



Prepared For:



Mr. Vern C. Rogers
Manager Compliance and Permitting
EnergySolutions
423 West 300 South, Suite 200
Salt Lake City, Utah 84101

*Closure and First-Year Post-Closure
Cost Estimate Forecasts for
EnergySolutions Clive, Utah Complex*

October 2016 (rev.)

Prepared By:

ERM-West, Inc.
136 E. South Temple
Suite 2150
Salt Lake City, UT 84111
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October 24, 2016

Mr. Vern C. Rogers
Manager Compliance and Permitting
EnergySolutions
423 West 300 South, Suite 200
Salt Lake City, Utah 84101



**RE: *Revised Closure and First-Year Post-Closure Cost Estimate
Forecasts for EnergySolutions Clive, Utah Complex***

Dear Vern,

ERM-West, Inc. (ERM) is pleased to submit this revised Closure and first-year Post-Closure Cost Estimate Forecast (Forecast) for EnergySolutions (ES) Clive, Utah Complex (Complex). This 2016 Forecast replaces in whole the original Forecast prepared by ERM dated October 14, 2015, based on input received from ES and the Utah Department of Environmental Quality, Division of Waste Management and Radiation Control (UDEQ). The purpose for this forecast is to provide ES with alternative (independent) cost estimates for Closure and Post-Closure financial assurance purposes in accordance with Utah Code 19-3-104(12)(c)(ii)(A), effective July 1, 2015. This rule allows financial assurance to be based on "a competitive site-specific bid for closure and post-closure care of the facility." This Forecast was prepared by ERM in a manner to meet the criterion of a "bid" as defined by the legislation as explained in this summary report.

ERM's estimate includes the decommissioning, decontamination, demolition, and closure of the Complex facilities. The information used to complete the forecast was compiled during a site visit in which the Complex facilities were visually inspected and documents for previous closure analyses were provided by ES for ERM use.

EXECUTIVE SUMMARY

The ES Clive, Utah Complex Closure and First-Year Post-Closure Cost Estimate Forecast was performed by Mr. David Wilson, Mr. Alex Cates, Mr. Kenneth Dow, and Mr. Garrett Rigard, who work across multiple ERM practices, including Decommissioning, Decontamination, and Demolition (DDD). Mr. Cates and Mr. Dow have considerable experience in the DDD of chemical, power, and

heavy manufacturing industry facilities. Mr. Wilson and Mr. Rigard have significant experience in landfill design, construction, operation, closure and remediation.

The purpose for this Forecast is to provide ES with cost estimates for Closure and Post-Closure financial assurance purposes to satisfy its permit obligations with the UDEQ and other agencies. It also provides ES with an estimate for closure and post-closure planning purposes, including detailed information on material quantities and estimated costs for overall budgeting of final Complex decommissioning.

The elements of the Forecast are listed below and described in the sections that follow.

- Methods for Determining Cost;
- Unit Cost Pricing;
- Contingencies;
- Assumptions and Guidelines; and
- Summary of Estimated Costs.

The Excel spreadsheets containing the cost estimate details are provided on a compact disc with this summary report, and printed pages of the spreadsheets are provided to document the Summary of Estimated Costs. The spreadsheets present the costs in terms of significant structures and ancillary facilities, as grouped by area.

The overall Closure Cost Forecast for the ES Clive, Utah Complex is **\$62,800,000** (rounded). The First-Year Post Closure estimated cost is **\$427,000** (rounded).

METHODS FOR DETERMINING COST

The Cost Estimate Forecast was developed based upon a site visit spanning three days between May 18 and 21, 2015, where Complex facilities were visually inspected and ES documents were reviewed. Building and structure details were compiled from the site inspection and documents provided during the site visit. The ERM field team estimated the effort to complete DDD of Complex structures and other

closure activities using standard labor and equipment typically used to perform work of this magnitude.

Dimensions, quantities, and assumptions provided in ES documents were verified or modified based on information obtained during the site visit and the application of industry standards.

UNIT COST PRICING

Because of the magnitude of this project, ERM used unit cost pricing, much of which is based upon ERM's expertise and extensive experience on similar DDD, remediation and site closure projects. ERM also relied upon actual ES unit costs for select activities (e.g., deflocculant addition to clay liner) where applicable.

ERM develop specific unit rates (or cost modules) for the majority of activities required for DDD and closure of the Complex structures and facilities (e.g., unit rates for demolition of asphalt, footings, steel sided building, and movement/placement of soil, etc.). Notes and tabs showing the breakdown of the unit rates are found within the cost estimation spreadsheets. Attachment 1 presents an example unit cost development module for soil materials excavation, transportation, and placement for informational purposes.

WORK BREAKDOWN STRUCTURE

The Forecast has been broken down into separate and definable work areas, similar to the method ES has previously used to compile its cost estimate forecasts. ERM used the various waste cell areas as a framework. Each work area has a detailed closure cost that was estimated separately, independently, and tabulated on a summary worksheet. The work areas are as follows:

- Mixed Waste Part B
- Class A West (LLRW)
- 11e(2)
- Unrestricted Areas (outside Section 32, per request by UDEQ)
- 1-year Post Closure (maintenance and monitoring)

The Forecast spreadsheet contains a cost summary tab followed by tabs that break down the costs for each work area (i.e., surety spreadsheets). The surety spreadsheets are fed by a Unit Price tab, which in-turn is fed by the Unit Price tabs for each price/operation module. Calculations for the equipment volume and disposal are provided on the "Equip Rpt 2014" tab as provided by ES.

CONTINGENCIES AND ADDITIONS

Specific additions have been applied to the subtotaled direct capital costs for each area Forecast based on permit requirements and/or ERM judgement. Specifically, a contingency of 10% (industry standard) of the direct estimated costs was added to cover potential unknown conditions and small items that did not receive direct attention and estimating. ES and ERM evaluated the validity of the 10% contingency by assessing the potential risks of impacts and costs for additional soil removal from areas of highest potential impact and confirmed that the contingency included in the surety is more than 5-times the cost of potential (worst-case) soil impacts based on ES experience.

In addition to the 10% contingency, other costs were considered, and estimated as appropriate, based on a percentage of the direct costs, including (remote) working conditions (5.5%), engineering and redesign (2.25%), profit and overhead (15%), management fee and legal expenses (4%), regulatory agency oversight (4%), and applicable maintenance and monitoring during closure work. These costs are broken down on the cost estimation worksheets for each area. The cost for mobilization/demobilization is included in ERM's 19% minor tools and equipment (MTE) addition to each unit price module, so a separate percentage was not added for this item in ERM's Forecasts.

ASSUMPTIONS AND GUIDELINES

During the site inspection, there were numerous conversations between ERM and ES representatives regarding the cost estimate. In these discussions many assumptions and generalizations were agreed upon to be used as guidelines for pricing of Closure and Post-Closure activities. The significant guidelines are as follows:

- Only include costs for items within the permitted area (Section 32) for the LLRW, MW and 11e(2) areas. A separate spreadsheet tab was added at the request of UDEQ to account for closure of facilities in the "Unrestricted Area" outside of Section 32.

- Low-level Radioactive Waste (LLRW) cap construction will remain a multi-layer, protective cover although an alternative evapotranspiration (“ET”) cover design is under consideration by ES and UDEQ.
- The existing shredder can be used for concrete waste (if mixed with steel appropriately), thus eliminating the need to purchase and dispose of a crusher. The cost estimate includes provision of rental generator equipment, under an assumption that the current power equipment (outside Section 32) may not be available for use during closure.
- Equipment disposal volume was calculated using a pounds-per-cubic-yard (lbs/cy) conversion instead of the physical dimensions (length, width, height) calculation used previously. The physical dimensions do not allow factoring for compaction or air space and voids within the piece of equipment or vehicle. This revised approach significantly reduces the disposal volume and is more indicative of the actual waste volume to be managed during closure.
- Facility equipment will continue to be maintained until closure activities begin and annual maintenance costs have been included in the surety calculations as separate and distinct line items. Having this equipment available could reduce the cost of renting or purchasing equipment needed during closure activities. However, ERM’s cost modules are based on assumed use of rental equipment (except Shredder) as a conservative approach.
- Rental equipment costs obtained from a national rental company (i.e., United Rental), assuming use on a rent-to-own basis, have been used to develop ERM’s unit cost modules.
- When appropriate, apply the triple rinse decontamination method to mixed waste items for disposal in the LLRW cell.
- ES provided clarification on which specific items throughout Section 32 should be decontaminated. Details regarding which items will be decontaminated are provided on the cost estimation spreadsheets.

- Guidelines for waste processing rates, precipitation and evaporation, borrow sources, health physics staffing, and environmental sampling where provide by ES.
- The cost for recovering, cleaning and selling salvageable materials is equal to the value obtained

SUMMARY OF ESTIMATED COSTS

The estimated costs are presented in Attachment 1, which is a detailed breakdown of the Cost Estimate Forecasts.

A summary of the costs is presented below:

Mixed Waste Part B	\$ 11,700,000
Class A West (LLRW)	\$ 40,500,000
11e(2)	\$ 9,000,000
Unrestricted Areas	\$ 1,600,000
Overall Total Cost	\$ 62,800,000
1-Year Post Closure Cost	\$ 427,000

ERM estimates that the closure construction activities will require approximately 2 years of work. However, the time for completion will be 3 years, due to one year of settlement monitoring to be performed for the LLRW facility after placement of temporary cover. It is assumed that closure of the LLRW operations and cell will be performed first, and other areas will closed during the year of settlement required for the LLRW cell, such that only one mobilization/demobilization period will be required.

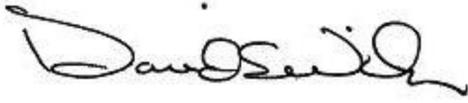
A detailed estimate of the schedule by area and surety cost element is presented on Figure 1 (attached). This closure schedule was developed using Microsoft Project software assuming mobilization for closure begins during December 2015, and formal closure activities begin at the start of 2016. However, these dates have been selected arbitrarily and actual closure dates will occur when site closure actually begins, but the task durations and links between preceding and following tasks are believed to provide efficient performance of the work. This schedule

was developed based on input from ES and ERM's DDD experience with similar sites, structures and operations.

We appreciate the opportunity to complete this work for ES. If you have any questions, please contact us at (801) 204-4300.

Sincerely,

ERM-West, Inc.



David Wilson, P.E., P.G.
Partner-in-Charge



Garrett Rigard
Project Manager

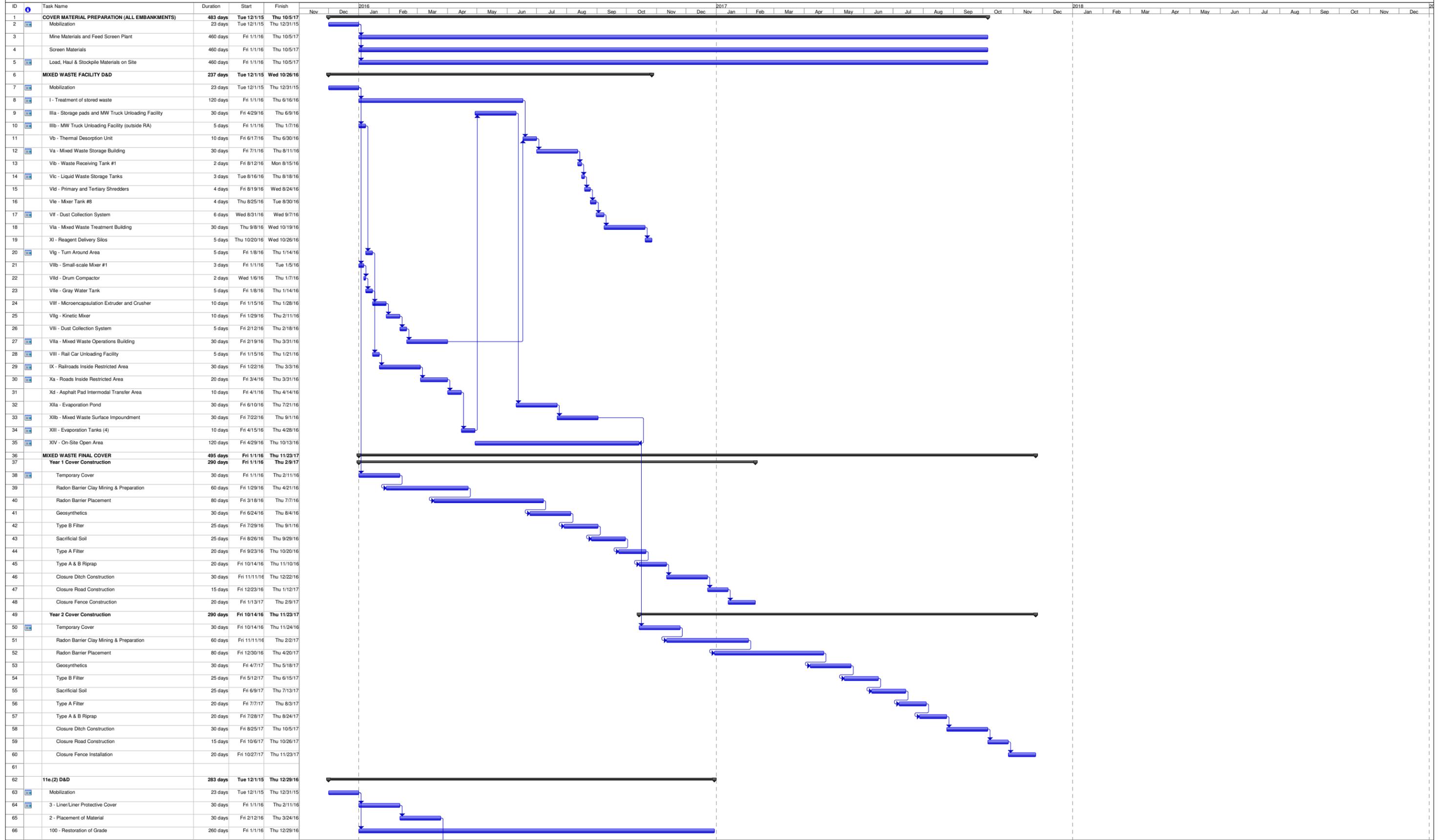
Figure 1 – Estimate Closure Schedule

Attachment 1 – Example Module Cost Development

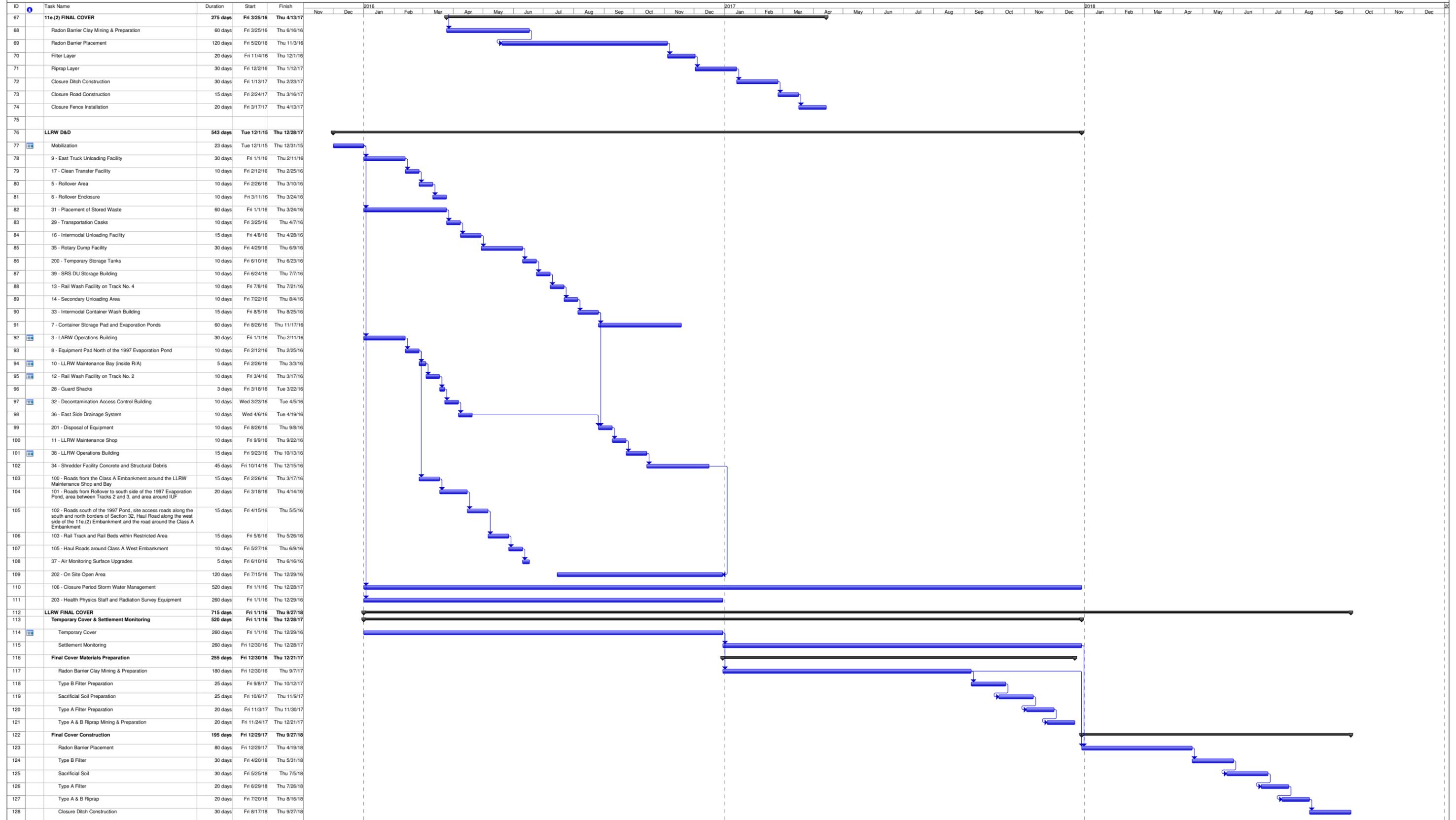
Attachment 2 – ERM Closure Cost Estimate Forecast

Figure 1
Estimated Closure Schedule

**FIGURE 1
ESTIMATED CLOSURE SCHEDULE
Energy Solutions - Clive Facility**



**FIGURE 1
ESTIMATED CLOSURE SCHEDULE
Energy Solutions - Clive Facility**



Attachment 1
Example Module Cost Development

EXAMPLE MODULE COST DEVELOPMENT

Example Pricing Module Description for Soil Excavation, Transport and Placement

The Cost Estimate Forecast prepared by ERM relies heavily upon two pricing modules that address the excavation of soil and the backfill and placement of soil. The pricing modules are named “Soil” (Soil) and “Soil Placement” (SP), respectively, and these same unit price modules were utilized for removing part of a liner as part of cell closure. The pricing modules have been developed using contractor pricing for rental of heavy equipment (i.e., rent-to-own pricing) from a national rental company (i.e., United Rentals), fuel, attachments (if applicable), and labor cost for the equipment operator and field labor. The removal of soil is programmed to be performed by 35-Ton off-road trucks, which make a 20-minute round trip from the site of excavation to the stockpile or disposal site. The pricing is built-up using the following rates:

Table 1

<u>Item Description</u>	<u>Rate</u>
1. 400 Series Trackhoe (400TH):	\$3,800/Week
2. 200 Series Trackhoe (200TH):	\$2,170/Week
3. 35-Ton Off-road Truck (ORT):	\$4,400/Week
4. Equipment Operator:	\$49/Hour
5. Equipment Tender/Laborer:	\$49/Hour
6. ORT Driver/Operator:	\$49/Hour
7. Heavy Equipment Fuel:	\$300/Day
8. ORT Fuel:	\$350/Day

The cost build-up for Soil is based upon a production average of 50 cubic yards of soil excavated per 30 minutes with a 400TH, operator and tender/laborer. Loadout cost is based upon a 200TH loading the ORT every 15 minutes. The circular haul route is based upon a 20 minute round-trip cycle in which 2 or 3 ORTs are running continuously; loading and dumping. These durations are conservative and designed to allow for average production rates aggregated over a long duration project (1.5 – 2 years) in which there are peaks and valleys of production as well as slowness attributed to weather and holidays.

The resulting cost per cubic yard of excavated soil is: \$8.84/cy.

The cost build-up for SP is based upon the same costing schedule as described above in Table 1, and is based upon placing 100 cubic yards of soil per hour. However, with SP, there is no need for load-out. This activity is for placement and compaction of the trucked soil (already available at the location for placement) to establish or re-establish grade. A smaller 200TH is utilized to place and spread soil. After placement, a grader is used to push and rough grade the soil. This module includes two heavy equipment operators and one tender/laborer and two units of fuel per 30 minute duration. The ORT cost is based upon 20 tons (32 cy) of soil being available/delivered every 20 minutes. The ORT cost includes the cost of the ORT driver (operator), weekly rental of the ORT and 20 minute unit of fuel.

The resulting cost per cubic yard of excavated soil is: \$4.78/cy.

As a point of reference, the *Cost Estimating Guide for Road Construction*, published March 2012 by United States Department of Agriculture (USDA) Forest Service Intermountain Southwestern Rocky Mountain Regions Engineering, which includes Utah, outlines a pricing guide in Section 212 for Linear Grading which assumes excavation costs at \$1.66/cy.

Attachment 2

ERM Closure Cost Estimate Forecast

Clive - Closure & First-Year Post-Closure Costs

Estimated Cost Summary

Mixed Waste Part B	\$	11,700,000
LLRW	\$	40,500,000
11e2	\$	9,000,000
Unrestricted Areas	\$	1,600,000
TOTAL ESTIMATED COST	\$	62,800,000
1st Year post closure	\$	427,000

Original Prepared by ERM, October 2015

Revised by ERM, October 2016

**2015 LLRW SURETY
QUANTITY CALCULATIONS AND ASSUMPTIONS**

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI
258	DEMOLITION																																	
259	Catch basin/manholes																																	
260	Assume 10 CY Each of Debris																																	
261	Debris																																	
262	4 Ea x 10 cy = 40.00 cy																																	
263	Pump Station																																	
264	Assume 2 CY Each of Debris																																	
265	Debris																																	
266	2 Ea x 2 cy = 4.00 cy																																	
267	Container Storage Pad																																	
268	Asphalt Pad																																	
269	Asphalt Pad																																	
270	Pad Base																																	
271	Soil																																	
272	Pad Berm (Assume Clean)																																	
273	1,040 ft long x 2 ft x 11 ft = 847.41 cy																																	
274	1995 and 1997 Evaporation Ponds																																	
275	Assume excavation of sump area beneath liners with a 2-foot offset																																	
276	1995 Pond																																	
277	1997 Pond																																	
278	Liner Removal																																	
279	Liner (estimated)																																	
280	Debris estimate (liner)																																	
281	Debris estimate (piping)																																	
282	Time to Shred Debris																																	
283	Excavation of Berms																																	
284	North Berm (clean; use as fill)																																	
285	South Berm (clean; use as fill)																																	
286	East Berm (clean; use as fill)																																	
287	West Berm (clean; use as fill)																																	
288	Total Berm Volume																																	
289	2000 LARW Evaporation Pond																																	
290	Assume excavation of sump area beneath liner with a 2-foot offset																																	
291	2000 Pond																																	
292	Liner Removal																																	
293	Liner (estimated)																																	
294	Debris estimate (liner)																																	
295	Debris estimate (piping)																																	
296	Time to Shred Debris																																	
297	Excavation of Berms																																	
298	North Berm (clean; use as fill)																																	
299	South Berm (clean; use as fill)																																	
300	East Berm (clean; use as fill)																																	
301	West Berm (clean; use as fill)																																	
302	Total berm volume																																	
303	Concrete Containment Trough and Spillway																																	
304	Curbing																																	
305	Curbing Volume																																	
306	Spillway surface																																	
307	Water Transfer Pad and Piping System																																	
308	Concrete Pad																																	
309	Curbing																																	
310	Curbing volume																																	
311	Sump Removal Volume																																	
312	2000 LARW Evaporation Pond Turnaround Area																																	
313	(area consists of road base material)																																	
314	Northwest Corner Pond (NWCP)																																	
315	Assume excavation of sump area beneath liner with a 2-foot offset																																	
316	NWC Pond																																	
317	Transfer Pad																																	
318	Concrete Pad																																	
319	Concrete Pad Berms																																	
320	Concrete Pad Bump Stop																																	
321	Upper Asphalt Ramp																																	
322	Lower Asphalt Ramp																																	
323	Liner Removal																																	
324	Liner (West Leg)																																	
325	Liner (West Leg Wedge)																																	
326	Discharge Pad HDPE Liner																																	
327	Liner (East Leg)																																	
328	Liner (East Leg Wedge)																																	
329	Rub Sheets																																	
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331	Rub Sheets																																	
332	Rub Sheets																																	
333	Total Liner Area																																	
334	Debris estimate (liner)																																	
335	Debris estimate (leak detection systems)																																	
336	Time to Shred Debris																																	
337	North Berm (clean; use as fill)																																	
338	South Berm (clean; use as fill)																																	
339	Transfer Pad Berms (clean; use as fill)																																	
340	East Berm (clean; use as fill)																																	
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**2015 LLRW SURETY
QUANTITY CALCULATIONS AND ASSUMPTIONS**

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	
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627													20	ft		x		10	ft			0.67	ft													
628																																				
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633													20	ft		x		5.5	ft			0.75	ft													
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**2015 LLRW SURETY
QUANTITY CALCULATIONS AND ASSUMPTIONS**

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**2015 LLRW SURETY
QUANTITY CALCULATIONS AND ASSUMPTIONS**

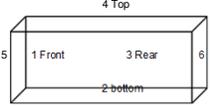
	A	B	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI			
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1537																							=													
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1545												110 ft	I	x		1 ft	w	x		2 ft			=													
1546												35 ft	I	x		20 ft	w	x		0.5 ft			=													
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1561																4.29 ft	th						=													
1562																							=													
1563																							=													
1564																							=													
1565																							=													
1566												25 ft	I	x		15 ft	w	x					=													
1567												25 ft	I	x		15 ft	w	x		3.5 ft			=													
1568												25 ft	I	x		15 ft	w	x		0.5 ft			=													
1569																							=													
1570																							=													
1571																							=													
1572												4 ea	x		3.33 ft	I				2 ft	w		=													
1573																							=													
1574												4 ea	x		3.33 ft	I	x			2 ft	w	x	7.43 ft	=												
1575																							=													
1576					</																															

**2015 LLRW SURETY
QUANTITY CALCULATIONS AND ASSUMPTIONS**

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI		
2884																																				
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**2015 LLRW SURETY
QUANTITY CALCULATIONS AND ASSUMPTIONS**

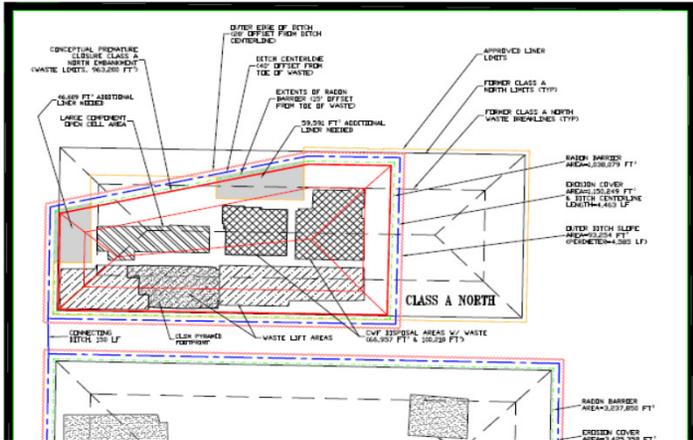
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI				
2972	Disposal Volume Assumptions																																					
2973	Method of Calculation																																					
2974	Assume Tank is																																					
2975				44.5	ft																																	
2976	Wall thickness equals 1/4" or 0.0209 ft																																					
2977	Four sides of the tank will be 8.5 ft h by 0.0209-ft thick by 44.5 ft long.																																					
2978	Two sides of the tank will be 9.8 ft h by 0.0209-ft thick by 8.5 ft long																																					
2979	Summing the multiplicative values of both will give the calculated disposal volume in cubic feet for each Tank																																					
2980				44.5	ft																																	
2981				8.5	ft																																	
2982																																						
2983				36.46	cf																																	
2984																																						
2985																																						
2986																																						
2987																																						
2988																																						
2989	201 DISPOSAL OF EQUIPMENT																																					
2990	This item includes the dismantling, size reduction, shredding, and disposal of equipment within the embankment.																																					
2991																																						
2992																																						
2993	Assume list of equipment to be updated during the annual review																																					
2994	Size reduction efforts include nesting and/or crushing of equipment																																					
2995	Displaced air volume equals maximum dimension L x W x H																																					
2996	This overestimates the total volume due to truck beds, etc.																																					
2997	Assume size reduction reduces the volume of each piece to 50% due to void space within the debris																																					
2998	Assume shredding reduces the volume of each piece to 20% due to void space within the debris																																					
2999	Use EQ volume totals x actual shredder cost (go to Equip Rpt 2014 Tab)																																					
3000	Actual List of Equipment provided as Attachment 1 (old values - updated for 2016 as noted above)																																					
3001				431,268	cf																																	
3002																																						
3003																																						
3004																																						
3005				6,369,566	lbs																																	
3006																																						
3007	CREW COSTS FOR SMALL EQUIPMENT																																					
3008				121	pieces																																	
3009				121	pieces																																	
3010																																						
3011	CREW COSTS FOR LARGE EQUIPMENT																																					
3012	3 labor hours and 0.1 operator hours per piece estimated as follows:																																					
3013																																						
3014																																						
3015																																						
3016																																						
3017																																						
3018				148	pieces																																	
3019				148	pieces																																	
3020				148	pieces																																	
3021																																						
3022																																						
3023	202 ON SITE OPEN AREA																																					
3024	This item covers potentially contaminated elements that are not covered under any previous item.																																					
3025	This Surety item includes the demolition and disposal of any structures not previously identified including the moisture adding station.																																					
3026	This item shall include the removal of power poles; miscellaneous debris and containers; and the excavation of any contaminated soil areas and roadways not previously covered, such as the area and access roads around the embankments.																																					
3027	All items in this section will be disposed of in the embankment with the exception of waste oil removal for incineration.																																					
3028																																						
3029																																						
3030	WASTE OIL (FLUIDS) REMOVAL FOR INCINERATION																																					
3031	Assume maximum quantity in gallons allowed on site																																					
3032																																						
3033																																						
3034																																						
3035	Based on ERM project experience with PCB contaminated oil (non-RAD) incineration at Aragonite facility: \$25 transport and \$375 disposal.																																					
3036																																						
3037	DEMOLITION																																					
3038	C-VAN Container Equivalents maximum quantity																																					
3039				1.18	cy																																	
3040																																						
3041																																						
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3049																																						
3050																																						
3051				20	ft																																	
3052				8	ft																																	
3053																																						



**2015 LLRW SURETY
QUANTITY CALCULATIONS AND ASSUMPTIONS**

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI				
3298	Credit is applied for areas with completed temporary cover																																						
3299																																							
3300	Native Soil Volume												4,202,401	sf	x	1	ft	=	155,644.48	cy																			
3301	Note that open cell area limitation during operations will not be exceeded in accordance with the Radioactive Material License.																																						
3302	Credit for for Class A Temp Cover (pre Class A West)												134,963	sf	x	1	ft	=	4,998.63	cy																			
3303																																							
3304	Credit for CAW Temp Cover												859,458	sf	x	1	ft	=	31,831.78	cy																			
3305													155,644	cy	-	4999	cy	=	118,814.07	cy	\$	8.84	\$	1,050,138.19															
3306	Remove Overburden												118,814	cy	x	0.11		=	13,069.55	cy	\$	8.84	\$	115,515.20															
3307																																							
3308	Temporary settlement monuments will be installed and monitored for one year prior to cover construction.																																						
3309	Assume that surcharging will be required if settlement data is not acceptable for final cover construction.																																						
3310	2 locations were provided in Figures 2 and 6 of the LLRW and 11e.(2) CQA/QC Manual.																																						
3311	Monuments Required for Class A and Class A North (premature, ~56% of CAN design)															=	326.00	ea																					
3312	Monument Total (estimated cost per monument \$27.50)															=	326.00	ea	\$	27.50	\$	8,985.13																	
3313	All temporary settlement monuments will be surveyed six times.																																						
3314	Surveying will be provided by differential GPS using an existing site system, and using a one person crew.																																						
3315	The analysis of settlement data for the temporary cover will be performed twice per year.																																						
3316																																							
3317																																							
3318	Performance of embankment surveys																																						
3319	8 ten-hour days per quarter (One Surveyor)												8	days	x	10	hr	x	4	qtr	x	=	320.00	hr	\$	45.00	\$	51,200.00											
3320	Purchase of monuments												326	Ea																									
3321																																							
3322	Placement of monuments included as incidental cost of temporary cover placement																																						
3323	Bi-annual engineering review (based on 24 hours)												2	events		24	hr / event	x	2		=			\$		\$	6,000.00												
3324																																							
3325	Assume that temporary cover is placed immediately after completion of waste placement and that settlement monitoring begins immediately. Assume preparation and stockpiling of cover clay and rock materials during one year of monitoring keeps the construction contractor occupied, reducing the scope of multiple mobilizations.																																						
3326	Assume a supplemental mobilization event to relocate surcharged material and complete final cover construction.																																						
3327	Costs for supplemental mobilization are listed in Section 307.																																						
3328																																							
3329																																							
3330																																							
3331																																							
3332	207 COVER CONSTRUCTION																																						
3333	This item includes the construction of the final cover, roads around the embankments, drainage structures around the embankments, and permanent fencing. The final cover design is assumed to be consistent with approved plan drawings of the Groundwater Quality Discharge Permit.																																						
3334	The assumed maximum quantities of stored waste and waste from site reclamation should bring the embankments up to final grade in preparation for construction of the final cover; no clean fill will be needed to mix with debris or added to achieve the final grade. If the maximum quantities of waste are not on site, and clean fill is needed, the costs associated with disposal of the assumed maximum waste volume would more than account for the excavation of clean fill and the reclamation of the clean fill areas. Reclamation of the pits, used for erosion barrier and filter material, is covered under a bond with the BLM.																																						
3335																																							
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3342																																							
3343																																							
3344	The final cover area funded is based on the area listed in the premature closure plan.																																						
3345	This includes cover that extends past the edges of the waste that is needed to meet the design slopes. At the time of closure a temporary cover will be placed. Upon completion of settlement monitoring and surcharging, the remainder of the cover will be placed. Costs for placement of Temporary Cover are accounted for within Section 205. A conceptual embankment design is shown below. All cover calculations are based on this drawing. The costs reflect use of an approved Rock Armor Cover.																																						
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\$ 1,231,818.53 SETTLEMENT MONITORING



**2015 LLRW SURETY
QUANTITY CALCULATIONS AND ASSUMPTIONS**

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI
3544	Fill in excavated areas with material from Section 5																																	
3545	Assume the following Areas Calculated using AutoCAD:																																	
3546	Class A North-West																																	
3547	Class A North-East																																	
3548																																		
3549	Total Area																																	
3550																																		
3551	Assume the following volumes of backfill required using AutoCAD:																																	
3552																																		
3553	Class A North-West																																	
3554	Class A North-East																																	
3555																																		
3556	Total Volume of Backfill																																	
3557																																		
3558	SECTION 5 BORROW AREA DRAINAGE																																	
3559	Item covered under "EXCAVATED LAND (BORROW PITS) - Sections 5 and 29"																																	
3560	See tab for "Unrestricted Areas" - Line 120																																	
3561																																		
3562	209 GENERAL CLEANUP																																	
3563	This item includes cleanup elements not covered under previous items. This Surety item																																	
3564	includes general cleanup of the site, and the decontamination of equipment used during the																																	
3565	decommissioning of the site.																																	
3566																																		
3567	HAUL TO LANDFILL																																	
3568	Debris Loading - assumed volume not covered previously																																	
3569	Haul (assume 100 miles round trip; \$500 per trip)																																	
3570	Disposal Tip Fee (assume 1.5 ton/cy; typical solid waste tipping fee \$25/ton)																																	
3571																																		
3572	DECONTAMINATION OF VARIOUS ITEMS																																	
3573	Note: Equipment quantities derived from Current Inventory.																																	
3574																																		
3575	Locomotives Assume 5 Days x 4 People x 10 hrs/day																																	
3576	(Decon) 2 People																																	
3577	2 Quantity																																	
3578																																		
3579	Railcars																																	
3580	Number of railcars determined by maximum volume allowed in railcars from Section 31, Placement of Stored Waste																																	
3581	Maximum Volume from Railcars allowed is 5100 cy																																	
3582	Average Volume per railcar is 75 cy																																	
3583	Number of railcars 75 railcars																																	
3584																																		
3585	Manhours for dumping of railcars																																	
3586	Based on 6 hrs of operating time per day																																	
3587	15 minutes per railcar																																	
3588	24 Railcars per day																																	
3589	267 Div 24 = 11.13 Days																																	
3590	Locomotive Operator/Switchman 11 Days 178 hr = 178.00 hr \$ 65.17 \$ 11,600.26																																	
3591	2 each																																	
3592	Laborers 11 Days 178 hr = 178.00 hr \$ 49.00 \$ 8,722.00																																	
3593	2 each																																	
3594	Foreman 11 Days 89 hr = 89.00 hr \$ 65.17 \$ 5,800.13																																	
3595	1 each																																	
3596	Loader Operator 11 Days 89 hr = 89.00 hr \$ 49.00 \$ 4,361.00																																	
3597	1 each																																	
3598																																		
3599	Startup and Maintenance Costs for the Rotary Dump Facility:																																	
3600	Based on Actual Costs																																	
3601	Start up of rollover after a year shut down																																	
3602	1. Replace and flush hydraulic fluid (10-55 gal drums) \$ 6,718.10 Manhours 10																																	
3603	2. Check out hydraulic system for leaks and function \$ - 10																																	
3604	3. Replace Hydraulic Pump if needed \$ 3,000.00 8																																	
3605	4. Replacement of all hydraulic hoses if needed \$ 2,500.00 20																																	
3606	5. Reseal hydraulic cylinders if needed \$ 1,000.00 20																																	
3607	6. Check out and grease Trunnion and Platen bearings \$ - 5																																	
3608	7. Check out Platen locks, wedges and stops \$ - 5																																	
3609	8. Check and grease drive system change gear box oil \$ 345.00 5																																	
3610	9. Check control system and limit switches for function, adjust as needed \$ - 4																																	
3611	10. Check and tighten all bolts on rollover end rings, drive system and platen \$ - 10																																	
3612	11. Replace air filters (2 @ \$200 ea.) \$ 400.00 1																																	
3613	Totals \$ 13,963.10 98 = 98 hr \$ 49.00 \$ 18,765.10																																	
3614	Decontamination of Railcars																																	
3615	Assume railcars will be demolished as miscellaneous equipment and run through shredder (per ERM Misc Equipment cost module, plus shredder)																																	
3616	Specifications for BNSF 100 ton Open Top Hopper car shows net weight at: 61,800 lbs																																	
3617	No. of rail cars: 75 railcars																																	
3618	Weight of railcars: 4,635,000 pounds																																	
3619	Volume of debris from railcars (13,365 pounds steel per CY, plus 10% bulk factor) 381 cy (Unit price based on cost per 2 CY) \$ 1,590.05 \$ 303,286.85																																	
3620																																		
3621	Startup and Maintenance Costs for the Track No. 4 Railwash Facility:																																	
3622	Based on Actual Costs																																	
3623	1. Rebuild 5,000 PSI Pump (parts and labor for 4 pumps) \$ 728.00 12																																	
3624	2. Replace hoses (4@ 100 ft) \$ 552.00 2																																	
3625	3. Replace wands (4 each) \$ 60.00 1																																	
3626																																		

**Part B Permit Closure Cost Calculations
Quantity Calculations Assumptions**

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AG	AH	AI	AJ	AK																												
92	Retaining wall (between truck access paved asphalt area and East Container Storage Area)																																																												
93									124 ft	l	x			3 ft	ht	x		12 in	th		1	=	372	13.8	14	cy				\$	93.41	\$	1,307.72																												
94																																																													
95	Retaining wall footing																																																												
96									124 ft	l	x			3 ft	ht	x		12 in	th		1	=	372	372.0	372	sf				\$	93.41	\$	1,307.72																												
97	Fencing and gates (assume)																																																												
98	TRUCK ACCESS PAVED ASPHALT AREA																																																												
99									105 ft	l	x		96 ft	w									10,080	1120.0	1,120	sy				\$		\$																													
100									105 ft	l	x		96 ft	w		4 in	th		0.33	=			3360	124.4	125	cy				\$	23.17	\$	2,895.94																												
101	Haul volume																																																												
102	Concrete 8" thick demolition area total																																																												
103	Concrete 12" thick demolition area total																																																												
104																																																													
105																																																													
106	IV	Pump House and Water Tank																																																											
107		This area is outside the restricted zone.																																																											
108		Fig. 9317-M1																																																											
109		COST TO HAUL OFF SITE IS ASSUMED TO BE SAME AS SALVAGE VALUE FOR THE FOLLOWING:																																																											
110		Fire Pump																																																											
111		Water Pump																																																											
112		Water Tank																																																											
113		DEMOLITION																																																											
114		Pump House Steel Exterior (consider as small steel building - half of demolition module cost)																																																											
115									20 ft	l	x		10 ft	ht	x	3 in	th		0.25	=			50	1.9	2	cy				\$	1,435.69	\$	1,435.69																												
116									20 ft	l	x		10 ft	ht	x	3 in	th		0.25	=			50	1.9	2	cy																																			
117									14 ft	l	x		10 ft	ht	x	3 in	th		0.25	=			35	1.3	2	cy																																			
118									14 ft	l	x		10 ft	ht	x	3 in	th		0.25	=			35	1.3	2	cy																																			
119									23 ft	l	x		15 ft	w	x	3 in	th		0.25	=			86.25	3.2	4	cy																																			
120									20 ft	l	x		14 ft	w	x	10 ft	ht			=			2800.0	2,800	cf																																				
121									20 ft	l	x		14 ft	w	x	10 ft	ht			=			2800.0	2,800	cf																																				
122									20 ft	l	x		14 ft	w	x	8 in	th		0.67	=			186.7	6.9	7	cy				\$	46.28	\$	323.99																												
123									20 ft	l	x		14 ft	w	x					=			280.0	280	sf																																				
124									68 ft	l	x		2 ft	ht						=			0	136.0	136	sf																																			
125									68 ft	l	x		1 ft	w						=			68	68.0	68	sf																																			
126									136 sf		x		6 in	th		0.5	=					68	2.5	3	cy				\$	93.41	\$	280.23																													
127									68 sf		x		2 ft	w						=			136	5.0	6	cy				\$	93.41	\$	560.45																												
128																																																													
129																																																													
130																																																													
131																																																													
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136																																																													
137																																																													
138																																																													
139	Va	MIXED WASTE STORAGE BUILDING																																																											
140		Figures 9517-1,9517-2,9517-3,9535-2,9535-3,																																																											
141		DECONTAMINATION																																																											
142		Sludge Tank #0275																																																											
143									25 ft	l	x		5 ft	w	x	0.25 in	th			=			31.3	32	cf																																				
144									25 ft	l	x		5 ft	w	x	0.25 in	th			=			31.3	32	cf																																				
145									25 ft	l	x		8 ft	w	x	0.25 in	th			=			50.0	50	cf																																				
146									25 ft	l	x		8 ft	w	x	0.25 in	th			=			50.0	50	cf																																				
147																																																													
148																																																													
149																																																													
150																																																													
151									100 ft	l	x		20.25 ft	ht	x	3 in	th		0.25	=			506.25	18.8	19	cy																																			
152									100 ft	l	x		20.25 ft	ht	x	3 in	th		0.25	=			506.25	18.8	19	cy																																			
153									60 ft	l	x		22 ft	ht	x	3 in	th		0.25	=			330	12.2	13	cy																																			
154									60 ft	l	x		22 ft	ht	x	3 in	th		0.25	=			330	12.2	13	cy																																			
155									60 ft	l	x		22 ft	ht	x	3 in	th		0.25	=			330	12.2	13	cy																																			
156									101 ft	l	x		60 ft	ht	x	3 in	th		0.25	=			1511.25	56.0	56	cy				\$	2,871.37	\$	5,742.75																												
157																																																													
158									25 ft	l	x		6 ft	ht	x	3 in	th		0.25	=			37.5	1.4	2	cy																																			
159									25 ft	l	x		6 ft	ht	x	3 in	th		0.25	=			37.5	1.4	2	cy																																			
160									60 ft	l	x		6 ft	ht	x	3 in	th</																																												

**Part B Permit Closure Cost Calculations
Quantity Calculations Assumptions**

A	B	C	D	E	F	G	H	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AG	AH	AI	AJ	AK			
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Part B Permit Closure Cost Calculations
Quantity Calculations Assumptions

A	B	C	D	E	F	G	H	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AG	AH	AI	AJ	AK																										
1068	(clean soil available for backfill - spread on site in this area, excess soil remains)																									4,825	cy	\$	1.41	\$	6,791.19																											
1069																																																										
1070																																																										
1071																																																										
1072	XV HEALTH PHYSICS STAFF AND RADIATION SURVEY EQUIPMENT																																																									
1073	Included with LLRW as item 203.																																																									
1074																																																										
1075	XVI CELL CLOSURE																																																									
1076	This item includes the construction of the final cover, roads around the embankments, drainage																																																									
1077	structures around the embankments, and permanent fencing. The final cover design is																																																									
1078	assumed to be consistent with approved plan drawings of the Groundwater Quality Discharge Permit.																																																									
1079	The assumed maximum quantities of stored waste and waste from site reclamation should																																																									
1080	bring the embankment up to final grade in preparation for construction of the final cover;																																																									
1081	no clean fill will be added to achieve the final grade. If the maximum quantities of waste																																																									
1082	are not on site, and clean fill is needed, the costs associated with the disposal of the assumed																																																									
1083	maximum waste volume would more than account for the excavation of clean fill																																																									
1084	and the reclamation of the clean fill areas. Reclamation of the pits, used for erosion barrier																																																									
1085	and filter material, is covered under a bond with the BLM.																																																									
1086	The embankment closure design is shown below. All cover calculations are based on this drawing.																																																									
1087																																																										
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**2015 11e.(2) Annual Surety Review
Quantity Calculations and Assumptions**

	A	B	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI
132	Assume embankment erosion barrier installation includes excavation and erosion barrier placement to																																
133	center line of ditch. Need to construct outer side of perimeter ditch only.																																
134	Length of ditch construction to be 3,100 ft.																																
135																																	
136	The embankment side of the ditch is covered with 18" of erosion protection (included in the final																																
137	cover section above). The other side of the drainage ditch is covered with 12" of erosion protection.																																
138																																	
139	Erosion Protection Volume	1.5 ft	x	30 ft	x	3,100 ft	=	5,167	5,167 cy																								
140	Erosion Protection Excavation (quarry)							5,167 cy	x	2.25	=	11,626	11,626 cy	(included in Erosion Barrier)																			
141	Screening Plant																		incl	incl													
142	Placement:																		incl	incl	\$	4.78	\$	24,690.51									
143																																	
144	Filter zone excavation (quarry), screening and material included in erosion protection																																
145	Filter Zone Volume	1 ft	x	30 ft	x	3,100 ft	=	3,444	3,445 cy																								
146	Erosion Protection Excavation (quarry)							3,445 cy	x	2.25	=	7,751	7,752 cy																				
147	Screening Plant																		incl	incl													
148	Placement:																		incl	incl	\$	4.78	\$	16,461.93									
149																																	
150	FENCES																																
151	Fencing will be placed using salvaged fence materials as available as well as purchased materials.																																
152	Construction of new fence on the south and west edge of embankment																																
153	Construction of new fence as shown in Figure 2 and calculated using AutoCAD																																
154		3,345 ft	=	3,345	3,345 lf																												
155	Construction of fencing using salvaged material			3,345 ft	=	3,345	3,345 lf	\$	14.00	\$	46,830.00																						
156	Chainlink fabric to be salvaged for re-use is shown in Figure 2 and was calculated using AutoCAD																																
157	Material costs for salvaged chainlink fabric will be deducted and shown in the costsheet.																																
158	Fencing to be disposed from areas where contamination																																
159	from site activities is likely	8,232 ft	=	8,232	8,232 lf																												
160	Debris estimated from rolled sections at 1 cf per 10 feet							8,232 div	div	10 cf	=	30	31 cy	(assumes 40 cy per unit cost)	\$	314.55	\$	314.55															
161																																	
162																																	
163	MONUMENTS																																
164	Assume 2 monuments		=	2	2 ea	\$	200.00	\$	400.00																								
165																																	
166																																	
167	201	STOCKPILES OF CLOSURE ASSETS																									\$	4,072,564.46 COVER CONSTRUCTION					
168	EnergySolutions is taking credit for 22,000 cy of cover material (rock) borrow material stockpiled on Section 5.																																
169	Cover Material (Rock) Borrow, purchased, mined, hauled and stockpiled on Section 5							22,000 cy	\$	(8.84)	\$	(194,447.00)																					
170																																	
171	202	RESERVED																									\$	STOCKPILES OF CLOSURE					
172	Groundwater sampling considered under Section 400 - long-term surveillance (to be consistent with LLRW Surety)																																
173																																	
174	203	GROUNDWATER RESTORATION & WELL PLUGGING																									\$	(194,447.00) ASSETS					
175	Consistent with the approved surety, this item covers the restoration of aquifers that have been																																
176	contaminated by the operation of the tailings impoundment although the facility is designed																																
177	to minimize any contamination of the aquifer from its current background levels. It is assumed																																
178	that at the time of closure, there will not be any remedial action required. However,																																
179	groundwater restoration costs to cover any corrective actions required to restore groundwater																																
180	quality are included in accordance with Section 4.1.2 of the Technical Position On Financial Assurances																																
181	For Reclamation, Decommissioning, and Long-Term Surveillance and Control Of Uranium																																
182	Recovery Facilities, 1988. These costs will be adjusted annually for inflation.																																
183	Costs are based on the following (per ERM experience):																																
184	Assume 16.9 million gallons to be treated using mid- to large-scale treatment system installed at facility							1 LS	\$750,000																								
185	(Assume 1/3 of water treatment facility is allocated to LLRW, MW and 11e2, as all water will be treated at one-third cost)							=	\$250,000	\$250,000																							
186	Wells to be installed in a pump and treat system.																																
187		5 wells																															
188	Costs to monitor the five wells quarterly are based upon a 4 year time frame.																																
189	The treatment well system will be required to be plugged and abandoned																																
190	Number of drill holes to be plugged:																																
191	It is assumed that Bentonite will be used to plug Groundwater wells																																
192		5 wells	x	40 lf deep	=	200	200 lf	\$	25.00	\$	5,000.00	\$	325,000.00																				
193																																	
194	SUBTOTAL																																
195	300	SG&A OVERHEAD COSTS																									Direct Cost (No MU)	\$	6,428,580.88				
196	Assume 5.5% of direct cost																																

Unrestricted Areas
Quantity Calculations and Assumptions

	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL			
1	MISCELLANEOUS ITEMS IN UNRESTRICTED AREAS																																				
2																																					
3	ADMINISTRATION BUILDING (NEW)																																				
4	This is the current brick structure Administrative Building outside the restricted area on the northeast corner of the complex.																																				
5	Items outside of restricted area will be salvaged; assume residual value of items equal to salvage costs.																																				
6																																					
7	REMOVE ALL PROPERTY																																				
8	Items outside of restricted area will be salvaged; assume residual value of items equal to salvage costs.																																				
9																																					
10	DEMOLISH BUILDING TO GRADE LEVEL																																				
11	Assume debris placed in landfill cell (lowest-cost option)																																				
12	Building-Outside Walls (210' X 90' rectangular building)	600	ft	l	x			12	ft	h	x						1	ft	th	=				266.67	cy	Scale Multiplier	\$	49.23	\$	13,127.97							
13	Building-Inside Walls (equals outside walls)	600	ft	l	x			12	ft	h	x							1	ft	th	=				266.67	cy	6.7	\$	314.55	\$	2,096.98						
14	Roof	210	ft	l	x			90	ft	w	x							1	ft	th	=				700.00	cy	17.5	\$	314.55	\$	5,504.57						
15	Slab on grade (includes sidewalks)	220	ft	l	x			100	ft	w	x							1	ft	th	=				814.81	cy		\$	46.28	\$	37,713.42						
16																																					
17	METEOROLOGICAL STATION (east of admin building)																																				
18	Remove/demolish station to grade level																																				
19	Meteorological station tower							3	ft	w	x			3	ft	l	x											\$	795.02	\$	795.02						
20	Perimeter Fence debris 1 cf per 10 LF	160	lf	div				10																				\$	314.55	\$	186.40						
21																																					
22	RADIOLOGICAL SURVEY																																				
23	Perform radiological survey (1 event) consisting of up to 20 samples consistent with sampling for annual environmental monitoring costs																																				
24																											\$	6,885.00	\$	3,442.50							
25																																					
26	EMPLOYEE PARKING AREA																																				
27	This item includes employee parking area measured at approximately 3,900 square yards with asphalt at 4 inches thick																																				
28																																					
29	DEMOLITION																																				
30	Asphalt Debris	3900	sq		x			0.11	yd																		\$	23.17	\$	10,039.26							
31																																					
32	RADIOLOGICAL SURVEY																																				
33	Perform radiological survey (1 event) consisting of up to 10 samples consistent with sampling for annual environmental monitoring costs																																				
34																											\$	6,885.00	\$	1,721.25							
35																																					
36	SOUTHWEST STORAGE POND (SECTION 6)																																				
37	Remove water - use water for dust suppression or other benefit during closure construction																																				
38	Remove sediment - allow sediment to dry and remove with liner for placement in landfill cell (lowest-cost option)																																				
39	Pond Base Dimensions (assume 1-foot sediment)	160	ft	w	x			230	ft	l	x							1	ft	th	=				1,362.96	cy		\$	8.84	\$	12,046.55						
40	Remove above-grade cement structures (assume same as other ponds)																																				
41	Concrete Pad	30	ft	w	x			19.5	ft	l	x			0.5	ft	th	=								10.83	cy		\$	46.28	\$	501.42						
42	Concrete Pad Berms	0.5	ft	w	x			39	ft	l	x			0.5	ft	th	=									0.36	cy		\$	46.28	\$	16.71					
43	Concrete Pad Bump Stop	0.8	ft	w	x			30	ft	l	x			1	ft	th	=									0.89	cy		\$	46.28	\$	41.14					
44	Upper Asphalt Ramp	51.8	ft	w	x			35.95	ft	l	x			1	ft	th	=									68.97	cy		\$	46.28	\$	3,192.29					
45	Lower Asphalt Ramp	52.1	ft	w	x			37.95	ft	l	x			1	ft	th	=									72.07	cy		\$	46.28	\$	3,335.81					
46	Liner Removal																																				
47	Liner (pond base)	160	ft	l	x			230	ft	w																36,800.00	sf										
48	Liner (North and South Wedges)	8300	sf	ea							x		2													16,600.00	sf										
49	Liner (East and West Wedges)	7500	sf	ea							x		2													15,000.00	sf										
50	Total Liner Area																									68,400.00	sf										
51	Debris estimate (liner)							68,400.00	sf	x		0.01	ft	th	=											25.33	cy		\$	8.84	\$	223.91					
52	Debris estimate (leak detection systems)	15	cy																								15.00	cy		\$	8.84	\$	132.58				
53																																					
54	Open Southwest Corner of Berm (assume 50-ft opening)																																				
55		50	ft	l	x			171	sf	cross section area																	\$	4.78	\$	1,513.19							
56	Radiological Survey																																				
57	Perform radiological survey (1 event) consisting of up to 20 samples consistent with sampling for annual environmental monitoring costs																																				
58																											\$	6,885.00	\$	3,442.50							
59	WATER STORAGE PONDS AND ASSOCIATED EQUIPMENT (SECTION 29)																																				
60	Remove water - use water for dust suppression or other benefit during closure construction																																				
61	No cement structures at these ponds																																				
62																																					
63	Pond 1 (large) Liner Removal																																				
64	Liner (pond base)	180	ft	l	x			90	ft	w																16,200.00	sf										
65	Liner (North and South Wedges)	5,700	sf	ea							x		2														11,400.00	sf									
66	Liner (East and West Wedges)	3,900	sf	ea							x		2														7,800.00	sf									
67	Total Liner Area																										35,400.00	sf									
68	Debris estimate (liner)							35,400.00	sf	x		0.01	ft	th	=												13.11	cy		\$	8.84	\$	115.88				
69	Debris estimate (leak detection systems)	10	cy																								10.00	cy		\$	8.84	\$	88.39				
70																																					
71	Pond 2 (small) Liner Removal																																				
72	Liner (pond base)	90	ft	l	x			90	ft	w																8,100.00	sf										
73	Liner (North and South Wedges)	1,700	sf	ea							x		2														3,400.00	sf									
74	Liner (East and West Wedges)	1,700	sf	ea							x		2														3,400.00	sf									
75	Total Liner Area																										14,900.00	sf									
76	Debris estimate (liner)							14,900.00	sf	x		0.01	ft	th	=												5.52	cy		\$	8.84	\$	48.78				
77	Debris estimate (leak detection systems)	5	cy																								5.00	cy		\$	8.84	\$	44.19				
78																																					
79	Radiological Survey																																				
80	Perform radiological survey (1 event) consisting of up to 20 samples consistent with sampling for annual environmental monitoring costs																																				
81																											\$	6,885.00	\$	3,442.50							
82	SHREDDER SUBSTATION																																				
83	Some equipment outside of restricted area will be salvaged; assume residual value of these items equal to salvage costs.																																				
84	Remove/demolish substation to grade level																																				
85	Non-salvageable equipment																																				
86	Assume debris placed in landfill cell (lowest-cost option)																																				
87	Substation equipment (assume 50% salvage and 50% disposal)																									15.00	cy		\$	795.02	\$	11,925.36					
88	Perimeter Fence debris 1 cf per 10 LF	530	lf	div				10																			1.96	cy		\$	314.55	\$	314.55				
89																																					
90	RADIOLOGICAL SURVEY																																				
91	Perform radiological survey (1 event) consisting of up to 20 samples consistent with sampling for annual environmental monitoring costs																																				
92																											\$	6,885.00	\$	3,442.50							
93																																					
94	RAIL OUTSIDE OF LICENSED AREA																																				
95	Assumed that rail material will be salvaged by outside entities. Surety cost is for removal of ties and track and the grading of area, plus radiation survey of ballast and base to demonstrate license compliance.																																				
96																																					
97	This item funds grading of the bed material from the main line to the main gate to match the natural contours of the area.																																				
98	EnergySolutions performs periodic radiological surveys on the rail bed and cleans up any areas																																				

Unrestricted Areas
Quantity Calculations and Assumptions

	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	
199	Remove all property																																		
200	Items outside of restricted area will be salvaged; assume residual value of items equal to salvage costs.																																		
201																																			
202	Demolish building to grade level																																		
203	Assume debris placed in landfill cell (lowest-cost option)																																		
204	Main Structure Size:										85	ft	I	x	35	ft	w	x	12	ft	h	=	1,322.22	cy											
205	Unit price based on 100' x 30' building																																		
206																									\$	2,871.37	\$	2,871.37							
207	Strip footings:																																		
208																									\$	93.41	\$	661.64							
209	Slab on grade (concrete)																																		
210																									\$	46.28	\$	3,401.62							
211	Radiological Survey																																		
212	Perform radiological survey (1 event) consisting of up to 20 samples consistent with sampling for annual environmental monitoring costs)																																		
213																									\$	6,885.00	\$	3,442.50							
214	WATER TOWER																																		
215	10,000 gallon tanker trailer with wheels on supports (assume 4 cy of debris)																																		
216	Unit price based on miscellaneous equipment demo - 2 cy																																		
217	Radiological Survey																																		
218	Perform radiological survey (1 event) consisting of up to 10 samples consistent with sampling for annual environmental monitoring costs)																																		
219																									\$	6,885.00	\$	1,721.25							
220	RADIO TOWER AND SUPPORT BUILDING WITH CONCRETE PAD																																		
221	This item includes costs for the dismantlement, hauling of tower off site, demolition of support building with pad, and the disposal of demolition debris.																																		
222	Items outside of restricted area will be salvaged; assume residual value of items equal to salvage costs.																																		
223	Placement of debris in landfill cell (lowest-cost option)																																		
224	DEMOLITION																																		
225	Building																																		
226																																			
227	Building Debris																																		
228																																			
229	Roof																																		
230	Roof Debris																																		
231	Concrete Tower Support																																		
232	Concrete Debris/Tower Support																																		
233	Concrete Support Building																																		
234	Concrete Debris/Support Building																																		
235	Total Debris																																		
236	Radiological Survey																																		
237	Perform radiological survey (1 event) consisting of up to 5 samples consistent with sampling for annual environmental monitoring costs)																																		
238																									\$	6,885.00	\$	688.50							
239																																			
240	RAIL REPAIR FOUNDATION SECTION 29																																		
241	Demolish down to grade level, test and properly dispose of debris, fill in sumps, conduct a final license approved radiation survey																																		
242	Remove foundation																																		
243	Main Slab (concrete)																																		
244																																			
245	Small Slab (concrete)																																		
246																																			
247	Remove sumps																																		
248																																			
249	Remove perimeter wall																																		
250																																			
251	Radiological Survey																																		
252	Perform radiological survey (1 event) consisting of up to 10 samples consistent with sampling for annual environmental monitoring costs)																																		
253																										\$	6,885.00	\$	1,721.25						
254																																			
255	CEMENT RAMP USED FOR OFF-LOADING																																		
256	Demolish down to grade level, test and properly dispose of debris, spread road base fill, and conduct a final license approved radiation survey																																		
257	Remove ramp (10' thick, 30' long, 12' wide, 9.5' max height, filled with road base material)																																		
258	Main Slab (concrete)																																		
259	Walls (assume average height 5')																																		
260	Grade road base material																																		
261																																			
262	Radiological Survey																																		
263	Perform radiological survey (1 event) consisting of up to 10 samples consistent with sampling for annual environmental monitoring costs)																																		
264																										\$	6,885.00	\$	1,721.25						
265																																			
266	SMOKING HUT																																		
267	Remove/demolish hut down to grade level, test and properly dispose of debris, conduct a final license approved radiation survey area																																		
268	Small, 3-sided sheet metal structure, placed on bare ground																																		
269	Assume "small-job" cost (one load)																																		
270																																			
271	Radiological Survey																																		
272	Perform radiological survey (1 event) consisting of up to 5 samples consistent with sampling for annual environmental monitoring costs)																																		
273																										\$	6,885.00	\$	688.50						
274																																			
275	MANHOLE ORA 013 AND SURROUNDING AREA																																		
276	Remove down to grade level, test and properly dispose of debris, fill in ORA 013, conduct a final license approved radiation survey of area																																		
277	Remove manhole and raised slab																																		
278	Raised slab																																		
279	Manhole (circular)																																		
280																																			
281	Fill manhole void (cylindrical shape)																																		
282																																			
283	Radiological Survey																																		
284	Perform radiological survey (1 event) consisting of up to 5 samples consistent with sampling for annual environmental monitoring costs)																																		
285																										\$	6,885.00	\$	688.50						
286																																			
287	POWER AND MANHOLE AND SURROUNDING AREA ON SECTION 29																																		
288	Remove down to grade level, test and properly dispose of debris, fill in manhole, conduct a final license approved radiation survey of area																																		
289	Manhole labeled ORA-012, square slab																																		
290	Remove manhole and slab																																		
291	Slab																																		
292	Manhole (circular steel)																																		
293	Assume "small-job" cost (one load)																																		
294																																			
295	Fill manhole void (cylindrical shape)																																		
296																																			
297	Radiological Survey																																		
298	Perform radiological survey (1 event) consisting of up to 5 samples consistent with sampling for annual environmental monitoring costs)																																		
299																										\$	6,885.00	\$	688.50						
300																																			
301	DIESEL FUELING AREA AND TANK																																		
302	Remove fuel, use or dispose of properly, remove tank and above ground items down to grade level, test																																		

Environmental Monitoring Costs - Clive Complex
Quantity Calculations and Assumptions

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U																			
1	Water Samples - Radiological																																							
2																				Closure	1-yr Post																			
3	401	LLRW																		Note - Include monitoring Costs for 2 years D&D period plus 1 year post D&D																				
4																				Assume that the number of wells required to be sampled remains the same as defined here (43 + 10% = 48 wells). Current GW Permit (UGW450005 issued 10/2014 seems to indicate fewer wells required for sampling in LLRW (27 as specified in Section F.1) and Appendix F to permit. Assumes lysimeter sampling included in man-hours																				
5																				43	+	5																		
6	Add 10% for quality control																			48	Monitoring wells	Total hours / yr	Rate /hr (\$) *	Annual Cost (\$)	Assumes samples are collected via low-flow															
7	=																			160		\$45	\$	7,200.00	Total calculated in Assumption (9.25 days) Utilize 10 days															
8																								\$	84,767.00	Assume \$45/hour labor														
9																										Costs provided by ES - LLRW Rad (\$1009), non-rad (\$ 756.97) = \$ 1766 (48 wells) = \$84,767														
10	Each day of sampling includes:																									Assumes 1 hour /well to sample (total 48 hours) + 1 hr lunch each day =54 hrs														
11	Sample Time																			1	hour	54	hours	54																
12	Travel Time																			3	hours	18	hours	18			Assumes 3 hrs travel for 6 days of sampling = 18 hours													
13	Prep Time (pick-up and drop-off samples)																			8	hours	8	hours	8			Obtain and prep bottles - 4 hours two personnel (8 hours)													
14																																								
15	10 Days per year total for two field technicians																			2	Number of Technicians	160		\$45	\$	7,200.00	Total calculated in Assumption (9.25 days) Utilize 10 days													
16																										Assume \$45/hour labor														
17																										\$	84,767.00													
18	Average cost per sample to EnergySolutions.																																							
19																				1	Each																			
20																				4	Each																			
21	Report preparation																			20	hours each report	20		\$54	\$	1,080.00	Assumes Senior Tech @ \$54/hr = \$1,080													
22	Report review																			4	hours each report	4		\$87	\$	348.00	Assumes RSO @ \$87 = \$348													
23																										\$	1,428.00													
24																										\$	93,395.00	Annual Cost for Sampling												
25	Sampling costs for 2 years of decommissioning and one year post operation																			3	(3 years total)			\$	373,580.00	Note: Assuming that monitoring is part of D&D cost and will be required during D&D activities. Then adding the first year post closure					\$186,790	\$93,395								
26																																								
27																																								
28	Part B																																							
29	XXVII WATER SAMPLES -- RADIOLOGICAL (years 1-100)																																							
30	Number of wells - Ground Water Quality Discharge Permit total is																			14	Monitoring wells (Module VI)																			
31																																								
32	Frequency - annual for 100 years post-closure monitoring period.																																							
33	Sampling - assume two field technicians for two days:																			2	Days per year total	32	hours	\$45	\$	1,440.00	Assumes sampling via Module VI - Attachment VI-1 - using low-flow Bottle Prep and travel time included with LLRW sampling. Assumes \$45/hr													
34																																								
35	Analysis - radiologic parameters specified by Condition 1.F.5 of GWQDP																																							
36	Average cost per sample to EnergySolutions.																																							
37	Radiologic parameters																																							
38	Report - included in cost of analysis.																																							
39																																								
40	Sampling costs for 2 years of decommissioning and one year post operation																			3	(3 years total)			\$	110,634.00	Note: Assuming that monitoring is part of D&D cost and will be required during D&D activities. Then adding the first year post closure					\$73,756	\$36,878								
41																																								
42	XXVIII WATER SAMPLES -- RCRA (years 1-30)																																							
43	Same crew collects these samples with the radiological samples - no extra sampling/labor costs																																							
44																																								
45	Analysis of RCRA parameters in all 14 wells (current EnergySolutions laboratory costs)																																							
46	Dioxin/Furan Analysis - only needed at two wells (current EnergySolutions laboratory costs)																																							
47																																								
48	Sampling costs for 2 years of decommissioning and one year post operation																			3	(3 years total)			\$	63,919.20	Costs provided by ES for Analysis. Assumes costs for analysis for Rad of \$1,009/ 14 wells/year, Non-rad \$1423/14 wells /year, PCDD/F of \$695/2 wells / year					\$42,613	\$21,306								
49																																								
50																																								
51	202 11e(2)																																							
52	RESERVED																																							
53	Groundwater sampling considered under Section 400 - long-term surveillance (to be consistent with LLRW Surety)																																							
54	400 LONG TERM SURVEILLANCE																																							
55	This item includes the annual inspections and maintenance that will be performed on the Surety area and off-site features that may have been impacted by operations. The value is based on 10 CFR 40, Appendix A - Criterion 10.																																							
56																																								
57	Wells in GW Permit UGW450005																			21	wells																			
58																				24	X 2	48		\$45	\$	-	Assume sample 8 wells /day, two field technicians													
59	Assume 3 hrs travel time / day																																							
60																																								
61	Cost per sample analysis																																							
62																																								
63																																								
64	Inspection Only For Well Integrity - Included with other site inspection of wells																																							
65																																								
66																																								
67	Other Site Wells																			No wells other than the 48 identified above are required for r surety.																				
68																																								
69	Air Monitoring																																							
70																																								
71	LLRW																																							
72	403 Airborne Particulate Monitoring																																							

Environmental Monitoring Costs - Clive Complex
Quantity Calculations and Assumptions

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Environmental Monitoring Costs - Clive Complex
Quantity Calculations and Assumptions

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Environmental Monitoring Costs - Clive Complex
Quantity Calculations and Assumptions

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U
230	Dosimeters (Electronic)	60	300	18,000																
231																				
232	Total Annual Cost			\$93,780																
233																				
234	Costs for 2 years of decommissioning						2 years										\$ 187,560.00	Assumes two years of PPE requirements		\$187,560
235																				
236																				
237	HP Instrumentation																			
238																				
239	Current inventory or equipment is operable and available for use during D&D activities																			
240																				
241	LLRW Embankment Surveys																			
242	This item funds survey of the embankments for the first 20 years of post-closure; to match the period of maximum expected settlement (see EnergySolutions' Post-Closure Monitoring Plan, Appendix F to the GWQDP, for survey conditions).																			
243																				
244																				
245																				
246	Cost for survey monuments (purchase and install - assume 20 monuments)				20 x	\$ 300.00										=	\$	6,000.00		
247	Assume cost for monument and installation at \$300 each																			
248																				
249	Fund for 20 year post-closure monitoring period.																			
250	Engineering Survey of Settlement Monuments with GPS. Cost estimated and adjusted annually for inflation.																			
251	Surveyor: Annual (every 12 mo), 1 Surveyor x 10hr da				1 x	10 hrs	x 12 da										20.00 yrs		2,400 hrs	
252	Engineer: Annual (every 12 mo), 1 Engineer x 10hr da				1 x	10 hrs	x 2 da										20.00 yrs		400 hrs	
253																				
254																	\$	45.00	=	\$ 108,000.00
255	Surveyor Cost				2,400 hrs											x	\$	45.00	=	\$ 108,000.00
256	Engineer Cost				400 hrs											x	\$	125.00	=	\$ 50,000.00
257																				
258	LLRW POST-OPERATIONAL MONITORING AND MAINTENANCE (YEAR 1-100)																			
259	This item includes the annual inspections and maintenance that will be performed on the Surety area and off-site features that may have been impacted by operations. The post operational monitoring is intended to ensure that the embankment(s) and other required elements perform as intended and that there are no adverse impacts to the environment or the public due to degradation of these elements.																			
260																				
261																				
262																				
263																				
264																				
265	This Surety item includes																			
266	Inspection of the embankments, fencing, roads, etc. and the performance of any maintenance on these elements. This item is funded annually for the 100-year post-closure monitoring period.																			
267	match the period of maximum expected settlement																			
268	(see EnergySolutions' Post-Closure Monitoring Plan, Appendix F to the GWQDP).																			
269																				
270																				
271	Embankment inspections (assume 5 days per year, 2 hours per visit, round-trip travel 750 miles per year)																			
272	Labor				2	hrs per visit		x	5 Day								\$	43	\$	430.00
273	Vehicle Miles				750	miles per year											\$	0.59	\$	442.50
274																				
275	Off site features																			
276	Assumed hours per year								4 hr								\$	43	\$	172.00
277																				
278	Access Road Maintenance																			
279	Assume no maintenance needed for first five years; after then, a dozer or grader is needed for 1 day per year																			
280					10	hr	x	1 Day									\$	1,500.00	\$	1,500.00
281																				
282	Fence Maintenance - Fence is essentially maintenance free; assume some vandalism or broken wires.																			
283	Labor				4	Hour of inspection											\$	43	\$	172.00
284	Labor				2	Hours repair per year											\$	43	\$	86.00
285																				
286	Gates - assume some vandalism and repairs required (every 5 years)				2	Hours of inspection (annual)		pe	5 years		at	\$	1,600				\$	43	\$	86.00
287						Average materials per year											\$	320	\$	320
288																				
289																				
290	Signs - assume 1 sign every 5 years				2	Hours of inspection		pe	5 years		at	\$	540				\$	43	\$	86.00
291						Average per year											\$	108	\$	108
292																				
293																				
294	Monuments - assume 3 replacements during 100 year period				2	Hours of inspection		pe	5 years		at	\$	200				\$	43	\$	86.00
295						Average cost per year											\$	6	\$	6
296																				
297																				
298	Wells - assume one well replacement every 10 years				4	Hours of inspection		pe	10 years		at	\$	4,800				\$	43	\$	172.00
299																				
300																				
301																				
302	Slopes - largely maintenance free (assume annual inspections and maintenance every 5 years)																			
303	No other material needed.					10 cy riprap		pe	5 years		at	\$	104.00				\$	43	\$	86.00
304					2	Hours inspection											\$	300	\$	300
305					1	Day of equipment		pe	5 years		at		1500				\$	20.80	\$	20.80
306					2	cy of riprap per year														
307																				
308	Embankment Structure - assume annual inspections and maintenance every 5 years																			
309	No other material needed.					10 cy riprap		pe	5 years		at	\$	104.00				\$	43	\$	86.00
310					2	Hours inspection											\$	300	\$	300
311					1	Day of equipment		pe	5 years		at		1500				\$	20.80	\$	20.80

