PETROTOMICS COMPANY

P.O. BOX 8509, SHIRLEY BASIN, WY TELEPHONE: (307) 234-9341

June 26, 1989

Mr. Edward F. Hawkins
Licensing Branch 1
U.S. Nuclear Regulatory Commission
Uranium Recovery Field Office, RIV
P.O. Box 25325
Denver, CO 80225

Ref: License Condition 23 - Source Materials License SUA-331

In accordance with the requirements in License Condition 22 and 10 CFR 40, Appendix A, Criteria 9 and 10, an annual update of the surety arrangement must be submitted to NRC 90 days prior to our designated anniversary date of October 1.

As you know, Petrotomics is currently in the process of revising its reclamation plan. We have been told the approval of our plan is imminent. Upon approval of that plan we will be required to submit a proposed revision to the financial surety in accordance with the requirements in License Condition 22.

The current bond as specified in License Condition 23 is $1,920,515. There have been no changes in the current approved reclamation plan nor have there been any additional disturbances in the bonded area. Petrotomics proposes to update the surety amount by a factor of 1.05 (the increase in the Consumer Price Index from March 1988 to March 1989). The bonded amount for the NRC area at Petrotomics would increase by $96,027 to a total of $2,016,572. The supporting documentation has not changed for the current approved reclamation plan.

This submittal was discussed with you on June 22, and Mr. Rose on June 26, 1989.

Please find enclosed a check for $150.00 for the amendment application fee as required by paragraph 170.31 of Part 170.

Should there be any questions please feel free to contact me at (307) 356-4341.

Sincerely,

Stephen J. Pfaff

Stephen J. Pfaff
Radiation Coordinator

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PETROTOMICS

ESTIMATED COST FOR RECLAMATION

NRC LICENSE SUA-551
CONDITION NO. 23

JANUARY, 1990

PETROTOMICS COMPANY
ESTIMATED COST FOR RECLAMATION
SUMMARY

1.	Facility Decommissioning	$ 30,652
2.	Groundwater Restoration and Well Plugging	$ 159,642
3.	Interim Stabilization of Tailings During the Drying-out Phase	- 0 -
4.	Tailings Impoundment Area Reclamation	$2,598,534
5.	Radiological Survey and Environmental Monitoring	$ 212,642
6.	Project Management and Miscellaneous	$1,082,950
7.	Labor and Equipment Overhead, Contractor Profit	- 0 -
	Subtotal	$4,084,420
8.	Long Term Surveillance and Control Fee	$ 463,750
9.	Contingencies	
	A. Engineering	$ 612,663
	B. Contract Administration	$ 408,442
	Estimated Total Cost	$5,569,275

PETROTOMICS COMPANY

ESTIMATED COST FOR RECLAMATION

1. Facility Decommissioning

o Salvageable building and equipment decontamination - None.

Petrotomics Mill was decommissioned in 1985. Minor salvage only is anticipated from the remaining office complex. Costs are estimated under non-salvageable buildings below.

o Non-Salvageable building and equipment disposal.

Four one-story sheet metal buildings remain in the office complex. In addition, two small building foundations remain.

	CF	SF	CY	
Office	42,841	4,284	53	concrete
Accounting	37,639	3,764	47	concrete
Warehouse	33,472	3,347	41	concrete
Shop	21,913	1,725	21	concrete
Foundations only-2 each		9,005	112	concrete
Total	135,865	22,125	274	

Demolish & bury buildings.
Unit cost (Appendix. Section B.1) - $0.082/CF
135,865 CF X $0.082/CF = $ 11,141

Light building foundation demolition.
Unit cost (Appendix. Section B.1) - $0.052/SF
22,125 SF X $0.052/SF = $ 1,151

Removal of electrical power distribution system.
Unit cost (Appendix. Section B.1) - $0.85/LF
21,600 LF X $0.85/LF = $ 18,360

Subtotal Non-salvageable buildings/equipment $ 30,652

o Restoration of contaminated areas.

Reclamation of the ore storage pad was completed in 1988. Clean cover was placed on the process area in 1985. Removal of contaminated soil, topsoil placement and revegetation of 27.5 acres located north of the process area was completed in 1988. An additional 12.5 acres was cleaned up in 1986.

Remaining cover material, contouring, topsoil and revegetation for the process area and office complex area are included under Item 4. - Tailings Impoundment Area Reclamation. Also included under Item 4 is 143,000 cubic yards estimated excavation and cleanup required outside of the tailings area which will be used in shaping the tailings area. Cleanup of access roads and the East drainage basin cleanup is included in this quantity.

Placement of topsoil and revegetation for remaining cleanup areas is included in Item 4.

Subtotal Section 1. Facility Decommissioning $ 30,652

2. Ground-water Restoration and Well Plugging

o Method of restoration

The corrective action program is continuing in accordance with License Condition 47C. Three additional wells will be installed in the down-gradient area early in 1990.

Pumping is planned for eight wells north of the tailings (seepage, 51-SC, 54-SC, PT-6, PT-7, 58-SC, 59-SC, and 60-SC). Wells 55-SC, 56-SC, and 57-SC, completed in 1989 encountered little or no saturation and are not pumpable.

It is anticipated that corrective action will be complete about mid - 1992.

The Stage I and II clay-lined evaporation ponds have been completed in the tailings area and are in operation, as is the enhanced evaporation system.

In addition, tailings dewatering is anticipated to be continued with about 12 wells (8 existing, 4 additional in early 1990).

o Volume of aquifer, pumping cycles, and cycling time.

Full data concerning the upper sand is not currently known. Recent reported data, October 1989, indicates substantially less saturation than previously estimated. There are indications that the fluid may consist of leachate only in the downgradient area of the upper sand. The basis of this corrective action estimate is a plan to continue pumping from tailings and from upper sand until the pumpable water is removed. Four and one-half years (until mid 1992) are estimated for multiple well pumping. The seepage collection system in the upper sand will have been pumped for about 11 years.

It is anticipated, as the annual reviews and interim reports are developed in accordance with License Condition 47D, that modifications to the corrective action plan may be made.

o Labor and equipment cost estimate - corrective action

Install three upper sand wells.
Est. unit cost (Appendix Section B.2) - $3,780/well
3 X $3,780 = $ 11,340

Install four tailings wells
Est. unit cost (Appendix B.2) - $1,448/well
4 X $1,448 = $ 5,792

Well and enhanced evaporation operation and maintenance
Est. unit cost (Appendix B.2) - $42,541/yr.
Est remaining time requirement - 2.5 years
2.5 years X $42,541/yr. = $106,353

Subtotal labor/equipment $123,485

o Verification Sample Analysis

It is anticipated that verification sampling and testing would be performed over approximately a six month period in accordance with License Condition 47A requirements for constituents. A full set of constituents would be analyzed at the beginning, middle and end of the six month period to determine verification.

Twenty five wells - sampled three times
Est. unit cost (Appendix Section B.4) - $ 281.04
25 wells X 3 = 75 samples
75 samples X $281.04/sample = $ 21,078

o Well Plugging

The anticipated number of wells to be plugged is 51. Depths range from 19 feet to 400 feet. Well casing size ranges from two inch to six inch. Total footage to be plugged is about 5,960 LF.

Est. unit cost (Appendix Section B.2) - $ 2.53/LF
5960 LF X $2.53/LF = $ 15,079

o Estimated total cost - Ground-water restoration completion

Subtotal Section 2. Groundwater Restoration and Well Plugging **$159,642**

3. Interim Stabilization of Tailings During the Drying-out Phase

The drying of surface water on the tailings was substantially complete in December, 1987. Final interim soil cover placement was completed in 1988.

Operation and maintenance costs for the enhanced evaporation system, and seepage control cost, are included in Item 2 above.

4. Tailings Impoundment Area Reclamation

Estimated costs of work required to complete reclamation of the area are computed below. Estimated unit costs for this work are developed in Appendix Sections A and B.4.

o Shaping, grading, and cover material.

Tailings excavation and shaping.

Est. quantity of 57,000 CY remain.
Est. unit cost (Appendix Section B.4 and Table B.4-1) = $0.57/CY
57,000 CY X $0.57/CY = $ 32,490

Outside excavation and clean-up.

Est. quantity of 143,000 CY
Est. unit cost = $0.72/CY
143,000 CY X $0.72/CY = $102,960

Borrow to complete shaping.

Est. quantity of 50,000 CY
Est. unit cost = $0.63/CY
50,000 CY X $0.63/CY = $ 31,500

Excavate and place clay cover.

106 acres remain to be completed, thickness 61 Cm.
Obtain cover material from clay stockpile.

Est. quantity of 343,000 CY
Est. unit cost = $0.77/CY
343,000 CY X $0.77/CY = $264,110

Regrade and recompact surface of clay cover.

145 acres of the clay cover to regrade and recompact, .5' average thickness.

Est. quantity of 117,000 CY
Est. unit cost = $0.33/CY
117,000 CY X $0.33/CY = $38,610

Excavate and place silty-sand cover.

145 acres to be covered, thickness 62 Cm. Obtain the cover material from the north channel, southwest channel and southwest borrow area.

Est. quantity of 476,000 CY
Est. unit cost = $0.88/CY
476,000 CY X $0.88/CY = $418,880

Excavate and place topsoil on tailing area.

137.1 acres to be covered, thickness 25 Cm. Obtain topsoil from topsoil piles #8 and #9 directly west of the tailings area.

Est. quantity of 182,000 CY
Est. unit cost = $0.76/CY
182,000 CY X $0.76/CY = $138,320

Dam Outslope Shaping.

Cut the existing tailings dam to the designed configuration.

Est. quantity of 532,000 CY
Est. unit cost = $0.47/CY
532,000 CY X $0.47/CY = $250,040

East Drainage Basin Shaping.

Fill the bottom to elevation 7085 and shape the slope into the basin. Obtain the material from the clay pile.

Est. quantity of 108,000 CY
Est. unit cost = $0.60/CY
108,000 CY X $0.60/CY = $ 64,800

Construct the east and west dump channels.

Minor cuts and fills along the face of the dump area for PMF drainage contol.

Est. quantity of 22,000 CY
Est. unit cost = $0.59/CY
22,000 CY X $0.59/CY = $ 12,980

Complete shaping of the north channel.

After excavating the material for the silty-sand cover, finish shaping will be required.

Est. quantity of 87,000 CY
Est. unit cost = $0.68/CY
87,000 CY X $0.68/CY = $ 59,160

Complete shaping of the southwest channel.

After excavating the material for the silty-sand cover, finish shaping will be required.

Est. quantity of 34,000 CY
Est. unit cost = $0.67/CY
34,000 CY X $0.67/CY = $ 22,780

Remove topsoil from the dam face and below.

Est. quantity of 40,000 CY
Est. unit cost = $0.61/CY
40,000 CY X $0.61/CY = $ 24,400

Replace topsoil on shaped dam outslope.

Est. quantity of 40,000 CY
Est. unit cost = $0.61/CY
40,000 CY X $0.61/CY = $ 24,400

Remove and replace topsoil in drainage areas.

Est. quantity to be removed 88,000 CY
Est. quantity to be replaced 88,000 CY
Est. unit cost = $0.51/CY
176,000 CY X $0.51/CY = $ 89,760

Place topsoil on remaining disturbed areas.

142.6 acres will require 0.5' topsoil from topsoil piles #1 and #10.

Est. quantity of 115,000 CY
Est. unit cost = $0.97/CY
115,000 CY X $0.97/CY = $111,550

Millsite clay cover.

An additional 52 Cm. - (use 21") of clay cover will be placed over 4 acre process area. Clay from clay stockpile.

Est. quantity of 11,300 CY
Est. unit cost = $0.57/CY
11,300 CY X $0.57/CY = $ 6,441

Office area cover.

4 acres to be covered with 1.5' of clean clay from the clay stockpile.

Est. quantity of 9,700 CY
Est. unit cost = $0.57/CY
9,700 CY X $0.57/CY = $ 5,529

Subtotal shaping, grading, and cover material $1,698,710

o Revegetation of disturbed areas.

AREAS	ACRES
Tailings area	137.1
Tailings dam, SW channel, and North Channel	128.0
Southwest borrow area	28.6
East and West dump channels	14.0
South dump slope repair	39.6
East drainage basin area	38.0
Clay stockpile area	22.2

EST

ITEM	Est. Quantity M CY	Haul Length	PERCENT GRADE	Cycle Time Minutes	Number 631 Scrape @ $124/
Tailing Exc. & Shaping	57.00	1,200.00	3.00	3.20	3.00
Outside Exc. Clean-up	143.00	2,000.00	2.00	3.90	3.00
Borrow to Complete Shaping	50.00	1,840.00	-1.00	3.40	3.00
Clay Cover 61 Cm.	343.00	2,900.00	-1.00	4.20	4.00
Regrade & Recompact Clay Surface	117.00	0.00	0.00		0.00
Silty-sand Cover 62 Cm.	476.00	3,800.00	1.00	4.80	4.00
Topsoil, Top of Tailings 25 Cm.	182.00	2,720.00	1.00	4.40	4.00
Dam Outslope Shaping	532.00	200.00	-12.00		0.00
East Drainage Basin	108.00	900.00	-5.00	2.75	2.00
East & West Dump Channels	22.00	1,500.00	1.00	3.20	3.00
North Channel	87.00	1,200.00	-1.00	3.10	3.00
S. W. Channel	34.00	1,000.00	-1.00	2.65	2.00
Remove Topsoil - Dam Face & Below	40.00	1,100.00	-10.00	2.80	2.00
Replace Topsoil - Dam Outslope	40.00	1,100.00	5.00	3.30	3.00
Remove & Replace Topsoil Drainage Areas	176.00	600.00	0.00	2.35	2.00
Place Topsoil (8 Disturbed Areas)	115.00	5,000.00	0.00	6.10	5.00
Mill site Clay Cover and Office Cover	21.00	975.00	-1.00	2.60	2.00

IMATED EARTHWORK COSTS
TABLE B.4 - 1

of rs Hr.	Number of D-9H Dozers @ $105/Hr.	Number of 140G Blade @ $67/Hr.	Number of 4000 gal. Water Truck @ $40/Hr.	Number of 815 Compactor @ $60/Hr.	Spread Cost/Hr. $	Production per Hr. Cubic Yards	Cost per Yard $
	1.00	1.00	0.50		564.00	983.00	0.57
	1.00	1.00	1.00		584.00	807.00	0.72
	1.00	1.00	1.00		584.00	927.00	0.63
	1.00	1.00	1.00	1.00	768.00	1,000.00	0.77
	0.00	298 Hr.	114 Hr.	228 Hr.			0.33
	1.00	1.00	1.00	1.00	768.00	874.00	0.88
	1.00	1.25	1.00		725.00	954.00	0.76
	3.00	1.00			382.00	813.00	0.47
	1.00	1.00	1.00		460.00	764.00	0.60
	1.00	1.00	1.00		584.00	985.00	0.59
	1.00	2.00	2.00		691.00	1,016.00	0.68
	1.00	2.00	2.00		567.00	842.00	0.67
	1.00	1.00	1.00		460.00	750.00	0.61
	1.00	1.00	1.00		584.00	955.00	0.61
	1.00	1.00	1.00		460.00	894.00	0.51
	1.00	1.00	1.00		832.00	861.00	0.97
	1.00	1.00	1.00		460.00	807.00	0.57

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Millsite and office area	23.5
Access roads	6.0
Est. total	437.0 acres

Est. unit cost (Appendix Section B.4) - $311/acre
437 acres X $311/acre = $135,907

o Riprap/rock armor

Riprap and rock armor are required as follows:

North and SW Channels and Swale Discharges - 11,100 CY of riprap, 1.9 feet thick, underlain by a 6-inch thick coarse filter, 2,900 CY, and a 6-inch thick fine filter, 2,900 CY. The dam outslope and the north swale discharge extensions require a 4.5-inch layer of rock armor, total 2,900 CY, underlain by a 4-inch thick layer of fine filter material, 2,600 CY. The 5:1 slope above tailings requires 7,200 CY of rock armor 5.75-inches thick, underlain by 5,000 CY of fine filter material 4-inches thick. All of these materials will require processing by crushing and/or screening. For purposes of this cost estimate, it is assumed that all of the above materials will be obtained from a quarry approximately fifteen miles East of the site.

Material from this site is currently being tested.

In summary, required quantities are as follows:

	Quantity, CY
Riprap	11,100
5.75" rock armor	7,200
4.5" rock armor	2,900
6" coarse filter	2,900
fine filter	10,500
Est. total	34,600 CY

Categories for estimating the cost for these materials are drilling and blasting, crushing and screening, haulage and placement, and royalty.

Drilling and blasting:

34,600 CY product required
Est. unit cost (Appendix Section B.4) - $2.54/CY

34,600 CY X $2.54/CY	=	$87,884

Crush and Screen:

Riprap and coarse filter
Est. 14,000 CY product required
Est. unit cost (Appendix Section B.4) - $4.84/CY

14,000 CY X $4.84/CY	=	$67,760

Rock armor
Est. 10,100 CY product required
Est. unit cost (Appendix Section B.4) - $7.77/CY

10,100 CY X $7.77/CY	=	$78,477

Fine filter
Est. 10,500 CY product required
Est. unit cost (Appendix Section B.4) - $9.54/CY

10,500 CY X $9.54/CY	=	$100,170

Haul and place
All materials estimated at the same rate of production.
Est. 34,600 CY product required
Est. unit cost (Appendix Section B.4) - $7.66/CY

34,600 CY X $7.66/CY	=	$265,036

Royalty
All materials estimated at the rate of $1.50/CY

34,600 CY X $1.50	=	$ 51,900
Subtotal Riprap/rock armor		$651,227

o Special engineered features

There are no special engineered features which require additional costs.

o Quality assurance program

Compacted clay and silty-sand cover:

For these materials, quality assurance testing frequency is as follows:

Field density	1/1000 CY
Gradation	1/5000 CY
Atterberg limits	1/5000 CY
Proctors	1/20,000 CY

The material quantities and number of tests by type are:

ITEM	QUANTITY M CY	# FIELD DENSITY	# GRADATIONS	# ATTER. LIMITS	# PROCTORS
clay cover	343	343	69	69	18
Regrade & compact clay	117	117	24	24	6
Silty-sand cover	476	476	95	95*	24
Total	936	936	188	188	48

* Probably nonplastic and will not be needed, but are included in estimate.

Assume Approx. Production of
6000 CY/day = 6 field density test/day
Days technician required = 936 test/6 test/day = 156 days
Assume a 10 hour day.
Rates are from a local consultant and are current.

Technician cost $35/Hr.
156 days X 10 Hr./day X $35/Hr. = $54,600
Mileage @ $0.30/mile
156 days X 130 miles X $0.30/mile= $ 6,084
Field Density (included in cost of inspection)
Atterberg Limits @ $40/test
188 test X $40/test = $ 7,520
Gradations @ $52/test
188 test X $52/test = $ 9,776
Proctors @ $79/test
48 test X $79/test = $ 3,792
Project Engineer @ $75/Hr.
100 Hr. X $75/Hr. = $ 7,500

Est. total - clay & silty-sand $89,272

Riprap, Rock Armor, and filter material

For these materials, quality assurance testing criteria are as follows:

Riprap Durability: Initial + Final + test at 1/3 & 2/3 of total Q

Rock Armor: Same as for riprap + 1 gradation/1000 CY

Coarse Filter: Same as for riprap + 1 gradation/1000 CY

Fine Filters: 1 gradation/1000 CY

* Riprap gradation will be done by inspector in the field - no charge other than Technician rate.

Material quantities and the number of test by type are:

ITEM	QUANTITY M CY	GRADATIONS	SP. Gr.	ABSORP-TION	SODIUM SOUNDNESS	L.A. ABRASION
1.9'riprap	11	*	4	4	4	4
5.75" R.A.	7	7	4	4	4	4
4.5" R. A.	3	3	4	4	4	4
6" C. F.	3	3	4	4	4	4
FINE F.	11	11	-	-	-	-
TOTAL	35	24	16	16	16	16

Assume Technician required for above materials throughout placement period of 35 days, plus 5 days at production site.

Technician cost $35/Hr.
40 days X 10 Hr./day X $35/Hr. = $14,000
Mileage @ $0.30/mile
40 days X 130 miles X $0.30/mile= $ 1,560
Gradations @ $27/test (coarse aggrate only)
24 test X $27/test = $ 648
Sp. Gravity @ $30/test
16 test X $30/test = $ 480
Absorption @ $30/test
16 test X $30/test = $ 480
Sodium Soundness @ $150/test
16 test X $150/test = $2,400
L. A. Abrasion @ $100/test
16 test X $100/test = $1,600
Project Engineer @ $75/Hr.
30 Hr. X $75/Hr. = $ 2,250
Est. total - riprap, R. A., F. M. $23,418

Subtotal - Quality assurance program - $112,690

Subtotal Section 4. Tailings Impoundment Area Reclamation **$2,598,534**

5. Radiological Survey and Environmental Monitoring

A radiological survey consisting of gamma surveys and soil samples was conducted on the areas outside the restricted boundry in 1985. Cleanup of contaminated areas was performed in 1986, 87, and 88. All equipment salvaged from the mill was surveyed prior to being released for unrestricted use in 1985 and 86. Records are on file at Petrotomics.

o Soil samples for radium-226

It is anticipated that 25 additional soil samples for radium-226 will be collected on areas surrounding the tailings as reclamation proceeds on site.

Est. unit cost (Appendix Section B.5) - $71.36/sample
25 samples X $71.36 = $ 1,784

o Decommissioning equipment and building smear samples.

The mill and the associated buildings were decommissioned in 1985.

o Gamma Survey

Two gamma surveys are planned. The first is to locate any contamination which may have been missed by previous surveys and flag it for cleanup. The second would be done prior to completion of the tailings cover to insure all areas meet the established standards for closure.

Est. unit cost (Appendix Section B.5) - $2,210/survey
2 surveys X $2,210/survey = $ 4,420

o Environmental Monitoring

Environmental monitoring will be conducted in accordance with License Condition Nos. 41 and 47. The monitoring program is subject to change as additional wells are brought on line or wells are abandoned due to construction requirements. Sampling is projected through 1994 when completion of the tailings cover is planned.

The environmental monitoring program consists of air, radon, ground-water, surface water, and direct radiation measurements as prescribed in License Condition 41 and 47.

Est. cost of Environmental Monitoring $206,438. Individual Item cost and total costs are shown below.

o Total cost of Radiological Survey & Environmental Monitoring.

Cost shown represent the cost of the sampling and analysis to be done through 1994.

25 soil samples Est. unit cost (Appendix B.5) - $71.36 25 samples X $71.36/sample	=	$ 1,784
2 gamma surveys Est. unit cost (Appendix B.5) - $2,210 2 surveys X $2,210/survey	=	$ 4,420
20 air samples Est. unit cost (Appendix B.5) - $677 20 samples X $677/sample	=	$ 13,540
40 radon samples Est. unit cost (Appendix B.5) - $70 40 samples X $70/sample	=	$ 2,800
375 quarterly ground-water samples Est. unit cost (Appendix B.5) - $359.92 375 samples X $359.92 sample	=	$134,970
125 annual ground-water samples Est. unit cost (Appendix B.5) - $407.92 125 samples X $407.92/sample	=	$ 50,990
20 surface water samples Est. unit cost (Appendix B.5) - $161 20 samples X $161/sample	=	$ 3,220
40 direct radiation Est. unit cost (Appendix B.5) - $22.95 40 samples X $22.95/sample	=	$ 918
Total cost of Radiological survey.* * (Includes cost of environmental monitoring)		$212,642
Subtotal Section 5. Radiological Survey and Environmental Monitoring		$212,642

6. Project Management and Miscellaneous

Reclamation work is anticipated to be complete by year-end 1994. Project management and miscellaneous cost are therfore estimated for a five year period.

Site representative - One

Est. $40/Hr. X 2,000 Hr./Yr. = $80,000/Yr. X 5 Yr. = $400,000
Transportation - 250 day/Yr.
250 day/Yr. X 130 mi. X $0.30/mi. X 5Yr. = $ 48,750

Clerical - One half time

Est. $20/Hr. X 1000 Hr./Yr. = $20,000/Yr. X 5 Yr. = $100,000

Field Survey - 4 construction seasons

Est. 5 months each or 20 months total
Est. 20 mos. X 20 days/mo. X 10Hr./day = 4,000 Hr.
Est. 2-man crew @ $50/Hr. (equipped)
4,000 Hr. X $50 = $200,000
Transportation - 20 mos. X 20 days/mo = 400 days
400 days X 130 mi. X $0.30/mi = $ 15,600

Telephone and Miscellaneous Supplies

Est. $500/mo. X 60 mos. = $ 30,000

Radiological Safety

Personnel monitoring, Instrument calibration, and bioassay.
Est. $4,900/Yr. X 5 = $ 24,500

Electrical power

Est. average $5,000/mo. to mid 1992 or 30 months, then $1,500/mo. through 1994.
$5,000 X 30 mo. = $150,000
$1,500 X 30 mo. = $ 45,000

Legal and Technical Consulting

Est. $10,000/Yr. X 5 Years = $ 50,000

Equipment Mobilization

Est. equipment mobilization (contractor)

Earthwork spread - mobilize 1990 and 1992

Scrapers -	6	@	$400/each X 2 =	$4,800
D9H -	3	@	$500/each X 2 =	$3,000
140G M.G.-	2	@	$400/each X 2 =	$1,600
Water Truck	2	@	$200/each X 2 =	$ 800
Compactor	1	@	$400/each X 2 =	$ 800
Subtotal				$11,000

Crushing & Screening Spread mobilize in 1994

Drills & Compressors	2	@	$400 =	$ 800
Grizzly	1	@	$700 =	$ 700
Crushing Plant	1	@	$2,400 =	$2,400
D9H Dozer	1	@	$500 =	$ 500
988 Loader	1	@	$500 =	$ 500
Trucks	7	@	$200 =	$1,400
140G Motor Grader	1	@	$400 =	$ 400
Truck scale	1	@	$900 =	$ 900
235 Backhoe	1	@	$500 =	$ 500
Subtotal				$8,100

Est. total Mobilization $ 19,100

Subtotal Section 6. Project Management and Miscellaneous **$1,082,950**

7. Labor and Equipment Overhead, Contractor Profit

The labor and equipment overhead and contractor profit are included in the labor and equipment rates used. Rates are developed in the Appendix.

8. Long Term Surveillance and Control Fee

$250,000 in 1978 dollars

Using the 1982 base CPI,
October 1989 = 125.6
December 1978 = 67.7
125.6 / 67.7 = 1.855
$250,000 X 1.855 = $ 463,750

9. Contingencies

A. Engineering Contingency

Reclamation cost estimate $4,084,420

15% X $4,084,420	=	$ 612,663

B. Contract Administration Contingency

10% X $4,084,420	=	$ 408,442

Estimated Total Cost	$5,569,275

APPENDIX

A. Equipment and Labor Costs

Equipment proposals for three Petrotomics Company projects, bid in 1988 and 1989, were analyzed to determine estimated equipment rates for completion of the reclamation work. The high bidder for each project was eliminated. Remaining bid rates for like units among twelve proposals were averaged to yield conservative rates. Equipment rates shown include ownership costs, operation, maintenance, supervision, overhead and profit. The rates determined on this basis are:

Unit	Hourly Rate
Cat 631 Scraper	$124.00
Cat 627 Scraper	107.00
Cat D9H Dozer/Rip	105.00
Cat D7G Dozer/Rip	81.00
Cat 140G Motor Grader	67.00
Water Truck - 4000 gal.	40.00
Cat 815 Compactor	60.00
Dump Truck 10-12 CY	45.00

A similar analysis of labor rate bids results in the following labor rates, which include wages, payroll tax and insurance, transportation, overhead and profit:

Classification	Hourly Rate
Foreman	$ 18.00
Operator	16.40
Truck Driver	14.23
Laborer	11.88

Rates for equipment units other than shown above are estimated based on the Cost Reference Guide For Construction Equipment, 1982. "Total Hourly Costs" from the guide are increased by 15% for contractor overhead and profit, and the appropriate operating labor cost above is added. Comparison of these rates with the current average bid rates shown above for the major equipment (Scrapers, D9H dozer, and trucks) shows that current bid rates are about 10 to 20 percent less than the adjusted Cost Reference Guide rates. The support equipment bid rates approach or exceed the adjusted Cost Reference Guide rates, from slightly less for the compactor to about 25% more for the water truck. Since production equipment spreads are heavily weighted with the major equipment, estimated costs on the 1982 Cost Reference Guide basis for equipment for which current bids are not available are believed to yield conservative values. These rates are as follows:

	CRG Total Hr.Cost	Contr. OH & P @ 15%	Operating Labor	Total	Est. Hrly. Rate
Cat 235 Backhoe	$84.70	$12.71	$16.40	$113.81	$114
Cat 988 Loader	$102.22	$15.33	$16.40	$133.95	$134
Tractor-Hwy					
80 M GVW	$25.19				
Trailer-					
Rear dump-21CY	$ 9.09				
	$34.28	$5.14	$14.23	$53.65	$ 54
Air Trac (12')	$14.07				
2 1/2"-4"drill	$ 3.82				
600 cfm Cmpr.	$33.13				
Subtotal	$51.02				
Bits & Steel-					
Est. $0.12/ft					
25'/hour	$ 3.00				
Total	$54.02	$8.10		$62.12	$63
Crushing Plant					
Cedarapids					
544 VS-M	$94.86				
250 hp motor	$ 9.24				
Total	$104.10	$15.62		$119.72	$120
Portable Screen Plant					
5'x 10' 3 deck	$37.64				
Motor - allow	$ 5.00				
Total	$42.64	$6.40		$49.04	$50
Grizzly	$25.99				
Motor - allow	$ 5.00				
Total	$30.99	$4.65		$35.64	$36
Generator Set - 200 KW					
Cat 3406 DITA	$30.55	$4.58		$35.13	$36
Truck Scales					
10'x 60'Tandem					
60 ton	$8.20	$1.23	$11.88	$21.31	$22

B. Reclamation Crews, Production Rates and Unit Costs

1. Facility Decommissioning

Demolish and bury buildings.

Crew:	Hourly Cost
1 Cat D9H	$105.00
1 Cat 235 /Backhoe	$114.00
2 Laborers @ $11.88 each	$ 23.76
Small tools - est. 10% labor cost	$ 2.38
Total	$245.14/Hr.

Production rate estimate - 3,000 CF per hour

Est. unit cost $245.14/3,000 CF/Hr. = $0.082 per CF

Light building foundation demolition.

Demolition crew item 1.	$245.14 /Hr.
Less - Cat 235 Backhoe	<114.00>
Total	$131.14 /Hr.

Production rate estimate - 2,500 SF per Hr.

Est. unit cost $131.14/2,500 SF/Hr. = $0.052 per SF

Removal of electrical power distribution system.

Cost estimate obtained by personal contact with local (Casper, Wyoming) electrical contractor, January, 1990.

Remove electrical power distribution system - unit cost - $0.85/LF

2. Ground-Water Restoration and Well Plugging.

Install wells:

Upper sand wells - depth est. 220 LF each

Drill, case and develop:
Drilling rates for Petrotomics in 1988 and 1989 ranged from $92/Hr. to $125/Hr.

Est. Drilling contractor @ $125/Hr.		
Overall production - Est. 20 LF/Hr.		
Cost per well - Est. 11 hours @ $125	=	$1,375/well
Casing, sand, bentonite & supplies		
Est. $3.50/LF X 220	=	$ 770/well
Pumps, piping, & installation supplies:		
Pumps - 3 HP, 480 v - Est.		$ 850/well
Pipe & supplies Est.		$ 550/well
Install pumps and piping:		
Est. 1 electrician & 1 labor - 5 hours		
$35/Hr. + $11.88/Hr. = $46.88/Hr.		
$46.88/Hr. X 5 hours	=	$ 235/well
Est. total per upper sand well		$3,780/well

Tailings wells - depth est. 50 LF each

Drill, case, & develop:		
Overall production est. 10 LF/Hr.		
Cost per well - Est. 5 hours @ $125	=	$ 625/well
Casing, sand, bentonite & supplies		
Est. $4.24/LF X 50	=	$ 212/well
Pumps, piping, & installation supplies:		
Pumps - 1/2 HP - Est.		$ 300/well
Pipe & supplies Est.		$ 170/well
Install pumps and piping:		
Est. 1 electrician & 1 labor - 3 hours		
$35/Hr. + $11.88/Hr. = $46.88/Hr.		
$46.88/Hr. X 3 hours	=	$ 141/well
Est. total per tailings well		$1,448/well

Well and enhanced evaporation operation and maintenance:

Operation and maintenance labor.

1 laborer @ $11.88/Hr. - Est. one-half time		
$11.88 X 0.5 X 176 Hr./Mth. X 12 Mth./Yr.	=	$ 12,545/Yr.
1 electrician @ $35/Hr. - Est. 1 day/Mth.		
8 Hr./day + 2 hours travel		
10 Hr./Mth X $35/Hr. X 12 Mths/Yr.	=	$ 4,200/Yr.
Est. total labor		$ 16,745/Yr.

Well pumps - replace

Tailings - Est. 50% /Yr. - 12 wells
6 X $300 = $ 1,800/Yr.

Upper Sand - Est. 25% /Yr. - 8 wells
2 X $850 = $ 1,700/Yr.
Pump replacement $ 3,500/Yr.

Enhanced evaporation system

Pump - 60 HP 480 v
Equipment Cost Guide - 1982 = $ 5.59/Hr.
Less electrical power $<2.01>
Est. cost/Hr. $3.58/Hr.

Est. 8 months/Yr., 24 Hr./day
24 Hr. X 30 X 8 Mths. = 5,760 Hr./Yr.
5,760 Hr./Yr. X $3.58/Hr. = $ 20,621/Yr.

Small tools and supplies
Est. 10% of labor
0.10 X $16,745 = $ 1,675/Yr.
Est. total unit cost $ 42,541/Yr.

Verification sample analysis

Sample 25 wells
Est. 3 - 10 hour days for 25 wells
Technician - $35/Hr. X 30 Hrs. = $ 1,050
Vehicle - Est. $0.40/mile + $40/day
($0.40 X 130 miles + $40) X 3 days = $ 276
Supplies - Est. $ 100
Laboratory analysis @ $224/sample
25 samples X $224/sample = $ 5,600
Est. total cost / sample period $ 7,026

Est. total unit cost/sample period
$7,026 / 25 samples = $ 281.04

Well plugging

Drilling Contractor - ream and plug hole
Production rate - Est. 50'/Hr.
Cost Est. $100/Hr. plus bits, plus mud
from communication with local (Casper, Wyoming)
drilling contractors - January 1990.

Estimated unit cost - 51 holes - 5,960 LF

Ream - $100/Hr. / 50'/Hr.		= $ 2.00/LF
Bit cost - 800'/bit, $120/bit		
$120/bit / 800'/bit		= $ 0.15/LF
Drilling mud - Est. 223 bags		
223 bags X $5.25/bag	= $1,171	
Abandonment mud - Est. 60 bags		
60 bags X $6.75/bag	= $ 405	
Backhoe (1/2 CY)		
0.5 Hr./hole @ $26/Hr.		
0.5 Hr. X $26/Hr. X 51 holes	= $ 663	
Subtotal	$2,239	
Est.. unit cost per LF		
$2,239 / 5,960 LF		= $ 0.38/LF
Est. total unit cost		$ 2.53/LF

4. Tailings Impoundment Area Reclamation

Earthwork

Tailings excavation and shaping - 57,000 CY

Use 631 scraper crew
Haul distance 1,200 feet
Grade - Est. 3%
Rolling resistance equivalent - Est. 3%
Cycle time data from Caterpillar - Performance Handbook, Edition No. 11

Cycle time:		Minutes
Load		0.7
Haul	3% + 3% = 6	1.2
Return	3% - 3% = 0	0.6
Dump & turn		0.7
Total		3.2

Efficiency adjustment - use 50 minute hour
Efficiency adjustment - limit D9H to 50 pushes/Hr.
50/3.2 = 15.6 loads/scraper/Hr.
50 pph/15.6 = 3.2 scrapers - use 3
Scraper yield - Est. struck capacity = 21 CY/load
Hourly production
3 scrapers X 15.6 loads/Hr. X 21 CY = 983 CY/Hr.

Crew:

3 - 631 scraper @ $124/Hr.	= $372 /Hr.
1 - D9H @ $105/Hr.	= $105 /Hr.
1 - 140G Motor Grader @ $67/Hr.	= $ 67 /Hr.
1/2 - Water Truck @ $40/Hr.	= $ 20 /Hr.
Total hourly cost	$564 /Hr.

Estimated unit cost $564/Hr. / 983 CY/Hr. = $0.57/CY

The remaining estimated unit costs for scraper crew hauls were developed in a similar manner. Crews, haul characteristics, production and unit costs are summarized in Table B.4-1.

Regrade and recompact clay surface

Use Cat 815 Compactor, 140G Blade and 4,000 Gallon Water Truck
Compactor performance from the Caterpillar - Performance Handbook,Edition No.11

Compactor yield 0.5' layer is 616 CY/Hr. compacted
Efficiency adjustment - use 50 minute hour = 513 CY/Hr.
Requires 70 additional hours of 140G blade to scarify, grade and regrade.
Used one 4,000 gallon water truck for moisture control and dust abatement one-half of the time.
The total quantity of 117,000 CY is used to calculate the total equipment hours required.

Crew:

1 - Cat 815 Compactor	228 Hr. @ $60/Hr.	= $ 13,680
1 - Cat 140G Blade	298 Hr. @ $67/Hr.	= $ 19,966
1 - Water Truck	114 Hr. @ $40/Hr.	= $ 4,560
Total cost		$ 38,206

Estimated unit cost $38,206 / 117,000 CY = $0.33/CY

Dam outslope shaping.

Shaping the existing tailings dam is estimated utilizing Cat D9H dozers. Using the Caterpillar - Performance Handbook , Edition No. 11 yields the following production:

Cat D9H production for a dozed distance of 200 feet is 640 LCY/Hr.

Correction factors are:

30% swell	=	0.769
Hard packed clay	=	0.80
Grade correction	=	1.10
Average operator	=	0.75
Job efficiency	=	0.833

Therefore:
640 LCY/Hr. X 0.769 X 0.80 X 1.10 X 0.75 X 0.833 = 271 BCY/Hr
3 dozers X 271 CY/Hr. = 813 CY/Hr.

Crew:

3 - Cat D9H Dozers @ $105/Hr.	=	$315/Hr.
1 - Cat 140G Blade @ $67/Hr.	=	$ 67/Hr.
Total		$382/Hr.

Est. unit cost of $382/Hr. / 813 CY/Hr. = $0.47

Revegetation of disturbed areas.

Shallow ripping (scarification)
Est. cost per acre - $ 74
The shallow ripping cost is the average of five bids for State of Wyoming Abandoned Mine Land Project #13, Shirley Basin, Wyoming, for performance in 1989.

Disking
Est. cost per acre - $ 50
The disking cost is the contract rate from Petrotomics site for fall 1989 work.

Seeding
Est. cost per acre - $ 50
The seeding cost is the contract rate from Petrotomics site for fall 1989 work.

Seed Cost
Est. cost per acre - $137
The cost for seed is that used in the State of Wyoming Mine Permit Surety. Due to seasonal variations in prices this value is higher than fall 1989 actual seed costs.

Est. total unit cost for revegetation $311/acre

Riprap/rock armor

Est. total 34,600 CY required

Drill and Blast
Est. drill @ 5"/min. rate
Efficiency adjustment - use 54 min hour
Allow for load and blast delays and equipment availability:
Est. total 20% reduction for average rate per hour.
0.42'/min X 60 min/Hr. X 0.80 = 20.2 Ft/Hr.
Est. pattern - 6.5' X 6.5' = 1.56 BCY/Ft
Est. swell factor 1/.75 = 1.33
1.56 CY/Ft X 1.33 = 2.07 in place CY/Ft
Allow 5% not usable 2.07 X .95 = 1.97 in place CY/Ft
1.97 CY/Ft X 20.2 Ft/Hr. = 39.7 in place CY/Hr.

Estimate using 2 drills:
Production: 2 drills X 39.7 CY/Hr. = 79.4 in place CY/Hr.

Crew:		Cost/Hr.
2 Air Trac & compressor @ $63/Hr.	=	$126.00
2 drillers @ $16.40/Hr.	=	$ 32.80
2 helpers @ $11.88/Hr.	=	$ 23.76
Blasting supplies:		
Est. $0.30/BCY X 62.7 BCY/Hr.	=	$ 18.81
Est. total		$201.37/Hr.

Est. unit cost = $201.37/Hr. / 79.4 in place CY/Hr.
Est. unit cost = $2.54/CY

Crush and Screen

Riprap and coarse filter - 14,000 CY, will not require crushing.

Est. 165 lbs /BCF X 0.75 = 123.75 lbs/in place CF or 1.67 tons/in place CY

Separate materials through grizzly @ 300 tons/Hr.
300 tons/Hr. / 1.67 tons/in place CY = 179.6 CY/Hr.
Efficiency factor 85%
0.85 X 179.6 CY/Hr. = 153 in place CY/Hr.

Est. one D9 Dozer and one 988 Loader sorting and stockpiling from blasting to Grizzly and from Grizzly to product areas.
Est. 120 CY/HR.
Net 60 CY/Hr.
60 CY / 153 in place CY/Hr. = 0.39 Grizzly operation factor.

Crew:		
1 Grizzly @ $36/Hr. X 0.39	=	$ 14.04
1 Generator Set @ $36/HR. X 0.39	=	$ 14.04
1 Foreman @ $18/Hr. X 0.39	=	$ 7.02
1 Operator @ $16.40/Hr. X 0.39	=	$ 6.40
1 Oiler @ $14.23/Hr. X 0.39	=	$ 5.55
1 Laborer @ $11.88/Hr. X 0.39	=	$ 4.63
1 D9H Dozer @ $105/Hr.	=	$105.00
1 988 Loader @ $134/Hr.	=	$134.00
Est. Total		$290.68

Est. unit cost -$290.68 / 60 CY/Hr. = $4.84/CY

Rock Armor - 10,100 CY

Est. 123.75 lbs/CF in place or 1.67 tons/in place CY
Est. production through crushing plant @ 145 ton/Hr.
145 tons/Hr. / 1.67 tons/in place CY = 86.8 CY/Hr.
Efficiency factor = 85%
86.8 CY/Hr. X 0.85 = 74 in place CY/Hr.
Estimate 1.5 D9's and 1.5 988's sorting, stockpiling, feeding, tramming finished product.

Crew:		Cost/Hr.
1 Crushing Plant	=	$120.00
1 Generator Set	=	$ 36.00
1 Foreman	=	$ 18.00
1 Operator	=	$ 16.40
1 Oiler	=	$ 14.23
1 Laborer	=	$ 11.88
1.5 D9H Dozer @ $105/Hr.	=	$157.50
1.5 988 Loader @ $134/Hr.	=	$201.00
Est. Total		$575.01/Hr.

Est. unit cost - $575.01/Hr. / 74 CY/Hr. = $7.77/CY

Fine filter - 10,500 CY

Est. 128.7 lbs/CF in place or 1.74 tons/in place CY
Est. production through crushing plant @ 90 tons/Hr.
90 tons/Hr. / 1.74 tons/in place CY = 51.7 CY/Hr.
Efficiency factor = 85%
51.7 CY/Hr. X 0.85 = 44 in place CY/Hr.
Estimated .85 D9's and .85 988's feeding & tramming

Crew:		Cost/Hr.
1 Crushing Plant	=	$120.00
1 Generator Set	=	$ 36.00
1 Foreman	=	$ 18.00
1 Operator	=	$ 16.40
1 Oiler	=	$ 14.23
1 Laborer	=	$ 11.88
.85 D9H Dozer @ $105/Hr.	=	$ 89.25
.85 988 Loader @ $134/Hr.	=	$113.90
Est. Total		$419.66

Est. unit cost - $419.66/Hr. / 44 CY/Hr. = $9.54/CY

Haul and Place
All materials estimated at the same rate of production.

Est. 34,600 CY required.
Est. truck cycle time for round trip of 31 miles equals 1.34 hours at 90% efficiency.
Est. trucks haul 14 CY/cycle

14 CY/cycle / 1.34 hours = 10.45 CY/Hr.
Est. 7 trucks used for haul
Production = 10.45 CY/Hr. X 7 trucks = 73.15 CY/Hr.
Use 1.1 blade and water truck for haul road maintenance
.20 backhoe and .30 blade for placement.

Crew:			Cost/Hr.
7 Trucks @	$54	=	$378.00
1 Scale @	$22	=	$ 22.00
1.1 Blade @	$67	=	$ 73.70
1.1 Water Truck @	$40	=	$ 44.00
.2 Backhoe @	$114	=	$ 22.80
.3 Blade @	$67	=	$ 20.10
Est. Total			$560.60

Est. unit cost = $560.60/Hr./ 73.15 CY/Hr. = $7.66/CY

Royalty

All materials estimated at the rate of $1.50/CY.

5. Radiological Survey and Environmental Monitoring

Prices used for technician, vehicle, mileage, and analysis are based upon current prices charged by a local (Casper, Wyoming) consultant laboratory from their December, 1989 price list.

Soil samples for Radium

25 samples X $36/sample	=	$900
Technician @ $35/Hr.		
Est. 2 days sampling		
2 days X 10 Hr./day X $35/Hr.	=	$700
vehicle $0.40/mile + $40/day		
($0.40/mi. X 130 mi. + $40/day) X 2 trips	=	$184
Est. Total		$1,784

Est. unit cost $1,784 / 25 samples = $71.36/sample

Decommissioning equipment and Building smear samples.

The Mill was decommissioned in 1985.

Gamma Survey

Technician @ $35/Hr.		
Est. 10 days sampling (5 days initial,		
5 days verification)		
10 days X 10 Hr./day X $35/Hr.	=	$3,500

vehicle $0.40/mile + $40/day
($0.40/mi. X 130 mi. + $40/day) X 10 trips = $ 920
Est. Total $4,420

Est. unit cost - $4,420 / 2 surveys = $2,210/survey

Environmental Monitoring

Monitoring performed according to the requirements in License Condition 41 and 47.

Air Sampling - one site

One site sampled quarterly
Quarterly analysis of radionuclides = $ 131/qr.
Est. one trip per month by technician
On site personal will check sampler
Technician @ $30/Hr.
Est. 3 days/quarter
3 days X 3 Hr./day X $30/Hr. = $ 270/qr.
vehicle $0.40/mile + $40/day
($0.40/mi. X 130 mi. + $40/day)
X 3 trips = $ 276
Est. Total $ 677

Est. unit cost = $677/sample

Radon Sampling - two sites

2 sites sampled quarterly
Transportation and technician cost
included in Air Sampling.
Cost $70 X 2 = $140/qr.
Unit cost $70/sample

Groundwater

Groundwater is sampled at 25 locations on a quarterly basis according to License Condition 41 and 47. Cost of analysis is taken directly from a price sheet of a local laboratory.

25 locations sampled quarterly
Quarterly analysis of constituents = $7,672/qr.
Est. three trips per quarter by technician
Technician @ $35/Hr.
Est. 3 days/quarter
3 days X 10 Hr./day X $35/Hr. = $1,050/qr.
vehicle $0.40/mile + $40/day
($0.40/mi. X 130 mi. + $40/day)
X 3 trips = $ 276/qr.
Est. Total $8,998/qr.

$8,998/qr. / 25 samples/qr. = $359.92/sample

Est. unit cost = $359.92/sample

25 locations sampled annually
Annual analysis of constituents = $8,872/qr.
Est. three trips per quarter by technician
Technician @ $35/Hr.
Est. 3 days/quarter
3 days X 10 Hr./day X $35/Hr. = $1,050/qr.
vehicle $0.40/mile + $40/day
($0.40/mi. X 130 mi. + $40/day)
X 3 trips = $ 276/qr.
Est. Total $10,198/qr.

$10,198/qr. / 25 samples/qr. = $407.92/sample

Est. unit cost = $407.92 /sample

Surface Water

1 location sampled quarterly
Quarterly analysis of constituents = $ 161/qr.
Transportation and technician included
in cost of Groundwater sampling.

Est. unit cost = $161 /sample

Direct Radiation

2 locations sampled quarterly.
Unit cost of sample $22.95

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