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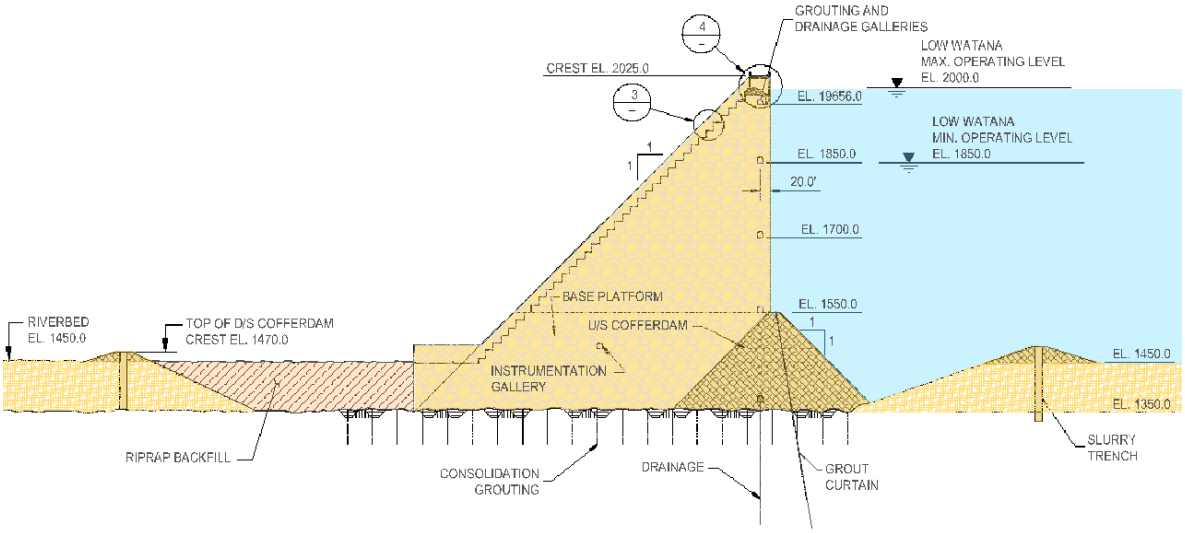
Susitna Project
Supplemental Report
Low Watana Dam RCC Concept Cost Evaluation

FINAL

November 29, 2010



Low Watana Gravity Dam – RCC Concept

Prepared by:
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EXECUTIVE SUMMARY

At the time of the Susitna Project studies for the 1983 FERC License Application and 1985 amendment to the License Application, roller compacted concrete (RCC) technology was not regarded as sufficiently developed to use in the construction of large dams. Over the past 30 years, however, roller compacted concrete has developed as a construction material for dams of increasing size and techniques of material placement and composition of the RCC mix has been refined with experience.

R&M Consultants study team (R&M) was engaged by the Alaska Energy Authority (AEA) to develop a conceptual design and perform concept level cost estimates for a RCC dam at the Watana site and Devil Canyon sites that were described in the R&M report dated November 16th, 2009. This is an addendum to that report and examines the Low Watana RCC dam options by exploring the cost differential between an expandable option and a non-expandable option, and gravity section vs. gravity arch. Additionally, the advantages and disadvantages of underground vs. surface powerhouse are explored as well as simplified transportation options utilizing updated information on railroad costs in conjunction with "rail only" surface transport to the project.

We have found no fatal flaw in Low Watana RCC Gravity Arch Dam or surface powerhouse options, and initial estimates indicate that there may be significant potential savings, particularly with the RCC dam arrangements. RCC dams have been constructed in cold climates and at greater heights than the 700-feet of Low Watana.

It is possible that developing the RCC concept to its final design configuration and moving toward construction could result in development opportunities for basic industries in Alaska in producing cement and exploitation of natural pozzolanic sources.

Access and logistical considerations including road, rail, and air transport are of concern at a remote site such as the Susitna Project sites. Addition of unrestricted access to undeveloped areas is often controversial. The access alternatives considered have assumed rail only access to the project site.

The cost estimate summary, Table ES-1, presents the estimated construction costs of the options, all of which consider surface powerhouses and "rail only" ground transportation.

Table ES-1 Summary of Cost of RCC Dams for the Susitna Project

Description	Low Watana Embankment Non-Expandable $1,000 (1)	Low Watana RCC Non-Expandable $1,000	Low Watana RCC Expandable $1,000	Low Watana Gravity Arch RCC Non-Expandable $1,000
Construction Cost Total (Millions of Dollars)	$ 4,500	$ 3,900	$ 4,200	$ 3,600

(1) HDR 2009

Supplemental Report
Low Watana RCC Concept

November 29, 2010

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1.0 Introduction

R&M Consultants, Inc. (R&M) formed a team under the R&M/AEA term agreement that includes Hatch Associates Consultants, Inc. (HACI) and Jack Linard Consulting (R&M/HACI/JLC) to investigate the feasibility of Roller Compacted Concrete (RCC) technology for the Susitna Project as an alternative to impervious core rockfill dam (ICRD) concepts that were developed during the licensing studies which concluded in 1985. Additionally R&M/HACI/JLC performed a review of regulatory and FERC licensing activities and timelines for precursor activities to issuance of a FERC license, and developed and a licensing phase strategy for the project. The results of those investigations were presented in the R&M report dated November 16th 2009 (R&M 2009).

The investigation was amended to consider additional alternatives with potentially lower costs. This document presents the results of the further investigations. It is an extension of the previous R&M 2009 report. In an effort to keep the comparison valid, the costs are based on December 2008 USD and are presented in the same format and structure as in the R&M 2009 report. The focus will be on a Low Watana option with the same general project size as described in recent studies (HDR 2009). Concepts focus on RCC dam options exploring the cost differential between an expandable option and a non-expandable option and straight gravity section dam vs. gravity arch dam.

The advantages and disadvantages of underground vs. surface powerhouse are also considered.

Transportation options utilizing updated information on railroad costs are developed with the alternative of "rail only" surface transport to the project. The cost estimate uses equipment/material prices consistent with the previous Watana cost estimate currently available from AEA.

2.0 Project Layout

2.1 General

The following assumptions and technical considerations were included in developing our conceptual project layouts. Replacement of one dam design for another affects more than just the dam. Many features of the project general arrangement may be affected by the selection of dam type. In keeping with our understanding of the dam design and costing task we have included the following considerations:

- Hydrology and hydraulics;
  - Assumed the same reservoir water levels as described for the Low Watana ICRD option;
  - Diversion scheme and tunnel capacities are different as the diversion scheme employs a shorter tunnel due to the smaller footprint of an RCC dam and the consequences of overtopping of RCC dams is lower than with ICRD;
  - The spillway configuration is different than for the ICRD alternative (eliminating the side channel spillway) and incorporating an overflow section into the RCC dam. The spillway configuration requirement included initial examination of energy dissipation and potential for scour and to reduce the potential for total dissolved gas (TDG) production at the project. The hydraulic capacity was taken to be the same as for the current ICRD configuration. The RCC dam Spillway design is conceptual only at this phase without detailed analysis, modeling and in depth review of energy dissipation of potential for rock scour.

- The intake structure and water conveyance use similar invert elevations and diameters as for the ICRD dam option;
- The powerhouse layout uses the same equipment sizes at the same setting as for the ICRD option;
- Foundation Conditions and Excavation Depth: Foundation conditions and foundation treatment, including the single line grout curtain, will be similar to those for the Full Watana RCC dam concept, which were similar to treatment of the foundation below the impervious core for the ICRD dam scheme;
- Dam cross section design – RCC dams are designed to the same principles and standards as concrete gravity dams. Design loadings and factors of safety are per FERC guidelines, including; waves and freeboard, earthquake, ice and silt loads. The principles used to develop the Full Watana RCC dam concept are the same as used for the Low Watana RCC dam concept.

2.2 Alternatives

Several RCC alternatives were examined for comparison with previous ICRD expandable and non-expandable Low Watana alternatives. To achieve this, we have focused on the elements of the RCC dam alternative that differ from the existing ICRD alternative. Elements that are similar will remain identical for both alternatives in order to achieve an "apples to apples" comparison to the extent possible. The alternatives being compared to the RCC schemes are the ICRD Low Watana Expandable (see Figure 2.2-1 through 2.2-4) and the ICRD Low Watana Non-expandable.

The following alternatives are addressed in this report:

- Low Watana RCC Gravity Dam Expandable;
- Low Watana RCC Gravity Dam Non-Expandable;
- Low Watana RCC Gravity Arch;
- Additionally, there is a discussion of above ground vs. underground powerhouses for these alternatives.

Major considerations are:

- Dam layout (axis, gravity arch vs. gravity);
- Intake (integral to the dam or separate, expansion to full height Watana);
- Spillway sections that could be modified for the expanded option;
- Powerhouse (location, surface vs. underground, expansion options).

Advantages of the RCC dam concept compared to ICRD include: a smaller footprint, lower dam volume, integral spillway, considerably shorter diversion tunnels and no vulnerability to overtopping. Table 2.2 shows a comparison summary of significant features of each alternative.

Table 2.2: Low Watana ICRD and RCC Alternatives Summary

Feature Description	Low Watana Non-Expandable ICRD	Low Watana Expandable ICRD	Low Watana RCC - Non-Expandable	Low Watana RCC - Expandable	Low Watana RCC Gravity Arch
Total Dam Fill Volume (cy)	22,000,000	32,000,000	7,600,000	7,600,000	6,000,000
Diversion Tunnel Diameter (ft)	36	36	27	27	27
Average Diversion Tunnel Length (ft)	3,700	3,700	2,000	2,200	2,000
Intake Area Excavation (cy)	1,970,000	1,970,000	270,000	760,000	270,000
Average Power Tunnel Length (ft)	200	200	260	300	330
Average Pressure Tunnel Length (ft)	400	400	550	1500	170
Tailrace Tunnel Length	1,500	1,500	N/A	N/A	N/A
Powerplant Concrete Volume (cy)	40,400	60,600	62,500	83,000	62,500
Powerplant Excavation Volume (cy)	242,000	363,000	1,500,000	2,200,000	1,500,000
Spillway Gates	(3) - 64' Tall x 44' Wide Radial Gates	(3) - 64' Tall x 44' Wide Radial Gates	N/A	N/A	N/A
Spillway Chute Excavation (cy)	2,960,000	2,960,000	N/A	N/A	N/A
Spillway Chute Conventional Concrete (cy)	130,300	130,300	99,000	99,000	99,000

This study does not have the scope for an exhaustive exploration of layout options, so some engineering judgment has been used to develop the configurations used for comparison. We have selected a layout based on general comparisons to existing projects. The Shasta project in California in particular is similar in size and layout to our selected configuration for the RCC Gravity and Gravity Arch dam arrangements (Kollgaard and Chadwick, 1988).

2.3 Powerhouse Layout

The powerhouse layout was examined to explore potential cost savings associated with the smaller footprint of gravity or gravity arch dams and robust concrete construction which allows configurations that would not be available with an ICRD dam.

A common reason for selecting an underground powerhouse is to take advantage of a steep gradient of the river between the dam and the tailrace; however this is not the case at the Watana Dam site. Another important consideration is to minimize the length of the water passage. The smaller footprint of the RCC dam allows shorter water conveyances as well as the option of intakes and water conveyance either through the dam, or in the rock abutments. The geological conditions must be suitable for an underground powerhouse, which they are at Watana. A surface powerhouse requires enough room to place the powerhouse along the river without excessive excavation, which is also the case. Our conclusion is that both an underground and surface powerhouse configuration is feasible at the Watana site and the choice should be based on economics, constructability and serviceability issues.

2.3.1 Surface vs. Underground Powerhouses

The choice of a surface or underground powerhouse is largely dependent on the project setting and site conditions. The following list compares the two options:

- Typical surface powerhouse advantages are:
  - Elimination of tailrace tunnel;
  - No requirement for tailrace surge chamber;
  - Less expensive excavation;
  - Ventilation is easier;
  - Less geotechnical exploration required (as less geotechnical risk to cost and schedule).

- Typical underground powerhouse advantages
  - Location is more flexible;
  - Shorter headrace tunnels with considerable reduction in length of steel-lined high pressure conduits;
  - Work area can be more easily separated from dam construction (two separate construction areas and schedules);
  - Powerhouse is not located in or near river bed materials;
  - Exterior shell not needed (rock forms support);
  - Protection against the elements (longer construction season);
  - Turbine setting can be lower;
  - Less concrete needed to control hydraulic uplift;
  - Less maintenance required.

The 1982 Acres Feasibility report discusses the choice of an underground powerhouse based on general assumptions of less costly installation for underground installations, additional operational flexibility and climatic considerations.

The 1985 Harza Ebasco FERC license application (Harza Ebasco 1885) includes a comparison of an underground to a surface powerhouse by major civil mechanical and electrical cost items where the surface powerhouse was shown to be more expensive due to the far greater cost of the power tunnel/penstock (see Table 2.3-1). The comparison in Table 2.3-1 is a simplified comparison and does not include the costs associated with the powerhouse superstructure or the considerable substructure required to insure that the powerhouse is stable against hydraulic uplift.

Table 2.3-1 Comparison of Surface to Underground Powerhouse (Harza Ebasco Study 1985)

TABLE B.2.2.6: SUMMARY COMPARISON OF POWERHOUSES AT WATANA

Item	SURFACE ($000) 4 x 210 MW	UNDERGROUND ($000) 4 x 210 MW	UNDERGROUND ($000) 6 x 140 MW
Civil Works:			
Intakes	54,000	54,000	70,400
Penstocks	72,000	22,700	28,600
Powerhouse/Draft Tube	29,600	26,300	28,100
Surge Chamber	NA	4,300	4,800
Transformer Gallery	NA	2,700	3,400
Tailrace Tunnel	NA	11,000	11,000
Tailrace Portal	NA	1,600	1,600
Main Access Tunnels	NA	8,100	8,100
Secondary Access Tunnels	NA	300	300
Main Access Shaft	NA	4,200	4,200
Access Tunnel Portal	NA	100	100
Cable Shaft	NA	1,500	1,500
Bus Tunnel/Shafts	NA	1,000	1,200
Fire Protection Head Tank	NA	400	400
Mechanical - For Above Items	54,600	55,500	57,200
Electrical - For Above Items	37,400	37,600	41,200
Switchyard - All Work	14,900	14,900	14,900
TOTAL	262,500	246,200	277,000

We have developed a potential project arrangement with a surface powerhouse (loosely based on the Shasta Hydroelectric Plant layout, Development of Dam Engineering in the United States, 1988) with an intake on the left abutment, transitioning to a tunnel. The length of the water passage is similar to that of the Low Watana underground option (Harza Ebasco 1985). The tailrace discharges directly into the Susitna River.

2.3.2 Surface Powerhouse Configuration

Considerations for the surface powerhouse include: setting of the units, elevation of high tailwater to prevent powerhouse flooding, rock cover over the tunnels and the need for steel lining, stability against hydraulic uplift, construction access, cofferdamming and diversion requirements to accommodate dam, powerhouse foundation, and tailrace channel. Costs of waterways (tunnels, shafts and intakes) are not included in the cost account for powerhouse cost comparisons but are in a separate cost account.

The conceptual layout of a surface powerhouse for the Low Watana RCC dam alternative was selected for favorable hydraulic characteristics as well as for cost effective excavation downstream of the proposed dam. The concrete volume for the surface powerhouse is a volume sufficient to ensure that there would be enough mass to prevent powerhouse floatation without installation of anchors.

The surface powerhouse is set on the south river bank (left bank) such that the tailrace apron end sill is adjacent to the end sill of the spillway stilling basin, as these two features are at the same elevation of 1450 ft. The tailrace end sill apron creates a downstream control weir for the powerhouse, thus maintaining minimum tailwater conditions. Several design considerations including;

excavation volumes, effects of discharge on downstream hydraulics, and the effect of spillway discharge on powerhouse operation, must be evaluated to determine the optimum physical setting of the powerhouse. The surface powerhouse for the low Watana RCC alternatives was set to be offset 27 degrees from the stilling basin, which is generally the expansion ratio of 2 longitudinal to 1 horizontal as defined by the USACE (HEC RAS v4.1 Reference Manual). This alignment directs the Low Watana RCC dam surface powerhouse discharge efficiently into the downstream river channel, noting that further downstream of the dam the river bends to the north.

For this study, the dimensions of the surface powerhouse were set to accommodate the same equipment layout proposed for the ICRD dam designs. The transformers will be located within the surface powerhouse rather than in a separate cavern as with the underground design. The surface alternative has the transformer deck set above the draft tube outlets and their overall dimensions are similar to those of the underground alternative. The entrance angle of penstocks with respect to the surface powerhouse remains the same 62 degrees as with the underground design.

The power intake (for the non-expandable and gravity arch RCC dam alternatives) is integrated into the dam body and transitions into two concrete lined tunnels that lead to vertical shafts and high pressure tunnels that bifurcate and transition into steel lined penstocks that lead into the four Francis units in the powerhouse. The intake invert and size for the RCC dam alternatives are approximately the same as in the ICRD dam alternatives and the overall penstock lengths are similar for the surface and underground alternatives. Although the penstocks are somewhat longer in the surface alternative than in the underground alternative, having sections of the power tunnels integral to the RCC dam may reduce tunnel excavation/support, and concrete lining costs.

The significant cost advantage between the conceptual RCC surface powerhouse and previously designed ICRD underground powerhouses is the elimination of surge chambers, tailrace tunnels and access tunnels for the surface powerhouse which are considered in the waterways cost account. Given the limited scope of this study, the surface powerhouse was investigated to determine its feasibility and provide an estimate of comparative costs. With this criteria, the surface powerhouse does show to be a feasible alternative. However, the scope did not include optimization of an underground design for the RCC designs. An underground powerhouse with the RCC dam may have shorter pressure tunnels a hydraulic transient analyses may demonstrate that surge chambers are not required.

Further analyses should be performed to evaluate both surface and underground layouts that will improve the configuration of the powerhouse, including; optimizing unit settings considering concrete requirements and excavation costs, optimizing high pressure and low pressure penstock lengths, as well as optimizing the tailrace configuration. Additional study will be required to better define hydraulic effects of the spillway discharge on powerhouse performance, including physical model testing. Indications are that both surface and underground powerhouse configurations are feasible for the Low Watana with an RCC dam, and future analyses will need to be performed in order to determine the optimum configuration.

2.4 Dam Design Considerations

2.4.1 RCC Dam Design

The geotechnical information is typically the most influential element for developing a dam design and the Watana site has well developed site information. The RCC dam alternatives were developed on axes similar to that of the ICRD dam axis. This is considered a conservative assumption, adopted to provide a dam axis in the location with the maximum amount of existing information on the foundation subsurface conditions, but not necessarily at the most efficient location. It is possible or even likely that a more efficient dam axis location could be found with further investigation.

The site has a foundation and abutments that are well suited to a concrete gravity dam. Concrete gravity dams are relatively straight forward to design, and many computer programs are available to improve the process of initial and final design. The dam design can be initially developed using assumptions for concrete strength based on similar mixes used on other projects. The final configuration of the dam requires accurate material properties for the RCC material that can only be determined by trial mix design using the actual selected cement and pozzolan and the aggregate material available from the site. Foundation treatment for all RCC dam options includes consolidation grouting under the dam footprint and curtain grouting similar to that assumed in the previous RCC dam study.

There is a buried channel north of the dam site which has been called the “Relict Channel”. For the RCC alternatives, the treatment for the Relict Channel has been taken to be identical as developed for the Low Watana non-expandable ICRD.

It is important to note, particularly with regard to the comparison with the gravity arch alternative that the Low Watana cross-section retains the 1H:1V downstream slope established for the High Watana option (R&M 2009). This face slope was considered to be on the conservative side for the high dam and is even more so for the low dam option.

At this stage of proceedings, it is not appropriate to try to refine or optimize the various elements of the different schemes, but it is important to bear in mind that more detailed analyses may well change the relative ranking of project alternatives. By the same token, more detailed analyses can only serve to ensure that the eventually selected alternative will be more attractive than the alternatives indicated herein because of the conservative approach adopted throughout in these comparative studies.

A more conventional spillway option for a dam of this configuration and height would be a smooth surfaced chute with forced air entrainment discharging back into the river via a flip bucket into a plunge pool. Such an arrangement would require the dam axis to be relocated to ensure that the jet from the flip bucket impacts in the river with an alignment such that back scour is minimized. The use of flip bucket and plunge pool may also result in hydraulic conditions that could lead to high total dissolved gas (TDG). TDG occurs when air mixes with water and goes into solution at depth, creating water supersaturated with air. If

fish breathe supersaturated water, air can come out of solution in their blood stream causing gas bubble disease, which can be fatal. The stepped spillway may allow spill without a plunge to depth that could lead to excessive levels of TDG. The design would look to dissipate as much energy as possible and create a spillway that creates skimming flow downstream of the spillway. The present work scope does not cover spillway and dam axis optimization and for that reason, the stilling basin concept, which is compatible with the ICRD axis, has been adopted for present reporting purposes.

The conceptual spillway for the RCC alternatives is incorporated in the dam structure. The flood outflows are discharged through an ungated spillway into a stepped, converging chute and terminating in a downstream stilling basin. As discussed in the R&M 2009 Report, the stepped spillway is expected to provide significant energy dissipation and to be compatible with the stilling basin arrangement shown on the drawings. However, a stepped spillway of this size exceeds precedent and details will have to be verified by comprehensive hydraulic model studies.

An extensive study, including large scale physical models (not less than 1:40 scale) will be required prior to finalizing the details of spillway configuration. The preliminary hydraulic calculations performed for a stepped spillway indicate that it is a potentially cost effective configuration and should warrant further consideration and analyses during future design studies. Modeling may well show that the optimum stepped spillway and stilling basin is different to the conceptual configuration, or that a different type of spillway may be required. Any modifications may influence not only the spillway costs but also the powerhouse costs as the layout may have to be reconfigured.

2.4.1.1 Steps for RCC Design

Development of the RCC dam design will require several steps, comprised of:

- Confirming design criteria, including loads and load combinations, materials and foundation properties, minimum factors of safety and allowable stresses;
- Evaluation of site climatic conditions which have a major impact on both construction programming and RCC mix design;
- Performing preliminary design – determine required performance, development of basic geometry, preliminary mix design and strength requirements;
- Performing three-dimensional finite element analysis (using initial assumed material properties), including dynamic and thermal stress analyses;
- Locating and testing aggregate, cement and pozzolan sources that will be used for construction;
- Establish RCC placement temperature, maximum allowable internal temperature and required temperature control measures; and
- Developing trial mixes for the full scale trial embankments (FSTE) to fine tune the mix design.

The trial mix program would be initially oriented towards:

- Aggregate gradation optimization;
- Selection of two preferred cement types and content;
- Selection of two preferred pozzolan types and content; and
- Selection of two preferred retarder types and content.

The minimum time from beginning the study of the prospective RCC to confirmation of mix details is 16 months. Conservatively, it would be appropriate to allow 18 months. At least 18 months is required to investigate, select, procure, ship and set up the necessary equipment (crushing plant, batching plant, conveyors). Most of this work is done during the trial mix/FSTE phase and the end result is that the RCC production facilities can be ready within 2 years of starting trial mixes. An upper limit would be 2.5 years.

2.4.1.2 Seismic Design Consideration

The most important safety concern of concrete dams subjected to earthquakes is excessive cracking, which can lead to potential instability from sliding or overturning. Sliding could occur on an existing plane of weakness in the dam foundation, at the foundation-dam interface or within the dam. Although some major concrete dams have experienced strong ground motion with some damage, it is of note that there has been only one major concrete dam failure in recent times as a result of earthquake induced ground motions. This failure was in Taiwan where the dam was constructed literally over the top of an active fault. In general, instability of gravity dams caused by excessive cracking of the concrete is most likely to occur in the upper half of the dam.

The application of defensive design measures when designing a dam is the most dependable approach to alleviate safety concerns. Defensive measures for concrete dams include the following:

- Adequate drainage is the first line of defense against foundation instability, in part because it is the most economical;
- Designing RCC mixes and construction procedures to ensure that direct tensile and shear strength parameters are always achieved without excessive cement content in the mix. (Increased cement will increase thermal stress problems, which may be more of a concern than the seismic risks);
- Use the best geometric design and structural detailing. The dam should have minimum geometric irregularities and gradual variations in structural stiffness. Examples of good geometric design are curved transitions and minimal mass at the crest;
- Effective quality control during construction to ensure foundation preparation, strength of the concrete and appropriate cleaning and preparation of lift joints and placement of reinforcement when used; and
- Design contraction joints to accommodate displacement.

2.4.2 Low Watana RCC Gravity Dam Expandable

The Low Watana RCC Expandable dam alternative consists of the Watana dam constructed to a lower height of 700 feet and a four-unit powerhouse with a total installed capacity of 600 MW (see Figures 2.4-1 to 2.4-3). The expandable option allows for a dam raise to the height of the original Watana concept with a dam height of 885 feet and installation of a new intake structure, an additional power tunnel and two additional generating units with a capacity of 1,200 MW. In order to provide for future raising of the dam and expansion of the powerhouse, the location of the powerhouse and power intakes were adjusted from the non-expandable alternative. The powerhouse was translated 185 feet downstream compared to the non-expandable RCC gravity dam alternative to allow room for RCC material to be placed downstream of the dam as part of the dam raise.

The power intake structure was located on the left abutment as opposed to being integral with the dam for the non-expandable alternative to provide more flexibility for the dam raise. If the power intake were integral to the dam, a new power intake would be more constrained and complicated by existing structures. During expansion, a new intake channel could be excavated above the existing structure at the appropriate invert elevation. Intakes for the expanded option could be developed at a higher invert elevation than the first stage intakes. The intakes for the expansion, second stage would be connected to the first stage water conveyances at the vertical shaft, to tap into the lower, high pressure portion tunnels leading to the powerhouse.

The powerhouse includes empty bays that can accommodate additional generating units in the future. The gravity section will be raised by placing additional RCC on the dam crest and downstream face of the dam. High strength steel anchors will be installed on the first stage dam faces and will tie into the second stage RCC placement. Prior to placement of the second stage RCC the surface of the first stage will be cleaned and scarified using high pressure washers. The spillway for the second stage will be constructed using the same placement procedures and similar design as in the first stage.

The gravity dam section was checked using the CADAM program for static and pseudo dynamic stability and found to have adequate safety factors (see R&M 2009 for a description of the analysis, loading and material properties).

The process of raising a dam at a later date is not a simple matter. We have included some general considerations, procedures and a potential sequence to provide some indication as to the process involved.

GENERAL

1. Planning and design prior to start of Stage 1 are critical. It may be necessary to place some Stage 2 base RCC (up to stilling basin level) during Stage 1 to minimize overall Stage 2 duration.
2. Stage 1 RCC mix will be designed for Stage 2 loads and loading conditions.
3. Foundation excavation for most or all Stage 2 should be performed during Stage 1 works to avoid blasting close to in-service dam and powerhouse.

4. Note that same 5.5 months per year is max time available for RCC placement (5 months for conventional concrete).
5. Draw reservoir level down to the minimum operating level at end of winter. Generate during summer to keep reservoir level as close as possible to the minimum level, Note that a critical problem is handling of flood inflows during Stage 2.
6. RCC production rates will be slower for Stage 2 than for Stage 1 due to greater constraints on placement.
7. Dam/spillway expansion construction expected to take approximately 5 years.

PROCEDURE

1. Clean existing RCC surface to exposed coarse aggregate.
2. Make sure exposed surfaces are saturated and surface dry and that outer 18 inches is above freezing point.
3. Place bedding mix on horizontal surfaces immediately prior to placing RCC.
4. Use grout enrichment to bond new RCC to sloping surfaces in existing RCC.
5. Otherwise standard RCC procedures will apply (anchors between Stage 1 and Stage 2 RCC are not required).

SEQUENCE

Year 1:

Clean-up and prepare foundation and abutments.

Remove concrete from Stage 1 chute and stilling basin.

Commence aggregate production and stockpiling.

Year 2:

Place RCC in base (up to stilling basin level) and on abutments up to approx El. 1650.

Year 3:

Continue RCC placement up to El. 1900 approx.

Place conventional concrete stilling basin.

Remove spillway conventional concrete including bridge and piers (winter).

Year 4:

Place RCC to underside of stage 2 spillway.

Place conventional concrete in chute.

Complete RCC to crest El. on right abutment.

Year 5:

Complete RCC to crest El. on left abutment.

Construct Stage 2 spillway crest works.

2.4.3 Low Watana RCC Gravity Dam Non-Expandable

The Low Watana Non-expandable RCC Gravity dam alternative has the same dam profile and the general configuration is similar to the expandable alternative above with a dam height of 700 feet and a four-unit powerhouse with a total installed capacity of 600 MW (see Figures 2.4-4 to 2.4-7).

The major differences that lead to reduced installation costs are the shorter diversion tunnel length and shorter power tunnel length for the surface powerhouse as well as the size of power tunnel and tailrace. The intake structure is shown as being incorporated into the dam on the left abutment. The assumption is that conventional concrete would be used for the intake structure with RCC placed against the conventional concrete.

The Powerhouse is shown as close to the dam and spillway as possible in order to minimize the water conveyance length. The powerhouse layout does not consider future expansion options.

2.4.4 Low Watana Gravity Arch

A Low Watana gravity arch RCC dam option was also considered (see Figures 2.4-8 to 2.4-10). The axis adopted for these preliminary gravity arch studies was effectively that adopted for the conventional gravity dam option. In turn, this was the axis chosen for the ICRD in the studies carried out in the 1980's. From this background, it can clearly be seen that the axis used for the G-A layout is by no means optimum.

This preliminary gravity arch dam configuration was based on several factors. First, the crown cantilever section was selected to be similar to the Hungry Horse (gravity arch) Dam in Montana which is sited in a geometrically similar canyon. The Hungry Horse Dam (Development of Dam Engineering in the United States, 1988) crown cantilever was configured with a vertical upstream face and a 0.6 Horizontal to 1.0 Vertical sloped downstream face. The Low Watana gravity arch crown cantilever section was configured with a vertical upstream face and a 0.7 Horizontal to 1.0 Vertical sloped downstream face. The larger ratio was selected based on the larger expected seismic hazard for the Susitna site and preliminary analysis for a gravity arch RCC dam at the High Devil Canyon site.

The stream channel physical dam location, arch (constant) radius and center point was selected based on the qualitative topographical features at the site. In studying the topography of the site, it appears that this site is not as well suited for arch action foundation support over the full 700-foot height of the dam. From about elevation 1850 to the crest elevation of 2025, the cross-valley slope is relatively small compared to the slope below elevation 1850. Therefore, in locating the arch, the topographic contours between elevations 1550 and 1850 on each side of the canyon were collectively examined for orientations that would best provide for arch thrust into the foundation. After the "best" thrust foundation profiles were located on each side of the canyon, the approximate tangent lines to the profiles on each side were laid out on the site plan. Their

intersection established the radius and center of the upstream arch. Having established the arch radius and center, the remaining geometry of the dam is integrated into the canyon using the basic section geometry of the crown cantilever and the topography of the site.

The seismic loading will have a large component of load in the upstream/downstream direction, and a thrust block structure may be required to accommodate this loading. We have assumed for this preliminary estimate (which will need to be confirmed by three-dimensional finite element analysis, when abutment and dam properties are better known) that an additional 25% of the base concrete costs would be sufficient to account for this component of the dam.

With the configuration described above, the structural support behavior of the dam is conceived to be primarily arch-gravity action in the lower two-thirds of the dam and gravity only in the upper third. It is to be noted that the preliminary configuration is only the starting point of the comprehensive structural and stability analyses that would include both seismic and PMF loading. Although the configuration is likely to be modified based on such analyses, the preliminary configuration serves to provide a reasonable estimate of dam volumes and construction costs.

The gravity arch has a smaller footprint than the gravity section, however the area will remain large enough for equipment to move efficiently. The assumption for this preliminary study has been that placement rates and RCC unit costs would be the same for all alternatives. There will be some difference with the grout treatment at the upstream face that will have a small increased effect on the overall unit cost, but this should be developed in more detail if this alternative is addressed in detail.

3.0 Project Access Issues

Access to the construction site for the alternatives considered in this report are by rail link alone to limit access to the site and reduce costs. The Alaska Railroad provided some input on recent costs to develop the rail link along the south side access corridor alignment. An airstrip would be provided near the Watana project to allow use of aircraft up to a C-130 Hercules or equivalent.

3.1 Previous Project Access Costs Comparisons

Previous cost estimates for project access infrastructure for the Full Watana RCC dam and High Devil Canyon RCC dam (R&M 2009) assumed both rail and road transportation to the site on alignments in the south side corridor. This alternative was compared to a Watana ICRD concept with only road access from the Denali Highway through a northeasterly corridor (HDR 2009). While it is true that the RCC concept would benefit greatly from the ease of transporting bulk cement and pozzolans and major equipment and logistical access to the site by rail, road transport of these materials equipment and supplies would also be feasible. The different project access and logistical support transportation assumptions between the RCC and ICRD concept studies led to a significant distortion of the comparison of the project costs. For an “apples to apples” comparison of the options, the same basic transportation configuration (road only, road and rail, or rail only) should be assumed for both schemes with logistics costs included to account for transport of imported materials.

For this immediate report, we are assuming rail access only, during construction. Future considerations regarding access may result in removal of the rails and converting the railroad to use of trucks and other over-the-road vehicles.

3.2 Rail Access

The alignment for the rail link only option along the southern alignment (see Figure 3.2-1) is based on the project access and logistical studies done by R&M. A report on the Access Planning Study by R&M for Acres was issued in January 1982 and a Supplement to the Access Planning Study was issued in September 1982.

For the R&M 2009 report on RCC concepts the rail link alignment was assumed to be as shown on Figure 3.2-1 which was drawn from the alignment details presented in the R&M 1982 report. The rail access would connect to the existing Anchorage-Fairbanks alignment of the Alaska Railroad near Gold Creek on the south east side of the Susitna River then would proceed east up the south side of the Susitna River to the Watana site via the north end of Stephan Lake and the west end of Fog Lakes. This alignment requires no new bridge across the Susitna River and only requires a railhead be constructed near Gold Creek from which to stage rail transport of goods and materials to the Watana dam site.

A railroad is considered desirable for access to the project for construction of the RCC dam because of the large quantities of bulk materials to be moved to the construction site and weights anticipated for large components such as gates, penstocks, turbines, generators and transformers and structural steel. Also a railroad would lessen the impact of project traffic and heavy haulage on the Alaska highway system. In addition, these material and equipment items will likely be brought to Alaska by barge, rail barge and/or ship from the source either via Seattle or other foreign or domestic port to Anchorage or Whittier for trans-loading onto railcars for movement to the Project site. Shipping possibilities include rail barge for most of the materials which would allow the loaded rail cars to pass through Whittier or Anchorage directly to the project site without trans-loading. Materials shipped in sea containers (CONEX's) could be offloaded from a container ship in Anchorage and loaded onto rail cars for hauling to the project site. Vehicles associated with the project can be moved via rail car to the Watana Project.

3.3 Airstrip

A permanent airstrip would be constructed at a suitable location near the main construction camp. The runway is assumed to be 6,000 feet in length based on the project final report and should be capable of accommodating the C-130 Hercules aircraft as well as small jet passenger aircraft. If construction personnel transport were to be done by using jet aircraft, such as the Boeing 737-400 or similar, the runway would require greater length and should be constructed to generally higher standards than that serving the C-130 aircraft. Roads will connect the airstrip to the camp, village, and dam site. A small building will be constructed to serve as a terminal and tower and a fuel truck/maintenance facility will be constructed. A helicopter pad will also be provided.

A temporary airstrip will be constructed to support the early phases of mobilization and construction. This temporary runway will be 2,500 feet in length and will be located in the vicinity of the main construction camp. The airstrip will be capable of supporting smaller aircraft.

The temporary airstrip would eventually be incorporated into one of the main haul roads after the permanent airstrip is in service.

4.0 Cost Estimates

Cost estimates were developed for the alternatives examined. The cost estimates are intended to extend the information provided previously (HDR 2009 and R&M 2009), and to be as comparable as possible to the previous options.

4.1 RCC Costs

Due to the significant influence of the dam costs in the total project costs, the RCC unit cost was developed further.

4.1.1 RCC Unit Cost Analysis for Watana Dam

The Watana dam RCC unit cost was analyzed utilizing the contractor estimating approach of itemizing labor, equipment and materials (L, E & M) costs. Furthermore the unit cost was analyzed with the L, E &M approach in respect to three phases; the aggregate production and pozzolan materials delivery; RCC placement; and RCC production. A detailed breakdown of RCC Unit Costs may be viewed in Appendix A.

In the 1985 Harza Ebasco study, Borrow Pit E was designated as the conventional concrete aggregate source (see Figure 4.1-1). Borrow Pit E is located approximately 2 miles west of the dam axis on the north bank of the river.

Since the proposed site access for the Low Watana Development is from the south and aggregate production is scheduled to commence 12 months prior to RCC production, other borrow pits were reviewed for possible RCC aggregate sources. In review of the Acres, "Susitna Hydroelectric Project – 1980-81 Geotechnical Report", Quarry Site A was of primary interest due to its close proximity to the dam and location on the south bank. The previous geotechnical reports indicate that Quarry Site A contains good quality rock. It has an estimated 23 million cubic yards (mcy) of weathered rock and 71 mcy of good quality rock above elevation 2300 ft. The geotechnical report described the rock as "very resistant to abrasion and mechanical breakdown, seldom losing strength or durability in the presence of water and demonstrating high resistance to breakdown by freeze-thaw." The requirements for RCC aggregates are different than for conventional concrete and effectively any moderately to slightly weathered, non-reactive rock can be assumed to be worthy of consideration until proven otherwise.

The Borrow Pit E source was considered the primary source for aggregate in the 1985 Harza Ebasco study, however there would likely be significant excavation below the Susitna River water line. Due to its close proximity to the dam on the south bank, good rock qualities and abundance of material, Quarry Site A appears to be a very attractive RCC aggregate source. Since Quarry Site A is well above the river level, permitting would likely be less complicated than with Borrow Pit E. Preliminary volume estimates for the Low Watana Gravity Dam indicate that approximately 7.6 mcy of roller compacted concrete would be required. The preliminary RCC mix design requires approximately 80% aggregate by volume, which results in a total required aggregate volume of 6.1 mcy.

Due to the limited scope of this study, a detailed cost estimate of an aggregate production facility at Quarry Site A was not done on an itemized basis, rather, the

costs developed in the 1982 Acres study were utilized and escalated to 2008 dollars. The 1982 unit cost for aggregate production and hauling were escalated using the USBR Construction Cost Index under the category "Concrete Dams". The 1982 study utilized Borrow Pit E as the aggregate source, and it was assumed that the crushing and screening facilities would be similar for Quarry Site A. The estimated production from Borrow Pit E was 6.2 mcy, while the required production at Quarry Site A is approximately 6.1 mcy or less depending on the selected alternative. The aggregate haul costs were similarly escalated to 2008 dollars, which may be conservative since the round trip distance for Borrow Pit E was 4 miles compared to an estimated 1 mile for Quarry Site A. Another source of conservatism is that Quarry Site A has a much deeper groundwater table and less overburden as compared to Borrow Pit E, which will decrease the dewatering and clearing costs.

The cementitous material costs $180/ton ($48.86/cy) as determined in the R&M 2009 study were used in this cost analysis1. Also it was assumed that 4 ARAN Modumix III (MM III) batch plants would be installed to produce an average of 1,000 cy/hr of RCC. The total installation cost of the batch plants was estimated to be $20 million. Each of these assumptions is consistent with the Full Watana RCC Analysis. Other important assumptions used in the Full Watana RCC analysis that were utilized for determining labor and equipment costs are; RCC is mixed in 8 cy batches; each work day consists of two 10 hour shifts; the construction season is 5.5 months; and the total number of working days per season is 165.

As previously mentioned, RCC will be delivered to the dam via conveyors and chutes. Standard 10 cy (or larger) rear dump trucks will be used to transport the mixes to various placement locations. The estimated cycle times for dump trucks was calculated in order to determine the total number of trucks required for placement. In order to determine the total amount of placement crews required, the RS Means (RS Means 2010) estimation of cy of RCC placed per day per crew was adjusted to an hourly placement rate. In this manner the total number of haul trucks and placement crews was determined by the average RCC production rate of 1,000 cy/hr. Additional workers including laborers, foreman, operators, and mechanics, etc., were estimated based on total number of crews and trucks. Hourly labor rates for each trade were taken from the RS Means data. This hourly rate was then prorated to include the overtime for a 10 hr work day and multiplied by the city cost index for Fairbanks.

The total pieces of equipment was based on the number of placement crews and batch plant operations. The RS Means (RS Means 2010) Hourly Operational Costs and Monthly Rental Rates were utilized for the analysis. Each was multiplied by the Fairbanks City Cost Index. Using the average production rate, a total number of required work days for placement was determined, which resulted in 3 construction seasons. The overall rental rates were then calculated for operational time and idle time. Based on previous experience, it was assumed that the total equipment operational cost of the batch plant was equal to the total cost of supply of the batch plant, which has been estimated to be approximately $20 million.

[1] Note that this cost is based on the assumption that all supplementary cementitious materials (pozzolan, fly ash, etc) used in the mix are imported. If suitable sources of pozzolanic materials are identified within Alaska, substantial reductions in this unit price may well be possible.

The detailed breakdown of the RCC unit cost resulted in a total per cubic yard cost of $97.21, which compares very well to the previous RCC unit cost of $100/cy used in for the Full Watana alternative (R&M 2009). Further analysis of the aggregate production plant and RCC batch plants may show additional reductions in costs, but for the scope of this analysis an RCC unit cost of $100/cy appears valid.

4.1.2 Sizing of RCC Batching Plant

The abutments at the Watana Site are ideal for the transportation of the RCC to the dam surface using a 'vacuum chute'. The RCC can be lowered 250 to 350 feet for placement without difficulty. Therefore, based on potential quarry location and using any of the above-mentioned transportation methods, the most appropriate location for the RCC batching plant for Low Watana would appear to be at the intake approach channel. This area is already planned to be excavated for the intake, therefore a separate excavation for a batch plant would not be required. It would also be approximately two-thirds the height of the dam and allow for transport of material to the placement elevations above and below the intake. For the bottom half of the dam, a fixed conveyor could run downwards from the plant to a hopper at about half height near the axis of the dam. This hopper could feed a chute that would load the trucks on the dam surface. As the dam increased in height, sections of the chutes/pipes would be removed. For the placement of RCC in the upper half of the dam, the fixed conveyor could run from the concrete batching plant upwards to a hopper just above the crest of the dam that would then feed a chute for final conveyance to the trucks on the dam surface. This RCC transportation scheme would provide a very simple and reliable (and inexpensive) method that has the potential for reducing the unit costs estimated.

4.2 Camp Cost

The 1982 Acres Feasibility Study cost estimate had assumed for the Watana embankment dam a camp for 3,600 workers, a project village, and support facilities. The 2009 HRD report indicated a much smaller camp than anticipated in 1982.

When comparing the ICRD to the RCC dam alone, the smaller volume of the RCC dam would logically reduce the workforce required. However is anticipated to be 24/7 for 5.5 months. Embankment fill placement for the ICRD is presumably daylight hours for 8-9 months. For RCC, crews are smaller (more highly mechanized operation) but there are more of them. We have assumed the camp for the RCC dam construction costing about 20 percent less than that for the embankment dam concept (factor of 18.75% was used in calculations).

4.3 Project Access Cost

It has been assumed that the rail line can be installed at the average rate of $4.7 million per mile based on Alaska Railroad estimating guidelines.

4.4 Cost Summary

A comparison table of the Low Watana options is presented as Table 4.4-1. Detailed cost estimates are presented in Appendix B.

Table 4.4-1: Cost Comparison of Selected Low Watana ICRD and RCC Alternatives

	Line Item Name	Low Watana Non-Expandable ICRD (1)	Low Watana Expandable ICRD (1)	Low Watana RCC - Non-Expandable	Low Watana RCC - Expandable	Low Watana RCC Gravity Arch
	Total Estimated Const. Costs (Billions $)	**4.50**	**5.00**	**3.90**	**4.20**	**3.60**
FERC Line #	**Line Item Name**	**Low Watana Non-Expandable ICRD (1)**	**Low Watana Expandable ICRD (1)**	**Low Watana RCC - Non-Expandable**	**Low Watana RCC - Expandable**	**Low Watana RCC Gravity Arch**
71A	Engineering, Env, and Regulatory (7%)	$ 236,000,000	$ 259,000,000	$ 203,200,000	$ 217,900,000	$ 186,600,000
330	Land and Land Rights	$ 121,000,000	$ 121,000,000	$ 120,900,000	$ 120,900,000	$ 120,900,000
331	Power Plant Structure Improvements	$ 115,000,000	$ 159,000,000	$ 121,219,000	$ 161,389,000	$ 121,219,000
332.1-.4	Reservoir, Dams and tunnels	$ 1,537,690,000	$ 1,718,000,000	$ 1,425,110,000	$ 1,472,944,000	$ 1,220,892,000
332.5-.9	Waterways	$ 590,000,000	$ 677,000,000	$ 276,342,000	$ 387,367,000	$ 242,655,000
333	Waterwheels, Turbines and Generators	$ 297,000,000	$ 297,000,000	$ 297,000,000	$ 297,000,000	$ 297,000,000
334	Accessory Electrical Equipment	$ 41,000,000	$ 41,000,000	$ 40,000,000	$ 40,000,000	$ 40,000,000
335	Misc Power Plant Equipment	$ 21,000,000	$ 32,000,000	$ 21,000,000	$ 32,000,000	$ 32,000,000
336	Roads, Rails and Air Facilities	$ 232,000,000	$ 232,000,000	$ 254,700,000	$ 254,700,000	$ 254,700,000
350-390	Transmission Features	$ 224,000,000	$ 224,000,000	$ 207,362,000	$ 207,362,000	$ 207,362,000
63	Main Construction Camp	$ 180,000,000	$ 180,000,000	$ 123,800,000	$ 123,800,000	$ 123,800,000
399	Other Tangible Property	$ 16,000,000	$ 16,000,000	$ 15,800,000	$ 15,800,000	$ 15,800,000
71B	Construction Management (4%)	$ 135,000,000	$ 148,000,000	$ 116,100,000	$ 124,500,000	$ 106,600,000
Total Subtotal	Subtotal	$ 3,745,690,000	$ 4,104,000,000	$ 3,222,533,000	$ 3,455,662,000	$ 2,969,528,000
Total Contingency	Contingency (20%)	$ 749,138,000	$ 821,005,200	$ 644,506,600	$ 691,132,400	$ 593,905,600
Total	Total Estimated Const. Costs (Million $)	**$4,500**	**$5,000**	**$3,900**	**$4,200**	**$3,600**

(1) From HDR 2009

5.0 Project Schedule

The ICRD configuration has two basic construction fronts; dam and powerhouse, which are relatively independent of each other. With a surface powerhouse near an RCC gravity or gravity arch, the construction area is less independent and a higher level of coordination would be required during construction operations.

5.1 Dam

The anticipated construction season for RCC or conventional concrete construction is 5.5 months, with a maximum of 165 working days. Certain activities such as aggregate production and underground work may be continuous, year-round operations. The ICRD dam configuration has two basic construction fronts; dam and powerhouse, which are relatively independent of each other. With a surface powerhouse near an RCC gravity or gravity arch, the construction area is less independent and a higher level of coordination would be required during construction.

Previous studies (R&M 2009) for the Full Watana RCC option have assumed an average daily placement rate of 20,000 cy/day, which equates to an average monthly placement rate of 600,000 cy/mn. Currently the maximum peak placement observed rate of RCC placement is 525,000 cy/mn (MD&A figures for a single production plant). The significantly higher monthly placement rate for the Watana Dam is due to the plan of installing two separate large RCC production facilities. In order to optimize the RCC construction during the short construction season at the site, significant production facilities will be needed. The nominal production capacity of each of the two RCC plants will be similar to existing recent projects. The Watana site is expected to benefit from aggregate production for more than the 5.5 months assumed for dam placement as well as advantageous location of the Site A quarry. Aggregate production will commence at least 12 months prior to the start of RCC placement. Production are estimated to be double shifts, 6 days per week for 8 to 9 months per year and must be planned to ensure that aggregate production does not impact critical path. The ratio of nominal daily production capacity to average production rates will be approximately 2. By factoring the volume of the dam and using average production rates ranging between 20,000–15,000 cy/day, the approximate dam construction time is shown below in Table 5.1

Table 5.1-1 Time Required for RCC Dam Placement

Alternative	Volume (million)	Time to place material
Full Watana	15.0	4.5 to 6 years
Low Watana Gravity	8	2.4 to 3.2 years
Low Watana Gravity Arch	6.5	2 to 2.6 years

5.2 Powerhouse

A surface powerhouse would be more subject to climatic constraints than an underground powerhouse and therefore the construction season for exterior work involving concrete placement would have similar limitations to dam placement. Once the powerhouse shell is completed, equipment installation could continue through the winter season.

The underground powerhouse is subject to greater geotechnical uncertainty which could result in modifications to design plans and potential project delays.

The powerhouse excavation for the surface powerhouse may begin prior to diversion tunnel and cofferdam completion (potentially providing material for the pre-cofferdam and cofferdam). Similarly the south abutment excavation and grouting may be performed concurrently with the diversion construction. Through careful scheduling, it may be possible for the excavation above river level on the south abutment and excavation for the surface powerhouse to be completed at approximately the same time as the diversion completion. After diversion, the dam and surface powerhouse foundation excavation and treatment may continue. The diversion cofferdams may also function for river crossing such that the north abutment excavation and treatment may begin.

Once the powerhouse shell is completed, equipment installation could continue through the winter season. Therefore the completion of the surface powerhouse shell is a significant project milestone, such that it should have a target completion date that will not cause it to be a critical path item.

5.3 Combined Dam and Powerhouse Schedule

The schedule for the ICRD Low Watana dam (HDR 2009) shows similar time for dam construction and powerhouse/transmission lines. More detailed review is required to determine which element is on the critical path. The RCC dam is expected to be constructed in less time than the ICRD dam, which will place the powerhouse onto the critical path for construction.

At this point, given the current level of design and schedule we are not able to demonstrate significant schedule advantage for the overall project with the RCC scheme. However it should be noted that other projects using RCC dams that allowed early completion of the dam construction and impoundment of the reservoir, found the benefit of early generation revenue and availability of additional construction and management resources combined to allow powerhouse construction and equipment installation to be significantly accelerated to significant economic advantage.

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Figures

NOTICE TO READER - Some of the Figures have been taken from previous Susitna Project reports and the conventions for cardinal direction are inconsistent from report to report in many cases, i.e. North is the top of the page on some figures and the bottom of the page on others. The Figures were not re-drawn for this report. New figures use the convention of North at the top of the sheet. Many old figures use the convention of stream flow from left to right; the Susitna River in the area of the Susitna project flows from east to west.

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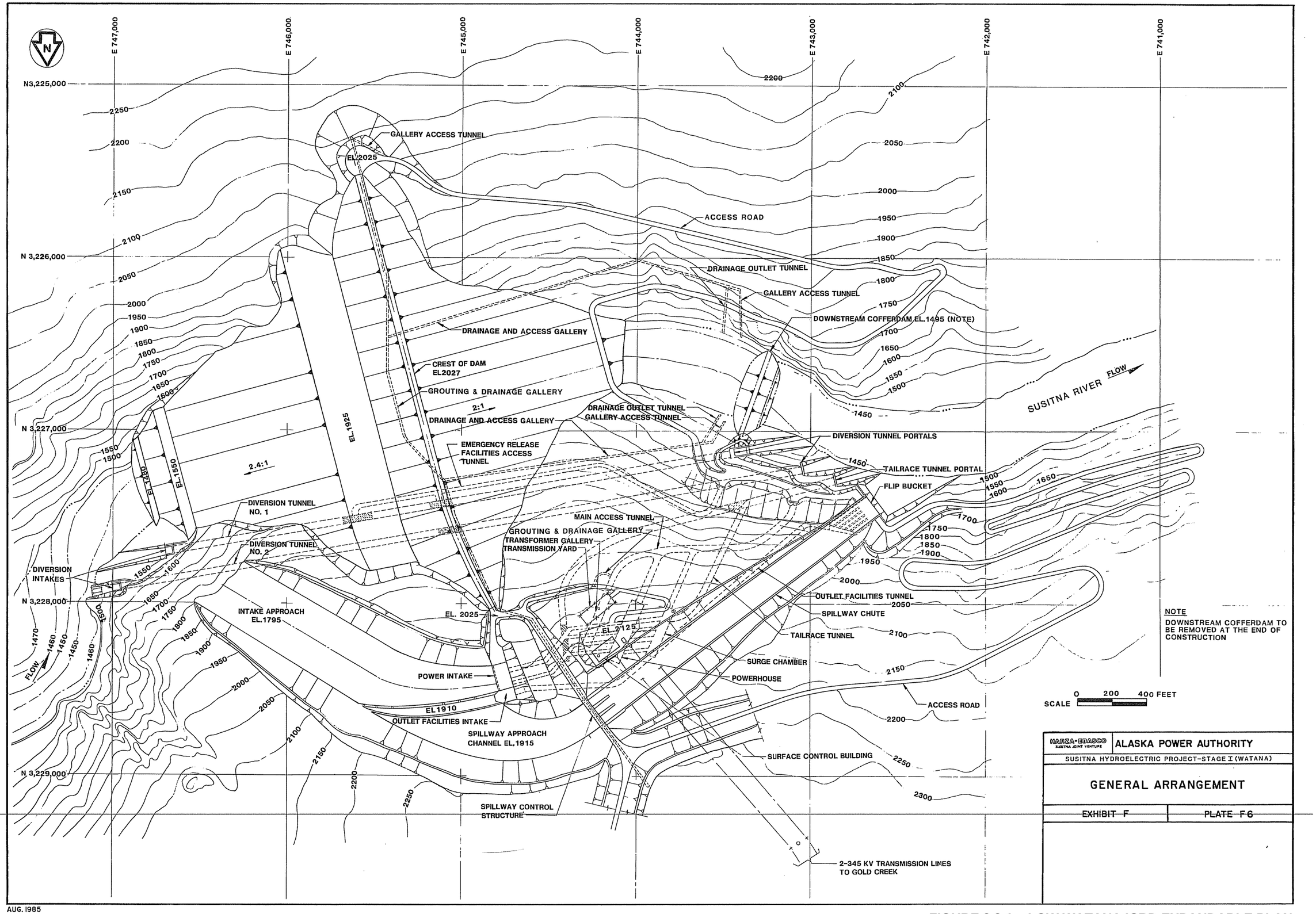

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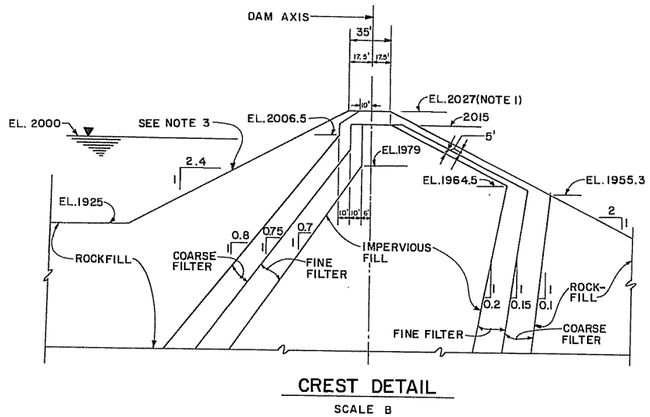
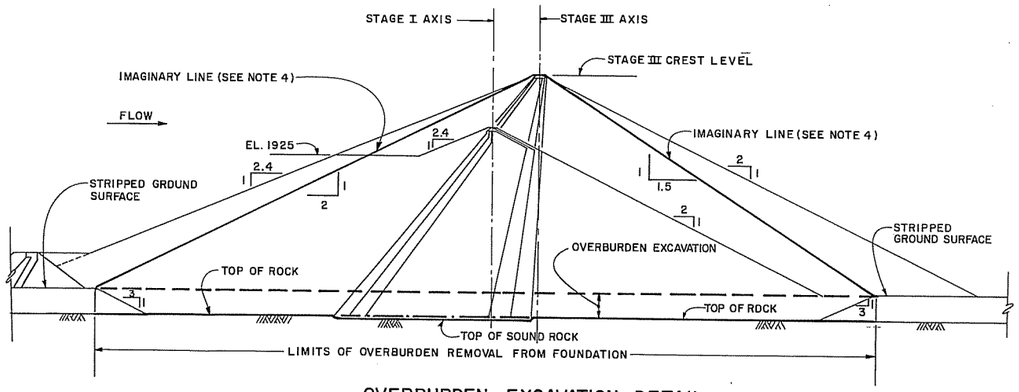
FIGURE 2.2-1 LOW WATANA ICRD EXPANDABLE PLAN



CREST DETAIL

SCALE B

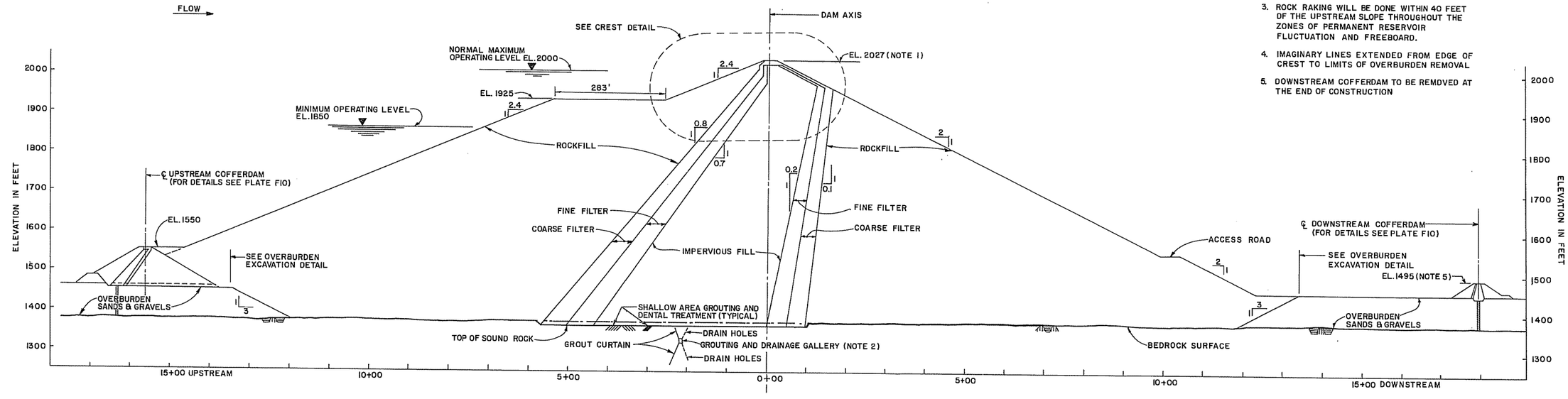


OVERBURDEN EXCAVATION DETAIL

SCALE C

NOTES:

1. INCLUDES 2' SETTLEMENT OVERBUILD.
2. DRAINAGE AND GROUTING DETAILS SHOWN ON PLATE F8.
3. ROCK RAKING WILL BE DONE WITHIN 40 FEET OF THE UPSTREAM SLOPE THROUGHOUT THE ZONES OF PERMANENT RESERVOIR FLUCTUATION AND FREEBOARD.
4. IMAGINARY LINES EXTENDED FROM EDGE OF CREST TO LIMITS OF OVERBURDEN REMOVAL
5. DOWNSTREAM COFFERDAM TO BE REMOVED AT THE END OF CONSTRUCTION



TYPICAL SECTION – DAM EMBANKMENT (MAXIMUM HEIGHT)

SCALE A

SCALE A 0 100 200 FEET

SCALE B 0 50 100 FEET

SCALE C 0 200 400 FEET

MARIA-BRASCO JOINT VENTURE	ALASKA POWER AUTHORITY
SUSITNA HYDROELECTRIC PROJECT-STAGE I (WATANA)	
DAM TYPICAL SECTION AND DETAILS	
EXHIBIT F	PLATE F7

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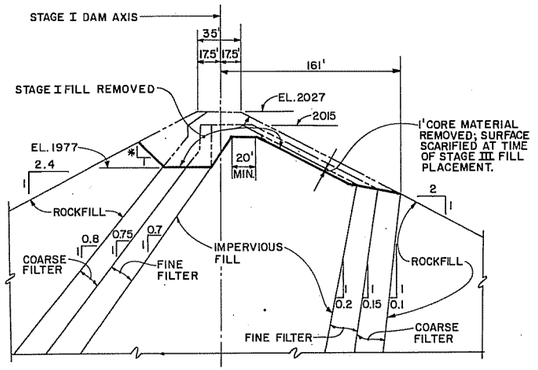
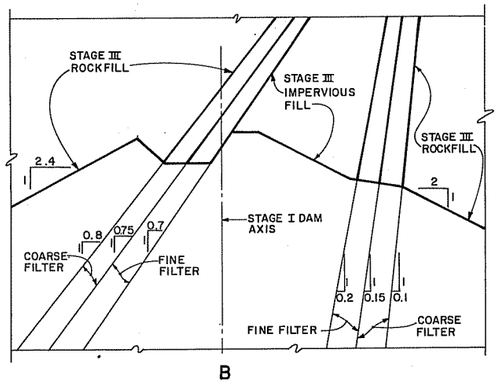
FIGURE 2.2-2 LOW WATANA ICRD EXPANDABLE SECTION



A

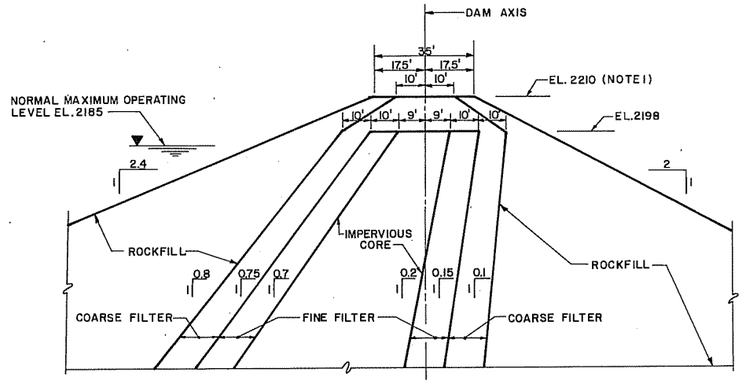
EXCAVATION DETAIL

* STABLE



B

FILL DETAIL

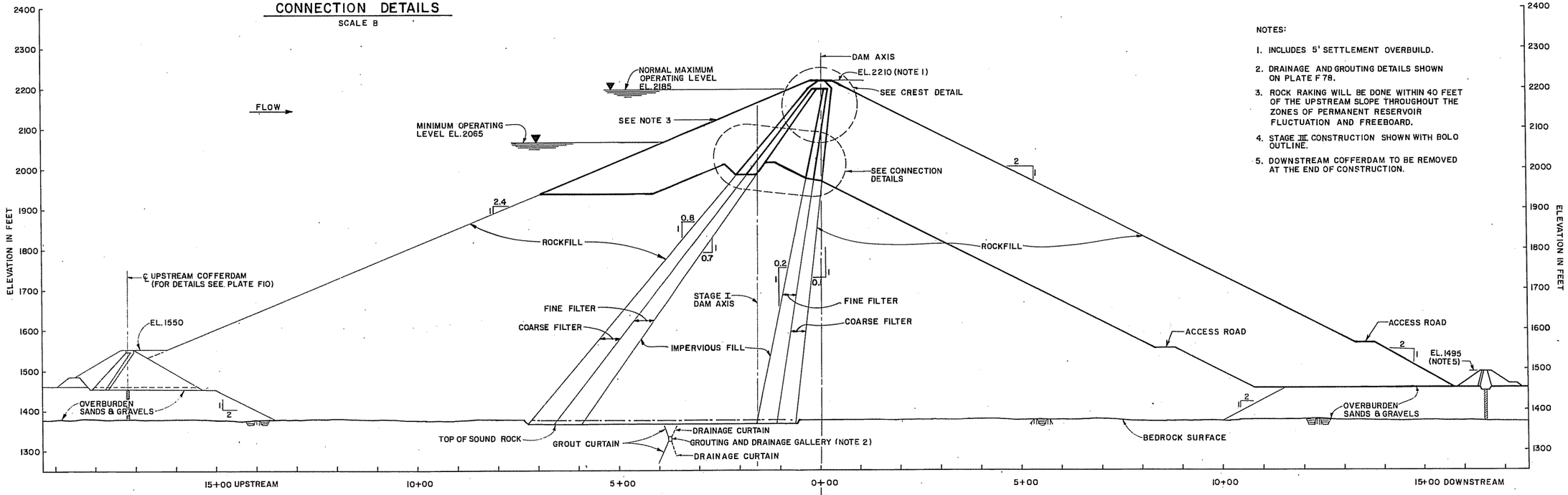


CREST DETAIL

SCALE C

CONNECTION DETAILS

SCALE B



TYPICAL SECTION – DAM EMBANKMENT (MAXIMUM HEIGHT)

SCALE A

NOTES:

1. INCLUDES 5' SETTLEMENT OVERBUILD.
2. DRAINAGE AND GROUTING DETAILS SHOWN ON PLATE F 78.
3. ROCK RAKING WILL BE DONE WITHIN 40 FEET OF THE UPSTREAM SLOPE THROUGHOUT THE ZONES OF PERMANENT RESERVOIR FLUCTUATION AND FREEBOARD.
4. STAGE III CONSTRUCTION SHOWN WITH BOLD OUTLINE.
5. DOWNSTREAM COFFERDAM TO BE REMOVED AT THE END OF CONSTRUCTION.

SCALE A 0 100 200 FEET

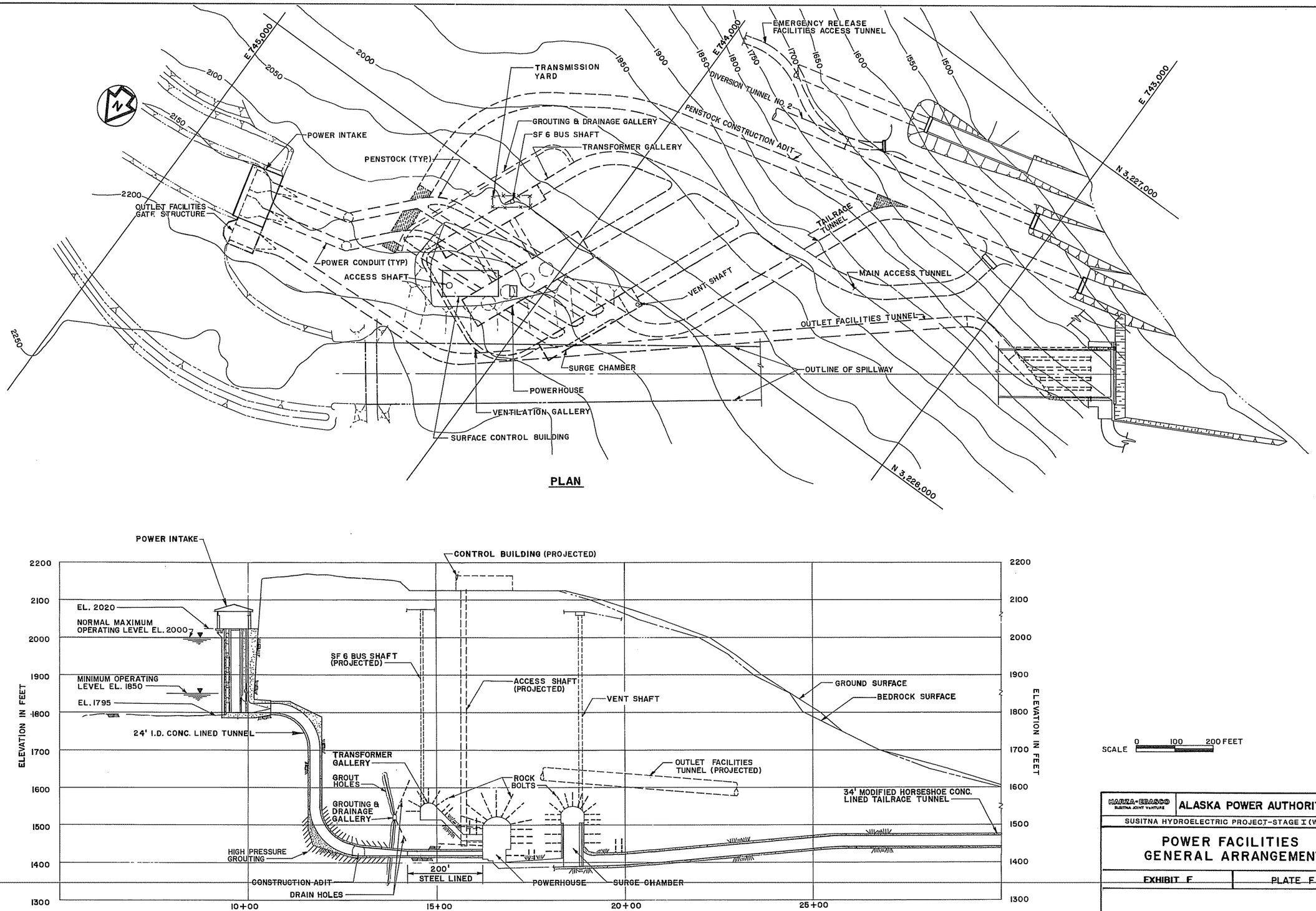
SCALE B 0 50 100 FEET

SCALE C 0 20 40 FEET

MANZA-ENSERCH SUSITNA JOINT VENTURE	ALASKA POWER AUTHORITY
SUSITNA HYDROELECTRIC PROJECT-STAGE III (WATANA)	
DAM TYPICAL SECTION AND DETAILS	
EXHIBIT F	PLATE F77

AUG. 1985

FIGURE 2.2-3 LOW WATANA ICRD EXPANDABLE STAGE 2 SECTION



PLAN

PROFILE

SCALE 0 100 200 FEET

HARZA-EBASCO SUSITNA JOINT VENTURE	ALASKA POWER AUTHORITY
SUSITNA HYDROELECTRIC PROJECT-STAGE I (WATANA)	
POWER FACILITIES GENERAL ARRANGEMENT	
EXHIBIT F	PLATE F-21

AUG. 1985

FIGURE 2.2-4 LOW WATANA ICRD POWER FACILITIES

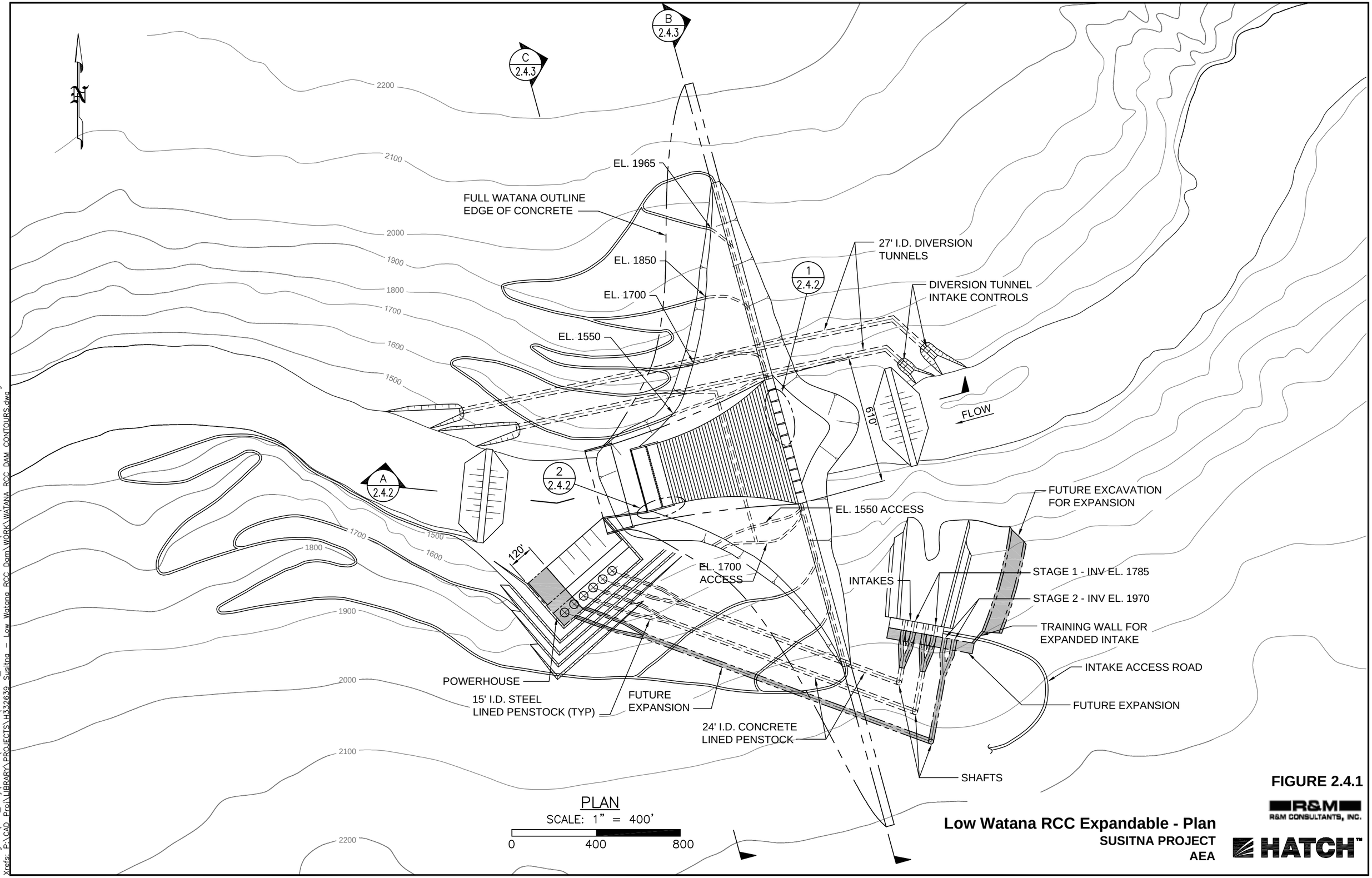


FIGURE 2.4.1

Low Watana RCC Expandable - Plan

SUSITNA PROJECT

AEA

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Plotted: Nov 09, 2010 – 9:47am
Drawing: P:\CAD_Proj\LIBRARY\PROJECTS\H332639_Susitna – Low Watana RCC Dam\WORK\FIGURES 2-4-1 TO 2-4-3.dwg
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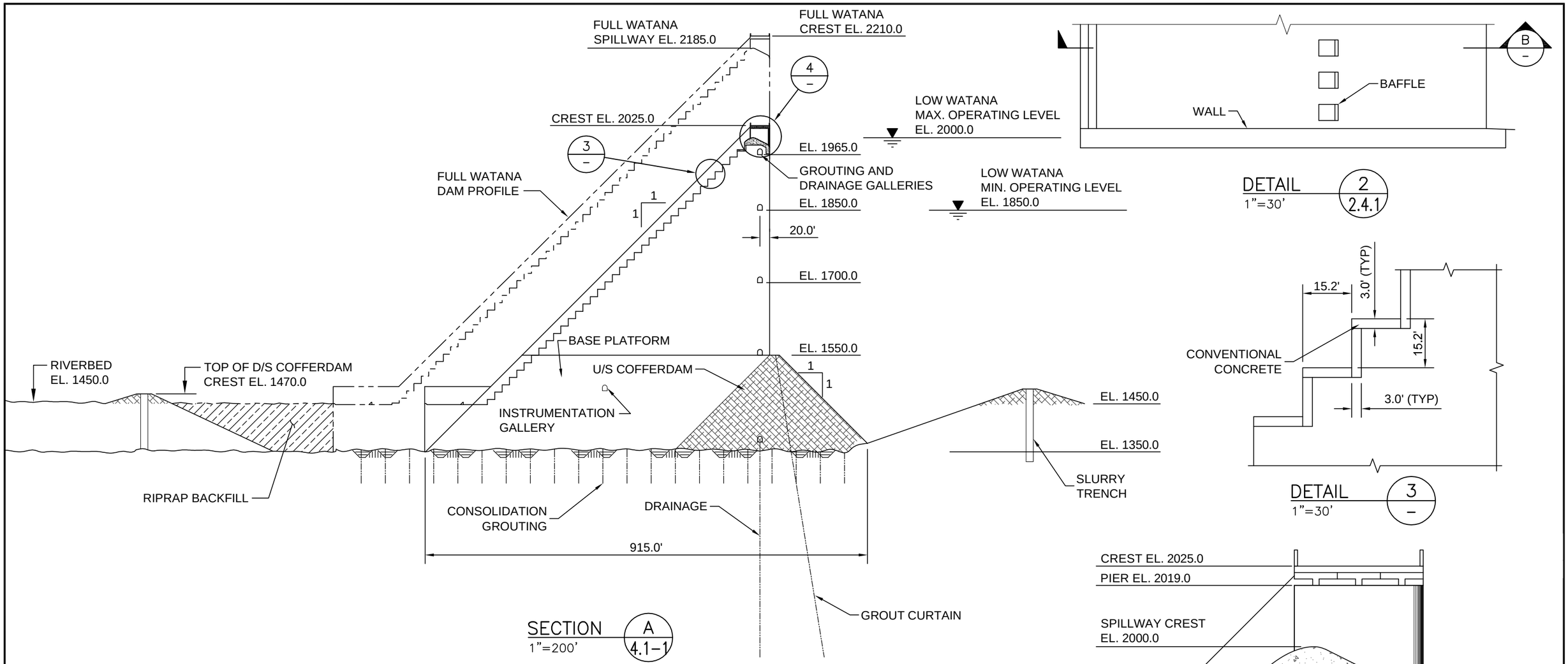
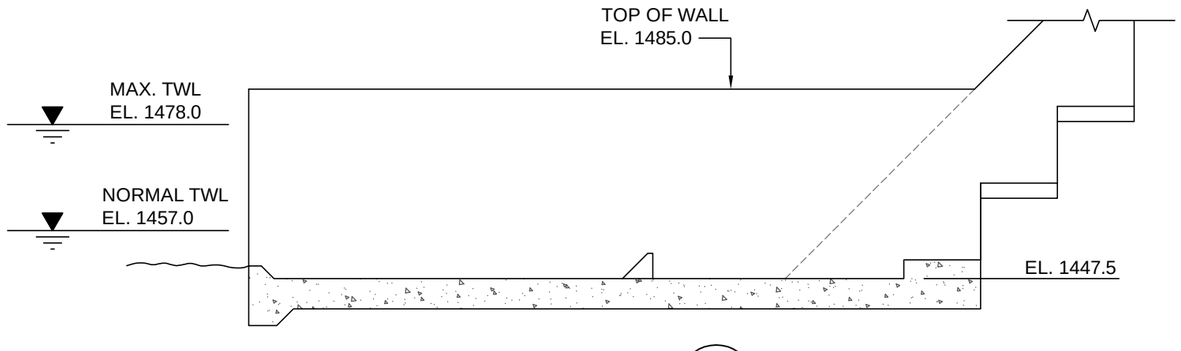


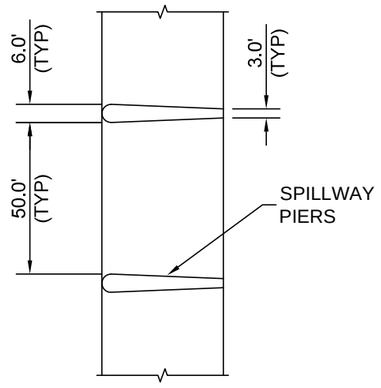
SECTION A
1"=200'
4.1–1

DETAIL 2
1"=30'
2.4.1

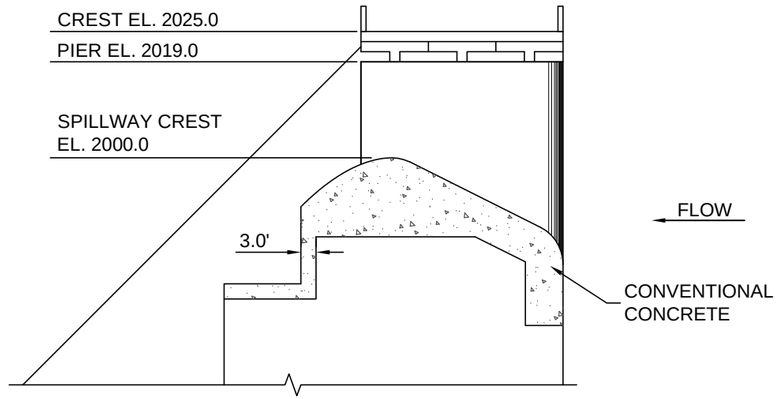
DETAIL 3
1"=30'
–



SECTION B
1"=30'
–



DETAIL 1
1"=50'
2.4.1



DETAIL 4
1"=30'
–

FIGURE 2.4.2

Low Watana RCC Expandable Sections and Details

SUSITNA PROJECT

AEA

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HATCH™

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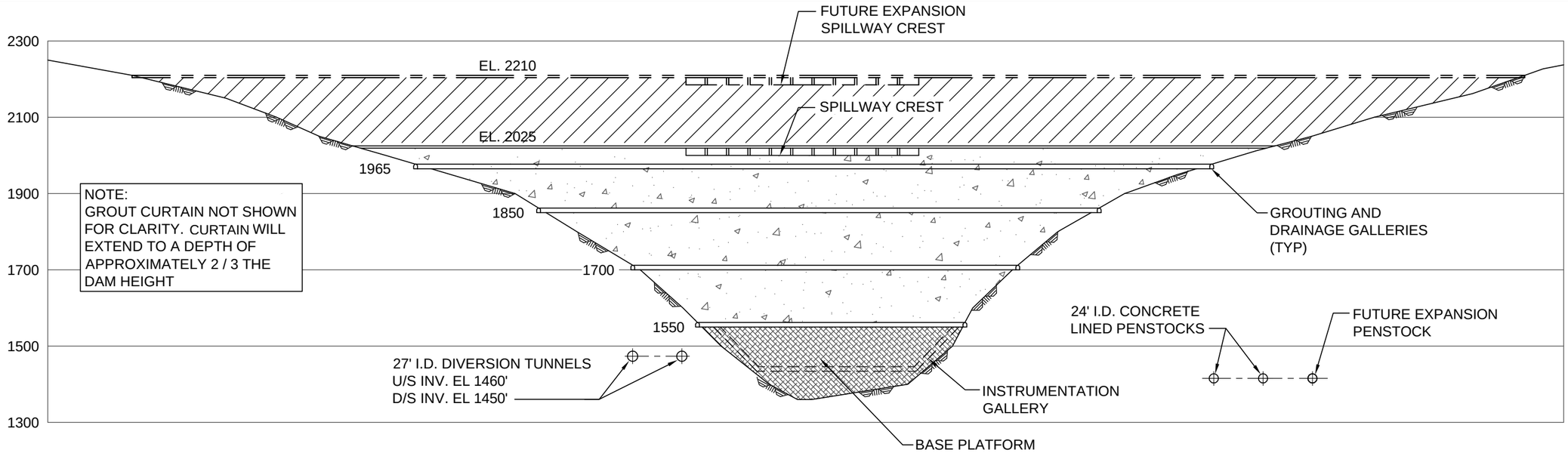
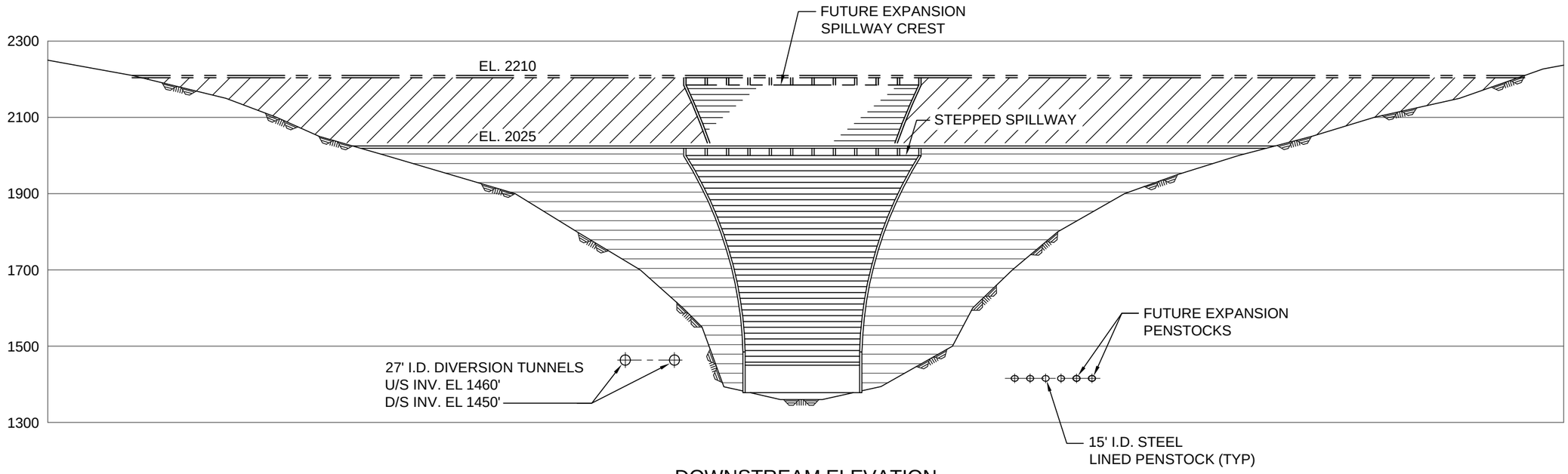


ELEVATION THRU GALLERIES

SECTION B
1"=300' 2.4.1



DOWNSTREAM ELEVATION

SECTION C
1"=300' 2.4.1

SCALE: 1" = 300'

0 300 600

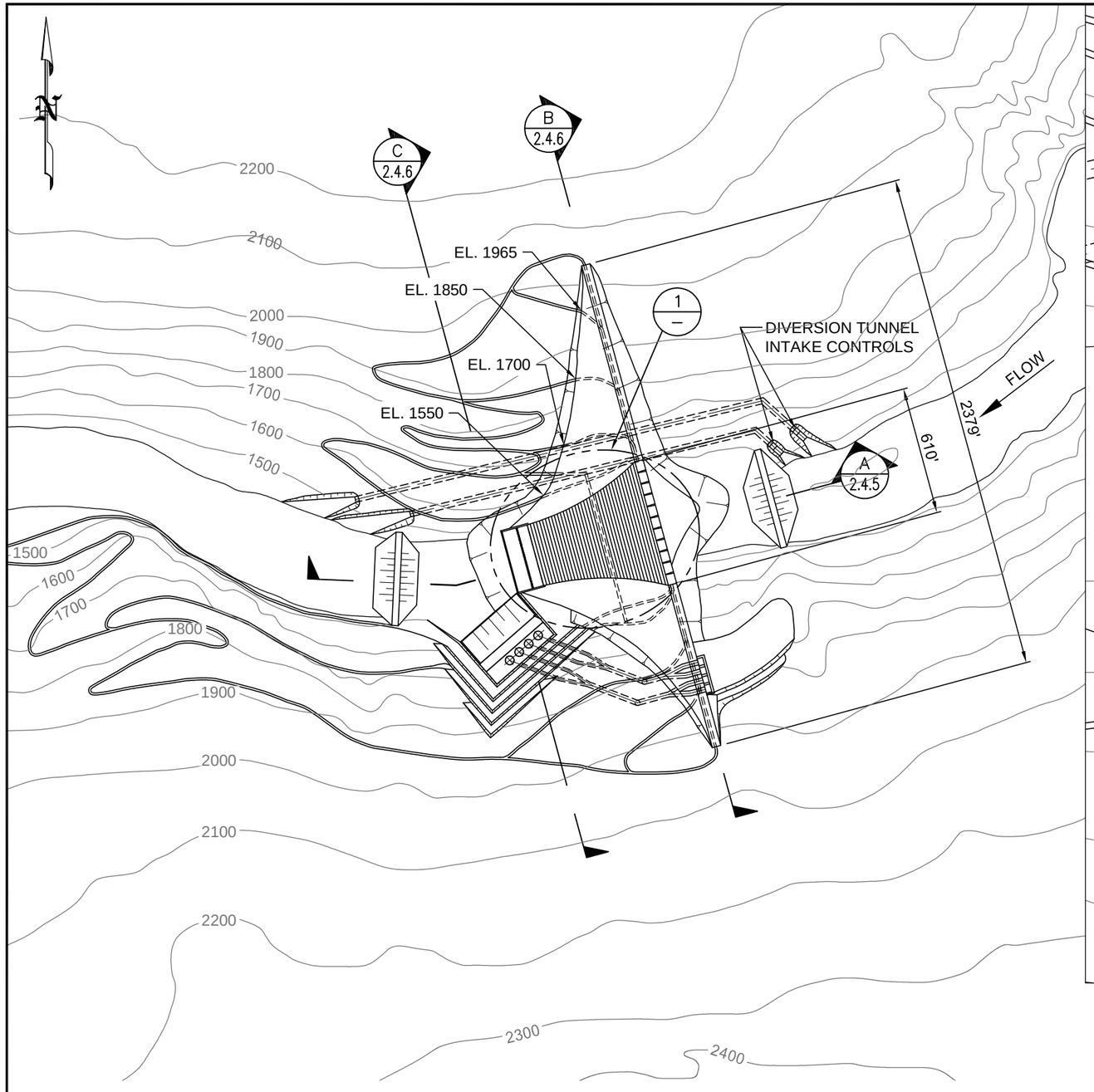
FIGURE 2.4.3

R&M CONSULTANTS, INC.

Low Watana RCC Expandable - Elevation Views

AEA

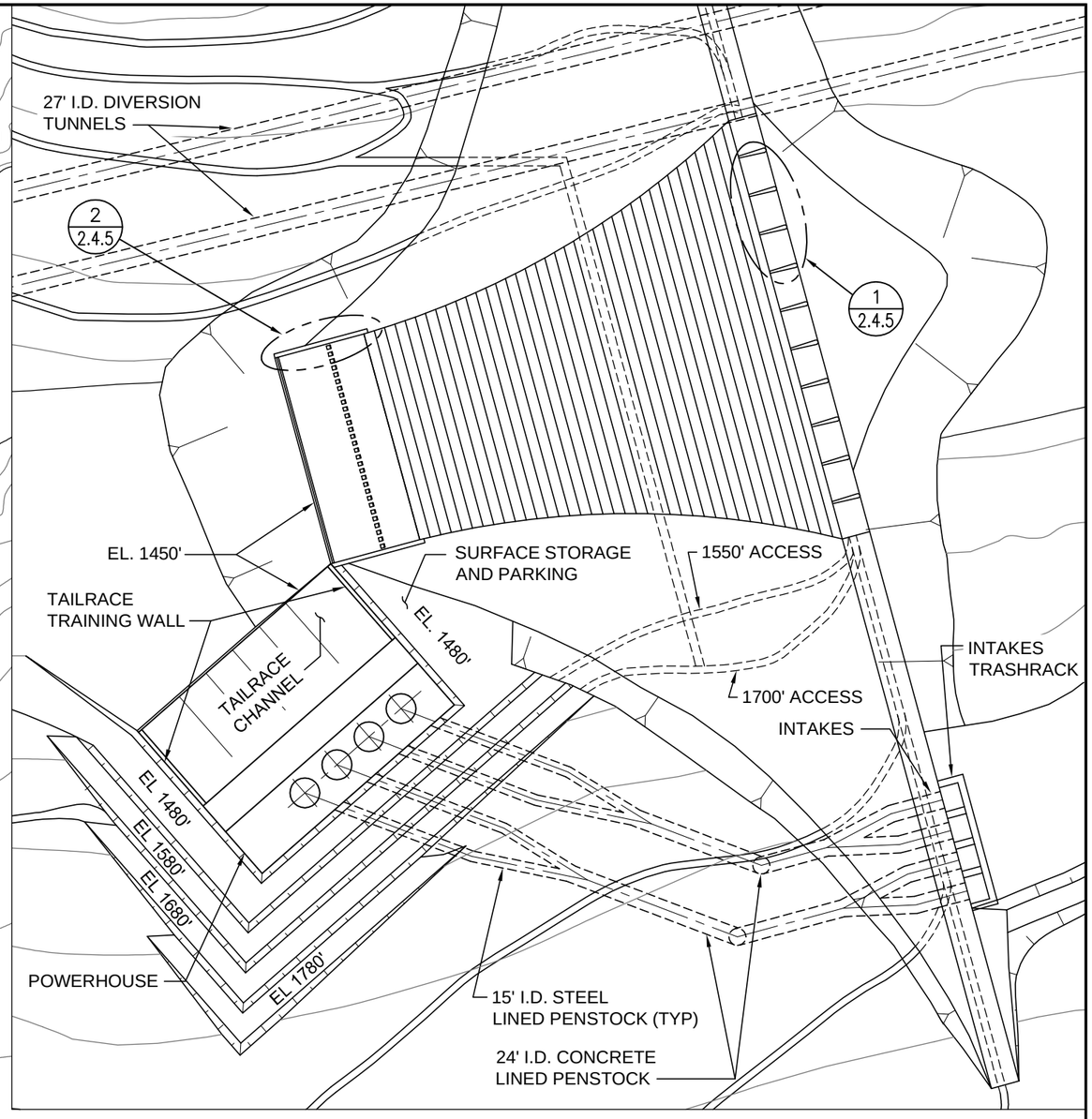
HATCH™



PLAN

SCALE: 1" = 600'

0 600 1200



DETAIL 1

SCALE: 1" = 200'

0 200 400

FIGURE 2.4.4

Low Watana RCC Non Expandable
Plan and Detail View
SUSITNA PROJECT
AEA

R&M CONSULTANTS, INC.

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Plotted: Nov 09, 2010 - 9:48am
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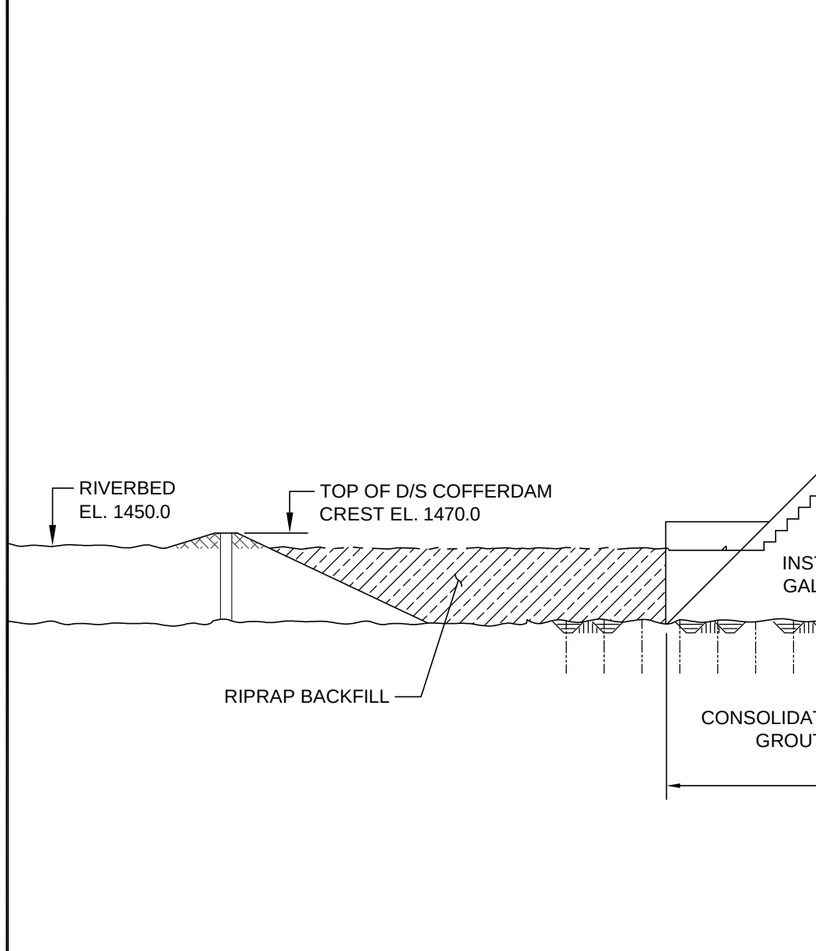
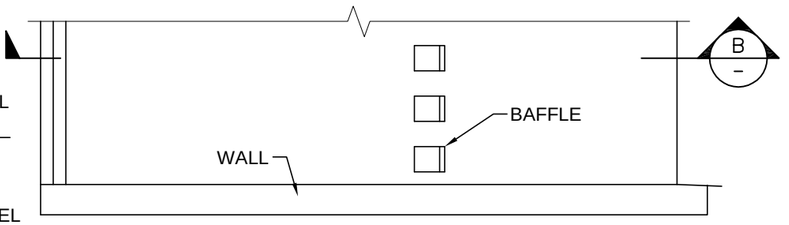
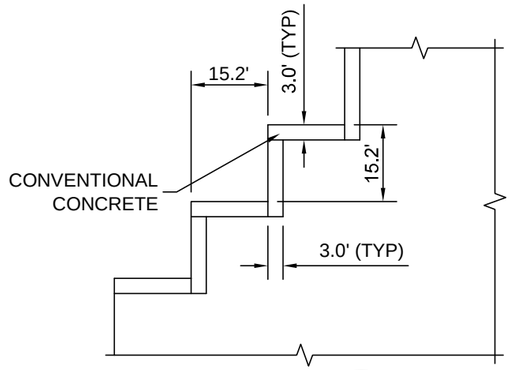


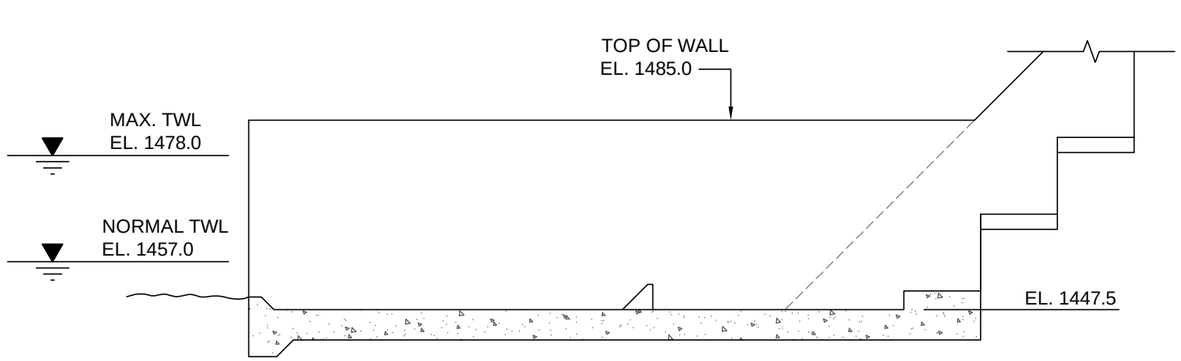
SECTION A
1"=200'
2.4.4



DETAIL 2
1"=30'
2.4.4

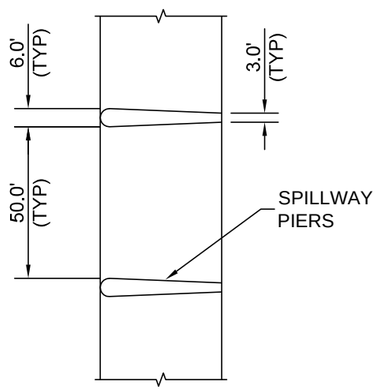


DETAIL 3
1"=30'
–

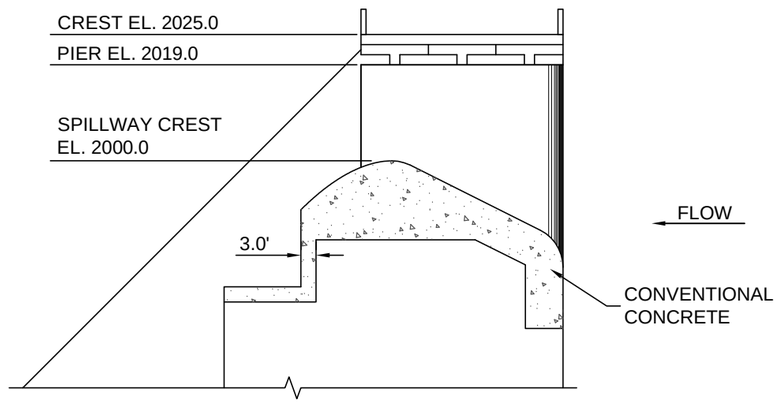


SECTION B
1"=30'
–

SCALE: 1" = 200'
0 200 400



DETAIL 1
1"=50'
2.4.4



DETAIL 4
1"=30'
–

FIGURE 2.4.5

Low Watana RCC Non Expandable Sections and Details

SUSITNA PROJECT

AEA

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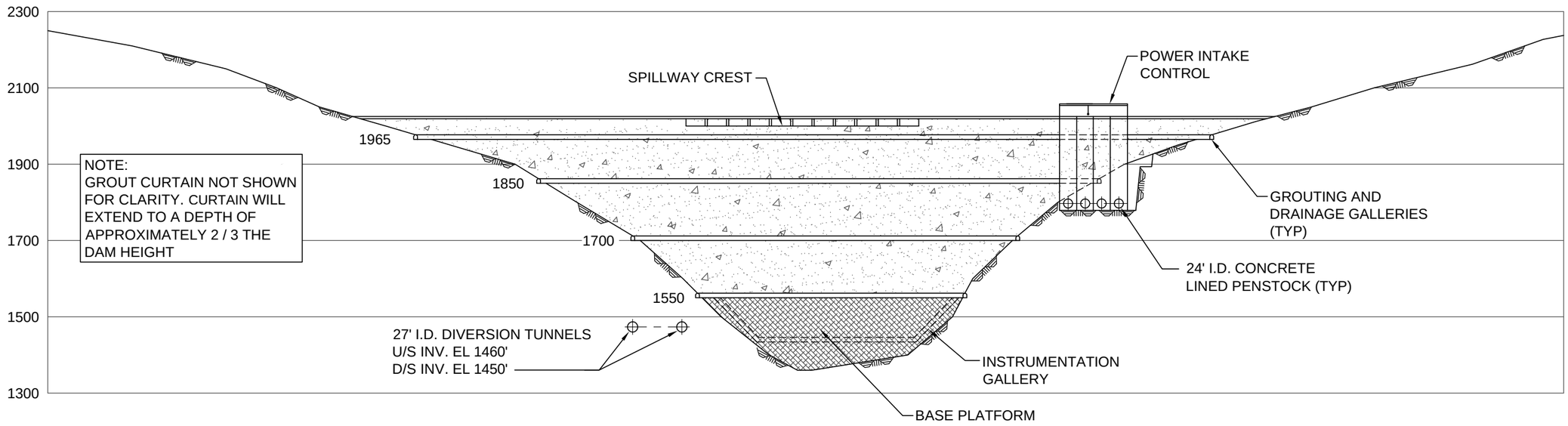
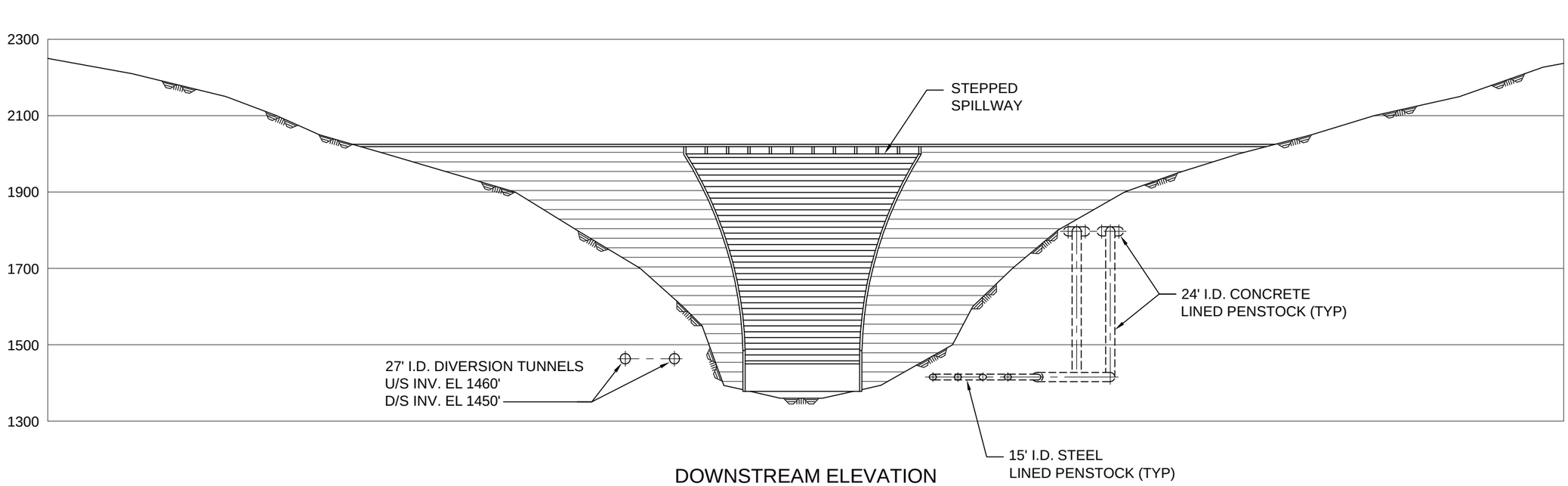
Xrefs: P:\CAD_Proj\LIBRARY\PROJECTS\V1333839_Susitna - Low Watana RCC Dam\WORK\WATANA RCC DAM CONTOURS.dwg; P:\CAD_Proj\LIBRARY\PROJECTS\V1333839_Susitna - Low Watana RCC Dam\WORK\ARCH DAM ALTERNATIVE.dwg



ELEVATION THRU GALLERIES

SECTION B
1"=300' 2.4.4



DOWNSTREAM ELEVATION

SECTION C
1"=300' 2.4.4

SCALE: 1" = 300'

0 300 600

FIGURE 2.4.6

Low Watana RCC Non Expandable - Elevation Views

SUSITNA PROJECT
AEA

R&M CONSULTANTS, INC.

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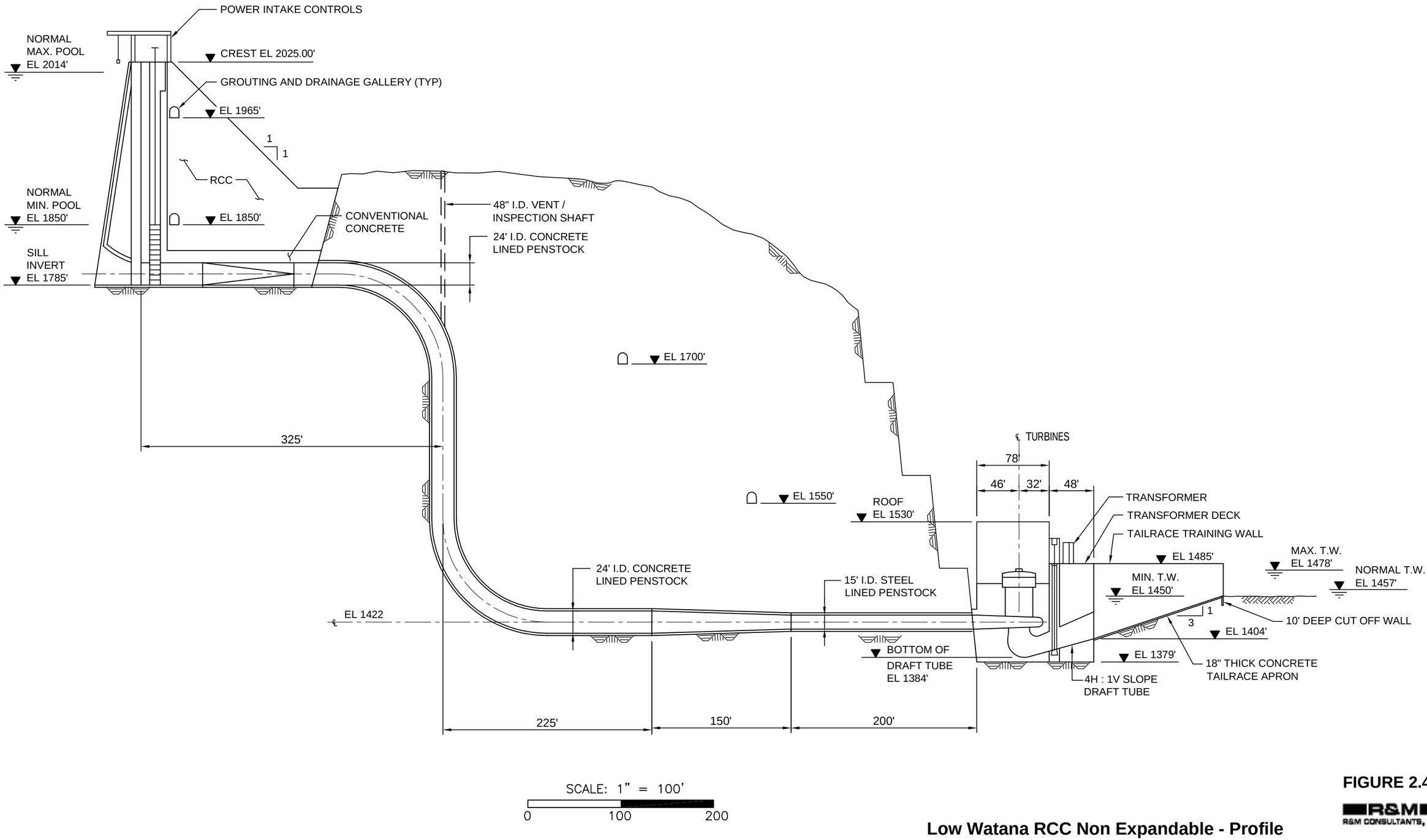

FIGURE 2.4.7

Low Watana RCC Non Expandable - Profile

SUSITNA PROJECT

AEA

R&M CONSULTANTS, INC.

HATCH™

Plotted: Nov 09, 2010 - 9:48am
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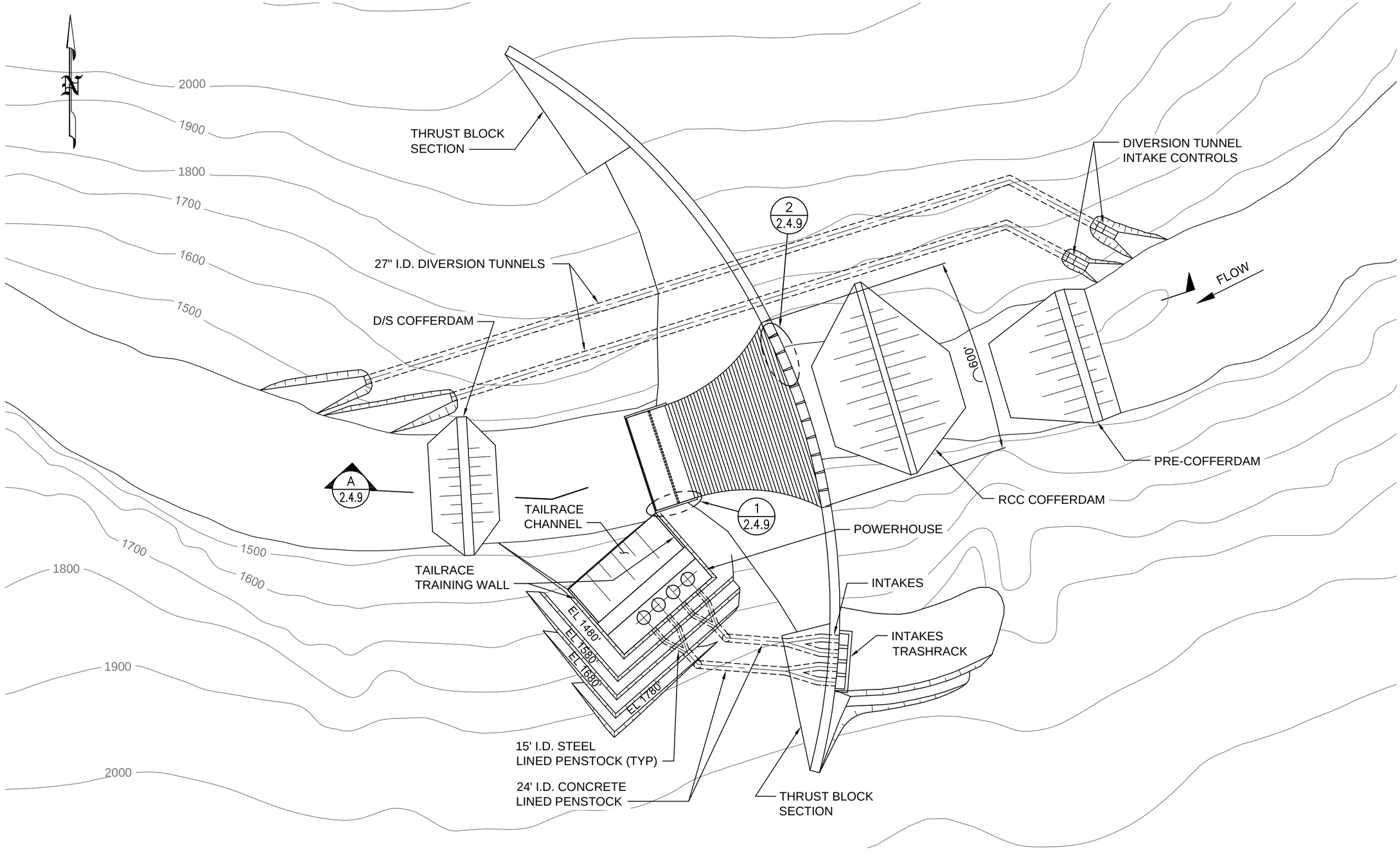
Xrefs:



PLAN

SCALE: 1" = 300'

0 300 600

FIGURE 2.4.8

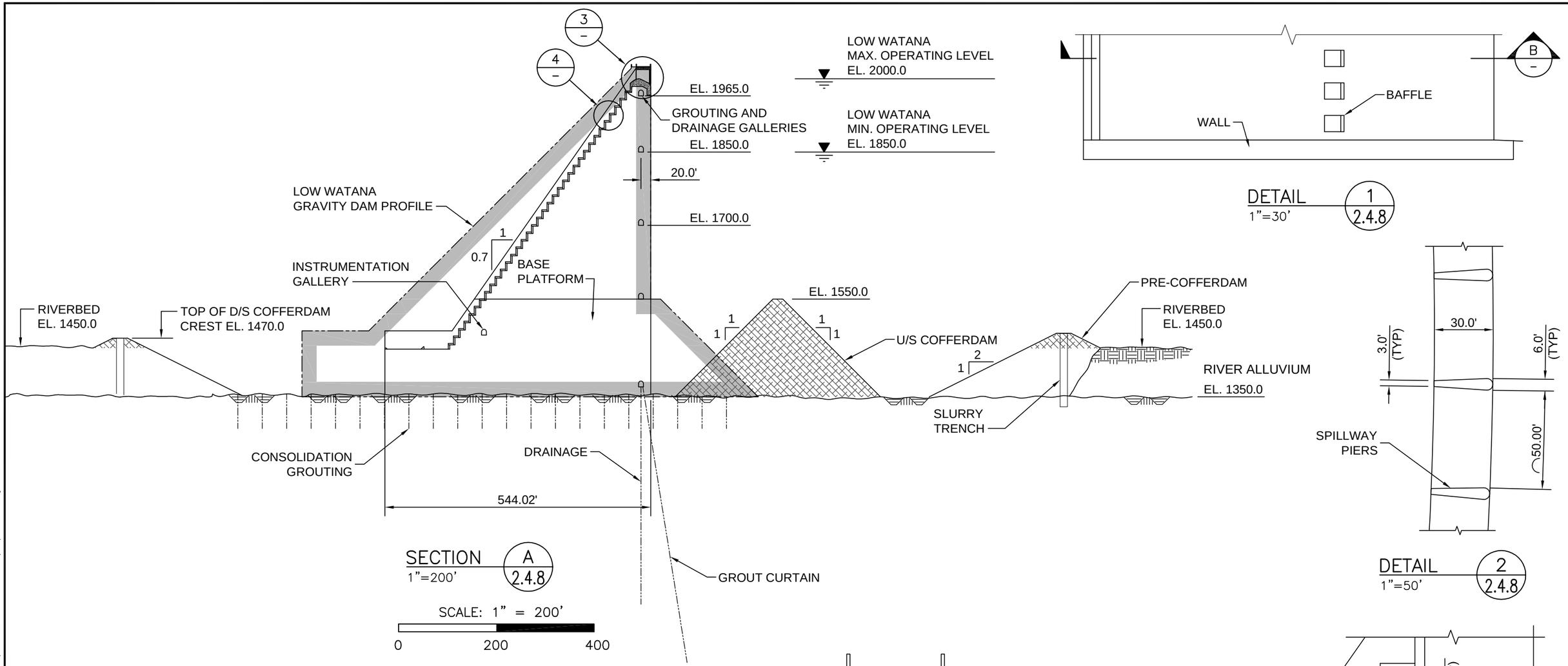
Low Watana RCC Non Expandable Gravity Arch - Plan

SUSITNA PROJECT

AEA

R&M CONSULTANTS, INC.

HATCH™

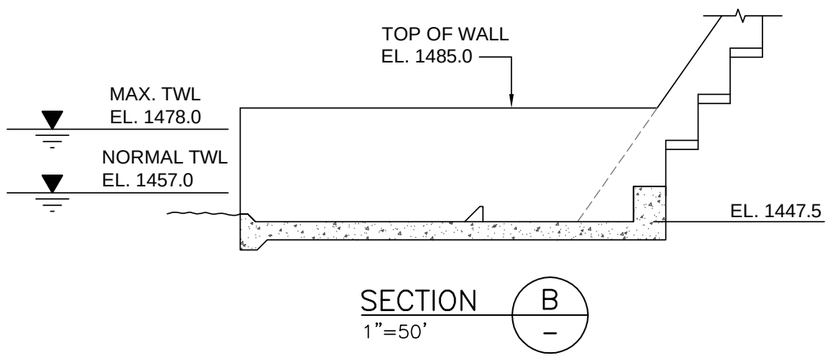


SECTION A
1"=200'

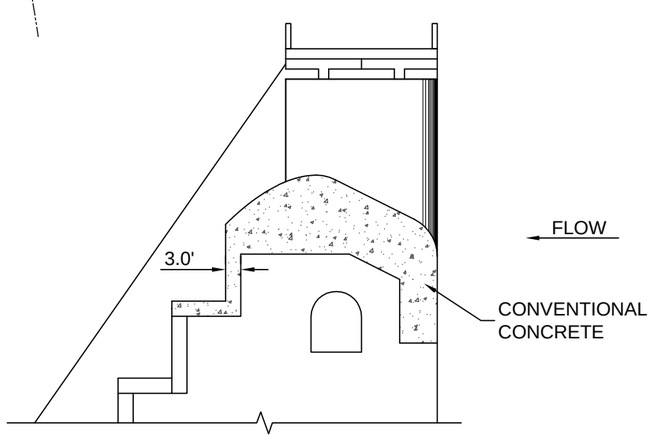
SCALE: 1" = 200'
0 200 400

DETAIL 1
1"=30'
2.4.8

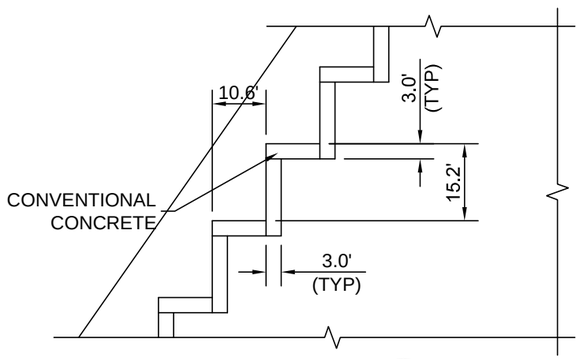
DETAIL 2
1"=50'
2.4.8



SECTION B
1"=50'



DETAIL 3
1"=30'



DETAIL 4
1"=30'

FIGURE 2.4.9

Low Watana RCC Non Expandable Gravity Arch - Sections and Details

SUSITNA PROJECT

AEA

R&M CONSULTANTS, INC.

HATCH™

LEGEND

RECOMMENDED ROUTE

Parks Highway

Gold Creek

Watana Dam Site

Legend:

Railroad Alignment

Dam Sites

SCALE 0 4 8 MILES

REFERENCE: BASE MAP FROM USGS, 1:250,000
HEALY, ALASKA
TALKEETNA MOUNTAINS, ALASKA

ACRES | ALASKA POWER AUTHORITY
SUSITNA HYDROELECTRIC PROJECT

ACCESS PLAN
RECOMMENDED ROUTE

ACRES AMERICAN INCORPORATED | MARCH 1982 | PLATE 35

Figure 3.2-1 Low Watana Rail Access

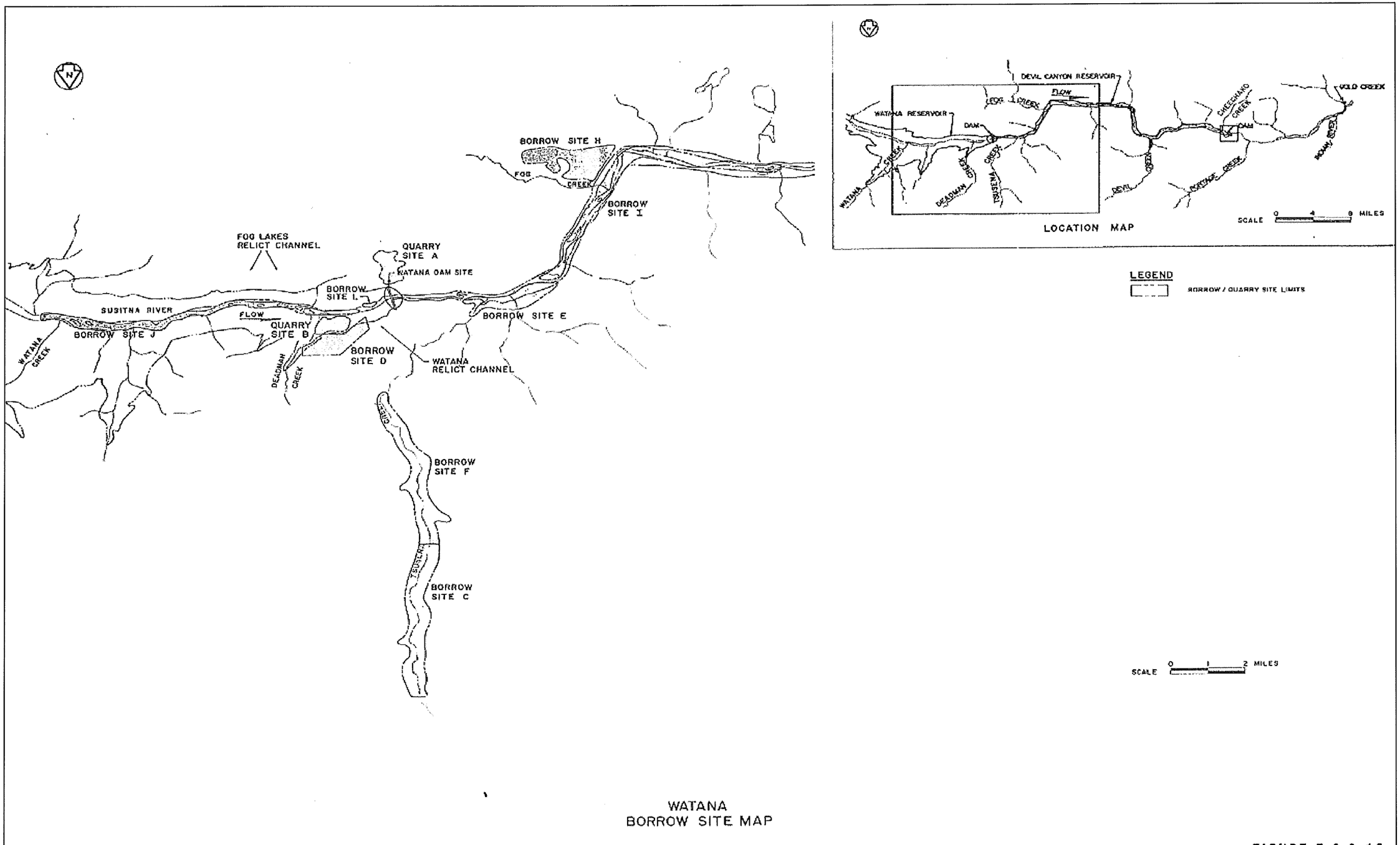


Figure 4.1-1 Borrow Areas

Appendix A

Breakdown of Unit Cost Analysis for RCC

Low Watana RCC Dam
RCC Unit Cost Analysis
November 3, 2010

Low Watana RCC Assumptions/Totals	
Total RCC Volume (cyd)	7,600,000
Percent of Aggregate by Volume	80.3%
Total Required Aggregate Volume (cyd)	6,102,800
Est. Round Trip Haul Dist. From Borrow Pit A to Processing (mi.)	1
Low Watana Embankment 1982 Assumptions/Totals (Book B - Development of Unit Costs)	
Total Volume (cyd)	6,200,000
Total Production Hours (hr)	13,000
Avg Production Rate (cyd/hr) (Not in Book B)	476.92
Est. Round Trip Haul Dist. From Borrow Pit E to Processing (mi.)	4

USBR Construction Cost Index	
USBR Category	Concrete Dams
Jan 1982 Factor	128
Oct 2008 Factor	334
Jul 2010 Factor	325

**Costs used for 1982 Aggregate Production will be escalated to 2010 costs. Total aggregate volumes are very similar. Also the haul costs will be conservative since haul distance to Borrow Pit A is less than Borrow Pit E.*

Low Watana Embankment 1982 Aggregate Production Costs (Book B - Development of Unit Costs)				
Description	**Labor**	**Materials**	**Equipment**	**Total**
Aggregate Processing	$ 16,584,230.00	$ 2,930,400.00	$ 36,322,000.00	$ 55,836,630.00
Install & Removal of Plant	$ 1,650,000.00	$ -	$ -	$ 1,650,000.00
Total Aggregate Processing Cost ($/cyd)	**$ 18,234,230.00**	**$ 2,930,400.00**	**$ 36,322,000.00**	**$ 57,486,630.00**
Aggregate Processing Unit Cost ($/cyd)	2.941	0.473	5.858	9.272
Aggregate Hauling Unit Cost ($/cyd)	1.104	0.01	3.583	4.697
Total Aggregate Production Cost ($/cyd)	**$ 4.05**	**$ 0.48**	**$ 9.44**	**$ 13.97**
USBR Ratio Jul 2010:Jan 1982	2.54	2.54	2.54	2.54
Jul 2010 Total Agg Production Cost ($/cyd)	**$ 10.27**	**$ 1.23**	**$ 23.97**	**$ 35.47**

Total Cost of 4 ARAN Modumix III Batch Plants incl Installation	$ 20,000,000.00	
Total Batch Plant Unit Cost ($/cyd)	$ 2.63	$ 2.63

Cement & Fly Ash Cost ($/cyd)	$ -	$ 48.86	$ -	$ 48.86
RCC Placement Cost ($/cyd)	$ 1.22	$ -	$ 3.22	$ 4.44
RCC production Cost ($/cyd)	$ 0.75	$ -	$ 5.05	$ 5.81
Final RCC Unit Cost ($/cyd)	**$ 12.24**	**$ 50.09**	**$ 34.88**	**$ 97.21**

RCC Labor Costs

City Cost Index for Fairbanks, AK	
Division	Installation Index
0241, 31-34 Site & Infrastructure, Demolition	131.5
03 Concrete	115.3

Adjustment Factor for Overtime	
RS Means Work Day (hr)	8
Low Watana RCC Work Day (hr)	10
Pay Rate Increase for Overtime	1.5
Ajustment Factor	1.375

	# of Workers	Trade	RS Means 2010 - Total Hourly Rate incl. O & P ($/hr)	Overtime Adjustment	Total Hourly Rate incl Overtime	City Cost Index	Total Hourly Rate at Watana ($/hr)
RCC Placement on Dam	7	Equipment Operator (med.) - Dozer	$ 64.30	1.375	$ 88.41	131.5	$ 116.26
	7	Equipment Operator (light.) - Roller	$ 61.85	1.375	$ 85.04	131.5	$ 111.83
	7	Laborers - RCC Placement	$ 48.45	1.375	$ 66.62	131.5	$ 87.60
	7	Foreman Average, Outside	$ 68.55	1.375	$ 94.26	131.5	$ 123.95
	5	Laborers - Flagman (Directing Truck Traffic)	$ 48.45	1.375	$ 66.62	131.5	$ 87.60
	4	Mechanic - Trucks, Dozers & Rollers	$ 66.75	1.375	$ 91.78	131.5	$ 120.69
	1	Electrician - Converyors & Equipment	$ 72.85	1.375	$ 100.17	131.5	$ 131.72
	25	Truck Drivers (Light) - 8 cyd Rear Dump	$ 49.20	1.375	$ 67.65	131.5	$ 88.96
	2	Truck Drivers (Light) - Fuel Trucks	$ 49.20	1.375	$ 67.65	131.5	$ 88.96
	2	Equipment Operator (light.) - Skid Steer Loader	$ 61.85	1.375	$ 85.04	131.5	$ 111.83
	1	Site Supervisor	$ 82.26	1.375	$ 113.11	131.5	$ 148.74
	68	**Total Hourly Wages**					**$ 1,218.15**
		Average RCC Production Rate (cyd/hr)					1000
		Total Labor Costs per Unit ($/cyd)					**$ 1.22**
RCC Production	4	Batch Plant Operator	$ 82.26	1.375	$ 113.11	131.5	$ 148.74
	8	Equipment Operator (med.) - Front End Loader	$ 64.30	1.375	$ 88.41	131.5	$ 116.26
	2	Mechanic - Batch Plant	$ 66.75	1.375	$ 91.78	131.5	$ 120.69
	1	Electrician - Batch Plants	$ 72.85	1.375	$ 100.17	131.5	$ 131.72
	7	Laborers - Flagman (At Dishcarge Chutes)	$ 48.45	1.375	$ 66.62	131.5	$ 87.60
	1	Site Supervisor	$ 82.26	1.375	$ 113.11	131.5	$ 148.74
	23	**Total Hourly Wages**					**$ 753.75**
		Average RCC Production Rate (cyd/hr)					1000
		Total Labor Costs per Unit ($/cyd)					**$ 0.75**

91

Total # of Workers, assumes (2) - 10hr Shifts **182**

RCC Equipment Costs

City Cost Index for Fairbanks, AK	
Division	Installation Index
0241, 31-34 Site & Infrastructure, Demolition	131.5
03 Concrete	115.3

Assumptions / Variables	
Shift Duration (hr)	10
Shifts per Day	2
Work Hours per Day	20
Average Production RCC Production Rate (cyd/hr)	1,000
Average RCC Production Per Day (cyd/day)	20,000
Total RCC Volume (cyd)	7,600,000
Required Days of Production	380
Construction Season (Months/Yr)	5.5
Construction Season (Days/Yr)	165
Minimum Construction Seasons	2.30
Total Number of Construction Season	3

Rental Rate Adjustment Factor for Unit Down Time	
Total Months in Operation per Year	5.5
Idle Equipment Cost vs Operation	75%
Total RCC Construction Seasons	3
Total Months of Operation	16.5
Total Months Idle	13.0

			Daily Operation Costs				Equipment Rental Costs						
	# of Units	Trade	RS Means 2010 - Total Hourly Rate incl. O & P ($/hr)	Hours of Operation per Day	Total Production Days	Equipment Operation Cost per Unit	Operation Rental Months	Monthly Rental Rate	Idle Rental Months	Total Equipment Rental Cost per Unit	Total Operation + Rental Cost per Unit	Total All Units	Total Incl Cost Index
RCC Placement on Dam	7	Dozer 200 hp	$ 68.60	20	380	$ 521,360.00	16.5	$ 9,650.00	13.0	$ 253,312.50	$ 774,672.50	$ 5,422,707.50	$ 7,130,860.36
	7	Vibratory Roller 35 hp	$ 10.40	20	380	$ 79,040.00	16.5	$ 2,275.00	13.0	$ 59,718.75	$ 138,758.75	$ 971,311.25	$ 1,277,274.29
	25	Truck, Dump, 2-axle, 12 ton, 8 cy payload	$ 33.35	20	380	$ 253,460.00	16.5	$ 2,025.00	13.0	$ 53,156.25	$ 306,616.25	$ 7,665,406.25	$ 10,080,009.22
	2	Fuel Truck (Used RS Means Water Truck Data)	$ 84.65	20	380	$ 643,340.00	16.5	$ 7,250.00	13.0	$ 190,312.50	$ 833,652.50	$ 1,667,305.00	$ 2,192,506.08
	1	Forklift, straight mast, 21' lift, 4WD	$ 20.20	20	380	$ 153,520.00	16.5	$ 2,225.00	13.0	$ 58,406.25	$ 211,926.25	$ 211,926.25	$ 278,683.02
	2	Skid Steer Loader, 1 cyd, 78 hp	$ 19.00	20	380	$ 144,400.00	16.5	$ 2,075.00	13.0	$ 54,468.75	$ 198,868.75	$ 397,737.50	$ 523,024.81
	13	Pickup Truck, 4WD	$ 13.50	20	380	$ 102,600.00	16.5	$ 645.00	13.0	$ 16,931.25	$ 119,531.25	$ 1,553,906.25	$ 2,043,386.72
	7	Laser Level - Grading	$ 1.17	20	380	$ 8,892.00	16.5	$ 700.00	13.0	$ 18,375.00	$ 27,267.00	$ 190,869.00	$ 250,992.74
	10	Floodlights, trailer mounted w generator - (4) 300 watts	$ 4.20	10	380	$ 15,960.00	16.5	$ 795.00	13.0	$ 20,868.75	$ 36,828.75	$ 368,287.50	$ 484,298.06
	3	Misc Hand Tools	$ 5.00	20	380	$ 38,000.00	16.5	$ 850.00	13.0	$ 22,312.50	$ 60,312.50	$ 180,937.50	$ 237,932.81
	77											Total Placement Equipment Costs	$ 24,498,968.11
												Total RCC cyd	7,600,000
												Total Placement Equipment Cost per Unit RCC ($/cyd)	**$ 3.22**
RCC Production	8	Front End Loader, 10 cyd, 620 hp	$ 129.55	20	380	$ 984,580.00	16.5	$ 23,500.00	13.0	$ 616,875.00	$ 1,601,455.00	$ 12,811,640.00	$ 16,847,306.60
	2	Forklift, straight mast, 21' lift, 4WD	$ 20.20	20	380	$ 153,520.00	16.5	$ 2,225.00	13.0	$ 58,406.25	$ 211,926.25	$ 423,852.50	$ 557,366.04
	8	Pickup Truck, 4WD	$ 13.50	20	380	$ 102,600.00	16.5	$ 645.00	13.0	$ 16,931.25	$ 119,531.25	$ 956,250.00	$ 1,257,468.75
	8	Floodlights, trailer mounted w generator - (4) 300 watts	$ 4.20	10	380	$ 15,960.00	16.5	$ 795.00	13.0	$ 20,868.75	$ 36,828.75	$ 294,630.00	$ 387,438.45
	2	Misc Hand Tools	$ 5.00	20	380	$ 38,000.00	16.5	$ 850.00	13.0	$ 22,312.50	$ 60,312.50	$ 120,625.00	$ 158,621.88
	28												$ 19,208,201.71
	LS	Total sum of all Batch Plants and Conveyence Systems (Assume Equal to all other Production Equipment Costs)											$ 19,208,201.71
												Total Equipment Costs	$ 38,416,403.43
												Total RCC cyd	7,600,000
												Total Production Equipment Cost per Unit RCC ($/cyd)	**$ 5.05**

RCC PRODUCTION

Parameter	Full Watana RCC				Low Watana RCC			
	US Standard		Metric		US Standard		Metric	
Quantity	**15,000,000**	Cy	**11,468,300**	M^3	**7,600,000**	Cy	**11,468,300**	M^3
Construction season (months/year)	5.5	Mn/Yr	5.5	Mn/yr	5.5	Mn/Yr	5.5	Mn/yr
Construction seasons	5	Yr	5	Yr	3.00	Yr	5	Yr
Placing days/year	165	Yr	160	Yr	165	Yr	160	Yr
Total required placing days based on avg daily placing rate	825	Dy	800	Dy	380	Dy	800	Dy
Total placing days	825	Dy	800	Dy	495	Dy	800	Dy
Σ months	25	Mn	25	Mn	12.66666667	Mn	25	Mn
Nominal monthly capacity	**600,000**	Cy	**458,732**	M^3	**600,000**	Cy	**458,732**	M^3
Average daily placing rate	20,000	Cy	15,291	M^3	20,000	Cy	15,291	M^3
Required daily average capacity	44,920	Cy	34,344	M^3	44,920	Cy	34,344	M^3
Required maximum month	1,200,000	Cy	917,464	M^3	1,200,000	Cy	917,464	M^3
Required nominal capacity	15,000,000	Cy	11,468,300	M^3	7,600,000	Cy	11,468,300	M^3
Mixer capacity,	8	Cy	6	M^3	8	Cy	6	M^3
Total mix time - start charge to complete discharge, min	2	Min	2	Min	2	Min	2	Min
batches/mixer/hour	30	Per Hr	30	Per hr	30	Per Hr	30	Per hr
Vol/mixer/hour	235	Cy	180	M^3	235	Cy	180	M^3
Total # of mixers	10	Ea	10	Ea	10	Ea	10	Ea
Nominal hourly production	2,350	Cy	1,800	M^3	2,350	Cy	1,800	M^3
Daily hours	20	Hr	20	Hr	20	Hr	20	Hr
Nominal daily production	47,000	Cy	36,000	M^3	47,000	Cy	36,000	M^3
Nominal monthly	1,175,000	Cy	900,000	M^3	1,175,000	Cy	900,000	M^3
Ratio nominal to average	1.96		1.96		1.96		1.96	
Long term average monthly	600,000	Cy	458,732	M^3	600,000	Cy	458,732	M^3
Total RCC placed	15,000,000	Cy	11,468,300	M^3	7,600,000	Cy	11,468,300	M^3

Appendix B
Detailed Cost Estimate

SUSITNA PROJECT - LOW WATANA DAM OPTIONS COST SUMMARY

Table 4.4-1: Cost Comparison of Selected Low Watana ICRD and RCC Alternatives

	Line Item Name	Low Watana Non-Expandable ICRD (1)	Low Watana Expandable ICRD (1)	Low Watana RCC - Non-Expandable	Low Watana RCC - Expandable	Low Watana RCC Gravity Arch
	Total Estimated Const. Costs (Billions $)	**4.50**	**5.00**	**3.90**	**4.20**	**3.60**
FERC Line #	**Line Item Name**	**Low Watana Non-Expandable ICRD (1)**	**Low Watana Expandable ICRD (1)**	**Low Watana RCC - Non-Expandable**	**Low Watana RCC - Expandable**	**Low Watana RCC Gravity Arch**
71A	Engineering, Env, and Regulatory (7%)	$ 236,000,000	$ 259,000,000	$ 203,200,000	$ 217,900,000	$ 186,600,000
330	Land and Land Rights	$ 121,000,000	$ 121,000,000	$ 120,900,000	$ 120,900,000	$ 120,900,000
331	Power Plant Structure Improvements	$ 115,000,000	$ 159,000,000	$ 121,219,000	$ 161,389,000	$ 121,219,000
332.1-.4	Reservoir, Dams and tunnels	$ 1,537,690,000	$ 1,718,000,000	$ 1,425,110,000	$ 1,472,944,000	$ 1,220,892,000
332.5-.9	Waterways	$ 590,000,000	$ 677,000,000	$ 276,342,000	$ 387,367,000	$ 242,655,000
333	Waterwheels, Turbines and Generators	$ 297,000,000	$ 297,000,000	$ 297,000,000	$ 297,000,000	$ 297,000,000
334	Accessory Electrical Equipment	$ 41,000,000	$ 41,000,000	$ 40,000,000	$ 40,000,000	$ 40,000,000
335	Misc Power Plant Equipment	$ 21,000,000	$ 32,000,000	$ 21,000,000	$ 32,000,000	$ 32,000,000
336	Roads, Rails and Air Facilities	$ 232,000,000	$ 232,000,000	$ 254,700,000	$ 254,700,000	$ 254,700,000
350-390	Transmission Features	$ 224,000,000	$ 224,000,000	$ 207,362,000	$ 207,362,000	$ 207,362,000
63	Main Construction Camp	$ 180,000,000	$ 180,000,000	$ 123,800,000	$ 123,800,000	$ 123,800,000
399	Other Tangible Property	$ 16,000,000	$ 16,000,000	$ 15,800,000	$ 15,800,000	$ 15,800,000
71B	Construction Management (4%)	$ 135,000,000	$ 148,000,000	$ 116,100,000	$ 124,500,000	$ 106,600,000
Total Subtotal	Subtotal	$ 3,745,690,000	$ 4,104,000,000	$ 3,222,533,000	$ 3,455,662,000	$ 2,969,528,000
Total Contingency	Contingency (20%)	$ 749,138,000	$ 821,005,200	$ 644,506,600	$ 691,132,400	$ 593,905,600
Total	Total Estimated Const. Costs (Million $)	**$4,500**	**$5,000**	**$3,900**	**$4,200**	**$3,600**

(1) From HDR 2009

HDR/AEA Susitna Hydroelectric Project
Cost Estimates based on 1982 quantities
By: HDR
By: Leanne Andruszkiewicz, E.I.T.
Checked By: Kellen Roberts, E.I.T.
Date: 10/15/2009
2008 Dollars

Low Watana (Non-Expandable) (4 Turbines)

FERC Line #	Sub Categories	Description	Quantity	Units	2008 Unit Price	Line Price	Total
	330	**Land and Land Rights**					
	0.1	Land	1	LS	$ 120,870,000.00	$ 120,870,000	
	0.2	Land Rights				$ -	
	0.3	Misc Charges in Credit Above				$ -	
						$ -	**$ 121,000,000**
						$ -	
	331	**Powerplant Structure Improvements**				$ -	
	0.1	Powerhouse				$ -	
	0.11	Powerhouse and Draft Tube				$ -	
	0.111	Excavation				$ -	
		Powerhouse Vault Rock	81,667	CY	$ 90.12	$ 7,360,000	
		Draft Tube Rock	16,800	CY	$ 90.12	$ 1,510,000	
	0.113	Surface Preparation/ Grouting	0			$ -	
		Powerhouse	66,000	SF	$ 3.33	$ 220,000	
Total	Total Estimated Const. Costs (Million $)	Draft Tube	51,000	SF	$ 3.33	$ 170,000	
		Grout Curtain- Drill holes	29,200	LF	$ 27.63	$ 810,000	
		Grout Curtain- Cement	11,667	CF	$ 81.10	$ 950,000	
	0.114	Concrete and Shot Crete	0			$ -	
		Powerhouse Concrete	21,733	CY	$ 692.87	$ 15,060,000	
		Powerhouse Concrete Overbreak	1,600	CY	$ 447.21	$ 720,000	
		Powerhouse Reinforcing Steel	1,087	TON	$ 2,858.29	$ 3,110,000	
		Powerhouse 4" Shotcrete	27,333	SF	$ 10.14	$ 280,000	
		Draft Tube Concrete	8,000	CY	$ 692.87	$ 5,540,000	
		Draft Tube Concrete Overbreak	1,667	CY	$ 447.21	$ 750,000	
		Draft Tube Reinforcing Steel	660	TON	$ 2,858.29	$ 1,890,000	
		Draft Tube 2" Shotcrete	4,067	SF	$ 5.45	$ 20,000	
	0.115	Support and Anchors	0			$ -	
		Powerhouse Rockbolts 1" @ 25' Hy	647	EA	$ 1,234.86	$ 800,000	
		Powerhouse Rockbolts 1" @ 15'	1,313	EA	$ 735.81	$ 970,000	
		Powerhouse Steel Mesh	29,733	SF	$ 5.81	$ 170,000	
		Powerhouse Steel Support	91	TON	$ 12,671.94	$ 1,160,000	
		Draft Tube Rockbolts 1" @ 25' Hy	100	EA	$ 1,234.86	$ 120,000	
		Draft Tube Rockbolts 1" @ 12'	260	EA	$ 528.34	$ 140,000	
		Draft Tube Rockbolts 1" @ 9'	127	EA	$ 432.12	$ 50,000	
		Draft Tube Steel Mesh	12,600	SF	$ 6.55	$ 80,000	
	0.117	Holes (U/S of Powerhouse)	10,000	LF	$ 51.32	$ 510,000	
		Holes (Powerhouse Crown)	19,000	LF	$ 51.32	$ 980,000	
	0.118	Structural- Misc Steelwork				$ -	
		Powerhouse and Draft Tube- Steel Crane Rails	1	LS	$ 10,276,309.00	$ 10,280,000	
	0.119	Architectural- Powerhouse	1	LS	$ 2,927,898.00	$ 2,930,000	
	0.11c	Mechanical				$ -	
		Draft Tube Gates	4	SETS	$ 427,880.00	$ 1,710,000	
		Draft Tube Gate Guides	4	SETS	$ 202,680.00	$ 810,000	
		Draft Tube Crane	1	LS	$ 1,140,000.00	$ 1,140,000	
	0.12	Access Tunnels and Portals				$ -	
	0.121	Excavation				$ -	
		Main Tunnel	33,500	CY	$ 97.45	$ 3,260,000	
		Transformer Gallery Tunnel	11,833	CY	$ 97.45	$ 1,150,000	
		Grouting Gallery Tunnel	1,267	CY	$ 396.04	$ 500,000	
		Surge Chamber Access Tunnel	4,833	CY	$ 145.22	$ 700,000	
		Penstock Access Tunnel	41,000	CY	$ 145.22	$ 5,950,000	

Low Watana (Non-Expandable) (4 Turbines)

FERC Line #	Sub Categories	Description	Quantity	Units	2008 Unit Price	Line Price	Total
		Penstock Elbow Access Tunnel	10,000	CY	$ 145.22	$	1,450,000
		Access Shaft Tunnel	867	CY	$ 145.22	$	130,000
		Connector Tunnel	1,267	CY	$ 379.26	$	480,000
		Portals Overburden	4,000	CY	$ 17.14	$	70,000
		Portals Rock	2,000	CY	$ 49.31	$	100,000
	0.123	Surface Preparation				$	-
		Main Tunnel Slab	35,400	SF	$ 2.21	$	80,000
		Penstock Access Slab	43,467	SF	$ 2.21	$	100,000
		Horizontal Portal	133	SF	$ 2.30	$	-
		Inclined Portal	1,400	SF	$ 3.33	$	-
	0.124	Concrete and Shot Crete				$	-
		Main Portal				$	-
		Concrete Slab	20	CY	$ 406.27	$	10,000
		Concrete Walls	380	CY	$ 406.27	$	150,000
		Concrete Overbreak	33	CY	$ 368.48	$	10,000
		Reinforcing Steel	27	TON	$ 2,887.51	$	80,000
		Tunnels				$	-
		Concrete Slab Main Tunnel	1,300	CY	$ 503.90	$	660,000
		Concrete Plugs Penstock Elbow ACC	10,000	CY	$ 755.86	$	7,560,000
		Concrete Overbreak Main Tunnel 6"	667	CY	$ 346.43	$	230,000
		Reinforcing Steel	47	TON	$ 2,887.51	$	130,000
		2 " Shotcrete Main Tunnel	13,400	SF	$ 5.26	$	70,000
		2 " Shotcrete Transformer Gal	4,733	SF	$ 5.26	$	20,000
		2 " Shotcrete Surge Chamber Acc	2,600	SF	$ 5.26	$	10,000
		2 " Shotcrete Penstock Access	16,467	SF	$ 5.26	$	90,000
		2 " Shotcrete Penstock Elbow Acc	4,733	SF	$ 5.26	$	20,000
		2 " Shotcrete Access Shaft	200	SF	$ 5.26	$	-
		2 " Shotcrete Grout Gallery	533	SF	$ 5.26	$	-
		2 " Shotcrete Connector Tunnel	533	SF	$ 5.26	$	-
	0.125	Support and Anchors				$	-
		Main Tunnel				$	-
		Rockbolts 1" @12'	800	EA	$ 528.34	$	420,000
		Rockbolts 1" @ 9'	167	EA	$ 432.12	$	70,000
		Steel Mesh	42,000	SF	$ 6.37	$	270,000
		Steel Support	44	TON	$ 12,801.49	$	560,000
		Main Tunnel Portal				$	-
		Rockbolts 1" @15'	33	EA	$ 735.79	$	20,000
		Transformer Gallery Tunnel				$	-
		Rockbolts 1" @12'	273	EA	$ 528.34	$	140,000
		Rockbolts 1" @ 9'	47	EA	$ 432.12	$	20,000
		Steel Mesh	15,000	SF	$ 5.89	$	90,000
		Steel Support	16	TON	$ 12,801.49	$	200,000
		Grouting Gallery Tunnel				$	-
		Rockbolts 3/4" @ 6'	107	EA	$ 327.15	$	30,000
		Steel Mesh	107	SF	$ 6.37	$	-
		Steel Support	2	TON	$ 12,801.49	$	30,000
		Surge Chamber Access Tunnel				$	-
		Rockbolts 1" @12'	153	EA	$ 528.34	$	80,000
		Rockbolts 1" @ 9'	33	EA	$ 432.12	$	10,000
		Steel Mesh	8,033	SF	$ 6.37	$	50,000
		Steel Support	9	TON	$ 12,801.49	$	120,000
		Penstock Access Tunnel				$	-
		Rockbolts 1" @12'	953	EA	$ 528.34	$	500,000
		Rockbolts 1" @ 9'	160	EA	$ 432.12	$	70,000
		Steel Mesh	51,667	SF	$ 6.37	$	330,000
		Steel Support	39	TON	$ 12,801.49	$	490,000
		Penstock Elbow Access Tunnel				$	-
		Rockbolts 1" @12'	280	EA	$ 528.34	$	150,000

Low Watana (Non-Expandable) (4 Turbines)

FERC Line #	Sub Categories		Description	Quantity	Units	2008 Unit Price	Line Price	Total
			Rockbolts 1" @ 9'	80	EA	$ 432.12	$	30,000
			Steel Mesh	15,000	SF	$ 6.37	$	100,000
			Steel Support	20	TON	$ 12,801.49	$	260,000
			Access Shaft Tunnel				$	-
			Rockbolts 1" @12'	13	EA	$ 528.34	$	10,000
			Rockbolts 1" @ 9'	13	EA	$ 432.12	$	10,000
			Steel Mesh	620	SF	$ 6.37	$	-
			Steel Support	5	TON	$ 12,801.49	$	70,000
			Connector Tunnel				$	-
			Rockbolts 3/4" @ 6'	107	EA	$ 327.15	$	30,000
			Steel Mesh	107	SF	$ 6.37	$	-
			Steel Support	2	TON	$ 12,801.49	$	30,000
		0.129	Architectural- Main Portal Doors	2	SETS	$ 158,371.90	$	320,000
		0.12c	Mechanical Ventilation System				$	-
	0.13		Access Shaft				$	-
		0.131	Excavation Rock	9,133	CY	$ 227.67	$	2,080,000
		0.133	Surface Preparation Shaft	42,667	SF	$ 3.33	$	140,000
		0.134	Concrete and Shot Crete				$	-
			Concrete Lining	2,233	CY	$ 944.82	$	2,110,000
			Concrete Overbreak 6"	813	CY	$ 551.14	$	450,000
		0.135	Support and Anchors - Rockbolts 3/4" @ 6'	700	EA	$ 327.15	$	230,000
		0.138	Structural Misc Steelwork	33	TON	$ 7,395.00	$	250,000
		0.139	Architectural- control Building				$	-
		0.13c	Mechanical Elevators	1	LS	$ 2,368,815.00	$	2,370,000
	0.14		Fire Protection Head Tank				$	-
		0.141	Excavation	767	CY	$ 588.80	$	450,000
		0.143	Surface Preparation	1,867	SF	$ 2.30	$	-
		0.144	Concrete & Shotcrete				$	-
			Concrete	167	CY	$ 963.72	$	160,000
			Concrete Overbreak 6"	30	CY	$ 406.27	$	10,000
			Reinforcing Steel	7	TON	$ 2,858.29	$	20,000
		0.145	Support and Anchors				$	-
			Rockbolts 1" @12'	17	EA	$ 528.34	$	10,000
			Rockbolts 1" @ 9'	7	EA	$ 432.12	$	-
			Steel Mesh	800	SF	$ 6.30	$	10,000
			Steel Support	2	TON	$ 12,671.95	$	30,000
		0.148	Misc Steelwork	1	LS	$ 73,297.50	$	70,000
		0.14c	Mechanical Piping/Valves				$	-
	0.15		Bus Tunnels (totals for 3 Bus Tunnels)				$	-
		0.151	Excavation				$	-
			Rock Horizontal	1,800	CY	$ 213.70	$	380,000
			Rock Inclined	867	CY	$ 601.04	$	520,000
		0.153	Surface Preparation- Tunnels	4,733	SF	$ 3.33	$	20,000
		0.154	Concrete and Shotcrete				$	-
			Concrete Slab	233	CY	$ 818.84	$	190,000
			Concrete Overbreak 12"	167	CY	$ 472.41	$	80,000
			Reinforcing Steel	12	TON	$ 2,858.29	$	30,000
			2" Shotcrete	1,467	SF	$ 5.26	$	10,000
		0.155	Supports and Anchors				$	-
			Rockbolts 1" @ 25'	40	EA	$ 1,234.86	$	50,000
			Rockbolts 1" @ 12'	93	EA	$ 528.34	$	50,000
			Rockbolts 1" @ 9'	33	EA	$ 432.12	$	10,000
			Steel Mesh	4,533	SF	$ 6.30	$	30,000
			Steel Support	7	TON	$ 12,671.94	$	90,000
	0.16		Transformer Gallery Tunnel				$	-
		0.161	Excavation- Rock	17,867	CY	$ 87.44	$	1,560,000
		0.163	Surface Preparation	16,400	SF	$ 2.30	$	40,000

Low Watana (Non-Expandable) (4 Turbines)

FERC Line #	Sub Categories			Description	Quantity	Units	2008 Unit Price	Line Price	Total	
			0.164	Concrete and Shotcrete				$ -		
				Concrete Base Slab	1,600	CY	$ 1,228.27	$ 1,970,000		
				Concrete Overbreak 12"H/6"V	513	CY	$ 377.93	$ 190,000		
				Reinforcing Steel	80	TON	$ 2,858.29	$ 230,000		
			0.165	Support and Anchors				$ -		
				Rockbolts 1" @ 25'	400	EA	$ 1,234.86	$ 490,000		
				Rockbolts 1" @ 15'	180	EA	$ 735.81	$ 130,000		
				Steel Mesh	13,800	SF	$ 5.81	$ 80,000		
				Steel Support	19	TON	$ 12,671.94	$ 240,000		
			0.167	Drainage Holes	5,533	LF	$ 47.95	$ 270,000		
		0.17		Cable Shafts				$ -		
			0.171	Excavation Rock	2,267	CY	$ 601.04	$ 1,360,000		
			0.173	Surface Preparation Shafts	27,600	SF	$ 3.33	$ 90,000		
			0.174	Concrete and Shotcrete				$ -		
				Concrete Lining	693	CY	$ 1,763.66	$ 1,220,000		
				Concrete Overbreak 6"	533	CY	$ 881.83	$ 470,000		
			0.175	Supports and Anchors- Rockbolts 3/4" @ 6'	433	EA	$ 327.15	$ 140,000		
			0.178	Structural Misc Steelwork	12	TON	$ 15,602.00	$ 190,000		
			0.179	Architectural- Enclosures	1	LS	$ 199,317.00	$ 200,000		
			0.17c	Mechanical Hoist	2	EA	$ 476,960.00	$ 950,000		
		0.18		Dewatering (during Construction)				$ -		
			0.181	Dewatering (Power Facilities)	1	LS	$ 1,336,798.50	$ 1,340,000		
		0.19		Instrumentation				$ -		
			0.191	Instrumentation	1	LS	$ 1,714,813.50	$ 1,710,000		
	0.2			Misc Buildings (Control Buildings)	1	LS	$ 4,433,085.00	$ 4,430,000		
	0.3			Permanent Town	(included in 63.5)					
								$ -	**$**	**115,000,000**
332				**Reservoir, Dams and Waterways**				$ -		
	0.1			Reservoir				$ -		
		0.11		Reservoir Clearing	23,000	ACRE	$ 3,005.85	$ 69,130,000		
	0.2			Diversion Tunnels /Cofferdams				$ -		
		0.21		Diversion Tunnels /Portals				$ -		
			0.211	Excavation				$ -		
				Upper Tunnel				$ -		
				Rock	221,000	CY	$ 92.33	$ 20,400,000		
				Lower Tunnel				$ -		
				Rock	208,000	CY	$ 92.33	$ 19,200,000		
				Excavate Concrete for Plug	700	CY	$ 96.92	$ 70,000		
				Upstream Upper Portal				$ -		
				Rock Usable (Face Only)	11,200	CY	$ 49.16	$ 550,000		
				Upstream Lower Portal (Including Most Exc for Upper Portal)				$ -		
				Rock Usable	108,000	CY	$ 49.16	$ 5,310,000		
				Rock Waste	21,750	CY	$ 49.16	$ 1,070,000		
				Downstream Portals				$ -		
				Overburden	17,000	CY	$ 17.14	$ 290,000		
				Rock Usable	120,000	CY	$ 49.16	$ 5,900,000		
				Rock Waste	28,000	CY	$ 49.16	$ 1,380,000		
				Emergency Release Chambers				$ -		
				Excavate Concrete for Plugs	1,800	CY	$ 101.98	$ 180,000		
				Gate Chamber	4,700	CY	$ 110.73	$ 520,000		
				Access Tunnel to Gate Chamber				$ -		
				Rock	19,100	CY	$ 97.15	$ 1,860,000		
			0.212	Fill- Temp for Coffer Dam to Construct Upstream Portals	23,000	CY	$ 11.66	$ 270,000		
			0.213	Surface Preparation \ grouting				$ -		
				Upstream Upper Portal				$ -		
				Horizontal	3,200	SF	$ 2.30	$ 10,000		
				Inclined	8,600	SF	$ 3.33	$ 30,000		
				Upstream Lower Portal				$ -		

Low Watana (Non-Expandable) (4 Turbines)

FERC Line #	Sub Categories	Description	Quantity	Units	2008 Unit Price	Line Price	Total
		Horizontal	1,300	SF	$ 2.30	$	-
		Inclined	14,900	SF	$ 3.33	$	50,000
		Downstream Upper Portal				$	-
		Horizontal	6,100	SF	$ 2.30	$	10,000
		Inclined	20,500	SF	$ 3.33	$	70,000
		Downstream Lower Portal				$	-
		Horizontal	600	SF	$ 2.30	$	-
		Inclined	5,600	SF	$ 3.33	$	20,000
		Grout Upper Tunnel Plugs				$	-
		Drill Holes	4,100	LF	$ 26.76	$	110,000
		Cement	820	CF	$ 81.10	$	70,000
		Grout Lower Tunnel Permanent Plugs				$	-
		Drill Holes	2,050	LF	$ 26.76	$	50,000
		Cement	410	CF	$ 81.10	$	30,000
	0.214	Concrete and Shotcrete				$	-
		Upper Tunnel				$	-
		Concrete Lining	42,400	CY	$ 566.89	$	24,040,000
		Concrete Lining Overbreak 6"	10,200	CY	$ 314.94	$	3,210,000
		Reinforcing Steel	24	TON	$ 2,887.51	$	70,000
		2" Shotcrete	56,000	SF	$ 5.26	$	290,000
		Lower Tunnel				$	-
		Concrete Lining	37,600	CY	$ 566.89	$	21,320,000
		Concrete Lining for Plug	6,200	CY	$ 428.32	$	2,660,000
		Concrete Lining Overbreak 6"	10,000	CY	$ 314.94	$	3,150,000
		Reinforcing Steel	24	TON	$ 2,887.51	$	70,000
		2" Shotcrete	57,900	SF	$ 5.26	$	300,000
		Upstream Upper Portal				$	-
		Concrete Headwall	3,200	CY	$ 651.93	$	2,090,000
		Concrete Lining	1,300	CY	$ 651.93	$	850,000
		Concrete Slab	750	CY	$ 651.93	$	490,000
		Concrete Piers	800	CY	$ 651.93	$	520,000
		Concrete Overbreak 12" H/6"V	300	CY	$ 472.41	$	140,000
		Reinforcing Steel	400	TON	$ 2,887.51	$	1,160,000
		Upstream Lower Portal				$	-
		Concrete Headwall	4,500	CY	$ 651.93	$	2,930,000
		Concrete Lining	3,000	CY	$ 651.93	$	1,960,000
		Concrete Slab	300	CY	$ 651.93	$	200,000
		Concrete Piers	700	CY	$ 651.93	$	460,000
		Concrete Overbreak 12" H/6"V	350	CY	$ 472.41	$	170,000
		Reinforcing Steel	600	TON	$ 2,887.51	$	1,730,000
		Downstream Upper Portal				$	-
		Concrete Headwall	500	CY	$ 651.93	$	330,000
		Concrete Slab	100	CY	$ 651.93	$	70,000
		Concrete Overbreak 12" H/6"V	100	CY	$ 472.41	$	50,000
		Reinforcing Steel	40	TON	$ 2,887.51	$	120,000
		Downstream Lower Portal				$	-
		Concrete Headwall	2,500	CY	$ 651.93	$	1,630,000
		Concrete Slab	100	CY	$ 651.93	$	70,000
		Concrete Overbreak 12" H/6"V	150	CY	$ 472.41	$	70,000
		Reinforcing Steel	170	TON	$ 2,887.51	$	490,000
		Downstream Flip Bucket				$	-
		Concrete Slab	800	CY	$ 651.93	$	520,000
		Concrete Walls	2,300	CY	$ 651.93	$	1,500,000
		Concrete Invert	1,200	CY	$ 651.93	$	780,000
		Concrete Overbreak 12" H/6"V	410	CY	$ 42.41	$	20,000
		Reinforcing Steel	280	TON	$ 2,887.51	$	810,000
		Downstream Retaining Wall				$	-
		Concrete Slab	200	CY	$ 651.93	$	130,000

Low Watana (Non-Expandable) (4 Turbines)

FERC Line #	Sub Categories	Description	Quantity	Units	2008 Unit Price	Line Price	Total
		Concrete Walls	2,000	CY	$ 651.93	$ 1,300,000	
		Concrete Overbreak 12" H/6"V	110	CY	$ 472.41	$ 50,000	
		Reinforcing Steel	90	TON	$ 2,887.51	$ 260,000	
		Emergency Release Chambers				$ -	
		Concrete Plug	15,300	CY	$ 755.86	$ 11,560,000	
		4" Shotcrete	2,790	SF	$ 10.13	$ 30,000	
		Access Tunnel to Gate Chamber				$ -	
		2" Shotcrete	12,800	SF	$ 5.26	$ 70,000	
	0.215	Supports and Anchors				$ -	
		Lower Tunnel				$ -	
		Rockbolts 1" @ 12'	3,650	EA	$ 528.34	$ 1,930,000	
		Rockbolts 1" @ 9'	620	EA	$ 432.12	$ 270,000	
		Steel Mesh	217,100	SF	$ 6.37	$ 1,380,000	
		Steel Support	220	TON	$ 12,801.49	$ 2,820,000	
		Upper Tunnel				$ -	
		Rockbolts 1" @ 12'	3,530	EA	$ 528.34	$ 1,870,000	
		Rockbolts 1" @ 9'	600	EA	$ 432.12	$ 260,000	
		Steel Mesh	210,200	SF	$ 6.37	$ 1,340,000	
		Steel Support	213	TON	$ 12,801.49	$ 2,730,000	
		Upstream Lower Portal				$ -	
		Rockbolts 1" @ 15'	240	EA	$ 735.81	$ 180,000	
		Anchors 1" @ 25'	290	EA	$ 1,234.86	$ 360,000	
		Upstream Upper Portal				$ -	
		Rockbolts 1" @ 15'				$ -	
		Anchors 1" @ 25'	130	EA	$ 735.81	$ 100,000	
		Downstream Lower Portal				$ -	
		Rockbolts 1" @ 15'	200	EA	$ 735.81	$ 150,000	
		Downstream Upper Portal				$ -	
		Rockbolts 1" @ 15'	100	EA	$ 735.81	$ 70,000	
		Retaining Wall Anchors 1" @25'	100	EA	$ 1,234.86	$ 120,000	
		Emergency Release Chambers				$ -	
		Rockbolts 1" @ 25'	100	EA	$ 1,234.86	$ 120,000	
		Rockbolts 1" @ 15'	125	EA	$ 735.77	$ 90,000	
		Steel Mesh	3,600	SF	$ 6.37	$ 20,000	
		Steel Support	14	TON	$ 12,801.49	$ 180,000	
		Metal to Roof Anchors 3/4" @ 6'	20	EA	$ 342.42	$ 10,000	
		Access Tunnel to Gate Chamber				$ -	
		Rockbolts 1" @ 12'	775	EA	$ 528.34	$ 410,000	
		Rockbolts 1" @ 9'	240	EA	$ 432.12	$ 100,000	
		Steel Mesh	39,900	SF	$ 6.37	$ 250,000	
		Steel Support	55	TON	$ 12,801.49	$ 700,000	
	0.218	Structural- Misc Steelwork	2,775	SF	$ 93.61	$ 260,000	
	0.21c	Mechanical				$ -	
		Upstream Lower Gates				$ -	
		Gate Equipment	2	EA	$ 5,073,120.00	$ 10,150,000	
		Upstream Upper Gates				$ -	
		Gate Equipment	2	EA	$ 2,840,080.00	$ 5,680,000	
		Trashracks	1	LS	$ 1,777,500.00	$ 1,780,000	
		Downstream Lower Outlet				$ -	
		Stoplog Guides	1	LS	$ 142,200.00	$ 140,000	
		Stoplogs includes follower	1	LS	$ 1,967,100.00	$ 1,970,000	
		Downstream Upper Outlet				$ -	
		Stoplog Guides	1	LS	$ 82,950.00	$ 80,000	
		Low Level Release				$ -	
		Slide Gates Include Steel Liner	9	EA	$ 3,517,470.00	$ 31,660,000	
						$ -	
	0.22	Upstream Cofferdam				$ -	
	0.221	Excavation				$ -	

Low Watana (Non-Expandable) (4 Turbines)

FERC Line #	Sub Categories			Description	Quantity	Units	2008 Unit Price	Line Price	Total
				Overburden Removal	1,000	CY	$ 11.56	$ 10,000	
		0.222		Fill				$ -	
				Rock Fill	38,400	CY	$ 10.90	$ 420,000	
				Fine Filter	16,600	CY	$ 36.84	$ 610,000	
				Coarse Filter	15,900	CY	$ 30.05	$ 480,000	
				Rock Shell	196,500	CY	$ 10.50	$ 2,060,000	
				Closure Dike	58,500	CY	$ 10.90	$ 640,000	
				Rip Rap	21,200	CY	$ 24.26	$ 510,000	
		0.223		Cutoff Slurry Wall				$ -	
				excavation	4,850	CY	$ 4.88	$ 20,000	
				slurry wall	43,600	SF	$ 72.44	$ 3,160,000	
		0.22d		Dewatering				$ -	
				Initial Dewatering	1	LS	$ 5,807,685.00	$ 5,810,000	
				Dewatering Maintenance	1	LS	$ 22,377,990.00	$ 22,380,000	
	0.23			Down Stream Cofferdam				$ -	
		0.231		Excavation				$ -	
				overburden	5,000	CY	$ 11.56	$ 60,000	
				Rock	500	CY	$ 9.91	$ -	
				Removal of Cofferdam	14,500	CY	$ 13.48	$ 200,000	
		0.232		Fill				$ -	
				Rip Rap	1,800	CY	$ 24.26	$ 40,000	
				Closure Dike	15,200	CY	$ 10.90	$ 170,000	
		0.233		Cutoff Slurry Wall				$ -	
				Excavation	1,830	CY	$ 4.60	$ 10,000	
				Slurry Wall	16,500	SF	$ 72.44	$ 1,200,000	
	0.3			Main Dam				$ -	
		0.31		Main Dam				$ -	
		0.311		Excavation				$ -	
				Overburden above el. 1470	2,026,000	CY	$ 11.53	$ 23,360,000	
				Overburden below el. 1470	5,320,000	CY	$ 11.06	$ 58,840,000	
				Rock Usable above el. 1470	1,289,000	CY	$ 43.03	$ 55,470,000	
				Rock Usable below el. 1470	478,000	CY	$ 43.72	$ 20,900,000	
				Rock Waste above el. 1470	1,950,000	CY	$ 43.03	$ 83,910,000	
				Rock Waste below el. 1470	869,500	CY	$ 50.18	$ 43,630,000	
		0.312		Fill- Estimated from Attatched Calculations				$ -	
				Rip Rap (upstream)	409,000	CY	$ 23.30	$ 9,530,000	
				Gravel (upstream)	6,659,000	CY	$ 20.56	$ 136,910,000	
				Coarse Filter (upstream)	925,759	CY	$ 28.86	$ 26,720,000	
				Fine Filter (upstream)	1,045,588	CY	$ 37.91	$ 39,640,000	
				Core (impervious)	6,300,000	CY	$ 25.37	$ 159,830,000	
				Fine Filter (downstream)	1,171,412	CY	$ 37.91	$ 44,410,000	
				Coarse Filter (downstream)	1,074,241	CY	$ 28.86	$ 31,000,000	
				Shell- Rock and Gravel	2,998,209	CY	$ 19.18	$ 57,510,000	
				Shell- Rock From Other Sources	1,445,000	CY	$ 10.09	$ 14,580,000	
				Cobbles (downstream Face)	530,000	CY	$ 16.35	$ 8,670,000	
				Road Base	12,000	CY	$ 34.42	$ 410,000	
				Frost Protection				$ -	
				Process Protection	960,000	CY	$ 10.31	$ 9,900,000	
				Place Protection	960,000	CY	$ 3.29	$ 3,160,000	
				Remove 1' Protect and Waste	93,000	CY	$ 7.21	$ 670,000	
				Scarify Core Surface	193	ACRE	$ 858.77	$ 170,000	
				Filter Fabric				$ -	
				Filter Fabric	592,000	SF	$ 0.88	$ 520,000	
		0.313		Surface Prep/ Grouting				$ -	
				Surface Preparation				$ -	
				Under Core/Filters above el. 1500	1,340,000	SF	$ 3.11	$ 4,170,000	
				Under Core/Filters below el. 1500	490,000	SF	$ 3.11	$ 1,520,000	
				Under Shell above el. 1500	4,149,000	SF	$ 2.15	$ 8,920,000	

Low Watana (Non-Expandable) (4 Turbines)

FERC Line #	Sub Categories		Description	Quantity	Units	2008 Unit Price	Line Price	Total
			Under Shell below el. 1500	2,067,000	SF	$ 2.15	$ 4,440,000	
			Consolidation Grout				$ -	
			Drill Holes	550,000	LF	$ 11.91	$ 6,550,000	
			Cement	550,000	CF	$ 67.81	$ 37,300,000	
			Grout Curtain				$ -	
			Drill Holes	372,000	LF	$ 26.76	$ 9,950,000	
			Cement	149,000	CF	$ 81.10	$ 12,080,000	
			Dental Concrete				$ -	
			Dental Concrete	68,000	CY	$ 365.33	$ 24,840,000	
		0.317	Drainage				$ -	
			Holes	109,000	LF	$ 51.32	$ 5,590,000	
	0.32		Grout Galleries/Portals				$ -	
		0.321	Excavation				$ -	
			Tunnels/ Shafts- Core Area				$ -	
			Rock Horizontal	8,100	CY	$ 394.80	$ 3,200,000	
			Rock Inclined	9,000	CY	$ 552.93	$ 4,980,000	
			Rock Vertical	1,600	CY	$ 536.19	$ 860,000	
			Tunnels/ Shafts- Access				$ -	
			Rock Horizontal	10,400	CY	$ 394.80	$ 4,110,000	
			Rock Inclined	1,600	CY	$ 552.93	$ 880,000	
			Portals				$ -	
			Overburden Rock	2,900	CY	$ 17.16	$ 50,000	
			Rock	800	CY	$ 49.16	$ 40,000	
		0.323	Surface Preparation				$ -	
			Portals				$ -	
			Horizontal	24	SF	$ 2.30	$ -	
			Inclined	160	SF	$ 3.33	$ -	
							$ -	
		0.324	Concrete and Shotcrete				$ -	
			Tunnels- Core Area				$ -	
			Concrete Plugs	800	CY	$ 428.32	$ 340,000	
			Concrete Slab	1,800	CY	$ 944.82	$ 1,700,000	
			Concrete Overbreak 6"	920	CY	$ 755.86	$ 700,000	
			Reinforcing Steel	64	TON	$ 2,887.51	$ 180,000	
			2" Shotcrete	12,000	SF	$ 5.26	$ 60,000	
			Tunnels-Access				$ -	
			Concrete Slab	1,280	CY	$ 944.82	$ 1,210,000	
			Concrete Overbreak 6"	640	CY	$ 755.86	$ 480,000	
			Reinforcing Steel	48	TON	$ 2,887.51	$ 140,000	
			2" Shotcrete	4,300	SF	$ 5.26	$ 20,000	
			Shafts				$ -	
			2" Shotcrete	4,000	SF	$ 5.26	$ 20,000	
			Portals				$ -	
			Concrete	16	CY	$ 406.36	$ 10,000	
			Reinforcing Steel	2	TON	$ 2,887.51	$ -	
		0.325	Support and Anchors				$ -	
			Tunnels- Core Area				$ -	
			Rockbolts 3/4" @6'	1,400	EA	$ 327.15	$ 460,000	
			Steel Mesh	2,400	SF	$ 5.37	$ 10,000	
			Steel Support	16	TON	$ 12,801.49	$ 200,000	
			Tunnels- Access				$ -	
			Rockbolts 3/4" @6'	960	EA	$ 327.15	$ 310,000	
			Steel Mesh	880	SF	$ 5.37	$ -	
			Steel Support	16	TON	$ 12,801.49	$ 200,000	
			Shafts				$ -	
			Rockbolts 3/4" @6'	280	EA	$ 327.15	$ 90,000	
			Steel Mesh	800	SF	$ 5.37	$ -	
			Portals				$ -	

Low Watana (Non-Expandable) (4 Turbines)

FERC Line #	Sub Categories			Description	Quantity	Units	2008 Unit Price	Line Price	Total	
				Rockbolts 1" @15'	24	EA	$ 735.81	$ 20,000		
			0.329	Architectural Portal Doors				$ -		
				Portal Doors	1	LS	$ 33,900.00	$ 30,000		
		0.33		Instrumentation				$ -		
			0.331	Instrumentation	1	LS	$ 17,315,220.00	$ 17,320,000		
	0.4			Relict Channel				$ -		
		0.41		Shore Protection				$ -		
			0.411	Excavation				$ -		
				Overburden Stripping 2' thick	2,200	CY	$ 11.56	$ 30,000		
			0.412	Fill				$ -		
				Dump and Spread				$ -		
				Filter Material - 2' layer	2,200	CY	$ 31.93	$ 70,000		
				Rock Spalls/ Rip Rap- 3' Ave	3,300	CY	$ 9.86	$ 30,000		
				Shore Protection				$ -		
				Rip Rap	24,000	CY	$ 24.26	$ 580,000		
				Waste Rock	24,000	CY	$ 22.78	$ 550,000		
		0.44		Channel Filter Blanket				$ -		
			0.442	Fill				$ -		
				Coarse Filter	2,900,000	CY	$ 33.85	$ 98,170,000		
				Fine Filter	2,180,000	CY	$ 43.65	$ 95,160,000		
				Rip Rap	182,000	CY	$ 24.26	$ 4,420,000		
			0.443	Surface preparation				$ -		
				Foundation Prep				$ -		
				Clearing and Grubbing	460	ACRE	$ 3,963.11	$ 1,820,000		
				Excavation	2,236,000	CY	$ 15.62	$ 34,930,000		
	0.5			Outlet Facilities					**$**	**1,537,690,000**
		0.51		Outlet Facilities- (Intake Civil Work Include in Power Intake)	1	LS	$ 73,000,000	$ 73,000,000		
		0.52		Main (Chute) Spillway (Includes Civil Works for Outlet Facilities)	1	LS	$ 182,000,000	$ 182,000,000		
		0.53		Emergency Spillway	1	LS	$ 164,000,000	$ 164,000,000		
	0.6			Power Intake (Inc Inlet exec and Inlet Structure Civil Works for Outlet)	1	LS	$ 97,000,000	$ 97,000,000		
	0.7			Surge Chamber	1	LS	$ 17,000,000	$ 17,000,000		
		0.81		Head Race (Based on Penstock costs	1	LS	$ 28,000,000	$ 28,000,000		
		0.82		Penstocks	1	LS	$ 17,000,000	$ 17,000,000		
	0.9			Tailrace Works (1 Portal with Combined Tailrace/Diversion Tunnel)	1	LS	$ 12,000,000	$ 12,000,000		
									$	**590,000,000**
333				**Waterwheels, Turbines and Generators**						
		0.11		Turbines and Governors						
			0.111	Supply						
			0.112	Install						
	0.2			Generators and Exciters						
		0.21		Generators and Exciters (Supply and Install)						
			0.211	Generators and Exciters						
	0.3			Total Bid From Vendor (includes all equipment in this category) Average from acquired quotes	4	EA	$ 74,200,000.00	$ 297,000,000	**$**	**297,000,000**
334				**Accessory Electrical Equipment**						
	0.1			Connections, Supports and Structures						
		0.11		Structures						
			0.111	Structures (included Below)						
		0.12		Conductors and Insulators						
			0.121	Generator Isolated Phase Bus	1	LS	$ 3,792,000.00	$ 3,790,000		
			0.122	HV Power Cables and Accessories	1	LS	$ 1,540,500.00	$ 1,540,000		
			0.123	LV Power Cables and Accessories	1	LS	$ 711,000.00	$ 710,000		
			0.124	Control Cables and Accessories	1	LS	$ 1,303,500.00	$ 1,300,000		
			0.125	Grounding System	1	LS	$ 177,750.00	$ 180,000		
		0.13		Conduits and Fittings						
			0.131	Conduits and Fittings	1	LS	$ 474,000.00	$ 470,000		

Low Watana (Non-Expandable) (4 Turbines)

FERC Line #	Sub Categories		Description	Quantity	Units	2008 Unit Price	Line Price	Total	
	0.2		Switchgear and Control Equipment						
	0.21		Auxiliary Transformers						
		0.211	Auxiliary Transformers	4	EA	$ 83,811	$ 340,000		
	0.22		Circuit Breakers Generators				$ -		
		0.221	Circuit Breakers Generators	4	EA	$ 1,504,300	$ 6,020,000		
	0.23		Surge Protectors and Generator Cubicles			$ -	$ -		
		0.231	Surge Protectors and Generator Cubicles	4	EA	$ 50,000.00	$ 200,000		
	0.24		Switch boards			$ -	$ -		
		0.241	Switch boards	1	LS	$ 924,300.00	$ 920,000		
	0.25		Auxiliary Power Equipment			$ -	$ -		
		0.251	Auxiliary Power Equipment	4	EA	$ 100,000	$ 400,000		
	0.3		Cubicles and Appurtenances				$ -		
	0.31		Control, relay and meter boards				$ -		
		0.311	Control, relay and meter boards	4	EA	$ 200,000	$ 800,000		
	0.32		Computer Control System			$ -	$ -		
		0.321	Computer Control System			$ -	$ -		
	0.33		Supervisor and Telemeter System			$ -	$ -		
		0.331	Supervisor and Telemeter System			$ -	$ -		
						$ -	$ -		
	0.4		Power Transformers			$ -	$ -		
	0.41		Power Transformers			$ -	$ -		
		0.411	Power Transformers	7	EA	$ 2,571,429	$ 18,000,000		
						$ -	$ -		
	0.5		Lighting System				$ -		
	0.51		Powerhouse and Transformer Gallery				$ -		
		0.511	Powerhouse and Transformer Gallery	1	LS	$ 1,824,900.00	$ 1,820,000		
	0.52		Access Tunnels and Roads				$ -		
		0.521	Access Tunnels and Roads	1	LS	$ 402,900.00	$ 400,000		
							$ -		
	0.6		Misc. Electrical Equipment				$ -		
	0.61		Misc. Electrical Equipment				$ -		
		0.611	Misc. Electrical Equipment	1	LS	$ 625,680.00	$ 630,000		
							$ -		
	0.7		Surface Accessory Equipment				$ -		
	0.71		34.5 kV and LV Equipment				$ -		
		0.711	Switchboard	1	LS	$ 213,300	$ 210,000		
		0.712	Cables	1	LS	$ 450,300	$ 450,000		
		0.713	Aux Transformers	1	LS	$ 284,400	$ 280,000		
	0.73		Diesel Generator- Standby				$ -		
		0.731	Diesel Generator- Standby	2	EA	$ 347,550	$ 700,000		
	0.74		Exterior Lighting				$ -		
		0.741	Exterior Lighting	1	LS	$ 355,500	$ 360,000		
	0.75		Mimic Board- Control Building				$ -		
		0.751	Mimic Board- Control Building	1	LS	$ 1,185,000	$ 1,190,000		
							$ -	**$**	**41,000,000**
335			**Misc Powerplant Equipment**				$ -		
	0.1		Auxiliary Systems- Underground				$ -		
	0.11		Station Water Systems				$ -		
		0.111	Station Water Systems	1	LS	$ 2,488,500.00	$ 2,490,000		
	0.12		Fire Protection Systems			$ -	$ -		
		0.121	Fire Protection Systems	1	LS	$ 1,422,000.00	$ 1,420,000		
	0.13		Compressed Air Systems			$ -	$ -		
		0.131	Compressed Air Systems	1	LS	$ 1,777,500.00	$ 1,780,000		
	0.14		Oil Handling Systems			$ -	$ -		
		0.141	Oil Handling Systems	1	LS	$ 1,185,000.00	$ 1,190,000		
	0.15		Drainage & Dewatering			$ -	$ -		
		0.151	Drainage & Dewatering	2	EA	$ 1,738,000	$ 3,480,000		
	0.16		Heating, Ventilation and Cooling System			$ -	$ -		

Low Watana (Non-Expandable) (4 Turbines)

FERC Line #	Sub Categories			Description	Quantity	Units	2008 Unit Price	Line Price	Total
			0.161	Heating, Ventilation and Cooling System	1	LS	$ 1,777,500.00	$ 1,780,000	
		0.17		Miscellaneous			$ -	$ -	
			0.171	Miscellaneous	1	LS	$ 1,185,000.00	$ 1,190,000	
	0.2			Auxiliary Systems- Surface Facilities			$ -	$ -	
		0.21		Auxiliary Systems- Surface Facilities			$ -	$ -	
			0.211	Auxiliary Systems- Surface Facilities	1	LS	$ 711,000	$ 710,000	
	0.3			Auxiliary Equipment			$ -	$ -	
		0.31		Powerhouse Cranes			$ -	$ -	
			0.311	Powerhouse Cranes	2	EA	$ 1,800,000	$ 3,600,000	
		0.32		Elevators			$ -	$ -	
			0.321	Elevators	2	EA	$ 181,700	$ 360,000	
		0.33		Miscellaneous Cranes and Hoists			$ -	$ -	
			0.331	Miscellaneous Cranes and Hoists	1	LS	$ 505,500	$ 510,000	
		0.34		Machine Shop Equipment			$ -	$ -	
			0.341	Machine Shop Equipment	1	LS	$ 2,022,000	$ 2,020,000	
	0.4			General Station Equipment			$ -	$ -	
	0.5			Communications Equipment	1	LS	$ 106,650.00	$ 110,000	
								$ -	**$ 21,000,000**
336				**Roads, Rails and Air Facilities**				$ -	
	0.1			Roads					
		0.11		Permanent Roads					
				Cost of road upgrades for 23 mi of Denali Highway	23	Mi	$ 1,000,000.00	$ 23,000,000.00	
				Cost of New road to 42 Mi of road to Watana	42	Mi	$ 3,000,000.00	$ 126,000,000.00	
		0.131		Site Roads					
				Construction Roads					
				Site Roads	20	Mile	$ 750,000.00	$ 15,000,000	
				Maintenance	141	MI/YRS	$ 223,092.85	$ 31,500,000	
		0.132		Permanent Roads					
				Permanent Roads	6	Mile	$ 1,287,997.42	$ 7,700,000	
	0.2			Rail					
			0.1	Railhead at Cantwell	1	LS	$ 14,000,000.00	$ 14,000,000	
	0.3			Airstrip					
		0.31		Airstrip					
				Permanent Airstrip	1	LS	$ 13,000,000.00	$ 13,000,000	
				Temporary Airstrip	1	LS	$ 2,000,000.00	$ 2,000,000	
									$ 232,000,000
350-359				**Transmission Plant**	33	MILE	$ 5,700,000.00	$ 188,100,000.00	
					2	EA	$ 18,000,000.00	$ 36,000,000.00	
									$ 224,000,000.00
				General Plant					
389				**Land and Land Rights**					
				Land and Land Rights					
							(incl in 330)		
390				**Structures and Improvements**					
				Structures and Improvements					
							(incl in 331.2)		
391				**Office Furniture and Equipment**					
				Office Furniture and Equipment					
							(incl in 399)		
392				**Transportation Equipment**					
				Transportation Equipment					
							(incl in 399)		
393				**Stores Equipment**					

Low Watana (Non-Expandable) (4 Turbines)

FERC Line #	Sub Categories	Description	Quantity	Units	2008 Unit Price	Line Price	Total
		Stores Equipment					
					(incl in 399)		
	394	**Tools Shop and Garage Equipment**					
		Tools Shop and Garage Equipment					
					(incl in 399)		
	395	**Laboratory Equipment**					
		Laboratory Equipment					
					(incl in 399)		
	396	**Power-Operated Equipment**					
		Power-Operated Equipment					
					(incl in 399)		
	397	**Communications Equipment**					
		Communications Equipment					
					(incl in 399)		
	398	**Miscellaneous Equipment**					
		Miscellaneous Equipment					
					(incl in 399)		
	399	**Other Tangible Property**					
		Other Tangible Property		1 LS	$ 16,000,000	$ 16,000,000	
		Saved Maintenance		1 LS	$ (231,220)	$ (230,000)	
						$ -	**$ 16,000,000**
		Indirect Costs					
	61	**Temporary Construction Facilities**					
		Temporary Construction Facilities			(incl in direct costs)		
	62	**Construction Equipment**					
		Construction Equipment			(incl in direct costs)		
	63	**Main Construction Camp**					
	0.1	Main Construction Camp		1 LS	$ 180,000,000	**$ 180,000,000**	
							$ 180,000,000
	64	**Labor Expense**					
		Labor Expense					
	65	**Superintendence**					
		Superintendence					
	66	**Insurance**					
		Insurance					
	68	**Mitigation Fishery, Terrestrial and Recreational)- Not Included**					
	69	**Fees**					
		Fees					
Subtotal							
	Contingency (20%)			1 LS	$ 749,200,000.00		**$ 749,000,000**
Subtotal							
	71	**Engineering (4%), Environmental (2%), Regulatory(1%)**		1 LS	$ 236,000,000.00		**$ 236,000,000**
	71a	**Construction Management (4%)**		1 LS	$ 135,000,000.00		**$ 135,000,000**
	72	**Legal Expenses**					
	75	**Taxes**					
	76	**Administrative & Gen. Expenses**					
	77	**Interest**					
	80	**Earnings/Expenses During Construction**					
Total Project Cost							**$ 4,495,000,000**
Max Plant Capacity	600						

HDR/AEA Susitna Hydroelectric Project
Cost Estimates based on 1982 quantities
By: HDR
By: Leanne Andruszkiewicz, E.I.T.
Checked By: Kellen Roberts, E.I.T.
Date: 10/15/2009
2008 Dollars
Low Watana (Expandable) (4 Turbines)

FERC Line #	Sub Categories	Description	Quantity	Units	2008 Unit Price	Line Price	Total
	330	**Land and Land Rights**					
	0.1	Land	1	LS	$ 120,870,000	$ 120,870,000	
	0.2	Land Rights				$ -	
	0.3	Misc Charges in Credit Above				$ -	
						$ -	**$ 121,000,000**
						$ -	
	331	**Powerplant Structure Improvements**				$ -	
	0.1	Powerhouse				$ -	
	0.11	Powerhouse and Draft Tube				$ -	
	0.111	Excavation				$ -	
		Powerhouse Vault Rock	122,500	CY	$ 90	$ 11,040,000	
		Draft Tube Rock	25,200	CY	$ 90	$ 2,270,000	
	0.113	Surface Preparation/ Grouting				$ -	
		Powerhouse	99,000	SF	$ 3	$ 330,000	
Total	Total Estimated Const. Costs (Million $)	Draft Tube	76,500	SF	$ 3	$ 250,000	
		Grout Curtain- Drill holes	43,800	LF	$ 28	$ 1,210,000	
		Grout Curtain- Cement	17,500	CF	$ 81	$ 1,420,000	
	0.114	Concrete and Shot Crete				$ -	
		Powerhouse Concrete	32,600	CY	$ 693	$ 22,590,000	
		Powerhouse Concrete Overbreak	2,400	CY	$ 447	$ 1,070,000	
		Powerhouse Reinforcing Steel	1,630	TON	$ 2,858	$ 4,660,000	
		Powerhouse 4" Shotcrete	41,000	SF	$ 10	$ 420,000	
		Draft Tube Concrete	12,000	CY	$ 693	$ 8,310,000	
		Draft Tube Concrete Overbreak	2,500	CY	$ 447	$ 1,120,000	
		Draft Tube Reinforcing Steel	990	TON	$ 2,858	$ 2,830,000	
		Draft Tube 2" Shotcrete	6,100	SF	$ 5	$ 30,000	
	0.115	Support and Anchors				$ -	
		Powerhouse Rockbolts 1" @ 25' Hy	970	EA	$ 1,235	$ 1,200,000	
		Powerhouse Rockbolts 1" @ 15'	1,970	EA	$ 736	$ 1,450,000	
		Powerhouse Steel Mesh	44,600	SF	$ 6	$ 260,000	
		Powerhouse Steel Support	137	TON	$ 12,672	$ 1,740,000	
		Draft Tube Rockbolts 1" @ 25' Hy	150	EA	$ 1,235	$ 190,000	
		Draft Tube Rockbolts 1" @ 12'	390	EA	$ 528	$ 210,000	
		Draft Tube Rockbolts 1" @ 9'	190	EA	$ 432	$ 80,000	
		Draft Tube Steel Mesh	18,900	SF	$ 7	$ 120,000	
	0.117	Holes (U/S of Powerhouse)	15,000	LF	$ 51	$ 770,000	
		Holes (Powerhouse Crown)	28,500	LF	$ 51	$ 1,460,000	
	0.118	Structural- Misc Steelwork				$ -	
		Powerhouse and Draft Tube- Steel Crane Rails	1	LS	$ 10,276,309	$ 10,280,000	
	0.119	Architectural- Powerhouse	1	LS	$ 2,927,898	$ 2,930,000	
	0.11c	Mechanical				$ -	
		Draft Tube Gates	4	SETS	$ 427,880	$ 1,710,000	
		Draft Tube Gate Guides	6	SETS	$ 202,680	$ 1,220,000	
		Draft Tube Crane	1	LS	$ 1,140,000	$ 1,140,000	
	0.12	Access Tunnels and Portals				$ -	
	0.121	Excavation				$ -	
		Main Tunnel	50,250	CY	$ 97	$ 4,900,000	
		Transformer Gallery Tunnel	17,750	CY	$ 97	$ 1,730,000	
		Grouting Gallery Tunnel	1,900	CY	$ 396	$ 750,000	
		Surge Chamber Access Tunnel	7,250	CY	$ 145	$ 1,050,000	
		Penstock Access Tunnel	61,500	CY	$ 145	$ 8,930,000	

Low Watana (Expandable) (4 Turbines)

FERC Line #	Sub Categories	Description	Quantity	Units	2008 Unit Price	Line Price	Total
		Penstock Elbow Access Tunnel	15,000	CY	$ 145	$ 2,180,000	
		Access Shaft Tunnel	1,300	CY	$ 145	$ 190,000	
		Connector Tunnel	1,900	CY	$ 379	$ 720,000	
		Portals Overburden	6,000	CY	$ 17	$ 100,000	
		Portals Rock	3,000	CY	$ 49	$ 150,000	
	0.123	Surface Preparation				$ -	
		Main Tunnel Slab	53,100	SF	$ 2	$ 120,000	
		Penstock Access Slab	65,200	SF	$ 2	$ 140,000	
		Horizontal Portal	200	SF	$ 2	$ -	
		Inclined Portal	2,100	SF	$ 3	$ 10,000	
	0.124	Concrete and Shot Crete				$ -	
		Main Portal				$ -	
		Concrete Slab	30	CY	$ 406	$ 10,000	
		Concrete Walls	570	CY	$ 406	$ 230,000	
		Concrete Overbreak	50	CY	$ 368	$ 20,000	
		Reinforcing Steel	40	TON	$ 2,888	$ 120,000	
		Tunnels				$ -	
		Concrete Slab Main Tunnel	1,950	CY	$ 504	$ 980,000	
		Concrete Plugs Penstock Elbow ACC	15,000	CY	$ 756	$ 11,340,000	
		Concrete Overbreak Main Tunnel 6"	1,000	CY	$ 346	$ 350,000	
		Reinforcing Steel	70	TON	$ 2,888	$ 200,000	
		2 " Shotcrete Main Tunnel	20,100	SF	$ 5	$ 110,000	
		2 " Shotcrete Transformer Gal	7,100	SF	$ 5	$ 40,000	
		2 " Shotcrete Surge Chamber Acc	3,900	SF	$ 5	$ 20,000	
		2 " Shotcrete Penstock Access	24,700	SF	$ 5	$ 130,000	
		2 " Shotcrete Penstock Elbow Acc	7,100	SF	$ 5	$ 40,000	
		2 " Shotcrete Access Shaft	300	SF	$ 5	$ -	
		2 " Shotcrete Grout Gallery	800	SF	$ 5	$ -	
		2 " Shotcrete Connector Tunnel	800	SF	$ 5	$ -	
	0.125	Support and Anchors				$ -	
		Main Tunnel				$ -	
		Rockbolts 1" @12'	1,200	EA	$ 528	$ 630,000	
		Rockbolts 1" @ 9'	250	EA	$ 432	$ 110,000	
		Steel Mesh	63,000	SF	$ 6	$ 400,000	
		Steel Support	66	TON	$ 12,801	$ 840,000	
		Main Tunnel Portal				$ -	
		Rockbolts 1" @15'	50	EA	$ 736	$ 40,000	
		Transformer Gallery Tunnel				$ -	
		Rockbolts 1" @12'	410	EA	$ 528	$ 220,000	
		Rockbolts 1" @ 9'	70	EA	$ 432	$ 30,000	
		Steel Mesh	22,500	SF	$ 6	$ 130,000	
		Steel Support	24	TON	$ 12,801	$ 310,000	
		Grouting Gallery Tunnel				$ -	
		Rockbolts 3/4" @ 6'	160	EA	$ 327	$ 50,000	
		Steel Mesh	160	SF	$ 6	$ -	
		Steel Support	2	TON	$ 12,801	$ 30,000	
		Surge Chamber Access Tunnel				$ -	
		Rockbolts 1" @12'	230	EA	$ 528	$ 120,000	
		Rockbolts 1" @ 9'	50	EA	$ 432	$ 20,000	
		Steel Mesh	12,050	SF	$ 6	$ 80,000	
		Steel Support	14	TON	$ 12,801	$ 180,000	
		Penstock Access Tunnel				$ -	
		Rockbolts 1" @12'	1,430	EA	$ 528	$ 760,000	
		Rockbolts 1" @ 9'	240	EA	$ 432	$ 100,000	
		Steel Mesh	77,500	SF	$ 6	$ 490,000	
		Steel Support	58	TON	$ 12,801	$ 740,000	
		Penstock Elbow Access Tunnel				$ -	
		Rockbolts 1" @12'	420	EA	$ 528	$ 220,000	

Low Watana (Expandable) (4 Turbines)

FERC Line #	Sub Categories		Description	Quantity	Units	2008 Unit Price	Line Price	Total
			Rockbolts 1" @ 9'	120	EA	$ 432	$	50,000
			Steel Mesh	22,500	SF	$ 6	$	140,000
			Steel Support	30	TON	$ 12,801	$	380,000
			Access Shaft Tunnel				$	-
			Rockbolts 1" @12'	20	EA	$ 528	$	10,000
			Rockbolts 1" @ 9'	20	EA	$ 432	$	10,000
			Steel Mesh	930	SF	$ 6	$	10,000
			Steel Support	8	TON	$ 12,801	$	100,000
			Connector Tunnel				$	-
			Rockbolts 3/4" @ 6'	160	EA	$ 327	$	50,000
			Steel Mesh	160	SF	$ 6	$	-
			Steel Support	2	TON	$ 12,801	$	30,000
		0.129	Architectural- Main Portal Doors	2	SETS	$ 158,372	$	320,000
		0.12c	Mechanical Ventilation System				$	-
	0.13		Access Shaft				$	-
		0.131	Excavation Rock	13,700	CY	$ 228	$	3,120,000
		0.133	Surface Preparation Shaft	64,000	SF	$ 3	$	210,000
		0.134	Concrete and Shot Crete				$	-
			Concrete Lining	3,350	CY	$ 945	$	3,170,000
			Concrete Overbreak 6"	1,220	CY	$ 551	$	670,000
		0.135	Support and Anchors - Rockbolts 3/4" @ 6'	1,050	EA	$ 327	$	340,000
		0.138	Structural Misc Steelwork	50	TON	$ 7,395	$	370,000
		0.139	Architectural- control Building				$	-
		0.13c	Mechanical Elevators	1	LS	$ 2,368,815	$	2,370,000
	0.14		Fire Protection Head Tank				$	-
		0.141	Excavation	1,150	CY	$ 589	$	680,000
		0.143	Surface Preparation	2,800	SF	$ 2	$	10,000
		0.144	Concrete & Shotcrete				$	-
			Concrete	250	CY	$ 964	$	240,000
			Concrete Overbreak 6"	45	CY	$ 406	$	20,000
			Reinforcing Steel	10	TON	$ 2,858	$	30,000
		0.145	Support and Anchors				$	-
			Rockbolts 1" @12'	25	EA	$ 528	$	10,000
			Rockbolts 1" @ 9'	10	EA	$ 432	$	-
			Steel Mesh	1,200	SF	$ 6	$	10,000
			Steel Support	2	TON	$ 12,672	$	30,000
		0.148	Misc Steelwork	1	LS	$ 73,298	$	70,000
		0.14c	Mechanical Piping/Valves				$	-
	0.15		Bus Tunnels (totals for 3 Bus Tunnels)				$	-
		0.151	Excavation				$	-
			Rock Horizontal	2,700	CY	$ 214	$	580,000
			Rock Inclined	1,300	CY	$ 601	$	780,000
		0.153	Surface Preparation- Tunnels	7,100	SF	$ 3	$	20,000
		0.154	Concrete and Shotcrete				$	-
			Concrete Slab	350	CY	$ 819	$	290,000
			Concrete Overbreak 12"	250	CY	$ 472	$	120,000
			Reinforcing Steel	18	TON	$ 2,858	$	50,000
			2" Shotcrete	2,200	SF	$ 5	$	10,000
		0.155	Supports and Anchors				$	-
			Rockbolts 1" @ 25'	60	EA	$ 1,235	$	70,000
			Rockbolts 1" @ 12'	140	EA	$ 528	$	70,000
			Rockbolts 1" @ 9'	50	EA	$ 432	$	20,000
			Steel Mesh	6,800	SF	$ 6	$	40,000
			Steel Support	11	TON	$ 12,672	$	140,000
	0.16		Transformer Gallery Tunnel				$	-
		0.161	Excavation- Rock	26,800	CY	$ 87	$	2,340,000
		0.163	Surface Preparation	24,600	SF	$ 2	$	60,000

Low Watana (Expandable) (4 Turbines)

FERC Line #	Sub Categories			Description	Quantity	Units	2008 Unit Price	Line Price	Total	
			0.164	Concrete and Shotcrete				$ -		
				Concrete Base Slab	2,400	CY	$ 1,228	$ 2,950,000		
				Concrete Overbreak 12"H/6"V	770	CY	$ 378	$ 290,000		
				Reinforcing Steel	120	TON	$ 2,858	$ 340,000		
			0.165	Support and Anchors				$ -		
				Rockbolts 1" @ 25'	600	EA	$ 1,235	$ 740,000		
				Rockbolts 1" @ 15'	270	EA	$ 736	$ 200,000		
				Steel Mesh	20,700	SF	$ 6	$ 120,000		
				Steel Support	29	TON	$ 12,672	$ 370,000		
			0.167	Drainage Holes	8,300	LF	$ 48	$ 400,000		
		0.17		Cable Shafts				$ -		
			0.171	Excavation Rock	3,400	CY	$ 601	$ 2,040,000		
			0.173	Surface Preparation Shafts	41,400	SF	$ 3	$ 140,000		
			0.174	Concrete and Shotcrete				$ -		
				Concrete Lining	1,040	CY	$ 1,764	$ 1,830,000		
				Concrete Overbreak 6"	800	CY	$ 882	$ 710,000		
			0.175	Supports and Anchors- Rockbolts 3/4" @ 6'	650	EA	$ 327	$ 210,000		
			0.178	Structural Misc Steelwork	18	TON	$ 15,602	$ 280,000		
			0.179	Architectural- Enclosures	1	LS	$ 199,317	$ 200,000		
			0.17c	Mechanical Hoist	2	EA	$ 476,960	$ 950,000		
		0.18		Dewatering (during Construction)				$ -		
			0.181	Dewatering (Power Facilities)	1	LS	$ 1,336,799	$ 1,340,000		
		0.19		Instrumentation				$ -		
			0.191	Instrumentation	1	LS	$ 1,714,814	$ 1,710,000		
	0.2			Misc Buildings (Control Buildings)	1	LS	$ 4,433,085	$ 4,430,000		
	0.3			Permanent Town	(included in 63.5)					
								$ -	**$**	**159,000,000**
332				**Reservoir, Dams and Waterways**				$ -		
	0.1			Reservoir				$ -		
		0.11		Reservoir Clearing	23,000	ACRE	$ 3,006	$ 69,130,000		
	0.2			Diversion Tunnels /Cofferdams				$ -		
		0.21		Diversion Tunnels /Portals				$ -		
			0.211	Excavation				$ -		
				Upper Tunnel				$ -		
				Rock	221,000	CY	$ 92	$ 20,400,000		
				Lower Tunnel				$ -		
				Rock	208,000	CY	$ 92	$ 19,200,000		
				Excavate Concrete for Plug	700	CY	$ 97	$ 70,000		
				Upstream Upper Portal				$ -		
				Rock Usable (Face Only)	11,200	CY	$ 49	$ 550,000		
				Upstream Lower Portal (Including Most Excav. for Upper Portal)				$ -		
				Rock Usable	108,000	CY	$ 49	$ 5,310,000		
				Rock Waste	21,750	CY	$ 49	$ 1,070,000		
				Downstream Portals				$ -		
				Overburden	17,000	CY	$ 17	$ 290,000		
				Rock Usable	120,000	CY	$ 49	$ 5,900,000		
				Rock Waste	28,000	CY	$ 49	$ 1,380,000		
				Emergency Release Chambers				$ -		
				Excavate Concrete for Plugs	1,800	CY	$ 102	$ 180,000		
				Gate Chamber	4,700	CY	$ 111	$ 520,000		
				Access Tunnel to Gate Chamber				$ -		
				Rock	19,100	CY	$ 97	$ 1,860,000		
			0.212	Fill- Temp for Coffer Dam to Construct Upstream Portals	23,000	CY	$ 12	$ 270,000		
			0.213	Surface Preparation \ grouting				$ -		
				Upstream Upper Portal				$ -		
				Horizontal	3,200	SF	$ 2	$ 10,000		
				Inclined	8,600	SF	$ 3	$ 30,000		
				Upstream Lower Portal				$ -		

Low Watana (Expandable) (4 Turbines)

FERC Line #	Sub Categories	Description	Quantity	Units	2008 Unit Price	Line Price	Total
		Horizontal	1,300	SF	$ 2	$	-
		Inclined	14,900	SF	$ 3	$	50,000
		Downstream Upper Portal				$	-
		Horizontal	6,100	SF	$ 2	$	10,000
		Inclined	20,500	SF	$ 3	$	70,000
		Downstream Lower Portal				$	-
		Horizontal	600	SF	$ 2	$	-
		Inclined	5,600	SF	$ 3	$	20,000
		Grout Upper Tunnel Plugs				$	-
		Drill Holes	4,100	LF	$ 27	$	110,000
		Cement	820	CF	$ 81	$	70,000
		Grout Lower Tunnel Permanent Plugs				$	-
		Drill Holes	2,050	LF	$ 27	$	50,000
		Cement	410	CF	$ 81	$	30,000
	0.214	Concrete and Shotcrete				$	-
		Upper Tunnel				$	-
		Concrete Lining	42,400	CY	$ 567	$	24,040,000
		Concrete Lining Overbreak 6"	10,200	CY	$ 315	$	3,210,000
		Reinforcing Steel	24	TON	$ 2,888	$	70,000
		2" Shotcrete	56,000	SF	$ 5	$	290,000
		Lower Tunnel				$	-
		Concrete Lining	37,600	CY	$ 567	$	21,320,000
		Concrete Lining for Plug	6,200	CY	$ 428	$	2,660,000
		Concrete Lining Overbreak 6"	10,000	CY	$ 315	$	3,150,000
		Reinforcing Steel	24	TON	$ 2,888	$	70,000
		2" Shotcrete	57,900	SF	$ 5	$	300,000
		Upstream Upper Portal				$	-
		Concrete Headwall	3,200	CY	$ 652	$	2,090,000
		Concrete Lining	1,300	CY	$ 652	$	850,000
		Concrete Slab	750	CY	$ 652	$	490,000
		Concrete Piers	800	CY	$ 652	$	520,000
		Concrete Overbreak 12" H/6"V	300	CY	$ 472	$	140,000
		Reinforcing Steel	400	TON	$ 2,888	$	1,160,000
		Upstream Lower Portal				$	-
		Concrete Headwall	4,500	CY	$ 652	$	2,930,000
		Concrete Lining	3,000	CY	$ 652	$	1,960,000
		Concrete Slab	300	CY	$ 652	$	200,000
		Concrete Piers	700	CY	$ 652	$	460,000
		Concrete Overbreak 12" H/6"V	350	CY	$ 472	$	170,000
		Reinforcing Steel	600	TON	$ 2,888	$	1,730,000
		Downstream Upper Portal				$	-
		Concrete Headwall	500	CY	$ 652	$	330,000
		Concrete Slab	100	CY	$ 652	$	70,000
		Concrete Overbreak 12" H/6"V	100	CY	$ 472	$	50,000
		Reinforcing Steel	40	TON	$ 2,888	$	120,000
		Downstream Lower Portal				$	-
		Concrete Headwall	2,500	CY	$ 652	$	1,630,000
		Concrete Slab	100	CY	$ 652	$	70,000
		Concrete Overbreak 12" H/6"V	150	CY	$ 472	$	70,000
		Reinforcing Steel	170	TON	$ 2,888	$	490,000
		Downstream Flip Bucket				$	-
		Concrete Slab	800	CY	$ 652	$	520,000
		Concrete Walls	2,300	CY	$ 652	$	1,500,000
		Concrete Invert	1,200	CY	$ 652	$	780,000
		Concrete Overbreak 12" H/6"V	410	CY	$ 42	$	20,000
		Reinforcing Steel	280	TON	$ 2,888	$	810,000
		Downstream Retaining Wall				$	-
		Concrete Slab	200	CY	$ 652	$	130,000

Low Watana (Expandable) (4 Turbines)

FERC Line #	Sub Categories	Description	Quantity	Units	2008 Unit Price	Line Price	Total
		Concrete Walls	2,000	CY	$ 652	$ 1,300,000	
		Concrete Overbreak 12" H/6"V	110	CY	$ 472	$ 50,000	
		Reinforcing Steel	90	TON	$ 2,888	$ 260,000	
		Emergency Release Chambers				$ -	
		Concrete Plug	15,300	CY	$ 756	$ 11,560,000	
		4" Shotcrete	2,790	SF	$ 10	$ 30,000	
		Access Tunnel to Gate Chamber				$ -	
		2" Shotcrete	12,800	SF	$ 5	$ 70,000	
	0.215	Supports and Anchors				$ -	
		Lower Tunnel				$ -	
		Rockbolts 1" @ 12'	3,650	EA	$ 528	$ 1,930,000	
		Rockbolts 1" @ 9'	620	EA	$ 432	$ 270,000	
		Steel Mesh	217,100	SF	$ 6	$ 1,380,000	
		Steel Support	220	TON	$ 12,801	$ 2,820,000	
		Upper Tunnel				$ -	
		Rockbolts 1" @ 12'	3,530	EA	$ 528	$ 1,870,000	
		Rockbolts 1" @ 9'	600	EA	$ 432	$ 260,000	
		Steel Mesh	210,200	SF	$ 6	$ 1,340,000	
		Steel Support	213	TON	$ 12,801	$ 2,730,000	
		Upstream Lower Portal				$ -	
		Rockbolts 1" @ 15'	240	EA	$ 736	$ 180,000	
		Anchors 1" @ 25'	290	EA	$ 1,235	$ 360,000	
		Upstream Upper Portal				$ -	
		Rockbolts 1" @ 15'				$ -	
		Anchors 1" @ 25'	130	EA	$ 736	$ 100,000	
		Downstream Lower Portal				$ -	
		Rockbolts 1" @ 15'	200	EA	$ 736	$ 150,000	
		Downstream Upper Portal				$ -	
		Rockbolts 1" @ 15'	100	EA	$ 736	$ 70,000	
		Retaining Wall Anchors 1" @25'	100	EA	$ 1,235	$ 120,000	
		Emergency Release Chambers				$ -	
		Rockbolts 1" @ 25'	100	EA	$ 1,235	$ 120,000	
		Rockbolts 1" @ 15'	125	EA	$ 736	$ 90,000	
		Steel Mesh	3,600	SF	$ 6	$ 20,000	
		Steel Support	14	TON	$ 12,801	$ 180,000	
		Metal to Roof Anchors 3/4" @ 6'	20	EA	$ 342	$ 10,000	
		Access Tunnel to Gate Chamber				$ -	
		Rockbolts 1" @ 12'	775	EA	$ 528	$ 410,000	
		Rockbolts 1" @ 9'	240	EA	$ 432	$ 100,000	
		Steel Mesh	39,900	SF	$ 6	$ 250,000	
		Steel Support	55	TON	$ 12,801	$ 700,000	
	0.218	Structural- Misc Steelwork	2,775	SF	$ 94	$ 260,000	
	0.21c	Mechanical				$ -	
		Upstream Lower Gates				$ -	
		Gate Equipment	2	EA	$ 5,073,120	$ 10,150,000	
		Upstream Upper Gates				$ -	
		Gate Equipment	2	EA	$ 2,840,080	$ 5,680,000	
		Trashracks	1	LS	$ 1,777,500	$ 1,780,000	
		Downstream Lower Outlet				$ -	
		Stoplog Guides	1	LS	$ 142,200	$ 140,000	
		Stoplogs includes follower	1	LS	$ 1,967,100	$ 1,970,000	
		Downstream Upper Outlet				$ -	
		Stoplog Guides	1	LS	$ 82,950	$ 80,000	
		Low Level Release				$ -	
		Slide Gates Include Steel Liner	9	EA	$ 3,517,470	$ 31,660,000	
						$ -	
	0.22	Upstream Cofferdam				$ -	
	0.221	Excavation				$ -	

Low Watana (Expandable) (4 Turbines)

FERC Line #	Sub Categories			Description	Quantity	Units	2008 Unit Price	Line Price	Total
				Overburden Removal	1,000	CY	$ 12	$	10,000
		0.222		Fill				$	-
				Rock Fill	38,400	CY	$ 11	$	420,000
				Fine Filter	16,600	CY	$ 37	$	610,000
				Coarse Filter	15,900	CY	$ 30	$	480,000
				Rock Shell	196,500	CY	$ 11	$	2,060,000
				Closure Dike	58,500	CY	$ 11	$	640,000
				Rip Rap	21,200	CY	$ 24	$	510,000
		0.223		Cutoff Slurry Wall				$	-
				excavation	4,850	CY	$ 5	$	20,000
				slurry wall	43,600	SF	$ 72	$	3,160,000
		0.22d		Dewatering				$	-
				Initial Dewatering	1	LS	$ 5,807,685	$	5,810,000
				Dewatering Maintenance	1	LS	$ 22,377,990	$	22,380,000
	0.23			Down Stream Cofferdam				$	-
		0.231		Excavation				$	-
				overburden	5,000	CY	$ 12	$	60,000
				Rock	500	CY	$ 10	$	-
				Removal of Cofferdam	14,500	CY	$ 13	$	200,000
		0.232		Fill				$	-
				Rip Rap	1,800	CY	$ 24	$	40,000
				Closure Dike	15,200	CY	$ 11	$	170,000
		0.233		Cutoff Slurry Wall				$	-
				Excavation	1,830	CY	$ 5	$	10,000
				Slurry Wall	16,500	SF	$ 72	$	1,200,000
	0.3			Main Dam				$	-
		0.31		Main Dam				$	-
		0.311		Excavation				$	-
				Overburden above el. 1470	2,026,000	CY	$ 12	$	23,360,000
				Overburden below el. 1470	5,320,000	CY	$ 11	$	58,840,000
				Rock Usable above el. 1470	1,289,000	CY	$ 43	$	55,470,000
				Rock Usable below el. 1470	478,000	CY	$ 44	$	20,900,000
				Rock Waste above el. 1470	1,950,000	CY	$ 43	$	83,910,000
				Rock Waste below el. 1470	869,500	CY	$ 50	$	43,630,000
		0.312		Fill- From 1985 FERC Application				$	-
				Rip Rap (upstream)	733,802	CY	$ 23	$	17,100,000
				Gravel (upstream)	11,950,489	CY	$ 21	$	245,700,000
				Coarse Filter (upstream)	925,759	CY	$ 29	$	26,720,000
				Fine Filter (upstream)	1,045,588	CY	$ 38	$	39,640,000
				Core (impervious)	6,300,000	CY	$ 25	$	159,830,000
				Fine Filter (downstream)	1,171,412	CY	$ 38	$	44,410,000
				Coarse Filter (downstream)	1,074,241	CY	$ 29	$	31,000,000
				Shell- Rock and Gravel	5,379,949	CY	$ 19	$	103,190,000
				Shell- Rock From Other Sources	2,569,967	CY	$ 10	$	25,930,000
				Cobbles (downstream Face)	950,100	CY	$ 16	$	15,530,000
				Road Base	12,000	CY	$ 34	$	410,000
				Frost Protection				$	-
				Process Protection	960,000	CY	$ 10	$	9,900,000
				Place Protection	960,000	CY	$ 3	$	3,160,000
				Remove 1' Protect and Waste	93,000	CY	$ 7	$	670,000
				Scarify Core Surface	193	ACRE	$ 859	$	170,000
				Filter Fabric				$	-
				Filter Fabric	592,000	SF	$ 1	$	520,000
		0.313		Surface Prep/ Grouting				$	-
				Surface Preparation				$	-
				Under Core/Filters above el. 1500	1,340,000	SF	$ 3	$	4,170,000
				Under Core/Filters below el. 1500	490,000	SF	$ 3	$	1,520,000
				Under Shell above el. 1500	4,149,000	SF	$ 2	$	8,920,000

Low Watana (Expandable) (4 Turbines)

FERC Line #	Sub Categories		Description	Quantity	Units	2008 Unit Price	Line Price	Total
			Under Shell below el. 1500	2,067,000	SF	$ 2	$ 4,440,000	
			Consolidation Grout				$ -	
			Drill Holes	550,000	LF	$ 12	$ 6,550,000	
			Cement	550,000	CF	$ 68	$ 37,300,000	
			Grout Curtain				$ -	
			Drill Holes	372,000	LF	$ 27	$ 9,950,000	
			Cement	149,000	CF	$ 81	$ 12,080,000	
			Dental Concrete				$ -	
			Dental Concrete	68,000	CY	$ 365	$ 24,840,000	
		0.317	Drainage				$ -	
			Holes	109,000	LF	$ 51	$ 5,590,000	
	0.32		Grout Galleries/Portals				$ -	
		0.321	Excavation				$ -	
			Tunnels/ Shafts- Core Area				$ -	
			Rock Horizontal	8,100	CY	$ 395	$ 3,200,000	
			Rock Inclined	9,000	CY	$ 553	$ 4,980,000	
			Rock Vertical	1,600	CY	$ 536	$ 860,000	
			Tunnels/ Shafts- Access				$ -	
			Rock Horizontal	10,400	CY	$ 395	$ 4,110,000	
			Rock Inclined	1,600	CY	$ 553	$ 880,000	
			Portals				$ -	
			Overburden Rock	2,900	CY	$ 17	$ 50,000	
			Rock	800	CY	$ 49	$ 40,000	
		0.323	Surface Preparation				$ -	
			Portals				$ -	
			Horizontal	24	SF	$ 2	$ -	
			Inclined	160	SF	$ 3	$ -	
							$ -	
		0.324	Concrete and Shotcrete				$ -	
			Tunnels- Core Area				$ -	
			Concrete Plugs	800	CY	$ 428	$ 340,000	
			Concrete Slab	1,800	CY	$ 945	$ 1,700,000	
			Concrete Overbreak 6"	920	CY	$ 756	$ 700,000	
			Reinforcing Steel	64	TON	$ 2,888	$ 180,000	
			2" Shotcrete	12,000	SF	$ 5	$ 60,000	
			Tunnels-Access				$ -	
			Concrete Slab	1,280	CY	$ 945	$ 1,210,000	
			Concrete Overbreak 6"	640	CY	$ 756	$ 480,000	
			Reinforcing Steel	48	TON	$ 2,888	$ 140,000	
			2" Shotcrete	4,300	SF	$ 5	$ 20,000	
			Shafts				$ -	
			2" Shotcrete	4,000	SF	$ 5	$ 20,000	
			Portals				$ -	
			Concrete	16	CY	$ 406	$ 10,000	
			Reinforcing Steel	2	TON	$ 2,888	$ -	
		0.325	Support and Anchors				$ -	
			Tunnels- Core Area				$ -	
			Rockbolts 3/4" @6'	1,400	EA	$ 327	$ 460,000	
			Steel Mesh	2,400	SF	$ 5	$ 10,000	
			Steel Support	16	TON	$ 12,801	$ 200,000	
			Tunnels- Access				$ -	
			Rockbolts 3/4" @6'	960	EA	$ 327	$ 310,000	
			Steel Mesh	880	SF	$ 5	$ -	
			Steel Support	16	TON	$ 12,801	$ 200,000	
			Shafts				$ -	
			Rockbolts 3/4" @6'	280	EA	$ 327	$ 90,000	
			Steel Mesh	800	SF	$ 5	$ -	
			Portals				$ -	

Low Watana (Expandable) (4 Turbines)

FERC Line #	Sub Categories			Description	Quantity	Units	2008 Unit Price	Line Price	Total
				Rockbolts 1" @15'	24	EA	$ 736	$ 20,000	
			0.329	Architectural Portal Doors				$ -	
				Portal Doors	1	LS	$ 33,900	$ 30,000	
		0.33		Instrumentation				$ -	
			0.331	Instrumentation	1	LS	$ 17,315,220	$ 17,320,000	
	0.4			Relict Channel				$ -	
		0.41		Shore Protection				$ -	
			0.411	Excavation				$ -	
				Overburden Stripping 2' thick	2,200	CY	$ 12	$ 30,000	
			0.412	Fill				$ -	
				Dump and Spread				$ -	
				Filter Material - 2' layer	2,200	CY	$ 32	$ 70,000	
				Rock Spalls/ Rip Rap- 3' Ave	3,300	CY	$ 10	$ 30,000	
				Shore Protection				$ -	
				Rip Rap	24,000	CY	$ 24	$ 580,000	
				Waste Rock	24,000	CY	$ 23	$ 550,000	
		0.44		Channel Filter Blanket				$ -	
			0.442	Fill				$ -	
				Coarse Filter	2,900,000	CY	$ 34	$ 98,170,000	
				Fine Filter	2,180,000	CY	$ 44	$ 95,160,000	
				Rip Rap	182,000	CY	$ 24	$ 4,420,000	
			0.443	Surface preparation				$ -	
				Foundation Prep				$ -	
				Clearing and Grubbing	460	ACRE	$ 3,963	$ 1,820,000	
				Excavation	2,236,000	CY	$ 16	$ 34,930,000	
									$ 1,718,000,000
	0.5			Outlet Facilities					
		0.51		Outlet Facilities- (Intake Civil Work Include in Power Intake)	1	LS	$ 73,000,000	$ 73,000,000	
		0.52		Main (Chute) Spillway (Includes Civil Works for Outlet Facilities)	1	LS	$ 182,000,000	$ 182,000,000	
		0.53		Emergency Spillway	1	LS	$ 164,000,000	$ 164,000,000	
	0.6			Power Intake (Inc Inlet exec and Inlet Structure Civil Works for Outlet)	1	LS	$ 145,000,000	$ 145,000,000	
	0.7			Surge Chamber	1	LS	$ 24,000,000	$ 24,000,000	
		0.81		Head Race (Based on Penstock costs	1	LS	$ 42,000,000	$ 42,000,000	
		0.82		Penstocks	1	LS	$ 25,000,000	$ 25,000,000	
	0.9			Tailrace Works (1 Portal with Combined Tailrace/Diversion Tunnel)	1	LS	$ 22,000,000	$ 22,000,000	
									$ 677,000,000
333				**Waterwheels, Turbines and Generators**					
		0.11		Turbines and Governors					
			0.111	Supply	4	EA			
			0.112	Install					
	0.2			Generators and Exciters					
		0.21		Generators and Exciters (Supply and Install)					
			0.211	Generators and Exciters	4	EA			
	0.3			Total Bid From Vendor (includes all equipment in this category)	4	EA	$ 74,200,000	$ 297,000,000	**$ 297,000,000**
				Average from acquired quotes					
334				**Accessory Electrical Equipment**					
	0.1			Connections, Supports and Structures					
		0.11		Structures					
			0.111	Structures (included Below)					
		0.12		Conductors and Insulators					
			0.121	Generator Isolated Phase Bus	1	LS	$ 3,792,000	$ 3,790,000	
			0.122	HV Power Cables and Accessories	1	LS	$ 1,540,500	$ 1,540,000	
			0.123	LV Power Cables and Accessories	1	LS	$ 711,000	$ 710,000	
			0.124	Control Cables and Accessories	1	LS	$ 1,303,500	$ 1,300,000	
			0.125	Grounding System	1	LS	$ 177,750	$ 180,000	
		0.13		Conduits and Fittings			$ -	$ -	
			0.131	Conduits and Fittings	1	LS	$ 474,000	$ 470,000	

Low Watana (Expandable) (4 Turbines)

FERC Line #	Sub Categories		Description	Quantity	Units	2008 Unit Price	Line Price	Total
	0.2		Switchgear and Control Equipment			$ -	$ -	
		0.21	Auxiliary Transformers			$ -	$ -	
		0.211	Auxiliary Transformers	4	EA	$ 83,811	$ 340,000	
		0.22	Circuit Breakers Generators				$ -	
		0.221	Circuit Breakers Generators	4	EA	$ 1,504,300	$ 6,020,000	
		0.23	Surge Protectors and Generator Cubicles			$ -	$ -	
		0.231	Surge Protectors and Generator Cubicles	4	EA	$ 50,000	$ 200,000	
		0.24	Switch boards			$ -	$ -	
		0.241	Switch boards	1	LS	$ 924,300	$ 920,000	
		0.25	Auxiliary Power Equipment			$ -	$ -	
		0.251	Auxiliary Power Equipment	4	EA	$ 100,000	$ 400,000	
	0.3		Cubicles and Appurtenances				$ -	
		0.31	Control, relay and meter boards			$ -	$ -	
		0.311	Control, relay and meter boards	4	EA	$ 200,000	$ 800,000	
		0.32	Computer Control System			$ -	$ -	
		0.321	Computer Control System			$ -	$ -	
		0.33	Supervisor and Telemeter System			$ -	$ -	
		0.331	Supervisor and Telemeter System			$ -	$ -	
						$ -	$ -	
	0.4		Power Transformers			$ -	$ -	
		0.41	Power Transformers			$ -	$ -	
		0.411	Power Transformers	7	EA	$ 2,571,429	$ 18,000,000	
						$ -	$ -	
	0.5		Lighting System			$ -	$ -	
		0.51	Powerhouse and Transformer Gallery			$ -	$ -	
		0.511	Powerhouse and Transformer Gallery	1	LS	$ 1,824,900	$ 1,820,000	
		0.52	Access Tunnels and Roads				$ -	
		0.521	Access Tunnels and Roads	1	LS	$ 402,900	$ 400,000	
							$ -	
	0.6		Misc. Electrical Equipment				$ -	
		0.61	Misc. Electrical Equipment				$ -	
		0.611	Misc. Electrical Equipment	1	LS	$ 782,100	$ 780,000	
							$ -	
	0.7		Surface Accessory Equipment				$ -	
		0.71	34.5 kV and LV Equipment				$ -	
		0.711	Switchboard	1	LS	$ 213,300	$ 210,000	
		0.712	Cables	1	LS	$ 450,300	$ 450,000	
		0.713	Aux Transformers	1	LS	$ 284,400	$ 280,000	
		0.73	Diesel Generator- Standby				$ -	
		0.731	Diesel Generator- Standby	2	EA	$ 347,550	$ 700,000	
		0.74	Exterior Lighting				$ -	
		0.741	Exterior Lighting	1	LS	$ 355,500	$ 360,000	
		0.75	Mimic Board- Control Building				$ -	
		0.751	Mimic Board- Control Building	1	LS	$ 1,185,000	$ 1,190,000	
							$ -	**$ 41,000,000**
335			**Misc Powerplant Equipment**				$ -	
	0.1		Auxiliary Systems- Underground				$ -	
		0.11	Station Water Systems				$ -	
		0.111	Station Water Systems	1	LS	$ 4,977,000	$ 4,980,000	
		0.12	Fire Protection Systems			$ -	$ -	
		0.121	Fire Protection Systems	1	LS	$ 2,844,000	$ 2,840,000	
		0.13	Compressed Air Systems			$ -	$ -	
		0.131	Compressed Air Systems	1	LS	$ 3,555,000	$ 3,560,000	
		0.14	Oil Handling Systems			$ -	$ -	
		0.141	Oil Handling Systems	1	LS	$ 2,370,000	$ 2,370,000	
		0.15	Drainage & Dewatering			$ -	$ -	
		0.151	Drainage & Dewatering	3	EA	$ 1,738,000	$ 5,210,000	
		0.16	Heating, Ventilation and Cooling System			$ -	$ -	

Low Watana (Expandable) (4 Turbines)

FERC Line #	Sub Categories			Description	Quantity	Units	2008 Unit Price	Line Price	Total	
			0.161	Heating, Ventilation and Cooling System	1	LS	$ 3,555,000	$ 3,560,000		
		0.17		Miscellaneous				$ -		
			0.171	Miscellaneous	1	LS	$ 2,370,000	$ 2,370,000		
	0.2			Auxiliary Systems- Surface Facilities				$ -		
		0.21		Auxiliary Systems- Surface Facilities				$ -		
			0.211	Auxiliary Systems- Surface Facilities	1	LS	$ 711,000	$ 710,000		
	0.3			Auxiliary Equipment				$ -		
		0.31		Powerhouse Cranes			$ -	$ -		
			0.311	Powerhouse Cranes	2	EA	$ 1,800,000	$ 3,600,000		
		0.32		Elevators			$ -	$ -		
			0.321	Elevators	3	EA	$ 181,700	$ 550,000		
		0.33		Miscellaneous Cranes and Hoists			$ -	$ -		
			0.331	Miscellaneous Cranes and Hoists	1	LS	$ 505,500	$ 510,000		
		0.34		Machine Shop Equipment			$ -	$ -		
			0.341	Machine Shop Equipment	1	LS	$ 2,022,000	$ 2,020,000		
	0.4			General Station Equipment			$ -	$ -		
	0.5			Communications Equipment	1	LS	$ 106,650	$ 110,000		
							$ -	$ -	**$**	**32,000,000**
336				**Roads, Rails and Air Facilities**				$ -		
	0.1			Roads						
		0.11		Permanent Roads						
				Cost of road upgrades for 23 mi of Denali Highway	23	Mi	$ 1,000,000.00	$ 23,000,000.00		
				Cost of New road to 42 Mi of road to Watana	42	Mi	$ 3,000,000.00	$ 126,000,000.00		
		0.131		Site Roads						
				Construction Roads						
				Site Roads	20	Mile	$ 750,000.00	$ 15,000,000		
				Maintenance	141	MI/YRS	$ 223,092.85	$ 31,500,000		
		0.132		Permanent Roads						
				Permanent Roads	6	Mile	$ 1,287,997.42	$ 7,700,000		
	0.2			Rail						
			0.1	Railhead at Cantwell	1	LS	$ 14,000,000.00	$ 14,000,000		
	0.3			Airstrip						
		0.31		Airstrip						
				Permanent Airstrip	1	LS	$ 13,000,000.00	$ 13,000,000		
				Temporary Airstrip	1	LS	$ 2,000,000.00	$ 2,000,000		
									$	**232,000,000**
350-359				**Transmission Plant**	33	MILE	$ 5,700,000.00	$ 188,100,000.00		
					2	EA	$ 18,000,000.00	$ 36,000,000.00		
									$	**224,000,000**

General Plant

389	**Land and Land Rights**	
	Land and Land Rights	(incl in 330)
390	**Structures and Improvements**	
	Structures and Improvements	(incl in 331.2)
391	**Office Furniture and Equipment**	
	Office Furniture and Equipment	(incl in 399)
392	**Transportation Equipment**	
	Transportation Equipment	

Low Watana (Expandable) (4 Turbines)

FERC Line #	Sub Categories	Description	Quantity	Units	2008 Unit Price	Line Price	Total
					(incl in 399)		
393		**Stores Equipment**					
		Stores Equipment					
					(incl in 399)		
394		**Tools Shop and Garage Equipment**					
		Tools Shop and Garage Equipment					
					(incl in 399)		
395		**Laboratory Equipment**					
		Laboratory Equipment					
					(incl in 399)		
396		**Power-Operated Equipment**					
		Power-Operated Equipment					
					(incl in 399)		
397		**Communications Equipment**					
		Communications Equipment					
					(incl in 399)		
398		**Miscellaneous Equipment**					
		Miscellaneous Equipment					
					(incl in 399)		
399		**Other Tangible Property**					
		Other Tangible Property		1 LS	$ 16,000,000	$ 16,000,000	
		Saved Maintenance		1 LS	$ (231,220)	$ (230,000)	
						$ -	**$ 16,000,000**
		Indirect Costs					
61		**Temporary Construction Facilities**					
		Temporary Construction Facilities			(incl in direct costs)		
62		**Construction Equipment**					
		Construction Equipment			(incl in direct costs)		
63		**Main Construction Camp**					
	0.1	Main Construction Camp		1 LS	$ 180,000,000	**$ 180,000,000**	
							$ 180,000,000
64		**Labor Expense**					
		Labor Expense					
65		**Superintendence**					
		Superintendence					
66		**Insurance**					
		Insurance					
68		**Mitigation Fishery, Terrestrial and Recrational)- Not Included**					
				1 LS	$ 200,000,000		**$ -**
69		**Fees**					
		Fees					
Subtotal							
	Contingency (20%)			1 LS	$ 821,000,000		**$ 821,000,000**
Subtotal							
71		**Engineering (4%), Enviornmental (2%), Regulatory(1%)**		1 LS	$ 259,000,000		**$ 259,000,000**
71a		**Construction Management (4%)**		1 LS	$ 148,000,000		**$ 148,000,000**
72		**Legal Expenses**					
75		**Taxes**					
76		**Administrative & Gen. Expenses**					
77		**Interest**					
80		**Earnings/Expenses During Construction**					
Total Project Cost							**$ 4,925,000,000**
Max Plant Capacity	600						

HDR/AEA Susitna Hydroelectric Project
Cost Estimates for 1982 quantities- Alternatives
By: DTA
By: Leanne Andruszkiewicz, EIT Date: 1/25/09
Reviewed By: David Elwood, EIT Date: 1/25/09, Modified by Hatch Acres mb 061109, R&M 11/16/09
Alternatives- 2008 Dollars
Full Watana RCC Estmate from 11/17/09 used as basis
Modified by Hatch Associates Consultants, Inc. _RST_10/28/10
Low Watana RCC (Non Expandable) Alternative (4 Turbines)

Md Badruzzaman revisions 6/11/09
Md Badruzzaman revisions 6/11/09
Color Denotes Cells copied from Low Watana Non Expandab
Denotes Qty Adjustment by RST

FERC Line #	Sub Categories							Description	Quantity	Units	Unit Price	Line Price	Total	Notes / Remarks
330			Land and Land Rights											
	0.1			Land					1	LS	$ 120,870,000.00	$ 120,870,000		
	0.2			Land Rights					Included Above					
	0.3			Misc Charges in Credit Above					Included Above					
													$ 120,900,000	
331			Powerplant Structure Improvements											
	0.1			Powerhouse										
		0.11		Powerhouse and Draft Tube										
			0.111	Excavation										
								Powerhouse Rock	914,400	CY	$ 43.72	$ 39,978,000		Performed End Area Calcs for total area, Assume 60% Rock, 40% Overburden. Used Unit price from Item 332.311 - Main Dam Exc ($43.
								Powerhouse Overburder	609,600	CY	$ 11.53	$ 7,029,000		Performed End Area Calcs for total area, Assume 40% Rock, 60% Overburden. Used Unit price from Item 332.311 - Main Dam Exc ($11.
								Draft Tube Rock	0	CY	$ 90.12	$ -		Included in Powerhouse Exc
Total	Total Estimat		0.113					Surface Preparation/ Grouting						Copied from Low Watana Non Expandabl
								Powerhouse	108,000	SF	$ 3.33	$ 360,000		Calculated Qty
								Draft Tube	0	SF	$ 3.33	$ -		Included in Powerhouse Grou
								Grout Curtain- Drill holes	47,700	LF	$ 27.63	$ 1,318,000		Multiplied by Surface area by ratio of original grout length to surface prep (29,200/66,0(
								Grout Curtain- Cemen	19,000	CF	$ 81.10	$ 1,541,000		Multiplied by Surface area by ratio of original cement qty to surface prep (11,667/66,0(
			0.114					Concrete and Shot Crete						
								Powerhouse Concrete	62,356	CY	$ 544.85	$ 33,970,000		Total Concrete Qty to Resist Uplift 56,687 cyd. Multiplied by Factor of Safety of 1.1 (Includes Transformer Deck Are
								Powerhouse Concrete Overbreal	0	CY	$ 447.21	$ -		Included in Item 332.111
								Powerhouse Reinforcing Stee	3,118	TON	$ 2,858.29	$ 8,910,000		Original Ratio of steel to concrete was 0.05 ton/cyd. Multiplied Concrete Volume by 0.
								Powerhouse 4" Shotcrete	0	SF	$ 10.14	$ -		Not needed for surface powerhous
								Draft Tube Concrete	0	CY	$ 692.87	$ -		Include w/ Powerhouse Concrete
								Draft Tube Concrete Overbreal	0	CY	$ 447.21	$ -		Not needed for surface powerhous
								Draft Tube Reinforcing Stee	0	TON	$ 2,858.29	$ -		Include w/ Powerhouse Concrete
								Draft Tube 2" Shotcrete	0	SF	$ 5.45	$ -		Not needed for surface powerhous
			0.115					Support and Anchors						
								Powerhouse Rockbolts 1" @ 25' Hy	148	EA	$ 1,234.86	$ 180,000		Multiplied Underground Qty by reduction in surface area on rock, 0.229
								Powerhouse Rockbolts 1" @ 15'	301	EA	$ 735.81	$ 220,000		Multiplied Underground Qty by reduction in surface area on rock, 0.229
								Powerhouse Steel Mesh	6,821	SF	$ 5.81	$ 40,000		Multiplied Underground Qty by reduction in surface area on rock, 0.229
								Powerhouse Steel Suppor	21	TON	$ 12,671.94	$ 270,000		Multiplied Underground Qty by reduction in surface area on rock, 0.229
								Draft Tube Rockbolts 1" @ 25' Hy	0	EA	$ 1,234.86	$ -		Assume no rockbolts for draft tube on surface powerhous
								Draft Tube Rockbolts 1" @ 12	0	EA	$ 528.34	$ -		Assume no rockbolts for draft tube on surface powerhous
								Draft Tube Rockbolts 1" @ 9	0	EA	$ 432.12	$ -		Assume no rockbolts for draft tube on surface powerhous
								Draft Tube Steel Mesh	0	SF	$ 6.55	$ -		Assume no rockbolts for draft tube on surface powerhous
			0.117					Holes (U/S of Powerhouse	0	LF	$ 51.32	$ -		Not needed for surface powerhous
								Holes (Powerhouse Crown	0	LF	$ 51.32	$ -		Not needed for surface powerhous
			0.118					Structural- Misc Steelwork				$ -		Copied from Low Watana Non Expandabl
								Powerhouse and Draft Tube- Steel Crane Rail	1	LS	$ 10,276,309.00	$ 10,280,000		Copied from Low Watana Non Expandabl
			0.119					Architectural- Powerhouse	1	LS	$ 5,500,000.00	$ 5,500,000		Increased ratio of Architectural Cost vs Total Powerplant Cost to approx 4.5% to reflect recent surface powerhouse experience. Formerly was at 2
y			0.11c					Mechanical						
								Draft Tube Gates	4	SETS	$ 427,880.00	$ 1,712,000		Copied from Low Watana Non Expandabl
								Draft Tube Gate Guides	4	SETS	$ 202,680.00	$ 811,000		Copied from Low Watana Non Expandabl
								Draft Tube Crane	1	LS	$ 1,140,000.00	$ 1,140,000		Copied from Low Watana Non Expandabl
		0.12		Access Tunnels and Portals										
			0.121	Excavation										
								Main Tunnel	0	CY	$ 97.45	$ -		No Tunnels for Surface Powerhouse Option. Access Through Powerhouse Excavatic
								Transformer Gallery Tunne	0	CY	$ 97.45	$ -		No Tunnels for Surface Powerhouse Option. Access Through Powerhouse Excavatic
								Grouting Gallery Tunne	0	CY	$ 396.04	$ -		No Tunnels for Surface Powerhouse Option. Access Through Powerhouse Excavatic
								Surge Chamber Access Tunne	0	CY	$ 145.22	$ -		No Tunnels for Surface Powerhouse Option. Access Through Powerhouse Excavatic
								Penstock Access Tunnel	0	CY	$ 145.22	$ -		No Tunnels for Surface Powerhouse Option. Access Through Powerhouse Excavatic
								Penstock Elbow Access Tunne	0	CY	$ 145.22	$ -		No Tunnels for Surface Powerhouse Option. Access Through Powerhouse Excavatic
								Access Shaft Tunnel	0	CY	$ 145.22	$ -		No Tunnels for Surface Powerhouse Option. Access Through Powerhouse Excavatic
								Connector Tunnel	0	CY	$ 379.26	$ -		No Tunnels for Surface Powerhouse Option. Access Through Powerhouse Excavatic
								Portals Overburder	0	CY	$ 17.14	$ -		No Tunnels for Surface Powerhouse Option. Access Through Powerhouse Excavatic
								Portals Rock	0	CY	$ 49.31	$ -		No Tunnels for Surface Powerhouse Option. Access Through Powerhouse Excavatic
			0.123					Surface Preparation						
								Main Tunnel Slab	0	SF	$ 2.21	$ -		No Tunnels for Surface Powerhouse Option. Access Through Powerhouse Excavatic
								Penstock Access Slab	0	SF	$ 2.21	$ -		No Tunnels for Surface Powerhouse Option. Access Through Powerhouse Excavatic
								Horizontal Portal	0	SF	$ 2.30	$ -		No Tunnels for Surface Powerhouse Option. Access Through Powerhouse Excavatic
								Inclined Porta	0	SF	$ 3.33	$ -		No Tunnels for Surface Powerhouse Option. Access Through Powerhouse Excavatic
			0.124					Concrete and Shot Crete						
								Main Portal						
								Concrete Slab	0	CY	$ 406.27	$ -		No Tunnels for Surface Powerhouse Option. Access Through Powerhouse Excavatic
								Concrete Walls	0	CY	$ 406.27	$ -		No Tunnels for Surface Powerhouse Option. Access Through Powerhouse Excavatic
								Concrete Overbreak	0	CY	$ 368.48	$ -		No Tunnels for Surface Powerhouse Option. Access Through Powerhouse Excavatic
								Reinforcing Stee	0	TON	$ 2,887.51	$ -		No Tunnels for Surface Powerhouse Option. Access Through Powerhouse Excavatic
								Tunnels						
								Concrete Slab Main Tunne	0	CY	$ 503.90	$ -		No Tunnels for Surface Powerhouse Option. Access Through Powerhouse Excavatic
								Concrete Plugs Penstock Elbow ACC	0	CY	$ 755.86	$ -		No Tunnels for Surface Powerhouse Option. Access Through Powerhouse Excavatic
								Concrete Overbreak Main Tunnel 6	0	CY	$ 346.43	$ -		No Tunnels for Surface Powerhouse Option. Access Through Powerhouse Excavatic
								Reinforcing Stee	0	TON	$ 2,887.51	$ -		No Tunnels for Surface Powerhouse Option. Access Through Powerhouse Excavatic
								2 " Shotcrete Main Tunne	0	SF	$ 5.26	$ -		No Tunnels for Surface Powerhouse Option. Access Through Powerhouse Excavatic
								2 " Shotcrete Transformer Ga	0	SF	$ 5.26	$ -		No Tunnels for Surface Powerhouse Option. Access Through Powerhouse Excavatic
								2 " Shotcrete Surge Chamber Acc	0	SF	$ 5.26	$ -		No Tunnels for Surface Powerhouse Option. Access Through Powerhouse Excavatic
								2 " Shotcrete Penstock Access	0	SF	$ 5.26	$ -		No Tunnels for Surface Powerhouse Option. Access Through Powerhouse Excavatic
								2 " Shotcrete Penstock Elbow Acc	0	SF	$ 5.26	$ -		No Tunnels for Surface Powerhouse Option. Access Through Powerhouse Excavatic
								2 " Shotcrete Access Shaft	0	SF	$ 5.26	$ -		No Tunnels for Surface Powerhouse Option. Access Through Powerhouse Excavatic
								2 " Shotcrete Grout Gallery	0	SF	$ 5.26	$ -		No Tunnels for Surface Powerhouse Option. Access Through Powerhouse Excavatic
								2 " Shotcrete Connector Tunne	0	SF	$ 5.26	$ -		No Tunnels for Surface Powerhouse Option. Access Through Powerhouse Excavatic
			0.125					Support and Anchors						
								Main Tunnel						
								Rockbolts 1" @12'	0	EA	$ 528.34	$ -		No Tunnels for Surface Powerhouse Optior
								Rockbolts 1" @ 9'	0	EA	$ 432.12	$ -		No Tunnels for Surface Powerhouse Optior

Low Watana RCC (Non Expandable) Alternative (4 Turbines)

Denotes Qty Adjustment by RST

FERC Line #	Sub Categories			Description	Quantity	Units	Unit Price	Line Price	Total	Notes / Remarks
				Steel Mesh	0	SF	$ 6.37	$ -		No Tunnels for Surface Powerhouse Optior
				Steel Support	0	TON	$ 12,801.49	$ -		No Tunnels for Surface Powerhouse Optior
				Main Tunnel Portal				$ -		
				Rockbolts 1" @15'	0	EA	$ 735.79	$ -		No Tunnels for Surface Powerhouse Optior
				Transformer Gallery Tunnel				$ -		No transformer gallery, included in surface powerhous
				Rockbolts 1" @12'	0	EA	$ 528.34	$ -		No transformer gallery, included in surface powerhous
				Rockbolts 1" @ 9'	0	EA	$ 432.12	$ -		No transformer gallery, included in surface powerhous
				Steel Mesh	0	SF	$ 5.89	$ -		No transformer gallery, included in surface powerhous
				Steel Support	0	TON	$ 12,801.49	$ -		No transformer gallery, included in surface powerhous
				Grouting Gallery Tunne				$ -		
				Rockbolts 3/4" @ 6'	0	EA	$ 327.15	$ -		No Tunnels for Surface Powerhouse Option. Access Through Powerhouse Excavatic
				Steel Mesh	0	SF	$ 6.37	$ -		No Tunnels for Surface Powerhouse Option. Access Through Powerhouse Excavatic
				Steel Support	0	TON	$ 12,801.49	$ -		No Tunnels for Surface Powerhouse Option. Access Through Powerhouse Excavatic
				Surge Chamber Access Tunne				$ -		
				Rockbolts 1" @12'	0	EA	$ 528.34	$ -		No Surge Chambe
				Rockbolts 1" @ 9'	0	EA	$ 432.12	$ -		No Surge Chambe
				Steel Mesh	0	SF	$ 6.37	$ -		No Surge Chambe
				Steel Support	0	TON	$ 12,801.49	$ -		No Surge Chambe
				Penstock Access Tunnel						
				Rockbolts 1" @12'	0	EA	$ 528.34	$ -		No Tunnels for Surface Powerhouse Option. Access Through Powerhouse Excavatic
				Rockbolts 1" @ 9'	0	EA	$ 432.12	$ -		No Tunnels for Surface Powerhouse Option. Access Through Powerhouse Excavatic
				Steel Mesh	0	SF	$ 6.37	$ -		No Tunnels for Surface Powerhouse Option. Access Through Powerhouse Excavatic
				Steel Support	0	TON	$ 12,801.49	$ -		No Tunnels for Surface Powerhouse Option. Access Through Powerhouse Excavatic
				Penstock Elbow Access Tunne						
				Rockbolts 1" @12'	0	EA	$ 528.34	$ -		No Tunnels for Surface Powerhouse Option. Access Through Powerhouse Excavatic
				Rockbolts 1" @ 9'	0	EA	$ 432.12	$ -		No Tunnels for Surface Powerhouse Option. Access Through Powerhouse Excavatic
				Steel Mesh	0	SF	$ 6.37	$ -		No Tunnels for Surface Powerhouse Option. Access Through Powerhouse Excavatic
				Steel Support	0	TON	$ 12,801.49	$ -		No Tunnels for Surface Powerhouse Option. Access Through Powerhouse Excavatic
				Access Shaft Tunnel						
				Rockbolts 1" @12'	0	EA	$ 528.34	$ -		No Tunnels for Surface Powerhouse Option. Access Through Powerhouse Excavation
				Rockbolts 1" @ 9'	0	EA	$ 432.12	$ -		No Tunnels for Surface Powerhouse Option. Access Through Powerhouse Excavation
				Steel Mesh	0	SF	$ 6.37	$ -		No Tunnels for Surface Powerhouse Option. Access Through Powerhouse Excavation
				Steel Support	0	TON	$ 12,801.49	$ -		No Tunnels for Surface Powerhouse Option. Access Through Powerhouse Excavation
				Connector Tunnel						
				Rockbolts 3/4" @ 6'	0	EA	$ 327.15	$ -		No Tunnels for Surface Powerhouse Option. Access Through Powerhouse Excavatic
				Steel Mesh	0	SF	$ 6.37	$ -		No Tunnels for Surface Powerhouse Option. Access Through Powerhouse Excavatic
				Steel Support	0	TON	$ 12,801.49	$ -		No Tunnels for Surface Powerhouse Option. Access Through Powerhouse Excavatic
		0.129		Architectural- Main Portal Doors	0	SETS	$ 158,371.90	$ -		No Tunnels for Surface Powerhouse Option. Access Through Powerhouse Excavatic
		0.12c		Mechanical Ventilation System	Included in (63.81 and 63.82)					
	0.13			Access Shaft						
		0.131		Excavation Rock	0	CY	$ 227.67	$ -		No Tunnels for Surface Powerhouse Option. Access Through Powerhouse Excavatic
		0.133		Surface Preparation Shaft	0	SF	$ 3.33	$ -		No Tunnels for Surface Powerhouse Option. Access Through Powerhouse Excavatic
		0.134		Concrete and Shot Crete						
				Concrete Lining	0	CY	$ 944.82	$ -		No Tunnels for Surface Powerhouse Option. Access Through Powerhouse Excavatic
				Concrete Overbreak 6'	0	CY	$ 551.14	$ -		No Tunnels for Surface Powerhouse Option. Access Through Powerhouse Excavatic
		0.135		Support and Anchors - Rockbolts 3/4" @ 6	0	EA	$ 327.15	$ -		No Tunnels for Surface Powerhouse Option. Access Through Powerhouse Excavatic
		0.138		Structural Misc Steelwork	0	TON	$ 7,395.00	$ -		No Tunnels for Surface Powerhouse Option. Access Through Powerhouse Excavatic
		0.139		Architectural- control Building						
		0.13c		Mechanical Elevators	0	LS	$ 2,368,815.00	$ -		No Tunnels for Surface Powerhouse Option. Access Through Powerhouse Excavatic
	0.14			Fire Protection Head Tank						
		0.141		Excavation	0	CY	$ 43.72	$ -		Excavation included in total powerhouse ex
		0.143		Surface Preparation	0	SF	$ 2.30	$ -		Surface Prep included in total powerhouse ex
		0.144		Concrete & Shotcrete						
				Concrete	208	CY	$ 963.72	$ 200,000		Increased underground Qty by 25% to account for thicker outside wal
				Concrete Overbreak 6'	0	CY	$ 406.27	$ -		None for Surface Optior
				Reinforcing Stee	8	TON	$ 2,858.29	$ 20,000		Increased underground Qty by 25% to account for thicker outside wal
		0.145		Support and Anchors						
				Rockbolts 1" @12'	0	EA	$ 528.34	$ -		None for Surface Optior
				Rockbolts 1" @ 9'	0	EA	$ 432.12	$ -		None for Surface Optior
				Steel Mesh	0	SF	$ 6.30	$ -		None for Surface Optior
				Steel Support	0	TON	$ 12,671.95	$ -		None for Surface Optior
		0.148		Misc Steelwork	1	LS	$ 73,297.50	$ 70,000		Copied from Low Watana Non Expandabl
		0.14c		Mechanical Piping/Valves						
	0.15			Bus Tunnels (totals for 3 Bus Tunnels)						
		0.151		Excavation						
				Rock Horizonta	0	CY	$ 213.70	$ -		No Bus Tunnel
				Rock Inclined	0	CY	$ 601.04	$ -		No Bus Tunnel
		0.153		Surface Preparation- Tunnels	0	SF	$ 3.33	$ -		No Bus Tunnel
		0.154		Concrete and Shotcrete						
				Concrete Slab	0	CY	$ 818.84	$ -		No Bus Tunnel
				Concrete Overbreak 12'	0	CY	$ 472.41	$ -		No Bus Tunnel
				Reinforcing Stee	0	TON	$ 2,858.29	$ -		No Bus Tunnel
				2" Shotcrete	0	SF	$ 5.26	$ -		No Bus Tunnel
		0.155		Supports and Anchors						
				Rockbolts 1" @ 25'	0	EA	$ 1,234.86	$ -		No Bus Tunnel
				Rockbolts 1" @ 12'	0	EA	$ 528.34	$ -		No Bus Tunnel
				Rockbolts 1" @ 9'	0	EA	$ 432.12	$ -		No Bus Tunnel
				Steel Mesh	0	SF	$ 6.30	$ -		No Bus Tunnel
				Steel Support	0	TON	$ 12,671.94	$ -		No Bus Tunnel
	0.16			Transformer Gallery Tunne						
		0.161		Excavation- Rock	0	CY	$ 87.44	$ -		No transformer gallery, included in surface powerhous
		0.163		Surface Preparation	0	SF	$ 2.30	$ -		No transformer gallery, included in surface powerhous
		0.164		Concrete and Shotcrete						
				Concrete Base Slab	0	CY	$ 544.85	$ -		Included in Powerhouse Cost, as all one building for surface optic
				Concrete Overbreak 12"H/6"V	0	CY	$ 377.93	$ -		Included in Powerhouse Cost, as all one building for surface optic
				Reinforcing Stee	0	TON	$ 2,858.29	$ -		Included in Powerhouse Cost, as all one building for surface optic
		0.165		Support and Anchors						
				Rockbolts 1" @ 25'	0	EA	$ 1,234.86	$ -		None for Surface Optior
				Rockbolts 1" @ 15'	0	EA	$ 735.81	$ -		None for Surface Optior
				Steel Mesh	0	SF	$ 5.81	$ -		None for Surface Optior
				Steel Support	0	TON	$ 12,671.94	$ -		None for Surface Optior
		0.167		Drainage Holes	0	LF	$ 47.95	$ -		None for Surface Optior

Low Watana RCC (Non Expandable) Alternative (4 Turbines)

Denotes Qty Adjustment by RST

FERC Line #	Sub Categories			Description	Quantity	Units	Unit Price	Line Price	Total	Notes / Remarks
		0.17		Cable Shafts						
			0.171	Excavation Rock	0	CY	$ 601.04	$ -		Included in Surface Powerhouse
			0.173	Surface Preparation Shafts	0	SF	$ 3.33	$ -		Copied from Low Watana Non Expandabl
			0.174	Concrete and Shotcrete						
				Concrete Lining	0	CY	$ 1,763.66	$ -		Copied from Low Watana Non Expandabl
				Concrete Overbreak 6"	0	CY	$ 881.83	$ -		Copied from Low Watana Non Expandabl
			0.175	Supports and Anchors- Rockbolts 3/4" @ 6	0	EA	$ 327.15	$ -		Copied from Low Watana Non Expandabl
			0.178	Structural Steel Support Towers	12	TON	$ 15,602.00	$ 190,000		Was formerly Structural Misc Steelwork, changed to Towers for running from transformer deck to switchyard. Kept qty and unit cost the sa
			0.179	Architectural- Enclosures	0	LS	$ 199,317.00	$ -		None for Surface Optior
			0.17c	Mechanical Hoist	0	EA	$ 476,960.00	$ -		None for Surface Optior
		0.18		Dewatering (during Construction						
			0.181	Dewatering (Power Facilities	1	LS	$ 1,336,798.50	$ 1,340,000		Copied from Low Watana Non Expandabl
		0.19		Instrumentation						
			0.191	Instrumentation	1	LS	$ 1,714,813.50	$ 1,710,000		Copied from Low Watana Non Expandabl
	0.2			Misc Buildings (Control Buildings	1	LS	$ 4,433,085.00	$ 4,430,000		Copied from Low Watana Non Expandabl
	0.3			Permanent Town	(included in 63.5)					
									$ 121,219,000	
332				**Reservoir, Dams and Waterways**						
	0.1			Reservoir						
		0.11		Reservoir Clearing	23,000	ACRE	$ 3,005.85	$ 69,135,000		Copied from Low Watana Non Expandabl
	0.2			Diversion Schemes /Cofferdams						
		0.21		Diversion Tunnels /Portals				$ -		
			0.211	Excavation				$ -		
				Combined Tunnels				$ -		Multiplied Low Watana Qty by (4100/7320)*(31/40) = 0.43
				Rock	186,500	CY	$ 92.33	$ 17,220,000		Multiplied Low Watana Qty by (4100/7320)*(31/40) = 0.43
				Combined Upstream Portals				$ -		Calculated Quantity
				Rock	35,000	CY	$ 49.16	$ 1,720,000		Calculated Quantity
				Combined Downstream Portal				$ -		Calculated Quantity
				Rock Usable	75,000	CY	$ 49.16	$ 3,690,000		Calculated Quantity
				Emergency Release Chambers				$ -		Multiplied Low Watana Qty by (31/49) = 0.63
				Excavate Concrete for Plugs	1,139	CY	$ 101.98	$ 120,000		Multiplied Low Watana Qty by (31/49) = 0.63
				Gate Chamber	2,975	CY	$ 110.73	$ 330,000		Multiplied Low Watana Qty by (31/49) = 0.63
				Access Tunnel to Gate Chambe				$ -		No Access Tunnel
				Rock	0	CY	$ 97.15	$ -		No Access Tunnel
			0.212	Fill- Temp for Coffer Dam to Construct Upstream Portal	23,000	CY	$ 11.66	$ 270,000		Copied from Low Watana Non Expandabl
			0.213	Surface Preparation \ grouting				$ -		Copied from Low Watana Non Expandabl
				Upstream Upper Portal				$ -		Copied from Low Watana Non Expandabl
				Horizontal	3,200	SF	$ 2.30	$ 10,000		Copied from Low Watana Non Expandabl
				Inclined	8,600	SF	$ 3.33	$ 30,000		Copied from Low Watana Non Expandabl
				Upstream Lower Portal				$ -		Copied from Low Watana Non Expandabl
				Horizontal	1,300	SF	$ 2.30	$ -		Copied from Low Watana Non Expandabl
				Inclined	14,900	SF	$ 3.33	$ 50,000		Copied from Low Watana Non Expandabl
				Downstream Upper Porta				$ -		Copied from Low Watana Non Expandabl
				Horizontal	6,100	SF	$ 2.30	$ 10,000		Copied from Low Watana Non Expandabl
				Inclined	20,500	SF	$ 3.33	$ 70,000		Copied from Low Watana Non Expandabl
				Downstream Lower Porta				$ -		Copied from Low Watana Non Expandabl
				Horizontal	600	SF	$ 2.30	$ -		Copied from Low Watana Non Expandabl
				Inclined	5,600	SF	$ 3.33	$ 20,000		Copied from Low Watana Non Expandabl
				Grout Upper Tunnel Plugs				$ -		Copied from Low Watana Non Expandabl
				Drill Holes	4,100	LF	$ 26.76	$ 110,000		Copied from Low Watana Non Expandabl
				Cement	820	CF	$ 81.10	$ 70,000		Copied from Low Watana Non Expandabl
				Grout Lower Tunnel Permanent Plugs				$ -		Copied from Low Watana Non Expandabl
				Drill Holes	2,050	LF	$ 26.76	$ 50,000		Copied from Low Watana Non Expandabl
				Cement	410	CF	$ 81.10	$ 30,000		Copied from Low Watana Non Expandabl
			0.214	Concrete and Shotcrete				$ -		
				Combined Tunnels				$ -		
				Concrete Lining	34,000	CY	$ 566.89	$ 19,270,000		Multiplied Low Watana Qty by 0.42
				Concrete Lining Overbreak 6	15,000	CY	$ 314.94	$ 4,720,000		Multiplied Low Watana Qty by 0.42
				Reinforcing Steel	21	TON	$ 2,887.51	$ 60,000		Multiplied Low Watana Qty by 0.42
				Concrete Lining for Plug	6,200	CY	$ 428.32	$ 2,660,000		Copied from Low Watana Non Expandabl
				2" Shotcrete	48,500	SF	$ 5.26	$ 260,000		Multiplied Low Watana Qty by 0.42
				Upstream Upper Porta				$ -		Copied from Low Watana Non Expandabl
				Concrete Headwall	3,200	CY	$ 651.93	$ 2,090,000		Copied from Low Watana Non Expandabl
				Concrete Lining	1,300	CY	$ 651.93	$ 850,000		Copied from Low Watana Non Expandabl
				Concrete Slab	750	CY	$ 651.93	$ 490,000		Copied from Low Watana Non Expandabl
				Concrete Piers	800	CY	$ 651.93	$ 520,000		Copied from Low Watana Non Expandabl
				Concrete Overbreak 12" H/6"\	300	CY	$ 472.41	$ 140,000		Copied from Low Watana Non Expandabl
				Reinforcing Steel	400	TON	$ 2,887.51	$ 1,160,000		Copied from Low Watana Non Expandabl
				Upstream Lower Portal				$ -		Copied from Low Watana Non Expandabl
				Concrete Headwall	4,500	CY	$ 651.93	$ 2,930,000		Copied from Low Watana Non Expandabl
				Concrete Lining	3,000	CY	$ 651.93	$ 1,960,000		Copied from Low Watana Non Expandabl
				Concrete Slab	300	CY	$ 651.93	$ 200,000		Copied from Low Watana Non Expandabl
				Concrete Piers	700	CY	$ 651.93	$ 460,000		Copied from Low Watana Non Expandabl
				Concrete Overbreak 12" H/6"\	350	CY	$ 472.41	$ 170,000		Copied from Low Watana Non Expandabl
				Reinforcing Steel	600	TON	$ 2,887.51	$ 1,730,000		Copied from Low Watana Non Expandabl
				Downstream Upper Porta				$ -		Copied from Low Watana Non Expandabl
				Concrete Headwall	500	CY	$ 651.93	$ 330,000		Copied from Low Watana Non Expandabl
				Concrete Slab	100	CY	$ 651.93	$ 70,000		Copied from Low Watana Non Expandabl
				Concrete Overbreak 12" H/6"\	100	CY	$ 472.41	$ 50,000		Copied from Low Watana Non Expandabl
				Reinforcing Steel	40	TON	$ 2,887.51	$ 120,000		Copied from Low Watana Non Expandabl
				Downstream Lower Porta				$ -		Copied from Low Watana Non Expandabl
				Concrete Headwall	2,500	CY	$ 651.93	$ 1,630,000		Copied from Low Watana Non Expandabl
				Concrete Slab	100	CY	$ 651.93	$ 70,000		Copied from Low Watana Non Expandabl
				Concrete Overbreak 12" H/6"\	150	CY	$ 472.41	$ 70,000		Copied from Low Watana Non Expandabl
				Reinforcing Steel	170	TON	$ 2,887.51	$ 490,000		Copied from Low Watana Non Expandabl
				Downstream Flip Bucke				$ -		No Flip Bucket
				Concrete Slab	0	CY	$ 651.93	$ -		No Flip Bucket
				Concrete Walls	0	CY	$ 651.93	$ -		No Flip Bucket
				Concrete Invert	0	CY	$ 651.93	$ -		No Flip Bucket
				Concrete Overbreak 12" H/6"\	0	CY	$ 42.41	$ -		No Flip Bucket
				Reinforcing Steel	0	TON	$ 2,887.51	$ -		No Flip Bucket
				Downstream Retaining Wal				$ -		Copied from Low Watana Non Expandabl
				Concrete Slab	200	CY	$ 651.93	$ 130,000		Copied from Low Watana Non Expandabl

Low Watana RCC (Non Expandable) Alternative (4 Turbines)

Denotes Qty Adjustment by RST

FERC Line #	Sub Categories							Description	Quantity	Units	Unit Price	Line Price	Total	Notes / Remarks
								Concrete Walls	2,000	CY	$ 651.93	$ 1,300,000		Copied from Low Watana Non Expandabl
								Concrete Overbreak 12" H/6"\	110	CY	$ 472.41	$ 50,000		Copied from Low Watana Non Expandabl
								Reinforcing Steel	90	TON	$ 2,887.51	$ 260,000		Copied from Low Watana Non Expandabl
							Emergency Release Chambers					$ -		Copied from Low Watana Non Expandabl
								Concrete Plug	5,500	CY	$ 755.86	$ 4,160,000		Multiplied Low Watana Qty by (13.5^2/22.5^2) = 0.3(
								4" Shotcrete	1,000	SF	$ 10.13	$ 10,000		Multiplied Low Watana Qty by (13.5^2/22.5^2) = 0.3(
							Access Tunnel to Gate Chambe					$ -		No Access Tunnel
								2" Shotcrete	0	SF	$ 5.26	$ -		No Access Tunnel
			0.215				Supports and Anchors					$ -		Copied from Low Watana Non Expandabl
							Combined Tunnels					$ -		Multiplied Low Watana Qty by (4100/7320)*(31/40) = 0.43
								Rockbolts 1" @ 12'	3,100	EA	$ 528.34	$ 1,640,000		Multiplied Low Watana Qty by (4100/7320)*(31/40) = 0.43
								Rockbolts 1" @ 9'	530	EA	$ 432.12	$ 230,000		Multiplied Low Watana Qty by (4100/7320)*(31/40) = 0.43
								Steel Mesh	186,000	SF	$ 6.37	$ 1,180,000		Multiplied Low Watana Qty by (4100/7320)*(31/40) = 0.43
								Steel Support	190	TON	$ 12,801.49	$ 2,430,000		Multiplied Low Watana Qty by (4100/7320)*(31/40) = 0.43
							Upstream Lower Porta					$ -		Copied from Low Watana Non Expandabl
								Rockbolts 1" @ 15'	240	EA	$ 735.81	$ 180,000		Copied from Low Watana Non Expandabl
								Anchors 1" @ 25'	290	EA	$ 1,234.86	$ 360,000		Copied from Low Watana Non Expandabl
							Upstream Upper Portal					$ -		Copied from Low Watana Non Expandabl
								Rockbolts 1" @ 15'				$ -		Copied from Low Watana Non Expandabl
								Anchors 1" @ 25'	130	EA	$ 735.81	$ 100,000		Copied from Low Watana Non Expandabl
							Downstream Lower Porta					$ -		Copied from Low Watana Non Expandabl
								Rockbolts 1" @ 15'	200	EA	$ 735.81	$ 150,000		Copied from Low Watana Non Expandabl
							Downstream Upper Porta					$ -		Copied from Low Watana Non Expandabl
								Rockbolts 1" @ 15'	100	EA	$ 735.81	$ 70,000		Copied from Low Watana Non Expandabl
								Retaining Wall Anchors 1" @25	100	EA	$ 1,234.86	$ 120,000		Copied from Low Watana Non Expandabl
							Emergency Release Chambers					$ -		Copied from Low Watana Non Expandabl
								Rockbolts 1" @ 25'	63	EA	$ 1,234.86	$ 80,000		Multiplied Low Watana Qty by (31/49) = 0.63
								Rockbolts 1" @ 15'	79	EA	$ 735.77	$ 60,000		Multiplied Low Watana Qty by (31/49) = 0.63
								Steel Mesh	2,279	SF	$ 6.37	$ 10,000		Multiplied Low Watana Qty by (31/49) = 0.63
								Steel Support	9	TON	$ 12,801.49	$ 110,000		Multiplied Low Watana Qty by (31/49) = 0.63
								Metal to Roof Anchors 3/4" @ 6	13	EA	$ 342.42	$ -		Multiplied Low Watana Qty by (31/49) = 0.63
							Access Tunnel to Gate Chambe					$ -		Copied from Low Watana Non Expandabl
								Rockbolts 1" @ 12'	0	EA	$ 528.34	$ -		No Access Tunnel
								Rockbolts 1" @ 9'	0	EA	$ 432.12	$ -		No Access Tunnel
								Steel Mesh	0	SF	$ 6.37	$ -		No Access Tunnel
								Steel Support	0	TON	$ 12,801.49	$ -		No Access Tunnel
			0.218				Structural- Misc Steelwork		2,775	SF	$ 93.61	$ 260,000		Copied from Low Watana Non Expandabl
			0.21c				Mechanical					$ -		Copied from Low Watana Non Expandabl
							Upstream Lower Gates					$ -		Copied from Low Watana Non Expandabl
								Gate Equipment	2	EA	$ 5,073,120.00	$ 10,150,000		Copied from Low Watana Non Expandabl
							Upstream Upper Gates					$ -		Copied from Low Watana Non Expandabl
								Gate Equipment	2	EA	$ 2,840,080.00	$ 5,680,000		Copied from Low Watana Non Expandabl
								Trashracks	1	LS	$ 1,777,500.00	$ 1,780,000		Copied from Low Watana Non Expandabl
							Downstream Lower Outlet					$ -		Copied from Low Watana Non Expandabl
								Stoplog Guides	1	LS	$ 142,200.00	$ 140,000		Copied from Low Watana Non Expandabl
								Stoplogs includes followe	1	LS	$ 1,967,100.00	$ 1,970,000		Copied from Low Watana Non Expandabl
							Downstream Upper Outlet					$ -		Copied from Low Watana Non Expandabl
								Stoplog Guides	1	LS	$ 82,950.00	$ 80,000		Copied from Low Watana Non Expandabl
							Low Level Release					$ -		Copied from Low Watana Non Expandabl
								Slide Gates Include Steel Line	9	EA	$ 3,517,470.00	$ 31,660,000		Copied from Low Watana Non Expandabl
		0.22			Upstream Cofferdam									
			0.221			Cofferdam								
							RCC		978,000	CY	$ 100.00			(incorporated in the main dam
			0.222			Pre-cofferdam								
							Rock Fill		23,400	CY	$ 10.90	$ 255,000		23333 CY, calculated
			0.223				Cutoff Slurry Wal							
								excavation	5,100	CY	$ 4.88	$ 25,000		4,850 CY from embankment dan
								slurry wal	46,000	SF	$ 72.44	$ 3,332,000		43,6000 SF from embankment dan
			0.22d			Dewatering								(same as embankment dam
							Initial Dewatering		1	LS	$ 5,807,685.00	$ 5,808,000		
							Dewatering Maintenance		1	LS	$ 22,377,990.00	$ 22,378,000		
		0.23			Down Stream Cofferdam									
			0.231			Cofferdam								
							RCC		261,300	CY	$ 100.00			(incorporated in the main dam
			0.232			Pre-cofferdam								
							Rock Fill		23,400	CY	$ 10.90	$ 255,000		
			0.233				Cutoff Slurry Wal							
								Excavation	5,100	CY	$ 4.60	$ 23,000		
								Slurry Wal	46,000	SF	$ 72.44	$ 3,332,000		
	0.3			Main Dam										
		0.31			Main Dam									
			0.311			Excavation								
							Overburden above el. 147(		367,381	CY	$ 11.53	$ 4,236,000		
							Overburden below el. 147(		964,693	CY	$ 11.06	$ 10,670,000		
							Rock Usable above el. 147(		233,739	CY	$ 43.03	$ 10,058,000		
							Rock Usable below el. 147(		86,677	CY	$ 43.72	$ 3,790,000		
							Rock Waste above el. 147(		353,600	CY	$ 43.03	$ 15,215,000		Previous Study Calcs indicate the ratio of foot print area of RCC dam / Embankment dam = 0.321. Multiplied Full RCC Qty by ratio of Base Length and Crest Width (915/1100)*(2380/3640) = 0.544
							Rock Waste below el. 147(		157,669	CY	$ 50.18	$ 7,912,000		
			0.312			Dam								
							RCC		7,600,000	CY	$ 100.00	$ 760,000,000		End Area Calculations
							Base RCC		0	CY	$ 100.00	$ -		Put all Volume in value abov
			0.313			Surface Prep/ Grouting								
							Surface Preparation							
								Under Core/Filters above el. 150(	911,200	SF	$ 3.11	$ 2,834,000		Multiplied Full RCC Qty by ratio of Base Length and Crest Width (915/1100)*(2380/3640) = 0.54
								Under Core/Filters below el. 150(	613,000	SF	$ 3.11	$ 1,906,000		Left the same as Embankment and Full RC(
								Under Shell above el. 150(	2,821,184	SF	$ 2.15	$ 6,066,000		Multiplied Full RCC Qty by ratio of Base Length and Crest Width (915/1100)*(2380/3640) = 0.54
								Under Shell below el. 150(	1,405,696	SF	$ 2.15	$ 3,022,000		Multiplied Full RCC Qty by ratio of Base Length and Crest Width (915/1100)*(2380/3640) = 0.54
							Consolidation Grou							
								Drill Holes	190,400	LF	$ 11.91	$ 2,268,000		687,000 LF from embankment dam. Multiply Full RCC Qty by ratio of footprint area = 0.5
								Cement	190,400	CF	$ 67.81	$ 12,911,000		687,000 CF from embankment dam. Multiply Full RCC Qty by ratio of footprint area = 0.5
							Grout Curtain							

Low Watana RCC (Non Expandable) Alternative (4 Turbines)

Denotes Qty Adjustment by RST

FERC Line #	Sub Categories	Description	Quantity	Units	Unit Price	Line Price	Total	Notes / Remarks
		Drill Holes	252,960	LF	$ 26.76	$ 6,769,000		465,000 LF from embankment dam. Multiply Full RCC Qty by ratio of footprint area = 0.5
		Cement	101,184	CF	$ 81.10	$ 8,206,000		186,000 CF from embankment dam. Multiply Full RCC Qty by ratio of footprint area = 0.5
		Dental Concrete						(same as embankment dam
		Dental Concrete	85,000	CY	$ 365.33	$ 31,053,000		
	0.317	Drainage						
		Holes	73,984	LF	$ 51.32	$ 3,797,000		Multiply Full RCC Qty by ratio fo crest lengths (2380/3640) = 0.65
	0.318	Bridge						
		Precast Bridge Beams	25,500	CY	$ 544.85	$ 13,894,000		Unit price from item 0.61
		Concrete Road Deck	5,400	CY	$ 544.85	$ 2,942,000		Unit price from item 0.61
		Piers	500	CY	$ 544.85	$ 272,000		Unit price from item 0.61
	0.32	Grout Galleries/Portals						(3 portals , multiply by 3
	0.321	Excavation				$ -		
		Tunnels/ Shafts- Core Area				$ -		
		Rock Horizonta	0	CY	$ 394.80	$ -		No Excavation in Core Area of RCC Option. Tunnels will be formed integral to the da
		Rock Inclined	0	CY	$ 552.93	$ -		No Excavation in Core Area of RCC Option. Tunnels will be formed integral to the da
		Rock Vertical	0	CY	$ 536.19	$ -		No Excavation in Core Area of RCC Option. Tunnels will be formed integral to the da
		Tunnels/ Shafts- Access				$ -		
		Rock Horizonta	1,300	CY	$ 394.80	$ 510,000		Galleries are accessed via surface roads in RCC option. Length of access tunnels reduced by approximately
		Rock Inclined	200	CY	$ 552.93	$ 110,000		Galleries are accessed via surface roads in RCC option. Length of access tunnels reduced by approximately
		Portals				$ -		
		Overburden Rock	2,900	CY	$ 17.16	$ 50,000		Keep the same as embankment. Conservative since portals are at dam face and excavation would be included w/ main dam
		Rock	800	CY	$ 49.16	$ 40,000		Keep the same as embankment. Conservative since portals are at dam face and excavation would be included w/ main dam
	0.323	Surface Preparation				$ -		
		Portals				$ -		
		Horizontal	24	SF	$ 2.30	$ -		Keep the same as embankment. Conservative since portals are at dam face and excavation would be included w/ main dam
		Inclined	160	SF	$ 3.33	$ -		Keep the same as embankment. Conservative since portals are at dam face and excavation would be included w/ main dam
						$ -		
	0.324	Concrete and Shotcrete				$ -		
		Tunnels- Core Area				$ -		
		Concrete Plugs	267	CY	$ 428.32	$ 110,000		With RCC Dam, tunnel lining may reduce from avg of 12 in for embankment to estimated 4 in. (Probably conservati
		Concrete Slab	600	CY	$ 944.82	$ 570,000		With RCC Dam, tunnel lining may reduce from avg of 12 in for embankment to estimated 4 in. (Probably conservati
		Concrete Overbreak 6'	0	CY	$ 755.86	$ -		Tunnels formed intergral to dam, so no overbrea
		Reinforcing Stee	21	TON	$ 2,887.51	$ 60,000		With RCC Dam, tunnel lining may reduce from avg of 12 in for embankment to estimated 4 in. (Probably conservati
		2" Shotcrete	0	SF	$ 5.26	$ -		Tunnels formed intergral to dam, so no overbrea
		Tunnels-Access				$ -		
		Concrete Slab	160	CY	$ 944.82	$ 150,000		Galleries are accessed via surface roads in RCC option. Length of access tunnels reduced by approximately
		Concrete Overbreak 6'	80	CY	$ 755.86	$ 60,000		Galleries are accessed via surface roads in RCC option. Length of access tunnels reduced by approximately
		Reinforcing Stee	6	TON	$ 2,887.51	$ 20,000		Galleries are accessed via surface roads in RCC option. Length of access tunnels reduced by approximately 1
		2" Shotcrete	538	SF	$ 5.26	$ -		Galleries are accessed via surface roads in RCC option. Length of access tunnels reduced by approximately 1
		Shafts				$ -		
		2" Shotcrete	4,000	SF	$ 5.26	$ 20,000		
		Portals				$ -		
		Concrete	16	CY	$ 406.36	$ 10,000		
		Reinforcing Stee	2	TON	$ 2,887.51	$ -		
	0.325	Support and Anchors				$ -		
		Tunnels- Core Area				$ -		
		Rockbolts 3/4" @6'	0	EA	$ 327.15	$ -		Not required in core area for the RCC optio
		Steel Mesh	0	SF	$ 5.37	$ -		Not required in core area for the RCC optio
		Steel Support	0	TON	$ 12,801.49	$ -		Not required in core area for the RCC optio
		Tunnels- Access				$ -		
		Rockbolts 3/4" @6'	120	EA	$ 327.15	$ 40,000		Galleries are accessed via surface roads in RCC option. Length of access tunnels reduced by approximately
		Steel Mesh	110	SF	$ 5.37	$ -		Galleries are accessed via surface roads in RCC option. Length of access tunnels reduced by approximately
		Steel Support	2	TON	$ 12,801.49	$ 30,000		Galleries are accessed via surface roads in RCC option. Length of access tunnels reduced by approximately 1
		Shafts				$ -		
		Rockbolts 3/4" @6'	280	EA	$ 327.15	$ 90,000		
		Steel Mesh	800	SF	$ 5.37	$ -		
		Portals				$ -		
		Rockbolts 1" @15'	24	EA	$ 735.81	$ 20,000		
	0.329	Architectural Portal Doors				$ -		
		Portal Doors	1	LS	$ 33,900.00	$ 30,000		
	0.33	Instrumentation				$ -		
	0.331	Instrumentation	1	LS	$ 8,657,610.00	$ 8,660,000		Used previous assumption of 50% embankment dam. Multiplied Low Watana by 0
	0.4	Relict Channel				$ -		Copied from Low Watana Non Expandabl
	0.41	Shore Protection				$ -		Copied from Low Watana Non Expandabl
	0.411	Excavation				$ -		Copied from Low Watana Non Expandabl
		Overburden Stripping 2' thick	2,200	CY	$ 11.56	$ 30,000		Copied from Low Watana Non Expandabl
	0.412	Fill				$ -		Copied from Low Watana Non Expandabl
		Dump and Spread				$ -		Copied from Low Watana Non Expandabl
		Filter Material - 2' laye	2,200	CY	$ 31.93	$ 70,000		Copied from Low Watana Non Expandabl
		Rock Spalls/ Rip Rap- 3' Ave	3,300	CY	$ 9.86	$ 30,000		Copied from Low Watana Non Expandabl
		Shore Protection				$ -		Copied from Low Watana Non Expandabl
		Rip Rap	24,000	CY	$ 24.26	$ 580,000		Copied from Low Watana Non Expandabl
		Waste Rock	24,000	CY	$ 22.78	$ 550,000		Copied from Low Watana Non Expandabl
	0.44	Channel Filter Blanket				$ -		Copied from Low Watana Non Expandabl
	0.442	Fill				$ -		Copied from Low Watana Non Expandabl
		Coarse Filter	2,900,000	CY	$ 33.85	$ 98,170,000		Copied from Low Watana Non Expandabl
		Fine Filter	2,180,000	CY	$ 43.65	$ 95,160,000		Copied from Low Watana Non Expandabl
		Rip Rap	182,000	CY	$ 24.26	$ 4,420,000		Copied from Low Watana Non Expandabl
	0.443	Surface preparation				$ -		Copied from Low Watana Non Expandabl
		Foundation Prep				$ -		Copied from Low Watana Non Expandabl
		Clearing and Grubbing	460	ACRE	$ 3,963.11	$ 1,820,000		Copied from Low Watana Non Expandabl
$ 235,760,000		Excavation	2,236,000	CY	$ 15.62	$ 34,930,000		Copied from Low Watana Non Expandabl
	0.5	Outlet Facilities						
	0.51	Outlet Facilities- (Intake Civil Work Include in Power Intake						(same as embankment dam
	0.511	Excavation						
		Inlet	(Included in 332.611)					
		Outlet	(Included in 332.521)					
		Tunnels						
		Rock Horizonta	0	CY	$ 103.00	$ -		No Tunnels for Outlet. Excavation Volumes incl in Powerhouse Calc
		Rock Inclined	0	CY	$ 183.49	$ -		No Tunnels for Outlet. Excavation Volumes incl in Powerhouse Calc
	0.513	Surface Preparation/ Grouting						
		Inlet	(Included in 332.613)					
		Outlet	(Included in 332.523)					

Low Watana RCC (Non Expandable) Alternative (4 Turbines)

Denotes Qty Adjustment by RST

FERC Line #	Sub Categories							Description	Quantity	Units	Unit Price	Line Price	Total	Notes / Remarks
								Tunnels	0	SF	$ 2.30	$ -		No Tunnels for Outlet. Excavation Volumes incl in Powerhouse Calc
								Contact Grouting	0	LS	$ 569,428.05	$ -		No Tunnels for Outlet. Excavation Volumes incl in Powerhouse Calc
			0.514					Concrete and Shotcrete						
								Inlet	(Included in 332.614)					
								Outlet	(Included in 332.524)					
								Tunnels						
								Concrete Lining	0	CY	$ 944.82	$ -		No Tunnels for Outlet. Excavation Volumes incl in Powerhouse Calc
								Concrete Overbreak 6'	0	CY	$ 440.92	$ -		No Tunnels for Outlet. Excavation Volumes incl in Powerhouse Calc
								2" Shotcrete	0	SF	$ 5.26	$ -		No Tunnels for Outlet. Excavation Volumes incl in Powerhouse Calc
								3" Shotcrete	0	SF	$ 7.69	$ -		No Tunnels for Outlet. Excavation Volumes incl in Powerhouse Calc
			0.515					Support and Anchors						
								Inlet	(Included in 332.615)					
								Outlet	(Included in 332.525)					
								Tunnels						
								Rock Bolts 1" @6'	0	EA	$ 327.15	$ -		No Tunnels for Outlet. Excavation Volumes incl in Powerhouse Calc
								Steel Mesh	0	SF	$ 6.37	$ -		No Tunnels for Outlet. Excavation Volumes incl in Powerhouse Calc
			0.516					Mechanical - Low Level Outle						Revised name from "Mechanical" to "Mechanical - Low Level Outlet" as a LLO system for the RCC option will be similar to Embankment Outlet Facili
								Inlet						
								Trash Racks/Guides	1	LS	$ 1,540,500.00	$ 1,541,000		Keep same as emebankment, as these will be used for LLO Structu
								Gate Equipment	2	EA	$ 3,317,040.00	$ 6,634,000		Keep same as emebankment, as these will be used for LLO Structu
								Stoplog Guides	2	SETS	$ 213,940.00	$ 428,000		Keep same as emebankment, as these will be used for LLO Structu
								Outlet						
								Fixed Cone Valves 6 +1 Spare	1	LS	$ 4,500,630.00	$ 4,501,000		Keep same as emebankment, as these will be used for LLO Structu
								Ring Follower Gates	6	EA	$ 1,936,494.80	$ 11,619,000		Keep same as emebankment, as these will be used for LLO Structu
								Steel Manifold Liner	1,100	TON	$ 8,952.53	$ 9,848,000		Determined new required steel liner quantity to be 1000 tons, added 10% to get 1100 to
								Misc Mechanical Equipmen	1	LS	$ 948,000.00	$ 948,000		Keep same as emebankment, as these will be used for LLO Structu
								Misc Electrical Systems	1	LS	$ 237,000.00	$ 237,000		Keep same as emebankment, as these will be used for LLO Structu
		0.52				Main (Chute) Spillway (Includes Civil Works for Outlet Facilities								
			0.522					Stepped Spillway						
								Conventional Concrete - Steps	55,300	CY	$ 544.85	$ 30,130,000		55,300 CY, calculated, unit price from item 0.61
								Reinforcing Steel - Steps	1,340	TON	$ 2,887.51	$ 3,869,000		1,340 TON, calculated, unit price from item 0.61
								Conventional Concrete - Training Walls	3,600	CY	$ 544.85	$ 1,961,000		55,300 CY, calculated, unit price from item 0.61
								Reinforcing Steel - Training Walls	90	TON	$ 2,887.51	$ 260,000		1,340 TON, calculated, unit price from item 0.61
			0.523					Stilling Basin						
								Conventional concrete	8,400	CY	$ 544.85	$ 4,577,000		8,400 CY, calculated, unit price from item 0.614 *Previous Estimate may have had error by inserting 85,000 cyd, not 8,400 c
								Reinforcing Stee	185	TON	$ 2,887.51	$ 534,000		183 TON, calculated, unit price from item 0.61
								Excavation Rock	13,000	CY	$ 50.18	$ 652,000		(03.31.311 Rock Waste)
			0.524					Consolidation Grouting						
								Drill Holes	7,000	LF	$ 11.91	$ 83,000		(caln for only stilling basin area
								Cement	7,000	CF	$ 67.81	$ 475,000		
								Grout Curtain						
			0.525					Support and Anchors						
								Drainage Tunne						(Assume drainage tunnel / gallery for spillway stillir
								Steel Support	7	TON	$ 12,801.49	$ 90,000		basin, same as for embankment dam shem
								Steel Mesh	1,000	SF	$ 5.87	$ 6,000		
								Rockbolts Drainage Gallery						
								3/4" @ 6'	576	EA	$ 330.19	$ 190,000		
								Rockbolts Approach						
								1" @ 15'	275	EA	$ 741.28	$ 204,000		
								Rockbolts Chute and Structure						
								1" @ 15'	112	EA	$ 741.28	$ 83,000		
								Rockbolts Valve Block/Bucket						
								1" @ 15'	46	EA	$ 741.28	$ 34,000		
								Slab/Wall Anchors						
								1" @ 10'	9,300	EA	$ 474.06	$ 4,409,000		
			0.527					Drainage						
								Drill Holes						
								Box Drains (To Drain Tunnel)	54,000	LF	$ 47.95	$ 2,589,000		
								3" Relief	640	LF	$ 49.50	$ 32,000		
			0.52c					Mechanical						
								Gate Equipment	0	EA	$ 4,249,280.00	$ -		Eliminated as the RCC alternative is an uncontrolled weir crest at the spillway, where embankment option had (3) 44 ft wide radial g
								Stoplog Guides	0	SETS	$ 92,196.88	$ -		Eliminated as the RCC alternative is an uncontrolled weir crest at the spillway, where embankment option had (3) 44 ft wide radial g
								Stoplogs Includes Followe	0	SET	$ 945,840.00	$ -		Eliminated as the RCC alternative is an uncontrolled weir crest at the spillway, where embankment option had (3) 44 ft wide radial g
								Misc Electrical	0	LS	$ 237,000.00	$ -		Eliminated as the RCC alternative is an uncontrolled weir crest at the spillway, where embankment option had (3) 44 ft wide radial g
	0.6			Power Intake (Inc Inlet exec and Inlet Structure Civil Works for Outle										(same as embankment dam
		0.61			Intake Structure and Approach									
			0.611					Excavation						
								Overburden	68,000	CY	$ 14.87	$ 1,011,000		272,000 Cyd calculated Excavation Volume. Assume 25% is overburde
								Rock Usable	204,000	CY	$ 40.27	$ 8,215,000		272,000 Cyd calculated Excavation Volume. Assume 75% is rock ex
			0.613					Surface Preparation						
								Horizontal	112,500	SF	$ 2.30	$ 259,000		Calculated 112,500 sq ft
								Inclined	60,300	SF	$ 3.33	$ 201,000		Calculated 60,300 sq ft
			0.614					Concrete and Shotcrete						
								Structure						
								Concrete Structure	121,000	CY	$ 544.85	$ 65,927,000		Same as embankment, as power intake and outlet structure intake will be sim
								Concrete - Apron Slab	3,500	CY	$ 545.85	$ 1,910,000		Same as embankment, as power intake and outlet structure intake will be sim
								Concrete Overbreak 12" H/6" V	0	CY	$ 336.99	$ -		No Overbreak if formed integral to dar
								Reinforcing Stee	7,870	TON	$ 2,887.51	$ 22,725,000		Same as embankment, as power intake and outlet structure intake will be sim
			0.615					Supports and Anchors- 1" @ 15	400	EA	$ 735.81	$ 294,000		
			0.61c					Mechanical						
								Trashracks and Guides	4	SETS	$ 1,080,960.00	$ 4,324,000		Revised Qty from 6 to 4
								Gate Equipment	4	EA	$ 1,902,720.00	$ 7,611,000		Revised Qty from 6 to 4
								Bulkhead Gates Guides	4	SETS	$ 225,200.00	$ 901,000		Revised Qty from 6 to 4
								Bulkhead Gates inc Followe	1	SET	$ 698,120.00	$ 698,000		
								Shutter with Guides	4	SETS	$ 720,640.00	$ 2,883,000		Revised Qty from 6 to 4
								Iceboom with Hois	4	SETS	$ 1,238,600.00	$ 4,954,000		Revised Qty from 6 to 4
								Iceboom Guides	4	SETS	$ 563,000.00	$ 2,252,000		Revised Qty from 6 to 4
								Intake Service Crane	1	EA	$ 693,700.00	$ 694,000		
								Bubbler System	1	LS	$ 948,000.00	$ 948,000		
								Misc Electrical	1	LS	$ 237,000.00	$ 237,000		
			0.61d					Intake Building	1	LS	$ 237,000.00	$ 237,000		
	0.7			Surge Chamber										No Surge Chamber for Surface Powerhouse Alternativ
		0.71			Surge Chamber									No Surge Chamber for Surface Powerhouse Alternativ

Low Watana RCC (Non Expandable) Alternative (4 Turbines)

Denotes Qty Adjustment by RST

FERC Line #	Sub Categories			Description	Quantity	Units	Unit Price	Line Price	Total	Notes / Remarks
			0.711	Excavation						No Surge Chamber for Surface Powerhouse Alternativ
				Chamber Rock	0	CY	$ 90.12	$ -		No Surge Chamber for Surface Powerhouse Alternativ
				Vent Shaft Rock	0	CY	$ 601.04	$ -		No Surge Chamber for Surface Powerhouse Alternativ
			0.713	Surface Preparation	0	SF	$ 2.30	$ -		No Surge Chamber for Surface Powerhouse Alternativ
			0.714	Concrete and Shotcrete						No Surge Chamber for Surface Powerhouse Alternativ
				Concrete	0	CY	$ 513.35	$ -		No Surge Chamber for Surface Powerhouse Alternativ
				Concrete Overbreak	0	CY	$ 440.92	$ -		No Surge Chamber for Surface Powerhouse Alternativ
				Reinforcing Stee	0	TON	$ 2,858.29	$ -		No Surge Chamber for Surface Powerhouse Alternativ
				4" Shotcrete	0	SF	$ 10.13	$ -		No Surge Chamber for Surface Powerhouse Alternativ
				Vent Shaft						No Surge Chamber for Surface Powerhouse Alternativ
				2" Shotcrete	0	SF	$ 5.26	$ -		No Surge Chamber for Surface Powerhouse Alternativ
			0.715	Supports and Anchors						No Surge Chamber for Surface Powerhouse Alternativ
				Rockbolts 1" @25' HY	0	EA	$ 1,234.86	$ -		No Surge Chamber for Surface Powerhouse Alternativ
				Rockbolts 1" @ 15'	0	EA	$ 735.81	$ -		No Surge Chamber for Surface Powerhouse Alternativ
				Steel Mesh	0	SF	$ 5.81	$ -		No Surge Chamber for Surface Powerhouse Alternativ
				Steel Support	0	TON	$ 12,671.94	$ -		No Surge Chamber for Surface Powerhouse Alternativ
				Vent Shaft						No Surge Chamber for Surface Powerhouse Alternativ
				Rock bolts 3/4" @ 6	0	EA	$ 327.15	$ -		No Surge Chamber for Surface Powerhouse Alternativ
				Steel Mesh	0	SF	$ 6.30	$ -		No Surge Chamber for Surface Powerhouse Alternativ
			0.717	Drainage Holes (In Chamber	0	LF	$ 47.95	$ -		No Surge Chamber for Surface Powerhouse Alternativ
			0.71c	Mechanical						No Surge Chamber for Surface Powerhouse Alternativ
				Stoplog Guides	0	SETS	$ 709,380.00	$ -		No Surge Chamber for Surface Powerhouse Alternativ
				Stoplog Includes Followe	0	SET	$ 3,558,160.00	$ -		No Surge Chamber for Surface Powerhouse Alternativ
	0.8			Penstocks						(same as embankment dam
		0.81		Penstocks						(same as embankment dam
			0.811	Excavation						(same as embankment dam
				Tunnels						(same as embankment dam
				Rock Horizontal	53,400	CY	$ 144.77	$ 7,731,000		(same as embankment dam
				Rock Inclined	54,000	CY	$ 286.15	$ 15,452,000		(same as embankment dam
			0.813	Surface Preparation/Grouting						(same as embankment dam
				Surface Preparation						(same as embankment dam
				Tunnels	378,000	SF	$ 3.33	$ 1,259,000		(same as embankment dam
				Contact Grouting						(same as embankment dam
				Contact Grouting	1	LS	$ 574,582.80	$ 575,000		(same as embankment dam
				Consolidation Grouting						(same as embankment dam
				Consolidation Grouting	1	LS	$ 797,268.00	$ 797,000		(same as embankment dam
			0.814	Concrete and Shotcrete						(same as embankment dam
				Concrete Liner	37,200	CY	$ 970.01	$ 36,084,000		(same as embankment dam
				Concrete Overbreak 6'	10,600	CY	$ 692.87	$ 7,344,000		(same as embankment dam
				Reinforcing Steel	27	TON	$ 2,858.29	$ 77,000		(same as embankment dam
				3" Shotcrete	34,000	SF	$ 7.69	$ 261,000		(same as embankment dam
				2" Shotcrete	20,800	SF	$ 5.26	$ 109,000		(same as embankment dam
			0.815	Support and Anchors						(same as embankment dam
				Rockbolts 1" @ 25'	150	EA	$ 1,234.86	$ 185,000		(same as embankment dam
				Rockbolts 1" @ 6'	4,200	EA	$ 327.15	$ 1,374,000		(same as embankment dam
				Steel Mesh	193,000	SF	$ 6.37	$ 1,229,000		(same as embankment dam
			0.818	Structural Misc Steelwork	2,400	TON	$ 9,673.24	$ 23,216,000		(same as embankment dam
	0.9			Tailrace Works (1 Portal with Combined Tailrace/Diversion Tunn						
		0.91		Tailrace Tunnels/Portals						
			0.911	Excavation						
				Tunnels						
				Rock	0	CY	$ 103.00	$ -		
				Portals						
				Overburden	0	CY	$ 17.14	$ -		
				Rock Usable	0	CY	$ 49.16	$ -		
				Rock Waste	0	CY	$ 49.16	$ -		
			0.913	Surface Preparation						
				Tunnels						
				Tunnels	0	SF	$ 3.33	$ -		
				Portals						
				Horizontal	0	SF	$ 2.30	$ -		
				Inclined	0	SF	$ 3.33	$ -		
			0.914	Concrete and Shotcrete						
				Tunnels						
				Concrete Lining	0	CY	$ 440.92	$ -		
				Concrete Overbreak 6'	0	CY	$ 314.94	$ -		
				2" Shotcrete	0	SF	$ 5.26	$ -		Included Qty in Item 331 - Powerplant Improvements
				Reinforcing Stee	0	TON	$ 2,887.51	$ -		
				Portals						
				Concrete Base Slab	0	CY	$ 651.93	$ -		
				Concrete Walls	0	CY	$ 651.93	$ -		
				Concrete Overbreak 12" H/6" V	0	CY	$ 471.65	$ -		
				Reinforcing Stee	0	TON	$ 2,887.51	$ -		
			0.915	Support and Anchors						
				Tunnels						
				Rockbolts 1" @ 12'	0	EA	$ 528.34	$ -		
				Rockbolts 1" @ 9'	0	EA	$ 432.12	$ -		
				Steel Support	0	TONS	$ 12,801.49	$ -		
				Steel Mesh	0	SF	$ 6.37	$ -		
				Portals						
				Rockbolts 1" @ 15'	0	EA	$ 735.81	$ -		
			0.91c	Mechanical						
				Stoplog Guides	0	SET	$ 112,600.00	$ -		
				Stoplogs Includes Followe	0	SET	$ 751,200.00	$ -		
		0.92		Tailrace Outlet Channel						
				Tailrace Outlet Channel Concrete - Slal	4,190	CY	$ 544.85	$ 2,280,000		Calculated Qty. Unit price from item 0.614. New item for surface powerhouse alternati
				Tailrace Outlet Channel Concrete - Training Wall	1,185	CY	$ 544.85	$ 650,000		Calculated Qty. Unit price from item 0.614. New item for surface powerhouse alternati
				Tailrace Reinforcing Stee	440	TON	$ 2,858.29	$ 1,260,000		Calculated Qty based on original Ratio of reinforcing steel to concrete volume for draft tubes (660/8000). New item for surface powerhouse alterna
									$ 1,701,500,000	for embankment dam $ 3,202,800,00(
333				**Waterwheels, Turbines and Generators**						
		0.11		Turbines and Governors						Copied from Low Watana Non Expandabl
			0.111	Supply						Copied from Low Watana Non Expandabl
			0.112	Install						Copied from Low Watana Non Expandabl

Low Watana RCC (Non Expandable) Alternative (4 Turbines)

Denotes Qty Adjustment by RST

FERC Line #	Sub Categories			Description	Quantity	Units	Unit Price	Line Price	Total	Notes / Remarks
	0.2			Generators and Exciters						Copied from Low Watana Non Expandabl
		0.21		Generators and Exciters (Supply and Instal						Copied from Low Watana Non Expandabl
			0.211	Generators and Exciters						Copied from Low Watana Non Expandabl
	0.3			Total Bid From Vendor (includes all equipment in this categor	4	EA	$ 74,200,000.00	$ 297,000,000	$ 297,000,000	Copied from Low Watana Non Expandabl
				Average from acquired quotes						Copied from Low Watana Non Expandabl
										Copied from Low Watana Non Expandabl
334				**Accessory Electrical Equipment**						
	0.1			Connections, Supports and Structures						
		0.11		Structures						
			0.111	Structures (included Below						
		0.12		Conductors and Insulators						
			0.121	Generator Isolated Phase Bus	1	LS	$ 5,056,000.00	$ 5,060,000		Multiply Full Watana Unit Cost by 4/6 due to turbine reductio
			0.122	HV Power Cables and Accessories	1	LS	$ 2,054,000.00	$ 2,050,000		Multiply Full Watana Unit Cost by 4/6 due to turbine reductio
			0.123	LV Power Cables and Accessories	1	LS	$ 948,000.00	$ 950,000		Multiply Full Watana Unit Cost by 4/6 due to turbine reductio
			0.124	Control Cables and Accessories	1	LS	$ 1,738,000.00	$ 1,740,000		Multiply Full Watana Unit Cost by 4/6 due to turbine reductio
			0.125	Grounding System	1	LS	$ 237,000.00	$ 240,000		Multiply Full Watana Unit Cost by 4/6 due to turbine reductio
		0.13		Conduits and Fittings						
			0.131	Conduits and Fittings	1	LS	$ 632,000.00	$ 630,000		Multiply Full Watana Unit Cost by 4/6 due to turbine reductio
	0.2			Switchgear and Control Equipment						
		0.21		Auxiliary Transformers						
			0.211	Auxiliary Transformers	4	EA	$ 83,811	$ 340,000		
		0.22		Circuit Breakers Generators				$ -		
			0.221	Circuit Breakers Generators	4	EA	$ 1,504,300	$ 6,020,000		
		0.23		Surge Protectors and Generator Cubicle						
			0.231	Surge Protectors and Generator Cubicle	1	LS	$ 726,800.00	$ 730,000		Multiply Full Watana Unit Cost by 4/6 due to turbine reductio
		0.24		Switch boards						
			0.241	Switch boards	1	LS	$ 1,232,400.00	$ 1,230,000		Multiply Full Watana Unit Cost by 4/6 due to turbine reductio
		0.25		Auxiliary Power Equipmen						
			0.251	Auxiliary Power Equipmen	1	LS	$ 347,600.00	$ 350,000		Multiply Full Watana Unit Cost by 4/6 due to turbine reductio
	0.3			Cubicles and Appurtenances						
		0.31		Control, relay and meter board						
			0.311	Control, relay and meter board	1	LS	$ 1,422,000.00	$ 1,420,000		Multiply Full Watana Unit Cost by 4/6 due to turbine reductio
		0.32		Computer Control System						
			0.321	Computer Control System	(Included in Trans-Ems)					
		0.33		Supervisor and Telemeter System						
			0.331	Supervisor and Telemeter System	Included in Trans EMS)					
	0.4			Power Transformers						
		0.41		Power Transformers						
			0.411	Power Transformers	7	EA	$ 2,000,000	$ 14,000,000		Copied from Low Watana Non Expandabl
	0.5			Lighting System						Copied from Low Watana Non Expandabl
		0.51		Powerhouse and Transformer Galler						Copied from Low Watana Non Expandabl
			0.511	Powerhouse and Transformer Galler	1	LS	$ 1,824,900.00	$ 1,820,000		Copied from Low Watana Non Expandabl
		0.52		Access Tunnels and Roads						
			0.521	Access Tunnels and Roads	0	LS	$ 402,900.00	$ -		Included in Site Roads
	0.6			Misc. Electrical Equipmen						Copied from Low Watana Non Expandabl
		0.61		Misc. Electrical Equipmen						Copied from Low Watana Non Expandabl
			0.611	Misc. Electrical Equipmen	1	LS	$ 625,680.00	$ 630,000		Copied from Low Watana Non Expandabl
										Copied from Low Watana Non Expandabl
	0.7			Surface Accessory Equipmen						Copied from Low Watana Non Expandabl
		0.71		34.5 kV and LV Equipmen						Copied from Low Watana Non Expandabl
			0.711	Switchboard	1	LS	$ 213,300	$ 210,000		Copied from Low Watana Non Expandabl
			0.712	Cables	1	LS	$ 450,300	$ 450,000		Copied from Low Watana Non Expandabl
			0.713	Aux Transformers	1	LS	$ 284,400	$ 280,000		Copied from Low Watana Non Expandabl
		0.73		Diesel Generator- Standby						Copied from Low Watana Non Expandabl
			0.731	Diesel Generator- Standby	2	EA	$ 347,550	$ 700,000		Copied from Low Watana Non Expandabl
		0.74		Exterior Lighting						Copied from Low Watana Non Expandabl
			0.741	Exterior Lighting	1	LS	$ 355,500	$ 360,000		Copied from Low Watana Non Expandabl
		0.75		Mimic Board- Control Building						Copied from Low Watana Non Expandabl
			0.751	Mimic Board- Control Building	1	LS	$ 1,185,000	$ 1,190,000		Copied from Low Watana Non Expandabl
									$ 40,000,000	
335				**Misc Powerplant Equipment**						
	0.1			Auxiliary Systems- Undergroun						Copied from Low Watana Non Expandabl
		0.11		Station Water Systems						Copied from Low Watana Non Expandabl
			0.111	Station Water Systems	1	LS	$ 2,488,500.00	$ 2,490,000		Copied from Low Watana Non Expandabl
		0.12		Fire Protection Systems						Copied from Low Watana Non Expandabl
			0.121	Fire Protection Systems	1	LS	$ 1,422,000.00	$ 1,420,000		Copied from Low Watana Non Expandabl
		0.13		Compressed Air Systems						Copied from Low Watana Non Expandabl
			0.131	Compressed Air Systems	1	LS	$ 1,777,500.00	$ 1,780,000		Copied from Low Watana Non Expandabl
		0.14		Oil Handling Systems						Copied from Low Watana Non Expandabl
			0.141	Oil Handling Systems	1	LS	$ 1,185,000.00	$ 1,190,000		Copied from Low Watana Non Expandabl
		0.15		Drainage & Dewatering						Copied from Low Watana Non Expandabl
			0.151	Drainage & Dewatering	2	EA	$ 1,738,000	$ 3,480,000		Copied from Low Watana Non Expandabl
		0.16		Heating, Ventilation and Cooling Syster						Copied from Low Watana Non Expandabl
			0.161	Heating, Ventilation and Cooling Syster	1	LS	$ 1,777,500.00	$ 1,780,000		Copied from Low Watana Non Expandabl
		0.17		Miscellaneous						Copied from Low Watana Non Expandabl
			0.171	Miscellaneous	1	LS	$ 1,185,000.00	$ 1,190,000		Copied from Low Watana Non Expandabl
	0.2			Auxiliary Systems- Surface Facilitie						Copied from Low Watana Non Expandabl
		0.21		Auxiliary Systems- Surface Facilitie						Copied from Low Watana Non Expandabl
			0.211	Auxiliary Systems- Surface Facilitie	1	LS	$ 711,000	$ 710,000		Copied from Low Watana Non Expandabl
	0.3			Auxiliary Equipmen						Copied from Low Watana Non Expandabl
		0.31		Powerhouse Cranes						Copied from Low Watana Non Expandabl
			0.311	Powerhouse Cranes	2	EA	$ 1,800,000	$ 3,600,000		Copied from Low Watana Non Expandabl
		0.32		Elevators						Copied from Low Watana Non Expandabl
			0.321	Elevators	2	EA	$ 181,700	$ 360,000		Copied from Low Watana Non Expandabl
		0.33		Miscellaneous Cranes and Hoists						Copied from Low Watana Non Expandabl
			0.331	Miscellaneous Cranes and Hoists	1	LS	$ 505,500	$ 510,000		Copied from Low Watana Non Expandabl
		0.34		Machine Shop Equipmen						Copied from Low Watana Non Expandabl
			0.341	Machine Shop Equipmen	1	LS	$ 2,022,000	$ 2,020,000		Copied from Low Watana Non Expandabl
	0.4			General Station Equipment	(Included in Mechanical And Electrical Systems					Copied from Low Watana Non Expandabl
	0.5			Communications Equipmen	1	LS	$ 106,650.00	$ 110,000		Copied from Low Watana Non Expandabl

Low Watana RCC (Non Expandable) Alternative (4 Turbines)

Denotes Qty Adjustment by RST

FERC Line #	Sub Categories	Description	Quantity	Units	Unit Price	Line Price	Total	Notes / Remarks
							$ 21,000,000	
336	Roads, Rails and Air Facilities							
	0.1	Roads						
	0.11	Pioneer Roads and Bridges						
	0.111	Gold Creek- Watana						
		Road (58 mi)						
		Clearing	0	ACRE	$ 11,416.62	$ -		Rail Only Access to Site
		Waste Excavation	0	CY	$ 9.51	$ -		Rail Only Access to Site
		Common Excavation	0	CY	$ 8.32	$ -		Rail Only Access to Site
		18" Culverts	0	LF	$ 62.55	$ -		Rail Only Access to Site
		36" Culverts	0	LS	$ 32,760.98	$ -		Rail Only Access to Site
		D-1 Base Materia	0	TON	$ 45.47	$ -		Rail Only Access to Site
		Fabric	0	SY	$ 6.73	$ -		Rail Only Access to Site
		Maintenance	0	MI/YR	$ 9,008.99	$ -		Rail Only Access to Site
	0.112	Gold Creek- Parks						
		Road (41.25 Miles)						
		Clearing	0	ACRE	$ 11,416.62	$ -		Rail Only Access to Site
		Waste Excavation	0	CY	$ 9.51	$ -		Rail Only Access to Site
		Common Excavation	0	CY	$ 8.32	$ -		Rail Only Access to Site
		18" Culverts	0	LF	$ 62.55	$ -		Rail Only Access to Site
		36" Culverts	0	LS	$ 35,451.31	$ -		Rail Only Access to Site
		D-1 Base Materia	0	TON	$ 45.47	$ -		Rail Only Access to Site
		Fabric	0	SY	$ 6.73	$ -		Rail Only Access to Site
		Maintenance	0	MI/YR	$ 9,008.32	$ -		Rail Only Access to Site
	0.113	Devil Canyon Low Level Crossing						
		Crossing (7.88 Miles)						
		Clearing	0	ACRE	$ 11,416.62			Rail Only Access to Site
		Waste Excavation	0	CY	$ 9.51			Rail Only Access to Site
		Common Excavation	0	CY	$ 8.32			Rail Only Access to Site
		Rock Excavation	0	CY	$ 28.45			Rail Only Access to Site
		18" Culverts	0	LF	$ 62.55			Rail Only Access to Site
		Bridge	0	LS	$ 120,000,000.00			Rail Only Access to Site
		D-1 Base Materia	0	TON	$ 45.47			Rail Only Access to Site
		Maintenance	0	MI/YR	$ 11,258.74			Rail Only Access to Site
								Rail Only Access to Site
	0.114	Gold Creek- Watana (41.25 miles	0	LS	$ 28,132,000			Rail Only Access to Site
	0.12	Permanent Roads and Bridges						
	0.124	Parks Highway to Watana (62 mi	0	MI	$ 3,000,000.00	$ -		Rail Only Access to Site
	0.125	Susitna Bridge	0	SF	$ 450.00	$ -		Rail Only Access to Site
	0.2	Rail Facilities						
	0.24	Permanent Railroad (including railheads						
	0.244	Gold Creek to Watana- Rai						
		R-1, (33 Mi)						
		Clearing	671	AC	$ 11,416.62	$ 7,662,183		Left the same as Full RCC Alternativ
		Waste Excavation	1687883	CY	$ 9.51	$ 16,051,766		Left the same as Full RCC Alternativ
		Common Excavation	3307678	CY	$ 8.32	$ 27,519,880		Left the same as Full RCC Alternativ
		Rock Excavation	9114	CY	$ 28.51	$ 259,867		Left the same as Full RCC Alternativ
		Borrow	449500	CY	$ 11.88	$ 5,340,060		Left the same as Full RCC Alternativ
		Subballast	711055	CY	$ 18.15	$ 12,902,807		Left the same as Full RCC Alternativ
		Grade "A" Base Materia	6650	CY	$ 35.45	$ 235,729		Left the same as Full RCC Alternativ
		D-1 Base materia	2400	TON	$ 43.20	$ 103,680		Left the same as Full RCC Alternativ
		A.C. Surfacing	2200	TON	$ 198.00	$ 435,600		Left the same as Full RCC Alternativ
		Dock Lumber	16	MBF	$ 1,258.60	$ 20,138		Left the same as Full RCC Alternativ
		18" Culvert	20093	LF	$ 68.26	$ 1,371,458		Left the same as Full RCC Alternativ
		36" + Culverts	0	LS	$ 92,160.00	$ -		Left the same as Full RCC Alternativ
		Fabric	12930	SY	$ 9.00	$ 116,369		Left the same as Full RCC Alternativ
		Thaw Pipes	41843	LF	$ 95.04	$ 3,976,745		Left the same as Full RCC Alternativ
		Topsoil & Seed	431	AC	$ 10,800.00	$ 4,653,257		Left the same as Full RCC Alternativ
		Rail Yard Control Devices	1	LS	$ 1,800.00	$ 1,800		Left the same as Full RCC Alternativ
		Bridges	0	SF	$ 900.00	$ -		Left the same as Full RCC Alternativ
		Trackage	325940	LF	$ 350.00	$ 114,079,000		Left the same as Full RCC Alternativ
		Maintenance						
		Rail	406	Mile-years	$ 10,000.00	$ 4,060,000		Left the same as Full RCC Alternativ
		Railhead	7	years	$ 75,000.00	$ 525,000		Left the same as Full RCC Alternativ
	0.13	Site Roads						
	0.131	Construction Roads						
		Site Roads	20	Mile	$ 750,000.00	$ 15,000,000		Left the same as Full RCC Alternative. Revised Unit Price to $750,000 (Same as Low Watana Non Expandable, Full RCC $12,554,637.62 seems hig
		Maintenance	102	MI/YRS	$ 223,092.85	$ 22,755,000		Reduced Full RCC Qty by ratio of Construction Time 4 yr / 5.5)
	0.132	Permanent Roads						
		Permanent Roads	6	MILE	$ 1,287,997.42	$ 7,728,000		Left the same as Full RCC Alternativ
	0.3	Airstrip						
	0.31	Airstrip						
		Permanent Airstrip	1	LS	$ 12,798,000.00	$ 12,798,000		Left the same as Full RCC Alternativ
		9 years maintenance savings	1	LS				
		Temporary Airstrip	1	LD	$ 2,133,000.00	$ 2,133,000		Left the same as Full RCC Alternativ
	0.4	Saved Maintenance	1	LS	$ (5,067,889.52)	$ (5,068,000)		Left the same as Full RCC Alternativ
							$ 254,700,000	
	Transmission Plant							
350	Land and Land Rights							
	Land and Land Rights							
	Transmission		33	MILE	$ 86,720.00	$ 2,862,000		Copied from Low Watana Non Expandabl
	Substations (4 Sites)		0	LS	$ 2,607,000.00	$ -		Left the same as Full Watana RCC
							$ 2,862,000	
352	Substation and Switching Statior							

Low Watana RCC (Non Expandable) Alternative (4 Turbines)

Denotes Qty Adjustment by RST

FERC Line #	Sub Categories	Description	Quantity	Units	Unit Price	Line Price	Total	Notes / Remarks
	0.1	Switchyard						
	0.11	Switchyard	2	LS	$ 14,000,000.00	$ 28,000,000		Left the same as Full Watana RCC
							$ 28,000,000	
353		**Substation/Switching Station Equipment**						
		Ester	0	LS	$ 57,922,800.00	$ -		
		Willow	0	LS	$ 3,613,020.00	$ -		
		Knik Arm	0	LS	$ 29,838,300.00	$ -		
		University	0	LS	$ 88,685,400.00	$ -		
		Devil Canyon	0	LS	$ 35,585,550.00	$ -		
		Willow Energy Management System (EMS						
		Equipment and System Cost	0	LS	$ 27,326,100.00	$ -		
		Microwave Communication Equipmen	0	LS	$ 11,660,400.00	$ -		
		EMS Control Center Building	0	LS	$ 9,148,200.00	$ -		
		Watana and Devil Canyon In-plant Monitor and Control Equipmer	0	LS	$ 8,619,690.00	$ -		
							$ -	
354		**Steel Towers and Fixtures**						
		Towers (Including Foundation and Hardware	33	miles	$ 4,500,000.00	$ 148,500,000		Used same length as Transmission Land Right
							$ 148,500,000	
356		**Conductors and Devices**						
		Conductors	0	MILE	$ 218,281.33	$ -		
		Submarine Cables	0	EACH	$ 15,808,340.56	$ -		
							$ -	
359		**Roads and Trails**						
		Roads and Trails	200	MILE	$ 75,744.00	$ 15,149,000		Left the same as Full Watana RCC
		Clearing and Roads	340	MILE	$ 37,872.00	$ 12,876,000		Left the same as Full Watana RCC
							$ 28,000,000	$ 207,362,000
		General Plant						
389		**Land and Land Rights**						
		Land and Land Rights				$ -		
390		**Structures and Improvements**						
		Structures and Improvements				$ -		
391		**Office Furniture and Equipment**						
		Office Furniture and Equipmen				$ -		
392		**Transportation Equipment**						
		Transportation Equipmen				$ -		
393		**Stores Equipment**						
		Stores Equipmen				$ -		
394		**Tools Shop and Garage Equipment**						
		Tools Shop and Garage Equipmer				$ -		
395		**Laboratory Equipment**						
		Laboratory Equipmen				$ -		
396		**Power-Operated Equipment**						
		Power-Operated Equipmen				$ -		
397		**Communications Equipment**						
		Communications Equipmen				$ -		
398		**Miscellaneous Equipment**						
		Miscellaneous Equipmen				$ -		
399		**Other Tangible Property**						
		Other Tangible Property	1	LS	$ 16,000,000	$ 16,000,000		Copied from Low Watana Non Expandabl
		Saved Maintence	1	LS	$ (231,220)	$ (231,000)		Copied from Low Watana Non Expandabl
							$ 15,800,000	
		Indirect Costs						
61		**Temporary Construction Facilities**						
		Temporary Construction Facilities						
62		**Construction Equipment**						
		Construction Equipmen						
63		**Main Construction Camp**						
	0.1	Main Construction Camp	1	LS	$ 316,340,280			Reduce Unit price by ratio of Low Watana Volume to High Watana Volume = (7.6/15.
		Saved Maintence	1	LS	$ (6,172,493.27)			
		Site Preparatior	3270533					Reduce Qty by ratio of Low Watana Volume to High Watana Volume = (7.6/15.(
		Buildings	15019120					Reduce Qty by ratio of Low Watana Volume to High Watana Volume = (7.6/15.(
		utilities	12172667					Reduce Qty by ratio of Low Watana Volume to High Watana Volume = (7.6/15.(
			30462320	5	$ 152,311,600.00			Reduce Qty by ratio of Low Watana Volume to High Watana Volume = (7.6/15.(
		MAIN CONSTRUCTION VILLAGE						
		site prep	3540080					Reduce Qty by ratio of Low Watana Volume to High Watana Volume = (7.6/15.(
		buildings	10008187					Reduce Qty by ratio of Low Watana Volume to High Watana Volume = (7.6/15.(
		utilities	4914160					Reduce Qty by ratio of Low Watana Volume to High Watana Volume = (7.6/15.(
			18462426.67	5	$ 92,312,133.33			
						$ 152,311,600	$ 123,800,000	**Camp cost to reflect lower volume (0.8125) *Previous Estimate doesn't total Con. Camp Costs Correctly**
64		**Labor Expense**						
		Labor Expense	(Included In Direct Costs)					
65		**Superintendence**						
		Superintendence	(Included In Direct Costs)					

Low Watana RCC (Non Expandable) Alternative (4 Turbines)

Denotes Qty Adjustment by RST

FERC Line #	Sub Categories	Description	Quantity	Units	Unit Price	Line Price	Total	Notes / Remarks
66		**Insurance**						
		Insurance	(Included In Direct Costs)					
68		**Mitigation Fishery, Terrestrial and Recrational**						
		Mitigation	(Not included in 1982 study)			$ -		
69		**Fees**						
		Fees						
Subtotal					Direct Construction Cost		$ 2,903,300,000	
	Contingency		21.313	%			$ 618,800,000	Used Same Contingency as Full RCC
Subtotal								
71A		**Engineering (4%), Enviornmental (2%), Regulatory(1%) and Construction Management**	7	%			$ 203,200,000	
71B		**Construction Management (4%)**	4	%			$ 116,100,000	
72		**Legal Expenses**	0	%				
75		**Taxes**	0	%				
76		**Administrative & Gen. Expenses**	0	%				
77		**Interest**	0	%				
80		**Earnings/Expenses During Construction**	0	%				
Total Project Cost							$ 3,841,400,000	

r of Years for Base Case 20.5 years

of Years for Full Watana 16.5 years

HDR/AEA Susitna Hydroelectric Project
Cost Estimates for 1982 quantities- Alternatives
By: DTA
By: Leanne Andruszkiewicz, EIT Date: 1/25/09
Reviewed By: David Elwood, EIT Date: 1/25/09, Modified by Hatch Acres_mb_061109, R&M 11/16/09
Alternatives- 2008 Dollars
Low Watana RCC (Non-Expandable) Estimate 10/28/10 used as basis
Modified by Hatch Associates Consultants, Inc._RST_10/28/10
Low Watana RCC (Expandable) Alternative (4 Turbines + 2 Additional Bays)

Copied Full Watana Data
Denotes Qty Adjustment by RST

FERC Line #	Sub Categories							Description	Quantity	Units	Unit Price	Line Price	Total	Notes / Remarks
330			**Land and Land Rights**											
	0.1			Land					1	LS	$ 120,870,000.00	$ 120,870,000		
	0.2			Land Rights					Included Above					
	0.3			Misc Charges in Credit Above					Included Above					
													$ 120,900,000	
331			**Powerplant Structure Improvements**											
	0.1			Powerhouse										
		0.11			Powerhouse and Draft Tube									
			0.111			Excavation								
								Powerhouse Rock	1,336,761	CY	$ 43.72	$ 58,443,000		Multiply by ratio of increased structure length (485/365) = 1.329, Plus additional 10%
								Powerhouse Overburden	891,174	CY	$ 11.53	$ 10,275,000		Multiply by ratio of increased structure length (485/365) = 1.329, Plus additional 10%
								Draft Tube Rock	0	CY	$ 90.12	$ -		
Total	Total Estimate		0.113			Surface Preparation/ Grouting								
								Powerhouse	143,532	SF	$ 3.33	$ 478,000		Multiply by ratio of increased structure length (485/365) = 1.329
								Draft Tube	0	SF	$ 3.33	$ -		
								Grout Curtain- Drill holes	63,393	LF	$ 27.63	$ 1,752,000		Multiply by ratio of increased structure length (485/365) = 1.329
								Grout Curtain- Cement	25,251	CF	$ 81.10	$ 2,048,000		Multiply by ratio of increased structure length (485/365) = 1.329
			0.114			Concrete and Shot Crete								
								Powerhouse Concrete	82,871	CY	$ 544.85	$ 45,150,000		Multiply by ratio of increased structure length (485/365) = 1.329
								Powerhouse Concrete Overbreak	0	CY	$ 447.21	$ -		
								Powerhouse Reinforcing Steel	4,144	TON	$ 2,858.29	$ 11,840,000		Multiply by ratio of increased structure length (485/365) = 1.329
								Powerhouse 4" Shotcrete	0	SF	$ 10.14	$ -		
								Draft Tube Concrete	0	CY	$ 692.87	$ -		
								Draft Tube Concrete Overbreak	0	CY	$ 447.21	$ -		
								Draft Tube Reinforcing Steel	0	TON	$ 2,858.29	$ -		
								Draft Tube 2" Shotcrete	0	SF	$ 5.45	$ -		
			0.115			Support and Anchors								
								Powerhouse Rockbolts 1" @ 25' Hy	197	EA	$ 1,234.86	$ 240,000		Multiply by ratio of increased structure length (485/365) = 1.329
								Powerhouse Rockbolts 1" @ 15'	400	EA	$ 735.81	$ 290,000		Multiply by ratio of increased structure length (485/365) = 1.329
								Powerhouse Steel Mesh	9,065	SF	$ 5.81	$ 50,000		Multiply by ratio of increased structure length (485/365) = 1.329
								Powerhouse Steel Support	28	TON	$ 12,671.94	$ 350,000		Multiply by ratio of increased structure length (485/365) = 1.329
								Draft Tube Rockbolts 1" @ 25' Hy	0	EA	$ 1,234.86	$ -		
								Draft Tube Rockbolts 1" @ 12'	0	EA	$ 528.34	$ -		
								Draft Tube Rockbolts 1" @ 9'	0	EA	$ 432.12	$ -		
								Draft Tube Steel Mesh	0	SF	$ 6.55	$ -		
			0.117			Holes (U/S of Powerhouse)			0	LF	$ 51.32	$ -		
								Holes (Powerhouse Crown)	0	LF	$ 51.32	$ -		
			0.118			Structural- Misc Steelwork						$ -		
								Powerhouse and Draft Tube- Steel Crane Rails	1	LS	$ 10,276,309.00	$ 10,280,000		*Same as Full Watana
			0.119			Architectural- Powerhouse			1	LS	$ 7,309,500.00	$ 7,310,000		Multiply by ratio of increased structure length (485/365) = 1.329
y			0.11c			Mechanical								
								Draft Tube Gates	6	SETS	$ 427,880.00	$ 2,567,000		Updated Qty for 6 total bays
								Draft Tube Gate Guides	6	SETS	$ 202,680.00	$ 1,216,000		Updated Qty for 6 total bays
								Draft Tube Crane	1	LS	$ 1,140,000.00	$ 1,140,000		
		0.12			Access Tunnels and Portals									
			0.121			Excavation								
								Main Tunnel	0	CY	$ 97.45	$ -		
								Transformer Gallery Tunnel	0	CY	$ 97.45	$ -		
								Grouting Gallery Tunnel	0	CY	$ 396.04	$ -		
								Surge Chamber Access Tunnel	0	CY	$ 145.22	$ -		
								Penstock Access Tunnel	0	CY	$ 145.22	$ -		
								Penstock Elbow Access Tunnel	0	CY	$ 145.22	$ -		
								Access Shaft Tunnel	0	CY	$ 145.22	$ -		
								Connector Tunnel	0	CY	$ 379.26	$ -		
								Portals Overburden	0	CY	$ 17.14	$ -		
								Portals Rock	0	CY	$ 49.31	$ -		
			0.123			Surface Preparation								
								Main Tunnel Slab	0	SF	$ 2.21	$ -		
								Penstock Access Slab	0	SF	$ 2.21	$ -		
								Horizontal Portal	0	SF	$ 2.30	$ -		
								Inclined Portal	0	SF	$ 3.33	$ -		
			0.124			Concrete and Shot Crete								
								Main Portal						
								Concrete Slab	0	CY	$ 406.27	$ -		
								Concrete Walls	0	CY	$ 406.27	$ -		
								Concrete Overbreak	0	CY	$ 368.48	$ -		
								Reinforcing Steel	0	TON	$ 2,887.51	$ -		
								Tunnels						
								Concrete Slab Main Tunnel	0	CY	$ 503.90	$ -		
								Concrete Plugs Penstock Elbow ACC	0	CY	$ 755.86	$ -		
								Concrete Overbreak Main Tunnel 6"	0	CY	$ 346.43	$ -		
								Reinforcing Steel	0	TON	$ 2,887.51	$ -		

Low Watana RCC (Expandable) Alternative (4 Turbines + 2 Additional Bays)

Denotes Qty Adjustment by RST

FERC Line #	Sub Categories							Description	Quantity	Units	Unit Price	Line Price	Total	Notes / Remarks
								2 " Shotcrete Main Tunnel	0	SF	$ 5.26	$ -		
								2 " Shotcrete Transformer Gal	0	SF	$ 5.26	$ -		
								2 " Shotcrete Surge Chamber Acc	0	SF	$ 5.26	$ -		
								2 " Shotcrete Penstock Access	0	SF	$ 5.26	$ -		
								2 " Shotcrete Penstock Elbow Acc	0	SF	$ 5.26	$ -		
								2 " Shotcrete Access Shaft	0	SF	$ 5.26	$ -		
								2 " Shotcrete Grout Gallery	0	SF	$ 5.26	$ -		
								2 " Shotcrete Connector Tunnel	0	SF	$ 5.26	$ -		
			0.125					Support and Anchors						
								Main Tunnel						
								Rockbolts 1" @12'	0	EA	$ 528.34	$ -		
								Rockbolts 1" @ 9'	0	EA	$ 432.12	$ -		
								Steel Mesh	0	SF	$ 6.37	$ -		
								Steel Support	0	TON	$ 12,801.49	$ -		
								Main Tunnel Portal				$ -		
								Rockbolts 1" @15'	0	EA	$ 735.79	$ -		
								Transformer Gallery Tunnel				$ -		
								Rockbolts 1" @12'	0	EA	$ 528.34	$ -		
								Rockbolts 1" @ 9'	0	EA	$ 432.12	$ -		
								Steel Mesh	0	SF	$ 5.89	$ -		
								Steel Support	0	TON	$ 12,801.49	$ -		
								Grouting Gallery Tunnel				$ -		
								Rockbolts 3/4" @ 6'	0	EA	$ 327.15	$ -		
								Steel Mesh	0	SF	$ 6.37	$ -		
								Steel Support	0	TON	$ 12,801.49	$ -		
								Surge Chamber Access Tunnel				$ -		
								Rockbolts 1" @12'	0	EA	$ 528.34	$ -		
								Rockbolts 1" @ 9'	0	EA	$ 432.12	$ -		
								Steel Mesh	0	SF	$ 6.37	$ -		
								Steel Support	0	TON	$ 12,801.49	$ -		
								Penstock Access Tunnel						
								Rockbolts 1" @12'	0	EA	$ 528.34	$ -		
								Rockbolts 1" @ 9'	0	EA	$ 432.12	$ -		
								Steel Mesh	0	SF	$ 6.37	$ -		
								Steel Support	0	TON	$ 12,801.49	$ -		
								Penstock Elbow Access Tunnel						
								Rockbolts 1" @12'	0	EA	$ 528.34	$ -		
								Rockbolts 1" @ 9'	0	EA	$ 432.12	$ -		
								Steel Mesh	0	SF	$ 6.37	$ -		
								Steel Support	0	TON	$ 12,801.49	$ -		
								Access Shaft Tunnel						
								Rockbolts 1" @12'	0	EA	$ 528.34	$ -		
								Rockbolts 1" @ 9'	0	EA	$ 432.12	$ -		
								Steel Mesh	0	SF	$ 6.37	$ -		
								Steel Support	0	TON	$ 12,801.49	$ -		
								Connector Tunnel						
								Rockbolts 3/4" @ 6'	0	EA	$ 327.15	$ -		
								Steel Mesh	0	SF	$ 6.37	$ -		
								Steel Support	0	TON	$ 12,801.49	$ -		
			0.129					Architectural- Main Portal Doors	0	SETS	$ 158,371.90	$ -		
			0.12c					Mechanical Ventilation System	Included in (63.81 and 63.82)					
		0.13				Access Shaft								
			0.131					Excavation Rock	0	CY	$ 227.67	$ -		
			0.133					Surface Preparation Shaft	0	SF	$ 3.33	$ -		
			0.134					Concrete and Shot Crete						
								Concrete Lining	0	CY	$ 944.82	$ -		
								Concrete Overbreak 6"	0	CY	$ 551.14	$ -		
			0.135					Support and Anchors - Rockbolts 3/4" @ 6'	0	EA	$ 327.15	$ -		
			0.138					Structural Misc Steelwork	0	TON	$ 7,395.00	$ -		
			0.139					Architectural- control Building						
			0.13c					Mechanical Elevators	0	LS	$ 2,368,815.00	$ -		
		0.14				Fire Protection Head Tank								
			0.141					Excavation	0	CY	$ 43.72	$ -		
			0.143					Surface Preparation	0	SF	$ 2.30	$ -		
			0.144					Concrete & Shotcrete						
								Concrete	208	CY	$ 963.72	$ 200,000		
								Concrete Overbreak 6"	0	CY	$ 406.27	$ -		
								Reinforcing Steel	8	TON	$ 2,858.29	$ 20,000		
			0.145					Support and Anchors						
								Rockbolts 1" @12'	0	EA	$ 528.34	$ -		
								Rockbolts 1" @ 9'	0	EA	$ 432.12	$ -		
								Steel Mesh	0	SF	$ 6.30	$ -		
								Steel Support	0	TON	$ 12,671.95	$ -		
			0.148					Misc Steelwork	1	LS	$ 73,297.50	$ 70,000		*Same as Full Watana
			0.14c					Mechanical Piping/Valves						
		0.15				Bus Tunnels (totals for 3 Bus Tunnels)								
			0.151					Excavation						
								Rock Horizontal	0	CY	$ 213.70	$ -		
								Rock Inclined	0	CY	$ 601.04	$ -		
			0.153					Surface Preparation- Tunnels	0	SF	$ 3.33	$ -		

Low Watana RCC (Expandable) Alternative (4 Turbines + 2 Additional Bays)

Denotes Qty Adjustment by RST

FERC Line #	Sub Categories						Description	Quantity	Units	Unit Price	Line Price	Total	Notes / Remarks
			0.154				Concrete and Shotcrete						
							Concrete Slab	0	CY	$ 818.84	$ -		
							Concrete Overbreak 12"	0	CY	$ 472.41	$ -		
							Reinforcing Steel	0	TON	$ 2,858.29	$ -		
							2" Shotcrete	0	SF	$ 5.26	$ -		
			0.155				Supports and Anchors						
							Rockbolts 1" @ 25'	0	EA	$ 1,234.86	$ -		
							Rockbolts 1" @ 12'	0	EA	$ 528.34	$ -		
							Rockbolts 1" @ 9'	0	EA	$ 432.12	$ -		
							Steel Mesh	0	SF	$ 6.30	$ -		
							Steel Support	0	TON	$ 12,671.94	$ -		
		0.16				Transformer Gallery Tunnel							
			0.161				Excavation- Rock	0	CY	$ 87.44	$ -		
			0.163				Surface Preparation	0	SF	$ 2.30	$ -		
			0.164				Concrete and Shotcrete						
							Concrete Base Slab	0	CY	$ 544.85	$ -		
							Concrete Overbreak 12"H/6"V	0	CY	$ 377.93	$ -		
							Reinforcing Steel	0	TON	$ 2,858.29	$ -		
			0.165				Support and Anchors						
							Rockbolts 1" @ 25'	0	EA	$ 1,234.86	$ -		
							Rockbolts 1" @ 15'	0	EA	$ 735.81	$ -		
							Steel Mesh	0	SF	$ 5.81	$ -		
							Steel Support	0	TON	$ 12,671.94	$ -		
			0.167				Drainage Holes	0	LF	$ 47.95	$ -		
		0.17				Cable Shafts							
			0.171				Excavation Rock	0	CY	$ 601.04	$ -		
			0.173				Surface Preparation Shafts	0	SF	$ 3.33	$ -		
			0.174				Concrete and Shotcrete						
							Concrete Lining	0	CY	$ 1,763.66	$ -		
							Concrete Overbreak 6"	0	CY	$ 881.83	$ -		
			0.175				Supports and Anchors- Rockbolts 3/4" @ 6'	0	EA	$ 327.15	$ -		
			0.178				Structural Steel Support Towers	12	TON	$ 15,602.00	$ 190,000		
			0.179				Architectural- Enclosures	0	LS	$ 199,317.00	$ -		
			0.17c				Mechanical Hoist	0	EA	$ 476,960.00	$ -		
		0.18				Dewatering (during Construction)							
			0.181				Dewatering (Power Facilities)	1	LS	$ 1,336,798.50	$ 1,340,000		*Same as Full Watana
		0.19				Instrumentation							
			0.191				Instrumentation	1	LS	$ 1,714,813.50	$ 1,710,000		*Same as Full Watana
	0.2			Misc Buildings (Control Buildings)				1	LS	$ 4,433,085.00	$ 4,430,000		*Same as Full Watana
	0.3			Permanent Town				(included in 63.5)					
												$ 161,389,000	
332				**Reservoir, Dams and Waterways**									
	0.1			Reservoir									
		0.11			Reservoir Clearing			37,500	ACRE	$ 3,005.85	$ 112,719,000		Copied Full Watana Data
	0.2			Diversion Schemes /Cofferdams									
		0.21			Diversion Tunnels /Portals						$ -		
			0.211				Excavation				$ -		
							Combined Tunnels				$ -		
							Rock	203,285	CY	$ 92.33	$ 18,770,000		Multiplied Non Expandable Qty by ratio of length increase (4,470/4,100) = 1.09
							Combined Upstream Portals				$ -		
							Rock	35,000	CY	$ 49.16	$ 1,720,000		
							Combined Downstream Portals				$ -		
							Rock Usable	75,000	CY	$ 49.16	$ 3,690,000		
							Emergency Release Chambers				$ -		
							Excavate Concrete for Plugs	1,139	CY	$ 101.98	$ 120,000		
							Gate Chamber	2,975	CY	$ 110.73	$ 330,000		
							Access Tunnel to Gate Chamber				$ -		
							Rock	0	CY	$ 97.15	$ -		
			0.212				Fill- Temp for Coffer Dam to Construct Upstream Portals	23,000	CY	$ 11.66	$ 270,000		
			0.213				Surface Preparation \ grouting				$ -		
							Upstream Upper Portal				$ -		
							Horizontal	3,200	SF	$ 2.30	$ 10,000		
							Inclined	8,600	SF	$ 3.33	$ 30,000		
							Upstream Lower Portal				$ -		
							Horizontal	1,300	SF	$ 2.30	$ -		
							Inclined	14,900	SF	$ 3.33	$ 50,000		
							Downstream Upper Portal				$ -		
							Horizontal	6,100	SF	$ 2.30	$ 10,000		
							Inclined	20,500	SF	$ 3.33	$ 70,000		
							Downstream Lower Portal				$ -		
							Horizontal	600	SF	$ 2.30	$ -		
							Inclined	5,600	SF	$ 3.33	$ 20,000		
							Grout Upper Tunnel Plugs				$ -		
							Drill Holes	4,100	LF	$ 26.76	$ 110,000		
							Cement	820	CF	$ 81.10	$ 70,000		
							Grout Lower Tunnel Permanent Plugs				$ -		
							Drill Holes	2,050	LF	$ 26.76	$ 50,000		
							Cement	410	CF	$ 81.10	$ 30,000		
			0.214				Concrete and Shotcrete				$ -		
							Combined Tunnels				$ -		
							Concrete Lining	37,060	CY	$ 566.89	$ 21,010,000		Multiplied Non Expandable Qty by ratio of length increase (4,470/4,100) = 1.09

Low Watana RCC (Expandable) Alternative (4 Turbines + 2 Additional Bays)

Denotes Qty Adjustment by RST

FERC Line #	Sub Categories								Description	Quantity	Units	Unit Price	Line Price	Total	Notes / Remarks
									Concrete Lining Overbreak 6"	16,350	CY	$ 314.94	$ 5,150,000		Multiplied Non Expandable Qty by ratio of length increase (4,470/4,100) = 1.09
									Reinforcing Steel	23	TON	$ 2,887.51	$ 70,000		Multiplied Non Expandable Qty by ratio of length increase (4,470/4,100) = 1.09
									Concrete Lining for Plug	6,200	CY	$ 428.32	$ 2,660,000		
									2" Shotcrete	52,865	SF	$ 5.26	$ 280,000		Multiplied Non Expandable Qty by ratio of length increase (4,470/4,100) = 1.09
								Upstream Upper Portal					$ -		
									Concrete Headwall	3,200	CY	$ 651.93	$ 2,090,000		
									Concrete Lining	1,300	CY	$ 651.93	$ 850,000		
									Concrete Slab	750	CY	$ 651.93	$ 490,000		
									Concrete Piers	800	CY	$ 651.93	$ 520,000		
									Concrete Overbreak 12" H/6"V	300	CY	$ 472.41	$ 140,000		
									Reinforcing Steel	400	TON	$ 2,887.51	$ 1,160,000		
								Upstream Lower Portal					$ -		
									Concrete Headwall	4,500	CY	$ 651.93	$ 2,930,000		
									Concrete Lining	3,000	CY	$ 651.93	$ 1,960,000		
									Concrete Slab	300	CY	$ 651.93	$ 200,000		
									Concrete Piers	700	CY	$ 651.93	$ 460,000		
									Concrete Overbreak 12" H/6"V	350	CY	$ 472.41	$ 170,000		
									Reinforcing Steel	600	TON	$ 2,887.51	$ 1,730,000		
								Downstream Upper Portal					$ -		
									Concrete Headwall	500	CY	$ 651.93	$ 330,000		
									Concrete Slab	100	CY	$ 651.93	$ 70,000		
									Concrete Overbreak 12" H/6"V	100	CY	$ 472.41	$ 50,000		
									Reinforcing Steel	40	TON	$ 2,887.51	$ 120,000		
								Downstream Lower Portal					$ -		
									Concrete Headwall	2,500	CY	$ 651.93	$ 1,630,000		
									Concrete Slab	100	CY	$ 651.93	$ 70,000		
									Concrete Overbreak 12" H/6"V	150	CY	$ 472.41	$ 70,000		
									Reinforcing Steel	170	TON	$ 2,887.51	$ 490,000		
								Downstream Flip Bucket					$ -		
									Concrete Slab	0	CY	$ 651.93	$ -		
									Concrete Walls	0	CY	$ 651.93	$ -		
									Concrete Invert	0	CY	$ 651.93	$ -		
									Concrete Overbreak 12" H/6"V	0	CY	$ 42.41	$ -		
									Reinforcing Steel	0	TON	$ 2,887.51	$ -		
								Downstream Retaining Wall					$ -		
									Concrete Slab	200	CY	$ 651.93	$ 130,000		
									Concrete Walls	2,000	CY	$ 651.93	$ 1,300,000		
									Concrete Overbreak 12" H/6"V	110	CY	$ 472.41	$ 50,000		
									Reinforcing Steel	90	TON	$ 2,887.51	$ 260,000		
								Emergency Release Chambers					$ -		
									Concrete Plug	5,500	CY	$ 755.86	$ 4,160,000		
									4" Shotcrete	1,000	SF	$ 10.13	$ 10,000		
								Access Tunnel to Gate Chamber					$ -		
									2" Shotcrete	0	SF	$ 5.26	$ -		
			0.215			Supports and Anchors									
								Combined Tunnels					$ -		
									Rockbolts 1" @ 12'	3,379	EA	$ 528.34	$ 1,790,000		Multiplied Non Expandable Qty by ratio of length increase (4,470/4,100) = 1.09
									Rockbolts 1" @ 9'	578	EA	$ 432.12	$ 250,000		Multiplied Non Expandable Qty by ratio of length increase (4,470/4,100) = 1.09
									Steel Mesh	202,740	SF	$ 6.37	$ 1,290,000		Multiplied Non Expandable Qty by ratio of length increase (4,470/4,100) = 1.09
									Steel Support	207	TON	$ 12,801.49	$ 2,650,000		Multiplied Non Expandable Qty by ratio of length increase (4,470/4,100) = 1.09
								Upstream Lower Portal					$ -		
									Rockbolts 1" @ 15'	240	EA	$ 735.81	$ 180,000		
									Anchors 1" @ 25'	290	EA	$ 1,234.86	$ 360,000		
								Upstream Upper Portal					$ -		
									Rockbolts 1" @ 15'				$ -		
									Anchors 1" @ 25'	130	EA	$ 735.81	$ 100,000		
								Downstream Lower Portal					$ -		
									Rockbolts 1" @ 15'	200	EA	$ 735.81	$ 150,000		
								Downstream Upper Portal					$ -		
									Rockbolts 1" @ 15'	100	EA	$ 735.81	$ 70,000		
									Retaining Wall Anchors 1" @25'	100	EA	$ 1,234.86	$ 120,000		
								Emergency Release Chambers					$ -		
									Rockbolts 1" @ 25'	63	EA	$ 1,234.86	$ 80,000		
									Rockbolts 1" @ 15'	79	EA	$ 735.77	$ 60,000		
									Steel Mesh	2,279	SF	$ 6.37	$ 10,000		
									Steel Support	9	TON	$ 12,801.49	$ 110,000		
									Metal to Roof Anchors 3/4" @ 6'	13	EA	$ 342.42	$ -		
								Access Tunnel to Gate Chamber					$ -		
									Rockbolts 1" @ 12'	0	EA	$ 528.34	$ -		
									Rockbolts 1" @ 9'	0	EA	$ 432.12	$ -		
									Steel Mesh	0	SF	$ 6.37	$ -		
									Steel Support	0	TON	$ 12,801.49	$ -		
			0.218			Structural- Misc Steelwork				2,775	SF	$ 93.61	$ 260,000		
			0.21c			Mechanical							$ -		
								Upstream Lower Gates					$ -		
									Gate Equipment	2	EA	$ 5,073,120.00	$ 10,150,000		
								Upstream Upper Gates					$ -		
									Gate Equipment	2	EA	$ 2,840,080.00	$ 5,680,000		
									Trashracks	1	LS	$ 1,777,500.00	$ 1,780,000		
								Downstream Lower Outlet					$ -		
									Stoplog Guides	1	LS	$ 142,200.00	$ 140,000		

Low Watana RCC (Expandable) Alternative (4 Turbines + 2 Additional Bays)

Denotes Qty Adjustment by RST

FERC Line #	Sub Categories								Description	Quantity	Units	Unit Price	Line Price	Total	Notes / Remarks
									Stoplogs includes follower	1	LS	$ 1,967,100.00	$ 1,970,000		
									Downstream Upper Outlet				$ -		
									Stoplog Guides	1	LS	$ 82,950.00	$ 80,000		
									Low Level Release				$ -		
									Slide Gates Include Steel Liner	9	EA	$ 3,517,470.00	$ 31,660,000		
		0.22			Upstream Cofferdam										
			0.221				Cofferdam								
								RCC		978,000	CY	$ 100.00			
			0.222				Pre-cofferdam								
								Rock Fill		23,400	CY	$ 10.90	$ 255,000		
			0.223					Cutoff Slurry Wall							
									excavation	5,100	CY	$ 4.88	$ 25,000		
									slurry wall	46,000	SF	$ 72.44	$ 3,332,000		
			0.22d				Dewatering								
								Initial Dewatering		1	LS	$ 5,807,685.00	$ 5,808,000		
								Dewatering Maintenance		1	LS	$ 22,377,990.00	$ 22,378,000		
		0.23			Down Stream Cofferdam										
			0.231				Cofferdam								
								RCC		261,300	CY	$ 100.00			
			0.232				Pre-cofferdam								
								Rock Fill		23,400	CY	$ 10.90	$ 255,000		
			0.233					Cutoff Slurry Wall							
									Excavation	5,100	CY	$ 4.60	$ 23,000		
									Slurry Wall	46,000	SF	$ 72.44	$ 3,332,000		
	0.3				Main Dam										
		0.31				Main Dam									
			0.311				Excavation								
								Overburden above el. 1470		367,381	CY	$ 11.53	$ 4,236,000		
								Overburden below el. 1470		964,693	CY	$ 11.06	$ 10,670,000		
								Rock Usable above el. 1470		233,739	CY	$ 43.03	$ 10,058,000		
								Rock Usable below el. 1470		86,677	CY	$ 43.72	$ 3,790,000		
								Rock Waste above el. 1470		353,600	CY	$ 43.03	$ 15,215,000		
								Rock Waste below el. 1470		157,669	CY	$ 50.18	$ 7,912,000		
			0.312				Dam								
								RCC		7,600,000	CY	$ 100.00	$ 760,000,000		
								Base RCC		0	CY	$ 100.00	$ -		
			0.313				Surface Prep/ Grouting								
								Surface Preparation							
									Under Core/Filters above el. 1500	911,200	SF	$ 3.11	$ 2,834,000		
									Under Core/Filters below el. 1500	613,000	SF	$ 3.11	$ 1,906,000		
									Under Shell above el. 1500	2,821,184	SF	$ 2.15	$ 6,066,000		
									Under Shell below el. 1500	1,405,696	SF	$ 2.15	$ 3,022,000		
								Consolidation Grout							
									Drill Holes	190,400	LF	$ 11.91	$ 2,268,000		
									Cement	190,400	CF	$ 67.81	$ 12,911,000		
								Grout Curtain							
									Drill Holes	252,960	LF	$ 26.76	$ 6,769,000		
									Cement	101,184	CF	$ 81.10	$ 8,206,000		
								Dental Concrete							
									Dental Concrete	85,000	CY	$ 365.33	$ 31,053,000		
			0.317				Drainage								
								Holes		73,984	LF	$ 51.32	$ 3,797,000		
			0.318				Bridge								
								Precast Bridge Beams		25,500	CY	$ 544.85	$ 13,894,000		
								Concrete Road Deck		5,400	CY	$ 544.85	$ 2,942,000		
								Piers		500	CY	$ 544.85	$ 272,000		
		0.32			Grout Galleries/Portals										
			0.321				Excavation						$ -		
								Tunnels/ Shafts- Core Area					$ -		
									Rock Horizontal	0	CY	$ 394.80	$ -		
									Rock Inclined	0	CY	$ 552.93	$ -		
									Rock Vertical	0	CY	$ 536.19	$ -		
								Tunnels/ Shafts- Access					$ -		
									Rock Horizontal	1,300	CY	$ 394.80	$ 510,000		
									Rock Inclined	200	CY	$ 552.93	$ 110,000		
								Portals					$ -		
									Overburden Rock	2,900	CY	$ 17.16	$ 50,000		
									Rock	800	CY	$ 49.16	$ 40,000		
			0.323				Surface Preparation						$ -		
								Portals					$ -		
									Horizontal	24	SF	$ 2.30	$ -		
									Inclined	160	SF	$ 3.33	$ -		
													$ -		
			0.324				Concrete and Shotcrete						$ -		
								Tunnels- Core Area					$ -		
									Concrete Plugs	267	CY	$ 428.32	$ 110,000		
									Concrete Slab	600	CY	$ 944.82	$ 570,000		
									Concrete Overbreak 6"	0	CY	$ 755.86	$ -		
									Reinforcing Steel	21	TON	$ 2,887.51	$ 60,000		

Low Watana RCC (Expandable) Alternative (4 Turbines + 2 Additional Bays)

Denotes Qty Adjustment by RST

FERC Line #	Sub Categories								Description	Quantity	Units	Unit Price	Line Price	Total	Notes / Remarks
									2" Shotcrete	0	SF	$ 5.26	$ -		
								Tunnels-Access					$ -		
									Concrete Slab	160	CY	$ 944.82	$ 150,000		
									Concrete Overbreak 6"	80	CY	$ 755.86	$ 60,000		
									Reinforcing Steel	6	TON	$ 2,887.51	$ 20,000		
									2" Shotcrete	538	SF	$ 5.26	$ -		
								Shafts					$ -		
									2" Shotcrete	4,000	SF	$ 5.26	$ 20,000		
								Portals					$ -		
									Concrete	16	CY	$ 406.36	$ 10,000		
									Reinforcing Steel	2	TON	$ 2,887.51	$ -		
			0.325				Support and Anchors						$ -		
								Tunnels- Core Area					$ -		
									Rockbolts 3/4" @6'	0	EA	$ 327.15	$ -		
									Steel Mesh	0	SF	$ 5.37	$ -		
									Steel Support	0	TON	$ 12,801.49	$ -		
								Tunnels- Access					$ -		
									Rockbolts 3/4" @6'	120	EA	$ 327.15	$ 40,000		
									Steel Mesh	110	SF	$ 5.37	$ -		
									Steel Support	2	TON	$ 12,801.49	$ 30,000		
								Shafts					$ -		
									Rockbolts 3/4" @6'	280	EA	$ 327.15	$ 90,000		
									Steel Mesh	800	SF	$ 5.37	$ -		
								Portals					$ -		
									Rockbolts 1" @15'	24	EA	$ 735.81	$ 20,000		
			0.329				Architectural Portal Doors						$ -		
								Portal Doors		1	LS	$ 33,900.00	$ 30,000		
		0.33				Instrumentation							$ -		
			0.331				Instrumentation			1	LS	$ 8,657,610.00	$ 8,660,000		
	0.4			Relict Channel									$ -		
		0.41				Shore Protection							$ -		
			0.411				Excavation						$ -		
								Overburden Stripping 2' thick		2,200	CY	$ 11.56	$ 30,000		
			0.412				Fill						$ -		
								Dump and Spread					$ -		
									Filter Material - 2' layer	2,200	CY	$ 31.93	$ 70,000		
									Rock Spalls/ Rip Rap- 3' Ave	3,300	CY	$ 9.86	$ 30,000		
								Shore Protection					$ -		
									Rip Rap	24,000	CY	$ 24.26	$ 580,000		
									Waste Rock	24,000	CY	$ 22.78	$ 550,000		
		0.44				Channel Filter Blanket							$ -		
			0.442				Fill						$ -		
								Coarse Filter		2,900,000	CY	$ 33.85	$ 98,170,000		
								Fine Filter		2,180,000	CY	$ 43.65	$ 95,160,000		
								Rip Rap		182,000	CY	$ 24.26	$ 4,420,000		
			0.443				Surface preparation						$ -		
								Foundation Prep					$ -		
									Clearing and Grubbing	460	ACRE	$ 3,963.11	$ 1,820,000		
									Excavation	2,236,000	CY	$ 15.62	$ 34,930,000		
	0.5			Outlet Facilities											
		0.51				Outlet Facilities- (Intake Civil Work Include in Power Intake)									
			0.511				Excavation								
								Inlet		(Included in 332.611)					
								Outlet		(Included in 332.521)					
								Tunnels							
									Rock Horizontal	0	CY	$ 103.00	$ -		
									Rock Inclined	0	CY	$ 183.49	$ -		
			0.513				Surface Preparation/ Grouting								
								Inlet		(Included in 332.613)					
								Outlet		(Included in 332.523)					
								Tunnels		0	SF	$ 2.30	$ -		
								Contact Grouting		0	LS	$ 569,428.05	$ -		
			0.514				Concrete and Shotcrete								
								Inlet		(Included in 332.614)					
								Outlet		(Included in 332.524)					
								Tunnels							
									Concrete Lining	0	CY	$ 944.82	$ -		
									Concrete Overbreak 6"	0	CY	$ 440.92	$ -		
									2" Shotcrete	0	SF	$ 5.26	$ -		
									3" Shotcrete	0	SF	$ 7.69	$ -		
			0.515				Support and Anchors								
								Inlet		(Included in 332.615)					
								Outlet		(Included in 332.525)					
								Tunnels							
									Rock Bolts 1" @6'	0	EA	$ 327.15	$ -		
									Steel Mesh	0	SF	$ 6.37	$ -		
			0.516				Mechanical - Low Level Outlet								
								Inlet							
									Trash Racks/Guides	1	LS	$ 1,540,500.00	$ 1,541,000		
									Gate Equipment	2	EA	$ 3,317,040.00	$ 6,634,000		
									Stoplog Guides	2	SETS	$ 213,940.00	$ 428,000		

Low Watana RCC (Expandable) Alternative (4 Turbines + 2 Additional Bays)

Denotes Qty Adjustment by RST

FERC Line #	Sub Categories							Description	Quantity	Units	Unit Price	Line Price	Total	Notes / Remarks
								Outlet						
								Fixed Cone Valves 6 +1 Spare	1	LS	$ 4,500,630.00	$ 4,501,000		
								Ring Follower Gates	6	EA	$ 1,936,494.80	$ 11,619,000		
								Steel Manifold Liner	1,100	TON	$ 8,952.53	$ 9,848,000		
								Misc Mechanical Equipment	1	LS	$ 948,000.00	$ 948,000		
								Misc Electrical Systems	1	LS	$ 237,000.00	$ 237,000		
		0.52						Main (Chute) Spillway (Includes Civil Works for Outlet Facilities)						
			0.522					Stepped Spillway						
								Conventional Concrete - Steps	55,300	CY	$ 544.85	$ 30,130,000		
								Reinforcing Steel - Steps	1,340	TON	$ 2,887.51	$ 3,869,000		
								Conventional Concrete - Training Walls	3,600	CY	$ 544.85	$ 1,961,000		
								Reinforcing Steel - Training Walls	90	TON	$ 2,887.51	$ 260,000		
			0.523					Stilling Basin						
								Conventional concrete	8,400	CY	$ 544.85	$ 4,577,000		
								Reinforcing Steel	185	TON	$ 2,887.51	$ 534,000		
								Excavation Rock	13,000	CY	$ 50.18	$ 652,000		
			0.524					Consolidation Grouting						
								Drill Holes	7,000	LF	$ 11.91	$ 83,000		
								Cement	7,000	CF	$ 67.81	$ 475,000		
								Grout Curtain						
			0.525					Support and Anchors						
								Drainage Tunnel						
								Steel Support	7	TON	$ 12,801.49	$ 90,000		
								Steel Mesh	1,000	SF	$ 5.87	$ 6,000		
								Rockbolts Drainage Gallery						
								3/4" @ 6'	576	EA	$ 330.19	$ 190,000		
								Rockbolts Approach						
								1" @ 15'	275	EA	$ 741.28	$ 204,000		
								Rockbolts Chute and Structure						
								1" @ 15'	112	EA	$ 741.28	$ 83,000		
								Rockbolts Valve Block/Bucket						
								1" @ 15'	46	EA	$ 741.28	$ 34,000		
								Slab/Wall Anchors						
								1" @ 10'	9,300	EA	$ 474.06	$ 4,409,000		
			0.527					Drainage						
								Drill Holes						
								Box Drains (To Drain Tunnel)	54,000	LF	$ 47.95	$ 2,589,000		
								3" Relief	640	LF	$ 49.50	$ 32,000		
			0.52c					Mechanical						
								Gate Equipment	0	EA	$ 4,249,280.00	$ -		
								Stoplog Guides	0	SETS	$ 92,196.88	$ -		
								Stoplogs Includes Follower	0	SET	$ 945,840.00	$ -		
								Misc Electrical	0	LS	$ 237,000.00	$ -		
	0.6							Power Intake (Inc Inlet exec and Inlet Structure Civil Works for Outlet)						(same as embankment dam)
		0.61						Intake Structure and Approach						
			0.611					Excavation						
								Overburden	19,100	CY	$ 14.87	$ 284,000		764,000 Cyd calculated Excavation Volume. Assume 25% is overburden
								Rock Usable	573,000	CY	$ 40.27	$ 23,075,000		764,000 Cyd calculated Excavation Volume. Assume 75% is rock exc.
			0.613					Surface Preparation						
								Horizontal	125,000	SF	$ 2.30	$ 288,000		Calculated 125,000 sq ft
								Inclined	151,000	SF	$ 3.33	$ 503,000		Calculated 60,300 sq ft
			0.614					Concrete and Shotcrete						
								Structure						
								Concrete Structure	121,000	CY	$ 544.85	$ 65,927,000		Same as embankment, as power intake and outlet structure intake will be similar
								Concrete - Apron Slab	3,500	CY	$ 545.85	$ 1,910,000		Same as embankment, as power intake and outlet structure intake will be similar
								Concrete Overbreak 12" H/6" V	0	CY	$ 336.99	$ -		No Overbreak if formed integral to dam
								Reinforcing Steel	7,870	TON	$ 2,887.51	$ 22,725,000		Same as embankment, as power intake and outlet structure intake will be similar
			0.615					Supports and Anchors- 1" @ 15'	400	EA	$ 735.81	$ 294,000		
			0.61c					Mechanical						
								Trashracks and Guides	4	SETS	$ 1,080,960.00	$ 4,324,000		
								Gate Equipment	4	EA	$ 1,902,720.00	$ 7,611,000		
								Bulkhead Gates Guides	4	SETS	$ 225,200.00	$ 901,000		
								Bulkhead Gates inc Follower	1	SET	$ 698,120.00	$ 698,000		
								Shutter with Guides	4	SETS	$ 720,640.00	$ 2,883,000		
								Iceboom with Hoist	4	SETS	$ 1,238,600.00	$ 4,954,000		
								Iceboom Guides	4	SETS	$ 563,000.00	$ 2,252,000		
								Intake Service Crane	1	EA	$ 693,700.00	$ 694,000		
								Bubbler System	1	LS	$ 948,000.00	$ 948,000		
								Misc Electrical	1	LS	$ 237,000.00	$ 237,000		
			0.61d					Intake Building	1	LS	$ 237,000.00	$ 237,000		
	0.7							Surge Chamber						
		0.71						Surge Chamber						
			0.711					Excavation						
								Chamber Rock	0	CY	$ 90.12	$ -		
								Vent Shaft Rock	0	CY	$ 601.04	$ -		
			0.713					Surface Preparation	0	SF	$ 2.30	$ -		
			0.714					Concrete and Shotcrete						
								Concrete	0	CY	$ 513.35	$ -		
								Concrete Overbreak	0	CY	$ 440.92	$ -		
								Reinforcing Steel	0	TON	$ 2,858.29	$ -		
								4" Shotcrete	0	SF	$ 10.13	$ -		

Low Watana RCC (Expandable) Alternative (4 Turbines + 2 Additional Bays)

Denotes Qty Adjustment by RST

FERC Line #	Sub Categories			Description	Quantity	Units	Unit Price	Line Price	Total	Notes / Remarks
				Vent Shaft						
				2" Shotcrete	0	SF	$ 5.26	$ -		
			0.715	Supports and Anchors						
				Rockbolts 1" @25' HY	0	EA	$ 1,234.86	$ -		
				Rockbolts 1" @ 15'	0	EA	$ 735.81	$ -		
				Steel Mesh	0	SF	$ 5.81	$ -		
				Steel Support	0	TON	$ 12,671.94	$ -		
				Vent Shaft						
				Rock bolts 3/4" @ 6'	0	EA	$ 327.15	$ -		
				Steel Mesh	0	SF	$ 6.30	$ -		
			0.717	Drainage Holes (In Chamber)	0	LF	$ 47.95	$ -		
			0.71c	Mechanical						
				Stoplog Guides	0	SETS	$ 709,380.00	$ -		
				Stoplog Includes Follower	0	SET	$ 3,558,160.00	$ -		
	0.8			Penstocks						
		0.81		Penstocks						
			0.811	Excavation						
				Tunnels						
				Rock Horizontal	116,946	CY	$ 144.77	$ 16,930,000		Increase by ratio of penstock length (2350/1075) = 2.19
				Rock Inclined	54,000	CY	$ 286.15	$ 15,452,000		
			0.813	Surface Preparation/Grouting						Increase by ratio of penstock length (2350/1075) = 2.19
				Surface Preparation						Increase by ratio of penstock length (2350/1075) = 2.19
				Tunnels	827,820	SF	$ 3.33	$ 2,757,000		Increase by ratio of penstock length (2350/1075) = 2.19
				Contact Grouting						Increase by ratio of penstock length (2350/1075) = 2.19
				Contact Grouting	1	LS	$ 1,258,336.33	$ 1,258,000		Increase by ratio of penstock length (2350/1075) = 2.19
				Consolidation Grouting						Increase by ratio of penstock length (2350/1075) = 2.19
				Consolidation Grouting	1	LS	$ 1,746,016.92	$ 1,746,000		Increase by ratio of penstock length (2350/1075) = 2.19
			0.814	Concrete and Shotcrete						Increase by ratio of penstock length (2350/1075) = 2.19
				Concrete Liner	81,468	CY	$ 970.01	$ 79,025,000		Increase by ratio of penstock length (2350/1075) = 2.19
				Concrete Overbreak 6"	23,214	CY	$ 692.87	$ 16,084,000		Increase by ratio of penstock length (2350/1075) = 2.19
				Reinforcing Steel	59	TON	$ 2,858.29	$ 169,000		Increase by ratio of penstock length (2350/1075) = 2.19
				3" Shotcrete	74,460	SF	$ 7.69	$ 573,000		Increase by ratio of penstock length (2350/1075) = 2.19
				2" Shotcrete	45,552	SF	$ 5.26	$ 240,000		Increase by ratio of penstock length (2350/1075) = 2.19
			0.815	Support and Anchors						Increase by ratio of penstock length (2350/1075) = 2.19
				Rockbolts 1" @ 25'	329	EA	$ 1,234.86	$ 406,000		Increase by ratio of penstock length (2350/1075) = 2.19
				Rockbolts 1" @ 6'	9,198	EA	$ 327.15	$ 3,009,000		Increase by ratio of penstock length (2350/1075) = 2.19
				Steel Mesh	422,670	SF	$ 6.37	$ 2,692,000		Increase by ratio of penstock length (2350/1075) = 2.19
			0.818	Structural Misc Steelwork	5,256	TON	$ 9,673.24	$ 50,843,000		Increase by ratio of penstock length (2350/1075) = 2.19
	0.9			Tailrace Works (1 Portal with Combined Tailrace/Diversion Tunnel						
		0.91		Tailrace Tunnels/Portals						
			0.911	Excavation						
				Tunnels						
				Rock	0	CY	$ 103.00	$ -		
				Portals						
				Overburden	0	CY	$ 17.14	$ -		
				Rock Usable	0	CY	$ 49.16	$ -		
				Rock Waste	0	CY	$ 49.16	$ -		
			0.913	Surface Preparation						
				Tunnels						
				Tunnels	0	SF	$ 3.33	$ -		
				Portals						
				Horizontal	0	SF	$ 2.30	$ -		
				Inclined	0	SF	$ 3.33	$ -		
			0.914	Concrete and Shotcrete						
				Tunnels						
				Concrete Lining	0	CY	$ 440.92	$ -		
				Concrete Overbreak 6"	0	CY	$ 314.94	$ -		
				2" Shotcrete	0	SF	$ 5.26	$ -		
				Reinforcing Steel	0	TON	$ 2,887.51	$ -		
				Portals						
				Concrete Base Slab	0	CY	$ 651.93	$ -		
				Concrete Walls	0	CY	$ 651.93	$ -		
				Concrete Overbreak 12" H/6" V	0	CY	$ 471.65	$ -		
				Reinforcing Steel	0	TON	$ 2,887.51	$ -		
			0.915	Support and Anchors						
				Tunnels						
				Rockbolts 1" @ 12'	0	EA	$ 528.34	$ -		
				Rockbolts 1" @ 9'	0	EA	$ 432.12	$ -		
				Steel Support	0	TONS	$ 12,801.49	$ -		
				Steel Mesh	0	SF	$ 6.37	$ -		
				Portals						
				Rockbolts 1" @ 15'	0	EA	$ 735.81	$ -		
			0.91c	Mechanical						
				Stoplog Guides	0	SET	$ 112,600.00	$ -		
				Stoplogs Includes Follower	0	SET	$ 751,200.00	$ -		
		0.92		Tailrace Outlet Channel						
				Tailrace Outlet Channel Concrete - Slab	5,569	CY	$ 544.85	$ 3,030,000		Multiply by ratio of increased structure length (485/365) = 1.329
				Tailrace Outlet Channel Concrete - Training Wallls	1,185	CY	$ 544.85	$ 650,000		
				Tailrace Reinforcing Steel	553	TON	$ 2,858.29	$ 1,580,000		Used same Ratio of reinforcing steel to concrete volume for draft tubes (660/8000).
									$ 1,860,300,000	for embankment dam $ 3,202,800,000
333			**Waterwheels, Turbines and Generators**							

Low Watana RCC (Expandable) Alternative (4 Turbines + 2 Additional Bays)

Denotes Qty Adjustment by RST

FERC Line #	Sub Categories				Description	Quantity	Units	Unit Price	Line Price	Total	Notes / Remarks
		0.11			Turbines and Governors						
			0.111		Supply						
			0.112		Install						
	0.2				Generators and Exciters						
		0.21			Generators and Exciters (Supply and Install)						
			0.211		Generators and Exciters						
	0.3				Total Bid From Vendor (includes all equipment in this category)	4	EA	$ 74,200,000.00	$ 297,000,000	**$ 297,000,000**	*Still only purchase (4) 150 MW Units
					Average from acquired quotes						
334			**Accessory Electrical Equipment**								
	0.1				Connections, Supports and Structures						
		0.11			Structures						
			0.111		Structures (included Below)						
		0.12			Conductors and Insulators						
			0.121		Generator Isolated Phase Bus	1	LS	$ 5,056,000.00	$ 5,060,000		
			0.122		HV Power Cables and Accessories	1	LS	$ 2,054,000.00	$ 2,050,000		
			0.123		LV Power Cables and Accessories	1	LS	$ 948,000.00	$ 950,000		
			0.124		Control Cables and Accessories	1	LS	$ 1,738,000.00	$ 1,740,000		
			0.125		Grounding System	1	LS	$ 237,000.00	$ 240,000		
		0.13			Conduits and Fittings						
			0.131		Conduits and Fittings	1	LS	$ 632,000.00	$ 630,000		
	0.2				Switchgear and Control Equipment						
		0.21			Auxiliary Transformers						
			0.211		Auxiliary Transformers	4	EA	$ 83,811	$ 340,000		*Assumes 2 additional systems would be purchased at time of expansion.
		0.22			Circuit Breakers Generators				$ -		
			0.221		Circuit Breakers Generators	4	EA	$ 1,504,300	$ 6,020,000		*Assumes 2 additional transformers would be purchased at time of expansion.
		0.23			Surge Protectors and Generator Cubicles						
			0.231		Surge Protectors and Generator Cubicles	1	LS	$ 726,800.00	$ 730,000		*Assumes 2 additional systems would be purchased at time of expansion.
		0.24			Switch boards						
			0.241		Switch boards	1	LS	$ 1,232,400.00	$ 1,230,000		*Assumes 2 additional systems would be purchased at time of expansion.
		0.25			Auxiliary Power Equipment						
			0.251		Auxiliary Power Equipment	1	LS	$ 347,600.00	$ 350,000		*Assumes 2 additional systems would be purchased at time of expansion.
	0.3				Cubicles and Appurtenances						
		0.31			Control, relay and meter boards						
			0.311		Control, relay and meter boards	1	LS	$ 1,422,000.00	$ 1,420,000		*Assumes 2 additional systems would be purchased at time of expansion.
		0.32			Computer Control System						
			0.321		Computer Control System	(Included in Trans-Ems)					
		0.33			Supervisor and Telemeter System						
			0.331		Supervisor and Telemeter System	Included in Trans EMS)					
	0.4				Power Transformers						
		0.41			Power Transformers						
			0.411		Power Transformers	7	EA	$ 2,000,000	$ 14,000,000		
	0.5				Lighting System						
		0.51			Powerhouse and Transformer Gallery						
			0.511		Powerhouse and Transformer Gallery	1	LS	$ 1,824,900.00	$ 1,820,000		
		0.52			Access Tunnels and Roads						
			0.521		Access Tunnels and Roads	0	LS	$ 402,900.00	$ -		
	0.6				Misc. Electrical Equipment						
		0.61			Misc. Electrical Equipment						
			0.611		Misc. Electrical Equipment	1	LS	$ 625,680.00	$ 630,000		
	0.7				Surface Accessory Equipment						
		0.71			34.5 kV and LV Equipment						
			0.711		Switchboard	1	LS	$ 213,300	$ 210,000		
			0.712		Cables	1	LS	$ 450,300	$ 450,000		
			0.713		Aux Transformers	1	LS	$ 284,400	$ 280,000		
		0.73			Diesel Generator- Standby						
			0.731		Diesel Generator- Standby	2	EA	$ 347,550	$ 700,000		
		0.74			Exterior Lighting						
			0.741		Exterior Lighting	1	LS	$ 355,500	$ 360,000		
		0.75			Mimic Board- Control Building						
			0.751		Mimic Board- Control Building	1	LS	$ 1,185,000	$ 1,190,000		
										$ 40,000,000	
335			**Misc Powerplant Equipment**								
	0.1				Auxiliary Systems- Underground						Used Full Watana Data
		0.11			Station Water Systems						Used Full Watana Data
			0.111		Station Water Systems	1	LS	$ 4,977,000.00	$ 4,977,000		Used Full Watana Data
		0.12			Fire Protection Systems						Used Full Watana Data
			0.121		Fire Protection Systems	1	LS	$ 2,844,000.00	$ 2,844,000		Used Full Watana Data
		0.13			Compressed Air Systems						Used Full Watana Data
			0.131		Compressed Air Systems	1	LS	$ 3,555,000.00	$ 3,555,000		Used Full Watana Data
		0.14			Oil Handling Systems						Used Full Watana Data
			0.141		Oil Handling Systems	1	LS	$ 2,370,000.00	$ 2,370,000		Used Full Watana Data
		0.15			Drainage & Dewatering						Used Full Watana Data
			0.151		Drainage & Dewatering	1	LS	$ 5,214,000.00	$ 5,214,000		Used Full Watana Data
		0.16			Heating, Ventilation and Cooling System						Used Full Watana Data
			0.161		Heating, Ventilation and Cooling System	1	LS	$ 3,555,000.00	$ 3,555,000		Used Full Watana Data
		0.17			Miscellaneous						Used Full Watana Data

Low Watana RCC (Expandable) Alternative (4 Turbines + 2 Additional Bays)

Denotes Qty Adjustment by RST

FERC Line #	Sub Categories	Description	Quantity	Units	Unit Price	Line Price	Total	Notes / Remarks
	0.171	Miscellaneous	1	LS	$ 2,370,000.00	$ 2,370,000		Used Full Watana Data
	0.2	Auxiliary Systems- Surface Facilities						Used Full Watana Data
	0.21	Auxiliary Systems- Surface Facilities						Used Full Watana Data
	0.211	Auxiliary Systems- Surface Facilities	1	LS	$ 711,000.00	$ 711,000		Used Full Watana Data
	0.3	Auxiliary Equipment						Used Full Watana Data
	0.31	Powerhouse Cranes						Used Full Watana Data
	0.311	Powerhouse Cranes	2	EA	$ 1,783,800.00	$ 3,568,000		Used Full Watana Data
	0.32	Elevators						Used Full Watana Data
	0.321	Elevators	1	LS	$ 545,100.00	$ 545,000		Used Full Watana Data
	0.33	Miscellaneous Cranes and Hoists						Used Full Watana Data
	0.331	Miscellaneous Cranes and Hoists	1	LS	$ 505,500.00	$ 506,000		Used Full Watana Data
	0.34	Machine Shop Equipment						Used Full Watana Data
	0.341	Machine Shop Equipment	1	LS	$ 2,022,000.00	$ 2,022,000		Used Full Watana Data
	0.4	General Station Equipment	(Included in Mechanical And Electrical Systems)					Used Full Watana Data
	0.5	Communications Equipment	1	LS	$ 213,300.00	$ 213,000		Used Full Watana Data
							$ 32,000,000	
336	**Roads, Rails and Air Facilities**							
	0.1	Roads						
	0.11	Pioneer Roads and Bridges						
	0.111	Gold Creek- Watana						
		Road (58 mi)						
		Clearing	0	ACRE	$ 11,416.62	$ -		
		Waste Excavation	0	CY	$ 9.51	$ -		
		Common Excavation	0	CY	$ 8.32	$ -		
		18" Culverts	0	LF	$ 62.55	$ -		
		36" Culverts	0	LS	$ 32,760.98	$ -		
		D-1 Base Material	0	TON	$ 45.47	$ -		
		Fabric	0	SY	$ 6.73	$ -		
		Maintenance	0	MI/YR	$ 9,008.99	$ -		
	0.112	Gold Creek- Parks						
		Road (41.25 Miles)						
		Clearing	0	ACRE	$ 11,416.62	$ -		
		Waste Excavation	0	CY	$ 9.51	$ -		
		Common Excavation	0	CY	$ 8.32	$ -		
		18" Culverts	0	LF	$ 62.55	$ -		
		36" Culverts	0	LS	$ 35,451.31	$ -		
		D-1 Base Material	0	TON	$ 45.47	$ -		
		Fabric	0	SY	$ 6.73	$ -		
		Maintenance	0	MI/YR	$ 9,008.32	$ -		
	0.113	Devil Canyon Low Level Crossing						
		Crossing (7.88 Miles)						
		Clearing	0	ACRE	$ 11,416.62			
		Waste Excavation	0	CY	$ 9.51			
		Common Excavation	0	CY	$ 8.32			
		Rock Excavation	0	CY	$ 28.45			
		18" Culverts	0	LF	$ 62.55			
		Bridge	0	LS	$ 120,000,000.00			
		D-1 Base Material	0	TON	$ 45.47			
		Maintenance	0	MI/YR	$ 11,258.74			
	0.114	Gold Creek- Watana (41.25 miles)	0	LS	$ 28,132,000			
	0.12	Permanent Roads and Bridges						
	0.124	Parks Highway to Watana (62 mi)	0	MI	$ 3,000,000.00	$ -		
	0.125	Susitna Bridge	0	SF	$ 450.00	$ -		
	0.2	Rail Facilities						
	0.24	Permanent Railroad (including railheads)						
	0.244	Gold Creek to Watana- Rail						
		R-1, (33 Mi)						
		Clearing	671	AC	$ 11,416.62	$ 7,662,183		
		Waste Excavation	1687883	CY	$ 9.51	$ 16,051,766		
		Common Excavation	3307678	CY	$ 8.32	$ 27,519,880		
		Rock Excavation	9114	CY	$ 28.51	$ 259,867		
		Borrow	449500	CY	$ 11.88	$ 5,340,060		
		Subballast	711055	CY	$ 18.15	$ 12,902,807		
		Grade "A" Base Material	6650	CY	$ 35.45	$ 235,729		
		D-1 Base material	2400	TON	$ 43.20	$ 103,680		
		A.C. Surfacing	2200	TON	$ 198.00	$ 435,600		
		Dock Lumber	16	MBF	$ 1,258.60	$ 20,138		
		18" Culvert	20093	LF	$ 68.26	$ 1,371,458		
		36" + Culverts	0	LS	$ 92,160.00	$ -		
		Fabric	12930	SY	$ 9.00	$ 116,369		
		Thaw Pipes	41843	LF	$ 95.04	$ 3,976,745		
		Topsoil & Seed	431	AC	$ 10,800.00	$ 4,653,257		
		Rail Yard Control Devices	1	LS	$ 1,800.00	$ 1,800		
		Bridges	0	SF	$ 900.00	$ -		
		Trackage	325940	LF	$ 350.00	$ 114,079,000		
		Maintenance						
		Rail	406	Mile-years	$ 10,000.00	$ 4,060,000		

Low Watana RCC (Expandable) Alternative (4 Turbines + 2 Additional Bays)

Denotes Qty Adjustment by RST

FERC Line #	Sub Categories									Description	Quantity	Units	Unit Price	Line Price	Total	Notes / Remarks
										Railhead	7	years	$ 75,000.00	$ 525,000		
			0.13							Site Roads						
				0.131						Construction Roads						
										Site Roads	20	Mile	$ 750,000.00	$ 15,000,000		
										Maintenance	102	MI/YRS	$ 223,092.85	$ 22,755,000		
				0.132						Permanent Roads						
										Permanent Roads	6	MILE	$ 1,287,997.42	$ 7,728,000		
	0.3									Airstrip						
		0.31								Airstrip						
										Permanent Airstrip	1	LS	$ 12,798,000.00	$ 12,798,000		
										9 years maintenance savings	1	LS				
										Temporary Airstrip	1	LD	$ 2,133,000.00	$ 2,133,000		
	0.4									Saved Maintenance	1	LS	$ (5,067,889.52)	$ (5,068,000)		
															$ 254,700,000	
				Transmission Plant												
350				**Land and Land Rights**												
										Land and Land Rights						
										Transmission	33	MILE	$ 86,720.00	$ 2,862,000		Copied from Low Watana Non Expandable
										Substations (4 Sites)	0	LS	$ 2,607,000.00	$ -		Left the same as Full Watana RCC
															$ 2,862,000	
352				**Substation and Switching Station**												
	0.1									Switchyard						
		0.11								Switchyard	2	LS	$ 14,000,000.00	$ 28,000,000		Left the same as Full Watana RCC
															$ 28,000,000	
353				**Substation/Switching Station Equipment**												
										Ester	0	LS	$ 57,922,800.00	$ -		
										Willow	0	LS	$ 3,613,020.00	$ -		
										Knik Arm	0	LS	$ 29,838,300.00	$ -		
										University	0	LS	$ 88,685,400.00	$ -		
										Devil Canyon	0	LS	$ 35,585,550.00	$ -		
										Willow Energy Management System (EMS)						
										Equipment and System Costs	0	LS	$ 27,326,100.00	$ -		
										Microwave Communication Equipment	0	LS	$ 11,660,400.00	$ -		
										EMS Control Center Building	0	LS	$ 9,148,200.00	$ -		
										Watana and Devil Canyon In-plant Monitor and Control Equipment	0	LS	$ 8,619,690.00	$ -		
															$ -	
354				**Steel Towers and Fixtures**												
										Towers (Including Foundation and Hardware)	33	miles	$ 4,500,000.00	$ 148,500,000		Used same length as Transmission Land Rights
															$ 148,500,000	
356				**Conductors and Devices**												
										Conductors	0	MILE	$ 218,281.33	$ -		
										Submarine Cables	0	EACH	$ 15,808,340.56	$ -		
															$ -	
359				**Roads and Trails**												
										Roads and Trails	200	MILE	$ 75,744.00	$ 15,149,000		Left the same as Full Watana RCC
										Clearing and Roads	340	MILE	$ 37,872.00	$ 12,876,000		Left the same as Full Watana RCC
															$ 28,000,000	$ 207,362,000
-																
				General Plant												
389				**Land and Land Rights**												
										Land and Land Rights				$ -		
390				**Structures and Improvements**												
										Structures and Improvements				$ -		
391				**Office Furniture and Equipment**												
										Office Furniture and Equipment				$ -		
392				**Transportation Equipment**												
										Transportation Equipment				$ -		
393				**Stores Equipment**												
										Stores Equipment				$ -		
394				**Tools Shop and Garage Equipment**												
										Tools Shop and Garage Equipment				$ -		
395				**Laboratory Equipment**												
										Laboratory Equipment				$ -		
396				**Power-Operated Equipment**												

Low Watana RCC (Expandable) Alternative (4 Turbines + 2 Additional Bays)

Denotes Qty Adjustment by RST

FERC Line #	Sub Categories	Description	Quantity	Units	Unit Price	Line Price	Total	Notes / Remarks
		Power-Operated Equipment				$ -		
397		**Communications Equipment**						
		Communications Equipment				$ -		
398		**Miscellaneous Equipment**						
		Miscellaneous Equipment				$ -		
399		**Other Tangible Property**						
		Other Tangible Property	1	LS	$ 16,000,000	$ 16,000,000		Copied from Low Watana Non Expandable
		Saved Maintence	1	LS	$ (231,220)	$ (231,000)		Copied from Low Watana Non Expandable
							$ 15,800,000	
		Indirect Costs						
61		**Temporary Construction Facilities**						
		Temporary Construction Facilities						
62		**Construction Equipment**						
		Construction Equipment						
63		**Main Construction Camp**						
	0.1	Main Construction Camp	1	LS	$ 316,340,280			Reduce Unit price by ratio of Low Watana Volume to High Watana Volume = (7.6/15.0)
		Saved Maintence	1	LS	$ (6,172,493.27)			
		Site Preparation	3270533					Reduce Qty by ratio of Low Watana Volume to High Watana Volume = (7.6/15.0)
		Buildings	15019120					Reduce Qty by ratio of Low Watana Volume to High Watana Volume = (7.6/15.0)
		utilities	12172667					Reduce Qty by ratio of Low Watana Volume to High Watana Volume = (7.6/15.0)
			30462320	5	$ 152,311,600.00			Reduce Qty by ratio of Low Watana Volume to High Watana Volume = (7.6/15.0)
		MAIN CONSTRUCTION VILLAGE						
		site prep	3540080					Reduce Qty by ratio of Low Watana Volume to High Watana Volume = (7.6/15.0)
		buildings	10008187					Reduce Qty by ratio of Low Watana Volume to High Watana Volume = (7.6/15.0)
		utilities	4914160					Reduce Qty by ratio of Low Watana Volume to High Watana Volume = (7.6/15.0)
			18462426.67	5	$ 92,312,133.33			
						$ 152,311,600	**$ 123,800,000**	**Camp cost to reflect lower volume (0.8125) *Previous Estimate doesn't total Con. Camp C**
64		**Labor Expense**						
		Labor Expense	(Included In Direct Costs)					
65		**Superintendence**						
		Superintendence	(Included In Direct Costs)					
66		**Insurance**						
		Insurance	(Included In Direct Costs)					
68		**Mitigation Fishery, Terrestrial and Recrational**						
		Mitigation	(Not included in 1982 study)			$ -		
69		**Fees**						
		Fees						
Subtotal						Direct Construction Cost	**$ 3,113,300,000**	
	Contingency		**21.313**	%			**$ 663,500,000**	Used Same Contingency as Full RCC
Subtotal								
71A		**Engineering (4%), Enviornmental (2%), Regulatory(1%) and Construction Management (4%**	**7**	**%**			**$ 217,900,000**	
71B		**Construction Management (4%)**	**4**	**%**			**$ 124,500,000**	
72		**Legal Expenses**	**0**	**%**				
75		**Taxes**	**0**	**%**				
76		**Administrative & Gen. Expenses**	**0**	**%**				
77		**Interest**	**0**	**%**				
80		**Earnings/Expenses During Construction**	**0**	**%**				
Total Project Cost							**$ 4,119,200,000**	

r of Years for Base Case 20.5 years

of Years for Full Watana 16.5 years

HDR/AEA Susitna Hydroelectric Project
Cost Estimates for 1982 quantities- Alternatives
By: DTA
By: Leanne Andruszkiewicz, EIT Date: 1/25/09
Reviewed By: David Elwood, EIT Date: 1/25/09, Modified by Hatch Acres_mb_061109, R&M 11/16/09
Alternatives- 2008 Dollars
Low Watana RCC (Non-Expandable) Estimate 10/28/10 used as basis
Modified by Hatch Associates Consultants, Inc._RST_10/28/10
Low Watana RCC Arch Alternative (4 Turbines)

Denotes Qty Adjustment by RST

FERC Line #	Sub Categories			Description	Quantity	Units	Unit Price	Line Price	Total	Notes / Remarks
330				**Land and Land Rights**						
	0.1			Land	1	LS	$ 120,870,000.00	$ 120,870,000		
	0.2			Land Rights	Included Above					
	0.3			Misc Charges in Credit Above	Included Above					
									$ 120,900,000	
331				**Powerplant Structure Improvements**						
	0.1			Powerhouse						
		0.11		Powerhouse and Draft Tube						
			0.111	Excavation						
				Powerhouse Rock	914,400	CY	$ 43.72	$ 39,978,000		
				Powerhouse Overburden	609,600	CY	$ 11.53	$ 7,029,000		
				Draft Tube Rock	0	CY	$ 90.12	$ -		
Total	Total Estimat		0.113	Surface Preparation/ Grouting						
				Powerhouse	108,000	SF	$ 3.33	$ 360,000		
				Draft Tube	0	SF	$ 3.33	$ -		
				Grout Curtain- Drill holes	47,700	LF	$ 27.63	$ 1,318,000		
				Grout Curtain- Cement	19,000	CF	$ 81.10	$ 1,541,000		
			0.114	Concrete and Shot Crete						
				Powerhouse Concrete	62,356	CY	$ 544.85	$ 33,970,000		
				Powerhouse Concrete Overbreak	0	CY	$ 447.21	$ -		
				Powerhouse Reinforcing Steel	3,118	TON	$ 2,858.29	$ 8,910,000		
				Powerhouse 4" Shotcrete	0	SF	$ 10.14	$ -		
				Draft Tube Concrete	0	CY	$ 692.87	$ -		
				Draft Tube Concrete Overbreak	0	CY	$ 447.21	$ -		
				Draft Tube Reinforcing Steel	0	TON	$ 2,858.29	$ -		
				Draft Tube 2" Shotcrete	0	SF	$ 5.45	$ -		
			0.115	Support and Anchors						
				Powerhouse Rockbolts 1" @ 25' Hy	148	EA	$ 1,234.86	$ 180,000		
				Powerhouse Rockbolts 1" @ 15'	301	EA	$ 735.81	$ 220,000		
				Powerhouse Steel Mesh	6,821	SF	$ 5.81	$ 40,000		
				Powerhouse Steel Support	21	TON	$ 12,671.94	$ 270,000		
				Draft Tube Rockbolts 1" @ 25' Hy	0	EA	$ 1,234.86	$ -		
				Draft Tube Rockbolts 1" @ 12'	0	EA	$ 528.34	$ -		
				Draft Tube Rockbolts 1" @ 9'	0	EA	$ 432.12	$ -		
				Draft Tube Steel Mesh	0	SF	$ 6.55	$ -		
			0.117	Holes (U/S of Powerhouse)	0	LF	$ 51.32	$ -		
				Holes (Powerhouse Crown)	0	LF	$ 51.32	$ -		
			0.118	Structural- Misc Steelwork				$ -		
				Powerhouse and Draft Tube- Steel Crane Rails	1	LS	$ 10,276,309.00	$ 10,280,000		
			0.119	Architectural- Powerhouse	1	LS	$ 5,500,000.00	$ 5,500,000		
y			0.11c	Mechanical						
				Draft Tube Gates	4	SETS	$ 427,880.00	$ 1,712,000		
				Draft Tube Gate Guides	4	SETS	$ 202,680.00	$ 811,000		
				Draft Tube Crane	1	LS	$ 1,140,000.00	$ 1,140,000		
		0.12		Access Tunnels and Portals						
			0.121	Excavation						
				Main Tunnel	0	CY	$ 97.45	$ -		
				Transformer Gallery Tunnel	0	CY	$ 97.45	$ -		
				Grouting Gallery Tunnel	0	CY	$ 396.04	$ -		
				Surge Chamber Access Tunnel	0	CY	$ 145.22	$ -		
				Penstock Access Tunnel	0	CY	$ 145.22	$ -		
				Penstock Elbow Access Tunnel	0	CY	$ 145.22	$ -		
				Access Shaft Tunnel	0	CY	$ 145.22	$ -		
				Connector Tunnel	0	CY	$ 379.26	$ -		
				Portals Overburden	0	CY	$ 17.14	$ -		
				Portals Rock	0	CY	$ 49.31	$ -		
			0.123	Surface Preparation						
				Main Tunnel Slab	0	SF	$ 2.21	$ -		
				Penstock Access Slab	0	SF	$ 2.21	$ -		
				Horizontal Portal	0	SF	$ 2.30	$ -		
				Inclined Portal	0	SF	$ 3.33	$ -		
			0.124	Concrete and Shot Crete						
				Main Portal						
				Concrete Slab	0	CY	$ 406.27	$ -		
				Concrete Walls	0	CY	$ 406.27	$ -		
				Concrete Overbreak	0	CY	$ 368.48	$ -		
				Reinforcing Steel	0	TON	$ 2,887.51	$ -		
				Tunnels						
				Concrete Slab Main Tunnel	0	CY	$ 503.90	$ -		

Low Watana RCC Arch Alternative (4 Turbines)

Denotes Qty Adjustment by RST

FERC Line #	Sub Categories	Description	Quantity	Units	Unit Price	Line Price	Total	Notes / Remarks
		Concrete Plugs Penstock Elbow ACC	0	CY	$ 755.86	$ -		
		Concrete Overbreak Main Tunnel 6"	0	CY	$ 346.43	$ -		
		Reinforcing Steel	0	TON	$ 2,887.51	$ -		
		2 " Shotcrete Main Tunnel	0	SF	$ 5.26	$ -		
		2 " Shotcrete Transformer Gal	0	SF	$ 5.26	$ -		
		2 " Shotcrete Surge Chamber Acc	0	SF	$ 5.26	$ -		
		2 " Shotcrete Penstock Access	0	SF	$ 5.26	$ -		
		2 " Shotcrete Penstock Elbow Acc	0	SF	$ 5.26	$ -		
		2 " Shotcrete Access Shaft	0	SF	$ 5.26	$ -		
		2 " Shotcrete Grout Gallery	0	SF	$ 5.26	$ -		
		2 " Shotcrete Connector Tunnel	0	SF	$ 5.26	$ -		
	0.125	Support and Anchors						
		Main Tunnel						
		Rockbolts 1" @12'	0	EA	$ 528.34	$ -		
		Rockbolts 1" @ 9'	0	EA	$ 432.12	$ -		
		Steel Mesh	0	SF	$ 6.37	$ -		
		Steel Support	0	TON	$ 12,801.49	$ -		
		Main Tunnel Portal				$ -		
		Rockbolts 1" @15'	0	EA	$ 735.79	$ -		
		Transformer Gallery Tunnel				$ -		
		Rockbolts 1" @12'	0	EA	$ 528.34	$ -		
		Rockbolts 1" @ 9'	0	EA	$ 432.12	$ -		
		Steel Mesh	0	SF	$ 5.89	$ -		
		Steel Support	0	TON	$ 12,801.49	$ -		
		Grouting Gallery Tunnel				$ -		
		Rockbolts 3/4" @ 6'	0	EA	$ 327.15	$ -		
		Steel Mesh	0	SF	$ 6.37	$ -		
		Steel Support	0	TON	$ 12,801.49	$ -		
		Surge Chamber Access Tunnel				$ -		
		Rockbolts 1" @12'	0	EA	$ 528.34	$ -		
		Rockbolts 1" @ 9'	0	EA	$ 432.12	$ -		
		Steel Mesh	0	SF	$ 6.37	$ -		
		Steel Support	0	TON	$ 12,801.49	$ -		
		Penstock Access Tunnel						
		Rockbolts 1" @12'	0	EA	$ 528.34	$ -		
		Rockbolts 1" @ 9'	0	EA	$ 432.12	$ -		
		Steel Mesh	0	SF	$ 6.37	$ -		
		Steel Support	0	TON	$ 12,801.49	$ -		
		Penstock Elbow Access Tunnel						
		Rockbolts 1" @12'	0	EA	$ 528.34	$ -		
		Rockbolts 1" @ 9'	0	EA	$ 432.12	$ -		
		Steel Mesh	0	SF	$ 6.37	$ -		
		Steel Support	0	TON	$ 12,801.49	$ -		
		Access Shaft Tunnel						
		Rockbolts 1" @12'	0	EA	$ 528.34	$ -		
		Rockbolts 1" @ 9'	0	EA	$ 432.12	$ -		
		Steel Mesh	0	SF	$ 6.37	$ -		
		Steel Support	0	TON	$ 12,801.49	$ -		
		Connector Tunnel						
		Rockbolts 3/4" @ 6'	0	EA	$ 327.15	$ -		
		Steel Mesh	0	SF	$ 6.37	$ -		
		Steel Support	0	TON	$ 12,801.49	$ -		
	0.129	Architectural- Main Portal Doors	0	SETS	$ 158,371.90	$ -		
	0.12c	Mechanical Ventilation System	Included in (63.81 and 63.82)					
0.13		Access Shaft						
	0.131	Excavation Rock	0	CY	$ 227.67	$ -		
	0.133	Surface Preparation Shaft	0	SF	$ 3.33	$ -		
	0.134	Concrete and Shot Crete						
		Concrete Lining	0	CY	$ 944.82	$ -		
		Concrete Overbreak 6"	0	CY	$ 551.14	$ -		
	0.135	Support and Anchors - Rockbolts 3/4" @ 6'	0	EA	$ 327.15	$ -		
	0.138	Structural Misc Steelwork	0	TON	$ 7,395.00	$ -		
	0.139	Architectural- control Building						
	0.13c	Mechanical Elevators	0	LS	$ 2,368,815.00	$ -		
0.14		Fire Protection Head Tank						
	0.141	Excavation	0	CY	$ 43.72	$ -		
	0.143	Surface Preparation	0	SF	$ 2.30	$ -		
	0.144	Concrete & Shotcrete						
		Concrete	208	CY	$ 963.72	$ 200,000		
		Concrete Overbreak 6"	0	CY	$ 406.27	$ -		
		Reinforcing Steel	8	TON	$ 2,858.29	$ 20,000		
	0.145	Support and Anchors						
		Rockbolts 1" @12'	0	EA	$ 528.34	$ -		
		Rockbolts 1" @ 9'	0	EA	$ 432.12	$ -		
		Steel Mesh	0	SF	$ 6.30	$ -		
		Steel Support	0	TON	$ 12,671.95	$ -		
	0.148	Misc Steelwork	1	LS	$ 73,297.50	$ 70,000		

Low Watana RCC Arch Alternative (4 Turbines)

Denotes Qty Adjustment by RST

FERC Line #	Sub Categories			Description	Quantity	Units	Unit Price	Line Price	Total	Notes / Remarks
			0.14c	Mechanical Piping/Valves						
		0.15		Bus Tunnels (totals for 3 Bus Tunnels)						
			0.151	Excavation						
				Rock Horizontal	0	CY	$ 213.70	$ -		
				Rock Inclined	0	CY	$ 601.04	$ -		
			0.153	Surface Preparation- Tunnels	0	SF	$ 3.33	$ -		
			0.154	Concrete and Shotcrete						
				Concrete Slab	0	CY	$ 818.84	$ -		
				Concrete Overbreak 12"	0	CY	$ 472.41	$ -		
				Reinforcing Steel	0	TON	$ 2,858.29	$ -		
				2" Shotcrete	0	SF	$ 5.26	$ -		
			0.155	Supports and Anchors						
				Rockbolts 1" @ 25'	0	EA	$ 1,234.86	$ -		
				Rockbolts 1" @ 12'	0	EA	$ 528.34	$ -		
				Rockbolts 1" @ 9'	0	EA	$ 432.12	$ -		
				Steel Mesh	0	SF	$ 6.30	$ -		
				Steel Support	0	TON	$ 12,671.94	$ -		
		0.16		Transformer Gallery Tunnel						
			0.161	Excavation- Rock	0	CY	$ 87.44	$ -		
			0.163	Surface Preparation	0	SF	$ 2.30	$ -		
			0.164	Concrete and Shotcrete						
				Concrete Base Slab	0	CY	$ 544.85	$ -		
				Concrete Overbreak 12"H/6"V	0	CY	$ 377.93	$ -		
				Reinforcing Steel	0	TON	$ 2,858.29	$ -		
			0.165	Support and Anchors						
				Rockbolts 1" @ 25'	0	EA	$ 1,234.86	$ -		
				Rockbolts 1" @ 15'	0	EA	$ 735.81	$ -		
				Steel Mesh	0	SF	$ 5.81	$ -		
				Steel Support	0	TON	$ 12,671.94	$ -		
			0.167	Drainage Holes	0	LF	$ 47.95	$ -		
		0.17		Cable Shafts						
			0.171	Excavation Rock	0	CY	$ 601.04	$ -		
			0.173	Surface Preparation Shafts	0	SF	$ 3.33	$ -		
			0.174	Concrete and Shotcrete						
				Concrete Lining	0	CY	$ 1,763.66	$ -		
				Concrete Overbreak 6"	0	CY	$ 881.83	$ -		
			0.175	Supports and Anchors- Rockbolts 3/4" @ 6'	0	EA	$ 327.15	$ -		
			0.178	Structural Steel Support Towers	12	TON	$ 15,602.00	$ 190,000		
			0.179	Architectural- Enclosures	0	LS	$ 199,317.00	$ -		
			0.17c	Mechanical Hoist	0	EA	$ 476,960.00	$ -		
		0.18		Dewatering (during Construction)						
			0.181	Dewatering (Power Facilities)	1	LS	$ 1,336,798.50	$ 1,340,000		
		0.19		Instrumentation						
			0.191	Instrumentation	1	LS	$ 1,714,813.50	$ 1,710,000		
	0.2			Misc Buildings (Control Buildings)	1	LS	$ 4,433,085.00	$ 4,430,000		
	0.3			Permanent Town	(included in 63.5)					
									$ 121,219,000	
332				**Reservoir, Dams and Waterways**						
	0.1			Reservoir						
		0.11		Reservoir Clearing	23,000	ACRE	$ 3,005.85	$ 69,135,000		
	0.2			Diversion Schemes /Cofferdams						
		0.21		Diversion Tunnels /Portals				$ -		
			0.211	Excavation				$ -		
				Combined Tunnels				$ -		
				Rock	171,580	CY	$ 92.33	$ 15,840,000		Multiplied Non Expandable Qty by ratio of length Decrease (3,770 / 4,100) = 0.92
				Combined Upstream Portals				$ -		
				Rock	35,000	CY	$ 49.16	$ 1,720,000		
				Combined Downstream Portals				$ -		
				Rock Usable	75,000	CY	$ 49.16	$ 3,690,000		
				Emergency Release Chambers				$ -		
				Excavate Concrete for Plugs	1,139	CY	$ 101.98	$ 120,000		
				Gate Chamber	2,975	CY	$ 110.73	$ 330,000		
				Access Tunnel to Gate Chamber				$ -		
				Rock	0	CY	$ 97.15	$ -		
			0.212	Fill- Temp for Coffer Dam to Construct Upstream Portals	23,000	CY	$ 11.66	$ 270,000		
			0.213	Surface Preparation \ grouting				$ -		
				Upstream Upper Portal				$ -		
				Horizontal	3,200	SF	$ 2.30	$ 10,000		
				Inclined	8,600	SF	$ 3.33	$ 30,000		
				Upstream Lower Portal				$ -		
				Horizontal	1,300	SF	$ 2.30	$ -		
				Inclined	14,900	SF	$ 3.33	$ 50,000		
				Downstream Upper Portal				$ -		
				Horizontal	6,100	SF	$ 2.30	$ 10,000		
				Inclined	20,500	SF	$ 3.33	$ 70,000		
				Downstream Lower Portal				$ -		
				Horizontal	600	SF	$ 2.30	$ -		
				Inclined	5,600	SF	$ 3.33	$ 20,000		

Low Watana RCC Arch Alternative (4 Turbines)

Denotes Qty Adjustment by RST

FERC Line #	Sub Categories						Description	Quantity	Units	Unit Price	Line Price	Total	Notes / Remarks
							Grout Upper Tunnel Plugs				$ -		
							Drill Holes	4,100	LF	$ 26.76	$ 110,000		
							Cement	820	CF	$ 81.10	$ 70,000		
							Grout Lower Tunnel Permanent Plugs				$ -		
							Drill Holes	2,050	LF	$ 26.76	$ 50,000		
							Cement	410	CF	$ 81.10	$ 30,000		
			0.214				Concrete and Shotcrete				$ -		
							Combined Tunnels				$ -		
							Concrete Lining	31,280	CY	$ 566.89	$ 17,730,000		Multiplied Non Expandable Qty by ratio of length Decrease (3,770 / 4,100) = 0.92
							Concrete Lining Overbreak 6"	13,800	CY	$ 314.94	$ 4,350,000		Multiplied Non Expandable Qty by ratio of length Decrease (3,770 / 4,100) = 0.92
							Reinforcing Steel	19	TON	$ 2,887.51	$ 60,000		Multiplied Non Expandable Qty by ratio of length Decrease (3,770 / 4,100) = 0.92
							Concrete Lining for Plug	6,200	CY	$ 428.32	$ 2,660,000		
							2" Shotcrete	44,620	SF	$ 5.26	$ 230,000		Multiplied Non Expandable Qty by ratio of length Decrease (3,770 / 4,100) = 0.92
							Upstream Upper Portal				$ -		
							Concrete Headwall	3,200	CY	$ 651.93	$ 2,090,000		
							Concrete Lining	1,300	CY	$ 651.93	$ 850,000		
							Concrete Slab	750	CY	$ 651.93	$ 490,000		
							Concrete Piers	800	CY	$ 651.93	$ 520,000		
							Concrete Overbreak 12" H/6"V	300	CY	$ 472.41	$ 140,000		
							Reinforcing Steel	400	TON	$ 2,887.51	$ 1,160,000		
							Upstream Lower Portal				$ -		
							Concrete Headwall	4,500	CY	$ 651.93	$ 2,930,000		
							Concrete Lining	3,000	CY	$ 651.93	$ 1,960,000		
							Concrete Slab	300	CY	$ 651.93	$ 200,000		
							Concrete Piers	700	CY	$ 651.93	$ 460,000		
							Concrete Overbreak 12" H/6"V	350	CY	$ 472.41	$ 170,000		
							Reinforcing Steel	600	TON	$ 2,887.51	$ 1,730,000		
							Downstream Upper Portal				$ -		
							Concrete Headwall	500	CY	$ 651.93	$ 330,000		
							Concrete Slab	100	CY	$ 651.93	$ 70,000		
							Concrete Overbreak 12" H/6"V	100	CY	$ 472.41	$ 50,000		
							Reinforcing Steel	40	TON	$ 2,887.51	$ 120,000		
							Downstream Lower Portal				$ -		
							Concrete Headwall	2,500	CY	$ 651.93	$ 1,630,000		
							Concrete Slab	100	CY	$ 651.93	$ 70,000		
							Concrete Overbreak 12" H/6"V	150	CY	$ 472.41	$ 70,000		
							Reinforcing Steel	170	TON	$ 2,887.51	$ 490,000		
							Downstream Flip Bucket				$ -		
							Concrete Slab	0	CY	$ 651.93	$ -		
							Concrete Walls	0	CY	$ 651.93	$ -		
							Concrete Invert	0	CY	$ 651.93	$ -		
							Concrete Overbreak 12" H/6"V	0	CY	$ 42.41	$ -		
							Reinforcing Steel	0	TON	$ 2,887.51	$ -		
							Downstream Retaining Wall				$ -		
							Concrete Slab	200	CY	$ 651.93	$ 130,000		
							Concrete Walls	2,000	CY	$ 651.93	$ 1,300,000		
							Concrete Overbreak 12" H/6"V	110	CY	$ 472.41	$ 50,000		
							Reinforcing Steel	90	TON	$ 2,887.51	$ 260,000		
							Emergency Release Chambers				$ -		
							Concrete Plug	5,500	CY	$ 755.86	$ 4,160,000		
							4" Shotcrete	1,000	SF	$ 10.13	$ 10,000		
							Access Tunnel to Gate Chamber				$ -		
							2" Shotcrete	0	SF	$ 5.26	$ -		
			0.215				Supports and Anchors				$ -		
							Combined Tunnels				$ -		
							Rockbolts 1" @ 12'	2,852	EA	$ 528.34	$ 1,510,000		Multiplied Non Expandable Qty by ratio of length Decrease (3,770 / 4,100) = 0.92
							Rockbolts 1" @ 9'	488	EA	$ 432.12	$ 210,000		Multiplied Non Expandable Qty by ratio of length Decrease (3,770 / 4,100) = 0.92
							Steel Mesh	171,120	SF	$ 6.37	$ 1,090,000		Multiplied Non Expandable Qty by ratio of length Decrease (3,770 / 4,100) = 0.92
							Steel Support	175	TON	$ 12,801.49	$ 2,240,000		Multiplied Non Expandable Qty by ratio of length Decrease (3,770 / 4,100) = 0.92
							Upstream Lower Portal				$ -		
							Rockbolts 1" @ 15'	240	EA	$ 735.81	$ 180,000		
							Anchors 1" @ 25'	290	EA	$ 1,234.86	$ 360,000		
							Upstream Upper Portal				$ -		
							Rockbolts 1" @ 15'				$ -		
							Anchors 1" @ 25'	130	EA	$ 735.81	$ 100,000		
							Downstream Lower Portal				$ -		
							Rockbolts 1" @ 15'	200	EA	$ 735.81	$ 150,000		
							Downstream Upper Portal				$ -		
							Rockbolts 1" @ 15'	100	EA	$ 735.81	$ 70,000		
							Retaining Wall Anchors 1" @25'	100	EA	$ 1,234.86	$ 120,000		
							Emergency Release Chambers				$ -		
							Rockbolts 1" @ 25'	63	EA	$ 1,234.86	$ 80,000		
							Rockbolts 1" @ 15'	79	EA	$ 735.77	$ 60,000		
							Steel Mesh	2,279	SF	$ 6.37	$ 10,000		
							Steel Support	9	TON	$ 12,801.49	$ 110,000		
							Metal to Roof Anchors 3/4" @ 6'	13	EA	$ 342.42	$ -		
							Access Tunnel to Gate Chamber				$ -		
							Rockbolts 1" @ 12'	0	EA	$ 528.34	$ -		

Low Watana RCC Arch Alternative (4 Turbines)

Denotes Qty Adjustment by RST

FERC Line #	Sub Categories								Description	Quantity	Units	Unit Price	Line Price	Total	Notes / Remarks
									Rockbolts 1" @ 9'	0	EA	$ 432.12	$ -		
									Steel Mesh	0	SF	$ 6.37	$ -		
									Steel Support	0	TON	$ 12,801.49	$ -		
			0.218						Structural- Misc Steelwork	2,775	SF	$ 93.61	$ 260,000		
			0.21c						Mechanical				$ -		
									Upstream Lower Gates				$ -		
									Gate Equipment	2	EA	$ 5,073,120.00	$ 10,150,000		
									Upstream Upper Gates				$ -		
									Gate Equipment	2	EA	$ 2,840,080.00	$ 5,680,000		
									Trashracks	1	LS	$ 1,777,500.00	$ 1,780,000		
									Downstream Lower Outlet				$ -		
									Stoplog Guides	1	LS	$ 142,200.00	$ 140,000		
									Stoplogs includes follower	1	LS	$ 1,967,100.00	$ 1,970,000		
									Downstream Upper Outlet				$ -		
									Stoplog Guides	1	LS	$ 82,950.00	$ 80,000		
									Low Level Release				$ -		
									Slide Gates Include Steel Liner	9	EA	$ 3,517,470.00	$ 31,660,000		
			0.22						Upstream Cofferdam						
				0.221					Cofferdam						
									RCC	978,000	CY	$ 100.00			
				0.222					Pre-cofferdam						
									Rock Fill	23,400	CY	$ 10.90	$ 255,000		
				0.223					Cutoff Slurry Wall						
									excavation	5,100	CY	$ 4.88	$ 25,000		
									slurry wall	46,000	SF	$ 72.44	$ 3,332,000		
				0.22d					Dewatering						
									Initial Dewatering	1	LS	$ 5,807,685.00	$ 5,808,000		
									Dewatering Maintenance	1	LS	$ 22,377,990.00	$ 22,378,000		
			0.23						Down Stream Cofferdam						
				0.231					Cofferdam						
									RCC	261,300	CY	$ 100.00			
				0.232					Pre-cofferdam						
									Rock Fill	23,400	CY	$ 10.90	$ 255,000		
				0.233					Cutoff Slurry Wall						
									Excavation	5,100	CY	$ 4.60	$ 23,000		
									Slurry Wall	46,000	SF	$ 72.44	$ 3,332,000		
	0.3				Main Dam										
		0.31				Main Dam									
			0.311						Excavation						
									Overburden above el. 1470	257,167	CY	$ 11.53	$ 2,965,000		
									Overburden below el. 1470	675,285	CY	$ 11.06	$ 7,469,000		
									Rock Usable above el. 1470	163,617	CY	$ 43.03	$ 7,040,000		
									Rock Usable below el. 1470	60,674	CY	$ 43.72	$ 2,653,000		
									Rock Waste above el. 1470	247,520	CY	$ 43.03	$ 10,651,000		
									Rock Waste below el. 1470	110,368	CY	$ 50.18	$ 5,538,000		Reduce Low Watana Non Expandable by 0.7 (Downstream Slope)
				0.312					Dam						
									RCC	6,000,000	CY	$ 100.00	$ 600,000,000		End Area Calculations
									Base RCC	0	CY	$ 100.00	$ -		
				0.313					Surface Prep/ Grouting						
									Surface Preparation						
									Under Core/Filters above el. 1500	637,840	SF	$ 3.11	$ 1,984,000		Reduce Low Watana Non Expandable by 0.7 (Downstream Slope)
									Under Core/Filters below el. 1500	429,100	SF	$ 3.11	$ 1,335,000		Reduce Low Watana Non Expandable by 0.7 (Downstream Slope)
									Under Shell above el. 1500	1,974,829	SF	$ 2.15	$ 4,246,000		Reduce Low Watana Non Expandable by 0.7 (Downstream Slope)
									Under Shell below el. 1500	983,987	SF	$ 2.15	$ 2,116,000		Reduce Low Watana Non Expandable by 0.7 (Downstream Slope)
									Consolidation Grout						Reduce Low Watana Non Expandable by 0.7 (Downstream Slope)
									Drill Holes	133,280	LF	$ 11.91	$ 1,587,000		Reduce Low Watana Non Expandable by 0.7 (Downstream Slope)
									Cement	133,280	CF	$ 67.81	$ 9,038,000		Reduce Low Watana Non Expandable by 0.7 (Downstream Slope)
									Grout Curtain						Reduce Low Watana Non Expandable by 0.7 (Downstream Slope)
									Drill Holes	177,072	LF	$ 26.76	$ 4,738,000		Reduce Low Watana Non Expandable by 0.7 (Downstream Slope)
									Cement	70,829	CF	$ 81.10	$ 5,744,000		Reduce Low Watana Non Expandable by 0.7 (Downstream Slope)
									Dental Concrete						Reduce Low Watana Non Expandable by 0.7 (Downstream Slope)
									Dental Concrete	59,500	CY	$ 365.33	$ 21,737,000		Reduce Low Watana Non Expandable by 0.7 (Downstream Slope)
				0.317					Drainage						Reduce Low Watana Non Expandable by 0.7 (Downstream Slope)
									Holes	51,789	LF	$ 51.32	$ 2,658,000		Reduce Low Watana Non Expandable by 0.7 (Downstream Slope)
				0.318					Bridge						
									Precast Bridge Beams	25,500	CY	$ 544.85	$ 13,894,000		
									Concrete Road Deck	5,400	CY	$ 544.85	$ 2,942,000		
									Piers	500	CY	$ 544.85	$ 272,000		
			0.32						Grout Galleries/Portals						
				0.321					Excavation				$ -		
									Tunnels/ Shafts- Core Area				$ -		
									Rock Horizontal	0	CY	$ 394.80	$ -		
									Rock Inclined	0	CY	$ 552.93	$ -		
									Rock Vertical	0	CY	$ 536.19	$ -		
									Tunnels/ Shafts- Access				$ -		
									Rock Horizontal	1,300	CY	$ 394.80	$ 510,000		

Low Watana RCC Arch Alternative (4 Turbines)

Denotes Qty Adjustment by RST

FERC Line #	Sub Categories								Description	Quantity	Units	Unit Price	Line Price	Total	Notes / Remarks
									Rock Inclined	200	CY	$ 552.93	$ 110,000		
								Portals					$ -		
									Overburden Rock	2,900	CY	$ 17.16	$ 50,000		
									Rock	800	CY	$ 49.16	$ 40,000		
			0.323				Surface Preparation						$ -		
								Portals					$ -		
									Horizontal	24	SF	$ 2.30	$ -		
									Inclined	160	SF	$ 3.33	$ -		
													$ -		
			0.324				Concrete and Shotcrete						$ -		
								Tunnels- Core Area					$ -		
									Concrete Plugs	267	CY	$ 428.32	$ 110,000		
									Concrete Slab	600	CY	$ 944.82	$ 570,000		
									Concrete Overbreak 6"	0	CY	$ 755.86	$ -		
									Reinforcing Steel	21	TON	$ 2,887.51	$ 60,000		
									2" Shotcrete	0	SF	$ 5.26	$ -		
								Tunnels-Access					$ -		
									Concrete Slab	160	CY	$ 944.82	$ 150,000		
									Concrete Overbreak 6"	80	CY	$ 755.86	$ 60,000		
									Reinforcing Steel	6	TON	$ 2,887.51	$ 20,000		
									2" Shotcrete	538	SF	$ 5.26	$ -		
								Shafts					$ -		
									2" Shotcrete	4,000	SF	$ 5.26	$ 20,000		
								Portals					$ -		
									Concrete	16	CY	$ 406.36	$ 10,000		
									Reinforcing Steel	2	TON	$ 2,887.51	$ -		
			0.325				Support and Anchors						$ -		
								Tunnels- Core Area					$ -		
									Rockbolts 3/4" @6'	0	EA	$ 327.15	$ -		
									Steel Mesh	0	SF	$ 5.37	$ -		
									Steel Support	0	TON	$ 12,801.49	$ -		
								Tunnels- Access					$ -		
									Rockbolts 3/4" @6'	120	EA	$ 327.15	$ 40,000		
									Steel Mesh	110	SF	$ 5.37	$ -		
									Steel Support	2	TON	$ 12,801.49	$ 30,000		
								Shafts					$ -		
									Rockbolts 3/4" @6'	280	EA	$ 327.15	$ 90,000		
									Steel Mesh	800	SF	$ 5.37	$ -		
								Portals					$ -		
									Rockbolts 1" @15'	24	EA	$ 735.81	$ 20,000		
			0.329				Architectural Portal Doors						$ -		
								Portal Doors		1	LS	$ 33,900.00	$ 30,000		
		0.33				Instrumentation							$ -		
			0.331				Instrumentation			1	LS	$ 8,657,610.00	$ 8,660,000		
	0.4				Relict Channel								$ -		
		0.41				Shore Protection							$ -		
			0.411				Excavation						$ -		
									Overburden Stripping 2' thick	2,200	CY	$ 11.56	$ 30,000		
			0.412				Fill						$ -		
								Dump and Spread					$ -		
									Filter Material - 2' layer	2,200	CY	$ 31.93	$ 70,000		
									Rock Spalls/ Rip Rap- 3' Ave	3,300	CY	$ 9.86	$ 30,000		
								Shore Protection					$ -		
									Rip Rap	24,000	CY	$ 24.26	$ 580,000		
									Waste Rock	24,000	CY	$ 22.78	$ 550,000		
		0.44				Channel Filter Blanket							$ -		
			0.442				Fill						$ -		
								Coarse Filter		2,900,000	CY	$ 33.85	$ 98,170,000		
								Fine Filter		2,180,000	CY	$ 43.65	$ 95,160,000		
								Rip Rap		182,000	CY	$ 24.26	$ 4,420,000		
			0.443				Surface preparation						$ -		
								Foundation Prep					$ -		
									Clearing and Grubbing	460	ACRE	$ 3,963.11	$ 1,820,000		
									Excavation	2,236,000	CY	$ 15.62	$ 34,930,000		
	0.5				Outlet Facilities										
		0.51				Outlet Facilities- (Intake Civil Work Include in Power Intake)									
			0.511				Excavation								
								Inlet		(Included in 332.611)					
								Outlet		(Included in 332.521)					
								Tunnels							
									Rock Horizontal	0	CY	$ 103.00	$ -		
									Rock Inclined	0	CY	$ 183.49	$ -		
			0.513				Surface Preparation/ Grouting								
								Inlet		(Included in 332.613)					
								Outlet		(Included in 332.523)					
								Tunnels		0	SF	$ 2.30	$ -		
								Contact Grouting		0	LS	$ 569,428.05	$ -		
			0.514				Concrete and Shotcrete								

Low Watana RCC Arch Alternative (4 Turbines)

Denotes Qty Adjustment by RST

FERC Line #	Sub Categories							Description	Quantity	Units	Unit Price	Line Price	Total	Notes / Remarks
							Inlet		(Included in 332.614)					
							Outlet		(Included in 332.524)					
							Tunnels							
								Concrete Lining	0	CY	$ 944.82	$ -		
								Concrete Overbreak 6"	0	CY	$ 440.92	$ -		
								2" Shotcrete	0	SF	$ 5.26	$ -		
								3" Shotcrete	0	SF	$ 7.69	$ -		
			0.515				Support and Anchors							
							Inlet		(Included in 332.615)					
							Outlet		(Included in 332.525)					
							Tunnels							
								Rock Bolts 1" @6'	0	EA	$ 327.15	$ -		
								Steel Mesh	0	SF	$ 6.37	$ -		
			0.516				Mechanical - Low Level Outlet							
							Inlet							
								Trash Racks/Guides	1	LS	$ 1,540,500.00	$ 1,541,000		
								Gate Equipment	2	EA	$ 3,317,040.00	$ 6,634,000		
								Stoplog Guides	2	SETS	$ 213,940.00	$ 428,000		
							Outlet							
								Fixed Cone Valves 6 +1 Spare	1	LS	$ 4,500,630.00	$ 4,501,000		
								Ring Follower Gates	6	EA	$ 1,936,494.80	$ 11,619,000		
								Steel Manifold Liner	960	TON	$ 8,952.53	$ 8,594,000		Req'd steel liner quantity approx 873 tons, added 10% to get 960 tons
								Misc Mechanical Equipment	1	LS	$ 948,000.00	$ 948,000		
								Misc Electrical Systems	1	LS	$ 237,000.00	$ 237,000		
		0.52			Main (Chute) Spillway (Includes Civil Works for Outlet Facilities)									
			0.522				Stepped Spillway							
								Conventional Concrete - Steps	47,724	CY	$ 544.85	$ 26,002,000		Reduced by ratio of spillway length, (671 / 778) = 0.863
								Reinforcing Steel - Steps	1,156	TON	$ 2,887.51	$ 3,339,000		Reduced by ratio of spillway length, (671 / 778) = 0.864
								Conventional Concrete - Training Walls	3,107	CY	$ 544.85	$ 1,693,000		Reduced by ratio of spillway length, (671 / 778) = 0.865
								Reinforcing Steel - Training Walls	78	TON	$ 2,887.51	$ 224,000		Reduced by ratio of spillway length, (671 / 778) = 0.866
			0.523				Stilling Basin							
								Conventional concrete	8,400	CY	$ 544.85	$ 4,577,000		
								Reinforcing Steel	185	TON	$ 2,887.51	$ 534,000		
								Excavation Rock	13,000	CY	$ 50.18	$ 652,000		
			0.524				Consolidation Grouting							
								Drill Holes	7,000	LF	$ 11.91	$ 83,000		
								Cement	7,000	CF	$ 67.81	$ 475,000		
								Grout Curtain						
			0.525				Support and Anchors							
							Drainage Tunnel							
								Steel Support	7	TON	$ 12,801.49	$ 90,000		
								Steel Mesh	1,000	SF	$ 5.87	$ 6,000		
							Rockbolts Drainage Gallery							
								3/4" @ 6'	576	EA	$ 330.19	$ 190,000		
							Rockbolts Approach							
								1" @ 15'	275	EA	$ 741.28	$ 204,000		
							Rockbolts Chute and Structure							
								1" @ 15'	112	EA	$ 741.28	$ 83,000		
							Rockbolts Valve Block/Bucket							
								1" @ 15'	46	EA	$ 741.28	$ 34,000		
							Slab/Wall Anchors							
								1" @ 10'	9,300	EA	$ 474.06	$ 4,409,000		
			0.527				Drainage							
							Drill Holes							
								Box Drains (To Drain Tunnel)	54,000	LF	$ 47.95	$ 2,589,000		
								3" Relief	640	LF	$ 49.50	$ 32,000		
			0.52c				Mechanical							
							Gate Equipment		0	EA	$ 4,249,280.00	$ -		
							Stoplog Guides		0	SETS	$ 92,196.88	$ -		
							Stoplogs Includes Follower		0	SET	$ 945,840.00	$ -		
							Misc Electrical		0	LS	$ 237,000.00	$ -		
	0.6			Power Intake (Inc Inlet exec and Inlet Structure Civil Works for Outlet)										
		0.61			Intake Structure and Approach									
			0.611				Excavation							
								Overburden	68,000	CY	$ 14.87	$ 1,011,000		
								Rock Usable	204,000	CY	$ 40.27	$ 8,215,000		
			0.613				Surface Preparation							
								Horizontal	112,500	SF	$ 2.30	$ 259,000		
								Inclined	60,300	SF	$ 3.33	$ 201,000		
			0.614				Concrete and Shotcrete							
							Structure							
								Concrete Structure	121,000	CY	$ 544.85	$ 65,927,000		
								Concrete - Apron Slab	3,500	CY	$ 545.85	$ 1,910,000		
								Concrete Overbreak 12" H/6" V	0	CY	$ 336.99	$ -		
								Reinforcing Steel	7,870	TON	$ 2,887.51	$ 22,725,000		
			0.615				Supports and Anchors- 1" @ 15'		400	EA	$ 735.81	$ 294,000		
			0.61c				Mechanical							
							Trashracks and Guides		4	SETS	$ 1,080,960.00	$ 4,324,000		

Low Watana RCC Arch Alternative (4 Turbines)

Denotes Qty Adjustment by RST

FERC Line #	Sub Categories				Description	Quantity	Units	Unit Price	Line Price	Total	Notes / Remarks
					Gate Equipment	4	EA	$ 1,902,720.00	$ 7,611,000		
					Bulkhead Gates Guides	4	SETS	$ 225,200.00	$ 901,000		
					Bulkhead Gates inc Follower	1	SET	$ 698,120.00	$ 698,000		
					Shutter with Guides	4	SETS	$ 720,640.00	$ 2,883,000		
					Iceboom with Hoist	4	SETS	$ 1,238,600.00	$ 4,954,000		
					Iceboom Guides	4	SETS	$ 563,000.00	$ 2,252,000		
					Intake Service Crane	1	EA	$ 693,700.00	$ 694,000		
					Bubbler System	1	LS	$ 948,000.00	$ 948,000		
					Misc Electrical	1	LS	$ 237,000.00	$ 237,000		
			0.61d		Intake Building	1	LS	$ 237,000.00	$ 237,000		
	0.7			Surge Chamber							
		0.71			Surge Chamber						
			0.711		Excavation						
					Chamber Rock	0	CY	$ 90.12	$ -		
					Vent Shaft Rock	0	CY	$ 601.04	$ -		
			0.713		Surface Preparation	0	SF	$ 2.30	$ -		
			0.714		Concrete and Shotcrete						
					Concrete	0	CY	$ 513.35	$ -		
					Concrete Overbreak	0	CY	$ 440.92	$ -		
					Reinforcing Steel	0	TON	$ 2,858.29	$ -		
					4" Shotcrete	0	SF	$ 10.13	$ -		
					Vent Shaft						
					2" Shotcrete	0	SF	$ 5.26	$ -		
			0.715		Supports and Anchors						
					Rockbolts 1" @25' HY	0	EA	$ 1,234.86	$ -		
					Rockbolts 1" @ 15'	0	EA	$ 735.81	$ -		
					Steel Mesh	0	SF	$ 5.81	$ -		
					Steel Support	0	TON	$ 12,671.94	$ -		
					Vent Shaft						
					Rock bolts 3/4" @ 6'	0	EA	$ 327.15	$ -		
					Steel Mesh	0	SF	$ 6.30	$ -		
			0.717		Drainage Holes (In Chamber)	0	LF	$ 47.95	$ -		
			0.71c		Mechanical						
					Stoplog Guides	0	SETS	$ 709,380.00	$ -		
					Stoplog Includes Follower	0	SET	$ 3,558,160.00	$ -		
	0.8			Penstocks							
		0.81			Penstocks						
			0.811		Excavation						
					Tunnels						
					Rock Horizontal	34,283	CY	$ 144.77	$ 4,963,000		Decrease by ratio of total penstock length (690/1075)
					Rock Inclined	54,000	CY	$ 286.15	$ 15,452,000		
			0.813		Surface Preparation/Grouting						Decrease by ratio of total penstock length (690/1075)
					Surface Preparation						Decrease by ratio of total penstock length (690/1075)
					Tunnels	242,676	SF	$ 3.33	$ 808,000		Decrease by ratio of total penstock length (690/1075)
					Contact Grouting						Decrease by ratio of total penstock length (690/1075)
					Contact Grouting	1	LS	$ 368,882.16	$ 369,000		Decrease by ratio of total penstock length (690/1075)
					Consolidation Grouting						Decrease by ratio of total penstock length (690/1075)
					Consolidation Grouting	1	LS	$ 511,846.06	$ 512,000		Decrease by ratio of total penstock length (690/1075)
			0.814		Concrete and Shotcrete						Decrease by ratio of total penstock length (690/1075)
					Concrete Liner	23,882	CY	$ 970.01	$ 23,166,000		Decrease by ratio of total penstock length (690/1075)
					Concrete Overbreak 6"	6,805	CY	$ 692.87	$ 4,715,000		Decrease by ratio of total penstock length (690/1075)
					Reinforcing Steel	17	TON	$ 2,858.29	$ 50,000		Decrease by ratio of total penstock length (690/1075)
					3" Shotcrete	21,828	SF	$ 7.69	$ 168,000		Decrease by ratio of total penstock length (690/1075)
					2" Shotcrete	13,354	SF	$ 5.26	$ 70,000		Decrease by ratio of total penstock length (690/1075)
			0.815		Support and Anchors						Decrease by ratio of total penstock length (690/1075)
					Rockbolts 1" @ 25'	96	EA	$ 1,234.86	$ 119,000		Decrease by ratio of total penstock length (690/1075)
					Rockbolts 1" @ 6'	2,696	EA	$ 327.15	$ 882,000		Decrease by ratio of total penstock length (690/1075)
					Steel Mesh	123,906	SF	$ 6.37	$ 789,000		Decrease by ratio of total penstock length (690/1075)
			0.818		Structural Misc Steelwork	1,541	TON	$ 9,673.24	$ 14,905,000		Decrease by ratio of total penstock length (690/1075)
	0.9			Tailrace Works (1 Portal with Combined Tailrace/Diversion Tunnel							
		0.91			Tailrace Tunnels/Portals						
			0.911		Excavation						
					Tunnels						
					Rock	0	CY	$ 103.00	$ -		
					Portals						
					Overburden	0	CY	$ 17.14	$ -		
					Rock Usable	0	CY	$ 49.16	$ -		
					Rock Waste	0	CY	$ 49.16	$ -		
			0.913		Surface Preparation						
					Tunnels						
					Tunnels	0	SF	$ 3.33	$ -		
					Portals						
					Horizontal	0	SF	$ 2.30	$ -		
					Inclined	0	SF	$ 3.33	$ -		
			0.914		Concrete and Shotcrete						
					Tunnels						
					Concrete Lining	0	CY	$ 440.92	$ -		
					Concrete Overbreak 6"	0	CY	$ 314.94	$ -		

Low Watana RCC Arch Alternative (4 Turbines)

Denotes Qty Adjustment by RST

FERC Line #	Sub Categories			Description	Quantity	Units	Unit Price	Line Price	Total	Notes / Remarks
				2" Shotcrete	0	SF	$ 5.26	$ -		
				Reinforcing Steel	0	TON	$ 2,887.51	$ -		
				Portals						
				Concrete Base Slab	0	CY	$ 651.93	$ -		
				Concrete Walls	0	CY	$ 651.93	$ -		
				Concrete Overbreak 12" H/6" V	0	CY	$ 471.65	$ -		
				Reinforcing Steel	0	TON	$ 2,887.51	$ -		
			0.915	Support and Anchors						
				Tunnels						
				Rockbolts 1" @ 12'	0	EA	$ 528.34	$ -		
				Rockbolts 1" @ 9'	0	EA	$ 432.12	$ -		
				Steel Support	0	TONS	$ 12,801.49	$ -		
				Steel Mesh	0	SF	$ 6.37	$ -		
				Portals						
				Rockbolts 1" @ 15'	0	EA	$ 735.81	$ -		
			0.91c	Mechanical						
				Stoplog Guides	0	SET	$ 112,600.00	$ -		
				Stoplogs Includes Follower	0	SET	$ 751,200.00	$ -		
		0.92		Tailrace Outlet Channel						
				Tailrace Outlet Channel Concrete - Slab	4,190	CY	$ 544.85	$ 2,280,000		
				Tailrace Outlet Channel Concrete - Training Wallls	1,185	CY	$ 544.85	$ 650,000		
				Tailrace Reinforcing Steel	440	TON	$ 2,858.29	$ 1,260,000		
									$ 1,463,500,000	for embankment dam $ 3,202,800,000
333			**Waterwheels, Turbines and Generators**							
		0.11		Turbines and Governors						
			0.111	Supply						
			0.112	Install						
	0.2			Generators and Exciters						
		0.21		Generators and Exciters (Supply and Install)						
			0.211	Generators and Exciters						
	0.3			Total Bid From Vendor (includes all equipment in this category)	4	EA	$ 74,200,000.00	$ 297,000,000	**$ 297,000,000**	
				Average from acquired quotes						
334			**Accessory Electrical Equipment**							
	0.1			Connections, Supports and Structures						
		0.11		Structures						
			0.111	Structures (included Below)						
		0.12		Conductors and Insulators						
			0.121	Generator Isolated Phase Bus	1	LS	$ 5,056,000.00	$ 5,060,000		
			0.122	HV Power Cables and Accessories	1	LS	$ 2,054,000.00	$ 2,050,000		
			0.123	LV Power Cables and Accessories	1	LS	$ 948,000.00	$ 950,000		
			0.124	Control Cables and Accessories	1	LS	$ 1,738,000.00	$ 1,740,000		
			0.125	Grounding System	1	LS	$ 237,000.00	$ 240,000		
		0.13		Conduits and Fittings						
			0.131	Conduits and Fittings	1	LS	$ 632,000.00	$ 630,000		
	0.2			Switchgear and Control Equipment						
		0.21		Auxiliary Transformers						
			0.211	Auxiliary Transformers	4	EA	$ 83,811	$ 340,000		
		0.22		Circuit Breakers Generators				$ -		
			0.221	Circuit Breakers Generators	4	EA	$ 1,504,300	$ 6,020,000		
		0.23		Surge Protectors and Generator Cubicles						
			0.231	Surge Protectors and Generator Cubicles	1	LS	$ 726,800.00	$ 730,000		
		0.24		Switch boards						
			0.241	Switch boards	1	LS	$ 1,232,400.00	$ 1,230,000		
		0.25		Auxiliary Power Equipment						
			0.251	Auxiliary Power Equipment	1	LS	$ 347,600.00	$ 350,000		
	0.3			Cubicles and Appurtenances						
		0.31		Control, relay and meter boards						
			0.311	Control, relay and meter boards	1	LS	$ 1,422,000.00	$ 1,420,000		
		0.32		Computer Control System						
			0.321	Computer Control System	(Included in Trans-Ems)					
		0.33		Supervisor and Telemeter System						
			0.331	Supervisor and Telemeter System	Included in Trans EMS)					
	0.4			Power Transformers						
		0.41		Power Transformers						
			0.411	Power Transformers	7	EA	$ 2,000,000	$ 14,000,000		
	0.5			Lighting System						
		0.51		Powerhouse and Transformer Gallery						
			0.511	Powerhouse and Transformer Gallery	1	LS	$ 1,824,900.00	$ 1,820,000		
		0.52		Access Tunnels and Roads						
			0.521	Access Tunnels and Roads	0	LS	$ 402,900.00	$ -		
	0.6			Misc. Electrical Equipment						
		0.61		Misc. Electrical Equipment						
			0.611	Misc. Electrical Equipment	1	LS	$ 625,680.00	$ 630,000		

Low Watana RCC Arch Alternative (4 Turbines)

Denotes Qty Adjustment by RST

FERC Line #	Sub Categories			Description	Quantity	Units	Unit Price	Line Price	Total	Notes / Remarks
	0.7			Surface Accessory Equipment						
		0.71		34.5 kV and LV Equipment						
			0.711	Switchboard	1	LS	$ 213,300	$ 210,000		
			0.712	Cables	1	LS	$ 450,300	$ 450,000		
			0.713	Aux Transformers	1	LS	$ 284,400	$ 280,000		
		0.73		Diesel Generator- Standby						
			0.731	Diesel Generator- Standby	2	EA	$ 347,550	$ 700,000		
		0.74		Exterior Lighting						
			0.741	Exterior Lighting	1	LS	$ 355,500	$ 360,000		
		0.75		Mimic Board- Control Building						
			0.751	Mimic Board- Control Building	1	LS	$ 1,185,000	$ 1,190,000		
									$ 40,000,000	
335			**Misc Powerplant Equipment**							
	0.1			Auxiliary Systems- Underground						
		0.11		Station Water Systems						
			0.111	Station Water Systems	1	LS	$ 2,488,500.00	$ 2,490,000		
		0.12		Fire Protection Systems						
			0.121	Fire Protection Systems	1	LS	$ 1,422,000.00	$ 1,420,000		
		0.13		Compressed Air Systems						
			0.131	Compressed Air Systems	1	LS	$ 1,777,500.00	$ 1,780,000		
		0.14		Oil Handling Systems						
			0.141	Oil Handling Systems	1	LS	$ 1,185,000.00	$ 1,190,000		
		0.15		Drainage & Dewatering						
			0.151	Drainage & Dewatering	2	EA	$ 1,738,000	$ 3,480,000		
		0.16		Heating, Ventilation and Cooling System						
			0.161	Heating, Ventilation and Cooling System	1	LS	$ 1,777,500.00	$ 1,780,000		
		0.17		Miscellaneous						
			0.171	Miscellaneous	1	LS	$ 1,185,000.00	$ 1,190,000		
	0.2			Auxiliary Systems- Surface Facilities						
		0.21		Auxiliary Systems- Surface Facilities						
			0.211	Auxiliary Systems- Surface Facilities	1	LS	$ 711,000	$ 710,000		
	0.3			Auxiliary Equipment						
		0.31		Powerhouse Cranes						
			0.311	Powerhouse Cranes	2	EA	$ 1,800,000	$ 3,600,000		
		0.32		Elevators						
			0.321	Elevators	2	EA	$ 181,700	$ 360,000		
		0.33		Miscellaneous Cranes and Hoists						
			0.331	Miscellaneous Cranes and Hoists	1	LS	$ 505,500	$ 510,000		
		0.34		Machine Shop Equipment						
			0.341	Machine Shop Equipment	1	LS	$ 2,022,000	$ 2,020,000		
	0.4			General Station Equipment	(Included in Mechanical And Electrical Systems)					
	0.5			Communications Equipment	1	LS	$ 106,650.00	$ 110,000		
									$ 21,000,000	
336	**Roads, Rails and Air Facilities**									
	0.1			Roads						
		0.11		Pioneer Roads and Bridges						
			0.111	Gold Creek- Watana						
				Road (58 mi)						
				Clearing	0	ACRE	$ 11,416.62	$ -		
				Waste Excavation	0	CY	$ 9.51	$ -		
				Common Excavation	0	CY	$ 8.32	$ -		
				18" Culverts	0	LF	$ 62.55	$ -		
				36" Culverts	0	LS	$ 32,760.98	$ -		
				D-1 Base Material	0	TON	$ 45.47	$ -		
				Fabric	0	SY	$ 6.73	$ -		
				Maintenance	0	MI/YR	$ 9,008.99	$ -		
			0.112	Gold Creek- Parks						
				Road (41.25 Miles)						
				Clearing	0	ACRE	$ 11,416.62	$ -		
				Waste Excavation	0	CY	$ 9.51	$ -		
				Common Excavation	0	CY	$ 8.32	$ -		
				18" Culverts	0	LF	$ 62.55	$ -		
				36" Culverts	0	LS	$ 35,451.31	$ -		
				D-1 Base Material	0	TON	$ 45.47	$ -		
				Fabric	0	SY	$ 6.73	$ -		
				Maintenance	0	MI/YR	$ 9,008.32	$ -		
			0.113	Devil Canyon Low Level Crossing						
				Crossing (7.88 Miles)						
				Clearing	0	ACRE	$ 11,416.62			
				Waste Excavation	0	CY	$ 9.51			
				Common Excavation	0	CY	$ 8.32			
				Rock Excavation	0	CY	$ 28.45			
				18" Culverts	0	LF	$ 62.55			
				Bridge	0	LS	$ 120,000,000.00			
				D-1 Base Material	0	TON	$ 45.47			
				Maintenance	0	MI/YR	$ 11,258.74			
			0.114	Gold Creek- Watana (41.25 miles)	0	LS	$ 28,132,000			

Low Watana RCC Arch Alternative (4 Turbines)

Denotes Qty Adjustment by RST

FERC Line #	Sub Categories									Description	Quantity	Units	Unit Price	Line Price	Total	Notes / Remarks
		0.12								Permanent Roads and Bridges						
			0.124							Parks Highway to Watana (62 mi)	0	MI	$ 3,000,000.00	$ -		
			0.125							Susitna Bridge	0	SF	$ 450.00	$ -		
	0.2									Rail Facilities						
		0.24								Permanent Railroad (including railheads)						
			0.244							Gold Creek to Watana- Rail						
										R-1, (33 Mi)						
										Clearing	671	AC	$ 11,416.62	$ 7,662,183		
										Waste Excavation	1687883	CY	$ 9.51	$ 16,051,766		
										Common Excavation	3307678	CY	$ 8.32	$ 27,519,880		
										Rock Excavation	9114	CY	$ 28.51	$ 259,867		
										Borrow	449500	CY	$ 11.88	$ 5,340,060		
										Subballast	711055	CY	$ 18.15	$ 12,902,807		
										Grade "A" Base Material	6650	CY	$ 35.45	$ 235,729		
										D-1 Base material	2400	TON	$ 43.20	$ 103,680		
										A.C. Surfacing	2200	TON	$ 198.00	$ 435,600		
										Dock Lumber	16	MBF	$ 1,258.60	$ 20,138		
										18" Culvert	20093	LF	$ 68.26	$ 1,371,458		
										36" + Culverts	0	LS	$ 92,160.00	$ -		
										Fabric	12930	SY	$ 9.00	$ 116,369		
										Thaw Pipes	41843	LF	$ 95.04	$ 3,976,745		
										Topsoil & Seed	431	AC	$ 10,800.00	$ 4,653,257		
										Rail Yard Control Devices	1	LS	$ 1,800.00	$ 1,800		
										Bridges	0	SF	$ 900.00	$ -		
										Trackage	325940	LF	$ 350.00	$ 114,079,000		
										Maintenance						
										Rail	406	Mile-years	$ 10,000.00	$ 4,060,000		
										Railhead	7	years	$ 75,000.00	$ 525,000		
		0.13								Site Roads						
			0.131							Construction Roads						
										Site Roads	20	Mile	$ 750,000.00	$ 15,000,000		
										Maintenance	102	MI/YRS	$ 223,092.85	$ 22,755,000		
			0.132							Permanent Roads						
										Permanent Roads	6	MILE	$ 1,287,997.42	$ 7,728,000		
	0.3									Airstrip						
		0.31								Airstrip						
										Permanent Airstrip	1	LS	$ 12,798,000.00	$ 12,798,000		
										9 years maintenance savings	1	LS				
										Temporary Airstrip	1	LD	$ 2,133,000.00	$ 2,133,000		
	0.4									Saved Maintenance	1	LS	$ (5,067,889.52)	$ (5,068,000)		
															$ 254,700,000	
			Transmission Plant													
350			**Land and Land Rights**													
										Land and Land Rights						
										Transmission	33	MILE	$ 86,720.00	$ 2,862,000		
										Substations (4 Sites)	0	LS	$ 2,607,000.00	$ -		
															$ 2,862,000	
352			**Substation and Switching Station**													
	0.1									Switchyard						
		0.11								Switchyard	2	LS	$ 14,000,000.00	$ 28,000,000		
															$ 28,000,000	
353			**Substation/Switching Station Equipment**													
										Ester	0	LS	$ 57,922,800.00	$ -		
										Willow	0	LS	$ 3,613,020.00	$ -		
										Knik Arm	0	LS	$ 29,838,300.00	$ -		
										University	0	LS	$ 88,685,400.00	$ -		
										Devil Canyon	0	LS	$ 35,585,550.00	$ -		
										Willow Energy Management System (EMS)						
										Equipment and System Costs	0	LS	$ 27,326,100.00	$ -		
										Microwave Communication Equipment	0	LS	$ 11,660,400.00	$ -		
										EMS Control Center Building	0	LS	$ 9,148,200.00	$ -		
										Watana and Devil Canyon In-plant Monitor and Control Equipment	0	LS	$ 8,619,690.00	$ -		
															$ -	
354			**Steel Towers and Fixtures**													
										Towers (Including Foundation and Hardware)	33	miles	$ 4,500,000.00	$ 148,500,000		
															$ 148,500,000	
356			**Conductors and Devices**													
										Conductors	0	MILE	$ 218,281.33	$ -		

Low Watana RCC Arch Alternative (4 Turbines)

Denotes Qty Adjustment by RST

FERC Line #	Sub Categories	Description	Quantity	Units	Unit Price	Line Price	Total	Notes / Remarks
		Submarine Cables	0	EACH	$ 15,808,340.56	$ -		
							$ -	
359		**Roads and Trails**						
		Roads and Trails	200	MILE	$ 75,744.00	$ 15,149,000		
		Clearing and Roads	340	MILE	$ 37,872.00	$ 12,876,000		
							$ 28,000,000	**$ 207,362,000**
-								
		General Plant						
389		**Land and Land Rights**						
		Land and Land Rights				$ -		
390		**Structures and Improvements**						
		Structures and Improvements				$ -		
391		**Office Furniture and Equipment**						
		Office Furniture and Equipment				$ -		
392		**Transportation Equipment**						
		Transportation Equipment				$ -		
393		**Stores Equipment**						
		Stores Equipment				$ -		
394		**Tools Shop and Garage Equipment**						
		Tools Shop and Garage Equipment				$ -		
395		**Laboratory Equipment**						
		Laboratory Equipment				$ -		
396		**Power-Operated Equipment**						
		Power-Operated Equipment				$ -		
397		**Communications Equipment**						
		Communications Equipment				$ -		
398		**Miscellaneous Equipment**						
		Miscellaneous Equipment				$ -		
399		**Other Tangible Property**						
		Other Tangible Property	1	LS	$ 16,000,000	$ 16,000,000		
		Saved Maintence	1	LS	$ (231,220)	$ (231,000)		
							$ 15,800,000	
		Indirect Costs						
61		**Temporary Construction Facilities**						
		Temporary Construction Facilities						
62		**Construction Equipment**						
		Construction Equipment						
63		**Main Construction Camp**						
	0.1	Main Construction Camp	1	LS	$ 316,340,280			
		Saved Maintence	1	LS	$ (6,172,493.27)			
		Site Preparation	3270533					
		Buildings	15019120					
		utilities	12172667					
			30462320	5	$ 152,311,600.00			
		MAIN CONSTRUCTION VILLAGE						
		site prep	3540080					
		buildings	10008187					
		utilities	4914160					
			18462426.67	5	$ 92,312,133.33			
						$ 152,311,600	**$ 123,800,000**	**Camp cost to reflect lower volume (0.8125) *Previous Estimate doesn't total**
64		**Labor Expense**						
		Labor Expense	(Included In Direct Costs)					
65		**Superintendence**						
		Superintendence	(Included In Direct Costs)					
66		**Insurance**						
		Insurance	(Included In Direct Costs)					
68		**Mitigation Fishery, Terrestrial and Recrational**						
		Mitigation	(Not included in 1982 study)			$ -		
69		**Fees**						

Low Watana RCC Arch Alternative (4 Turbines)

Denotes Qty Adjustment by RST

FERC Line #	Sub Categories	Description	Quantity	Units	Unit Price	Line Price	Total	Notes / Remarks
		Fees						
Subtotal						Direct Construction Cost	$ 2,665,300,000	
	Contingency		21.313	%			$ 568,100,000	Used Same Contingency as Full RCC
Subtotal								
71A		Engineering (4%), Enviornmental (2%), Regulatory(1%) and Construction Management (	7	%			$ 186,600,000	
71B		Construction Management (4%)	4	%			$ 106,600,000	
72		Legal Expenses	0	%				
75		Taxes	0	%				
76		Administrative & Gen. Expenses	0	%				
77		Interest	0	%				
80		Earnings/Expenses During Construction	0	%				
Total Project Cost							$ 3,526,600,000	

r of Years for Base Case 20.5 years

of Years for Full Watana 16.5 years