

Basis for Estimated Cost for the Ambrosia Lake Facility Reclamation and Stabilization

Introduction

The Ambrosia Lake Site is a uranium recovery facility that is currently undergoing reclamation and decommissioning. The site current status has the tailings areas entirely closed and the erosion protection in place. The mill is currently standing, but demolition is anticipated to start before the 4th Quarter of Calendar Year 2003. The site is continuing to operate a groundwater corrective action program to remediate two tailings contaminated groundwater plumes, and with the submittal and review of the Alternate Concentration Limits petition, it is anticipated that the life of this program is limited to the current calendar year. The site has completed significant cleanup of windblown tailings and is in the process of completing a soil cleanup verification plan that will address release criteria for the entire site.

Description

The following description of reclamation and decommissioning work units is based on current remaining work at the site. Each work unit is described with respect to the scope of work and basis of cost. The cost listing is found in Table 1.

- A. Tailings Areas – All of the work units in this section have been completed and/or removed from license requirements by amendment. There are no future costs associated with these work units.
- B. Rock Protection – Erosion protection facilities for tailings and disposal areas.
 - 1. Pond 1 Tailings Pile Cover – The entire cover and slopes along Pond #1 has been completed prior to June 30, 2002.
 - 2. Pond #1 Toe Protection and Run-off aprons – This work unit is based on a 1999 inspection by NRC and a follow-up visit by NRC and DOE (LT Custodian) regarding excessive erosion on the toe trenches along the north and southeast embankments. Additionally, NRC required that the potential for headcutting from runoff along the drop to the Arroyo del Puerto be addressed through an engineered design. Both these requirements increased the erosion protection to include additional diversion channels and run-off aprons.
 - a. Rock Haul – 55,795 yards of rock will be required.
 - b. Contouring and Placement – Work unit includes the channel construction, rock placement, and hand placement of large rock.
 - 3. Pond #2 South Half – Placement of rock on Pond #2 is complete. Remaining work entails the installation of the run-on/run-off aprons. This work will be completed in the summer of 2003. Rock Haul – 2,600 yards of rock. A small portion of this rock will be purchased new. The majority is in inventory at the site. Contouring and Placement – Work unit includes the cost to install the run-on apron (complete) and the run-off apron (50% complete).
 - 4. Pond #2 North Half – This is the location of the byproduct disposal areas. The radon barrier is installed and compacted, protective soil cover is in place. All of the rock has been purchased and is inventoried at the site. Costs for this work unit is the placement of rock, installation of run-on aprons and toe into the west outslope of pond #1.

5. **Pond #3** – This pond is a former decant pond used during the historic milling activities. During reclamation, it is the disposal cell for all of the tailings contaminated soils recovered from the windblown cleanup activities. Due to the volume of material disposed into Pond #3, the final elevation will be significantly higher than originally planned in the original approved closure plan. A revised erosion protection design plan for Pond #3 was submitted on May 16, 2002 and approved by NRC. The costs for closure of Pond #3 is provided below:

- a. **Rock Haul** – 79,450 yards of new rock will be purchased and hauled to the site.
- b. **Placement and contouring** – This portion of the work unit includes the labor and equipment to compact the soils, install a radon barrier from a nearby borrow area (if needed), contour to design grade, place rock mulch, construct toes and embankments. The cost includes QA/QC on compaction, radon flux measurements, QA/QC on rock placement and gradations.

C. **Evaporation Ponds** – This group of work units encompasses all of the lined and unlined evaporation ponds at the site.

1. **Unlined Evaporation Ponds** – These ponds operated from 1957 to the early '80's as the primary liquid effluent disposal system for the mill. After dewatering, these ponds have been excavated to remove the primary Ra-226 contaminants. Characterization indicates that there is deeper concentrations of Th-230 that exceed a safe excavation depth. These ponds have been closed and backfilled to grade to prevent any windblown contamination from the pond bottoms. The intent is to close these ponds using alternate release criteria within the site LTS boundary.
 - a. **Pond 4** – Up to 4 – 5 feet of pond soils have been excavated and disposed into the Pond #3 disposal area. The pond has been backfilled to grade with soils obtained from the borrow area. The work unit cost estimates remaining are the labor and equipment costs, radiation safety and revegetation expenses to complete the final contour and stabilize the surface.
 - b. **Pond 5** - Up to 3-4 feet of pond soils have been excavated and disposed into the Pond #3 disposal area. The pond has been backfilled to grade with soils obtained from the borrow area. The work unit cost estimates remaining are the labor and equipment costs, radiation safety and revegetation expenses to complete the final contour and stabilize the surface.
 - c. **Pond 6** - Up to 3-4 feet of pond soils have been excavated and disposed into the Pond #3 disposal area. The pond has been backfilled to grade with soils obtained from the borrow area. The work unit cost estimates remaining are the labor and equipment costs, radiation safety and revegetation expenses to complete the final contour and stabilize the surface.
 - d. **Pond 7** – The excavation has been completed, and the surface has been re-contoured to grade, mulched and seeded. The work unit cost remaining covers any future reseeding and radiation surveys for final characterization.
 - e. **Pond 8** - The excavation has been completed, and the surface has been re-contoured to grade, mulched and seeded. The work

unit cost remaining covers any future reseeding and radiation surveys for final characterization

- f. **Reclamation of Soil Borrow Areas** – The locations of the borrow sites will be reclaimed, top-soiled, and re-vegetated. There are two principle soil borrow areas. One to the north on Section 30 and one to the east of Pond 8.
2. **Lined Evaporation Ponds** – This section of work units covers the lined evaporation ponds that are located near the tailings disposal areas, pond 9 and the former pond 10. Also, the closure costs associated with the closure of the interceptor trench system that is tied to the groundwater corrective action program.
 - a. **Pond 9** – An active lined evaporation pond used almost exclusively for handling groundwater captured through the interceptor trench system. The plan for closure of pond 9 entails the dewatering of the sediments, removal of the liner and sediments and placing them at the base of the main intercept trench. Costs associated with this work unit includes labor and equipment to remove the dewater the sediments, relocate the liners and sediments to the base of the main intercept trench, compaction, cleanup of contaminated soils, contouring of the former pond location, radiation safety, soil sampling, QA/QC, and revegetation.
 - b. **Pond 10** – Former lined evaporation pond located adjacent to Pond 9. The pond has been reclaimed, and the work unit costs are associated with the characterization of the soils, additional cleanup of hot spots, contouring, radiation safety, and revegetation.
 - c. **Interceptor Trench System** – The main intercept trench lies parallel to the edge of pond 3. The cost associated with this work unit includes labor and equipment for backfilling of the trench to grade with the closure plan for pond 3, compaction, radiation safety, and QA/QC. The trench will be covered by the outslope of pond 3.
3. **Section 4 Lined Ponds (11-21)** – These ponds are located southeast of the mill facility. These ponds were constructed in the late '70's and early '80's and constitute the primary liquid effluent disposal for the facility. These ponds consume 240 acres and contain approximately 750,000 yards of materials. Under the anticipated closure approach, ponds 16 –21 will be dewatered and relocated to ponds 11-15. The material will be consolidated and compacted. Ponds 11-15 will be covered with an engineered cover and erosion protection. The site is anticipated to be transferred to the Department of Energy for long-term care.
 - a. **Remove Contaminated Material (16-21)** – Work unit includes the dewatering and removal of pond sediments, liners and contaminated soils and placement in ponds 11-15. The costs estimated in this work unit include labor and equipment, radiation safety, surveys, and QA/QC for the soil cleanup.
 - b. **Consolidation of material** – Work unit covers the consolidation of the materials in 11-21 for closure, including dewatering and compaction. Costs include labor and equipment, radiation safety, geotech testing, and QA/QC.

- c. Closure and Stabilization – Placement of the interim cover and stabilization. Work unit costs include labor and equipment, radiation safety, geotech testing and QA/QC.
 - d. Radon Barrier installation – Placement of compacted clays and silt from a nearby borrow location. Costs include labor and equipment, geotech testing, radon flux testing, and QA/QC.
 - e. Rock Haul – It is anticipated that due to the location of the closed ponds, they will be located in an area that will require some form of rock armor and mulch to ensure long-term stability. Rock will be hauled in from off-site.
 - f. Placement and contouring – Labor and equipment for the contouring of the cover and the surrounding area to grade and the placement of rock, and QA/QC.
 - g. Revegetation – Soil stabilization of the area where the former ponds 16-21 were located and other disturbed areas related to the closure of the lined pond. Costs cover labor and equipment, seed, mulch, and QA/QC.
- D. Clean Up Windblown and Tailings Contaminated Material – The areas that fall under this work area include north, south and east of the tailings areas and the areas adjacent to the unlined and lined evaporation ponds. These areas do not include the areas located within the mill area.
- 1. Section 30 Area – Complete
 - 2. Section 5 Area – Complete
 - 3. Section 32 and Area North of Pond 9 – Complete
 - 4. Additional Surveys – Re-surveys of previously released areas and re-contaminated by recent activities (e.g. windblown sediments from unlined ponds). This also includes the work for the development of background conditions and release levels. Cost includes labor and equipment, radiation safety, surveys, sampling, and QA/QC.
 - 5. Area N & E of Pond 1 – This is the area is currently too wet to cleanup as a result of ongoing licensed activities (e.g CAP surface discharges). The costs associated with this work unit are labor and equipment, radiation surveys, disposal, re contouring to grade.
 - 6. Soils Verification – Verification of prior cleanup. Costs include labor and equipment to conduct the gamma survey, sampling, and QA/QC.
 - 7. Revegetation of Disturbed Areas – Upon completion of the cleanup and verification, the disturbed areas will be re-vegetated. Costs include labor and equipment, mulch, seed and verification.
- E. Mill Decommissioning – This work unit includes the cost to demolish the mill and associated buildings and dispose of the residual material into the designated disposal areas. Costs are based on current contractor quotes to conduct the work. Costs estimates do not reflect any salvage values.
- 1. Asbestos Abatement – The mill has significant areas that are asbestos containing, principally the transite siding and some of the piping and floor tiles. Costs reflect the labor to perform the abatement as required under State regulations and includes the removal of the siding and disposal.
 - 2. Mill Structures Demolition – Based on contractors quote to demolish and dispose of all of the remaining mill structures and buildings that will not be required for future reclamation activities. Work is according to the plan submitted to NRC dated December 2002. Includes radiation safety and industrial safety supervision and monitoring.

3. Shop/Warehouse Removal – Buildings associated with ongoing reclamation activities. Costs are for characterization, demolition and disposal.
 4. IX Building – Upon authorization to cease the operation of the CAP, the IX plant will be demolished and disposed. Costs are associated with labor and equipment, radiation safety, industrial safety, and disposal.
 5. Administrative Building – This is the office building. The building will be demolished and disposed as per the plan. The costs are associated with industrial safety, labor and equipment.
 6. Soils Cleanup and verification – As per the tailings contaminated area, but limited to the mill areas.
 7. Mill Pond Reclamation – The dam will be breached and the mill pond will be backfilled and closed to match the surface grade.
 8. Contouring and vegetation – Re-contouring of the former mill location and vegetation to provide surface stability.
- F. Groundwater Remediation – The application for Alternate Concentration Limits has been submitted to NRC for review and approval. The plan anticipates that those limits will be approved in early 2004. That will be followed by a cessation of the CAP and the change of the program to stability monitoring followed by the reclamation of the monitor wells.
1. CAP operation – Anticipates the continued operation of the CAP for 9 months. This anticipates the approval of the Alternate Concentration Limit application and the cessation of pumping.
 2. Monitoring – Stability monitoring for 1 year, including sample analysis, labor, equipment and QA/QC.
 3. Well Closure – Cost to reclaim the wells not included in the LTS plan. Includes plugging, capping and surface restoration.
 4. Old Stope Leaching – This work unit is associated solely with Section 24 and the authorized chemical addition for the Stopes Leaching. This program was very limited, and discontinued after a short operation. Costs for closure match the closure program approved by the State of New Mexico at the other OSL areas.
 - a. Shaft Reclamation – Recovery of the pumps and closure of the shaft.
 - b. Ventilation Holes – Closure of the vent holes as per the approved State program
 - c. Injection holes – Closure as approved by the State of New Mexico.
 - d. Site Reclamation – Re-contouring of disturbed areas.
 - e. Re-vegetation – Mulching and reseeding.
- G. De-Minimus 11(e)2 Byproduct Disposal – This is the direct disposal activity authorized by License Condition 41. To date there have been no significant quantities of byproduct disposal, and as a result, there is currently no need to add any additional reclamation costs to the disposal area. The costs associated with this work unit are in anticipation of the receipt of 50% of the annual volume allowed under License Condition 41.
1. Disposal Area Radon Barrier – Costs associated with additional radon cover required with additional byproduct material disposed in the authorized areas.

2. Disposal Area Rock Cover – Costs associated with purchasing additional rock to address any changes in elevation related to byproduct disposal activities.
 3. Salary/Management – Overhead costs associated with byproduct disposal.
 4. Soil Testing – Soil and compaction testing
 5. Radiation / Health and Safety – Management and monitoring of the radiation safety and industrial hygiene programs.
- H. Site Management – Estimated cost for the administration of the reclamation program at the site. Based on actual costs for the site.
- I. Overhead and Profit – Contractor overhead and profit estimated at 10% of the cost for the above work units.
- J. Long-Term Surveillance and Monitoring - \$250,000 (\$1978) adjusted for inflation using CPI (April 2003)
- K. Contingency – Estimated at 15% of all costs.

		WORK UNIT	NRC 2003-2004 BOND AMOUNT (\$000)
A		TAILINGS AREAS	
		Pond 1 Interim Cover	Complete
		Pond 2 Interim Cover	Complete
		Pond 1 Low Perm Layer	Complete
		Pond 1 Radon Barrier Foot 1	Complete
		Pond 1 Radon Barrier Foot 2	Complete
		Pond 1 Radon Barrier Foot 3	Deleted by Amendment #31
		Pond 2 Low Perm Layer	Complete
		Pond 2 Radon Barrier Foot 1	Complete
		Pond 2 Radon Barrier Foot 2	Complete
		Pond 2 Radon Barrier Foot 3	Deleted by Amendment #31
		Pond 1 Erosion Cover	Deleted by Amendment #29
		Pond 2 Erosion Cover	Deleted by Amendment #29
		Pond 3 Cover	Deleted by Amendment #31
		SUB-TOTAL	0
		Pond 2 Sand Contour	Complete
		Pond 2 Fill to Grade South of "R" Line	Complete
		SUB-TOTAL	0
B		Rock Protection	
	1	Pond #1 Tailings Pile Cover	complete
	2	Pond #1 Toe Protection and Runoff aprons	
	a	Rock Haul	220
	b	Placement and Contouring	400
		Pond #2	
	3	Pond #2 South-half (closed)(run-on/run-off aprons)	247
	4	Pond #2 North-half (byproduct disposal area)	300
	5	Pond #3	
	a	Rock Haul	1,717
	b	Placement and Contouring	1,296
		SUB-TOTAL	4,180

		WORK UNIT	NRC 2003-2004 BOND AMOUNT (\$000)
C		EVAPORATION PONDS	
	1	Contour and/or Cover Unlined Ponds	
	a	Pond 4 (final contour and re-seeding)	67
	b	Pond 5 (final contour and re-seeding)	66
	c	Pond 6 (final contour and re-seeding)	66
	d	Pond 7 (re-seeding)	12
	e	Pond 8 (re-seeding)	13
	f	Reclamation of Soil Borrow Sites	140
		Un-Lined Evaporation Ponds Sub-Total	364
	2	Lined Ponds	
	a	Pond 9	585
	b	Pond 10	40
	c	Interceptor Trench	266
		Lined Evaporation Ponds Closure	891
	3	Section 4 Ponds (Lined Evaporation Ponds 11-21)	
	a	Remove Contaminated Material (16-21)	250
	b	Consolidation of material (16-21)	440
	c	closure and stabilization (11-15)	80
	d	Radon Barrier installation	360
	e	Rock Haul	1,100
	f	Placement and contouring	250
	g	Revegetation	250
		Section 4 Ponds Sub-Total	2,730
		SUB-TOTAL (Evaporation Ponds)	3,985
D		Clean Up Tailings Contaminated and Windblown Material	
	1	Section 30 Area	Complete
	2	Section 5 Area	Complete
	3	Sec. 32 & Area N. of Pond 9	Complete
	4	Additional Survey	100
	5	Area N. and E of Pond 1	100
	6	Soils verification	115
	7	Re-vegetation of disturbed areas	150
		SUB-TOTAL	465
E		Mill Decommissioning	
	1	Asbestos Abatement	575
	2	Mill Structures Demolition	1,678
	3	Shop/Warehouse Removal	500
	4	IX Building	100
	5	Administrative Building Removal	100
	6	Soils Cleanup and verification	100
	7	Mill Pond Reclamation	75
	8	Contouring and vegetation	200
		Mill Decommissioning Sub-Total	3,328

	WORK UNIT	NRC 2003-2004 BOND AMOUNT (\$000)
F	Groundwater Cleanup	
1	CAP Operation	725
2	Monitoring	78
3	Well Closure	82
	CAP Operation and Closure Sub-Total	885
4	Old Stope Leaching (Section 24)	
a	Shaft Reclamation	6
b	Ventilation Holes	8
c	Injection Holes	10
d	Site Reclamation	2
e	Re-vegetation	4
	Section 24 Closure Subtotal	30
	Groundwater Sub-Total	915
G	De-Minimis 11(e)2 Disposal	
1	Disposal Area Radon Barrier	54
2	Disposal Area Rock Cover	69
3	Salary/Management	10
4	Soil Testing	3
5	Radiation/Health Safety	9
	Sub-Total	145
H	Site Management	1,252
	Total Closure Costs	14,270
I	Overhead and Profit at 10%	1,427
J	Long-Term Surveillance and Monitoring	705
	Sub-Total	15,680
K	Contingency at 15%	2,352
	Total Closure Costs	18,032