DOCKET NUMBER
BYPRODUCTS 40-8968-ML

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

DOCKETED
USNRC

August 31, 1999

'99 SEP -3 A8:56

RELATED CORRESPONDENCE

OFFICE OF SECRETARY
RULEMAKINGS AND
ADJUDICATIONS STAFF

Mr. Richard F. Clement, Jr., President
Hydro Resources, Inc.
PO Box 15910
Rio Rancho, NM 87174

SUBJECT: RESTORATION COSTS AND SURETY REVIEW SUBMITTALS

Dear Mr. Clement:

This letter is in response to Hydro Resources, Inc.'s (HRI's) proposed restoration costs and surety submittals dated February 4 and March 19, 1999, respectively. Included In your February 4 submittal was a letter to Ms. Katherine Yuhas of the New Mexico Environmental Department, dated September 11, 1997, providing updated restoration cost estimates for HRI's proposed Church Rock - Section 8 in-situ leach uranium mining project. HRI's March 19 submittal provided draft text for a performance bond, performance bond guarantee, and a trust agreement for the Crownpoint project. Enclosure 1 is the NRC staff's review and request for additional information concerning these submittals.

In addition, Enclosures 2 and 3 are examples of restoration cost submittals that provide an acceptable level of detail for NRC staff review. If you have any questions regarding this subject matter, please contact Mr. Robert Carlson of my staff at (301) 415-8165.

Sincerely,

John J. Surmeier, Chief
Uranium Recovery and
Low-Level Waste Branch
Division of Waste Management
Office of Nuclear Material Safety
and Safeguards

Enclosures: As stated

cc: K. Yuhas, NMED
See Attached List

SECY-EHD-001

20785

HRI Mailing List - Letter dated August 31, 1999

Office of Commission Appellate
Adjudication
Mail Stop O-16C1
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Administrative Judge
Peter B. Bloch
Presiding Officer
Atomic Safety and Licensing Board
Mail Stop T-3F23
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Administrative Judge
Thomas D. Murphy
Special Assistant
Atomic Safety and Licensing Board
Mail Stop T-3F23
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Secretary (2)
Attn: Rulemakings and Adjudications Staff
Mail Stop O-16C1
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Adjudicatory File(2)
Atomic Safety and Licensing Board
Mail Stop T-3F23
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Atomic Safety and Licensing Board Panel
Mail Stop T-3F23
U.S. Nuclear Regulatory Commission
Washington, DC 20555

John T. Hull, Esq.(2)
Mitzi A. Young, Esq.
Office of the General Counsel
Mail Stop O-15B18
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Jep Hill, Esq.
Jep Hill and Associates
PO Box 2254
Austin, Texas 78768-2254

Richard F. Clement, Jr.
President
Hydro Resources, Inc.
PO Box 15910
Rio Rancho, New Mexico 87174

Mitchell W. Capitan, President
Eastern Navajo-Dine' Against
Uranium Mining
PO Box 471
Crownpoint, New Mexico 87313

James Copeland
Bureau of Land Management
Farmington District Office
1235 LaPlata Highway

Diane Curran, Esq.
Harmon, Curran, Spielberg,
& Eisenberg, L.L.P.
2001 S Street, N.W., Suite 430
Washington, DC 20009

Jenni Denetsone
Area Realty Office
Bureau of Indian Affairs
Navajo Area Office
Real Estate Services
PO Box 1060
Gallup, NM 87305-1060

Alan Downer, Director
Navajo National Historic Preservation Dept.
ATTN: Peter Noyes & Rolf Nabahe
PO Box 4950
Window Rock, AZ 86515

Douglas Meiklejohn
New Mexico Environmental Law Center
1405 Luisa Street, Suite 5
Santa Fe, New Mexico 87505

W. Paul Robinson
Chris Shuey
Southwest Research and
Information Center
PO Box 4524
Albuquerque, New Mexico 87106

Anthony J. Thompson, Esq.
Counsel for Hydro Resources, Inc.
Shaw, Pittman, Potts & Trowbridge
2300 N Street, N.W.
Washington, DC 20037-1128

ENCLOSURE 1

U.S. NUCLEAR REGULATORY COMMISSION STAFF
REQUEST FOR ADDITIONAL INFORMATION
CONCERNING HYDRO RESOURCES, INC.'S PROPOSED SURETY SUBMITTALS

The following request for information (RAI) is composed of two sections. Section I contains the U.S. Nuclear Regulatory Commission (NRC) staff comments related to Hydro Resources, Inc.'s (HRI's) proposed "Performance Bond and Trust Agreement Formats" submittal, dated March 19, 1999. Section II consists of the NRC staff comments related to HRI's proposed "Church Rock - Section 8 Restoration and Reclamation" plan submittal, dated February 4, 1999.

When addressing this RAI, HRI should ensure that its responses correspond to the following numerical order of NRC staff comments for future tracking and closure purposes.

SECTION I - PERFORMANCE BOND AND TRUST AGREEMENT COMMENTS

1. **COMMENT:** Penal Sum Amount

DISCUSSION:

Neither the performance or performance guarantee bonds have penal sum amounts listed. Once HRI adequately addresses the NRC staff's subsequent comments regarding restoration and reclamation costs, a penal sum figure should be established for each of the aforementioned bonds.

ACTION NEEDED:

HRI should submit a penal sum amount for both the performance and performance guarantee bonds prior to NRC staff approval of HRI's surety instruments.

2. **COMMENT:** Performance Bond Provisions for Injection Well Plugging and Abandonment

DISCUSSION:

Under the current provisions of the performance bond for injection well plugging and abandonment, if HRI cannot provide alternate financial assurance during the 60 days following receipt of a notice of bond cancellation, the bond amount will be placed in the standby trust. The provisions also state that the cancellation will not occur during the 120-day period, beginning with receipt of the note of cancellation. These two dates are inconsistent. The NRC's "Technical Position on Financial Assurance for Reclamation, Decommission, and Long-Term Surveillance and Control of Uranium Recovery Facilities," dated October 1988, recommends that both dates should be 90 days.

ACTION NEEDED:

HRI should correct the above mentioned date discrepancies in the provisions of its performance bond.

3. **COMMENT:** Performance Bond Provisions for Closure Activities

DISCUSSION:

Under the current provisions of the performance bond for closure activities, if HRI cannot provide alternate financial assurance during the 60 days following receipt of a notice of bond cancellation, the bond amount will be placed in the standby trust. The provisions also state that the cancellation will not occur during the 120-day period, beginning with receipt of the note of cancellation. These two dates are inconsistent. The NRC's "Technical Position on Financial Assurance for Reclamation, Decommission, and Long-Term Surveillance and Control of Uranium Recovery Facilities," dated October 1988, recommends that both dates should be 90 days.

ACTION NEEDED:

HRI should correct the above mentioned date discrepancies in the provisions of its performance bond.

4. **COMMENT:** Standby Trust Agreement

DISCUSSION:

HRI's proposed standby trust instrument should be revised to be consistent with the recommended wording for standby trust agreements in the NRC's "Technical Position on Financial Assurance for Reclamation, Decommission, and Long-Term Surveillance and Control of Uranium Recovery Facilities," dated October 1988. Also, information contained in example Schedules A, B, and C of the NRC's standby trust need to be provided as recommended in the above mentioned technical position.

ACTION NEEDED:

HRI should revise its proposed standby trust agreement to be consistent with language found in the NRC's "Technical Position on Financial Assurance for Reclamation, Decommission, and Long-Term Surveillance and Control of Uranium Recovery Facilities," dated October 1988.

5. **COMMENT:** Consolidation of State and NRC Surety Instruments

DISCUSSION:

HRI's proposed Performance Guarantee Bond currently is written in terms of addressing the New Mexico Environmental Department's (NMED's) restoration and reclamation

requirements. In order to avoid unnecessary duplication and expense, 10 CFR Part 40, Appendix A, Criterion 9 (Financial Criteria) clearly allows for consolidation of State and Federal financial or surety arrangements established to meet restoration, reclamation, and decommissioning costs provided that "the portion of the surety which covers the decommissioning and reclamation of the mill, mill tailings site and associated areas ... is clearly identified and committed for use in accomplishing these activities." Although these activities are implied in HRI's proposed surety instrument and in its March 19, 1999, letter to NRC and NMED, the Performance Guarantee Bond should state directly the requirements of Criterion 9 above.

ACTION NEEDED:

HRI should revise the language of its proposed surety instrument to adhere to 10 CFR Part 40, Appendix A, Criterion 9 requirements regarding specific delineation of decommissioning and reclamation costs.

SECTION II - CHURCH ROCK-SECTION 8 RESTORATION AND RECLAMATION PLAN COMMENTS

6. COMMENT: Cost Details for Restoration and Reclamation Activities

DISCUSSION:

HRI's proposed restoration and reclamation plan (hereafter referred to as 'rec plan') lacks sufficient enough detail for the NRC staff to make an adequate decision with respect to the acceptability of HRI's reclamation costs. Specifically, HRI's rec plan submittal lacks any details concerning cost basis figures and assumptions, calculations and/or methodologies used in deriving cost estimates, references, and clarity with respect to its cost detail figures. This information should be descriptive enough for the NRC staff to determine the acceptability of HRI's proposed cost figures, and should be based on an independent contractor performing the decommissioning and reclamation work in accordance with 10 CFR Part 40, Appendix A, Criterion 9 requirements. Examples of acceptable "levels of detail" for cost estimates pertaining to surety submittals can be found in Appendix E of the NRC's draft "Standard Review Plan for In-Situ Leach Uranium Extraction License Applications" (NUREG-1569, dated October 1997), and Section 4 of the NRC's "Technical Position on Financial Assurances for Reclamation, Decommissioning, and Long-Term Surveillance and Control of Uranium Recovery Facilities" (dated October 1988).

ACTION NEEDED:

HRI should provide additional cost details for the restoration and reclamation activities associated with its surety submittal.

7. **COMMENT:** Cost Areas for Restoration and Reclamation Activities

DISCUSSION:

HRI's proposed rec plan fails to adequately address numerous areas of decommissioning regarding restoration and reclamation costs. The following areas are deficient in HRI's rec plan submittal: a) facility decommissioning costs are not inclusive (e.g., no costs identified for restoration and decommissioning efforts associated with the Crownpoint processing facility, nor for the proposed evaporation ponds at Section 8) and lack sufficient detail to determine their adequacy; b) ground-water restoration costs do not indicate a restoration method for the proposed 1.33 billion gallon restoration effort at Section 8 (i.e., 9 pore volumes); c) radiological survey and environmental monitoring costs are not reflected; d) no project management and miscellaneous costs are specified; e) no contractor profit indicated, and labor and equipment overhead costs are sketchy; and f) no contingency cost is reflected. As mentioned in Comment 6 above, this information should be descriptive enough for the NRC staff to determine the acceptability of HRI's proposed cost figures, and should be based on an independent contractor performing the decommissioning and reclamation work in accordance with 10 CFR Part 40, Appendix A, Criterion 9 requirements. Examples of acceptable "levels of detail" for cost estimates pertaining to surety submittals can be found in Appendix E of the NRC's draft "Standard Review Plan for In-Situ Leach Uranium Extraction License Applications" (NUREG-1569, dated October 1997), and Section 4 of the NRC's "Technical Position on Financial Assurances for Reclamation, Decommissioning, and Long-Term Surveillance and Control of Uranium Recovery Facilities" (dated October 1988).

ACTION NEEDED:

HRI should provide additional cost information in the areas of decommissioning listed above for the restoration and reclamation activities associated with its surety submittal.

8. **COMMENT:** Well-Field Zone Map

DISCUSSION:

HRI's proposed rec plan includes an enclosure titled "Church Rock Section 8 - Pore Volume Calculated By Zone." However, it is unclear what the Section 8 zone designations represent in this enclosure (e.g., UA, LA, UB, etc.). HRI should submit a proposed well-field map clarifying the zone designations and locations within Section 8.

ACTION NEEDED:

HRI should submit a proposed well-field map that clarifies the zone designations and locations within Section 8.

9. **COMMENT:** Proposed Bonding Figure

DISCUSSION:

HRI proposed to initially bond for one-third of the total Section 8 project cost, which it estimates at $8,017,063 over a five year period. HRI further indicated that groundwater restoration at the first well-field would be $1,001,532. In order for the NRC staff to adequately review the proposed surety amount, HRI must submit a detailed plan with appropriate cost figures that clearly indicates all current and future activities requiring reclamation and decommissioning prior to the NRC's next annual surety review (e.g., surface construction and/or disturbances, facilities and equipment, etc.), in addition to restoration costs of the first well-field.

ACTION NEEDED:

HRI should submit a detailed plan with appropriate cost figures for all current and future activities requiring reclamation and decommissioning prior to the NRC's next annual surety review.

ENCLOSURE 2

1999 RESTORATION/RECLAMATION SURETY COST ESTIMATE

SUMMARY

A.	Groundwater Restoration	$4,547,963
B.	Wellfield Reclamation	2,308,364
C.	Commercial Plant Reclamation/Decommissioning	339,445
D.	R O Building Reclamation/Decommissioning	49,918
E.	Evaporation Pond Reclamation	407,536
F.	Miscellaneous Site Reclamation	60,870
G.	Deep Disposal Well Reclamation	65,055
H.	I - 196 Brule Aquifer Restoration	26,466
	Subtotal	$7,805,617
I.	Contract Administration (10%)	780,562
J.	Contingency (15%)	1,170,843
	TOTAL	**$9,757,022**

Enclosure 2

BASIS OF COSTS:

Costs used in the surety bond calculations are based on the following rationale:

1. Labor Rates: Labor rates are based on 1998 actual CBR labor for plant and wellfield operations including benefits and payroll taxes, plus 20% for contractors overhead and profit.

2. Disposal Costs: Disposal costs of byproduct material are based on a current disposal agreement held by CBR.

	Fee	Transport Cost	Total
Packaged Material	$10.00/cf	$2.42/cf	$12.42/cf
Soil, etc.	$81.00/cy	$66.00/cy	$147.00/cy

Disposal of non-byproduct material will be at a licensed landfill per NDEQ permit. $10 load fee plus transport cost of $360/20 tons @ 30 miles.

3. Power Costs Based on actual 1998 power costs including demand factor, energy charge, taxes, and service fees, $0.05/Kw-hr

4. Equipment Costs

Equipment	Base(1) Rental Cost ($/hr)	Labor Cost ($/hr)	Oper. Cost ($/hr)	Fuel(2) Cost ($/hr)	Mob. &(3) Demob ($/hr)	Total ($/hr)
IT12 Loader	21	17	9	4	2	53
Shredder	12	--	--	incl.	incl.	12
Bulldozer (D8N)	85	17	19	12	2	135
Smeal	42	incl	incl.	incl.	incl.	42
Mixing Unit	12	--	--	incl.	incl.	12

(1) From Nebraska Machinery rental rates for IT12 and D8N. Shredder and mixing units are estimates.
(2) From Caterpillar Handbook, Edition 19 fuel consumption using $1.00/gal for diesel cost.
(3) Based on $2.08/mile at 90 miles one way x 2 trips/176 hours.

A. GROUNDWATER RESTORATION

Restoration costs are based on restoring Mine Units (MU) 1, 2, 3, 4, 5 and 6. MU-1, 2, 3, 4 and 5 are based on actual installed information. Construction of MU-6 is underway.

Mine Unit	Thickness (ft)	No. Patterns	Pattern Size (ft^2)	Porosity	Pore Volume (gals)	Mine Unit Total Area (Acres)
MU-1	19.6	38	10,624	0.29	17,165,000	9.3
MU-2	16.3	52	9,800	0.29	18,018,500	11.7
MU-3	12.5	57	10,284	0.29	15,894,490	13.4
MU-4	12.9	96	10,765	0.29	28,918,420	23.7
MU-5	14.4	187	7,557	0.29	44,142,110	31.8
MU-6	16.2	191	7,561	0.29	50,748,970	34.2
MU-7	15.0	200	10,000	29	65,076,000	45.9

MU-1

1) Remove 1 pore volumes (PV) groundwater transfer/sweep.
   - o Produce at 1,150 gpm with (36) 32 gpm downhole pumps (5 HP).
   - o Total horsepower = 180 HP
   - o Time to do work:
     1 PV x 17,165,000 gal/PV x 1 min/1,150 gal x
     1 hour/60 min = 249 hours

   a. Power Cost:
      249 hours x 180 HP x .75 Kw/HP x $0.05/Kw-hr = $1,681
   b. Labor Cost:
      249 hours x 2 man-day/8 hours x $136/man-day = 8,466

      $10,147

      or $0.59/1000 gal

2) Treat 4 PV with R.O. and re-inject permeate using a 300 gpm R.O. unit.
   - o 4 PV x 17,165,000 gal/PV x 1 min/300 gal x 1 hr/60 min = 3,814 hours

   a. Power cost:

Downhole pump HP	
300 gpm/32 gpm/pump x 5 HP pump	47 HP
Injection Pump	25 HP
R.O. System	
R.O. Unit pump	123 HP
Permeate pump	40 HP
Waste pump	8 HP
	243 HP

      3,814 hrs x 243 HP x .75 Kw/HP x $0.05/Kw-hr = $34,755

   b. Chemical Cost:
      Antiscalant: $31/gal x 0.20 gal/hr x 3,814 hrs = 23,647
      Reductant: $0.29/lb x 0.56 lb Na2S/1000gal x 4PV
      x 17,165,000 gal/PV= 11,150

   c. Labor Cost:
      3,814 hrs x 2 man-day/8 hours x $136 man-day = $129,676
      Total

      $199,228

      or $2.90/1,000 gal

3) Recirculate 1 PV with reductant @ 1,150 gpm

   a. Power Cost:

(36) 5 HP downhole pumps =	180 HP
(1) Injection pump =	30 HP
Total HP	210 HP

      210 HP x 249 hrs x .75 Kw/HP x $0.05/Kw-hr = $ 1,961
   b. Chemical Cost:
      1 PV x 17,165,000 gal/PV x 0.56 lb Na2S/1000 gal
      x $0.29/lb = 2,788

   c. Labor Cost: (see above) 8,466
      Total

      $13,215

      or $0.77/1000 gal

4) Spare parts, filters, consumables, etc
for items 1-4 above are estimated to be $16,468/yr
- o Time to do work is 3,358 hours/24 hours
= 140 days
- a. $16,468/yr x 140/365= $6,316

5) Sampling and Monitoring.
- o Number of wells to be sampled are a minimum of 10 per mine unit or 1/acre plus any monitor wells on excursion.
- a. Sample prior to restoration
10 wells x $150/well (32 parameter suite) = $1,500
- b. Phase I sampling (GW transfer/sweep):
10 wells x $47/well (6 parameters) x 1 month = 470
- c. Phase 2 sampling (4PV R.O., 1PV reductant):
10 wells x $150/well x 6 months = 9,000
- d. Phase 3 sampling (stabilization)
10 wells x $150/well x 6 months = 9,000
- e. Monitor well sampling:
14 wells x 2 samples/month x $47 well x 13 months = 17,108
- f. Other lab analysis (radon, urinalysis, etc)
$806/month x 5 months = 4,030
Total sampling and monitoring $ 41,108

6) Supervisory labor for restoration work (including 33% overhead factor)
- a. (1) Engineer $6,256/month x 7 months = $43,792
- b. (1) Radiation Technician $5,212/month x 7 months = 36,484
(Operator wages included in above calculations)
$ 80,276

MU-1 TOTAL **$350,290**

MU-2

1)	Remove 1 PV, gw transfer/sweep.		
	o 1 PV x 18,018,500 gal/PV x 1 min/1,150 gal x 1 hr/60 min = 261 hours		
	a. 1 PV x 18,018,500 gal/PV x $0.59/1000 gal =		$10,631
2)	Treat 4 PV with R.O and inject permeate.		
	o 4PV x 18,018,500 gal/PV x 1 min/300 gal x 1 hr/60 min = 4,004 hours		
	a. 4 PV x 18,018,500 gal/PV x $2.90/1000 gal =		$209,015
3)	Recirculate 1 PV with reductant.		
	o Time = 261 hours		
	a. 1PV x 18,018,500 gal/PV x $0.77/1000 gal =		$13,874
4)	Spare parts, etc.		
	o Total time to do work = 147 days		
	a. $16,468/yr x 147/365 =		$6,632
5)	Sampling and monitoring - 12 restoration wells plus 14 monitor wells.		
	a. Sample prior to restoration 12 wells x $150/well (32 parameter suite) =	$1,800	
	b. Phase I sampling (gw transfer/sweep) 12 wells x $47/well x 1 month (6 parameters) =	564	
	c. Phase 2 sampling (4PV R.O., 1PV reductant) 12 wells x $150/well x 6 months =	10,800	
	d. Phase 3 sampling (stabilization) 12 wells x $150/well x 6 months =	10,800	
	e. Monitor well sampling 14 wells x 2 samples/month x $47 well x 13 months =	17,108	
	f. Other lab analysis (radon, urinalysis, etc) $806/month x 5 months =	4,030	
			$45,102
7)	Supervisory Labor (same as MU-1)		$80,276
	MU-2 TOTAL		**$365,530**

MU-3

1)	Remove 1 PV. gw transfer/sweep.		
	o 1 PV x 15,894,490 gal/PV x 1 min/1,150 gal x 1 hr/60 min = 230 hours		
	a. 1 PV x 15,894,490 gal/PV x $0.59/1000 gal =		$9,378
2)	Treat 4 PV with R.O. and inject permeate.		
	o 4PV x 15,894,490 gal/PV x 1 min/300 gal x 1 hr/60 min = 3,532 hours		
	a. 4 PV x 15,894,490 gal/PV x $2.90/1000 gal =		$184,376
3)	Recirculate 1 PV with reductant.		
	o Time = 230 hours		
	a. 1PV x 15,894,490 gal/PV x $0.77/1000 gal =		$12,239
4)	Spare parts, etc.		
	o Total time to do work = 166 days		
	a. $16,468/yr x 166/365 =		$7,489
5)	Sampling and monitoring 18 restoration wells plus 14 monitor wells.		
	a. 18 wells x $150/well =	$2,700	
	b 18 wells x $47/well x 1 months =	846	
	c. 18 wells x $150/well x 5 months =	13,500	
	d. 18 wells x $150/well x 6 months =	16,200	
	e. 14 wells x 2 samples/month x $47 well x 12 months =	15,792	
	f. Other lab: $806/month x 6 months =	4,836	
	Total		$53,874
6)	Supervisory Labor		
	a. (1) Engineer $6,256/month x 6 months =	$37,536	
	b (1) Radiation Technician $5,212/month x 6 months =	31,272	
	(Operator wages included in above calculations)		
			$ 68,808
	MU-3 TOTAL		**$336,164**

MU-4

1)	Remove 1 PV, gw transfer/sweep.		
	o 1 PV x 28,918,420 gal/PV x 1 min/1,150 gal x 1 hr/60 min = 419 hours		
	a. 1 PV x 28,918,420 gal/PV x $0.59/1000 gal =		$17,062
2)	Treat 4 PV with R.O. and inject permeate.		
	o 4PV x 28,918,420 gal/PV x 1 min/300 gal x 1 hr/60 min = 6,426 hours		
	a. 4 PV x 28,918,420 gal/PV x $2.90/1000 gal =		$335,454
3)	Recirculate 1 PV with reductant.		
	o Time = 419 hours		
	a. 1PV x 28,918,420 gal/PV x $0.77/1000 gal =		$22,267
4)	Spare parts, etc		
	o Total time to do work = 303 days		
	a. $10,468/yr x 303/365 =		$13,071
5)	Sampling and monitoring 25 restoration wells plus 18 monitor wells.		
	a. 25 wells x 150/well=	$3,750	
	b. 25 wells x 47/well x 1 months=	1,175	
	c. 25 wells x 150/well x 9 months=	33,750	
	d. 25 wells x 150/well x 6 months=	22,500	
	e. 18 wells x 2 samples/month x 47/well x 16 months =	27,072	
	f. Other lab: $806/month x 10 months=	8,060	
			$96,307
6)	Supervisory Labor:		
	a. (1) Engineer: $6,256/month x 10 months=	$62,560	
	b. (1) Radiation Technician. $5,212/month x 10 months (Operator wages included in above calculations)	52,120	
			$114,680
	MU-4 TOTAL		**$599,441**

MU-5

1)	Remove 1 PV, gw transfer/sweep.		
	o 1 PV x 44,142,110 gal/PV x 1 min/1,150 gal x 1 hr/60 min = 640 hours		
	a. 1 PV x 44,142,110 gal/PV x $0.59/1000 gal =		$26,044
2)	Treat 4 PV with R.O. and inject permeate.		
	o 4PV x 44,142,110 gal/PV x 1 min/300 gal x 1 hr/60 min = 9,809 hours		
	a. 4 PV x 44,142,110 gal/PV x $2.90/1000 gal =		$512,048
3)	Recirculate 1 PV with reductant.		
	o Time = 640 hours		
	a. 1PV x 44,142,110 gal/PV x $0.77/1000 gal =		$33,989
4)	Spare parts, etc.		
	o Total time to do work = 462 days		
	a $16,468/yr x 462/365 =		$20,844
5)	Sampling and monitoring 33 restoration wells plus 52 monitor wells		
	a. 33 wells x $150/well=	$4,950	
	b 33 wells x $47/well x 1 months=	1,551	
	c 33 wells x 150/well x14 months=	69,300	
	d. 33 wells x 150/well x 6 months=	29,700	
	e. 52 wells x 2 samples/month x 47/well x 21 months =	102,648	
	f. Other lab: $806/month x 15 months=	12,090	
			$220,239
6)	Supervisory Labor:		
	a. (1) Engineer: $6,256/month x 15 months=	$93,840	
	b (1) Radiation Technician. $5,212/month x 15 months (Operator wages included in above calculations)	78,180	
			$172,020
	MU-5 TOTAL		**$985,184**

MU-6

1)	Remove 1 PV, gw transfer/sweep		
	o 1 PV x 50,748,970 gal/PV x 1 min/1,150 gal x 1 hr/60 min = 735 hours		
	a. 1 PV x 50,748,970 gal/PV x $0.59/1000 gal =		$29,942
2)	Treat 4 PV with R.O. and inject permeate.		
	o 4PV x 50,748,970 gal/PV x 1 min/300 gal x 1 hr/60 min = 11,278 hours		
	a. 4 PV x 50,748,970 gal/PV x $2.90/1000 gal =		$588,688
3)	Recirculate 1 PV with reductant.		
	o Time = 735 hours		
	a. 1PV x 50,748,970 gal/PV x $0.77/1000 gal =		$39,077
4)	Spare parts, etc.		
	o Total time to do work = 531 days		
	a. $16,468/AT x 531/365 =		$23,958
5)	Sampling and monitoring 33 restoration wells plus 52 monitor wells		
	a. 33 wells x $150/well=	$4,950	
	b. 33 wells x $47/well x 1 months=	1,551	
	c. 33 wells x 150/well x10 months=	79,200	
	d. 33 wells x 150/well x 6 months=	29,700	
	e. 52 wells x 2 samples/month x 47/well x 32 months =	156,416	
	f. Other lab: $806/month x 18 months=	14,508	
			$286,325
6)	Supervisory Labor:		
	a. (1) Engineer: $6,256/month x 18 months=	$112,608	
	b. (1) Radiation Technician: $5,212/month x 18 months (Operator wages included in above calculations)	93,816	
			$206,424
	MU-6 TOTAL		**$1,174,414**

MU-7 (One half of Mine Unit 7 is to be constructed in 1999, the total for MU-7 is calculated below and then one half is included in the surety total.)

1)	Remove 1 PV, gw transfer/sweep.			
	o 1 PV x 65,076,000 gal/PV x 1 min/1,150 gal x 1 hr/60 min = 943 hours			
	a. 1 PV x 65,076,000 gal/PV x $0.59/1000 gal =		$38,395	
2)	Treat 4 PV with R.O. and inject permeate.			
	o 4PV x 65,076,000 gal/PV x 1 min/300 gal x 1 hr/60 min = 14,461 hours			
	a. 4 PV x 65,076,000 gal/PV x $2.90/1000 gal =		$754,882	
3)	Recirculate 1 PV with reductant.			
	o Time = 943 hours			
	a. 1PV x 65,076,000 gal/PV x $0.77/1000 gal =		$50,108	
4)	Spare parts, etc			
	o Total time to do work = 681 days			
	a. $16,468/Yr x 681/365 =		$30,725	
5)	Sampling and monitoring 46 restoration wells plus 44 monitor wells.			
	a. 46 wells x $150/well=	$6,900		
	b. 46 wells x $47/well x 2 months=	4,324		
	c. 46 wells x 150/well x21 months=	144,900		
	d. 46 wells x 150/well x 6 months=	41,400		
	e. 44 wells x 2 samples/month x 47/well x 29 months =	119,944		
	f. Other lab: $806/month x 23 months=	18,538		
			$336,006	
6)	Supervisory Labor:			
	a. (1) Engineer: $6,256/month x 23 months=	$143,888		
	b. (1) Radiation Technician: $5,212/month x 23 months (Operator wages included in above calculations)	119,876		
			$263,764	
	MU-7 TOTAL		**$1,473,880**	
	One Half of MU-7			**$736,940**

TOTAL MU-1, 2, 3, 4, 5, 6 and one half of MU-7 RESTORATION COST **$4,547,963**

B. WELLFIELD RECLAMATION

Wellfield Reclamation costs are based on removing and disposing of the wellfield pipe at a licensed facility. The soil around the production wells will also be removed and disposed of at a licensed facility.

Mine Unit	2" Prod & Inj. Lines (ft)	#3/8" O2 Hose	1-1/4" Stinger (ft)	2" Prod. Downhole Pipe	Producers	Injectors
MU-1	30,000		43,200	15,200	38	72
MU-2	34,000		47,400	20,800	52	79
MU-3	39,520		57,400	22,800	57	95
MU-4	68,900		101,400	38,400	96	169
MU-5	106,080	66,300	0	74,800	187	221
MU-6	128,700		91,200	76,400	191	304
MU-7	136,500		97,500	80,000	200	325

Pipe Volumes Normal Pipe Size	Wall Thickness (inches)	Pipe O.D. (Inches)	Volume[1] per Foot (ft^3/ft)
3/8" O2 Hose		0.375	0.0313
2" Sch. 40 downhole	0.154	2.375	0.0074
1-1/4" Sch. 40 stinger	0.140	1.660	0.0044
2" SDR 13.5 inj. & prod.	0.14815	2.2963	0.0069
4" SDR 35	0.1143	4.2286	0.0103
6" Sch. 40 process pipe	0.280	6.5600	0.0384
6" Trunkline	0.491	6.566	0.0651
8" Trunkline	0.639	8.548	0.1103
10" Trunkline	0.796	10.654	0.1712
12" Trunkline	0.944	12.637	0.2408

MU-1

1) Removal/disposal of 2" production and injection lines. Piping is rated SDR 13.5 and constructed of HDPE.

- o Two inch lines are buried 18-24" deep and can be pulled up with a loader. A two man crew should remove 450 ft per day. Two additional men will shred the pipe

a.	Remove pipe: 30,000 ft x 2 man-days/450 ft x $136/man-day =	$18,133
b.	Shred pipe: 30,000 ft x 2 man-days/450 ft x $136/man-day =	18,133
c.	Equipment:	
	o IT12 loader, $53/hr x 533 hours =	28,249
	o Shredder, $12/hr x 533 hours =	6,396
d.	Disposal: 30,000 ft x .0069 ft³/ft x $12.42/ft³ x 1.25(1) =	3,214
		74,125
	or	$2.47/ft

(1) 1.25 factor for void spaces

2) Removal/disposal of trunklines, including trunklines to plant buildings Piping is rated SDR 13.5

a.	Remove pipe: 5,400 ft x 2 man-days/200 ft x $136/man-day =	$7,344
b.	Shred pipe: 5,400 ft x 2 man-days/200 ft x $136/man-day =	7,344
c.	Equipment:	
	o IT12 loader, $53/hr x 216 hours =	11,448
	o Shredder, $12/hr x 216 hours =	2,592
d.	Disposal: 6" - 1000 ft x 0.0651 ft³/ft x $12.42/ft³ x 1.25 =	1,011
	8" - 4,400 ft x 0.1103 ft³/ft x $12.42/ft³ x 1.25 =	7,535
		37,274

3) Removal/disposal of downhole pipe Downhole pipe is Sch. 40 PVC.

- o From experience, 10 wells of downhole pipe can be removed each day with a 3 man crew and a smeal.

a.	Removal of downhole pipe 43,200 ft stinger x 3 man-days/6,000 ft x $136/man-day =	2,938
	15,200 ft prod. x 3 man-days/6,000 ft	

	x $136/man-day =	1,034	
b.	Shred pipe:		
	43,200 ft x 2 man-days/4,500 ft x $136/man-day =	2,611	
	15,200 ft x 2 man-days/4,500 ft x $136/man-day =	919	
c.	Equipment:		
	Smeal: $42/hour x 78 hours =	3,276	
	Shredder: $12/hour x 78 hours =	936	
d.	Disposal:		
	43,200 ft x .0044 ft³/ft x $12.42/ft³ x 1.25 =	2,951	
	15,200 ft x .0074 ft³/ft x $12.42/ft³ x 1.25 =	1,746	
			$16,411

or $0.26/ft (stinger pipe)
or $0.31/ft (2" production pipe)

4) Well Plugging.

o Assume 700 ft total depth/well average.

a.	Materials:		
	Cement - 564 lbs x $100/ton =	$28	
	Bentonite - 45 lbs x $190/ton =	4	
	Salt - 33 lbs x $56/ton =	1	
	Well Cap	16	
b.	Labor:		
	2 hours/well x 1 day/8 hours x 2 man-days x $136/man-day =	68	
c.	Equipment:		
	Backhoe - 1/2 hour/well x $46/hour =	23	
	Mixing Unit - 2 hours x $12/hour =	24	
		$158/well	
	110 production and injection wells x $158/well =	$17,380	
	11 monitor wells x $158/well =	1,738	
			$19,118

5) Wellfield surface area reclamation

o Remove and dispose of contaminated soil around well, scarify and seed well locations

a.	Remove and dispose of contaminated soil		
	10 ft³/well x 110 wells x 1 cy/27 ft³ x $147/cy =	$5,989	
	20 hours loader x $53/hour =	1,060	
	20 man-hours x $136.8 hours =	340	
b	Recontour and seed		
	9.3 acres x $300/acre =	2,790	
			$10,179

6) Wellfield house dismantle and disposal.

o Dismantle wellfield house (10'x20'x10')

a. Labor:
2 man-days x $136/man-day $272

b. Equipment (IT12)
2 hours x $53/hour = 106

c. Disposal at landfill
$370/load x 6,000 lbs/wellhouse
x 1 load/40,000 lbs = 56
Total per wellhouse $434

2 Wellhouses x $434/wellhouse = $868

MU-1 Total **$157,975**

MU-2

1)	Removal/disposal of 2" production and injection lines		
	a. 34,000 ft x $2.47/ft =		$83,980
2)	Removal/disposal of trunklines. Piping is rated SDR 13.5.		
	a. Remove pipe: 2,900 ft x 2 man-days/200 ft x $136/man-day =	$3,944	
	b. Shred pipe: 2,900 ft x 2 man-days/200 ft x $136/man-day =	3,944	
	c. Equipment:		
	o IT12 loader, $53/hr x 116 hours =	6,148	
	o Shredder, $12/hr x 116 hours =	1,392	
	d. Disposal:		
	6" - 1,600 ft x 0.0651 ft³/ft x $12.42/ft³ x 1.25 =	1,617	
	8" - 1,300 ft x 0.1103 ft³/ft x $12.42/ft³ x 1.25 =	2,226	
			19,271
3)	Removal/disposal of downhole pipe		
	a. 47,400 ft stinger x $0.26/ft =	12,324	
	b. 20,800 ft production x $0.31 ft =	6,448	
			18,772
4)	Well plugging		
	o 131 production and injection wells, 14 monitoring wells		
	a. 145 wells x $158/well =		22,910
5)	Surface reclamation		
	a. Removal/disposal of contaminated soil 131 wells x $54/well =	7,074	
	b. Recontour, seed 11.7 acres x $300/acre =	3,510	
			10,584
6)	Wellfield house dismantle/disposal		
	a 3 wellfield houses x $434/wellfield house =		1,302
	MU-2 Total		**$156,819**

MU-3

1)	Removal/disposal of 2" production and injection lines		
	a. 39,520 ft x $2.47/ft =		$97,614
2)	Removal/disposal of trunklines. Piping is rated SDR 13.5.		
	a. Remove pipe.		
	2,950 ft x 2 man-days/200 ft		
	x $136/man-day =	$4,012	
	b. Shred pipe:		
	2,950 ft x 2 man-days/200 ft		
	x $136/man-day =	4,012	
	c Equipment:		
	o IT12 loader, $53/hr x 118 hours =	6,254	
	o Shredder, $12/hr x 118 hours =	1,416	
	d. Disposal:		
	8" - 1,450 ft x 0.1103 ft^3/ft x		
	$12.42/ft^3 x 1.25 =	2,483	
	12" - 1,500 ft x 0.2408 ft^3/ft x		
	$12.42/ft^3 x 1.25 =	5,608	
			23,785
3)	Removal/disposal of downhole pipe		
	a. 57,400 ft stinger x $0.26/ft =	$14,924	
	b 22,800 ft production x $0.31/ft =	7,068	
			21,992
4)	Well plugging		
	o (152 production and injection wells, 14 monitor wells)		
	a. 166 wells x $158/well =		26,228
5)	Surface reclamation		
	a. Removal/disposal of contaminated soil		
	166 wells x $54/well =	8,964	
	b. Recontour, seed		
	13.4 acres x $300/acre =	4,020	
			12,984
6)	Wellfield house dismantle/disposal		
	a 4 wellfield houses x $434/wellfield house =		1,736
	MU-3 Total		**$184,339**

MU-4

1)	Removal/disposal of 2" production and injection lines		
	a. 68,900 ft x $2.47/ft=		$170,183
2)	Removal/disposal of trunklines. Piping is rated SDR 13.5.		
	a. Remove pipe:		
	7,400 ft x 2 man-days/200 ft		
	x $136/man-day =	$10,064	
	b. Shred pipe:		
	7,400 ft x 2 man-days/200 ft		
	x $136/man-day =	10,064	
	c Equipment:		
	o IT12 loader, $53/hr x 296 hours =	15,688	
	o Shredder, $12/hr x 296 hours =	3,552	
	d. Disposal:		
	8" - 5,400 ft x 0.1103 ft³/ft x		
	$12.42/ft³ x 1.25 =	9,247	
	12" - 2,000 ft x 0.2408 ft³/ft x		
	$12.42/ft³ x 1.25 =	7,477	
			56,092
3)	Removal/disposal of downhole pipe		
	a. 101,400 ft stinger x $0.26/ft=	26,364	
	b. 38,400 ft production x $0.31/ft=	11,904	
			38,268
4)	Well plugging		
	o (265 production and injection wells, 18 monitor wells)		
	a. 283 wells x $158/well=		44,714
5)	Surface reclamation		
	a. Removal/disposal of contaminated soil		
	283 wells x $54/well =	15,282	
	b. Recontour, seed		
	25 acres x $300/acre=	7,500	
			22,782
6)	Wellfield house dismantle/disposal		
	a. 5 wellfield houses x $434/wellfield house =		2,170
	MU-4 Total		**$334,209**

MU-5

1)	Removal/disposal of 2" production and injection lines			
	a. 106,080 ft x $2.47/ft=		$262,018	
2)	Removal/disposal of trunklines. Piping is rated SDR 13.5			
	a. Remove pipe:			
	17,800 ft x 2 man-days/200 ft			
	x $136/man-day =	$24,208		
	b Shred pipe:			
	17,800 ft x 2 man-days/200 ft			
	x $136/man-day =	24,208		
	e. Equipment:			
	o IT12 loader, $53/hr x 712 hours =	37,736		
	o Shredder, $12/hr x 712 hours =	8,544		
	d. Disposal:			
	8" - 3,700 ft x 0.1103 ft³/ft x			
	$12.42/ft³ x 1.25 =	6,336		
	12" - 14,100 ft x 0.2408 ft³/ft x			
	$12.42/ft³ x 1.25 =	52,712		
			153,744	
3)	Removal/disposal of downhole pipe			
	a. Dispose:			
	66,300 ft hose x 0.0313ft³/ft x$12.42/cf x 1.25=	32,217		
	Remove:			
	66,300 ft x 1 man-day/1,000ft x $136/man-day=	9,017		
	b. 74,800 ft production x $0.31/ft=	23,188		
			64,422	
4)	Well plugging			
	o (408 production and injection wells, 52 monitor wells)			
	a. 460 wells x $158/well=		72,680	
5)	Surface reclamation			
	a. Removal/disposal of contaminated soil			
	460 wells x $54/well =	24,840		
	b. Recontour, seed			
	32 acres x $300/acre=	9,600		
			34,440	
6)	Wellfield house dismantle/disposal			
	a. 7 wellfield houses x $434 wellfield house =		3,038	
	MU-5 Total			**$590,342**

MU-6

1)	Removal/disposal of 2" production and injection lines			
	a. 128,700 ft x $2.47/ft=		$317,889	
2)	Removal/disposal of trunklines. Piping is rated SDR 13.5			
	a. Remove pipe:			
	12,000 ft x 2 man-days/200 ft			
	x $136/man-day =	$16,320		
	b. Shred pipe:			
	12,000 ft x 2 man-days/200 ft			
	x $136/man-day =	16,320		
	c Equipment:			
	o IT12 loader, $53/hr x 480 hours =	25,440		
	o Shredder, $12/hr x 480 hours =	5,760		
	d. Disposal:			
	8" - 2,000 ft x 0.1103 ft³/ft x			
	$12.42/ft³ x 1.25 =	3,425		
	12" - 10,000 ft x 0.2408 ft³/ft x			
	$12.42/ft³ x 1.25 =	37,384		
			104,649	
3)	Removal/disposal of downhole pipe			
	a. Dispose			
	91,200 ft stinger x 0.26/ft =	23,712		
	b 76,400 ft production x $0.31/ft=	23,684		
			47,396	
4)	Well plugging			
	o (495 production and injection wells, 52 monitor wells)			
	a. 547 wells x $158/well=		86,426	
5)	Surface reclamation			
	a. Removal/disposal of contaminated soil			
	432 wells x $54/well =	23,328		
	b Recontour, seed			
	40.2 acres x $300/acre=	12,060		
			35,388	
6)	Wellfield house dismantle/disposal			
	a. 7 wellfield houses x $434/wellfield house =		3,038	
	MU-6 Total			**$594,786**

MU-7 (One half of Mine Unit 7 is to be constructed in 1999, the total for MU-7 is calculated below and then one half is included in the surety total.)

1)	Removal/disposal of 2" production and injection lines			
	a. 136,500 ft x $2.47/ft=		$337,155	
2)	Removal/disposal of trunklines. Piping is rated SDR 13.5.			
	a. Remove pipe.			
	5,000 ft x 2 man-days/200 ft			
	x $136/man-day =	$6,800		
	b. Shred pipe:			
	5,000 ft x 2 man-days/200 ft			
	x $136/man-day =	6,800		
	c. Equipment:			
	o IT12 loader, $53/hr x 200 hours =	10,600		
	o Shredder, $12/hr x 200 hours =	2,400		
	d. Disposal:			
	8" - 1,000 ft x 0.1103 ft³/ft x			
	$12.42/ft³ x 1.25 =	1,712		
	12" - 5,000 ft x 0.2408 ft³/ft x			
	$12.42/ft³ x 1.25 =	18,692		
			47,004	
3)	Removal/disposal of downhole pipe			
	a. Dispose.			
	97,500 ft stinger x 0.26/ft=	25,350		
	b. 80,000 ft production x $0.31/ft=	24,800		
			50,150	
4)	Well plugging			
	o (525 production and injection wells, 90 monitor wells)			
	a. 615 wells x $158/well=		97,170	
5)	Surface reclamation			
	a. Removal/disposal of contaminated soil			
	615 wells x $54/well =	33,210		
	b Recontour, seed			
	40.2 acres x $300/acre=	12,060		
			45,270	
6)	Wellfield house dismantle/disposal			
	a. 7 wellfield houses x $434/wellfield house =		3,038	
	MU-7 Total		**$579,787**	
	One half of Mine Unit 7			**$289,894**
TOTAL WELLFIELD RECLAMATION MU-1, 2, 3, 4, 5, 6 and one half of MU-7				**$2,308,364**

C. COMMERCIAL PLANT RECLAMATION/DECOMMISSIONING

The plant interior components: tanks, pumps, steel structure, filters, piping and electrical components are from an in-situ plant that was moved from Texas to the Crow Butte site in 1988. The actual cost to perform this work, escalated to 1998 $'s, is used for bonding purposes with the breakdown of volumes of equipment and other structural items included.

1) Dismantle interior steel, tanks, pumps, filters, piping and electrical components (including labor, equipment, tools, etc.)
The volume of components to be dismantled are detailed below:

Interior structural steel - 75 tons
Tanks - 34 each
Pumps - 30 each
Piping - 8,250 feet
Filters - 4 each
Dryer - 1 each
Electrical boxes - 20 each (estimate)

- $66,600 (1988$) x 162.5 (April 1998 CPI Index) / 118.3 (1988 average CPI Index) = $91,484

2) Dismantle plant building (including office and lab area)
- 146 tons of steel, siding, girts x $300 (1988 dismantle cost)/ton x 160.3/118.3 = $59,350

3) Decontaminate floor and walls of plant building:
Plant floor area is 30,000 sf; 5,450 sf will be removed and disposed of, and 7,000 sf is in warehouse, shop and water tank areas which will not be contaminated. The remaining floor area is 17,530 sf.
HCl will be sprayed on the floors and walls and recycled in the plant sumps for reuse until neutralized.

Wall area is approximately 24,000 sf
Use 1 gal HCl/sf for wall area and 2 gal HCl/sf for floors

a. Material:
Floors: 17,530 sf x 2 gal HCl/sf x $0.57/gal HCl = $19,984
Walls: 24,000 sf x 1 gal HCl/sf x $0.57/gal HCl = 13,680

b. Labor:
2 men x 30 days x $136/man-day = $8,160

c. HCl Disposal (to ponds)
59,060 gal HCl x 5 HP/30 gpm x .75 Kw/HP x $0.05/Kw-hr= $370

d. Decontamination equipment:

Sprayer pump	$500		
Tank (on hand)			
Recycle pump	500		
Sprayer with hose	1,000		
		$2,000	$44,194

4) Dispose of concrete

o Area which would be potentially contaminated and not decontaminated by HCl is 5,450 ft². The areas are in the trough drains, sumps, yellowcake dryer, belt filter, precipitation cells and eluant tanks. Average concrete thickness is 6"

a. Disposal:
5,450 ft² x .5 ft x $147/cy x 1 cy/27 ft³ = $14,836

b. Removal:
5,450 ft² x $2.72/sf = $14,824 $29,660

5) Dismantle/dispose of tanks

o There are 27 process tanks to be disposed of at an NRC licensed disposal facility. All of the tanks are fiberglass and will be cut up into pieces for disposal. Seven tanks are chemical storage tanks and will be disposed of at a licensed landfill.

a. Labor:
34 tanks x 2 man-days/tank x $136/man-day = 9,248

b. Disposal:
27 tanks @ (14' dia x 14' high x 1/4" wall thickness)
27 tanks x 19.3 ft³/tank x 1.20(1) x $12.42/ft= 7,766

c. Clean and haul chemical tanks. 7 chemical storage tanks will be disposed of in a licensed landfill (1 truckload
$10 fee + $360 = 370
7 tanks x 1 man-day cleaning/tank x $136/man-day = 952

d. Equipment:
Saws, scaffolding, tools, etc. = 5,708 $24,044

(1) void space factor

6) Dispose of pumps

o 30 process pumps are in the commercial plant plus 78 downhole pumps. Plant pumps are approximately 5 ft³ each, downhole pumps are 0.5 ft³ each

a. 30 pumps x 5 ft³/pump x $12.42/ft³ = $1,863

b. 350 downhole pumps x 0.5 ft³/pump x $12.42/ft³ = 2,174 $4,037

7) Dispose of filters. (2) injection filters, (1) backwash filter and (1) yellowcake filter

a. .4 filters x 100 ft^3/filter x $12.42/$ft^3$= $4,968

8) Dispose of yellowcake dryer

o yellowcake dryer system is approximately 400 ft^3 in volume

a. 400 ft^3 x $12.42/$ft^3$ = $4,968

9) Dispose of piping

o There is a total of 8,250 ft of process piping in the plant with an average diameter of approximately 6". Of the 8,250 ft, roughly 50% is used for yellowcake process. The other pipe is for chemical make-up, raw and potable water.

a. NRC licensed disposal:
4,125 ft x 0.04 ft^3/ft x $12.42/$ft^3$ x 1.25(1) = $2,562

b. Landfill disposal
1 load @ $1) fee + $360 = 370

$2,932

(1) void space factor

10) Reclaim plant site

a. Dirtwork
20,000 cy x 1 hour/700 cy x $133/hour = $3,800

b. Seed:
4 acres x $300/acre = 1,200

$5,000

11) Supervisory labor for plant reclamation

a. (1) Engineer
$6,256/month x 6 months = $37,536

b. (1) Radiation Technician
$5,212/month x 6 months
(operator wages included in above calculation) = 31,272

$68,808

TOTAL COMMERCIAL PLANT RECLAMATION/DECOMMISSIONING **$339,445**

D. R.O. BUILDING RECLAMATION/DECOMMISSIONING

Use a factor based on square footage of commercial plant for total reclamation/decommissioning of R.O. building

a. $339,445 x 5,000 ft²/34,000 ft² = $49,918

TOTAL R.O. BUILDING RECLAMATION/DECOMMISSIONING **$49,918**

E. EVAPORATION POND RECLAMATION

Pond reclamation consists of removal and disposal of the pond liners, piping, and sludge to an NRC licensed disposal facility. The pond earthen embankments will be leveled, top soiled and seeded. The liner will be cut in sections and stacked for shipment.

1) Removal and disposal of pond liner systems

a. Five solar evaporation ponds at 250,000 ft^2/each at commercial plant
Total thickness of liners is 100 mils.
5 ponds x 250,000 ft^2/pond x 0.00833 ft thick x 1.25(1) x \$12.42/ft^3 = \$161,654

b. Two solar evaporation ponds at R&D plant
Total liner thickness is 36 mils.
2 ponds x 50,000 ft^2 x 0.0030 ft thick x 1.25 x \$12.42/ft^3 = \$4,657

c. Labor for liner and pipe removal
Cut and stack 40,000 ft^2/day with a four man crew (5 ponds x 250,000 ft^2/pond + 2 ponds x 50,000 ft^2/pond) x 4 man-days/40,000 ft^2 x \$136/man-day = \$18,360

d. Equipment for liner and pipe removal
Loader
176 hours x \$53/hour = \$9,328

\$193,999

(1) void space factor

2) Removal/Disposal of leak detection pipe, SDR 35 pipe.

a. Commercial pond pipe removal
5 ponds x 2,100 ft of 4" pipe/pond x .0103 ft^3/ft x 1.25 x \$12.42/ft^3 = \$1,679

b. R&D pond pipe removal
2 ponds x 600 ft of 3" pipe/pond x .0069 ft^3/ft x 1.25 x \$12.42/ft^3 = 129

c. Pipe disposal
24.60 ft^3 x \$12.42/ft^3 x 1.25 = 382

\$2,190

3) Removal/disposal of pond sludge

o Pond sludge removal is based on removal of sludge in R&D ponds after operation and restoration.

a. Sludge disposal
38 barrels x 55 gallons/barrel x 1 cf/7.48 gallons x 1 cy/27 cf = 10.4 cy
Flow through R&D plant was 101,625,362 gallons, therefore, 1 cy of sludge per 9,772,000 gallons processed. Total flow for 1991 to 1997 will be approximately 6,066,700,000 gallons
6,066,700,000 gallons x 1 cy/9,772,000 gallons x \$147/cy = \$91,261

b. Labor:
532 cy x 3 man-days/25 cy x $136/man-day = 8,682

c. Equipment (IT12):
$53/hour x 100 hours = 5,300

$105,243

4) Reclaim ponds.
- o Dirtwork volume per pond is approximately 60,000 cy/pond at commercial and 30,000 cy total at R&D based on post construction surveys
- o Total earthwork volume is 330,000 cy
- o Average dozing distance is 150 ft. A D8 will get 700 cy per hour(1).

a. Dirtwork:
330,000 cy x 1 hour/700 cy x $133 (including operator)/hour = $62,700

b Topsoil placement and seed.
30 acres x $300/acre = 9,000

$71,700

(1) Caterpillar Handbook, Edition 19

5) Supervisory labor for pond reclamation
a (1) Engineer
$6,256/month x 3 months = $18,768

b. (1) Radiation Technician
$5,212/month x 3 months (operator wages included in above calculation) = 15,636

$34,404

TOTAL EVAPORATION POND RECLAMATION **$407,536**

F. MISCELLANEOUS SITE RECLAMATION

1) Reclaim/seed main access road.

a. Road dirtwork:
4,000' long x 25' wide x 1' deep x
1 cy/27 ft^3 = 3,704 cy
3,704 cy x 1 hour/200 cy x $133/hour = $2,463

b. Wellfield road dirtwork:
25,000' long x 12' wide x 1/2' deep x
1cy/27 ft^3 = 5,556 cy
5,556 cy x 1hour/200cy x $133/hour= 3,695

c. Seed roadway.
2.3 acres x $300/acre = 690

$6,848

2) Remove/dispose of pipe from commercial plant to ponds and from commercial plant to R.O. building.

- Pond pipeline (2) at 2,000' = 4,000 ft
- Pipe to R.O. (4) at 300' = 1,200 ft
- 5,200' average size 4" Sch. 40

a. Disposal
5,200 ft x .021 ft^2 x $12.42 ft^3 x 1.25 = $1,695

b. Removal labor
5,200 ft x 3 man-days/200 ft x $130 man-day = 10,608

c. Equipment:
- Loader
  5 days x $53 hour x 8 hours/day = 2,120
- Shredder.
  5 days x $12/hour x 8 hours/day = 480

$14,903

3) Remove electrical facilities.

a. Remove HV lines:
6,000 ft of HV line at $0.59/ft = $3,540

b. Remove substations: 1,175

$4,715

4) Supervisory Labor

a. (1) Engineer
$6,256/month x 3 months = $18,768

b. (1) Radiation Technician
$5,212/month x 3 months
(Operator wages included
in above calculations) = 15,636

$34,404

TOTAL MISCELLANEOUS SITE RECLAMATION **$60,870**

G. DEEP DISPOSAL WELL RECLAMATION

Attachment A includes the cost estimate for the deep well plugging , abandonment and site reclamation. This information is from the June 6, 1996 Completion of Construction Report - Crow Butte Resources, Inc., Class I UIC Well submitted to the NDEQ. A summary of the cost is given below, escalated to 1998 $.

1) Plugging and Abandonment $59,026 x 1.06=	$62,568	
2) Site Reclamation $2,346 x 1.06=	2,487	
TOTAL DEEP DISPOSAL WELL RECLAMATION		**$65,055**

H. I - 196 BRULE AQUIFER RESTORATION

The following estimate is based on the May 28, 1996 Remediation Plan using six pore volumes (pv) as the total water extracted.

1)Pump Wells I96a, j & n (Ground Water Sweep)		
a.Power: 337,758 gals/pv x 3 pv x 1min/3gal x 1 hour/60min x 3kw x $0.05/kwhr=	$844	
b.Manpower: 234 days x 0.13 man-day/ day x $136 man-day =	4,137	4,981
2) Bi-weekly sampling (in-house analyses) 234 days x 1 man-day /14days x $136/man-day=		2,273
3) Bi-weekly I - 196i, m, l sampling (Same as # 2)		2,273
4) Pump additional wells		
a. Pump from additionaal wells (Same as 1-3 above)	9,527	
b. Drill four additional wells 4 wells x 50 ft x $26 =	5,200	14,727
5) Well Abandonment a. 14 wells x $158/well=		2,212
TOTAL I-196 RESTORATION		**$26,466**

ENCLOSURE 3

Total Restoration and Reclamation Cost Estimate (Revised December 1998)		
I.	GROUNDWATER RESTORATION COST	$9,760,435
II.	EQUIPMENT REMOVAL & DISPOSAL COST	$141,975
III.	BUILDING DEMOLITION AND DISPOSAL COST	$1,647,318
IV.	WELLFIELD BUILDINGS & EQUIPMENT REMOVAL & DISPOSAL COST	$1,678,020
V.	WELL ABANDONMENT COST	$1,213,077
VI.	WELLFIELD AND SATELLITE SURFACE RECLAMATION COST	$82,160
VII.	TOTAL MISCELLANEOUS RECLAMATION COST	$579,441
	SUBTOTAL RECLAMATION AND RESTORATION COST ESTIMATE	$15,102,426
	OVERHEAD AND MANAGEMENT (10%)	$1,510,243
	SUBTOTAL	$16,612,669
	15% CONTINGENCY	$2,491,900
	TOTAL	$19,104,569
	TOTAL CALCULATED SURETY (IN 1998 DOLLARS)	$19,104,600

Enclosure 3

ound Water Restoration	A-Wellfield	B-Wellfield	C-Wellfield	C-19N Pattern	C-Haul. Drifts	D-Wellfield	E-Wellfield	F-Wellfield	H-Wellfield
/ Assumptions									
Wellfield Area (ft2)	151900	690900	1274000	32500		279500	994500	2769000	780000
Wellfield Area (acres)	3.49	15.86	29.25	0.75	0.00	6.42	22.83	63.57	17.91
Affected Ore Zone Area (ft2)	151900	690900	1274000	32500	0	279500	994500	2769000	780000
Avg. Completed Thickness	15	15	15	15		15	15	15	15
Porosity	0.27	0.27	0.27	0.27		0.27	0.27	0.27	0.27
Flare Factor	2.94	2.94	2.94	2.94		2.94	2.94	2.94	2.94
Affected Volume (ft3)	6698790	30468690	56183400	1433250	1360000	12325950	43857450	122112900	34398000
Kgallons per Pore Volume	13529	61535	113468	2895	10173	24893	88575	246619	69470
umber of Patterns in Unit(s)									
Current	31	141	196	5	0	43	153	426	0
Total Estimated	31	141	196	5	0	43	153	459	100
lumber of Wells in Unit(s)									
Production Wells									
Current	27	141	192			45	143	492	0
Estimated next report period	0	0	0			0	0	30	138
Total Estimated	27	141	192			45	143	522	138
Injection Wells									
Current	50	319	343			91	307	786	0
Estimated next report period	0	0	0	Wells		0	0	69	222
Total Estimated	50	319	343	included		91	307	855	222
Monitor Wells				under					
Current	18	67	78	C-Wellfield		38	86	134	81
Estimated next report period	0	0	0			0	0	0	0
Total Estimated	18	67	78			38	86	134	81
Restoration Wells									
Current	13	18	10			0	0	3	0
Estimated next report period	0	20	10			0	0	10	0
Total Estimated	13	38	35			15	30	35	30
Number of Wells per Wellfield	108	565	648	0	0	189	566	1546	471
Total Number of Wells	4093								
Average Well Depth (ft)	500	450	550	550	550	600	550	650	500
I. Restoration Well Installation Costs									
Number of Restoration Wells	0	20	25	0	0	15	30	32	30
Well Installation Unit Cost ($/Well)	$4,000	$4,000	$4,000	$4,000	$4,000	$4,000	$4,000	$4,000	$4,000
Subtotal Restoration Well Installation Costs per Wellfield	$0	$80,000	$100,000	$0	$0	$60,000	$120,000	$128,000	$120,000
Total Restoration Well Installation Costs	**$608,000**								
II. Ground Water Sweep Costs									
PV's Required	1	1	1	1	1	1	1	1	1
Total Kgals for Treatment	13529	61535	113468	2895	10173	24893	88575	246619	69470
Ground Water Sweep Unit Cost ($/Kgal)	$0.77	$0.77	$0.77	$0.77	$0.77	$0.77	$0.77	$0.77	$0.77
Subtotal Ground Water Sweep Costs per Wellfield	$10,358	$47,114	$86,877	$2,216	$7,789	$19,060	$67,817	$188,824	$53,190
Total Ground Water Sweep Costs	**$483,245**								
III. Reverse Osmosis Costs									
PV's Required	5	5	5	5	5	5	5	5	5
Total Kgals for Treatment	67644	307673	567340	14473	50864	124467	442873	1233096	347351

ound Water Restoration	A-Wellfield	[redacted]field	C-Wellfield	C-19N Pattern	C-[redacted]ifts	D-Wellfield	E-Wellfield	F-Wellfield	H-Wellfield
Reverse Osmosis Unit Cost ($/Kgal)	$1.33	$1.33	$1.33	$1.33	1.33	$1.33	$1.33	$1.33	$1.33
Subtotal Reverse Osmosis Costs per Wellfield	$89,669	$407,851	$752,066	$19,185	$67,425	$164,994	$587,072	$1,634,592	$460,448
Total Reverse Osmosis Costs	**$4,183,302**								
Chemical Reductant Costs									
Number of Patterns	27	172	196	5		43	153	413	138
Chemical Reductant Unit Cost ($/pattern)	$245	$245	$245	$245		$245	$245	$245	$245
Subtotal Chemical Reductant Costs per Wellfield	$6,615	$42,140	$48,020	$1,225	$0	$10,535	$37,485	$101,185	$33,810
Total Chemical Reductant Costs	**$281,015**								
V. Elution Costs									
A. Elution Processing Costs									
Kgals/Elution Required	35000	35000	35000	35000	35000	35000	35000	35000	35000
Number of Elutions	2	11	19	1	2	4	15	42	12
Processing Unit Cost ($/Elution)	$525	$525	$525	$525	$525	$525	$525	$525	$525
Subtotal Processing Costs	$1,050	$5,775	$9,975	$525	$1,050	$2,100	$7,875	$22,050	$6,300
B. Deep Well Injection Costs									
Deep Well Injection Volume (Kgals/Elution)	12	12	12	12	12	12	12	12	12
Total Kgals for Injection	24	132	228	12	24	48	180	504	144
Deep Well Injection Unit Cost ($/Kgals)	$4.60	$4.60	$4.60	$4.60	$4.60	$4.60	$4.60	$4.60	$4.60
Subtotal Deep Well Injection Costs	$110	$607	$1,049	$55	$110	$221	$828	$2,319	$663
Subtotal Elution Costs per Wellfield	$1,160	$6,382	$11,024	$580	$1,160	$2,321	$8,703	$24,369	$6,963
Total Elution Costs	**$62,662**								
V. Monitoring and Sampling Costs									
A. Restoration Well Sampling									
Estimated Restoration Period (Years)	5	5	5	5	2	5	5	5	5
1. Well Sampling prior to restoration start									
# of Wells	5	20	31	5	7	9	31	21	6
$/sample	$150	$150	$150	$150	$150	$150	$150	$150	$150
2. Restoration Progress Sampling									
# of Wells	5	20	31	5	7	9	31	21	6
$/sample	$150	$150	$150	$150	$150	$150	$150	$150	$150
Samples/Year	1	1	1	1	1	1	1	1	1
# of Wells	5	20	31	5	7	9	31	21	6
$/sample	$34	$34	$34	$34	$34	$34	$34	$34	$34
Samples/Year	6	6	6	6	6	6	6	6	6
3. UCL Sampling									
# of Wells	18	70	78	5	20	29	55	89	69
$/sample	$19	$19	$19	$19	$19	$19	$19	$19	$19
Samples/Year	6	6	6	6	6	3	6	6	6
Sub-total Restoration Analyses	$19,860	$78,300	$103,980	$12,450	$10,566	$25,545	$90,870	$91,050	$50,850
B. Short-term Stability									
Estimated Stabilization Period (Months)	12	12	12	12	12	12	12	12	12
# of Wells	6	56	44	6	2	19	28	89	69
Samples/Year	6	6	6	6	6	6	6	6	6
$/sample	$19	$19	$19	$19	$19	$19	$19	$19	$19
# of Wells	5	20	31	6	2	9	31	21	6
Samples/Year	6	6	6	6	6	6	6	6	6
$/sample	$34	$34	$34	$34	$34	$34	$34	$34	$34

round Water Restoration	A-Wellfield	B-Wellfield	C-Wellfield	C-19N Pattern	C-Haul. Drifts	D-Wellfield	E-Wellfield	F-Wellfield	H-Wellfield
# of Wells	5	20	31	6	2	9	31	21	6
Samples/Year	2	2	2	2	2	2	2	2	2
$/sample	$150	$150	$150	$150	$150	$150	$150	$150	$150
Sub-total Short-term Analyses	$3,204	$16,464	$20,640	$3,708	$1,236	$6,702	$18,816	$20,730	$10,890
Subtotal Monitoring and Sampling Costs per Wellfield	$23,064	$94,764	$124,620	$16,158	$11,802	$32,247	$109,686	$111,780	$61,740
Total Monitoring and Sampling Costs	**$585,861**								
I. Mechanical Integrity Test (MIT) Costs									
Five Year MIT Unit Cost ($/well)	$94	$94	$94	$94	$94	$94	$94	$94	$94
Number of Wells (30% of Inj. and Rest. Wells)	19	107	113	0	0	32	101	267	76
Subtotal Mechanical Integrity Testing Costs per Wellfield	$1,777	$10,067	$10,660	$0	$0	$2,989	$9,503	$25,098	$7,106
Total Mechanical Integrity Testing Cost	**$67,200**								
TOTAL RESTORATION COST PER WELLFIELD	$132,643	$688,318	$1,133,267	$39,364	$88,176	$292,146	$940,266	$2,213,848	$743,257
TOTAL WELLFIELD RESTORATION COST	**$6,271,285**								

X. Building Utility Costs	Central Plant	Main Office	Satellite No.1	Satellite No.2	Satellite No.3
Electricity ($/Month)	$600	$1,000	$750	$750	$750
Propane ($/Month)	$0	$0	$1,600	$0	$1,000
Natural Gas ($/Month)	$1,400	$180	$0	$1,300	$0
Number of Months	48	60	36	48	48
Subtotal Utility Costs per Building	$96,000	$70,800	$84,600	$98,400	$84,000
Total Building Utility Costs	**$433,800**				

VII. Irrigation Maintenance and Monitoring Costs	Irrigator No.1	Irrigator No.2
A. Irrigation Maintenance and Repair		
Irrigation Operation Months/Year	6	6
Cost per Month	$667	$667
Total Number of Years	5	5
Subtotal Maintenance and Repair Costs	$20,010	$20,010
B. Irrigation Monitoring and Sampling		
# of Irrigation Fluid Samples/Year	6	6
Cost/sample	$121	$121
# of Vegetation Samples/Year	4	4
Cost/sample	$165	$165
# of Soil Samples/Year	28	32
Cost/sample	$174	$174
# of Soil Water Samples/Year	12	2
Cost/sample	$121	$121
Total Number of Years	5	5
Subtotal Sampling Costs	$38,550	$35,980
Subtotal Maintenance and Monitoring Costs per Irrigator	$58,560	$55,990
Total Irrigation Maintenance and Monitoring Costs	**$114,550**	

VIII. Capital Costs (RO Purchase)	
Purchase/Installation Costs for 500 gpm RO Capacity	$500,000
Total Capital Costs	**$500,000**

IX. Vehicle Operation Costs	
Number of Pickup Trucks/Pulling Units (Gas)	10

round Water Restoration	A-Wellfield	[redacted]lfield	C-Wellfield	C-19N Pattern	C-[redacted]ifts	D-Wellfield	E-Wellfield	F-Wellfield	H-Wellfield
Operating Unit Cost in $/hr (WDEQ Guideline No.12)	$8.77								
Average Operating Time (Hrs/Year)	1000								
Total Number of Years (Average)	4								
Total Vehicle Operation Costs	**$350,800**								
I. Labor Costs									
Number of Environmental Managers/RSOs	1								
$/Year	$60,000								
Number of Restoration Managers	1								
$/Year	$50,000								
Number of Environmental Technicians	2								
$/Year	$28,000								
Number of Operators/Laborers	7								
$/Year	$28,000								
Number of Maintenance Technicians	2								
$/Year	$28,000								
Number of Years	5								
Total Labor Costs	**$2,090,000**								
TOTAL GROUND WATER RESTORATION COSTS	**$9,760,435**								

uipment Removal & Disposal	Central Plant	Satellite No.1	Satellite No.2	Satellite No.3
Removal and Loading Costs				
A. Tankage				
Number of Tanks	26	8	14	18
Volume of Tank Construction Material (ft^3)	1028	162	290	397
1. Labor				
Number of Persons	3	3	3	3
Ft^3/Day	25	25	25	25
Number of Days	41	6	12	16
$/Day/Person	$112	$112	$112	$112
Subtotal Labor Costs	$13,776	$2,016	$4,032	$5,376
2. Equipment				
Number of Days	41	6	12	16
$/Day	$338	$338	$338	$338
Subtotal Equipment Costs	$13,858	$2,028	$4,056	$5,408
Subtotal Tankage Removal and Loading Costs	$27,634	$4,044	$8,088	$10,784
B. PVC Pipe				
PVC Pipe Footage	5000	1000	4000	4000
Average PVC Pipe Diameter (inches)	3	3	3	3
Shredded PVC Pipe Volume Reduction (ft^3/ft)	0.016	0.016	0.016	0.016
Volume of Shredded PVC Pipe (ft^3)	80	16	64	64
1. Labor				
Number of Persons	2	2	2	2
Ft/Day	200	200	200	200
Number of Days	25	5	20	20
$/Day/Person	$112	$112	$112	$112
Subtotal Labor Costs	$5,600	$1,120	$4,480	$4,480
Subtotal PVC Pipe Removal and Loading Costs	$5,600	$1,120	$4,480	$4,480
C. Pumps				
Number of Pumps	50	10	14	13
Average Volume (ft^3/pump)	4.93	4.93	4.93	4.93
Volume of Pumps (ft^3)	246.5	49.3	69.02	64.09
1. Labor				
Number of Persons	1	1	1	1
Pumps/Day	2	2	2	2
Number of Days	25	5	7	7
$/Day/Person	$112	$112	$112	$112
Subtotal Labor Costs	$2,800	$560	$784	$784
Subtotal Pump Removal and Loading Costs	$2,800	$560	$784	$784
D. Dryer				
Dryer Volume (ft^3)	885			
1. Labor				
Number of Persons	5			
Ft^3/Day	175			
Number of Days	5			
$/Day/Person	$112			
Total Labor Cost	$2,800			
Total Dryer Dismantling and Loading Cost	$2,800			

uipment Removal & Disposal	[redacted]l Plant	Satellite No.1	Satellite No.2	Sate[redacted]3
Subtotal Equipment Removal and Loading Costs per Facility	$38,834	$5,724	$13,352	$[redacted]048
Total Equipment Removal and Loading Costs	**$73,958**			
Transportation and Disposal Costs (NRC-Licensed Facility)				
A. Tankage				
Volume of Tank Construction Material (ft^3)	1028	162	290	397
Volume for Disposal Assuming 10% Void Space (ft^3)	1131	178	319	436
Transportation and Disposal Unit Cost ($/$ft^3$)	$17.19	$17.19	$17.19	$17.19
Subtotal Tankage Transportation and Disposal Costs	$19,442	$3,060	$5,484	$7,495
B. PVC Pipe				
Volume of Shredded PVC Pipe (ft^3)	80	16	64	64
Volume for Disposal Assuming 10% Void Space (ft^3)	88	18	70	70
Transportation and Disposal Unit Cost ($/$ft^3$)	$17.19	$17.19	$17.19	$17.19
Subtotal PVC Pipe Transportation and Disposal Costs	$1,513	$309	$1,203	$1,203
C. Pumps				
Volume of Pumps (ft^3)	246.5	49.3	69.02	64.09
Volume for Disposal Assuming 10% Void Space (ft^3)	271	54	76	70
Transportation and Disposal Unit Cost ($/$ft^3$)	$17.19	$17.19	$17.19	$17.19
Subtotal PVC Pipe Transportation and Disposal Costs	$4,658	$928	$1,306	$1,203
D. Dryer				
Dryer Volume (ft^3)	885			
Volume for Disposal Assuming Dryer Remains Intact (ft^3)	885			
Transportation and Disposal Unit Cost ($/$ft^3$)	$17.19			
Total Dryer Transportation and Disposal Costs	$15,213			
Subtotal Equipment Transportation and Disposal Costs per Facility	$40,826	$4,297	$7,993	$9,901
Total Equipment Transportation and Disposal Costs	**$63,017**			
III. Health and Safety Costs				
Radiation Safety Equipment	$1,250	$1,250	$1,250	$1,250
Total Health and Safety Costs	**$5,000**			
SUBTOTAL EQUIPMENT REMOVAL AND DISPOSAL COSTS PER FACILITY	$80,910	$11,271	$22,595	$27,199
TOTAL EQUIPMENT REMOVAL AND DISPOSAL COSTS	**$141,975**			

Building Demolition and Disposal	Central Plant	Dryer Building	Satellite No. 1	Satellite No. 2	Satellite No. 3	Sat. No.3 Fab. Shop	Yellow Cake Warehouse	South Warehouse	Suspended Walkway
I. Decontamination Costs									
A. Wall Decontamination									
Area to be Decontaminated (ft^2)	131000	0	0	0	0	0	0	0	0
Application Rate (Gallons/ft^2)	1	1	1	1	1	1	1	1	1
HCl Acid Wash, including labor ($/Gallon)	$0.50	$0.50	$0.50	$0.50	$0.50	$0.50	$0.50	$0.50	$0.50
Subtotal Wall Decontamination Costs	$65,500	$0	$0	$0	$0	$0	$0	$0	$0
B. Concrete Floor Decontamination									
Area to be Decontaminated (ft^2)	17820	0	6000	9600	9600	0	0	0	0
Application Rate (Gallons/ft^2)	4	4	4	4	4	4	4	4	4
HCl Acid Wash, including labor ($/Gallon)	$0.50	$0.50	$0.50	$0.50	$0.50	$0.50	$0.50	$0.50	$0.50
Subtotal Concrete Floor Decontamination Costs	$35,640	$0	$12,000	$19,200	$19,200	$0	$0	$0	$0
C. Deep Well Injection Costs									
Total Kgals for Injection	202.28	0	24	38.4	38.4	0	0	0	0
Deep Well Injection Unit Cost ($/Kgals)	$4.60	$4.60	$4.60	$4.60	$4.60	$4.60	$4.60	$4.60	$4.60
Subtotal Deep Well Injection Costs	$931	$0	$110	$177	$177	$0	$0	$0	$0
Subtotal Decontamination Costs per Building	$102,071	$0	$12,110	$19,377	$19,377	$0	$0	$0	$0
Total Decontamination Costs	**$158,021**								
II. Demolition Costs									
A. Building									
Assumptions:									
Dryer bldg. demolition unit cost of $0.73/$ft^3$ for additional radiation safety equipment									
Volume of Building (ft^3)	794000	30720	192000	320000	320000	37560	91000	333000	5600
Demolition Unit Cost per WDEQ Guideline No. 12 ($/$ft^3$)	$0.152	$0.000	$0.152	$0.152	$0.152	$0.152	$0.152	$0.152	$0.152
Dryer Building Demolition Unit Cost ($/$ft^3$)	$0.00	$0.73	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Subtotal Building Demolition Costs	$120,688	$22,426	$29,184	$48,640	$48,640	$5,709	$13,832	$50,616	$851
B. Concrete Floor									
Area of Concrete Floor (ft^2)	23760	0	8000	12800	12800	0	6500	18000	0
Demolition Unit Cost per WDEQ Guideline No. 12 ($/$ft^2$)	$8.13	$8.13	$8.13	$8.13	$8.13	$8.13	$8.13	$8.13	$8.13
Subtotal Concrete Floor Demolition Costs	$193,169	$0	$65,040	$104,064	$104,064	$0	$52,845	$146,340	$0
C. Concrete Footing									
Length of Concrete Footing (ft)	622	0	360	480	480	0	360	580	0
Demolition Unit Cost per WDEQ Guideline No.12 ($/linear ft)	$11.07	$11.07	$11.07	$11.07	$11.07	$11.07	$11.07	$11.07	$11.07
Subtotal Concrete Footing Demolition Costs	$6,886	$0	$3,985	$5,314	$5,314	$0	$3,985	$6,421	$0
Subtotal Demolition Costs per Building	$320,743	$22,426	$98,209	$158,018	$158,018	$5,709	$70,662	$203,377	$851
Total Demolition Costs	**$1,317,309**								
III. Disposal Costs									
A. Building									
Volume of Building (cy)	29407	1138	7111	11852	11852	1391	3370	12333	207
1. On-Site									
Assumptions:									
On-site disposal cost of $0.54/cy									
Percentage (%)	100	0	100	100	100	100	100	100	100
Volume for Disposal (cubic yards)	29407	0	7111	11852	11852	1391	3370	12333	207
Disposal Unit Cost ($/cy)	$0.54	$0.54	$0.54	$0.54	$0.54	$0.54	$0.54	$0.54	$0.54

Building Demolition and Disposal	Changehouse and Lab Bldg.	Maintenance Building	Main Office	Office Trailers	Process/Fire Water Bldg.	Potable Water Bldg.	Potable Water Tank Slab	Central Plant Tank Slabs	Exxon R&D RO Bldg.
I. Decontamination Costs									
A. Wall Decontamination									
Area to be Decontaminated (ft^2)	0	0	0	0	0	0	0	0	0
Application Rate (Gallons/ft^2)	1	1	1	1	1	1	1	1	1
HCl Acid Wash, including labor ($/Gallon)	$0.50	$0.50	$0.50	$0.50	$0.50	$0.50	$0.50	$0.50	$0.50
Subtotal Wall Decontamination Costs	$0	$0	$0	$0	$0	$0	$0	$0	$0
B. Concrete Floor Decontamination									
Area to be Decontaminated (ft^2)	0	0	0	0	0	0	0	0	1260
Application Rate (Gallons/ft^2)	4	4	4	4	4	4	4	4	4
HCl Acid Wash, including labor ($/Gallon)	$0.50	$0.50	$0.50	$0.50	$0.50	$0.50	$0.50	$0.50	$0.50
Subtotal Concrete Floor Decontamination Costs	$0	$0	$0	$0	$0	$0	$0	$0	$2,520
C. Deep Well Injection Costs									
Total Kgals for Injection	0	0	0	0	0	0	0	0	5.04
Deep Well Injection Unit Cost ($/Kgals)	$4.60	$4.60	$4.60	$4.60	$4.60	$4.60	$4.60	$4.60	$4.60
Subtotal Deep Well Injection Costs	$0	$0	$0	$0	$0	$0	$0	$0	$23
Subtotal Decontamination Costs per Building	$0	$0	$0	$0	$0	$0	$0	$0	$2,543
Total Decontamination Costs									
II. Demolition Costs									
A. Building									
Assumptions:									
Dryer bldg. demolition unit cost of $0.73/$ft^3$ for additional radiation safety equipment									
Volume of Building (ft^3)	73000	27000	72000	20000	16500	6300	0	0	15120
Demolition Unit Cost per WDEQ Guideline No. 12 ($/$ft^3$)	$0.152	$0.152	$0.152	$0.152	$0.152	$0.152	$0.152	$0.000	$0.000
Dryer Building Demolition Unit Cost ($/$ft^3$)	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Subtotal Building Demolition Costs	$11,096	$4,104	$10,944	$3,040	$2,508	$958	$0	$0	$0
B. Concrete Floor									
Area of Concrete Floor (ft^2)	5400	2100	6000	0	800	180	1256	7854	1260
Demolition Unit Cost per WDEQ Guideline No. 12 ($/$ft^2$)	$8.13	$8.13	$8.13	$8.13	$8.13	$8.13	$8.13	$8.13	$8.13
Subtotal Concrete Floor Demolition Costs	$43,902	$17,073	$48,780	$0	$6,504	$1,463	$10,211	$63,853	$10,244
C. Concrete Footing									
Length of Concrete Footing (ft)	300	200	340	0	120	54	0	0	144
Demolition Unit Cost per WDEQ Guideline No.12 ($/linear ft)	$11.07	$11.07	$11.07	$11.07	$11.07	$11.07	$0.00	$0.00	$11.07
Subtotal Concrete Footing Demolition Costs	$3,321	$2,214	$3,764	$0	$1,328	$598	$0	$0	$1,594
Subtotal Demolition Costs per Building	$58,319	$23,391	$63,488	$3,040	$10,340	$3,019	$10,211	$63,853	$11,838
Total Demolition Costs									
III. Disposal Costs									
A. Building									
Volume of Building (cy)	2704	1000	2667	741	611	233	0	0	560
1. On-Site									
Assumptions:									
On-site disposal cost of $0.54/cy									
Percentage (%)	100	100	100	100	100	100	0	0	100
Volume for Disposal (cubic yards)	2704	1000	2667	741	611	233	0	0	560
Disposal Unit Cost ($/cy)	$0.54	$0.54	$0.54	$0.54	$0.54	$0.54	$0.54	$0.54	$0.54

Building Demolition and Disposal	Exxon R&D Process Bldg.	D, E-Wellfield Booster Stat.	Morton No. 1-20 Bdlg.	Vollman No. 33-27 Bdlg.
I. Decontamination Costs				
A. Wall Decontamination				
Area to be Decontaminated (ft^2)	0	0	0	0
Application Rate (Gallons/ft^2)	1	1	1	1
HCl Acid Wash, including labor ($/Gallon)	$0.50	$0.50	$0.50	$0.50
Subtotal Wall Decontamination Costs	$0	$0	$0	$0
B. Concrete Floor Decontamination				
Area to be Decontaminated (ft^2)	1260	0	0	0
Application Rate (Gallons/ft^2)	4	4	4	4
HCl Acid Wash, including labor ($/Gallon)	$0.50	$0.50	$0.50	$0.50
Subtotal Concrete Floor Decontamination Costs	$2,520	$0	$0	$0
C. Deep Well Injection Costs				
Total Kgals for Injection	5.04	0	0	0
Deep Well Injection Unit Cost ($/Kgals)	$4.60	$4.60	$4.60	$4.60
Subtotal Deep Well Injection Costs	$23	$0	$0	$0
Subtotal Decontamination Costs per Building	$2,543	$0	$0	$0
Total Decontamination Costs				
II. Demolition Costs				
A. Building				
Assumptions:				
Dryer bldg. demolition unit cost of $0.73/$ft^3$ for additional radiation safety equipment				
Volume of Building (ft^3)	15120	8640	14400	14400
Demolition Unit Cost per WDEQ Guideline No. 12 ($/$ft^3$)	$0.152	$0.152	$0.152	$0.152
Dryer Building Demolition Unit Cost ($/$ft^3$)	$0.00	$0.00	$0.00	$0.00
Subtotal Building Demolition Costs	$2,298	$1,313	$2,189	$2,189
B. Concrete Floor				
Area of Concrete Floor (ft^2)	1260	0	600	600
Demolition Unit Cost per WDEQ Guideline No. 12 ($/$ft^2$)	$8.13	$8.13	$8.13	$8.13
Subtotal Concrete Floor Demolition Costs	$10,244	$0	$4,878	$4,878
C. Concrete Footing				
Length of Concrete Footing (ft)	144	0	100	100
Demolition Unit Cost per WDEQ Guideline No.12 ($/linear ft)	$11.07	$11.07	$11.07	$11.07
Subtotal Concrete Footing Demolition Costs	$1,594	$0	$1,107	$1,107
Subtotal Demolition Costs per Building	$14,136	$1,313	$8,174	$8,174
Total Demolition Costs				
III. Disposal Costs				
A. Building				
Volume of Building (cy)	560	320	533	533
1. On-Site				
Assumptions:				
On-site disposal cost of $0.54/cy				
Percentage (%)	100	100	100	100
Volume for Disposal (cubic yards)	560	320	533	533
Disposal Unit Cost ($/cy)	$0.54	$0.54	$0.54	$0.54

Building Demolition and Disposal	Central Plant	Dryer Building	Satellite No. 1	Satellite No. 2	Satellite No. 3	Sat. No.3 Fab. Shop	Yellow Cake Warehouse	South Warehouse	Suspended Walkway
Subtotal On-Site Disposal Costs	$15,880	$0	$3,840	$6,400	$6,400	$751	$1,820	$6,660	$112
2. NRC-Licensed Facility									
Percentage (%)	0	100	0	0	0	0	0	0	0
Volume for Disposal (ft^3)	0	2624	0	0	0	0	0	0	0
Volume for Disposal Assuming 10% Void Space (ft^3)	0	2886	0	0	0	0	0	0	0
Transportation and Disposal Unit Cost ($/$ft^3$)	$17.19	$6.67	$17.19	$17.19	$17.19	$17.19	$17.19	$17.19	$17.19
Subtotal NRC-Licensed Facility Disposal Costs	$0	$19,250	$0	$0	$0	$0	$0	$0	$0
Subtotal Building Disposal Costs	$15,880	$19,250	$3,840	$6,400	$6,400	$751	$1,820	$6,660	$112
B. Concrete Floor									
Area of Concrete Floor (ft^2)	23760	0	8000	12800	12800	0	6500	18000	0
Average Thickness of Concrete Floor (ft)	0.75	0	0.67	0.67	0.67	0	0.5	0.5	0
Volume of Concrete Floor (ft^3)	17820	0	5360	8576	8576	0	3250	9000	0
Volume of Concrete Floor (cy)	660	0	199	318	318	0	120	333	0
1. On-Site									
Percentage (%)	75	0	75	75	75	0	100	100	0
Volume for Disposal (cy)	495	0	149	238	238	0	120	333	0
Disposal Unit Cost per WDEQ Guideline No.12 ($/cy)	$4.42	$4.42	$4.42	$4.42	$4.42	$4.42	$4.42	$4.42	$4.42
Subtotal On-Site Disposal Costs	$2,188	$0	$658	$1,053	$1,053	$0	$532	$1,473	$0
2. NRC-Licensed Facility									
Assumptions:									
Additional $2.00/$ft^3$ for segregation of concrete									
Percentage (%)	25	0	25	25	25	0	0	0	0
Volume for Disposal (ft^3)	4455	0	1340	2144	2144	0	0	0	0
Segregation and Loading Unit Cost ($/$ft^3$)	$2.00	$2.00	$2.00	$2.00	$2.00	$2.00	$2.00	$2.00	$2.00
Transportation and Disposal Unit Cost ($/$ft^3$)	$6.67	$6.67	$6.67	$6.67	$6.67	$6.67	$6.67	$6.67	$6.67
Subtotal NRC-Licensed Facility Disposal Costs	$38,625	$0	$11,618	$18,588	$18,588	$0	$0	$0	$0
Subtotal Concrete Floor Disposal Costs	$40,813	$0	$12,276	$19,641	$19,641	$0	$532	$1,473	$0
C. Concrete Footing									
Length of Concrete Footing (ft)	622	0	360	480	480	0	360	580	0
Average Depth of Concrete Footing (ft)	4	4	4	4	4	4	4	4	0
Average Width of Concrete Footing (ft)	1	1	1	1	1	1	1	1	0
Volume of Concrete Footing (ft^3)	2488	0	1440	1920	1920	0	1440	2320	0
Volume of Concrete Footing (cy)	92	0	53	71	71	0	53	86	0
On-ste Disposal Unit Cost per WDEQ Guideline No.12 ($/cy)	$4.42	$4.42	$4.42	$4.42	$4.42	$4.42	$4.42	$4.42	$4.42
Subtotal Concrete Footing Disposal Costs	$407	$0	$236	$314	$314	$0	$236	$380	$0
Subtotal Disposal Costs per Building	$57,100	$19,250	$16,352	$26,355	$26,355	$751	$2,588	$8,513	$112
Total Disposal Costs	**$166,988**								
III. Health and Safety Costs									
Radiation Safety Equipment	$1,000	$1,000	$1,000	$1,000	$1,000	$0	$0	$0	$0
Total Health and Safety Costs	**$5,000**								
SUBTOTAL BUILDING DEMOLITION AND DISPOSAL COSTS	$480,914	$42,676	$127,671	$204,750	$204,750	$6,460	$73,250	$211,890	$963
TOTAL BUILDING DEMOLITION AND DISPOSAL COSTS	**$1,647,318**								

Building Demolition and Disposal	Changehouse and Lab Bldg.	Maintenance Building	Main Office	Office Trailers	Process/Fire Water Bldg.	Potable Water Bldg.	Potable Water Tank Slab	Central Plant Tank Slabs	Exxon R&D RO Bldg.
Subtotal On-Site Disposal Costs	$1,460	$540	$1,440	$400	$330	$126	$0	$0	$302
2. NRC-Licensed Facility									
Percentage (%)	0	0	0	0	0	0	0	0	0
Volume for Disposal (ft^3)	0	0	0	0	0	0	0	0	0
Volume for Disposal Assuming 10% Void Space (ft^3)	0	0	0	0	0	0	0	0	0
Transportation and Disposal Unit Cost ($/$ft^3$)	$17.19	$17.19	$17.19	$17.19	$17.19	$17.19	$17.19	$17.19	$17.19
Subtotal NRC-Licensed Facility Disposal Costs	$0	$0	$0	$0	$0	$0	$0	$0	$0
Subtotal Building Disposal Costs	$1,460	$540	$1,440	$400	$330	$126	$0	$0	$302
B. Concrete Floor									
Area of Concrete Floor (ft^2)	5400	2100	6000	0	800	180	1256	7854	1260
Average Thickness of Concrete Floor (ft)	0.5	0.5	0.5	0	0.5	0.5	1	1	0.5
Volume of Concrete Floor (ft^3)	2700	1050	3000	0	400	90	1256	7854	630
Volume of Concrete Floor (cy)	100	39	111	0	15	3	47	291	23
1. On-Site									
Percentage (%)	100	100	100	0	100	100	100	100	100
Volume for Disposal (cy)	100	39	111	0	15	3	47	291	23
Disposal Unit Cost per WDEQ Guideline No.12 ($/cy)	$4.42	$4.42	$4.42	$4.42	$4.42	$4.42	$4.42	$4.42	$4.42
Subtotal On-Site Disposal Costs	$442	$172	$491	$0	$65	$15	$206	$1,286	$103
2. NRC-Licensed Facility									
Assumptions:									
Additional $2.00/$ft^3$ for segregation of concrete									
Percentage (%)	0	0	0	0	0	0	0	0	0
Volume for Disposal (ft^3)	0	0	0	0	0	0	0	0	0
Segregation and Loading Unit Cost ($/$ft^3$)	$2.00	$2.00	$2.00	$2.00	$2.00	$2.00	$2.00	$2.00	$2.00
Transportation and Disposal Unit Cost ($/$ft^3$)	$6.67	$6.67	$6.67	$6.67	$6.67	$6.67	$6.67	$6.67	$6.67
Subtotal NRC-Licensed Facility Disposal Costs	$0	$0	$0	$0	$0	$0	$0	$0	$0
Subtotal Concrete Floor Disposal Costs	$442	$172	$491	$0	$65	$15	$206	$1,286	$103
C. Concrete Footing									
Length of Concrete Footing (ft)	300	200	340	0	120	54	0	0	144
Average Depth of Concrete Footing (ft)	4	4	4	0	4	4	4	4	4
Average Width of Concrete Footing (ft)	1	1	1	0	1	1	1	1	1
Volume of Concrete Footing (ft^3)	1200	800	1360	0	480	216	0	0	576
Volume of Concrete Footing (cy)	44	30	50	0	18	8	0	0	21
On-ste Disposal Unit Cost per WDEQ Guideline No.12 ($/cy)	$4.42	$4.42	$4.42	$4.42	$4.42	$4.42	$4.42	$4.42	$4.42
Subtotal Concrete Footing Disposal Costs	$196	$131	$223	$0	$79	$35	$0	$0	$94
Subtotal Disposal Costs per Building	$2,098	$843	$2,154	$400	$474	$176	$206	$1,286	$499
Total Disposal Costs									
III. Health and Safety Costs									
Radiation Safety Equipment	$0	$0	$0	$0	$0	$0	$0	$0	$0
Total Health and Safety Costs									
SUBTOTAL BUILDING DEMOLITION AND DISPOSAL COSTS	$60,417	$24,234	$65,642	$3,440	$10,814	$3,195	$10,417	$65,139	$14,880
TOTAL BUILDING DEMOLITION AND DISPOSAL COSTS									

Building Demolition and Disposal	Exxon R&D Process Bldg.	D, E-Wellfield Booster Stat.	Morton No. 1-20 Bdlg.	Vollman No. 33-27 Bdlg.
Subtotal On-Site Disposal Costs	$302	$173	$288	$288
2. NRC-Licensed Facility				
Percentage (%)	0	0	0	0
Volume for Disposal (ft^3)	0	0	0	0
Volume for Disposal Assuming 10% Void Space (ft^3)	0	0	0	0
Transportation and Disposal Unit Cost ($/$ft^3$)	$17.19	$17.19	$17.19	$17.19
Subtotal NRC-Licensed Facility Disposal Costs	$0	$0	$0	$0
Subtotal Building Disposal Costs	$302	$173	$288	$288
B. Concrete Floor				
Area of Concrete Floor (ft^2)	1260	0	600	600
Average Thickness of Concrete Floor (ft)	0.5	0	0.5	0.5
Volume of Concrete Floor (ft^3)	630	0	300	300
Volume of Concrete Floor (cy)	23	0	11	11
1. On-Site				
Percentage (%)	100	0	100	100
Volume for Disposal (cy)	23	0	11	11
Disposal Unit Cost per WDEQ Guideline No.12 ($/cy)	$4.42	$4.42	$4.42	$4.42
Subtotal On-Site Disposal Costs	$103	$0	$49	$49
2. NRC-Licensed Facility				
Assumptions:				
Additional $2.00/$ft^3$ for segregation of concrete				
Percentage (%)	0	0	0	0
Volume for Disposal (ft^3)	0	0	0	0
Segregation and Loading Unit Cost ($/$ft^3$)	$2.00	$2.00	$2.00	$2.00
Transportation and Disposal Unit Cost ($/$ft^3$)	$6.67	$6.67	$6.67	$6.67
Subtotal NRC-Licensed Facility Disposal Costs	$0	$0	$0	$0
Subtotal Concrete Floor Disposal Costs	$103	$0	$49	$49
C. Concrete Footing				
Length of Concrete Footing (ft)	144	0	100	100
Average Depth of Concrete Footing (ft)	4	4	4	4
Average Width of Concrete Footing (ft)	1	1	1	1
Volume of Concrete Footing (ft^3)	576	0	400	400
Volume of Concrete Footing (cy)	21	0	15	15
On-ste Disposal Unit Cost per WDEQ Guideline No.12 ($/cy)	$4.42	$4.42	$4.42	$4.42
Subtotal Concrete Footing Disposal Costs	$94	$0	$65	$65
Subtotal Disposal Costs per Building	$499	$173	$402	$402
Total Disposal Costs				
III. Health and Safety Costs				
Radiation Safety Equipment	$0	$0	$0	$0
Total Health and Safety Costs				
SUBTOTAL BUILDING DEMOLITION AND DISPOSAL COSTS	$17,178	$1,486	$8,576	$8,576
TOTAL BUILDING DEMOLITION AND DISPOSAL COSTS				

llfield Buildings & Equipment Removal & Disposal	A-Wellfield	B-Wellfield	C-Wellfield	D-Wellfield	E-Wellfield	F-Wellfield	H-Wellfield
Wellfield Piping							
Assumptions:							
Number of Header Houses per Wellfield	5	18	20	4	15	42	15
Length of Piping per Header House (ft)	15000	15000	15000	15000	15000	15000	15000
Total Length of Piping (ft)	75000	270000	300000	60000	225000	630000	225000
A. Removal and Loading							
Wellfield Piping Removal Unit Cost ($/ft of pipe)	$0.31	$0.31	$0.31	$0.31	$0.31	$0.31	$0.31
Subtotal Wellfield Piping Removal and Loading Costs	$23,250	$83,700	$93,000	$18,600	$69,750	$195,300	$69,750
B. Transport and Disposal Costs (NRC-Licensed Facility)							
Average Diameter of Piping (inches)	2	2	2	2	2	2	2
Chipped Volume Reduction (ft^3/ft)	0.005	0.005	0.005	0.005	0.005	0.005	0.005
Chipped Volume per Wellfield (ft^3)	375	1350	1500	300	1125	3150	1125
Volume for Disposal Assuming 10% Void Space (ft^3)	413	1485	1650	330	1238	3465	1238
Transportation and Disposal Unit Cost ($/$ft^3$)	$17.19	$17.19	$17.19	$17.19	$17.19	$17.19	$17.19
Subtotal Wellfield Piping Transport and Disposal Costs	$7,099	$25,527	$28,364	$5,673	$21,281	$59,563	$21,281
Wellfield Piping Costs per Wellfield	$30,349	$109,227	$121,364	$24,273	$91,031	$254,863	$91,031
C. Capitol Costs							
PVC Pipe Shredder	$40,000						
Total Wellfield Piping Costs	**$762,138**						
i. Well Pumps and Tubing							
Assumptions:							
Pump and tubing removal costs included under ground water restoration labor costs							
60% of production/injection wells contain pumps and/or tubing							
A. Pump and Tubing Transportation and Disposal							
Number of Production Wells	27	141	192	45	143	522	138
Number of Injection Wells	50	319	343	91	307	855	222
1. Pump Volume							
Number of Production Wells with Pumps	16	85	115	27	86	313	83
Average Pump Volume (ft^3)	1	1	1	1	1	1	1
Pump Volume per Wellfield (ft^3)	16	85	115	27	86	313	83
2. Tubing Volume							
Assumptions:							
Average tubing length/wellfield based on average well depth minus 25 ft							
Number of Production Wells with Tubing	16	85	115	27	86	313	83
Number of Injection Wells with Tubing	30	191	206	55	184	513	133
Average Tubing Length per Well (ft)	475	425	525	575	525	625	475
Tubing Length per Wellfield (ft)	21850	117300	168525	47150	141750	516250	102600
Diameter of Production Well Fiberglass Tubing (inches)	2	2	2	2	2	2	2
Diameter of Injection Well HDPE Tubing (inches)	1.25	1.25	1.25	1.25	1.25	1.25	1.25
Chipped Volume Reduction (ft^3/ft)	0.005	0.005	0.005	0.005	0.005	0.005	0.005

/ellfield Buildings & Equipment Removal & Disposal	[redacted]Wellfield	B-Wellfield	C-Wellfield	[redacted]ifield	E-Wellfield	F-Wellfield	H-Wellfield
Chipped Volume per Wellfield (ft^3)	109	587	843	236	709	2581	513
Volume of Pump and Tubing (ft^3)	125	672	958	263	795	2894	596
Volume for Disposal Assuming 10% Void Space (ft^3)	138	739	1054	289	875	3183	656
Transportation and Disposal Unit Cost ($/ft^3$)	$17.19	$17.19	$17.19	$17.19	$17.19	$17.19	$17.19
Subtotal Pump and Tubing Transport and Disposal Costs	$2,372	$12,703	$18,118	$4,968	$15,041	$54,716	$11,277
Pump and Tubing Costs per Wellfield	$2,372	$12,703	$18,118	$4,968	$15,041	$54,716	$11,277
Total Pump and Tubing Costs	**$119,195**						
II. Buried Trunkline	**A/B-Wellfields**			**D/E-Wellfields**			
Assumptions:							
A/B-Wellfields use the same trunkline							
D/E-Wellfields use the same trunkline							
Length of Trunkline Trench (ft)	6500		5900	12000		11700	13200
A. Removal and Loading							
Main Pipeline Removal Unit Cost ($/ft of trench)	$0.85		$0.85	$0.85		$0.85	$0.85
Subtotal Trunkline Removal and Loading Costs	$5,525		$5,015	$10,200		$9,945	$11,220
B. Transport and Disposal Costs (NRC-Licensed Facility)							
1. 3" HDPE Trunkline							
Piping Length (ft)	6500		5900	12000		11700	13200
Chipped Volume Reduction (ft^3/ft)	0.022		0.022	0.022		0.022	0.022
Chipped Volume (ft^3)	143		129.8	264		257.4	290.4
2. 10" HDPE Trunkline							
Piping Length (ft)	13000		0	0		0	0
Chipped Volume Reduction (ft^3/ft)	0.277		0.277	0.277		0.277	0.277
Chipped Volume (ft^3)	3601		0	0		0	0
3. 12" HDPE Trunkline							
Piping Length (ft)	0		11800	24000		0	0
Chipped Volume Reduction (ft^3/ft)	0.293		0.293	0.293		0.293	0.293
Chipped Volume (ft^3)	0		3457.4	7032		0	0
4. 14" HDPE Trunkline							
Piping Length (ft)	0		0	0		23400	26400
Chipped Volume Reduction (ft^3/ft)	0.359		0.359	0.359		0.359	0.359
Chipped Volume (ft^3)	0		0	0		8400.6	9477.6
Total Trunkline Chipped Volume (ft^3)	3744		3587.2	7296		8658	9768
Volume for Disposal Assuming 10% Void Space (ft^3)	4118		3946	8026		9524	10745
Transportation and Disposal Unit Cost ($/ft^3$)	$17.19		$17.19	$17.19		$17.19	$17.19
Subtotal Trunkline Transport and Disposal Costs	$70,788		$67,832	$137,967		$163,718	$184,707
Trunkline Decommissioning Costs per Wellfield	$76,313		$72,847	$148,167		$173,663	$195,927
Total Trunkline Decommissioning Costs	**$666,917**						
IV. Well Houses							
Total Quantity	90	498	570	151	480	1412	390

ellfield Buildings & Equipment Removal & Disposal	A-Wellfield	B-Wellfield	C-Wellfield	D-Wellfield	E-Wellfield	F-Wellfield	H-Wellfield
Average Well House Volume (ft^3)	12.5	12.5	12.5	12.5	12.5	12.5	12.5
A. Removal							
Total Volume (ft^3)	1125	6225	7125	1887.5	6000	17650	4875
Demolition Unit Cost per WDEQ Guideline No. 12 ($/ft^3$)	$0.152	$0.152	$0.152	$0.152	$0.152	$0.152	$0.152
Subtotal Well House Demolition Costs	$171	$946	$1,083	$287	$912	$2,683	$741
B. Survey and Decontamination							
Assumptions:							
Cost per Well House	$5	$5	$5	$5	$5	$5	$5
Subtotal Survey and Decontamination Costs	$450	$2,490	$2,850	$755	$2,400	$7,060	$1,950
C. Disposal							
Total Volume (cy)	42	231	264	70	222	654	181
Volume for Disposal Assuming 10% Void Space (cy)	46	254	290	77	244	719	199
Disposal Unit Cost per WDEQ Guideline No.12 ($/cy)	$5.45	$5.45	$5.45	$5.45	$5.45	$5.45	$5.45
Subtotal On-Site Disposal Costs	$251	$1,384	$1,581	$420	$1,330	$3,919	$1,085
Well House Removal and Disposal Costs per Wellfield	$872	$4,820	$5,514	$1,462	$4,642	$13,662	$3,776
Total Well House Removal and Disposal Costs	**$34,748**						
VI. Header Houses							
Total Quantity	5	18	20	4	15	42	15
Average Header House Volume (ft^3)	1600	1600	1600	1600	1600	1600	1600
A. Removal							
Total Volume (ft^3)	8000	28800	32000	6400	24000	67200	24000
Demolition Unit Cost per WDEQ Guideline No. 12 ($/ft^3$)	$0.152	$0.152	$0.152	$0.152	$0.152	$0.152	$0.152
Subtotal Building Demolition Costs	$1,216	$4,378	$4,864	$973	$3,648	$10,214	$3,648
B. Survey and Decontamination							
Assumptions:							
Cost per Header House	$200	$200	$200	$200	$200	$200	$200
Subtotal Survey and Decontamination Costs	$1,000	$3,600	$4,000	$800	$3,000	$8,400	$3,000
C. Disposal							
Total Volume (cy)	296	1067	1185	237	889	2489	889
Volume for Disposal Assuming 10% Void Space (cy)	326	1173	1304	261	978	2738	978
Disposal Unit Cost per WDEQ Guideline No.12 ($/cy)	$5.45	$5.45	$5.45	$5.45	$5.45	$5.45	$5.45
Subtotal On-Site Disposal Costs	$1,777	$6,393	$7,107	$1,422	$5,330	$14,922	$5,330
Header House Removal and Disposal Costs per Wellfield	$3,993	$14,371	$15,971	$3,195	$11,978	$33,536	$11,978
Total Header House Removal and Disposal Costs	**$95,022**						
TOTAL REMOVAL AND DISPOSAL COSTS PER WELLFIELD	$113,899	$141,121	$233,814	$182,065	$122,692	$530,440	$313,989
TOTAL WELLFIELD BUILDINGS AND EQUIPMENT REMOVAL AND DISPOSAL COSTS	**$1,678,020**						

ell Abandonment	A-Well [redacted]	B-Wellfield	C-Wellfield	[redacted]ield	E-Wellfield	F-Wellfield	H-Wellfield
Well Abandonment (Wellfields)							
# of Production Wells	27	141	192	45	143	522	138
# of Injection Wells	50	319	343	91	307	855	222
# of Monitoring Wells	18	67	78	38	86	134	81
#of Restoration Wells	13	38	35	15	30	35	30
Total Number of Wells	108	565	648	189	566	1546	471
Average Diameter of Casing (inches)	5	5	5	5	5	5	5
Average Depth (ft)	500	450	550	600	550	650	500
Well Abandonment Unit Cost ($/well)	$280	$277	$284	$287	$284	$290	$280
Subtotal Abandonment Cost per Wellfield	$30,267	$156,449	$183,773	$54,234	$160,518	$448,804	$131,998
Total Wellfield Abandonment Costs	**$1,166,043**						
	Morton No.1-20	**Vollman No.33-27**					
I. Waste Disposal Well Abandonment							
A. Well Plugging							
Drill Rig Operation ($/hr)	150	150					
Number of Hours	31	31					
Drill Rig Operating Costs	$4,650	$4,650					
Cementing Costs	$7,500	$7,500					
Equipment Transport Costs	$1,000	$1,000					
Well Cap Welding Costs	$1,000	$1,000					
Brine Makeup and Injection Costs	$1,500	$1,500					
Subtotal Well Plugging Costs per Well	$15,650	$15,650					
B. Pump Dismantling and Decontamination							
Number of Persons	2	2					
Number of Pumps	2	2					
Pumps/Day	0.5	0.5					
Number of Days	4	4					
$/Day/Person	$112	$112					
Subtotal Dismantling and Decon Costs per Well	$896	$896					
C. Tubing String Disposal (NRC-Licensed Facility)							
Length of Tubing String (ft)	9000	9000					
Diameter of Tubing String (inches)	2.875	2.875					
Volume of Tubing String (ft^3)	406	406					
Transportation and Disposal Unit Cost ($/$ft^3$)	$17.19	$17.19					
Subtotal Tubing String Disposal Costs per Well	$6,971	$6,971					
Subtotal Waste Disposal Well Abandonment Costs per Well	$23,517	$23,517					
Total Waste Disposal Well Abandonment Costs	**$47,034**						
TOTAL WELL ABANDONMENT COSTS	**$1,213,077**						

:llfield and Satellite Surface Reclamation	A/B-Wellfield	C-Wellfield	D-Wellfield	E-Wellfield	F-Wellfield	H-Wellfield
Wellfield Pattern Area Reclamation						
Pattern Area (acres)	25	31	9	28	100	25
Disking/Seeding Unit Cost ($/acre)	$200	$200	$200	$200	$200	$200
Subtotal Pattern Area Reclamation Costs per Wellfield	$5,000	$6,200	$1,800	$5,600	$20,000	$5,000
Total Wellfield Pattern Area Reclamation Costs	**$43,600**					
Wellfield Road Reclamation						
A. Road Construction Before January 1, 1997						
Length of Wellfield Roads (1000 ft)	12.2	11.3	2.4	13.3	15	0
Wellfield Road Reclamation Unit Cost ($/1000 ft)	$580	$580	$580	$580	$580	$580
Subtotal Pre-1997 Wellfield Road Reclamation Costs	$7,076	$6,554	$1,392	$7,714	$8,700	$0
B. Road Construction After January 1, 1997						
Length of Wellfield Roads (1000 ft)	0	0	0	0	2.4	6
Wellfield Road Reclamation Unit Cost ($/1000 ft)	$299	$299	$299	$299	$299	$299
Subtotal Post-1997 Wellfield Road Reclamation Costs	$0	$0	$0	$0	$718	$1,794
Subtotal Road Reclamation Costs per Wellfield	$7,076	$6,554	$1,392	$7,714	$9,418	$1,794
Total Wellfield Road Reclamation Costs	**$33,948**					
UBTOTAL SURFACE RECLAMATION COSTS PER WELLFIELD	$12,076	$12,754	$3,192	$13,314	$29,418	$6,794
'OTAL WELLFIELD SURFACE RECLAMATION COSTS	**$77,548**					
II. Satellite Area Reclamation	**Satellite No.1**	**Satellite No.2**	**Satellite No.3**			
Assumptions:						
Area of Disturbance (acres)	1	1	1			
Average Depth of Stripped Topsoil (ft)	1	0.67	0.67			
Surface Grade: Level Ground						
Average Length of Topsoil Haul (ft)	1000	500	500			
A. Ripping Overburden with Dozer						
Ripping Unit Cost per WDEQ Guideline No.12, App.I1 ($/acre)	$581.67	$581.67	$581.67			
Subtotal Ripping Costs	$582	$582	$582			
B. Topsoil Application with Scraper						
Volume of Topsoil Removed (cy)	1613	1081	1081			
Application Unit Cost per WDEQ Guideline No.12, App.C ($/cy)	$0.60	$0.60	$0.60			
Subtotal Topsoil Application Costs	$968	$649	$649			
C. Discing and Seeding						
Discing/Seeding Unit Cost ($/acre)	$200	$200	$200			
Subtotal Discing/Seeding Costs	$200	$200	$200			
Subtotal Surface Reclamation Costs per Satellite	$1,750	$1,431	$1,431			
Total Satellite Building Area Reclamation Costs	**$4,612**					
TOTAL WELLFIELD AND SATELLITE SURFACE RECLAMATION COSTS	**$82,160**					

Miscellaneous Reclamation				
I. CPF/Office Area Reclamation				
Assumptions				
Concrete, asphalt, and building material used to backfill low areas				
No topsoil salvaged or applied (area is pre-law)				
CPF/Office area = 10 acres				
A. Ripping and Hauling Asphalt				
Assumptions				
Average haul distance (ft)	500			
Surface grade (%)	0%			
Average Thickness of Asphalt (ft)	0.5			
Surface Area (acres)	3.4			
Ripping Unit Cost per WDEQ Guideline No.12, App.I ($/acre)	$418.80			
Volume of Asphalt (cy)	2743			
Hauling Unit Cost per WDEQ Guideline No.12, App.C ($/cy)	$0.50			
Total Asphalt Ripping and Hauling Cost	$2,795			
B. Borrow Cover				
1. Topsoil Removal/Replacement				
Assumptions				
Surface area of borrow area (acres)	3			
Six inches of topsoil removed and replaced at borrow area				
Volume of topsoil (cy)	2420			
Topsoil Removal/Replacement Unit Cost ($/cy)	$1.00			
Total Topsoil Removal/Replacement Cost	$2,420			
2. Borrow Application				
Assumptions				
Final borrow cover depth will range from 0 to 4 ft, average = 1 ft				
Average haul distance = 1000 ft				
Surface grade (%)	0%			
Borrow Volume (cy)	16133			
Borrow Cover Unit Cost per WDEQ Guideline No.12, App.C ($/cy)	$0.60			
Total Borrow Application Cost	$9,680			
Total Borrow Cover Cost	$12,100			
C. Discing/Seeding				
Assumptions				
Includes discing/seeding of borrow area (3 acres)				
Surface Area (acres)	13			
Discing/Seeding Unit Cost ($/acre)	$200			
Total Discing/Seeding Costs	$2,600			
Total CPF/Office Area Reclamation	**$17,495**			
[redacted]cess Road Reclamation	**CPF/Office Area**	**Satellite No. 1**	**Satellite No. 3**	**Vollman No. 33-27**
Assumptions				
CPF/Office Area Road is pre-law (no topsoil applied)				
Surface grade	5%	0%	0%	0%
Length of road (miles)	2.5	3	1	1
Average road width (ft)	25	30	30	25
B. Ripping and Hauling Asphalt				
Assumptions				
Average haul distance (miles)	1.25	0	0	0
Average Thickness of Asphalt (ft)	0.5	0	0	0
Asphalt Surface Area (acres)	7.6	0.0	0.0	0.0
Ripping Unit Cost per WDEQ Guideline No.12, App.I ($/acre)	$418.80	$418.80	$418.80	$418.80
Volume of Asphalt (cy)	6111	0	0	0
Hauling Unit Cost per WDEQ Guideline No.12, App.C ($/cy)	$1.61	$0.00	$0.00	$0.00
Subtotal Asphalt Ripping and Hauling Costs	$13,012	$0	$0	$0
B. Gravel Road Base Removal				
Assumptions				
Average haul distance (ft)	0	1000	1000	1000
Gravel Road Base Width (ft)	0	14	14	10
Gravel Road Base Area (acres)	0.0	5.1	1.7	1.2
Average Road Base Depth (ft)	0	0.5	0.5	0.25
Volume of Road Base (cy)	0	4107	1369	489
Removal Unit Cost per WDEQ Guideline No.12, App.C ($/cy)	$0.00	$0.60	$0.60	$0.60
Subtotal Gravel Road Base Removal Costs	$0	$2,464	$821	$293
C. Ripping Overburden with Dozer				
Overburden Surface Area (acres)	0.0	10.9	3.6	3.0
Ripping Unit Cost per WDEQ Guideline No.12, App.I1 ($/acre)	$581.67	$581.67	$581.67	$581.67
Subtotal Ripping Overburden Costs	$0	$6,345	$2,115	$1,763

Miscellaneous Reclamation						
D.	Topsoil Application					
	Assumptions .					
	Average haul distance (ft)		0	5000	1500	1500
	Topsoil Surface Area (ft^2)		0	475200	158400	132000
	Depth of Topsoil (ft)		0	0.5	0.5	0.5
	Volume of Topsoil (cy)		0	8800	2933	2444
	Topsoil Unit Cost per WDEQ Guideline No.12, App.C ($/cy)		$0.00	$1.27	$0.69	$0.69
	Subtotal Topsoil Application Costs		$0	$11,176	$2,024	$1,687
E.	Discing/Seeding					
	Assumptions					
	Surface Area (acres)		7.6	10.9	3.6	3.0
	Discing/Seeding Unit Cost ($/acre)		$200	$200	$200	$200
	Subtotal Discing/Seeding Costs		$1,515	$2,182	$727	$606
Subtotal Reclamation Costs per Access Road			$14,527	$22,167	$5,687	$4,349
Total Access Road Reclamation Costs			**$46,730**			
III.	**Wastewater Pipeline Reclamation**		**SAT2 to SAT1 WW Pipeline**	**SAT3 to SAT2 PSR**		
A.	Pipeline Removal and Loading					
	Length of HDPE Pipe Trench (ft)		24000	22000		
	Main Pipeline Removal Unit Cost ($/ft of trench)		$0.85	$0.85		
	Subtotal Pipeline Removal Costs		$20,400	$18,700		
B.	Pipeline Transportation and Disposal (NRC-Licensed Facility)					
	Pipe Diameter (inches)		3	4		
	Chipped Volume Reduction (ft^3/ft)		0.022	0.032		
	Subtotal Volume of Shredded PVC Pipe (ft^3)		528	704		
	Transportation and Disposal Unit Cost ($/ft^3$)		$17.19	$17.19		
	Subtotal Pipeline Disposal Costs		$9,076	$12,102		
C.	Discing/Seeding					
	Assumptions:					
	Width of Pipeline Trench (ft)		10	10		
	Area of Pipeline Trench (acres)		5.5	5.1		
	Discing/Seeding Unit Cost ($/acre)		$200	$200		
	Subtotal Discing/Seeding Costs		$1,102	$1,010		
Subtotal Reclamation Costs per Pipeline			$30,578	$31,812		
Total Wastewater Pipeline Reclamation Costs			**$62,390**			
IV.	**Radium Settling Basin Reclamation**		**East Radium Pond**	**West Radium Pond**		
A.	Soil Sampling and Monitoring					
	Number of Soil Samples		15	15		
	$/Sample		$60	$60		
	Subtotal Soil Sampling and Monitoring Costs		$900	$900		
B.	Liner/Subsoil Removal and Disposal					
	Assumptions:					
	Clay liner and subsoil constitute by-product material					
	Thickness of clay liner (ft)		0.25	0.25		
	Thickness of contaminated subsoil (ft)		0.25	0.25		
	Removal and Loading Unit Cost based on engineer's design					
	report and Cat Performance Handbook					
	Width of Pond (ft)		90	90		
	Length of Pond (ft)		160	160		
	Surface area of pond (ft^2)		14400	14400		
1.	Removal and Loading					
	Volume of Clay Liner (cy)		267	267		
	Clay Liner Removal and Loading Unit Cost ($/cy)		$3	$3		
	Subtotal Liner Removal and Loading Costs		$800	$800		
2.	Transportation and Disposal					
	Volume of Clay Liner (ft^3)		7200	7200		
	Transportation and Disposal Unit Cost ($/ft^3$)		$6.67	$6.67		
	Subtotal Liner Transportation and Disposal Costs		$48,024	$48,024		
Subtotal Liner Removal and Disposal Costs			$48,824	$48,824		
C.	Topsoil Application					
	Assumptions:					
	Area of surface disturbance (ft^2)		37500	37500		
	Average thickness of topsoil (ft)		1	1		
	Average haul distance (ft)		2000	2000		
	Surface grade (%)		0%	0%		
	Volume of Topsoil (cy)		1,389	1,389		
	Topsoil Unit Cost per WDEQ Guideline No.12, App.C ($/cy)		$0.78	$0.78		

Miscellaneous Reclamation					
	Subtotal Topsoil Application Costs		$1,083	$1,083	
	D. Discing/Seeding				
		Assumptions:			
		Area of surface disturbance (acres)	1	1	
		Discing/Seeding Unit Cost ($/acre)	$200	$200	
		Subtotal Discing/Seeding Costs	$200	$200	
	Subtotal Reclamation Costs per Radium Pond		$51,007	$51,007	
	Total Radium Settling Basin Reclamation Costs		**$102,014**		
V.	**Purge Storage Reservoir Reclamation**		**PSR-1**	**PSR-2**	
	A. Soil Sampling and Analysis Costs		$3,000	$3,000	
	B. Leachate Collection System Removal Costs		$5,000	$0	
	C. Topsoil/Subsoil Application				
		Assumptions:			
		Average haul distance (ft)	1000	150	
		Surface grade (%)	0%	0%	
		Volume of Topsoil/Subsoil (cy)	83000	74000	
		Topsoil/Subsoil Unit Cost per WDEQ Guideline No.12, App.C ($/cy)	$0.60	$0.00	
		Topsoil/Subsoil Unit Cost per WDEQ Guideline No.12, App.E ($/cy)	$0.000	0.174	
	Subtotal Topsoil/Subsoil Application Costs per Reservoir		$49,800	$12,876	
	D. Discing/Seeding				
		Surface Area (acres)	6	32	
		Discing/Seeding Unit Cost ($/acre)	$200	$200	
	Subtotal Discing/Seeding Costs		$1,200	$6,400	
	Subtotal Reclamation Costs per Reservoir		$59,000	$22,276	
	Total Purge Storage Reservoir Reclamation Costs		**$81,276**		
VI.	**Irrigation Area Reclamation**		**Irrigator No. 1A**	**Irrigator No. 1B**	**Irrigator No. 2**
	A. Irrigation Equipment Removal Costs		$2,000	$0	$2,000
	B. Plowing				
		Assumptions:			
		Plowing Unit Cost ($/acre)	$30	$30	$30
		Irrigation Area (acres)	55	55	116
		Number of Cultivations	2	2	2
	Subtotal Plowing Costs		$3,300	$3,300	$6,960
	C. Discing/Seeding				
		Discing/Seeding Unit Cost ($/acre)	$200	$200	$200
	Subtotal Discing/Seeding Costs		$11,000	$11,000	$23,200
	Subtotal Reclamation Costs per Irrigation Area		$16,300	$14,300	$32,160
	Total Irrigation Area Reclamation Costs		**$62,760**		
	Drilling Fluid Storage Cell Reclamation				
		Assumptions:			
		Each cell is 100 ft (width) by 100 ft (length) by 10 ft (depth)			
		Volume of each cell, discounting side slopes (cy)	3704		
		Surface area disturbance associated with each cell (acres)	1		
		Average haul distance (ft)	500		
		Surface grade (%)	0		
	A. Topsoil/Subsoil Application				
		Topsoil/Subsoil Unit Cost per WDEQ Guideline No.12, App.C ($/cy)	$0.50		
	Topsoil/Subsoil Application Costs per Storage Cell		$1,852		
	B. Discing/Seeding				
		Discing/Seeding Unit Cost ($/acre)	$200		
	Subtotal Discing/Seeding Costs		$200		
	Subtotal Reclamation Costs per Storage Cell		$2,052		
	Total Number of Storage Cells		5		
	Total Drilling Fluid Storage Cell Reclamation Costs		**$10,260**		
VIII.	**Delineation Drillhole/Mud Pit Reclamation**				
		Assumptions:			
		Total number of delineation drillholes	850		
		Percentage of drillholes that need bentonite in top 100 ft	20%		
		Bentonite chips, labor, and seeding costs ($/drillhole)	$160		
		Total number of mud pits that need backfilling with backhoe	40		
		Mudpit reclamation cost ($/mudpit)	$30		
		Area of surface disturbance (acres)	2		
	A. Delineation Drillhole Top Off		$27,200		
	B. Mud Pit Backfilling		$1,200		
	C. Discing/Seeding				
		Discing/Seeding Unit Cost ($/acre)	$200		

Miscellaneous Reclamation												
		Subtotal Discing/Seeding Costs									$400	
	Total Delineation Drillhole/Mud Pit Reclamation Costs										**$28,800**	
IX.	**Exxon Solvent Extraction (SX) Pond Reclamation**											
		Assumptions:										
			Pond dimensions are 55 ft (width) by 130 ft (length) by 7 ft (depth)									
			Liner and sludge constitute by-product material									
			Soil beneath liner is not contaminated									
			Average thickness of liner and sludge (ft)								1	
			Backhoe operation unit cost = $45/hr (not including operator)									
			Volume of By-Product Material (ft^3)								7150	
	A.	Removal and Loading										
		1.	Equipment									
				Number of Backhoes							1	
				ft^3/hr							300	
				Number of Hours							24	
				$/hr/Backhoe							45	
			Equipment Costs								$1,073	
		2.	Labor									
				Number of Persons							1	
				Number of Hours							24	
				$/hr/Person							$14	
			Labor Costs								$334	
		Total Removal and Loading Costs									$1,407	
	B.	Transportation and Disposal (NRC-Licensed Facility)										
			Transportation and Disposal Unit Cost ($/$ft^3$)								$17.19	
		Total Transportation and Disposal Costs									$122,909	
	Total Exxon SX Pond Reclamation Costs										**$124,316**	
X.	**Revegetation of Exxon Reclaimed Lands**											
		Assumptions:										
			Reseeding potential areas of erosion ($/acre)								$200	
		Surface Area (acres)									217	
	Total Exxon Reclaimed Lands Revegetation Costs										**$43,400**	
TOTAL MISCELLANEOUS RECLAMATION COSTS											**$579,441**	

RADIUM TREATMENT

Assumptions:

1. Based on actual 1998 operating costs from Satellite No. 2

Radium Treatment Costs per 1000 Gallons

Chemical	= $ 0.177
Filtration	= $ 0.021
Electricity	= $ 0.019
By Product Disposal of Sludge	= $ 0.097

TOTAL RADIUM TREATMENT COSTS PER 1000 GALLONS = $ 0.31

GROUNDWATER SWEEP (GWS)

Assumptions:

1. All pumps are 5 hp pumping at 5.0 gpm
2. Cost of electricity = $0.03/kwh
3. All water pumped is treated for radium removal at actual cost of $0.31/1000 gallons
4. All water pumped is disposed at irrigation facility with a 20 hp pump
5. Repair and maintenance costs estimated at $0.03/1000 gallons
6. Process sampling and analysis costs estimated at $0.03/1000 gallons
7. Labor costs are not included

Wellfield Pumping Costs per 1000 Gallons

$$\frac{1000\ \text{gal}}{} \times \frac{5\ \text{hp}}{5\ \text{gpm}} \times \frac{1\ \text{hr}}{60\ \text{min}} \times \frac{0.746\ \text{kwh}}{\text{hp}} \times \frac{\$\ 0.03}{\text{kwh}} = \$\ 0.373$$

Radium Treatment Costs per 1000 Gallons = $ 0.31

Pumping to Irrigator Costs per 1000 Gallons

$$\frac{1000\ \text{gal}}{} \times \frac{20\ \text{hp}}{400\ \text{gpm}} \times \frac{1\ \text{hr}}{60\ \text{min}} \times \frac{0.746\ \text{kwh}}{\text{hp}} \times \frac{\$\ 0.03}{\text{kwh}} = \$\ 0.019$$

Repair and Maintenance Costs per 1000 Gallons = $ 0.03

Process Sampling and Analysis Costs per 1000 Gallons = $ 0.03

TOTAL GWS COSTS PER 1000 GALLONS **= $ 0.77**

REVERSE OSMOSIS (RO)

Assumptions:

1. Based on actual 1998 operating costs at Satellite No. 1. Verified by Hydranautics RO System Design Software, Version 6.0 (1995)
2. Cost of electricity = $0.03/kwh
3. 80% permeate/20% reject split
4. Membrane life of 4 years with a cost of $695 per membrane element
5. Includes cost of pumping from wellfield to RO Unit
6. The 20% reject is treated for radium removal prior to irrigation at actual cost of $0.31/1000 gallons
7. The 20% reject is disposed at irrigation facility with a 20 hp pump at actual cost of $0.019/1000 gallons
8. The permeate is returned to the wellfield with a 20 hp pump at actual cost of $0.019/1000 gallons
9. Process sampling and analysis costs estimated at $0.03/1000 gallons
10. Labor costs are not included

Reverse Osmosis Costs per 1000 Gallons

Electricity	= $ 0.17
Chemicals	= $ 0.26
Membrane Replacement	= $ 0.15
Repair and Maintenance	= $ 0.26
Pumping from Wellfield	= $ 0.37
Pumping to Wellfield	=$ 0.019
Radium Treatment	
$ 0.31 X 0.2	= $ 0.0628
Pumping to Irrigator	
$ 0.019 X 0.2	= $ 0.004
Process Sampling and Analysis	= $ 0.03

TOTAL RO COSTS PER 1000 GALLONS = $ 1.33

CHEMICAL REDUCTANT

Assumptions:

1. Based on actual operating costs during restoration activities
2. H2S introduced to RO permeate at concentration of 400 mg/L
3. Volume distribution varies with each pattern, average = 200,000 gals/pattern (i.e., approximately one pore volume at 50% of pattern areas)
4. Chemical cost = $0.367/lb, includes tank rental and safety equipment
5. Labor costs are not included

Chemical Reductant Costs per Pattern

$$\frac{200\ \text{kgal}}{\text{pattern}} \times \frac{3785\ \text{L}}{1\ \text{kgal}} \times \frac{400\ \text{mg}}{1\ \text{L}} \times \frac{2.205\text{E-}06\ \text{lbs}}{\text{mg}} \times \frac{\$\ 0.367}{\text{lb}} = \$\ 245$$

TOTAL CHEMICAL REDUCTANT COSTS PER PATTERN = $ 245

ELUTION PROCESSING

Assumptions:

1. Based on actual operating costs

TOTAL PROCESSING COSTS PER ELUTION = $ 525

DEEP WELL INJECTION

Assumptions:

1. Pump 75 hp pumping at 45 gpm
2. Cost of electricity = $0.03/kwh
3. Repair and maintenance costs based on average injection volume of 8,000,000 gallons per year
4. Repair and maintenance costs estimated at $1.25/1000 gallons
5. Chemical costs based on average injection volume of 8,000,000 gallons per year
6. Labor costs are not included

Waste Disposal Pumping Costs per 1000 Gallons

$$\frac{1000\ \text{gal}}{} \times \frac{75\ \text{hp}}{45\ \text{gpm}} \times \frac{1\ \text{hr}}{60\ \text{min}} \times \frac{0.746\ \text{kwh}}{\text{hp}} \times \frac{\$\ 0.03}{\text{kwh}} = \$\ 0.62$$

Repair and Maintenance Costs per 1000 Gallons = $ 1.25

Chemical Costs per 1000 Gallons = $ 2.73

Scale Inhibitor	= $ 1.20
Corrosion Inhibitor	= $ 1.16
Oxygen Scavenger	= $ 0.37

TOTAL DEEP WELL INJECTION COSTS PER 1000 GALLONS = $ 4.60

WELL ABANDONMENT

Assumptions:

1. Based on 1998 PRI contractor costs.
2. Use backhoe for 0.5 hr/well to dig and reclaim pit. Backhoe cost at $45/hr.
3. Use drill rig for 1.25 hr/well to remove liner assembly at a cost of $110/hr.
4. A cementer is used to pump plug gel into well.
5. Use cementer and tow vehicle for 0.5 hr/well. Assume cementer and tow vehicle cost $20/hr to operate.
6. Labor for pulling hoses, running cementer, inserting plug gel, etc. will require 2 workers at $15/hr for 2.5 hrs/well.
7. Materials include a hole plug at $1.75 and one sack of plug gel/100 ft of 5 inch well casing. Cost of plug gel is $6.70/sack.

Well Abandonment Costs per 100 ft of Well Depth

Backhoe					
0.5 hours	X	$ 45	per hour		=$ 22.50
Drill Rig					
1.25 hours	X	$ 110	per hour		=$ 137.50
Cementer/Tow Vehicle					
0.5 hours	X	$ 20	per hour		=$ 10.00
Labor					
5 man hours	X	$ 15.00	per man hour		=$ 75.00
Materials (Fixed Cost)					
1 hole plug	X	$ 1.75	per hole plug		=$ 1.75
			Total Fixed Costs		=$ 246.75
Materials (Variable Cost)					
1 sack plug gel per 100 feet	X	$ 6.70	per sack		=$ 6.70

Cost per Well per Unit of Average Depth

Well Depth (ft)	
450	**=$ 277**
500	**=$ 280**
550	**=$ 284**
600	**=$ 287**
650	**=$ 290**

FIVE YEAR MECHANICAL INTEGRITY TESTS (MIT)

Assumptions:

1. Based on 1998 PRI contractor costs.
2. Use pulling unit for 0.25 hr/well at cost of $30/hr.
3. Use water truck for 0.5 hr/well at cost of $30/hr.
4. Use logging truck for 0.75 hr/well at cost of $45/hr.
5. Labor for operation of pulling unit will require 2 workers at $15/hr
6. Labor for operation of water truck will require 1 worker at $15/hr
7. Labor for operation of logging truck will require 1 worker at $30/hr

MIT Costs per Well

Equipment:

Pulling Unit						
0.25 hours	X	$ 30	per hour			=$ 7.50
Water Truck						
0.5 hours	X	$ 30	per hour			=$ 15.00
Logging Truck						
0.75 hours	X	$ 45	per hour			=$ 33.75

Labor:

Pulling Unit						
0.25 hours	X	$ 15	per hour	X	2 workers	=$ $7.50
Water Truck						
0.5 hours	X	$ 15	per hour			=$ 7.50
Logging Truck						
0.75 hours	X	$ 30	per hour			=$ 22.50

MIT COST PER WELL =$ 94

MAIN PIPELINE REMOVAL

Assumptions:

1. Trenching with trackhoe at 1500 ft/day
2. Pipeline extraction and backfilling with trackhoe at 1500 ft/day
3. Trackhoe rental: $1600/week
4. Fuel cost: $9/operating hour
5. Trackhoe operation requires 1 worker at $15/hour
6. Pipeline extraction requires 2 workers at $15/hour (in addition to trackhoe operator)
7. Pipelines removed simutaneously
8. Includes removal of manholes
9. Operating schedule: 8 hrs/day, 5 days/week

Main Pipeline Removal Costs per ft of Trench

Equipment

Trackhoe

$$\frac{\$\ 1600}{\text{week}} \times \frac{1\ \text{week}}{5\ \text{days}} \times \frac{2\ \text{days}}{1500\ \text{ft}} = \$\ 0.43$$

Fuel

$$\frac{\$\ 9}{\text{hour}} \times \frac{8\ \text{hrs}}{1\ \text{day}} \times \frac{2\ \text{days}}{1500\ \text{ft}} = \$\ 0.10$$

Labor

Trackhoe Operation

$$\frac{\$\ 15}{\text{man hr}} \times \frac{8\ \text{man hrs}}{1\ \text{day}} \times \frac{2\ \text{days}}{1500\ \text{ft}} = \$\ 0.16$$

Pipeline Extraction

$$\frac{\$\ 15}{\text{man hr}} \times \frac{16\ \text{man hrs}}{1\ \text{day}} \times \frac{1\ \text{day}}{1500\ \text{ft}} = \$\ 0.16$$

MAIN PIPELINE REMOVAL COST PER FT OF TRENCH =$ 0.85

WELLFIELD PIPING REMOVAL

Assumptions:

1. Trenching with backhoe at 3000 ft/day
2. Pipeline extraction and backfilling with backhoe at 3000 ft/day
3. Backhoe rental: $750/week
4. Fuel cost: $9/operating hour
5. Backhoe operation requires 1 worker at $15/hour
6. Pipeline extraction requires 2 workers at $15/hour (in addition to trackhoe operator)
7. Operating schedule: 8 hrs/day, 5 days/week

Main Pipeline Removal Costs per ft of Pipe

Equipment

Backhoe

$$\frac{\$\ 750}{\text{week}} \times \frac{1\ \text{week}}{5\ \text{days}} \times \frac{2\ \text{days}}{3000\ \text{ft}} = \$\ 0.10$$

Fuel

$$\frac{\$\ 9}{\text{hour}} \times \frac{8\ \text{hrs}}{1\ \text{day}} \times \frac{2\ \text{days}}{3000\ \text{ft}} = \$\ 0.05$$

Labor

Backhoe Operation

$$\frac{\$\ 15}{\text{man hr}} \times \frac{8\ \text{man hrs}}{1\ \text{day}} \times \frac{2\ \text{days}}{3000\ \text{ft}} = \$\ 0.08$$

Pipeline Extraction

$$\frac{\$\ 15}{\text{man hr}} \times \frac{16\ \text{man hrs}}{1\ \text{day}} \times \frac{1\ \text{day}}{3000\ \text{ft}} = \$\ 0.08$$

MAIN PIPELINE REMOVAL COST PER FT OF PIPE =$ 0.31

WELLFIELD ROAD RECLAMATION

Assumptions (Roads constructed before January 1, 1997):

1. Gravel road base removed at cost of $0.60/cy/1000 ft (WDEQ Guideline No. 12, Appendix C)
2. Gravel road base: average depth = 0.25 ft, average width = 10 ft
3. Roads scarified prior to topsoil application at cost of $30.51/acre (WDEQ Guideline No. 12, Appendix P)
4. Grading of scarified roads prior to topsoil application at cost of $33.27/acre (WDEQ Guideline No. 12, Appendix G)
5. Topsoil applied at cost of $0.60/cy/1000 ft (WDEQ Guideline No. 12, Appendix C, Surface Grade: level ground)
6. Stripped topsoil: average depth = 0.67 ft, average width = 25 ft
7. Discing/seeding cost of $200/acre is based on actual contractor costs

Gravel Road Base Removal Costs per 1000 ft of Road

$$\frac{1000\ ft}{} \times \frac{0.25\ ft}{} \times \frac{10\ ft}{} \times \frac{1\ cy}{27\ ft^3} \times \frac{\$0.60}{cy} = \$\ 56$$

Scarification Costs per 1000 ft of Road

$$\frac{1000\ ft}{} \times \frac{25\ ft}{} \times \frac{1\ acre}{4.356E{+}04\ ft^2} \times \frac{\$30.51}{acre} = \$\ 18$$

Grading Costs per 1000 ft of Road

$$\frac{1000\ ft}{} \times \frac{25\ ft}{} \times \frac{1\ acre}{4.356E{+}04\ ft^2} \times \frac{\$33.27}{acre} = \$\ 19$$

Topsoil Application Costs per 1000 ft of Road

$$\frac{1000\ ft}{} \times \frac{0.67\ ft}{} \times \frac{25\ ft}{} \times \frac{1\ cy}{27\ ft^3} \times \frac{\$0.60}{cy} = \$\ 372$$

Discing/Seeding Costs per 1000 ft of Road

$$\frac{1000\ ft}{} \times \frac{25\ ft}{} \times \frac{1\ acre}{4.356E{+}04\ ft^2} \times \frac{\$200}{acre} = \$\ 115$$

TOTAL WELLFIELD ROAD RECLAMATION COSTS PER 1000 FT OF ROAD (BEFORE JANUARY 1, 1997) = $ 580

Assumptions (Roads constructed after January 1, 1997):

1. Gravel road base will not be removed
2. Roads scarified prior to topsoil application at cost of $30.51/acre (WDEQ Guideline No. 12, Appendix P)
3. Grading of scarified roads prior to topsoil application at cost of $33.27/acre (WDEQ Guideline No. 12, Appendix G)
4. Topsoil applied at cost of $0.60/cy/1000 ft (WDEQ Guideline No. 12, Appendix C, Surface Grade: level ground)
5. Stripped topsoil: average depth = 0.4 ft, average width = 20 ft
6. Discing/seeding cost of $200/acre is based on actual contractor costs

Scarification Costs per 1000 ft of Road

$$\frac{1000\ ft}{} \times \frac{20\ ft}{} \times \frac{1\ acre}{4.356E{+}04\ ft^2} \times \frac{\$30.51}{acre} = \$\ 14$$

Grading Costs per 1000 ft of Road

$$\frac{1000\ ft}{} \times \frac{20\ ft}{} \times \frac{1\ acre}{4.356E{+}04\ ft^2} \times \frac{\$33.27}{acre} = \$\ 15$$

Topsoil Application Costs per 1000 ft of Road

$$\frac{1000\ ft}{} \times \frac{0.40\ ft}{} \times \frac{20\ ft}{} \times \frac{1\ cy}{27\ ft^3} \times \frac{\$0.60}{cy} = \$\ 178$$

Discing/Seeding Costs per 1000 ft of Road

$$\frac{1000\ ft}{} \times \frac{20\ ft}{} \times \frac{1\ acre}{4.356E{+}04\ ft^2} \times \frac{\$200}{acre} = \$\ 92$$

TOTAL WELLFIELD ROAD RECLAMATION COSTS PER 1000 FT OF ROAD (AFTER JANUARY 1, 1997) = $ 299

TRANSPORTATION AND DISPOSAL

Assumptions:

1. Based on actual 1997 costs for transportation to and disposal at an NRC-licensed disposal facility
2. Includes profit of transporter and disposal facility

By-product Material Transportation and Disposal Costs per ft^3

Type of Waste: Sludge, resin, and other by-product type wastes (e.g., tank and building construction materials, PVC/HDPE/fiberglass piping, pumps)

Transportation		Disposal		Total
$1.44 /$ft^3$	+	$15.75 /$ft^3$	=	**$17.19 /$ft^3$**

Type of Waste: Soil, sand, and demolished concrete

Transportation		Disposal		Total
$1.44 /$ft^3$	+	$5.23 /$ft^3$	=	**$6.67 /$ft^3$**

DISKING/SEEDING

Assumptions:

1. Based on actual contractor costs

TOTAL DISKING/SEEDING COSTS PER ACRE = $ 200

Abbreviations/Acronyms

$	Dollars
$/Kgal	Dollars per 1000 gallons
avg	average
ft	feet
ft2	square feet
ft3	cubic feet
gal	gallon
gpm	gallons per minute
H&S	Health and Safety
H2S	Hydrogen Sulfide
H2SO4	Sulfuric Acid
HCl	Hydrochloric Acid
Hp	Horsepower
Kgal	1000 gallons
Kwh	Kilowatt-hours
NaOH	Caustic Soda
OD	Outside Diameter
PPE	personal protective equipment
PV	Pore Volume Estimate
reqm't	requirement
RO	Reverse Osmosis
WDW	Waste Disposal Well
yd3	cubic yards
yr	year