and explain any variances and proposed modifications to ongoing studies for completion of the Study Plans.

Agenda Items

8:30 – 8:45	Introduction
8:45 – 9:30	Geology and Soils Characterization Study (Study 4.5) – M. Bruen
9:30 – 10:00	Probable Maximum Flood (PMF) Study (Study 16.5) – J. Haapala
10:00 – 10:15	Break
10:15 – 11:15	Site-Specific Seismic Hazard Study (Section 16.6) – M. Bruen
11:15 – 12:00	Subsistence Resources (Study 14.5) – T. Krauthoefer
12:00 – 1:00	Lunch
1:00 – 2:00	Cultural Resources Study (Study 13.5) – J. Hayes
2:00 – 2:15	Paleontological Resources Study (Study 13.6) – J. Hayes
2:15 – 2:30	Next Steps and Adjourn

Initial Study Report Meeting

Study 4.5 Geology and Soils Characterization

October 22, 2014

Prepared by MWH



Study 4.5 Objectives

- Identify the existing soil and geology at the proposed construction site, reservoir area, and access road and transmission line corridors
- Determine the potential effects of Project construction, operation, and maintenance activities on the geology and soil resources (including mineral resources) in the Project area including identification and potential applicability of protection, mitigation, and enhancement (PM&E) measures
- Identify known mineral resources and mineral potential of the Project area
- Acquire soils and geologic information for the Project area for use in the preparation of a supporting design report that demonstrates that the proposed structures are safe and adequate to fulfill their stated functions

Study 4.5 Components

- **Review of Project Documentation** (ISR Part A, Section 4.1.1; pg 3)
- **Regional Geologic Analysis and Mineral Resources Assessment** (ISR Part A, Section 4.1.2; pg 3)
- **Geologic and Geotechnical Investigation and Testing Program Development** (ISR Part A, Section 4.1.3; pg 4)
- **Field Geologic and Geotechnical Investigations** (ISR Part A, Section 4.1.4; pg 4)
- **Reservoir-Triggered Seismicity** (ISR Part A, Section 4.1.5; pg 5)
- **Reservoir Slope Stability Study** (ISR Part A, Section 4.1.6; pg 5)
- **Long-Term Earthquake Monitoring System** (ISR Part A, Section 4.1.7; pg 6)
- **Geologic and Engineering Analysis** (ISR Part A, Section 4.1.8; pg 6)

Study 4.5 Variances

Land access restrictions in 2013 limited ground studies on Cook Inlet Regional Working Group (CIRWG) lands that were scheduled to be undertaken. This restriction largely impacted geologic mapping, geotechnical exploration and testing (e.g., drilling, geophysical surveys, geo-instrumentation monitoring), and the seismic hazard study. Consequently, the field exploration and testing program was deferred to 2014 and 2015 study seasons.

Study 4.5 Summary of Results in ISR (ISR Study 4.5, Part A – Section 5)

- **Review of Project Documentation**
 - Existing geologic, geotechnical, and seismic documentation from 1970s and 1980s was brought into geo-referenced, geotechnical databases; review rock core availability
 - Data used in development of geologic model and site characterization
- **Regional Geologic Studies** – update geology and soil resources from previous studies (TMs)
 - Terrain Unit Mapping – update previous landform mapping using bare earth 3D LiDAR digital imagery
 - Reservoir Slope Stability Study, Preliminary – using terrain unit mapping and GIS tool, assess potential for major landslide, slope failure with construction of the Project.
 - Mineral Resources Assessment – partial assessment conducted to identify mineral resources, metallic and non-metallic, that may be affected by the construction of the Project.
 - Regional Geologic Mapping – develop regional geologic map, work-in-progress
- **Geologic and Geotechnical Field Investigation and Testing Program Development** – prepared work plan for data acquisition needed to support feasibility and licensing plan (TM)

Study 4.5 Summary of Results in ISR (ISR Study 4.5, Part A – Section 5)

- Field Geologic and Geotechnical Investigations – investigations have included geologic mapping, drilling and in situ testing, installation of geotechnical instrumentation, instrumentation monitoring, and laboratory testing of geologic materials of the proposed dam site area and potential quarry sources
- Geologic and Engineering Analyses – previous and newly obtained data has been used to characterize the geologic and foundation conditions, development of a geologic model for optimization of the general arrangement, development of foundation and underground designs, and prepare a preliminary assessment of abutment stability. Work-in-progress.

Study 4.5 Summary of Results in ISR (ISR Study 4.5, Part A – Section 5)

- Seismic Hazard Study (see 16.6 Study Plan)
 - Preliminary Site Specific Seismic Hazard Analysis; DSHA and PSHA ground motion estimates
 - Crustal seismic source evaluation of lineaments and potential faults within 100 km radius of dam site; partially completed
 - Preliminary reservoir triggered seismicity; max. magnitude 6.3 to 6.5
 - Long-term seismic monitoring system installed; seven stations; monitoring data

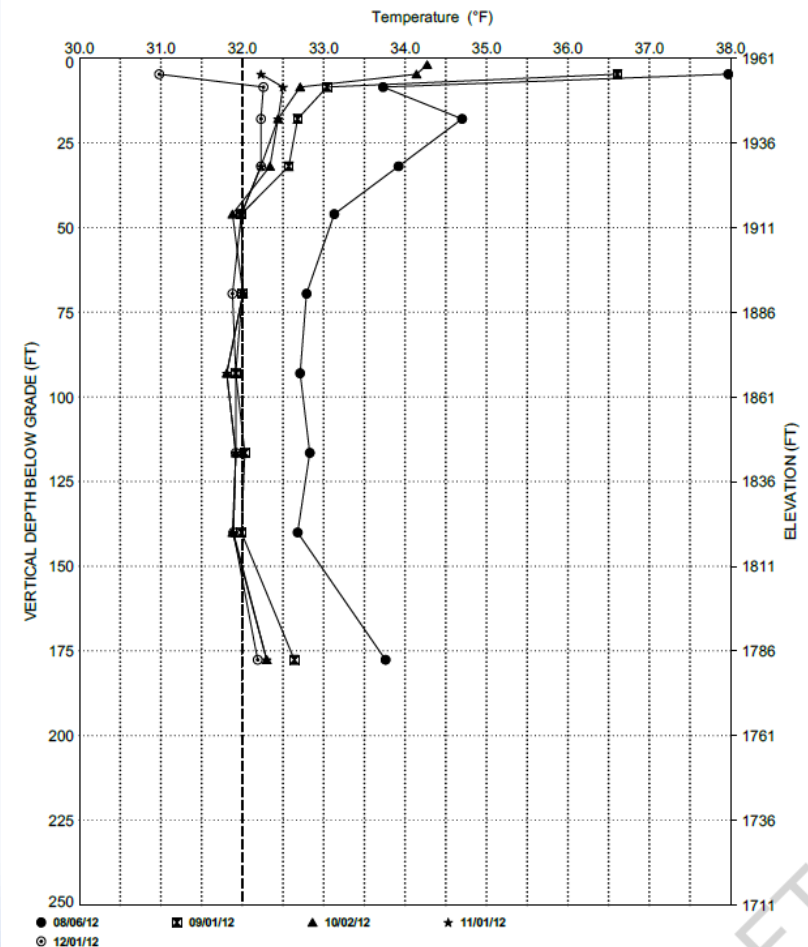
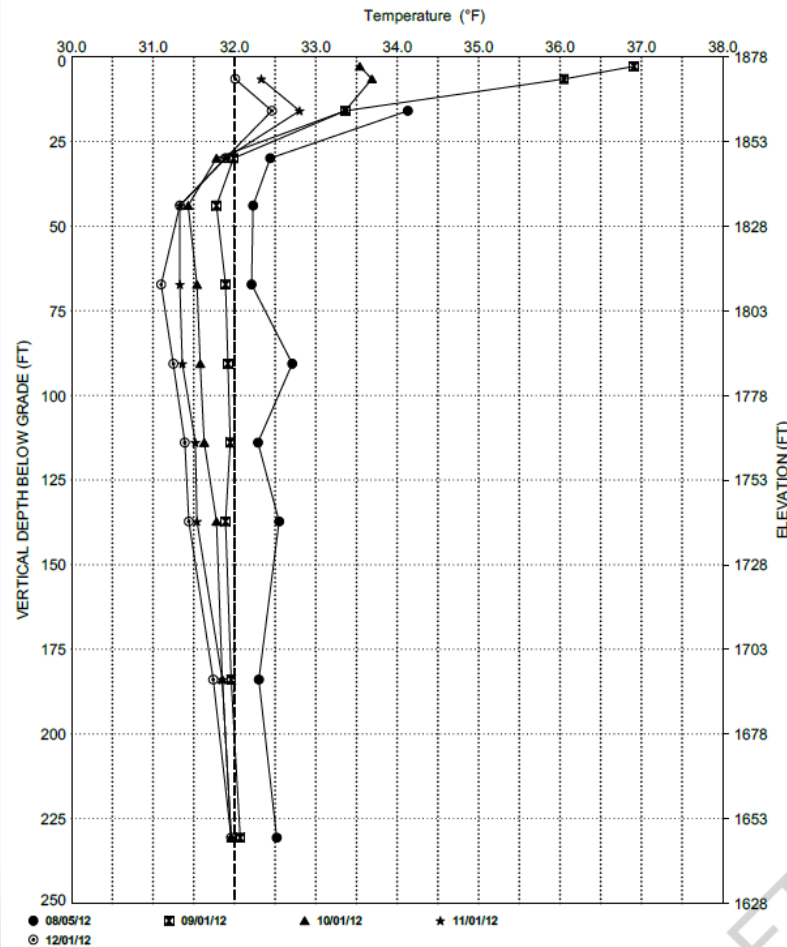
Study 4.5 Summary of Results since ISR

(Instrumentation Annual Report, 2014; Briefing Document-Permit Support)

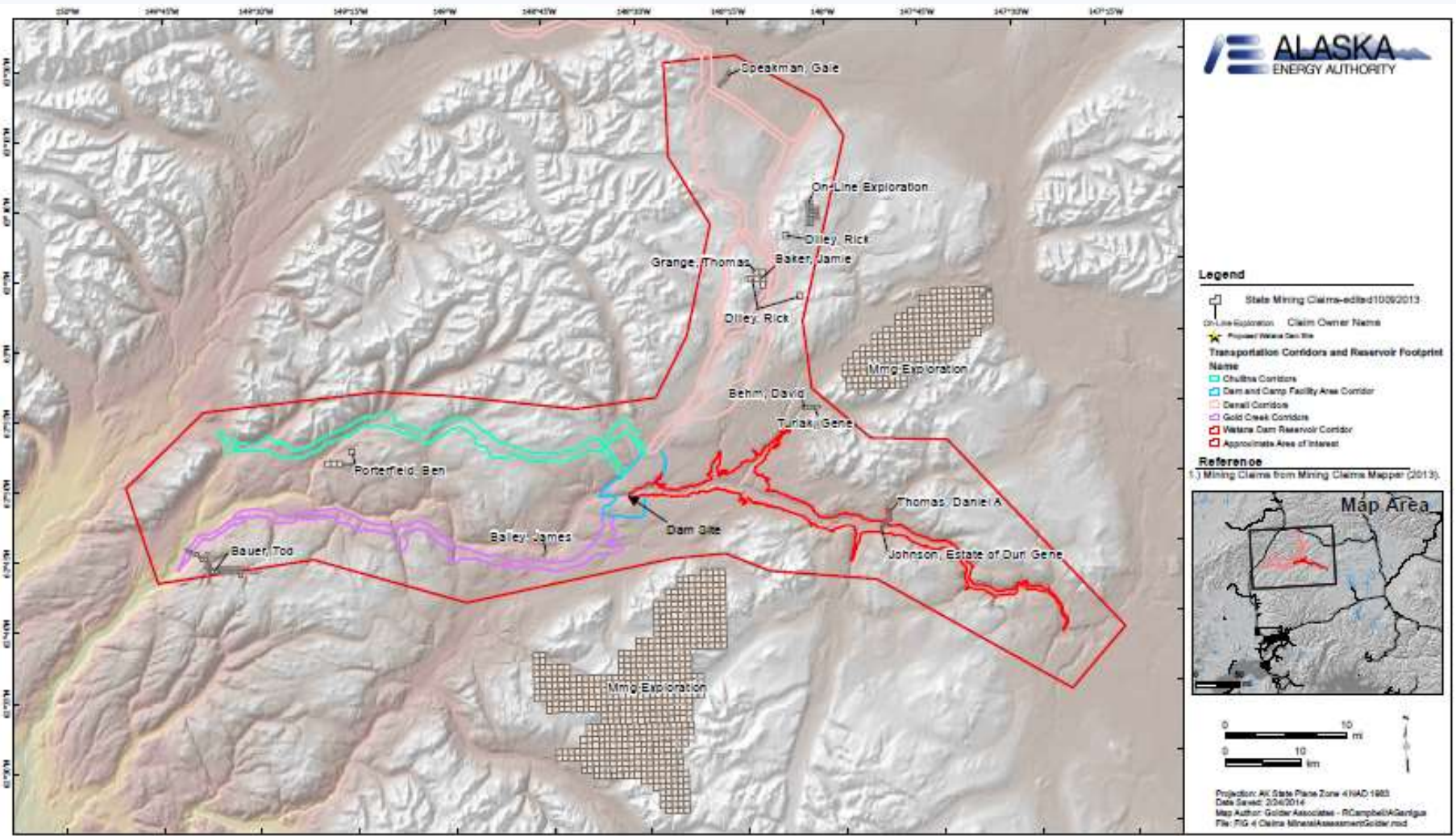
- Implementation of Field Investigations in 2014.
- Geotechnical instrumentation indicates that frozen ground is present in south abutment to depths of up to 230 feet.
- Top of bedrock isopach in river channel at dam site was updated .
- Selection of appropriate engineering properties of rock mass
- Prepared preliminary foundation characterization and made preliminary assessment of abutment stability
- Geologic Characterization – Based on additional investigations 2012-14, it appears that the geologic features previously mapped by others was a conservative interpretation. Recent investigations indicate that the geologic features are less significant, narrow zones, than has been indicated on geologic maps. Update planned.

Study 4.5 Summary of Results since ISR

(South Abutment Ground Temperature; 2014 Geo Instrumentation Annual Report)



Study 4.5 Summary of Results since ISR (Mining Claims; Interim Mineral Resource Assessment Report, 2014)



AEA Proposed Modifications to Study 4.5 in ISR (ISR Study 4.5, Part C – Section 7.1.2)

- To complete this study, the study team will implement the methods in the Study Plan with no modifications to methods.
- Study Area - the study area has changed from that described in the RSP (Section 4.5.3). As described in the ISR Overview and depicted in Figure 1, AEA has added the Denali East Option road and transmission line corridor to the study area as well as is proposing to drop further study of the Chulitna Corridor. The study team will collect relevant geologic information for this additional area to help ensure the geologic and soil conditions are adequate for construction of road and transmission facilities.
- Schedule - as noted in ISR Section 4.2, based on the approved study plan, the methods of field investigations and testing associated with this study plan were planned to begin in 2013 but have been rescheduled for 2014 and 2015 (refer to Exploration and Testing Work Plan, 2013).

New Modifications to Study 4.5 since ISR

- No modifications to the Study Plan methods are needed to complete the study and meet Study Plan objectives.
- The Chulitna Corridor was dropped from the study area in 2014.

Study 4.5 Summary of Results since ISR

- Completed the 2014 Field Investigation program – Drilling cross borings under the river and drilling to intersect geologic features on north abutment, In Situ testing
- Geologic mapping of the dam site abutments, with focus on geologic features, rock discontinuities
- Rock samples selected for laboratory testing and age-dating
- Re-installed data loggers on geotechnical instrumentation, resumed data acquisition.
- Maintenance of seismic monitoring station system
- Completed field assessment of crustal seismic sources and potential for fault displacement in dam site proximity.

Steps to Complete Study 4.5

(ISR Study 4.5, Part C – Section 7.1)

To complete this study, the study team will implement the methods in the Study Plan, with no modifications. To summarize, AEA will:

- Continue geologic mapping associated with regional geology development, mineral resources and claims, reservoir rim stability, and a continuation of geologic mapping as needed for lineaments and geologic features (potential fracture and shear zones) and evaluation of rock displacement or rupture in the dam site area;
- Continue geophysical surveys to identify top of rock surface and to characterize the general soil and rock conditions;
- Continue to investigate mineral resources and claims on those lands not accessed in 2013; select rock samples for testing; and identify aggregates sources along potential corridors;

Steps to Complete Study 4.5 (ISR Study 4.5, Part C – Section 7.1) (continued)

- Continue geotechnical instrumentation monitoring with re-installation of data loggers for resuming the data collection for groundwater and ground temperature;
- Finalize reservoir slope stability analyses; and
- Complete geologic analyses of the road and transmission corridors.

Licensing Participants Proposed Modifications to Study 4.5?

- Agencies
- CIRWG members and Ahtna
- Public

Initial Study Report Meeting

Study 16.5 Probable Maximum Flood (PMF)

October 22, 2014

Prepared by



MWH



Study 16.5 Objectives

- Develop a site-specific 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
- Determine the required outlet capacity to safely route the PMF through the reservoir
- Determine the freeboard allowance
- Use the Board of Consultants (BOC) for technical review during development and performance of the site-specific studies

Study 16.5 Components

- **Board of Consultants Review** (ISR Part A, Section 4.1; pg 2)
- **Data Acquisitions** (ISR Part A, Section 4.2; pg 2)
- **Historical Data Analysis** (ISR Part A, Section 4.3; pg 3)
- **Review of Previous PMF Study Report** (ISR Part A, Section 4.4; pg 4)
- **Field Visits** (ISR Part A, Section 4.5; pg 4)
- **Flood Hydrology Model Selection** (ISR Part A, Section 4.6; pg 5)
- **Flood Hydrology Model Initial Setup** (ISR Part A, Section 4.7; pg 6)
- **Flood Hydrology Model Calibration and Verification**
(ISR Part A, Section 4.8; pg 6)
- **Development of the Site-Specific PMP** (ISR Part A, Section 4.9; pg 7)
- **Coincident Conditions for the PMF** (ISR Part A, Section 4.10; pg 8)
- **Development of the PMF Inflow Hydrograph**
(ISR Part A, Section 4.11; pg 8)
- **Reservoir Routing of the PMF** (ISR Part A, Section 4.12; pg 9)
- **Freeboard Analysis** (ISR Part A, Section 4.13; pg 9)
- **Reporting** (ISR Part A, Section 4.14; pg 10)

Study 16.5 Variances

- There were no variances from the RSP that would limit the accuracy, effectiveness or utility of the PMP and PMF results.
- The most significant variance from the RSP was to **increase the number of calibration and verification floods from the standard three to six floods**. As the PMF study progressed, it became clear that floods resulting from two different dominant sources (rainfall and snowmelt) must be considered. Choosing three floods of each type doubled the need for historic meteorological data development and flood calibration and verification, but ensured the accuracy of the ultimate controlling PMF hydrograph.

Study 16.5 Summary of Results in ISR

- **Review of Previous PMF Study Report**
 - Showed importance of snowmelt
 - Most historic floods were available for the 1980s study
- **Data Acquisition**
 - All major storms in the region initially considered for PMP
 - 6 historical floods for runoff model calibration and verification
 - Snowpack data
- **Historical Data Analysis**
 - Floods of record – temporal and magnitude
 - Temperature, wind speed, and dew point
 - 100-year snowpack and probable maximum snowpack
- **Field Visits**
 - September 27, 2012 study team flyover
 - May 29, 2013 with BOC and study team
 - Near coincident with June 2, 2013 sunny day maximum flood

Study 16.5 Summary of Results in ISR

- **Flood Hydrology Model Selection**
 - SSARR model from 1980s is not currently in use
 - HEC-HMS current model but does not include the recommended energy budget snowmelt method
 - HEC-1 Flood Hydrograph Package – selected - includes the energy budget snowmelt method with much previous experience available
- **Flood Hydrology Model Initial Setup**
 - Sub-basin delineation – 29 to Watana Dam; 34 total to Gold Creek
 - Areas in elevation bands; initial estimates of loss rates
- **Flood Hydrology Model Calibration and Verification**
 - Seasonal snowmelt dominated and rainfall dominated floods resulted in 6 calibration/verification floods rather than the usual 3
 - Hourly meteorological data provided by Applied Weather Associates
- **Coincident Conditions for the PMF – Alternative Cases**
 - 100-year snowpack + seasonal PMP
 - Probable maximum snowpack + 100-year rainfall
 - Probable maximum snowpack + maximum temperatures (no rain)

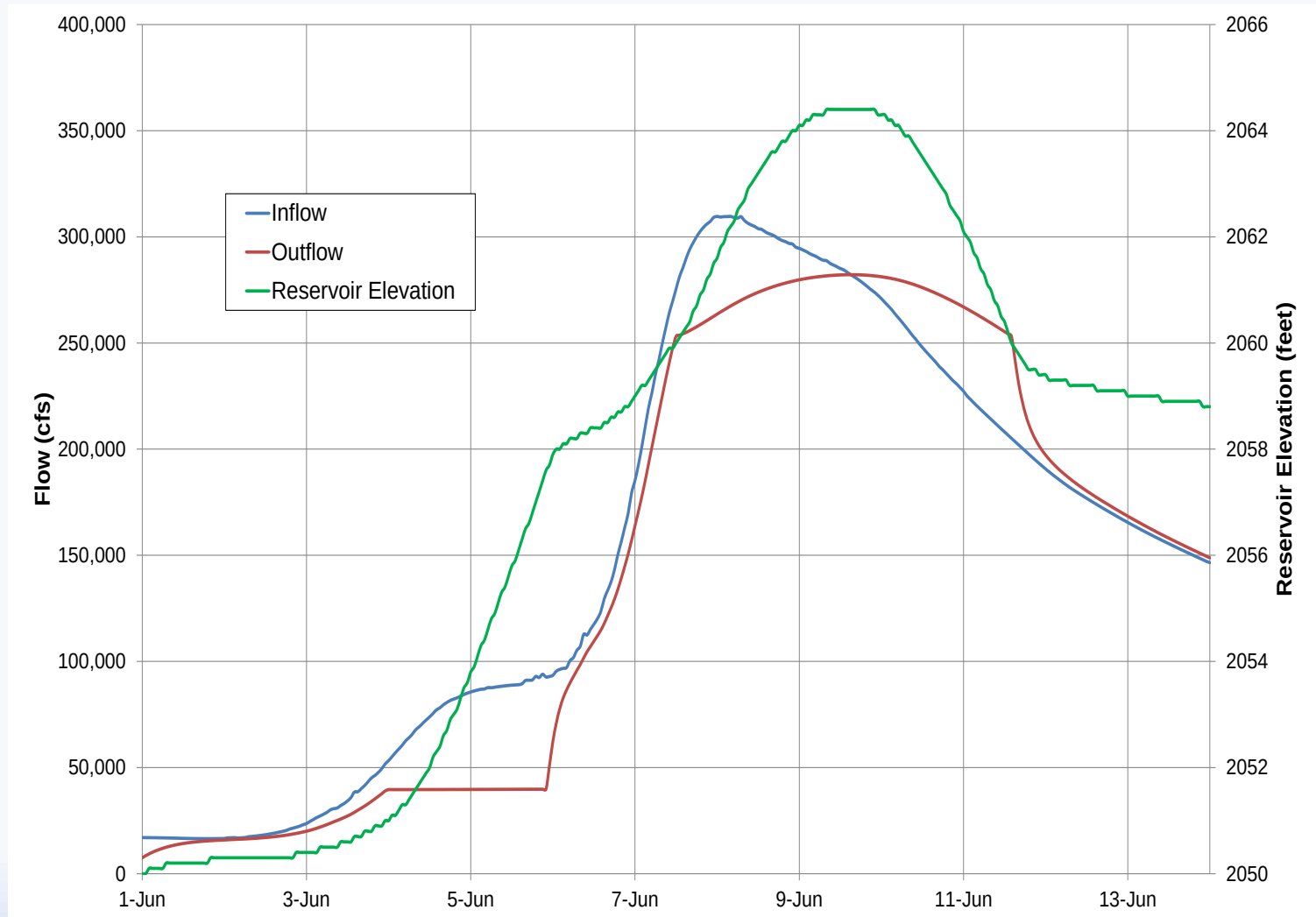
Study 16.5 Summary of Results in ISR

- **Development of the Site-Specific PMP**
 - Existing Weather Bureau (NWS) PMP guidance documents were inadequate – maximum 400 square miles and 24-hour duration
 - Storm search – long list; all major storms analyzed to determine if further analysis was warranted
 - Storm search – short list; 9 storms fully analyzed to determine PMP
 - Maximization, transposition, and orographic analysis
 - August 1967 Fairbanks storm was critical
 - All data prepared on an hourly time increment
 - All-season (maximum) PMP would occur in July or August
 - Alternative temporal sequences were developed
 - Basin average values: 1.78 in. for 6 hours; 4.40 inches for 24 hours; 7.19 inches for 72 hours; 10.00 inches for 216 hours (9 days)
 - Concurrent meteorological data (temperature, wind speed, dew point) for snowmelt for each hour in the time sequence
 - Adjustment factors for data from the maximum month to the months of April through October

Study 16.5 Summary of Results in ISR

- **Development of the PMF Inflow Hydrograph**
 - Cases - PMP temporal, PMF seasonal, PMF sensitivity
 - 310,000 cfs peak inflow
- **Reservoir Routing of the PMF**
 - Peak reservoir elevation – 2,064.5 ft
 - Peak outflow – 282,000 cfs
- **Freeboard Analysis**
 - Normal freeboard: required = 9.6 ft; provided = 18.5 ft
 - Minimum freeboard: required = 3.5 ft; provided = 4.0 ft
- **Board of Consultants meeting and review comments – April 2-4, 2014**
 - PMP and PMF were substantially complete
 - Concurrence with primary study methods and results
 - Sun-on-Snow PMF
- **Reporting**
 - Final Draft Report - May 2014 – 390 pages
 - Included as Study 16.5 ISR, Part C, 2 of 2

Study 16.5 Summary of Results in ISR



Current Status and Steps to Complete Study 16.5

The PMF Study is complete subject to inclusion of any additional responses to potential comments from the BOC and others, which would be addressed in the USR

Licensing Participants Proposed Modifications to Study 16.5?

- Agencies
- CIRWG members and Ahtna
- Public

Initial Study Report Meeting

Study 16.6 Site-Specific Seismic Hazard

October 22, 2014

Prepared by MWH-Fugro



Study 16.6 Objectives

- Lineament mapping and analysis, desktop study and field evaluation
- 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 for D/PSHA
- 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 Project long-term monitoring network 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
- Prepare a supporting design report that includes the seismic criteria and results of dam stability analysis under seismic loading (see dam analysis, this is not part of the seismic characterization)
- Use of Board of Consultants for independent technical review and guidance during development of site-specific studies

Study 16.6 Components

- Methods (ISR Part A, Section 4.1; pg 2)
- Review of Project Documentation (ISR Part A, Section 4.1, pg. 3)
- Seismic Hazard Analysis (ISR Part A, Section 4.1, pg 3)
- Long-Term Earthquake Monitoring System (ISR Part A, Section 4.2; pg 4)
- Preliminary Reservoir Triggered Seismicity (ISR Part A, Section 4.3; pg 5)

Study 16.6 Variances

- Land access restrictions in 2013 limited ground studies on Cook Inlet Regional Working Group (CIRWG) lands. This restriction largely impacted on-the-ground field activities, (e.g., geologic mapping, shallow pits and sampling). Also new LiDAR imagery being obtained for other studies near the dam site area was not obtained because of weather. New field techniques were implemented to measure shear wave velocities.

Study 16.6 Summary of Results in ISR (ISR Study 16.6, Part A – Section 5)

- Review of Project Documentation
 - Review geologic, geotechnical, and seismic conditions within the Project area from previous studies and research (WCC, 1980, 1982)
 - Contact technical experts in the Alaskan seismotectonics
 - Development of an initial geological and seismotectonics database and library.
- Preliminary PSHA
 - Updated seismic source model and attenuation relationships
 - Intralab (subduction) event is likely be strongest contributor to site ground motions
 - Preliminary Ground Motion – Deterministic 0.53g, Probabilistic 0.66g @2,500 yrs.
- Crustal Seismic Source Assessment, Interim
 - Lineament mapping and analysis for fault studies using LiDAR and IFSAR data
 - Criteria were developed for determining significant crustal seismic source potential (e.g., rupture length and earthquake magnitude, length – distance criteria)
 - Many of the lineaments visited in 2013 are judged to be dominantly erosional in origin, or to a lesser extent, related to rock bedding or jointing, and are not evidently associated with tectonic faults

Study 16.6 Summary of Results in ISR

(ISR Study 16.6, Part A – Section 5)

- **Seismic Monitoring**

- Established seven-station long-term monitoring system, comprised of four 6-component broadband and strong motion seismographs, three broadband seismographs, and one GPS station at the proposed Watana Dam site.
- Recorded about 1,150 earthquakes per year which were located within a region roughly 50 miles east-west and 30 miles north-south.
- Earthquakes in the Project area form two distinct groups, crustal events between 0 and 16 mi depth and intermediate depth events below 19 mi in the subducting Pacific plate.
- Largest recent event, M_L 4.0, occurred on October 23, 2013 at a depth of 42.0 mi (67.6 km), with an epicenter 8.7 mi (~14 km) west-northwest of the proposed Watana Dam site.

- **Preliminary Reservoir Triggered Seismicity**

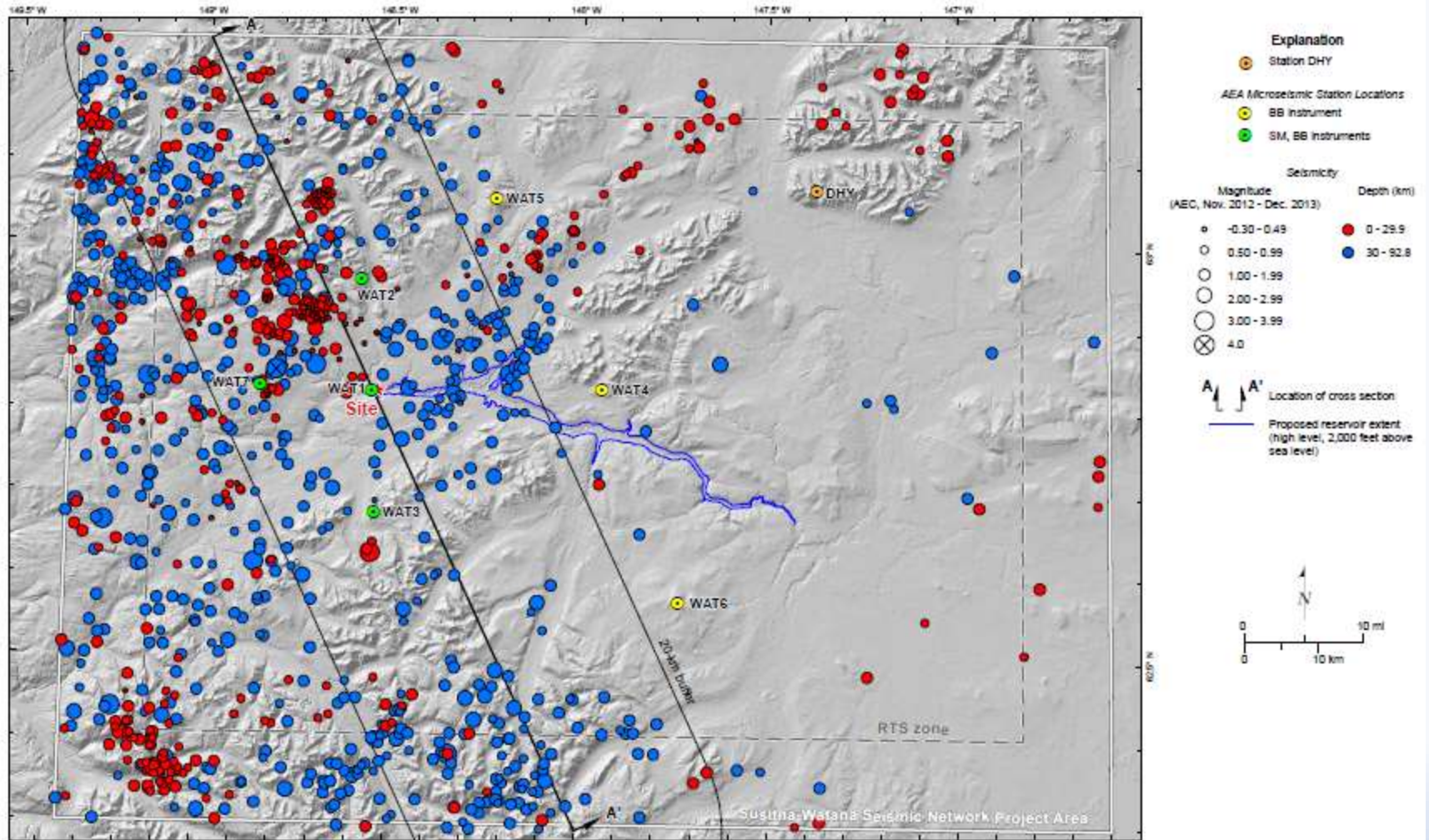
- Empirical data suggest most RTS events will have relatively small magnitudes and would most likely occur within 10 years of initial reservoir filling; may be influenced by magnitude and rate of reservoir filling
- From observations to date, the maximum RTS magnitudes may be on the order of 6.3 to 6.5

Study 16.6 Summary of Results since ISR

(Interim Crustal Seismic Source Evaluation , 2013 Seismicity Report)

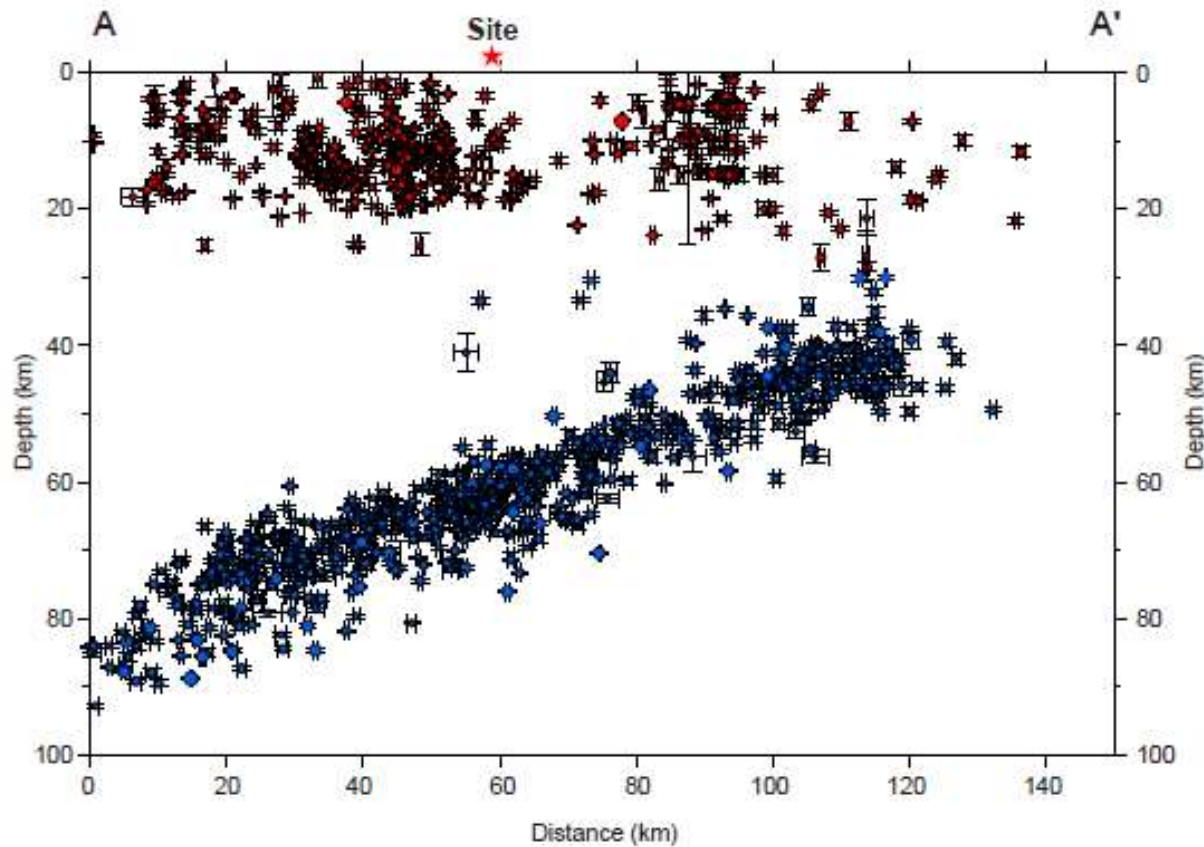
- Quaternary faults or folds mapped by State of Alaska are consistent with those recognized by this study.
- No mapped Quaternary faults within Talkeetna Block near dam site.
- Evidence of the absence of late Quaternary tectonic geomorphology, within the last 12k to 15k years, suggestive of high slip rates, based on field investigation and assessment.
- Increase in recorded events has led to a better picture of shallow crustal seismicity and intraslab seismicity associated with the subducting Pacific Plate below the proposed dam site; new slab model - segmented down-going slab.
- Focal mechanisms for earthquakes in the M4 range in the area around the proposed dam site indicate:
 - for shallow crustal events, the crust is undergoing N-NW S-SE oriented compression, consistent with the convergence between the Pacific-North America plate margin.
 - for intraslab events, indicate strike-parallel horizontal compression within the down-going Pacific Plate (in an E-W direction) .

Study 16.6 Summary of Results since ISR (Seismic Network 2013 Annual Seismicity Report)



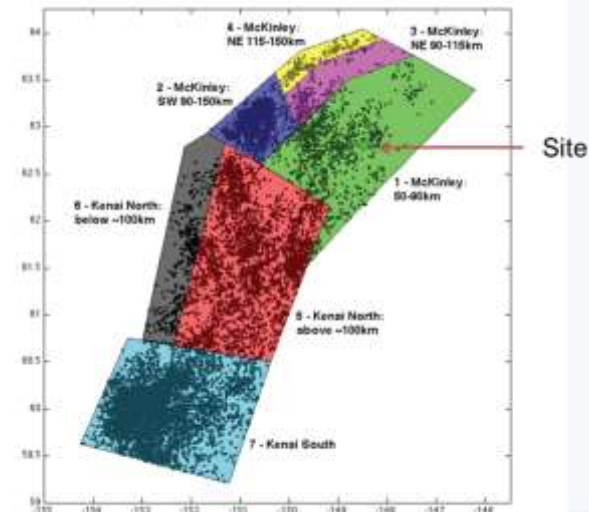
Study 16.6 Summary of Results since ISR (Seismic Network 2013 Annual Seismicity Report)

November 16, 2012 - December 31, 2013



Explanation

- Crustal events (depths < 30 km)
- Intraslab events (depths ≥ 30 km)



AEA Proposed Modifications to Study 16.6 in ISR (ISR Study 16.6, Part C – Section 7.1.2)

- No modifications to the Study Plan are needed to complete the study and meet Study Plan objectives

Current Status and Steps to Complete Study 16.6

- Current Status:
 - Completed the 2014 Field Investigation program – Field Assessment of Crustal Seismic Sources, Potential for Fault Displacement
 - Samples of Geologic Materials Collected for Age Dating Purposes
 - Seismic Event Monitoring Continues
- Steps to Complete Study:
 - Update understanding of geologic conditions and seismo-tectonic setting for the dam site area.
 - Identify and characterize the seismic sources, including detailed geologic studies and lineament analyses.
 - Identify and characterize any faults near or beneath the dam.
 - Complete deterministic and probabilistic seismic hazard assessments.
 - Assess risk to Project structures and operations associated with seismic loading conditions.
 - Propose appropriate seismic design criteria.

Steps to Complete Study 16.6

(ISR Study 16.6, Part C – Section 7.1)

To complete the study, AEA will continue to implement the methods in the Study Plan. These activities include the following:

- Update the understanding of geologic conditions and seismo-tectonic setting for the dam site area
- Identify and characterize the seismic sources, including detailed geologic studies and lineament analyses
- Identify whether a fault may be encountered beneath or adjacent to the dam and assess the activity of the feature and, if active, the likelihood for potential fault displacement or ground offset
- Perform a deterministic and probabilistic seismic hazard assessment in order to define earthquake ground motions for structural analyses.
- Assess risks to Project structures and operation associated with seismic loading conditions
- Propose appropriate seismic design criteria

Licensing Participants Proposed Modifications to Study 16.6?

- Agencies
- CIRWG members and Ahtna
- Public

Initial Study Report Meeting

Study 14.5 Subsistence Resources

October 22, 2014



Study 14.5 Objectives

- 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 the Project area for subsistence harvests**
- 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**
- 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**
- Collect and document **traditional and local knowledge** of communities within the Susitna River watershed, or those that 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
- Evaluate Project development plans to identify likely sources of potential impacts on identified subsistence uses
- Provide the necessary information needed to support preparation of an **ANILCA 810 evaluation**

Study 14.5 Components

- **Compilation of Existing Data** (ISR Part A, Section 4.1; pg 3)
- **Household Harvest Surveys** (ISR Part A, Section 4.2; pg 9)
- **Household Harvest Surveys in State-Designated Nonsubsistence Areas** (ISR Part A, Section 4.3; pg 10)
- **Traditional and Local Knowledge Interviews** (ISR Part A, Section 4.4; pg 10)

Study 14.5 Variances

- One additional community, Knik, was selected for Traditional and Local Knowledge workshops (RSP Section 14.5.4.5)

Study 14.5 Summary of Results in ISR (ISR Study 14.5, Part A – Section 5)

- The study team reviewed and compiled existing data for all 37 identified study communities, completed household harvest surveys in 10 study communities, and conducted a total of 28 traditional and local knowledge workshops in seven communities.
- Pertinent data from traditional and local knowledge workshops have been shared with the study teams for the Cultural Resources Study (Study 13.5) and Health Impact Assessment Study (Study 15.8) for follow-up.
- Overall, the combination of study methods and resulting data have created a comprehensive baseline of subsistence harvest and use information for the Susitna River watershed and Project area.

Study 14.5 Summary of Results Since the ISR

Household Harvest Surveys were completed in the following communities in February and March 2014:

- Copperville
- Glennallen
- Gulkana
- Lake Louise
- Mendeltna
- Nabesna
- Nelchina
- Paxon
- Tazlina
- Tolsona
- Tonsina

AEA Proposed Modifications to Study 14.5 in ISR (ISR Study 14.5, Part C – Section 7.1.2)

- As described in Section 4.4.7 of this ISR, AEA implemented a variance in 2013 to include the Knik Tribe, a federally recognized tribe with ties to the Susitna River watershed, in traditional and local knowledge interviews. AEA will continue to implement this method as a Study Plan modification in 2015.

Steps to Complete Study 14.5

(ISR Study 14.5, Part C – Section 7.1)

To complete this study, AEA will implement the methods in the Study Plan except as described in Sections 7.1.1 and 7.1.2. These activities include:

- Scheduling and conducting traditional and local knowledge workshops with the Chickaloon Traditional Village Council and Knik Tribal Councils (RSP Section 14.5.4.5)
- Conducting subsistence mapping interviews in selected study communities to document last 10-year subsistence use areas as well as related baseline indicators (RSP Section 14.5.4.4). Eight communities (Cantwell, Chase, Healy, Talkeetna, Lake Louise, McKinley Park, Trapper Creek, and Petersville) were identified in the Study Plan for possible inclusion in the subsistence mapping studies due to their proximity to the Project. Five of these communities (Cantwell, Chase, Healy, Lake Louise, and McKinley Park) have documented subsistence use area data showing use of the Project area and Trapper Creek's use areas are within the Susitna River watershed. Available use area data for these four communities are all at least 10 years old. For the remaining communities of Talkeetna 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)

Licensing Participants Proposed Modifications to Study 14.5?

- Agencies
- CIRWG members and Ahtna
- Public

Initial Study Report Meeting

Study 13.5 Cultural Resources

October 22, 2014

Prepared by

Northern Land Use Research Alaska LLC

Charles M. Mobley & Associates

URS Corporation

Ahtna, Inc.

Gwanshii



Study 13.5 Objectives

- Consult with the SHPO, BLM, and Alaska Native entities during implementation of the cultural resources survey.
- Inventory cultural resources within the APE.
- Evaluate National Register eligibility of cultural resources within the APE that may be affected by the Project.
- Determine the potential Project-related effects on National Register-eligible historic properties within the APE.
- Develop information needed to prepare a Historic Properties Management Plan (HPMP) for the Project.

Study 13.5 Components

- **Previous Surveys** (ISR Part A, Section 4.1; pg 4).
- **Locational Model of Survey Strategy** (ISR Part A, Section 4.2; pg 6).
- **Survey Strategy and Phasing of Field Investigations in the Direct APE** (ISR Part A, Section 4.3; pg 6).
- **Survey Strategy and Phasing of Field Investigation in the Indirect APE** (ISR Part A, Section 4.4; pg 8).
- **Mapping-Related Activities** (ISR Part A, Section 4.5; pg 8).
- **Ethnogeography-Related Activities** (ISR Part A, Section 4.6; pg 9).
- **Synthesis and Analysis Activities** (ISR Part A, Section 4.7; pg 10).
- **Unanticipated Discoveries Protocol** (ISR Part A, Section 4.8; pg 10).
- **Archaeological Internship and Additional Workforce** (ISR Part A, Section 4.9; pg 11).

Study 13.5 Variances

- The Study Plan (RSP Section 13.5.4.7) stated that all Traditional Cultural Properties information would be incorporated into a geodatabase. To date, however, there has not been sufficient data to support such a file.
- The Dena'ina ethnogeography component of the Study Plan (FERC February 2013 SPD) was not initiated in 2013.
- The study team received no responses to its recruitment and advertising efforts for the archaeological internship described in the Study Plan (RSP Section 13.5.4.11), so this program was not initiated in 2013.

Study 13.5 Summary of Results in ISR (ISR Study 13.5, Part A – Section 5)

Ethnogeography Study Results

- Interviewed 18 Ahtna elders on contemporary land use.
- Transcribed 25 interview tapes from BIA, BLM and other sources.
- Translated 31 Ahtna language narratives.
- Updated the existing Ahtna place name GIS data-base.

Study 13.5 Summary of Results in ISR (ISR Study 13.5, Part A – Section 5)

Archaeology Study Results

- 167 sites were inventoried, 82 were newly discovered cultural resources.
- Majority of the sites were surface finds in the Denali corridor.
- Location Model identified 262 high-potential test areas in the direct APE, 26 were tested resulting in two newly discovered cultural resources in buried sediments.
- Lab analyses focused on radiocarbon dating, diagnostic artifacts, and X-ray fluorescence.
- Synthesis of ethnogeographic oral histories into GIS model.

Study 13.5 Summary of Results in ISR (ISR Study 13.5, Part A – Section 5)

Facilities Survey

- Conducted a Phase I site identification survey in conjunction with the installation of a seismic station on BLM land (Deadman Mountain).

Study 13.5 Summary of Results since ISR

Ethnogeography Study Results

- Data collection for Ahtna ethnogeography study has been completed.
- A final meeting presenting results in Cantwell was held on June 30, 2014.
- A final report on Ahtna ethnogeographic study is in progress.
- Commenced planning for the Dena'ina ethnogeographic study, which will be initiated in 2015.

Study 13.5 Summary of Results since ISR

Archaeology Study Results

- Inventoried 29 sites; approximately 100% of known sites on CIRWG lands.
- Inventoried 12 sites on BLM lands; 17% of known sites.
- Inventoried 30 sites on State lands; 41% of known sites.
 - The number of newly discovered sites is still pending.
 - The majority of new sites were recorded on the ground surface in the Denali East alternative corridor.
- Completed paleoenvironmental component of study (i.e., lake coring).

AEA Proposed Modifications to Study 13.5 in ISR (ISR Study 13.5, Part C – Section 7.1.2)

- AEA added the Denali East Option road and transmission corridor to the study area (direct APE).
- Possibility that adding the Denali East Option could affect the sequence of Phase I inventory and Phase II NRHP evaluation within some parts of the study area. Work in 2015 could involve field investigations in which some sites are inventoried and evaluated at the same time, rather than seasonal phasing outlined in the Study Plan.

New Modifications to Study 13.5 since ISR

The Chulitna Corridor was dropped from the study area in 2014.

Steps to Complete Study 13.5

(ISR Study 13.5, Part C – Section 7.1)

To complete the study, AEA will implement the methods in the Study Plan, as follows:

- ***Inventory and Evaluation:*** Systematic inventory of archaeological and structural cultural resources within the APE and NRHP evaluation of those that may be affected by the Project.
 - In 2013 and 2014, much of the study area (direct APE and indirect APE) was surveyed and sites inventoried.
 - Subsurface testing and site evaluations will occur in 2015, as appropriate.

Steps to Complete Study 13.5 (ISR Study 13.5, Part C – Section 7.1)

To complete the study, AEA will implement the methods in the Study Plan, as follows:

- ***Ethnogeography:*** Assembly of ethnographic and linguistic information to help inventory and evaluate historic properties—particularly Traditional Cultural Properties—that may be affected by the Project
 - Data collection for Ahtna ethnogeographic study is complete; final report in progress.
 - Planning for Dena'ina ethnographic study is underway and will be initiated in 2015.

Steps to Complete Study 13.5 (ISR Study 13.5, Part C – Section 7.1)

To complete the study, AEA will implement the methods in the Study Plan, as follows:

- ***Paleoenvironmental:*** A lake-coring effort to obtain environmental information for evaluating the prehistoric cultural resources in their temporal and ecological context.
 - Fieldwork for paleoenvironmental component was completed in 2014.
 - Analyses are ongoing.

Licensing Participants' Proposed Modifications to Study 13.5?

- Agencies
- CIRWG members and Ahtna
- Public

Initial Study Report Meeting

Study 13.6 Paleontological Resources

October 22, 2014

Prepared by

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Study 13.6 Objectives

- The objective of this study is to determine the effects of the proposed Project on paleontological resources by locating, documenting, and evaluating paleontological resources within the study area.

Study 13.6 Components

- Identification of Potential Impacts to Paleontological Resources (ISR Part A, Section 4.1; pg 2).
- Determination of Field Survey and Monitoring Needs (ISR Part A, Section 4.2; pg 2).
- Field Survey (ISR Part A, Section 4.3; pg 2).

Study 13.6 Variances

- The impact analysis of the geologic units that may be impacted by the proposed Project and assertion of their associated Potential Fossil Yield Classification (PFYC) was deferred until 2015.
- Determination of field surveys and monitoring needs was deferred until 2015.

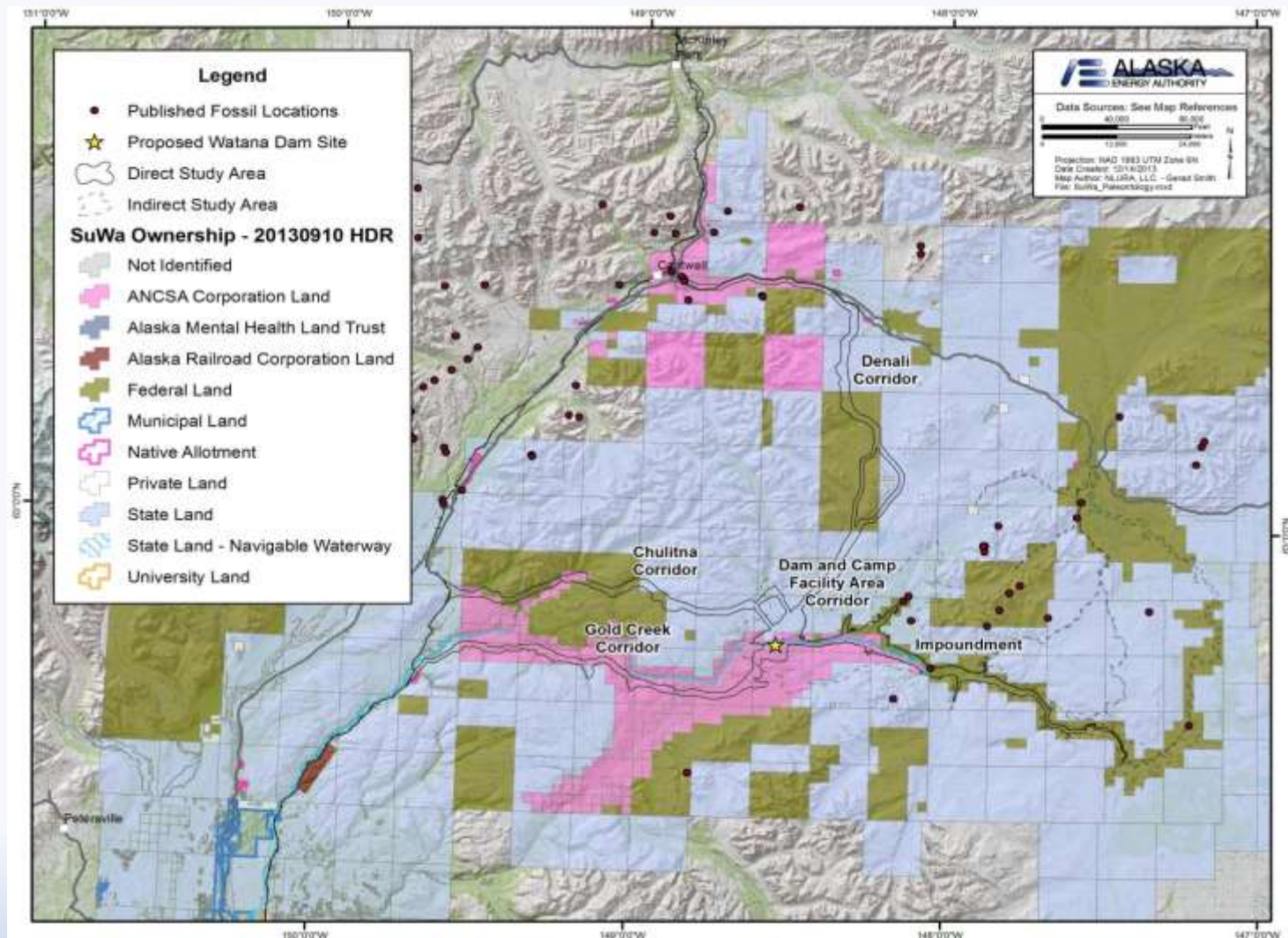
Study 13.6 Summary of Results in ISR (ISR Study 13.6, Part A – Section 5)

- The potential fossil-bearing rock units identified in the literature review included:
 - The Wrangellia Terrane
 - Kahiltna Flysch
 - Windy Terrane
 - Susitna Terrane
 - Chulitna Group of Terranes
 - Quaternary Cover Sequences
- Spreadsheet prepared summarizing information from approximately 100 fossil locations in these potential fossil-bearing rock units.
- Most fossil locales occur in two distinct, northeast-striking belts on the east-central and western portions of the study area, with a scattering of fossils in other locales.
- Three fossil localities occur within the area that could be within the inundation zone.
- Twelve other fossil localities occur within the transportation corridors.

Study 13.6 Summary of Results in ISR (ISR Study 13.6, Part A – Section 5)

- Analysis of the existing paleontological site inventory as derived from the literature search indicates that none of the known fossil finds in the study area are of critical scientific importance.
- Archaeological crews performing fieldwork in 2013 reported four fossil plant finds in the study area.
- The sites were assigned Alaska Heritage Resources Survey (AHRs) numbers and added to the paleontological site inventory.

Study 13.6 Summary of Results in ISR (ISR Study 13.6, Part A – Section 5)



Study 13.6 Summary of Results since ISR

- No additional work was performed in 2014. Paleontology work will resume in 2015.

AEA Proposed Modifications to Study 13.6 in ISR (ISR Study 13.6, Part C – Section 7.1.2)

- In the ISR, AEA proposes no modifications to the methods in the FERC-approved study plan.
- The study area has changed to include the Denali East Option road and transmission line corridor.

New Modifications to Study 13.5 since ISR

The Chulitna Corridor was dropped from the study area in 2014.

Current Status and Steps to Complete Study 13.6 ISR Study 13.6, Part C – Section 7.1

To complete the study, AEA will implement the methods in the Study Plan, as follows:

- ***Identify potential impacts to paleontological resources:***
The study team will determine the geologic units that may be impacted by the proposed Project and the associated PFYC classes. Based on this information, AEA will evaluate the risk of impacting significant paleontological resources.
 - Literature review is complete.
 - In 2015, AEA will complete impact analysis and ascertain PFYC for geologic units that may be impacted.

Current Status and Steps to Complete Study 13.6

ISR Study 13.6, Part C – Section 7.1

To complete the study, AEA will implement the methods in the Study Plan, as follows:

- ***Determine the need for field survey and monitoring efforts:***

The need for field survey and monitoring efforts will vary by location and will be determined largely upon the basis of the PFYC classifications for the particular location.

- Development of field program is in progress.

Current Status and Steps to Complete Study 13.6

ISR Study 13.6, Part C – Section 7.1

To complete the study, AEA will implement the methods in the Study Plan, as follows:

- ***Field Surveys:***

Field surveys will generally be undertaken for PFYC Class 4 and 5 units, especially exposed bedrock areas (Class 4a and 5a). Class 3 units may or may not require a survey.

- Fieldwork is planned for summer 2015.
- Field surveys will focus on areas with fossil potential that may be impacted by the Project (e.g., inundated areas, dam site, borrow sites).
- Fossil specimens will be sent to laboratories for identification in fall 2015.

Licensing Participants Proposed Modifications to Study 13.6?

- Agencies
- CIRWG members and Ahtna
- Public