SUSITNA PROJECT

WATANA DAM
CONCRETE

FEASIBILITY LEVEL ESTIMATE

VOLUME IV

HARZA-EBASCO SUSITNA JOINT VENTURE

MARCH 1984

SURFACE CONCRETE

PROJECT SUSITNA - WATANA
SUMMARY ABOVE GROUND AND POWERHOUSE CONCRETE

ITEM	$/CY CONCRETE
331. POWERSTATION	
.114 POWERHOUSE	$249.00
.124 PORTAL	273.89
332. DIVERSION TUNNEL	
.215 PORTAL CONCRETE	322.97
.216 FLIP BUCKET	170.79
332. MAIN DAM	
.314 DENTAL	99.27
.325 PORTAL	295.54
332. MAIN SPILLWAY	
.52G PIERS	195.80
.52H DECK	588.05
.52I GUIDE WALLS	305.57
.52J SLAB	345.88
.52K OGEE	154.31
.52L FLIP BUCKET & OUTFALL	216.04
.52M DRAINAGE & AERATION GALLERIES	457.19
.52P RETAINING WALL	314.59
332. POWER INTAKE & OUTLET	
.614 CONCRETE	325.29
332. TAILRACE	
.91A PORTAL	314.99

SUSITNA - WATANA

STRUCTURAL CONCRETE QUANTITIES TABLE

ITEM	DESCRIPTION	PLACING RATE CY/HR	BASIC QUANTITY CY	lb RE-STEEL PER CY CONC	FORMWORK SF				UNFORMED SF	CLEAN UP & JOINT PREP. SF	ROCK SURFACE PREP. SF
					%	BULKHEAD	STRAIGHT	CURVED			
331	POWERSTATION										
.114	Powerhouse	25	43,500	70	2	2,800	140,000	-	38,000	195,750	38,000
.115	Portal	15	600	90	-	-	900	900	600	2,400	600
332	DIVERSION TUNNELS-										
.215	Portal Concrete	25	18,525	120	-	-	91,220	16,745	11,780	27,788	11,780
.216	Flip Bucket	25	2,000	50	20	180	900	-	300	3,000	300
332	MAIN DAM -										
.314	Dental	50	85,000	-	-	-	-	-	-	-	-
.325	Portal	25	20	90	-	-	30	30	100	30	100
332	MAIN SPILLWAY -										
.52G	Piers	25	18,670	50	-	-	43,794	4,740	-	29,000	-
.52H	Deck	25	350	300	-	-	4,488	-	-	-	-
.52I	Guide Walls	25	32,900	80	25	27,160	164,735	2,244	14,900	93,484	166,470
.52J	Slab	50	30,800	80	-	40,000	-	-	-	-	276,192
.52K	Ogee	50	24,800	15	20	5,790	11,130	17,820	23,780	76,766	34,834
.52L	Flip Bucket & Outfall	25	28,500	60	20	12,424	54,444	7,680	11,900	100,602	27,648
.52M	Aeration Gallery	25	3,710	90	10	3,708	37,085	-	36,380	-	36,380
.52P	Retaining Wall	17	1,000	80	-	-	5,400	-	900	1,800	5,400
332	POWER INTAKE & OUTLET										
.614	Concrete	25	95,800	140	20	83,370	370,000	46,850	26,600	143,700	26,600
332	TAILRACE										
.91A	Portal	10	300	120	-	-	450	450	200	800	200

3/3 of 13,151.1 Ton

[redacted]CT [redacted]TN [redacted]AT[redacted]

DATE 3/2/84
ESTIMATOR SMA/CJS

ITEM NO. 331.114
POWERSTATION-POWERHOUSE

LABOR	136.26 $/CY
M&S	88.10 $/CY
EQUIP	24.64 $/CY
TOTAL UNIT COST	249.00 $/CY

INPUT DATA
CONCRETE QUANTITY 43500. CY
PLACING RATE 25.00 CY/HR
CONCRETE IS PUMPED

FORMWORK	WOOD		STEEL		TOTAL
TYPE	SF	NO. USES	SF	NO. USES	SF
BULKHEAD	840.	6.00	1960.	50.00	2800.
CURVED	0.	1.00	0.	1.00	0.
STRAIGHT	42000.	4.00	98000.	50.00	140000.

FINISHING - FORMED SURFACES	140000. SF
FINISHING - UNFORMED SURFACES	38000. SF
CONSTRUCTION JOINT PREPARATION	195750. SF
ROCK SURFACE PREPARATION	38000. SF

OVERBREAK ALLOWANCE IS 1.00 FT
WASTE ALLOWANCE FACTOR IS 1.04
FORM RATIO 3.22 SF/CY

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DATE 3/2/84
ESTIMATOR SMA/CJS

ITEM NO. 331.114
POWERSTATION-POWERHOUSE

QUANTITY	LABOR	M&S	EQUIP	
BATCH AND MIX				
46703.7	661324.	2526670.	453960.	
TRANSPORT - 1				
44907.4	173792.	0.	101491.	
TRANSPORT - 2				
0.0	0.	0.	0.	
CRANE & BUCKET COS				
0.0	0.	0.	0.	
PUMPED COST				
1796.3	416022.	0.	274761.	
	1,251,138.	2,526,670.	830,212.	
	28.76	58.08	19.09	= 105.93
BLD WD BHD FRMS				
140.0	1239.	286.	0.	
BLD WD CVD FRMS				
0.0	0.	0.	0.	
BLD WD STR FRMS				
10500.0	100380.	21420.	0.	
0.0	0.	0.	0.	
S&S WD BHD FRMS				
840.0	6098.	252.	202.	
S&S WD CVD FRMS				
0.0	0.	0.	0.	
S&S WD STR FRMS				
42000.0	409080.	12600.	10080.	
BUY STL BHD FRMS				
39.2	0.	1058.	0.	
BUY STL CVD FRMS				
0.0	0.	0.	0.	
BUY STL STR FRMS				
1960.0	0.	52920.	0.	
S&S STL BHD FRMS				
1960.0	13544.	588.	470.	
S&S STL CVD FRMS				
0.0	0.	0.	0.	
S&S STL STR FRMS				
98000.0	884940.	29400.	23520.	
FIN FRMD SURFACES				
140000.0	93800.	0.	0.	
FIN UNFM SURFACES				

[illegible]00	[illegible]38[illegible]	[illegible]	[illegible]	[illegible]
CLNUP & JNT PREP				
195750.0	170302.	0.	74385.	
CURE				
43500.0	123975.	8700.	0.	
ROCK SURFACE PREP				
38000.0	134520.	0.	12920.	
ST&S				
3227017.	0.	161351.	0.	
TOTAL DIRECT COST				
43500.0	3227017.	2815245.	951789.	
				Additional overbreak concrete(walls & crown) 70,000sf X 1ft/27 = 2592 say 2600 @ (28.76 + 58.08 + 19.09)
	74776.	73008.	49634.	
				Add for tiebacks into rock. Say additional cost is cost for drilling & grouting 1 1/2" hole 3ft into rock @ $15/ft or $45/tie. Say 3ft centers 70,000/3x3=7777 say 7800 tiebacks @ $45=$351,000. 80/20 L/E
	280800.		70200.	
	3582593.	2888253.	1071623.	
PER CY	82.36	66.40	24.64	
RE-STEEL				
3045000.	2344650.	943950.	0.	
PER CY	53.9	21.70	0.0	
TOTAL				
PER CY	136.26	88.10	24.64	

P [redacted] T [redacted] NA [redacted] TA [redacted]
DATE 3/2/84
ESTIMATOR SMA/CJS

ITEM NO. 331.124
POWERSTATION-PORTALS

LABOR	154.19	$/CY
M&S	93.72	$/CY
EQUIP	25.98	$/CY
TOTAL UNIT COST	273.89	$/CY

INPUT DATA
CONCRETE QUANTITY 600. CY
PLACING RATE 15.00 CY/HR
CONCRETE IS PLACED BY CRANE AND BUCKET

FORMWORK	WOOD		STEEL		TOTAL
TYPE	SF	NO. USES	SF	NO. USES	SF
BULKHEAD	0.	1.00	0.	1.00	0.
CURVED	450.	2.00	450.	50.00	900.
STRAIGHT	450.	4.00	450.	50.00	900.

FINISHING - FORMED SURFACES	1800.	SF
FINISHING - UNFORMED SURFACES	600.	SF
CONSTRUCTION JOINT PREPARATION	2400.	SF
ROCK SURFACE PREPARATION	600.	SF

OVERBREAK ALLOWANCE IS 1.00 FT
WASTE ALLOWANCE FACTOR IS 1.04
FORM RATIO 3.00 SF/CY

P[redacted]T [redacted]NA [redacted]AI [redacted]
DATE 3/2/84
ESTIMATOR SMA/CJS

ITEM NO. 331.124
POWERSTATION-PORTALS

QUANTITY	LABOR	M&S	EQUIP
BATCH AND MIX			
647.1	9163.	35009.	6290.
TRANSPORT - 1			
622.2	2408.	0.	1406.
TRANSPORT - 2			
0.0	0.	0.	0.
CRANE & BUCKET COS			
41.5	9607.	0.	6345.
PUMPED COST			
0.0	0.	0.	0.
BLD WD BHD FRMS			
0.0	0.	0.	0.
BLD WD CVD FRMS			
225.0	2788.	459.	0.
BLD WD STR FRMS			
112.5	1076.	229.	0.
0.0	0.	0.	0.
S&S WD BHD FRMS			
0.0	0.	0.	0.
S&S WD CVD FRMS			
450.0	4860.	148.	108.
S&S WD STR FRMS			
450.0	4383.	135.	108.
BUY STL BHD FRMS			
0.0	0.	0.	0.
BUY STL CVD FRMS			
9.0	0.	333.	0.
BUY STL STR FRMS			
9.0	0.	243.	0.
S&S STL BHD FRMS			
0.0	0.	0.	0.
S&S STL CVD FRMS			
450.0	4860.	135.	108.
S&S STL STR FRMS			
450.0	4064.	135.	108.
FIN FRMD SURFACES			
1800.0	1206.	0.	0.
FIN UNFM SURFACES			
600.0	600.	0.	0.
CLNUP & JNT PREP			
2400.0	2088.	0.	912.
CURE			

0.	17	12	0
ROCK SURFACE PREP			
600.0	2124.	0.	204.
ST&S			
50936.0	0.	2547.	0.
TOTAL DIRECT COST			
600.0	50936.	39494.	15589.
PER CY	84.89	65.82	25.98
RE-STEEL			
54000.	41580.	16740.	0.
PER CY	69.30	27.90	0.0
TOTAL			
PER CY	154.19	93.72	25.98

DIVERSION TUNNEL

PROJECT SUSITNA WATANA
DATE 3/2/84
ESTIMATOR SMA/CJS

ITEM NO. 332.215
DIVERSION TUNNELS - PORTALS

LABOR	196.52 $/CY
M&S	105.34 $/CY
EQUIP	21.11 $/CY
TOTAL UNIT COST	322.97 $/CY

INPUT DATA
CONCRETE QUANTITY 18525. CY
PLACING RATE 25.00 CY/HR
CONCRETE IS PLACED BY CRANE AND BUCKET

FORMWORK	WOOD		STEEL		TOTAL
TYPE	SF	NO. USES	SF	NO. USES	SF
BULKHEAD	0.	1.00	0.	1.00	0.
CURVED	8372.	2.00	8373.	50.00	16745.
STRAIGHT	45610.	4.00	45610.	50.00	91220.

FINISHING - FORMED SURFACES 107965. SF
FINISHING - UNFORMED SURFACES 11780. SF
CONSTRUCTION JOINT PREPARATION 27788. SF
ROCK SURFACE PREPARATION 11780. SF
OVERBREAK ALLOWANCE IS 1.00 FT
WASTE ALLOWANCE FACTOR IS 1.04
FORM RATIO 5.83 SF/CY

[redacted]ECT [redacted]TN [redacted]9T [redacted]
DATE 3/2/84
ESTIMATOR SMA/CJS

ITEM NO. 332.215
DIVERSION TUNNELS - PORTALS

QUANTITY	LABOR	M&S	EQUIP
BATCH AND MIX			
19719.7	279232.	1066838.	191676.
TRANSPORT - 1			
18961.3	73380.	0.	42853.
TRANSPORT - 2			
0.0	0.	0.	0.
CRANE & BUCKET COS			
758.5	175657.	0.	116013.
PUMPED COST			
0.0	0.	0.	0.
BLD WD BHD FRMS			
0.0	0.	0.	0.
BLD WD CVD FRMS			
4186.2	51868.	8540.	0.
BLD WD STR FRMS			
11402.5	109008.	23261.	0.
0.0	0.	0.	0.
S&S WD BHD FRMS			
0.0	0.	0.	0.
S&S WD CVD FRMS			
8372.5	90423.	2763.	2009.
S&S WD STR FRMS			
45610.0	444241.	13683.	10946.
BUY STL BHD FRMS			
0.0	0.	0.	0.
BUY STL CVD FRMS			
167.5	0.	6196.	0.
BUY STL STR FRMS			
912.2	0.	24629.	0.
S&S STL BHD FRMS			
0.0	0.	0.	0.
S&S STL CVD FRMS			
8372.5	90423.	2512.	2009.
S&S STL STR FRMS			
45610.0	411858.	13683.	10946.
FIN FRMD SURFACES			
107965.0	72337.	0.	0.
FIN UNFM SURFACES			
11780.0	11780.	0.	0.
CLNUP & JNT PREP			
27788.0	24176.	0.	10559.
CURE			

[redacted]	[redacted]	[redacted]	0.
ROCK SURFACE PREP			
11780.0	41701.	0.	4005.
ST&S			
1928880.	0.	96444.	0.
TOTAL DIRECT COST			
18525.0	1928880.	1262254.	391018.
PER CY	104.12	68.14	21.11
RE-STEEL			
2223000.	1711710.	689130.	0.
PER CY	92.40	37.20	0.0
TOTAL			
PER CY	196.40	105.34	21.11

PROJECT SUSITNA - WITHHELD
D[redacted]
ESTIMATOR SMA/CJS

ITEM NO. 332.216
DIVERSION TUNNEL - FLIP BUCKET

LABOR	76.81 $/CY
M&S	74.64 $/CY
EQUIP	19.34 $/CY
TOTAL UNIT COST	170.79 $/CY

INPUT DATA
CONCRETE QUANTITY 2000. CY
PLACING RATE 25.00 CY/HR
CONCRETE IS PLACED BY CRANE AND BUCKET

FORMWORK	WOOD		STEEL		TOTAL
TYPE	SF	NO. USES	SF	NO. USES	SF
BULKHEAD	54.	6.00	126.	50.00	180.
CURVED	0.	1.00	0.	1.00	0.
STRAIGHT	270.	4.00	630.	50.00	900.

FINISHING - FORMED SURFACES 900. SF
FINISHING - UNFORMED SURFACES 300. SF
CONSTRUCTION JOINT PREPARATION 3000. SF
ROCK SURFACE PREPARATION 300. SF
OVERBREAK ALLOWANCE IS 1.00 FT
WASTE ALLOWANCE FACTOR IS 1.04
FORM RATIO 0.45 SF/CY

PF CK ST S NCE NA P TAN
DATE 3/2/84
ESTIMATOR SMA/CJS

ITEM NO. 332.216
DIVERSION TUNNEL - FLIP BUCKET

QUANTITY	LABOR	M&S	EQUIP
BATCH AND MIX			
2091.6	29616.	113153.	20330.
TRANSPORT - 1			
2011.1	7783.	0.	4545.
TRANSPORT - 2			
0.0	0.	0.	0.
CRANE & BUCKET COS			
80.4	18631.	0.	12305.
PUMPED COST			
0.0	0.	0.	0.
BLD WD BHD FRMS			
9.0	80.	18.	0.
BLD WD CVD FRMS			
0.0	0.	0.	0.
BLD WD STR FRMS			
67.5	645.	138.	0.
0.0	0.	0.	0.
S&S WD BHD FRMS			
54.0	392.	16.	13.
S&S WD CVD FRMS			
0.0	0.	0.	0.
S&S WD STR FRMS			
270.0	2630.	81.	65.
BUY STL BHD FRMS			
2.5	0.	68.	0.
BUY STL CVD FRMS			
0.0	0.	0.	0.
BUY STL STR FRMS			
12.6	0.	340.	0.
S&S STL BHD FRMS			
126.0	871.	38.	30.
S&S STL CVD FRMS			
0.0	0.	0.	0.
S&S STL STR FRMS			
630.0	5689.	189.	151.
FIN FRMD SURFACES			
900.0	603.	0.	0.
FIN UNFM SURFACES			
300.0	300.	0.	0.
CLNUP & JNT PREP			
3000.0	2610.	0.	1140.
CURE			

[illegible].0	70[illegible]	[illegible]00	[illegible]0.
ROCK SURFACE PREP			
300.0	1062.	0.	102.
ST&S			
76611.7	0.	3831.	0.
TOTAL DIRECT COST			
2000.0	76612.	118272.	38681.
PER CY	38.31	59.14	19.34
RE-STEEL			
100000.	77000.	31000.	0.
PER CY	38.50	15.50	0.0
TOTAL			
PER CY	76.81	74.64	19.34

MAIN DAM

DATE 3/2/84
ESTIMATOR SMA/CJS

ITEM NO. 332.314
MAIN DAM - DENTAL CONCRETE

LABOR	26.08	$/CY
M&S	57.77	$/CY
EQUIP	15.43	$/CY
TOTAL UNIT COST	99.27	$/CY

INPUT DATA
CONCRETE QUANTITY 85000. CY
PLACING RATE 50.00 CY/HR
CONCRETE IS PLACED BY CRANE AND BUCKET

FORMWORK	WOOD		STEEL		TOTAL
TYPE	SF	NO. USES	SF	NO. USES	SF
BULKHEAD	0.	1.00	0.	1.00	0.
CURVED	0.	1.00	0.	1.00	0.
STRAIGHT	0.	1.00	0.	1.00	0.

FINISHING - FORMED SURFACES 0. SF
FINISHING - UNFORMED SURFACES 0. SF
CONSTRUCTION JOINT PREPARATION 0. SF
ROCK SURFACE PREPARATION 0. SF
OVERBREAK ALLOWANCE IS 1.00 FT
WASTE ALLOWANCE FACTOR IS 1.04
FORM RATIO 0.00 SF/CY

PROJECT [redacted]
DATE 3/2/84
ESTIMATOR SMA/CJS

ITEM NO. 332.314
MAIN DAM - DENTAL CONCRETE

QUANTITY	LABOR	M&S	EQUIP
BATCH AND MIX			
88400.0	1251744.	4782440.	859248.
TRANSPORT - 1			
85000.0	328950.	0.	192100.
TRANSPORT - 2			
0.0	0.	0.	0.
CRANE & BUCKET COS			
1700.0	393720.	0.	260032.
PUMPED COST			
0.0	0.	0.	0.
BLD WD BHD FRMS			
0.0	0.	0.	0.
BLD WD CVD FRMS			
0.0	0.	0.	0.
BLD WD STR FRMS			
0.0	0.	0.	0.
0.0	0.	0.	0.
0.0	0.	0.	0.
S&S WD BHD FRMS			
0.0	0.	0.	0.
S&S WD CVD FRMS			
0.0	0.	0.	0.
S&S WD STR FRMS			
0.0	0.	0.	0.
BUY STL BHD FRMS			
0.0	0.	0.	0.
BUY STL CVD FRMS			
0.0	0.	0.	0.
BUY STL STR FRMS			
0.0	0.	0.	0.
S&S STL BHD FRMS			
0.0	0.	0.	0.
S&S STL CVD FRMS			
0.0	0.	0.	0.
S&S STL STR FRMS			
0.0	0.	0.	0.
FIN FRMD SURFACES			
0.0	0.	0.	0.
FIN UNFM SURFACES			
0.0	0.	0.	0.
CLNUP & JNT PREP			
0.0	0.	0.	0.
CURE			

[illegible]0	[illegible]5[illegible]	[illegible]	[illegible]0	[illegible].
ROCK SURFACE PREP				
0.0	0.		0.	0.
ST&S				
2216664.	0.		110833.	0.
TOTAL DIRECT COST				
85000.0	2216664.		4910273.	1311380.
PER CY	26.08		57.77	15.43
RE-STEEL	0.		0.	0.
TOTAL				
PER CY	26.08		57.77	15.43

PR[redacted]T S[redacted]NA [redacted]TAN[redacted]
DATE 3/2/84
ESTIMATOR SMA/CJS

ITEM NO. 332.325
MAIN DAM - PORTAL CONCRETE

LABOR	167.90 $/CY
M&S	102.74 $/CY
EQUIP	24.90 $/CY
TOTAL UNIT COST	295.54 $/CY

INPUT DATA
CONCRETE QUANTITY 20. CY
PLACING RATE 25.00 CY/HR
CONCRETE IS PLACED BY CRANE AND BUCKET

FORMWORK	WOOD		STEEL		TOTAL
TYPE	SF	NO. USES	SF	NO. USES	SF
BULKHEAD	0.	1.00	0.	1.00	0.
CURVED	15.	2.00	15.	50.00	30.
STRAIGHT	15.	4.00	15.	50.00	30.

FINISHING - FORMED SURFACES	60. SF
FINISHING - UNFORMED SURFACES	100. SF
CONSTRUCTION JOINT PREPARATION	30. SF
ROCK SURFACE PREPARATION	100. SF

OVERBREAK ALLOWANCE IS 1.00 FT
WASTE ALLOWANCE FACTOR IS 1.04
FORM RATIO 3.00 SF/CY

P[redacted]T [redacted]NA [redacted]TAI [redacted]
DATE 3/2/84
ESTIMATOR SMA/CJS

ITEM NO. 332.325
MAIN DAM - PORTAL CONCRETE

QUANTITY	LABOR	M&S	EQUIP
BATCH AND MIX			
24.7	349.	1334.	240.
TRANSPORT - 1			
23.7	92.	0.	54.
TRANSPORT - 2			
0.0	0.	0.	0.
CRANE & BUCKET COS			
0.9	220.	0.	145.
PUMPED COST			
0.0	0.	0.	0.
BLD WD BHD FRMS			
0.0	0.	0.	0.
BLD WD CVD FRMS			
7.5	93.	15.	0.
BLD WD STR FRMS			
3.8	36.	8.	0.
0.0	0.	0.	0.
S&S WD BHD FRMS			
0.0	0.	0.	0.
S&S WD CVD FRMS			
15.0	162.	5.	4.
S&S WD STR FRMS			
15.0	146.	5.	4.
BUY STL BHD FRMS			
0.0	0.	0.	0.
BUY STL CVD FRMS			
0.3	0.	11.	0.
BUY STL STR FRMS			
0.3	0.	8.	0.
S&S STL BHD FRMS			
0.0	0.	0.	0.
S&S STL CVD FRMS			
15.0	162.	5.	4.
S&S STL STR FRMS			
15.0	135.	5.	4.
FIN FRMD SURFACES			
60.0	40.	0.	0.
FIN UNFM SURFACES			
100.0	100.	0.	0.
CLNUP & JNT PREP			
30.0	26.	0.	11.
CURE			

[redacted].0	[redacted] 5	[redacted] 4	[redacted]0.
ROCK SURFACE PREP			
100.0	354.	0.	34.
ST&S			
1972.0	0.	99.	0.
TOTAL DIRECT COST			
20.0	1972.	1497.	498.
PER CY	98.60	74.84	24.90
RE-STEEL			
1820.	1386.	558.	0.
PER CY	69.30	27.90	0.0
TOTAL			
PER CY	167.90	102.74	24.90

8 6 2

MAIN SPILLWAY

P[illegible]T [illegible]NA [illegible]TAI [illegible]
DATE 3/2/84
ESTIMATOR SMA/CJS

ITEM NO. 332.52G
MAIN SPILLWAY - PIERS

LABOR	98.88	$/CY
M&S	77.22	$/CY
EQUIP	19.70	$/CY
TOTAL UNIT COST	195.80	$/CY

INPUT DATA
CONCRETE QUANTITY 18670. CY
PLACING RATE 25.00 CY/HR
CONCRETE IS PLACED BY CRANE AND BUCKET

FORMWORK	WOOD		STEEL		TOTAL
TYPE	SF	NO. USES	SF	NO. USES	SF
BULKHEAD	0.	1.00	0.	1.00	0.
CURVED	1422.	2.00	3318.	50.00	4740.
STRAIGHT	13138.	4.00	30656.	50.00	43794.

FINISHING - FORMED SURFACES	48534.	SF
FINISHING - UNFORMED SURFACES	0.	SF
CONSTRUCTION JOINT PREPARATION	29000.	SF
ROCK SURFACE PREPARATION	0.	SF

OVERBREAK ALLOWANCE IS 1.00 FT
WASTE ALLOWANCE FACTOR IS 1.04
FORM RATIO 2.60 SF/CY

332

P[illegible]ST [illegible]NA [illegible]TAI
DATE 3/2/84
ESTIMATOR SMA/CJS

ITEM NO. 332.52G
MAIN SPILLWAY - PIERS

QUANTITY	LABOR	M&S	EQUIP
BATCH AND MIX			
19416.8	274942.	1050449.	188731.
TRANSPORT - 1			
18670.0	72253.	0.	42194.
TRANSPORT - 2			
0.0	0.	0.	0.
CRANE & BUCKET COS			
746.8	172959.	0.	114231.
PUMPED COST			
0.0	0.	0.	0.
BLD WD BHD FRMS			
0.0	0.	0.	0.
BLD WD CVD FRMS			
711.0	8809.	1450.	0.
BLD WD STR FRMS			
3284.5	31400.	6700.	0.
0.0	0.	0.	0.
S&S WD BHD FRMS			
0.0	0.	0.	0.
S&S WD CVD FRMS			
1422.0	15358.	469.	341.
S&S WD STR FRMS			
13138.2	127966.	3941.	3153.
BUY STL BHD FRMS			
0.0	0.	0.	0.
BUY STL CVD FRMS			
66.4	0.	2455.	0.
BUY STL STR FRMS			
613.1	0.	16554.	0.
S&S STL BHD FRMS			
0.0	0.	0.	0.
S&S STL CVD FRMS			
3318.0	35834.	995.	796.
S&S STL STR FRMS			
30655.8	276822.	9197.	7357.
FIN FRMD SURFACES			
48534.0	32518.	0.	0.
FIN UNFM SURFACES			
0.0	0.	0.	0.
CLNUP & JNT PREP			
29000.0	25230.	0.	11020.
CURE			

[illegible]0.0	[illegible]320.	[illegible]734.	0.
ROCK SURFACE PREP			
0.0	0.	0.	0.
ST&S			
1127300.	0.	56365.	0.
TOTAL DIRECT COST			
18670.0	1127300.	1152311.	367824.
PER CY	60.38	61.72	19.70
RE-STEEL			
933500.	718795.	289385.	0.
PER CY	38.50	15.50	0.0
TOTAL			
PER CY	98.88	77.22	19.70

PROJECT [illegible] TASK [illegible]
DATE 3/2/84
ESTIMATOR SMA/CJS

ITEM NO. 332.52H
MAIN SPILLWAY - DECK

LABOR	398.02 $/CY
M&S	168.47 $/CY
EQUIP	21.56 $/CY
TOTAL UNIT COST	588.05 $/CY

INPUT DATA
CONCRETE QUANTITY 350. CY
PLACING RATE 25.00 CY/HR
CONCRETE IS PLACED BY CRANE AND BUCKET

FORMWORK	WOOD		STEEL		TOTAL
TYPE	SF	NO. USES	SF	NO. USES	SF
BULKHEAD	0.	1.00	0.	1.00	0.
CURVED	0.	1.00	0.	1.00	0.
STRAIGHT	1346.	4.00	3142.	50.00	4488.

FINISHING - FORMED SURFACES	4488. SF
FINISHING - UNFORMED SURFACES	0. SF
CONSTRUCTION JOINT PREPARATION	0. SF
ROCK SURFACE PREPARATION	0. SF

OVERBREAK ALLOWANCE IS 1.00 FT
WASTE ALLOWANCE FACTOR IS 1.04
FORM RATIO 12.82 SF/CY

PR [redacted] S [redacted] A [redacted] AN [redacted]
DATE 3/2/84
ESTIMATOR SMA/CJS

ITEM NO. 332.52H
MAIN SPILLWAY - DECK

QUANTITY	LABOR	M&S	EQUIP
BATCH AND MIX			
364.0	5154.	19692.	3538.
TRANSPORT - 1			
350.0	1354.	0.	791.
TRANSPORT - 2			
0.0	0.	0.	0.
CRANE & BUCKET COS			
14.0	3242.	0.	2141.
PUMPED COST			
0.0	0.	0.	0.
BLD WD BHD FRMS			
0.0	0.	0.	0.
BLD WD CVD FRMS			
0.0	0.	0.	0.
BLD WD STR FRMS			
336.6	3218.	687.	0.
0.0	0.	0.	0.
S&S WD BHD FRMS			
0.0	0.	0.	0.
S&S WD CVD FRMS			
0.0	0.	0.	0.
S&S WD STR FRMS			
1346.4	13114.	404.	323.
BUY STL BHD FRMS			
0.0	0.	0.	0.
BUY STL CVD FRMS			
0.0	0.	0.	0.
BUY STL STR FRMS			
62.8	0.	1696.	0.
S&S STL BHD FRMS			
0.0	0.	0.	0.
S&S STL CVD FRMS			
0.0	0.	0.	0.
S&S STL STR FRMS			
3141.6	28369.	942.	754.
FIN FRMD SURFACES			
4488.0	3007.	0.	0.
FIN UNFM SURFACES			
0.0	0.	0.	0.
CLNUP & JNT PREP			
0.0	0.	0.	0.
CURE			

50			
ROCK SURFACE PREP			
0.0	0.	0.	0.
ST&S			
58456.1	0.	2923.	0.
TOTAL DIRECT COST			
350.0	58456.	26415.	7548.
PER CY	167.02	75.47	0.
RE-STEEL			
105000.	80850.	32550.	0.
PER CY	231.00	93.00	0.0
TOTAL			
PER CY	398.02	168.47	21.56

PI [redacted] ST [redacted] NA [redacted] TAI [redacted]
DATE 3/2/84
ESTIMATOR SMA/CJS

ITEM NO. 332.521
MAIN SPILLWAY - GUIDE WALLS

LABOR	176.91 $/CY
M&S	102.49 $/CY
EQUIP	26.17 $/CY
TOTAL UNIT COST	305.57 $/CY

INPUT DATA
CONCRETE QUANTITY 32900. CY
PLACING RATE 25.00 CY/HR
CONCRETE IS PLACED BY CRANE AND BUCKET

FORMWORK	WOOD		STEEL		TOTAL
TYPE	SF	NO. USES	SF	NO. USES	SF
BULKHEAD	5432.	6.00	21728.	50.00	27160.
CURVED	449.	2.00	1795.	50.00	2244.
STRAIGHT	32947.	4.00	131788.	50.00	164735.

FINISHING - FORMED SURFACES 166979. SF
FINISHING - UNFORMED SURFACES 14900. SF
CONSTRUCTION JOINT PREPARATION 93484. SF
ROCK SURFACE PREPARATION 166470. SF
OVERBREAK ALLOWANCE IS 1.00 FT
WASTE ALLOWANCE FACTOR IS 1.04
FORM RATIO 5.08 SF/CY

PROJECT SUSANNA - UNTANC
DATE 3/2/84
ESTIMATOR SMA/CJS

ITEM NO. 332.521
MAIN SPILLWAY - GUIDE WALLS

QUANTITY	LABOR	M&S	EQUIP
BATCH AND MIX			
40628.2	575295.	2197984.	394906.
TRANSPORT - 1			
39065.6	151184.	0.	88288.
TRANSPORT - 2			
0.0	0.	0.	0.
CRANE & BUCKET COS			
1562.6	361903.	0.	239019.
PUMPED COST			
0.0	0.	0.	0.
BLD WD BHD FRMS			
905.3	8012.	1847.	0.
BLD WD CVD FRMS			
224.4	2780.	458.	0.
BLD WD STR FRMS			
8236.7	78743.	16803.	0.
0.0	0.	0.	0.
S&S WD BHD FRMS			
5432.0	39436.	1630.	1304.
S&S WD CVD FRMS			
448.8	4847.	148.	108.
S&S WD STR FRMS			
32947.0	320904.	9884.	7907.
BUY STL BHD FRMS			
434.6	0.	11733.	0.
BUY STL CVD FRMS			
35.9	0.	1328.	0.
BUY STL STR FRMS			
2635.8	0.	71166.	0.
S&S STL BHD FRMS			
21728.0	150140.	6518.	5215.
S&S STL CVD FRMS			
1795.2	19388.	539.	431.
S&S STL STR FRMS			
131788.0	1190046.	39536.	31629.
FIN FRMD SURFACES			
166979.0	111876.	0.	0.
FIN UNFM SURFACES			
14900.0	14900.	0.	0.
CLNUP & JNT PREP			
93484.0	81331.	0.	35524.
CURE			

[illegible].0	[illegible].	[illegible].	0.
ROCK SURFACE PREP			
166470.0	589304.	0.	56600.
ST&S			
3793855.	0.	189693.	0.
TOTAL DIRECT COST			
32900.0	3793855.	2555847.	860930.
PER CY	115.31	77.69	26.17
RE-STEEL			
2632000.	2026640.	815920.	0.
PER CY	61.60	24.80	0.0
TOTAL			
PER CY	176.91	102.49	26.17

PROJECT SHASTA DAM
DATE 3/2/84
ESTIMATOR SMA/CJS

ITEM NO. 332.52J
MAIN SPILLWAY - SLAB

LABOR	211.28 $/CY
M&S	109.19 $/CY
EQUIP	25.43 $/CY
TOTAL UNIT COST	345.88 $/CY

INPUT DATA
CONCRETE QUANTITY 30800. CY
PLACING RATE 50.00 CY/HR
CONCRETE IS PLACED BY CRANE AND BUCKET

FORMWORK	WOOD		STEEL		TOTAL
TYPE	SF	NO. USES	SF	NO. USES	SF
BULKHEAD	40000.	6.00	0.	50.00	40000.
CURVED	0.	1.00	0.	1.00	0.
STRAIGHT	0.	1.00	0.	1.00	0.

FINISHING - FORMED SURFACES 0. SF
FINISHING - UNFORMED SURFACES 0. SF
CONSTRUCTION JOINT PREPARATION 0. SF
ROCK SURFACE PREPARATION 276192. SF
OVERBREAK ALLOWANCE IS 1.00 FT
WASTE ALLOWANCE FACTOR IS 1.04
FORM RATIO 0.00 SF/CY

DATE 3/2/84
ESTIMATOR SMA/CJS

ITEM NO. 332.52J
MAIN SPILLWAY - SLAB

QUANTITY	LABOR	M&S	EQUIP
BATCH AND MIX			
42670.5	604214.	2308474.	414757.
TRANSPORT - 1			
41029.3	158784.	0.	92726.
TRANSPORT - 2			
0.0	0.	0.	0.
CRANE & BUCKET COS			
820.6	190048.	0.	125517.
PUMPED COST			
0.0	0.	0.	0.
BLD WD BHD FRMS			
6666.7	59000.	13600.	0.
BLD WD CVD FRMS			
0.0	0.	0.	0.
BLD WD STR FRMS			
0.0	0.	0.	0.
0.0	0.	0.	0.
S&S WD BHD FRMS			
40000.0	290400.	12000.	9600.
S&S WD CVD FRMS			
0.0	0.	0.	0.
S&S WD STR FRMS			
0.0	0.	0.	0.
BUY STL BHD FRMS			
0.0	0.	0.	0.
BUY STL CVD FRMS			
0.0	0.	0.	0.
BUY STL STR FRMS			
0.0	0.	0.	0.
S&S STL BHD FRMS			
0.0	0.	0.	0.
S&S STL CVD FRMS			
0.0	0.	0.	0.
S&S STL STR FRMS			
0.0	0.	0.	0.
FIN FRMD SURFACES			
0.0	0.	0.	0.
FIN UNFM SURFACES			
0.0	0.	0.	0.
CLNUP & JNT PREP			
0.0	0.	0.	0.
CURE			

[redacted]0.[redacted]	[redacted]77[redacted]	[redacted]16[redacted]	[redacted]0[redacted]
ROCK SURFACE PREP			
276192.0	977720.	0.	93905.
ST&S			
2367945.	0.	118397.	0.
TOTAL DIRECT COST			
30800.0	2367945.	2458632.	736506.
SLIP FORMING			
270200.	173100.	11200.	42710.
BOX DRAINS FORMWORK			
15000.	1911600.	107100.	0.
SLAB FORMWORK			
17370.	157372.	22407.	4169.
RE-STEEL			
2464000.	1897280.	763840.	0.
PER CY	61.60	24.80	0.0
TOTAL	6507297.	3363179.	783385.

PROJECT SUSITNA - WATANA
DATE 3/2/84
ESTIMATOR SMA/CJS

ITEM NO. 332.52K
MAIN SPILLWAY - OGEE

LABOR	67.73 $/CY
M&S	68.36 $/CY
EQUIP	18.22 $/CY
TOTAL UNIT COST	154.31 $/CY

INPUT DATA
CONCRETE QUANTITY 24800. CY
PLACING RATE 50.00 CY/HR
CONCRETE IS PLACED BY CRANE AND BUCKET

FORMWORK	WOOD		STEEL		TOTAL
TYPE	SF	NO. USES	SF	NO. USES	SF
BULKHEAD	2855.	6.00	2895.	50.00	5790.
CURVED	17820.	2.00	0.	50.00	17820.
STRAIGHT	11130.	4.00	0.	50.00	11130.

FINISHING - FORMED SURFACES 28950. SF
FINISHING - UNFORMED SURFACES 23780. SF
CONSTRUCTION JOINT PREPARATION 76776. SF
ROCK SURFACE PREPARATION 34834. SF
OVERBREAK ALLOWANCE IS 1.00 FT
WASTE ALLOWANCE FACTOR IS 1.04
FORM RATIO 1.17 SF/CY

PROJECT SUSITNA - WATANA
DATE 3/2/84
ESTIMATOR SMA/CJS

ITEM NO. 332.52K
MAIN SPILLWAY - OGEE

QUANTITY	LABOR	M&S	EQUIP
BATCH AND MIX			
27133.8	384214.	1467936.	263740.
TRANSPORT - 1			
26090.1	100969.	0.	58964.
TRANSPORT - 2			
0.0	0.	0.	0.
CRANE & BUCKET COS			
521.8	120850.	0.	79815.
PUMPED COST			
0.0	0.	0.	0.
BLD WD BHD FRMS			
482.5	4270.	984.	0.
BLD WD CVD FRMS			
8910.0	110395.	18176.	0.
BLD WD STR FRMS			
2782.5	26601.	5676.	0.
0.0	0.	0.	0.
S&S WD BHD FRMS			
2895.0	21018.	868.	695.
S&S WD CVD FRMS			
17820.0	192456.	5881.	4277.
S&S WD STR FRMS			
11130.0	108406.	3339.	2671.
BUY STL BHD FRMS			
57.9	0.	1563.	0.
BUY STL CVD FRMS			
0.0	0.	0.	0.
BUY STL STR FRMS			
0.0	0.	0.	0.
S&S STL BHD FRMS			
2895.0	20004.	869.	695.
S&S STL CVD FRMS			
0.0	0.	0.	0.
S&S STL STR FRMS			
0.0	0.	0.	0.
FIN FRMD SURFACES			
28950.0	19396.	0.	0.
FIN UNFM SURFACES			
23780.0	23780.	0.	0.
CLNUP & JNT PREP			
76776.0	66795.	0.	29175.
CURE			

80	7		4																

ROCK SURFACE PREP

34834.0	123312.	0.	11844.

ST&S

1393146.	0.	69657.	0.

TOTAL DIRECT COST

24800.0	1393146.	1579910.	451875.
PER CY	56.18	63.71	18.22

RE-STEEL

372000.	286440.	115320.	0.
PER CY	11.55	4.65	0.0

TOTAL

PER CY	67.73	68.36	18.22

[redacted]
DATE 3/2/84
ESTIMATOR SMA/CJS

ITEM NO. 332.52L
SPILLWAY-FLIP BUCKET & OUTFALL

LABOR	111.98 $/CY
M&S	82.61 $/CY
EQUIP	21.45 $/CY
TOTAL UNIT COST	216.04 $/CY

INPUT DATA
CONCRETE QUANTITY 28500. CY
PLACING RATE 25.00 CY/HR
CONCRETE IS PLACED BY CRANE AND BUCKET

FORMWORK	WOOD		STEEL		TOTAL
TYPE	SF	NO. USES	SF	NO. USES	SF
BULKHEAD	3727.	6.00	8697.	50.00	12424.
CURVED	2304.	2.00	5376.	50.00	7680.
STRAIGHT	16333.	4.00	38111.	50.00	54444.

FINISHING - FORMED SURFACES	62124. SF
FINISHING - UNFORMED SURFACES	11900. SF
CONSTRUCTION JOINT PREPARATION	100602. SF
ROCK SURFACE PREPARATION	27648. SF

OVERBREAK ALLOWANCE IS 1.00 FT
WASTE ALLOWANCE FACTOR IS 1.04
FORM RATIO 2.18 SF/CY

[illegible] BRANCH REPORT
DATE 3/2/84
ESTIMATOR SMA/CJS

ITEM NO. 332.52L
SPILLWAY-FLIP BUCKET & OUTFALL

QUANTITY	LABOR	M&S	EQUIP
BATCH AND MIX			
30705.0	434782.	1661138.	298452.
TRANSPORT - 1			
29524.0	114258.	0.	66724.
TRANSPORT - 2			
0.0	0.	0.	0.
CRANE & BUCKET COS			
1181.0	273510.	0.	180640.
PUMPED COST			
0.0	0.	0.	0.
BLD WD BHD FRMS			
621.2	5498.	1267.	0.
BLD WD CVD FRMS			
1152.0	14273.	2350.	0.
BLD WD STR FRMS			
4083.3	39036.	8330.	0.
0.0	0.	0.	0.
S&S WD BHD FRMS			
3727.2	27059.	1118.	895.
S&S WD CVD FRMS			
2304.0	24883.	760.	553.
S&S WD STR FRMS			
16333.2	159085.	4900.	3920.
BUY STL BHD FRMS			
173.9	0.	4696.	0.
BUY STL CVD FRMS			
107.5	0.	3978.	0.
BUY STL STR FRMS			
762.2	0.	20580.	0.
S&S STL BHD FRMS			
8696.8	60095.	2609.	2087.
S&S STL CVD FRMS			
5376.0	58061.	1613.	1290.
S&S STL STR FRMS			
38110.8	344141.	11433.	9147.
FIN FRMD SURFACES			
62124.0	41623.	0.	0.
FIN UNFM SURFACES			
11900.0	11900.	0.	0.
CLNUP & JNT PREP			
100602.0	87524.	0.	38229.
CURE			

[redacted]	[redacted]	[redacted]	[redacted]
ROCK SURFACE PREP			
27648.0	97874.	0.	9400.
ST&S			
1874828.	0.	93741.	0.
TOTAL DIRECT COST			
28500.0	1874828.	1824215.	611337.
PER CY	65.78	64.01	21.45
RE-STEEL			
1710000.	1316700.	530100.	0.
PER CY	46.20	18.60	0.0
TOTAL			
PER CY	111.98	82.61	21.45

[redacted]
DATE 3/2/84
ESTIMATOR SMA/CJS

ITEM NO. 332.52M
SPILLWAY-DRAIN & AERATION GALLERIES

LABOR	299.29 $/CY
M&S	126.73 $/CY
EQUIP	31.17 $/CY
TOTAL UNIT COST	457.19 $/CY

INPUT DATA
CONCRETE QUANTITY 3710. CY
PLACING RATE 25.00 CY/HR
CONCRETE IS PLACED BY CRANE AND BUCKET

FORMWORK	WOOD		STEEL		TOTAL
TYPE	SF	NO. USES	SF	NO. USES	SF
BULKHEAD	3708.	6.00	0.	1.00	3708.
CURVED	0.	1.00	0.	1.00	0.
STRAIGHT	37085.	3.00	0.	1.00	37085.

FINISHING - FORMED SURFACES 37085. SF
FINISHING - UNFORMED SURFACES 36380. SF
CONSTRUCTION JOINT PREPARATION 0. SF
ROCK SURFACE PREPARATION 36380. SF
OVERBREAK ALLOWANCE IS 1.00 FT
WASTE ALLOWANCE FACTOR IS 1.04
FORM RATIO 10.00 SF/CY

PROJECT ESTIMATE
DATE 3/2/84
ESTIMATOR SMA/CJS

ITEM NO. 332.52M
SPILLWAY-DRAIN & AERATION GALLERIES

QUANTITY	LABOR	M&S	EQUIP
BATCH AND MIX			
5259.7	74477.	284550.	51124.
TRANSPORT - 1			
5057.4	19572.	0.	11430.
TRANSPORT - 2			
0.0	0.	0.	0.
CRANE & BUCKET COS			
202.3	46852.	0.	30943.
PUMPED COST			
0.0	0.	0.	0.
BLD WD BHD FRMS			
618.0	5469.	1261.	0.
BLD WD CVD FRMS			
0.0	0.	0.	0.
BLD WD STR FRMS			
12361.7	118178.	25218.	0.
0.0	0.	0.	0.
S&S WD BHD FRMS			
3708.0	26920.	1112.	890.
S&S WD CVD FRMS			
0.0	0.	0.	0.
S&S WD STR FRMS			
37085.0	361208.	11125.	8900.
BUY STL BHD FRMS			
0.0	0.	0.	0.
BUY STL CVD FRMS			
0.0	0.	0.	0.
BUY STL STR FRMS			
0.0	0.	0.	0.
S&S STL BHD FRMS			
0.0	0.	0.	0.
S&S STL CVD FRMS			
0.0	0.	0.	0.
S&S STL STR FRMS			
0.0	0.	0.	0.
FIN FRMD SURFACES			
37085.0	24847.	0.	0.
FIN UNFM SURFACES			
36380.0	36380.	0.	0.
CLNUP & JNT PREP			
0.0	0.	0.	0.
CURE			

10.	105		74		0														
ROCK SURFACE PREP																			
36380.0	128785.		0.		12369.														
ST&S																			
853261.9	0.		42663.		0.														
TOTAL DIRECT COST																			
3710.0	853262.		366671.		115657.														
PER CY	229.99		98.83		31.17														
RE-STEEL																			
333900.	257103.		103509.		0.														
PER CY	69.30		27.90		0.0														
TOTAL																			
PER CY	299.29		126.73		31.17														

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[redacted]CT [redacted]TN[redacted]ATF[redacted]
DATE 3/2/84
ESTIMATOR SMA/CJS

ITEM NO. 332.52P
SPILLWAY - RETAINING WALL

LABOR	182.10 $/CY
M&S	103.03 $/CY
EQUIP	29.46 $/CY
TOTAL UNIT COST	314.59 $/CY

INPUT DATA
CONCRETE QUANTITY 1000. CY
PLACING RATE 17.00 CY/HR
CONCRETE IS PLACED BY CRANE AND BUCKET

FORMWORK	WOOD		STEEL		TOTAL
TYPE	SF	NO. USES	SF	NO. USES	SF
BULKHEAD	0.	1.00	0.	1.00	0.
CURVED	0.	1.00	0.	1.00	0.
STRAIGHT	1620.	4.00	3780.	50.00	5400.

FINISHING - FORMED SURFACES 5400. SF
FINISHING - UNFORMED SURFACES 900. SF
CONSTRUCTION JOINT PREPARATION 1800. SF
ROCK SURFACE PREPARATION 5400. SF
OVERBREAK ALLOWANCE IS 1.00 FT
WASTE ALLOWANCE FACTOR IS 1.04
FORM RATIO 5.40 SF/CY

PF[redacted]T S[redacted]NA [redacted]TAN[redacted]
DATE 3/2/84
ESTIMATOR SMA/CJS

ITEM NO. 332.52P
SPILLWAY - RETAINING WALL

QUANTITY	LABOR	M&S	EQUIP
BATCH AND MIX			
1248.0	17672.	67517.	12131.
TRANSPORT - 1			
1200.0	4644.	0.	2712.
TRANSPORT - 2			
0.0	0.	0.	0.
CRANE & BUCKET COS			
70.6	16348.	0.	10797.
PUMPED COST			
0.0	0.	0.	0.
BLD WD BHD FRMS			
0.0	0.	0.	0.
BLD WD CVD FRMS			
0.0	0.	0.	0.
BLD WD STR FRMS			
0.0	0.	0.	0.
BLD WD STR FRMS			
405.0	3872.	826.	0.
0.0	0.	0.	0.
S&S WD BHD FRMS			
0.0	0.	0.	0.
S&S WD CVD FRMS			
0.0	0.	0.	0.
S&S WD STR FRMS			
1620.0	15779.	486.	389.
BUY STL BHD FRMS			
0.0	0.	0.	0.
BUY STL CVD FRMS			
0.0	0.	0.	0.
BUY STL STR FRMS			
75.6	0.	2041.	0.
S&S STL BHD FRMS			
0.0	0.	0.	0.
S&S STL CVD FRMS			
0.0	0.	0.	0.
S&S STL STR FRMS			
3780.0	34133.	1134.	907.
FIN FRMD SURFACES			
5400.0	3618.	0.	0.
FIN UNFM SURFACES			
900.0	900.	0.	0.
CLNUP & JNT PREP			
1800.0	1566.	0.	684.
CURE			

0.	28	20	0
ROCK SURFACE PREP			
5400.0	19116.	0.	1836.
ST&S			
120497.9	0.	6025.	0.
TOTAL DIRECT COST			
1000.0	120498.	78229.	29456.
PER CY	120.50	78.23	29.46
RE-STEEL			
80000.	61600.	24800.	0.
PER CY	61.60	24.80	0.0
TOTAL			
PER CY	182.10	103.03	29.46

ITEM NO. 332.614
POWER INTAKE & OUTLET - CONCRETE

LABOR	195.43 $/CY
M&S	109.27 $/CY
EQUIP	20.59 $/CY
TOTAL UNIT COST	325.29 $/CY

INPUT DATA
CONCRETE QUANTITY 95800. CY
PLACING RATE 25.00 CY/HR
CONCRETE IS PLACED BY CRANE AND BUCKET

FORMWORK	WOOD		STEEL		TOTAL
TYPE	SF	NO. USES	SF	NO. USES	SF
BULKHEAD	25011.	6.00	58359.	50.00	83370.
CURVED	14055.	2.00	32795.	50.00	46850.
STRAIGHT	111000.	4.00	259000.	50.00	370000.

FINISHING - FORMED SURFACES 416850. SF
FINISHING - UNFORMED SURFACES 26600. SF
CONSTRUCTION JOINT PREPARATION 143700. SF
ROCK SURFACE PREPARATION 26600. SF
OVERBREAK ALLOWANCE IS 1.00 FT
WASTE ALLOWANCE FACTOR IS 1.04
FORM RATIO 4.35 SF/CY

ITEM NO. 332.614
POWER INTAKE & OUTLET - CONCRETE

QUANTITY	LABOR	M&S	EQUIP
BATCH AND MIX			
100656.6	1425297.	5445522.	978382.
TRANSPORT - 1			
96785.2	374559.	0.	218735.
TRANSPORT - 2			
0.0	0.	0.	0.
CRANE & BUCKET COS			
3871.4	896618.	0.	592170.
PUMPED COST			
0.0	0.	0.	0.
BLD WD BHD FRMS			
4168.5	36891.	8504.	0.
BLD WD CVD FRMS			
7027.5	87071.	14336.	0.
BLD WD STR FRMS			
27750.0	265290.	56610.	0.
0.0	0.	0.	0.
S&S WD BHD FRMS			
25011.0	181580.	7503.	6003.
S&S WD CVD FRMS			
14055.0	131794.	4638.	3373.
S&S WD STR FRMS			
111000.0	1081140.	33300.	26640.
BUY STL BHD FRMS			
1167.2	0.	31514.	0.
BUY STL CVD FRMS			
655.9	0.	24268.	0.
BUY STL STR FRMS			
5180.0	0.	139860.	0.
S&S STL BHD FRMS			
58359.0	403261.	17508.	14006.
S&S STL CVD FRMS			
32795.0	354186.	9839.	7871.
S&S STL STR FRMS			
259000.0	2338770.	77700.	62160.
FIN FRMD SURFACES			
416850.0	279290.	0.	0.
FIN UNFM SURFACES			
26600.0	26600.	0.	0.
CLNUP & JNT PREP			
143700.0	125019.	0.	54606.
CURE			

[illegible]	[illegible]	[illegible]	0.
ROCK SURFACE PREP			
26600.0	94164.	0.	9044.
ST&S			
8394559.	0.	419728.	0.
TOTAL DIRECT COST			
95800.0	8394559.	6309989.	1972990.
PER CY	87.63	65.87	20.59
RE-STEEL			
13412000.	10327240.	4157720.	0.
PER CY	107.80	43.40	0.0
TOTAL			
PER CY	195.43	109.27	20.59

TAILRACE

PROJECT SUSITNA
DATE 3/2/84
ESTIMATOR SMA/CJS

ITEM NO. 332.91A
TAILRACE - PORTAL CONCRETE

LABOR	182.11 $/CY
M&S	102.57 $/CY
EQUIP	30.31 $/CY
TOTAL UNIT COST	314.99 $/CY

INPUT DATA
CONCRETE QUANTITY 300. CY
PLACING RATE 10.00 CY/HR
CONCRETE IS PLACED BY CRANE AND BUCKET

FORMWORK	WOOD		STEEL		TOTAL
TYPE	SF	NO. USES	SF	NO. USES	SF
BULKHEAD	0.	1.00	0.	1.00	0.
CURVED	225.	2.00	225.	50.00	450.
STRAIGHT	225.	4.00	225.	50.00	450.

FINISHING - FORMED SURFACES 900. SF
FINISHING - UNFORMED SURFACES 200. SF
CONSTRUCTION JOINT PREPARATION 900. SF
ROCK SURFACE PREPARATION 200. SF
OVERBREAK ALLOWANCE IS 1.00 FT
WASTE ALLOWANCE FACTOR IS 1.04
FORM RATIO 3.00 SF/CY

[redacted]
DATE 3/2/84
ESTIMATOR SMA/CJS

ITEM NO. 332.91A
TAILRACE - PORTAL CONCRETE

QUANTITY	LABOR	M&S	EQUIP
BATCH AND MIX			
319.7	4527.	17296.	3108.
TRANSPORT - 1			
307.4	1190.	0.	695.
TRANSPORT - 2			
0.0	0.	0.	0.
CRANE & BUCKET COS			
30.7	7120.	0.	4702.
PUMPED COST			
0.0	0.	0.	0.
BLD WD BHD FRMS			
0.0	0.	0.	0.
BLD WD CVD FRMS			
112.5	1394.	229.	0.
BLD WD STR FRMS			
56.3	538.	115.	0.
0.0	0.	0.	0.
S&S WD BHD FRMS			
0.0	0.	0.	0.
S&S WD CVD FRMS			
225.0	2430.	74.	54.
S&S WD STR FRMS			
225.0	2191.	67.	54.
BUY STL BHD FRMS			
0.0	0.	0.	0.
BUY STL CVD FRMS			
4.5	0.	167.	0.
BUY STL STR FRMS			
4.5	0.	122.	0.
S&S STL BHD FRMS			
0.0	0.	0.	0.
S&S STL CVD FRMS			
225.0	2430.	68.	54.
S&S STL STR FRMS			
225.0	2032.	68.	54.
FIN FRMD SURFACES			
900.0	603.	0.	0.
FIN UNFM SURFACES			
200.0	200.	0.	0.
CLNUP & JNT PREP			
800.0	696.	0.	304.
CURE			

80.1	8!	6(	0.
ROCK SURFACE PREP			
200.0	708.	0.	68.
ST&S			
26913.1	0.	1346.	0.
TOTAL DIRECT COST			
300.0	26913.	19611.	9092.
PER CY	89.71	65.37	30.31
RE-STEEL			
36000.	27720.	11160.	0.
PER CY	92.40	37.20	0.0
TOTAL			
PER CY	182.11	102.57	30.31

MARCH 1984

The following summarizes unit direct costs used in deriving concrete costs for Watana
WATANA
SUSITNA
1563
3 - No. of cost categories (Labor, M&S, and Equipment)
ENGLISH
1.0 - Overbreak allowance for concrete placed against rock - in feet.
1.04 - Waste factor
Unit Costs

Labor	M&S	Equipment
BATCH AND MIX		
14.16	54.10	9.72
TRANSPORT - 1		
3.87		2.26
TRANSPORT - 2		
3.87		2.26
CRANE & BUCKET COST		
231.60		152.96
PUMPED COST		
231.60		152.96
BLD WD BHD FRMS		
8.85	2.04	
BLD WD CVD FRMS		
12.39	2.04	
BLD WD STR FRMS		
9.56	2.04	
S&S WD BHD FRMS		
7.26	.30	.24
S&S WD CVD FRMS		
10.8	.33	.24
S&S WD STR FRMS		
9.74	.30	.24
BUY STL BHD FRMS		
	27.00	
BUY STL CVD FRMS		
	37.00	
BUY STL STR FRMS		
	27.00	
S&S STL BHD FRMS		
6.91	.30	.24
S&S STL CVD FRMS		
10.80	.30	.24
S&S STL STR FRMS		
9.03	.30	.24

FIN FRMD SURFACES
.67
FIN UNFM SURFACES
1.00
CLNUP & JNT PREP
.87 .38
CURE
2.85 .20
ROCK SURFACE PREP
3.54 .34
ST&S
.05

ITEM Concrete Batch & Mix Page 1
QUANTITY Approx 600,000 CY

	LABOR	M & S	EQUIPMENT	TOTAL
Use Johnson 4X4 plant (see note next page)				
1. Depreciation of plant - 40%X(1,350,000)			540,000	
2. Repair parts .35(util. factor) X 1,350,000			337,500	
3. Repair labor 2/3 of parts costs			225,000	
4. Operation				
1 plant foreman 39.00				
1 plant operator 37.90				
3 operators@36.00 108.00				
3 laborers@31.30 93.90				
2 electricians@41.20 82.40				
361.20				
Pay 20 hr/day, 6 days/wk, 30 wks/year				
2 years + 5 years of low utilization				
@ 10 hr/day 6x30x(20x2+10x5) = 16200				
16200 hrs @ 361.20	5,855,052			
5. Electric power 5hp-hr/cyx600,000 =300,000/1.36=220,000 kwh @ 0.135			29,700	
6. Lube - use 10% of power cost			3,000	
7. Aggregates - say 2.1 ton/cy @(1.13 + 0.11 + 2.93) x 600,000cy	1,423,800	138,600	3,691,800	
8. Cooling (ice) plant -(per LFL) say 50% of concrete requires it.				
labor-.0375mh/cy x 1.5(low util.) x 600,000 x 0.5 x 36.00 =	607,500			
Ammonia & parts-0.30/cy x 600,000x0.5x0.6 duty factor			54,000	
Depreciation-15% of 1,000,000(cost)			150,000	
Power-1/1.36x6.5 kwh/cy x 300,000x0.135x0.6 util.			116,000	
9. Additives - 600,000 cy @ 2.50		1,500,000		
10. Cement 5 1/2 sack = 0.26 tons/cy x 600,000cy = 155,000 tons say 20% pozzolan=31,000 tons @ 159.00 x 1.05 waste		5,175,450		
Cement 124,000 tons @ 196.00 x 1.05 waste		25,519,200		
Subtotal	7,886,352	32,333,250	5,147,000	45,366,602
per cy	13.14	53.89	8.58	75.61

ITEM Concrete Batch & Mix Page 2
QUANTITY Approx 600,000 CY

	LABOR	M & S	EQUIPMENT	TOTAL
Shipping Cost			350,000	
Install & Remove	611,760	127,500	337,813	
Total	8,498,112	32,460,750	5,834,813	46,793,675
per cy	14.16	54.10	9.72	77.98

WATANA - MARCH 1984
NOTE:
Total concrete required for Watana appears to be 506,370 cu , including underground concrete. Most concrete would be placed during an approx. 5 year period (refer to D. Ruotolo's 5/11/83 "Construction Schedule" for the A2185 scheme). Including waste 5% and an assumed allowance for overbreak on surface structures (5% x 342,245 cu), have

basic qty	506,370 cu
waste 5%	25,318
overbreak on surface str 342,245 x .05	17,112
misc say	50,000
total	598,800 say 600,000 cu req'd

For peak batching & mixing capacity, assume:
average 4 days/wk placing
average 30 wk/year

Average daily production 600,000/(5x30x4) = 1000 cu/day

Say peak is 2.5 x this = 2,500

Say peak occurs working 2-10 hour shifts.
Actively place concrete 8 hrs/shifts.i
Peak 2,500/(2x8) = 156 cu/hr

Allow 25% additional plant capacity.
156 x 1.25 = 195 cu/hr plant capacity requirement

Use a 4 x 4 gravity-feed batching/mixing plant. (240 cu/hr capacity)

WATANA - MARCH 1984

ITEM: Concrete Transport
QUANTITY Per cu

	LABOR	M & S	EQUIPMENT	TOTAL
Truck cycle for avg 2 mile haul from batch plant to structures where concrete is to be placed. Avg 6% downgrade. Use a 30-ton Tractor-trailer hauling 2-3cu bucket. Cycle:	Max	Min		
load @ plant	4.0 min	4.0		
haul 2mi@8mph	15.0	2.0		
unload 2x4+1	9.0	9.0		
return @ 10mph	12.0	2.0		
	40.0	17.0		
Say 1/2 is short haul; 1/2 longer haul (40+17)/2 28 min avg haul but use 32 min incl. queing				
Production - 1 truck 2x3 6cyx50/32 = 9.4 cy/hr				
Cost -1 truck driver				
30-ton tractor-trailer				
26.07 x 80% duty factor			20.86	
Total	36.40		20.86	57.26
per cy - divided by 9.4 cy/hr	3.87		2.22	6.09

ITEM Concrete Placing - Crane & Bucket
QUANTITY per hour

	LABOR	M & S	EQUIPMENT	TOTAL
Place concrete using 125-ton crane and 3 cy bucket. Use following spread for placing concrete -				
1 foreman	34.10			
1 crane operator	37.90			
1 oiler	34.40			
1 bucketman |				
2 vibratormen |4@31.30	125.20			
1 laborers |				
7 men total	231.60			
1 125 ton crane 175.83x.8 duty			140.66	
6 3cy buckets@1.79			10.74	
2 vibrators 7x2-5/8 elect@ 0.78			1.56	
total			152.96	
total, per hour	231.60		152.96	384.56

WATANA - MARCH 1984

ITEM bulkhead wood formwork for concrete
QUANTITY per SFCA (sq. ft. contact area)

	LABOR	M & S	EQUIPMENT	TOTAL
Following per square foot of form-concrete contact area (SFCA):				
Build - 0.25 mh @ $35.40/ mh	8.85			
1.1 sf pluform @ $0.20 / sf		0.77		
3 FBM dimension lumber @ $.40/FBM		1.20		
Nails, etc.		0.07		
subtotal, build	8.85	2.04		10.89
Set & Strip (S&S) .20mh @ $35.40/mh	7.08			
.25 FBM dimension lumber for erection @ $.40 / FBM		0.10		
Ties, hardware, oil		0.20		
Crane time 200 sf/hour 18 ton crane (RT518) 1/200 x (36.00+48.70)	0.18		0.24	
total, per SFCA - set & strip	7.26	0.30	0.24	7.80

ITEM curved wood formwork for concrete
QUANTITY per SFCA

	LABOR	M & S	EQUIPMENT	TOTAL
Following per square foot of form concrete contact area (SFCA):				
Build - 0.35 mh @ $35.40/ mh	12.39			
1.1 sf pluform @ $0.70 / sf		0.77		
3 FBM dimension lumber @ $.40/FBM		1.20		
Nails, etc.		0.07		
subtotal, build	12.39	2.04		14.43
Set & Strip (S&S) .30 mh @ $35.40	10.62			
.25 FBM dimension lumber for erection @ $.49 / FBM		0.10		
Ties, hardware		0.20		
Crane time 200 sf/hour 18 ton (rt518) 1/200 x (36.00 + 48.70)	0.18		0.24	
total, per SFCA - set & strip	10.80	0.30	0.24	11.34

WATANA - MARCH 1984

ITEM straight wood formwork for concrete
QUANTITY per SFCA

	LABOR	M & S	EQUIPMENT	TOTAL
Following per square foot of form-concrete contact area (SFCA):				
Build - .27 mh @ $35.40/ mh	9.56			
1.1 sf pluform @ $.70 / sf		0.77		
3 FBM dimension lumber @ $.40/FBM		1.20		
Nails, etc.		0.07		
subtotal, build	9.56	2.04		11.60
Set & Strip (S&S) .27 mh @ $35.40	9.56			
.25 FBM dimension lumber for erection @ $.40 / FBM		0.10		
Ties, hardware, oil		0.20		
Crane time 200 sf/hour - 18 ton (rt518) 1/200 x (36.00 + 48.70)	0.18		0.24	
total, per SFCA	9.74	0.30	0.24	10.28

ITEM steel bulkhead formwork for concrete
QUANTITY per SFCA

	LABOR	M & S	EQUIPMENT	TOTAL
Following per square foot of form-concrete contact area (SFCA): Purchase - same as straight face panels - $27.00/sf				
Set & Strip (S&S) .19 mh @ $35.40	6.73			
.25 FBM dimension lumber for erection @ $.40 / FBM		0.10		
Ties, hardware		0.20		
Crane time 200 sf/hour (18T Grove RT518) 1/200 x (36.00 + 48.70)	0.18		0.24	
total, per SFCA - set & strip	6.91	0.30	0.24	7.45

ITEM curved steel formwork for concrete
QUANTITY per SFCA

	LABOR	M & S	EQUIPMENT	TOTAL
Following per square foot of form-concrete contact area (SFCA):				
Purchase - use straight panel cost + 35% for custom curved formed				
27.00 x 1.35 = 36.45 sqy $37.00/sf				
Set & Strip (S&S) .30 mh @ $35.40	10.62			
.25 FBM dimension lumber for erection @ $.40 / FBM		0.10		
Ties, hardware		0.20		
Crane time 200 sf/hour (18T Grove RT518) 1/200 x (36.00 + 48.70)	0.18		0.24	
total, per SFCA - set & strip	10.80	0.30	0.24	11.34

ITEM straight steel formwork for concrete
QUANTITY per SFCA

	LABOR	M & S	EQUIPMENT	TOTAL
Following per square foot of form-concrete contact area (SFCA):				
Based on EFCO 8' x 20' panels-				
$2014/20x8 - $12.59/sf (2/81 price in US)				
ENR Building Costs 353(6/83)/298(2/81)=				
1.18 say 1.25 to current level.				
12.59X1.25 =$15.74/sf		15.74		
Shipping- 8x20x2/40 = 8 shipping tons				
/panel @ 220.00/panel to site =				
$1760 shipping per panel /160 =		11.00		
Say $27.00/sf purchase cost		26.74		26.74
Set & Strip (S&S) .25 mh @ $35.40	8.85			
.25 FBM dimension lumber for erection				
@ $.40 / FBM		0.10		
Ties, hardware		0.20		
Crane time 200 sf/hour (18T Grove RT518)				
1/200 x (36.00 + 48.70)	0.18		0.24	
total, per SFCA - set & strip	9.03	0.30	0.24	9.57

ITEM spillway slipform
QUANTITY per cu

	LABOR	M & S	EQUIPMENT	TOTAL
Use a tractor-winched slipform to form the spillway (140' wide) in 4 passes 35' wide. Spillway is approx. 1930 ft long. Sau can do 100' of 1 pass in 1 shift - approx. 35x(3+1) x 100/27 = 518cu/shift or 52cu/hr (10 hr shifts). Require 1930/100 =20 shifts per pass x 4 passes = 80 shifts. Sau 100 shifts x 10 hr/shift = 1000 hr incl. set-up & learning curve.				
1 foreman 39.00				
2 finishers @33.40 66.80				
1 laborer 31.30				
1 operator 36.00				
1000 hr @ 173.10/hr	173,100			
Equip				
1 D6 tractor to winch up the slipform				
1000 hr @ 42.71			42,710	
Slipform				
Figure 40'x7' =280 sf. Use straight steel form costs + 50% for bracing,etc.				
26.74 x 1.5 = $40/sf x 280 sf =		11,200		
total	173,100	11,200	42,710	227,010

WATANA - MARCH 1984

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ITEM spillway box drain formwork
QUANTITY per LF

	LABOR	M & S	EQUIPMENT	TOTAL
Box drains under spillway slab. Refer to dwg WASKC403625. Build in place + strip. 1 use.				
Build - 0.60 mh @ $35.40/ mh	21.24			
1.2 sf pluform @ $0.70 / sf		0.84		
3 FBM dimension lumber @ $.40/FBM		1.20		
Nails, etc.		0.10		
Spikes,wires caulking - say $1/1f/4		0.25		
subtotal, per sf	21.24	2.39		23.63
Per 1f , x 6(sf/1f)	127.44	14.34		141.78
Total quantity-15,000lf @ (127.44 +14.34 +0) =	1,911,600	215,100		2,126,700

ITEM slab form - spillway
QUANTITY 9x1930=17,370 SFCA

	LABOR	M & S	EQUIPMENT	TOTAL
Figure cost of forming underside of spillway concrete slab (Ref. dwg WASKC403625) over the "drain trench".				
Use an 8' steel panel with wood fill strips. Use steel 20 times.				
Purchase- $27/20 x 8/9 =		1.20		
set&strip- .24mh@35.40 x8/9	7.55			
Wood - purchase and build - 4 uses				
(9.50 + 2.04 + 0)x 1/9 x 1/4	0.27	0.06		
set&strip wood (9.56+.30 +0)x1/9	1.06	0.03		
Crane time (see other form items)	0.18		0.24	
Total - per sf	9.06	1.29	0.24	10.59
Total cost 17,370 sf @(9.06+1.29+0)	157,372	22,407	4,169	183,948

ITEM finishing concrete - formed surf
QUANTITY per sf

	LABOR	M & S	EQUIPMENT	TOTAL
Use .02 mh per sfca @ 33.40 to finish formed surfaces (Mat'l covered under ST&S)	0.67			
total per sf	0.67			0.67

ITEM finishing concrete - unformed surf
QUANTITY per sf

	LABOR	M & S	EQUIPMENT	TOTAL
Use .03 mh/sfca @ 33.40 & finish unformed concrete surfaces	1.00			
total per sf	1.00			1.00

WATANH - MARCH 1984

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ITEM concrete cleanup & joint prep
QUANTITY per sf

	LABOR	M & S	EQUIPMENT	TOTAL
Use a high-pressure (6000 psi) water jet. Following spread can do 160sf/hr.				
1 operator/foreman 39.00				
2 nozzlemen@31.70 63.40				
total 102.40				
102.40 per hr/ 160sf/hr =	0.64			
1 high-pressure water jet - say cost is equivalent to 600 cfm compressor. (40.36/160)=			0.25	
Cleanup-use 30% of joint prep cost	0.19		0.08	
Crane time - using RT518 crane, avg 1000 sf/hr of crane time 1/1000 x (36.00 + 48.70)	0.04		0.05	
total per sf	0.87		0.38	1.25

WATANA - MARCH 1984

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ITEM cure concrete
QUANTITY approx 45000 m3

	LABOR	M & S	EQUIPMENT	TOTAL
Cure total of approx. 500,000 pay cy of concrete during 5 construction seasons. Approx 7 mos/yr, 7 days/wk, 20 hr/day. Pay rates are for 60 hr/wk. Pay for 20 hr overtime/wk @ 1.5 x base. 2 laborers @ 31.30 = 62.60 Pay for 150 hr/wk @ 62.60 = 9390/wk (9390 x 52 x 5 x 7/12)/500,000 =	2.85			
Mat'l- Assume curing compound used. Assume avg. 13.5 sf/cy (4' thick wall avg.) Cost Means 3.3-16.030 1.50/csf 13.5 x 1.50/100 =		0.20		
total per cy	2.85	0.20		3.05

WHITMAN - MARCH 1984

****

ITEM rock surface preparation for concete
QUANTITY per cu

	LABOR	M & S	EQUIPMENT	TOTAL
Say following spread can do 100sf per hour.				
1 foreman	34.10			
8 laborers @31.30	250.40			
1.5 operator(light)@35.20	52.80			
.5 truck driver @34.30	17.15			
total	354.45			
354.45 / 100sf/hr =		3.54		
.5 Case 580 Loader/backhoe				
.5@(16.19)	8.10			
1 low pressure water jet-use				
150 cfm compressor cost	10.07			
.5 11-1/2 cy truck				
@.5(31.08)	15.54			
total	33.71			
33.71 /100sf/hr			0.34	
Total per sf		3.54	0.34	3.88

WATANA - MARCH 1984

ITEM reinforcing steel
QUANTITY per lb

	LABOR	M & S	EQUIPMENT	TOTAL
Purchase re-steel @ 0.20/lb		0.20		
Ship to site @$220/shipping ton In this case weight governs (1 shipping ton - 2000 lbs) $220/2000 =		0.11		
Fabricate - cut,place,tie - allow 40 mh/ton @ 38.40 =1536/2000 =	0.77			
Total per lb	0.77	0.31		1.08

UNDERGROUND CONCRETE

PROJECT: SUSITNA,ALASKA FILE # 1494X EST. OEB REV. RAM D
SUBJECT: TUNNEL CONCRETE DATE: FEB. 13,1984

COST ANALYSIS

SUMMARY: ITEM	QUANTITY		LABOR	EQUIPMENT	M&S	TOTAL
DIVERSION TUNNEL (LINING)	3860	LF	2574858	295878	5264945	8,135,681
UNIT COSTS			667.06	76.65	1363.98	2107.69
TAILRACE MOD HORSESHOE(LI	3300	LF	1758930	260595	3789374	5,808,899
UNIT COSTS			533.01	78.97	1148.30	1760.27
PENSTOCK 24'ID SHAFT (LIN	1000	LF	1409975	133380	1762565	3,305,920
UNIT COSTS			1409.97	133.38	1762.56	3305.92
OUTLET TUNNEL 28 ID (LIN	2100	LF	1418721	134319	2543372	4,096,412
UNIT COSTS			675.58	63.96	1211.13	1950.67
PENSTOCK 15'ID STEEL (LIN	400	LF	85305	25202	949730	1,060,237
UNIT COSTS			213.26	63.01	2374.32	2650.59

w/Liner (1776/LF)
w/o Liner

MANPOWER SUMMARY

ACTIVITY	QUANTITY		CREW	MANHOURS	QTY/MH	$/UNIT	DAYS
CONCRETE PLACING	88,237	CY	13.	43000	2.05	17.80	344
CLEANING	88,237	CY	7.	24080	3.66	9.92	344
STRIPPING	1,155,000	SF	11.	36520	31.63	1.22	332
ERECTING STEEL FORMS	1,155,000	SF	11.	36520	31.63	1.22	332
REINFORCING	6,938,050	LBS	10.	34689	200.01	0.21	347
MAKING CURVED FORMS	46,000	SF	15.	13813	3.33	11.55	92
TOTAL MANHOURS				188622			

NOTE : DAYS BASED ON 10 HRS SHIFTS

PROJECT: SUSITNA,ALASKA FILE # 1494X EST. OEB REV. RAM D
SUBJECT: TUNNEL CONCRETE DATE: FEB. 13,1984

COST ANALYSIS

EQUIPMENT SUMMARY

DESCRIPTION	UNIT COST $/HR TOTAL	LABOR	CREW	TOTALS OPR HRS	MANHOURS	COST
COMPRESSOR (600 CFM)	40.36	13.60	39.09	3167	1102	127860
CONC PUMP(100CY/HR)	50.00	20.00	39.09	2703	1383	135199
VIBRATOR (EXTERNAL)	1.50	0.60	39.09	21631	332	32447
AGITATOR CARS	23.44	1.46	39.09	13759	513	322534
LOCO 25T	84.06	17.39	39.09	2751	1224	231333
TOTALS				44011	4554	849373

PROJECT: SUSITNA,ALASKA FILE # 1494X EST. OEB REV. L LEVY
SUBJECT: TUNNEL CONCRETE DATE: FEB. 24,1984

COST ANALYSIS

SUMMARY: ITEM	QUANTITY		LABOR	EQUIPMENT	M&S	TOTAL
TUNNEL SLAB CONCRETE	1690	CY	87710	13150	244470	345,330
UNIT COSTS			51.90	7.78	144.66	204.34
PENSTOCK ACCESS PLUG	7275	CY	187058	51661	685380	924,099
UNIT COSTS			25.71	7.10	94.21	127.02
ACCESS SHAFT LINING 20'ID	740	LF	431351	54479	619405	1,105,235
UNIT COSTS			582.91	73.62	837.03	1493.56
BUS SHAFT 9.0' DIA	560	LF	211260	30057	210599	451,916
UNIT COSTS			377.25	53.67	376.07	806.99

MANPOWER SUMMARY

ACTIVITY	QUANTITY		CREW	MANHOURS	QTY/MH	$/UNIT	DAYS
CONCRETE PLACING	12,216	CY	13.	7950	1.54	23.77	64
CLEANING	12,216	CY	7.	4888	2.50	14.54	70
STRIPPING	62,300	SF	11.	3960	15.73	2.44	36
ERECTING STEEL FORMS	62,300	SF	11.	3960	15.73	2.44	36
REINFORCING	687,720	LBS	10.	3437	200.09	0.21	34
TOTAL MANHOURS				24195			

NOTE : DAYS BASED ON 10 HRS SHIFTS

PROJECT: SUSITNA,ALASKA FILE # 1494X EST. OEB REV. L LEVY
SUBJECT: TUNNEL CONCRETE DATE: FEB. 24,1984

COST ANALYSIS

EQUIPMENT SUMMARY

DESCRIPTION	UNIT COST $/HR TOTAL	LABOR	CREW	TOTALS OPR HRS	MANHOURS	COST
COMPRESSOR (600 CFM)	40.36	13.60	39.09	381	132	15401
CONC PUMP(100CY/HR)	50.00	20.00	39.09	508	260	25439
VIBRATOR (EXTERNAL)	1.50	0.60	39.09	4070	62	6105
AGITATOR CARS	23.44	1.46	39.09	2543	95	59631
LOCO 25T	84.06	17.39	39.09	508	226	42769
TOTALS				8010	775	149345

PROJECT: SUSITNA,ALASKA FILE # 1494X EST. DEB REV. RAM D
SUBJECT: TUNNEL CONCRETE DATE: FEB. 13,1984

COST ANALYSIS

ITEM: DIVERSION TUNNEL (LINING) QUANTITY: 3,860 LF

**** MANPOWER ****

CODE	ITEM/ACTIVITIES	QTY	UNIT	CREW	PF	MANHOURS	$/HR	TOTAL COST
1	CONCRETE PLACING	26450	CY	13.	1.00	15750	36.52	575,189
2	CLEANING	26450	CY	7.	1.00	8820	36.34	320,518
3	STRIPPING	480000	SF	11.	1.00	13860	38.44	532,778
4	ERECTING STEEL FORMS	480000	SF	11.	1.00	13860	38.44	532,778
5	REINFORCING	2909500	LBS	10.	1.00	14547	42.18	613,592
TOTAL MANHOURS & LABOR COST						66837		2,574,858

EQUIPMENT TYPE	NO.	OPR HOURS	DUTY	$/HR	TOTAL COST
CONC PUMP(100CY/HR)	1.00	1260.00	0.80	50.00	50,399
VIBRATOR (EXTERNAL)	8.00	1260.00	0.80	1.50	12,095
COMPRESSOR (600 CFM)	1.00	1260.00	0.60	40.36	30,512
AGITATOR CARS	5.00	1260.00	0.80	23.44	118,137
LOCO 25T	1.00	1260.00	0.80	84.06	84,732
TOTAL EQUIPMENT COSTS					295,878

MATERIAL DESCRIPTION	QUANTITY	UNIT	$/UNIT	TOTAL COST
CONCRETE (AT SITE)	43115	CY	80.00	3,449,200
REINFORCING (110 LBS/CY	2909500	LBS	0.20	581,899
STEEL FORMS (40 FT/SET)	5000	SF	40.00	200,000
FORM HARDWARE & OIL	493060	SF	1.00	493,060
FORM LUMBER	32750	BF	0.40	13,099
WATER LINE	3860	LF	10.00	38,600
AIR LINE	3860	LF	10.00	38,600
ELECTRIC SUPPLIES	3860	LF	50.00	193,000
ST & S 10.% OF LABOR				257,485
TOTAL MATERIAL AND SUPPLIES COSTS				5,264,945

SUMMARY: ITEM	QUANTITY		LABOR	EQUIPMENT	M&S	TOTAL
DIVERSION TUNNEL (LINING)	3860	LF	2574858	295878	5264945	8,135,681
UNIT COSTS			667.06	76.65	1363.98	2107.69

PROJECT: SUSITNA,ALASKA FILE # 1494X EST. Dec REV. RAM D
SUBJECT: TUNNEL CONCRETE DATE: FEB. 13,1984

COST ANALYSIS

ITEM: DIVERSION TUNNEL (LINING) QUANTITY: 3,860 LF

ITEM CRITERIA

THE DIVERSION TUNNEL HAS THE FOLLOWING COMPONENTS-

(1) 3000 FT - 36 ID (AT BOTH ENDS)
(2) 100 FT - EXPANSION 36-45 FT ID
(3) 660 FT - 45 ID
(4) 100 FT - TAPPERS 45-36 FT ID

THE DIVERSION TUNNEL CONCRETE OPERATION WILL BE PERFORMED USING THE FOLLOWING CREWS:

POURING CREW -	1 CONCRETE FOREMAN	CLEAN UP CREW -	1 FOREMAN
	1 PUMP OPERATOR		2 FINISHERS
	1 NOZZLE MAN		4 MINERS
	1 COMPRESSOR OPERATOR		
	.5 ELECTRICIAN		
	2 LOCO OPERATORS		
	6 MINERS		
	12.5 MEN (AVG $ 36.52/HR)		7 MEN (AVG $ 36.34/H
STRIPPING CREW -	1 CARPENTER FOREMAN	FORM ERECT CREW -	1 CARPENTER FOREMAN
	8 CARPENTERS		8 CARPENTERS
	2 MINERS		2 MINERS
	11 MEN (AVG $ 38.44/HR)		11 MEN (AVG $ 38.44/H

SCHEDULE:

	(SHIFT # 1)	(SHIFT #2)	(SHIFT #3)
POUR CONCRETE	----------		
CLEANUP		----------	
STRIP FORM		----------	
ERECT FORMS			----------

PROJECT: SUSITNA, ALASKA FILE # 1494X EST. OLD REV. RAM D
SUBJECT: TUNNEL CONCRETE DATE: FEB. 13, 1984

COST ANALYSIS

ITEM: DIVERSION TUNNEL (LINING) QUANTITY: 3,860 LF

BACK UP COMPUTATIONS

CY/POUR = 6.85 X 40 FT X 1.63 (OB) = 447 CY

POURING HOURS = 447 CY/(60 CY/HR X 50/60 X 0.85) = 10.51 HRS

ADVANCE RATE = 40 FT/3 SHIFT CYCLE

CONSTRUCTION SCHEDULE :

(1) LEARNING CURVE	200 LF/40 X 0.50	= 10	CYCLES
(2) CURVES	200 LF/40 X .20	= 25	" "
(3) REMAINING	3460 LF/40	= 87	" "
(4) DELAYS		4	CYCLES
TOTAL CYCLES		126	CYCLES

EQUIPMENT
OPERATING HOURS = 126 X 30 = 3,780 HRS

PROJECT: SUSITNA,ALASKA FILE # 1494X EST. OLD REV. RAM D
SUBJECT: TUNNEL CONCRETE DATE: FEB. 13,1984

COST ANALYSIS

ITEM: DIVERSION TUNNEL (LINING) QUANTITY: 3,860 LF

TUNNEL CONCRETE PARAMETERS:	LENGTH		3860.00	FT
	PERIMETER		146.00	FT
	CY/LF (AVG)		6.85	
	OVERBREAK FACTOR		1.63	
	FORM LENGHT		40.00	FT
	POURING RATE		60.00	CY/HR
	MINUTES/HR		50.00	
	EFFICIENCY FACTOR		0.85	
REINFORCING :	LBS/CY		110.00	
WORKING SCHEDULE :	SHIFTS/DAY		2.00	SHIFTS
	HOURS/SHIFT		10.00	HOURS
SCHEDULE PARAMETERS :	LEARNING CURVE	200.00 LF	50.00	%
	ALIGNMENT CURVE	200.00 LF	20.00	%
	CYCLE DELAYS		2.00	CYCLES

PROJECT: SUSITNA,ALASKA FILE # 1494X EST. OEB REV. RAM D
SUBJECT: TUNNEL CONCRETE DATE: FEB. 13,1984

COST ANALYSIS

ITEM: TAILRACE MOD HORSESHOE(LINING) QUANTITY: 3,300 LF

**** MANPOWER ****

CODE	ITEM/ACTIVITIES	QTY	UNIT	CREW	PF	MANHOURS	$/HR	TOTAL COST
1	CONCRETE PLACING	29732	CY	13.	1.00	11500	36.52	419,979
2	CLEANING	29732	CY	7.	1.00	6440	36.3[illegible]	234,029
3	STRIPPING	400000	SF	11.	1.00	10120	38.44	389,012
4	ERECTING STEEL FORMS	400000	SF	11.	1.00	10120	38.44	389,012
5	REINFORCING	1550010	LBS	10.	1.00	7750	42.18	326,894
TOTAL MANHOURS & LABOR COST						45930		1,758,930

EQUIPMENT TYPE	NO.	OPR HOURS	DUTY	$/HR	TOTAL COST
CONC PUMP(100CY/HR)	1.00	920.00	0.80	50.00	36,799
VIBRATOR (EXTERNAL)	8.00	920.00	0.80	1.50	8,831
COMPRESSOR (600 CFM)	1.00	2760.00	0.60	40.36	66,836
AGITATOR CARS	5.00	920.00	0.80	23.44	86,259
LOCO 25T	1.00	920.00	0.80	84.06	61,868
TOTAL EQUIPMENT COSTS					260,595

MATERIAL DESCRIPTION	QUANTITY	UNIT	$/UNIT	TOTAL COST
CONCRETE (AT SITE)	31000	CY	80.00	2,480,000
REINFORCING (110 LBS/CY	1550010	LBS	0.20	310,001
STEEL FORMS (40 FT/SET)	4612	SF	40.00	184,480
FORM HARDWARE & OIL	400000	SF	1.00	400,000
FORM LUMBER	20000	BF	0.40	7,999
WATER LINE	3300	LF	10.00	33,000
AIR LINE	3300	LF	10.00	33,000
ELECTRIC SUPPLIES	3300	LF	50.00	165,000
ST & S 10.% OF LABOR				175,893
TOTAL MATERIAL AND SUPPLIES COSTS				3,789,374

SUMMARY: ITEM	QUANTITY		LABOR	EQUIPMENT	M&S	TOTAL
TAILRACE MOD HORSESHOE(LI	3300	LF	1758930	260595	3789374	5,808,899
UNIT COSTS			533.01	78.97	1148.30	1760.27

PROJECT: SUSITNA,ALASKA FILE # 1494X EST. Ucd REV. RAM D
SUBJECT: TUNNEL CONCRETE DATE: FEB. 13,1984

COST ANALYSIS

ITEM: TAILRACE MOD HORSESHOE(LINING) QUANTITY: 3,300 LF

ITEM CRITERIA

THE TAILRACE TUNNEL HAS THE FOLLOWING COMPONENTS-
SHAPE FACTOR = 1.0196
PERIMETER = 115.31 FT

THE TAILRACE TUNNEL CONCRETE OPERATION WILL BE PERFORMED USING
THE SAME CREWS AS OUTLINED IN DIVERSION TUNNEL.

SCHEDULE:

	(SHIFT # 1)	(SHIFT #2)	(SHIFT #3)
POUR CONCRETE	----------		
CLEANUP		----------	
STRIP FORM			----------
ERECT FORMS			

PROJECT: SUSITNA, ALASKA FILE # 1494X EST. U&B REV. RAM D
SUBJECT: TUNNEL CONCRETE DATE: FEB. 13, 1984

COST ANALYSIS

ITEM: TAILRACE MOD HORSESHOE(LINING) QUANTITY: 3,300 LF

BACK UP COMPUTATIONS

CY/POUR = 4.27 X 40 FT X 2.11 (OB) = 360 CY

POURING HOURS = 360 CY/(60 CY/HR X 50/60 X 0.85) = 8.48 HRS

ADVANCE RATE = 40 FT/3 SHIFT CYCLE

CONSTRUCTION SCHEDULE :

(1) LEARNING CURVE	200 LF/40 X 0.50	= 10	CYCLES
(2) CURVES		= 0	" "
(3) REMAINING	3100 LF/40	= 78	" "
(4) DELAYS		4	CYCLES
TOTAL CYCLES		92	CYCLES

EQUIPMENT
OPERATING HOURS = 92 X 30 = 2,760 HRS

PROJECT: SUSITNA,ALASKA FILE # 1494X EST. OEB REV. RAM D
SUBJECT: TUNNEL CONCRETE DATE: FEB. 13,1984

COST ANALYSIS

ITEM: TAILRACE MOD HORSESHOE(LINING) QUANTITY: 3,300 LF

TUNNEL CONCRETE PARAMETERS:	LENGTH		3300.00	FT
	PERIMETER		115.31	FT
	CY/LF (AVG)		4.27	
	OVERBREAK FACTOR		2.11	
	FORM LENGHT		40.00	FT
	POURING RATE		60.00	CY/HR
	MINUTES/HR		50.00	
	EFFICIENCY FACTOR		0.85	
REINFORCING :	LBS/CY		110.00	
WORKING SCHEDULE :	SHIFTS/DAY		2.00	SHIFTS
	HOURS/SHIFT		10.00	HOURS
SCHEDULE PARAMETERS :	LEARNING CURVE	200.00 LF	50.00	%
	ALIGNMENT CURVE	200.00 LF	20.00	%
	CYCLE DELAYS		2.00	CYCLES

PROJECT: SUSITNA,ALASKA FILE # 1494X EST. OLD REV. RAM D
SUBJECT: TUNNEL CONCRETE DATE: FEB. 13,1984

COST ANALYSIS

ITEM: PENSTOCK 24'ID SHAFT (LINING) QUANTITY: 1,000 LF

**** MANPOWER ****

CODE	ITEM/ACTIVITIES	QTY	UNIT	CREW	PF	MANHOURS	$/HR	TOTAL COST
1	CONCRETE PLACING	12423	CY	13.	1.00	7100	36.52	259,291
2	CLEANING	12423	CY	7.	1.00	3976	36.34	144,487
6	MAKING CURVED FORMS	24000	SF	15.	1.00	7207	38.48	277,325
3	STRIPPING	80000	SF	11.	1.00	6248	38.44	240,173
4	ERECTING STEEL FORMS	80000	SF	11.	1.00	6248	38.44	240,173
5	REINFORCING	1178540.	LBS	10.	1.00	5892	42.18	248,524
TOTAL MANHOURS & LABOR COST						36671		1,409,975

EQUIPMENT TYPE	NO.	OPR HOURS	DUTY	$/HR	TOTAL COST
CONC PUMP(100CY/HR)	1.00	568.00	0.80	50.00	22,719
VIBRATOR (EXTERNAL)	8.00	568.00	0.80	1.50	5,452
COMPRESSOR (600 CFM)	1.00	568.00	0.60	40.36	13,754
AGITATOR CARS	5.00	568.00	0.80	23.44	53,255
LOCO 25T	1.00	568.00	0.80	84.06	38,196
TOTAL EQUIPMENT COSTS					133,380

MATERIAL DESCRIPTION	QUANTITY	UNIT	$/UNIT	TOTAL COST
CONCRETE (AT SITE)	12422	CY	80.00	993,760
REINFORCING (110 LBS/CY	1178540	LBS	0.20	235,707
STEEL FORMS (40 FT/SET)	5000	SF	40.00	200,000
FORM HARDWARE & OIL	80000	SF	1.00	80,000
PLYWOOD (CURVED)	27000	SF	0.70	18,899
FORM LUMBER	58000	BF	0.40	23,199
WATER LINE	1000	LF	10.00	10,000
AIR LINE	1000	LF	10.00	10,000
ELECTRIC SUPPLIES	1000	LF	50.00	50,000
ST & S 10.% OF LABOR				140,997
TOTAL MATERIAL AND SUPPLIES COSTS				1,762,565

SUMMARY: ITEM	QUANTITY		LABOR	EQUIPMENT	M&S	TOTAL
PENSTOCK 24'ID SHAFT (LIN	1000	LF	1409975	133380	1762565	3,305,920
UNIT COSTS			1409.97	133.38	1762.56	3305.92

PROJECT: SUSITNA,ALASKA FILE # 1494X EST. OLD REV. RAM D
SUBJECT: TUNNEL CONCRETE DATE: FEB. 13,1984

COST ANALYSIS

ITEM: PENSTOCK 24'ID SHAFT (LINING) QUANTITY: 1,000 LF

ITEM CRITERIA

THE PENSTOCK SHAFT HAS A VERTICAL DROP OF 600 FT. THE HORIZONTAL LENGTH OF APPROXIMATELY 200FT FROM THE INTAKE AND ANOTHER 200FT LEADING TO THE PH IS INCLUDED IN THE ABOVE TOTAL LENGHT.

CY OF CONCRETE	(1) VERTICAL SHAFT	4.45 CY/LF X 400	= 1780 CY
	(2) HORIZONTAL	4.45 CY/LF X 200	= 890 CY
	(3) ELBOWS (W/OB)	2 X 4022 CY	= 8044 CY

THE PENSTOCK SHAFT CONCRETE OPERATION WILL BE PERFORMED USING THE CREWS OUTLINED UNDER DIVERSION TUNNEL.

PROJECT: SUSITNA, ALASKA FILE # 1494X EST. OLB REV. RAM D
SUBJECT: TUNNEL CONCRETE DATE: FEB. 13, 1984

COST ANALYSIS

ITEM: PENSTOCK 24'ID SHAFT (LINING) QUANTITY: 1,000 LF

BACK UP COMPUTATIONS

VERTICAL SHAFT:
CY/POUR = 4.45 X 30 FT X 1.64 (OB) = 219 CY
POURING HOURS = 219 CY/(40 CY/HR X 50/60 X 0.85) = 7.73 HRS
ADVANCE RATE = 30 FT/3 SHIFT CYCLE (10 HR)

HORIZONTAL:
CY/POUR = 4.45 X 30 FT X 1.64 (OB) = 219 CY
POURING HOURS = 219 CY/(30 CY/HR X 50/60 X 0.85) = 10.31 HRS
ADVANCE RATE = 30 FT/3 SHIFT CYCLE (12 HR)

ELBOWS:
CY/POUR = 25.60 CY/LF X 10 FT X 1.0 = 256 CY
POURING HOURS = 256 CY/(30 CY/HR X 50/60 X 0.85) = 12.05 HRS
ADVANCE RATE = 10 FT/3 SHIFT CYCLE (12 HR)

CONSTRUCTION SCHEDULE :

(1) CURVES	200 LF/10	= 20 "	"
(2) VERTICAL SHAFT	400 LF/30	= 14	
(3) HORIZONTAL	400 LF/30	= 14 "	"
(4) DELAYS		2 CYCLES	
TOTAL CYCLES		50 CYCLES	

EQUIPMENT
OPERATING HOURS = 20 X 36 + 14 X 30 + 14 X 36 + 2 X 30
= 1704 HRS

PROJECT: SUSITNA,ALASKA
SUBJECT: TUNNEL CONCRETE

FILE # 1494X EST. OEB REV. RAM D
DATE: FEB. 13,1984

COST ANALYSIS

ITEM: PENSTOCK 24' ID SHAFT (LINING) QUANTITY: 1,000 LF

TUNNEL CONCRETE PARAMETERS:	LENGTH	1000.00	FT
	PERIMETER	75.40	FT
	CY/LF (AVG)	12.42	
	OVERBREAK FACTOR (INCLUDED)	1.00	
	FORM LENGHT	30.00	FT
	POURING RATE	30.00	CY/HR
	MINUTES/HR	50.00	
	EFFICIENCY FACTOR	0.85	
REINFORCING :	LBS/CY	110.00	
WORKING SCHEDULE :	SHIFTS/DAY	2.00	SHIFTS
	HOURS/SHIFT	10.00	HOURS

SCHEDULE PARAMETERS :	LEARNING CURVE	100.00	LF	50.00 %
	ALIGNMENT CURVE	200.00	LF	20.00 %
	CYCLE DELAYS			2.00 CYCLES

PROJECT: SUSITNA,ALASKA FILE # 1494X EST. UcB REV. RAM D
SUBJECT: TUNNEL CONCRETE DATE: FEB. 13,1984

COST ANALYSIS

ITEM: OUTLET TUNNEL 28 ID (LINING) QUANTITY: 2,100 LF

**** MANPOWER ****

CODE	ITEM/ACTIVITIES	QTY	UNIT	CREW	PF	MANHOURS	$/HR	TOTAL COST
1	CONCRETE PLACING	18612	CY	13.	1.00	7150	36.52	261,117
2	CLEANING	18612	CY	7.	1.00	4004	36.34	145,505
6	MAKING CURVED FORMS	22000	SF	15.	1.00	6606	38.48	254,198
3	STRIPPING	195000	SF	11.	1.00	6292	38.44	241,864
4	ERECTING STEEL FORMS	195000	SF	11.	1.00	6292	38.44	241,864
5	REINFORCING	1300000.	LBS	10.	1.00	6500	42.18	274,169
TOTAL MANHOURS & LABOR COST						36844		1,418,721

EQUIPMENT TYPE	NO.	OPR HOURS	DUTY	$/HR	TOTAL COST
CONC PUMP(100CY/HR)	1.00	572.00	0.80	50.00	22,879
VIBRATOR (EXTERNAL)	8.00	572.00	0.80	1.50	5,491
COMPRESSOR (600 CFM)	1.00	572.00	0.60	40.36	13,851
AGITATOR CARS	5.00	572.00	0.80	23.44	53,630
LOCO 25T	1.00	572.00	0.80	84.06	38,465
TOTAL EQUIPMENT COSTS					134,319

MATERIAL DESCRIPTION	QUANTITY	UNIT	$/UNIT	TOTAL COST
CONCRETE (AT SITE)	19500	CY	80.00	1,560,000
REINFORCING (110 LBS/CY	1300000	LBS	0.20	259,999
STEEL FORMS (40 FT/SET)	5000	SF	40.00	200,000
FORM HARDWARE & OIL	195000	SF	1.00	195,000
PLYWOOD (CURVED)	25000	SF	0.70	17,499
FORM LUMBER	55000	BF	0.40	21,999
WATER LINE	2100	LF	10.00	21,000
AIR LINE	2100	LF	10.00	21,000
ELECTRIC SUPPLIES	2100	LF	50.00	105,000
ST & S 10.% OF LABOR				141,872
TOTAL MATERIAL AND SUPPLIES COSTS				2,543,372

SUMMARY: ITEM	QUANTITY		LABOR	EQUIPMENT	M&S	TOTAL
OUTLET TUNNEL 28 ID (LIN	2100	LF	1418721	134319	2543372	4,096,412
UNIT COSTS			675.58	63.96	1211.13	1950.67

PROJECT: SUSITNA, ALASKA FILE # 1494X EST. Dcd REV. RAM D
SUBJECT: TUNNEL CONCRETE DATE: FEB. 13, 1984

COST ANALYSIS

ITEM: OUTLET TUNNEL 28 ID (LINING) QUANTITY: 2,100 LF

ITEM CRITERIA

THE OUTLET FACILITY TUNNEL AS SHOWN ON DRAWING WA SKC 403624 IS COMPOSED OF THE FOLLOWING COMPONENST: (DOES NOT INCLUDE GATE STRUCTURE)

CY OF CONCRETE	(1) HORINZONTAL	5.15 CY/LF X 100 =	515 CY
	(2) 2 ELBOWS	7.00 CY/LF X 250 =	1750
	(2) INCLINE	5.15 CY/LF X 280 =	1445 CY
	(3) SLOPING 8.0%	5.15 CY/LF X 1470=	7570 CY
	TOTAL (W/O OB)		11280 CY

THE PENSTOCK SHAFT CONCRETE OPERATION WILL BE PERFORMED USING THE CREWS OUTLINED UNDER DIVERSION TUNNELS IN ADDITION TO THE FORM MAKING CREW.

FORM MAKING -	1 FOREMAN
	10 CARPENTERS
	4 HELPERS
	15 MEN (AVG $ 38.48/HR)

PROJECT: SUSITNA,ALASKA FILE # 1494X EST. DcB REV. RAM D
SUBJECT: TUNNEL CONCRETE DATE: FEB. 13,1984

COST ANALYSIS

ITEM: OUTLET TUNNEL 28 ID (LINING) QUANTITY: 2,100 LF

BACK UP COMPUTATIONS

INCLINED 45 DEG SHAFT:
CY/POUR = 5.37 X 30 FT X 1.65 (OB) = 266 CY
POURING HOURS = 266 CY/(40 CY/HR X 50/60 X 0.85) = 9.39 HRS
ADVANCE RATE = 30 FT/3 SHIFT CYCLE (10 HR)

HORIZONTAL:
CY/POUR = 5.37 X 30 FT X 1.65 (OB) = 266 CY
POURING HOURS = 266 CY/(50 CY/HR X 50/60 X 0.85) = 7.51 HRS
ADVANCE RATE = 30 FT/3 SHIFT CYCLE (10 HR)

ELBOWS:
CY/POUR = 7.0 CY/LF X 20 FT X 1.65 = 231 CY
POURING HOURS = 231 CY/(30 CY/HR X 50/60 X 0.85) = 10.87 HRS
ADVANCE RATE = 20 FT/3 SHIFT CYCLE (12 HR)

SLOPING 8%:
CY/POUR = 5.37 X 40 X 1.65 (OB) = 355 CY
POURING HOURS = 355 CY/(60 CY/HR X 50/60 X 0.85) = 8.35 HRS
ADVANCE RATE = 40 FT/3 SHIFT CYCLE (10 HR)

CONSTRUCTION SCHEDULE :

(1) HORIZONTAL	100 LF/30	=	3 CYCLES
(1) ELBOWS	250 LF/20	=	13 " "
(2) INCLINE 45 DEG	280 LF/30	=	10
(3) SLOPING 8%	1470 LF/40	=	37 " "
(4) DELAYS			2 CYCLES
TOTAL CYCLES			65 CYCLES

EQUIPMENT
OPERATING HOURS = 3 X 30 + 13 X 12 + 10 X 30 + 37 X 30

PROJECT: SUSITNA,ALASKA FILE # 1494X EST. OLD REV. RAM D
SUBJECT: TUNNEL CONCRETE DATE: FEB. 13,1984

COST ANALYSIS

ITEM: OUTLET TUNNEL 28 ID (LINING) QUANTITY: 2,100 LF

TUNNEL CONCRETE PARAMETERS:	LENGTH		2100.00	FT
	PERIMETER		88.00	FT
	CY/LF (AVG)		5.37	
	OVERBREAK FACTOR (INCLUDED)		1.65	
	FORM LENGHT		40.00	FT
	POURING RATE		50.00	CY/HR
	MINUTES/HR		50.00	
	EFFICIENCY FACTOR		0.85	
REINFORCING :	LBS/CY		110.00	
WORKING SCHEDULE :	SHIFTS/DAY		2.00	SHIFTS
	HOURS/SHIFT		10.00	HOURS
SCHEDULE PARAMETERS :	LEARNING CURVE	100.00 LF	50.00	%
	CYCLE DELAYS		2.00	CYCLES

PROJECT: SUSITNA, ALASKA FILE # 1494X EST. GEO REV. RAM D
SUBJECT: TUNNEL CONCRETE DATE: FEB. 13, 1984

COST ANALYSIS

ITEM: OUTLET TUNNEL 28 ID (LINING) QUANTITY: 2,100 LF

2 X 30 = 1716 HRS

PROJECT: SUSITNA,ALASKA FILE # 1494X EST. OLD REV. RAM D
SUBJECT: TUNNEL CONCRETE DATE: FEB. 13,1984

COST ANALYSIS

ITEM: PENSTOCK 15'ID STEEL (LINING) QUANTITY: 400 LF

**** MANPOWER ****

CODE	ITEM/ACTIVITIES	QTY	UNIT	CREW	PF	MANHOURS	$/HR	TOTAL COST
1	CONCRETE PLACING	1020	CY	13.	1.00	1500	36.52	54,779
2	CLEANING	1020	CY	7.	1.00	840	36.34	30,525
	TOTAL MANHOURS & LABOR COST					2340		85,305

EQUIPMENT TYPE	NO.	OPR HOURS	DUTY	$/HR	TOTAL COST
CONC PUMP(100CY/HR)	1.00	60.00	0.80	50.00	2,399
VIBRATOR (EXTERNAL)	8.00	60.00	0.80	1.50	575
COMPRESSOR (600 CFM)	1.00	120.00	0.60	40.36	2,905
AGITATOR CARS	5.00	120.00	0.80	23.44	11,251
LOCO 25T	1.00	120.00	0.80	84.06	8,069
TOTAL EQUIPMENT COSTS					25,202

MATERIAL DESCRIPTION	QUANTITY	UNIT	$/UNIT	TOTAL COST
CONCRETE (AT SITE)	2040	CY	80.00	163,200
STEEL LINER	300000	LBS	2.50	750,000
WATER LINE	400	LF	10.00	4,000
AIR LINE	400	LF	10.00	4,000
ELECTRIC SUPPLIES	400	LF	50.00	20,000
ST & S 10.% OF LABOR				8,530
TOTAL MATERIAL AND SUPPLIES COSTS				949,730

SUMMARY: ITEM	QUANTITY	LABOR	EQUIPMENT	M&S	TOTAL
PENSTOCK 15'ID STEEL (LIN	400 LF	85305	25202	949730	1,060,237
UNIT COSTS		213.26	63.01	2374.32	2650.59

PROJECT.-SUSITNA,ALASKA FILE # 1494X EST. 6cd REV. RAM D
SUBJECT: TUNNEL CONCRETE DATE: FEB. 13,1984

COST ANALYSIS

ITEM: PENSTOCK 15'ID STEEL (LINING) QUANTITY: 400 LF

ITEM CRITERIA

THE SIX 15'ID STEEL LINED PENSTOCKS LEADING FROM THE POWER INTAKE TUNNEL TO THE POWERHOUSE IS APROXIMATELY 200 FT LONG.

CY OF CONCRETE (1) HORIZONTAL 2.88 CY/LF X 200 = 576 CY

THE PENSTOCK SHAFT CONCRETE OPERATION WILL BE PERFORMED USING THE CREWS OUTLINED FOR THE DIVERSION TUNNEL.

PROJECT: SUSITNA,ALASKA FILE # 1494X EST. Old REV. RAM D
SUBJECT: TUNNEL CONCRETE DATE: FEB. 13,1984

COST ANALYSIS

ITEM: PENSTOCK 15'ID STEEL (LINING) QUANTITY: 400 LF

BACK UP COMPUTATIONS

HORIZONTAL:
CY/POUR = 2.88 X 40 FT X 1.77 (OB) = 205 CY
POURING HOURS = 205 CY/(50 CY/HR X 50/60 X 0.85) = 5.76 HRS
ADVANCE RATE = 40 FT/3 SHIFT CYCLE (10 HR)

CONSTRUCTION SCHEDULE :

(1) HORIZONTAL	200 LF/40	= 5 "	"
(4) DELAYS		1 CYCLES	
TOTAL CYCLES		6 CYCLES	

EQUIPMENT
OPERATING HOURS = 6 X 30 = 180 HRS X 2 = 360 HRS

PROJECT: SUSITNA,ALASKA FILE # 1494X EST. 6th REV. RAM D
SUBJECT: TUNNEL CONCRETE DATE: FEB. 13,1984

COST ANALYSIS

ITEM: PENSTOCK 15'ID STEEL (LINING) QUANTITY: 400 LF

TUNNEL CONCRETE PARAMETERS:	LENGTH	200.00 FT
	PERIMETER	47.12 FT
	CY/LF (AVG)	2.88
	OVERBREAK FACTOR (INCLUDED)	1.77
	FORM LENGHT	40.00 FT
	POURING RATE	50.00 CY/HR
	MINUTES/HR	50.00
	EFFICIENCY FACTOR	0.85
REINFORCING :	LBS/CY	110.00
WORKING SCHEDULE :	SHIFTS/DAY	2.00 SHIFTS
	HOURS/SHIFT	10.00 HOURS

SCHEDULE PARAMETERS :

CYCLE DELAYS	2.00 CYCLES

PROJECT: SUSITNA,ALASKA FILE # 1494X EST. DEB REV. L LEVY
SUBJECT: TUNNEL CONCRETE DATE: FEB. 24,1984

COST ANALYSIS

ITEM: TUNNEL SLAB CONCRETE QUANTITY: 1,690 CY

**** MANPOWER ****

CODE	ITEM/ACTIVITIES	QTY	UNIT	CREW	PF	MANHOURS	$/HR	TOTAL COST
1	CONCRETE PLACING	1690	CY	13.	1.00	700	36.52	25,563
2	CLEANING	1690	CY	7.	1.00	828	36.34	30,089
5	REINFORCING	152100	LBS	10.	1.00	760	42.18	32,056
	TOTAL MANHOURS & LABOR COST					2288		87,710

EQUIPMENT TYPE	NO.	OPR HOURS	DUTY	$/HR	TOTAL COST
CONC PUMP(100CY/HR)	1.00	56.00	0.80	50.00	2,239
VIBRATOR (EXTERNAL)	8.00	56.00	0.80	1.50	537
COMPRESSOR (600 CFM)	1.00	56.00	0.60	40.36	1,356
AGITATOR CARS	5.00	56.00	0.80	23.44	5,250
LOCO 25T	1.00	56.00	0.80	84.06	3,765
TOTAL EQUIPMENT COSTS					13,150

MATERIAL DESCRIPTION	QUANTITY	UNIT	$/UNIT	TOTAL COST
CONCRETE (AT SITE)	1775	CY	80.00	142,000
REINFORCING (110 LBS/CY	160000	LBS	0.20	31,999
LUMBER	2000	BF	0.40	799
WATER LINE	870	LF	10.00	8,700
AIR LINE	870	LF	10.00	8,700
ELECTRIC SUPPLIES	870	LF	50.00	43,500
ST & S 10.% OF LABOR				8,771
TOTAL MATERIAL AND SUPPLIES COSTS				244,470

SUMMARY: ITEM	QUANTITY	LABOR	EQUIPMENT	M&S	TOTAL
TUNNEL SLAB CONCRETE	1690 CY	87710	13150	244470	345,330
UNIT COSTS		51.90	7.78	144.66	204.34

PROJECT: SUSITNA, ALASKA
SUBJECT: TUNNEL CONCRETE

FILE # 1494X EST. OEB REV. L LEVY
DATE: FEB. 24, 1984

COST ANALYSIS

ITEM: TUNNEL SLAB CONCRETE QUANTITY: 1,690 CY

BACK UP COMPUTATIONS

CY = 1690 CY X 1.33 (OB) = 2248 CY

POURING HOURS = 2248 CY/(60 CY/HR X 50/60 X 0.90) = 50.00 HRS

CONSTRUCTION SCHEDULE :

(1) SLAB	50 HRS	= 50 HRS "
(2) DELAYS	6 HRS	= 6 HRS
TOTAL		56 HRS

EQUIPMENT
OPERATING HOURS = 56

PROJECT: SUSITNA, ALASKA
SUBJECT: TUNNEL CONCRETE

FILE # 1494X EST. OLD REV. L LEVY
DATE: FEB. 24, 1984

COST ANALYSIS

ITEM: TUNNEL SLAB CONCRETE QUANTITY: 1,690 CY

ITEM CRITERIA

THE TUNNEL SLAB WILL BE USED AS THE INVERT OF THE ACCESS TUNNEL

WORKING SCHEDULE :	SHIFTS/DAY	2.00
	HOURS/SHIFT	10.00
	MINUTES/HOURS	50.00
MATERIAL PARAMETERS :	CONCRETE WASTE	5.00 %
	ADDITIONAL REINFORCING	.00 %
	PLYWOOD NUMBER OF USES	.00
	LUMBER BF/SF	.00
	NUMBER OF STEEL SETS	.00
SCHEDULE PARAMETERS :	DELAYS IN CYCLES	2.0

SECTION DESCRIPTION	CY/LF	TOTAL LENGHT	FORM LENGHT	POUR CY/HR	OB	EFF.R FACTOR	REBAR LBS/CY
BASE SLAB	1690.	CY		60.		.90	90.

PROJECT: SUSITNA, ALASKA FILE # 1494X EST. Oct REV. L LEVY
SUBJECT: TUNNEL CONCRETE DATE: FEB. 24, 1984

COST ANALYSIS

ITEM: PENSTOCK ACCESS PLUG QUANTITY: 7,275 CY

**** MANPOWER ****

CODE	ITEM/ACTIVITIES	QTY	UNIT	CREW	PF	MANHOURS	$/HR	TOTAL COST
1	CONCRETE PLACING	7275	CY	13.	1.00	2750	36.52	100,429
2	CLEANING	7275	CY	7.	1.00	1540	36.34	55,963
5	REINFORCING	145500	LBS	10.	1.00	727	42.18	30,664
	TOTAL MANHOURS & LABOR COST					5017		187,058

EQUIPMENT TYPE	NO.	OPR HOURS	DUTY	$/HR	TOTAL COST
CONC PUMP(100CY/HR)	1.00	220.00	0.80	50.00	8,799
VIBRATOR (EXTERNAL)	8.00	220.00	0.80	1.50	2,111
COMPRESSOR (600 CFM)	1.00	220.00	0.60	40.36	5,327
AGITATOR CARS	5.00	220.00	0.80	23.44	20,627
LOCO 25T	1.00	220.00	0.80	84.06	14,794
TOTAL EQUIPMENT COSTS					51,661

MATERIAL DESCRIPTION	QUANTITY	UNIT	$/UNIT	TOTAL COST
CONCRETE (AT SITE)	7639	CY	80.00	611,120
REINFORCING	152775	LBS	0.20	30,554
FORM LUMBER	10000	BF	0.40	3,999
WATER LINE	300	LF	10.00	3,000
AIR LINE	300	LF	10.00	3,000
ELECTRIC SUPPLIES	300	LF	50.00	15,000
ST & S 10.% OF LABOR				18,705
TOTAL MATERIAL AND SUPPLIES COSTS				685,380

SUMMARY: ITEM	QUANTITY		LABOR	EQUIPMENT	M&S	TOTAL
PENSTOCK ACCESS PLUG	7275	CY	187056	51661	685380	924,099
UNIT COSTS			25.71	7.10	94.21	127.02

PROJECT: SUSITNA, ALASKA
SUBJECT: TUNNEL CONCRETE

FILE # 1494X EST. UCB REV. L LEVY
DATE: FEB. 24, 1984

COST ANALYSIS

ITEM: PENSTOCK ACCESS PLUG QUANTITY: 7,275 CY

BACK UP COMPUTATIONS

CY/POUR = 7275 X 1.33 (OB) = 9676 CY

POURING HOURS = 9676 CY/(60 CY/HR X 50/60 X 0.90) = 215. HRS

CONSTRUCTION SCHEDULE :

(1) CONCRETE PLUG	=	215 HRS
(2) DELAYS	=	5 HRS
TOTAL		220 HRS

EQUIPMENT
OPERATING HOURS = 220 HRS

PROJECT: SUSITNA, ALASKA
SUBJECT: TUNNEL CONCRETE

FILE # 1494X EST. Ucd REV. L LEVY
DATE: FEB. 24, 1984

COST ANALYSIS

ITEM: PENSTOCK ACCESS PLUG QUANTITY: 7,275 CY

ITEM CRITERIA

WORKING SCHEDULE :	SHIFTS/DAY	2.00
	HOURS/SHIFT	10.00
	MINUTES/HOURS	50.00
MATERIAL PARAMETERS :	CONCRETE WASTE	5.00 %
	ADDITIONAL REINFORCING	5.00 %
	PLYWOOD NUMBER OF USES	0.00
	LUMBER BF/SF	0.00
	NUMBER OF STEEL SETS	0.00
SCHEDULE PARAMETERS :	DELAYS IN CYCLES	2.0

SECTION DESCRIPTION	CY/LF	TOTAL LENGHT	FORM LENGHT	POUR CY/HR	OB	EFF.R FACTOR	REBAR LBS/CY
PLUG	7275. CY			60.		.90	20

PROJECT: JUSITNA, ALASKA FILE # 1494X EST. OLJ REV. L LEVY
SUBJECT: TUNNEL CONCRETE DATE: FEB. 24, 1984

COST ANALYSIS

ITEM: ACCESS SHAFT LINING 20'ID QUANTITY: 740 LF

**** MANPOWER ****

CODE	ITEM/ACTIVITIES	QTY	UNIT	CREW	PF	MANHOURS	$/HR	TOTAL COST
1	CONCRETE PLACING	2775	CY	13.	1.00	2900	36.52	105,907
2	CLEANING	2775	CY	7.	1.00	1624	36.34	59,016
3	STRIPPING	46500	SF	11.	1.00	2552	38.44	98,098
4	ERECTING STEEL FORMS	46500	SF	11.	1.00	2552	38.44	98,098
5	REINFORCING	333000	LBS	10.	1.00	1665	42.18	70,229
TOTAL MANHOURS & LABOR COST						11293		431,351

EQUIPMENT TYPE	NO.	OPR HOURS	DUTY	$/HR	TOTAL COST
CONC PUMP(100CY/HR)	1.00	232.00	0.80	50.00	9,279
VIBRATOR (EXTERNAL)	8.00	232.00	0.80	1.50	2,227
COMPRESSOR (600 CFM)	1.00	232.00	0.60	40.36	5,618
AGITATOR CARS	5.00	232.00	0.80	23.44	21,752
LOCO 25T	1.00	232.00	0.80	84.06	15,601
TOTAL EQUIPMENT COSTS					54,479

MATERIAL DESCRIPTION	QUANTITY	UNIT	$/UNIT	TOTAL COST
CONCRETE (AT SITE)	4100	CY	80.00	328,640
REINFORCING (120 LBS/CY	349650	LBS	0.20	69,929
STEEL FORMS (30 FT/SET)	1885	SF	40.00	75,400
FORM HARDWARE & OIL	46500	SF	1.00	46,500
FORM LUMBER	10000	BF	0.40	3,999
WATER LINE	740	LF	10.00	7,400
AIR LINE	740	LF	10.00	7,400
ELECTRIC SUPPLIES	740	LF	50.00	37,000
ST & S 10.% OF LABOR				43,135
TOTAL MATERIAL AND SUPPLIES COSTS				619,405

SUMMARY: ITEM	QUANTITY		LABOR	EQUIPMENT	M&S	TOTAL
ACCESS SHAFT LINING 20'ID	740	LF	431351	54479	619405	1,105,235
UNIT COSTS			582.91	73.62	837.03	1493.56

PROJECT: SUSITNA, ALASKA
SUBJECT: TUNNEL CONCRETE

FILE # 1494X EST. UEB REV. L LEVY
DATE: FEB. 24, 1984

COST ANALYSIS

ITEM: ACCESS SHAFT LINING 20' ID QUANTITY: 740 LF

BACK UP COMPUTATIONS

CY/POUR = 3.75 X 30 FT X 1.41 (OB) = 159 CY

POURING HOURS = 159 CY/(45 CY/HR X 50/60 X 0.80) = 5.30 HRS

ADVANCE RATE = 30 FT/3 SHIFT CYCLE (8 HR/CYCLE)

CONSTRUCTION SCHEDULE :

(1) REMAINING	740 LF/30	= 25 " "
(2) DELAYS		4 CYCLES
TOTAL CYCLES		29 CYCLES

EQUIPMENT
OPERATING HOURS = 29 X 24 = 696 HRS

PROJECT: SUSITNA, ALASKA FILE # 1494X EST. DLB REV. L LEVY
SUBJECT: TUNNEL CONCRETE DATE: FEB. 24, 1984

COST ANALYSIS

ITEM: ACCESS SHAFT LINING 20'ID QUANTITY: 740 LF

ITEM CRITERIA

TUNNEL PARAMETERS :		LENGTH	740.00 FT
		INSIDE DIAMETER	20.00 FT
		EXCAVATED DIAMETER	23.00 FT
		SHAPE FACTOR	1.00
		INVERT-SPRINGLINE	
		INVERT-CROWN	
		WIDTH	
	(HORSESHOE)	LINING THICKNESS	18.00 IN
WORKING SCHEDULE :		SHIFTS/DAY	2.00
		HOURS/SHIFT	10.00
		MINUTES/HOURS	50.00
MATERIAL PARAMETERS :		CONCRETE WASTE	5.00 %
		ADDITIONAL REINFORCING	5.00 %
		PLYWOOD NUMBER OF USES	4.00
		LUMBER BF/SF	2.00
		NUMBER OF STEEL SETS	1.00
SCHEDULE PARAMETERS :		DELAYS IN CYCLES	2.0

SECTION DESCRIPTION	CY/LF	TOTAL LENGHT	FORM LENGHT	POUR CY/HR	OB	EFF.R FACTOR	REBAR LBS/CY
20'ID SHAFT		740.	20.	45.		.80	170.

PROJECT: SUSITNA,ALASKA FILE # 1494X EST. DLB REV. L LEVY
SUBJECT: TUNNEL CONCRETE DATE: FEB. 24,1984

COST ANALYSIS

ITEM: BUS SHAFT 9.0' DIA QUANTITY: 560 LF

**** MANPOWER ****

CODE	ITEM/ACTIVITIES	QTY	UNIT	CREW	PF	MANHOURS	$/HR	TOTAL COST
1	CONCRETE PLACING	476	CY	13.	1.00	1600	36.52	58,431
2	CLEANING	476	CY	7.	1.00	896	36.34	32,560
3	STRIPPING	15800	SF	11.	1.00	1408	38.44	54,123
4	ERECTING STEEL FORMS	15800	SF	11.	1.00	1408	38.44	54,123
5	REINFORCING	57120	LBS	10.	1.00	285	42.18	12,021
	TOTAL MANHOURS & LABOR COST					5597		211,260

EQUIPMENT TYPE	NO.	OPR HOURS	DUTY	$/HR	TOTAL COST
CONC PUMP(100CY/HR)	1.00	128.00	0.80	50.00	5,119
VIBRATOR (EXTERNAL)	8.00	128.00	0.80	1.50	1,228
COMPRESSOR (600 CFM)	1.00	128.00	0.60	40.36	3,099
AGITATOR CARS	5.00	128.00	0.80	23.44	12,001
LOCO 25T	1.00	128.00	0.80	84.06	8,607
TOTAL EQUIPMENT COSTS					30,057

MATERIAL DESCRIPTION	QUANTITY	UNIT	$/UNIT	TOTAL COST
CONCRETE (AT SITE)	950	CY	80.00	76,000
REINFORCING (110 LBS/CY	60000	LBS	0.20	11,999
STEEL FORMS (40 FT/SET)	1131	SF	40.00	45,240
FORM HARDWARE & OIL	15834	SF	1.00	15,834
FORM LUMBER	3000	BF	0.40	1,199
WATER LINE	560	LF	10.00	5,600
AIR LINE	560	LF	10.00	5,600
ELECTRIC SUPPLIES	560	LF	50.00	28,000
ST & S 10.% OF LABOR				21,126
TOTAL MATERIAL AND SUPPLIES COSTS				210,599

SUMMARY: ITEM	QUANTITY		LABOR	EQUIPMENT	M&S	TOTAL
BUS SHAFT 9.0' DIA	560	LF	211260	30057	210599	451,916
UNIT COSTS			377.25	53.67	376.07	806.99

PROJECT: SUSITNA, ALASKA
SUBJECT: TUNNEL CONCRETE

FILE # 1494X EST. DLB REV. L LEVY
DATE: FEB. 24, 1984

COST ANALYSIS

ITEM: BUS SHAFT 9.0' DIA QUANTITY: 560 LF

BACK UP COMPUTATIONS

CY/POUR = 0.85 X 40 FT X 1.90 (OB) = 65 CY

POURING HOURS = 65 CY/(30 CY/HR X 50/60 X 0.80) = 4.85 HRS

ADVANCE RATE = 40 FT/3 SHIFT CYCLE (8HRS/CYCLE)

CONSTRUCTION SCHEDULE :

(1) REMAINING	560 LF/40	= 14 " "
(2) DELAYS		2 CYCLES
TOTAL CYCLES		16 CYCLES

EQUIPMENT
OPERATING HOURS = 16 X 24 = 384 HRS

PROJECT: SUSITNA, ALASKA FILE # 1494X EST. Ucb REV. L LEVY
SUBJECT: TUNNEL CONCRETE DATE: FEB. 24, 1984

COST ANALYSIS

ITEM: BUS SHAFT 9.0' DIA QUANTITY: 560 LF

ITEM CRITERIA

TUNNEL PARAMETERS :		LENGTH	560.00 FT
		INSIDE DIAMETER	9.00 FT
		EXCAVATED DIAMETER	10.50 FT
		SHAPE FACTOR	1.00
		INVERT-SPRINGLINE	
		INVERT-CROWN	
		WIDTH	
	(HORSESHOE)	LINING THICKNESS	9.00 IN
WORKING SCHEDULE :		SHIFTS/DAY	2.00
		HOURS/SHIFT	10.00
		MINUTES/HOURS	50.00
MATERIAL PARAMETERS :		CONCRETE WASTE	5.00 %
		ADDITIONAL REINFORCING	5.00 %
		LUMBER BF/SF	2.00
		NUMBER OF STEEL FORM	1.00
SCHEDULE PARAMETERS :		DELAYS IN CYCLES	2.0

SECTION DESCRIPTION	CY/LF	TOTAL LENGHT	FORM LENGHT	POUR CY/HR	OB	EFF.R FACTOR	REBAR LBS/CY
9.0'ID SHAFT		560.	40.	20.		.80	120.

PROJECT: SUSITNA,ALASKA FILE # 1494X EST. [illegible] REV. L LEVY
SUBJECT: SURGE CHAMBER DATE: FEB. 24,1984

COST ANALYSIS

SUMMARY: ITEM	QUANTITY	LABOR	EQUIPMENT	M&S	TOTAL
SURGE CHAMBER CONCRETE	5100 CY	842815	117411	963541	1,923,767
UNIT COSTS		165.26	23.02	188.93	377.21

MANPOWER SUMMARY

ACTIVITY	QUANTITY	CREW	MANHOURS	QTY/MH	$/UNIT	DAYS
CONCRETE PLACING	5,100 CY	13.	6250	0.82	44.75	50
CLEANING	5,100 CY	7.	3500	1.46	24.94	50
STRIPPING	86,000 SF	11.	5500	15.64	2.46	50
ERECTING STEEL FORMS	86,000 SF	11.	5500	15.64	2.46	50
REINFORCING	306,000 LBS	10.	1530	200.00	0.21	15
TOTAL MANHOURS			22280			

NOTE : DAYS BASED ON 10 HRS SHIFTS

PROJECT: SUSITNA,ALASKA FILE # 1494X EST. OLD REV. L LEVY
SUBJECT: SURGE CHAMBER DATE: FEB. 24,1984

COST ANALYSIS

EQUIPMENT SUMMARY

DESCRIPTION	UNIT COST $/HR TOTAL	LABOR	CREW	TOTALS OPR HRS	MANHOURS	COST
COMPRESSOR (600 CFM)	40.36	13.60	39.09	299	104	12107
CONC PUMP(100CY/HR)	50.00	20.00	39.09	399	204	19999
VIBRATOR (EXTERNAL)	1.50	0.60	39.09	3199	49	4799
AGITATOR CARS	23.44	1.46	39.09	1999	74	46879
LOCO 25T	84.06	17.39	39.09	399	177	33623
TOTALS				6295	608	117407

PROJECT: SUSITNA, ALASKA FILE # 1494X EST. CJB REV. L LEVY
SUBJECT: SURGE CHAMBER DATE: FEB. 24, 1984

COST ANALYSIS

ITEM: SURGE CHAMBER CONCRETE QUANTITY: 5,100 CY

**** MANPOWER ****

CODE	ITEM/ACTIVITIES	QTY	UNIT	CREW	PF	MANHOURS	$/HR	TOTAL COST
1	CONCRETE PLACING	5100	CY	13.	1.00	6250	36.52	228,249
2	CLEANING	5100	CY	7.	1.00	3500	36.34	127,189
3	STRIPPING	86000	SF	11.	1.00	5500	38.44	211,419
4	ERECTING STEEL FORMS	86000	SF	11.	1.00	5500	38.44	211,419
5	REINFORCING	306000	LBS	10.	1.00	1530	42.18	64,535
TOTAL MANHOURS & LABOR COST						22280		842,815

EQUIPMENT TYPE	NO.	OPR HOURS	DUTY	$/HR	TOTAL COST
CONC PUMP(100CY/HR)	1.00	500.00	0.80	50.00	19,999
VIBRATOR (EXTERNAL)	8.00	500.00	0.80	1.50	4,799
COMPRESSOR (600 CFM)	1.00	500.00	0.60	40.36	12,107
AGITATOR CARS	5.00	500.00	0.80	23.44	46,879
LOCO 25T	1.00	500.00	0.80	84.06	33,623
TOTAL EQUIPMENT COSTS					117,411

MATERIAL DESCRIPTION	QUANTITY	UNIT	$/UNIT	TOTAL COST
CONCRETE (AT SITE)	7500	CY	80.00	600,000
REINFORCING (60 LBS/CY	321300	LBS	0.20	64,259
PREFAB FORMS	200	SET	800.00	160,000
LUMBER	15000	BF	0.40	5,999
WATER LINE	350	LF	20.00	7,000
AIR LINE	350	LF	20.00	7,000
ELECTRIC SUPPLIES	350	LF	100.00	35,000
ST & S 10.% OF LABOR				84,281
TOTAL MATERIAL AND SUPPLIES COSTS				963,541

SUMMARY: ITEM	QUANTITY		LABOR	EQUIPMENT	M&S	TOTAL
SURGE CHAMBER CONCRETE	5100	CY	842815	117411	963541	1,923,767
UNIT COSTS			165.26	23.02	188.93	377.21

PROJECT: SUSITNA,ALASKA FILE # 1494X EST. OLD REV. L LEVY
SUBJECT: SURGE CHAMBER DATE: FEB. 24,1984

COST ANALYSIS

ITEM: SURGE CHAMBER CONCRETE QUANTITY: 5,100 CY

BACK UP COMPUTATIONS

CY = 5100 CY X 1.40 (OB) = 7140 CY

POURING HOURS = 7140 CY/(20 CY/HR X 50/60 X 0.90) = 476. HRS

CONSTRUCTION SCHEDULE :

(1)	WALL CONCRETE	= 476 HRS "
(2)	DELAYS	= 24 HRS
	TOTAL	500 HRS

EQUIPMENT
OPERATING HOURS = 500

PROJECT: SUSITNA, ALASKA
SUBJECT: SURGE CHAMBER

FILE # 1494X EST. DLB REV. L LEVY
DATE: FEB. 24, 1984

COST ANALYSIS

ITEM: SURGE CHAMBER CONCRETE QUANTITY: 5,100 CY

ITEM CRITERIA

WORKING SCHEDULE :	SHIFTS/DAY	2.00
	HOURS/SHIFT	10.00
	MINUTES/HOURS	50.00
MATERIAL PARAMETERS :	CONCRETE WASTE	5.00 %
	ADDITIONAL REINFORCING	5.00 %
	LUMBER BF/SF	2.00
	PREFAB FORMS SETS	200.00
SCHEDULE PARAMETERS :	DELAYS IN CYCLES	2.0

SECTION DESCRIPTION	TOTAL CY/LF	LENGHT	FORM LENGHT	POUR CY/HR	OB	EFF.R FACTOR	REBAR LBS/CY
WALL CONCRETE	5100.	CY		20.		.90	60.