Gustavus Electric Company
P.O. Box 102 Gustavus Alaska 99826 (907) 697-2299 fax (907) 697-2355

TO:
Intervening and Advisory Agencies and Organizations

SUBJECT:
Modification of the Final Environmental Design Plan for
Tailrace Design Changes, including
Restoration and Mitigation
FERC # P-11659

DRAFT

FOR COMMENT

DATE SUBMITTED:
12/12/06

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GUSTAVUS ELECTRIC COMPANY
P.O. Box 102 Gustavus, Alaska 99826
(907) 607-2299 Fax (907) 697-2355

December 11, 2006

Dear All,

On September 13, 2005, FERC issued an Order Modifying and Approving Final Environmental Design Plan Pursuant to Article 401 of Gustavus Electric Company's Hydropower License, P-11659 for Falls Creek. This plan included under paragraph (1), the final location of the powerhouse and tailrace to reduce effects on anadromous fish and their habitat. The approved plan was assembled in consultation with and agreement of all interested resources agencies. This plan included a shorter tailrace due to concerns of slope failure along the canyon walls.

During construction, it was found that slope failure was a problem even in the area of the shorter tailrace. Present and future construction-related mass wasting in this area are enough of a concern to the Environmental Compliance Monitor (ECM) and resource management agencies that a collaborative restoration and mitigation planning process has been instigated, including modification of the final tailrace design.

As a result, GEC is proposing to modify its Final Environmental Design Plan. The new plan proposes to restore habitat features impacted by slides to date, change the location of the tailrace outfall and add mitigation to reduce the effects of tailrace design modifications on anadromous fish habitat. Enclosed is a draft plan prepared by Bob Christensen, the project ECM. Please review this document and return your comments and concerns as soon as possible. When the comments are received, they will be incorporated into a final plan to be sent to FERC for approval. We will be happy to work with you further to agree on a final plan.

On another subject, the above mentioned FERC Order approving the Final Environmental Design Plan required GEC to submit design drawings for structures that (1) provide flow continuation and avoid flow fluctuation from load following in the anadromous reach; and (2) convey sediments downstream of the diversion dam. These pertain to paragraphs 3 and 7 of the License Requirements for the Final Environmental Design Plan. Enclosed please find three drawings, M-431, C-402 and C-404 for flow continuation design and two drawings, C-301 and C-303for submitted material concerning flow continuation and sediment transport in the Final Environmental Design Plan. We welcome your comments and concerns.

We would appreciate receiving your comments by January 11, 2006.

Sincerely,

Richard H. Levitt

FALLS CREEK HYDROELECTRIC PROJECT

FINAL TAILRACE LOCATION PLAN -

INCLUDING RESTORATION AND MITIGATION

Prepared by Bob Christensen - Environmental Compliance Monitor

12/11/2006

SYNOPSIS

Potential for mass wasting during construction of the Falls Creek Hydroelectric Project was first emphasized in environmental assessment work done for the Federal Energy and Regulatory Commission (FERC) license application (Mann, 2000). These risks were reemphasized by the Environmental Compliance Monitor following a small construction-related slide event in July, and again following construction-related slides in September and October. Despite considerable effort (and much success) to reduce the likelihood of mass wasting during road construction, six construction-related slides have occurred in the Falls Creek Watershed: three along the intake service road and three along the powerhouse service road.

Two of three powerhouse area slides had direct impacts to fish habitat in Falls Creek. Immediately following these impacts the ECM notified relevant agencies and submitted a record of concern on October 18th. Soon after, the ECM consulted with the hydro-project manager, FERC, the Department of Natural Resources (DNR) and the Alaska Department of Fish and Game (ADF&G) on the need for a restoration and mitigation plan, including potential design changes for the water return tailrace. Changes in the tailrace design dictate a modification of the Final Environmental Design Plan and documented support from intervening agencies.

An initial meeting with a broad range of resource management agencies was held in Juneau on November 29th (*see attachment for list of participants*). During this meeting it was agreed that a draft restoration and mitigation plan (including a minimal action alternative) would be submitted to the agencies for comment and collaboration with the goal of developing consensus support by January of 2007.

BACKGROUND

Fluvial History - The Falls Creek canyon shows evidence of repeated mass wasting events over the last several centuries. Material has been provided by unstable bedrock slopes, woody debris, and especially by residual Pleistocene canyon fill.

In the powerhouse area, a period of activity about a century ago produced several events along the canyon's west wall. At least two of these events, related to ravines just upstream of the powerhouse site, placed considerable debris into Falls Creek. The terminal lobe of one of these historical slides forms an island in the creek just upstream of the powerhouse site. This island acts as a catchment for large woody debris. This island-logjam provides the elevational control for the riffles and glides immediately upstream. The other debris lobe remains largely intact and forms a choke point in the creek beginning at the approximate location of the powerhouse site.

Smaller events in the least stable areas of the canyon wall appear to occur frequently. The most recent of these occurred in the Fall/Winter of 2005 when a small slide down a bedrock face moved material to the creek edge.

Stream Habitat Values - The island-logjam controls stream gradient and encourages the deposition of gravel and the formation of pools at and upstream of its location, creating perhaps the most important Coho spawning and rearing areas in Falls Creek. 76% of Coho spawning activity was observed immediately above the island and its associated logjam (Flory, 2001). Armstrong and Streveler (1998) rate the habitat for Coho in the anadromous reach of Falls Creek as "poor", based on scarcity of rearing habitat, though the relative abundance of spawning habitat was noted. Significant rearing habitat for Coho and Cutthroat is associated with the island-logjam and with the undercut margin of the old colluvial lobe downstream of the powerhouse site.

Terrestrial Habitat Values - Some of the highest Marbled Murrelet habitat values in the Falls Creek area were associated with the large tree forest in the powerhouse area (Lentfer & Streveler, 2001). This same big tree forest contained a concentration of bear trails and bedding sites, used for the most part in conjunction with access to spawning salmon.

Much of this forest has now been cut, but an important remnant remains upstream of the powerhouse site along the west bank. In addition to having high Marbled Murrelet habitat values, one of the primary bear travel corridors and bedding areas remains in this forest remnant.

CONSTRUCTION-RELATED MASS WASTING EVENTS IN THE POWERHOUSE AREA

Slide 1 – This relatively small event (approximately 1,500 yards) was triggered by roadway blasting in August. Rock, soil and woody debris slid down a steep bedrock chute and thence across an old debris lobe, stopping just shy of the stream. This event entrained just a few smaller trees, but it bisected the remnant forest patch upstream of the powerhouse site and placed several large trees along the chute margins at immediate risk of further slope unraveling

Slide 2 – This relatively moderate event (approximately 2,500 yards) was triggered by roadway blasting in October. Weathered bedrock, soil and woody debris slid down a bedrock face and thence across an old debris lobe and onto the active stream channel. This slide removed 5-10 relatively small trees and buried an approximately 15' by 75' area of creek. The covered creek area was comprised mostly of periodically dewatered coarse gravel. Based on the ages of trees occupying the slope prior to the slide, mass wasting activity had occurred here about a century ago.

Slide 3 – This relatively large, composite event (approximately 5,000 yards) occurred in two phases. Phase one occurred immediately following roadway blasting. Weathered bedrock, shot rock, soil and woody debris slid down a bedrock face and thence across an old debris lobe and onto the stream bed. No live trees were lost in this event as the area had already been logged. This slide covered approximately 25' by 75' area of creek comprised of coarse gravels and large woody debris (within the ordinary stream bed). Based on the ages of trees occupying the slope prior to the slide, mass wasting activity had occurred here about 100 years ago.

The phase two event occurred about a minute after the blast and partly covered the lobe of the phase one event. This slide resulted from slope loading of shot rock that mobilized old colluvium, soil and woody debris into the creek bed and on top of an existing island, forming a convex lobe armored by shot rock and large trees. An approximately 15' by 75' channel was completely covered on the west side of the creek. Although not mapped as such in 2000, it is likely that this channel provided moderate quality spawning and rearing habitat prior to the slide (based on field images from 2006 surveys). The island had supported a dense thicket of slide alder and young spruce trees and was completely covered in rock, mud and woody debris. An approximately 20' by 50' area of logjam was also covered and/or displaced. No live trees were lost from the uplands as the area had been logged during initial site preparation in April. Based on the upland stump aging in the slide area, the mobilized surface was comprised of at least two distinct ages – one perhaps a century old and one considerably older.

For more information about these slides please see the October Record of Concern/Record of Response and the October construction report.

IMPACTS

Slope destabilization – Areas immediately adjacent to recent slides are now more slide-prone than previously and the slide faces are now open to direct siltation into the water. Addressing siltation is at least in part fairly straight forward with matting, revegetation and water control. The slide-proneness will be difficult to mitigate but may also benefit from the actions listed above.

Loss of forest - .1 acres of mostly young forest was erased, and an additional .7 acres of older forest has been destabilized. The old forest habitat is highly valuable to murrelets and bears, as well as future salmon habitat maintenance. Preserving these adjacent forests will be challenging. The strip downstream of slide 1 is particularly at risk of future mass wasting.

Loss of fish habitat - The key stream habitat types along this reach are spawning gravel and pools associated with log jams; bar and cobble/boulder channel is of secondary concern. Slide 2 covered approximately 1,000 Sq ft of channel and bar habitat. Slide 3 covered an additional 1,000 Sq ft of channel habitat, including potentially suitable spawning gravel, along with approximately 250 Sq ft of logjam, including some high quality rearing habitat (pools).

Addition of coarse debris - The toes of slide 2 and especially slide 3 have added large amounts of wood and rock that

could over time be arranged by the creek into pool and spawning habitat. Although this will likely result in a net increase in high quality fish habitat in the near future, short-term increases should be weighed against long-term loss of forested slopes and their ability to provide LWD recruits in the powerhouse vicinity, and against increased siltation as the slide material is winnowed by the creek.

Changes to the stream gradient - Based on the stream's reaction to an event similar to slide 3 occurring about a century ago, we expect at least a slight reduction in stream gradient immediately upstream of the island-logjam area. Stream gradient may initially increase because of damage to the previously existing logjam but with the abundant LWD placed by slides 2 and 3 it is likely that the logjam will reconstruct itself soon.

RESTORATION, TAILRACE DESIGN MODIFICATIONS AND MITIGATION

Given the relative scarcity of Coho spawning and rearing habitat in Falls Creek it is clear that the island-logjam is a critical habitat feature for this species productivity. In that light, we advocate a restoration and mitigation strategy that seeks to stabilize upland slopes, minimize additional disturbance of the canyon wall and insures the island-logjam is reestablished in form and function providing at least equal habitat values to its pre-slide condition.

Toward that end, consultation with geophysical and specialized environmental experts will be provided by *Philip Duoos Geophysics Consulting* and *Herrera Environmental Consulting* (Please see attached Scope of Work from HEC).

Slope stabilization – Following a site visit and geotechnical report from the geophysical consultant, efforts will be made to stabilize the disturbed slopes left in the wake of the three slides. Stabilization measures will likely include, but not be limited to: control of runoff, the use of geotextile matting and revegetation. Additional consideration will also be given to areas that remain to be excavated, i.e. the powerhouse site.

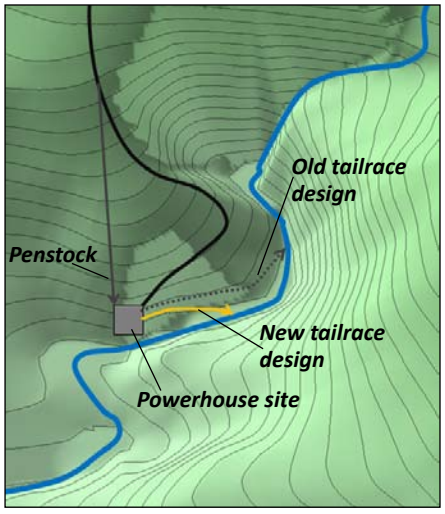
Modifications of the tailrace design - The present design plan calls for extending a tailrace approximately 500' upstream of the powerhouse to a point near the upstream extremity of spawning habitat. This installation would require the removal of the largest remaining spruce trees in the area and destabilize the forested uplands, very likely resulting in failure of the slope that currently maintains the last major remnant of high quality bear and murrelet habitat in this portion of the canyon. To avoid this, we recommend shortening the tailrace so that remnant forest patches are not further disturbed. This change may, however, dewater a portion of the suitable spawning habitat upstream of the powerhouse at very low flow periods.

Stream habitat restoration and mitigation – We propose consideration of two alternative approaches to stream habitat restoration and mitigation: a minimal action alternative and an engineered logjam (ELJ) alternative.

The minimal action alternative would include all slope stabilization measures deemed necessary and would shorten the tailrace length to approximately 300'. The in stream conditions would be left as is. Under this scenario we expect these effects:

1. the stream will erode some of slide 3's lobe away during flood events, leaving the thickest, best-armored portion as a mid-channel island;
2. the stream will be necked down and provide a catchment for large woody debris, which will act as a stream gradient control, provide rearing habitat, and encourage the deposition of gravels immediately upstream and excavation of sheltered pools in the jam itself; and,
3. the lobe face will be excavated into an undercut bank of interlaced rock and logs.

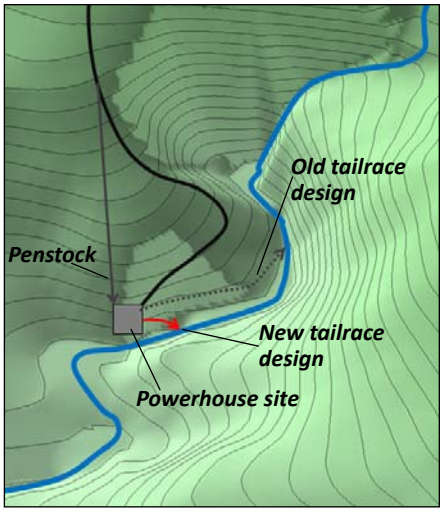
Under this scenario a net loss of spawning habitat upstream of the logjam would likely occur as result of the shortened tailrace. Rearing habitat would likely return to pre-slide conditions. Channel morphology would likely remain highly dynamic, including potential risks of stream bank erosion immediately below powerhouse facilities. Geomorphic modeling of this scenario will be provided to agencies before a final plan is chosen.



Schematic for minimal action alternative.

The engineered logjam alternative would include all slope stabilization measures deemed necessary and would shorten the tailrace length to approximately 150'. In addition, the logjam area would be engineered and reconstructed to result in:

1. restoration of island-logjam habitat impacted by October landslides;
2. long-term maintenance of logjam habitat through a "permanent" anchor system;
3. minimize net loss of suitable spawning habitat upstream of the tailrace outflow,
4. development of rearing habitat (pools) in the channel west of the island; and,
5. control of gradient and flow to insure natural bedload throughput, reduce the likelihood of a velocity barrier to fish passage and protect the stream bank in immediate vicinity of powerhouse facilities from erosion.



Schematic for ELJ alternative.

Under this scenario a reduction in the net loss of spawning habitat upstream of the logjam would be maintained by the ELJ. A net gain in rearing habitat would occur (this could be very important given that rearing habitat is likely a limiting factor for Coho production in this system). The east channel would "permanently" become the primary flow channel.

Geomorphic modeling and limited design drawings of this scenario will be provided to agencies before a final plan is chosen.

MONITORING AND REVIEW

Depending on the restoration and mitigation alternative chosen a variety of monitoring options will be considered, including but not limited to:

- Reoccupation of IFIM transects for monitoring of stream morphology.
- Monitoring of Log Jam pool habitat quality and fish passibility.
- Monitoring of bedload throughput to spawning areas downstream of the powerhouse.
- Monitoring of site suitability for spawning habitat upstream of the tailrace.

Selected monitoring plans will be drafted in consultation with all relevant agencies and will depend on available funding. A summary report and review meeting will be provided 3-5 years after completion of project to assess effectiveness and the potential need for additional work.

ADDITIONAL INFORMATION

Relevant documents have been posted to the Gustavus Electric web site. Please visit the web site to download these documents if you do not already have them. Please contact us if you need the login information.

- Final Environmental Design Plan
- Geology Report for Preliminary Draft Environmental Assessment
- Aquatic Habitat Report for Preliminary Draft Environmental Assessment
- Mammal Report for Preliminary Draft Environmental Assessment
- 20060715 Record of Concern / Record of Response
- 20061027 Record of Concern / Record of Response
- September and October Monthly Construction Reports

CONTACT

Please provide comments on this document to the Falls Creek Hydroelectric Project ECM, Bob Christensen, via e-mail: bob.christensen3@gmail.com. Bob will distribute each set of comments to the entire distribution list.

FALLS CREEK HYDROELECTRIC PROJECT

FINAL TAILRACE LOCATION PLAN -

INCLUDING RESTORATION AND MITIGATION:

PLANNING MEETING PARTICIPANTS

11/06/2006

Dick Levitt – Gustavus Electric Company
Bob Christensen – Environmental Compliance Monitor for Falls Creek Hydro
Greg Streveler – Icy Strait Environmental Services
Jackie Timothy – Department of Natural Resources/Habitat Division
Travis Guymon – Department of Natural Resources/Mining, Land and Water
Brady Scott – Department of Natural Resources/Mining, Land and Water
Kate Karouse – Department of Natural Resources
Garth Zimbelman – Army Corps of Engineers
Richard Enriquez – US Fish and Wildlife
Shawn Johnson – Alaska Department of Fish and Game
Linda Shaw - National Oceanic and Atmospheric Administration

- on conference call

Mel Langdon – Department of Environmental Conservation
Chad Soiseth – Glacier Bay National Park and Preserve
Jim Ferguson – Alaska Department of Fish and Game

- additions

Jeffery Esterle – Federal Energy Regulatory Commision
Michael Spillane – Herrara Environmental Consultants

Herrera Environmental Consultants *Draft* Scope of Work

Falls Creek Hydroelectric Final Tailrace Design, Restoration and Mitigation Project

EXHIBIT A-1

INTRODUCTION

This Draft scope of services describes the consulting services that will be provided to Living Systems Design representing the Gustavus Electric Company. The services to be provided include data review, site reconnaissance, concept alternatives development and feasibility analysis, design development and construction oversight for mitigation measures at the Falls Creek power house site and logjam area.

The project is intended to be performed in 4 phases.

Phase 1 Data Review - will include data review to assist in the development of concept alternatives. This work would commence **February/March 2007**.

Phase 2 Reconnaissance and Feasibility Analysis - The second phase of the work will include a site reconnaissance visit by one engineer and one geomorphologist in **late March or early April, 2007** pending suitable weather conditions for collection additional geomorphic site data and assessing project constraints. Following the field reconnaissance, mitigation alternatives would be developed and evaluated based on effectiveness, risk, cost, constructability, environmental impact. During this phase of the project, the work will include review of existing data, site reconnaissance, and selective subsurface investigation, evaluation of potential risks and priority levels for repair or mitigation, and evaluation of repair/mitigation options, impacts and costs. The outcome of this phase of the project will be the selection of an alternative to carry forward with formal PS&E activities for the preferred repair or mitigation option.

Phase 3 Design Development – Design Development will occur in **April**/**May 2007**. Design development of the preferred alternative will be done assuming construction will occur in June/July 2007 with work performed by Gustavus Electric crews. The construction drawings will include construction notes such that specifications documents are minimized. The design drawings will be prepared to coordinate Agency permit format to the extent possible. ***It is assumed that the Living Systems Design will provide all permitting support.***

Phase 4 Construction Oversight (June/July 2007)
Construction oversight assistance is expected to include review of requests for information (RFIs), site observation field visits and material and methods submittal reviews. Additional assistance will include field directing equipment operators (with authorization from the superintendent), structure layout and modifications to adapt to actual conditions. One Herrera design engineer will visit the site and spend up to 2 days laying out the structure, participating in a kickoff meeting, and provide guidance in structure construction. Design modifications will be identified and reviewed during this site visit. A second Herrera construction engineer will be available for up to 10 days (10 days) to provide construction assistance and to document asbuilt data. Actual survey of the structure will be the responsibility of the Contractor.

The primary project objectives are:

1. restoration of island-logjam habitat impacted by October landslides;
2. long-term maintenance of logjam habitat through a “permanent” anchor system;
3. minimize net loss of suitable spawning habitat upstream of the tailrace outflow,
4. development of rearing habitat (pools) in the channel west of the island; and,
5. control of gradient and flow to insure natural bedload throughput, reduce the likelihood of a velocity barrier to fish passage and protect the stream bank in immediate vicinity of powerhouse facilities from erosion.

DETAILS OF SCOPE

The following is a listing and brief descriptions of the work elements for this project. Both CONSULTANT and CLIENT responsibilities are included in this scope of work.

PC-09 Project Management

PC-09.02 Project Management Plan

PC-09.02.01 Project Administration:

The CONSULTANT shall be responsible for on-going management of the consultant team for this project in accordance with the provisions of the AGREEMENT. On-going management will include ensuring that the work is completed on time and within the AGREEMENT budget.

The CONSULTANT shall be responsible for:

- Preparing a Project Management Plan
- Preparing a project budget with management and reporting procedures in accordance with CED funding requirements
- Preparing and maintaining an electronic schedule
- Implementing effective Quality Assurance/Quality Control procedures
- Establishing and maintaining an effective Communication Plan
- Other Work Elements as necessary to maintain schedules, budgets and quality work products.

Deliverables:

- Project Management Plan (includes other plans as described further below)

PC-09.02.04 Project Schedule:

For the purposes of budgeting, the anticipated length of this phase of the project will be 8 months, beginning in February 2007 and ending in September 2008. The CONSULTANT shall prepare a project baseline schedule, within twenty (20) days of the award of this AGREEMENT. The schedule will include both Client and CONSULTANT work tasks and show dates of meetings and presentations, when input is required from CLIENT, work element duration, products, and milestone dates for the events necessary to complete each work task. The schedule will also identify milestone dates and the duration of report preparation and review. The duration between draft and final reports will allow adequate time for distribution, review, and incorporation of review comments into the final version of the report. The schedule will be updated as necessary to reflect significant schedule changes. Any project schedule changes will be submitted to CLIENT for approval prior to finalization.

Deliverables:

- Project Baseline Schedule and monthly updates

PC-09.02.07 Monthly Status/Progress Reports and Invoices:

The CONSULTANT will provide a monthly status/progress report with monthly invoices to CLIENT that will include current work performed by the Consultant Team members. The progress reports will be prepared in a format approved by the Project Manager. This format will include the following topics:

- A general summary of the activities preformed by the CONSULTANT TEAM including meetings held during the reporting period.

- Listing of activities by work element performed by the CONSULTANT during the reporting period.
- An estimate of work completed by the overall CONSULTANT TEAM.
- A listing of problems/issues encountered during the reporting period and their resolution.
- A listing of activities to be accomplished during the next reporting period.

Deliverables:

- Monthly Status/Progress Reports
- Monthly Invoices

PC-09.02.08 Regular Coordination with the CLIENT:

In addition to the monthly status meetings, the CONSULTANT will maintain regular contact with Project Manager and maintain regular coordination with CLIENT staff for this project in accordance with the provisions of the AGREEMENT. Regular coordination with CLIENT will include ensuring that CLIENT is involved with all aspects of the project. The CONSULTANT will be responsible for maintaining regular contact with CLINET and designated project management team staff through informal office visits, telephone conversations, e-mails, faxes, etc.

Deliverables:

- None identified

PC-09.02.10 Change Management:

During the life of the project, changes to the project scope, schedule, and resources will occur. The sources of these changes will be internal changes initiated by the project team; external changes initiated by the customers and external changes that are a result of resource agency decisions, availability of resources, changes in technologies and standards.

Whether the effects of changes are positive or negative, managing change during the project is an important factor for success. Managing change will require planning, discipline, and communication among the project team and their customers. As the change management plan is executed, the following should occur: improved relationship with customers, improved financial performance, reduced project delays, better project teamwork, and improved management of project quality. .

Deliverables:

- Notification in writing to CLIENT identifying management changes

PC-12 Project Data

PC-12.01.01 Data Review

The CONSULTANT will review available and relevant data, drawings, environmental documents, historical channel information, aerials and topographical surveys (or Lidar) to assess the relative scale of the issues and geomorphic site constraints. CONSULTANT review existing cross sections and profiles to assess the magnitude of steep slopes gradients, and areas with significant gradient changes. The CONSULTANT will identify the areas that lack adequate topographical data needed and identify ground survey needs.

PC-12.01.02 Site Reconnaissance and Inspection

The CONSULTANT will conduct a two-day site visit of the project area to collect field data. Two Herrera staff members will conduct a 2-day site evaluation. This evaluation will focus on the slide site as well as the areas 600 feet immediately

upgradient and downgradient. The purpose of the site reconnaissance is to assess stream channel characteristics, bank conditions, local topography, site constraints, the nature and extent of current damage to embankments and/or roadways, extent of change in characteristics and damage levels compared to previous years, and other pertinent aspects of the problem area. This information will be used to assess flood related risks, and to identify possible restoration/ mitigation options. CLIENT will accompany the reconnaissance team. After the site reconnaissance is complete, the CONSULTANT will meet with CLIENT to discuss the site-by-site findings, relative magnitude of the issues, risks and hazards, and potential repair/mitigation design options as part of the Alternatives Workshop in Task PC-13.02.

Assumptions:

- CLIENT will provide most recent aerial photos.
- CLIENT will provide any preliminary topographic surveys of the problem sites.
- CLIENT will provide the OHWM delineation at each of the problem sites.

Deliverables:

- Digital photos from field reconnaissance
- Copies of field notes
- GPS Data in electronic file format
- Technical memo summarizing the findings of the reconnaissance.

PC-12.05 Surveying Data

- CLIENT will provide topographic surveys and hydraulic cross sections of the river and surrounding ground at the site in sufficient detail to allow hydraulic and slope stability analyses as needed for the problem evaluation and design options assessment (see PC-13 Alternative Assessment).

Deliverables:

- Plan and profile view topographic data obtained at selected cross sections for each problem site.

PC-13 Alternative Assessment

Following review of available data and site reconnaissance, Herrera will prepare a list of design assumptions, opportunities and constraints for use in locating, designing, and constructing ELJ structure(s) for the Falls Creek mitigation project.

The assumptions and constraints will be used to develop 10% layout of up to three concept alternatives and a no action alternative to evaluate potential adverse impacts of the project to infrastructure and property. This assessment will be dependent on results of the baseline hydraulic modeling, the project goals identified above and compatibility of the proposed design with historical geomorphology of the river while also protecting existing infrastructure and property. Herrera will meet with the Client in a workshop setting to review the proposed design assumptions and constraints to refine the project approach and to ensure project objectives are met.

Assumptions

The client will clearly delineate risk thresholds, including:

- Definition of flood elevations not to be exceeded

- Map of desired limits of flood inundation
- Map of desired limits of channel migration (erosion)
- Map of critical infrastructure and property

Herrera will summarize assessment findings and explain recommendations for the design

Herrera will compile and summarize assessment analysis and conclusions as part of the Basis of Design Report

Herrera will prepare initial draft of design assumptions, opportunities and constraints for distribution prior to the meeting.

The client will clearly delineate risk thresholds, project constraints and objectives during the workshop. The results of the workshop will be used as a basis of design guideline for subsequent tasks.

Herrera will prepare the workshop agenda and send to client for review. The client will finalize and mail agenda to workshop participants.

Deliverables

Herrera will prepare workshop agenda.

Follow-up deliverables (delivered within 7 working days of workshop):

Herrera will summarize design assumptions, opportunities and constraints in table format. The table will also be included as an attachment in the Task 4.7, Design Report.PC-13.02 Workshop

PC-21 Geotechnical Evaluations

PC-21.04 Project Site Data

- The CONSULTANT will conduct geomorphic inspections. The CLIENT will coordinate geotechnical explorations, analyses, and prepare a preliminary geotechnical report for Slide Area and proposed in stream project area. The Geotechnical and geomorphic inspections should be coordinated at the same time.

Field Explorations – The proposed options for mitigating the potential for slope instability at the Slide Site will depend on the geometry of the slope, the subsurface profile of soil and rock at the slope location, the engineering characteristics of the soil and rock layers, the nature of groundwater conditions, and the likely changes to conditions at the toe of the slope resulting from river flow-induced erosion and deterioration. At this stage of the project, only one boring is considered necessary for making a preliminary characterization of the subsurface conditions and developing geotechnical recommendations for environmental documentation, design options assessment, and preliminary engineering associated with proposed ELJ structure construction. Additional exploration and geophysical testing may be necessary in later phases of the project and for slope stability repairs.

Deliverables:

- Boring(s) or test pit log to determine depth to bedrock at proposed structure locations.

PC-21.05 Preliminary Geotechnical Report

The CLIENT will provide geotechnical reports that present the results of the field explorations and engineering analyses for the slide site. . Specifically, the report will include:

- A summary of the estimated soil and rock profile at key locations at the problem site.
- Results of stability analysis of the slope under existing conditions for static and seismic loading, using the observed embankment behavior to back-compute approximate soil shear strength parameters.
- Discussions of construction related issues including temporary excavations, dewatering, re-use of existing subsurface materials, requirements for new fill materials, erosion control, monitoring requirements, and other pertinent geotechnical issues.

Deliverables:

- Geotechnical Report to the Consultant

PC-24 Design Development

Structure Locations and Hydraulic Analysis

A one-dimensional hydraulic model will be developed to analyze the preliminary design proposed for the site. HEC-RAS will be used to analyze the project hydraulics. Herrera will also conduct a scour analysis of in-stream structures to ensure engineered logjams are designed to accommodate the maximum probable scour.

Assumptions

Channel geometry developed for proposed design will be modeled to evaluate flood elevations and flow velocities associated with the 1-year and 100-year flows, and an intermediate flow as identified by the client.

Output of hydraulic modeling will be used to define incident flow conditions used for scour analysis.

A range of structure sizes will be evaluated (cross-sectional areas exposed to incident flow).

Engineered logjams will be modeled as simple bluff body flow obstructions (i.e., blunt bridge piers).

Deliverables

Herrera will compile and summarize hydraulic modeling of proposed conditions and scour analysis and conclusions as attachments to the basis of Design Report.

Structural Design, Specifications, and Plans

This task represents the labor and expenses associated with preparing design documents for the final design. The design configuration will reflect analysis and decisions performed in previous tasks. Herrera will prepare a 50% and 90%, PS&E package for review by the Client. The Client will provide consolidated comments which will be incorporated in the final design package.

Assumptions

Herrera will conduct a force balance stability analysis for the ELJ structures to determine a factor of safety for each structure. Herrera will present CLIENT with the benefits and risks of different

structure architectures. Herrera will estimate destabilizing forces (buoyancy, lift, and drag) based on existing hydraulic information . Boundary shear stress and scour estimates will also be based on existing flow and substrate information.

Drawings files will be in AutoCAD 2004 format.

Budget is based on development of 12 contract-drawing sheets. (7 plan sheets and 5 detail sheets)

No landscape restoration plans or revisions to the standard provisions for landscape will be provided.

Specifications will follow the CSI (Construction Specification Institute) Format.

Client project manager will review the 50% construction documents and provide consolidated comments to Herrera to be incorporated into the 90% design package.

Client project manager will review the 90% construction documents for graphic consistency and will provided minor comments to Herrera for coordination into the final signed construction document set.

Electronic sheet and reference files will be submitted to client in AutoCAD 2004 format.

Client to coordinate review with other agencies and groups.

Deliverables

Herrera will submit five plan sets for review and comment. Plans will be prepared in 11x17-inch format.

A standard specification item and number list will be prepared and submitted for review. No specifications will be submitted with the 50% submittal.

A preliminary construction-phasing schedule and cost estimate in bid tab format will be submitted for review.

Final signed construction document package including one set of 24" x 36" Mylar original drawings, electronic copy of revisions to the standard specifications and the cost estimate.

Meetings

One technical review meeting to present 50% design package and solicit comments. Two Herrera staff, will attend the meeting (or conference call) and is assumed that the meeting will not exceed 4 hours.

-Construction Cost Estimate

Herrera will prepare an estimate of probable construction cost for the 50%, 90% and final contract package submittals. The cost estimates will be prepared in bid tab form using industry estimating guides for construction including *RS Means Heavy Construction Cost Data* and *The Guide: Building Construction Material Prices for use in Alaska, Oregon and Washington,* Spring/Summer 2007 version (www.bestconstructionsite.com), vendor quotes, as well as professional judgment.

Assumptions

Client will provide labor and equipment rates for tribe contractors if used.

Construction costs will be presented in 2007 dollars. An escalation rate of 4% will be used to inflate costs for bidding as necessary.

Deliverables

Herrera will prepare cost estimates in bid tab format using Excel. Cost estimate will accompany design package submittals at 50%, 90% and final design.

-Design Memo

Herrera will prepare a brief design memorandum (Summary of Design Basis) with attachments summarizing the hydraulic modeling, risk analysis and data used in the scour and structural analyses. Two hard copies of the technical memorandum will be submitted to Client. One round of review is assumed.

Assumptions

Herrera will prepare design memorandum as an executive summary of the design basis .

Structure Locations and Hydraulic Analysis summary will be provided as an attachment.

Scour and stability calculations will be provided as attachments.

Risk assessment summary will be provided as an attachment.

The client will provide comments and edits to the draft technical memorandum to be incorporated into the final technical memorandum.

Deliverables

Two hard copies of the draft technical memorandum will be submitted to Client.

Two hard copies of the final technical memorandum will be submitted to Client.

PC-25 Construction Oversight

Construction oversight assistance is expected to include review of requests for information (RFIs), site observation field visits and material and methods submittal reviews. Additional assistance will include field directing equipment operators (with authorization from the superintendent), structure layout and modifications to adapt to actual conditions. One Herrera design engineer will visit the site and spend up to 2 days laying out the structure, participating in a kickoff meeting, and provide guidance in structure construction. Design modifications will be identified and reviewed during this site visit. A second Herrera construction engineer will be available for up to 10 days (10 days) to provide construction assistance and to document asbuilt data. Actual survey of the structure will be the responsibility of the Contractor.

Assumptions

- Cost to provide one (10) days of construction oversight,
- Herrera will communicate all issues identified to the Owners Inspector or the Resident Engineer and the Contractors Superintendent. Herrera will not direct the Contractor for work deviating from the plans unless authorized by the Owner.
- Herrera staff will identify any structure changes or modifications and provide hard copy documentation to owner and contractor for approval.

- Herrera staff will sign in at the contractor's trailer each day of a site visit. Herrera staff will wear hardhats, eye protection and orange vests when in zones of active construction with heavy equipment.
- Herrera staff will be available 7 days a week, 14 hours per day during the construction period.
- Herrera will provide work services on a time and materials basis up to but not exceeding the contract amount.
- Herrera will provide itemized breakdown of expenses and hours billed.

Deliverables

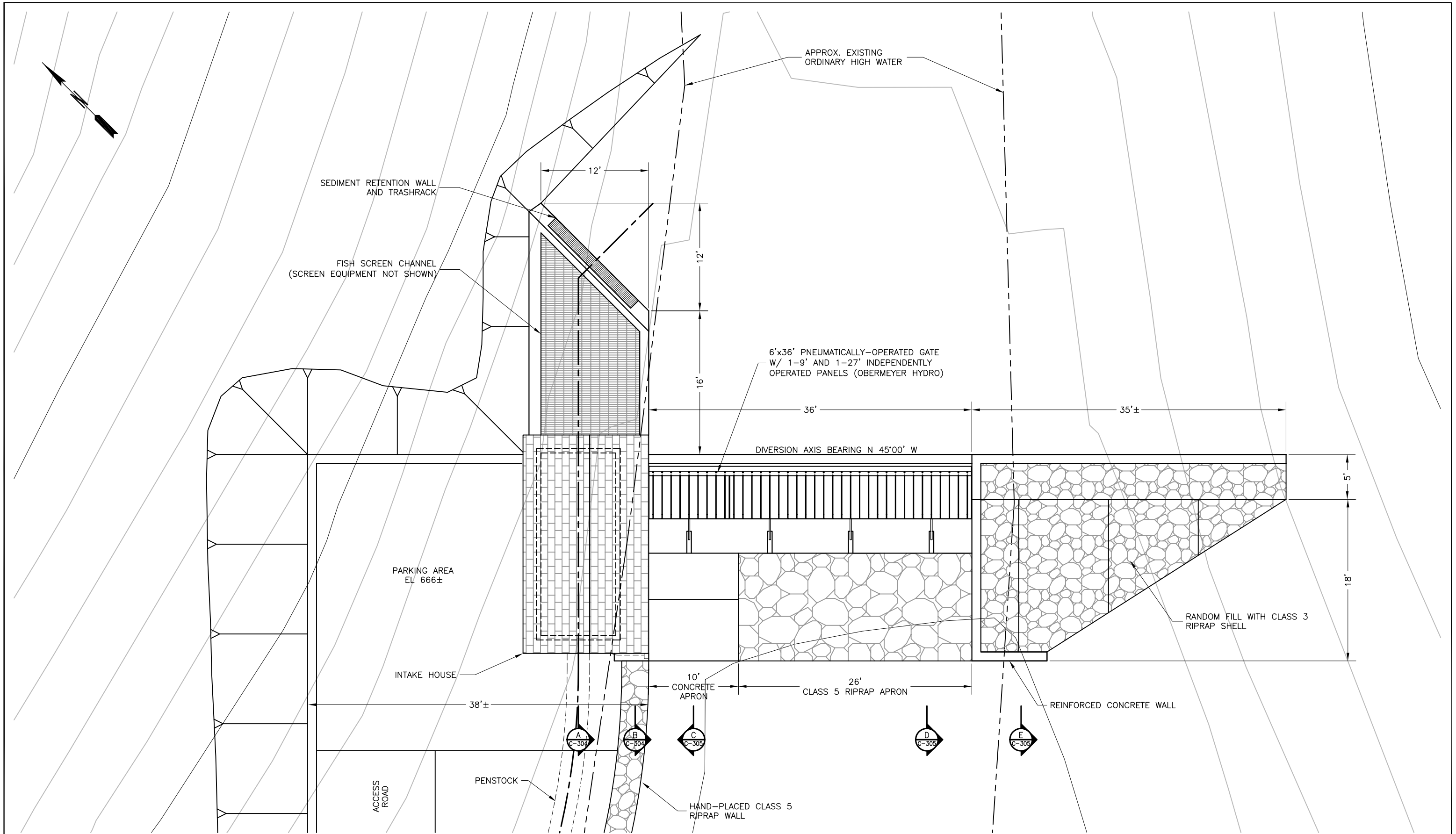
- Construction observation daily inspection forms will be delivered to Contractor and Owner by fax or email after each site visit.
- RFI response forms or email.
- Material and Method submittal review forms.

FALLS CREEK HYDROELECTRIC PROJECT

Design Drawings for Structures that

(1) provide flow continuation and avoid flow fluctuation

(2) convey sediments downstream of the diversion dam



ISSUE NO.	DATE	DESCRIPTION	BY	CHK	APPR
A	12/8/06	ISSUED FOR AGENCY REVIEW	LDC		

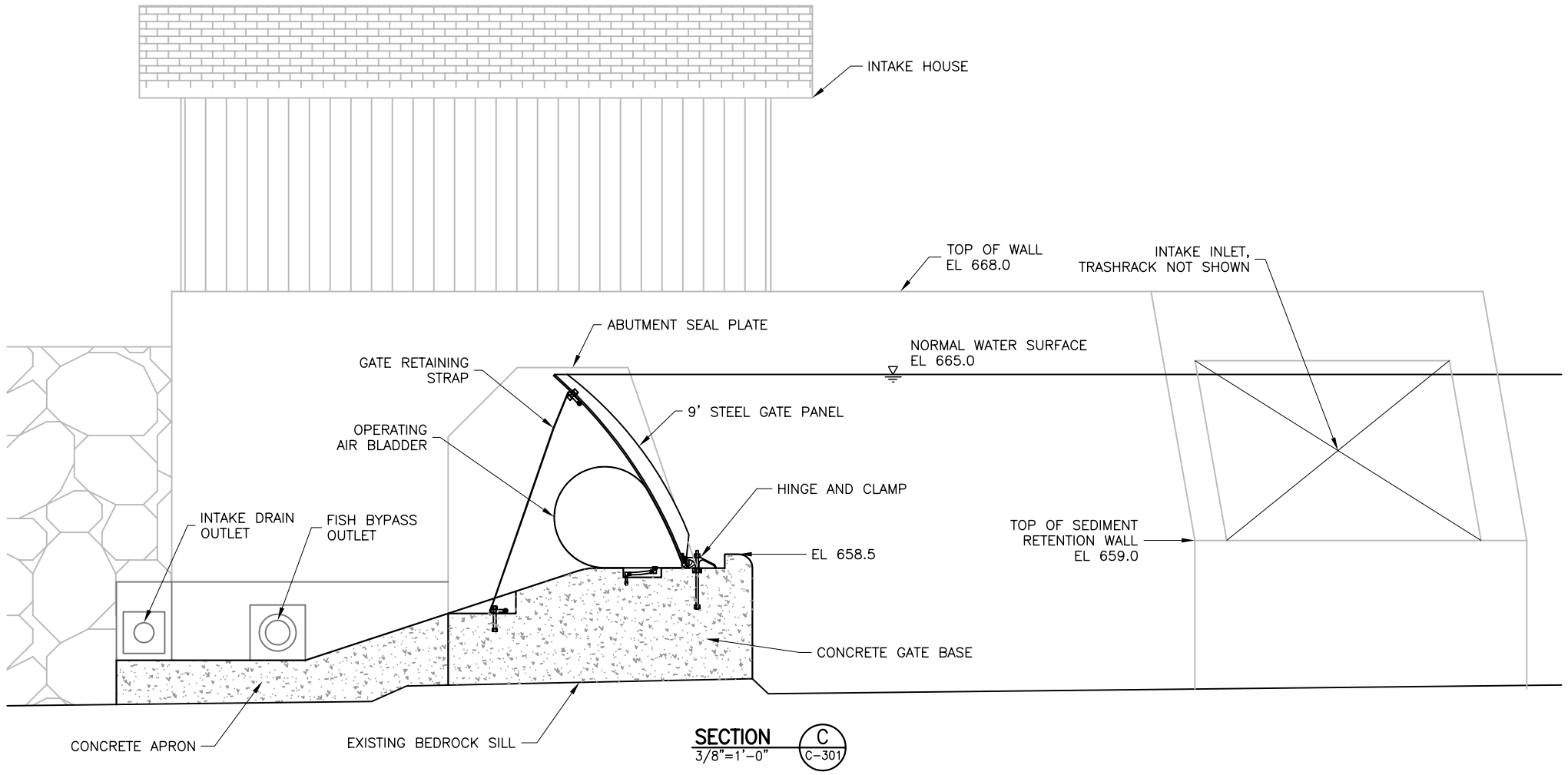
SCALE: 1"=5'
DESIGNED: L.COUPE
DRAWN: L. COUPE
CHECKED:

DESIGNER:
ALASKA POWER & TELEPHONE COMPANY

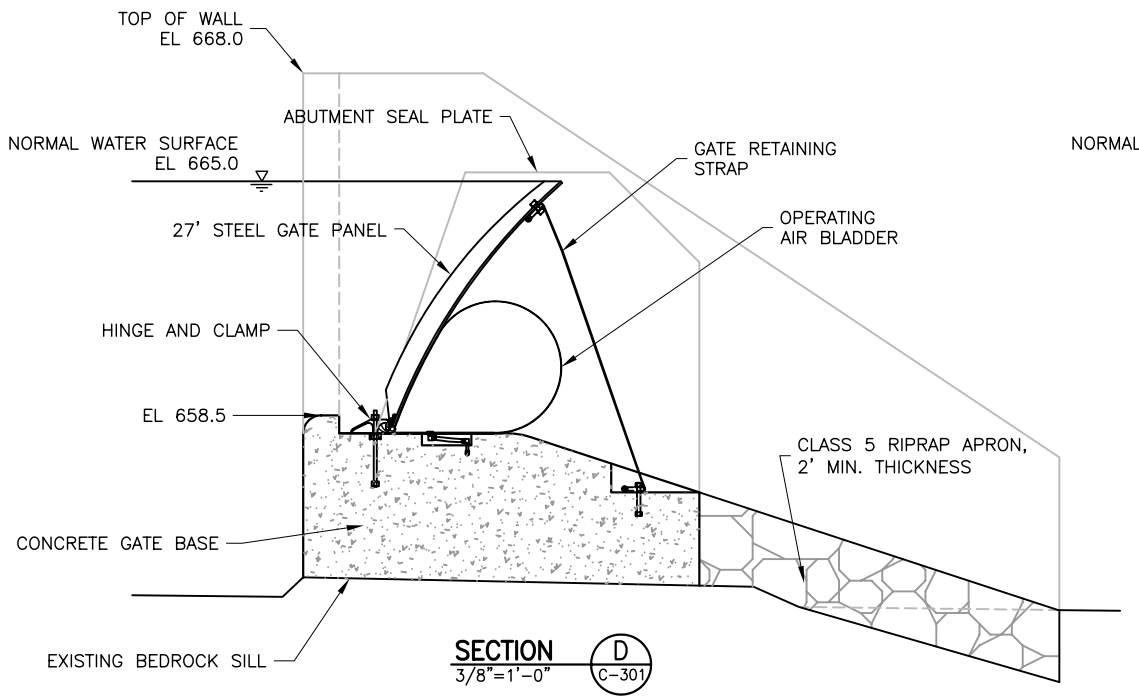
OWNER:
GUSTAVUS ELECTRIC COMPANY
P.O. BOX 102
GUSTAVUS, ALASKA 99826

FALLS CREEK HYDROELECTRIC PROJECT
DIVERSION/INTAKE STRUCTURE GENERAL ARRANGEMENT SITE PLAN

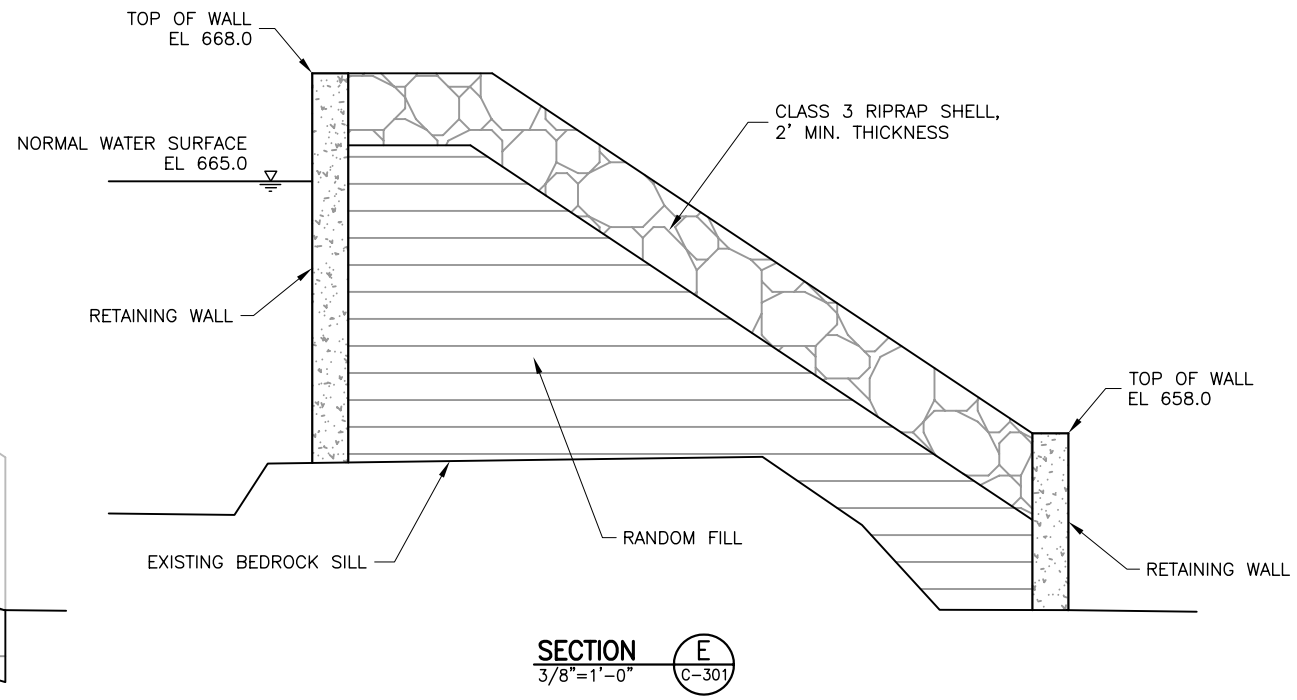
DATE: 12/08/2006
PROJECT NUMBER:
SHEET NUMBER: C–301
ISSUE NO.: A



SECTION C
3/8"=1'-0" C-301



SECTION D
3/8"=1'-0" C-301



SECTION E
3/8"=1'-0" C-301

ISSUE NO.	DATE	DESCRIPTION	BY	CHK	APPR
A	12/8/06	ISSUED FOR AGENCY REVIEW	LDC		

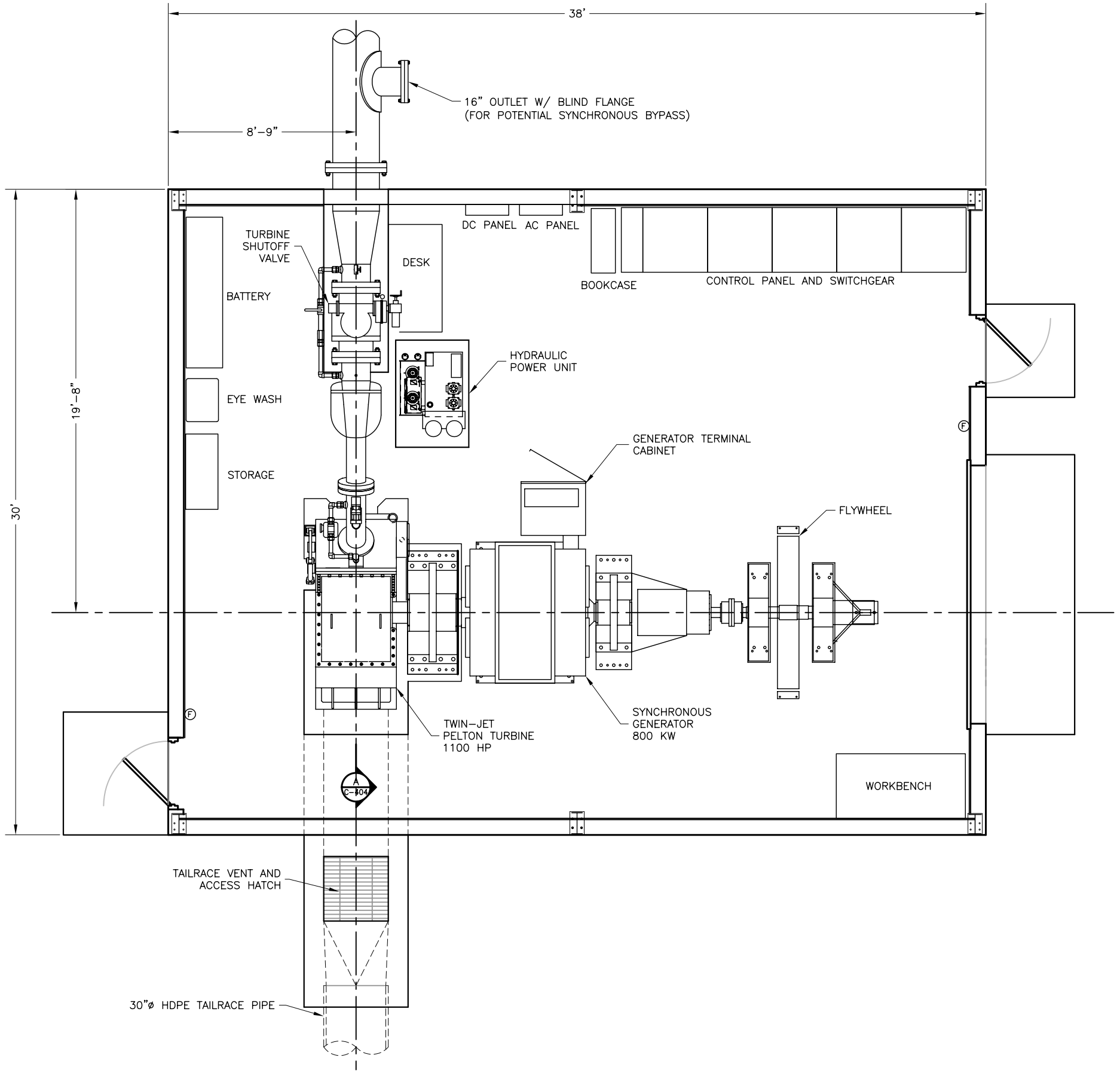
SCALE: 3/8"=1'-0"
DESIGNED: L.COUPE
DRAWN: L. COUPE
CHECKED:

DESIGNER: ALASKA POWER & TELEPHONE COMPANY

OWNER:
GUSTAVUS ELECTRIC COMPANY
P.O. BOX 102
GUSTAVUS, ALASKA 99826

FALLS CREEK
HYDROELECTRIC PROJECT
DIVERSION/INTAKE STRUCTURE
GENERAL ARRANGEMENT
SECTIONS

DATE: 12/08/2006
PROJECT NUMBER:
SHEET NUMBER: C-305
ISSUE NO. A



ISSUE NO.	DATE	DESCRIPTION	BY	CHK	APPR
A	12/8/06	ISSUED FOR AGENCY REVIEW	LDC		

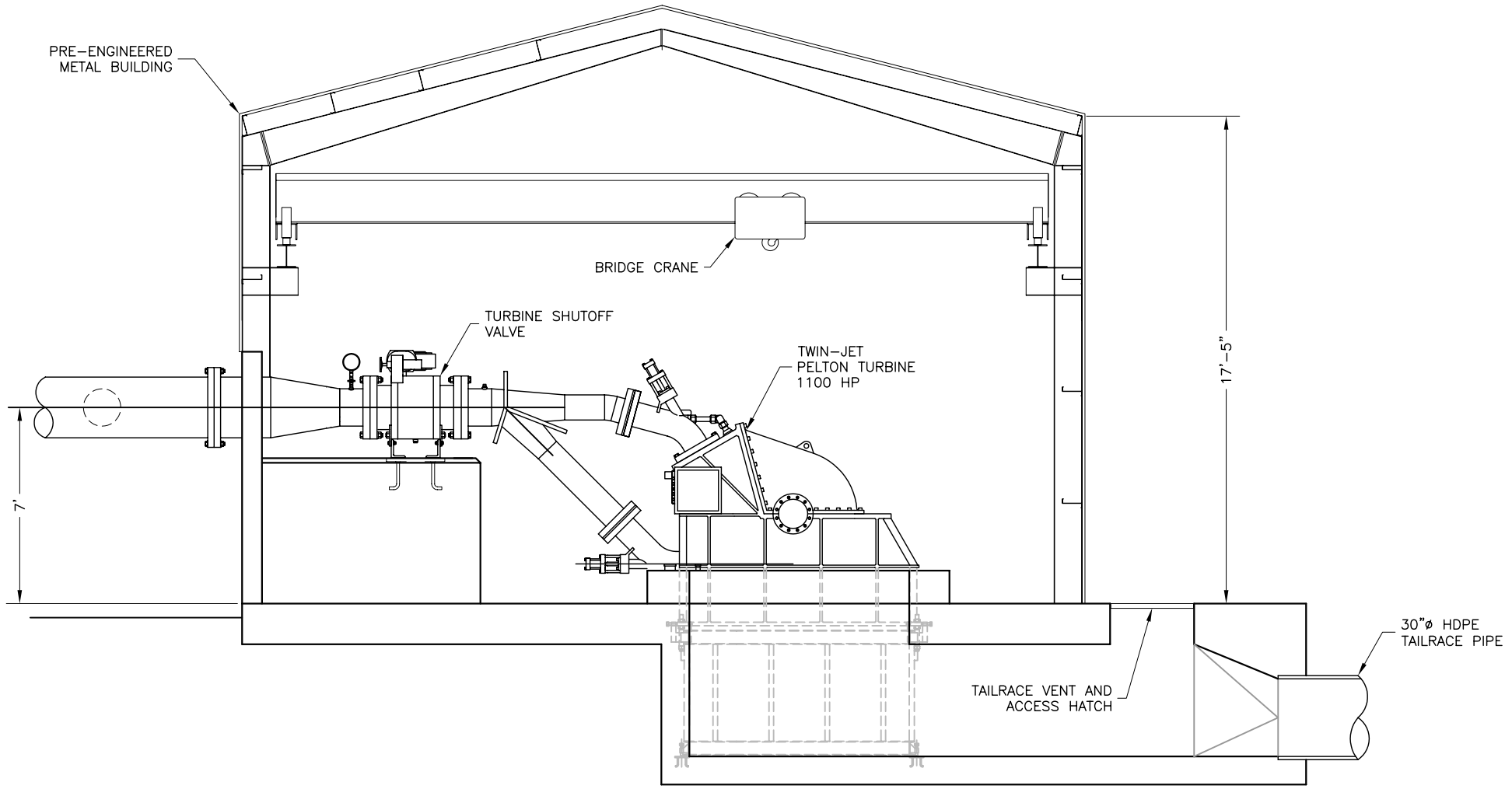
SCALE: 3/8"=1'-0"
DESIGNED: L. COUPE
DRAWN: L. COUPE
CHECKED:

DESIGNER:
ALASKA POWER & TELEPHONE COMPANY

OWNER:
GUSTAVUS ELECTRIC COMPANY
P.O. BOX 102
GUSTAVUS, ALASKA 99826

FALLS CREEK
HYDROELECTRIC PROJECT
POWERHOUSE
GENERAL ARRANGEMENT
FLOOR PLAN

DATE: 12/08/2006
PROJECT NUMBER:
SHEET NUMBER: C-402
ISSUE NO.: A



SECTION A
3/8"=1'–0" C–402

ISSUE NO.	DATE	DESCRIPTION	BY	CHK	APPR
A	12/8/06	ISSUED FOR AGENCY REVIEW	LDC		

SCALE: 3/8"=1'–0"
DESIGNED: L. COUPE
DRAWN: L. COUPE
CHECKED:

DESIGNER:
ALASKA POWER & TELEPHONE COMPANY

OWNER:
GUSTAVUS ELECTRIC COMPANY
P.O. BOX 102
GUSTAVUS, ALASKA 99826

FALLS CREEK
HYDROELECTRIC PROJECT
POWERHOUSE
GENERAL ARRANGEMENT
SECTIONS – SHEET 1

DATE: 12/08/2006
PROJECT NUMBER:
SHEET NUMBER: C–404
ISSUE NO. A

Upper assembly shown, lower assembly similar
NTS

Fitting flange (111) shall be machined after shop assembly and gap measurement. Flanges shall be marked at TDC and shall be labeled '1' for the upper pipe and '2' for the lower.

Inlet Flange Detail
NTS

Notes:
1. Typical assembly for both needle servomotors
2. Needle orifice (418) shall be drilled with two 0.024 (#73) dia holes. Connector (409) shall be D&T 3/8 NPT. Install orifice with teflon pipe thread sealant, see Assembly Note 9.

Section A–A

Section B–B

ISSUE NO.	DATE	DESCRIPTION	BY	CHK	APPR
A	12/8/06	ISSUED FOR AGENCY REVIEW	LDC		

SCALE: 1–1/2"=1'–0"
DESIGNED: L. COUPE
DRAWN: L. COUPE
CHECKED:

DESIGNER: ALASKA POWER & TELEPHONE COMPANY

OWNER:
GUSTAVUS ELECTRIC COMPANY
P.O. BOX 102
GUSTAVUS, ALASKA 99826

FALLS CREEK
HYDROELECTRIC PROJECT
POWERHOUSE
TURBINE
SECTIONS – SHEET 1

DATE: 12/08/2006
PROJECT NUMBER:
SHEET NUMBER: M–431
ISSUE NO.: A