

**SUSITNA
HYDROELECTRIC PROJECT**

**FEDERAL ENERGY REGULATORY COMMISSION
PROJECT No. 7114**

**WATANA DAM AND RESERVOIR
FEASIBILITY LEVEL
PROJECT COST ESTIMATE**

DRAFT REPORT

**HARZA-EBASCO
SUSITNA JOINT VENTURE**

**APRIL 1984
DOCUMENT No. 1457**

ALASKA POWER AUTHORITY

SUSITNA HYDROELECTRIC PROJECT

FEASIBILITY LEVEL PROJECT COST ESTIMATE

WATANA DAM AND RESERVOIR

Report by

Harza-Ebasco Susitna Joint Venture

Prepared for

Alaska Power Authority

Draft Report
April 1984

SUSITNA HYDROELECTRIC PROJECT
FEASIBILITY LEVEL PROJECT COST ESTIMATE
WATANA DAM AND RESERVOIR

Introduction and Scope

The License Application for the Susitna Project was submitted to the FERC on February 28, 1983 and was accepted with subsequent revisions on July 29, 1983.

The project design and arrangement which served as a basis for the application was developed from the Project Feasibility Report prepared by Acres American in 1982.

During the time the License Application was being revised after its initial submittal, a Watana geotechnical exploration program was undertaken. This program provided a better assessment of the dam foundation than had previously been available. As a result, studies were made to reassess the original dam design and to develop a refined design which would more realistically reflect the existing foundation conditions. At the same time, studies of refinements to the project arrangement were initiated to assist in reducing the project cost as much as possible within the same parameters of performance and safety as were used in the License Application.

The cost estimate and the related revised Exhibit F drawings, dated April 1984, are based upon the design concept refinements which were selected for adoption from the various refinement studies undertaken along with this cost reduction effort.

The following conceptual design refinements are included in this feasibility level cost estimate for Watana Dam:

1. Reduced bedrock and alluvium excavation and foundation treatment for dam embankment foundation.
2. Revised configuration and composition of dam and cofferdam internal zoning.
3. Revised diversion tunnels.
4. Relocation and reorientation of transformer gallery, powerhouse and surge chamber caverns.
5. Revised power conduits and power intake.
6. Elimination of fuse-plug spillway and increased size of main spillway to pass the PMF specified in the FERC license application.
7. Revised layout of power intake and spillway approach channels.
8. Reduction of construction facilities in accordance with above reductions in construction work.
9. Speed of units increased from 225 to 257.1 rpm.
10. Use of SF6 gas insulated switchgear instead of open-air switchyard.
11. Use of open-cut trench instead of tunnel for drainage of spillway chute.
12. Revised Relict Channel treatment.

Basis of Estimate

The Feasibility Level Estimate dated April 1984 was started in January 1984 as a supporting activity to the "Need for Power" hearings. As such, it was to be basically an independent and defensible estimate. New unit prices for construction work were developed.

During the course of the work some of the refinements in the above-mentioned earlier reports were modified or eliminated. More accurate quantities were calculated, stability analysis of certain structures were completed and Exhibit F drawings were either revised or redrawn.

Description of Refinements

The following describes the Watana Dam design refinements included in the estimate:

1. The main dam foundation treatment, as refined, would reduce rock excavation beneath the core and shells and limit excavation of the river valley alluvium to the central 80% of the dam foundation.

Evaluation of the "1983 Winter Exploration Program" indicated the possibility of leaving the river bed alluvium as a foundation for the dam embankment shells. However, the ability of the foundation overburden to sustain the effects of seismic shaking caused by the design earthquake has not been clearly established. Therefore, it is presently planned to found the embankment on bedrock except for the areas in proximity to the upstream and downstream toes of the embankment.

The explorations indicate the bedrock is of a better quality than originally anticipated. Therefore, only limited excavation of bedrock beneath the embankment is foreseen in the river channel. Fresh hard diorite in most instances exists from the bedrock surface. Removal or

foundation treatment (dental excavation of concrete backfill) will be performed in local areas beneath the shells where erodible or otherwise unsatisfactory foundation bedrock is encountered. The quantity of rock to be removed under the embankment will be reduced. The License Application cost estimates assumed a trench beneath the impervious core and filters averaging 40 feet deep and an average excavated depth under the shells of 10 feet. The design refinement provides a core trench 10 feet deep in the river section and 20 feet deep on the abutments. Excavation, under the shells on the abutments averages one foot. A reduction in the grout curtain was also included.

2. The Watana License Application design for the dam cross section has been essentially retained as it is considered to be satisfactory and will produce a stable structure. To increase safety against seismic shaking, which is at a maximum near the embankment crest, the steepening of the exterior slopes in this vicinity has been eliminated. This results in the same exterior slope from crest to toe both upstream and downstream.

The embankment internal zoning design has also been modified to incorporate materials from the required excavations along with by-product materials from the processing operations. The refined layout includes the use of rock and processed granular materials in the shells outside the impervious core. This section increases the utilization of available materials and will reduce required borrow as well as reduce spoil requirements.

The cofferdam sections were revised to a more conservative design and a positive slurry trench cutoff to bedrock would be provided. The freeboard of the cofferdams was increased to provide additional safety against ice pile up or higher water levels caused by ice jams.

3. The two diversion tunnels as shown in the FERC License Application were 38 foot diameter concrete lined. The discharge capacity is 80,500 cfs. One tunnel has an intake portal invert below the river bed level, while the other is 70 feet higher.

With the deep alluvium in the river bed upstream, the low tunnel could result in sediment deposition during flood recession. This tunnel could be partially filled with gravels thereby reducing its hydraulic capacity for the next flood season. Therefore, the refinement consists of raising the intake portal invert of the lower tunnel to El. 1445. The refinements also consist of adjusting the location and orientation of the tunnels based on more recent geological information and lowering the upper tunnel for greater hydraulic efficiency and thus decreasing the diameters of both tunnels to 36 feet.

The cofferdam locations would simultaneously be adjusted to utilize the reduced excavation of alluvium in the dam foundation. The length of the upstream cofferdam would be reduced by relocating it further downstream.

A comparison of the refined layout with the License Application follows:

	<u>FERC</u> <u>Layout</u>	<u>Refined</u> <u>Layout</u>
Tunnel 1 U/S Invert	El. 1490	El. 1468
Tunnel 1 D/S Invert	El. 1450	El. 1455
Tunnel 2 U/S Invert	El. 1420	El. 1445
Tunnel 2 D/S Invert	El. 1405	El. 1430
U/S Ice-Free Water Level Elevation	El. 1535	El. 1532
U/S Cofferdam Crest Elevation	El. 1545	El. 1550

U/S Cofferdam Freeboard (ft.)	9	8
D/S Ice-Free Water Level	El. 1468	El. 1468
D/S Cofferdam Crest	El. 1472	El. 1495
D/S Cofferdam Freeboard (ft.)	4	27

4. A review of the site geology, as presented in prior geotechnical reports (1980-81 and 1982), indicated a major set of fractures which trended N 50°W and a second minor set perpendicular to these. The caverns for the powerhouse, transformer gallery, and surge chamber, as shown in the feasibility report, trend in a direction approximately N 20°W, straddling between the major joint system and a subjoint system.

Excavation of the longitudinal walls would be improved if the major joint planes intersect the walls as near to the perpendicular as possible. Consequently, the caverns were rotated accordingly, dictating some changes in the water conduit and access tunnel geometry. This change will result in less overbreak of rock in the cavern faces, lessen construction problems and contribute to greater safety during construction.

5. The power conduits include a) the power tunnels extending from the power intake to the powerhouse and b) the tailrace tunnels.

The License Application shows the power intake located approximately 1,000 feet upstream from the dam axis. The power conduits consist of six individual penstock tunnels and shafts with a developed length of about 1,500 feet each, and two tailrace tunnels approximately 2,000 feet long. The downstream 300 feet of one of the tailrace tunnels utilized the downstream portion of one of the diversion tunnels.

To reduce the power conduit length in the design refinement, the intake structure was shifted to a location between the spillway and the river

channel, near to the dam axis. The number of penstock tunnels was reduced from six to three, each of which bifurcates into smaller penstock tunnels, approximately 200 feet upstream from the powerhouse. Guard valves will be provided for each turbine. The net head on the generating units will be greater, and the shorter, more efficient power conduits will provide better unit operation. Overall, the three power tunnel scheme is more cost effective than the six penstock tunnel scheme.

Vertical shafts are also recommended instead of sloping shafts because the excavation and concreting of a vertical shaft requires less time, personnel, and equipment; and given the geologic conditions, should result in less overbreak.

6. The License Application shows provisions for two spillways - a service spillway and a fuse-plug type emergency spillway sized for peak discharges of 152,000 cfs and 120,000 cfs, respectively. In this concept, the main spillway, the middle level outlet works, and a minimum of two generating units would discharge flows up to the 10,000-year flood. For larger floods, the reservoir would be surcharged and releases would be made through the main spillway and middle level outlet works until the reservoir reaches El. 2200. At this time, the fuse plug would begin to be breached and after a period of time, become fully eroded and the spillway would reach its design capacity. This spillway concept would allow passing of the Probable Maximum Flood (PMF) without overtopping the dam. During the PMF, the maximum reservoir elevation would be at El. 2201.

Review and analyses of alternative spillway layouts indicated that the combination of gated and fuse-plug spillways was more costly than a single spillway of the same capacity. Thus, a single spillway is

recommended with the capacity to pass the PMF while maintaining the same reservoir surcharge criterion.

7. The lower construction quantities and costs for the Watana Development entail reduced labor requirements, thereby reducing the size of the construction camp and catering services.
8. The proposed refinement is an increase in the synchronous speed of the generating set from 225 to 257.1 rpm.

The setting of the turbine distributor below tailwater needs to be greater for higher speed turbines. The depth shown in the FERC License Application is, however, more than adequate for the 225 rpm turbine and is adequate for the 257.1 rpm turbine. The increased speed will reduce the size and the cost of the turbine and generator set.

9. Revisions of the high voltage conductors from the main power transformers and elimination of the switchyard by use of SF6 gas insulated switchgear are proposed. These revisions include use of a single 9'-0" diameter vertical SF6 bus shaft instead of two vertical 7'-6" diameter cable shafts from the transformer gallery to the surface.

All switching equipment will be underground thus simplifying maintenance. This refinement will achieve improved operating and maintenance conditions by elimination of the potential for icing of equipment in an open-air switchyard. Substitution of SF6 buses for oil-filled cables will improve safety by removal of fire hazards from the cable shaft area. Elimination of the switchyard will also reduce environmental impact and improve aesthetics by the construction of fewer and smaller surface structures.

10. Subdrainage of the spillway chute as shown on the License Application consists of a drainage tunnel excavated 30 feet below the chute slab under the longitudinal centerline of the chute. Angled drainage holes would lead from box drains under the chute slab to the drainage tunnel. The design refinement consists of substituting for the drainage tunnel a gallery excavated in an open cut trench also along the longitudinal centerline of the chute. Box drains would then lead to this gallery. This refinement simplifies the construction procedure from that of a tunnelling operation to open cut excavation.
11. Treatment of the relict channel in the FERC License Application, based on foundation data then available, included an estimated cost of \$110 million for that work. The 1983 winter drilling program and subsequent geotechnical investigations indicate that other methods of treatment under what FERC deems a "worst case" scenario will provide adequate safety at a much lower cost. This treatment concept was submitted to FERC as part of a supplemental response. It consists of a postive seepage cut-off similar to an I.C.O.S. wall in combination with a downstream drainage gallery. Future investigations and studies may indicate that a less conservative and less costly treatment will be feasible.

WATANA - FERC APPLICATION

FILE # 1563-103

FEASIBILITY LEVEL ESTIMATE

(L LEVY, RAM D, OEB)

PRICE REPORT SUMMARY

MARCH 26, 1984

=====

- ACCOUNT 330 LAND & LAND RIGHTS	51,000,000
- ACCOUNT 331 POWERHOUSE	69,458,842
- ACCOUNT 332.1 RESERVOIR, DAMS & WATERWAYS	48,060,187
- ACCOUNT 332.2 DIVERSION TUNNELS	97,348,501
- ACCOUNT 332.22 U/S COFFERDAM	18,350,520
- ACCOUNT 332.23 D/S COFFERDAM	2,689,410
- ACCOUNT 332.3 MAIN DAM	800,962,218
- ACCOUNT 332.4 RELICT CHANNEL	58,613,000
- ACCOUNT 332.51 OUTLET FACILITIES	39,151,349
- ACCOUNT 332.52 MAIN SPILLWAY	120,041,986
- ACCOUNT 332.6 POWER&OUTLET INTAKE AND APPR.	96,979,367
- ACCOUNT 332.8 PENSTOCKS & SURGE CHAMBER	54,499,980
- ACCOUNT 332.9 TAILRACE	14,129,012
- ACCOUNT 333 WATERWHEELS, TURBINE & GENERATORS	70,800,000
- ACCOUNT 334 ACCESSORY ELECTRICAL	21,200,000
- ACCOUNT 335 MISC POWER PLANT EQUIPMENT	13,800,000
- ACCOUNT 336 ROADS, RAIL FACILITIES & AIRSTRIP	213,865,000
- ACCOUNTS 350-359 TRANSMISSION LINES	468,800,000
- ACCOUNT 399 GENERAL PLANT	5,092,000
- ACCOUNT (63) CONSTRUCTION CAMP & FACILITIES	301,824,033
- ACCOUNT (68) MITIGATION	29,200,000

GRAND TOTAL -

2,595,865,405
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NOTE: ALL UNIT PRICES HAVE BEEN ESTABLISHED TO THE NEAREST CENT
TO RECONCILE WITHIN 0.0011% OF THE TOTAL PRICE AND THE
TOTAL AMOUNT DEVELOPED ON THE MARKUP DERIVATION.

SUSITNA/WATANA

CIVIL WORK COST ESTIMATE

- 1) General:
- 2) Basic Estimating Criteria for Civil Works:
 - a) Type of Estimate
 - b) Price Level
 - c) Quantities
 - d) Working Season
 - e) Construction Contract Breakdown
 - f) Labor
 - g) Equipment
 - h) Materials, Supplies and Small Tools
 - i) Indirect Costs
 - (i) Personnel
 - (ii) Travel Allowance
 - (iii) Vehicles
 - (iv) Misc. & Maint. Expense
 - (v) General Plant & Services
 - (vi) Bonds, Insurance & Taxes
 - (vii) Financing
 - (viii) Mobilization
 - (ix) Contractor's Profit & Home Office Support
- 3) Material Sources
 - a) Sand & Gravel Fills
 - b) Rockfill
 - c) Impervious Fill
 - d) Concrete Aggregates
- 4) Construction Schedule Considerations
- 5) Construction Plant
 - a) Quarry
 - b) Alluvium
 - c) Impervious
 - d) Concrete
 - e) Underground Excavation

WATANA PROJECT COST ESTIMATE

- 1) General. The construction cost of the Susitna Project-Watana Development was estimated in detail (with the exceptions noted below) based on the revised conceptual design reflected in the following reports:

"Review and Update of Conceptual Design"
(Category 1 changes - Nov. 1983)

"Proposed Category 2 Conceptual Design Refinements"
(Draft-Jan. 1984)

These were prepared for the Alaska Power Authority by the Harza-Ebasco Susitna Joint Venture, and include a 6 unit underground powerhouse, normal maximum reservoir at El. 2185 and spillway and appurtenances.

After a review of the backup calculations, estimating procedures and basic criteria used in the Feasibility Estimate by Acres American Inc., it was concluded that, in order to reduce the total effort, it should not be necessary to reanalyze in detail the following work items:

- Land and Land Rights
- Road, Rail facilities and Airstrip
- Clearing and Grubbing, Dewatering, Drilling & Grouting & Slurry Walls.
- Misc. Metals, Architectural, Gates and Hoists
- Mitigation

The costs for the relict channel were developed by the Harza/Ebasco office in Anchorage and have been used in this estimate.

2) Basic Estimating Criteria for Civil Works. The construction costs for the Susitna-Watana Development Civil Works were estimated based on the following criteria:

- (a) Type of Estimate - The estimate will be used at the feasibility level for FERC license application.
- (b) Price Level - All costs were estimated at Jan. 1982 price levels.
- (c) Quantities - All quantities reflect the configuration outlined in the November 1983 report "Review and Update of Conceptual Design" prepared for the Alaska Power Authority by Harza-Ebasco. The quantity take-offs were prepared in the Anchorage Harza-Ebasco office.
- (d) Working Season - It was assumed that earthmoving and outside concrete activities will be performed on a 7 month season basis. Underground work will be performed on a year around schedule.
- (e) Construction Contract Breakdown - The cost estimate was calculated on the basis of awarding the work in 15 separate contracts:

- C-1 Diversion Tunnel & Facilities
- C-2 Main Dam: Abut. Exc., Drainage & Grouting
- C-3 Main Dam River Bottom Exc. and Treatment.
Embank to El. 1460 Power Intake Excav.,
Cofferdams
- C-4 Spillway Excavation, Found. Treatment and Drain
Galleries
- C-5 Outlet Facilities. Tunnel Exc. & Concrete
Power Intake Concrete
- C-6 Power Facilities. Excav. & Concrete
- C-7 Main Dam Embank. & Relict Channel
- C-8 Aggregate and Concrete Supply
- C-9 Spillway Concrete
- C-10 Gates and Hoists
- C-11 Roads, Air & Rail Facilities
- C-12 Clearing and Grubbing
- C-13 Camp Construction, Maintenance & Catering
- C-14 Mechanical & Electrical
- C-15 Transmission Lines

- f) Labor - The rates represent January 1982 dollars and are based on two 10 Hr. shifts, 6 days per/week operation. The rates include the following allowances to the base:

Overtime	17.0%
Two Shifts	3.0%
Burden:	
Workman's Comp.	9.60%
State Unemployment	4.45%
Federal "	0.70
Liability Insurance	2.00
Social Sec. Insura.	6.70
Holiday Pay	1.60
Travel Allowance	1.60
	<u>26.65</u> say 27.0%

The overtime and shift allowance of 20% is a percentage mark-up to the base rate, that sum is adjusted by the Labor Burden of 27.0% to which the fringe benefits are added resulting in an average hourly rate:

Base Rate X 1.20 X 1.27 + Fringes = Adjusted Rate

- g) Equipment - The equipment hourly rates used in the cost estimate are based on the "Cost Reference Guide for Construction Equipment" for Jan 1982 adjusted as follows:

Depreciation	X 1.10
Maint. Labor	X 2.50
Parts	X 1.25
G.E.C.	X 1.25
Fuel	X 1.27
Lube	X 1.27
Electr.	X 1.00

- h) Materials, Supplies and Small Tools - The cost of the materials and supplies was based at Jan 1982 levels and represent prices delivered to the jobsite warehouses. The cost of material control and warehousing is in the indirect cost. The cost of handling and installing is in the direct cost. The cost of small tools was assumed at 5-10% of labor costs and it is included in the direct cost.

- i) Indirect Costs - These costs include the following:
- i) Personnel: Under this heading all administrative and unassigned personnel is included, such as: Project Managers, General Superintendents, Shift Superintendents, Master Mechanics, Engineers, Engineering, Office, Warehousing and Equipment Crews.
 - ii) Travel Allowances: Include mobilization of contractor's staff personnel, vacation travel, allowances for turn-over travel costs.
 - iii) Vehicles - Include vehicles assigned to administrative personnel, and other equipment not accounted in the direct costs such as ambulances, airplanes, flat-bed trucks, buses, service trucks, fork-lifts etc.
 - iv) Misc. & Maintenance Expense: Include such expenses as the cost of office, photo, reproduction supplies, outside engineering, legal, auditing consultants, communication, utilities, testing and computer services, building maintenance, warehousing and air purchasing.
 - v) General Plant and Services: Includes cost of construction plant such as: offices, warehouses, shops, installation of light and power, telephone, radio, and utility systems. It also includes general services such as: ambulance, air transport, explosive storage and distribution, construction lighting, snow removal and fuel storage and dispatching, truck steam house etc.
 - vi) Bonds, Insurances & Taxes: The cost estimate does not include the cost of bonds, insurances and taxes.
 - vii) Financing: The cost of contractor's financing was estimated as follows:
 - Cash Penetration - 30 days at 15% per year, for 85% of monthly certification
 - Holdback - financing retention of 10% up to 50% of work completed plus 1 year maintenance, at interest rate of 15% per year.

viii) Mob & Demob - The cost of mobilizing all construction equipment is included in the indirect costs. The cost of mobilizing all construction plants such as material processing, clay drying, concrete batch and mix is included in the direct cost items. The cost of demobilizing is assumed to "wipe-out" salvage value.

ix) Contractor's Profit & Home Office Support - The civil work contractor's profit and home office support was estimated at 10% of the civil work contract amount. Home office support will include administrative personnel recruiting, and down-states expediting and marshalling expenses.

3) Material Sources - The cost estimate was prepared based on obtaining the materials for embankments and concrete as follows:

a) Sand & Gravel Fills:

- Alluvium Deposits Borrow Area E located + 2 miles D/S on left bank	29,426.800 BCY
- Required Excavations	4,244,200
	<u>33,671,000 BCY</u>

b) Rockfill:

- Quarry on RT. Abutment Extension of Spillway	14,618,900 BCY
- Required Excavations:	
° Directly	3,090,600
° Rehandled from Stockpile	1,816,500
	<u>19,526,000 BCY</u>

c) Impervious Fill:

- Deposit Borrow, "D" located + 2 miles. U/S, RT Bank	9,540,000 BCY
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d) Concrete Aggregates:

- Alluvium Deposits Borrow "E"	651,000 BCY
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4) Construction Schedule Considerations: The construction costs were based on the construction schedule of Feb. 3, 1984 prepared by Harza-Ebasco in Anchorage, Alaska.

PRICE REPORT

WATANA - FERC APPLICATION

FILE # 1563-103

FEASIBILITY LEVEL ESTIMATE

(L LEVY, RAM D, OEB)

PRICE REPORT SUMMARY

MARCH 26, 1984

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DATE MARCH 30, 1984
FILE NO 1563-103
PROJECT WATANA - FERC APPLICATION

HARZA ENGINEERING COMPANY
FEASIBILITY ESTIMATE
(L LEVY/RAM D/OEB)

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL PRICE
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A
SCHEME 2105B
(FILL TYPE DAM)

330	LAND & LAND RIGHTS	1	LS	51000000.00	51,000,000
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SUBTOTAL, PAGE 1				51,000,000
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SUBTOTAL - ACCOUNT 330 LAND & LAND RIGHTS				51,000,000
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DATE MARCH 30, 1904
FILE NO 1563-103
PROJECT WATANA - FERC APPLICATION

HARZA ENGINEERING COMPANY
FEASIBILITY ESTIMATE
(L LEVY/RAM D/OEB)

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL PRICE
331.1	UNDERGROUND POWERHOUSE				
.11	POWERHOUSE & TAILRACE				
.111	EXCAVATION - ROCK	168000	CY	79.42	13,342,560
.113	DRILL & GROUT U/S OF PH	44730	LF	29.59	1,323,561
.114	CONCRETE	43500	CY	307.75	16,067,125
.117	DRAIN HOLES	44430	LF	23.36	1,037,005
.118	METALWORK	1	LS	2831425.00	2,831,425
.119	ARCHITECTURAL	1	LS	1146905.00	1,146,905
.11C	MECHANICAL	1	LS	1763415.00	1,763,415
.12	ACCS. TUNLS&PORTALS				
.120	35'X20' EXC	2970	LF	3140.95	9,320,621
SUBTOTAL, PAGE 2					47,641,497

DATE MARCH 30, 1984
FILE NO 1563-103
PROJECT WATANA - FERC APPLICATION

HARZA ENGINEERING COMPANY
FEASIBILITY ESTIMATE
(L LEVY/RAM D/OEB)

ITEM	DESCRIPTION	QUANTITY UNIT	UNIT PRICE	TOTAL PRICE
.121	21'H X 25' W.H.S SURGE CH. ACCESS	100 LF	2005.56	519,401
.123	DRAINAGE GALLERY 10'X10' EXC	570 LF	1100.96	627,550
.12A	ACCESS PORTAL & ROAD COM EXC	94420 CY	5.67	535,361
.12B	ACCESS PORTAL & ROAD ROCK EXC	71790 CY	21.00	1,565,022
.12C	VENTILATION GALLERY 14' H X 12' W H.S.	560 LF	1323.65	741,244
.124	PORTALS CONCRETE	600 CY	426.60	256,000
.125	TUNNEL SLAB CONCRETE	1690 CY	317.60	536,079
.126	PENSTOCK ACCESS PLUG CONCRETE	7275 CY	197.77	1,438,777
.129	MAIN PORTAL DOORS	2 SETS	97969.00	195,938
SUBTOTAL, PAGE 3				6,416,100

DATE MARCH 30, 1984
FILE NO 1563-103
PROJECT LATANA - FERC APPLICATION

HARZA ENGINEERING COMPANY
FEASIBILITY ESTIMATE
(L LEVY/RAM D/OEB)

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL PRICE
.13	ACCESS SHAFT				
.131	ROCK EXC 23' DIA	740	LF	3673.53	2,718,408
.134.	CONCRETE LINING 20' ID	740	LF	2324.95	1,720,467
.138	MISC. METALWORK	50	TONS	3893.10	194,655
.13C	ELEVATORS	1	LS	927960.00	927,960
.14	FIRE PROTECTION HEADTANK	1	LS	470908.50	470,909
.15	BUS TUNNELS				
.151	EXC HORIZONTAL 22X22	156	LF	2874.66	448,447
.152	EXC INCLINED 16X16	202	LF	2305.69	672,765
.154	BUS TUNNEL SLAB CONC	350	CY	317.60	111,180
.16	TRANSFORMER GALLERY				
.161	EXCAVATION	26200	CY	85.21	2,232,502

SUDTOTAL, PAGE 4

9,497,301

DATE MARCH 30, 1984
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PROJECT WATANA - FERC APPLICATION

HARZA ENGINEERING COMPANY
FEASIBILITY ESTIMATE
(L LEVY/RAM D/DEB)

ITEM	DESCRIPTION	QUANTITY UNIT	UNIT PRICE	TOTAL PRICE
.164	CONCRETE SLAB	2180 CY	317.68	692,542
.167	DRAIN HOLES	8300 LF	23.36	193,888
.17	BUS SHAFTS			
.171	EXCAVATION 10.5 DIA	560 LF	1971.47	1,104,020
.174	CON. LINING 9.0 DIA	560 LF	1255.13	702,076
.178	MISC. METALWORK	9 TONS	3893.10	35,038
.179	ENCLOSURES (ARCH.)	1 LS	44692.70	44,693
.170	MANHOIST	1 EA	204731.50	204,732
.18	CARE OF WATER	1 LS	520300.00	520,300
.19	INSTRUMENTATION	1 LS	668055.00	668,055
.2	MISC. BUILDINGS & STRUCTURES	1 LS	1737720.00	1,737,720

SUBTOTAL, PAGE 5 5,903,864

SUBTOTAL - ACCOUNT 331 POWERHOUSE 69,458,042

DATE MARCH 30, 1984
FILE NO 1563-103
PROJECT WATANA - FERC APPLICATION

HARZA ENGINEERING COMPANY
FEASIBILITY ESTIMATE
(L LEVY/RAM D/OEB)

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL PRICE
332	RESERVOIRS, DAMS AND WATERWAYS				
.1	RESERVOIR CLEARING	37500	ACRES	1281.60	48,060,187
SUBTOTAL, PAGE 6					48,060,187
SUBTOTAL - ACCOUNT 332.1 RESERVOIR, DAMS & WATER.					48,060,187

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PROJECT WATANA - FERC APPLICATION

HARZA ENGINEERING COMPANY
FEASIBILITY ESTIMATE
(L LEVY/RAM D/OEB)

ITEM	DESCRIPTION	QUANTITY UNIT	UNIT PRICE	TOTAL PRICE
.2	DIVERSION TUNNELS			
.210	ACCESS TUNNEL TO GATE CHAMBER 15'X20'	2100 LF	1731.65	3,636,465
.211	DIVERSION TUNNEL EXCAVATION 39 FT DIA	7220 LF	3510.02	25,342,300
.21A	DIVERSION TUNNEL EXCAVATION 48 FT DIA	760 LF	4665.49	3,545,769
.21B	PORTALS - COM EXC	67100 CY	7.37	494,527
.21C	PORTALS - ROCK EXC	85550 CY	21.96	1,878,678
.21D	EMERGENCY RELEASE CHAMBERS ROCK EXC	4700 CY	98.32	462,104
.212	TEMPORARY COFFERDAM FILL FOR U/S PORTALS	34540 CY	4.73	163,374
.214	TUNNEL CONC. LINING-- 36' ID	7220 LF	3281.10	23,689,542
SUBTOTAL, PAGE 7				59,212,767

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PROJECT WATANA - FERC APPLICATION

HARZA ENGINEERING COMPANY
FEASIBILITY ESTIMATE
(L LEVY/RAM D/OEB)

ITEM	DESCRIPTION	QUANTITY UNIT	UNIT PRICE	TOTAL PRICE
.21E	TUNNEL CONC. LINING- 45' ID	760 LF	3201.10	2,493,636
.215	PORTAL CONCRETE	18525 CY	266.29	4,933,022
.215a	MASS CONCRETE	200 CY	240.30	40,060
.216	FLIP BUCKET CONCRETE	2000 CY	265.96	531,920
.217	EMERGENCY RELEASE CHAMBER CONCRETE	15300 CY	389.31	5,956,443
.218	SUSPENDED METAL ROOF- EMERG. RELEASE CHMB	2775 SF	52.03	144,383
.219	LOWER DIVERSION TUNNEL PLUG CONCRETE	5570 CY	197.77	1,101,579
.21F	LOWER DIVERSION TUNNEL PLUG CONCRETE AT TAILRACE TUNNEL	0500 CY	197.77	1,001,045
.21G	DIV TUNNEL MECHANICAL	1 LS	21136400.00	21,136,400
SUBTOTAL, PAGE 8				30,026,400

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PROJECT WATAHA - FERC APPLICATION

HARZA ENGINEERING COMPANY
FEASIBILITY ESTIMATE
(L LEVY/RAM D/DEB)

ITEM	DESCRIPTION	QUANTITY UNIT	UNIT PRICE	TOTAL PRICE
.21H	GRANULAR BACKFILL	8245 CY	13.25	109,246
SUBTOTAL, PAGE 9				109,246
SUBTOTAL - ACCOUNT 332.2 DIVERSION TUNNELS				97,348,501

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PROJECT WATANA - FERC APPLICATION

HARZA ENGINEERING COMPANY
FEASIBILITY ESTIMATE
(L LEVY/RAM D/OEB)

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL PRICE
.21H	GRANULAR BACKFILL	8245	CY	13.25	109,246
SUBTOTAL, PAGE 9					109,246
SUBTOTAL - ACCOUNT 332.2 DIVERSION TUNNELS					97,348,501

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PROJECT WATANA - FERC APPLICATION

HARZA ENGINEERING COMPANY
FEASIBILITY ESTIMATE
(L LEVY/RAM D/OEB)

ITEM	DESCRIPTION	QUANTITY UNIT	UNIT PRICE	TOTAL PRICE
.22	U/S COFFERDAM			
.221	COMMON EXCAVATION	1000 CY	4.25	4,250
.222	IMPERVIOUS FILL	52000 CY	11.06	575,120
.223	ROCK & GRAVEL FILL	313000 CY	13.25	4,147,250
.224	FILTERS	33000 CY	13.25	437,250
.225	CUT-OFF WALL U/S	39000 SF	38.65	1,507,350
.226	CARE OF WATER	1 LS	11679300.00	11,679,300
SUBTOTAL, PAGE 10				18,350,520
SUBTOTAL - ACCOUNT 332.22 U/S COFFERDAM				18,350,520

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HARZA ENGINEERING COMPANY
FEASIBILITY ESTIMATE
(L LEVY/RAM D/OEB)

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL PRICE
.23	D/S COFFERDAM				
.231	COMMON EXCAVATION	5000	CY	4.25	21,250
.232	IMPERVIOUS FILL	47250	CY	11.06	522,505
.233	ROCK & GRAVEL FILL	42000	CY	13.25	567,100
.235	CUTOFF WALL D/S	29500	SF	38.65	1,140,175
.236	REMOVAL OF COFFERDAM	90000	CY	4.87	430,300
SUBTOTAL, PAGE 11					2,609,410
SUBTOTAL - ACCOUNT 332.23 D/S COFFERDAM					2,689,410

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HA/ZA ENGINEERING COMPANY
FEASIBILITY ESTIMATE
(L LEVY/RAM D/OED)

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL PRICE
.3	MAIN DAM				
.311	EXCAVATION - COMMON	4936000	CY	5.57	27,493,520
.312	EXCAVATION - ROCK	1214000	CY	19.22	23,333,080
.31A	IMPERVIOUS FILL	7077000	CY	11.06	07,119,620
.31B	PROVIDE DRYING FACILITIES FOR IMPERVIOUS FILL	1	LS	13282300.00	13,282,300
.31C	DRYING IMPERVIOUS FILL	1576000	CY	7.32	11,536,320
.31D	U/S GRAVEL & D/S SAND FILL	20626000	CY	13.25	273,294,500
.31E	FILTERS	6330000	CY	13.25	83,970,500
.31F	ROCKFILL FROM QUARRY	10563400	CY	11.31	209,952,054
.31G	ROCKFILL FROM STOCKPILE	2307000	CY	4.73	10,912,110

SUBTOTAL, PAGE 12

740,982,604

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HARZA ENGINEERING COMPANY
FEASIBILITY ESTIMATE
(L LEVY/RAM D/OEB)

ITEM	DESCRIPTION	QUANTITY UNIT	UNIT PRICE	TOTAL PRICE
.31H	ROCKFILL DIRECTLY FROM EXCAVATION	3924600 CY	0.78	3,061,108
.3H1	RAKING ROCKFILL	902000 CY	0.75	676,500
.313	DRILL&GROUT - CONSOL.	345000 LF	20.03	9,670,350
.311	DRILL&GROUT - CURTAIN	203450 LF	31.14	0,026,633
.314	DAM DENTAL CONCRETE	85000 CY	155.72	13,236,200
.317	DRAIN HOLES	136000 LF	23.36	3,176,960
.32	GROUT GALLRS&PORTALS			
.321	HORIZ. GALLRS 10X10	7450 LF	839.35	6,253,157
.322	INCLINED GALLERIES 10' X 10'	2580 LF	1286.20	3,310,602
.323	SHAFTS 10X10	900 LF	2331.18	2,098,066
.32A	PORTALS - COMMON EXC	3600 CY	4.25	15,300
SUBTOTAL, PAGE 13				50,332,956

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HARZA ENGINEERING COMPANY
FEASIBILITY ESTIMATE
(L LEVY/RAM D/OEB)

ITEM	DESCRIPTION	QUANTITY UNIT	UNIT PRICE	TOTAL PRICE
.32B	PORTALS - ROCK EXC	1000 CY	18.84	18,840
.324	TUNNEL CONCRETE SLABS	3410 CY	317.68	1,083,289
.325	PORTAL CONCRETE	20 CY	467.17	9,343
.326	TUNNEL PLUG CONCRETE	700 CY	197.77	138,439
.329	PORTAL DOORS (ARCH.)	2 EA	29073.60	58,147
.33	DAM INSTRUMENTATION	1 LS	8419200.00	0,419,200
SUBTOTAL, PAGE 14				9,727,258
SUBTOTAL - ACCOUNT 332.3 MAIN DAM				800,962,218

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HARZA ENGINEERING COMPANY
FEASIBILITY ESTIMATE
(L LEVY/RAM D/OEB)

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL PRICE
.4	RELICT CHANNEL	1	LS	58613000.00	58,613,000
SUBTOTAL, PAGE 15					58,613,000
SUBTOTAL - ACCOUNT 332.4 RELICT CHANNEL					58,613,000

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HARZA ENGINEERING COMPANY
FEASIBILITY ESTIMATE
(L LEVY/RAM D/OED)

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL PRICE
.5	OUTLET FACILITIES				
.512	TUNNEL - HORIZONTAL EXCAVATION - 31' DIA	2050	LF	3231.27	6,624,103
.510	INCLINED SHAFT EXCAVATION 31' DIA	460	LF	3606.56	1,659,018
.51B	TUNNEL EXCAVATION - MANIFOLD	900	LF	1192.04	1,073,560
.514	CONCRETE LINING - HORIZONTAL 28' ID	1675	LF	3036.61	5,086,330
.51C	CONC. LINING -HORIZ, STEEL LINED 28' ID	375	LF	2256.43	846,163
.51D	CONCRETE LINING - MANIFOLD 8' ID	900	LF	1114.98	1,003,482
.51E	INCLINED LINING - SHAFT 28' ID	460	LF	3036.61	1,396,843
.51F	MECHANICAL - INLET	1	LS	5243200.00	5,243,200

SUBTOTAL, PAGE 16

22,932,699

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HARZA ENGINEERING COMPANY
FEASIBILITY ESTIMATE
(L LEVY/RAM D/OEB)

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL PRICE
<hr/>					
.51G	MECHANICAL - OUTLET	1	LS	16218650.00	16,218,650
<hr/>					
SUBTOTAL, PAGE 17					16,218,650
SUBTOTAL - ACCOUNT 332.51 OUTLET FACILITIES					39,151,349

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HARZA ENGINEERING COMPANY
FEASIBILITY ESTIMATE
(L LEVY/RAM D/DEB)

ITEM	DESCRIPTION	QUANTITY UNIT	UNIT PRICE	TOTAL PRICE
.52	MAIN SPILLWAY, INCL CIVIL WORKS FOR OUTLET FACILITIES			
.521	COMMON EXC - APPROACH & CONTROL STRUCTURE	379000 CY	4.07	1,045,730
.522	COMMON EXC - CHUTE, FLIP BKT & OUTFALL	310300 CY	5.39	1,713,637
.520	RIVER CHANNEL ALLUVIUM EXCAVATION	1060000 CY	6.37	6,752,200
.52B	ROCK EXCAVATION - APPROACH STRUCTURE	1096000 CY	14.20	15,650,000
.52C	ROCK EXCAVATION - CONTROL STRUCTURE	274000 CY	22.70	6,241,720
.52D	ROCK EXC - CHUTE & FLIP BUCKET	1592500 CY	17.47	27,020,975
.52F	BACKFILL	1 LS	62289.50	62,290
SUBTOTAL, PAGE 18				60,089,432

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HARZA ENGINEERING COMPANY
FEASIBILITY ESTIMATE
(L LEVY/RAM D/OEB)

ITEM	DESCRIPTION	QUANTITY UNIT	UNIT PRICE	TOTAL PRICE
.523	DRILL&GRT - CONSOL.	66000 LF	28.03	1,845,980
.524	SPILLWAY CONCRETE			
.52G	PIERS	40060 [✓] CY	304.91	12,214,695
.52H	DECK	350 CY	915.73	320,505
.52I	GUIDE WALLS	11510 [✓] CY	475.04	5,476,910
.52J	SLAB	30000 CY	530.61	16,509,100
.52K	OGEE	24000 CY	240.30	5,959,440
.52L	FLIP BUCKET & OUTLET [✓] DISCHARGE STRUCTURE	29300 CY	336.43	9,520,969
.52M	DRAIN GALRY AND NERATION GALLERY CONCRETE	3710 CY	711.95	2,641,334
.52P	GRAVITY RETAINING WALL & FLIP BUCKET	1000 CY	409.09	409,090

SUBTOTAL, PAGE 19

55,062,919

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HARZA ENGINEERING COMPANY
FEASIBILITY ESTIMATE
(L LEVY/RAM D/OEB)

ITEM	DESCRIPTION	QUANTITY UNIT	UNIT PRICE	TOTAL PRICE
.525	15' ROCKBOLTS	433 EA	197.77	85,634
.526	10' ROCKBOLTS	8100 EA	132.36	1,072,116
.528	HALF ROUNDS TO DRAINAGE GALLERY	15000 LF	15.57	233,550
.52H	SPILLWAY MECH&ELECT	1 LS	3490335.00	3,490,335
SUBTOTAL, PAGE 20				4,889,635
SUBTOTAL - ACCOUNT 332.52 MAIN SPILLWAY				120,041,986

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HARZA ENGINEERING COMPANY
FEASIBILITY ESTIMATE
(L LEVY/RAM D/OEB)

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL PRICE
.6	POWER AND OUTLET INTAKE&APPROACH				
.611	COMMON EXCAVATION	423000	CY	5.39	2,279,970
.612	APPROACH - ROCK EXCAVATION	1695300	CY	14.28	24,200,004
.61B	INTAKE ROCK EXCAVATION	115300	CY	22.70	2,626,534
.614	CONCRETE	96400	CY	506.55	40,031,420
.615	1"X15' ROCKBOLTS	330	EA	197.77	65,264
.61C	INTAKE MECH&ELECT	1	LS	13672550.00	13,672,550
.61D	INTAKE BUILDING	1	LS	2002450.00	2,002,450
.61E	STRAND VSL ANCHORS INCLUDING INSTALL.	5800	LF	155.72	903,176
.61F	DRILLING 11" DIA HOLES AND GROUTING	5800	LF	23.36	135,408

SUBTOTAL, PAGE 21

94,725,736

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HARZA ENGINEERING COMPANY
FEASIBILITY ESTIMATE
(L LEVY/RAM D/OEB)

ITEM	DESCRIPTION	QUANTITY UNIT	UNIT PRICE	TOTAL PRICE
.62	INTAKE GATE	2 EA	590815.00	1,181,630
.63	BULKHEAD GATE	2 EA	123644.50	247,289
.64	CIRCULAR TRASHRACK	4 EA	206178.00	824,712
SUBTOTAL, PAGE 22				2,253,631
SUBTOTAL - ACCOUNT 332.6 POWER INTAKE				96,979,367

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HARZA ENGINEERING COMPANY
FEASIBILITY ESTIMATE
(L LEVY/RAM D/OEB)

ITEM	DESCRIPTION	QUANTITY UNIT	UNIT PRICE	TOTAL PRICE
.711	ROCK EXCAVATION	102000 CY	84.09	8,577,180
.712	VENT SHAFT EXC 8.5 DIA	535 LF	2008.83	1,074,727
.714	CONCRETE 6.5 ID	90 LF	906.31	81,568
.715	SHOTCRETE 2 INCH	1 LS	31144.75	31,145
.716	SURGE CHAMBER CONC.	5100 CY	587.08	2,994,108
.717	DRAIN HOLES	15500 LF	31.14	482,670
.718	1"X10" ROCKDOLTS	400 EN	130.01	52,324
.71C	STOPLOGS, GUIDES AND FOLLOWERS STOPLOGS 40"W X44"H	1 LS	2052750.00	2,052,750
.8	PENSTOCKS			
.011	EXC -SHAFT - 27"DIA	1000 LF	4544.02	0,179,236

SUBTOTAL, PAGE 23

23,525,700

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HARZA ENGINEERING COMPANY
FEASIBILITY ESTIMATE
(L LEVY/RAM D/OEB)

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL PRICE
.01A	EXC -HORIZ- 27' DIA	1245	LF	2921.30	3,637,110
.012	EXC - HORIZ - 21' DIA	690	LF	2089.81	1,441,972
.01B	EXC - HORIZ - 18' DIA	1200	LF	1756.57	2,107,878
.013	DRILL & GROUT-CONSOL	1	LS	357121.50	357,122
.014	PENSTOCK CONCRETE LINER-SHAFT-24'	1000	LF	5146.65	9,263,970
.019	CONCRETE LINER LINER-HORIZ 24' ID	1245	LF	3036.61	3,780,586
.01C	CONCRETE LINER HORIZ 18' ID	690	LF	1952.78	1,347,415
.015	CONCRETE LINER HORIZONTAL - 15' ID	1200	LF	1627.31	1,952,770
.010	STEEL LINER	1020	TON	3093.10	7,005,433
SUBTOTAL PAGE 24					30,974,272
SUBTOTAL - ACCOUNT 332.8 PENSTOCKS & SURGE CH.					54,499,980

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HARZA ENGINEERING COMPANY
 FEASIBILITY ESTIMATE
 (L LEVY/RAM D/OEB)

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL PRICE
.9	TAILRACE				
.911	TUNNEL EXC. - 37'	2080	LF	3332.49	6,931,579
.912	PORTAL COMMON EXC	4560	CY	5.67	25,855
.913	PORTAL ROCK EXC	31095	CY	21.96	682,846
.914	TAILRACE TUNNEL CONCRETE -34' ID	2080	LF	2740.74	5,700,739
.91A	PORTAL CONCRETE	300	CY	490.53	147,159
.915	PORTAL ROCKBOLTS 1"X25'	110	EA	330.13	36,314
.91C	TAILRACE STOPLOGS GUIDES & FOLLOWERS	1	LS	604520.00	604,520

SUBTOTAL, PAGE 25 14,129,012

SUBTOTAL - ACCOUNT 332.9 TAILRACE 14,129,012

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HARZA ENGINEERING COMPANY
FEASIBILITY ESTIMATE
(L LEVY/RAM D/OEB)

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL PRICE
333	WATERWHEELS, TURBINE & GENERATORS				
.10	GUARD VALVES	6	EA	1500000.00	9,000,000
.11	TURBINES & GOVERNORS	6	EA	4500000.00	27,000,000
.21	GENERATORS & EXCITERS	6	EA	5000000.00	34,000,000
SUBTOTAL, PAGE 26					70,000,000
SUBTOTAL - ACCOUNT 333 WATERWHEELS, TURB & GEN					70,000,000

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HARZA ENGINEERING COMPANY
FEASIBILITY ESTIMATE
(L LEVY/RAM D/DEB)

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL PRICE
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334	ACCESSORY ELECTRICAL EQUIPMENT	1	LS	21200000.00	21,200,000
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SUBTOTAL, PAGE 27				21,200,000
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SUBTOTAL - ACCOUNT 334 ACCESSORY ELEC EQ.				21,200,000
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HARZA ENGINEERING COMPANY
FEASIBILITY ESTIMATE
(L LEVY/RAM D/OED)

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL PRICE
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335	MISC POWER PLNT EQUIP	1	LS	13800000.00	13,800,000
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SUBTOTAL, PAGE 20				13,800,000	
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SUBTOTAL - ACCOUNT 335 MISC POWER PLANT EQ.				13,800,000	
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HARZA ENGINEERING COMPANY
FEASIBILITY ESTIMATE
(L LEVY/RAM D/DEB)

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL PRICE
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336
ROADS, RAIL & AIR FAC

.11	PERM. ACCESS ROADS	1	LS	60930000.00	60,930,000
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.12	SITE ROADS	20	MI	4871000.00	97,420,000
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.13	PERMANENT ROADS	6	MILES	504000.00	3,024,000
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.2	RAIL FACILITIES	1	LS	45481000.00	45,481,000
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.3	AIRSTRIP	1	LS	7010000.00	7,010,000
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SUBTOTAL PAGE 29				213,865,000
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SUBTOTAL - ACCOUNT 336 ROADS&RAIL FAC & AIRPORT				213,865,000
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HARZA ENGINEERING COMPANY
FEASIBILITY ESTIMATE
(L LEVY/RAM D/OEB)

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL PRICE
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350-359	TRANSMISSION PLANT (DIVIDED INTO 10 UNITS FOR PROGRAM CONVENIENCE)	10	LS	46800000.00	468,800,000
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SUBTOTAL, PAGE 30				468,800,000	
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SUBTOTAL - ACCOUNTS 350-359 TRANSMISSION LINES				468,800,000	
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HARZA ENGINEERING COMPANY
FEASIBILITY ESTIMATE
(L LEVY/RAM D/OEB)

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL PRICE
399	GENERAL PLANT	1	LS	5092000.00	5,092,000
SUBTOTAL, PAGE 31					5,092,000
SUBTOTAL - ACCOUNT 399 GENERAL PLANT					5,092,000

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HARZA ENGINEERING COMPANY
FEASIBILITY ESTIMATE
(L LEVY/RAM D/OEB)

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL PRICE
(63)	CONSTRUCT. FACILITIES				
.1-.5	CONSTRUCTION CAMPS & PERMANENT VILLAGE (DIVIDED INTO 10 UNITS FOR PROGRAM CONVENIENCE)	10	LS	13000000.00	130,000,000
.6	CATERING & SUPPORT	2227336	MD	62.30	138,763,033
.7	ELECTRIC POWER				
.71	34.5 KV SYSTEM	1	LS	2025000.00	2,025,000
.72	CAMP POWER	00000	MWH	140.00	12,320,000
.73	CONSTRUCTION POWER	60000	MWH	140.00	9,520,000
.8	CONSTRUCTION HEATING & VENTILATING				
.81	PLANT	1	LS	1160000.00	1,160,000
SUBTOTAL, PAGE 32					294,500,033

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HARZA ENGINEERING COMPANY
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(L LEVY/RAM D/OEB)

ITEM	DESCRIPTION	QUANTITY UNIT	UNIT PRICE	TOTAL PRICE
.02	OPERATION	2700 DAYS	2680.00	7,236,000

SUBTOTAL, PAGE 33 7,236,000

SUBTOTAL - ACCOUNT (63) CONSTRUCTION FAC 301,824,033

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HARZA ENGINEERING COMPANY
FEASIBILITY ESTIMATE
(L LEVY/RAM D/DEB)

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL PRICE
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(68)	MITIGATION	1	LS	29200000.00	29,200,000
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SUBTOTAL, PAGE 34				29,200,000
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SUBTOTAL - ACCOUNT (68) MITIGATION				29,200,000
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GRAND TOTALS				2,595,865,405
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DIRECT COST REPORT

DATE MARCH 26, 1984
FILE NO 1563-103
PROJECT WATANA - FERC APPLICATION

HARZA ENGINEERING COMPANY
FEASIBILITY ESTIMATE
(L LEVY/RAM D/OEB)

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL PRICE
.2	DIVERSION TUNNELS				
.210	ACCESS TUNNEL TO GATE CHAMBER 15'X20'	2100	LF	1112.00	2,335,200
.211	DIVERSION TUNNEL EXCAVATION 39 FT DIA	7220	LF	2254.00	16,273,880
.21A	DIVERSION TUNNEL EXCAVATION 48 FT DIA	760	LF	2996.00	2,276,960
.21B	PORTALS - COM EXC	67100	CY	4.73	317,383
.21C	PORTALS - ROCK EXC	85550	CY	14.10	1,205,255
.21D	EMERGENCY RELEASE CHAMBERS ROCK EXC	4700	CY	63.14	296,758
.212	TEMPORARY COFFERDAM FILL FOR U/S PORTALS	34540	CY	3.04	105,002
.214	TUNNEL CONC. LINING- 36' ID	7220	LF	2107.00	15,212,540
SUBTOTAL, PAGE 7					38,023,978

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL PRICE
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21H	GRANULAR BACKFILL	8245	CY	8.51	70,165
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SUBTOTAL, PAGE 9					70,165
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SUBTOTAL - ACCOUNT 332.2 DIVERSION					62,513,283
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DATE MARCH 26, 1984
FILE NO 1563-103
PROJECT WATANA - PERC APPLICATION

HARZA ENGINEERING COMPANY
FEASIBILITY ESTIMATE
(L LEVY/RAM D/OEB)

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL PRICE
.22	U/S COFFERDAM				
.221	COMMON EXCAVATION	1000	CY	2.73	2,730
.222	IMPERVIOUS FILL	52000	CY	7.10	369,200
.223	ROCK & GRAVEL FILL	313000	CY	8.51	2,663,630
.224	FILTERS	33000	CY	8.51	280,830
.225	CUT-OFF WALL U/S	39000	SF	24.82	967,980
.226	CARE OF WATER	1	LS	7500000.00	7,500,000

SUBTOTAL, PAGE 10

11,784,370

SUBTOTAL - ACCOUNT 332.22 U/S COFF

11,784,370

DATE MARCH 26, 1984
FILE NO 1563-103
PROJECT WATANA - FERC APPLICATION

HARZA ENGINEERING COMPANY
FEASIBILITY ESTIMATE
(L LEVY/RAM D/OEB)

ITEM	DESCRIPTION	QUANTITY UNIT	UNIT PRICE	TOTAL PRICE
.23	D/S COFFERDAM			
.231	COMMON EXCAVATION	5000 CY	2.73	13,650
.232	IMPERVIOUS FILL	47250 CY	7.10	335,475
.233	ROCK & GRAVEL FILL	42800 CY	8.51	364,228
.235	CUTOFF WALL D/S	29500 SF	24.82	732,190
.236	REMOVAL OF COFFERDAM	90000 CY	3.13	281,700
SUBTOTAL, PAGE 11				1,727,243
SUBTOTAL - ACCOUNT 332.23 D/S COF				1,727,243

DATE MARCH 26, 1984
FILE NO 1563-103
PROJECT WATANA - FERC APPLICATION

HARZA ENGINEERING COMPANY
FEASIBILITY ESTIMATE
(L LEVY/RAM D/OEB)

ITEM	DESCRIPTION	QUANTITY UNIT	UNIT PRICE	TOTAL PRICE
.3	MAIN DAM			
.311	EXCAVATION - COMMON	4936000 CY	3.58	17,670,880
.312	EXCAVATION - ROCK	1214000 CY	12.34	14,980,760
.31A	IMPERVIOUS FILL	7877000 CY	7.10	55,926,700
.31B	PROVIDE DRYING FACILITIES FOR IMPERVIOUS FILL	1 LS	8529500.00	8,529,500
.31C	DRYING IMPERVIOUS FILL	1576000 CY	4.70	7,407,200
.31D	U/S GRAVEL & D/S SAND FILL	20626000 CY	8.51	175,527,260
.31E	FILTERS	6338000 CY	8.51	53,936,380
.31F	ROCKFILL FROM QUARRY	18563400 CY	7.26	134,770,284
.31G	ROCKFILL FROM STOCKPILE	2307000 CY	3.04	7,013,280

SUBTOTAL, PAGE 12

475,762,244

719

DATE MARCH 26, 1984
FILE NO 1563-103
PROJECT WATANA - FERC APPLICATION

HARZA ENGINEERING COMPANY
FEASIBILITY ESTIMATE
(L LEVY/RAM D/OEB)

ITEM	DESCRIPTION	QUANTITY UNIT	UNIT PRICE	TOTAL PRICE
.31H	ROCKFILL DIRECTLY FROM EXCAVATION	3924600 CY	0.50	1,962,300
.3H1	RAKING ROCKFILL	902000 CY	0.48	432,960
.313	DRILL&GROUT - CONSOL.	345000 LF	18.00	6,210,000
.311	DRILL&GROUT - CURTAIN	283450 LF	20.00	5,669,000
.314	DAM DENTAL CONCRETE	85000 CY	100.00	8,500,000
.317	DRAIN HOLES	136000 LF	15.00	2,040,000
.32	GROUT GALLRS&PORTALS			
.321	HORIZ. GALLRS 10X10	7450 LF	539.00	4,015,550
.322	INCLINED GALLERIES 10' X 10'	2580 LF	826.00	2,131,080
.323	SHAFTS 10X10	900 LF	1497.00	1,347,300
.32A	PORTALS - COMMON EXC	3600 CY	2.73	9,828
SUBTOTAL, PAGE 13				32,310,010

DATE MARCH 26, 1984
FILE NO 1563-103
PROJECT WATANA - FERC APPLICATION

HARZA ENGINEERING COMPANY
FEASIBILITY ESTIMATE
(L LEVY/RAM D/OEB)

ITEM	DESCRIPTION	QUANTITY UNIT	UNIT PRICE	TOTAL PRICE
.31H	ROCKFILL DIRECTLY FROM EXCAVATION	3924600 CY	0.50	1,962,300
.3H1	RAKING ROCKFILL	902000 CY	0.48	432,960
.313	DRILL&GROUT - CONSOL.	345000 LF	18.00	6,210,000
.311	DRILL&GROUT - CURTAIN	283450 LF	20.00	5,669,000
.314	DAM DENTAL CONCRETE	85000 CY	100.00	8,500,000
.317	DRAIN HOLES	136000 LF	15.00	2,040,000
.32	GROUT GALLRS&PORTALS			
.321	HORIZ. GALLRS 10X10	7450 LF	539.00	4,015,550
.322	INCLINED GALLERIES 10' X 10'	2580 LF	826.00	2,131,080
.323	SHAFTS 10X10	900 LF	1497.00	1,347,300
.32A	PORTALS - COMMON EXC	3600 CY	2.73	9,828

SUBTOTAL, PAGE 13

32,318,018

DATE MARCH 26, 1984
FILE NO 1563-103
PROJECT WATANA - FERC APPLICATION

HARZA ENGINEERING COMPANY
FEASIBILITY ESTIMATE
(L LEVY/RAM D/OEB)

ITEM	DESCRIPTION	QUANTITY UNIT	UNIT PRICE	TOTAL PRICE
.32B	PORTALS - ROCK EXC	1000 CY	12.10	12,100
.324	TUNNEL CONCRETE SLABS	3410 CY	204.00	695,640
.325	PORTAL CONCRETE	20 CY	300.00	6,000
.326	TUNNEL PLUG CONCRETE	700 CY	127.00	88,900
.329	PORTAL DOORS (ARCH.)	2 EA	18670.00	37,340
.33	DAM INSTRUMENTATION	1 LS	5406500.00	5,406,500
SUBTOTAL, PAGE 14				6,246,400
SUBTOTAL - ACCOUNT 332.3 MAIN DAM				514,326,742

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL PRICE
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.4	RELICT CHANNEL	1	LS	37639000.00	37,639,000
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SUBTOTAL, PAGE 15				37,639,000	
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SUBTOTAL - ACCOUNT 332.4 RELICT CH				37,639,000	
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DATE MARCH 26, 1984
FILE NO 1563-103
PROJECT WATANA - FERC APPLICATION

HARZA ENGINEERING COMPANY
FEASIBILITY ESTIMATE
(L LEVY/RAM D/OEB)

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL PRICE
.5	OUTLET FACILITIES				
.512	TUNNEL - HORIZONTAL EXCAVATION - 31' DIA	2050	LF	2075.00	4,253,750
.51A	INCLINED SHAFT EXCAVATION 31' DIA	460	LF	2316.00	1,065,360
.51B	TUNNEL EXCAVATION - MANIFOLD	900	LF	766.00	689,400
.514	CONCRETE LINING - HORIZONTAL 28' ID	1675	LF	1950.00	3,266,250
.51C	CONC. LINING -HORIZ, STEEL LINED 28' ID	375	LF	1449.00	543,375
.51D	CONCRETE LINING - MANIFOLD 8' ID	900	LF	716.00	644,400
.51E	INCLINED LINING - SHAFT 28' ID	460	LF	1950.00	897,000
.51F	MECHANICAL - INLET	1	LS	3367000.00	3,367,000

SUBTOTAL, PAGE 16

14,726,535

DATE MARCH 26, 1984
FILE NO 1563-103
PROJECT WATANA - FERC APPLICATION

HARZA ENGINEERING COMPANY
FEASIBILITY ESTIMATE
(L LEVY/RAM D/OEB)

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL PRICE
.51G	MECHANICAL - OUTLET	1	LS	10415000.00	10,415,000
SUBTOTAL, PAGE 17					10,415,000
SUBTOTAL - ACCOUNT 332.51 OUTLET F					25,141,535

DATE MARCH 26, 1984
FILE NO 1563-103
PROJECT WATANA - FERC APPLICATION

HARZA ENGINEERING COMPANY
FEASIBILITY ESTIMATE
(L LEVY/RAM D/OEB)

ITEM	DESCRIPTION	QUANTITY UNIT	UNIT PRICE	TOTAL PRICE
.52	MAIN SPILLWAY, INCL CIVIL WORKS FOR OUTLET FACILITIES			
.521	COMMON EXC - APPROACH & CONTROL STRUCTURE	379000 CY	3.13	1,186,270
.522	COMMON EXC - CHUTE, FLIP BKT & OUTFALL	318300 CY	3.46	1,101,318
.52A	RIVER CHANNEL ALLUVIUM EXCAVATION	1060000 CY	4.09	4,335,400
.52B	ROCK EXCAVATION - APPROACH STRUCTURE	1096000 CY	9.17	10,050,320
.52C	ROCK EXCAVATION - CONTROL STRUCTURE	274000 CY	14.63	4,008,620
.52D	ROCK EXC - CHUTE & FLIP BUCKET	1592500 CY	11.22	17,867,850
.52F	BACKFILL	1 LS	40000.00	40,000
SUBTOTAL, PAGE 18				38,589,778

DATE MARCH 26, 1984
FILE NO 1563-103
PROJECT WATANA - FERC APPLICATION

HARZA ENGINEERING COMPANY
FEASIBILITY ESTIMATE
(L LEVY/RAM D/OEB)

ITEM	DESCRIPTION	QUANTITY UNIT	UNIT PRICE	TOTAL PRICE
.523	DRILL&GRT - CONSOL.	66000 LF	18.00	1,188,000
.524	SPILLWAY CONCRETE			
.52G	PIERS	40060 CY	195.80	7,843,748
.52H	DECK	350 CY	588.05	205,817
.52I	GUIDE WALLS	11510 CY	305.57	3,517,111
.52J	SLAB	30800 CY	345.88	10,653,104
.52K	OGEE	24800 CY	154.31	3,826,888
.52L	FLIP BUCKET & OUTLET DISCHARGE STRUCTURE	28300 CY	216.04	6,113,932
.52M	DRAIN GALRY AND AERATION GALLERY CONCRETE	3710 CY	457.19	1,696,175
.52P	GRAVITY RETAINING WALL & FLIP BUCKET	1000 CY	314.59	314,590
SUBTOTAL, PAGE 19				35,359,365

DATE MARCH 26, 1984
FILE NO 1563-103
PROJECT WATANA - FERC APPLICATION

HARZA ENGINEERING COMPANY
FEASIBILITY ESTIMATE
(L LEVY/RAM D/OEB)

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL PRICE
.525	15' ROCKBOLTS	433	EA	127.00	54,991
.526	10' ROCKBOLTS	8100	EA	85.00	688,500
.528	HALF ROUNDS TO DRAINAGE GALLERY	15000	LF	10.00	150,000
.52N	SPILLWAY MECH&ELECT	1	LS	2246500.00	2,246,500
SUBTOTAL, PAGE 20					3,139,991
SUBTOTAL - ACCOUNT 332.52 MAIN SPI					77,089,134

DATE MARCH 26, 1984
FILE NO 1563-103
PROJECT WATANA - FERC APPLICATION

HARZA ENGINEERING COMPANY
FEASIBILITY ESTIMATE
(L LEVY/RAM D/OEB)

ITEM	DESCRIPTION	QUANTITY UNIT	UNIT PRICE	TOTAL PRICE
.6	POWER AND OUTLET INTAKE&APPROACH			
.611	COMMON EXCAVATION	423000 CY	3.46	1,463,580
.612	APPROACH - ROCK EXCAVATION	1695300 CY	9.17	15,545,901
.61B	INTAKE ROCK EXCAVATION	115300 CY	14.63	1,686,839
.614	CONCRETE	96400 CY	325.29	31,357,956
.615	1"X15' ROCKBOLTS	330 EA	127.00	41,910
.61C	INTAKE MECH&ELECT	1 LS	8700000.00	8,780,000
.61D	INTAKE BUILDING	1 LS	1285900.00	1,285,900
.61E.	STRAND VSL ANCHORS INCLUDING INSTALL.	5800 LF	100.00	580,000
.61F	DRILLING 11" DIA HOLES AND GROUTING	5800 LF	15.00	87,000

SUBTOTAL, PAGE 22

60,829,086

DATE MARCH 26, 1984
FILE NO 1563-103
PROJECT WATANA - FERC APPLICATION

HARZA ENGINEERING COMPANY
FEASIBILITY ESTIMATE
(L LEVY/RAM D/OEB)

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL PRICE
.62	INTAKE GATE	2	EA	379400.00	758,800
.63	BULKHEAD GATE	2	EA	79400.00	158,800
.64	CIRCULAR TRASHRACK	4	EA	132400.00	529,600
SUBTOTAL, PAGE 23					1,447,200
SUBTOTAL - ACCOUNT 332.6 POWER INT					62,276,286

DATE MARCH 26, 1984
FILE NO 1563-103
PROJECT WATANA - FERC APPLICATION

HARZA ENGINEERING COMPANY
FEASIBILITY ESTIMATE
(L LEVY/RAM D/OEB)

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL PRICE
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.7

SUBTOTAL, PAGE 24

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SUBTOTAL - ACCOUNT 332.7 SURGE CHA

0

DATE MARCH 26, 1984
FILE NO 1563-103
PROJECT WATANA - FERC APPLICATION

HARZA ENGINEERING COMPANY
FEASIBILITY ESTIMATE
(L LEVY/RAM D/OEB)

ITEM	DESCRIPTION	QUANTITY UNIT	UNIT PRICE	TOTAL PRICE
.711	ROCK EXCAVATION	102000 CY	54.00	5,508,000
.712	VENT SHAFT EXC 8.5 DIA	535 LF	1290.00	690,150
.714	CONCRETE 6.5 ID	90 LF	582.00	52,380
.715	SHOTCRETE 2 INCH	1 LS	20000.00	20,000
.716	SURGE CHAMBER CONC.	5100 CY	377.00	1,922,700
.717	DRAIN HOLES	15500 LF	20.00	310,000
.719	1"X10' ROCKBOLTS	400 EA	84.00	33,600
.71C	STOPLOGS, GUIDES AND FOLLOWERS STOPLOGS 40'W X44'H	1 LS	1318200.00	1,318,200
.8	PENSTOCKS			
.811	EXC -SHAFT - 27'DIA	1800 LF	2918.00	5,252,400
SUBTOTAL, PAGE 25				15,107,430

DATE MARCH 26, 1984
FILE NO 1563-103
PROJECT WATANA - FERC APPLICATION

HARZA ENGINEERING COMPANY
FEASIBILITY ESTIMATE
(L LEVY/RAM D/OEB)

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL PRICE
.81A	EXC -HORIZ- 27' DIA	1245	LF	1876.00	2,335,620
.812	EXC - HORIZ - 21'DIA	690	LF	1342.00	925,980
.81B	EXC - HORIZ - 18'DIA	1200	LF	1128.00	1,353,600
.813	DRILL & GROUT-CONSOL	1	LS	229330.00	229,330
.814	PENSTOCK CONCRETE LINER-SHAFT-24'	1800	LF	3305.00	5,949,000
.81B	CONCRETE LINER LINER-HORIZ 24' ID	1245	LF	1950.00	2,427,750
.81C	CONCRETE LINER HORIZ 18' ID	690	LF	1254.00	865,260
.815	CONCRETE LINER HORIZONTAL - 15' ID	1200	LF	1045.00	1,254,000
.818	STEEL LINER	1820	TON	2500.00	4,550,000
SUBTOTAL, PAGE 26					19,890,540
SUBTOTAL - ACCOUNT 332.8 PENSTOCKS					34,997,970

DATE MARCH 26, 1984
FILE NO 1563-103
PROJECT WATANA - FERC APPLICATION

HARZA ENGINEERING COMPANY
FEASIBILITY ESTIMATE
(L LEVY/RAM D/OEB)

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL PRICE
.9	TAILRACE				
.911	TUNNEL EXC. - 37'	2080	LF	2140.00	4,451,200
.912	PORTAL COMMON EXC	4560	CY	3.64	16,598
.913	PORTAL ROCK EXC	31095	CY	14.10	438,439
.914	TAILRACE TUNNEL CONCRETE -34' ID	2080	LF	1760.00	3,660,800
.91A	PORTAL CONCRETE	300	CY	315.00	94,500
.915	PORTAL ROCKBOLTS 1"X25'	110	EA	212.00	23,320
.91C	TAILRACE STOPLOGS GUIDES & FOLLOWERS	1	LS	388200.00	388,200

SUBTOTAL, PAGE 27 9,073,057

SUBTOTAL - ACCOUNT 332.9 TAILRACE 9,073,057

DATE MARCH 26, 1984
FILE NO 1563-103
PROJECT WATANA - FERC APPLICATION

HARZA ENGINEERING COMPANY
FEASIBILITY ESTIMATE
(L LEVY/RAM D/OEB)

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL PRICE
333	WATERWHEELS, TURBINE & GENERATORS				
.10	GUARD VALVES	6	EA	1500000.00	9,000,000
.11	TURBINES & GOVERNORS	6	EA	4500000.00	27,000,000
.21	GENERATORS & EXCITERS	6	EA	5800000.00	34,800,000
SUBTOTAL, PAGE 28					70,800,000
SUBTOTAL - ACCOUNT 333 WATERWHEELS					70,800,000

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL PRICE
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334	ACCESSORY ELECTRICAL EQUIPMENT	1	LS	21200000.00	21,200,000
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SUBTOTAL, PAGE 29				21,200,000
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SUBTOTAL - ACCOUNT 334 ACCESSORY E				21,200,000
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DATE MARCH 26, 1984
FILE NO 1563-103
PROJECT WATANA - FERC APPLICATION

HARZA ENGINEERING COMPANY
FEASIBILITY ESTIMATE
(L LEVY/RAM D/OEB)

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL PRICE
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335	MISC POWER PLNT EQUIP	1	LS	13800000.00	13,800,000
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SUBTOTAL, PAGE 30					13,800,000
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SUBTOTAL - ACCOUNT 335 MISC POWER					13,800,000
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DATE MARCH 26, 1984
FILE NO 1563-103
PROJECT WATANA - FERC APPLICATION

HARZA ENGINEERING COMPANY
FEASIBILITY ESTIMATE
(L LEVY/RAM D/OEB)

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL PRICE
336	ROADS, RAIL & AIR FAC				
.11	PERM. ACCESS ROADS	1	LS	60930000.00	60,930,000
.12	SITE ROADS	20	MI	4871000.00	97,420,000
.13	PERMANENT ROADS	6	MILES	504000.00	3,024,000
.2	RAIL FACILITIES	1	LS	45481000.00	45,481,000
.3	AIRSTRIP	1	LS	7010000.00	7,010,000

SUBTOTAL, PAGE 31

213,865,000

SUBTOTAL - ACCOUNT 336 ROADS RAIL

213,865,000

DATE MARCH 26, 1984
FILE NO 1563-103
PROJECT WATANA - FERC APPLICATION

HARZA ENGINEERING COMPANY
FEASIBILITY ESTIMATE
(L LEVY/RAM D/OEB)

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL PRICE
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350-359	TRANSMISSION PLANT (DIVIDED INTO 10 UNITS FOR PROGRAM CONVENIENCE)	10	LS	46880000.00	468,800,000
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SUBTOTAL, PAGE 32				468,800,000
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SUBTOTAL - ACCOUNTS 350-359 TRANSM				468,800,000
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DATE MARCH 26, 1984
FILE NO 1563-103
PROJECT WATANA - FERC APPLICATION

HARZA ENGINEERING COMPANY
FEASIBILITY ESTIMATE
(L LEVY/RAM D/OEB)

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL PRICE
399	GENERAL PLANT	1	LS	5092000.00	5,092,000
SUBTOTAL, PAGE 33					5,092,000
SUBTOTAL - ACCOUNT 399 GENERAL PLA					5,092,000

DATE MARCH 30, 1984
FILE NO 1563-103
PROJECT WATANA - FERC APPLICATION

HARZA ENGINEERING COMPANY
FEASIBILITY ESTIMATE
(L LEVY/RAMD/OEB)

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL PRICE
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(63)
CONSTRUCT. FACILITIES

.1-.5
CONSTRUCTION CAMPS &
PERMANENT VILLAGE
(DIVIDED INTO 10
UNITS FOR PROGRAM
CONVENIENCE)

16 LS 13050000.00 130,800,000

.6
CATERING & SUPPORT 2227336 MD 62.30 130,763,033

.7
ELECTRIC POWER

.71
34.5 KV SYSTEM 1 LS 2025000.00 2,025,000

.72
CAMP POWER 88000 MJH 140.00 12,320,000

.73
CONSTRUCTION POWER 68000 MJH 140.00 9,520,000

.8
CONSTRUCTION HEATING
& VENTILATING

.81
PLANT 1 LS 1160000.00 1,160,000

SUBTOTAL, PAGE 34

294,588,033

DATE MARCH 30, 1984
FILE NO 1563-103
PROJECT WATANA - FERC APPLICATION

HARZA ENGINEERING COMPANY
FEASIBILITY ESTIMATE
(L LEVY/RAMD/OEB)

ITEM	DESCRIPTION	QUANTITY UNIT	UNIT PRICE	TOTAL PRICE
.82	OPERATION	2700 DAYS	2680.00	7,236,000
SUBTOTAL, PAGE 35				7,236,000
SUBTOTAL - ACCOUNT (63) CONSTRUCTION FACILITIES				301,824,033

INDIRECT COST REPORT

WATANA - FERC APPLICATION

FILE # 1563-103

FEASIBILITY LEVEL ESTIMATE

(L. LEVY, RAM D, DEB)

INDIRECT COST SUMMARY

MARCH 26, 1984

CONTRACT # 1 DIVERSION TUNNEL & FACILITIES	16,560,400
CONTRACT # 2 MAIN DAM EXCAVATION & GROUTING	17,351,750
CONTRACT # 3 FDN TREATMENT, COFFERDAMS	24,922,500
CONTRACT # 4 SPILLWAY EXC, FND TREATMENT, DRAINAGE GAL	20,883,250
CONTRACT # 5 OUTLET FAC, POWER INTAKE TUNNEL EXC & CONC	25,465,300
CONTRACT # 6 POWER FACILITIES EXCAVATION & CONCRETE	41,291,900
CONTRACT # 7 MAIN DAM EMBANKMENT & RELICT CHANNEL	36,753,200
CONTRACT # 8 AGGREGATE & CONCRETE SUPPLY	7,190,900
CONTRACT # 9 SPILLWAY CONCRETE	16,116,900
CONTRACT # 10 GATES & HOISTS	4,091,280
OTHER INDIRECT COSTS-AMBULANCE, SNOW REM, HAUL ROADS ETC	60,590,150
TOTAL INDIRECT COSTS	271,217,530

No change low / power

NOTES: (1) THE TOTAL INDIRECT COSTS WERE ROUNDED TO \$ 271,220,000 IN THE DEVELOPMENT OF THE MARK UP FACTOR.

(2) FULL ELECTRONIC CALCULATOR ACCURACY WAS USED IN DEVELOPING UNIT COSTS AND QUANTITIES, SO THAT INTERMEDIATE NUMBERS PRESENTED DO NOT NECESSARILY EXACTLY EQUAL THE NUMBER USED TO COMPUTE A RESULT. (E.G. $3.14 \times 10000 = 31,415$ BECAUSE "PI" RATHER THAN 3.14 IS USED, ETC)

(3) INDIRECT COST FINAL EXTENSIONS ARE IN GENERAL ROUNDED TO 4 SIGNIFICANT DIGITS.

PROJECT: SUSITNA - LUTONA
SUBJECT: INDIRECT COSTS FOR ALL CONTRACTS
DATE: MARCH 27, 1984

NO. 1563X103
EST. BY OLS
REV. L LEVY

HARZA ENGINEERING COMPANY
INDIRECT COSTS

SUMMARY OF INDIRECT COSTS

A. AMBULANCE SERVICE	12,397,200
B. AIRPORT SERVICE	3,638,000
C. POWDER HOUSE	2,921,450
D. CAP HOUSE	23,500
E. CONSTRUCTION LIGHTING	12,408,000
F. SNOW REMOVAL	4,868,000
G. FUEL STORAGE & DISPATCHING	2,334,000
H. HAUL ROADS	22,000,000

GRAND TOTAL INDIRECT COSTS	60,590,150

PRO: SU: NA: TANG: 103
SUBJECT: INDIRECT COSTS FOR ALL CONTRACTS
DATE: MARCH 27, 1984

EST. BY JEB
REV. L LEVY

HARZA ENGINEERING COMPANY
INDIRECT COSTS

ROUNDED TOTAL

A. AMBULANCE SERVICE

ASSUME THAT THE AMBULANCE SERVICE
FOR ALL CONTRACTS CAN BE SUBCON-
TRACTED TO A CONCESSIONARY.
ALLOW ONE AMBULANCE FULLY STAFFED
PER 2000 WORKERS AND AN AVERAGE
OF 5000 INHABITANTS IN THE CON-
STRUCTION SITE.

USE 2.5 AMBULANCE
STAFF 1-DRIVER
2-PARAMEDICS

LABOR (A) SUMMER

HRS = 24 X 30 X 7 X 7 = 35280

NO. OF MEN = 3 X 2.5 = 7.5

7.5 X 35. \$/HR 35280. 9,250,000

(B) WINTER

HRS = 24 X 30 X 5 X 6 = 21600

NO. OF MEN = 3.0

3.0 X 35. \$/HR 21600. 2,268,000

EQUIPMENT

PURCHASE

4. UNITS 110000. 440,000

OPERATION (10%)

40. \$/HR 10980. 439,200

SUBTOTAL - A. AMBULANCE SERVICE

12,397,200

PROJECT SL 100 HA 100 ANA 100
SUBJECT: INDIRECT COSTS FOR ALL CONTRACTS
DATE: MARCH 27, 1984

*100 103
EST. BY DEB
REV. L LEVY

HARZA ENGINEERING COMPANY
INDIRECT COSTS

ROUNDED TOTAL

B. AIRPORT SERVICE

DURING THE SUMMER MONTHS
2-6 SEATER AIRCRAFT WILL BE
PROVIDED FOR 7 MOS/YEAR
FOR 7 YEARS. DURING THE
WINTER MONTHS (5 MOS/YR) ONE
AIRCRAFT WILL BE PROVIDED FOR
6 YEARS. THE AIRCRAFT WILL
BE ASSUMED TO BE RENTED
AT \$ 150/HR WITH AN AVERAGE
FLIGHT TIME OF 70 HRS/MO

A) SUMMER

HRS = 70 X 7 X 7 = 3430

\$/PLANE = 3430 X 150

2. PL @ 514500. 1,029,000

B) WINTER

HRS = 70 X 5 X 6 = 2100

\$/PLANE = 2100 X 150

1. PL @ 315000. 315,000

TWO PILOTS IN DAY TIME
ONLY.

A) SUMMER

\$/YR = 260 HR/MO X 7 @ 50

2.0 X 7. YRS @ 91000. 1,274,000

B) WINTER

\$/YR = 260 HR/MO X 5 @ 50

1.0 X 6. YRS @ 65000. 390,000

SERVICE CREW (3 CLERKS)

\$ 2500/MO X 12 MOS

3.0 X 7. YRS @ 30000. 630,000

SUBTOTAL - B. AIRPORT SERVICE

3,638,000

PROJECT: SUSITNA - MONTANA
SUBJECT: INDIRECT COSTS FOR ALL CONTRACTS
DATE: MARCH 27, 1984

NO. #15624103
EST. BY DEB
REV. L LEVY

HARZA ENGINEERING COMPANY
INDIRECT COSTS

ROUNDED TOTAL

C. POWDER HOUSE

OPEN CUT EXCAVATION

BCY = 6,180,000

QUARRY

BCY = 14,760,000

LBS = 20,940,000

UNDERGROUND

LBS = 9,600,000

LBS/YR = 5,090,000

LBS/MO = 727,145

STORAGE CAPACITY LBS = 1450000

CF = 1450000/60 LBS/CF

= 24,300 CF

SF = 24,300/7 = 3,500

REQD SF = 3,500 X 1.20 = 4155

50. \$/SF

4155.

207,800

EXCAVATION (6' DEEP)

BCY = 4155X6/27 = 923

10. \$/CY

923.

9,250

SERVICING CREW

1 - POWDER DISPATCHER

2 - CLERKS

3 MEN X 2 SHIFTS

HRS = 10 X 26 X 7 MO X 7 YR

= 12740 HRS @ \$ 35/HR

6.0 X 35. \$/HR

12740.

2,675,000

PICK UP

NO OF MONTHS = 7 X 7 = 49.

1.0 X 49. MO @

600.

29,400

SUBTOTAL - C. POWDER HOUSE

2,921,450

D. CAP HOUSE

THE CAP HOUSE WILL BE ASSUMED

TO BE 1/10 OF THE POWDER

HOUSE SIZES

50. \$/SF

450.

22,500

EXCAVATION (6' DEEP)

BCY = 450X6/27 = 100

10. \$/CY

100.

1,000

SUBTOTAL - D. CAP HOUSE

23,500

PROJECT: SUBJANA - WATANK

SUBJECT: INTERESTS ALL TRAFFIC

DATE: MARCH 27, 1984

NO. 15-103

REV. L. LEVY

HARZA ENGINEERING COMPANY
INDIRECT COSTS

ROUNDED TOTAL

E. CONSTRUCTION LIGHTING

THE CONSTRUCTION AREA IS
APPROXIMATELY

SF = 28,000,000

LIGHTING REQUIREMENTS

(PARKING LOT

DOWNTOWN AREA)

0.40 WATTS/SF

REQD KW = 11200

AT \$ 0.135 /KW-HR

HRS = 5 HR/DAY X 26 X 7 X 7

= 6370

\$/HR = 11200 X .135 = 1512

TOTAL COST

\$ = 1512 \$/HR X 6370 HRS

1. LS

9631440.

9,630,000

LIGHTING MAINTENANCE

CREW (3 MEN)

3.0 X 35. \$/HR

12740.

1,330,000

STADIUM LIGHTS WILL BE
PROVIDED DURING THE CONST-

RUCTION AT A COST OF

\$ 120,000/LIGHT INCLUDING

ERECTION, FOUNDATION & WIRING

NUMBER AND LOCATION OF LIGHTS

ARE AS FOLLOWS:

* LOCATION

2- EMBANKMENTS

2- QUARRY

4- ABUTMENTS

2- SPILLWAY

1- GRAVEL PIT

1- IMPERVIOUS PIT

12- STADIUM LIGHTS

12. LGT @ 120000.

1,440,000

SUBTOTAL - E. CONSTRUCTION LIGHTING

12,400,000

PROJECT: SUB. INA CATANA
SUBJECT: INDIRECT COSTS FOR ALL CONTRACTS
DATE: MARCH 27, 1984

EST. BY DEB
REV. L LEVY

HARZA ENGINEERING COMPANY
INDIRECT COSTS

ROUNDED TOTAL

F. SNOW REMOVAL

THE SNOW REMOVAL WILL BE PERFOR-
MED USING AN 8 MAN CREW FOR
5 MOS/YR , 8HRS/DAY. THIS CREW IS
COMPOSED OF FOUR CAT OPERATORS AN
4 MEN ON MOTOR PATROLS. IT WILL B
ASSUMED THAT 50 TONS OF SALT WILL
BE USED PER DAY.

LABOR:

HRS = 8 X 15 D/MO X 5 X 7
= 4200 HRS

8.0 X 35. \$/HR 4200. 1,176,000

EQUIPMENT:

CATS

4.0 X 7. YR 0 69000. 1,932,000

MOTOR PATROL

4.0 X 6. YR 0 30000. 720,000

MATERIAL:

SALT:

TONS = 50 X 15 X 5 X 7
= 26250. SAY (26000)

40. \$/TON 26000. 1,040,000

SUBTOTAL - F. SNOW REMOVAL

4,868,000

G. FUEL STORAGE & DISPATCHING

LABOR:

2 MEN X 20 X 26 X 7 X 7

35. \$/HR 50960. 1,784,000

PLANT & EQUIP :

STORAGE = 2000 TONS/MO

60. \$/TON 2000. 120,000

ERECTION

1. LS 150000. 150,000

PUMPS (4)

4. \$/EA 20000. 80,000

GREASE RACK & ETC.

1. LS 200000. 200,000

SUBTOTAL - G. FUEL STORAGE & DISPATCHING

2,334,000

PROJECT: SUGLINA TANG
SUBJECT: INDIRECT COSTS FOR ALL CONTRACTS
DATE: MARCH 27, 1984

#15 .03
B. 28
REV. L LEVY

HARZA ENGINEERING COMPANY
INDIRECT COSTS

ROUNDED TOTAL

H. HAUL ROADS

APPROXIMATELY 10 MILES
OF HAUL ROADS ARE REQUIRE.
THE COST WAS DEVELOPED IN
DETAIL BUT IS NOT CONTAINED
IN THIS REPORT.

\$/MILE= \$ 2,200,000

10. MI @ 2200000.

22,000,000

SUBTOTAL - H. HAUL ROADS

22,000,000

GRAND TOTAL - INDIRECT COSTS

ROUNDED TOTAL

60,620,150

MARK UP FACTORS

PROJECT: WATANA - FERC APPLICATION
TYPE: MARK UP DERIVATION
DATE: MARCH 30, 1984

NO. #1563-103
EST. BY RAM D/
& REV. OEB/L LEVY

HARZA ENGINEERING COMPANY
MARK UP DERIVATION

MARK UP SUMMARY

A. INDIRECTS & ADMINISTRATIVE	271,220,000
B. MOBILIZATION & DEMOBILIZATION	17,770,000
C. INSURANCE	0
D. FINANCING COST	75,630,000
E. PROFIT	143,600,000

(1) TOTAL INDIRECT COSTS	508,220,000

(2) TOTAL DIRECT COST	2,087,615,871

(3) TOTAL PROJECT COSTS	2,595,835,871

(4) TOTAL- LAND & LAND RIGHTS, MECHANICAL & ELECTRICAL CONSTRUCTION CAMP & FACILITIES AND MITIGATION	1,175,581,033

MARK UP FACTOR =	(3) - (4)

	(2) - (4)

	2,595,835,871 - 1,175,581,033

	2,087,615,871 - 1,175,581,033

	1,420,254,838

	912,034,838

	1.557237486

NOTES: (1) MECH & ELECT ITEMS INCLUDE INDIRECT COSTS AND PROFITS
(2) MOB & DEMOB OF AGGREGATE, CONCRETE BATCH & MIX AND
DRYING PLANTS INCLUDED IN THE DIRECT COST ITEMS.
(3) THE TOTAL PROJECT COST INDICATED ABOVE WOULD BE
SLIGHTLY DIFFERENT FROM THE GRAND TOTAL ON THE LAST
PAGE OF THE PRICE REPORT DUE TO ROUNDINGS OF THE
UNIT COSTS.

PROJECT: WATANA - PERC APPLICATION

TYPE: MARK UP DERIVATION

DATE: MARCH 26, 1984

NO. 1503-105

EST. BY RAM D/

& REV. OEB/L LEVY

HARZA ENGINEERING COMPANY
MARK UP DERIVATION

A. MOBILIZATION & DEMOBILIZATION

THE SHIPPING COSTS WERE
DETERMINED BASED ON THE
CONSTRUCTION EQUIPMENT USED
FOR THE PROJECT.

SHIPPING TONS:

(1) EARTH MOVING EQUIP 58,230 TONS
(2) UNDERGROUND " 16,770 "
(3) CONCRETE " 4,000 "

TOTAL 79,000 TONS

THE APPROXIMATE SHIPPING COST
PER TON IS \$225 FROM SEATTLE
AREA.

(USE 10 UNITS FOR PROGRAM
CONVENIENCE)

***** 1. 79000. 17,770,000

SUBTOTAL - B. MOBILIZATION & DEMOBILIZATION 17,770,000

PROJECT: WATANK - FERC APPLICATION
TYPE: MARK UP DERIVATION
DATE: MARCH 26, 1984

NO. 1353-185
EST. BY RAM D/
& REV. OEB/L LEVY

HARZA ENGINEERING COMPANY
MARK UP DERIVATION

C. INSURANCE

THE BID AMOUNT IS APPROXIMATE-
LY \$ 2,600,000,000 LESS THE
MECHANICAL, ELECTRICAL & OTHER
\$ 1,165,381,033. THEREFORE THE
NET BID AMOUNT FOR WHICH
INSURANCE HAVE NOT BEEN
PROVIDED IS:

\$ 2,600,000,000 (APPROX)
- \$ 1,163,981,033

\$ 1,436,018,967

THE INSURANCE COST IS 1.2 %
OF THIS AMOUNT OR
\$ 17,232,000. FOR THE PURPOSE
OF THIS ESTIMATE IT IS ASSUMED
THAT THIS COST WILL BE BORNE
BY THE OWNER.

SUBTOTAL - C. INSURANCE

0

PROJECT: WATHAH - FERC APPLICATION
TYPE: MARK UP DERIVATION
DATE: MARCH 26, 1984

NO. 4-1503-100
EST. BY RAM D/
& REV. OEB/L LEVY

HARZA ENGINEERING COMPANY
MARK UP DERIVATION

D. FINANCING COST

THE APPROXIMATE COST
OF THE PROJECT IS
\$ 2,600,000,000.

-CASH PENETRATION (CP) FOR THE
PROJECT PER MONTH IS AS
FOLLOWS:

$$\begin{aligned} \text{CP} &= \frac{\text{CIVIL WORKS COST}}{\text{* OF PERIODS}} \\ &= \frac{\$ 2600 - 1164.0 - 200.0}{8 \text{ YR} \times 12 \text{ MO}} \\ &= \frac{\$ 1236.0}{96} \\ &= \$ 12,875,000 / \text{PERIOD} \end{aligned}$$

THE \$ 200,000,000 AMOUNT
SHOWN ABOVE INDICATES THE BID
PRICE OF MISC ITEMS INCLUDED
IN THE CIVIL COSTS

OUT OF THIS TOTAL CASH PENETRA-
TION FOR THE JOB IT WILL BE
ASSUMED THAT THE CONTRACTOR WILL
REQUIRE ONLY 85 % FOR HIS DIRECT
COSTS. THE INTEREST RATE WILL BE
TAKEN AT 15 % PER YEAR OR 1.25 %
PER MONTH FOR 1.0 MOS.

$$\begin{aligned} \$/\text{PERIOD} &= 12.875 \times .85 \times 0.0125 \\ &= \$ 136,800 / \text{PERIOD} \end{aligned} \quad \begin{array}{ll} 96.00 \text{ PER } 0 & 136800. \end{array} \quad \begin{array}{l} 13,130,000 \end{array}$$

- HOLD BACK COSTS WILL BE 10 %
OF THE 50% REVENUE OWED
TO THE CONTRACTOR. THE REVENUE
WILL BE HELD FOR 5 YRS.

PROJECT: WATHAN - FERC APPLICATION
TYPE: MARK UP DERIVATION
DATE: MARCH 26, 1984

NO. 41553-100
EST. BY RAM D/
& REV. OEB/L LEVY

HARZA ENGINEERING COMPANY
MARK UP DERIVATION

D. FINANCING COST

THE APPROXIMATE COST
OF THE PROJECT IS
\$ 2,600,000,000.

-CASH PENETRATION (CP) FOR THE
PROJECT PER MONTH IS AS
FOLLOWS:

CIVIL WORKS COST
CP = -----
OF PERIODS

\$ 2600 - 1164.0 - 200.0

8 YR X 12 MO

\$ 1236.0

96

\$ 12,875,000 /PERIOD

THE \$ 200,000,000 AMOUNT
SHOWN ABOVE INDICATES THE BID
PRICE OF MISC ITEMS INCLUDED
IN THE CIVIL COSTS

OUT OF THIS TOTAL CASH PENETRA-
TION FOR THE JOB IT WILL BE
ASSUMED THAT THE CONTRACTOR WILL
REQUIRE ONLY 85 % FOR HIS DIRECT
COSTS. THE INTEREST RATE WILL BE
TAKEN AT 15 % PER YEAR OR 1.25 %
PER MONTH FOR 1.0 MOS.

\$/PERIOD = 12.875 X .85 X 0.0125
= \$ 136,800/PERIOD

96.00 PER @ 136800. 13,130,000

- HOLD BACK COSTS WILL BE 10 %
OF THE 50% REVENUE OWED
TO THE CONTRACTOR. THE REVENUE
WILL BE HELD FOR 5 YRS.

HELPER V 10 50
\$ 61,800,000

INTEREST FACTOR = $(1 + .15)^{50}$
= 2.01

COST = $(2.01 - 1) \times 61.80$

1.00 LS \$ 62410000. 62,500,000

SUBTOTAL - D. FINANCING COST

75,630,000

TYPE: MARK UP DERIVATION

EST. BY RAM D/

DATE: MARCH 26, 1984

& REV. OEB/L LEVY

HARZA ENGINEERING COMPANY
 MARK UP DERIVATION

E. PROFIT

THE PROFIT WILL BE TAKEN
 TO BE 10% OF THE TOTAL
 REVENUE LESS MECH,ELEC
 CAMP AND OTHERS

NET=(2600 - 1164.0) 10.0 % OF 1436000000. 143,600,000
 (IN MILLIONS)

SUBTOTAL - E. PROFIT 143,600,000

ESTIMATING CRITERIA

Basic Estimating Criteria and Assumptions

Project: SUSITNA - WATANA DAM No. 1563-103

FERC APPLICATION Date: MARCH 1984

Level of Estimate: FEASIBILITY Date Required: MARCH 1984

Price Level of Estimate: ALL PRICES ARE ESTABLISHED AT JANUARY 1982
LEVEL AND THEN ESCALATED TO JANUARY 1983.

Currency: UNITED STATES DOLLARS

Basis of Labor Rates: BASED ON UNION AGREEMENTS PREVAILING IN THE
ALASKA AREA

Basis of Equipment Rates: COST REFERENCE GUIDE AND EQUIPMENT
RENTAL BOOK

Basis of Material Prices: OBTAINED FROM SUPPLIERS & ENR

Overhead & Profit Allowance: DEVELOPED INDEPENDENTLY

Escalation Allowance: 4.3% from JANUARY 1982 TO JAN 1983

ST & S Allowance: VARIES FROM 5 TO 15 % OF LABOR COSTS

Remarks: _____

MATERIAL COSTS

SUSITNA - MATERIAL COSTS

MSCODE	LPRICE	FPRICE	UNITS	DESCRIPTION
111	.2	0.	lf	Bits & Steel - Drifter
112	.13	0.	lf	Bits & Steel - Jackleg
121	3.5	0.	lf	1 " Rock Bits w/Resin
122	.85	0.	Lb	Steel Ribs
131	12.	0.	lf	Air & Water Lines
133	10.	0.	lf	18 " Vent Line
134	13.5	0.	lf	24 " Vent Line
135	17.	0.	lf	30 " Vent Line
136	22.	0.	lf	36 " Vent Line
137	30.	0.	lf	48 " Vent Line
301	82.	0.	cu	Concrete
302	109.	0.	cu	Shotcrete Dry Mix
12	50.	0.	EA	PRIMERS
14	.5	0.	LF	PRIMERCORD
51	.4	0.	LF	DRILL BITS & STL-3.5"D
54	1.7	0.	LBS	EXPLOSIVES
199	12.	0.	SY	SURFACE COURSE
198	12.	0.	SY	RESURFACING
197	15.	0.	CY	BASE COURSE MTRL
451	1.4	0.	GAL	FUEL
79	10.	0.	CY	GRAVEL

WATANA - FERC APPLICATION

FILE # 1563-103

FEASIBILITY LEVEL ESTIMATE

(L LEVY/RAM D/OEB)

COST REPORT SUMMARY

MARCH 30, 1984

- ACCOUNT 330 LAND & LAND RIGHTS	51,000,000
- ACCOUNT 331 POWERHOUSE	44,603,718
- ACCOUNT 332.1 RESERVOIR, DAMS & WATERWAYS	30,862,500
- ACCOUNT 332.2 DIVERSION TUNNELS	62,513,283
- ACCOUNT 332.22 U/S COFFERDAM	11,784,370
- ACCOUNT 332.23 D/S COFFERDAM	1,727,243
- ACCOUNT 332.3 MAIN DAM	514,326,742
- ACCOUNT 332.4 RELICT CHANNEL	37,639,000
- ACCOUNT 332.51 OUTLET FACILITIES	25,141,535
- ACCOUNT 332.52 MAIN SPILLWAY	77,089,134
- ACCOUNT 332.6 POWER&OUTLET INTAKE AND APPR.	62,276,286
- ACCOUNT 332.8 PENSTOCKS & SURGE CHAMBER	34,997,970
- ACCOUNT 332.9 TAILRACE	9,073,057
- ACCOUNT 333 WATERWHEELS, TURBINE & GENERATORS	70,800,000
- ACCOUNT 334 ACCESSORY ELECTRICAL	21,200,000
- ACCOUNT 335 MISC POWER PLANT EQUIPMENT	13,800,000
- ACCOUNT 336 ROADS, RAIL FACILITIES & AIRSTRIP	213,865,000
- ACCOUNTS 350-359 TRANSMISSION LINES	468,800,000
- ACCOUNT 399 GENERAL PLANT	5,092,000
- ACCOUNT (63) CONSTRUCTION CAMP & FACILITIES	301,824,033
- ACCOUNT (68) MITIGATION	29,200,000

GRAND TOTAL - DIRECT COSTS**2,087,615,871**

DATE MARCH 26, 1984
FILE NO 1563-103
PROJECT WATANA - FERC APPLICATION

HARZA ENGINEERING COMPANY
FEASIBILITY ESTIMATE
(L LEVY/RAM D/OEB)

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL PRICE
------	-------------	----------	------	---------------	----------------

A
SCHEME 2185B
(FILL TYPE DAM)

330	LAND & LAND RIGHTS	1	LS	51000000.00	51,000,000
-----	--------------------	---	----	-------------	------------

SUBTOTAL, PAGE 1				51,000,000
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SUBTOTAL - ACCOUNT 330 LAND & LAND				51,000,000
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DATE MARCH 26, 1984
FILE NO 1563-103
PROJECT WATANA - FERC APPLICATION

HARZA ENGINEERING COMPANY
FEASIBILITY ESTIMATE
(L LEVY/RAM D/OEB)

ITEM	DESCRIPTION	QUANTITY UNIT	UNIT PRICE	TOTAL PRICE
331.1	UNDERGROUND POWERHOUSE			
.11	POWERHOUSE & TAILRACE			
.111	EXCAVATION - ROCK	168000 CY	51.00	8,568,000
.113	DRILL & GROUT U/S OF PH	44730 LF	19.00	849,870
.114	CONCRETE	43500 CY	249.00	10,831,500
.117	DRAIN HOLES	44430 LF	15.00	666,450
.118	METALWORK	1 LS	1818250.00	1,818,250
.119	ARCHITECTURAL	1 LS	736500.00	736,500
.11C	MECHANICAL	1 LS	1132400.00	1,132,400
.12	ACCS. TUNLS&PORTALS			
.120	35'X28' EXC	2970 LF	2017.00	5,990,490

SUBTOTAL, PAGE 2

30,593,460

DATE MARCH 26, 1984
FILE NO 1563-103
PROJECT WATANA - FERC APPLICATION

HARZA ENGINEERING COMPANY
FEASIBILITY ESTIMATE
(L LEVY/RAM D/OEB)

ITEM	DESCRIPTION	QUANTITY UNIT	UNIT PRICE	TOTAL PRICE
.121	21'H X 25' W.H.S SURGE CH. ACCESS	180 LF	1853.00	333,540
.123	DRAINAGE GALLERY 10'X10' EXC	570 LF	707.00	402,990
.12A	ACCESS PORTAL & ROAD COM EXC	94420 CY	3.64	343,689
.12B	ACCESS PORTAL & ROAD ROCK EXC	71790 CY	14.00	1,005,060
.12C	VENTILATION GALLERY 14' H X 12' W H.S.	560 LF	850.00	476,000
.124	PORTALS CONCRETE	600 CY	274.00	164,400
.125	TUNNEL SLAB CONCRETE	1690 CY	204.00	344,760
.126	PENSTOCK ACCESS PLUG CONCRETE	7275 CY	127.00	923,925
.129	MAIN PORTAL DOORS	2 SETS	62910.00	125,820
SUBTOTAL, PAGE 3				4,120,184

DATE MARCH 26, 1984

HARZA ENGINEERING COMPANY

NO 3-1

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PROJECT WATANA - FERC APPLICATION

(L LEVY/RAM D/OEB)

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL PRICE
.13	ACCESS SHAFT				
.131	ROCK EXC 23' DIA	740	LF	2359.00	1,745,660
.134.	CONCRETE LINING 20' ID	740	LF	1493.00	1,104,820
.138	MISC. METALWORK	50	TONS	2500.00	125,000
.13C	ELEVATORS	1	LS	595900.00	595,900
.14	FIRE PROTECTION HEADTANK	1	LS	302400.00	302,400
.15	BUS TUNNELS				
.151	EXC HORIZONTAL 22X22	156	LF	1846.00	287,976
.152	EXC INCLINED 16X16	282	LF	1532.00	432,024
.154	BUS TUNNEL SLAB CONC	350	CY	204.00	71,400
.16	TRANSFORMER GALLERY				
.161	EXCAVATION	26200	CY	54.72	1,433,664
SUBTOTAL, PAGE 4					6,098,844

DATE MARCH 26, 1984

HARZA ENGINEERING COMPANY

NO 3-1

FEAR IT TIM

PROJECT WATANA - FERC APPLICATION

(L LEVY/RAM D/OEB)

ITEM	DESCRIPTION	QUANTITY UNIT	UNIT PRICE	TOTAL PRICE
.164	CONCRETE SLAB	2180 CY	204.00	444,720
.167	DRAIN HOLES	8300 LF	15.00	124,500
.17	BUS SHAFTS			
.171	EXCAVATION 10.5 DIA	560 LF	1266.00	708,960
.174	CON. LINING 9.0 DIA	560 LF	806.00	451,360
.178	MISC. METALWORK	9 TONS	2500.00	22,500
.179	ENCLOSURES (ARCH.)	1 LS	28700.00	28,700
.170	MANHOIST	1 EA	131470.00	131,470
.18	CARE OF WATER	1 LS	334120.00	334,120
.19	INSTRUMENTATION	1 LS	429000.00	429,000
.2	MISC. BUILDINGS & STRUCTURES	1 LS	1115900.00	1,115,900

SUBTOTAL, PAGE 5

3,791,230

SUBTOTAL - ACCOUNT 331 POWERHOUSE

44,603,718

DATE MARCH 26, 1984
FILE NO 1563-103
PROJECT WATANA - FERC APPLICATION

HARZA ENGINEERING COMPANY
FEASIBILITY ESTIMATE
(L LEVY/RAM D/OEB)

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL PRICE
332	RESERVOIRS, DAMS AND WATERWAYS				
.1	RESERVOIR CLEARING	37500	ACRES	823.00	30,862,500
SUBTOTAL, PAGE 6					30,862,500
SUBTOTAL - ACCOUNT 332.1 RESERVOIR					30,862,500