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**SUSITNA – LOW WATANA & CHAKACHAMNA PROJECTS
LARGE HYDRO EVALUATION OF TWO PROJECTS
PRELIMINARY DECISION DOCUMENT
ENVIRONMENTAL & REGULATORY ISSUES**

**Prepared for:
The Alaska Energy Authority**

R&M Consultants No. 1158.21-8

**Prepared by:
Hatch Associates Consultants, Inc.**

November 14, 2010

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EXECUTIVE SUMMARY

This Executive Summary provides a “30,000-foot-level overview” of the challenges associated with development of two potential hydroelectric projects under consideration as the next resource to meet the growing demand in the Railbelt Region of Alaska. This Executive Summary focuses on regulatory and environmental aspects of the project development process; we also provide herein a very preliminary snapshot view of forces that influence overall development, including: licensing, permitting, engineering and construction activities that would influence bringing on line either the proposed Chakachamna Project or the proposed Susitna / Low Watana Project.

OVERVIEW - REGULATORY PROCESS

Pursuant to the Federal Power Act (FPA), the Federal Energy Regulatory Commission (FERC) has exclusive authority to issue licenses for most non-federal hydropower projects. However, as discussed below, some federal agencies and state agencies with delegated authority are authorized to submit mandatory and recommended terms and conditions that may be included in a FERC-issued license. Major elements of the FERC licensing process include:

- **FERC’s Licensing Process Options** – Applicants may propose to use one of three options: the Integrated (ILP), Alternative (ALP), or Traditional (TLP). The default is the ILP unless FERC approves use of either the ALP or TLP.
- **Pre-filing Consultation** – extensive pre-filing meetings and exchange of information required
- **Federal Energy Regulatory Commission** – Application for License required; Draft submitted for review & comments; Final filed
- **Federal and State Resource Agencies Consultation & Terms & Conditions** – File mandatory & recommended terms and conditions; most become License Articles and require compliance

Numerous Other State & Federal Approvals & Permits are Required – Applicants are required to provide evidence of consultation with agencies in an Application for License, and provide copies of permits and/or approvals.

OVERVIEW – CHAKACHAMNA PROJECT

TDX Power Inc. (TDX) a subsidiary of Tahadgusix Corporation, Inc., received its first FERC Preliminary Permit (FERC Permit) to study the proposed Chakachamna Project, FERC No. 12660 (Chakachamna Project), on November 14, 2006. That Permit expired and on November 3, 2009, TDX filed an application for a successive (second) FERC Permit to continue to study the Project. On February 25, 2010, TDX received its successive FERC Permit with an expiration date of January 31, 2013. FERC noted that a greater standard of Commission oversight and monitoring of progress accompany successive FERC Permits.

The 300 MW Chakachamna Project would generate 1300 GWh average annual energy:

- Located approx 40 mi. W of Native Village of Tyonek; approx 82 mi W of Anchorage
- Project entails inter-basin water transfer from Chakachamna Lake through approx 10.8 mi-long hard-rock tunnel
- Underground powerhouse containing three vertical Francis units discharging to McArthur River.
- Proposed operation could cause adverse effects on Kenibuna Lake located within Lake Clark National Park and Preserve/Wilderness Area, adjacent to Chakachamna Lake.
- Proposed operation could cause adverse effects on Trading Bay State Game

ENGINEERING ISSUES – CHAKACHAMNA PROJECT

- **Site Access** - 55 miles of new access roads; close proximity to Lake Clark National Park/Wilderness Area & Trading Bay Refuge could affect FERC licensing & approval/permitting process. 2 years to construct.
- **Geologic Site Conditions / Geotechnical Risk** - exploratory program required to define extensive proposed underground civil works including: 10.8-mile long, 21-foot diameter hard-rock tunnel that would cross faulted zones along the route/route would not be self-supporting; cavern-type powerhouse, approximately 60-feet wide by 200-feet long housing three vertical axis Francis units; 1,000-foot long tailrace tunnel; 21-foot diameter 13,800-foot-long tunnel housing separate juvenile and adult fish passage channels.
- **Access** - Active volcano near intake location may present barrier to access. Nearby glaciers and potential for avalanche danger
- **Equipment Procurement** - excavated with Tunnel Boring Machines (TBMs); 14 – 16 month lead time to procure and have TBMs delivered to site.
- **Project Transmission** - 42 miles of new transmission lines traversing over miles of challenging terrain
- **Project Interconnection** - no excess capacity outbound & Beluga substation nearing end of useful life at time project would come on line
- **Development Schedule** – Licensing would take 7 years from re-starting the current process + engineering would require 7.5 years for an estimated total to StartUp of 14 – 15 years; due to uncertainties, schedule has high risk of exceeding this estimate

ENVIRONMENTAL ISSUES – CHAKACHAMNA PROJECT

- **Cross-basin transfer from Lake Chakachamna to McArthur River**
- **Potential effects on Lake Clark National Park Wilderness Area** – reservoir level changes could affect level of Lake Kenibuna
- **Fish Passage Facilities into and out of reservoir**; current design will not work – very expensive to build and operate
- **Fish Habitat** – Sockeye salmon utilize Lake Chakachamna and tributaries – at risk
- **Complex Waterways** – numerous channels & large areas affected by groundwater flow
- **Instream Flow Release that will maintain fish & wildlife populations** – will require extensive (3 – 5 years) and costly flow, groundwater & temperature studies
- **Wildlife** – concern that negative impact on anadromous fish adversely affects wildlife dependent upon fish; includes wildlife within National Park/Wilderness Area & Trading Bay State Game Refuge

OVERVIEW – SUSITNA / LOW WATANA PROJECT

Alaska Power Authority (APA), now Alaska Energy Authority (AEA), filed an Application for License for Major Project for the Susitna Hydroelectric Project in February 1983. In May 1985, APA concluded that substantial benefits would be realized with modification of the construction plan and prepared 1985 Amendment to Application. 1986 the APA abandoned its pursuit of a FERC license for numerous reasons including financial feasibility. In 2008, the Alaska State Legislature authorized the AEA to perform an update of the project.

The 600 MW Low Watana Project would generate _____ average annual energy:

- Non-expandable 700-ft high dam with gross head of 557-ft
- Powerhouse containing four turbine/generator units @ 150 MW each for a total installed capacity of 600 MW
- Reservoir with a maximum pool elevation at 2014-ft EL / 2,704,800 acre-ft of usable storage.
- 36-foot diameter, 3,700-foot long diversion tunnel; and a 1,500-foot long tailrace tunnel.

ENGINEERING ISSUES – SUSITNA / LOW WATANA PROJECT

- **Site Access**

Site access options under consideration include pioneer and permanent roads, helicopter pads and/or an airport, and bridges. The 1985 Amendment to the Application envisioned a “44-mile road running south from about mile 23 of the Denali Highway (Milepost 112) to the Watana site...” (APA November 1995).

The final selection for an overall site access plan would be developed during Final Feasibility and would be addressed in the Application for License.

- **Geologic Site Conditions**

Significant geotechnical investigations were performed in the 1980’s and the results provided in the 1983 Application for License.

- **Equipment Procurement**

Construction: Unlike Chakachamna, the proposed Susitna / Low Watana Project would not require a TBM. There are no other long-lead time requirements to commence construction. Generation Equipment: Ordering turbine/generator units would not be expected to vary among the two projects.

- **Project Transmission**

The 1985 Amendment proposed that power would be transmitted from the Project via power lines to a substation to be built at Gold Creek, about 37 air-miles east-southeast of the Watana site. At that point the existing Anchorage-Fairbanks Intertie would transmit power to the two major Railbelt population centers with appropriate upgrading of the Railbelt system.

This line, like the line from Chakachamna to a point of retail service or interconnection is jurisdictional to the FERC as a “primary line” under Part I of the FPA and the FERC hydropower licensing program, but is not jurisdictional under Part II as the State of Alaska is not interconnected in interstate commerce. Recommend evaluation of the “fit” of the 600 MW Susitna / Low Watana Project to the Railbelt IRP in future studies.

- **Construction Schedule**

There are more surface features and work carries more schedule certainty and less risk.

Compared to Chakachamna, with an anticipated schedule extending over 14 – 15 years, the Susitna / Low Watana estimated schedule has a lower risk of extending beyond 11 total years.

ENVIRONMENTAL ISSUES – CHAKACHAMNA PROJECT

The Chakachamna Project was studied in the early 1980’s, baseline information was collected. TDX filed its Pre-Application Document (PAD) with the FERC on July 17, 2009. TDX extracted information acquired by researchers during 1981 as presented in the Bechtel 1983 Report. TDX acknowledges in its June 2009 PAD that “The Project is somewhat unique in that there is little resource information currently available for the project area.” The PAD included a comprehensive studies program. TDX withdrew the PAD on September 21, 2009 stating that the PAD and NOI would be updated and resubmitted in 2010. TDX stated that it would implement a field season in 2010 prior to initiation of the formal licensing process in order to begin key baseline studies identified in the PAD as “Phase 1” studies agencies in February 2010 and that formal study plan would commence in the fall of 2010. A review of the FERC Docket for the proceeding and a visit to the TDX website indicate that no action has been taken to further the environmental studies program.

Table 1 – Resource Comparison, attached to and made part of this Report, provides an overview of environmental issues required to be addressed in preparing an Application for License. One of the key aspects of the FERC pre-filing process is that an Applicant is required to identify potential resources that may be affected by the construction and operation of a project and to develop study plans in consultation with federal and state agencies, and Alaska Native Organizations.

While TDX held an initial three-year FERC Preliminary Permit, no project-related studies were performed. TDX now holds a second FERC Permit and there is no evidence of agreement with agencies on study plans, nor are results from studies available.

Key resources for the Chakachamna Project include:

- Surface Water – Cross-basin transfer; potential impacts of reservoir management on National Park and Wilderness Area; Kenibuna Lake, and resulting changes in lakes operation; effects on Trading Bay State Game Refuge
- Wetlands – effect on wetlands within Game Refuge
- Geology & Soils: Avalanche & Volcano Risks – Mt. Spurr, an active volcano, located adjacent to the project
- Anadromous Fish – potential impacts to aquatic resources, including significant habitat for sockeye salmon; fish passage into and out of the reservoir
- Fish Passage – Major concern regarding anadromous and resident fish use of Chakachamna Lake and tributaries to the lake
- Mammals – Brown bear and black bear use the area; calving grounds for moose
- Birds – Nesting sites for bald eagles and trumpeter swans; migratory bird use of the area
- Threatened and Endangered Species – Beluga whale and harbour seal are listed by the State as Species of Special Concern
- Land Use – Competing interests would need to be addressed
- Protected Lands – The upper end of Lake Kenibuna and streams that flow into it are within the Lake Clark National Park and Wilderness. Risk whether, if studies show that water bodies within the Park would be affected, that FERC would decline to license the project. Potential effects on Trading Bay State Game Refuge near McArthur and Chakachamna River deltas.
- Archaeological, Cultural & Historic Resources – Area has not been studied.
- Recreation – potential effect on National Park & Wilderness Area; and, Trading Bay State Game Refuge

ENVIRONMENTAL ISSUES - SUSITNA / LOW WATANA PROJECT

The Susitna Hydroelectric Project, studies performed in support of the 1983 Final Application for License and the revisions to the project description discussed in the 1985 Draft License Application, are significant, extensive, valid and relevant to the proposed modifications to the earlier proposed project. Existing engineering reports, including detailed geotechnical and geological aspects, that would be required to support an Application for License at the Low Watana site; and existing environmental reports that comprise the Exhibit E for the 1983 and 1985 FERC applications include comprehensive descriptions of the baseline environment; discussion of potential effects associated with construction and operation of the then-proposed project; and also provide proposed mitigation plans for each resource category. Baseline environmental descriptions, supported by study reports, and information regarding potential measures to protect, mitigate, and enhance any resources that might be affected by construction and long-term operation of a proposed hydroelectric project would be useful in preparing the required Preliminary Application Document, and the Application for Original License; and in conducting the required consultation with the resource agencies, Native Alaskan organizations, and other interested persons and organizations.

Table 1 – Resource Comparison, attached to and made part of this Report, provides an overview of environmental issues required to be addressed in preparing an Application for License. One of the key aspects of the FERC pre-filing process is that an Applicant is required to identify potential resources that may be affected by the construction and operation of a project and to develop study plans in consultation with federal and state agencies, and Alaska Native Organizations.

AS noted above, extensive environmental studies were performed in 1981 - 83 in support of the Original Application for License and reviewed again in 1985 when the Susitna Project was revisited. As with the

rest of this Report, information has been from results of earlier licensing proceedings that were relevant to the Watana development. We note that these earlier studies provide a comprehensive description of the baseline environment presented in the framework for an Application for License.

Key resources for the Susitna / Low Watana Project include:

- Surface Water - Effects of impoundment alteration on water quality; and effects of seasonal alteration in flows on downstream channel morphology
- Anadromous Fish – effects on downstream main-stem Susitna habitat, including over-winter use; and effects of seasonal and daily alteration in flow due to project operation. While fish passage is not likely to be an issue, minimum flow release to sustain the downstream fishery would be of interest to the agencies
- Resident Fish – effects on Arctic Grayling
- Mammals – Brown & black bear; Nelchina Caribou
- Birds – active use of area by ravens; bald & golden eagles; gyrfalcon; goshawk
- Threatened and Endangered Species – None identified in area
- Protected Lands – None identified in area
- Archaeological / Cultural / Historic properties – numerous sites were identified in the area; no listed sites identified, however, many could be significant
- Recreation Use – no developed areas

REGULATORY ISSUES – CHAKACHAMNA PROJECT

Please also see Section 2 of this Report for a detailed presentation of the various agencies and their authorities who would shape the content of any issued license.

TDX received its first Preliminary Permit on November 14, 2006. The purpose of a Preliminary Permit is to reserve priority to conduct studies for a period of three years, and if the effort results in filing an Application for License. A successive (second) permit was issued on February 25, 2010. This permit expires on January 31, 2013. FERC noted in issuing the permit that “a successive permit can warrant a greater standard of Commission oversight.” “If the permittee fails to make significant progress toward developing a license application, the permit may be subject to cancellation.”

On July 17, 2009, TDX filed its Notice of Intent to File an Application for License (NOI), Request to Use a Traditional Licensing Process (TLP), and Pre-Application Document (PAD). By letter dated July 27, 2009, FERC requested that TDX consider which licensing process it wishes to use and to refile its request noting that TDX would not need to refile the PAD. TDX met with FERC on August 5, 2009 to discuss the proceeding. On September 21, 2009, TDX requested to rescind its PAD. TDX stated that “this Project may be best served by an Integrated Licensing Process (ILP). TDX stated its intent to implement a field season in 2010 and to hold a study plan review and workshop in February 2010. TDX has a website for the Project and there is no evidence that work is proceeding as noted in their September 21, 2009, correspondence to the FERC. Nor has any further information been filed with the Commission. Under TDX’s current development schedule, a third FERC Permit would be necessary.

Licensing Schedule

Table 2 shows a Licensing, Engineering and Construction Schedule Comparison for the two projects; for Chakachamna, based on available information the FERC Schedule, once TDX restarts the pre-filing process could be:

- Prepare and File Final Application for License – 4.5 years
- FERC Processing and License Issuance – 2.5 years

REGULATORY ISSUES - SUSITNA / LOW WATANA PROJECT

At present, there is no FERC Preliminary Permit in effect. While a FERC Permit is not required, it would be prudent for an entity representing the State to secure priority to study the Project. As discussed above,

the Alaska Power Authority (APA), now known as AEA prepared and filed an application for license in February 1983. That application was withdrawn and APA revised the Project schedule to realize benefits identified with a three, as opposed to two-year construction schedule in 1985. In 1986, APA abandoned pursuit of a FERC license for numerous reasons, including financial feasibility.

In 2008, AEA began an update of the project, including preparation of the Railbelt IRP to evaluate the ability of the Susitna Project, and other resources, to meet long term demand in the Railbelt Region. An engineering assessment of a Low Watana RCC Concept is currently underway and information in this Report is based on an understanding that this concept would be the preferred option moving forward.

Licensing Schedule

Table 2 shows a Licensing, Engineering and Construction Schedule Comparison for the two projects; for Susitna / Low Watana, the FERC Schedule, based on information available at this time, the FERC schedule could be:

- Prepare and File Final Application for License – 3.5 years
- FERC Processing and License Issuance – 2 years

TOTAL PROJECT DEVELOPMENT TIMEFRAME

Table 2 provides a Development Schedule Comparison for the two projects. Based on information available at this time, the comparative total schedule from start of the FERC process, in the case of the Chakachamna a restart of their pre-filing process, could be:

MAJOR TASK	CHAKACHAMANA	SUSITNA-LOW WATANA
FERC Pre-filing Process	4.5 years	3.5 years
FERC Processing – DC	2.5 years	2.0 years
FERC Processing - Portland	2.0 years	1.0 years
Construction through Startup	5.5 years	4.5 years
TOTALS	14.5 YEARS	11 YEARS

1. INTRODUCTION

This preliminary report discusses challenges associated with development of two potential hydroelectric projects under consideration as the next resource to meet the growing demand in the Railbelt Region of Alaska. While this report was originally designed to focus on “license-ability” based on regulatory and environmental aspects of the project development process, we also provide herein a very preliminary snapshot view of forces that influence the overall development licensing, permitting, engineering and construction activities that would influence bringing on line the proposed Chakachamna Project compared to the proposed Susitna / Low Watana Project.

This Report includes three sections:

- The following narrative that discusses the two projects and the environmental issues and regulatory process options that apply to the two projects
- Table 1 presents a summary of the comparative challenges of developing the two projects
- Table 2 presents a comparison of the Licensing, Engineering and Construction Schedules for the two projects.

The following narrative consists of the following sections:

1. Introduction – presents an Overview of the two projects
2. Regulatory Process – presents the major elements of the licensing and permitting requirements associated with the two projects
3. Engineering Issues associated with the two projects
4. Environmental Issues – provides a brief statement regarding the primary issues associated with the two projects and refers the reader to Table 1 for a detailed presentation
5. Regulatory Issues – FERC Licensing & Permitting - provides a brief overview and refers the reader to Table 1 for a detailed presentation of the various levels of review & approval leading to a FERC-issued license
6. Total Procurement Development Timeframe provides a table with the primary elements and refers the reader to Tables 1 & 2

1.1 Overview – Chakachamna Project

TDX Power Inc. (TDX) is a subsidiary of Tahadgusix Corporation, Inc., a shareholder-owned Aleut Alaska Native Village Corporation founded in 1973. TDX received its first FERC Preliminary Permit (FERC Permit) to study the proposed Chakachamna Project, FERC No. 12660 (Chakachamna Project), on November 14, 2006. TDX set up a website for the FERC proceeding [www.chakachamna-hydro.com]. On July 16, 2009, TDX issued its Notice of Intent to File; Request to Use the Traditional Licensing Process (TLP); and, a Preliminary Application Document (PAD). On September 21, 2009, TDX withdrew this request, and advised FERC that the Integrated Licensing Process (ILP) may be a better choice. In this request, TDX stated that it planned to: hold a meeting in February 2010 to discuss studies; and, implement a field season in 2010 in order to begin key baseline studies.

The PAD summarizes all reasonably available existing information acquired by TDX and therefore is of interest and value to this evaluation. The first FERC Permit expired and on November 3, 2009, TDX filed an application for a successive (second) FERC Permit to continue to study the feasibility of the Chakachamna Project. On February 25, 2010, TDX received its successive FERC Permit with an expiration date of January 31, 2013. FERC noted that a greater standard of Commission oversight and monitoring of progress will accompany successive FERC Permits.

The Chakachamna Project would be located approximately 40 miles west of the Native Village of Tyonek and approximately 82 miles west of Anchorage in the Kenai Peninsula Borough. TDX is proposing a project that would entail an inter-basin transfer of water from a lake-tap near the outlet of Chakachamna Lake through an approximately 10.8 mile long hard-rock tunnel to an underground powerhouse that would discharge to the McArthur River. TDX estimates that the proposed 300 MW project could produce about

1300 GWh average annual energy. Major Chakachamna Project proposed features would include: (1) 200-foot-long, 9-foot-high flow-control weir at the natural lake outlet; (2) 26-foot-diameter submerged intake structure located about 0.5 mile west-southwest of the natural lake outlet; (3) 10.8-mile long, 21-foot-diameter hard rock tunnel extending southeast from the intake to the powerhouse with a surge shaft approximately 60-feet in diameter at the downstream end of the tunnel close to the powerhouse; (4) underground cavern-type powerhouse with three vertical axis Francis units and a total installed capacity of 300 MW; 1,000-foot-long tailrace tunnel connecting powerhouse to McArthur River; (6) 21-foot-diameter, 13,800-foot-long tunnel housing separate juvenile and adult fish passage channels extending from Chakachamna Lake to Chakachamna River; (7) fish ladder at Chakachamna Lake outlet control weir with a pool-and-chute fishway at flow-control weir to facilitate upstream fish passage to the lake; (8) two 42-mile long 230 kV transmission lines from powerhouse to Beluga substation (10) three access roads totalling 55 miles; an unloading facility (dock); and new bridges at Straight Creek and the Chakachamna River; (11) buried 25kV power cable extending 22 miles from powerhouse; and (12) appurtenant facilities. The Chakachamna Project would occupy an estimated 1,009 acres of lands managed by the Bureau of Land Management (BLM)

Operation of the proposed Chakachamna Project could potentially cause adverse effects on Kenibuna Lake located adjacent to Chakachamna Lake and associated tributaries. The eastern boundary of the Lake Clark National Park and Preserve/Lake Clark Wilderness Area (Lake Clark National Park) crosses Kenibuna Lake upstream of Chakachamna Lake. This portion of the park was classified as wilderness in 1980 and is managed by the National Park Service.

The Trading Bay State Game Refuge (Trading Bay Refuge), created in 1976, is located and could potentially be affected by the powerhouse proposed to be located with a discharge to the McArthur River; a portion of the transmission line and access road is in close proximity to the refuge. The refuge is managed by the Alaska Department of Natural Resources (ADNR).

1.2 Overview – Susitna / Low Watana Project

The Alaska Power Authority (APA), now known as the Alaska Energy Authority (AEA), commissioned ACRES to conduct extensive investigations in support of the potential multi-faceted Final Application for License for Major Project for the Susitna Hydroelectric Project and filed with the FERC in February 1983 (1983 Final Application). The Susitna site was originally studied by the US Bureau of Reclamation in 1953 and 1961; the Alaska Power Administration in 1974; and the US Army Corps of Engineers in 1977 and 1979. Information from these studies plus extensive on-the-ground investigations went into preparation of the 1982 Application for License. Valuable environmental baseline data records were preserved and are available. In May 1985, APA concluded that substantial benefits would be realized with modification of the construction plan to three, as opposed to the two stages proposed in the 1983 Final Application. Harza/Ebasco prepared a revised Draft Amendment to Application (1985 Draft Application). In 1986 the APA abandoned its pursuit of a FERC license for numerous reasons including financial feasibility.

In 2008, the Alaska State Legislature authorized the AEA to perform an update of the project. That authorization included preparation of an Integrated Resource Plan for the Railbelt (Railbelt IRP) to evaluate the ability of the Susitna Project and other potential energy sources to meet long term demand in the Railbelt Region. Several alternative schemes for the Susitna Project were evaluated. The scheme addressed in this document focuses on a Low Watana non-expandable 700-ft high dam with gross head of 557-ft; a powerhouse containing four turbine/generator units @ 150 MW each for a total installed capacity of 600 MW; reservoir with a maximum pool elevation at 2014-ft EL / minimum pool at 1850-ft EL; tailwater at 1457-feet EL; and 2,704,800 acre-ft of usable storage. Water conveyances could include: a 36-foot diameter, 3,700-foot long diversion tunnel; and a 1,500-foot long tailrace tunnel. Access options to the site, determination of whether it would be a surface powerhouse set on the south river bank (left bank) or an underground powerhouse and final project layout are under investigation and would be the subject of a separate report.

A separate detailed report, Low Watana RCC Concept, will present options for AEA's consideration, including final project layout and description and access options to the site.

2. REGULATORY PROCESS

2.1 Federal Energy Regulatory Commission Licensing

Pursuant to the Federal Power Act (FPA), as amended, the Federal Energy Regulatory Commission (FERC) has exclusive authority to issue licenses for most non-federal hydropower Projects located on navigable waterways or federal lands, or connected to the interstate electric grid.

FERC may issue an original license for up to 50 years for constructing, operating, and maintaining jurisdictional projects. When a license expires, FERC can issue a new license (relicense) to either the existing licensee or a new licensee for a period of 30 to 50 years.

2.1.1 *FERC's Hydropower Licensing Process & Role of State & Federal Resource Agencies*

- **FERC's Licensing Process Options**

Applicants may propose to use one of three options during pre-filing: the integrated (ILP), alternative (ALP), or traditional (TLP) licensing process. The default is the ILP. If an Applicant wishes to use the ALP or TLP process, the Applicant must file a request with the FERC to receive approval; a detailed supporting statement is required to explain why the ILP would not be appropriate. Options include:

- ♦ ILP – FERC Staff is involved on a sustained basis throughout the licensing process. FERC and NEPA requirements are merged. FERC maintains control over the schedule.
- ♦ ALP – NEPA Scoping is done concurrent with preparation of the application; FERC Staff is advisory in nature. Schedule is designed by Participants in the ALP.
- ♦ TLP – FERC Staff conducts NEPA Scoping after an application is accepted for filing; minimal FERC Staff involvement during the pre-filing consultation process. NOTE: TDX initially requested authorization to use the TLP, but has withdrawn that request.

- **Shared Authority in Development of License Terms & Conditions**

FERC's authority to serve as a "one-stop shop", as was the case in 1983 when the License Application for the Susitna Project was filed and in 1985 when the Amendment Application was underway, was significantly limited by Congress in 1986 when the Federal Power Act (FPA) was amended by the Electric Consumers Projection Act (ECPA), amending the FPA, including a new Section 10(j) and clarification to Sections 4(e) and 18:

- ♦ New Section 10(j) regarding mandated and recommended terms and conditions submitted by state and federal fish and wildlife agencies, including the US Fish and Wildlife Service (USFWS), National Marine Fisheries Service (NMFS), and state fish and wildlife agencies, in this case the Alaska Department of Fish and Game (ADF&G);
 - Enhanced authority of federal and state resource agencies in submitting conditions to: protect, mitigate and enhance (PM&E measures) fish and wildlife resources and related habitat that might be affected by development, operation, and management of the project. Unless modified, 10(j) recommendations are included in a license
 - Authorized FERC to attempt to resolve a problem if a recommendation is determined inconsistent with the FPA
- ♦ Section 4(e) recommendations submitted by federal land management agencies, including the Forest Service (USFS), USFWS, US Bureau of Land Management (BLM), National Park Service to request modification of a draft 4(e) condition

- FERC can enter into consultation
 - Unless an agency agrees, FERC cannot change these conditions
- ◆ Section 18 mandated fishways submitted by the US Fish & Wildlife Service (USFWS) and the National Marine Fisheries Service (NMFS).
 - FERC can enter into consultation
 - Unless an agency agrees, FERC must accept fishways as submitted.
- ◆ FERC is prohibited from issuing licenses to proposed projects that would be located in, or affect, National Parks, Wilderness Areas; or projects that would affect rivers and stream segments protected under the national Wild & Scenic Rivers Act

- Consultations & Related Documents

Applicants for license are required to conduct comprehensive pre-filing consultations with the federal and state resource agencies. These consultations include:

- ◆ Host Joint Public/Agency Meetings & Site Visit to discuss proposed Project and potential environmental effects associated with construction and operation.
- ◆ Identify resource issues and prepare study plans. Review study results
- ◆ Provide Draft Application for pre-filing review and comments
- ◆ Review comments on Draft Application
- ◆ Discuss potential PM&E recommended & mandated measures with agencies and other participants; develop comprehensive Resource Management Plan that includes how measures
- ◆ Participate in consultations pursuant to 10(j) to attempt to resolve any disagreements

- Settlement Agreements

FERC generally supports use of a Settlement Agreement to address complex issues and present proposed measures to be considered by the FERC. The above noted Resource Management Plan would serve as the basis a potential Settlement Agreement.

- Filing Requirements

FERC encourages the use of electronic filing. If an applicant desires to file paper copies, an Original and eight copies are required to be filed with the Office of the Secretary

- Post-Filing Process

Once filed, the Application is docketed. FERC Staff (Staff) review for adequacy with the regulations and determine acceptance for filing. Staff may request additional information. Once found adequate, FERC issues a Notice of the filing. Staff reviews environmental information. Staff can request additional studies at this stage, and/or request additional information. Once adequate environmental information is filed, FERC issues a Notice that the Application is ready for Environmental Analysis and requests resource agencies provide final recommended and mandated terms and conditions. Each of these Notices provides opportunity for any person, agency, or organization to file an Intervention. Following receipt of all information that Staff deem necessary to complete analysis, Staff prepares a recommendation for Commission action.

- Post Issuance of a FERC Order

Any person, agency or organization may request rehearing. If no such requests are filed, the License Order is deemed final within 30 days of issuance

2.1.2 Role of Tribal Organizations

While there are no “Indian Tribes” that would be affected, the FERC does recognize Alaska Native Corporations. When an Application for Preliminary Permit or License is filed with FERC, the FERC advises all Alaska Native Tribal Corporations and other Alaska Native organizations of the proceeding and invites their participation. FERC has established a Tribal Liaison Officer.

2.2 Federal & State Authorities, Approvals & Permits

2.2.1 Federal Energy Regulatory Commission

While the FERC does not have direct authority in issuance of below identified approvals & permits, the FERC does have the responsibility to participate in consultations with federal agencies regarding recommended and/or mandated measures that are proposed to be included in a FERC-issued license.

2.2.2 Fish and Wildlife Agencies

As noted above, the ADF&G, USFWS and NMFS may submit PM&E measures under Section 10(j) of the FPA regarding fish and wildlife and related habitat affected by a proposed Project. The 10(j) process affords an Applicant the opportunity to attempt to negotiate these PM&E measures, and FERC may elect to not include measures if they are inconsistent with the FPA. 10(j) PM&E measures are included as terms and conditions of a FERC License. Both proposed projects, Chakachamna Project and the Susitna / Low Watana Project, would be affected by 10(j) PM&E measures.

USFWS and NMFS may submit mandatory requirements for fishways under Section 18 of the FPA. Fishways has a broad definition and includes up- and down-stream passage, flow necessary to implement measures, and protection of invertebrates. The proposed Chakachamna Project includes significant proposed up-and down-stream fish passage facilities.

Pursuant to the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act), Applicants for FERC license must document any essential fish habitat (EFH) that may be affected by the project and address each managed species and life stage for which EFH was designated.

Pursuant to the Endangered Species Act (ESA), Applicants must describe the process used to address project effects on federally listed or proposed species in the project vicinity and summarize any anticipated environmental effects on these species. Pursuant to Section 7 of the ESA, Applicants are required to enter into consultation regarding any such effects.

2.2.3 Federal Land Management Agencies

The BLM, USFS, NPS, USFWS and other Federal land managers are authorized under Section 4(e) of the FPA to submit mandatory PM&E measures addressing potential project-related effects on federal lands and associated resources. Applicants are required to include a description in the vicinity of a proposed project boundary that is designated as wilderness areas under the Wilderness Act. The Lake Clark National Park is located adjacent to the proposed Chakachamna Project.

2.2.4 State Water Quality Agencies

As of November 2010, the State of Alaska does not implement Section 401 of the Clean Water Act that enables state water quality agencies to mandate terms and conditions in a FERC license.

2.2.5 State Historic Preservation Officer

Section 106 of the National Historic Preservation Act (NHPA) requires an Applicant to document efforts to identify archaeological, cultural and/or historic properties eligible for listing on the National Register of Historic Places. If there would be an adverse effect of such properties, the Applicant is required to prepare a management plan that includes PM&E measures. The Applicant must include documentation of consultation with the State Historic Preservation Officer (SHPO) or, in the case of Tribal properties, the

Tribal Historic Preservation Officer (THPO), and, in the case of an action affecting National Parks, the National Park Service.

3. ENGINEERING ISSUES

R&M Consultants, Inc., Hatch Associates Consultants, Inc., and Jack Linard Consulting are preparing a report “Low Watana RCC Concept” that will discuss updated options for Low Watana and will provide that report to AEA later this month. The following information was gleaned from existing documents. Please also see Table 2 Development Schedule Comparison.

3.1 Chakachamna Project

- Site Access

The proposed Project is located in close proximity to the Lake Clark National Park and the Trading Bay Refuge; this could affect the FERC licensing, approval and permitting process. Approximately 55 miles of new access roads and 42 miles of new transmission lines traversing over miles of challenging terrain would be needed to develop the Project and deliver energy to the load center from its remote location. There is anecdotal evidence (Hatch 2008) that roads have been pioneered in the Tyonek-Chaka area. There are also two bridges that would be required at Straight Creek and the Chakachatna River. Once licensed, Project access would require 2 years to construct.

- Geologic Site Conditions / Geotechnical Risk

TDX Power in its Preliminary Application Document (PAD) dated July 2009, stated that “A comprehensive geotechnical investigation program would be undertaken as part of the feasibility study...” We note that TDX is in its second FERC Permit and do not understand why a feasibility study has not already been prepared.

Notwithstanding the above observation, an exploratory program is needed to better define the extensive underground civil works proposed for inclusion in the Project. These works include: proposed 10.8-mile long, 21-foot diameter hard-rock tunnel that would cross faulted zones along the route, and the route would not be self-supporting (TDX Power July 2009); proposed underground cavern-type powerhouse, approximately 60-feet wide by 200-feet long housing three vertical axis Francis units; proposed 1,000-foot long tailrace tunnel; proposed 21-foot diameter 13,800-foot-long tunnel housing separate juvenile and adult fish passage channels.

During tunnel construction there are several situations that could pose problems: presence of very hard rock along tunnel alignment – more than 35,000 psi; potential to “hit bad rock”; anticipated numerous geological fault zones along the tunnel alignment; and, a semi-active fault located 4500-feet from powerhouse.

Active volcano near intake location may present barrier to access. Nearby glaciers and potential for avalanche danger

- Equipment Procurement

TDX states that the power tunnel would be excavated with Tunnel Boring Machines (TBMs) and since the bored surface would be relatively smooth, with small head losses, the tunnel would be unlined over most of its length. (TDX Power July 2009).

We note the 14 – 16 month lead time to procure and have TBMs delivered to site. This procurement would be on the Critical Path for the Project.

Generation Equipment: Ordering turbine/generator units would not be expected to vary among the two projects.

- Fish Passage Facilities

TDX proposes to construct a 21-foot-diameter, 13,800-foot-long tunnel housing separate juvenile and adult fish passage channels extending from Chakachamna Lake to Chakachamna River; and a fish ladder at Chakachamna Lake outlet control weir with a pool-and-chute fishway at the flow-control weir to facilitate upstream fish passage to the lake. TDX stated in its July 2009 that it had reviewed alternative concepts and selected a proposal that represents TDX's most current thinking about the "best way to balance project economics with fish passage considerations." TDX presented several questions that TDX would consider during the formal study process. In their PAD.

"Informal information from NMFS fish passage experts in the Northwest region suggests that the current fish passage designs will not work, and that it is likely that no system will guarantee that anadromous fish migrating to and through the lake will not be reduced in numbers or even extirpated." (Jim Ferguson, Ph.D.)

Uncertainty regarding resource agency approval of the TDX proposal and the related potential delay in License issuance may affect the overall Project schedule.

- Project Transmission

Two 42-mile long 230 kV transmission lines would be constructed from the powerhouse to Chugach Electric Association's (CEA) Beluga substation. Currently there is no excess outbound capacity from the Beluga substation and this substation would be nearing the end of its useful life at the time that TDX currently estimates the Chakachamna Project would be coming online. TDX states that it would be able to reach an agreement with CEA for an interconnection.

TDX states that if excess transmission capacity does not become available, or an agreement with CEA cannot be reached that an alternative route would be considered. TDX states that "Detailed transmission line design, including loss calculations, has not yet been completed." (TDX July 2009)

There is no reference to the Railbelt Integrated Resource Plan (IRP), and how the Project would be interconnected. The Project transmission line would be considered a "primary line" pursuant to Part I of the Federal Power Act (FPA) and would be under the jurisdiction of the FERC in the hydropower licensing arena, but not jurisdictional under Part II of the FPA in that the State of Alaska is not currently interconnected in interstate commerce.

- Project Construction Schedule

There may be a potential delay in receiving authority to access the site to commence construction. (B. Carey communication) The Project would require a 5.5 year construction schedule due to significant underground work, with higher risk profile and greater uncertainty.

Under the FPA and the FERC regulations, construction is required to commence within two years of license issuance. A Licensee may be granted one two-year extension based on the merit of the request.

Estimated project construction schedule has a higher risk of extending beyond 14.5 years.

3.2 Susitna / Low Watana Project

- Site Access

Site access options under consideration include pioneer and permanent roads, helicopter pads and/or an airport, and bridges. The 1985 Amendment to the Application envisioned a "44-mile road running south from about mile 23 of the Denali Highway (Milepost 112) to the Watana site..." (APA November 1995).

The final selection for an overall site access plan would be developed during Final Feasibility and would be addressed in the Application for License.

- Geologic Site Conditions

Significant geotechnical investigations were performed in the 1980's and the results provided in the 1983 Application for License.

- Equipment Procurement

Construction: Unlike Chakachamna, the proposed Susitna / Low Watana Project would not require a TBM. There are no other long-lead time requirements to commence construction.

Generation Equipment: Ordering turbine/generator units would not be expected to vary among the two projects.

- Project Transmission

The 1985 Amendment proposed that power would be transmitted from the Project via power lines to a substation to be built at Gold Creek, about 37 air-miles east-southeast of the Watana site. At that point the existing Anchorage-Fairbanks Intertie would transmit power to the two major Railbelt population centers with appropriate upgrading of the Railbelt system.

This line, like the line from Chakachamna to a point of retail service or interconnection is jurisdictional to the FERC as a "primary line" under Part I of the FPA and the FERC hydropower licensing program, but is not jurisdictional under Part II as the State of Alaska is not interconnected in interstate commerce. Recommend evaluation of the "fit" of the 600 MW Susitna / Low Watana Project to the Railbelt IRP in future studies.

- Construction Schedule

There are more surface features and work carries more schedule certainty and less risk.

Compared to Chakachamna, with an anticipated schedule extending over 14 – 15 years, the Susitna / Low Watana estimated schedule has a lower risk of extending beyond 11 total years.

4. ENVIRONMENTAL ISSUES

The following discussion of the two projects includes lists of potential issues that are discussed in Table 1 – Resource Comparison and we refer the reader to this attached table.

4.1 Chakachamna Project

4.1.1 Overview

The Chakachamna Project was studied in the early 1980's, baseline information was collected and detailed information from those investigations is provided in TDX's Pre-Application Document (PAD) filed with the FERC on July 17, 2009. TDX extracted information acquired by researchers during 1981 as presented in the Bechtel 1983 Report. TDX acknowledges in its June 2009 PAD that "The Project is somewhat unique in that there is little resource information currently available for the project area." The PAD included a comprehensive studies program. TDX withdrew the PAD on September 21, 2009 stating that the PAD and NOI would be updated and resubmitted in 2010. TDX stated that it would implement a field season in 2010 prior to initiation of the formal licensing process in order to begin key baseline studies identified in the PAD as "Phase 1" studies agencies in February 2010 and that formal study plan would commence in the fall of 2010.

A review of the FERC Docket for the proceeding and a visit to the TDX website indicate that no action has been taken to further the environmental studies program.

4.1.2 Issues Discussion

Table 1 – Resource Comparison, and attached to and made part of this Report provides an overview of environmental issues that are required to be addressed in preparing an Application for License. One of the key aspects of developing studies to address environmental and other social resources that may be

affected by a licensing proceeding is that an Applicant is required to develop studies to address identified issues in consultation with federal and state agencies, and Alaska Native Organizations.

We refer the reader to Table 1 to clearly understand the resources, issues, and requirements going forward. A major problem identified is the lack of any current studies despite TDX holding an initial FERC Preliminary Permit and no studies being performed during that period. TDX now holds a second FERC Permit and no evidence of studies is available.

Key resources for the Chakachamna Project include:

- Surface Water – Cross-basin transfer; potential impacts of reservoir management on National Park and Wilderness Area; Kenibuna Lake, and resulting changes in lakes operation
- Wetlands – effect on wetlands within Game Refuge
- Geology & Soils: Avalanche & Volcano Risks – Mt. Spurr, an active volcano, located adjacent to the project
- Anadromous Fish – potential impacts to aquatic resources, including significant habitat for sockeye; fish passage into and out of the reservoir
- Fish Passage – Major concern regarding anadromous and resident fish use of Chakachamna Lake and tributaries to the lake
- Mammals – Grizzly bear, black bear use the area; calving grounds for moose
- Birds – Nesting sites for bald eagles and trumpeter swans; migratory bird use of the area
- Threatened and Endangered Species – Beluga whale and harbour seal are listed by the State as Species of Special Concern
- Land Use – Competing interests would need to be addressed
- Protected Lands – Lake Clark National Park and Wilderness at Chackamna Lake; and effect on Trading Bay State Game Refuge near McArthur and Chakachatna River deltas
- Archaeological, Cultural & Historic Resources – Area has not been studied
- Recreation – potential effect on National Park & Wilderness Area; and, Trading Bay State Game Refuge

4.2 Susitna / Low Watana Project

4.2.1 Overview

The Susitna (Low Watana) Hydroelectric Project, studies performed in support of the 1983 Final Application for License and the revisions to the project description discussed in the 1985 Draft License Application, are significant, extensive, valid and relevant to the proposed modifications to the earlier proposed project. Existing engineering reports, including detailed geotechnical and geological aspects, that would be required to support an Application for License at the Low Watana site; and existing environmental reports that comprise the Exhibit E for the 1983 and 1985 FERC applications include comprehensive descriptions of the baseline environment; discussion of potential effects associated with construction and operation of the then-proposed project; and also provide proposed mitigation plans for each resource category. Baseline environmental descriptions, supported by study reports, and information regarding potential measures to protect, mitigate, and enhance any resources that might be affected by construction and long-term operation of a proposed hydroelectric project would be useful in preparing the required Preliminary Application Document, and the Application for Original License; and in conducting required consultation with the resource agencies, Native Alaskan organizations, and other interested persons and organizations.

4.2.2 Issues Discussion

Table 1 – Resource Comparison, and attached to and made part of this Report provides an overview of environmental issues that are required to be addressed in preparing an Application for License. One of the key aspects of developing studies to address environmental and other social resources that may be affected by a licensing proceeding is that an Applicant is required to develop studies to address identified issues in consultation with federal and state agencies, and Alaska Native Organizations.

We refer the reader to Table 1 to clearly understand the resources, issues, and requirements going forward. The environmental studies were performed in 1981 - 83 in support of the Original Application for License and reviewed again in 1985 when the Susitna Project was revisited. As with the rest of this Report, we have extracted information from the earlier licensing proceedings that were relevant to the Watana development. We note that these earlier studies provide a comprehensive description of the baseline environment presented in the framework for an Application for License.

Key resources for the Susitna / Low Watana Project include:

- Surface Water - Effects of impoundment alteration on water quality; and effects of seasonal alteration in flows on downstream channel morphology
- Anadromous Fish – effects on downstream main-stem Susitna habitat, including over-winter use; and effects of seasonal and daily alteration in flow due to project operation. While fish passage is not likely to be an issue, minimum flow release to sustain the downstream fishery would be of interest to the agencies
- Resident Fish – effects on Arctic Grayling
- Mammals – Nelchina Caribou
- Archaeological / Cultural / Historic properties – numerous sites were identified in the area

5. REGULATORY ISSUES – FERC LICENSING & PERMITTING

Please also see Section 2 of this Report for a detailed presentation of the various agencies and their authorities who would shape the content of any issued license.

5.1 Chakachamna Project

5.1.1 Overview

TDX received its first Preliminary Permit on November 14, 2006. The purpose of a Preliminary Permit is to reserve priority to conduct studies for a period of three years, and if the effort results in filing an Application for License. A successive (second) permit was issued on February 25, 2010. This permit expires on January 31, 2013. FERC noted in issuing the permit that “a successive permit can warrant a greater standard of Commission oversight.” “If the permittee fails to make significant progress toward developing a license application, the permit may be subject to cancellation.”

On July 17, 2009, TDX filed its Notice of Intent to File an Application for License (NOI), Request to Use a Traditional Licensing Process (TLP), and Pre-Application Document (PAD). By letter dated July 27, 2009, FERC requested that TDX consider which licensing process it wishes to use and to refile its request noting that TDX would not need to refile the PAD. TDX met with FERC on August 5, 2009 to discuss the proceeding. On September 21, 2009, TDX requested to rescind its PAD. TDX stated that “this Project may be best served by an Integrated Licensing Process (ILP). TDX stated its intent to implement a field season in 2010 and to hold a study plan review and workshop in February 2010. TDX has a website for the Project and there is no evidence that work is proceeding as noted in their September 21, 2009, correspondence to the FERC. Nor has any further information been filed with the Commission. Under TDX’s current development schedule, a third FERC Permit would be necessary.

5.1.2 Licensing Schedule

Table 2 shows a Licensing, Engineering and Construction Schedule Comparison for the two projects; for Chakachamna, based on available information the FERC Schedule, once TDX restarts the pre-filing process could be:

- Prepare and File Final Application for License – 4.5 years
- FERC Processing and License Issuance – 2.5 years

5.2 Susitna / Low Watana Project

5.2.1 Overview

At present, there is no FERC Preliminary Permit in effect. While a FERC Permit is not required, it would be prudent for an entity representing the State to secure priority to study the Project. As discussed above, the Alaska Power Authority (APA), now known as AEA prepared and filed an application for license in February 1983. That application was withdrawn and APA revised the Project schedule to realize benefits identified with a three, as opposed to two-year construction schedule in 1985. In 1986, APA abandoned pursuit of a FERC license for numerous reasons, including financial feasibility.

In 2008, AEA began an update of the project, including preparation of the Railbelt IRP to evaluate the ability of the Susitna Project, and other resources, to meet long term demand in the Railbelt Region. An engineering assessment of a Low Watana RCC Concept is currently underway and information in this Report is based on an understanding that this concept would be the preferred option moving forward.

5.2.2 Licensing Schedule

Table 2 shows a Licensing, Engineering and Construction Schedule Comparison for the two projects; for Susitna / Low Watana, the FERC Schedule, based on information available at this time, the FERC schedule could be:

- Prepare and File Final Application for License – 3.5 years
- FERC Processing and License Issuance – 2 years

6. TOTAL PROJECT DEVELOPMENT TIMEFRAME

Table 2 provides a Development Schedule Comparison for the two projects. Based on information available at this time, the comparative total schedule from start of the FERC process, in the case of the Chakachamna a restart of their pre-filing process, could be:

MAJOR TASK	CHAKACHAMANA	SUSITNA-LOW WATANA
FERC Pre-filing Process*	4.5 years	3.5 years
FERC Processing – DC	2.5 years	2.0 years
FERC Processing - Portland	2.0 years	1.0 years
Construction through Start-up	5.5 years	4.5 years
TOTALS	14.5 YEARS	11 YEARS

7. REFERENCES

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ALASKA ENERGY AUTHORITY
LARGE HYDRO PRELIMINARY EVALUATION
CHAKACHAMNA PROJECT
SUSITNA / LOW WATANA PROJECT

TABLE 1 – RESOURCE COMPARISON

This table presents a summary of the comparative challenges of developing the Chakachamna and Susitna (Low Watana) Hydroelectric Projects. This format enables the reader to quickly grasp the issues that would be confronted by an entity seeking to license either project. A companion table, Table 2 – Licensing, Engineering and Construction Schedule Comparison shows the major tasks associated with hydro development and an estimated preliminary schedule to complete the regulatory process, construct the project, and bring the project on-line. This table provides information in four major sections:

- Regulatory
- Environmental
- Engineering
- Construction

Resource	Agency/ Org/ Auth.	Chakachamna Hydroelectric Project		Susitna /Low Watana Hydroelectric Project	
		Issue	Notes / Requirements	Issue	Notes / Requirements
Regulatory					
FERC License	FERC	<ul style="list-style-type: none">• First Preliminary Permit issued to TDX for FERC No. 12660 on November 14, 2006.• Preliminary Application Document (PAD) filed in June 2009 and later was withdrawn• No evidence of studies plan approved by agencies, and no studies reports filed in docket.	<ul style="list-style-type: none">• Third preliminary permit would be necessary under current development schedule	<ul style="list-style-type: none">• 1983 Application for License Filed with FERC• 1985 Application Amendment not Filed• No preliminary permit applied for or issued• No FERC licensing process underway	<ul style="list-style-type: none">• Information from the 1983 Application and 1985 Amendment provide significant baseline information and would provide basis for Preliminary Application Document (PAD)• State cannot be project licensee absent legislative action

Resource	Agency/ Org/ Auth.	Chakachamna Hydroelectric Project		Susitna /Low Watana Hydroelectric Project	
		Issue	Notes / Requirements	Issue	Notes / Requirements
		<ul style="list-style-type: none"> • A successive (second) permit was issued on February 25, 2010, and it expires January 31, 2013 • TDX had advised FERC it would hold a meeting with agencies in February 2010 and start studies following agency review of study plans. This did not happen. 			
Project Baseline Data	NA	<ul style="list-style-type: none"> • Project data dates to 1982 (Battelle) and 1983 (Bechtel) • Relevance of project data assessed in 2008 (Hatch and NES) • Studies proposed to be initiated in 2011. 	<ul style="list-style-type: none"> • Environmental studies need to be updated or conducted • Significant geotechnical investigations would be necessary for design, prior to and during construction 	<ul style="list-style-type: none"> • Project data dates to 1980 – 1985. • Baseline data is relevant to preparation of a FERC Application. 	<ul style="list-style-type: none"> • Significant, extensive and valid environmental studies performed in 1980's, provide baseline to be updated • Significant geotechnical investigations previously provide baseline
Regulatory Schedule	NA	<ul style="list-style-type: none"> • Estimated 7 years to FERC license issuance • Higher risk that schedule would extend beyond 7 years 	<ul style="list-style-type: none"> • Assumes comprehensive studies program would be underway in 2011 	<ul style="list-style-type: none"> • Estimated 5.5 years to FERC license issuance • Lower risk that schedule would extend beyond 5.5 years 	<ul style="list-style-type: none"> • Assumes licensing process would begin in 2011
Environmental					
<i>Climate, Hydrology, Water, and Geology / Soils</i>					
Climate & Hydrology	FWS NMFS ADF&G	<ul style="list-style-type: none"> • USGS gaging record at site – 11 years of data • FERC now requires assessment of GHG & climate change 	<ul style="list-style-type: none"> • Hydrology information from 1981 Bechtel investigations. Need to better understand hydrology and 	<ul style="list-style-type: none"> • USGS gaging record at site – 34 years of data • FERC now requires assessment of GHG & climate change 	<ul style="list-style-type: none"> • Hydrology information from 1983 Application. Need to better understand hydrology and supplement with gages

Resource	Agency/ Org/ Auth.	Chakachamna Hydroelectric Project		Susitna /Low Watana Hydroelectric Project	
		Issue	Notes / Requirements	Issue	Notes / Requirements
			supplement with gages noted below at surface water discussion <ul style="list-style-type: none"> EPA has tool to assist in estimation of avoided GHG 		noted below at surface water discussion <ul style="list-style-type: none"> EPA has tool to assist in estimation of avoided GHG
Surface Water	FWS NMFS ADF&G	<ul style="list-style-type: none"> Cross-basin transfer from Chakachamna Lake to powerhouse location on McArthur River Potential impacts within Chakachamna and Kenibuna Lakes and Lake Tributaries resulting from reservoir management & Outflow to power tunnel USGS gage at the Chakachamna Lake outlet provided 11 years of monthly data from June 1959 to August 1971. Synthetic hydrology was used to create a longer period of record. Change in Lake operation and cross-basin transfer would change river temperature 	<ul style="list-style-type: none"> Potential effects on National Park and Wilderness Area due to nature of Chakachamna and Kenibuna Lakes & Tributaries The FERC regulation requires at least 2 years of current data. Stream gages should be installed and water temperature recording should be conducted. Studies to determine change in the water column – physical, biological, & chemical should be conducted. 	<ul style="list-style-type: none"> Effects of impoundment alteration on water quality (temperature, suspended sediment). Effects of seasonal alteration in flows on downstream channel morphology 	<ul style="list-style-type: none"> Stream gages required to collect current record – note FERC requirement for at least 2 years of current data. Stream gages should be installed and water temperature recording should be conducted. Studies to determine change in the water column – physical, biological & chemical should be conducted.
Wetlands / Groundwater	FWS ADF&G	<ul style="list-style-type: none"> Transfer of water from Chakachamna to McArthur River & effect on wetland habitats within & adjacent to Game Refuge Area is extremely 	<ul style="list-style-type: none"> Wetland delineation would be required Consultation regarding any effects on the adjacent Game Refuge would be required This complexity would 	<ul style="list-style-type: none"> Effects on groundwater regimes and resultant effects on upwelling in downstream side-stream spawning habitats 	<ul style="list-style-type: none"> Would require evaluation of extent Susitna Low/Watana would effect downstream waterways

Resource	Agency/ Org/ Auth.	Chakachamna Hydroelectric Project		Susitna /Low Watana Hydroelectric Project	
		Issue	Notes / Requirements	Issue	Notes / Requirements
		complex, with numerous channels and large areas affected by groundwater flow	likely lead resource agencies to request 3 – 5 years of studies, and years of ongoing studies once project is operational		
Geology / Soils: Avalanche & Volcano Risks		<ul style="list-style-type: none"> • Mt. Spurr located adjacent to project site • Potential seismic activity • Lack of detailed topographic surveys and mapping • Lack of geological mapping information available: bedrock structures along tunnel alignment • Lack of detailed geotechnical investigations • Potential effects/risk of nearby volcanic eruption and related mud slides • Potential effects/risk of snow hazard / avalanche 	<ul style="list-style-type: none"> • Comprehensive geotechnical investigations would be necessary for design, prior to and during construction • Program should evaluate nature of selected geological faults along the tunnel alignment and also provide fundamental data on rock strength, mineralogy, and abrasivity for tunnel design purposes • Seismic refraction investigations should be performed at the powerhouse area • Subsurface drilling recommended at powerhouse location 	<ul style="list-style-type: none"> • Detailed topographic surveys and mapping available, • Potential seismic activity • Geological mapping available – may require site-specific confirmation • Detailed geotechnical investigations available 	<ul style="list-style-type: none"> • Would require analysis of effects; confirm relevance of existing data and update if required
Aquatic					
Anadromous Fish	FWS NMFS ADF&G	<ul style="list-style-type: none"> • All five of the North American Pacific salmon species were present in the general vicinity of the project area and spawn in both rivers, including side channels and sloughs. 	<ul style="list-style-type: none"> • Baseline information used in PAD would need to be updated • Extensive studies program would be required and would extend over multiple years 	<ul style="list-style-type: none"> • Fishery resources in the Susitna River comprise a major portion of the Cook Inlet commercial salmon harvest and provide an important sport fishery. • Chinook, coho, chum, 	<ul style="list-style-type: none"> • Detailed information, including proposed PM&E measures, is available in the 1983 APA Application; and summarized in the 1985 APA Amendment • Field investigations to

Resource	Agency/ Org/ Auth.	Chakachamna Hydroelectric Project		Susitna /Low Watana Hydroelectric Project	
		Issue	Notes / Requirements	Issue	Notes / Requirements
		<p>Lampreys may be present in both rivers.</p> <ul style="list-style-type: none"> • Sockeye salmon utilize Lake Chakachamna and tributaries to the lake. Dolly Varden char are also present in the lake and tributaries; some of these Dolly Varden may be anadromous. It is possible that Coho salmon utilize the same habitat, but their presence has not been established. • Sockeye salmon may be the most prevalent in both Chakachamna and McArthur Rivers as well as upper tributaries of Chakachamna Lake. One known sockeye salmon spawning tributary to Chakachamna Lake lies within the Lake Clark National Park Wilderness Area. • Very little is known about existing fish habitat populations and distribution in lower Chakachamna River channels and tributaries, Lake Chakachamna and its tributaries, and the McArthur River. 	<p>as the habitat is extensive and complex, particularly in the lower Chakachamna River</p> <ul style="list-style-type: none"> • Presence of sockeye salmon spawning habitat in a tributary to Chakachamna Lake within the Lake Clark National Park Wilderness Area and connectivity needs to be clearly defined. • Need to apply for a Fish Habitat Permit 	<p>sockeye, and pink salmon and eulachon and Bering cisco present in vicinity.</p> <ul style="list-style-type: none"> • Effects on downstream main-stem Susitna habitat, including over-winter use of the main-stem river. • Effects of seasonal and daily alteration in flows due to project operation on movement of fish through the system and on spawning and rearing in the main-stem river, side channels, and tributary streams. 	<p>confirm information would be required</p> <ul style="list-style-type: none"> • Fish Habitat Permit required • Update PM&E measures through consultation with resource agencies.

Resource	Agency/ Org/ Auth.	Chakachamna Hydroelectric Project		Susitna /Low Watana Hydroelectric Project	
		Issue	Notes / Requirements	Issue	Notes / Requirements
		<ul style="list-style-type: none"> • Potential impacts to aquatic resources within Chakachamna and Kenibuna Lakes and Lake Tributaries resulting from reservoir management and outflow of water to power tunnel • Effect on fish spawning and rearing and habitat in Chakachamna Lake • Effect on fish habitat (spawning, rearing, over wintering) in mainstem Chakachamna and McArthur Rivers;and in side channels, sloughs, wetlands, and tributaries • Straight Creek provides important spawning habitat for King Salmon. • False attraction of Chachtna River salmon to the McArthur River expected to occur; not clear how this issue would be resolved • Potential entrainment 			
Resident Fish	FWS NMFS ADF&G	<ul style="list-style-type: none"> • Lake trout found only in Chakachamna Lake. Chakachamna Lake also supports populations of resident Dolly Varden and round whitefish. • Both drainages supported 	<ul style="list-style-type: none"> • Studies would need to be updated / conducted • Need to apply for a Fish Habitat Permit 	<ul style="list-style-type: none"> • Arctic Grayling dominant species upstream from Devils Canyon site • Rainbow trout and Dolly Varden were recorded at mouths of tributary streams 	<ul style="list-style-type: none"> • Detailed information, including proposed PM&E measures is available in the 1983 APA Application; and summarized in the 1985 APA Amendment • Field investigations to

Resource	Agency/ Org/ Auth.	Chakachamna Hydroelectric Project		Susitna /Low Watana Hydroelectric Project	
		Issue	Notes / Requirements	Issue	Notes / Requirements
		Dolly Varden with rainbow trout in the lower reaches.			confirm information and assess effects of impoundment on grayling populations above Watana; and other resident species in downstream affected habitat would be required <ul style="list-style-type: none"> • Fish Habitat Permit required • Update PM&E measures through consultation with resource agencies
Reservoir Level & Instream Flow	FWS NMFS ADF&G	<ul style="list-style-type: none"> • Reservoir level changes could affect fish access to inlet streams, and could affect the level of Lake Kenibuna and, thus, access of salmon and Dolly Varden to tributary streams • Upper end of Lake Kenibuna and streams that flow into it are within Lake Clark National Park Wilderness Area 	<ul style="list-style-type: none"> • Connectivity between Lake Chakachamna and Lake Kenibuna • Determining instream flow release quantity and timing for Chakachamna River to maintain fish & wildlife would require extensive flow, groundwater, and temperature studies. 	<ul style="list-style-type: none"> • Instream flows and temperatures in lower Susitna River were studied in previous licensing effort 	<ul style="list-style-type: none"> • Greater study of off-channel habitat would be required • Project design has changed; flow releases appropriate to Low Watana and other alternatives would need to be assessed.
Fish Passage	FWS NMFS ADF&G	<ul style="list-style-type: none"> • Sockeye salmon utilize Chakachamna Lake and tributaries to the lake • 1983 Bechtel studies included a fish ladder and a 1.6 mile long tunnel in the right rock abutment. • Fish passage into and out of the reservoir would 	<ul style="list-style-type: none"> • Need to redesign – informal information from NMFS suggests that current design would not work; and, it is likely that no system would guarantee that fish migrating to and through the lake would not be 	<ul style="list-style-type: none"> • Expect that fish passage would not be a requirement • Fish passage to and from spawning and rearing areas in the lower Susitna drainage would be an important issue. Instream flows would need to be sufficient to allow access by 	<ul style="list-style-type: none"> • Confirm expectation

Resource	Agency/ Org/ Auth.	Chakachamna Hydroelectric Project		Susitna /Low Watana Hydroelectric Project	
		Issue	Notes / Requirements	Issue	Notes / Requirements
		almost certainly be required by the USFWS and NMFS under FPA Section 18, and by ADF&G under T16 S841	reduced, or even extirpated	spawning salmon to the river and the important off-channel habitat connected to the river, and for smolt out-migration, rearing and resident fish habitat, and egg survival.	
Fish Habitat	FWS NMFS ADF&G	<ul style="list-style-type: none"> • Very little is known about existing fish habitat, populations, and distribution in the lower Chakachamna River channels and tributaries, Lake Chakachamna and its tributaries, and the McArthur River. 	<ul style="list-style-type: none"> • Extensive studies would be required and would be expensive and lengthy, since the habitat is both extensive and complex, particularly in the lower Chakachamna River. • Existing water temperature in habitat areas throughout the project area would need to be measured. The potential changes in temperature due to changes in instream flows in both watersheds would need to be estimated. • Effects on fish & wildlife habitat and stream temperature of increased instream flows to McArthur River would need to be assessed 	<ul style="list-style-type: none"> • Habitat in the lower Susitna River was studied in the previous licensing process 	<ul style="list-style-type: none"> • Further studies would be necessary, particularly of off-channel habitat and groundwater influences on habitat.
Terrestrial					
Habitat	FWS NMFS ADF&G	<ul style="list-style-type: none"> • The project area is composed of a variety of vegetation types that, individually and collectively 	<ul style="list-style-type: none"> • Studies would need to be reviewed; need to be updated 	<ul style="list-style-type: none"> • Botanical resources in the Susitna watershed make essential contributions to human activities and Land 	<ul style="list-style-type: none"> • Detailed information, including proposed PM&E measures is available in the 1983 APA Application;

Resource	Agency/ Org/ Auth.	Chakachamna Hydroelectric Project		Susitna /Low Watana Hydroelectric Project	
		Issue	Notes / Requirements	Issue	Notes / Requirements
		provide important habitat to species of wildlife throughout the year.		uses: contribute to regional maintenance of surface & ground water quality; provide valuable habitat to species of wildlife	and summarized in the 1985 APA Amendment <ul style="list-style-type: none"> Field investigations to confirm information and assess effects of proposed Low Watana on available habitat Update PM&E measures through consultation with resource agencies
Mammals	FWS ADF&G	<ul style="list-style-type: none"> Brown bear, black bear and moose, and other mammals occur throughout proposed project area. Bear denning areas in both drainages will need to be identified. Calving grounds for moose identified around McArthur River, Middle River (Chaka.) and Noaukta Slough. If anadromous fish utilizing the reservoir and tributaries are negatively impacted, wildlife dependent upon these fish would also be impacted Impact would include wildlife within Lake Clark National Park Wilderness Area Effects on project on wetland complex in Chakachamna River basin 	<ul style="list-style-type: none"> Studies would need to be reviewed, need to be updated Study regarding importance of anadromous fish as food source required Study required on project effects in wetlands 	<ul style="list-style-type: none"> Several species of small mammals are present Big game species include: Moose, caribou, brown bear, & black bear are the most abundant species and are given high priority; Dall sheep, wolf, and wolverine also occur in project area Nelchina Caribou herd importance due to size of herd & proximity to population centers Furbearers include: beaver, marten & muskrat are important to trappers. Important calving & breeding areas Important recreational hunting & subsistence use New reservoir would inundate habitat in upper Susitna River valley Impacts to wildlife in lower 	<ul style="list-style-type: none"> Detailed information, including proposed PM&E measures is available in the 1983 APA Application; and summarized in the 1985 APA Amendment Field investigations to confirm information and assess effects of proposed Low Watana on species and available habitat; and value to recreation & subsistence Update PM&E measures through consultation with resource agencies; likely that resource agencies would request compensatory mitigation for loss of habitat

Resource	Agency/ Org/ Auth.	Chakachamna Hydroelectric Project		Susitna /Low Watana Hydroelectric Project	
		Issue	Notes / Requirements	Issue	Notes / Requirements
		<ul style="list-style-type: none"> • If instream flow decreased, there would be effect on habitat • Increased flows in the McArthur River drainage could have an impact on wildlife, including bear denning areas known to exist along river 		Susitna River would likely be tied to any changes in habitat and fish populations due to changes in instream flow	
Birds	FWS ADF&G	<ul style="list-style-type: none"> • Large expanses of standing water and dense vegetation provide nesting and staging areas for migratory waterfowl and nesting shore and passerine birds. • Nesting sites for bald eagles and trumpeter swans identified • Valuable habitat and use by Migratory birds • If instream flow decreased, there would be effect on habitat 	<ul style="list-style-type: none"> • Studies would need to be reviewed, need to be updated • Wetlands delineation needs to be performed • Assess areas affected by migratory birds • Nesting survey would be required • Surveys needed for water bird nesting in the Chakachamna Lake area. 	<ul style="list-style-type: none"> • Active nesting sites in 1981 included: ravens – nest & breed; bald & golden eagles nest & breed in the area; gyrfalcon nest; goshawk. • Middle Susitna region not appear to be a major migration route for waterbirds 	<ul style="list-style-type: none"> • Studies would need to be reviewed; need to be updated • Nesting survey would be required
Threatened and Endangered Species	FWS NMFS ADF&G	<ul style="list-style-type: none"> • Two species, Beluga whale and harbour seal are listed by the State as Species of Special Concern and have been sighted in Trading Bay. 	<ul style="list-style-type: none"> • No study was performed, sightings are anecdotal. • Need to request list from the USFWS and NMFS re T&E Species • Consult with agencies, NGOs. Study needs to be performed. 	<ul style="list-style-type: none"> • No threatened or endangered species of fish have been identified in Alaska. 	<ul style="list-style-type: none"> • Need to request list from the USFWS and NMFS re T&E species
Lands					
Land Use	Private &	• Timber harvesting, coal	• Original study would	• No roads; several off-road	• Review current land

Resource	Agency/ Org/ Auth.	Chakachamna Hydroelectric Project		Susitna /Low Watana Hydroelectric Project	
		Issue	Notes / Requirements	Issue	Notes / Requirements
	public entities	<p>prospecting and subsistence hunting and fishing in general vicinity.</p> <ul style="list-style-type: none"> • Mining claims along upper McArthur River • Geothermal development proposed nearby 	<p>need to be updated as land use activities may have changed / expanded over 25 years.</p>	<p>vehicle and sled trails.</p> <ul style="list-style-type: none"> • Floatplanes provide principal means of access • Mineral exploration and mining use is limited 	<p>ownership and land use</p>
Land Ownership See also Protected Lands below	AEA / AIDEA Landowner	<ul style="list-style-type: none"> • Area that would be Project Boundary is reserved under Power Site Withdrawal pursuant to FPA • Bechtel report and anecdotal evidence suggests that all land required for power development was withdrawn as a power site by the State of Alaska. • Homesteading along Cook Inlet since original study 	<ul style="list-style-type: none"> • Confirm project boundary, including reservoir and tributaries, transmission line, and access roads • Confirm land ownership within proposed project boundary. 	<ul style="list-style-type: none"> • Area that would be Project Boundary is reserved under Power Site Withdrawal pursuant to FPA • Most of the lands have been selected under the Alaska Native Claims Settlement Act • Lands to the north are managed by the Bureau of Land Management • 	<ul style="list-style-type: none"> • Confirm project boundary, including reservoir and tributaries, transmission line, and access roads • Confirm land ownership within proposed project boundary.
Protected Lands	NPS ADF&G Public entities FERC	<ul style="list-style-type: none"> • Lake Clark National Park & Wilderness Area borders western edge of project boundary, crosses Kenibuna Lake. • Trading Bay State Game Refuge encompasses McArthur and Chakachamna River deltas and Cook Inlet shoreline • Upper end of Lake Kenibuna and streams that flow into it are within the Lake Clark National Park Wilderness Area. 	<ul style="list-style-type: none"> • Study effects of project operations on Kenibuna Lake. • No project facilities sited within Refuge, however need to study effects of project operations on McArthur and Chaka. Rivers • Risk if studies show water bodies within the Park and associated lands would be affected, FERC would decline to license 	<p>• Not Applicable</p>	<p>• Not Applicable</p>

Resource	Agency/ Org/ Auth.	Chakachamna Hydroelectric Project		Susitna /Low Watana Hydroelectric Project	
		Issue	Notes / Requirements	Issue	Notes / Requirements
			project <ul style="list-style-type: none"> Any work in or effects on the Trading Bay State Game Refuge would require a Special Area permit from ADF&G. Trading Bay State Game Refuge plan is on the list of FERC Comprehensive Plans 		

Resource	Agency/ Org/ Auth.	Chakachamna Hydroelectric Project		Susitna /Low Watana Hydroelectric Project	
		Issue	Notes / Requirements	Issue	Notes / Requirements
Other Environmental					
Archaeological / Cultural / Historic	NPS ADNR/ SHPO Native corps Native villages	<ul style="list-style-type: none">• The area has not been well studied.• Archaeological on-the-ground survey should be done prior to construction activities.• 1981 study did not recommend survey of intake/dam area due to the unlikely possibility of any impact to cultural resources resulting from the facilities at Chakachamna Lake.	<ul style="list-style-type: none">• Perform on-the-ground survey of the powerhouse area, and transmission and road alignment(s) after location is selected and the limits of the construction zone determined, but prior to construction.	<ul style="list-style-type: none">• Three field seasons of recon survey and two seasons of systematic testing have been conducted.• 167 sites documented in Project area – another 80 sites may occur in area; 30 sites were identified that would be affected by Watana Dam and its impoundment.• 13 sites were identified along proposed transmission corridors• No Listed Sites were identified, however, most of the sites likely to be significant, and could collectively hold potential to define prehistory for this region of Alaska	<ul style="list-style-type: none">• Review surveys to identify sites that would be within the Area of Project Effect (APE); and potentially eligible for Listing on the National Register.• Complete investigations• Re-initiate consultation with the SHPO
Recreation	NPS Landowner Rec outfitters Native corps	<ul style="list-style-type: none">• Recreation use concentrated toward coast but increasingly into Chakachamna Lake and upper tributaries.• Trading Bay State Game Refuge supports waterfowl hunting• Lake Clark National Park & Wilderness Area borders western edge of project boundary, crosses	<ul style="list-style-type: none">• Original study would need to be updated as recreation activities may have expanded / increases over 25 years.• Recreation Plan would probably be required	<ul style="list-style-type: none">• Middle Susitna River basin has not been developed as a significant recreational resource• Area is immense and isolated, access is difficult, and potential users live great distances away.• Small planes are the most common form of recreational access and use the few gravel airstrips in	<ul style="list-style-type: none">• Survey to determine current recreational use of area would be required• Recreation Plan would probably be required

Resource	Agency/ Org/ Auth.	Chakachamna Hydroelectric Project		Susitna /Low Watana Hydroelectric Project	
		Issue	Notes / Requirements	Issue	Notes / Requirements
		Kenibuna Lake.		<p>the area.</p> <ul style="list-style-type: none"> • Floatplanes land on larger lakes and rivers. • Auto access consists of a few all-terrain vehicular (ATV) trails & rough roads in the settled areas. • Some subsistence use of the area. • No public recreational facilities in study area, except for roadside facilities on the Denali and Parks highways • Some private cabins & commercial lodges in area • Area, when access is not a problem, is used for sport & trophy hunting & fishing. Boating use is south of study area. 	
Socio-economics	Local comm. Native villages Borough	<ul style="list-style-type: none"> • Proposed project has potential to create population, employment, income, infrastructure and subsistence impacts in the Tyonek area. 	<ul style="list-style-type: none"> • Original study would need to be updated as socioeconomic and infrastructure conditions have likely changed over time. 	<ul style="list-style-type: none"> • Middle Susitna Basin is essentially uninhabited. • Potential impacts on nearby small communities • Proposed project has potential to create population, employment, income, infrastructure and subsistence impacts in the project area. • Lands selected under ANCSA throughout the area 	<ul style="list-style-type: none"> • Impact management program is recommended to help optimize project-induced changes for small communities located near construction site & to minimize adverse impacts on workers. • Consultation with land owners regarding use of construction purposes

Resource	Agency/ Org/ Auth.	Chakachamna Hydroelectric Project		Susitna /Low Watana Hydroelectric Project	
		Issue	Notes / Requirements	Issue	Notes / Requirements
Visual / Aesthetic	NPS ADF&G Landowner s	<ul style="list-style-type: none"> Project area generally exists in pristine natural state. Population and development located at or near coastline. Lake Clark National Park boundary extends into Kenibuna Lake. 	<ul style="list-style-type: none"> The “no dam” option under consideration would limit visual impacts at Chakachamna Lake. Visual simulation of powerhouse and transmission line may be required. 	<ul style="list-style-type: none"> Although the Susitna River Basin is not considered to be unusually scenic in comparison to other areas, the aesthetic resources valued due to basin’s location between two major population centers – Anchorage & Fairbanks Basin has distinct and diverse combinations of landforms, waterforms, vegetation, and wildlife species Seasonal changes are dramatic 	<ul style="list-style-type: none"> Review documentation from 1983 Application for License and assess whether major changes have occurred over the years Identify measures to mitigate effect of construction in an undisturbed area close to population centers
Alternative Locations, Designs, and Energy Sources		<ul style="list-style-type: none"> Identify reasonable alternatives to proposed Chakachamna Project Alternative Locations & Designs Alternative Energy Sources 	<ul style="list-style-type: none"> Assessment of reasonable alternatives required by FERC regulation and NEPA process Licensing process currently underway would need to assess Information available from Railbelt IRP 	<ul style="list-style-type: none"> Identify reasonable alternatives to proposed Susitna (Low Watana) Project Alternative Locations & Designs Alternative Energy Sources 	<ul style="list-style-type: none"> Review of Alternatives required by the FERC regulation and NEPA process Detailed studies currently underway would provide information Information available from Railbelt IRP
Engineering					
Geotechnical		<ul style="list-style-type: none"> Very large (25 ft diameter) very long (11.5 mi) power tunnel Limited geotechnical information Proximity to active volcano (Mt. Spurr) Proximity to semi-active Castle Mt. Regional Fault Significant geotechnical investigations would be necessary for design, prior to and during construction 		<ul style="list-style-type: none"> Significant geotechnical investigations performed previously Limited number of geotechnical fault zones to pass through, due to location and short length of tunnels, provided “Fingerbuster” and “Fin” zones are avoided 	

Resource	Agency/ Org/ Auth.	Chakachamna Hydroelectric Project		Susitna /Low Watana Hydroelectric Project	
		Issue	Notes / Requirements	Issue	Notes / Requirements
		<ul style="list-style-type: none">Significant geotechnical investigations would be necessary for design, prior to and during construction			
Transportation / Access	DOTPF Local comm. Native villages Borough	<ul style="list-style-type: none">Resource development in the area may eventually lead to an expansion of existing facilities.Mineral and geothermal investigations and logging roads may have been pioneered since original study (anecdotal evidence)Original study would need to be updated as roads and road use have likely changed over time.Investigate condition of existing port facilities in the Tyonek area.Investigate condition of existing airfields in the project area (Tyonek, Beluga)Access to require 2 years to construct		<ul style="list-style-type: none">Primary access alternative would be from the north along Denali HighwayAlternative access has been considered including a rail only option from the Parks Highway to the west of the projectAccess would require 2 years to construct	
Transmission		<ul style="list-style-type: none">Distance to load center would be 85 miles to Anchorage and 42 miles to Chugach Electric AssociationExisting transmission line from Beluga plant not useful, must be replacedExisting transmission corridor and some tx equip could be used, 42 mi of pioneered transmission corridor		<ul style="list-style-type: none">58 miles of new transmission line would be required to connect to the existing transmission corridor, which would need to be selected, permitted and constructed	
Energy		<ul style="list-style-type: none">Long tunnel (11.5 mi) higher total headloss (loss of energy to friction in tunnelTunnel boring machine is less expensive to construct, but would be rougher than a concrete or steel lined tunnelLong tunnels are more difficult to inspect and maintain and headloss may increase with time		<ul style="list-style-type: none">Tunnels would be significantly shorter with less headloss and are easier to inspect and maintainAlternative dam types (roller compacted concrete) could lead to even shorter tunnels	
Construction					
Access		<ul style="list-style-type: none">Project would be assessable by boat or air. From docking facilities south to Cook Inlet, existing roads would be improved and new access roads would be constructed.Delivery of equipment and construction materials would		<ul style="list-style-type: none">Primary access alternative would be from the north along Denali HighwayAlternative access has been considered, including a rail-only option from Parks Highway to west of project	

Resource	Agency/ Org/ Auth.	Chakachamna Hydroelectric Project		Susitna /Low Watana Hydroelectric Project	
		Issue	Notes / Requirements	Issue	Notes / Requirements
		be by barge to a new dock; access grade to powerhouse would be generally flat. • Access grade to Chakachamna Lake could have grades up to 10%			
Transmission		• Proposed line would convey power to the Beluga Substation or beyond to a substation in Anchorage. Transmission corridor would follow new or existing roads and transmission lines and may include submarine cables for the final 3.5 miles to the substation in Anchorage		• Proposed line would connect to existing substation at Gold Creek, where it connects to major transmission connection between Anchorage and Fairbanks	
Construction		<ul style="list-style-type: none"> • Large power tunnel – 25 ft • Very long power tunnel – 11.5 miles, higher risk of hitting bad rock • Moderately deep tunnel with 3000+ ft of rock cover under high mtn. ranges, which may lead to overstressing requiring additional support during excavation • Anticipated numerous geological fault zones along tunnel alignment • Semi-active fault located 4500 ft from powerhouse • Active volcano near intake location, impact to access • Very hard rock along tunnel alignment – more than 35,000 psi • Long construction sched required for completion with multiple work camps • Multiple access roads required, 2 years to construct access 		<ul style="list-style-type: none"> • Large size multiple power tunnels • Relatively short power tunnel(s) – 1.0 mi max (length depends on alternative) • Limited number of geotechnical fault zones to pass through, due to location and short length of tunnels • No active or semi-active faults near project site. Denali Fault 45 miles away; Castle Mountain Fault 65 miles away • No other high risk geo-hazards (e.g. active volcano) associated with project site • Competent rock conditions for dam and tunnel construction, studies in 1980s • Construction access would require 2 years to construct 	
Construction Diversion		• Diversion tunnels would not be needed		<ul style="list-style-type: none"> • Risk of overtopping causing delay to construction • “Fingerbuster” and “Fin” fault zones would require lining/support 	
Construction Schedule		<ul style="list-style-type: none"> • TBM est. 14-16 months to order and deliver to site • 7.5 year engineering/construction schedule based on TDX PAD, 2009 • Longer construction schedule due to significant 		<ul style="list-style-type: none"> • More surface features and work carries more schedule certainty, less risk • Susitna-Low Watana estimated schedule has lower risk of extending beyond 11 total years 	

Resource	Agency/ Org/ Auth.	Chakachamna Hydroelectric Project		Susitna /Low Watana Hydroelectric Project	
		Issue	Notes / Requirements	Issue	Notes / Requirements
		underground work, which carries higher risk profile and greater uncertainty <ul style="list-style-type: none"> Chakachamna estimated schedule has higher risk of extending beyond 14.5 total years 			

ALASKA ENERGY AUTHORITY
LARGE HYDRO PRELIMINARY EVALUATION
CHAKACHAMNA PROJECT
SUSITNA / LOW WATANA PROJECT

TABLE 2 – DEVELOPMENT SCHEDULE COMPARISON

Licensing, Engineering and Construction Schedule Comparison
Chakachamna Hydro Project and Susitna (Low Watana) Hydro Project

This table shows the major tasks associated with hydro project development, and the estimated preliminary schedule for completion for the Chakachamna Hydro Project compared to the estimated preliminary schedule for completion for the Susitna (Low Watana) Hydro Project.

Special considerations and assumptions for each are listed below.

	Regulatory / Environmental Major Tasks			Engineering / Construction Major Tasks		
		Chaka	Su-LW		Chaka	Su-LW
Pre-License Issuance	Preliminary Permit					
	Scoping					
	Draft Application					
	Final Application	4.5 yrs	3.5 yrs	Feasibility		
				Engineering Design		
	FERC Processing (DHAC)			Specifications, Drawings & Bid Documents		
	License Order Issued	2.5 yrs	2 yrs	↓		
Post-License Issuance				FERC Processing (Portland Regional Office)		
	↓			Procurement	2 yrs	1 yr
	License & Permits Compliance			Construction		
				Testing & Commissioning	5.5 yrs	4.5 yrs
				Project Startup		
Reg/Env Estimated Schedule		7 yrs	5.5 yrs	Eng/Const Estimated Schedule	7.5 yrs	5.5 yrs
ESTIMATED TOTAL TO STARTUP					14-15 years	11 years

Considerations / Assumptions	
Chakachamna Hydro Project	Susitna (Low Watana) Hydro Project
<ul style="list-style-type: none"> • TBM est. 14-16 months to order and deliver to site • 4.5 year pre-filing process assumes studies underway in 2011 (one year behind schedule in TDX PAD, 2009) • 2.5 years for FERC Processing and License Issuance, and 5.5 year construction schedule based on PAD (Appendix 2-1) • FERC-PRO processing and some procurement must be accomplished before field work can begin • Longer construction schedule due to significant underground work, with higher risk profile and greater uncertainty • Project “access” to require 2 yrs to construct • Chakachamna has higher risk that the schedule to Project Startup will extend beyond 14.5 years. 	<ul style="list-style-type: none"> • Significant, extensive and valid environmental studies performed in 1980's to be updated and used to develop FERC documents • Significant geotechnical investigations performed previously • FERC-PRO processing and some procurement must be accomplished before field work can begin • More surface features and work carries more schedule certainty, less risk • Project “access” to require 2 yrs to construct • Engineering schedule based on “Low Watana Non-Expandable Development” (HDR, 2009) • Susitna-Low Watana has lower risk that the schedule to Project Startup will extend beyond 11 years.