

ORIENT CONTROL

[REDACTED]

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(A) Unit Prices - Backup Calculations

Watana Dam

Unit Cost Summary Sheets: Unit Cost Summary

Revisions to Rock Exc. Unit Costs

Production Rates

Copy of Printout

Standard Sheets



Calculations

SUSITNA HEP - WATANA

SUBJECT: LISTING OF ESTIMATED QUANTITIES
ITEM 332: RESERVOIRS, DAMS & WATERWAYS.

JOB NUMBER PS700 09
FILE NUMBER _____
SHEET 1 OF _____
BY RGA DATE 2/1/82
APP _____ DATE _____

ITEM	DESCRIPTION	SUMMARY SHEET #
332.212 ✓	TEMPERARY COFFERDAM TO CONSTRUCT UPSTREAM PORTALS	1
332.22:	UPSTREAM COFFERDAM	
.221 ✓	EXCAVATION - OVERBURDEN	2
.222	FILL	
✓	FINE FILTER	4
✓	COARSE FILTER	5
	ROCK FILL	3
✓	CLOSURE DIKE	3
✓	RIP RAP	3
	GRAVEL FILL ?	
.223	FOUNDATION PREP/GROUTING	
✓	SLURRY WALL	6
✓	EXCAVATION	6
332.23	DOWNSTREAM COFFERDAM	
.231	EXCAVATION	
✓	OVERBURDEN (REF. U/S COFFERDAM)	2
✓	REMOVAL OF COFFERDAM	7
.232	FILL	
✓	RIP RAP (REF. U/S COFFERDAM)	3
✓	CLOSURE DIKE (REF. U/S COFFERDAM)	3
.233	FOUNDATION PREP/GROUTING	
✓	SLURRY WALL (REF. U/S COFFERDAM)	6
✓	EXCAVATION (" ")	6

A - 2



Calculations SUSITNA HEP - WATANA

SUBJECT: LISTING OF ESTIMATED QUANTITIES

ITEM 332: RESERVOIRS, DAMS & WATERWAYS

JOB NUMBER PS700.09

FILE NUMBER

SHEET 2 OF

BY RGA

DATE 2/1/22

APP

DATE

ITEM	DESCRIPTION	SUMMARY SHEET #
332.31	MAIN DAM	
.311	EXCAVATION	
✓	OVERBURDEN - ABOVE EL. 1470	10
✓	OVERBURDEN - BELOW EL. 1470	11
✓	ROCK ABOVE EL. 1470	12
✓	ROCK BELOW EL. 1470 - USEABLE	13
✓	ROCK BELOW EL. 1470 - WASTE	14
.312	FILL	
✓	RIP RAP (UPSTREAM)	15
✓	GRAVEL (UPSTREAM)	16
✓	COARSE FILTER (UPSTREAM) [REF. U/S COFFERDAM]	5
✓	FINE FILTER (UPSTREAM) [REF. U/S COFFERDAM]	4
✓	CORE (IMPERVIOUS)	17-19
✓	FINE FILTER (DOWNSTREAM) [REF. U/S COFFERDAM]	4
✓	COARSE FILTER (DOWNSTREAM) [REF. U/S COFFERDAM]	5
✓	SHELL - ROCK & GRAVEL (DOWNSTREAM)	20
✓	ROCK FROM OTHER SOURCES	21
✓	COBBLES (DOWNSTREAM FACE) → RIP-RAP	15
	FROST PROTECTION	
✓	PROCESS PROTECTION	22
✓	REMOVE 1' PROTECTION AND WASTE	22
✓	SCARIFY CORE SURFACE	22
✓	PLACE PROTECTION	22
.313	FOUNDATION PREP/GROUTING	
✓	UNDER CORE FILTERS } above and below. SHELL } EL. 1500'	23



Calculations

SUSITNA AEP - WATANA

SUBJECT: LISTING OF ESTIMATED QUANTITIES

ITEM 332: RESERVOIRS, DAMS & WATERWAYS

JOB NUMBER P570009

FILE NUMBER

SHEET 3

OF

BY RGA

DATE 2/2/82

APP

DATE

ITEM	DESCRIPTION	SUMMARY SHEET #
332. 4	RELICT CHANNEL	
.411	EXCAVATION OVERBURDEN STRIPPING - 2' THICK	24
.412	FILL SHORE PROTECTION RIP RAP (UPSTREAM) } (Ref. U/S COFFERDAM) WASTE ROCK	25 25
.44	CHANNEL FILTER BLANKET	
.442	FILL COARSE FILTER	26
	FINE FILTER	27
	RIP RAP (Ref. U/S COFFERDAM)	28
.443	FOUNDATION PREP CLEARING & GRUBBING	29
	SURFACE GRADING	29
332. 5	TUNNEL SPILLWAY	
.52	MAIN CHUTE SPILLWAY	
.521	EXCAVATION APPROACH OVERBURDEN & ROCK WASTE	43 30
	CONTROL STRUCTURE	
	OVERBURDEN & ROCK WASTE	31
	STRUCTURAL ROCK EXCAVATION	32
	ROCK USEABLE (INCLINED & VERTICAL)	
	UPPER CHUTE	
	OVERBURDEN & ROCK WASTE	33
	ROCK USEABLE (INCLINED & VERTICAL)	33
	LOWER CHUTE	
	OVERBURDEN & WASTE	34
	ROCK USEABLE	35



Calculations

SUSITNA HEP - WATANA

SUBJECT: LISTING OF ESTIMATED QUANTITIES

ITEM 332: RESERVOIRS, DAMS & WATERWAYS

JOB NUMBER P575009

FILE NUMBER _____

SHEET 4 OF _____BY RGA DATE 2/2/82

APP _____ DATE _____

ITEM	DESCRIPTION	SUMMARY SHEET #
332.521 (continued)	VALVE BLOCK/FLIP & OUTFALL OVERBURDEN & ROCK WASTE ROCK USEABLE	34 35
.523	RIVER CHANNEL ALLUVIUM EXCAVATION FOUNDATION PREP/GROUTING FOUNDATION PREP. SPILLWAY ROCK HORIZONTAL } (REF. MAIN DAM) ROCK INCLINED }	36 23 23
332.53 .531	EMERGENCY SPILLWAY EXCAVATION OVERBURDEN ROCK USEABLE ROCK WASTE	37, 38 39, 40 41
<u>GENERAL</u>	- ROAD MAINTENANCE COST (ROAD BED ON PAGE 9) - CONSTRUCTION HAUL ROADS	8, 9 42

(A) Unit Cost Summary Sheets
Unit Cost Summary



Design Calculation Cover Sheet

Project No. P 5700.

File No. _____

Serial No. _____

Project Title SUSITNA

Department CIVIL (for Project Services)

Calculations for: WATANA DAM
ESTIMATES
Unit Costs for Excavation and Fill Quantities

Original By R. D. Chamberlain

Date 1st / Feb / 1982

Checked By _____

Date / /

Rev. No.	By	Date	Checked	Date
_____	_____	<u>/ /</u>	_____	<u>/ /</u>
_____	_____	<u>/ /</u>	_____	<u>/ /</u>
_____	_____	<u>/ /</u>	_____	<u>/ /</u>
_____	_____	<u>/ /</u>	_____	<u>/ /</u>
_____	_____	<u>/ /</u>	_____	<u>/ /</u>
_____	_____	<u>/ /</u>	_____	<u>/ /</u>
_____	_____	<u>/ /</u>	_____	<u>/ /</u>

Approved By

Professional Engineers
Seal

Original Copies Placed in Main File on Closure of Project

By _____

Date / /

Total No. of Sheets _____



Calculations

SUBJECT: Item # 352.212

Temporary Cofferdam to Construct
Upstream Portals.

JOB NUMBER D5700.09

FILE NUMBER

SHEET 1 OF

BY RDC Jan DATE 27/82
RGA

APP 11/1 DATE

[illegible]

NOTES: See Book B, pg. 13



Calculations

SUSITNA
WATANA

SUBJECT: Item # 332.221
Upstream Cofferdam Overburden Removal.

JOB NUMBER D5700.09

FILE NUMBER

SHEET 2 OF

BY RSC JGA Jan DATE 27/82

APP ☒ DATE

Description	Labour	Material	Equipment	TOTAL
1. Doze overburden Ref: Main dam o'burden removal, Main Dam.	0.250	—	0.715	0.965
2. Haul and Dump (2 miles)	0.781		2.082	2.863
3. Road maintenance	0.079	0.0002	0.137	0.216
	1.090	0.0002	2.934	4.024 ✓

NOTES:

1000 CY

- Item 1 : Book B, pg 32 --
Item 2 : Book B, pgs 10, 11
Item 3 : Book A, pg. 15

A - 11

ACRES

Calculations

SUSITNA
WATANA

SUBJECT: Item # 332.222

Upstream Cofferdam + .312

Fine Filter for both

JOB NUMBER D5700.09

FILE NUMBER

SHEET 4 OF

BY RDC JGA DATE 27/82

APP DATE

Cofferdams and Main Dam
 Cofferdam : 16,600 CY
 Main Dam : 2,011,000 CY (upstream)
 2,253,000 CY (downstream)

Description	Labour	Material	Equipment	TOTAL
Downstream Material	1.80	0.01	4.30	6.11
Add 22% Processed Aggregate	1.15	0.11	2.20	3.46
Haul and Place 2 miles (same cost as for coarse filter)	0.48	—	1.23	1.71
	3.43	0.12	7.73	11.28

NOTES:

1. Downstream mat'l : Book A
2. Haul & Place : Book A Pg 12



Calculations

SUSITNA
WATANA

SUBJECT: Item # 332.222

Upstream Cofferdam + .312

Coarse Filter

JOB NUMBER D5700.09

FILE NUMBER

SHEET 5 OF

BY RDC Jan DATE 2-182

APP DATE

for Cofferdam and Main Dam

Description	Labour	Material	Equipment	TOTAL
U/S Fill Material	1.90	0.02	4.65	6.57
Processed Aggregate	0.52	0.05	1.00	1.57
Haul and Place 2 miles Ref: 1/2 haul distance of Upstream Process and Fill.	0.48		1.23	1.71
	2.90	0.07	6.88	9.85 ✓

NOTES:

U/S Fill - Book 'A' Pg 25

Proc. Aggr - Book 'A' Pg 25

Haul & Place - 1/2 Unit Prices Book 'B' Pg 41



Calculations

SUBJECT: ~~Item~~ # 332. 223

Upstream Cofferdam

Slurry Wall

SUSITNA
WATANA

JOB NUMBER ~~D5700~~ . DA

FILE NUMBER

SHEET 6 OF

BY **RDC** **RG-A** Jan DATE 27/82

APP DATE

Subcontract cost of supplying placing & lump mix

of Cement 15%
Bentonite 10%
Water 75% } \$23 / SF (verbally by L. Duncan).

[illegible]

NOTES:

1. Excnv.: Book B, pg. 59

A - 14



Calculations

SUSITNA
WATANA

SUBJECT: Item # 332.231

Downstream Cofferdam
Removal of Cofferdam

JOB NUMBER P5700.09

FILE NUMBER

SHEET 7 OF

BY RDC JGA Jan DATE 27/82

APP DATE

Volume to be removed 8,000 cu.yds.

Description	Labour	Material	Equipment	TOTAL
Dragline Excavation	0.462	0.007	1.131	1.600
Load, Haul, Dump (2 mile)	0.781		2.082	2.863
Road Maintenance	0.079	0.0002	0.137	0.216
U/C	1.32	0.007	3.35	4.68

NOTES:

1. Excav. Book B ; pg 59
2. Ld, haul, dump Book B, pgs 10 & 11
3. Road Maint : Book A, pg 15

A - 15



Calculations

SUBJECT: Item #

SUSITNA
WATANA

JOB NUMBER D5700.09

FILE NUMBER _____

SHEET 8 OF _____

BY RDC Jan DATE 27/82

APP _____ DATE _____

ROAD MAINTENANCE COST

Description	Labour	Material	Equipment	TOTAL
Levelling	312,938		642,880	955,818
Road Bed Replaced Once	927,690	9,690	2,303,160	3,240,540
Road Maintenance During Construction	3,296,146		4,926,240	8,222,386
	4,536,774	9,690	7,872,280	12,418,744

NOTES:

^{36%}
35.92 0.079 ✓ ^{1.08%} 0.0002 ✓ ^{63%}
29.35 0.137 ✓ ^{39.65} 0.216

Unit cost found by dividing Total cost by
total excavation volume including roads, conc. and dam fill

$$= 57.5 \times 10^6 \text{ cy}$$



Calculations

SUBJECT: Item #

SUSITNA
WATANA

JOB NUMBER D5700.09

FILE NUMBER

SHEET 9 OF

BY RSC Jan DATE 27/82

APP DATE

Road Bed (Replaced Once)

Same as Upstream Process and Haul

Description	Labour	Material	Equipment	TOTAL
Processing	0.401 ✓	0.012 ✓	0.926 ✓	1.339
Excavation	0.462 ✓	0.007 ✓	1.131 ✓	1.600
Haul Place & Compact (4 mile haul)	0.956 ✓		2.459 ✓	3.415 ✓
	1.819	0.019	4.516	6.354

* 2 x 255,000 927,690 9,690 2,303,160 3,240,540

NOTES:

For Road Bed ↗

* 2 for replacement

1. Processing Book B, pg. 56

2. Excav. Book B, pg. 57

3. Haul, place & compact: Book B, pg. 61

AGRES

Calculations

SUBJECT: Item #
Main Dam
Excavation 0

SUSITNA
WATANA

332.391

Overlaid above 1470'

JOB NUMBER D5700.DA

FILE NUMBER

SHEET 10

OF

BY RDC San DATE 27/82
RGA

APP

DATE _____

2,026,000 c4

Description	Labour	Material	Equipment	TOTAL
DOZING	0.230	—	0.715	0.945
Road Maintenance	0.079	0.0002	0.137	0.216
Haul and Dump 2 mile	0.781	—	2.082	2.863
	1.09	0.0002	2.93	4.02

NOTES :

1. Dozing: Book E, pg. 32
2. Road Maint.: Book A, pg. 15
3. Ld, haul, dump Book E, pgs. 10 & 11



SUEITNA

WATANA

MAIN DAM

332.311

Excavation Overburden below 1270'

JOB NUMBER D5700 . 09

FILE NUMBER

SHEET 11 OF

BY ~~RAJ~~ ~~GA~~ Jan DATE 27/82

APP _____ DATE _____

5,320,000 CY

NOTES :

1. Excav, haul, dump : Book B, pg 34
2. Road maint. : Book A, pg. 15



Calculations

SUBJECT: Item # 332.311
Main Dam
Excavation Rock Above 1470ft.

SUSITNA
WATANA

JOB NUMBER D5700.09

FILE NUMBER

SHEET 12 OF

BY RSC Jan DATE 27/82

APP DATE

calculated in terms of total cost.

REVISED
16th Feb 1982
see sheet 12R
A 62

Description	Labour	Material	Equipment	TOTAL
Rock (drilling)	12364	16088	6984	35436
Rock (blasting)	1934	—	540	2474
Rock (doze clear)	836	—	2592	3428
Lower + Raise Equip	691	—	1344	2035
Total Cost	15825	16088	11460	43373
(a) UC ÷ 3327 cu/s	4.755	4.834	3.444	13.033
(b) Haul + dump 2 miles	0.781	—	2.082	2.863
(c) Road Maintenance	0.079	0.0002	0.137	0.216
(a) + (b) + (c)	5.62	4.834	5.66	16.11

NOTES:

ACRES

SUSITNA
WATANA

332.311

Below 1470 ft

"USEABLE"

JOB NUMBER D5700.DA

FILE NUMBER

SHEET 13 OF

BY RDC Jan DATE 27/82
RGA

APP _____ DATE _____

REVISED
16th Feb 1982
See Sheet 13R (A 63)

	Description	Labour	Material	Equipment	TOTAL
(a)	Area II (Drill)	581.82	7947	381.00	
(b)	Area II (Blast)	161.19		50.00	
	(a) x 12 hrs	6982	7947	4572	19501
	(b) x 10 hrs	1612		500	2112
	(a) + (b)	8594	7947	5072	21613
(c) U/C	(a) + (b) ÷ Vol (15446 cu)	5.566	5.147	3.285	13.998
	Haul D/S Damfill and Spread	0.917	—	2.515	3.432
	Total U/C	6.48	5.15	5.80	17.43

NOTES :



Calculations
 SUSITNA
 WATANA
 SUBJECT: Item # 332.311
 Rock Excavation Below 1470 ft
 "WASTE"

JOB NUMBER D5700.09
 FILE NUMBER _____
 SHEET 14 OF _____
 BY RDC San DATE 27/82
 APP _____ DATE _____

REVISED
 16th Feb 1982
 See sheet 14R (A 64)

	Description	Labour	Material	Equipment	TOTAL
(a)	Area I (DML) \$/hr	581.82	16368	381.0	
(b)	Area I (Blast)	161.19		50.0	
	(a) x 20 hrs	11636	16368	7620	35624
	(b) x 10 hrs	1612	—	500	2112
	(a) + (b)	13248	16368	8120	37736
(c)	a + b ÷ 3857 U/C	3.435	4.244	2.105	9.784
(d)	Does + ... \$/hr	216.99		762.00	1008.98
	...	0.494		1.524	2.018
(e)	...	3.924	4.244	3.624	11.802
(f)	Haul U/S Waste	5.312	—	9.071	14.383
(g)	(c) + (f)	8.747	4.244	11.176	24.167
	incl. drill, blast, haul to U/S.				

NOTES:



Calculations

SUBJECT: Item #

Excavation

Main Dam Rock Excavation below 1470ft.

SUSITNA
WATANA

332.311

JOB NUMBER 25700.09

FILE NUMBER

SHEET Rev 14A OF

BY RDC RGA Jan DATE 27/82

APP

DATE

WASTE ROCK On 2nd Feb 1982 it was agreed to shorten the hauling distance by dumping the waste rock between the U/S slope and the diversion tunnel area.

Description	Labour	Material	Equipment	TOTAL
Drill and Blast	3.435	4.244	2.105	9.784
Load and Haul (Rev)	3.668	—	5.485	9.153
TOTAL	7.103	4.244	7.590	18.937
REVISED 1602 Feb 1982 see sheet 14R				

NOTES:



Calculations

SUBJECT: Item # 332.312
Main Dam
Upstream/Damstream Slope Protection

JOB NUMBER D5700.09

FILE NUMBER

SHEET 15 OF

BY RDC Jan DATE 27/82
RGA

APP _____ DATE _____

"RIP RAP"

Riprap (upstream)	1,547,000 CY
Cobble (downstream)	2,003,000 CY

[illegible]

NOTES :

1. Rip rap : Book B, pg 29 based on 1,550,000 cy
2. Gobbles : Book B, pg 27 based on 2,200,000 cy

A 24



Calculations

SUBJECT: Item #

Main Dam

Gravel (Upstream)

SUSITNA

WATANA

332.312

JOB NUMBER D5700.09

FILE NUMBER

SHEET 16 OF

BY RDC Jan DATE 27/82

APP DATE

25,194,000 CY

	Description	Labour	Material	Equipment	TOTAL
1	Overburden Removal at Pit E (Cleaning cost)	0.06	—	0.21	0.27
2	Processing	0.401	0.012	0.926	1.339
3	Excavation	0.462	0.007	1.131	1.600
4	Haul & Place (4 miles)	0.956	—	2.459	3.415
5	Road Maintenance	0.079	0.0002	0.137	0.216
	Total	1.96	0.019	4.86	6.84

NOTES:

1. OB. removal: Book B, pg 75
2. Processing: Book B, pg 56, 57
3. Excav. : Book B, pg 59
4. Haul & place: Book B, pg 61
5. Road Maint.: Book A, pg 15

$$\begin{aligned} \text{Total cost OB removal Pit E} &= \frac{15,458.720}{57.5 \times 10^6 \text{ CY}} \times 75 \\ &= 0.209/\text{CY} \end{aligned}$$



Calculations

SUBJECT: AGGREGATE PROCESS
Coarse and Fine Filter

JOB NUMBER P 5700

FILE NUMBER

SHEET 16 A. OF

BY RGA Jan DATE 27/82

APP DATE

Description	Lab	Mat	Equip	Total
Aggr. process	20 181 070	2 930 400	36 328 500	59,439,970
Install & Remove (LS)	1,650,000			1,650,000
TOTAL	21 831 070	2 930 400	36 328 500	61,089,970
(a) → U/C. (Vol = 6,200,000)	3.52	0.47	5.86	9.85
(b) → Conc Aggr from PTE	1.72	0.01	4.16	5.89
a. Haul 4 mile	0.956 ✓	—	2.459	3.415
b. Excavate	0.462	0.007	1.131	1.600
c. Process	0.306	0.0033	0.570	0.879
(a) + (b)	5.24	0.48	10.02	15.74
Proc Aggr. (10%)	0.52	0.05	1.00	1.57
U/S Fill Material				
(a) Processing	0.401	0.012	0.926	1.339
(b) Excavation	0.462	0.007	1.131	1.600
(c) Haul and Place (4 miles)	0.956 ✓	—	2.459	3.415
(c) U/S Fill Material	1.819	0.019	4.516	6.354
(d) Road Maintenance	0.079	0.0002	0.137	0.216
(c) + (d)	1.89	0.02	4.65	6.56
D/S Fill material as for (b)	1.72	0.01	4.16	5.89
plus Road maintenance.	0.08	0.0002	0.14	0.22
(e) U/C/D/S material	1.80	0.01	4.30	6.11
GRAVEL Fill				
(e) Cleaning cart	1.80	0.01	4.30	6.11
	0.06	—	0.21	0.27
	1.86	0.01	4.51	6.38

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Calculations

SUBJECT: Item # 332.312
Main Dam
Impervious Core

SUSITNA
WATANA

JOB NUMBER D5700.09

FILE NUMBER _____

SHEET 17 OF _____BY RSC Jan DATE 27/82

APP _____ DATE _____

Combine Sheets 1 and 2 in terms of Total Cost
Then summarizing in terms of unit cost of ~~8,245,000~~ cy.
8,254,000

Description	Labour	Material	Equipment	TOTAL
Tundra Removal (dozing)	244,722	—	821 829	1,066,551
(load haul dump)	109,838	—	250 462	360,300
Topsoil Removal (dozing)	342,298	—	1,435 981	1,778,279
(load haul dump)	395,521	—	1,187,607	1,583,128
Gravel Overlay Proc & load	319,339	3444	594,847	917,630
(haul & dump)	608 414	36000	1,774,105	2,418,519
Drainage Ditches (Exc)	118,326	—	240,989	359,315
(load haul dump)	149,921	—	392,768	542,689
(pitrun excav)	147,448	2234	360 961	510,643
(pitrun process)	97,661	1053	181,917	280,631
(Oversize; load haul dump)	14,754	—	59,670	74,424
Excavate Imp. Till	16,059,120	—	42,943,215	59,002,335
Remove Oversize	333,900	—	728,550	1,062,450
	18,946,262	42,731	50,972,901	69,961,894
	2.282	0.003	6.145	8.430

NOTES:

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Calculations

SUBJECT: Item #
Main Dam
Impervious Core

SUSITNA
WATANA

332.312

JOB NUMBER D5700.09

FILE NUMBER _____

SHEET 18. OF _____

BY RDC Jan DATE 27/82

APP _____ DATE _____

8,254,000 cy

Sheet 1.

Description	Labour	Material	Equipment	TOTAL
Tundra Removal (a) dozing	0.469	—	1.545	2.044
(i) Vol. 521,796 cy TC =	244,722	—	821,829	1,066,551
(b) load, haul, dump (1/2 vol)	0.421	—	0.960	1.381
(ii) Vol. 260,898 TC =	109,838	—	250,462	360,300
Topsoil Removal (a) dozing	0.328	—	1.376	1.704
(iii) Vol. 1,043,591 TC =	342,298	—	1,435,981	1,778,279
(b) Load haul dump	0.379	—	1.138	1.517
(iv) Vol. 1,043,591 TC =	395,521	—	1,187,657	1,583,128
Gravel Overlay (a) Process and Load W/C	0.306	0.0033	0.540	0.879
Vol = 1,043,591	319,339	3,444	594,847	917,630
(b) Haul and Dump (W/C)	0.583	—	1.700	2.283
Vol = 1,043,591	608,414	36,000	1,774,105	2,418,519

NOTES:

TUNDRA DOZING - BOOK 'B' - Pg 98
HAUL - BOOK 'B' - Pg 100
TOPSOIL DOZING - BOOK 'B' - Pg 105
HAUL - BOOK 'B' - Pg 106
OVERLAY PROCESS - BOOK 'B' - Pg 71
HAUL - BOOK 'B' - Pg 135

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Calculations

SUSITNA
WATANA

SUBJECT: Item # 332.312
Main Dam
Impervious Core

JOB NUMBER D5700.09

FILE NUMBER _____

SHEET 19. OF _____BY RSC Jan DATE 27/82

APP _____ DATE _____

8,254,000 Cy

Sheet 2.

Description	Labour	Material	Equipment	TOTAL
<u>Drainage Ditches</u>				
(a) Excavation U/C	0.382	—	0.778	1.160
Vol = 309,754 TC	118,326	—	240,989	359,315
(b) Load, haul, dump, spread U/C	0.484	—	1.268	1.752
Vol = 309,754 TC	149,921	—	392,768	542,689
(c) Pitrun excavation U/C	0.462	0.007	1.131	1.600
Vol = 319,152 TC	147,448	2234	360,961	510,643
(d) Pitrun process U/C	0.306	0.0033	0.570	0.8793
Vol = 319,152	97,661	1053	181,917	280,631
(e) Oversize load, haul dump U/C	1.110	—	3.353	4.463
Vol = 177,96 cy	19,754	—	59,670	79,424
Excavate Imp. till U/C	1.936	—	5.177	7.113
Vol = 8295,000 TC	16,059,120	—	42,943,215	59,002,335
Remove Oversize U/C	0.742	—	1.619	2.361
Vol = 450,000 TC	333,900	—	728,550	1,062,450

NOTES:

Exc. - Book 'B' - Pg 112
 Load, haul - BK 'B' - Pg 114
 Pitrun Exc. - BK 'B' - Pg 59
 Pitrun Proc. - BK 'B' - Pg 71
 Load Dump - BK 'B' - Pg 118
 Exc Imp - BK 'B' - Pg 93
 Remove - BK 'B' - Pg 94

A 29



Calculations

SUBJECT: Item # 332.312

Main Dam
Shell Rock and Gravel (Downstream)

SUSITNA
WATANA

JOB NUMBER D5700.09

FILE NUMBER

SHEET 20. OF

BY RDC
RGA Jan DATE 27/82

APP DATE

[illegible]

NOTES:

Hand, P.C	- BOOK 'B'	Pg	61
EXCHANGE	- BOOK 'B'	Pg	29
Process	- BOOK 'B'	Pg	71
Board Maint.	BOOK 'A'	Pg	15
Cleaning	- BOOK 'A'	Pg	24

A 30



Calculations

SUBJECT: Item # 332.312
Main Dam - Fill
Rock Shell
Rock from other sources

JOB NUMBER P5700.09
FILE NUMBER _____
SHEET 21 OF _____
BY RDC BGA Jan DATE 27/82
APP _____ DATE _____

Total Rock and Gravel Fill required = ~~18,000,000~~ cu. yds.
 Rock from Other Sources = ~~6,700,000~~ 5,418,000
 Rock and Gravel reqd. from Downstream = 11,342,000

Description	Labour	Material	Equipment	TOTAL
Rock from other sources (Spread only) Reference: Rock excavation below 1470ft "USEABLE"	0.917	—	2.515	3.432
Rock and Gravel from D/S				

NOTES:

Rock - Book 'E' Pg 50
(Spent only)

A 31



Calculations

SUSITNA
WATANA

SUBJECT: Item # 332.312

Frost Protection

Process and Place Protection.

JOB NUMBER D5700.09

FILE NUMBER _____

SHEET 22 OF _____

BY RDC Jan DATE 27/82

APP _____ DATE _____

960,000 cy Placed

93,000 cy Remove & Waste

	Description	Labour	Material	Equipment	TOTAL
A.	1. Process and Load	0.306	0.003	0.570	0.879
	2. Haul and Dump	0.583		1.700	2.283
	1. + 2. PROC PROTECTION	0.889	0.003	2.270	3.162
B.	Remove 1ft Prot + Waste _{W/C}	0.458	—	1.753	2.211
C.	Scarify One foot W/C	114.12	—	167.37	281.49
D.	Place Protection Doze & Compact	0.382	—	0.634	1.016

NOTES:

Process: - Book 'B' Pg 71

Remove Prot & Waste - Book 'E' Pg 135

Scarify - Book 'E' - Pg 137

Place Prot. - Book 'E' - Pg 141

A 32



Calculations

SUSITNA
WATANA

SUBJECT: Item # 332.313

MAIN DAM
Surface Preparation.

JOB NUMBER D5700.09

FILE NUMBER _____

SHEET 23 OF _____

BY RDC San DATE 27/82

APP _____ DATE _____

Surface Prep consists of inclined and horizontal preparation worked by F. Tatz

Description	Labour	Material	Equipment	TOTAL
Inclined (above 1500')	0.71	0.06	0.40	1.17
Horizontal (below 1500')	0.38	0.04	0.25	0.67
Recomputed by Bob Beal				

NOTES:

Surface Prep - Booriz 'B' Pz 151 & 152

SUSITNA
WATANA



Calculations

SUBJECT: Item # 332.411

Relict Channel

Excavation, ~2200 cyp

JOB NUMBER P5700.09

FILE NUMBER

SHEET 24 OF

BY RDC Jan DATE 27/82
RG-A

APP _____ DATE _____

Same as for dragline excavation cost.

- cf Upstream Cofferdam Overburden Removal

[illegible]

NOTES :

See Pg A9

A 35



Calculations

 SUSITNA
WATANA
SUBJECT: Item # 332.442

 Channel Filter Blanket
Fill
JOB NUMBER P5400.09

FILE NUMBER _____

SHEET 26 OF _____BY RDC RGA Jan DATE 27/82

APP _____ DATE _____

Coarse Filter.

2,900,000 cy

Description	Labour	Material	Equipment	TOTAL
1. Coarse Filter				
(a) Haul, Place + Compact (4 miles)	0.956	—	2.459	3.415.
(b) Coarse Filter				
(i) U/S Fill material	1.819	0.019	4.516	6.354
(ii) + 10% proc. aggr.	0.52	0.05	1.00	1.57
(c) Road Maintenance	0.079	0.0002	0.137	0.216
	3.374	0.069	8.112	11.555

NOTES:

Haul P & C BOOK 'B' Pg 61
 U/S Fill MAT. BOOK 'A' Pg 14.
 Proc. Aggr. BOOK 'A' Pg 25
 Road Maint BOOK 'A' Pg 15

A 36



Calculations

SUSITNA
WATANA

SUBJECT: Item # 332.442
Channel Filter Blanket
Fill

JOB NUMBER D-5700.09

FILE NUMBER _____

SHEET 27 OF _____BY RDC EGA Jan DATE 27/82

APP _____ DATE _____

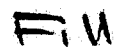
Fine Filter 2,180,000 cu

Description	Labour	Material	Equipment	TOTAL
1. Fine Filter				
(a) Haul Place + Compact 4 miles	0.956	—	2.459	3.415
(b) Fine Filter				
(i) D/S Fill Material	1.724	0.010	4.160	5.894
(ii) + 22% proc aggr.	1.153	0.106	2.204	3.463
(c) Road Maintenance	0.079	0.0002	0.137	0.216
	3.912	0.116	8.960	12.988

NOTES:

Haul, P&C Book 'B' Pg 61
D/S FILL MAT Book 'A' Pg 25
Proc. Agg
Road Maint. Book 'A' Pg 15

6000



WATANA

APP: _____ DATE: _____

182,000 C.Y.

Rif Rap - Book 'B' Pg 29

A 38



Calculations

SUSITNA
WATANA

SUBJECT: Item # 552.443
Channel Filter Blanket
Foundation Prep

JOB NUMBER D5700.09

FILE NUMBER _____

SHEET 29 OF _____BY RSC RGA Jan DATE 27/82

APP _____ DATE _____

460 Acres

	Description	Labour	Material	Equipment	TOTAL
1.	Clearing & Grubbing \$/Acre	2774.58 Recomputed	— by others	9641.90	12416.48
2.	Surface Grading (Level Area) \$/cy	1.557	—	3.634	5.191

NOTES:

Clearing - Book E - Pg 154
Surface Grading - Book E - Pg 155



Calculations

SUBJECT: Item # 332.521
Main (Chute) Spillway

A 39

SUSITNA
WATANA

JOB NUMBER P5700.09

FILE NUMBER

SHEET 30 OF

BY RDC Jan DATE 27/82

APP

DATE

Waste Rock

(i) Forbay (approach) area IF,

REVISED
16 Feb 1982
see sheet 30R (A45)

Description	Labour	Material	Equipment	TOTAL
IF				
Drill TC	11 636	16368	7620	35 624
Blast TC	16 12	—	500	2112
Haul (1.5mi + stockpile)	3907	—	12 423	16 330
TOTAL	17 155	16368	20 543	54 066
Unit Cost (^{Vol} 3857)	4.448	4.244	5.326	14.018
1.5 mile Haul Unit Cost	1.013	—	3.221	4.234

NOTES:

In approach section "ch" rock wasted

Overburden portion small ⇒ consider as part of rock waste



Calculations

SUSITNA
WATANA

SUBJECT: Item # 332.521

Main (Chute) Spillway

Excavation Control Structure

JOB NUMBER P5700.09

FILE NUMBER

SHEET 31. OF

BY RDC Jan DATE 27/82

APP DATE

Control Structure Rock Surface Fit

Overburden

Rock Useable - inclined, vertical (consider the same).

Rock Waste

WASTE ROCK

REVISED

16th Feb 1982

See sheet 31 R (A66)

Description	Labour	Material	Equipment	TOTAL
I				
Drill	5818	11111	3810	20739
Blast	806		250	1056
Total	6624	11111	4060	21795
Unit Cost Vol = 2584 CY	2.563	4.300	1.571	8.434
(2) Haul 1.5 mi + stockpile	1.013	-	3.221	4.234
(1) + (2)	3.576	4.300	4.792	12.668

NOTES: Cost for Overburden and Waste Rock.

SUSITNA
WATANA



Calculations

SUBJECT: Item # 332.521
Main (Chute) Spillway
Excavation

JOB NUMBER P5700.DA

FILE NUMBER

SHEET 32 OF

BY RDC Jan DATE 27/82
RG-A

APP _____ DATE _____

Control Structure. Structural Rock Excavation

REVISED
16 Feb 1982
See sheet 32R (AG7)

[illegible]

NOTES:

A 42



Calculations

SUSITNA
WATANA
SUBJECT: Item # 332.521
Main (Chute) Spillway
Excavation

JOB NUMBER P5700.DA

FILE NUMBER _____

SHEET 33 OF _____BY RDC Jan DATE 27/82

APP _____ DATE _____

Upper Chute

Overburden and Waste type IF as for (Fairbay) Approach

Rock Useable type IF

REVISED

16th Feb 1982

see sheet 33R(A6B)

Description	Labour	Material	Equipment	TOTAL
IF "Overburden and Waste"	4.448	4.244	5.326	14.018
IF "Structural"				
Drill	6982	7947	4572	19,501
Blast	1612		500	2,112
TOTAL	8594	7947	5072	21,613
Unit Cost				
Vol = 1544 cy	5.566	5.147	3.285	13.998
(2) Haul (1.5 mi + stockpile)	1.013	—	3.221	4.234
(1) + (2)	6.579	5.147	6.506	18,232

NOTES:

A 43



Calculations

SUSITNA
WATANA

SUBJECT: Item # 332.521
Main (Chute) Spillway
Excavation

JOB NUMBER D5400.09

FILE NUMBER _____

SHEET 34 OF _____BY RDC Jan DATE 27/82

APP _____ DATE _____

Lower Chute

Overburden and Waste type A
Drill and Blast as for IF
Haul - push with dozers then haul

REVISED

16th Feb 1982

see sheet 34R (A69)

Description	Labour	Material	Equipment	TOTAL
A				
Drill TC	11636	16368	7620	35624
Blast TC	1612	-	500	2112
Total	13248	16368	8120	37736
(1) Unit Cost Vol = 3854 cy	3.435	4.244	2.105	9.784
Doze and Stockpile Sandrock				
Total Cost \$/hour	247	-	762	1009
(2) Unit Cost Vol = 523 cy	0.494	-	1.524	2.018
(1) + (2)	3.929	4.244	3.629	11.802

NOTES:



SUEITNA
WATANA

FILE NUMBER

SHEET **35** OF

BY RDC RG DATE 27/82

APP DATE

Lower Chute

Rock Useable - Structural - type B.

Drill and Blast as for IIF Retaining

Doze and Stockpile Shotrock Reference Lower Chute (lic Summary)

REVISED

16th Feb 1982

see sheet 35 RA70

Upper Chute (1st Summary)

FORM NO. 152 REV. 1-1-64

NOTES :

SUSITNA
WATANA

Main (Chute) Spillway

River Channel ~ Alluvium Excavation.

JOB NUMBER ~~P5700~~ . 09

FILE NUMBER

SHEET **36** OF

BY RDC
RGA Jan DATE 27/82

APP DATE

Haul a distance of 1.5 miles (Estimated).

Granular Backfill 5000 CY

IMPERVIOUS 1,000 CY

[illegible]

NOTES:

Dragline Exc - Book B Pg 59

Haul 1.5 Miles: - Brook B Pg 188

A 46



Calculations

Susitna

SUBJECT: Wotana Item: 332.531Emergency Spillway
Overburden RemovalJOB NUMBER P. 5700

FILE NUMBER _____

SHEET 37 OF _____BY RDC Feb DATE 1/82

APP _____ DATE _____

Each component item summed in terms of total cost,
and divided by volume of 4,158,000 cu.yds.

Description	Labour	Material	Equipment	Total
(a) Tundra Removal	230,794	—	785,735	1,016,529
(b) Drainage Ditch	191,000	—	389,000	580,000
(c) Gravel Overlay	330,225	1221	823,620	1,155,066
(d) Overburden	2,147,716	—	7,364,280	9,511,996
Total Cost	2,899,735	1221	9,362,635	12,263,591
Volume 4,158,000				
Unit Cost	0.697	0.0003	2.252	2.949

Unit Cost See Pg A47

A 47



Calculations

SUBJECT: Item # 332.531

Emergency Spillway
Overburden Removal

SUSITNA
WATANA

JOB NUMBER D5700.DA

FILE NUMBER

SHEET 38. OF

BY RDC Jan DATE 27/82
RG A

APP _____ DATE _____

Overburden Removal

$$Vol = \frac{4,158,000}{4,440,000} \text{ cy}$$

[illegible]

NOTES:

OVERBURDEN Removal - Book 'B' Pg 192



Calculations

SUSITNA
WATANA

SUBJECT: Item # 332.531

Emergency Spillway.

Rock Excavation IIA

JOB NUMBER D5700.09

FILE NUMBER _____

SHEET 39 OF _____

BY RDC Jan DATE 27/82

APP _____ DATE _____

To be utilised for Emergency Spillway.

Add. Rock Excavation cost to Haul to Dam

Total divide by 2,562,000 to give

REVISED
16 Feb 1982
Cost see sheet 39B
Unit Cost. (A72)

Description	Labour	Material	Equipment	TOTAL
Rock Excavation IIA				
Drilling TC	14521	20850	11020	46391
Blast TC	1612	—	500	2112
Total	16133	20850	11520	48503
Unit cost (Vol = 4800cy)	3.361	4.344	2.400	10.105
1 x 2,562,000 CY TC	8,610,882	11,129,328	6,148,800	25,889,010
2 Haul to Dam TC	2,618,364	—	8,416,170	11,034,534
3 Secondary Compaction TC	482,218	—	1,836,954	2,321,172
TOTAL	11,713,464	11,129,328	16,401,924	39,244,716
Unit Cost				
1 + 2. Total cost	11,229,246	11,129,328	14,564,970	36,923,544
÷ 2,562,000 UIC	4.383	4.344	5.685	14.412

NOTES:

Calculations

SUBJECT: Item # 332.531

Emergency Spillway
Rock Useable

JOB NUMBER P5700.DA

FILE NUMBER _____

SHEET 40 OF

BY RDC RGA Jan DATE 27/82

APP _____ DATE _____

2,893,000 CY

Change to D/S Per F.11

[illegible]

NOTES :

Rock Useable - Book 'B' Pg 194
Spread & Comput - Book 'B' Pg 196



Calculations

SUBJECT: Item # 332.531
Emergency Spillway
Rock Waste

A 50
SUSITNA
WATANA

JOB NUMBER D5700.09
FILE NUMBER _____
SHEET 41 OF _____
BY RDC Jan DATE 27/82
APP _____ DATE _____

Costs consist of: Excavation from Service Spillway Area I
Haul to U/S Reservoir Area
Spread and Compact
Road Maintenance

REVISED
16th Feb 1982
see sheet 41R.

Description	Labour	Material	Equipment	TOTAL
Service Spillway Exc				
Drilling Total Cost	5,818	11,111	3,810	20,739
÷ 2584 Unit Cost	2.252	4.300	1.474	8.026
Blasting Total Cost	806	—	250	1056
÷ 2584 Unit Cost	0.312	—	0.097	0.409
Haul to U/S Reservoir Area (F.Total same as for Rock Use)	1.022	—	3.285	4.307
Spread and Compact (F.Total as for Rock Use)	0.189	—	0.717	0.906
Road Maintenance	0.079	0.0002	0.137	0.216
TOTAL IIC	3.854	4.300	5.710	13.864

NOTES:



Calculations

SUBJECT: Item #

CONSTRUCTION HAUL ROADS.

A 51
SUSITNA
WATANA

JOB NUMBER D5700.09

FILE NUMBER

SHEET 12. OF

BY RDC Jan DATE 27/82

APP DATE

Description	Labour	Material	Equipment	TOTAL
OVERBURDEN EXCAVATION	365,104	/	1,060,763	1,425,867
ROCK EXCAVATION (DOZED)	19,082	/	55,440	74,522
ROCK EXCAVATION (HAULED)	474,814	(479,101)	345,150	811,964
HAUL EXCAVATED ROCK	40,819	/	134,640	175,459
SUB-TOTAL (EXCAVATION)	899,819	/	1,595,993	2,495,812
MATERIALS (MAINTENANCE)				
3 FT. GRAVEL BLANKET	18,337	112	43,700	62,149
ROAD SURFACING	34,147	342	83,712	118,201
SUB-TOTAL (MATERIALS)	52,484	454	127,412	180,350
TOTAL :	952,303	454	1,723,405	\$2,676,162

Cost: \$/mile

NOTES :

- SUB-TOTAL (EXCAVATION) COVERS COST OF ROAD EXCAVATION ONLY.

- SUB-TOTAL (MATERIALS) COVERS COST OF ROAD MATERIALS FOR MAINTENANCE AT THE PROCESS PLANT ONLY.



Calculations

SUBJECT: Item # 332.521

Main (Chetiv) Spillway and Emergency Spillway.

Overburden.

JOB NUMBER PS-100.09

FILE NUMBER

SHEET 43. OF

BY RDC
BY RGA ~~FILE~~ DATE 30/82

APP _____ DATE _____

Overburden Removal : For overburden costs use same haul and dump costs as for excavated rock. Drill and Blast not included, excavate by dozing and stockpiling.

308,500 cy (main spillway)

[illegible]

NOTE :

DOZING - BOOK 'B' Pg 32.

HAUL - Book 'B' Pg 174

900009

(A) Unit Cost Summary Sheets

Revisions to Rock Excavation Unit Costs



Calculations

SUBJECT: SUSITNA [REDACTED]
Revision to drilling costs.

JOB NUMBER P. 5700
FILE NUMBER _____
SHEET _____ OF _____
BY RDC Feb DATE 16/82
APP _____ DATE _____

Discussions with L. Cousineau of the Susitna Hydroelectric Project review panel on Monday 15th February 1982. resulted in a reconsideration of the drill rates able to be achieved with the airtrack drills.

For a medium duty airtrack previously assumed drill production rate was 20ft/hour.

This production rate includes an allowance for moving equipment about and setting up.

Cousineau's suggestion was to use a drilling rate of 40ft/hour find equivalent drill production per shift then make an allowance for moving and setting up.

Use following assumptions for drilling

- (a) Benching: 40 ft / hour
- (b) Slopes: 30 ft / hour (this assumes 40 ft / hour production but includes 25% downtime).



Calculations

SUBJECT: Drilling Cost Revisions
Service Spillway

JOB NUMBER P. 5700

FILE NUMBER _____

SHEET _____ OF _____

BY RDC Feb DATE 16/82

APP _____ DATE _____

1. Service Spillway Area I (AI)
 Production 40 ft/hour. (cf 20 ft/hour previously).
 ⇒ Reduce # airtrucks from 7 to 4, similarly compressors.
 Also reduce labour to suit. Material cost unchanged.
 * Revision sheet 1 attached.

2. Service Spillway Area II (AII)
 Production 30 ft/hour (cf 20 ft/hour previously) side slopes.
 ⇒ Require only $20/30 = 0.67$ original equipment and manpower.
 ⇒ Reduce # airtrucks from 17 to 12.
 * Revision sheet 2 attached.

3. Service Spillway Area IF
 Drilling (labour and equipment) costs as for Area AI
 Material cost as calculated * Revision sheet 3 attached

4. Service Spillway Area IIF
 Concrete structure excavation
 Drilling (labour and equipment) costs as for Area AI
 Material cost unchanged (as calculated).
 * Revision sheet 4 attached.

5. Service Spillway - Hillside part of excavation
 (i) Area A : Unit costs as for area IF
 (ii) Area B : Unit costs as for area IIF

WATANA: A 57	Item #	Labour	Material	Equipment	Total	Mark up Price
Main Dam Excavation						
Rock Useable above 1470 ft	332.311	4.70	4.83	5.44	14.97	23.20
Rock Waste above 1470 ft	.311	4.70	4.83	5.44	14.97	23.20
Rock Useable below 1470 ft	.311	5.00	5.15	5.06	15.21	23.58
Rock Waste below 1470 ft	.311	6.12	4.24	7.10	17.46	27.06
Main (Chute) Spillway Excavation Approach						
Rock Useable	332.521	3.46	4.24	4.83	12.53	19.42
Rock Waste	.521	3.46	4.24	4.83	12.53	19.42
Control Structure						
Rock Waste	.521	2.84	4.30	4.42	11.56	17.92
Rock Useable (No need to distinguish between inclined + vertical)	.521	3.64	4.34	4.95	12.93	20.04
Upper Chute						
Rock Waste	.521	3.46	4.24	4.83	12.53	19.42
Rock Useable	.521	5.09	5.15	5.76	16.00	24.80
Lower Chute						
Rock Waste	.521	2.94	4.24	3.13	10.31	15.98
Rock Useable	.521	4.57	5.15	4.07	13.79	21.37
Valve Block / Flip and Outfall.						
Rock Waste	.521	2.94	4.24	3.13	10.31	15.98
Rock Useable	.521	4.57	5.15	4.07	13.79	21.37
Emergency Spillway Excavation						
Rock Useable	.531	3.64	4.34	5.02	13.00	20.15
Rock Waste	.531	3.11	4.30	5.34	12.75	19.76

Notes Above table summarises the revisions made to the unit costs for Wastana Dam Rock Excavation. Following discussion with Cousineau Monday 15th February it was decided to increase drill rates of airtrucks from 20 ft/hour to 30 and 40 ft/hour depending on location. Changes to costs calculated and compiled by R.D. Chamberlain 16th and 17th February 1982.

(WATANA) A 50		Item #	Labour	Material	Equipment		Total	Mark Price
Dam Excavation					CUN	OPER		
Rock Useable above 1470 ft	✓	532.311	4.70	4.83	2.45	5.44 2.99	14.97 ✓	23.0
Rock Waste above 1470 ft	✓	.311	4.70	4.83	2.45	5.44 2.99	14.97 ✓	23.0
Rock Useable below 1470 ft	✓	532.311	5.00	5.15	2.28	5.06 2.78	15.21 ✓	23.5
Rock Waste below 1470 ft	✓	.311	6.12	4.24	3.20	7.10 3.90	17.46 ✓	27.0
Chute Spillway Excavation								
Approach								
Rock Useable	✓	532.521	3.46	4.24	2.17	4.83 2.66	12.53 ✓	19.4
Rock Waste	✓	.521	3.46	4.24	2.17	4.83 2.66	12.53 ✓	19.4
Control Structure								
Rock Waste	✓	.521	2.84	4.30	1.99	4.42 2.43	11.56 ✓	17.9
Rock Useable (No. need to distinguish between inclined + vertical)	✓	.521	3.64	4.34	2.23	4.95 2.72	12.93 ✓	20.0
per Chute								
Rock Waste	✓	.521	3.46	4.24	2.17	4.83 2.66	12.53 ✓	19.4
Rock Useable	✓	.521	5.09	5.15	2.59	5.76 3.17	16.00 ✓	24.8
over Chute								
Rock Waste	✓	.521	2.94	4.24	1.41	3.13 1.72	10.31 ✓	15.9
Rock Useable	✓	.521	4.57	5.15	1.83	4.07 2.24	13.79 ✓	21.5
Block / Flip and Outfall.								
Rock Waste	✓	.521	2.94	4.24	1.41	3.13 1.72	10.31 ✓	15.9
Rock Useable	✓	.521	4.57	5.15	1.83	4.07 2.24	13.79 ✓	21.5
Emergency Spillway Excavation								
Rock Useable		.531	3.64	4.34	2.26	5.02 2.76	13.00	20.1
Rock Waste		.531	3.11	4.30	2.40	5.34 2.94	12.75 ✓	19.7

Notes - Above table summarizes the revisions made to the unit costs for Wastana Dam Rock Excavation. Following discussion with Cousineau Monday 15th February it was decided to increase drill rates of airtrackers from 20 ft/hour to 30 and 40 ft/hour depending on location. Changes to costs calculated and compiled by R.D. Chamberlain 16th and 17th February 1982.

Entered on print out #78 for
Corrections to next computer run.

R. Jay 2-17-82

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Calculations

SUBJECT: SUSITNA [REDACTED]
Revision to Drilling Costs

JOB NUMBER P. 5700
FILE NUMBER _____
SHEET _____ OF _____
BY RDC Feb DATE 17/82
APP _____ DATE _____

The following notes explain changes to the Rock Excavation costs for the Devil Canyon Site.
Costs have generally been transferred from the Watana Site except where noted.

1. Main Dam: Rock Excavation costs as for Watana
"Rock Waste below 1470 ft"
2. Saddle Dam: Rock Excavation as for Watana
"Upper Chute Waste Rock"
3. Main (Chute) Spillway: Rock excavation costs as for Watana Main (chute) spillway.
4. Emergency Spillway: Same as for Emergency Spillway,
at Watana

A 60

DEVIL CANYON SITE — REVISIONS TO ROCK EXCAVATION COSTS.

Compiled: R. D. Chamberlain

17th February 1982.

Description.	Item #	Labour	Material	Equipment	Total	Mark Up Price
Main Dam ~ Excavation Rock	532.311	6.12	4.24	7.10	17.46	
Main Saddle Dam ~ Excavation Rock	.411	3.46	4.24	4.83	12.53	
Main (Chute) Spillway ~ Excavation Approach						
Rock Usable	.521	3.46	4.24	4.83	12.53	
Rock Waste	.521	3.46	4.24	4.83	12.53	
Control Structure						
Rock Usable	.521	3.64	4.34	4.95	12.93	
Rock Waste	.521	2.84	4.30	4.42	11.56	
Chute and Flip						
Rock Usable	.521	5.09	5.15	5.76	16.00	
Rock Waste	.521	3.46	4.24	4.83	12.53	
Outfall						
Rock Usable	.521	4.57	5.15	4.07	13.79	
Rock Waste	.521	2.94	4.24	3.13	10.31	
Emergency Spillway						
Rock Usable	.531	3.64	4.34	5.02	13.00	
Rock Waste	.531	3.11	4.30	5.34	12.75	

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A 61

DEVIL CANYON SITE — REVISIONS TO ROCK EXCAVATION COSTS.

Compiled: R. D. Chamberlain

17th February 1982.

Description.	Item #	Labour	Material	Equipment			Total	Mark Up Price
Main Dam ~ Excavation Rock	532.511	6.12	4.24	OWN 3.20	OPER. 7.10	OPER. 3.90	17.46 ✓	
Main Saddle Dam ~ Excavation Rock	. 411	3.46	4.24	2.17	4.83	2.66	12.53 ✓	
Main (Chute) Spillway ~ Excavation Approach								
Rock Useable	. 521	3.46	4.24	2.17	4.83	2.66	12.53 ✓	
Rock Waste	. 521	3.46	4.24	2.17	4.83	2.66	12.53 ✓	
Control Structure								
Rock Useable	. 521	3.64	4.34	2.23	4.95	2.72	12.93 ✓	
Rock Waste	. 521	2.84	4.30	1.99	4.42	2.43	11.56 ✓	
Chute and Flip								
Rock Useable	. 521	3.09	5.15	2.59	5.76	3.17	16.00 ✓	
Rock Waste	. 521	3.46	4.24	2.17	4.83	2.66	12.53 ✓	
Outfall								
Rock Useable	. 521	4.57	5.15	1.83	4.07	2.24	13.79 ✓	
Rock Waste	. 521	2.94	4.24	1.41	3.13	1.72	10.51 ✓	
Emergency Spillway								
Rock Useable	. 531	3.64	4.34	2.26	5.02	2.76	15.00 ✓	
Rock Waste	. 531	3.11	4.30	2.40	5.34	2.94	12.75 ✓	

SUSITNA



SUBJECT: Item # 332.311

Main Dam

Excavation of Rock above 1470 ft

JOB NUMBER D5700.DA

FILE NUMBER

SHEET 12 R OF

BY: RDC Feb DATE 16/82

APP _____ DATE _____

Math ✓ PGA 2/17/82

3,239,000 CY

NOTES:

NOTES:

1. Rock drilling : Book B, pg. 38
2. " blasting : Book B, pg. 41
3. " dozing : Book B, pg. 42
4. Lower & raise equip: Book B, pg. 44
5. Haul & dump 2 miles : Book B, pgs 10 & 11
6. Road maint. : Book A, pg 15



SUBJECT: Item # 332-311
Rock Excavation Below 1470 ft
"USEABLE"

JOB NUMBER P5700.0A

FILE NUMBER

SHEET 13 R OF

BY RDE Feb DATE 16/82

APP _____ DATE _____

478,000 cy

Math ✓ RGA 2/17/82

NOTES :

1. Drilling - Book B, pg 179
2. Blasting: Book B, pg 167
3. Haul & spread: Book B, pg. 50

SUSITNA



SUBJECT: Item # 332.521

Excavation Useable / Waste Rock.

FILE NUMBER

SHEET 30 R OF

BY RDC Feb DATE 16/82

APP _____ DATE _____

Math. ✓ RGA 2/17/82

382,500 c4

[illegible]

NOTES:

Drill - Book' B Pg. 178	$\frac{L}{2.03}$	$\frac{M}{4.24}$	$\frac{E}{1.48}$	$\frac{TOT}{7.75}$
ELAST - " Pg. 147	.418	—	.130	.548
Hawl - " Pg. 174	$\frac{1.013}{3.46}$	$\frac{—}{4.24}$	$\frac{3.221}{4.83}$	$\frac{4.234}{12.53}$

FORM NO. 152 REV. 1

45

SUSITNA.



SUBJECT: Item # 332.521
CONTROL STRUCTURE
Excavation 'Waste' Rock

JOB NUMBER D5700 DA

FILE NUMBER

SHEET **31 R** OF _____

BY RDC Feb DATE 16/82

APP _____ DATE _____

16500 C4

Math ✓ RGA 2/17/82

Description	Labour	Material	Equipment	TOTAL
I Drilling	3913	11111	2850	17874
II Blast	806	—	250	1056
TOTAL	4719	11,111	3,100	18,930
Unit Cost (Vol = 2584 cu)	1.83	4.30	1.20	7.33
Haul 1.5 mile + stockpile.	1.013 ✓	—	3.221 ✓	4.234 ✓
(1) + (2)	2.84	4.30	4.42	11.56

NOTES:

		<u>L</u>	<u>M</u>	<u>E</u>	<u>tot</u>
Drilling	- Book 'B' Pg 168	1.514	4.30	1.10	6.91
Blast	- Book 'B' Pg 167	0.312	-	0.087	0.409
Haul	- Book 'B' - Pg 174	1.013	-	3.221	4.234
		<u>2.84</u>	<u>4.30</u>	<u>4.42</u>	<u>11.56</u>

FORM NO. 152 REV. 1



Calculations

SUBJECT: Item # 332.521
UPPER CHUTE
Rock Excavation Waste/Useable

JOB NUMBER D5700.09
FILE NUMBER _____
SHEET 33R OF _____
BY RDC Feb DATE 16/82
APP _____ DATE _____

Rock Waste : As for 'Approach' rock excavation
349,000 CY

Math v 2/17/82 RCA

Description	Labour	Material	Equipment	TOTAL
IF Rock Waste	3.46	4.24	4.83	12.53
IF Structural				
Drill	4695	7947	3420	16062
Blast	1612	-	500	2112
Total	6307	7947	3920	18174
Unit Cost (Vol = 15440)	4.08	5.15	2.54	11.77
Haul 1.5 mile + stockpile	1.013	-	3.221	4.234
(1) + (2)	5.09	5.15	5.76	16.00

Rock Waste Basic 'A' Pg 65

NOTES:

		<u>L</u>	<u>M</u>	<u>E</u>	<u>TOT</u>
Drill	Book 'B' Pg 179	3.004	5.115	2.22	10.41
Blast	Book 'B' Pg 167	1.04	-	.32	1.36
Haul	Book 'B' Pg 174	1.013	-	3.221	4.234
		5.09	5.15	5.76	16.00

SUSITNA



Calculations

SUBJECT: Item # 352. 521

LOWER CHUTE

Rock Excavation 'Waste'

JOB NUMBER ~~DS~~700 . DA

FILE NUMBER

SHEET 34 R OF

BY RDC Feb DATE 16/82

APP

DATE _____

Math ✓ 2/17/82 RGA

43,500 cy

Description	Labour	Material	Equipment	TOTAL
Type II Drilling	7826	16368	5700	29894
Type II Blast	1612	—	500	2112
TOTAL	9438	16368	6200	32006
Unit Cost (Vol = 3857 cy)	2.45	4.24	1.61	8.30
Dore and Stockpile Shotrock	0.494	—	1.524	2.018
(1) + (2)	2.94	4.24	3.13	10.31

NOTES:

NOTES:		<u>L</u>	<u>M</u>	<u>E</u>	<u>tot</u>
Drilling	Book 'B' Pg 178	2.03	4.24	1.46	7.75
Inst	Book 'B' Pg 147	.418	—	.130	.548
Boze & Stockpile	Book 'B' Pg 184	.494	—	1.524	2.018
		<u>2.94</u>	<u>4.24</u>	<u>3.13</u>	<u>10.31</u>

SUSITNA



SUBJECT: Item # 332.521

LOWER CHUTE

Rock Excavation 'Useable'

JOB NUMBER. PS400.DA

FILE NUMBER

SHEET 35R OF

BY RDE Feb DATE 16/82

APP _____ DATE _____

Rock Usable - ~~Structural~~ - Type B. Math ✓ 2/17/82 RGA
Drill and Blast as for IIF Ref: Upper Chute
152,500 Cy

NOTES :

Drill & Blast Book 'B' Pg 179, 187 (continued)

Doza & Stock Book 'E' Pg 184

SUSITNA



JOB NUMBER P5700.09

FILE NUMBER _____

SHEET 36 R OF

BY RDC Feb DATE 16/82.

APP _____ DATE _____

Math ✓ RGA 2/17/82.

374,000 cy

NOTES:

FORM NO. 152 REV. 1

A-72

SUSITNA



Calculations

SUBJECT: Item # 332.531

EMERGENCY SPILLWAY

Rock Useable

JOB NUMBER P5400.09

FILE NUMBER

SHEET 39R OF

BY RDE Feb DATE 16/82

APP DATE

Math ✓ RGA 2/17/82

2,893,000 cy

Description	Labour	Material	Equipment	TOTAL
Type IIA Drilling	10 985	20 850	7790	39 625
Blast	16 12	—	500	21 12
Total	12 597	20 850	8290	41 737
Unit Cost (Vol = 4800 cy)	2.62	4.34	1.73	8.69
(1) x 2,562,000 cy TC	6,712,440	11,119,080	4,432,260	22,263,780
(2) Haul to Dam TC	2,618,364	—	8,416,170	11,034,534
(1) + (2)	9,330,804	11,119,080	12,848,430	33,298,314
÷ 2,562,000 Unit Cost	3.64	4.34	5.02	13.00

NOTES:

Drilling Book 'B' Pg 171
 Blast Book 'B' Pg 167
 1 c/2 Book 'B' Pg 194

SUSITNA



SUBJECT: Item # 332.531
EMERGENCY SPILLWAY
Rock Waste

JOB NUMBER D5700.DA

FILE NUMBER

SHEET 41R OF

BY RJC FEL DATE 16/82

APP _____ DATE _____

543,000 C9

Math. ✓ RGA 2/7/82

NOTES :

Drill	Book 'B'	Pg	168
Chart	Book 'B'	Pg	167
Haul	Book 'E'	Pg	194
Spread	Book 'B'	Pg	196
Rose L. Mount	Book 'A'	Pg	15

(A) Unit Cost Summary Sheets
Production Rates

(A) Unit Cost Summary Sheeets
Copy of Printout

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SUSITNA HYDROELECTRIC PROJECT
FEASIBILITY STUDY ESTIMATE - ACRES AMERICAN
WATANA

date: 27-JAN-82
file: WACOST.DAT:45
Page: 1

ITEM	DESCRIPTION	QUANTITY	UNITS	LABOR		JOB MATERIALS		PERM. MATERIALS		SURCONTRACTS		EQPT. OWNERSHIP		EQPT. OPERATION		EQUIV. UNIT PRICE	TOTAL AMOUNT
				UNIT PRICE	AMOUNT	UNIT PRICE	AMOUNT	UNIT PRICE	AMOUNT	UNIT PRICE	AMOUNT	UNIT PRICE	AMOUNT	UNIT PRICE	AMOUNT		
				\$	\$ 000	\$	\$ 000	\$	\$ 000	\$	\$ 000	\$	\$ 000	\$	\$ 000	\$	\$ 000
PRODUCTION PLANT																	
WATANA DAM -																	
330	LAND & LAND RIGHTS																
.1	LAND																
	LAND	1	LS														
.2	LAND RIGHTS																
	LAND RIGHTS	A	LS														
.3	MISC CHARGES & CREDITS																
	MISC CHARGES & CREDITS	A	LS														
331	POWERPLANT STRUCTURE IMPROVEMENTS																
.1	POWERHOUSE																
.11	POWERHOUSE & DRAFT TUBE																
.111	EXCAVATION																
	POWERHOUSE VAULT ROCK	122,500	CY														
	DRAFT TUBE ROCK	25,200	CY														
.113	FOUNDATION PREPARATION																
	POWERHOUSE																
	FOUND PREP (HORIZONTAL)	43,200	SF														
	DRAFT TUBE																
	FOUNDATION PREPARATION	95,400	SF														
.114	CONCRETE & SHOTCRETE																
	POWERHOUSE																
	CONCRETE	31,500	CY														
	REINFORCING STEEL	1,940	TON														
	4" SHOTCRETE	44,000	SF														
	CONC OVERBREAK 12"H/9"V	2,400	CY														
	DRAFT TUBE																
	CONCRETE	12,000	CY														
	REINFORCING STEEL	620	TON														
	2" SHOTCRETE	37,800	SF														
	4" SHOTCRETE	6,900	SF														
	CONCRETE OVERBREAK 6"	4,300	CY														
.115	SUPPORT & ANCHORS																
	POWERHOUSE																
	ROCK BOLTS 1" & 25' HY	1,040	EACH														

Excavation / Fill Unit Costs
as at 30th January 1982.
Calculations by: R. Chamberlain
R. Adams
For: F. Toth

TOTAL W.O.F. ITEMS
ESTIMATED IS 59.

SUSITNA HYDROELECTRIC PROJECT
FEASIBILITY STUDY ESTIMATE - ACRES AMERICAN
WATANA

date: 27-JAN-82
file: WACOST.DAT#45
page: 2

ITEM	DESCRIPTION	QUANTITY	UNITS	LABOR		JOB MATERIALS		PERK. MATERIALS		SUBCONTRACTS		EQPT. OWNERSHIP		EQPT. OPERATION		EQUIV. UNIT PRICE	TOTAL AMOUNT
				UNIT PRICE	AMOUNT	UNIT PRICE	AMOUNT	UNIT PRICE	AMOUNT	UNIT PRICE	AMOUNT	UNIT PRICE	AMOUNT	UNIT PRICE	AMOUNT		
				\$	\$ 000	\$	\$ 000	\$	\$ 000	\$	\$ 000	\$	\$ 000	\$	\$ 000	\$	\$ 000
	ROCKBOLTS 1" @ 15'	2,110	EACH														
	STEEL MESH	48,800	SF														
	STEEL SUPPORT	137	TON														
	DRAFT TUBE																
	ROCKBOLTS 1" @ 12'	400	EACH														
	ROCKBOLTS 1" @ 9'	180	EACH														
	STEEL MESH	20,000	SF														
.118	STRUCTURAL - MISC STEELWORK POWERHOUSE & DRAFT TUBE																
	STRUCTURAL STEEL/CRANE RAILS	1	LS														
.119	ARCHITECTURAL POWERHOUSE																
	ARCHITECTURAL	1	LS														
.11C	MECHANICAL CONSTR HEATING & VENT.	1	LS														
.12	ACCESS TUNNELS & PORTALS																
.121	EXCAVATION TUNNELS - ROCK																
	MAIN TUNNEL	50,250	CY														
	TRANSFORMER GALLERY TUNNEL	17,750	CY														
	GROUTING GALLERY TUNNEL	1,900	CY														
	SURGE CHAMBER ACCESS TUN	7,250	CY														
	PENSTOCK ACCESS TUNNEL	61,500	CY														
	PENSTOCK ELBOW ACCESS TUN	15,000	CY														
	ACCESS SHAFT TUNNEL	12,000	CY														
	CONNECTOR TUNNEL	1,900	CY														
	PORTALS																
	OVERBURDEN	6,000	CY														
	ROCK	3,000	CY														
.123	FOUNDATION PREPARATION																
	TUNNELS																
	MAIN TUNNEL SLAB		SF														
	PORTALS																
	HORIZONTAL		SF														
	INCLINED		SF														
.124	CONCRETE & SHOTCRETE																
	CONCRETE																
	MAIN TUNNEL CONC SLAB	1,950	CY														
	MAIN TUN CONC OVERBREAK 6"	1,000	CY														
	CONC PLUGS PENS ELBOW ACC		CY														
	CONCRETE ACCESS SHAFT	2,950	CY														
	ACC SHAFT CONC OVERBREAK	1,100	CY														
	REINFORCING STEEL	40	TON														
	PORTALS																
	CONCRETE SLAB		CY														
	CONCRETE WALLS		CY														

[illegible]

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SUSITNA HYDROELECTRIC PROJECT
FEASIBILITY STUDY ESTIMATE - ACRES AMERICAN
WATANA

date: 27-JAN-82
file: WACOST.DAT:45
Page: 4

ITEM	DESCRIPTION	QUANTITY	UNITS	LABOR		JOB MATERIALS		PERM. MATERIALS		SUBCONTRACTS		EQPT. OWNERSHIP		EQPT. OPERATION		EQUIV. UNIT PRICE	TOTAL AMOUNT
				UNIT PRICE	AMOUNT	UNIT PRICE	AMOUNT	UNIT PRICE	AMOUNT	UNIT PRICE	AMOUNT	UNIT PRICE	AMOUNT	UNIT PRICE	AMOUNT		
				\$	\$ 000	\$	\$ 000	\$	\$ 000	\$	\$ 000	\$	\$ 000	\$	\$ 000	\$	\$ 000
	STEEL MESH	22,500	SF														
	ACCESS SHAFT TUNNEL																
	ROCKBOLTS 1" x 12'	20	EACH														
	ROCKBOLTS 1" x 9'	20	EACH														
	ROCKBOLTS 3/4" x 6'	920	EACH														
	STEEL SUPPORT	8	TON														
	STEEL MESH	80	SF														
	CONNECTOR TUNNEL																
	ROCKBOLTS 3/4" x 9'	160	EACH														
	STEEL MESH	260	SF														
	STEEL SUPPORT	2	TON														
.129	ARCHITECTURAL																
	PORTAL DOORS (2 SETS)	1	LS														
.12C	MECHANICAL																
	VENTILATING SYSTEM	1	LS														
.13	ACCESS SHAFT																
.131	EXCAVATION																
	ROCK	14,200	CY														
.132	FOUNDATION PREPARATION																
	SHAFT	64,800	SF														
.134	CONCRETE & SHOTCRETE																
	CONCRETE LINING	4,400	CY														
	REINFORCING STEEL	67	TON														
	SHOTCRETE	16,200	SF														
	CONCRETE OVERBREAK 6"	1,200	CY														
.135	SUPPORT & ANCHORS																
	ROCKBOLTS 3/4" x 6'	1,020	EACH														
	STEEL MESH	37,300	SF														
.138	STRUCTURAL - MISC STEELWORK																
	MISC STEELWORK	38	TON														
.139	ARCHITECTURAL																
	20' x 30' BUILDING	1	LS														
.13C	MECHANICAL																
	ELEVATORS	1	LS														
.14	FIRE PROTECTION HEADTANK																
.141	EXCAVATION																
	ROCK	2,000	CY														
.143	FOUNDATION PREPARATION																
	HEADTANK		SF														
.144	CONCRETE & SHOTCRETE																
	CONCRETE	340	CY														
	CONC OVERBREAK 12"H/9"V		CY														
	REINFORCING STEEL	17	TON														
.145	SUPPORT & ANCHORS																
	ROCKBOLTS (1" x 6')	3	TON														
	STEEL MESH		SF														

MOORE BUSINESS FORMS, INC. 110

AUTO
MANUAL
P. 10

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ITEM	DESCRIPTION	QUANTITY	UNITS	LABOR		JOB MATERIALS		PERM. MATERIALS		SUBCONTRACTS		EQUIP. OWNERSHIP		EQUIP. OPERATION		EQUIV. UNIT PRICE	TOTAL AMOUNT
				UNIT PRICE	AMOUNT	UNIT PRICE	AMOUNT	UNIT PRICE	AMOUNT	UNIT PRICE	AMOUNT	UNIT PRICE	AMOUNT	UNIT PRICE	AMOUNT		
				\$	\$ 000	\$	\$ 000	\$	\$ 000	\$	\$ 000	\$	\$ 000	\$	\$ 000	\$	\$ 000
	STEEL SUPPORT	10	TON														
.148	STRUCTURAL - MISC STEELWORK																
	MISC STEELWORK	1	LS														
.14C	MECHANICAL																
	PIPING & VALVES-SEE 335.12		LS														
.15	BUS TUNNELS																
.151	EXCAVATION																
	ROCK HORIZONTAL	2,700	CY														
	ROCK INCLINED	1,300	CY														
.153	FOUNDATION PREPARATION																
	TUNNELS	4,500	SF														
.154	CONCRETE & SHOTCRETE																
	CONCRETE SLAB	300	CY														
	2" SHOTCRETE	5,500	CY														
	6" SHOTCRETE	3,400	CY														
	CONCRETE OVERBREAK 12"	200	CY														
.155	SUPPORT & ANCHORS																
	ROCKBOLTS 1" @ 25'	60	EACH														
	ROCKBOLTS 1" @ 12"	325	EACH														
	ROCKBOLTS 1" @ 9'	80	EACH														
	STEEL MESH	17,500	SF														
	STEEL SUPPORT	11	TON														
.16	TRANSFORMER GALLERY																
.161	EXCAVATION																
	ROCK	30,250	CY														
.163	FOUNDATION PREPARATION																
	TRANSFORMER GALLERY	19,600	SF														
.164	CONCRETE & SHOTCRETE																
	CONCRETE BASE SLAB	2,900	CY														
	REINFORCING STEEL	145	TON														
	CONC OVERBREAK 12"H/6"V	700	CY														
.165	SUPPORT & ANCHORS																
	ROCKBOLTS 1" @ 25' HY	570	EACH														
	ROCKBOLTS 1" @ 15' HY	260	EACH														
	STEEL MESH	19,800	SF														
	STEEL SUPPORT	28	TON														
.17	CABLE SHAFTS																
.171	EXCAVATION																
	ROCK	3,400	CY														
.173	FOUNDATION PREPARATION																
	SHAFTS	21,600	SF														
.174	CONCRETE & SHOTCRETE																
	CONCRETE LINING	1,000	CY														
	2" SHOTCRETE	5,400	SF														
	CONCRETE OVERBREAK 6"	760	CY														

ITEM	DESCRIPTION	QUANTITY	UNITS	LABOR		JOB MATERIALS		PERM. MATERIALS		SURCONTRACTS		EQPT. OWNERSHIP		EQPT. OPERATION		EQUIV. UNIT PRICE	TOTAL AMOUNT
				UNIT PRICE	AMOUNT	UNIT PRICE	AMOUNT	UNIT PRICE	AMOUNT	UNIT PRICE	AMOUNT	UNIT PRICE	AMOUNT	UNIT PRICE	AMOUNT		
				\$	\$ 000	\$	\$ 000	\$	\$ 000	\$	\$ 000	\$	\$ 000	\$	\$ 000		
.175	SUPPORT & ANCHORS																
	ROCKBOLTS 3/4" x 6'	340	EACH														
	STEEL MESH	1,080	SF														
.178	STRUCTURAL - MISC STEELWORK																
	MISC STEELWORK	9	TON.														
.179	ARCHITECTURAL																
	ENCLOSURES	1	LS														
.17C	MECHANICAL																
	HANHOIST	2	LS														
.18	DEWATERING																
.181	DEWATERING (POWER FAC)																
	DEWATERING	1	LS														
.2	MISC. BUILDINGS & STRUCTURES																
	MISC. BUILDINGS & STRS	1	LS														
.3	PERMANENT VILLAGE																
	(INCLUDED IN 63.3)																
																	0
332	RESERVOIR, DAMS & WATERWAYS																
.1	RESERVOIR																
.11	CLEARING																
	CLEARING	37,500	ACRE														
.2	DIVERSION TUNNELS/COFFERDAMS																
.21	DIVERSION TUNNELS/PORTALS -																
	(INCL COMBINED TAILRACE/DIV-																
	ERSION TUNNEL & PORTAL -																
	SEE 332.9)																
.211	EXCAVATION																
	UPPER TUNNEL																
	ROCK	219,000	CY														
	LOWER TUNNEL																
	ROCK	208,000	CY														
	EXC CONC FOR PLUG	700	CY														
	UPSTREAM UPPER PORTAL																
	ROCK USEABLE (FACE ONLY)	11,000	CY														
	UPSTREAM LOWER PORTAL (INCL																
	MOST EXC FOR UPPER PORTAL)																
	ROCK USEABLE	56,000	CY														
	ROCK WASTE	9,800	CY														
	DOWNSTREAM PORTALS																
	OVERBURDEN-DRY	17,600	CY														
	ROCK USEABLE	126,600	CY														
	ROCK WASTE	31,000	CY														
	REMOVE CONCRETE FOR PLUGS	700	CY														

ITEM	DESCRIPTION	QUANTITY	UNITS	LABOR		JOB MATERIALS		PERM. MATERIALS		SUBCONTRACTS		EQPT. OWNERSHIP		EQPT. OPERATION		EQUIV. UNIT PRICE	TOTAL AMOUNT
				UNIT PRICE	AMOUNT	UNIT PRICE	AMOUNT	UNIT PRICE	AMOUNT	UNIT PRICE	AMOUNT	UNIT PRICE	AMOUNT	UNIT PRICE	AMOUNT		
				\$	\$ 000	\$	\$ 000	\$	\$ 000	\$	\$ 000	\$	\$ 000	\$	\$ 000		
	DOWNSTREAM LOWER PORTAL																
	OVERBURDEN		CY														
	ROCK USEABLE		CY														
	ROCK WASTE		CY														
	REMOVE CONC FOR PLUGS	1,900	CY														
	EMERGENCY RELEASE CHAMBERS																
	EXC CONC FOR PLUGS	1,800	CY														
	GATE CHAMBER	5,000	CY														
	ACCESS TUN TO GATE CHAMBER																
	ROCK	19,100	CY														
	TEMPORARY COFFERDAM TO CON-																
	STRUCT UPSTREAM PORTALS	23,000	CY	0.98	22.54	0	0.00					2.59	59.57	3.57	82.14		
.213	FOUNDATION PREPARATION																
	UPSTREAM UPPER PORTAL																
	HORIZONTAL	3,200	SF														
	INCLINED	8,600	SF														
	UPSTREAM LOWER PORTAL																
	HORIZONTAL	1,300	SF														
	INCLINED	14,900	SF														
	DOWNSTREAM UPPER PORTAL																
	HORIZONTAL	6,100	SF														
	INCLINED	20,500	SF														
	DOWNSTREAM LOWER PORTAL																
	HORIZONTAL	800	SF														
	INCLINED	5,600	SF														
.214	CONCRETE & SHOTCRETE																
	UPPER TUNNEL																
	CONCRETE LINING	37,900	CY														
	CONC LINING OVERBREAK 6"	10,200	CY														
	CONC FOR FERN PLUGS	6,200	CY														
	REINFORCING STEEL		TON														
	LOWER TUNNEL																
	CONCRETE LINING	37,900	CY														
	CONC LINING OVERBREAK 6"	10,000	CY														
	REINFORCING STEEL		TON														
	UPSTREAM UPPER PORTAL																
	CONCRETE HEADWALL	3,200	CY														
	CONCRETE LINING	1,300	CY														
	CONCRETE SLAB	700	CY														
	CONCRETE PIERS	800	CY														
	REINFORCING STEEL	195	TON														
	CONCRETE OVERBREAK 12'H/6'V		CY														
	UPSTREAM LOWER PORTAL																
	CONCRETE HEADWALL	4,500	CY														
	CONCRETE LINING	4,200	CY														

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Note: These 2 items
not yet broken down
EQUIP. OWNERSHIP EQUIP. OPERATION

ITEM DESCRIPTION	QUANTITY	UNITS	LABOR		JOB MATERIALS		PERM. MATERIALS		SUBCONTRACTS		EQUIP. OWNERSHIP		EQUIP. OPERATION		EQUIV. UNIT PRICE	TOTAL AMOUNT
			UNIT PRICE	AMOUNT	UNIT PRICE	AMOUNT	UNIT PRICE	AMOUNT	UNIT PRICE	AMOUNT	UNIT PRICE	AMOUNT	UNIT PRICE	AMOUNT		
			\$	\$ 000	\$	\$ 000	\$	\$ 000	\$	\$ 000	\$	\$ 000	\$	\$ 000	\$	\$ 000
.22 UPSTREAM COFFERDAM																
.221 EXCAVATION																
OVERBURDEN REMOVAL	6,600	CY	1.00	6.60	0.00	0.00										
.222 FILL																
Rock Fill	2,000	CY	0.90	1.80	0.00	0.00										
Gravel Fill	2,000	CY	0.90	1.80	0.00	0.00										
FINE FILTER	16,600	CY	0.00	0.00	0.00	0.00										
COARSE FILTER	15,900	CY	0.00	0.00	0.00	0.00										
Needs backup shields → CLOSURE DIKE	93,850	CY	0.00	0.00	0.00	0.00										
RIP RAP	21,200	CY	0.00	0.00	0.00	0.00										
.223 FOUNDATION PREP/GROUTING																
SLURRY WALL	4,850	CY	0.00	0.00	0.00	0.00										
SLURRY WALL	4,850	SF	0.00	0.00	0.00	0.00										
.224 CONCRETE & SHOTCRETE																
ACCESS TUN TO GATE CHAMBER																
2" SHOTCRETE	12,800	SF														
6" SHOTCRETE	9,150	SF														
.225 Dewatering																
Dewatering	1	LS														
.23 DOWNSTREAM COFFERDAM																
.231 EXCAVATION																
OVERBURDEN	5,000	CY	1.00	5.00	0.00	0.00										
REMOVAL OF COFFERDAM	8,000	CY	0.00	0.00	0.00	0.00										
.232 FILL																
RIP RAP	1,800	CY	0.00	0.00	0.00	0.00										
CLOSURE DIKE	15,200	CY	0.00	0.00	0.00	0.00										
.233 FOUNDATION PREP/GROUTING																
SLURRY WALL	18,300	CY	0.00	0.00	0.00	0.00										
SLURRY WALL	16,500	SF	0.00	0.00	0.00	0.00										
.31 MAIN DAM																
.311 EXCAVATION																
OVERBRN ABOVE EL 1470	2,026,000	CY	0.00	0.00	0.00	0.00										
OVERBRN ALLUV BELOW 1470	5,220,000	CY	0.00	0.00	0.00	0.00										
ROCK ABOVE 1470	1,123,000	CY	0.00	0.00	0.00	0.00										
ROCK WASTE (BELOW)	1,123,000	CY	0.00	0.00	0.00	0.00										
.312 FILL																
ROCK USABLE (1470)	1,123,000	CY	0.00	0.00	0.00	0.00										
RIP RAP (UPSTREAM)	1,525,000	CY	0.00	0.00	0.00	0.00										
GRAVEL (UPSTREAM)	23,837,000	CY	0.00	0.00	0.00	0.00										
COARSE FILTER (UPSTREAM)	1,610,000	CY	0.00	0.00	0.00	0.00										
FINE FILTER (UPSTREAM)	2,047,000	CY	0.00	0.00	0.00	0.00										
CORE IMPERVIOUS	8,295,000	CY	0.00	0.00	0.00	0.00										
FINE FILTER (DOWNSTREAM)	2,225,000	CY	0.00	0.00	0.00	0.00										
COARSE FILTER (DOWNSTREAM)	2,195,000	CY	0.00	0.00	0.00	0.00										
SHELL - ROCK & GRAVEL (B/S)	11,342,000	CY	0.00	0.00	0.00	0.00										
ROCK FROM OTHER SOURCES	6,700,000	CY	0.00	0.00	0.00	0.00										

ACRES BUSINESS FORMS, INC. 110

AUTO
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 EPT. OWNERSHIP EPT. OPERATION

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	Quantity	u/c Labour	u/c Materials	u/c Equipment	u/c Total
332.313 Foundation Prep / Grouting					
Surface Preparation					
Under Core Filters (above 1500')	1,675,000	0.71	0.06	0.40	1.17
(below 1500')	615,000	0.38	0.04	0.25	0.67
Under Shell (above 1500')	5,156,000	0.71	0.06	0.40	1.17
(below 1500')	2,582,000	0.38	0.04	0.25	0.67

PORTALS			
OVERBURDEN	4,400		CY
.323 FOUNDATION PREPARATION			
PORTALS			
HORIZONTAL			SF
INCLINED			SF
.324 CONCRETE & SHOTCRETE			
TUNNELS - CORE AREA			
CONCRETE PLUGS	1,000		CY
CONCRETE SLAB	2,300		CY
REINFORCING STEEL	50		TON
CONCRETE OVERBREAK 4'			CY

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			UNIT PRICE	AMOUNT	UNIT PRICE	AMOUNT	UNIT PRICE	AMOUNT	UNIT PRICE	AMOUNT	UNIT PRICE	AMOUNT	UNIT PRICE	AMOUNT		
			\$	\$ 000	\$	\$ 000	\$	\$ 000	\$	\$ 000	\$	\$ 000	\$	\$ 000	\$	\$ 000
* SHOTCRETE	15,000	SF														
TUNNELS - ACCESS																
CONCRETE SLAB	1,600	CY														
REINFORCING STEEL	40	TON														
* SHOTCRETE	10,000	SF														
SHAFTS - CORE AREA																
SHOTCRETE	5,000	SF														
PORTALS																
CONCRETE		CY														
REINFORCING STEEL		TON														
.325 SUPPORT & ANCHORS																
TUNNELS - CORE AREA																
ROCKBOLTS 3/4" P 8'	2,100	EACH														
STEEL SUPPORT	20	TON														
TUNNELS - ACCESS																
ROCKBOLTS 3/4" P 8'	1,400	EACH														
STEEL SUPPORT	20	TON														
SHAFTS - CORE AREA																
ROCKBOLTS 3/4" P 8'	350	EACH														
PORTALS																
ROCKBOLTS 1" P 15'	20	EACH														
STEEL MESH		SF														
.329 ARCHITECTURAL																
PORTAL DOORS	6	EACH														
.320 DEWATERING																
DEWATERING	1	LS														
VENTILATION SYSTEMS	1	LS														
.33 INSTRUMENTATION																
.331 INSTRUMENTATION (POWER FAC)																
INSTRUMENTATION	1	LS														
.34 DEWATERING (TUNNELS)																
.341 DEWATERING																
DEWATERING	1	LS														
.4 RELIN CHANNEL																
.41 SHORE PROTECTION																
.411 EXCAVATION																
OVERBURDEN STRIPPING-2' THK	2,200	CY														
.412 FILL																
DUMP & SPREAD																
FILTER MAT'L - 2' LAYER	2,200	CY														
ROCK SPALLS/RIP RA#-3' AVE	3,300	CY														
SHORE PROTECTION																
RIP RA#	24,000	CY														
WASTE ROCK	24,000	CY														

Labour Materials

Equipment Total

0.0007

2.95

4.92

0

5.10

7.95

0

5.10

7.95

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				UNIT PRICE	AMOUNT	UNIT PRICE	AMOUNT	UNIT PRICE	AMOUNT	UNIT PRICE	AMOUNT	UNIT PRICE	AMOUNT	UNIT PRICE	AMOUNT		
				\$	\$ 000	\$	\$ 000	\$	\$ 000	\$	\$ 000	\$	\$ 000	\$	\$ 000	\$	\$ 000
				Labour		Materials						Equipment		Total			
.44	CHANNEL FILTER BLANKET																
.442	FILL																
	COARSE FILTER	1,200,000	CY	3.38		0.04						3.42		14.55			
	FINE FILTER	900,000	CY	3.91		0.12						4.03		49.98			
	RIP RAP	75,000	CY	2.85		0						5.10		7.95			
.443	FOUNDATION PREP																
	CLEARING & GRUBBING	190	AC	25.44		0						86.41	10	17.74	16.48		
	SURFACE GRADING	1,500,000	CY	1.56		0						3.63		5.49			
.5	TUNNEL SPILLWAY																
.51	TUNNEL SPILLWAY - (INTAKE CIVIL WORK INCL IN POWER INTAKE - SEE 332.61 OUTLET CIVIL WORK INCL IN 332.51)																
.511	EXCAVATION																
	INLET (SEE 332.611)																
	OUTLET (SEE 332.521)																
	TUNNELS																
	ROCK HORIZONTAL	93,000	CY														
	ROCK INCLINED	9,000	CY														
.513	FOUNDATION PREP/GROUTING																
	FOUNDATION PREP																
	INLET (SEE 332.613)																
	OUTLET (SEE 332.523)																
	TUNNELS																
.514	CONCRETE & SHOTCRETE																
	INLET (SEE 332.614)																
	OUTLET (SEE 332.524)																
	TUNNELS																
	CONCRETE LINING	27,200	CY														
	CONCRETE OVERBREAK 6"	6,200	CY														
	REINFORCING STEEL	705	TON														
.515	SUPPORT & ANCHORS																
	INLET (SEE 332.615)																
	OUTLET (SEE 332.525)																
	TUNNELS																
	ROCKBOLTS		EACH														
	STEEL SUPPORT	118	TON														
	STEEL MESH		SF														
.51C	MECHANICAL																
	INLET																
	TRASH RACK	1	LS														
	GATE HP15'	1	LS														
	STOPLOG	1	LS														
	OUTLET																
	MAIN VALVES	6	EACH														
	MISC MECH SYSTEM	6	EACH														

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Sardas Preparation			u/c	u/c	u/c	u/c		
Inclined			Labour	Materials	Equipment	Total		
			0.71	0.06	0.40	1.17		
Horizontal			0.38	0.04	0.25	0.67		
ITEM DESCRIPTION							UNIT	TOTAL AMOUNT
								\$ 000
.52 MAIN CIVIL WAY OUT APPROACH								
CONTR (TO E)								
ROCK WASTE	187,500	CY						
ROCK USEABLE (INCLINED)	37,500	CY		0.00	0	0.00		
ROCK USEABLE (VERTICAL)	76,500	CY	4.37	0.00	0	0.00	5.62	
UPPER CHUTE (END ROLLWAY TO STA 11+00)								
OVERBURDEN	104,500	CY	4.45	4.24			5.33	
ROCK WASTE	77,500	CY		0.00	0	0.00		
ROCK USEABLE (INCLINED)	215,000	CY	6.58	5.15			6.51	
ROCK USEABLE (VERTICAL)	134,000	CY		0.00	0	0.00		
LOWER CHUTE (STATION 11+00 TO 17+00)								
OVERBURDEN	79,500	CY						
ROCK WASTE	43,500	CY	3.93	4.24			3.63	
ROCK USEABLE (INCLINED)	107,500	CY		0.00	0	0.00		
ROCK USEABLE (VERTICAL)	45,000	CY	6.06	5.15			4.81	
VALVE BLOCK/FLIP & OUTFALL (FROM STA 17+00 TO END FLIP)								
OVERBURDEN	52,000	CY						
ROCK WASTE	71,000	CY	3.93	4.24			3.63	
ROCK USEABLE (INCLINED)	316,000	CY		0.00	0	0.00		
ROCK USEABLE (VERTICAL)	58,000	CY	6.06	5.15			4.81	
DRAIN TUNNEL								
ROCK INCLINED	3,000	CY						
ROCK HORIZONTAL	4,500	CY						
RIVER CHANNEL ALLUVIUM EXCAVATION		CY	1.01	0.007			3.16	
.522 FILL								
GRANULAR BACKFILL IMPERVIOUS	5,000	CY						
FOUNDATION PREP/GROUTING	1,000	CY						
FOUNDATION PREP SPILLWAY								
ROCK HORIZONTAL	240,000	SF	0.38	0.04			0.25	
ROCK INCLINED	167,000	SF	0.71	0.06			0.40	

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				UNIT PRICE	AMOUNT	UNIT PRICE	AMOUNT	UNIT PRICE	AMOUNT	UNIT PRICE	AMOUNT	UNIT PRICE	AMOUNT	UNIT PRICE	AMOUNT		
				\$	\$ 000	\$	\$ 000	\$	\$ 000	\$	\$ 000	\$	\$ 000	\$	\$ 000	\$	\$ 000
	CONSOLIDATION GROUTING																
	DRILL HOLES	54,000	LF														
	CEMENT	54,000	CF														
	GROUT CURTAIN (SEE 332.313)																
.524	CONCRETE & SHOTCRETE																
	CONC APPROACH & STRUCTURE																
	CONCRETE OUTERWALLS	20,500	CY														
	CONC PIERS (FULL LENGTH)	8,000	CY														
	CONCRETE DECK	1,600	CY														
	CONCRETE ROLLWAY SLABS	19,500	CY														
	CONC OVERBREAK 12"H/6"V	1,500	CY														
	REINFORCING STEEL	2,700	TON														
	CONCRETE CHUTE																
	(INCL BOX DRAIN GALLERIES)																
	(FROM END OF ROLLWAY)																
	CONCRETE SLAB	22,000	CY														
	CONCRETE WALLS	10,500	CY														
	CONC OVERBREAK 18"H/6"V	11,500	CY														
	REINFORCING STEEL	1,300	TON														
	CONCRETE VALVE BLOCK/FLIP -																
	& OUTFALL																
	CONCRETE BLOCK/BUCKET	29,500	CY														
	CONCRETE OUTFALL LINING	2,500	CY														
	CONC OVERBREAK 12"H/6"V	2,200	CY														
	REINFORCING STEEL	1,300	TON														
	CONCRETE DRAIN GALLERY																
	CONCRETE SLAB	1,000	CY														
	2" SHOTCRETE DOME	5,000	SF														
	REINFORCING STEEL (SLAB)	30	TON														
	STEEL MESH	1,000	SF														
	CONC OVERBREAK 6"		CY														
.525	SUPPORT & ANCHORS																
	DRAINAGE TUNNEL																
	STEEL SUPPORT	7	TON														
	ROCKBOLTS																
	APPROACH 1" @ 15'	275	EACH														
	CHUTE & STRUCTURE 1" @ 15'	112	EACH														
	VALVE BLOCK/BUCK 1" @ 15'	46	EACH														
	DRAINAGE GAL 3/4" @ 6'	576	EACH														
	ROCK ANCHORS																
	1" @ 10'	9,300	EACH														
.527	DRAINAGE																
	DRILL HOLES																
	BOX DRAINS	54,000	LF														
	3" RELIEF	640	LF														

MOORE DESIGN FORMS, INC. 110

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				UNIT PRICE	AMOUNT	UNIT PRICE	AMOUNT	UNIT PRICE	AMOUNT	UNIT PRICE	AMOUNT	UNIT PRICE	AMOUNT	UNIT PRICE	AMOUNT		
				\$	\$ 000	\$	\$ 000	\$	\$ 000	\$	\$ 000	\$	\$ 000	\$	\$ 000	\$	\$ 000
.52C	MECHANICAL																
	FIXED WHL GATE 42'H x 36'W	3	EACH														
	GATE HOIST	A 3	EACH														
	STOPLOGS	A 3	EACH														
*.53	EMERGENCY SPILLWAY																
.531	EXCAVATION																
	(INCLUDING BRIDGE & FUSE PLUG)																
	OVERBURDEN	4,158,000	CY	1.792	0.0003									5.96			
	ROCK USEABLE	2,562,000	CY	4.38	4.34	0.00	0	0.00	0	5.69							
	ROCK WASTE	523,000	CY	3.85	4.30	0.00	0	0.00	0	5.71							
.532	FILL																
	FUSE PLUG	27,000	CY														
.533	FOUNDATION PREP/GROUTING																
	FOUNDATION PREP (UNDER - FUSE PLUG)																
	INCLINED	47,700	SF														
	HORIZONTAL	42,000	SF														
	CONSOLIDATION GROUTING																
	DRILL HOLES	13,800	LF														
	CEMENT	13,800	CF														
	GROUT CURTAIN (SEE 332.313)																
.535	SUPPORT & ANCHORS																
	ROCKBOLTS 1" x 15'	740	EACH														
.53B	BRIDGE																
	BRIDGE	1	LS														
.6	POWER INTAKE (INCL INLET & IN-LET STRUCTURE CIVIL WORKS FOR TUNNEL SPILLWAY - SEE 332.5)																
.61	INTAKE STRUCTURE																
.611	EXCAVATION																
	OVERBURDEN	524,000	CY														
	ROCK USEABLE	1,306,000	CY														
	ROCK WASTE	1,380,000	CY														
.613	FOUNDATION PREPARATION																
	HORIZONTAL		SF														
	INCLINED		SF														
.614	CONCRETE & SHOTCRETE STRUCTURE																
	CONCRETE STRUCTURE	142,800	CY														
	CONCRETE MASS	31,600	CY														
	REINFORCING STEEL	7,150	TON														
.615	SUPPORT & ANCHORS STRUCTURE																
	ROCKBOLTS 1" x 15'	400	EACH														
	TIEBACKS	A	TON														

DO NOT
ENTER
HERE

ACRES BUSINESS FORMS, INC. 110

AUTO
MANUAL
FEED

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				UNIT PRICE	AMOUNT	UNIT PRICE	AMOUNT	UNIT PRICE	AMOUNT	UNIT PRICE	AMOUNT	UNIT PRICE	AMOUNT	UNIT PRICE	AMOUNT		
				\$	\$ 000	\$	\$ 000	\$	\$ 000	\$	\$ 000	\$	\$ 000	\$	\$ 000		
.61C	MECHANICAL																
	TRASH RACKS	1	LS														
	GATES & HOISTS	A 1	LS														
	STOPLOGS	A 1	LS														
.7	SURGE CHAMBER																
.71	SURGE CHAMBER																
.711	EXCAVATION																
	ROCK	101,000	CY														
.713	FOUNDATION PREPARATION																
	FOUNDATION PREPARATION	98,100	SF														
.714	CONCRETE & SHOTCRETE																
	CONCRETE CHAMBER	6,000	CY														
	4" SHOTCRETE	38,400	SF														
	REINFORCING STEEL	510	TON														
	CONCRETE OVERBREAK	1,000	CY														
.715	SUPPORT & ANCHORS																
	ROCKBOLTS 1" @ 25' HY	570	EACH														
	ROCKBOLTS 1" @ 15'	2,110	EACH														
	STEEL SUPPORT	66	TON														
	STEEL MESH	28,900	SF														
.71C	MECHANICAL																
	GATES	1	LS														
.8	PENSTOCKS																
.81	PENSTOCKS																
.811	EXCAVATION																
	TUNNELS																
	ROCK HORIZONTAL	53,400	CY														
	ROCK INCLINED	54,000	CY														
.813	FOUNDATION PREP/GROUTING																
	FOUNDATION PREPARATION																
	TUNNELS	489,600	SF														
	CONTACT GROUTING																
	CONTACT GROUTING	1	LS														
	CONSOLIDATION GROUTING																
	CONSOLIDATION GROUTING	1	LS														
.814	CONCRETE & SHOTCRETE																
	CONCRETE LINER	37,200	CY														
	REINFORCING STEEL	1,152	TON														
	3" SHOTCRETE	49,000	SF														
	2" SHOTCRETE	30,000	SF														
	CONC OVERBREAK 6"	10,500	CY														
	CONCRETE PLUG	11,100	CY														
	CONC OVERBREAK PLUG	960	CY														
.815	SUPPORT & ANCHORS																
	ROCKBOLTS 1" @ 25'	150	EACH														
	ROCKBOLTS 1" @ 6'	6,040	EACH														

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				UNIT PRICE	AMOUNT	UNIT PRICE	AMOUNT	UNIT PRICE	AMOUNT	UNIT PRICE	AMOUNT	UNIT PRICE	AMOUNT	UNIT PRICE	AMOUNT		
				\$	\$ 000	\$	\$ 000	\$	\$ 000	\$	\$ 000	\$	\$ 000	\$	\$ 000	\$	\$ 000
	STEEL MESH	186,000	SF														
	SUPPORT STEEL	127	TON														
.818	STRUCTURAL - MISC STEELWORK																
	STEEL LINER	1,600	TON														
.9	TAILRACE WORKS (1 PORTAL & LF TUNNEL COMBINED TAILRACE/DIVERSION INCL IN DIVERSION WORKS 332.21)																
.91	TAILRACE TUNNELS/PORTALS																
.911	EXCAVATION																
	TUNNELS																
	ROCK	135,000	CY														
	PORTALS																
	OVERBURDEN	3,200	CY														
	ROCK USEABLE	46,000	CY														
	ROCK WASTE	14,500	CY														
.913	FOUNDATION PREPARATION																
	PORTALS																
	HORIZONTAL	600	SF														
	INCLINED	6,000	SF														
	TUNNELS																
	TUNNELS	428,400	SF														
.914	CONCRETE & SHOTCRETE																
	TUNNELS																
	CONCRETE LINING	14,500	CY														
	CONCRETE OVERBREAK 6"	7,500	CY														
	6" SHOTCRETE	27,540	SF														
	2" SHOTCRETE	44,500	SF														
	REINFORCING STEEL	185	TON														
	PORTALS																
	CONCRETE BASE SLAB	100	CY														
	CONCRETE WALLS	650	CY														
	CONC OVERBREAK 12"H/6"V		CY														
	REINFORCING STEEL	30	TON														
.915	SUPPORT & ANCHORS																
	TUNNELS																
	ROCKBOLTS 1" x 12"	2,850	EACH														
	ROCKBOLTS 1" x 9"	600	EACH														
	STEEL MESH	141,700	SF														
	PORTAL																
	ROCKBOLTS " x "	15	TON														
.91C	MECHANICAL																
	GATES & HOISTS	1	LS														
	STOPLOSS	1	LS														

(A) Unit Cost Summary Sheets
Standard Sheets



NOTES:



SUBJECT: SUSITNA - WATANA
Estimates

JOB NUMBER P. 5700

FILE NUMBER _____

SHEET _____ OF _____

BY _____ DATE _____

APP _____ DATE _____

[illegible]

VOLUME =

DURATION =

[illegible]

LABOUR	MATERIAL	EQUIPMENT	TOTAL

UNIT COST

TOTAL COST