



November 30, 2016

Attention: Document Control Desk  
Office of Nuclear Material Safety and Safeguards  
U.S. Nuclear Regulatory Commission  
Washington, DC 20555-0001

Re: Strata Energy, Inc., Ross In-Situ Recovery Project  
Source Materials License SUA-1601, Docket No. 040-09091  
Annual Revised Surety Estimate and Restoration Action Plan

To Whom it May Concern:

As required by License Condition 9.5 Strata Energy Inc. (Strata) is submitting the proposed annual update to the financial assurance amount for the Ross ISR Project. Enclosed are the Revised Restoration Action Plan (Attachment 1) and Revised Surety Estimate (Attachment 2). This estimate covers the projected costs for decommissioning and reclamation of facilities planned for construction and operation through November 16, 2017. In summary, the surety estimate includes the estimated costs for a third party to decommission and complete final reclamation of four (4) wellfield headerhouses at Mine Unit 1 (MU-1), six (6) wellfield headerhouses at Mine Unit 2 (MU2), the Central Processing Plant (CPP), lined storage pond 1 and all other related facilities anticipated to be constructed through the November 16, 2017. Specific changes from the 2016 estimate include the following:

GW REST worksheet:

- Revised completed thickness for MU1 and MU2 from 15 ft. to 17.4 and 17.7 ft., respectively.
- Revised number of wells in MU-1 and MU-2 from total of 1,022 to 971.
- Updated number of wells sampled in MU-1 and MU-2 for monitoring and sampling costs.
- Revised number of wells for Mechanical Integrity Test (MIT) costs from 273 to 971.
- Increased labor component for all workers, building costs and equipment by two years to allow time for additional groundwater restoration.

BLDGS worksheet

- Revised concrete floor demolition unit cost per WDEQ Guideline No. 12 from \$5.55/ft<sup>2</sup> to \$0.76/ft<sup>2</sup>.
- Revised concrete footing demolition unit cost per WDEQ Guideline No. 12 from \$20.46/lin. ft. to \$15.67/lin. ft.
- Revised concrete floor disposal from On-Site to Moorcroft Land Fill.
- Revised concrete footing disposal for CPP and CPP Truck Bay to Moorcroft Landfill and revised disposal cost per WDEQ Guideline No. 12 of concrete from \$8.64/cy to \$8.63/cy.

NMSSD1

WF BLDGS PIPE worksheet

- Revised number of headerhouses for MU-2 from 3 to 6.
- Revised number of production and injection wells for pump and tubing transportation disposal in MU-1 and MU-2.
- Revised total quantity of well head covers for MU-1 and MU-2 from 315 and 255 to 296 and 533, respectively.
- Revised demolition cost of well head covers and headerhouses per WDEQ Guideline No. 12 from \$0.287/ft<sup>3</sup> to \$0.270/ft<sup>3</sup>.
- Revised total trench length of buried trunk line from 11,800 ft. to 19,104 ft.

WELL ABAN worksheet

- Revised total wells in MU-1 from 387 to 346.
- Revised total wells in MU-2 from 635 to 625.
- Increased waste disposal well abandonment cost by three percent from \$118,450 to \$122,004.

WF REC worksheet

- Revised pattern area acres in MU-1 from 34.40 to 33.06 and MU-2 from 30.19 to 48.00.
- Revised wellfield road reclamation unit cost from \$1,203/1000 ft. to \$910/1000 ft.

MISC REC worksheet

- Revised scarification of gravel unit cost for CPP/office reclamation to conform with WDEQ/LQD Guideline No. 12A
- Updated topsoil removal/replacement unit cost for CPP/office reclamation per WDEQ Guideline No. 12A from \$0.99/cy to \$1.00/cy.
- Revised gravel road base unit cost per WDEQ Guideline No. 12A from \$0.82/cy to \$0.72/cy for access road reclamation.
- Revised movement of road fill material unit cost per WDEQ Guideline No. 12A from \$0.90/cy to \$0.79/cy for access road reclamation.
- Revised scarification of road surface area unit cost per WDEQ Guideline No. 12A from \$239.17/acre to \$57.80/acre for access road reclamation.
- Revised main wastewater pipeline removal unit cost from \$3.33/ft. of trench to \$3.47/ft. of trench.
- Updated backfill unit cost for pond backfill per WDEQ Guideline No. 12A from \$0.16/cy and \$0.82/cy to \$0.19/cy and \$0.72/cy for Wastewater (WW) Storage Pond 1 and Sediment Pond, respectively.
- Revised removal cost for diversion berm from \$0.99/cy to \$1.00/cy per WDEQ Guideline No. 12A.
- Updated culvert removal estimate to include total number of feet of removal and disposal.
- Updated total feet of fence removal to include 7,000 ft. of 4-strand barbwire fence for MU-2 and revised length of MU-1 from 6,000 ft. to 6,340 ft.
- Revised fencing unit cost per WDEQ Guideline No. 12 from \$0.32/ft. to \$0.38/ft.
- Revised number of delineation holes outside MU-1 and MU-2 from 40 to 200 for surface reclamation estimate.

The attached revised estimate puts the costs of groundwater restoration, decommissioning and reclamation at \$12,159,890 over a five year period during which the site would be decommissioned and reclaimed to meet the standards of the WDEQ-LQD and the NRC. The estimate format implements the recommended format provided by the WDEQ-LQD.

Strata hereby respectfully requests that NRC approve the Revised Surety Estimate and amend License SUA-1601.

If you have any questions regarding the provided information, please contact me at 307-467-5995 or by email at [mgriffin@stratawyo.com](mailto:mgriffin@stratawyo.com).

Sincerely,  
STRATA ENERGY INC.

A handwritten signature in black ink, appearing to read 'Mike Griffin', with a stylized, cursive script.

Mike Griffin  
Vice President of Permitting, Regulatory and Environmental Compliance

Enclosures: Attachment 1 – Revised Restoration Action Plan  
Attachment 2 – Revised Surety Estimate

Cc: John Saxton, NRC Project Manager (via email)

**Attachment 1**  
**Revised Restoration Action Plan**

## **I. REVISED RESTORATION ACTION PLAN**

### **A. Purpose Statement**

#### **1. Introduction**

*The following summarizes the Restoration Action Plan (RAP) for the second and third years of development and operation of the Ross ISR Project (calendar year 2016 and 2017). The accompanying surety estimate is based on this RAP and it covers the potential decommissioning and reclamation of facilities planned for construction and operation during the period. In summary, the surety estimate includes the estimated costs by a third party to conduct groundwater restoration, decommission and complete final reclamation of four (4) wellfield headerhouses at Mine Unit 1 (MU-1) and six (6) wellfield headerhouses at Mine Unit 2 (MU-2). The estimate also includes estimated costs to decommission and complete final reclamation at MU-1 and MU-2, planned wellfield development activities in MU-3 and MU-4, the Central Processing Plant (CPP), water storage ponds, roads and pipelines and all other related facilities. The estimate puts the costs of groundwater restoration, decommissioning and reclamation at \$12,159,890 over a five-year period during which the site would be decommissioned and reclaimed to a condition agreed upon by the Wyoming Department of Environmental Quality (WDEQ) Land Quality Division (LQD) and the US Nuclear Regulatory Commission (NRC) that would return the site to unrestricted use. The RAP encompasses the full cycle of activities necessary for:*

*Aquifer restoration and well plugging;*

*Building and equipment decontamination, dismantling and disposal;*

*Pond and wellfield removal and reclamation of the entire site;*

*Radiological surveying and environmental monitoring;*

*Administrative, Overhead; and*

*Contingency of 25%.*

*Strata's surety estimate presented herein employs assumptions that are based on best professional judgment given the data currently available and WDEQ-LQD guidance contained in Guideline (GL) 12A (February 2-16) and, where GL 12A does not provide specific guidance, GL 12 (May 2016). This estimate is presented in the Excel format specified by the WDEQ/LQD.*

*The surety estimate is considered conservative because it does not consider the potential reduction in cost through recovery of salvage value. Significant salvage value would exist for the CPP and Administration buildings (e.g., steel), motors and electrical switch gear, gravel road base, etc.*

### **B. Consolidation of State and NRC Surety Instruments**

*In addition to being crafted to comply with NRC criteria in 10 CFR Part 40, Appendix A, Criterion 9 (Financial Criteria), Strata's proposed surety estimate is designed to address the Wyoming Environmental*

Quality Act requirements for a reclamation performance bond. The surety estimate is provided in the format specified by the WDEQ-LQD and accepted by NRC staff.

### C. Cost Details for Groundwater Restoration, Reclamation, and Decommissioning Activities

#### 1. Introduction

The following tabulation summarizes the costs necessary to hire an independent contractor to assume all groundwater restoration, decommissioning and reclamation activities required for the CPP, the first ten (10) wellfield headerhouses, and associated facilities. Descriptions of the work are provided below, and detailed costs estimates for each major item of work are provided in Attachment 2, Revised Surety Estimate.

#### Total Restoration and Reclamation Cost Estimate

I.	Groundwater Restoration Cost	\$6,809,308
II.	Equipment Removal & Disposal Cost	\$96,880
III.	Building Demolition	\$560,781
IV	Wellfield Buildings, Pipe & Equipment Removal & Disposal Cost	\$365,337
V	Well Abandonment Cost	\$1,579,954
VI	Wellfield Surface Reclamation Cost	\$39,110
VII	Total Miscellaneous Reclamation Cost	\$276,543
	Subtotal Reclamation and Restoration Cost Estimate	\$9,727,912
	Administrative, Overhead, and Contingency Items (25%)	\$2,431,978
	<b>TOTAL</b>	<b>\$12,159,890</b>

#### 2. Aquifer Restoration

The Groundwater Restoration worksheet (GW REST) and supporting unit cost worksheets (UC-GWS, UC-RO, UC-RECIRC, and UC-DDW) contain details concerning cost basis figures and assumptions, calculations and methodologies used in deriving cost estimates for the full cycle of groundwater restoration. It is estimated that active restoration will be completed in 48 months and that an additional 12 months will be necessary for final site decommissioning and reclamation following the stabilization monitoring period and regulatory approval of groundwater restoration. This estimate is designed to be descriptive enough for the NRC and WDEQ staff to determine the acceptability of Strata's proposed cost figures and is based on the estimated costs for an independent contractor to perform the decommissioning and reclamation work in accordance with 10 CFR Part 40, Appendix A, Criterion 9 and the Wyoming Environmental Quality Act and its accompanying rules and regulations and guidelines. Strata has developed its cost estimates to address all items in Appendix C of the NRC's "Standard Review Plan for In-Situ Leach Uranium Extraction License Applications" (NUREG-1569, dated June 2003).

*Among other items, the groundwater restoration costs are broken down into separate phases of work:*

*Groundwater sweep;*

*Reverse osmosis (RO) with permeate injection;*

*Groundwater recirculation; Monitoring; and*

*Vehicles and Labor.*

*For each phase of work, the estimated number of pore volume displacements (PVDs) required to complete that phase is provided (0.5 PVD for Groundwater Sweep, 7 PVD for Reverse Osmosis and 1 PVD for Recirculation). The worksheets also provide the assumptions and unit prices for all the work necessary to complete each phase of work for the first ten wellfield headerhouses.*

*Restoration progress is typically measured on the basis of the number of pore volumes (PVs) processed during each phase of groundwater restoration. A pore volume is a term used by the ISR industry to define an indirect measurement of a unit volume of aquifer affected by ISR recovery or restoration (NUREG-1910, NRC 2009). Following industry standards, Strata calculates a PV as follows:*

$$PV = \text{thickness} \times \text{wellfield area} \times \text{porosity} \times \text{flare} \times \text{conversion factor}$$

*Where:*

*The thickness is the average completion thickness for the recovery and injection wells. Based on actual well completions in MU-1 and MU-2, the ore zone thickness averages approximately 17.5 feet (revised from original of 15 feet) across the area of MU-1 and MU-2.*

*The wellfield area is the surficial area of the injection and recovery well patterns for each wellfield headerhouse.*

*The porosity (or pore space) is defined as the collective open spaces of the formation or a measure of the amount of liquid or gas that may be absorbed or produced by a particular formation (NUREG-1910). The porosity of the ore zone within the Ross Project area was determined by laboratory analysis of core samples collected during exploration drilling. The porosity is estimated to average 34% across the Ross Project area.*

*The flare is a proportionality factor that estimates the amount of aquifer water outside of the pore volume that has been affected by lixiviant flow during the recovery phase (NUREG-1910). Flare estimates usually include a horizontal and vertical flare factor. The horizontal flare is the volume of water affected by lixiviant outside the edge of the wellfield pattern. The vertical flare is the volume of water affected by lixiviant above and below the completion interval. Based on groundwater modeling of expected operational conditions completed by WWC Engineering to support the permit and license applications for the Ross Project it was determined that the horizontal flare would be approximately 32% and the vertical flare would be approximately 20%. Therefore, the overall flare, which is dependent on the geometry of the affected area, is approximately 58%. This is consistent with other ISR operating facilities.*

*An estimate of the PV of the four (4) Headerhouses in MU-1 is calculated as follows:*

$$PV = 17.4 \text{ ft.} \times 1,440,019 \text{ ft}^2 \times 0.34 \times 1.58 \times 7.48 \text{ gal/ft}^3 = 100.68 \text{ million gallons}$$

*An estimate of the PV of the six (6) Headerhouses in MU-2 is calculated as follows:*

$$PV = 17.7 \text{ ft.} \times 2,091,000 \text{ ft}^2 \times 0.34 \times 1.58 \times 7.48 \text{ gal/ft}^3 = 148.72 \text{ million gallons}$$

*The aquifer restoration phase was based on the processing and circulation of 8.5 pore volumes of groundwater. Because the cost for restoration equipment such as wellfield pumps, lined retention ponds, the deep disposal well (DDW), one RO unit, restoration IX columns, laboratory equipment, trucks, and field equipment will have been incurred for uranium production operations, they are considered operational capital and are not included as capital requirements in any of the RAP budget items. It should be noted that the estimated cost of purchasing and installing an additional high efficiency RO unit (\$750,000) is included in the groundwater restoration cost estimate (worksheet GW REST, item VI). This additional RO would be used to augment the RO included with the construction and initial operation of the CPP. As with other operating ISR operations, the NRC and the WDEQ will be able to verify the availability of the restoration equipment during routine inspections.*

*The surety will be maintained at this calculated level until the number of pore volumes required to satisfactorily complete each phase has been demonstrated. Strata will adjust the surety estimate for aquifer restoration during each annual update review to reflect experience gained from actual work completed and the associated costs.*

### **3. Description of Work**

*The first stage of aquifer restoration is groundwater sweep, in which groundwater is pumped from the wellfield headerhouse with no reinjection. This causes water from the formation surrounding the wellfield headerhouse to sweep through the wellfield toward the recovery wells and remove the high total dissolved solids (TDS) production fluids. Based on the anticipated aquifer restoration schedule, during most aquifer restoration operations, when some wellfield headerhouses are undergoing groundwater sweep while others are in RO treatment with permeate injection, the water removed from the groundwater sweep is taken to the RO units (see below) and the purified water (RO permeate) is reinjected into the wellfield headerhouse(s) undergoing RO treatment with permeate injection. The brine from the RO units can be taken to the lined retention ponds and/or to a deep disposal well.*

*For the first wellfield headerhouse undergoing groundwater sweep, it is assumed there are no wells concurrently in RO treatment with permeate injection. Thus, the groundwater from the groundwater sweep will be taken to the RO units, the high-quality permeate will be discharged or used for other purposes and the brine will be disposed via the deep disposal well. It is estimated that the groundwater sweep will remove about 0.5 PV from the wellfield at a rate of 200 gpm (20 gpm at 10 wells) per headerhouse. The duration of the groundwater sweep is estimated to take about two months per headerhouse. Groundwater sweep at one headerhouse may be done concurrently with RO at another headerhouse.*

*RO is a water treatment process whereby the majority of dissolved ions, which are too large to pass through a filter that passes pure water molecules, are concentrated into brine. The product water that*



*passes through the filter (permeate) typically meets drinking water standards and during most restoration activities is reinjected back into the wellfield. This reinjection of relatively pure water (permeate) mixes with formation water and helps bring the quality of the underground solutions toward baseline quality. During restoration the RO brine can be pumped to a lined retention pond to level out flow rates or pumped to the disposal well.*

*Groundwater recovered from a depleted portion of the ore zone will be treated with an antiscalant and/or corrosion inhibitor to prevent fouling; these are the only pretreatment chemicals budgeted.*

*The water will also pass through a restoration IX system for removal of uranium and a pre-filtration system for particulate removal. To achieve RO purification, the pretreated solution is pressurized and directed to the first step of a two-stage RO process. Approximately 70 percent of the total feed volume will be converted to product water (permeate) in the first stage. The brine water of the first stage will then act as the feed for the second stage, which yields an overall permeate recovery rate of approximately 90 percent. It is estimated that the RO Phase for all 10 headerhouses will take 60 months.*

*The third phase of aquifer restoration is groundwater recirculation, which begins after completion of the RO treatment with permeate injection phase. In this phase, water from the production zone will be pumped from recovery wells and recirculated into injection wells in the same headerhouse. This recirculation will homogenize the groundwater and help reduce the risk of "hot spots," or areas of unusually high concentrations of dissolved constituents. The only treatment that will potentially occur during recirculation will be the filtration of particulates and/or uranium removal. It is expected that one PV will be circulated from, or within, the wellfield during this phase, at a rate of 500 to 800 gpm per headerhouse. This recirculation can be completed concurrently during the overall RO phase once RO is completed at a particular headerhouse.*

*The total duration of active aquifer restoration (groundwater sweep, RO treatment with permeate injection, and groundwater recirculation) is estimated to be 64 months for the first 10 wellfield headerhouses.*

*The final step in aquifer restoration will be the stability monitoring phase, which will be used to ensure that chemical species of concern do not increase in concentration to unacceptable levels subsequent to restoration. The stability monitoring phase is described in Section 1.2.1.5 of the WDEQ Reclamation Plan (Section 6.1.2.5 of the NRC Technical Report) and includes well sampling, data analysis and reporting.*

#### **4. Labor Staffing Plan for Groundwater Restoration**

*The majority of labor costs for decommissioning the Ross Project would be associated with the 64-month period that active groundwater restoration occurs. This would include the operation of the wellfield production and injection wells and the CPP and ancillary facilities to complete the groundwater restoration commitments in accordance with the WDEQ permit and NRC license.*

*The stability period requires one year of sample collection and an indeterminate period for regulatory approval of groundwater restoration. During this period the manpower requirements lessen significantly as activities at the site are limited to groundwater monitoring and maintenance of the CPP.*

*Once the stability period is completed the actual facility decommissioning, demolition and disposal occurs. The associated labor costs are included in the surety estimate details for the particular activity.*

*The labor estimate also included 7 years of Environmental Manager/RSO and Environmental/Radiation Safety Technician for this period.*

*Given the above, Strata has included the labor costs associated with groundwater restoration in section IX of the groundwater restoration worksheet (GW REST):*

<b><u>Position</u></b>	<b><u>Years</u></b>
Environmental Manager/RSO	7
Restoration Manager	6
Environmental/Radiation Safety Technician	7
Operators/Laborers (4)	6
Maintenance Technician	6.5

#### **5. Facilities Area Decommissioning and Reclamation**

*Following wellfield restoration and stability monitoring, when the water treatment equipment is no longer needed, reclamation can begin on the surface facilities. Detailed cost estimates for the facilities area decommissioning and reclamation are provided in the following worksheets and supporting unit costs worksheets:*

*CPP Equipment - EQUIP  
Main Facility Buildings- BLDGS  
Wellfield Buildings and Pipelines- WF BLDGS PIPE  
Well Abandonment- WELL ABAN  
Wellfield Reclamation- WF REC  
Miscellaneous Reclamation Items- MISC REC*

#### **6. Equipment and Buildings**

*Unlike the original RAP and surety estimate that included the decommissioning, demolition and disposal of a full scale CPP including yellowcake precipitation and drying equipment, the revised Operations Plan results in the CPP that will only be used as a "Satellite" IX facility. Therefore, uranium elution, precipitation and drying equipment will not be installed. This results in considerably less equipment that will require decontamination and disposal as 11e.(2) waste or solid waste. Additionally, the lack of yellowcake processing will make it easier to decontaminate limited portions of the CPP walls and floor.*

*Buildings to be removed include the CPP, Administration building, the deep disposal well building, the Potable Water building and the wellfield headerhouse buildings. The latest surety estimate includes the actual sizes of the buildings that were constructed in 2015. Decontamination of salvageable building materials, equipment, pipe, and other materials to be released for unrestricted use will be accomplished by completing a preliminary radiological survey to determine the location and extent of the contamination and to identify any hazards.*

*Processing and water treatment equipment, including tanks, filters, IX columns, pipes, and pumps, will be decontaminated as necessary and disposed of in accordance with applicable regulations.*

*Decontaminated and non-contaminated equipment and materials will be disposed at the Moorcroft Landfill. A salvage percentage of 60 percent for clean building material (steel) is assumed. This salvage is*

*assumed at no value with the remaining 40 percent disposed at the Moorcroft Landfill. Contaminated equipment and materials will be disposed at a licensed 11e.(2) byproduct disposal facility.*

*The disposal of concrete on site as "clean fill" is desired by both the State of Wyoming (WDEQ), Crook County, and local municipalities due to the limited space for such material in municipal landfills. This is appropriate due to the benign character of concrete and safety concerns with transporting this material via large trucks on rural and single lane roadways. Additionally, Strata owns the land at the CPP site and adequate areas exist to bury the materials on-site. Also, it is likely that due to the relatively large quantity of concrete, it would be recycled rather than buried. However, in a recent Request for Additional Information for the Kendrick Expansion Area, NRC identified additional dose modelling that would be necessary to support disposal on site. Disposal on site may be appropriate but must be approved by NRC after preparation and submittal of modelling that predicts the dose to the public from residual radioactive materials. Strata determined that it is not appropriate to perform such modelling at this time and therefore it is assumed the clean concrete will be sent to the Moorcroft landfill. To satisfy this NRC concern, the surety estimate was revised (increased) in 2016/2017 to include the estimated cost to dispose of uncontaminated concrete at the Moorcroft Landfill instead of on site.*

#### **7. Ponds**

*Work required to reclaim Pond 1 will include brine disposal in the deep disposal well, removal of the liner and brine residue to a licensed 11e.(2) disposal site, disposal of all non-11e.(2) solid waste to an approved landfill or on-site solid waste facility, backfilling and regrading to restore an acceptable topography, topsoil replacement and revegetation. These reclamation costs are based on the actual as-built details of Pond 1 and are provided in the worksheet MISC REC.*

#### **8. Earthwork**

*After the buildings and ponds are demolished and removed, the entire site will be regraded to restore the original topography, topsoil will be replaced to approximate its original depth, and the area will be seeded with the approved seed mix. Earthwork costs to complete the regrading of the CPP, parking areas, and access roads are provided in the worksheet MISC REC.*

#### **9. Containment Barrier Wall**

*The containment barrier wall (CBW) at the CPP will be reclaimed to the extent necessary to restore the flow pattern of shallow groundwater. Reclamation of this wall will be accomplished by creating a series of breaches, also known as finger drains, along the CBW. Each finger drain will consist of a 1.5 ft. wide by 25 ft. long trench that is cut through the CBW at a right angle and to a depth that is 2 ft. below the lowest historical groundwater level. Gravel will be placed in the trench from the bottom to a point 2 ft. above the highest recorded groundwater level such that a highly permeable flow path is created through the CBW. The remaining trench will be backfilled with topsoil and seeded.*

*This method of CBW reclamation was selected as a means of effectively restoring the groundwater flow system in the CPP area, while minimizing surface and environmental disturbance. The cost estimate for this phase of work is included in the worksheet MISC REC.*

## 10. Wellfield Equipment Removal and Disposal

*Decommissioning and reclamation of the wellfields will include removal of any staging or laydown areas, the headerhouse buildings and all pipes and utilities connecting the wells to the headerhouse buildings and the CPP, shredding or chipping the solid materials to reduce the volume, and disposing of these materials in a permitted landfill or licensed 11e.(2) waste site as appropriate, and reclaiming the surface as described for the other surface facilities. All pumps and tubing will be removed from production, injection and monitoring wells to permit well plugging.*

*The estimated costs for each item of work in this task are included in the worksheet WF BLDGS PIPE.*

## 11. Well Abandonment

*All injection, recovery and monitor wells will be abandoned (plugged) with high solids bentonite in accordance with WDEQ LQD Rules and Regulations Chapter 8. After the well casing is cut off below grade a cement hole plug will be installed prior to backfill above the plug with soil. This work includes abandonment and reclamation of monitor wells and production and injection wells currently used, or planned for use during the next report period, for uranium recovery at MU-1 and MU-2. It also includes an estimated 200 delineation holes in MU-3 and MU-4. It also includes 59 existing five-inch baseline monitor wells. The costs for plugging and abandoning one deep disposal well are included. The estimated costs to abandon and reclaim all wells are included in worksheet WELL ABAN.*

## 12. Reclamation of Wellfields, Roads, CPP Area

*Once all wells are plugged at the wellfield and pipelines, headerhouse buildings and utilities have been removed, a radiological survey (Section K) will be completed prior to any topsoil application and final seeding with the approved seed mix. If deemed necessary, high traffic areas and/or compacted areas will be ripped or chisel plowed prior to seeding. Gravel from main roads, the CPP area, wellfield roads and areas will be salvaged with scrapers and either used as clean fill material or more likely recycled for use on adjacent private or county roads. If necessary, compacted areas will be ripped or chisel plowed prior to the application of topsoil and final seeding. Procedures are fully described in Sections 6.2 and 6.3 of the NRC Technical Report and the applicable sections of the Reclamation Plan.*

*Cost estimates are included for the removal of 7,628 feet of 6-inch trunk line, 7,290 feet of 8-inch trunk line, 4,080 feet of 10-inch trunk line, 3,350 feet of 12-inch trunk line, and 7,290 feet of 16-inch trunk line in MU-1 and MU-2 and between the CPP and the mine units. Cost estimates are also included to remove and reclaim approximately 11,800 feet of existing and planned wellfield roads associated with MU-1 and MU-2, and the connecting road from MU-1 to the CPP area.*

## 13. Radiological Surveys

*During equipment decontamination, contamination surveys of building and equipment surfaces will be performed and analyzed. The results of these surveys will drive decontamination efforts. Following removal of all structures and regrading of the site to approximate original contours, and before topsoil is spread on the regraded area, a gamma survey and soil sampling will be conducted as described in Section 2 of the WDEQ Reclamation Plan (Section 6.4 of the NRC Technical Report).*

*Soils will be cleaned up in accordance with the requirements of 10 CFR Part 40, Appendix A, including consideration of ALARA goals. The proposed limits and ALARA goals for cleanup of soils are summarized in the approved WDEQ Reclamation Plan and NRC Technical Report. Any areas that do not meet these limits will be remediated by removing contaminated soils and disposing at a licensed site. The site will then be regraded. This process will be repeated until all sites meet the ALARA goals for cleanup.*

*The costs and areas subject to these surveys are provided in worksheets EQUIP, BLDGS, WF BLDGS PIPE and MISC REC.*

#### 14. Revegetation

*At the completion of the previous tasks, and after topsoil has been spread across all regraded areas, all of the disturbed lands will be seeded with vegetation species that will return the lands to their pre-project conditions. The reclaimed land will be capable of supporting livestock grazing, dry land farming and wildlife habitat. Baseline soils, vegetation, and radiological data will be used to guide the reclamation activities.*

*The costs and the areas to be revegetated are provided in worksheets WF REC and MISC REC and are based on actual costs for revegetation at the Ross site.*

#### 15. Miscellaneous Reclamation Activities

Costs for miscellaneous reclamation activities, some of which were discussed in the preceding sections, are provided in MISC REC. This includes:

Item

- CPP/Office area reclamation
- Access road reclamation
- Wastewater pipeline reclamation
- Pond reclamation
- Diversion berm earthwork and reclamation
- Containment barrier wall reclamation
- Main trunk line reclamation
- Culvert removal and disposal
- Fence removal and disposal
- Monitoring site removal and disposal
- Radiologic surveys
- Miscellaneous ecological surveys
- Surface reclamation for delineation and historic hole abandonment

The complete surety estimate is contained in Attachment 2 - Revised Surety Estimate. The bond estimate was prepared using the approved and current LQD Guidelines 12A and 12 and the Noncoal ISL Bond Spreadsheet.

**Attachment 2**  
**Revised Surety Estimate**

## Ross Uranium Project Surety Update November 2016

### Total Restoration and Reclamation Cost Estimate

I.	GROUNDWATER RESTORATION COST	\$6,809,308
II.	EQUIPMENT REMOVAL & DISPOSAL COST	\$96,880
III.	BUILDING DEMOLITION AND DISPOSAL COST	\$560,781
IV.	WELLFIELD BUILDINGS, PIPE & EQUIPMENT REMOVAL & DISPOSAL COST	\$365,337
V.	WELL ABANDONMENT COST	\$1,579,954
VI.	WELLFIELD SURFACE RECLAMATION COST	\$39,110
VII.	TOTAL MISCELLANEOUS RECLAMATION COST	\$276,543
	SUBTOTAL RECLAMATION AND RESTORATION COST ESTIMATE	\$9,727,912
	ADMINISTRATIVE, OVERHEAD, AND CONTINGENCY ITEMS (25%)	\$2,431,978
	TOTAL	\$12,159,890

## Ross Uranium Project Surety Update November 2016

Groundwater Restoration	MU-1	MU-2
<b>PV Assumptions</b>		
Wellfield Area (ft2) (10 Mods injected (4 in MU-1 and 6 in MU-2))	1440019	2091000
Wellfield Area (acres)	33.06	48.00
Affected Ore Zone Area (ft2)	1440019	2091000
Avg. Completed Thickness	17.4	17.7
Porosity	0.34	0.34
Flare Factor (H=1.32, V=1.20, Overall= 1.58)	1.58	1.58
Affected Volume (ft3)	39589002	58476906
Kgallons per Pore Volume	100683	148718
<b>Number of Wells in Unit(s)</b>		
Production Wells (P)		
Current	106	77
Estimated next report period	0	120
Total Estimated	106	197
Injection Wells (I)		
Current	185	136
Estimated next report period	5	200
Total Estimated	190	336
Monitor Wells		
Current	49	76
Estimated next report period	0	0
Total Estimated	49	76
Restoration Wells (not included with P and I wells)		
Current	1	16
Estimated next report period	0	0
Total Estimated	1	16
Number of Wells per Wellfield	346	625
<b>Total Number of Wells</b>	<b>971</b>	
Average Well Depth (ft)	500	620
<b>I. Groundwater Sweep Costs (includes brine disposal)</b>		
PV's Required	0.5	0.5
Total Kgals for Treatment	50341	74359
Groundwater Sweep Unit Cost (\$/Kgal)	\$0.72	\$0.72
Subtotal Groundwater Sweep Costs per Wellfield	\$36,247	\$53,541
<b>Total Groundwater Sweep Costs</b>	<b>\$89,788</b>	
<b>II. Reverse Osmosis Costs (includes brine disposal)</b>		
PV's Required	7	7
Total Kgals for Treatment	704779	1041029
Reverse Osmosis Unit Cost (\$/Kgal)	\$0.84	\$0.84
Subtotal Reverse Osmosis Costs per Wellfield	\$595,116	\$879,045
<b>Total Reverse Osmosis Costs</b>	<b>\$1,474,161</b>	



## Ross Uranium Project Surety Update November 2016

Groundwater Restoration	MU-1	MU-2
<b>III. Recirculation</b>		
PV's Required	1	1
Total Kgals for Treatment	100683	148718
Recirculation Unit Cost (\$/Kgal)	\$0.43	\$0.43
Subtotal Recirculation Unit Costs per Wellfield	\$43,608	\$64,414
<b>Total Recirculation Costs</b>	<b>\$108,022</b>	
<b>IV. Monitoring and Sampling Costs</b>		
<b>A. Restoration Well Sampling</b>		
Estimated Restoration Period (Years)	4	4
1. Well Sampling prior to restoration start		
# of OZ BL Wells	12	22
\$/sample	\$330	\$330
2. Restoration Progress Sampling		
# of OZ BL Wells	12	22
\$/sample	\$30	\$30
Samples/Year	6	6
3. UCL Sampling		
# of UCL Wells	47	76
\$/sample	\$20	\$20
Samples/Year	6	6
Sub-total Restoration Analyses	\$35,160	\$59,580
<b>B. Short-term Stability</b>		
Estimated Stabilization Period (Months)	12	12
# of OZ BL Wells	12	22
Samples/Year	48	88
\$/sample	\$330	\$330
# of UCL Wells	47	76
Samples/Year	6	6
\$/sample	\$30	\$30
Sub-total Short-term Stability Analyses	\$24,300	\$42,720
Subtotal Monitoring and Sampling Costs per Wellfield	\$59,460	\$102,300
<b>Total Monitoring and Sampling Costs</b>	<b>\$161,760</b>	
<b>V. Mechanical Integrity Test (MIT) Costs</b>		
Five Year MIT Unit Cost (\$/well)	\$191	\$191
Number of Wells (Existing wells at end of 2017)	346	625
Subtotal Mechanical Integrity Testing Costs per Wellfield	\$66,086	\$119,375
<b>Total Mechanical Integrity Testing Cost</b>	<b>\$185,461</b>	
<b>TOTAL RESTORATION COSTS PER WELLFIELD</b>	<b>\$800,517</b>	<b>\$1,218,675</b>
<b>TOTAL WELLFIELD RESTORATION COST</b>	<b>\$2,019,192</b>	

## Ross Uranium Project Surety Update November 2016

<b>Groundwater Restoration</b>		<b>MU-1</b>	<b>MU-2</b>
<b>VI. Purchase/Install Additional High Eff. RO Unit (550 gpm)</b>			
Cost for Additional High Eff RO Unit (includes installation)		\$750,000	
<b>Total Cost for Additional High Eff RO Unit</b>		<b>\$750,000</b>	
<b>VII. Building Utility Costs</b>			
	<b>CPP</b>		<b>Office</b>
Electricity (\$/Month) estimate	\$2,500		\$300
Propane (\$/Month)			
Natural Gas (\$/Month) estimate	\$2,000		\$500
Number of Months	84		84
Subtotal Utility Costs per Building	\$378,000		\$67,200
<b>Total Building Utility Costs</b>	<b>\$445,200</b>		
<b>VIII. Vehicle Operation Costs</b>			
Number of Pickup Trucks/Pulling Units (Gas)	6		
Unit Cost in \$/hr (WDEQ Guideline No.12, Table D-1)	\$12.49		
Average Operating Time (Hrs/Year)	200		
Total Number of Years (Average)	7		
<b>Total Vehicle Operation Costs</b>	<b>\$104,916</b>		
<b>IX. Labor Costs</b>			
Number of Environmental Managers/RSOs	1		
\$/Year	\$125,000		
Number of Years	7		
Number of Restoration Managers (during active restoration)	1		
\$/Year	\$75,000		
Number of Years	6		
Number of Environmental Technicians	1		
\$/Year	\$65,000		
Number of Years	7		
Number of Operators/Laborers (reduced during stabilization)	4		
\$/Year	\$55,000		
Number of Years	6		
Number of Maintenance Technicians (reduced during stabilization)	1		
\$/Year	\$60,000		
Number of Years	6.5		
<b>Total Labor Costs</b>	<b>\$3,490,000</b>		
<b>TOTAL GROUNDWATER RESTORATION COSTS</b>	<b>\$6,809,308</b>		

## Ross Uranium Project Surety Update November 2016

Equipment Removal Onsite Disposal and Loading	CPP	DDW Building
<b>I. Removal and Loading Costs</b>		
<b>A. Tankage</b>		
Number of Uncontaminated FG Tanks to be Cut Up	2	
Volume of Uncontaminated Tank Construction Material (ft <sup>3</sup> )	246	
Weight of Uncontaminated Tank Construction Material @ 1000 lb/yd <sup>3</sup> (tons)	5	
1. Labor for Dismantling		
Number of Persons	3	
Ft <sup>3</sup> /Day	50	
Number of Days	5	
\$/Day/Person	\$200	
Subtotal Labor Costs	\$3,000	
2. Equipment		
Number of Days	5	
\$/Day	\$500	
Subtotal Equipment Costs	\$2,500	
3. Off site transport and disposal at Moorcroft Landfill Unit Cost (\$/ton)	\$338.00	
Off site transport and disposal cost	\$1,540	
Subtotal Uncontaminated tankage Removal, Loading, Disposal Costs	\$7,040	
Number of Contaminated FG Tanks to be Cut Up	4	
Volume of Contaminated Tank Construction Material (ft <sup>3</sup> )	283	
1. Labor for Dismantling		
Number of Persons	3	
Ft <sup>3</sup> /Day	50	
Number of Days	6	
\$/Day/Person	\$200	
Subtotal Labor Costs	\$3,600	
2. Equipment		
Number of Days	6	
\$/Day	\$500	
Subtotal Equipment Costs	\$3,000	
Subtotal Tankage Removal and Loading Costs	\$6,600	

## Ross Uranium Project Surety Update November 2016

Equipment Removal Onsite Disposal and Loading		CPP	DDW Building
B.	Number of IX Columns to be Decontaminated, Cut Up and Salvaged (no value)		
	Number of 11,000 gal IX Columns	9	
	Number of 5,500 gal Guard IX Columns	1	
	Weight of 11,000 gal IX Column (lbs)	24,000	
	Weight of 5,500 gal Guard IX Column (lbs)	5500	
	Assume 90% steel salvage (no value)		
	Weight of 11,000 gal IX column for disposal (tons)	1.2	
	Weight of 5,500 gal IX column for disposal (tons)	0.275	
1.	Labor for Decontamination and Dismantling		
	Number of Persons	3	
	Number of Days	18	
	\$/Day/Person	\$200	
	Subtotal Labor Costs	\$10,800	
2.	Equipment		
	Number of Days	18	
	\$/Day	\$500	
	Subtotal Equipment Costs	\$9,000	
3.	Off site transport and disposal at Moorcroft Landfill Unit Cost (\$/ton)	\$338.00	
	Off site transport and disposal cost	\$3,743	
	Subtotal Decontaminated IX Columns Removal and Offsite Disposal Costs	\$23,543	
C.	Contaminated PVC Pipe		
	PVC Pipe Footage	7700	30
	Average PVC Pipe Diameter (inches)	4	4
	Shredded PVC Pipe Volume Reduction (ft <sup>3</sup> /ft)	0.2	0.2
	Volume of Shredded PVC Pipe (ft <sup>3</sup> )	1540	6
1.	Labor for Shredding		
	Number of Persons	2	1
	Ft/Day	350	350
	Number of Days	22	1
	\$/Day/Person	\$200	\$200
	Subtotal Labor Costs	\$8,800	\$200
	Subtotal PVC Pipe Removal and Loading Costs	\$9,000	

## Ross Uranium Project Surety Update November 2016

<b>Equipment Removal Onsite Disposal and Loading</b>		<b>CPP</b>	<b>DDW Building</b>
<b>D. Contaminated Pumps</b>			
Number of Contaminated Pumps		16	1
Average Volume (ft <sup>3</sup> /pump)		4	6
Volume of Pumps (ft <sup>3</sup> )		64	6
1. Labor			
Number of Persons		3	2
Pumps/Day		10	1
Number of Days		2	1
\$/Day/Person		\$200	\$200
Subtotal Labor Costs		\$1,200	\$400
Subtotal Pump Removal and Loading Costs		\$1,600	
<b>E. Contaminated Dryer</b>			
Dryer Volume (ft <sup>3</sup> )	NA		
1. Labor			
Number of Persons	NA		
Ft <sup>3</sup> /Day	NA		
Number of Days	NA		
\$/Day/Person	NA		
Total Labor Cost	NA		
Total Dryer Dismantling and Loading Cost		\$0	
<b>F. Contaminated RO Units</b>			
Number of RO Units			
Current		1	
Planned (One RO installed with CPP, one installed later for restoration)		1	
Average Volume (ft <sup>3</sup> /RO Unit)		1000	
1. Labor			
Number of Persons		3	
Number of Days		1	
\$/Day/Person		\$200	
Subtotal Labor Costs		\$1,200	
Subtotal RO Unit Removal and Loading Costs		\$1,200	
<b>Total Equipment Removal and Loading Costs</b>		<b>\$48,983</b>	

## Ross Uranium Project Surety Update November 2016

Equipment Removal Onsite Disposal and Loading	CPP	DDW Building
<b>II. Transportation and Disposal Costs (NRC-Licensed Facility)</b>		
A. Tankage		
Volume of Tank Construction Material (ft <sup>3</sup> )	283	
Volume for Disposal Assuming 10% Void Space (ft <sup>3</sup> )	311	
Transportation and Disposal Unit Cost (\$/ft <sup>3</sup> )	\$12.85	
Subtotal Tankage Transportation and Disposal Costs	\$3,997	
B. PVC Pipe		
Volume of Shredded PVC/HDPE Pipe (ft <sup>3</sup> )	1540	
Volume for Disposal Assuming 10% Void Space (ft <sup>3</sup> )	1694	
Transportation and Disposal Unit Cost (\$/ft <sup>3</sup> )	\$12.85	
Subtotal PVC Pipe Transportation and Disposal Costs	\$21,769	
C. Pumps		
Volume of Pumps (ft <sup>3</sup> )	64	6
Volume for Disposal Assuming 10% Void Space (ft <sup>3</sup> )	70	7
Transportation and Disposal Unit Cost (\$/ft <sup>3</sup> )	\$12.85	\$12.85
Subtotal Pump Transportation and Disposal Costs	\$900	\$90
D. Dryer		
Dryer Volume (ft <sup>3</sup> )	NA	
Volume for Disposal Assuming Dryer Remains Intact (ft <sup>3</sup> )	NA	
Transportation and Disposal Unit Cost (\$/ft <sup>3</sup> )	\$12.85	
Total Dryer Transportation and Disposal Costs	NA	
E. RO Units		
Volume of RO Units (ft <sup>3</sup> )	1000	
Volume for Disposal Assuming 50% Volume Reduction (ft <sup>3</sup> )	1000	
Transportation and Disposal Unit Cost (\$/ft <sup>3</sup> )	\$12.85	
Subtotal RO Unit Transportation and Disposal Costs	\$12,851	
Subtotal Equipment Transportation and Disposal Costs per Facility	\$39,517	\$90
<b>Total Equipment Transportation and Disposal Costs</b>	<b>\$39,607</b>	<b>\$90</b>
<b>III. Health and Safety Costs</b>		
Radiation Safety Equipment	\$8,000	200
<b>Total Health and Safety Costs</b>	<b>\$8,000</b>	<b>\$200</b>
<b>SUBTOTAL EQUIPMENT REMOVAL AND DISPOSAL COSTS PER FACILITY</b>	<b>\$96,590</b>	<b>\$290</b>
<b>TOTAL EQUIPMENT REMOVAL AND DISPOSAL COSTS</b>	<b>\$96,880</b>	

## Ross Uranium Project Surety Update November 2016

	CPP	CPP Truck Bay	Office	DDW Building	Pot Water Building
Building Demolition and Disposal	140'x102'x30	20'x102'x22'	115'x100'x16'	10'x12'x10'	30x30x12'
<b>I. Decontamination Costs</b>					
A. Wall Decontamination					
Assumption: Approx 25% of CPP walls require decontamination					
Area to be Decontaminated (ft <sup>2</sup> )	3500	1122	0	110	0
Application Rate (Gallons/ft <sup>2</sup> )	1	1		1	
HCl Acid Wash, including labor (\$/Gallon)	\$0.50	\$0.50		\$0.50	
Subtotal Wall Decontamination Costs	\$1,750	\$561	\$0	\$55	\$0
B. Concrete Floor Decontamination					
Assumption: Approx 50% of CPP floor requires decontamination					
Area to be Decontaminated (ft <sup>2</sup> )	7200	1020	0	120	0
Application Rate (Gallons/ft <sup>2</sup> )	2	2		2	
HCl Acid Wash, including labor (\$/Gallon)	\$0.50	\$0.50		\$0.50	
Subtotal Concrete Floor Decontamination Costs	\$7,200	\$1,020	\$0	\$120	\$0
C. Deep Well Injection Costs					
Total Kgals for Injection	17.9	3.162	0	0.35	0
Deep Well Injection Unit Cost (\$/Kgals)	\$1.37	\$1.37	\$1.37	\$1.37	\$1.37
Subtotal Deep Well Injection Costs	\$25	\$4	\$0	\$0	\$0
Subtotal Decontamination Costs per Building	\$8,975	\$1,585	\$0	\$175	\$0
<b>Total Decontamination Costs</b>	<b>\$10,735</b>		0		0
<b>II. Demolition Costs</b>					
A. Building					
Assumptions:					
Limited contamination of CPP as there is no Precip/Dryer					
Volume of Building (ft <sup>3</sup> )	428400	44880	184000	1200	10800
Demolition Unit Cost per WDEQ Guideline No.12, App.K (\$/ft <sup>3</sup> )	\$0.287	\$0.287	\$0.287	\$0.287	\$0.287
Subtotal Building Demolition Costs	\$122,951	\$12,881	\$52,808	\$344	\$3,100
B. Concrete Floor					
Area of Concrete Floor (ft <sup>2</sup> )	14280	2040	11500	0	900
Demolition Unit Cost per WDEQ Guideline No.12, App.K (\$/ft <sup>2</sup> )	\$0.76	\$0.76	\$0.76	\$0.76	\$0.76
Subtotal Concrete Floor Demolition Costs	\$10,853	\$1,550	\$8,740	\$0	\$684
C. Concrete Footing					
Length of Concrete Footing (ft)	484	142	430	0	120
Demolition Unit Cost per WDEQ Guide. No.12, App.K (\$/lin. ft)	\$15.67	\$15.67	\$15.67	\$15.67	\$15.67
Subtotal Concrete Footing Demolition Costs	\$7,584	\$2,225	\$6,738	\$0	\$1,880
Subtotal Demolition Costs per Building	\$141,388	\$16,656	\$68,286	\$344	\$5,664
<b>Total Demolition Costs</b>	<b>\$232,338</b>				

## Ross Uranium Project Surety Update November 2016

	CPP	CPP Truck Bay	Office	DDW Building	Pot Water Building
	140'x102'x30	20'x102'x22'	115'x100'x16'	10'x12'x10'	30x30x12'
<b>Building Demolition and Disposal</b>					
<b>III. Disposal Costs</b>					
A. Building					
Volume of Building Materials-no concrete, 10% of building full volume (cy)	1587	166	681	44	400
Weight of Building Materials @ 405 lb/cy (ton)	321	34	138	9	81
1. Moorcroft Land Fill					
Assumptions:					
Percentage salvage -no value (40%)	0.4	0.4	0.4	0.4	0.4
Weight for Disposal (tons)	129	13	55	4	32
Disposal Unit Cost (\$/ton)	\$338.00	\$338.00	\$338.00	\$338.00	\$338.00
Subtotal Landfill Disposal Costs	\$43,440	\$4,551	\$18,658	\$1,217	\$10,951
2 Building Steel Recycle transportation					
Assumptions:					
Percentage salvage -recycle value (60%)	0.6	0.6	0.6	0.6	0.6
Weight for Disposal (tons)	193	20	83	5	49
Transport Unit Cost (\$/ton)	\$138.00	\$138.00	\$138.00	\$138.00	\$138.00
Subtotal Building Steel Recycling Costs	\$26,604	\$2,787	\$11,426	\$745	\$6,707
Subtotal Building Disposal Costs	\$70,044	\$7,338	\$30,084	\$1,962	\$17,658
B. Concrete Floor					
Area of Concrete Floor (ft <sup>2</sup> )	14280	2040	11500	0	900
Average Thickness of Concrete Floor (ft)	0.5	0.5	0.5	0.5	0.5
Volume of Concrete Floor (ft <sup>3</sup> )	7140	1020	5750	0	450
Volume of Concrete Floor (cy)	264	38	213	0	17
1. Moorcroft Land Fill					
Percentage (%)	80	80	0	0	0
Weight for Disposal (tons)	429	61	0	0	0
Disposal Unit Cost (\$/ton) at Moorcroft Landfill					
Disposal Unit Cost (\$/ton)	\$338.00	\$338.00	\$338.00	\$338.00	\$338.00
Subtotal Landfill Disposal Costs	\$145,157	\$20,737	\$0	\$0	\$0
2. NRC-Licensed Facility					
Assumptions:					
Percentage (%)	20	20	0	0	0
Volume for Disposal (ft <sup>3</sup> )	1428	204	0	0	0
Segregation and Loading Unit Cost (\$/ft <sup>3</sup> )	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Transportation and Disposal Unit Cost (\$/ft <sup>3</sup> )	\$12.85	\$12.85	\$12.85	\$12.85	\$12.85
Subtotal NRC-Licensed Facility Disposal Costs	\$18,351	\$2,622	\$0	\$0	\$0
Subtotal Concrete Floor Disposal Costs	\$163,508	\$23,359	\$0	\$0	\$0
C. Concrete Footing					
Length of Concrete Footing (ft)	484	142	430	0	120
Average Depth of Concrete Footing (ft)	2	2	2	2	2
Average Width of Concrete Footing (ft)	3	3	3	3	3
Weight for Disposal (tons)	73	21	0	0	0
Disposal Cost (\$/ton) at Moorcroft Landfill (\$338/ton)	\$24,599	\$7,217			
Volume of Concrete Footing (cy)			96		27
Disposal Cost per WDEQ Guideline No.12, App.K (\$8.63/cy)			\$825		\$230
Subtotal Disposal Costs per Building	\$233,552	\$30,697	\$30,909	\$1,962	\$17,888
<b>Total Disposal Costs</b>	<b>\$315,008</b>				
<b>IV. Health and Safety Costs</b>					
Radiation Safety Equipment	\$2,000	\$500		\$200	
<b>Total Health and Safety Costs</b>	<b>\$2,700</b>				



## Ross Uranium Project Surety Update November 2016

	CPP	CPP Truck Bay	Office	DDW Building	Pot Water Building
<b>Building Demolition and Disposal</b>	140'x102'x30	20'x102'x22'	115'x100'x16'	10'x12'x10'	30x30x12'
SUBTOTAL BUILDING DEMOLITION AND DISPOSAL COSTS	\$385,915	\$49,438	\$99,195	\$2,681	\$ 23,552
<b>TOTAL BUILDING DEMOLITION AND DISPOSAL COSTS</b>	<b>\$560,781</b>				

## Ross Uranium Project Surety Update November 2016

Wellfield Buildings and Equipment Removal and Disposal	MU-1	MU-2
<b>I. Wellfield Piping</b>		
Assumptions:		
Number of Headerhouses per Wellfield	4	6
Length of Piping per Headerhouse (ft) (updated to reflect actual average 2017)	22700	22700
Total Length of Piping (ft)	90800	136200
A. Removal and Loading		
Wellfield Piping Removal Unit Cost (\$/ft of pipe)	\$0.41	\$0.41
Subtotal Wellfield Piping Removal and Loading Costs	\$37,228	\$55,842
B. Transport and Disposal Costs (NRC-Licensed Facility)		
Average Diameter of Piping (inches)	1.5	1.5
Chipped Volume Reduction (ft <sup>3</sup> /ft)	0.0069	0.0069
Chipped Volume per Wellfield (ft <sup>3</sup> )	626.52	939.78
Volume for Disposal Assuming 10% Void Space (ft <sup>3</sup> )	689	1034
Transportation and Disposal Unit Cost (\$/ft <sup>3</sup> )	\$12.85	\$12.85
Subtotal Wellfield Piping Transport and Disposal Costs	\$8,854	\$13,288
Wellfield Piping Costs per Wellfield	\$46,082	\$69,130
<b>Total Wellfield Piping Costs</b>	<b>\$115,212</b>	
<b>II. Well Pumps and Tubing</b>		
Assumptions:		
Pump and tubing removal costs included under groundwater restoration labor costs		
100% of production/injection wells contain pumps and/or tubing		
A. Pump and Tubing Transportation and Disposal		
Number of Production Wells (operating wells only)	106	197
Number of Injection Wells (operating wells only)	190	336
1. Pump Volume		
Number of Production Wells with Pumps	106	197
Average Pump Volume (ft <sup>3</sup> )	2	2
Pump Volume per Wellfield (ft <sup>3</sup> )	212	394
2. Tubing Volume		
Assumptions:		
Average tubing length/wellfield based on average well depth minus 25 ft		
Number of Production Wells with Tubing	106	197
Number of Injection Wells with Tubing	190	336
Average Tubing Length per Well (ft)	475	595
Tubing Length per Wellfield (ft)	140600	121000
Diameter of Production Well HDPE Tubing (inches)	1.5	1.5
Diameter of Injection Well HDPE Tubing (inches)	1.5	1.5
Chipped Volume Reduction (ft <sup>3</sup> /ft)	0.0069	0.0069
Chipped Volume per Wellfield (ft <sup>3</sup> )	970	835
Volume of Pump and Tubing (ft <sup>3</sup> )	1182	1229
Volume for Disposal Assuming 10% Void Space (ft <sup>3</sup> )	1300	1352
Transportation and Disposal Unit Cost (\$/ft <sup>3</sup> )	\$12.85	\$12.85
Pump and Tubing Transport and Disposal Costs per Wellfield	\$16,709	\$17,373
<b>Total Pump and Tubing Costs</b>	<b>\$34,081</b>	

## Ross Uranium Project Surety Update November 2016

Wellfield Buildings and Equipment Removal and Disposal	MU-1	MU-2
<b>III. Well Head Covers</b>		
Total Quantity (operating wells)	296	533
Average Well Head Cover Volume (ft <sup>3</sup> ) (2'x2'x3')	12	12
A. Removal		
Total Volume (ft <sup>3</sup> )	3552	6396
Demolition Unit Cost per WDEQ Guideline No.12, App.K (\$/ft <sup>3</sup> )	\$0.270	\$0.270
Subtotal Well Head Cover Demolition Costs	\$959	\$1,727
B. Survey and Decontamination		
Assumptions:		
Cost per Well Head Cover		
Subtotal Survey and Decontamination Costs		
C. Disposal		
Total Volume (cy)	132	237
Volume for Disposal Assuming 10% Void Space (cy)	145	261
Disposal Unit Cost 11E2 (\$/cy)	\$12.85	\$12.85
Subtotal 11E2 Disposal Costs	\$1,863	\$3,354
Well Head Cover Removal and Disposal Costs per Wellfield	\$2,822	\$5,081
<b>Total Well Head Cover Removal and Disposal Costs</b>	<b>\$7,903</b>	
<b>IV. Header Houses</b>		
Total Quantity (operating)	4	6
Average Header House Volume (ft <sup>3</sup> ) (12'x30'x8')	2880	2880
A. Removal		
Total Volume (ft <sup>3</sup> )	11520	17280
Demolition Unit Cost per WDEQ Guideline No.12, App.K (\$/ft <sup>3</sup> )	\$0.270	\$0.270
Subtotal Building Demolition Costs	\$3,110	\$4,666
B. Survey and Decontamination		
Assumptions:		
Cost per Header House	\$1,000	\$1,000
Subtotal Survey and Decontamination Costs	\$4,000	\$6,000
C. Volume of Building Materials-no concrete,40% of full building volume (yd3)	171	256
1. Moorcroft Land Fill		
Assumptions:		
Weight for Disposal @405 lb/yd3 (tons)	35	52
Disposal Unit Cost (\$/ton)	\$338.00	\$338.00
Subtotal Landfill Disposal Costs	\$11,681	\$17,522
Total Header House Removal and Disposal Costs per Wellfield	\$15,791	\$23,188
<b>Total Header House Removal and Disposal Costs</b>	<b>\$38,979</b>	

# Ross Uranium Project Surety Update November 2016

## Wellfield Buildings and Equipment Removal and Disposal

	MU-1	MU-2	From CPP to
V. Buried Trunk Line	MU1	MU2	MU-1
Number of Lines per trench	2	2	2
Length of 16 inch lines	1280	3005	3645
Length of 12 inch lines		1675	
Length of 10 inch lines		2040	
Length of 8 inch lines			3645
Length of 6 inch lines	1749	2065	
A. Removal and Loading			
Total Trench Length (ft.)	3029	8785	7290
Main Pipeline Removal Unit Cost (\$/ft of trench)	\$3.47	\$3.47	\$3.47
Subtotal Trunk line Removal and Loading Costs	\$10,511	\$30,484	\$25,296
B. Transport and Disposal Costs (NRC-Licensed Facility)			
1. 6" HDPE Trunk line			
Piping Length (ft)	3498	4130	
Chipped Volume Reduction (ft <sup>3</sup> /ft)	0.078	0.078	
Chipped Volume (ft <sup>3</sup> )	273	322	
2. 8" HDPE Trunk line			
Piping Length (ft)			7290
Chipped Volume Reduction (ft <sup>3</sup> /ft)			0.141
Chipped Volume (ft <sup>3</sup> )			1028
3. 10" HDPE Trunk line			
Piping Length (ft)		4080	
Chipped Volume Reduction (ft <sup>3</sup> /ft)		0.277	
Chipped Volume (ft <sup>3</sup> )		1130	
4. 12" HDPE Trunk line			
Piping Length (ft)		3350	
Chipped Volume Reduction (ft <sup>3</sup> /ft)		0.293	0.293
Chipped Volume (ft <sup>3</sup> )		982	
6. 16" HDPE Trunk line			
Piping Length (ft)			7290
Chipped Volume Reduction (ft <sup>3</sup> /ft)			0.486
Chipped Volume (ft <sup>3</sup> )			3543
Total Trunk line Chipped Volume (ft <sup>3</sup> )	273	2434	4571
Volume for Disposal Assuming 10% Void Space (ft <sup>3</sup> )	300	2677	5028
Transportation and Disposal Unit Cost 11E2 (\$/ft <sup>3</sup> )	\$12.85	\$12.85	\$12.85
Subtotal Trunk line Transport and Disposal Costs	\$3,855	\$34,401	\$64,614
Trunk line Decommissioning Costs per Wellfield	\$14,366	\$64,885	\$89,910
Total Trunk Line Decommissioning Costs	\$169,161		
<b>TOTAL WELLFIELD BUILDINGS, PIPE AND EQUIPMENT REMOVAL AND DISPOSAL COSTS</b>	<b>\$365,337</b>		

## Ross Uranium Project Surety Update November 2016

Well Abandonment	MU-1	MU-2	Five Inch MU1 and Regional Baseline Wells
<b>I. Well Abandonment (Wellfields)</b>			
# of Production Wells (operating and/or installed)	106	197	0
# of Injection Wells (operating and/or installed)	190	336	28
# of Monitoring Wells (operating and/or installed)	49	76	26
# of Restoration Wells (operating and/or installed)	1	16	0
Total Number of Wells	346	625	54
Average Diameter of Casing (inches)	4.5	4.5	5
Average Depth (ft)	500	620	420
Well Abandonment Unit Cost per WDEQ Guideline No.12 App L (\$2.50/ft)	\$1,250	\$1,550	\$1,050
Subtotal Abandonment Cost per Wellfield	\$432,500	\$968,750	\$56,700
<b>Total Wellfield Abandonment Costs</b>	<b>\$1,457,950</b>		
<b>II. Waste Disposal Well Abandonment</b>	<b>DDW- 2</b>		
Estimated Well Abandonment Cost per Well	\$122,004		
Subtotal Waste Disposal Well Abandonment Costs per Well	\$122,004		
<b>Total Waste Disposal Well Abandonment Costs</b>	<b>\$122,004</b>		
<b>TOTAL WELL ABANDONMENT COSTS</b>	<b>\$1,579,954</b>		

## Ross Uranium Project Surety Update November 2016

<b>Wellfield Surface Reclamation</b>		<b>Connecting Road from CPP</b>	<b>MU-1</b>	<b>MU-2</b>
<b>I.</b>	<b>Wellfield Pattern Area Reclamation</b>			
	Pattern Area (acres)		33.06	48.00
	Disking/Seeding Unit Cost (\$/acre)		\$350	\$350
	Subtotal Pattern Area Reclamation Costs per Wellfield		\$11,571	\$16,801
	<b>Total Wellfield Pattern Area Reclamation Costs</b>		<b>\$28,372</b>	
<b>II.</b>	<b>Wellfield Road Reclamation</b>			
	A. Road Reclamation			
	Length of Wellfield Roads (1000 ft)	2.5	6.6	2.7
	Wellfield Road Reclamation Unit Cost (\$/1000 ft)	\$910	\$910	\$910
	Subtotal Road Reclamation Costs per Wellfield	\$2,275	\$6,006	\$2,457
	<b>Total Wellfield Road Reclamation Costs</b>	<b>\$10,738</b>		
	<b>SUBTOTAL SURFACE RECLAMATION COSTS PER WELLFIELD</b>	<b>\$2,275</b>	<b>\$17,577</b>	<b>\$19,258</b>
	<b>TOTAL WELLFIELD SURFACE RECLAMATION COSTS</b>	<b>\$39,110</b>		

## Ross Uranium Project Surety Update November 2016

### Miscellaneous Reclamation

#### I. CPP/Office Area Reclamation

##### Assumptions

Concrete used to backfill low areas as Clean Fill

#### A. Scarification of Gravel

##### Assumptions

Average haul distance (ft) NA

Surface grade (%) 0%

Average Thickness of Gravel (ft) 0.33

Surface Area (acres) (minus building floor area) 4.1

Scarification Unit Cost per WDEQ Guideline No.12A (\$/acre) \$57.80

Total Gravel Scarification Cost \$237

#### B. Topsoil Application

##### 1. Topsoil Replacement

##### Assumptions

Average haul distance (ft) 1000

Surface area (acres) 4.82

18 inches of topsoil removed and replaced at borrow area

Volume of topsoil (cy) 35,550.00

Topsoil Removal/Replacement Unit Cost per WDEQ GL No. 12A(\$/cy) \$1.00

Total Topsoil Removal/Replacement Cost \$35,550

#### C. Disking/Seeding

##### Assumptions

Surface Area (acres) 44.1

Disking/Seeding Unit Cost (\$/acre) \$350

Total Disking/Seeding Costs \$15,435

**Total CPF/Office Area Reclamation \$51,222**

# Ross Uranium Project Surety Update November 2016

## Miscellaneous Reclamation

II. Access Road Reclamation	Main Access Road	Water Supply Well Road	DDW Road
A. Assumptions			
Surface grade			
Length of road (miles)	0.45	0.09	0.25
Average road width (ft)	30	12	24
B. Gravel Percentage salvage -no value (60%)			
Assumptions			
Average haul distance (ft)	500	500	500
Gravel Road Base Width (ft)	30	12	24
Gravel Road Base Area (acres)	1.6	0.1	0.7
Average Road Base Depth (ft)	0.33	0.33	0.33
Volume of Road Base (cy)	871	66	381
Removal Unit Cost per WDEQ Guideline No.12A (\$/cy)	\$0.72	\$0.72	\$0.72
Subtotal Gravel Road Base Removal Costs	\$627	\$47	\$274
C. Move Road Fill Material			
Assumptions			
Estimated volume to move (cy)	30,500		
Average haul distance (ft)	750		
Removal Unit Cost per WDEQ Guideline No.12A (\$/cy)	\$0.79		
Subtotal Gravel Road Fill Removal Costs	\$24,095		
D. Scarification with Dozer			
Road Surface Area (acres)	1.6	0.1	0.7
Scarification Unit Cost per WDEQ Guideline No.12A D8 Dozer (\$/acre)	\$57.80	\$57.80	\$57.80
Scarification Costs	\$95	\$7	\$41
E. Topsoil Application			
Assumptions			
F. Disking/Seeding			
Subtotal Reclamation Costs per Road	\$24,817	\$54	\$315
Total Access Road Reclamation Costs	\$25,186		



## Ross Uranium Project Surety Update November 2016

### Miscellaneous Reclamation

	<b>DDW-2 Pipeline</b>	<b>CPP-Pond 1</b>
<b>III. Wastewater Pipeline Reclamation</b>		
<b>A. Pipeline Removal and Loading</b>		
Length of HDPE Pipe Trench (ft)	1600	900
Main Pipeline Removal Unit Cost (\$/ft of trench)	\$3.47	\$3.47
Subtotal Pipeline Removal Costs	\$5,552	\$3,123
<b>B. Pipeline Transportation and Disposal (NRC-Licensed Facility)</b>		
Pipe Diameter (inches)	4	4
Chipped Volume Reduction (ft <sup>3</sup> /ft)	0.028	0.028
Subtotal Volume of Shredded PVC Pipe (ft <sup>3</sup> )	49.28	27.72
Transportation and Disposal Unit Cost (\$/ft <sup>3</sup> )	\$12.85	\$12.85
Subtotal Pipeline Disposal Costs	\$633	\$356
<b>C. Disking/Seeding</b>		
Assumptions:		
Width of Pipeline Trench (ft)		2 Included in CPP reclamation
Area of Pipeline Trench (acres)	0.1	
Disking/Seeding Unit Cost (\$/acre)	\$350	
Subtotal Disking/Seeding Costs	\$26	
Subtotal Reclamation Costs per Pipeline	\$6,211	\$3,479
<b>Total Wastewater Pipeline Reclamation Costs</b>	<b>\$9,690</b>	

# Ross Uranium Project Surety Update November 2016

## Miscellaneous Reclamation

### IV. Pond Reclamation

#### A. HDPE Liner Removal and Disposal

##### Assumptions:

HDPE Primary liner for Pond 1 constitutes 11E2 waste  
 Thickness of HDPE Primary liner (mil) 60  
 HDPE Secondary liner for Pond 1 and Sediment pond not contaminated  
 Thickness of HDPE Secondary liner (mil) 40  
 Liner swell factor (50%) 1.5

Width of Pond (ft)	240	130
Length of Pond (ft)	545	130
Depth of Pond (ft)	15	15
Surface area of pond (ft <sup>2</sup> )	130800	16900
Surface area of liner (ft <sup>2</sup> )	143616	
Volume of HDPE Liner (cy)	0	40

#### 1. Removal and Loading

Removal and Loading Unit Cost based on engineer's estimate \$30,000.00

**Sub Total Liner Removal and Loading Costs \$30,000**

#### 2. Transportation and Disposal 11E2

Volume of HDPE Primary Liner (ft<sup>3</sup>) 1077  
 Transportation and Disposal Unit Cost 11E2 (\$/ft<sup>3</sup>) \$12.85

**Sub Total Liner Transportation and Disposal Costs 11E2 \$13,842**

#### 3. Transportation and Disposal Non Contaminated

Volume of HDPE Secondary Liner (ft<sup>3</sup>) 718 0  
 Assume loose liner weighs 1500 lbs/yd<sup>3</sup>  
 Offsite Transport and Disposal Unit Cost (\$/ton) \$338

Subtotal Liner Transportation and Disposal Costs \$6,742 \$0

**Total Liner Transportation and Disposal Costs \$6,742**

#### B. Removal and disposal pond leak detection system

Labor/equipment estimate \$5,000  
 Volume of material estimate (ft<sup>3</sup>) 500  
 Transportation and Disposal Unit Cost 11E2 (\$/ft<sup>3</sup>) \$12.85

**Sub Total Leak Detection Removal and Disposal Costs \$11,425**

#### C. Backfill Pond

##### Assumptions per cell (3):

Estimated volume to approx natural grade (yd <sup>3</sup> )	10080	13600
Average push distance with dozer (ft)	50	
Approx haul for scraper from road fill (ft)		500
Surface grade (%)	0%	0%

Volume of WW Pond backfill for 3 cells (cy) 30,240  
 Backfill Unit Cost per WDEQ Guideline No.12A., (\$/cy) \$0.19 \$0.72

Subtotal Backfill Costs \$5,746 \$9,792

**Subtotal Backfill Costs \$15,538**

#### D. Topsoil Application

##### Assumptions

Included in CPP reclamation

#### E. Soil Sampling and Analysis Costs

Number of samples 12  
 Cost per sample (\$) \$150

Subtotal Soil Sampling Costs (\$) \$1,800

**Total Pond Reclamation Costs \$79,347**

## Ross Uranium Project Surety Update November 2016

### Miscellaneous Reclamation

#### V. Diversion Berm Earthwork and Reclamation

Assumptions	
Estimated volume to move (cy)	10800
Average haul distance (ft)	1000
Removal Unit Cost per WDEQ Guideline No. 12A (\$/cy)	\$1.00
Subtotal Berm Fill Removal Costs	\$10,800
Topsoil Application	
Assumptions	Included in CPP reclamation
<b>TOTAL DIVERSION BERM EARTHWORK AND RECLAMATION</b>	<b>\$10,800</b>

#### VI. Containment Barrier Wall (CBW) Reclamation

Assumptions	
Labor/equip to excavate/install finger drains (estimate)	\$7,650
Gravel for finger drains (estimate)	\$3,000
<b>Total Containment Barrier Wall (CBW) Reclamation Costs</b>	<b>\$10,650</b>

#### VII. Main Trunk Line Reclamation

Assumptions	
4000 feet requires seeding (located outside wellfield area) (ft)	4000
Assume 20 feet wide (ft)	20
Disking/Seeding Unit Cost (\$/acre)	\$350.00
<b>Total Trunk Line Reclamation</b>	<b>\$643</b>

## Ross Uranium Project Surety Update November 2016

### Miscellaneous Reclamation

#### VIII. Culvert Removal and Disposal

##### Assumptions

Total Feet

Removal Unit Cost per WDEQ Guideline No.12A (13.20 per ft.)

MU1

MU2

250

40

\$3,300.00

\$528.00

#### Total Culvert Removal and Disposal

**\$3,828**

#### IX. Fence Removal and Disposal

##### Assumptions

Length 4-Strand Barbwire Fence (MU-1)

Length 4-Strand Barbwire Fence (MU-2)

Length CPP Fence

Unit Cost per WDEQ Guideline No.12, App H (\$/ft)

6340

7000

8500

\$0.38

**\$8,299**

#### Total Fence Removal and Disposal Costs

#### X. Monitoring Site Removal and Disposal

Ass 3 Surface Water Sites (estimated at \$2400 each)

7 Air Mon Sites (estimated at \$500 each)

1 Met Station (estimated at \$2500 each)

\$7,200

\$3,500

\$2,500

**\$13,200**

#### Total Monitoring Site Removal and Disposal Costs

#### XI. Radiologic Surveys

Ass Misc meter/smear surveys buildings/equipment (100 at \$55 each)

Decomm area gamma surveys (est based on baseline survey costs)

Misc soil samples (Ra-226/U)

\$5,500

\$15,000

\$13,000

**\$33,500**

#### Total Radiologic Surveys Costs

#### XII. MISC Ecological Surveys

##### Assumptions

##### Total Survey Costs

**\$30,000**

#### XIII. Surface reclamation for Delineation and Historic Hole Abandonment

Historic holes associated with Mine Unit 2

Delineation Holes outside MU1 and MU2

Total acres disturbed (400 ft2 per hole)

Disking/Seeding Unit Cost (\$/acre)

0

200

1.8

\$350

#### Total Surface Reclamation for Delineation and Historic Holes

**\$643**

#### TOTAL MISCELLANEOUS RECLAMATION COSTS

**\$276,543**

## Ross Uranium Project Surety Update November 2016

### GROUNDWATER SWEEP (GWS)

#### Assumptions:

1. All pumps are 5 hp pumping at 20 gpm
2. Cost of electricity = \$0.06/kwh (updated 2017 to reflect PRECORP rates)
3. All wastewater brine pumped to DDW for injection at \$1.37/1000 gallons.  
with 90% permeate/10% brine split
4. Repair and maintenance costs estimated at \$0.10/1000 gallons
5. Process sampling and analysis costs estimated at \$0.25/1000 gallons at 200 GPM flow rate
6. Labor costs are covered in GW REST

#### Wellfield Pumping Costs per 1000 Gallons

$$\frac{1000 \text{ gal}}{1} \times \frac{5 \text{ hp}}{20 \text{ gpm}} \times \frac{1 \text{ hr}}{60 \text{ min}} \times \frac{0.746 \text{ kwh}}{\text{hp}} \times \frac{\$ 0.060}{\text{kwh}} \times \frac{1}{0.8} = \$ 0.233125$$

Repair and Maintenance Costs per 1000 Gallons = \$ \$0.10

Process Sampling and Analysis Costs per 1000 Gallons = \$ \$0.25

RO Wastewater Brine to DDW per 1000 Gallons = \$ \$0.14

Note: only 10% of RO Volume Requires DDW Disposal

**TOTAL GWS COSTS PER 1000 GALLONS = \$ 0.72**

## Ross Uranium Project Surety Update November 2016

### REVERSE OSMOSIS (RO)

#### Assumptions:

- 1 Cost of electricity = \$0.06/kwh (updated 2017 to reflect PRECORP rates)
- 2 90% permeate/10% brine split
- 3 Membrane life of 4 years.
- 4 Includes cost of pumping from wellfield to RO Unit
- 5 The 10% reject is disposed at the DDW at a cost of \$1.37/1000 gallons
- 6 Process sampling and analysis costs estimated at \$0.17/1000 gallons at 700 GPM flow rate
- 7 Labor costs are covered in GW REST

#### Reverse Osmosis Costs per 1000 Gallons

Electricity	= \$ 0.15
Chemicals	= \$ 0.10
Membrane Replacement	= \$ 0.00
Repair and Maintenance	= \$ 0.10
Pumping from Wellfield	= \$ 0.19
Process Sampling and Analysis	= \$ 0.17

RO Wastewater Brine to DDW per 1000 Gallons = \$ 0.137

Note: only 10% of RO Volume Requires DDW Disposal

**TOTAL RO COSTS PER 1000 GALLONS = \$ 0.84**

## Ross Uranium Project Surety Update November 2016

### RECIRCULATION (REC)

#### Assumptions:

1. All pumps are 5 hp pumping at 20 gpm
2. Cost of electricity = \$0.06/kwh (updated 2017 to reflect PRECORP rates)
- 4 Repair and maintenance costs estimated at \$0.10/1000 gallons
- 5 Process sampling and analysis costs estimated at \$0.10/1000 gallons
- 6 Labor costs are covered in GW REST

#### Wellfield Pumping Costs per 1000 Gallons

$$\frac{1000 \text{ gal}}{1} \times \frac{5 \text{ hp}}{20 \text{ gpm}} \times \frac{1 \text{ hr}}{60 \text{ min}} \times \frac{0.746 \text{ kwh}}{\text{hp}} \times \frac{\$ 0.060}{\text{kwh}} \times \frac{1}{0.8} = \$ 0.23313$$

Repair and Maintenance Costs per 1000 Gallons = \$ 0.10

Process Sampling and Analysis Costs per 1000 Gallons = \$ 0.10

**TOTAL GWS COSTS PER 1000 GALLONS = \$ 0.43**

## Ross Uranium Project Surety Update November 2016

### DEEP WELL INJECTION

#### Assumptions:

1. Pump 75 hp pumping at 50 gpm
2. Cost of electricity = \$0.06/kwh (updated 2017 to reflect PRECORP rates)
- 3 Repair and maintenance costs estimated at \$0.10/1000 gallons
- 4 Labor costs are covered in GW REST

#### Waste Disposal Pumping Costs per 1000 Gallons

$$\frac{1000 \text{ gal}}{1} \times \frac{75 \text{ hp}}{50 \text{ gpm}} \times \frac{1 \text{ hr}}{60 \text{ min}} \times \frac{0.746 \text{ kwh}}{\text{hp}} \times \frac{\$ 0.060}{\text{kwh}} = \$ 1.12$$

Repair and Maintenance Costs per 1000 Gallons = \$ 0.10

Chemical Costs per 1000 Gallons = \$ 0.15

Scale Inhibitor	= \$	0.10
Corrosion Inhibitor	= \$	0.05

TOTAL DEEP WELL INJECTION COSTS PER 1000 GALLONS = \$ 1.37



## Ross Uranium Project Surety Update November 2016

### FIVE YEAR MECHANICAL INTEGRITY TESTS (MIT)

#### Assumptions:

1. Based on actual operating costs
2. Use Pulling Unit for 1 hr/well at cost of \$28.50/hr.
3. Use MIT Unit for 1 hr/well at cost of \$28.50/hr.
4. Labor for operation of pulling unit will require 2 workers at \$26.44/hr
5. Labor for operation of MIT Unit will require 1 worker at \$26.44/hr

#### MIT Costs per Well

##### Equipment:

Pulling Unit					
1 hours	X	\$ 28.50	per hour		= \$ 28.50
MIT Unit					
2 hours	X	\$ 28.50	per hour		= \$ 57.00

##### Labor:

Pulling Unit					
1 hours	X	\$ 26.44	per hour X 2 workers		= \$ 52.88
MIT Unit					
2 hours	X	\$ 26.44	per hour		= \$ 52.88

**MIT COST PER WELL = \$ 191**

## Ross Uranium Project Surety Update November 2016

### MAIN PIPELINE REMOVAL

#### Assumptions:

1. Trenching with track hoe at 400 ft/day
2. Pipeline extraction and backfilling with track hoe at 300 ft/day
3. Trackhoe rental: \$1725/week (updated 2017)
4. Fuel cost: \$12.00/operating hour (updated from Caterpillar tables 2017)
5. Trackhoe operation requires 1 worker at \$25/hour
6. Pipeline extraction requires 2 workers at \$25/hour (in addition to trackhoe operator)
7. Pipelines removed simultaneously
8. Includes removal of manholes
9. Operating schedule: 8 hrs/day, 5 days/week

#### Main Pipeline Removal Costs per ft of Trench

##### Equipment

###### Trackhoe

$$\frac{\$ 1725}{\text{week}} \times \frac{1 \text{ week}}{5 \text{ days}} \times \frac{1 \text{ days}}{300 \text{ ft}} = \$ 1.15$$

###### Fuel

$$\frac{\$ 12}{\text{hour}} \times \frac{8 \text{ hrs}}{1 \text{ day}} \times \frac{1 \text{ days}}{300 \text{ ft}} = \$ 0.32$$

##### Labor

###### Track hoe Operation

$$\frac{\$ 25}{\text{man hr}} \times \frac{8 \text{ man hrs}}{1 \text{ day}} \times \frac{1 \text{ days}}{300 \text{ ft}} = \$ 0.67$$

###### Pipeline Extraction

$$\frac{\$ 25}{\text{man hr}} \times \frac{16 \text{ man hrs}}{1 \text{ day}} \times \frac{1 \text{ day}}{300 \text{ ft}} = \$ 1.33$$

**MAIN PIPELINE REMOVAL COST PER FT OF TRENCH = \$ 3.47**

## Ross Uranium Project Surety Update November 2016

### WELLFIELD PIPING REMOVAL

#### Assumptions:

1. Trenching with backhoe at 2000 ft/day
2. Pipeline extraction and backfilling with backhoe at 2000 ft/day
3. Backhoe rental: \$855/week (\$3,700/mo. updated 2017)
4. Fuel cost: \$7.25/operating hour (updated from Caterpillar tables 2017)
5. Backhoe operation requires 1 worker at \$25/hour
6. Pipeline extraction requires 1 workers at \$25/hour (in addition to backhoe operator)
7. Operating schedule: 8 hrs/day, 5 days/week

#### Wellfield Pipe Removal Costs per ft of Pipe

##### Equipment

###### Backhoe

$$\frac{\$ 855}{\text{week}} \times \frac{1 \text{ week}}{5 \text{ days}} \times \frac{1 \text{ days}}{1500 \text{ ft}} = \$ 0.11$$

###### Fuel

$$\frac{\$ 7.25}{\text{hour}} \times \frac{8 \text{ hrs}}{1 \text{ day}} \times \frac{1 \text{ days}}{1500 \text{ ft}} = \$ 0.04$$

##### Labor

###### Backhoe Operation

$$\frac{\$ 25}{\text{man hr}} \times \frac{8 \text{ man hrs}}{1 \text{ day}} \times \frac{1 \text{ days}}{1500 \text{ ft}} = \$ 0.13$$

###### Pipeline Extraction

$$\frac{\$ 25}{\text{man hr}} \times \frac{8 \text{ man hrs}}{1 \text{ day}} \times \frac{1 \text{ day}}{1500 \text{ ft}} = \$ 0.13$$

**WELLFIELD PIPE REMOVAL COST PER FT OF PIPE = \$ 0.41**

## Ross Uranium Project Surety Update November 2016

### WELLFIELD ROAD RECLAMATION

#### Assumptions

1. Gravel road base removed at cost of \$96/1000 ft (WDEQ Guideline No. 12, App. C, Level Ground, 500 ft haul)
2. Gravel road base: average depth = 0.3 ft, average width = 12 ft
3. Roads scarified prior to topsoil application at cost of \$57.80/acre (WDEQ Guideline No. 12A)
4. Grading of scarified roads prior to topsoil application at cost of \$65.91/acre (WDEQ Guideline No. 12A)
5. Topsoil applied at cost of \$0.72/cy (WDEQ Guideline No. 12A Level Ground, 500 ft haul)
6. Stripped topsoil: average depth = 1.5 ft, average width = 16 ft
7. Disking/seeding cost of \$350 acre is based on LQD recommendation and LQD Guideline 12A.

Gravel Road Base Removal Costs per 1000 ft of Road

$$\frac{1000 \text{ ft}}{1000 \text{ ft}} \times \frac{0.30 \text{ ft}}{0.30 \text{ ft}} \times \frac{12 \text{ ft}}{12 \text{ ft}} \times \frac{1 \text{ cy}}{27 \text{ ft}^3} \times \frac{\$0.72}{\text{cy}} = \$ 96$$

Scarification Costs per 1000 ft of Road

$$\frac{1000 \text{ ft}}{1000 \text{ ft}} \times \frac{16 \text{ ft}}{16 \text{ ft}} \times \frac{1 \text{ acre}}{4.356 \times 10^4 \text{ ft}^2} \times \frac{\$57.8}{\text{acre}} = \$ 21$$

Grading Costs per 1000 ft of Road

$$\frac{1000 \text{ ft}}{1000 \text{ ft}} \times \frac{16 \text{ ft}}{16 \text{ ft}} \times \frac{1 \text{ acre}}{4.356 \times 10^4 \text{ ft}^2} \times \frac{\$65.91}{\text{acre}} = \$ 24$$

Topsoil Application Costs per 1000 ft of Road

$$\frac{1000 \text{ ft}}{1000 \text{ ft}} \times \frac{1.50 \text{ ft}}{1.50 \text{ ft}} \times \frac{16 \text{ ft}}{16 \text{ ft}} \times \frac{1 \text{ cy}}{27 \text{ ft}^3} \times \frac{\$0.72}{\text{cy}} = \$ 640$$

Disking/Seeding Costs per 1000 ft of Road

$$\frac{1000 \text{ ft}}{1000 \text{ ft}} \times \frac{16 \text{ ft}}{16 \text{ ft}} \times \frac{1 \text{ acre}}{4.356 \times 10^4 \text{ ft}^2} \times \frac{\$350}{\text{acre}} = \$ 129$$

**TOTAL WELLFIELD ROAD RECLAMATION COSTS PER  
1000 FT OF ROAD**

**= \$ 910**

## Ross Uranium Project Surety Update November 2016

### NON CONTAMINATED WASTE TRANSPORT AND DISPOSAL AT MOORCROFT LANDFILL

#### Assumptions:

1. 20 yd<sup>3</sup> per load
2. 46 miles to Moorcroft Landfill roundtrip
3. Transportation at \$3.00 per mile
4. Disposal fee at \$200/ ton

#### Non Contaminated Waste Transport

$$\frac{46 \text{ miles}}{1 \text{ mile}} \times \$3.00 = \$138.00 \text{ 20 tons}$$

#### Non Contaminated Waste Disposal Cost

\$4,000.00 20 tons

**Total NON CONTAMINATED WASTE TRANSPORT AND DISPOSAL**      \$338.00 per ton

## Ross Uranium Project Surety Update November 2016

### 11E2 BY PRODUCT CONTAMINATED WASTE TRANSPORT AND DISPOSAL

#### Assumptions:

1. 30 yd3 per load
2. 470 miles to Shirley Basin 11E2 disposal facility (round trip)
3. Transportation at \$3.00 per mile
4. Disposal fee at \$300/yd3 (\$11.11/ft3)

#### 11E2 By Product Waste Transport

$$\frac{470 \text{ miles}}{1 \text{ mile}} \times \$3.00 = \$1,410.00 \text{ 30 yd3}$$

#### 11E2 By Product Waste Disposal Cost

\$11.11 ft3

**Total 11E2 BY PRODUCT CONTAMINATED WASTE TRANSPORT AND DISPOSAL      \$12.85 ft3**

## Ross Uranium Project Surety Update November 2016

### Abbreviations/Acronyms

\$	Dollars
\$/Kgal	Dollars per 1000 gallons
avg	average
CBW	Containment Barrier Wall
cy	cubic yard
DDW	Deep Disposal Well
FG	Fiberglass
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
PVD	Pore Volume Displacement
reqm't	requirement
RO	Reverse Osmosis
yd3	cubic yards
yr	year