CAMECO RESOURCES
CROW BUTTE OPERATION

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September 26, 2019

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

AD-8943

Marty Link, Water Quality Division Administrator
Nebraska Department of Environmental Quality
P.O. Box 98922
Lincoln, Nebraska 68509-8922

2020 Surety Estimate
Class III Underground Injection Control Permit Number NE 0122611
Class I Underground Injection Control Permit Number NE 0211670
Class I Underground Injection Control Permit Number NE 0210825

Dear Ms. Link:

Attached is the annual update to the surety estimate for the Crow Butte Uranium Mine. This estimate meets the requirements of Chapter 13 of Title 122, *Rules and Regulations for Underground Injection and Mineral Production Wells* and the annual update requirements included in the referenced permits issued by the Nebraska Department of Environmental Quality (NDEQ). Attached as required in the approved minor permit modification dated August 21, 2007, is an audit statement from Gardner, Loutzenhiser & Ryan; an independent professional auditing firm.

As stated in Criterion 9 of 10 CFR, Appendix A, this surety estimate supplies sufficient information for the U.S. Nuclear Regulatory Commission (NRC) to verify that the amount of coverage provided by the financial assurance will permit the completion of all decontamination, decommissioning, and reclamation of sites, structures, and equipment used in conjunction with facility operation.

Cost estimates have been calculated on the basis of completion of all activities by a third party who is not financially affiliated with Crow Butte. Costs quoted by independent contractors include profit and overhead costs and do not include any credit for salvage value. Crow Butte does not incur any annual costs due to licenses or permits from any State, County, or Local Governments.

The 2020 Surety Estimate is $51,772,730, an increase of $1,108,085 over the 2019 Surety Estimate of $50,664,645, submitted on September 26, 2018. The chemical and electrical costs are based on

NM5501
NM55

current day invoiced costs. Project management costs have been incorporated into the various phases of decommissioning under the labor costs associated with engineering. There were no significant changes to the site infrastructure in 2019 or planned for 2020 that impacted the surety estimate.

The most significant factor contributing to the increased surety estimate is an 8.5% increase in electrical costs. This is partially offset by a slight decrease in realized fuel costs in 2019 compared to 2018. The increase closely reflects the 2019 escalation factor of 1.02.

By letter dated December 19, 2018, NRC staff requested additional information in four areas addressed in the 2019 surety submittal. CBO responded to each of these requests for additional information (RAI), and NRC approved the 2019 surety submittal by letter dated March 21, 2019. Each RAI and the CBO response is detailed below.

RAI (1)

As currently presented, the annual surety submission does not include sufficient information to justify the reduction in costs for Guideline 8 Analysis.

CBO Response: In 2018, CBO requested bids from contract laboratories for completion of Guideline 8 Analysis of groundwater samples. The successful bidder, Intermountain Laboratories (IML) in Sheridan, Wyoming, bid $220 per sample, which compares to the price of $372 that CBO was paying for Guideline 8 Analysis. This resulted in a reduction of $870,048 in the overall surety cost. CBO has been using IML for Guideline 8 Analysis and the current charge for this analysis is in fact $220 per sample.

RAI (2)

As currently presented, the annual surety submission does not include sufficient information to identify how the costs related to "Other Laboratory Costs" were derived.

CBO Response: CBO believes this question refers to the Master Costs page of the surety spreadsheet, specifically to the subheading "Other (radon, biossays, etc.)" under the "Analytical Costs" section of this page. This subheading captures the monthly costs for monitoring employee exposures. The estimate included in this section is based on monthly billing from the contract laboratory for this analysis. The realized monthly cost for this analysis was reduced in the current surety estimate because the number of staff was reduced in 2018. The surety submitted in 2017 included 32 employees in this program, and the surety submitted in 2018 included only 19 employees (each sample set also includes three fictitious names that represent two spike samples and a blank sample for quality assurance). This resulted in a cost reduction from $925 to $600.

RAI (3)

As currently presented, the annual surety submission does not include sufficient information to determine why costs were only identified for "Engineer support during final stabilization" and "HP [health physicist] Technician support during final stabilization" for mine units (MU) 9 through 11.

CBO Response: CBO believes this request for additional information refers to the "Ground Water Restoration" page of the surety spreadsheet, specifically the rows labeled "3 Engineer support during final stabilization" and "4 HP Technician support during final stabilization" under the subheading "VI. Supervisory Labor Cost". These headings have been a standard section of the surety estimate for a number of years. They refer to a specific stage of restoration CBO has termed "final stabilization". In this phase, active restoration activities (i.e. groundwater transfer, groundwater sweep, or groundwater treatment) are complete in all mine units, but stability monitoring continues in the last mine units, MU 9 through 11. Before this phase begins, engineering and HP Technician costs are captured in the "1 Engineer support during active restoration" and the "2 HP Technician support during active restoration" rows located immediately above the rows in question. The rows in question capture the costs associated with engineering support and HP Technician support that will be realized when active restoration activities are complete, but stability monitoring continues in MU 9-11.

RAI (4)

As currently presented, the annual surety submission does not include sufficient information to determine how cost decreases under "Cost reduction due to concurrent restoration of Mine Units" was derived.

CBO Response: CBO believes this request for additional information refers to the "Ground Water Restoration" page of the surety spreadsheet, specifically the row labeled "5 Cost reduction due to concurrent restoration of Mine Units" under the subheading "VI. Supervisory Labor Cost". As is the case with the rows referenced in RAI (3), this heading has been a standard section of the surety estimate for a number of years. The surety document captures costs for engineering support and HP technician support for the restoration of each mine unit, based on the number of months CBO estimates each mine unit will be in restoration. CBO multiplies the estimated monthly labor cost in both categories by the estimated active restoration period for each respective mine unit to derive this estimate. This methodology significantly overestimates the costs associated with this labor, because multiple mine units will be in active restoration at one time, and the monthly labor costs in question will apply to the entire site, not each individual mine unit. Said another way, the monthly labor of the engineer and HP technician will apply to **all** mine units as well as the rest of the site, not just one mine unit. The formula for reducing these costs is to divide the total estimated labor cost by 2. CBO believes that this methodology still results in a very conservative estimate, because it assumes that only two mine units will be in restoration at a given time. For most of 2018, mine units 3, 4, 5, and 6 were concurrently in active restoration. Obviously, this number will vary as mine units move into stability monitoring and other mine units are added to the active restoration roster, but CBO believes that 2 is a representative, conservative estimate of the number of mine units in active restoration at a given time, and application of this number to the formula results in a conservative estimate of the supervisory labor costs that will be associated with active restoration.

Status of Mine Units in Restoration

Mine Unit #2

History

The restoration plan for this mine unit was submitted to NDEQ on December 5, 1995 and was approved by NDEQ in a letter dated December 15, 1995. Injection of lixiviant into this mine unit ceased on January 2, 1996. Since that time period, the mine unit has been in IX and RO treatment and stability monitoring with the following exception.

On August 9, 2007 the entire restoration circuit was shut down so that changes could be made to increase the flow through IX and RO treatment. During this time period the mine unit was in recirculation to maintain a hydrologic bleed until April 1, 2009, when IX treatment resumed in this mine unit. On May 26, 2009, the RO circuit was restarted and this mine unit was placed back into RO treatment.

In February 2009, Crow Butte contracted with a third party hydrogeologist to develop a restoration flow model for Mine Units 2 through 5. The groundwater flow at the facility was simulated using MODFLOW2000, a three-dimensional groundwater flow model developed by the United States Geological Survey. The groundwater flow model was calibrated to pre-mining conditions using water level data collected prior to the mining activities in January 1983. Initial estimates of aquifer properties and boundary water levels were adjusted slightly as part of the model calibration process in order to achieve the best possible match between observed and simulated water levels. The calibrated groundwater flow model is currently being used to optimize restoration in Mine Units 2 through 5 given certain practical limitations on treatment rates, disposal capacity, and existing well injection and extraction rates. The model is calibrated periodically to reflect current mine conditions. Based on this model, eight additional restoration wells were installed to remediate the excursion of lixiviant along the perimeter monitor wells PR-8, PR-15, and IJ13-P. On February 1, 2010 the Safety Environmental Review Panel approved the startup of these additional wells.

Based on these conditions, it was estimated that Mine Unit 2 would be placed into stability monitoring by July 1, 2012. By letter dated August 20, 2009 and Technical Evaluation Report dated August 5, 2009, the NRC approved CBO's request to complete groundwater restoration in Mine Unit 2 by July 1, 2012.

2019 Status

On May 23, 2013, CBO submitted to the Nebraska Department of Environmental Quality (NDEQ) data supporting the successful restoration of the groundwater in Mine Unit #2. By letter June 10, 2013, the NDEQ indicated that the data had been reviewed and determined that stabilization could begin. Stability monitoring and sampling was initiated in June 2013 and continued through September 2014. The data indicates that all the monitored constituents have stabilized and have been returned to the approved NDEQ restoration standards. However, a few of the monitored constituents do not meet the concentration limits under 10 CFR 40, Appendix A, Criterion 5B(5). As a result of this, CBO has collected coring data from this mine unit and anticipates submitting an application requesting an alternate concentration limit (ACL) for these constituents. Because of the small size, geographic proximity, and similar water quality between Mine Unit #2 and Mine

Unit #3, CBO plans to prepare and submit the ACL application for these mine units together, which will defray significant cost in preparation of the submittal. CBO projects that this application will be submitted during the fourth quarter of 2020 and that regulatory review will be completed by the fourth quarter of 2022.

Mine Unit #3

History

The restoration plan for this mine unit was submitted to NDEQ on March 24, 1999 and was amended and approved by NDEQ in a letter dated February 13, 2008. Injection of lixiviant into this mine unit ceased on July 22, 1999. Since that time period, the mine unit has been in IX and RO treatment and stability monitoring with the following exception.

On August 9, 2007 the entire restoration circuit was shut down so that changes could be made to increase the flow through IX and RO treatment. During this time period the mine unit was in recirculation to maintain a hydrologic bleed until April 1, 2009, when IX treatment resumed in this mine unit. On May 26, 2009, the RO circuit was restarted and this mine unit was placed back into RO treatment.

In February 2009, Crow Butte contracted with a third party hydrogeologist to develop a restoration flow model for Mine Units 2 through 5. The groundwater flow at the facility was simulated using MODFLOW2000, a three-dimensional groundwater flow model developed by the United States Geological Survey. The groundwater flow model was calibrated to pre-mining conditions using water level data collected prior to the mining activities in January 1983. Initial estimates of aquifer properties and boundary water levels were adjusted slightly as part of the model calibration process in order to achieve the best possible match between observed and simulated water levels. The calibrated groundwater flow model is currently being used to optimize restoration in Mine Units 2 through 5 given certain practical limitations on treatment rates, disposal capacity, and existing well injection and extraction rates. The model is calibrated periodically to reflect current mine conditions. Based on this model, eight additional restoration wells were installed to remediate the excursion of lixiviant along the perimeter monitor wells PR-8, PR-15, and IJ13-P. On February 1, 2010 the Safety Environmental Review Panel approved the startup of these additional wells.

Based on these conditions, it was estimated that Mine Unit 3 would be placed into stability monitoring by July 1, 2013. By letter dated August 20, 2009 and Technical Evaluation Report dated August 5, 2009, the NRC approved CBO's request to complete groundwater restoration in Mine Unit 3 by July 1, 2013.

On May 23, 2013, CBO submitted to the Nebraska Department of Environmental Quality (NDEQ) data supporting the successful restoration of the groundwater in Mine Unit #3. By letter June 10, 2013, the NDEQ indicated that the data had been reviewed and determined that

stabilization could begin. Stability monitoring and sampling was initiated in June 2013 and continued through September 2014. The data indicates that all the monitored constituents have stabilized and have been returned to the approved NDEQ restoration standards. However, a few of the monitored constituents do not meet the concentration limits under 10 CFR 40, Appendix A, Criterion 5B(5). As a result of this, CBO has collected coring data from this mine unit and anticipates submitting an application requesting an ACL for these constituents.

2019 Status
On September 15, 2017, spot treatment of P246 in Mine Unit 3 was reinitiated after in-house samples indicated that the uranium levels in the well had increased significantly. Additional sampling indicated that the likely source of the elevated uranium levels in the well was an incursion of solutions from neighboring Mine Unit 7. In addition to spot treating the well, CBO initiated a conductivity monitoring program utilizing downhole trolls around the Mine Unit 2 and 3 perimeters that interface with active Mine Units 4, 5, and 7. CBO is currently collecting stability samples form Mine Unit 3 on a quarterly basis. An ACL application will be submitted during the fourth quarter of 2020 with regulatory review finished during the fourth quarter of 2022.

Mine Unit #4

History
The restoration plan for this mine unit was submitted to NDEQ on March 4, 2003 and was approved by NDEQ in a letter dated August 26, 2003. Injection of lixiviant into this mine unit ceased on October 31, 2003. Since that time period the mine unit has been in IX and RO treatment with the same exceptions as Mine Unit 2. On April 1, 2009, IX and RO treatment was resumed in this mine unit. Based on these conditions, it was estimated that Mine Unit 4 would be placed into stability monitoring by January 1, 2015. By letter dated August 20, 2009 and Technical Evaluation Report dated August 5, 2009, the NRC approved CBO's request to complete groundwater restoration in Mine Unit 4 by January 1, 2015.

2019 Status
Stability monitoring in Mine Unit 4 was initiated in September, 2018. CBO is currently collecting stability samples from the mine unit on a quarterly basis. If an ACL is required, CBO anticipates this submitting the application during the first quarter of 2021. It is estimated that the regulatory review will be completed during the first quarter of 2023.

Mine Unit #5

History
The restoration plan for this mine unit was submitted to NDEQ on July 9, 2007 and was approved by NDEQ in a letter dated August 6, 2007. Injection of lixiviant into this mine unit ceased on August 14, 2007. Since that time period the mine unit has been in IX and RO

treatment with the same exceptions as Mine Unit 2. On April 1, 2009, IX and RO treatment was resumed in this mine unit. Based on these conditions, it was estimated that Mine Unit 5 would be placed into stability monitoring by July 1, 2016. By letter dated August 20, 2009 and Technical Evaluation Report dated August 5, 2009, the NRC approved CBO's request to complete groundwater restoration in Mine Unit 5 by July 1, 2016.

2019 Status
On August 20, 2018, CBO initiated stability monitoring in Mine Unit 5 by collecting guideline 8 samples from the baseline restoration wells in the mine unit and splitting these samples with NDEQ. Stability monitoring of the mine unit continues on a quarterly basis. If an ACL is required, CBO anticipates this submitting the application during the first quarter of 2021. It is estimated that the regulatory review will be completed during the first quarter of 2023.

Mine Unit #6

History
On October 28, 2010, CBO permanently ceased injection of lixiviant into the mine unit. By letter dated December 21, 2010, CBO provided notice of cessation of mining in Mine Unit #6. As specified in 10 CFR Part 40.42(h)(l), CBO must also complete mine unit restoration within 24 months after restoration is initiated. If the mine unit requires more than 24 months to complete, CBO must notify the NRC and request an alternate schedule for completion of decommissioning, along with adequate justification for the request. The following table was submitted displaying the schedule and timeline for the various phases of restoration for the mine unit.

IX Treatment	Flow
November 1, 2010 through June 30, 2014 (3 pore volumes)	100 GPM
RO Treatment July 1, 2014 through June 30, 2016 (6 pore volumes)	400 GPM
Recirculation July 1, 2016 through December 31, 2014 (2 pore volumes)	200 GPM
Stability and Regulatory Approval January 1, 2018 through December 31, 2019	N/A

2019 Status
Mine Unit 6 is currently in IX and RO treatment. Based on the MODFLOW2000 model, stability of the mine unit should begin during the first quarter of 2021. If an ACL is required, CBO

anticipates submitting the application during the first quarter of 2023. It is estimated that the regulatory review will be completed during the fourth quarter of 2024.

Mine Unit #7

On June 25, 2018, CBO received a minor modification to NDEQ Class III UIC Permit NE0122611. The modification, in part, allows CBO to place more than five mine units into restoration status when the mine is no longer actively mining. CBO and NDEQ collected a split Guideline 8 sample from the Mine Unit 7 injection stream on September 5, 2018. CBO suspended injection in the mine unit on the next day. Mine Unit 7 is currently in the IX and RO treatment phase of restoration. CBO anticipates that Mine Unit will remain in treatment through the third quarter of 2021, and enter stability monitoring the following quarter.

Sufficient funds have been included in the 2020 Surety Estimate to cover the MU restoration periods and any associated work (e.g. development of an ACL application per Part 40, Appendix A, Criterion 5B(6)) by a third party.

Upon approval of the surety estimate update by the NDEQ, the Crow Butte Operation (CBO) will provide a secured letter of credit on the renewal date to the State of Nebraska in an amount equal to the updated surety estimate.

If you have any questions or require any further information, please do not hesitate to call me at (308) 665-2215 Ext 117.

Sincerely,
CAMECO RESOURCES
CROW BUTTE OPERATION

Walter D. Nelson
SHEQ Coordinator

Enclosure

cc: ATTN: Document Control Desk, Director
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U.S. Nuclear Regulatory Commission
Washington D.C. 20555-0001

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Cameco Resources
Crow Butte Operation
Crawford, Nebraska

INDEPENDENT ACCOUNTANTS' REPORT ON APPLYING AGREED-UPON PROCEDURES

Crow Butte Uranium Mine 2020 Surety Estimate

Gardner, Loutzenhiser and Ryan, P.C.
CERTIFIED PUBLIC ACCOUNTANTS

INDEPENDENT ACCOUNTANTS' REPORT ON APPLYING AGREED-UPON PROCEDURES

Doug Pavlick, President
Crow Butte Resources, Inc.
P.O. Box 1201
Glenrock, WY 82637

At your request we have performed certain agreed-upon procedures, as enumerated below, with respect to evaluating the mathematical accuracy of the Crow Butte Uranium Project 2020 Surety Estimate, and to test the supporting assumptions in the master cost worksheet for the period 2020. These procedures, which were agreed to by Cameco Resources Crow Butte Operation were performed solely to assist Crow Butte Resources in complying with Chapter 13, Title 122, Rules and Regulations for Underground Injections and Mineral Production Wells in providing the Nebraska Department of Environmental Quality with surety bond estimate of costs. The sufficiency of these procedures is solely the responsibility of the specified parties. Consequently, we make no representation regarding the sufficiency of the procedures described below either for the purpose for which the report has been requested or for any other purpose.

Our procedures and findings are as follows:

1. Obtained the 2020 excel file for the Crow Butte Uranium Project 2020 Surety Estimate totaling $51,772,730 from Walt Nelson on September 16, 2019.
    - Verified the mechanical accuracy of the spreadsheet by creating a separate recalculation excel spreadsheet (with all applicable tabs).
        - Manually re-entered cost amounts and formula values.
        - Beginning with the MasterCosts tab formula values were referenced forward through the entire spreadsheet.
        - Costs were verified as to properly flowing between the various tabs of the spreadsheet.
    - No notable differences were found between values in this excel spreadsheet and the 2020 Surety Estimate spreadsheet.
2. Verified accuracy of cost assumptions used in "MasterCosts" tab of 2020 Surety Estimate spreadsheet by tracing amounts reported to various supporting documentation including:
    - Labor rates for Operator Labor, Engineer Costs, and Radiation Technician Expenses were

agreed to the Nebraska Department of Labor website for labor statistics 2nd Quarter 2019.

- Chemical costs were agreed to actual invoices or other third party documentation.
- Per unit costs of chemicals were recalculated.
- Equipment rental costs were agreed to vendor quotes from Dominic Kleich at NMC Rental Services, Scottsbluff Compact Equipment Rental, and Chadron Ace Rental.
- Total hourly costs of equipment rental were recalculated.
- Diesel costs were agreed using monthly average diesel fuel costs at the Nebraska Energy Office website.
- Traced and agreed the diesel tax rates to the Nebraska Department of Revenue website to determine the cost of Ruby #1 diesel.
- Waste disposal costs were agreed to invoices from SWANN and Stumph Sanitation.
- Transportation and disposal costs were recalculated.
- Plant dismantling costs were agreed to a 2017 bid from Paul Reed Construction & Supply, Inc. in Gering, Nebraska.

3. Verified Consumer Price Index (CPI) assumptions used for accuracy, by tracing to the Historical Consumer Price Index for all Urban Consumers (CPI-U) at the Bureau of Labor Statistics website.

4. Recalculated the consumer price index ratios.

This agreed-upon procedures engagement was conducted in accordance with the attestation standards established by the American Institute of Certified Public Accountants. We were not engaged to and did not conduct an examination or review, the objective of which would be the expression of an opinion or conclusion, respectively, on the accompanying Surety Estimate. Accordingly, we do not express an opinion or conclusion on whether the Surety Estimate is presented in conformity with AICPA presentation guidelines or on whether the underlying assumptions provide a reasonable basis for the presentation assuming closure of the entire mine. Had we performed additional procedures, other matters might have come to our attention that would have been reported to you. Furthermore, even if closure of the entire mine should occur, there will usually be differences between the projected and actual results, because events and circumstances frequently do not occur as expected, and those differences may be material. We have no responsibility to update this report for events and circumstances occurring after the date of this report.

This information is intended solely for the use of Cameco Resources Crow Butte Operation and the Nebraska Department of Environmental Quality, and is not intended to be, and should not be, used by anyone other than these specified parties.

Gardner, Loutzenhiser & Ryan PC

September 25, 2019
Chadron, Nebraska

Crow Butte Resources, Inc.
Crow Butte Uranium Project 2019 Surety Estimate
(Revised September 2018)

Total Restoration and Reclamation Cost Estimate

I.	Groundwater Restoration (Sheets 3 to 6)			$23,758,996
II.	Wellfield Reclamation (Sheets 7 to 9)			$13,523,130
III.	Commercial Plant Reclamation/Decommissioning (Sheets 10 to 12)			$1,464,015
IV.	R.O. Building Reclamation/Decommissioning (Sheets 10 to 12)			$368,400
V.	Evaporation Pond Reclamation (Sheets 13)			$1,358,097
VI.	Miscellaneous Site Reclamation (Sheets 14)			$670,764
VII.	Deep Disposal Well Reclamation (Sheet 15)			$242,727
VIII.	I-196 Brule Aquifer Restoration (Sheets 16)			$32,055
	Subtotal Reclamation and Restoration Cost Estimate			$41,418,184
		Contract Administration	10%	$4,141,818
		Contingency	15%	$6,212,728
			TOTAL	$51,772,730

Crow Butte Resources, Inc.
Crow Butte Uranium Project 2019 Surety Estimate
(Revised September 2018)

Comparison of Total Surety and Major Cost Elements to Previous Year
Projected Costs for 2020 are Compared with Costs for 2019 and Changes are Calculated

	2020	2019	Change
Total Surety	$51,772,730	$50,664,645	$1,108,085
Contract Administration	$4,141,818	$4,053,172	$88,646
Contingency	$6,212,728	$6,079,757	$132,971
Groundwater Restoration	**2020**	**2019**	**Change**
Groundwater IX			
Total Gallons Processed (Kgal)	2,893,512	2,893,512	0
Total Cost	$1,273,145	$1,186,340	$86,805
RO Treatment			
Total Gallons Processed (Kgal)	5,787,024	5,787,024	0
Total Cost	$7,754,612	$7,407,391	$347,221
Recirculation			
Total Gallons Processed (Kgal)	1,929,008	1,929,008	0
Total Cost	$636,573	$597,992	$38,580
Sampling and Monitoring			
Total 5 Parameter Samples	85,563	85,563	0
Total 5 Parameter Analysis Costs	$5,133,780	$5,133,780	$0
Total Guideline 8 Samples	5,724	5,724	0
Total Guideline 8 Analysis Costs	$1,259,280	$1,259,280	$0
Wellfield Reclamation	**2020**	**2019**	**Change**
Pipeline Removal and Loading	$1,685,776	$1,634,727	$51,049
Well Abandonment			
Total Number of Wells	4,953	4,953	0
Total Abandonment Cost	$3,183,056	$3,213,434	-$30,378
Site Reclamation	**2020**	**2019**	**Change**
Site Earthwork	$1,560,824	$1,532,028	$28,796
Plant and Equipment Decontamination	**2020**	**2019**	**Change**
Decontamination Costs	$278,597	$272,202	$6,395
Demolition Costs	$952,607	$915,426	$37,181
Piping Shredding Costs	$487,231	$465,115	$22,116
Transportation and Disposal	**2020**	**2019**	**Change**
Byproduct Material			
Soil-Type Materials, Total Volume (Yd3)	4,410	4,410	0
Soil-Type Materials, Total Cost	$1,471,026	$1,419,377	$51,648
Unpackaged Bulk Materials, Total Volume (Yd3)	3,418	3,418	0
Unpackaged Bulk Materials, Total Cost	$756,195	$727,417	$28,778

Crow Butte Resources, Inc.
Crow Butte Uranium Project 2019 Surety Estimate
(Revised September 2018)

Ground Water Restoration

		Mine Unit 2	Mine Unit 3	Mine Unit 4	Mine Unit 5	Mine Unit 6	Mine Unit 7	Mine Unit 8	Mine Unit 9	Mine Unit 10	Mine Unit 11	Total
I. IX Treatment Costs												
PV's Required		3	3	3	3	3	3	3	3	3	3	
Total Kgals for Treatment		64866	57219	314268	643926	181311	213447	348732	273090	487269	309384	2893512
IX Treatment Unit Cost ($/Kgal)	(Sheet 25)	$0.44	$0.44	$0.44	$0.44	$0.44	$0.44	$0.44	$0.44	$0.44	$0.44	
Subtotal IX Treatment Costs per Wellfield		**$28,541.04**	**$25,176.36**	**$138,277.92**	**$283,327.44**	**$79,776.84**	**$93,916.68**	**$153,442.08**	**$120,159.60**	**$214,398.36**	**$136,128.96**	**$1,273,145.28**
Total IX Treatment Costs		**$1,273,145.28**										
II. Reverse Osmosis Costs												
PV's Required		6	6	6	6	6	6	6	6	6	6	
Total Kgals for Treatment		129732	114438	628536	1287852	362622	426894	697464	546180	974538	618768	5787024
Reverse Osmosis Unit Cost ($/Kgal)	(Sheet 26)	$1.34	$1.34	$1.34	$1.34	$1.34	$1.34	$1.34	$1.34	$1.34	$1.34	$1.34
Subtotal Reverse Osmosis Costs per Wellfield		**$173,840.88**	**$153,346.92**	**$842,238.24**	**$1,725,721.68**	**$485,913.48**	**$572,037.96**	**$934,601.76**	**$731,881.20**	**$1,305,880.92**	**$829,149.12**	**$7,754,612.16**
Total Reverse Osmosis Costs		**$7,754,612.16**										
III. Recirculation Costs												
PV's Required		2	2	2	2	2	2	2	2	2	2	
Total Kgals for Treatment		43244	38146	209512	429284	120874	142298	232488	182060	324846	206256	1929008
Recirculation Unit Cost ($/Kgal)	(Sheet 27)	$0.33	$0.33	$0.33	$0.33	$0.33	$0.33	$0.33	$0.33	$0.33	$0.33	$0.33
Subtotal Recirculation Costs per Wellfield		**$14,270.52**	**$12,588.18**	**$69,138.96**	**$141,663.72**	**$39,888.42**	**$46,958.34**	**$76,721.04**	**$60,079.80**	**$107,199.18**	**$68,064.48**	**$636,572.64**
Total Recirculation Costs		**$636,572.64**										
IV. Consumables												
Spare parts, filters and consumables = $56,596.84 year												
Active restoration period (months)		9.55	8.43	46.28	94.81	26.70	31.44	51.35	40.20	71.74	45.55	426.05
Consumable usage (months restoration x annual rate estimate)		$45,041.65	$39,759.28	$218,275.15	$447,162.20	$125,927.97	$148,283.72	$242,187.31	$189,599.41	$338,354.78	$214,832.17	$2,009,423.64
Subtotal Consumables per Mine Unit		**$45,041.65**	**$39,759.28**	**$218,275.15**	**$447,162.20**	**$125,927.97**	**$148,283.72**	**$242,187.31**	**$189,599.41**	**$338,354.78**	**$214,832.17**	**$2,009,423.64**
Total Consumables Costs		**$2,009,423.64**										

Crow Butte Resources, Inc.
Crow Butte Uranium Project 2019 Surety Estimate
(Revised September 2018)

Ground Water Restoration

		Mine Unit 2	Mine Unit 3	Mine Unit 4	Mine Unit 5	Mine Unit 6	Mine Unit 7	Mine Unit 8	Mine Unit 9	Mine Unit 10	Mine Unit 11	Total
V. Monitoring and Sampling Costs												
Guideline 8 analysis =	$220.00 analysis											
5 parameter analysis =	$60 00 analysis											
Total restoration wells		12	18	43	59	55	25	34	21	36	25	328
Total monitor wells		13	10	20	50	54	33	50	33	64	43	370
IX Treatment duration (months)		1.29	1.14	6.24	12 78	3 60	4.24	6 92	5 42	9.67	6.14	57.44
Reverse Osmosis duration (months)		7.40	6.53	35 88	73.51	20.70	24.37	39.81	31.17	55.62	35.32	330.31
Recirculation duration (months)		0.86	0.76	4 16	8.52	2.40	2.83	4.62	3.61	6.45	4 09	38.30
Stabilization duration (months)		24	24	24	24	24	24	24	24	24	24	
Regulatory Review (months)		60	60	60	60	60	60	60	60	60	60	
A. Restoration Well Sampling												
1 Well Sampling prior to restoration start												
# of Wells		0	0	0	0	0	25	34	21	36	25	141
$/sample		$220 00	$220 00	$220.00	$220 00	$220.00	$220 00	$220 00	$220.00	$220 00	$220 00	
2. IX Treatment Sampling												
# of Wells		12	18	43	59	55	25	34	21	36	25	
Total # samples		24	36	301	767	220	125	238	126	360	175	2372
$/sample		$60 00	$60 00	$60.00	$60.00	$60 00	$60.00	$60.00	$60 00	$60.00	$60 00	
3 RO Sampling												
# of Wells		12	18	43	59	55	25	34	21	36	25	
Total # samples		84	126	1548	4366	1155	600	1360	651	2016	875	12781
$/sample		$60.00	$60.00	$60.00	$60.00	$60.00	$60.00	$60.00	$60 00	$60.00	$60.00	

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			Mine Unit 2	Mine Unit 3	Mine Unit 4	Mine Unit 5	Mine Unit 6	Mine Unit 7	Mine Unit 8	Mine Unit 9	Mine Unit 10	Mine Unit 11	Total
4. Recirculation Sampling													
# of Wells			12	18	43	59	55	25	34	21	36	25	
Total # samples			12	18	215	531	165	75	170	84	252	125	1647
$/sample			$220.00	$220.00	$220.00	$220 00	$220 00	$220.00	$220.00	$220 00	$220.00	$220.00	
5. Stabilization Sampling (Guideline 8)													
# of Wells			12	18	43	59	55	25	34	21	36	25	
Total # samples			144	216	516	708	660	300	408	252	432	300	3936
$/sample			$220 00	$220.00	$220.00	$220 00	$220 00	$220.00	$220.00	$220 00	$220.00	$220.00	
6 Stabilization Sampling (5 parameter)													
# of Wells			12	18	43	59	55	25	34	21	36	25	
Total # samples			288	432	1032	1416	1320	600	816	504	864	600	7872
$/sample			$60.00	$60.00	$60.00	$60 00	$60 00	$60.00	$60.00	$60.00	$60.00	$60.00	
7. Monitor Well Sampling													
# of Wells			13	10	20	50	54	33	50	33	64	43	
$/sample			$60.00	$60.00	$60.00	$60.00	$60.00	$60 00	$60.00	$60 00	$60.00	$60.00	
Total # samples (2 2/mo for entire period)			960	713	3092	13069	6023	4025	8289	4661	13480	6579	60891
8. Alternate Concentration Limit Sampling													
Average Cost per Mine Unit			$41,633 00	$41,633.00	$41,633.00	$41,633.00	$41,633 00	$41,633.00	$41,633.00	$41,633.00	$41,633.00	$41,633.00	
9 Other Laboratory Costs													
Radon, bioassays, etc. =	$600 00 month												
Total Laboratory Costs.			$5,730.00	$5,058.00	$27,768.00	$56,886.00	$16,020 00	$18,864.00	$30,810 00	$24,120 00	$43,044 00	$27,330.00	$255,630 00
Subtotal Monitoring and Sampling Costs per Mine Unit			**$163,043.00**	**$176,591.00**	**$588,601.00**	**$1,548,179.00**	**$762,233.00**	**$469,497.00**	**$849,263.00**	**$500,813.00**	**$1,246,277.00**	**$661,703.00**	**$6,966,200.00**
Total Monitoring and Sampling Costs			**$6,966,200.00**										
VI. MIT Costs													
MIT Costs per Well			$92.98	$92 98	$92 98	$92 98	$92.98	$92.98	$92.98	$92 98	$92.98	$92 98	
Restoration period, plus stabilization			33.55	32.43	70.28	118.81	50.70	55.44	75.35	64.20	95.74	69.55	
Remaining MIT's per 5 year cycle			1	1	1	2	2	2	2	3	3	3	
Number of Wells MIT'd for Life of Mine Unit			144	163	292	496	550	618	731	552	865	528	
Subtotal MIT Mine Unit			**$13,389.12**	**$15,155.74**	**$27,150.16**	**$92,236.16**	**$102,278.00**	**$114,923.28**	**$135,936.76**	**$153,974.88**	**$241,283.10**	**$147,280.32**	
2-year MIT Costs for Disposal Wells	$6,793												
Number of DDWs	2												
Number of MITs per DDW	8												
Subtotal MIT DDW Costs		**$108,692**											
Total MIT Costs		**$1,152,300**											

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Ground Water Restoration

	Mine Unit 2	Mine Unit 3	Mine Unit 4	Mine Unit 5	Mine Unit 6	Mine Unit 7	Mine Unit 8	Mine Unit 9	Mine Unit 10	Mine Unit 11	Total
VI. Supervisory Labor Cost											
Engineer Support = $8,868 33 month											
HP Technician support = $6,505.75 month											
Active restoration period (months)	9 55	8.43	46.28	94.81	26 70	31.44	51.35	40.20	71.74	45.55	
Stabilization period (months)	24	24	24	24	24	24	24	24	24	24	
1 Engineer support during active restoration	$84,692 55	$74,760 02	$410,426.31	$840,806 37	$236,784.41	$278,820.30	$455,388 75	$356,506.87	$636,213.99	$403,952.43	$3,778,352 00
2 HP Technician support during active restoration	$62,129 91	$54,843.47	$301,086.11	$616,810.16	$173,703 53	$204,540.78	$334,070 26	$261,531.15	$466,722.51	$296,336.91	$2,771,774.79
3 Engineer support during final stabilization								$212,839.92	$212,839.92	$212,839.92	$638,519 76
4 HP Technician support during final stabilization								$156,138.00	$156,138.00	$156,138 00	$468,414 00
5 Cost reduction due to concurrent restoration of Mine Units			-355,756.21	-728,808.27	-205,243 97	-241,680.54	-394,729.51	-493,507.97	-735,957.21	-534,633.63	-$3,690,317 30
Subtotal Supervisory Labor per Mine Unit	**$146,822.46**	**$129,603.49**	**$355,756.21**	**$728,808.27**	**$205,243.97**	**$241,680.54**	**$394,729.51**	**$493,507.97**	**$735,957.21**	**$534,633.63**	**$3,966,743.25**
Total Supervisory Labor Costs	**$3,966,743.25**										
TOTAL RESTORATION COST PER WELLFIELD	**$571,559.55**	**$537,065.23**	**$2,212,287.48**	**$4,874,862.31**	**$1,698,983.68**	**$1,572,374.24**	**$2,650,944.70**	**$2,096,040.98**	**$3,948,067.45**	**$2,444,511.36**	**$22,606,696.97**

TOTAL GROUND WATER RESTORATION COSTS	**$23,758,996.49**

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Wellfield Reclamation

	Mine Unit 1	Mine Unit 2	Mine Unit 3	Mine Unit 4	Mine Unit 5	Mine Unit 6	Mine Unit 7	Mine Unit 8	Mine Unit 9	Mine Unit 10	Mine Unit 11	Totals
Wellfield Piping												
Assumptions												
Number of Wellhouses	0	3	3	5	7	7	6	9	7	10	6	63
Total Mine Unit surface area (acres)	9 27	11 70	13 46	71 62	129 66	34 61	51.01	62 51	48 95	76 19	42 11	551.09
Total length of small diameter production and injection lines (laterals) (ft)	0	34000	39520	68900	106080	130700	172900	211200	163150	262600	92000	1281050
Total length of 3/8-inch hose (ft)					66300							66300
Total length 1-1/4-inch stinger pipe (ft)	0	0	0	0	0	0	72000	14600	129600	110000	100000	426200
Total length of 2-inch downhole production pipe (ft)	1200	20000	30000	22000	50000	45000	104000	72500	95000	72000	97500	609200
Total Length of Trunkline (6-inch) (ft)	1000	2100	4000	600		4500		900		5600		18700
Total Length of Trunkline (8-inch) (ft)	4400	1300	1450	7800	3700	2000	1000	2200	2225	3600	1400	31075
Total Length of Trunkline (10-inch) (ft)								400				400
Total Length of Trunkline (12-inch) (ft)			10800	6500	31900	12000	5000	19100	11525	14500	5000	116325
Total Length of All Trunkline (ft)	5400	3400	16250	14900	35600	18500	6000	22600	13750	23700	6400	166500
Total number of production wells	3	52	57	103	210	187	205	269	195	298	201	1780
Total number of injection wells	0	79	96	169	236	309	380	412	324	503	284	2792
Total number of shallow monitor wells	0	3	3	11	25	28	25	30	20	32	24	201
Total number of perimeter monitor wells	11	10	7	9	25	26	8	20	13	32	19	180
I. Production and Injection Piping												
A. Removal and Loading												
Production and Injection Piping Removal Unit Cost ($/ft of pipe)	$0 76	$0 76	$0 76	$0.76	$0 76	$0 76	$0 76	$0 76	$0 76	$0 76	$0 76	
Subtotal Production and Injection Piping Removal and Loading Costs	*$0 00*	*$25,840 00*	*$30,035.20*	*$52,364 00*	*$80,620 80*	*$99,332 00*	*$131,404 00*	*$160,512 00*	*$123,994 00*	*$199,576 00*	*$69,920 00*	*$973,598 00*
B. Pipe Shredding												
Production and Injection Piping Shredding Unit Cost ($/ft of pipe)	$0 09	$0 09	$0 09	$0 09	$0 09	$0 09	$0.09	$0 09	$0 09	$0 09	$0 09	
Subtotal Production and Injection Piping Removal and Loading Costs	*$0 00*	*$3,060 00*	*$3,556 80*	*$6,201 00*	*$9,547 20*	*$11,763 00*	*$15,561 00*	*$19,008 00*	*$14,683.50*	*$23,634.00*	*$8,280.00*	*$115,294 50*
C Equipment Costs												
Cat 924G Loader Unit Costs for removal (450'/day)	$0 00	$128,764 80	$149,670 14	$260,938 08	$401,746 18	$494,987 04	$654,806 88	$799,856 64	$617,881 68	$994,518 72	$348,422 40	
Shredder Unit Costs for shredding (450'/day)	$0 00	$7,628 09	$8,866.53	$15,458 10	$23,799 64	$29,323 27	$38,791 08	$47,383 89	$36,603 61	$58,915 77	$20,640.71	
Subtotal Equipment Costs	*$0 00*	*$136,392 89*	*$158,536 67*	*$276,396 18*	*$425,545.82*	*$524,310 31*	*$693,597 96*	*$847,240 53*	*$654,485 29*	*$1,053,434 49*	*$369,063 11*	*$5,159,003 25*
D Transport and Disposal Costs (NRC-Licensed Facility)												
Chipped Volume Reduction (ft^3/ft)	0 0069	0 0069	0 0069	0 0069	0 0069	0 0069	0 0069	0 0069	0 0069	0 0069	0 0069	
Chipped Volume per Wellfield (yd^3)	0 0	8 7	10.1	17 6	27 1	33 4	44 2	54 0	41 7	67 1	23 5	
Volume for Disposal Assuming 25% Void Space (yd^3)	0 0	10 9	12 6	22 0	33 9	41 8	55 3	67 5	52 1	83 9	29 4	409 4
Transportation and Disposal Unit Cost ($/yd^3$) Unpackaged Bulk	$220 99	$220 99	$220.99	$220 99	$220 99	$220 99	$220 99	$220 99	$220 99	$220 99	$220 99	
Subtotal Production and Injection Piping Transport and Disposal Costs	*$0 00*	*$2,408 79*	*$2,784.47*	*$4,861 78*	*$7,491 56*	*$9,237 58*	*$12,220 75*	*$14,916 83*	*$11,513 58*	*$18,541.06*	*$6,497.11*	*$90,473 51*
Total Production and Injection Piping Costs	**$0.00**	**$167,701.68**	**$194,913.14**	**$339,822.96**	**$523,295.38**	**$644,642.69**	**$852,783.71**	**$1,041,677.36**	**$804,676.37**	**$1,295,185.55**	**$453,760.22**	**$6,318,369.06**
II. Trunklines												
A. Removal and Loading												
Trunkline Removal Unit Cost ($/ft of pipe)	$1 72	$1.72	$1 72	$1 72	$1 72	$1 72	$1.72	$1.72	$1.72	$1.72	$1 72	
Subtotal Trunklines Removal and Loading Costs	*$9,288 00*	*$5,848 00*	*$27,950 00*	*$25,628 00*	*$61,232 00*	*$31,820 00*	*$10,320 00*	*$38,872 00*	*$23,650 00*	*$40,764 00*	*$11,008 00*	*$286,380 00*
B Pipe Shredding												
Trunkline Shredding Unit Cost ($/ft of pipe)	$1.72	$1.72	$1.72	$1 72	$1 72	$1 72	$1.72	$1 72	$1.72	$1.72	$1 72	
Subtotal Trunkline Shredding Costs	*$9,288 00*	*$5,848 00*	*$27,950.00*	*$25,628 00*	*$61,232 00*	*$31,820 00*	*$10,320 00*	*$38,872 00*	*$23,650 00*	*$40,764 00*	*$11,008 00*	*$286,380 00*
C Equipment Costs												
Cat 924G Loader Unit Costs for removal (200'/day)	$46,014 48	$28,972 08	$138,469 50	$126,965 88	$303,354 72	$157,642 20	$51,127 20	$192,579.12	$117,166 50	$201,952 44	$54,535 68	
Shredder Unit Costs for shredding (200'/day)	$2,725 92	$1,716 32	$8,203.00	$7,521 52	$17,970 88	$9,338 80	$3,028 80	$11,408 48	$6,941.00	$11,963.76	$3,230 72	
Subtotal Equipment Costs	*$48,740 40*	*$30,688 40*	*$146,672 50*	*$134,487.40*	*$321,325 60*	*$166,981 00*	*$54,156 00*	*$203,987.60*	*$124,107 50*	*$213,916 20*	*$57,766.40*	*$1,502,829 00*
D. Transport and Disposal Costs (NRC-Licensed Facility)												
Chipped Volume Reduction (6-inch) (ft^3/ft)	0 0651	0 0651	0 0651	0 0651	0 0651	0 0651	0 0651	0 0651	0 0651	0 0651	0 0651	
Chipped Volume Reduction (8-inch) (ft^3/ft)	0.1103	0 1103	0 1103	0 1103	0 1103	0,1103	0 1103	0.1103	0 1103	0 1103	0 1103	
Chipped Volume Reduction (10-inch) (ft^3/ft)	0 1712	0 1712	0 1712	0 1712	0 1712	0 1712	0 1712	0.1712	0.1712	0 1712	0 1712	
Chipped Volume Reduction (12-inch) (ft^3/ft)	0 2408	0 2408	0 2408	0.2408	0 2408	0 2408	0 2408	0.2408	0 2408	0 2408	0 2408	
Chipped Volume per Wellfield (yd^3)	20 4	10 4	111 9	91 3	299 6	126 0	48 7	184 0	111 9	157 5	50 3	
Volume for Disposal Assuming 25% Void Space (ft^3)	25.5	13.0	139 9	114 1	374 5	157.5	60,9	230.0	139.9	196 9	62 9	1515.1
Transportation and Disposal Unit Cost ($/ft^3)	$220 99	$220 99	$220 99	$220 99	$220 99	$220 99	$220 99	$220 99	$220 99	$220 99	$220 99	
Subtotal Transport and Disposal Costs	*$5,635 25*	*$2,872.87*	*$30,916 50*	*$25,214 96*	*$82,760.76*	*$34,805 93*	*$13,458 29*	*$50,827 70*	*$30,916 50*	*$43,512 93*	*$13,900 27*	*$334,821 96*
Total Trunkline Costs	**$72,951.65**	**$45,257.27**	**$233,489.00**	**$210,958.36**	**$526,550.36**	**$265,426.93**	**$88,254.29**	**$332,559.30**	**$202,324.00**	**$338,957.13**	**$93,682.67**	**$2,410,410.96**

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Wellfield Reclamation

	Mine Unit 1	Mine Unit 2	Mine Unit 3	Mine Unit 4	Mine Unit 5	Mine Unit 6	Mine Unit 7	Mine Unit 8	Mine Unit 9	Mine Unit 10	Mine Unit 11	Totals
III. Downhole Pipe												
A. Removal and Loading												
Downhole Piping Removal Unit Cost ($/ft of pipe)	$0 090	$0 090	$0.090	$0.090	$0 090	$0 090	$0 090	$0 090	$0 090	$0 090	$0.090	
Downhole Hosing Removal Unit Cost ($/ft of pipe)	$0 170	$0 170	$0 170	$0 170	$0 170	$0 170	$0 170	$0 170	$0 170	$0 170	$0 170	
Removal of 1-1/4-inch stinger pipe	$0 00	$0 00	$0 00	$0.00	$0 00	$0 00	$6,480 00	$1,314.00	$11,664 00	$9,900 00	$9,000 00	
Removal of downhole production pipe	$108.00	$1,800 00	$2,700 00	$1,980 00	$4,500 00	$4,050 00	$9,360 00	$6,525 00	$8,550 00	$6,480 00	$8,775 00	
Removal of downhole hose	$0 00	$0 00	$0 00	$0 00	$11,271 00	$0 00	$0 00	$0 00	$0 00	$0 00	$0 00	
Subtotal Downhole Piping Removal and Loading Costs	*$108 00*	*$1,800.00*	*$2,700 00*	*$1,980 00*	*$15,771 00*	*$4,050 00*	*$15,840 00*	*$7,839 00*	*$20,214 00*	*$16,380 00*	*$17,775 00*	*$104,457 00*
B Pipe Shredding												
Downhole Piping Shredding Unit Cost ($/ft of pipe)	$0 080	$0 080	$0 080	$0.080	$0 080	$0 080	$0 080	$0 080	$0 080	$0 080	$0 080	
Subtotal Downhole Piping Shredding Costs	*$96.00*	*$1,600 00*	*$2,400 00*	*$1,760 00*	*$4,000 00*	*$3,600 00*	*$14,080 00*	*$6,968 00*	*$17,968 00*	*$14,560 00*	*$15,800 00*	*$82,832 00*
C Equipment Costs												
Smsel Unit Costs for removal	$89 07	$1,484 53	$2,226 80	$1,632 99	$3,711.33	$3,340 20	$13,063.89	$6,465 14	$16,671 31	$13,509 25	$14,659.77	
Shredder Unit Costs for shredding	$26 92	$448 71	$673 07	$493 58	$1,121 78	$1,009 60	$3,948 66	$1,954 14	$5,039 03	$4,083 27	$4,431.02	
Subtotal Equipment Costs	*$115 99*	*$1,933 24*	*$2,899 87*	*$2,126 57*	*$4,833 11*	*$4,349 80*	*$17,012 55*	*$8,419 28*	*$21,710 34*	*$17,592 52*	*$19,090 79*	*$100,084 06*
D Transport and Disposal Costs (NRC-Licensed Facility)												
Chipped Volume Reduction - 1-1/4-inch stinger (ft^3/ft)	0 0044	0 0044	0 0044	0 0044	0 0044	0 0044	0 0044	0 0044	0.0044	0 0044	0 0044	
Chipped Volume Reduction - 2-inch downhole production (ft^3/ft)	0 0074	0 0074	0 0074	0 0074	0 0074	0 0074	0 0074	0 0074	0 0074	0 0074	0 0074	
Volume Reduction - 3/8-inch hose (ft3/ft)	0 0313	0 0313	0 0313	0.0313	0 0313	0 0313	0 0313	0 0313	0 0313	0 0313	0 0313	
Chipped Volume - 1-1/4-inch stinger (ft^3)	0	0	0	0	0	0	317	64	570	484	440	
Chipped Volume - 2-inch downhole production (ft^3)	9	148	222	163	370	333	770	537	703	533	722	
Volume 3/8-inch hose (ft3)	0	0	0	0	2075	0	0	0	0	0	0	
Volume for Disposal Assuming 25% Void Space (yd^3)	0 4	6 9	10 3	7.5	113 2	15 4	50 3	27 8	58 9	47.1	53.8	391 6
Transportation and Disposal Unit Cost ($/yd^3$) (Unpackaged Bulk)	$220 99	$220 99	$220 99	$220 99	$220 99	$220 99	$220.99	$220 99	$220 99	$220.99	$220 99	
Subtotal Downhole Piping Transport and Disposal Costs	*$88 40*	*$1,524 83*	*$2,276 20*	*$1,657 45*	*$25,016 07*	*$3,403 25*	*$11,115 80*	*$6,143 52*	*$13,016 31*	*$10,408 63*	*$11,889 26*	*$86,539.70*
Total Downhole Piping Costs	**$408.39**	**$6,858.07**	**$10,276.07**	**$7,524.90**	**$49,620.18**	**$15,403.05**	**$58,048.35**	**$29,369.80**	**$72,908.65**	**$58,941.15**	**$64,555.85**	**$373,912.76**
IV. Surface Reclamation												
A. Removal and disposal of contaminated soil around wells and wellhouses												
Volume of contaminated soil (0 37 yd3 per injection and production well)	1 11	48 47	56 61	100 64	165.02	183 52	216 45	251.97	192.03	296 37	179.45	1691.64
Volume of contaminated soil (5 yd3 per wellhouse)	0	15	15	25	35	35	30	45	35	50	30	
Estimated volume of contaminated soil from spills in the Mine Unit (yd3)	0	116	57	40	170	253	64	70	81	13	1	
Disposal of contaminated soil $263 17 per yd3	$292 12	$47,231 12	$33,846 29	$43,591.48	$97,378 16	$124,089 92	$81,701 13	$96,575 49	$81,064 26	$94,575 40	$55,384.13	$755,729 50
Equipment (Cat 924G loader at 2 yd3/hr)	$118 23	$5,162 78	$6,029 81	$10,719 67	$17,577 11	$19,547 63	$23,055 17	$26,838 58	$20,454 08	$31,567 85	$19,114 12	
Labor (1 man-hour per 2 Yd3)	$11 90	$519 60	$606 86	$1,078 86	$1,769 01	$1,967 33	$2,320 34	$2,701 12	$2,058 56	$3,177 09	$1,923 70	
Subtotal removal and disposal of contaminated soil	*$422 25*	*$52,913 50*	*$40,482.96*	*$55,390 01*	*$116,724.28*	*$145,604 88*	*$107,076 64*	*$126,115 19*	*$103,576 90*	*$129,320 34*	*$76,421 95*	*$954,048 90*
B Recontour and seeding												
Recontour and seeding (est. $300/acre)	$2,781 00	$3,510 00	$4,038 00	$21,486.00	$38,898 00	$10,383 00	$15,303 00	$18,753 00	$14,685 00	$22,857.00	$12,633 00	
Subtotal Recontour and Seeding	*$2,781 00*	*$3,510.00*	*$4,038 00*	*$21,486 00*	*$38,898 00*	*$10,383 00*	*$15,303 00*	*$18,753 00*	*$14,685 00*	*$22,857.00*	*$12,633.00*	*$165,327 00*
Total Surface Reclamation	**$3,283.25**	**$56,423.50**	**$44,520.96**	**$76,876.01**	**$155,622.28**	**$155,987.88**	**$122,379.64**	**$144,868.19**	**$118,261.90**	**$152,177.34**	**$89,054.95**	**$1,119,375.90**
IV. Well Houses												
Total Quantity	0	3	3	5	7	7	6	9	7	10	6	
Average Well House Weight (Lbs) (Includes wellhead covers for each well)	9200	9200	9200	9200	9200	9200	9200	9200	9200	9200	9200	
A. Removal												
Dismantlement at 2-man-days per wellhouse (man-days)	0	6	6	10	14	14	12	18	14	20	12	
Dismantlement Labor Costs	$0 00	$1,029 12	$1,029 12	$1,715 20	$2,401 28	$2,401 28	$2,058 24	$3,087 36	$2,401 28	$3,430.40	$2,058.24	$21,611 52
Equipment (Cat 924G at 2 hours per wellhouse) (hrs)	0	6	6	10	14	14	12	18	14	20	12	
Equipment Costs	$0 00	$1,278.18	$1,278 18	$2,130 30	$2,982.42	$2,982 42	$2,556 36	$3,834 54	$2,982 42	$4,260 60	$2,556 36	$26,841.78
Subtotal Well House Dismantlement Costs	*$0 00*	*$2,307.30*	*$2,307 30*	*$3,845 50*	*$5,383.70*	*$5,383 70*	*$4,614 60*	*$6,921 90*	*$5,383.70*	*$7,691.00*	*$4,614.60*	*$48,453 30*
B Disposal												
Total Disposal Weight (9200 lbs per wellhouse) (Lbs)	0	27600	27600	46000	64400	64400	55200	82800	64400	92000	55200	
Subtotal Disposal Costs	*$0 00*	*$3,312 00*	*$3,312 00*	*$5,520 00*	*$7,728 00*	*$7,728 00*	*$6,624 00*	*$9,936 00*	*$7,728 00*	*$11,040 00*	*$6,624.00*	*$69,552 00*
Total Well House Removal and Disposal Costs	**$0.00**	**$5,619.30**	**$5,619.30**	**$9,365.50**	**$13,111.70**	**$13,111.70**	**$11,238.60**	**$16,857.90**	**$13,111.70**	**$18,731.00**	**$11,238.60**	**$118,005.30**
TOTAL REMOVAL AND DISPOSAL COSTS PER WELLFIELD	**$76,563.29**	**$281,859.82**	**$488,818.47**	**$644,546.83**	**$1,268,189.90**	**$1,094,572.25**	**$1,132,784.69**	**$1,565,332.55**	**$1,211,282.62**	**$1,863,992.17**	**$712,291.49**	**$10,340,073.98**

TOTAL WELLFIELD BUILDINGS AND EQUIPMENT REMOVAL AND DISPOSAL COSTS	**$10,340,073.98**

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Well Abandonment

		Mine Unit 1	Mine Unit 2	Mine Unit 3	Mine Unit 4	Mine Unit 5	Mine Unit 6	Mine Unit 7	Mine Unit 8	Mine Unit 9	Mine Unit 10	Mine Unit 11	Total
I. Well Abandonment (Wellfields)													
# of Production Wells		3	52	57	103	210	187	205	269	195	298	201	
# of Injection Wells		0	79	96	169	236	309	380	412	324	503	284	
# of Perimeter Monitoring Wells		11	10	7	9	25	26	8	20	13	32	19	
# of Shallow Monitoring Wells		0	3	3	11	25	28	25	30	20	32	24	
Total Number of Deep Wells		14	141	160	281	471	522	593	701	532	833	504	4752
Total Number of Shallow Wells		0	3	3	11	25	28	25	30	20	32	24	201
Average Diameter of Casing (inches)		5	5	5	5	5	5	5	5	5	5	5	
Production, Injection and Perimeter Well Average Depth (ft)		665	631	774	698	675	515	762	500	770	480	790	660
Shallow Well Average Depth (ft)		200	200	200	200	200	200	200	200	200	150	300	205
Total Mine Unit Well Depth (ft)		9310	89571	124440	198338	322925	274430	456866	356500	413640	404640	405360	3056020
Well Abandonment Unit Cost ($/ft. of well)		$1.04	$1.04	$1.04	$1.04	$1.04	$1.04	$1.04	$1.04	$1.04	$1.04	$1.04	
Subtotal Abandonment Cost per Wellfield		**$9,682.40**	**$93,153.84**	**$129,417.60**	**$206,271.52**	**$335,842.00**	**$285,407.20**	**$475,140.64**	**$370,760.00**	**$430,185.60**	**$420,825.60**	**$421,574.40**	**$3,178,260.80**
II. Downhole Pump Disposal													
Number of Downhole Pumps	1174												
Pump Disposal Volume(ft3)	0.5												
Total Pump Disposal Volume(yd3)	21.7												21.7
Downhole Pump Disposal Rate ($/yd3)	$220.99												220.99
Subtotal Downhole Pump Disposal		**$4,795.48**											**$4,795.48**
Total Wellfield Abandonment Costs		**$3,183,056.28**											

Plant Equipment Decommissioning

	Commercial Plant	R.O. Building
I. Removal and Loading Costs		
Tankage		
Number of Contaminated Tanks	141	
Volume of Contaminated Tank Construction Material (ft^3)	2721	
Number of Chemical Tanks	21	
Disposal Void Factor	1.25	
A. Labor to Remove and Load Tankage		
Number of Persons	2	
Tanks/Day	1	
Number of Days	162	
$/Day/Person	$171.52	
Subtotal Removal Labor Costs	*$55,572.48*	
B. Labor to Clean Chemical Tankage		
Number of Persons	1	
Tanks/Day	1	
Number of Days	21	
$/Day/Person	$171.52	
Subtotal Cleaning Labor Costs	*$3,601.92*	
C. Equipment		
Saws, scaffolding, etc.	$6,000	
Subtotal Equipment Costs	*$6,000*	
Total Equipment Removal and Loading Costs	**$65,174.40**	
II. Transportation and Disposal Costs (NRC-Licensed Facility)		
A. Tankage		
Volume of Tank Construction Material (ft^3)	2721	
Volume for Disposal Assuming Void Space (yd^3)	126.0	
Transportation and Disposal Unit Cost ($/$yd^3$) (Unpackaged Bulk)	$220.99	
Subtotal Tankage Transportation and Disposal Costs	*$27,844.74*	
B. Contaminated PVC Pipe		
Volume of Shredded PVC Pipe (ft^3)	422.4	
Volume for Disposal Assuming Void Space (yd^3)	19.6	
Transportation and Disposal Unit Cost ($/$yd^3$) (Unpackaged Bulk)	$220.99	
Subtotal Contaminated PVC Pipe Transportation and Disposal Costs	*$4,331.40*	
C. Pumps		
Volume of Process Pumps (yd^3) (no void factor used)	34.8	
Transportation and Disposal Unit Cost ($/$yd^3$) (Unpackaged Bulk)	$220.99	
Subtotal Pump Transportation and Disposal Costs	*$7,690.45*	
D. Filters (injection, backwash and yellowcake filters)		
Volume of Filters (yd^3) (no void factor used)	463.0	
Transportation and Disposal Unit Cost ($/$yd^3$) (Unpackaged Bulk)	$220.99	
Subtotal Filter Transportation and Disposal Costs	*$102,318.37*	
E. Dryer		
Dryer Volume (yd^3) (no void factor used)	29.6	
Transportation and Disposal Unit Cost ($/$yd^3$) (Unpackaged Bulk)	$220.99	
Total Dryer Transportation and Disposal Costs	*$6,541.30*	
Total Contaminated Equipment Transportation and Disposal Costs	**$148,726.26**	
III. Transportation and Disposal (Solid Waste for Landfill Disposal)		
A. Cleaned Tankage		
Volume of Tank Construction Material (ft^3)	405	
Number of Landfill Trips	1	
Transportation and Disposal Unit Cost ($/Load)	$1,000.00	
Subtotal Tankage Transportation and Disposal Costs	*$1,000.00*	
B. Uncontaminated PVC Pipe		
Volume of Shredded PVC Pipe (ft^3)	184.3	
Number of Landfill Trips	1	
Transportation and Disposal Unit Cost ($/Load)	$1,000.00	
Subtotal PVC Pipe Transportation and Disposal Costs	*$1,000.00*	
Total Uncontaminated Equipment Transportation and Disposal Costs	**$2,000.00**	
IV. Supervisory Labor Costs During Plant Decommissioning		
Estimated Duration (months)	6	
Engineer	$53,209.98	
Radiation Technician	$39,034.50	
Total Supervisory Labor Costs	**$92,244.48**	
SUBTOTAL EQUIPMENT REMOVAL AND DISPOSAL COSTS PER FACILITY	$308,145.14	
Building Area (Ft2)	39,738	10,000
Building Equipment Removal and Disposal Cost per Square Foot	$7.75	$7.75
TOTAL EQUIPMENT REMOVAL AND DISPOSAL COSTS	**$308,145.14**	**$77,500.00**

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Building Demolition

	Commercial Plant
I. Decontamination Costs	
A. Wall Decontamination	
Area to be Decontaminated (ft^2)	36,470
HCl Application Rate (Gallons/ft^2)	1
HCl Acid Cost	$1.72
Subtotal Wall Decontamination Materials Costs	$62,728.40
B. Concrete Floor Decontamination	
Area to be Decontaminated (ft^2)	39738
HCl Application Rate (Gallons/ft^2)	2
HCl Acid Cost	$1.72
Subtotal Floor Decontamination Materials Costs	$136,698.72
C. Decontamination Labor	
Labor (man-days)	60
Subtotal Decontamination Labor Cost	$10,291.20
D. Decontamination Equipment Costs	
Sprayer pump	$500
Recycle pump	$500
Sprayer with hose	$1,000
Subtotal Decontamination Equipment Costs	$2,000
E. Decontamination Waste Disposal (to Ponds)	
Total gallons HCl waste	115,946
Pumping costs (5 HP/30 gpm)	$1,704.48
Subtotal Decontamination Costs	$213,422.80
Total Decontamination Costs	**$213,422.80**
II. Demolition Costs	
Assumptions (based on 2017 costs):	
Dismantling plant building	$625,758.00
A. Building Dismantling	
Plant contents and building dismantling (2017 $'s escalated by CPI)	$637,021.64
Subtotal Building and Contents Dismantling	*$637,021.64*
B. Concrete Floor Removal	
Area of direct-dispose concrete floors (ft2)	11,100
Removal Rate ($/ft2)	$17.80
Subtotal Concrete Floor Removal	*$197,580.00*
Total Demolition Costs	**$834,601.64**
III. Disposal Costs	
A. Concrete Floor	
Area of Direct-Dispose Concrete Floor (ft^2)	11,100
Average Thickness of Concrete Floor (ft)	0.50
Volume of Concrete Floor (ft^3)	5,550
Volume of Concrete Floor (Yd3)	206
B. Contaminated Soil	
Volume of Contaminated Soil (Yd3)	206
Transportation and Disposal Unit Cost ($/$Yd^3$) (Unpackaged Bulk)	$220.99
Subtotal Concrete Floor and Soil Disposal Costs	*$91,047.88*
Total Disposal Costs	**$91,047.88**
IV Plant Site Reclamation	
A. Plant Site Earthwork	
Material to be Moved (Yd3)	20,500
D8N Bulldozer Earthwork Rate (Yd3/hr)	700
D8N Hourly Rate	$512.12
Subtotal Plant Site Earthwork	*$14,997.80*
B. Revegetation	
Area requiring Revegetation (Ac)	6
Revegetation Unit Cost ($/Ac)	$300
Subtotal Plant Site Revegetation	*$1,800.00*
Total Plant Site Reclamation Costs	**$16,797.80**
SUBTOTAL BUILDING DEMOLITION AND DISPOSAL COSTS	$1,155,870.12
Building Area (Ft2)	39,738
Building Demolition Cost per Square Foot	$29.09

TOTAL BUILDING DEMOLITION AND DISPOSAL COSTS	**$1,155,870.12**

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Building Demolition

R.O. Building

I. Decontamination Costs
- A. Wall Decontamination
  - Area to be Decontaminated (ft^2)
  - HCl Application Rate (Gallons/ft^2)
  - HCl Acid Cost
  - Subtotal Wall Decontamination Materials Costs
- B. Concrete Floor Decontamination
  - Area to be Decontaminated (ft^2)
  - HCl Application Rate (Gallons/ft^2)
  - HCl Acid Cost
  - Subtotal Floor Decontamination Materials Costs
- C. Decontamination Labor
  - Labor (man-days)
  - Subtotal Decontamination Labor Cost
- D. Decontamination Equipment Costs
  - Sprayer pump
  - Recycle pump
  - Sprayer with hose
  - Subtotal Decontamination Equipment Costs
- E. Decontamination Waste Disposal (to Ponds)
  - Total gallons HCl waste
  - Pumping costs (5 HP/30 gpm)

Subtotal Decontamination Costs

Total Decontamination Costs

II. Demolition Costs

Assumptions (based on 2017 costs):
- Dismantling plant building

A. Building Dismantling
- Plant contents and building dismantling (2017 $'s escalated by CPI)

Subtotal Building and Contents Dismantling

B. Concrete Floor Removal
- Area of direct-dispose concrete floors (ft2)
- Removal Rate ($/ft2)

Subtotal Concrete Floor Removal

Total Demolition Costs

III. Disposal Costs
- A. Concrete Floor
  - Area of Direct-Dispose Concrete Floor (ft^2)
  - Average Thickness of Concrete Floor (ft)
  - Volume of Concrete Floor (ft^3)
  - Volume of Concrete Floor (Yd3)
- B. Contaminated Soil
  - Volume of Contaminated Soil (Yd3)
  - Transportation and Disposal Unit Cost ($/$Yd^3$) (Unpackaged Bulk)
  - *Subtotal Concrete Floor and Soil Disposal Costs*

Total Disposal Costs

IV Plant Site Reclamation
- A. Plant Site Earthwork
  - Material to be Moved (Yd3)
  - D8N Bulldozer Earthwork Rate (Yd3/hr)
  - D8N Hourly Rate
  - *Subtotal Plant Site Earthwork*
- B. Revegetation
  - Area requiring Revegetation (Ac)
  - Revegetation Unit Cost ($/Ac)
  - *Subtotal Plant Site Revegetation*

Total Plant Site Reclamation Costs

SUBTOTAL BUILDING DEMOLITION AND DISPOSAL COSTS

Building Area (Ft2)	10,000
Building Demolition Cost per Square Foot	$29.09

TOTAL BUILDING DEMOLITION AND DISPOSAL COSTS	**$290,900.00**

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Evaporation Pond Reclamation

	Commercial Ponds	R&D Ponds	Total
Assumptions/Data:			
Number of Ponds	3	2	
Area of Ponds (ft2)	250,000	50,000	
Thickness of Liner Material (ft)	0 00833	0 0030	
Leak detection piping size average (in)	6	3	
Leak detection piping length (ft/pond)	2,100	600	
Earthwork Requirements (Yd3/pond)	60,000	30,000	
Surface Restoration/Revegetation (Acres)	20	10	
Sludge Production Rate (Yd3 sludge/gal)		0.000000102	
(1 Yd3 sludge/9,772,000 gal R&D Phase)			
Estimated 1991 to 2019 Total Production (gallons)	26651220240		
Liner Removal Rate (ft2/man-day)	10000	10,000	
Sludge Removal Rate (Yd3/man-day)	8.33	8 33	
2017 - Pond #4 New Liner	250,000		
2017 - Pond #4 Leak detection piping addition	920		
I. Pond Liner and Piping Removal			
A. Pond Liner and Piping Removal Labor			
Area of Ponds	1,000,000	100,000	
Liner Removal Rate (ft2/Man-Day)	10,000	10,000	
Total Man-Days	100	10	
Labor Rate ($/man-day)	$171.52	$171.52	
Subtotal Liner and Piping Removal Labor Costs	*$17,152.00*	*$1,715.20*	*$18,867.20*
B Pond Liner and Piping Removal Equipment			
Total Man-Days Removal Effort	100	10	
Size of Crew	4	4	
Total Days Removal Effort	25	2.5	
Cat 924G Loader Hourly Rate ($/hr)	$213.03	$213.03	
Subtotal Liner and Piping Removal Equipment Costs	*$42,606.00*	*$4,260.60*	*$46,866.60*
Total Pond Liner and Piping Removal Costs	**$59,758.00**	**$5,975.80**	**$65,733.80**
II. Pond Sludge Removal			
Pond Sludge Estimate			
Estimated Production Flow since 1991 (gal)	26,651,220,240		
Historical Sludge Production Rate	0.000000102		
Estimated Pond Sludge Volume (Yd3)	2,718	Cleaned following R&D	
A Pond Sludge Removal Labor			
Pond Sludge Volume (Yd3)	2,718		2,718
Sludge Removal Rate (Yd3/man-day)	8.33		
Total Man-Days	326		
Labor Rate ($/man-day)	$171.52		
Subtotal Pond Sludge Removal Labor Costs	*$55,915.52*	*$0.00*	*$55,915.52*
B Pond Sludge Removal Equipment			
Total Man-Days Removal Effort	326		
Size of Crew	3		
Total Days Removal Effort	109		
Cat 924G Loader Hourly Rate ($/hr)	$213.03		
Subtotal Pond Sludge Removal Equipment Costs	*$185,762.16*	*$0.00*	*$185,762.16*
Total Pond Sludge Removal Costs	**$241,677.68**	**$0.00**	**$241,677.68**
III. Pond Byproduct Material Disposal			
A. Pond Liner Disposal			
Area of Pond Liner (ft2)	1,000,000	100,000	
Thickness of Pond Liner (ft)	0 00833	0.00300	
Volume of Pond Liner (ft3)	8,330	300	
Void Space Factor	1.25	1.25	
Total Disposed Volume (yd3)	386	14	400.0
Disposal Unit Costs ($/yd3) (Unpackaged Bulk)	$220.99	$220.99	
Subtotal Pond Liner Disposal Costs	*$85,302.14*	*$3,093 86*	*$88,396.00*
B. Pond Piping Disposal			
Total Length of Piping	7,220	1,200	
Piping Volume Factor (ft3/ft)	0 0103	0.0069	
Total Volume Pond Piping (ft3)	74	8	
Void Space Factor	1.25	1 25	
Total Disposed Volume (yd3)	3 4	0.4	3 8
Disposal Unit Costs ($/yd3) (Unpackaged Bulk)	$220.99	$220.99	
Subtotal Pond Piping Disposal Costs	*$751 37*	*$88.40*	*$839.77*
C. Pond Sludge Disposal			
Total Volume Pond Sludge (Yd3)	2,718		2,718
Disposal Unit Costs ($/yd3) (Soil rate)	$263.17		
Subtotal Pond Sludge Disposal Costs	*$715,296.06*	*$0.00*	*$715,296.06*
Total Byproduct Material Disposal Costs	**$801,349.57**	**$3,182.26**	**$804,531.83**
IV Pond Site Reclamation			
A. Pond Earthwork Requirements			
Earthwork Requirements Yd3)	180,000	60,000	
D8N Bulldozer Earthwork Rate (Yd3/hr)	700	700	
Total D8N Hours	257	86	
D8N Hourly Rate	$512.12	$512.12	
Subtotal Pond Earthwork	*$131,614.84*	*$44,042.32*	*$175,657.16*
B Revegetation			
Area requiring Revegetation (Ac)	20	10	
Revegetation Unit Cost ($/Ac)	$300 00	$300 00	
Subtotal Plant Site Revegetation	*$6,000.00*	*$3,000.00*	
Total Pond Site Reclamation Costs	**$137,614.84**	**$47,042.32**	$184,657.16
V. Supervisory Labor Costs During Pond Reclamation			
Estimated Duration (months)	4		
Engineer Rate ($/month)	$8,868.33		
Total Engineer Labor	$35,473 32		
Radiation Technician Rate ($/month)	$6,505 75		
Total Radiation Technician Labor	$26,023 00		
Total Supervisory Labor Costs	**$61,496.32**	**$0.00**	$61,496.32
TOTAL EVAPORATION POND RECLAMATION PER POND	$1,301,896.41	$56,200.38	$1,358,096.79

TOTAL EVAPORATION POND RECLAMATION COSTS	**$1,358,096.79**

Miscellaneous Site Reclamation

I. Access Road Reclamation	
Assumptions	
Road Reclamation production rate (Yd3/hr)	200
Length of Main Access Roads (ft)	18,300
Average Main Access Road width (ft)	25
Depth of Main Access Road Gravel Surface (ft)	1
Surface Area of Main Access Road (Ac)	10.5
Length of Wellfield Access Roads (ft)	58,500
Average Wellfield Access Road width (ft)	12
Depth of Wellfield Access Road Gravel Surface (ft)	0.5
Surface Area of Wellfield Road (Ac)	16.1
A. Main Access Road Dirtwork	
Main Access Road Gravel Volume (Yd3)	16,944
Total reclamation time (hrs)	85
D8N Unit Operating Cost ($/hr)	$512.12
Subtotal Main Access Road Gravel Roadbase Removal Costs	*$43,530.20*
B. Wellfield Road Dirtwork	
Wellfield Road Gravel Volume (Yd3)	13,000
Total reclamation time (hrs)	65
D8N Unit Operating Cost ($/hr)	$512.12
Subtotal Wellfield Road Gravel Roadbase Removal Costs	*$33,287.80*
E Discing/Seeding	
Assumptions	
Surface Area (acres)	26.6
Discing/Seeding Unit Cost ($/acre)	$300.00
Subtotal Discing/Seeding Costs	*$7,980.00*
Total Access Road Reclamation Costs	**$84,798.00**
II. Wastewater Pipeline Reclamation	
Assumptions	
Pipeline Removal Rate (ft./man-day)	67
Pipeline Shredding Rate (ft /man-day)	1,500
Number of Pond Pipelines	4
Length of Pond Pipelines (ft)	3,500
Number of RO Building Pipelines	4
Length of RO Building Pipelines (ft)	300
Average Pipe Size (Sch 40)	4
A. Pipeline Removal Costs	
Length of Pipelines (ft)	15,200
Removal Rate (ft/man-day)	67
Removal Labor Rate ($/man-day)	$171.52
Cat 924G Loader Use (days)	227
Cat 924G Loader Cost	$386,862 48
Subtotal Pipeline Removal Costs	*$425,797.52*
B. Pipeline Shredding Costs	
Length of Pipelines (ft)	15,200
Shredding Rate (ft/man-day)	1,500
Shredding Labor Rate ($/man-day)	$171.52
Shredder Use (days)	10
Shredder Cost	$1,009 60
Subtotal Pipeline Shredding Costs	*$2,724.80*
C. Pipeline Transportation and Disposal (NRC-Licensed Facility)	
Pipe Diameter (inches)	4
Chipped Volume Reduction (ft^3/ft)	0.0103
Subtotal Volume of Shredded PVC Pipe (yd^3)	5.8
Disposal Void Factor	1.25
Final Disposal Volume (yd3)	7.25
Transportation and Disposal Unit Cost ($/$yd^3$) (Unpackaged Bulk)	$220.99
Subtotal Pipeline Disposal Costs	*$1,602.18*
Total Wastewater Pipeline Reclamation Costs	**$430,124.50**
III. Electrical Distribution System Removal	
Assumptions	
Length of High Voltage Lines	49,640
High Voltage Line Removal Rate ($/ft.)	$2.17
High Voltage Line Removal Cost ($/ft)	$107,718 80
Substation Removal	$2,000 00
Subtotal Electrical Distribution System Removal Costs	**$109,718.80**
IV. Supervisory Labor Costs During Miscellaneous Reclamation	
Estimated Duration (months)	3
Engineer Rate ($/month)	$8,868.33
Total Engineer Labor	$26,604 99
Radiation Technician Rate ($/month)	$6,505 75
Total Radiation Technician Labor	$19,517 25
Total Supervisory Labor Costs	**$46,122.24**
TOTAL MISCELLANEOUS RECLAMATION COSTS	**$670,763.54**

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Deep Disposal Well Reclamation

I.	**Cost Basis**	Well # 1	Well # 2
	A. Plugging and Abandonment		
	Cost Estimate from subcontractor (January 2014)	$104,900	$104,900
	June 2014 CPI	238.3	238.3
	July 2019 CPI	256.6	256.6
	Subtotal Escalated June 2014 Plugging and Abandonment Costs	*$112,942.92*	*$112,942.92*
	B. Site Reclamation		
	Cost Estimate from subcontractor (January 2014)	$7,821	$7,821
	June 2014 CPI	238.3	238.3
	July 2019 CPI	256.6	256.6
	Subtotal Escalated June 2014 Reclamation Costs	*$8,420.65*	*$8,420.65*
	Subtotal Abandonment cost per well	**$121,363.57**	**$121,363.57**

TOTAL DEEP DISPOSAL WELL RECLAMATION COSTS	**$242,727.14**

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I-196 Brule Aquifer Restoration

I. Ground Water Sweep Costs	
Assumptions	
PV's Required from I-196a, I-196j and I-196n	3
Total Gallons per Pore Volume	337,758
Total Gallons to Treat	1,013,274
Flow Rate (gpm)	3
Pump Power Requirements (kwh)	3
Power Cost ($/kw)	$0.1180
Pumping Labor (man-day per day) (1hr/day)	0.125
Sampling Labor (man-day per day) (.5hr/day)	0.0625
Labor Rate ($/man-day)	$171.52
Days to complete	235
A. Electrical Costs	
Cost to pump 3 Pore Volumes	*$1,992.77*
B. Labor Costs	
Labor for pumping 3 Pore Volumes	*$5,038.40*
Total Ground Water Sweep Costs	**$7,031.17**
II. Monitoring and Sampling Costs	
A. Labor Costs for Monitoring I-196a, I-196j, and I-196n	$2,519.20
B. Monitoring for I-196i, I-196m, and I-196l	$2,519.20
Total Monitoring and Sampling Costs	**$5,038.40**
III Additional Ground Water Sweep	
Pump from additional wells and monitor as above	$12,069.57
Drill 4 additional wells, 50 ft deep at $26/ft.	$5,200.00
Total Additional Ground Water Sweep	**$17,269.57**
IV Well Abandonment	
Abandon 14 wells at $194/well	$2,716.00
Total Well Abandonment	**$2,716.00**
TOTAL I-196 BRULE AQUIFER RESTORATION COSTS	**$32,055.14**

GROUNDWATER RESTORATION
GROUNDWATER IX TREATMENT (GIX) Unit Costs

Assumptions:

1. All pumps are 5 hp pumping at 32 gpm
2. Cost of electricity = $0.1180 Kw hr
3. Horsepower to kilowatt conversion = 0.746 Kw/HP
4. Operator labor costs = $171.52 man-day
5. Labor costs are based on 36 pumps at 1,150 gpm

Wellfield Pumping Electrical Costs per 1000 Gallons (Includes bleed to the Deepwell / Evaporation Pond)

$$\frac{1000\ \text{gal}}{} \times \frac{5\ \text{hp}}{32\ \text{gpm}} \times \frac{1\ \text{hr}}{60\ \text{min}} \times \frac{0.746\ \text{kwh}}{\text{hp}} \times \frac{\$\ 0.1180}{\text{kwh}} = \$\ 0.229$$

Wellfield Pumping Labor Costs per 1000 Gallons

$$\frac{1000\ \text{gal}}{} \times \frac{1\ \text{min}}{1150\ \text{gal}} \times \frac{1\ \text{man-day}}{1440\ \text{min}} \times \frac{\$171.52}{\text{man-day}} \times \frac{2\ \text{operators}}{} = \$\ \$0.207$$

Groundwater IX Production Rate

$$\frac{1150\ \text{gal}}{\text{min}} \times \frac{60\ \text{min}}{\text{hr}} \times \frac{24\ \text{hr}}{\text{day}} \times \frac{365\ \text{day}}{\text{year}} \times \frac{1\ \text{year}}{12\ \text{month}} = \frac{50{,}370{,}000\ \text{gallons}}{\text{month}}$$

TOTAL GIX COSTS PER 1000 GALLONS	= $ 0.44

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Groundwater Reverse Osmosis (RO) Treatment Unit Costs

Assumptions:

1. All pumps are 5 hp pumping at 32 gpm
2. Membrane Replacement — $0.041 per 1000 gal
3. Cost of electricity = — $0.1180 Kw hr
4. Horsepower to kilowatt conversion = — 0.746 Kw/HP
5. Operator labor costs = — $171.52 man-day
6. RO System horsepower requirements for 600 gpm rated flow based upon:

RO Unit Pump	300 hp
Permeate/Injection pump	50 hp
Waste pump (1 (Bleed - Deepwell / Evap Ponds)	25 hp
TOTAL:	375 hp

7. Chemical costs:
   - Reductant = — $0.540 lb
   - Antiscalant = — $43.27 gal

Membrane Replacement Costs per 1000 Gallons

1100 gal X $660 membrane cost / month / 17,520,000 gallons month = $ 0.041 per Kgal

Wellfield Pumping Electrical Costs per 1000 Gallons

1100 gal X 5 hp / 32 gpm X 1 hr / 60 min X 0.746 kwh / hp X $ 0.1180 / kwh = $ 0.252 per Kgal

Reverse Osmosis Electrical Costs per 1000 Gallons

1100 gal X 375 hp / 1100 gpm X 1 hr / 60 min X 0.746 kwh / hp X $ 0.1180 / kwh = $ 0.550 per Kgal

Reverse Osmosis Labor Costs per 1000 Gallons

1100 gal X 1 min / 1100 gal X 1 man-day / 1440 min X $171.52 / man-day X 2 operators = $ $0.238 per Kgal

Treatment chemical costs per 1000 Gallons

Antiscalant:

1100 gal X 0.000003000 gal antiscalant / 1 gal X $43.27 / gal antiscalant = $ $0.143 per Kgal

Reductant:

1100 gal X 0.000200 lbs reductant / 1 gal X $0.540 / lb reductant = $ $0.119 per Kgal

Reverse Osmosis Production Rate per Mine Unit

400 gal/min X 60 min/hr X 24 hr/day X 365 day/year X 1/12 year/month = *17,520,000 gallons/month*

TOTAL RO COSTS PER 1000 GALLONS	**= $**	**1.34**

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Groundwater Recirculation Unit Costs

Assumptions:

1. All pumps are 5 hp pumping at 32 gpm
2. Cost of electricity = $0.1180 Kw hr
3. Horsepower to kilowatt conversion = 0.746 Kw/HP
4. Operator labor costs = $171.52 man-day

Wellfield Pumping Electrical Costs per 1000 Gallons

1000	gal	X	5 / 32	hp / gpm	X	1 / 60	hr / min	X	0.746 / hp	kwh	X	$ 0.1180 / kwh			= $	0.229	per Kgal

Wellfield Injection Electrical Costs per 1000 Gallons

1000	gal	X	0 / 1150	hp / gpm	X	1 / 60	hr / min	X	0.746 / hp	kwh	X	$ 0.1180 / kwh			= $	0.000	per Kgal

Recirculation Labor Costs per 1000 Gallons

1000	gal	X	1 / 1150	min / gal	X	1 / 1440	man-day / min	X	$171.52 / man-day		X	1	operators		= $	0.104	per Kgal

Recirculation Production Rate

1150	gal / min	X	60	min / hr	X	24	hr / day	X	365	day / year	X	1 / 12	year / month		=	*50,370,000*	*gallons / month*

TOTAL RECIRCULATION COSTS PER 1000 GALLONS	**= $ 0.33**

WELL ABANDONMENT Unit Costs

Assumptions:

1 Use backhoe for 0.25 hr/well to dig, cut off, and cap well.
2 Drill rig used 2.5 hrs to plug well.
3 Labor for installing chips, etc. will require 2 workers at 0.5 hrs per well

Well Abandonment Costs					**Cost per ft (based on 700 ft wells)**
Labor Costs	1 hours	X $ 21.44	per hour	=$ 21.44	$0.0306
Cat 416 Backhoe	0.25 hours	X $ 127.43	per hour	=$ 31.86	$0.0455
Drill rig	2.5 hours	X $ 218.00	per hour	=$ 545.00	$0.7786
Well Cap	1 each	X $ 11.06	each	=$ 11.06	$0.0158
Materials per foot of well (Variable Cost)					
Cement	0.0714 lbs/ft	X $	0.070 per pound		$0.0050
Bentonite Chips	0.007 tubes/ft	X $	10.49 per tube		$0.0734
Plug Gel	0.0086 sacks/ft	X $	10.72 per sack		$0.0922

Total Estimated Cost per Foot:	**$1.04**

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Alternate Concentration Limit (ACL) Unit Cost per Mine Unit

Assumptions:

1 Equipment and labor
2 Analytical Costs
3 Third Party Engineering Consultant
4 Core Holes per Mine Unit

ACL Costs per Core Hole

Equipment and Labor:

Drilling Costs

34 hours	X	$	218.00	per hour	=	$	7,412.00

Analytical Costs:

XRD Bulk

1 samples	X	$	197.07	per sample	=	$	197.07

XRD Bulk + Clay

1 samples	X	$	394.14	per sample	=	$	394.14

Selective Extraction

4 samples	X	$	772.31	per sample	=	$	3,089.24

Elemental Analysis

1 samples	X	$	499.06	per sample	=	$	499.06

Porosity + Particle Size

1 samples	X	$	356.86	per sample	=	$	356.86

Third Party Engineering Consultant Costs:

1 months	X	$	8,868.33	per month	=	$	8,868.00

Unit Cost per Core Hole: = $ 20,816.37

Core Holes per Mine Unit:

2 Holes	X	$	20,816.37	per hole	=	$	41,633.00

TOTAL ACL COST PER MINE UNIT = **$ 41,633.00**

FIVE YEAR MECHANICAL INTEGRITY TESTS (MIT)

Assumptions:

1 Pulling Unit for 8 hr/day
2 MIT Unit for 8 hr/day
3 Labor for operation of pulling unit requires 2 workers (one operator & one laborer)
4 Labor for operation of MIT Unit requires 1 worker

MIT Costs per Well

Equipment and Labor:

Pulling Unit includes one operator					
	8 hours	X	$ 24.17	per hour	=$ 193.36
Laborer					
	8 hours	X	$ 21.44	per hour	=$ 171.52
MIT Unit includes one operator					
	8 hours	X	$ 24.17	per hour	=$ 193.00
				TOTAL MIT COST PER DAY	**=$ 557.88**
Wells Completed		6		per day	

MIT COSTS PER WELL **=$ 92.98**
MIT COSTS PER DEEP DISPOSAL WELL (2019 Cost) **=$ 6793**

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Mine Unit Data

		Mine Unit 1	Mine Unit 2	Mine Unit 3	Mine Unit 4	Mine Unit 5	Mine Unit 6	Mine Unit 7	Mine Unit 8	Mine Unit 9	Mine Unit 10	Mine Unit 11
Total number of production wells		3	52	57	103	210	187	205	269	195	298	201
Total number of injection wells		0	79	96	169	236	309	380	412	324	503	284
Total number of shallow monitor wells		0	3	3	11	25	28	25	30	20	32	24
Total number of perimeter monitor wells		11	10	7	9	25	26	8	20	13	32	19
Total number of restoration wells		10	12	18	43	59	55	25	34	21	36	25
Wellfield Area (ft2)		403,712	509,600	586,188	3,119,671	5,647,809	1,507,647	2,222,190	2,722,992	2,132,355	3,319,003	1,834,174
Wellfield Area (acres)		9 27	11.70	13.46	71 62	129 66	34.61	51 01	62 51	48 95	76 19	42 11
Affected Ore Zone Area (ft2)		403,712	509,600	586,188	3,119,671	5,647,809	1,507,647	2,222,190	2,722,992	2,132,355	3,319,003	1,834,174
Avg Completed Thickness		19 6	16 3	12 5	12 9	14.6	15 4	12 3	16 4	16 4	18.8	21.6
Porosity		0 29	0.29	0 29	0.29	0 29	0 29	0 29	0 29	0.29	0.29	0 29
Affected Volume (ft3)		7,912,755	8,306,480	7,327,350	40,243,756	82,458,011	23,217,764	27,332,937	44,657,069	34,970,622	62,397,256	39,618,158
Flare Factor		1 2	1 2	1 2	1 2	1 2	1.2	1 2	1.2	1 2	1 2	1.2
Kgallons per Pore Volume		20,597	21,622	19,073	104,756	214,642	60,437	71,149	116,244	91,030	162,423	103,128
Number of Patterns in Unit(s)												
	Current	0	52	57	96	187	187	205	269	195	298	201
	Estimated next report	0	0	0	0	0	0	0	20	0	0	0
	Total Estimated	0	52	57	96	187	187	205	289	195	298	201
Number of Wells in Unit(s)												
Production Wells												
	Current	3	52	57	103	210	187	205	269	195	298	201
	Estimated next report	0	0	0	0	0	0	0	0	0	0	0
	Total Estimated	3	52	57	103	210	187	205	269	195	298	201
Injection Wells												
	Current	0	79	96	169	236	309	380	412	324	503	284
	Estimated next report	0	0	0	0	0	0	0	0	0	0	0
	Total Estimated	0	79	96	169	236	309	380	412	324	503	284
Shallow Monitor Wells												
	Current	0	3	3	11	25	28	25	30	20	32	24
	Estimated next report	0	0	0	0	0	0	0	0	0	0	0
	Total Estimated	0	3	3	11	25	28	25	30	20	32	24
Perimeter Monitor Wells												
	Current	11	10	7	7	23	26	8	20	13	32	19
	Estimated next report	0	0	0	2	2	0	0	0	0	0	0
	Total Estimated	11	10	7	9	25	26	8	20	13	32	19
Number of Wells per Wellfield		14	144	163	292	496	550	618	731	552	865	528
Total Number of Wells		4953										
Average Well Depth (ft) - Deep Wells		665	631	774	698	675	515	762	500	770	480	790
Average Well Depth (ft) - Shallow Wells		200	200	200	200	200	200	200	200	200	150	300

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Electrical Costs	2019	2020 Est Rate	
Power cost (adj for current actual cost)	$0 1090	$0 1180	kwHr
Kilowatt to Horsepower	0 746	0 746	Kw/HP
Horsepower per gallon per minute	0.167	0 167	HP/gpm

Labor Rates	2019	2020 Est Rate	
Operator Labor Cost	$164 64	$171 52	day
Pulling Unit Operator	$185 68	$193 36	day
Engineer Cost	$8,358.00	$8,868 33	month
Radiation Technician Costs	$6,571 00	$6,505.75	month

Costs are from Nebraska Department of Labor

Chemical Costs	2019	2020 Est Rate	
Antiscalant for RO (adj for current actual cost)	$37 99	$43 27	gal
Reductant (adj for current actual cost)	$0 63	$0 54	lb
Cement (adj for current actual cost)	$0 15	$0 07	pound
Bentonite Tubes (adj for current actual cost)	$10 75	$10 49	tube
Salt (adj for current actual cost)	$127 46	$116 32	ton
Plug Gel (adj for current actual cost)	$10 75	$10 72	sack
Well Cap (adj for current actual cost)	$10 86	$11 06	each
Hydrochloric Acid (adj for current actual cost)	$1 69	$1 72	gallon

Costs are based off of current invoices No current invoices for well caps or hydrochloric acid, so escalation factor applied

Analytical Costs	2019	2020 Est Rate	
Gundelme 8	$220 00	$220 00	analysis
5 parameter	$60 00	$60.00	analysis
Other (radon, bioassays, etc.)	$600 00	$600 00	month

Costs are based on third party lab fees

Analytical Costs for Coring	2019	2020 Est Rate (CPI)	
XRD Bulk	$193.59	$197 07	analysis
XRD Bulk + Clay	$387 17	$394 14	analysis
Selective Extraction Method (SEM)	$758 65	$772 31	analysis
Elemental	$490 24	$499.06	analysis
Porosity + Particle Size	$350 55	$356 86	analysis

Costs are based on third party lab fees

Spare Parts	2019	2020 Est Rate (CPI)	
Restoration spare parts estimate	$55,596 11	$56,596 84	year

Pumps, motors, filters, etc

CPI Escalators (CPI-U, U.S. City Average)	
1988 CPI (average)	118 5
June 2014 CPI (deep well estimate)	238.3
2018 CPI (July 2018 used in last update)	252 0
Current CPI (July 2019)	256 6
2019 Escalation Factor	1 02

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Equipment Costs

Equipment	Base Rental Rate ($/hr)	Labor Costs ($/hr)	Repair Reserve Costs ($/hr)	Fuel Costs ($/hr)	Mob & Demob ($/hr)	Total ($/hr)
Cat 924H Loader	$44 00	$21 44	$125 00	$22 59	inc	$213 03
Cat 420E Backhoe	$27.00	$21 44	$71 00	$7 99	inc	$127 43
Pipe Chipper	$12 62			inc	inc	$12 62
Cat D8T Bulldozer	$119.00	$21 44	$340 00	$31.68	inc	$512 12
Pulling Unit	$55 67	inc	inc	inc	inc	$55 67
Mixing Unit	$5 00			inc	inc	$5.00
Drill Rig	$218 00	inc	inc	inc	inc	$218 00

Basis
Drill rig based on current 2019 contract.
Equipment rates based on Cost from NMC Cat Rental August 2019
Average 2019 costs for off-road fuel $2 76 gallon

Pipe Volumes

Nominal Pipe Size	Wall Thickness (in.)	Pipe OD (in.)	Volume per foot (ft3/ft)
3/8-inch O2 hose		0 37500	0 03130
2-inch Sch 40 downhole	0.15400	2 37500	0 00740
1-1/4-inch Sch 40 stinger	0.14000	1.66000	0 00440
2-inch SDR 13 5 inj & prod.	0.14815	2 29630	0 00690
4-inch SDR 35	0.11430	4 22860	0 01030
6-inch Sch 40 process pipe	0.28000	6 56000	0.03840
6-inch Trunkline	0.49100	6.56600	0.06510
8-inch Trunkline	0.63900	8 54800	0 11030
10-inch Trunkline	0.79600	10.65400	0 17120
12-inch Trunkline	0.94400	12 63700	0 24080

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Pipe Removal and Shredding Costs

Activity	*Removal Rate (ft/man-day)*	*Shredding Rate (ft/man-day)*	*Labor Rate (day)*	*Activity Cost per foot*
2-inch SDR 13 5 inj & prod Removal	225		$171 52	$0.76
2-inch SDR 13 5 inj & prod Shredding		1920	$171 52	$0 09
Trunkline Removal	100		$171 52	$1 72
Trunkline Shredding		100	$171 52	$1.72
Downhole Pipe Removal	2000		$171 52	$0 09
Downhole Pipe Shredding		2250	$171 52	$0.08
Downhole Hose Removal	1000		$171 52	$0.17
Waste and RO Building Pipeline Removal	67		$171 52	$2 56
Waste and RO Building Pipeline Shredding		1500	$171 52	$0.11

Waste Disposal Costs

Waste Form	*Fee*		*Density Correction Factor (Tons/Yd3)*	*Fee per Cubic Yard*	*Transport Cost*		*Total Transportation and Disposal*	
Soil, Bulk Byproduct Material*	$279.43	per Ton	0 54	$150 89	$112 28	per Yd3	$263.17	per Yd3
Unpackaged Bulk Byproduct Material (e g., pipe, equipment)*	$258 83	per Ton	0 42	$108 71	$112 28	per Yd3	$220 99	per Yd3
Solid Waste (landfill)	$0.12	per Lb			Incl	per Lb	$0 12000	per Lb
Solid Waste (landfill)	$1,000 00	per Load			Incl.	per Load	$1,000 00	per Load
Void Factor (for disposal)	1 25							

*no current invoice, escalation factor applied

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Plant Dismantling

Plant Components:	*Number*	*Units*	*Estimated Disposal Volume*	*Units*	*Activity*	*Units*		*2017 Cost*
Contaminated Tanks	141	each	193	Ft3 each	Dismantle interior steel, tanks, piping electrical, and Plant Building		$	625758 00
Uncontaminated Tanks	21	each	193	Ft3 each				
Pumps	188	each	5	Ft3 each				
Downhole Pumps	1174	each	0 5	Ft3 each	Concrete floor removal rate	Current Cost	$/ft2	17 80
Contaminated Piping	11000	feet						
Uncontaminated Piping	4800	feet	See estimate by piping size and material					
Filters	125	each	100	Ft3 each				
Dryer	2	each	400	Ft3 each				
Average PVC Pipe Diameter (inches)	6							

Plant Decontamination

Direct Dispose Plant Floor Area	11100	ft2	Decon Solution (HCl) Floor Application Rate	2	gal/ft2
Uncontaminated Plant Floor Area	7270	ft2			
Decontaminated Plant Floor Area*	39738	ft2			
Average concrete thickness	0.5	ft			
Plant Wall Area	36470	ft2	Decon Solution (HCl) Wall Application Rate	1	gal/ft2