

## **APPENDIX J**

### **Detailed Cost Estimates**

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**Table J-1. Load Line 1 – Volume Calculation Supporting Information for Industrial/Commercial Land Use**

Remediation Area	Area (SF)	Treatment Interval (feet bgs)	Depth (feet)	In-situ		Ex-situ		COCs
				Volume (cy)	Volume with Constructability (cy)	Volume (cy)	Weight (tons)	
CB-4	1,403	2-3	1	52	65	78	97	PCB-1254
CB-4A	9,212	1-5	4	1,365	1,706	2,047	2,559	RDX, TNT
CB-3	400	0-2	2	30	37	44	56	Antimony, Lead
CB-13B (LL1-252)	400	0-1.5	1.5	22	28	33	42	Lead
Outlet Channel D (LL1-049)	400	0-1.5	1.5	22	28	33	42	Antimony, Lead
<b>Total</b>	<b>11,815</b>			<b>1,491</b>	<b>1,864</b>	<b>2,236</b>	<b>2,795</b>	

**Table J-2. Load Line 1 – Volume Calculation Supporting Information for Unrestricted (Residential) Land Use**

Remediation Area	Area (SF)	Treatment Interval (feet bgs)	Depth (feet)	In-situ		Ex-situ		COCs
				Volume (cy)	Volume with Constructability (cy)	Volume (cy)	Weight (tons)	
CB-4 Area 1	1,403	2-4	2	104	130	156	195	PCB-1254
CB-4 Area 2	12,808	0-1	1	474	593	712	889	TNT, BAP, PCB-1254
CB-4 Area 3	400	0-1	1	15	19	22	28	TNT
CA-6 Area 1	400	0-2	2	30	37	44	56	TNT
CA-6 Area 2	1,058	1-3, 5-8	5	196	245	294	367	PAHs
LL1ss-024-cs	467	2.5-4.5	2	35	43	52	65	TNT
CB-4A Area 1	7,327	0-2	2	543	678	814	1,018	Lead, TNT
CB-4A Area 2	10,043	0-5	5	1,860	2,325	2,790	3,487	TNT, RDX, PAHs, PCB-1254
CB-4A Area 3	7,287	0-1, 3-5	3	810	1,012	1,214	1,518	PAHs, RDX, PCB-1254
CB-4A Area 4	400	0-2	2	30	37	44	56	PAHs
CB-4A Area 5	400	0-2	2	30	37	44	56	TNT
CA-6A Area 1	512	2.25-4.25	2	38	47	57	71	TNT
CA-6A Area 2	1,222	3-5	2	90	113	136	170	TNT
CB-3	400	0-2	2	30	37	44	56	Antimony, Lead
between CB-2 & CB-19	400	0-2	2	30	37	44	56	Antimony, Lead, PAHs
FWC <sub>ss</sub> -001	2,490	0-1.5	1.5	138	173	208	259	PAHs
Outlet Channel D (LL1-049)	400	0-1.5	1.5	22	28	33	42	Antimony, Lead
CB-3 (LL1-386)	400	0-2	2	30	37	44	56	Lead
CB-3 (LL1-387)	400	0-2	2	30	37	44	56	Lead
LL1-410	400	0-2	2	30	37	44	56	Lead
CB-13B (LL1-252)	400	1-1.5	1.5	22	28	33	42	Lead
<b>Total</b>	<b>49,017</b>			<b>4,584</b>	<b>5,730</b>	<b>6,876</b>	<b>8,595</b>	

**Table J-3. Load Line 2 – Volume Calculation Supporting Information for Industrial/Commercial Land Use**

Remediation Area	Area (SF)	Treatment Interval (feet bgs)	Depth (feet)	In-situ		Ex-situ		COCs
				Volume (cy)	Volume with Constructability (cy)	Volume (cy)	Weight (tons)	
DB-4A	400	0-2	2	30	37	46	56	TNT
<b>Total</b>	<b>400</b>			<b>30</b>	<b>37</b>	<b>46</b>	<b>56</b>	

**Table J-4. Load Line 2 – Volume Calculation Supporting Information for Unrestricted (Residential) Land Use**

Remediation Area	Area (SF)	Treatment Interval (feet bgs)	Depth (feet)	In-situ		Ex-situ		COCs
				Volume (cy)	Volume with Constructability (cy)	Volume (cy)	Weight (tons)	
<i>Soil</i>								
DB-10	7,420	0-2	2	550	687	859	1,031	PAHs, TNT
DB-10	1,544	1.25-3.25	2	114	143	179	215	PAHs, PCB-1254
N & W side of DB-4	5,013	0-2	2	371	464	580	696	PAHs, PCB-1254
S & E side of DB-4	9,056	0-1	1	335	419	524	629	PAHs, PCB-1254, TNT
DA-6	840	2-4	2	62	78	97	117	TNT
DA-6	1,179	1-3	2	87	109	136	164	TNT
DB-4A	400	0-2	2	30	37	46	56	TNT
DB-6A Area c	3,058	0-1.5	1.5	170	212	265	319	TNT
DB-6A Area a	400	0-1, 3-6	4	59	74	93	111	TNT, 2,4-DNT
DA-BA Area b	1,281	3-5	2	95	119	148	178	TNT
DB-3	625	0-2	2	46	58	72	87	PAHs, PCB-1254
DC-1	400	0-2	2	30	37	46	56	PAHs
LL-252	400	0-1.5	1.5	22	28	35	42	Antimony, Lead
<b>Total</b>	<b>31,616</b>			<b>1,972</b>	<b>2,465</b>	<b>3,081</b>	<b>3,698</b>	
<i>Sediment</i>								
Kelly's Pond	52,272	0-1	1	1,936	2,420	3,025	3,630	PAHs
LL2sd-632	400		1	15	19	23	28	
LL2sd-633	400		1	15	19	23	28	
<b>Total</b>	<b>53,072</b>			<b>1,966</b>	<b>2,457</b>	<b>3,071</b>	<b>3,686</b>	

**Table J-5. Load Line 3 – Volume Calculation Supporting Information for Industrial/Commercial Land Use**

Remediation Area	Area (SF)	Treatment Interval (feet bgs)	Depth (feet)	In-situ		Ex-situ		COCs
				Volume (cy)	Volume with Constructability (cy)	Volume (cy)	Weight (tons)	
EB-10 (a)	9,962	3-5	2	738	922	1,107	1,384	PAHs
EB-10 (b)	400	0 to 2ft	2	30	37	44	56	PCBs
EA-7	400	0-1	1	15	19	22	28	PCBs
EA-6	400	0-1	1	15	19	22	28	Explosives, PAHs, PCBs
EA-6	400	0-1	1	15	19	22	28	Explosives and PAHs
EA-6	4,062	4.5-6	1.5	226	282	339	423	PAHs
EB-4	6,996	1-3	2	518	648	777	972	PCBs
EB-9A	1,009	0-1	1	37	47	56	70	Explosives
West Perimeter	625	0-0.5	0.5	12	14	17	22	PAHs
EB-803	400	0-1	1	15	19	22	28	PCBs and metals
EA-5 (LL3-056)	400	1 to 3ft	2	30	37	44	56	Explosives
<b>Total</b>	<b>25,056</b>			<b>1,649</b>	<b>2,062</b>	<b>2,474</b>	<b>3,093</b>	

**Table J-6. Load Line 3 – Volume Calculation Supporting Information for Unrestricted (Residential) Land Use**

Remediation Area	Area (SF)	Treatment Interval (feet bgs)	Depth (feet)	In-situ		Ex-situ		COCs
				Volume (cy)	Volume with Constructability (cy)	Volume (cy)	Weight (tons)	
EB-10 (a)	400	0-1	1	15	19	22	28	
EB-10 (b)	31,501	1-7	6	7000	8,750	10,500	13,125	PAHs
EB-10 (c)	400	0 to 1ft	1	15	19	22	28	PCBs
EA-7	400	0-1	1	15	19	22	28	PAHs
EB-11	486	2.5-3.5	1	18	23	27	34	PCBs
EA-6	400	0-1	1	15	19	22	28	PCBs
EA-6	4,062	4.5-6	1.5	226	282	339	423	Explosives, PAHs, and PCBs
EA-6	400	0-1	1	15	19	22	28	PAHs
EA-6	400	0-1	1	15	19	22	28	Explosives and PAHs
EB-4 (413M)	6,996	1-3	2	518	648	777	972	PCBs
EB-4 (253M and 297M)	3,912	3-5	2	290	362	435	543	PCBs
EB-4 (77cs and 85cs)	4,871	2.5-3.5	1	180	226	271	338	Explosives, PAHs, and PCBs
LL3-104	400	0-1	1	15	19	22	28	PCBs
LL3-227	400	0-1	1	15	19	22	28	PCBs
EB-4A	420	2-3	1	16	19	23	29	Explosives
EB-4A (256M)	8743	0-1	1	324	405	486	607	Explosives
EB-4A (258M)	584	0-1	1	22	27	32	41	Explosives, PAHs, and PCBs
EB-4A (419M)	625	0-1	1	23	29	35	43	Explosives
EA-6A	400	0-1	1	15	19	22	28	PAHs
EB-9A	1,010	0-1	1	37	47	56	70	Metals and PCBs
West Perimeter (LL3sd-416M)	625	0-0.5	0.5	12	14	17	22	Explosives
West Perimeter (LL3-050(p2))	400	0-0.5	0.5	7	9	11	14	PAHs
EB-803 (LL3-144)	400	0-1	1	15	19	22	28	PAHs
LL3-047(p2)	400	0-0.5	0.5	7	9	11	14	PCBs and metals
LL3-sd/sw-048(d)	400	0-0.5	0.5	7	9	11	14	PAHs and PCBs
EA-5 (LL3-056)	400	1-3	2	30	37	44	56	Explosives and PAHs
<b>Total</b>	<b>69,435</b>			<b>8,865</b>	<b>11,082</b>	<b>13,298</b>	<b>16,622</b>	

**Table J-7. Load Line 4 – Volume Calculation Supporting Information for Industrial/Commercial Land Use**

Remediation Area	Area (SF)	Treatment Interval (feet bgs)	Depth (feet)	In-situ		Ex-situ		COCs
				Volume (cy)	Volume with Constructability (cy)	Volume (cy)	Weight (tons)	
Former Water Tower	400	0 to 1ft	1	15	19	22	28	Metals
Building G-16	400	0 to 1ft	1	15	19	22	28	PCBs
Building G-8 (a)	400	1 to 7ft	6	89	111	133	167	PAHs
Building G-8 (b)	4,794	3 to 5 ft	2	355	444	533	666	PAHs
<b>Total</b>	<b>5,994</b>			<b>474</b>	<b>592</b>	<b>710</b>	<b>888</b>	

**Table J-8. Load Line 4 – Volume Calculation Supporting Information for Unrestricted (Residential) Land Use**

Remediation Area	Area (SF)	Treatment Interval (feet bgs)	Depth (feet)	In-situ		Ex-situ		COCs
				Volume (cy)	Volume with Constructability (cy)	Volume (cy)	Weight (tons)	
Former Water Tower (a)	400	0-1	1	15	19	22	28	Metals
Former Water Tower (b)	400	0-1	1	15	19	22	28	Metals
Former Water Tower (c )	400	0-1	1	15	19	22	28	Metals
Building G-16	400	0-1	1	15	19	22	28	Metals, PAHs, and PCBs
Building G-8 (a)	6,897	0-1	1	255	319	383	479	PAHs
Building G-8 (b)	4,822	1-5	4	714	893	1,072	1,339	PAHs
Building G-8 (c)	5,495	1-3	2	407	509	611	763	PAHs
Building G-8 (d)	4,305	5-7	2	319	399	478	598	PAHs
Building G-8 (e)	4,793	1-7	6	1065	1,331	1,598	1,997	PAHs
Building G-10	400	0-1	1	15	19	22	28	PCBs
Building G-9 (a)	400	0-1	1	15	19	22	28	PCBs
Building G-9 (b)	400	0-1	1	15	19	22	28	PAHs and PCBs
Building G-12A	400	0-1	1	15	19	22	28	PAHs
Building G-6	400	0-1	1	15	19	22	28	PAHs
LL4ss-420M	625	0-1	1	23	29	35	43	PAHs
LL4-116	400	0-1	1	15	19	22	28	Metals
LL4-185	400	0-0.5	0.5	7	9	11	14	Metals
<b>Total</b>	<b>31,337</b>			<b>2,940</b>	<b>3,674</b>	<b>4,409</b>	<b>5,512</b>	

**Table J-9. Load Line 12 – Volume Calculation Supporting Information for Industrial/Commercial Land Use**

Remediation Area	Area (SF)	Treatment Interval (feet bgs)	Depth (feet)	In-situ		Ex-situ		COCs
				Volume (cy)	Volume with Constructability (cy)	Volume (cy)	Weight (tons)	
Active Area Channel	400	0-2	2	30	37	44	56	TNT, 2,6-DNT, BAP
FF-19 North	625	0-1	1	23	29	35	43	PAHs, PCB-1260
FF-19 South	625	0-4.5	4.5	104	130	156	195	PAHs, PCB-1260
FF-19 South	983	0-2.5	2.5	91	114	137	171	PAHs, PCB-1260
<b>Total</b>	<b>2,633</b>			<b>248</b>	<b>310</b>	<b>372</b>	<b>465</b>	

**Table J-10. Load Line 12 – Volume Calculation Supporting Information for Unrestricted (Residential) Land Use**

Remediation Area	Area (SF)	Treatment Interval (feet bgs)	Depth (feet)	In-situ		Ex-situ		COCs
				Volume (cy)	Volume with Constructability (cy)	Volume (cy)	Weight (tons)	
904	400	0-4	4	59	74	89	111	Explosives, PAHs
Active Area Channel Area 1	400	0-2	2	30	37	44	56	Explosives, PAHs
Active Area Channel Area 2	400	0-2	2	30	37	44	56	Explosives, PAHs
FF-19 North	625	0-3.5	3.5	81	101	122	152	PAHs
FF-19 South	625	0-4.5	4.5	104	130	156	195	PAHs
FF-19 ©	983	0-2.5	2.5	91	114	137	171	PAHs
FF-19 North	400	0-3.4	3.4	50	63	76	94	PAHs, PCB-1260
FF-19 North	400	1-3	2	30	37	44	56	PAHs, PCB-1260
<b>Total</b>	<b>4,233</b>			<b>475</b>	<b>593</b>	<b>712</b>	<b>890</b>	

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**Feasibility Study for RVAAP Load Line 1**  
**Ravenna Army Ammunition Plant (RVAAP), Ravenna, Ohio**  
**Summary of Alternatives**

RVAAP Load Line 1		Duration	Non Discounted Cost		
			Capital Cost	O&M Cost	Total
1	No Action.	0	\$0	\$0	\$0
2	Commercial/Industrial Land Use – Excavation and Off-site Disposal of Soil and Administrative LUCs	30 yr	\$509,805	\$94,349	\$604,154
3	Commercial/Industrial Land Use – Ex-situ Thermal Treatment of Soil and Administrative LUCs	30 yr	\$358,647	\$94,349	\$452,996
4	Unrestricted (Residential) Land Use – Excavation and Off-site Disposal of Soil/Sediment	<1 yr	\$1,531,408	\$0	\$1,531,408
5	Unrestricted (Residential) Land Use - Ex-situ Thermal Treatment and Excavation/Off-site Disposal of Soil/Sediment	<1 yr	\$1,006,668	\$0	\$1,006,668

Load Line 1 Phase Name	Non Discounted Cost			
	Alt. 2	Alt. 3	Alt. 4	Alt. 5
Remedial Design	\$18,609	\$24,168	\$21,551	\$34,515
Remedial Action	\$406,055	\$257,964	\$1,187,419	\$747,700
Completion Report	\$21,942	\$32,054	\$30,185	\$32,341
Contingency	\$63,199	\$44,460	\$292,253	\$192,112
<b>Total Capital Costs:</b>	<b>\$509,805</b>	<b>\$358,647</b>	<b>\$1,531,408</b>	<b>\$1,006,668</b>
Operations and Maintenance (O&M)	\$79,373	\$79,373	\$0	\$0
Contingency	\$14,976	\$14,976	\$0	\$0
<b>Total O&amp;M Costs:</b>	<b>\$94,349</b>	<b>\$94,349</b>	<b>\$0</b>	<b>\$0</b>
<b>Total Alternative Cost</b>	<b>\$604,154</b>	<b>\$452,996</b>	<b>\$1,531,408</b>	<b>\$1,006,668</b>

Notes:

1. The base year of comparison and cost data will be CY2016.
2. Costs were estimated for comparison purposes only and are believed to be accurate within a range of -30% to +50%. Use of these costs for other purposes, including but not limited to, budgetary or construction cost estimating is not appropriate.

**Feasibility Study for RVAAP Load Line 1**  
**Ravenna Army Ammunition Plant (RVAAP), Ravenna, Ohio**  
**Summary of AOC Areas and Volumes**

Load Line 1 Alternative	Area (sf)	In-situ		Ex-situ <sup>1,2</sup>		Total Waste Characterization Samples	Total Confirmation Sample Locations
		Volume (cy)	Volume with constructability <sup>1</sup> (cy)	Volume (cy)	Weight (tons)		
Alternative 2 - Excavation and Off-site Disposal Volumes above Industrial RGOs	11,815	1,491	1,864	2,236	3,354	3	24
Alternative 3 - Thermal Treatment Volumes	10,615	1,417	1,771	2,125	3,188	3	24
Alternative 3 - Excavation/Off-site Disposal	1200	74	93	111	167		
Alternative 4 -Excavation and Offsite Disposal Volumes above Residential RGOs	49,017	4,584	5,730	6,876	10,314	7	103
Alternative 5 - Thermal Treatment Volumes	38,890	3,849	4,811	5,773	8,660	7	103
Alternative 5 - Excavation/Off-site Disposal	10,127	735	919	1103	1,654		

<sup>1</sup> Constructability factor accounts for over excavation, sloping of sidewalls, and addresses limitations of removal equipment. The in situ volume was increased by 25% for a constructability factor.

<sup>2</sup> Includes 20% swell factor to account for soil expansion after excavating.

**Feasibility Study for RVAAP Load Line 1**  
**Alternative 2 - Commercial/Industrial Land Use - Excavation and Off-site Disposal of Soil and Administrative LUCs.**

**Key Parameters and Assumptions**

**Key Parameters and Assumptions:**

Item	Unit	Value	Notes
<b><u>Capital Cost</u></b>			
<b><u>Site Work</u></b>			
Site Area	sf	11,815	
Civil Survey	day	1.0	Survey AOC areas and set monuments for land use controls.
Civil Survey	\$/day	1,154	RSMeans 17123131100.
As Built Drawings	hours	8	
As Built Drawings	\$/hr	70	Develop plat map for incorporation into the Base Master Plan.
Clearing	day	0.75	Clearing including mob/demob for trees/brush cleared, chipped, & left onsite. RSMeans 022302000200.
Clearing	\$/day	3,329	
Sediment and Erosion Control	lf	220	Includes silt fence and straw bales along down slope of excavation. RSMeans 312514161000 & 250.
Sediment and Erosion Control	\$/lf	5.59	
<b><u>Soil Excavation</u></b>			
Soil Excavation Volume (In situ)	cy	1,864	Includes excavation of the AOC area based on the areas and depths presented in the volume summary table. In situ volumes include a 25% constructability factor.
Soil Excavation Volume (Ex situ)	cy	2,236	Includes soil volume to be transported and disposed. Ex situ volumes include 20% swell factor.
Soil Excavation Mass	tons	3,354	Includes soil mass to be transported and disposed.
Soil Excavation Surface Area	sf	11,815	
<b><u>Mobilization/Demobilization</u></b>			
	ls	5,000	Includes mob/demob of excavation equipment and preparing submittals.
<b><u>Excavate Soils</u></b>			
	cy/day	240	Includes 2 cy excavator, 5-22 cy trucks, 1 O.E., 5 T.D., 1 L.S. spotter, 2 L.S. to prep trucks/and misc. Reduced productivity by 50% for loading trucks, small/precise excavations, overburden stockpiling, and security/S&H requirements. Assume trucks are direct loaded. Average 240 cy/day. RSMeans Crew B12-E.
	day	10	
	\$/day	7,769	
<b><u>Standby Time</u></b>			
	day	3	Assume equipment standby while analysis is being performed.
	\$/day	1026	Assume no additional hot spot excavation.
<b><u>Nonhazardous Waste</u></b>			
Transport and Offsite Disposal	tons	3,354	Based on shipping waste to American Landfill, Waynesburg, Ohio (approximately 80 mi RT). Assumes a minimum of 22 tons /load. Rate includes \$16.60/ton tax from Portage County.
	\$/ton	52.00	

**Feasibility Study for RVAAP Load Line 1**  
**Alternative 2 - Commercial/Industrial Land Use - Excavation and Off-site Disposal of Soil and Administrative LUCs.**  
**Key Parameters and Assumptions**

**Key Parameters and Assumptions:**

Item	Unit	Value	Notes
<b><u>Waste Characterization and Confirmation Sampling</u></b>			
Waste Characterization Samples	ea	3	Includes composite samples for waste characterization (TCLP metals, TCLP SVOCs, TCLP pesticides, TCLP herbicides, reactive cyanide, reactive sulfide, and PCBs) and ISM samples for confirmation (PCB-1254, RDX, TNT, Antimony, Lead).
Confirmation Sample Locations	ea	24	
Sampling Labor	hrs	24	Assumes 1 sampling technician to collect and ship samples.
Sampling Labor	\$/hr	70	
Truck Rental / Gas	\$/event	300	1 truck x \$100/day including fuel.
Sample Materials	ea	27	Reference ECHOS 33 02 0401/0402 for ISM, processing, disposable sampling and decontamination materials.
Sample Materials	\$/ea	35	
Analytical Cost	\$/event	4,579	Analyze samples for TCLP metals, TCLP SVOCs, TCLP pesticides, TCLP herbicides, reactive cyanide, reactive sulfide, and PCBs (\$553 ea) and PCB-1254, RDX, TNT, Antimony, Lead (\$2,920 for all areas).
<b><u>Restoration</u></b>			
Native Soil Backfill	cy	2,236	Includes native soil backfill. Assume productivity has been reduced by 25% to account for security and safety requirements. Includes 12-in lift of native fill assuming 20% swell. RSMMeans 312323160040, Unclassified Fill, 6" Lifts, offsite Source @ 20 miles, Includes delivery, spreading, and compaction.
Native Soil Backfill	\$/cy	26.20	
Seeding, Vegetative Cover	MSF	18	Seeding with mulch and fertilizer. Include restoration of excavated areas and equipment damage. RSMMeans 329219142200.
Seeding, Vegetative Cover	\$/MSF	63.21	
SWPPP Inspections	hrs	4	Assume one follow-up inspection.
SWPPP Inspections	\$/hr	70	
<b><u>Plans and Reports</u></b>			
Remedial Action Completion Report	hrs	200	Includes Construction QC data and preparing report.
Technical Labor	\$/hr	90	

**Feasibility Study for RVAAP Load Line 1**  
**Alternative 2 - Commercial/Industrial Land Use - Excavation and Off-site Disposal of Soil and Administrative LUCs.**  
**Key Parameters and Assumptions**

**Key Parameters and Assumptions:**

Item	Unit	Value	Notes
<b><u>O&amp;M Cost (Years 0 to 30)</u></b>			
Site Inspection and Maintenance	years	30	Inspect site annually for compliance with land use controls and complete checklist.
Site Inspection	events	30	
Site Inspections	hrs	4	
Field Labor	\$/hr	70	
<b><u>CERCLA Reviews</u></b>			
CERCLA 5-Year Reviews	events	6	Assume 5 year reviews for 30 years.
CERCLA 5-Year Reviews	\$/event	8,200	Assume 80 hours/review @ \$90/hr. Add \$1,000 misc expenses.

**Feasibility Study for RVAAP Load Line 1**  
**Alternative 2 - Commercial/Industrial Land Use - Excavation and Off-site Disposal of Soil and Administrative**  
**LUCs.**  
**Cost Estimate**

**CAPITAL COST**

**\$509,805**

Activity (unit)	Quantity	Unit Cost	Total
<b><u>Site Work</u></b>			
Civil Survey (day)	1.0	\$1,154.00	\$1,154
As Built Drawings (hrs)	8	\$70.00	\$560
Clearing (acre)	0.8	\$3,329.00	\$2,497
Sediment and Erosion Control (lf)	220	\$5.59	\$1,230
<b><u>Soil Excavation</u></b>			
Mobilization/Demobilization (ls)	1	\$5,000.00	\$5,000
Excavate Soil (days)	10	\$7,769.13	\$77,691
Standby Time (day)	3	\$1,026.00	\$3,078
Nonhazardous Transport and Offsite Disposal (ton)	3,354	\$52.00	\$174,408
<b><u>Waste Characterization and Confirmation Sampling</u></b>			
Sampling Labor (hrs)	24	\$70.00	\$1,680
Truck Rental / Gas (event)	1	\$300.00	\$300
Sample Materials (ea)	27	\$35.00	\$945
Sample Analysis (event)	1	\$4,579.00	\$4,579
<b><u>Restoration</u></b>			
Native Soil Backfill (cy)	2,236	\$26.20	\$58,583
Seeding, Vegetative Cover (MSF)	18	\$63.21	\$1,120
SWPPP Inspections (hrs)	4	\$70.00	\$280
<b><u>Plans and Reports</u></b>			
Remedial Action Completion Report (hrs)	200	\$90.00	\$18,000
<b>Subtotal</b>			<b>\$351,105</b>
Design		5%	\$17,555
Office Overhead		5%	\$17,555
Field Overhead		10%	\$35,111
<b>Subtotal</b>			<b>\$421,326</b>
Profit		6%	\$25,280
Contingency		15%	\$63,199
<b>Total</b>			<b>\$509,805</b>

**OPERATION AND MAINTENANCE**

**\$94,349**

Activity (unit)	Quantity	Unit Cost	Total Cost
<b><u>Site Inspection and Maintenance</u></b>			
Site Inspection (ea)	30	\$280	\$8,400
<b><u>CERCLA Reviews</u></b>			
CERCLA 5-Year Reviews (ea)	6	\$8,200	\$49,200
Subtotal O&M			\$57,600
Design		15%	\$8,640
Office Overhead		5%	\$2,880
Field Overhead		10%	\$5,760
Subtotal			\$74,880
Profit		6%	\$4,493
Contingency		20%	\$14,976
Total			\$94,349

**TOTAL ALTERNATIVE CAPITAL AND O&M COST (Non Discounted Cost)**

**\$604,154**

**Feasibility Study for RVAAP Load Line 1**  
**Alternative 3 - Commercial/Industrial Land Use - Ex-situ Thermal Treatment and Excavation/Off-site Disposal of**  
**Soil and Administrative LUCs.**  
**Key Parameters and Assumptions**

**Key Parameters and Assumptions:**

Item	Unit	Value	Notes
<b><u>Capital Cost</u></b>			
<b><u>Site Work</u></b>			
Site Area	sf	11,815	
Civil Survey	day	1.0	Survey AOC areas and set monuments for land use controls.
Civil Survey	\$/day	1,154	RSMeans 17123131100.
As Built Drawings	hours	8	
As Built Drawings	\$/hr	70	Develop plat map for incorporation into the Base Master Plan.
Clearing	day	0.75	Clearing including mob/demob for trees/brush cleared, chipped, & left onsite. RSMeans 022302000200.
Clearing	\$/day	3,329	
Sediment and Erosion Control	lf	220	Includes silt fence and straw bales along down slope of excavation.
Sediment and Erosion Control	\$/lf	5.59	RSMeans 312514161000 & 250.
<b><u>Soil Excavation</u></b>			
Soil Excavation Volume (In situ)	cy	1,864	Includes excavation of the AOC area based on the areas and depths presented in the volume summary table. In situ volumes include a 25% constructability factor.
Soil Excavation Volume (Ex situ)	cy	2,236	Includes soil volume to be transported and disposed. Ex situ volumes include 20% swell factor.
Soil Excavation Mass	tons	3,355	Includes soil mass to be treated
Soil Excavation Surface Area	sf	11,815	
<b><u>Mobilization/Demobilization</u></b>			
	ls	5,000	Includes mob/demob of excavation equipment and preparing submittals.
<b><u>Excavate Soils</u></b>			
	cy/day	240	Includes 2 cy excavator, 5-22 cy trucks, 1 O.E., 5 T.D., 1 L.S. spotter, 2 L.S. to prep trucks/and misc. Reduced productivity by 50% for loading trucks, small/precise excavations, overburden stockpiling, and security/S&H requirements. Assume trucks are direct loaded. Average 240 cy/day. RSMeans Crew B12-E.
	day	10	
	\$/day	7,769	
<b><u>Standby Time</u></b>			
	day	3	Assume equipment standby while analysis is being performed.
	\$/day	1026	Assume no additional hot spot excavation.
<b><u>Thermal Treatment of Contaminated Soil</u></b>			
	cy	2125	Source: Endpoint Technology cost estimate using Vapor Energy Generator (VEG) Soil Remediation.
	\$/cy	41.00	
<b><u>Nonhazardous Waste</u></b>			
Transport and Offsite Disposal	tons	167	Based on shipping waste to American Landfill, Waynesburg, Ohio (approximately 80 mi RT). Assumes a minimum of 22 tons /load. Rate includes \$16.60/ton tax from Portage County.
	\$/ton	52.00	

**Feasibility Study for RVAAP Load Line 1**  
**Alternative 3 - Commercial/Industrial Land Use - Ex-situ Thermal Treatment and Excavation/Off-site Disposal of**  
**Soil and Administrative LUCs.**  
**Key Parameters and Assumptions**

**Key Parameters and Assumptions:**

Item	Unit	Value	Notes
<b><u>Waste Characterization and Confirmation Sampling</u></b>			
Waste Characterization Samples	ea	3	Includes composite samples for waste characterization (TCLP metals, TCLP SVOCs, TCLP pesticides, TCLP herbicides, reactive cyanide, reactive sulfide, and PCBs) and ISM samples for confirmation (PCB-1254, RDX, TNT, Antimony, Lead).  Assumes 1 sampling technician to collect and ship samples.  1 truck x \$100/day including fuel.  Reference ECHOS 33 02 0401/0402 for ISM, processing, disposable sampling and decontamination materials.  Analyze samples for TCLP metals, TCLP SVOCs, TCLP pesticides, TCLP herbicides, reactive cyanide, reactive sulfide, and PCBs (\$553 ea) and PCB-1254, RDX, TNT, Antimony, Lead (\$2,920 all areas).
Confirmation Sample Locations	ea	24	
Sampling Labor	hrs	24	
Sampling Labor	\$/hr	70	
Truck Rental / Gas	\$/event	300	
Sample Materials	ea	27	
Sample Materials	\$/ea	35	
Analytical Cost	\$/event	4,579	
<b><u>Restoration</u></b>			
			Includes native soil backfill. Assume productivity has been reduced by 25% to account for security and safety requirements.
Native Soil Backfill	cy	263	Includes 12-in lift of native fill assuming 20% swell. RSM means 312323160040, Unclassified Fill, 6" Lifts, offsite Source @ 20 miles, Includes delivery, spreading, and compaction.
Native Soil Backfill	\$/cy	26.20	
Seeding, Vegetative Cover	MSF	18	Seeding with mulch and fertilizer. Include restoration of excavated areas and equipment damage. RSM means 329219142200.
Seeding, Vegetative Cover	\$/MSF	63.21	
SWPPP Inspections	hrs	4	Assume one follow-up inspection.
SWPPP Inspections	\$/hr	70	
<b><u>Plans and Reports</u></b>			
Remedial Action Completion Report	hrs	280	Includes Construction QC data and preparing report.
Technical Labor	\$/hr	90	

**Feasibility Study for RVAAP Load Line 1**  
**Alternative 3 - Commercial/Industrial Land Use - Ex-situ Thermal Treatment and Excavation/Off-site Disposal of**  
**Soil and Administrative LUCs.**  
**Key Parameters and Assumptions**

**Key Parameters and Assumptions:**

Item	Unit	Value	Notes
<b><u>O&amp;M Cost (Years 0 to 30)</u></b>			
<u>Site Inspection and Maintenance</u>	years	30	
Site Inspection	events	30	
Site Inspections	hrs	4	Inspect site annually for compliance with land use controls and complete checklist.
Field Labor	\$/hr	70	
<b><u>CERCLA Reviews</u></b>			
CERCLA 5-Year Reviews	events	6	Assume 5 year reviews for 30 years.
CERCLA 5-Year Reviews	\$/event	8,200	Assume 80 hours/review @ \$90/hr. Add \$1,000 misc expenses.

**Feasibility Study for RVAAP Load Line 1**

**Alternative 3 - Commercial/Industrial Land Use - Ex-situ Thermal Treatment and Excavation/Off-site Disposal of Soil and Administrative LUCs.**

**Cost Estimate**

**CAPITAL COST**

**\$358,647**

Activity (unit)	Quantity	Unit Cost	Total
<b><u>Site Work</u></b>			
Civil Survey (day)	1.0	\$1,154.00	\$1,154
As Built Drawings (hrs)	8	\$70.00	\$560
Clearing (acre)	0.8	\$3,329.00	\$2,497
Sediment and Erosion Control (lf)	220	\$5.59	\$1,230
<b><u>Soil Excavation</u></b>			
Mobilization/Demobilization (ls)	1	\$5,000.00	\$5,000
Excavate Soil (day)	10	\$7,769.13	\$77,691
Standby Time (day)	3	\$1,026.00	\$3,078
Thermal Treatment of Contaminated Soil (cy)	2,125	\$41.00	\$87,125
Nonhazardous Transport and Offsite Disposal (ton)	167	\$52.00	\$8,684
<b><u>Waste Characterization and Confirmation Sampling</u></b>			
Sampling Labor (hrs.)	24	\$70.00	\$1,680
Truck Rental / Gas (event)	1	\$300.00	\$300
Sample Materials (ea)	27	\$35.00	\$945
Sample Analysis (event)	1	\$4,579.00	\$4,579
<b><u>Restoration</u></b>			
Native Soil Backfill (cy)	263	\$26.20	\$6,879
Seeding, Vegetative Cover (MSF)	18	\$63.21	\$1,120
SWPPP Inspections (hrs.)	4	\$70.00	\$280
<b><u>Plans and Reports</u></b>			
Remedial Action Completion Report (hrs)	280	\$90.00	\$25,200
<b>Subtotal</b>			<b>\$228,002</b>
Design		10%	\$22,800
Office Overhead		10%	\$22,800
Field Overhead		10%	\$22,800
<b>Subtotal</b>			<b>\$296,403</b>
Profit		6%	\$17,784
Contingency		15%	\$44,460
<b>Total</b>			<b>\$358,647</b>

**Feasibility Study for RVAAP Load Line 1**

**Alternative 3 - Commercial/Industrial Land Use - Ex-situ Thermal Treatment and Excavation/Off-site Disposal of Soil and Administrative LUCs.  
Cost Estimate**

**OPERATION AND MAINTENANCE**

**\$94,349**

Activity (unit)	Quantity	Unit Cost	Total Cost
<b><u>Site Inspection and Maintenance</u></b>			
Site Inspection (ea.)	30	\$280	\$8,400
<b><u>CERCLA Reviews</u></b>			
CERCLA 5-Year Reviews (ea)	6	\$8,200	\$49,200
Subtotal O&M			\$57,600
Design		15%	\$8,640
Office Overhead		5%	\$2,880
Field Overhead		10%	\$5,760
Subtotal			\$74,880
Profit		6%	\$4,493
Contingency		20%	\$14,976
Total			\$94,349

**TOTAL ALTERNATIVE CAPITAL AND O&M COST (Non Discounted Cost)**

**\$452,996**

## Feasibility Study for RVAAP Load Line 1

### Alternative 4 - Unrestricted (Residential) Land Use - Excavation and Off-site Disposal of Soil/Sediment. Key Parameters and Assumptions

#### Key Parameters and Assumptions:

Item	Unit	Value	Notes
<b><u>Capital Cost</u></b>			
<b><u>Site Work</u></b>			
Site Area	sf	49,017	
Civil Survey	day	2.0	Survey AOC areas and set monuments for land use controls.
Civil Survey	\$/day	1,154	RSMMeans 17123131100.
As Built Drawings	hours	16	
As Built Drawings	\$/hr	70	Develop plat map for incorporation into the Base Master Plan.
Clearing	day	1.50	Clearing including mob/demob for trees/brush cleared, chipped, & left onsite. RSMMeans 022302000200.
Clearing	\$/day	3,329	
Sediment and Erosion Control	lf	450	Includes silt fence and straw bales along down slope of excavation. RSMMeans 312514161000 & 250.
Sediment and Erosion Control	\$/lf	5.59	
<b><u>Soil Excavation</u></b>			
Soil Excavation Volume (In situ)	cy	5,730	Includes excavation of the AOC area based on the areas and depths presented in the volume summary table. In situ volumes include a 25% constructability factor.
Soil Excavation Volume (Ex situ)	cy	6,876	Includes soil volume to be transported and disposed. Ex situ volumes include 20% swell factor.
Soil Excavation Mass	tons	10,314	Includes soil mass to be transported and disposed.
Soil Excavation Surface Area	sf	49,017	
<b><u>Mobilization/Demobilization</u></b>			
	ls	5,000	Includes mob/demob of excavation equipment and preparing submittals.
<b><u>Excavate Soils</u></b>			
	cy/day	240	
	day	29	Includes 2 cy excavator, 5-22 cy trucks, 1 O.E., 5 T.D., 1 L.S. spotter, 2 L.S. to prep trucks/and misc. Reduced productivity by 50% for loading trucks, small/precise excavations, overburden stockpiling, and security/S&H requirements. Assume trucks are direct loaded. Average 240 cy/day. RSMMeans Crew B12-E.
	\$/day	7,769	
<b><u>Standby Time</u></b>			
	day	3	Assume equipment standby while analysis is being performed.
	\$/day	1026	Assume no additional hot spot excavation.
<b><u>Nonhazardous Waste</u></b>			
Transport and Offsite Disposal	tons	10,314	Based on shipping waste to American Landfill, Waynesburg, Ohio (approximately 80 mi RT). Assumes a minimum of 22 tons /load. Rate includes \$16.60/ton tax from Portage County.
	\$/ton	52.00	

## Feasibility Study for RVAAP Load Line 1

### Alternative 4 - Unrestricted (Residential) Land Use - Excavation and Off-site Disposal of Soil/Sediment. Key Parameters and Assumptions

#### Key Parameters and Assumptions:

<b><u>Waste Characterization and Confirmation Sampling</u></b>			Includes composite samples for waste characterization (TCLP metals, TCLP SVOCs, TCLP pesticides, TCLP herbicides, reactive cyanide, reactive sulfide, and PCBs) and ISM samples for confirmation (PCB-1254, RDX, TNT, Antimony, Lead, and PAH).  Assumes 1 sampling technician to collect and ship samples.  1 truck x \$100/day including fuel.  Reference ECHOS 33 02 0401/0402 for ISM, processing, disposable sampling and decontamination materials.  Analyze samples for TCLP metals, TCLP SVOCs, TCLP pesticides, TCLP herbicides, reactive cyanide, reactive sulfide, and PCBs (\$553 ea) and PCB-1254, RDX, TNT, Antimony, Lead, and PAH (\$14,916 all areas).
Waste Characterization Samples	ea	7	
Confirmation Sample Locations	ea	103	
Sampling Labor	hrs	36	
Sampling Labor	\$/hr	70	
Truck Rental / Gas	\$/event	450	
Sample Materials	ea	110	
Sample Materials	\$/ea	35	
Analytical Cost	\$/event	18,787	
<b><u>Restoration</u></b>			Includes native soil backfill. Assume productivity has been reduced by 25% to account for security and safety requirements.  Includes 12-in lift of native fill assuming 20% swell. RSMMeans 312323160040, Unclassified Fill, 6" Lifts, offsite Source @ 20 miles, Includes delivery, spreading, and compaction.  Seeding with mulch and fertilizer. Include restoration of excavated areas and equipment damage. RSMMeans 329219142200.
Native Soil Backfill	cy	6,876	
Native Soil Backfill	\$/cy	26.20	
Seeding, Vegetative Cover	MSF	74	
Seeding, Vegetative Cover	\$/MSF	63.21	
SWPPP Inspections	hrs	4	
SWPPP Inspections	\$/hr	70	
<b><u>Plans and Reports</u></b>			Includes Construction QC data and preparing report.
Remedial Action Completion Report	hrs	280	
Technical Labor	\$/hr	90	

## Feasibility Study for RVAAP Load Line 1

### Alternative 4 - Unrestricted (Residential) Land Use - Excavation and Off-site Disposal of Soil/Sediment. Cost Estimate

#### CAPITAL COST

**\$1,531,408**

Activity (unit)	Quantity	Unit Cost	Total
<b><u>Site Work</u></b>			
Civil Survey (day)	2.0	\$1,154.00	\$2,308
As Built Drawings (hrs)	16	\$70.00	\$1,120
Clearing (acre)	1.5	\$3,329.00	\$4,994
Sediment and Erosion Control (lf)	450	\$5.59	\$2,516
<b><u>Soil Excavation</u></b>			
Mobilization/Demobilization (ls)	1	\$5,000.00	\$5,000
Excavate Soil (days)	29	\$7,769.13	\$225,305
Standby Time (day)	3	\$1,026.00	\$3,078
Nonhazardous Transport and Offsite Disposal (ton)	10,314	\$52.00	\$536,328
<b><u>Confirmation Sampling</u></b>			
Sampling Labor (hrs)	36	\$70.00	\$2,520
Truck Rental / Gas (event)	1	\$450.00	\$450
Sample Materials (ea)	110	\$35.00	\$3,850
Sample Analysis (event)	1	\$18,787.00	\$18,787
<b><u>Restoration</u></b>			
Native Soil Backfill (cy)	6,876	\$26.20	\$180,151
Seeding, Vegetative Cover (MSF)	74	\$63.21	\$4,648
SWPPP Inspections (hrs)	4	\$70.00	\$280
<b><u>Plans and Reports</u></b>			
Remedial Action Completion Report (hrs)	280	\$90.00	\$25,200
Subtotal			\$1,016,534
Design		2%	\$20,331
Office Overhead		5%	\$50,827
Field Overhead		8%	\$81,323
Subtotal			\$1,169,014
Profit		6%	\$70,141
Contingency		25%	\$292,253
Total			\$1,531,408

**Feasibility Study for RVAAP Load Line 1**  
**Alternative 5 - Unrestricted (Residential) Land Use - Ex-situ Thermal Treatment and Excavation/Off-site Disposal**  
**of Soil/Sediment.**  
**Key Parameters and Assumptions**

**Key Parameters and Assumptions:**

Item	Unit	Value	Notes
<b><u>Capital Cost</u></b>			
<b><u>Site Work</u></b>			
Site Area	sf	49,017	
Civil Survey	day	2.0	Survey AOC areas and set monuments for land use controls.
Civil Survey	\$/day	1,154	RSMMeans 17123131100.
As Built Drawings	hours	16	
As Built Drawings	\$/hr	70	Develop plat map for incorporation into the Base Master Plan.
Clearing	day	1.50	Clearing including mob/demob for trees/brush cleared, chipped, &
Clearing	\$/day	3,329	left onsite. RSMMeans 022302000200.
Sediment and Erosion Control	lf	450	Includes silt fence and straw bales along down slope of
Sediment and Erosion Control	\$/lf	5.59	excavation. RSMMeans 312514161000 & 250.
<b><u>Soil Excavation</u></b>			
Soil Excavation Volume (In situ)	cy	5,730	Includes excavation of the AOC area based on the areas and depths presented in the summary table. In situ volumes include a 25% constructability factor.
Soil Excavation Volume (Ex situ)	cy	6,876	Includes soil volume to undergo thermal treatment. Ex situ volumes include a 25% constructability and 20% swell factor.
Soil Excavation Mass	tons	10,314	Includes soil mass to be treated
Soil Excavation Surface Area	sf	49,017	
<b><u>Mobilization/Demobilization</u></b>			
	ls	5,000	Includes mob/demob of excavation equipment and preparing submittals.
<b><u>Excavate Soils</u></b>			
	cy/day	240	Includes 2 cy excavator, 5-22 cy trucks, 1 O.E., 5 T.D., 1 L.S. spotter, 2 L.S. to prep trucks/and misc. Reduced productivity by 50% for loading trucks, small/precise excavations, overburden stockpiling, and security/S&H requirements. Assume trucks are direct loaded. Average 240 cy/day. RSMMeans Crew B12-E.
	day	29	
	\$/day	7,769	
<b><u>Standby Time</u></b>			
	day	3	Assume equipment standby while analysis is being performed.
	\$/day	1026	Assume no additional hot spot excavation.
<b><u>Thermal Treatment of Contaminated Soil</u></b>			
	cy	5,773	Source: Endpoint Technology cost estimate using Vapor Energy Generator (VEG) Soil Remediation.
	\$/cy	41.00	
<b><u>Nonhazardous Waste</u></b>			
Transport and Offsite Disposal	tons	1,654	Based on shipping waste to American Landfill, Waynesburg, Ohio (approximately 80 mi RT). Assumes a minimum of 22 tons /load. Rate includes \$16.60/ton tax from Portage County.
	\$/ton	52.00	

**Feasibility Study for RVAAP Load Line 1**  
**Alternative 5 - Unrestricted (Residential) Land Use - Ex-situ Thermal Treatment and Excavation/Off-site Disposal**  
**of Soil/Sediment.**  
**Key Parameters and Assumptions**

**Key Parameters and Assumptions:**

Item	Unit	Value	Notes
<b><u>Waste Characterization and Confirmation Sampling</u></b>			
Waste Characterization Samples	ea	7	Includes composite samples for waste characterization (TCLP metals, TCLP SVOCs, TCLP pesticides, TCLP herbicides, reactive cyanide, reactive sulfide, and PCBs) and ISM samples for confirmation (PCB-1254, RDX, TNT, Antimony, Lead, and PAH).  Assumes 1 sampling technician to collect and ship samples.  1 truck x \$100/day including fuel.  Reference ECHOS 33 02 0401/0402 for ISM, processing, disposable sampling and decontamination materials.  Analyze samples for TCLP metals, TCLP SVOCs, TCLP pesticides, TCLP herbicides, reactive cyanide, reactive sulfide, and PCBs (\$553 ea.) and PCB-1254, RDX, TNT, Antimony, Lead, and PAH (\$14,916 all areas).  Includes 12-in lift of native fill assuming 20% swell. ECHOS 17030423 and RSMeans 312323160040, Unclassified Fill, 6" Lifts, offsite Source @ 20 miles, Includes delivery, spreading, and compaction.
Confirmation Sample Locations	ea	103	
Sampling Labor	hrs	36	
Sampling Labor	\$/hr	70	
Truck Rental / Gas	\$/event	450	
Sample Materials	ea	110	
Sample Materials	\$/ea	35	
Analytical Cost	\$/event	18,787	
<b><u>Restoration</u></b>			
Native Soil Backfill	cy	1,089	Includes 12-in lift of native fill assuming 20% swell. RSMeans 312323160040, Unclassified Fill, 6" Lifts, offsite Source @ 20 miles, Includes delivery, spreading, and compaction.
Native Soil Backfill	\$/cy	26.20	
Seeding, Vegetative Cover	MSF	44	Seeding with mulch and fertilizer. Include restoration of excavated areas and equipment damage. RSMeans 329219142200.
Seeding, Vegetative Cover	\$/MSF	63.21	
SWPPP Inspections	hrs	4	Assume one follow-up inspection.
SWPPP Inspections	\$/hr	70	
<b><u>Plans and Reports</u></b>			
Remedial Action Completion Report	hrs	300	Includes Construction QC data and preparing report.
Technical Labor	\$/hr	90	

**Feasibility Study for RVAAP Load Line 1**

**Alternative 5 - Unrestricted (Residential) Land Use - Ex-situ Thermal Treatment and Excavation/Off-site Disposal of Soil/Sediment.**

**Cost Estimate**

**CAPITAL COST**

**\$1,006,668**

Activity (unit)	Quantity	Unit Cost	Total
<b><u>Site Work</u></b>			
Civil Survey (day)	2.0	\$1,154.00	\$2,308
As Built Drawings (hrs)	16	\$70.00	\$1,120
Clearing (acre)	1.5	\$3,329.00	\$4,994
Sediment and Erosion Control (lf)	450	\$5.59	\$2,516
<b><u>Soil Excavation</u></b>			
Mobilization/Demobilization (ls)	1	\$5,000.00	\$5,000
Excavate Soil (day)	29	\$7,769.13	\$225,305
Standby Time (day)	3	\$1,026.00	\$3,078
Thermal Treatment of Contaminated Soil (cy)	5,773	\$41.00	\$236,693
Nonhazardous Transport and Offsite Disposal (ton)	1,654	\$52.00	\$86,008
<b><u>Confirmation Sampling</u></b>			
Sampling Labor (hrs.)	36	\$70.00	\$2,520
Truck Rental / Gas (event)	1	\$450.00	\$450
Sample Materials (ea)	110	\$35.00	\$3,850
Sample Analysis (event)	1	\$18,787.00	\$18,787
<b><u>Restoration</u></b>			
Native Soil Backfill (cy)	1,089	\$26.20	\$28,539
Seeding, Vegetative Cover (MSF)	44	\$63.21	\$2,781
SWPPP Inspections (hrs.)	4	\$70.00	\$280
<b><u>Plans and Reports</u></b>			
Remedial Action Completion Report (hrs)	300	\$90.00	\$27,000
<b>Subtotal</b>			<b>\$651,228</b>
Design		5%	\$32,561
Office Overhead		5%	\$32,561
Field Overhead		8%	\$52,098
<b>Subtotal</b>			<b>\$768,449</b>
Profit		6%	\$46,107
Contingency		25%	\$192,112
<b>Total</b>			<b>\$1,006,668</b>

**Feasibility Study for RVAAP Load Line 2**  
**Ravenna Army Ammunition Plant (RVAAP), Ravenna, Ohio**  
**Summary of Alternatives**

RVAAP Load Line 2		Duration	Non Discounted Cost		
			Capital Cost	O&M Cost	Total
1	No Action.	0	\$0	\$0	\$0
2	Commercial/Industrial Land Use - Excavation and Off-site Disposal of Soil and Administrative LUCs.	30 yr	\$82,882	\$94,349	\$177,231
3	Commercial/Industrial Land Use - Ex-situ Thermal Treatment and Excavation/Off-site Disposal of Soil and Administrative LUCs.	30 yr	\$98,669	\$94,349	\$193,018
4	Unrestricted (Residential) Land Use - Excavation and Off-site Disposal of Soil/Sediment.	<1 yr	\$1,429,453	\$0	\$1,429,453
5	Unrestricted (Residential) Land Use - Ex-situ Thermal Treatment and Excavation/Off-site Disposal of Soil/Sediment.	<1 yr	\$1,057,205	\$0	\$1,057,205

Load Line 2 Phase Name	Non Discounted Cost			
	Alt. 2	Alt. 3	Alt. 4	Alt. 5
Remedial Design	\$11,711	\$18,335	\$28,325	\$34,218
Remedial Action	\$36,093	\$33,377	\$1,055,088	\$786,887
Completion Report	\$24,804	\$34,726	\$30,719	\$34,344
Contingency	\$10,275	\$12,232	\$315,320	\$201,757
<b>Total Capital Costs:</b>	<b>\$82,882</b>	<b>\$98,669</b>	<b>\$1,429,453</b>	<b>\$1,057,205</b>
Operations and Maintenance (O&M)	\$79,373	\$79,373	\$0	\$0
Contingency	\$14,976	\$14,976	\$0	\$0
<b>Total O&amp;M Costs:</b>	<b>\$94,349</b>	<b>\$94,349</b>	<b>\$0</b>	<b>\$0</b>
<b>Total Alternative Cost</b>	<b>\$177,231</b>	<b>\$193,018</b>	<b>\$1,429,453</b>	<b>\$1,057,205</b>

Notes:

1. The base year of comparison and cost data will be CY2016.
2. Costs were estimated for comparison purposes only and are believed to be accurate within a range of -30% to +50%. Use of these costs for other purposes, including but not limited to, budgetary or construction cost estimating is not appropriate.

**Feasibility Study for RVAAP Load Line 2**  
**Ravenna Army Ammunition Plant (RVAAP), Ravenna, Ohio**  
**Summary of AOC Areas and Volumes**

Load Line 2 Alternative	Area (SF)	In-situ		Ex-situ <sup>1,2</sup>		Total Waste Characterization Samples	Total Confirmation Sample Locations
		Volume (cy)	Volume with constructability (cy)	Volume (cy)	Weight (tons)		
Alternative 2	400	30	37	46	56	1	5
Alternative 3 - Thermal Treatment Volumes	400	30	37	46	56	1	5
Alternative 3 - Excavation/Off-site Disposal Volumes	0	0	0	0	0		
Alternative 4 - Soil Excavation/Off-site Disposal Volumes	31,616	1,972	2,465	3,081	3,698	4	62
Alternative 4 - Sediment Excavation/Off-site Disposal Volume	53,072	1,966	2,457	3,071	3,686	4	3
Alternative 5 - Thermal Treatment Volume - Soil	31,216	1,950	2,437	3,047	3,656	7	57
Alternative 5 - Thermal Treatment Volumes - Sediment	53,072	1,966	2,457	3,071	3,686		
Alternative 5 - Excavation/Off-site Disposal Volumes	400	22	28	35	42		

<sup>1</sup> Constructability factor accounts for over excavation, sloping of sidewalls, and addresses limitations of removal equipment. The in situ volume was increased by 25% for a constructability factor.

<sup>2</sup> Includes 20% swell factor to account for soil expansion after excavating.

**Feasibility Study for RVAAP Load Line 2**  
**Alternative 2 - Commercial/Industrial Land Use - Excavation and Off-site Disposal of Soil and Administrative LUCs.**

**Key Parameters and Assumptions**

**Key Parameters and Assumptions:**

Item	Unit	Value	Notes
<b><u>Capital Cost</u></b>			
<b><u>Site Work</u></b>			
Site Area	sf	400	
Civil Survey	day	1.0	Survey AOC areas and set monuments for land use controls.
Civil Survey	\$/day	1,154	RSMMeans 17123131100.
As Built Drawings	hours	8	
As Built Drawings	\$/hr	70	Develop plat map for incorporation into the Base Master Plan.
Clearing	day	0.50	Clearing including mob/demob for trees/brush cleared, chipped, & left onsite. RSMMeans 022302000200.
Clearing	\$/day	3,329	
Sediment and Erosion Control	lf	40	Includes silt fence and straw bales along down slope of excavation. RSMMeans 312514161000 & 250.
Sediment and Erosion Control	\$/lf	5.59	
<b><u>Soil Excavation</u></b>			
Soil Excavation Volume (In situ)	cy	37	Includes excavation of the AOC area based on the areas and depths presented in the volume summary table. In situ volumes include a 25% constructability factor.
Soil Excavation Volume (Ex situ)	cy	46	Includes soil volume to be transported and disposed. Ex situ volumes include 20% swell factor.
Soil Excavation Mass	tons	56	Includes soil mass to be transported and disposed.
Soil Excavation Surface Area	sf	400	
<b><u>Mobilization/Demobilization</u></b>			
	ls	5,000	Includes mob/demob of excavation equipment and preparing submittals.
<b><u>Excavate Soils</u></b>			
	cy/day	240	Includes 2 cy excavator, 5-22 cy trucks, 1 O.E., 5 T.D., 1 L.S. spotter, 2 L.S. to prep trucks/and misc. Reduced productivity by 50% for loading trucks, small/precise excavations, overburden stockpiling, and security/S&H requirements. Assume trucks are direct loaded. Average 240 cy/day. RSMMeans Crew B12-E.
	day	1	
	\$/day	7,769	
<b><u>Standby Time</u></b>			
	day	3	Assume equipment standby while analysis is being performed.
	\$/day	1026	Assume no additional hot spot excavation.
<b><u>Nonhazardous Waste</u></b>			
Transport and Offsite Disposal	tons	56	Based on shipping waste to American Landfill, Waynesburg, Ohio (approximately 80 mi RT). Assumes a minimum of 22 tons /load. Rate includes \$16.60/ton tax from Portage County.
	\$/ton	52.00	

**Feasibility Study for RVAAP Load Line 2**  
**Alternative 2 - Commercial/Industrial Land Use - Excavation and Off-site Disposal of Soil and Administrative LUCs.**  
**Key Parameters and Assumptions**

**Key Parameters and Assumptions:**

Item	Unit	Value	Notes
<b><u>Waste Characterization and Confirmation Sampling</u></b>			
Waste Characterization Samples	ea	1	Includes composite samples for waste characterization (TCLP metals, TCLP SVOCs, TCLP pesticides, TCLP herbicides, reactive cyanide, reactive sulfide, and PCBs) and ISM samples for confirmation (TNT).  Assumes 1 sampling technician to collect and ship samples.  1 truck x \$100/day including fuel.  Reference ECHOS 33 02 0401/0402 for ISM, processing, disposable sampling and decontamination materials.  Analyze samples for TCLP metals, TCLP SVOCs, TCLP pesticides, TCLP herbicides, reactive cyanide, reactive sulfide, and PCBs (\$553 ea) and PCB-1254, RDX, TNT, Antimony, Lead (\$900 for all areas).  Includes native soil backfill. Assume productivity has been reduced by 25% to account for security and safety requirements.
Confirmation Sample Locations	ea	5	
Sampling Labor	hrs	8	
Sampling Labor	\$/hr	70	
Truck Rental / Gas	\$/event	100	
Sample Materials	ea	6	
Sample Materials	\$/ea	35	
Analytical Cost	\$/event	1,453	
<b><u>Restoration</u></b>			
Native Soil Backfill	cy	46	Includes 12-in lift of native fill assuming 20% swell. RSMMeans 312323160040, Unclassified Fill, 6" Lifts, offsite Source @ 20 miles, Includes delivery, spreading, and compaction.
Native Soil Backfill	\$/cy	26.20	
Seeding, Vegetative Cover	MSF	1	Seeding with mulch and fertilizer. Include restoration of excavated areas and equipment damage. RSMMeans 329219142200.
Seeding, Vegetative Cover	\$/MSF	63.21	
SWPPP Inspections	hrs	4	Assume one follow-up inspection.
SWPPP Inspections	\$/hr	70	
<b><u>Plans and Reports</u></b>			
Remedial Action Completion Report	hrs	200	Includes Construction QC data and preparing report.
Technical Labor	\$/hr	90	

**Feasibility Study for RVAAP Load Line 2**  
**Alternative 2 - Commercial/Industrial Land Use - Excavation and Off-site Disposal of Soil and Administrative LUCs.**  
**Key Parameters and Assumptions**

**Key Parameters and Assumptions:**

Item	Unit	Value	Notes
<b><u>O&amp;M Cost (Years 0 to 30)</u></b>			
Site Inspection and Maintenance	years	30	
Site Inspection	events	30	
Site Inspections	hrs	4	Inspect site annually for compliance with land use controls and complete checklist.
Field Labor	\$/hr	70	
<b><u>CERCLA Reviews</u></b>			
CERCLA 5-Year Reviews	events	6	Assume 5 year reviews for 30 years.
CERCLA 5-Year Reviews	\$/event	8,200	Assume 80 hours/review @ \$90/hr. Add \$1,000 misc expenses.

**Feasibility Study for RVAAP Load Line 2**  
**Alternative 2 - Commercial/Industrial Land Use - Excavation and Off-site Disposal of Soil and Administrative**  
**LUCs.**  
**Cost Estimate**

**CAPITAL COST**

**\$82,882**

Activity (unit)	Quantity	Unit Cost	Total
<b><u>Site Work</u></b>			
Civil Survey (day)	1.0	\$1,154.00	\$1,154
As Built Drawings (hrs)	8	\$70.00	\$560
Clearing (acre)	0.5	\$3,329.00	\$1,665
Sediment and Erosion Control (lf)	40	\$5.59	\$224
<b><u>Soil Excavation</u></b>			
Mobilization/Demobilization (ls)	1	\$5,000.00	\$5,000
Excavate Soil (days)	1	\$7,769.13	\$7,769
Standby Time (day)	3	\$1,026.00	\$3,078
Nonhazardous Transport and Offsite Disposal (ton)	56	\$52.00	\$2,889
<b><u>Waste Characterization and Confirmation Sampling</u></b>			
Sampling Labor (hrs)	8	\$70.00	\$560
Truck Rental / Gas (event)	1	\$100.00	\$100
Sample Materials (ea)	6	\$35.00	\$210
Sample Analysis (event)	1	\$1,453.00	\$1,453
<b><u>Restoration</u></b>			
Native Soil Backfill (cy)	46	\$26.20	\$1,213
Seeding, Vegetative Cover (MSF)	1	\$63.21	\$38
SWPPP Inspections (hrs)	4	\$70.00	\$280
<b><u>Plans and Reports</u></b>			
Remedial Action Completion Report (hrs)	200	\$90.00	\$18,000
Subtotal			\$44,192
Design		25%	\$11,048
Office Overhead		15%	\$6,629
Field Overhead		15%	\$6,629
Subtotal			\$68,498
Profit		6%	\$4,110
Contingency		15%	\$10,275
Total			\$82,882

**OPERATION AND MAINTENANCE**

**\$94,349**

Activity (unit)	Quantity	Unit Cost	Total Cost
<b><u>Site Inspection and Maintenance</u></b>			
Site Inspection (ea)	30	\$280	\$8,400
<b><u>CERCLA Reviews</u></b>			
CERCLA 5-Year Reviews (ea)	6	\$8,200	\$49,200
Subtotal O&M			\$57,600
Design		15%	\$8,640
Office Overhead		5%	\$2,880
Field Overhead		10%	\$5,760
Subtotal			\$74,880
Profit		6%	\$4,493
Contingency		20%	\$14,976
Total			\$94,349

**TOTAL ALTERNATIVE CAPITAL AND O&M COST (Non Discounted Cost)**

**\$177,231**

**Feasibility Study for RVAAP Load Line 2**  
**Alternative 3 - Commercial/Industrial Land Use - Ex-situ Thermal Treatment and Excavation/Off-site Disposal of**  
**Soil and Administrative LUCs.**  
**Key Parameters and Assumptions**

**Key Parameters and Assumptions:**

Item	Unit	Value	Notes
<b><u>Capital Cost</u></b>			
<b><u>Site Work</u></b>			
Site Area	sf	400	
Civil Survey	day	1.0	Survey AOC areas and set monuments for land use controls.
Civil Survey	\$/day	1,154	RSMeans 17123131100.
As Built Drawings	hours	8	
As Built Drawings	\$/hr	70	Develop plat map for incorporation into the Base Master Plan.
Clearing	day	0.50	Clearing including mob/demob for trees/brush cleared, chipped, & left onsite. RSMeans 022302000200.
Clearing	\$/day	3,329	
Sediment and Erosion Control	lf	40	Includes silt fence and straw bales along down slope of excavation.
Sediment and Erosion Control	\$/lf	5.59	RSMeans 312514161000 & 250.
<b><u>Soil Excavation</u></b>			
Soil Excavation Volume (In situ)	cy	37	Includes excavation of the AOC area based on the areas and depths presented in the volume summary table. In situ volumes include a 25% constructability factor.
Soil Excavation Volume (Ex situ)	cy	46	Includes soil volume to be transported and disposed. Ex situ volumes include 20% swell factor.
Soil Excavation Mass	tons	56	Includes soil mass to be treated
Soil Excavation Surface Area	sf	400	
<b><u>Mobilization/Demobilization</u></b>			
	ls	5,000	Includes mob/demob of excavation equipment and preparing submittals.
<b><u>Excavate Soils</u></b>			
	cy/day	240	Includes 2 cy excavator, 5-22 cy trucks, 1 O.E., 5 T.D., 1 L.S. spotter, 2 L.S. to prep trucks/and misc. Reduced productivity by 50% for loading trucks, small/precise excavations, overburden stockpiling, and security/S&H requirements. Assume trucks are direct loaded. Average 240 cy/day. RSMeans Crew B12-E.
	day	1	
	\$/day	7,769	
<b><u>Standby Time</u></b>			
	day	3	Assume equipment standby while analysis is being performed.
	\$/day	1026	Assume no additional hot spot excavation.
<b><u>Thermal Treatment of Contaminated Soil</u></b>			
	cy	46	Source: Endpoint Technology cost estimate using Vapor Energy Generator (VEG) Soil Remediation.
	\$/cy	41.00	
<b><u>Nonhazardous Waste</u></b>			
Transport and Offsite Disposal	tons	0	Based on shipping waste to American Landfill, Waynesburg, Ohio (approximately 80 mi RT). Assumes a minimum of 22 tons /load. Rate includes \$16.60/ton tax from Portage County.
	\$/ton	52.00	

**Feasibility Study for RVAAP Load Line 2**  
**Alternative 3 - Commercial/Industrial Land Use - Ex-situ Thermal Treatment and Excavation/Off-site Disposal of**  
**Soil and Administrative LUCs.**  
**Key Parameters and Assumptions**

**Key Parameters and Assumptions:**

Item	Unit	Value	Notes
<b><u>Waste Characterization and Confirmation Sampling</u></b>			
Waste Characterization Samples	ea	1	Includes composite samples for waste characterization (TCLP metals, TCLP SVOCs, TCLP pesticides, TCLP herbicides, reactive cyanide, reactive sulfide, and PCBs) and ISM samples for confirmation (TNT).
Confirmation Sample Locations	ea	5	
Sampling Labor	hrs	8	Assumes 1 sampling technician to collect and ship samples.
Sampling Labor	\$/hr	70	
Truck Rental / Gas	\$/event	100	1 truck x \$100/day including fuel.
Sample Materials	ea	6	Reference ECHOS 33 02 0401/0402 for ISM, processing, disposable sampling and decontamination materials.
Sample Materials	\$/ea	35	
Analytical Cost	\$/event	1,453	Analyze samples for TCLP metals, TCLP SVOCs, TCLP pesticides, TCLP herbicides, reactive cyanide, reactive sulfide, and PCBs (\$553 ea) and PCB-1254, RDX, TNT, Antimony, Lead (\$900 all areas).
<b><u>Restoration</u></b>			
Includes native soil backfill. Assume productivity has been reduced by 25% to account for security and safety requirements.			
Native Soil Backfill	cy	9	Includes 12-in lift of native fill assuming 20% swell. RSM means 312323160040, Unclassified Fill, 6" Lifts, offsite Source @ 20 miles, Includes delivery, spreading, and compaction.
Native Soil Backfill	\$/cy	26.20	
Seeding, Vegetative Cover	MSF	1	Seeding with mulch and fertilizer. Include restoration of excavated areas and equipment damage. RSM means 329219142200.
Seeding, Vegetative Cover	\$/MSF	63.21	
SWPPP Inspections	hrs	4	Assume one follow-up inspection.
SWPPP Inspections	\$/hr	70	
<b><u>Plans and Reports</u></b>			
Remedial Action Completion Report	hrs	280	Includes Construction QC data and preparing report.
Technical Labor	\$/hr	90	

**Feasibility Study for RVAAP Load Line 2**  
**Alternative 3 - Commercial/Industrial Land Use - Ex-situ Thermal Treatment and Excavation/Off-site Disposal of**  
**Soil and Administrative LUCs.**  
**Key Parameters and Assumptions**

**Key Parameters and Assumptions:**

Item	Unit	Value	Notes
<b><u>O&amp;M Cost (Years 0 to 30)</u></b>			
<u>Site Inspection and Maintenance</u>	years	30	
Site Inspection	events	30	
Site Inspections	hrs	4	Inspect site annually for compliance with land use controls and complete checklist.
Field Labor	\$/hr	70	
<b><u>CERCLA Reviews</u></b>			
CERCLA 5-Year Reviews	events	6	Assume 5 year reviews for 30 years.
CERCLA 5-Year Reviews	\$/event	8,200	Assume 80 hours/review @ \$90/hr. Add \$1,000 misc expenses.

**Feasibility Study for RVAAP Load Line 2**

**Alternative 3 - Commercial/Industrial Land Use - Ex-situ Thermal Treatment and Excavation/Off-site Disposal  
of Soil and Administrative LUCs.**

**Cost Estimate**

**CAPITAL COST**

**\$98,669**

Activity (unit)	Quantity	Unit Cost	Total
<b><u>Site Work</u></b>			
Civil Survey (day)	1.0	\$1,154.00	\$1,154
As Built Drawings (hrs)	8	\$70.00	\$560
Clearing (acre)	0.5	\$3,329.00	\$1,665
Sediment and Erosion Control (lf)	40	\$5.59	\$224
<b><u>Soil Excavation</u></b>			
Mobilization/Demobilization (ls)	1	\$5,000.00	\$5,000
Excavate Soil (day)	1	\$7,769.13	\$7,769
Standby Time (day)	3	\$1,026.00	\$3,078
Thermal Treatment of Contaminated Soil (cy)	46	\$41.00	\$1,898
Nonhazardous Transport and Offsite Disposal (ton)	0	\$52.00	\$0
<b><u>Waste Characterization and Confirmation Sampling</u></b>			
Sampling Labor (hrs.)	8	\$70.00	\$560
Truck Rental / Gas (event)	1	\$100.00	\$100
Sample Materials (ea)	6	\$35.00	\$210
Sample Analysis (event)	1	\$1,453.00	\$1,453
<b><u>Restoration</u></b>			
Native Soil Backfill (cy)	9	\$26.20	\$233
Seeding, Vegetative Cover (MSF)	1	\$63.21	\$38
SWPPP Inspections (hrs.)	4	\$70.00	\$280
<b><u>Plans and Reports</u></b>			
Remedial Action Completion Report (hrs)	280	\$90.00	\$25,200
<b>Subtotal</b>			<b>\$49,421</b>
Design		35%	\$17,297
Office Overhead		15%	\$7,413
Field Overhead		15%	\$7,413
<b>Subtotal</b>			<b>\$81,545</b>
Profit		6%	\$4,893
Contingency		15%	\$12,232
<b>Total</b>			<b>\$98,669</b>

**Feasibility Study for RVAAP Load Line 2**

**Alternative 3 - Commercial/Industrial Land Use - Ex-situ Thermal Treatment and Excavation/Off-site Disposal  
of Soil and Administrative LUCs.**

**Cost Estimate**

**OPERATION AND MAINTENANCE**

**\$94,349**

Activity (unit)	Quantity	Unit Cost	Total Cost
<b><u>Site Inspection and Maintenance</u></b>			
Site Inspection (ea.)	30	\$280	\$8,400
<b><u>CERCLA Reviews</u></b>			
CERCLA 5-Year Reviews (ea)	6	\$8,200	\$49,200
Subtotal O&M			\$57,600
Design		15%	\$8,640
Office Overhead		5%	\$2,880
Field Overhead		10%	\$5,760
Subtotal			\$74,880
Profit		6%	\$4,493
Contingency		20%	\$14,976
Total			\$94,349

**TOTAL ALTERNATIVE CAPITAL AND O&M COST (Non Discounted Cost)**

**\$193,018**

## Feasibility Study for RVAAP Load Line 2

### Alternative 4 - Unrestricted (Residential) Land Use - Excavation and Off-site Disposal of Soil/Sediment. Key Parameters and Assumptions

#### Key Parameters and Assumptions:

Item	Unit	Value	Notes
<b><u>Capital Cost</u></b>			
<b><u>Site Work</u></b>			
Site Area	sf	84,688	
Civil Survey	day	1.0	Survey AOC areas and set monuments for land use controls.
Civil Survey	\$/day	1,154	RSMMeans 17123131100.
As Built Drawings	hours	8	
As Built Drawings	\$/hr	70	Develop plat map for incorporation into the Base Master Plan.
Clearing	day	0.50	Clearing including mob/demob for trees/brush cleared, chipped, &
Clearing	\$/day	3,329	left onsite. RSMMeans 022302000200.
Sediment and Erosion Control	lf	590	Includes silt fence and straw bales along down slope of
Sediment and Erosion Control	\$/lf	5.59	excavation. RSMMeans 312514161000 & 250.
Temporary Haul Road	lf	150	Temporary haul roads, gravel fill, 8" gravel depth. RSMMeans
Temporary Haul Road	\$/lf	19.88	15523500100
Temporary Stream Diversion	lf	400	Sanitary utility sewerage piping, HDPE Corrugated Type S with
Temporary Stream Diversion	\$/lf	27.65	watertight gaskets, 24" diameter. RSMMeans 333113203140.
Pump and Filter	ea	2	Water filter and rent trash pump, 4" diameter, diesel drive, 45
Pump and Filter	\$/ea	7,721.95	days. Includes hourly operational cost. RSMMeans 15433701300 and 225119500900.
			Includes excavation of the AOC area based on the areas and
			depths presented in the volume summary table. In situ volumes
			include a 25% constructability factor.
<b><u>Soil Excavation</u></b>			
Soil Excavation Volume (In situ)	cy	4,922	
Soil Excavation Volume (Ex situ)	cy	6,153	Includes soil volume to be transported and disposed. Ex situ
			volumes include 20% swell factor.
Soil Excavation Mass	tons	7,383	Includes soil mass to be transported and disposed.
Soil Excavation Surface Area	sf	84,688	
			Includes mob/demob of excavation equipment and preparing
			submittals.
<b><u>Mobilization/Demobilization</u></b>	ls	5,000	
<b><u>Excavate Soils</u></b>	cy/day	240	Includes 2 cy excavator, 5-22 cy trucks, 1 O.E., 5 T.D., 1 L.S.
	day	26	spotter, 2 L.S. to prep trucks/and misc. Reduced productivity by
	\$/day	9,323	50% for loading trucks, small/precise excavations, overburden
			stockpiling, and security/S&H requirements. Assume trucks are
			direct loaded. Average 240 cy/day. RSMMeans Crew B12-E. Add
			20% to excavation unit rate to account for additional cost
			associated with dredging.
<b><u>Standby Time</u></b>	day	3	Assume equipment standby while analysis is being performed.
	\$/day	1026	Assume no additional hot spot excavation.
<b><u>Nonhazardous Waste</u></b>	tons	7,383	Based on shipping waste to American Landfill, Waynesburg,
Transport and Offsite Disposal	\$/ton	52.00	Ohio (approximately 80 mi RT). Assumes a minimum of 22 tons
			/load. Rate includes \$16.60/ton tax from Portage County.

## Feasibility Study for RVAAP Load Line 2

### Alternative 4 - Unrestricted (Residential) Land Use - Excavation and Off-site Disposal of Soil/Sediment. Key Parameters and Assumptions

#### Key Parameters and Assumptions:

<b><u>Waste Characterization and Confirmation Sampling</u></b>			
Waste Characterization Samples	ea	4	Includes composite samples for waste characterization (TCLP metals, TCLP SVOCs, TCLP pesticides, TCLP herbicides, reactive cyanide, reactive sulfide, and PCBs) and ISM samples for confirmation (PCB-1254, TNT, Antimony, Lead, and PAH).
Confirmation Sample Locations	ea	62	
Sampling Labor	hrs	50	Assumes 1 sampling technician to collect and ship samples.
Sampling Labor	\$/hr	70	
Truck Rental / Gas	\$/event	625	1 truck x \$100/day including fuel.
Sample Materials	ea	66	Reference ECHOS 33 02 0401/0402 for ISM, processing, disposable sampling and decontamination materials.
Sample Materials	\$/ea	35	
Analytical Cost	\$/event	19,022	Analyze samples for TCLP metals, TCLP SVOCs, TCLP pesticides, TCLP herbicides, reactive cyanide, reactive sulfide, and PCBs (\$553 ea) and PCB-1254, TNT, Antimony, Lead, and PAH (\$16,810 all areas).
<b><u>Restoration</u></b>			
Native Soil Backfill	cy	6,153	Includes native soil backfill. Assume productivity has been reduced by 25% to account for security and safety requirements. Includes 12-in lift of native fill assuming 20% swell. RSM means 312323160040, Unclassified Fill, 6" Lifts, offsite Source @ 20 miles, Includes delivery, spreading, and compaction.
Native Soil Backfill	\$/cy	26.20	
Seeding, Vegetative Cover	MSF	127	Seeding with mulch and fertilizer. Include restoration of excavated areas and equipment damage. RSM means 329219142200.
Seeding, Vegetative Cover	\$/MSF	63.21	
SWPPP Inspections	hrs	4	Assume one follow-up inspection.
SWPPP Inspections	\$/hr	70	
<b><u>Plans and Reports</u></b>			
Remedial Action Completion Report	hrs	280	Includes Construction QC data and preparing report.
Technical Labor	\$/hr	90	

## Feasibility Study for RVAAP Load Line 2

### Alternative 4 - Unrestricted (Residential) Land Use - Excavation and Off-site Disposal of Soil/Sediment. Cost Estimate

#### CAPITAL COST

**\$1,429,453**

Activity (unit)	Quantity	Unit Cost	Total
<b><u>Site Work</u></b>			
Civil Survey (day)	1.0	\$1,154.00	\$1,154
As Built Drawings (hrs)	8	\$70.00	\$560
Clearing (acre)	0.5	\$3,329.00	\$1,665
Sediment and Erosion Control (lf)	590	\$5.59	\$3,298
Temporary Haul Road (lf)	150	\$19.88	\$2,981
Temporary Stream Diversion (lf)	400	\$27.65	\$11,060
Pump and Filter (ea)	2	\$7,721.95	\$15,444
<b><u>Soil Excavation</u></b>			
Mobilization/Demobilization (ls)	1	\$5,000.00	\$5,000
Excavate Soil (days)	26	\$9,322.96	\$242,397
Standby Time (day)	3	\$1,026.00	\$3,078
Nonhazardous Transport and Offsite Disposal (ton)	7,383	\$52.00	\$383,931
<b><u>Confirmation Sampling</u></b>			
Sampling Labor (hrs)	50	\$70.00	\$3,500
Truck Rental / Gas (event)	1	\$625.00	\$625
Sample Materials (ea)	66	\$35.00	\$2,310
Sample Analysis (event)	1	\$19,022.00	\$19,022
<b><u>Restoration</u></b>			
Native Soil Backfill (cy)	6,153	\$26.20	\$161,202
Seeding, Vegetative Cover (MSF)	127	\$63.21	\$8,030
SWPPP Inspections (hrs)	4	\$70.00	\$280
<b><u>Plans and Reports</u></b>			
Remedial Action Completion Report (hrs)	280	\$90.00	\$25,200
<b>Subtotal</b>			<b>\$890,736</b>
Design		3%	\$26,722
Office Overhead		5%	\$44,537
Field Overhead		10%	\$89,074
<b>Subtotal</b>			<b>\$1,051,068</b>
Profit		6%	\$63,064
Contingency		30%	\$315,320
<b>Total</b>			<b>\$1,429,453</b>

**Feasibility Study for RVAAP Load Line 2**  
**Alternative 5 - Unrestricted (Residential) Land Use - Ex-situ Thermal Treatment and Excavation/Off-site Disposal of Soil/Sediment.**  
**Key Parameters and Assumptions**

**Key Parameters and Assumptions:**

Item	Unit	Value	Notes
<b><u>Capital Cost</u></b>			
<b><u>Site Work</u></b>			
Site Area	sf	84,688	
Civil Survey	day	2.0	Survey AOC areas and set monuments for land use controls.
Civil Survey	\$/day	1,154	RSMeans 17123131100.
As Built Drawings	hours	8	
As Built Drawings	\$/hr	70	Develop plat map for incorporation into the Base Master Plan.
Clearing	day	0.50	Clearing including mob/demob for trees/brush cleared, chipped, & left onsite. RSMeans 022302000200.
Clearing	\$/day	3,329	
Sediment and Erosion Control	lf	590	Includes silt fence and straw bales along down slope of excavation. RSMeans 312514161000 & 250.
Sediment and Erosion Control	\$/lf	5.59	
Temporary Haul Road	lf	150	Temporary haul roads, gravel fill, 8" gravel depth. RSMeans 15523500100
Temporary Haul Road	\$/lf	19.88	
Temporary Stream Diversion	lf	400	Sanitary utility sewerage piping, HDPE Corrugated Type S with watertight gaskets, 24" diameter. RSMeans 333113203140.
Temporary Stream Diversion	\$/lf	27.65	
Pump and Filter	ea	2	Water Filter and rent trash pump self-prime 4" diameter, diesel drive, 45 days. Includes hourly operational cost. RSMeans 15433701300 and 225119500900.
Pump and Filter	\$/ea	7,721.95	
<b><u>Soil Excavation</u></b>			
Soil Excavation Volume (In situ)	cy	4,922	Includes excavation of the AOC area based on the areas and depths presented in the summary table. In situ volumes include a 25% constructability factor.
Soil Excavation Volume (Ex situ)	cy	6,153	Includes soil volume to undergo thermal treatment. Ex situ volumes include a 25% constructability and 20% swell factor.
Soil Excavation Mass	tons	7,383	Includes soil mass to be treated
Soil Excavation Surface Area	sf	84,688	
<b><u>Mobilization/Demobilization</u></b>			
	ls	5,000	Includes mob/demob of excavation equipment and preparing submittals.
<b><u>Excavate Soils</u></b>			
	cy/day	240	Includes 2 cy excavator, 5-22 cy trucks, 1 O.E., 5 T.D., 1 L.S. spotter, 2 L.S. to prep trucks/and misc. Reduced productivity by 50% for loading trucks, small/precise excavations, overburden stockpiling, and security/S&H requirements. Assume trucks are direct loaded. Average 240 cy/day. RSMeans Crew B12-E. Add 20% to excavation unit rate to account for additional cost associated with dredging.
	day	26	
	\$/day	9,323	
<b><u>Standby Time</u></b>			
	day	3	Assume equipment standby while analysis is being performed.
	\$/day	1026	Assume no additional hot spot excavation.
<b><u>Thermal Treatment of Contaminated Soil</u></b>			
	cy	6,118	Source: Endpoint Technology cost estimate using Vapor Energy Generator (VEG) Soil Remediation.
	\$/cy	41.00	

**Feasibility Study for RVAAP Load Line 2**  
**Alternative 5 - Unrestricted (Residential) Land Use - Ex-situ Thermal Treatment and Excavation/Off-site Disposal of Soil/Sediment.**  
**Key Parameters and Assumptions**

**Key Parameters and Assumptions:**

Item	Unit	Value	Notes
<u>Nonhazardous Waste</u>	tons	42	Based on shipping waste to American Landfill, Waynesburg, Ohio (approximately 80 mi RT). Assumes a minimum of 22 tons /load. Rate includes \$16.60/ton tax from Portage County.
Transport and Offsite Disposal	\$/ton	52.00	
<b><u>Waste Characterization and Confirmation Sampling</u></b>			
Waste Characterization Samples	ea	4	Includes composite samples for waste characterization (TCLP metals, TCLP SVOCs, TCLP pesticides, TCLP herbicides, reactive cyanide, reactive sulfide, and PCBs) and ISM samples for confirmation (PCB-1254, TNT, Antimony, Lead, and PAH).
Confirmation Sample Locations	ea	62	
Sampling Labor	hrs	50	Assumes 1 sampling technician to collect and ship samples.
Sampling Labor	\$/hr	70	
Truck Rental / Gas	\$/event	625	1 truck x \$100/day including fuel.
Sample Materials	ea	66	Reference ECHOS 33 02 0401/0402 for ISM, processing, disposable sampling and decontamination materials.
Sample Materials	\$/ea	35	
Analytical Cost	\$/event	19,022	Analyze samples for TCLP metals, TCLP SVOCs, TCLP pesticides, TCLP herbicides, reactive cyanide, reactive sulfide, and PCBs (\$553 ea.) and PCB-1254, TNT, Antimony, Lead, and PAH (\$16,810 all areas).
<b><u>Restoration</u></b>			
Native Soil Backfill	cy	1,882	Includes 12-in lift of native fill assuming 20% swell. ECHOS 17030423 and RSMMeans 312323160040, Unclassified Fill, 6" Lifts, offsite Source @ 20 miles, Includes delivery, spreading, and compaction.
Native Soil Backfill	\$/cy	26.20	
Seeding, Vegetative Cover	MSF	44	Seeding with mulch and fertilizer. Include restoration of excavated areas and equipment damage. RSMMeans 329219142200.
Seeding, Vegetative Cover	\$/MSF	63.21	
SWPPP Inspections	hrs	4	Assume one follow-up inspection.
SWPPP Inspections	\$/hr	70	
<b><u>Plans and Reports</u></b>			
Remedial Action Completion Report	hrs	300	Includes Construction QC data and preparing report.
Technical Labor	\$/hr	90	

**Feasibility Study for RVAAP Load Line 2**

**Alternative 5 - Unrestricted (Residential) Land Use - Ex-situ Thermal Treatment and Excavation/Off-site Disposal of Soil/Sediment.**

**Cost Estimate**

**CAPITAL COST**

**\$1,057,205**

Activity (unit)	Quantity	Unit Cost	Total
<b><u>Site Work</u></b>			
Civil Survey (day)	2.0	\$1,154.00	\$2,308
As Built Drawings (hrs)	8	\$70.00	\$560
Clearing (acre)	0.5	\$3,329.00	\$1,665
Sediment and Erosion Control (lf)	590	\$5.59	\$3,298
Temporary Haul Road (lf)	150	\$19.88	\$2,981
Temporary Stream Diversion (lf)	400	\$27.65	\$11,060
Pump and Filter (ea)	2	\$7,721.95	\$15,444
<b><u>Soil Excavation</u></b>			
Mobilization/Demobilization (ls)	1	\$5,000.00	\$5,000
Excavate Soil (day)	26	\$9,322.96	\$242,397
Standby Time (day)	3	\$1,026.00	\$3,078
Thermal Treatment of Contaminated Soil (cy)	6,118	\$41.00	\$250,839
Nonhazardous Transport and Offsite Disposal (ton)	42	\$52.00	\$2,167
<b><u>Confirmation Sampling</u></b>			
Sampling Labor (hrs.)	50	\$70.00	\$3,500
Truck Rental / Gas (event)	1	\$625.00	\$625
Sample Materials (ea)	66	\$35.00	\$2,310
Sample Analysis (event)	1	\$19,022.00	\$19,022
<b><u>Restoration</u></b>			
Native Soil Backfill (cy)	1,882	\$26.20	\$49,307
Seeding, Vegetative Cover (MSF)	44	\$63.21	\$2,781
SWPPP Inspections (hrs.)	4	\$70.00	\$280
<b><u>Plans and Reports</u></b>			
Remedial Action Completion Report (hrs)	300	\$90.00	\$27,000
Subtotal			\$645,621
Design		5%	\$32,281
Office Overhead		5%	\$32,281
Field Overhead		15%	\$96,843
Subtotal			\$807,027
Profit		6%	\$48,422
Contingency		25%	\$201,757
<b>Total</b>			<b>\$1,057,205</b>

**Feasibility Study for RVAAP Load Line 3**  
**Ravenna Army Ammunition Plant (RVAAP), Ravenna, Ohio**  
**Summary of Alternatives**

RVAAP Load Line 3		Duration	Non Discounted Cost		
			Capital Cost	O&M Cost	Total
1	No Action.	0	\$0	\$0	\$0
2	Commercial/Industrial Land Use – Excavation and Off-site Disposal of Soil and Administrative LUCs	30 yr	\$572,781	\$94,349	\$667,130
3	Commercial/Industrial Land Use – Ex-situ Thermal Treatment of Soil and Administrative LUCs	30 yr	\$393,933	\$94,349	\$488,281
4	Unrestricted (Residential) Land Use – Excavation and Off-site Disposal of Soil/Sediment	<1 yr	\$2,812,921	\$0	\$2,812,921
5	Unrestricted (Residential) Land Use - Ex-situ Thermal Treatment and Excavation/Off-site Disposal of Soil/Sediment	<1 yr	\$1,726,374	\$0	\$1,726,374

Load Line 3 Phase Name	Non Discounted Cost			
	Alt. 2	Alt. 3	Alt. 4	Alt. 5
Remedial Design	\$20,907	\$27,608	\$40,645	\$59,191
Remedial Action	\$458,926	\$286,771	\$2,206,076	\$1,305,382
Completion Report	\$21,942	\$30,719	\$29,383	\$32,341
Contingency	\$71,006	\$48,835	\$536,817	\$329,461
<b>Total Capital Costs:</b>	<b>\$572,781</b>	<b>\$393,933</b>	<b>\$2,812,921</b>	<b>\$1,726,374</b>
Operations and Maintenance (O&M)	\$79,373	\$79,373	\$0	\$0
Contingency	\$14,976	\$14,976	\$0	\$0
<b>Total O&amp;M Costs:</b>	<b>\$94,349</b>	<b>\$94,349</b>	<b>\$0</b>	<b>\$0</b>
<b>Total Alternative Cost</b>	<b>\$667,130</b>	<b>\$488,281</b>	<b>\$2,812,921</b>	<b>\$1,726,374</b>

Notes:

1. The base year of comparison and cost data will be CY2016.
2. Costs were estimated for comparison purposes only and are believed to be accurate within a range of -30% to +50%. Use of these costs for other purposes, including but not limited to, budgetary or construction cost estimating is not appropriate.

**Feasibility Study for RVAAP Load Line 3**  
**Ravenna Army Ammunition Plant (RVAAP), Ravenna, Ohio**  
**Summary of AOC Areas and Volumes**

Load Line 3 Alternative	Area (SF)	In-situ		Ex-situ <sup>1,2</sup>		Total Waste Characterization Samples	Total Confirmation Sample Locations
		Volume (cy)	Volume with constructability (cy)	Volume (cy)	Weight (tons)		
Alternative 2 - Excavation and Offsite Disposal Volumes above Industrial RGOs	25,056	1,649	2,062	2,474	3,711	3	45
Alternative 3 - Thermal Treatment Volumes	24,656	1,635	2,043	2,452	3,678	3	45
Alternative 3 - Excavation/Off-site Disposal Volumes	400	15	19	22	28		
Alternative 4	69,435	8,865	11,082	13,298	19,947	14	103
Alternative 5 - Thermal Treatment Volumes	68,025	8,821	11,026	13,231	19,846	14	103
Alternative 5 - Excavation/Off-site Disposal Volumes	1,410	45	56	67	84		

<sup>1</sup> Constructability factor accounts for over excavation, sloping of sidewalls, and addresses limitations of removal equipment. The in situ volume was increased by 25% for a constructability factor.

<sup>2</sup> Includes 20% swell factor to account for soil expansion after excavating.

**Feasibility Study for RVAAP Load Line 3**  
**Alternative 2 - Commercial/Industrial Land Use - Excavation and Off-site Disposal of Soil and Administrative LUCs.**

**Key Parameters and Assumptions**

**Key Parameters and Assumptions:**

Item	Unit	Value	Notes
<b><u>Capital Cost</u></b>			
<b><u>Site Work</u></b>			
Site Area	sf	25,056	
Civil Survey	day	2.0	Survey AOC areas and set monuments for land use controls.
Civil Survey	\$/day	1,154	RSMeans 17123131100.
As Built Drawings	hours	16	
As Built Drawings	\$/hr	70	Develop plat map for incorporation into the Base Master Plan.
Clearing	day	0.75	Clearing including mob/demob for trees/brush cleared, chipped, & left onsite. RSMeans 022302000200.
Clearing	\$/day	3,329	
Sediment and Erosion Control	lf	320	Includes silt fence and straw bales along down slope of excavation. RSMeans 312514161000 & 250.
Sediment and Erosion Control	\$/lf	5.59	
<b><u>Soil Excavation</u></b>			
Soil Excavation Volume (In situ)	cy	2,062	Includes excavation of the AOC area based on the areas and depths presented in the volume summary table. In situ volumes include a 25% constructability factor.
Soil Excavation Volume (Ex situ)	cy	2,474	Includes soil volume to be transported and disposed. Ex situ volumes include 20% swell factor.
Soil Excavation Mass	tons	3,711	Includes soil mass to be transported and disposed.
Soil Excavation Surface Area	sf	25,056	
<b><u>Mobilization/Demobilization</u></b>			
	ls	5,000	Includes mob/demob of excavation equipment and preparing submittals.
<b><u>Excavate Soils</u></b>			
	cy/day	240	Includes 2 cy excavator, 5-22 cy trucks, 1 O.E., 5 T.D., 1 L.S. spotter, 2 L.S. to prep trucks/and misc. Reduced productivity by 50% for loading trucks, small/precise excavations, overburden stockpiling, and security/S&H requirements. Assume trucks are direct loaded. Average 240 cy/day. RSMeans Crew B12-E.
	day	11	
	\$/day	7,769	
<b><u>Standby Time</u></b>			
	day	3	Assume equipment standby while analysis is being performed.
	\$/day	1026	Assume no additional hot spot excavation.
<b><u>Nonhazardous Waste</u></b>			
Transport and Offsite Disposal	tons	3,711	Based on shipping waste to American Landfill, Waynesburg, Ohio (approximately 80 mi RT). Assumes a minimum of 22 tons /load. Rate includes \$16.60/ton tax from Portage County.
	\$/ton	52.00	

**Feasibility Study for RVAAP Load Line 3**  
**Alternative 2 - Commercial/Industrial Land Use - Excavation and Off-site Disposal of Soil and Administrative**  
**LUCs.**  
**Key Parameters and Assumptions**

**Key Parameters and Assumptions:**

Item	Unit	Value	Notes
<b><u>Waste Characterization and Confirmation Sampling</u></b>			
Waste Characterization Samples	ea	3	Includes composite samples for waste characterization (TCLP metals, TCLP SVOCs, TCLP pesticides, TCLP herbicides, reactive cyanide, reactive sulfide, and PCBs) and ISM samples for confirmation (PCB-1254, Explosives, Metals, Lead, and PAH).  Assumes 1 sampling technician to collect and ship samples.  1 truck x \$100/day including fuel.  Reference ECHOS 33 02 0401/0402 for ISM, processing, disposable sampling and decontamination materials.  Analyze samples for TCLP metals, TCLP SVOCs, TCLP pesticides, TCLP herbicides, reactive cyanide, reactive sulfide, and PCBs (\$553 ea) and PCB-1254, Explosives, Metals, Lead, and PAH (\$8,140 for all areas).  Includes native soil backfill. Assume productivity has been reduced by 25% to account for security and safety requirements.
Confirmation Sample Locations	ea	45	
Sampling Labor	hrs	40	
Sampling Labor	\$/hr	70	
Truck Rental / Gas	\$/event	500	
Sample Materials	ea	48	
Sample Materials	\$/ea	35	
Analytical Cost	\$/event	9,799	
<b><u>Restoration</u></b>			
Native Soil Backfill	cy	2,474	Includes 12-in lift of native fill assuming 20% swell. RSMMeans 312323160040, Unclassified Fill, 6" Lifts, offsite Source @ 20 miles, Includes delivery, spreading, and compaction.
Native Soil Backfill	\$/cy	26.20	
Seeding, Vegetative Cover	MSF	38	Seeding with mulch and fertilizer. Include restoration of excavated areas and equipment damage. RSMMeans 329219142200.
Seeding, Vegetative Cover	\$/MSF	63.21	
SWPPP Inspections	hrs	4	Assume one follow-up inspection.
SWPPP Inspections	\$/hr	70	
<b><u>Plans and Reports</u></b>			
Remedial Action Completion Report	hrs	200	Includes Construction QC data and preparing report.
Technical Labor	\$/hr	90	

**Feasibility Study for RVAAP Load Line 3**  
**Alternative 2 - Commercial/Industrial Land Use - Excavation and Off-site Disposal of Soil and Administrative LUCs.**  
**Key Parameters and Assumptions**

**Key Parameters and Assumptions:**

Item	Unit	Value	Notes
<b><u>O&amp;M Cost (Years 0 to 30)</u></b>			
Site Inspection and Maintenance	years	30	
Site Inspection	events	30	
Site Inspections	hrs	4	Inspect site annually for compliance with land use controls and complete checklist.
Field Labor	\$/hr	70	
<b><u>CERCLA Reviews</u></b>			
CERCLA 5-Year Reviews	events	6	Assume 5 year reviews for 30 years.
CERCLA 5-Year Reviews	\$/event	8,200	Assume 80 hours/review @ \$90/hr. Add \$1,000 misc expenses.

**Feasibility Study for RVAAP Load Line 3**  
**Alternative 2 - Commercial/Industrial Land Use - Excavation and Off-site Disposal of Soil and Administrative LUCs.**  
**Cost Estimate**

**CAPITAL COST**

**\$572,781**

Activity (unit)	Quantity	Unit Cost	Total
<b>Site Work</b>			
Civil Survey (day)	2.0	\$1,154.00	\$2,308
As Built Drawings (hrs)	16	\$70.00	\$1,120
Clearing (acre)	0.8	\$3,329.00	\$2,497
Sediment and Erosion Control (lf)	320	\$5.59	\$1,789
<b>Soil Excavation</b>			
Mobilization/Demobilization (ls)	1	\$5,000.00	\$5,000
Excavate Soil (days)	11	\$7,769.13	\$85,460
Standby Time (day)	3	\$1,026.00	\$3,078
Nonhazardous Transport and Offsite Disposal (ton)	3,711	\$52.00	\$192,972
<b>Waste Characterization and Confirmation Sampling</b>			
Sampling Labor (hrs)	40	\$70.00	\$2,800
Truck Rental / Gas (event)	1	\$500.00	\$500
Sample Materials (ea)	48	\$35.00	\$1,680
Sample Analysis (event)	1	\$9,799.00	\$9,799
<b>Restoration</b>			
Native Soil Backfill (cy)	2,474	\$26.20	\$64,819
Seeding, Vegetative Cover (MSF)	38	\$63.21	\$2,376
SWPPP Inspections (hrs)	4	\$70.00	\$280
<b>Plans and Reports</b>			
Ramedial Action Completion Report (hrs)	200	\$90.00	\$18,000
<b>Subtotal</b>			<b>\$394,477</b>
Design		5%	\$19,724
Office Overhead		5%	\$19,724
Field Overhead		10%	\$39,448
<b>Subtotal</b>			<b>\$473,373</b>
Profit		6%	\$28,402
Contingency		15%	\$71,006
<b>Total</b>			<b>\$572,781</b>

**OPERATION AND MAINTENANCE****\$94,349**

Activity (unit)	Quantity	Unit Cost	Total Cost
<b><u>Site Inspection and Maintenance</u></b>			
Site Inspection (ea)	30	\$280	\$8,400
<b><u>CERCLA Reviews</u></b>			
CERCLA 5-Year Reviews (ea)	6	\$8,200	\$49,200
Subtotal O&M			\$57,600
Design		15%	\$8,640
Office Overhead		5%	\$2,880
Field Overhead		10%	\$5,760
Subtotal			\$74,880
Profit		6%	\$4,493
Contingency		20%	\$14,976
Total			\$94,349

**TOTAL ALTERNATIVE CAPITAL AND O&M COST (Non Discounted Cost)****\$667,130**

**Feasibility Study for RVAAP Load Line 3**  
**Alternative 3 - Commercial/Industrial Land Use - Ex-situ Thermal Treatment and Excavation/Off-site Disposal of**  
**Soil and Administrative LUCs.**  
**Key Parameters and Assumptions**

**Key Parameters and Assumptions:**

Item	Unit	Value	Notes
<b><u>Capital Cost</u></b>			
<b><u>Site Work</u></b>			
Site Area	sf	25,056	
Civil Survey	day	2.0	Survey AOC areas and set monuments for land use controls.
Civil Survey	\$/day	1,154	RSMeans 17123131100.
As Built Drawings	hours	16	
As Built Drawings	\$/hr	70	Develop plat map for incorporation into the Base Master Plan.
Clearing	day	0.75	Clearing including mob/demob for trees/brush cleared, chipped, & left onsite. RSMeans 022302000200.
Clearing	\$/day	3,329	
Sediment and Erosion Control	lf	320	Includes silt fence and straw bales along down slope of excavation.
Sediment and Erosion Control	\$/lf	5.59	RSMeans 312514161000 & 250.
<b><u>Soil Excavation</u></b>			
Soil Excavation Volume (In situ)	cy	2,062	Includes excavation of the AOC area based on the areas and depths presented in the volume summary table. In situ volumes include a 25% constructability factor.
Soil Excavation Volume (Ex situ)	cy	2,474	Includes soil volume to be transported and disposed. Ex situ volumes include 20% swell factor.
Soil Excavation Mass	tons	3,706	Includes soil mass to be treated
Soil Excavation Surface Area	sf	25,056	
<b><u>Mobilization/Demobilization</u></b>			
	ls	5,000	Includes mob/demob of excavation equipment and preparing submittals.
<b><u>Excavate Soils</u></b>			
	cy/day	240	Includes 2 cy excavator, 5-22 cy trucks, 1 O.E., 5 T.D., 1 L.S. spotter, 2 L.S. to prep trucks/and misc. Reduced productivity by 50% for loading trucks, small/precise excavations, overburden stockpiling, and security/S&H requirements. Assume trucks are direct loaded. Average 240 cy/day. RSMeans Crew B12-E.
	day	11	
	\$/day	7,769	
<b><u>Standby Time</u></b>			
	day	3	Assume equipment standby while analysis is being performed.
	\$/day	1026	Assume no additional hot spot excavation.
<b><u>Thermal Treatment of Contaminated Soil</u></b>			
	cy	2452	Source: Endpoint Technology cost estimate using Vapor Energy Generator (VEG) Soil Remediation.
	\$/cy	41.00	
<b><u>Nonhazardous Waste</u></b>			
Transport and Offsite Disposal	tons	28	Based on shipping waste to American Landfill, Waynesburg, Ohio (approximately 80 mi RT). Assumes a minimum of 22 tons /load. Rate includes \$16.60/ton tax from Portage County.
	\$/ton	52.00	

**Feasibility Study for RVAAP Load Line 3**  
**Alternative 3 - Commercial/Industrial Land Use - Ex-situ Thermal Treatment and Excavation/Off-site Disposal of**  
**Soil and Administrative LUCs.**  
**Key Parameters and Assumptions**

**Key Parameters and Assumptions:**

Item	Unit	Value	Notes
<b><u>Waste Characterization and Confirmation Sampling</u></b>			
Waste Characterization Samples	ea	3	Includes composite samples for waste characterization (TCLP metals, TCLP SVOCs, TCLP pesticides, TCLP herbicides, reactive cyanide, reactive sulfide, and PCBs) and ISM samples for confirmation (PCB-1254, Explosives, Metals, Lead, and PAH).  Assumes 1 sampling technician to collect and ship samples.  1 truck x \$100/day including fuel.  Reference ECHOS 33 02 0401/0402 for ISM, processing, disposable sampling and decontamination materials.  Analyze samples for TCLP metals, TCLP SVOCs, TCLP pesticides, TCLP herbicides, reactive cyanide, reactive sulfide, and PCBs (\$553 ea) and PCB-1254, Explosives, Metals, Lead, and PAH (\$8,140 all areas).
Confirmation Sample Locations	ea	45	
Sampling Labor	hrs	40	
Sampling Labor	\$/hr	70	
Truck Rental / Gas	\$/event	500	
Sample Materials	ea	48	
Sample Materials	\$/ea	35	
Analytical Cost	\$/event	9,799	
<b><u>Restoration</u></b>			
			Includes native soil backfill. Assume productivity has been reduced by 25% to account for security and safety requirements.
Native Soil Backfill	cy	557	Includes 12-in lift of native fill assuming 20% swell. RSM means 312323160040, Unclassified Fill, 6" Lifts, offsite Source @ 20 miles, Includes delivery, spreading, and compaction.
Native Soil Backfill	\$/cy	26.20	
Seeding, Vegetative Cover	MSF	38	Seeding with mulch and fertilizer. Include restoration of excavated areas and equipment damage. RSM means 329219142200.
Seeding, Vegetative Cover	\$/MSF	63.21	
SWPPP Inspections	hrs	4	Assume one follow-up inspection.
SWPPP Inspections	\$/hr	70	
<b><u>Plans and Reports</u></b>			
Remedial Action Completion Report	hrs	280	Includes Construction QC data and preparing report.
Technical Labor	\$/hr	90	

**Feasibility Study for RVAAP Load Line 3**  
**Alternative 3 - Commercial/Industrial Land Use - Ex-situ Thermal Treatment and Excavation/Off-site Disposal of**  
**Soil and Administrative LUCs.**  
**Key Parameters and Assumptions**

**Key Parameters and Assumptions:**

Item	Unit	Value	Notes
<b><u>O&amp;M Cost (Years 0 to 30)</u></b>			
<u>Site Inspection and Maintenance</u>	years	30	
Site Inspection	events	30	
Site Inspections	hrs	4	Inspect site annually for compliance with land use controls and complete checklist.
Field Labor	\$/hr	70	
<b><u>CERCLA Reviews</u></b>			
CERCLA 5-Year Reviews	events	6	Assume 5 year reviews for 30 years.
CERCLA 5-Year Reviews	\$/event	8,200	Assume 80 hours/review @ \$90/hr. Add \$1,000 misc expenses.

**Feasibility Study for RVAAP Load Line 3**

**Alternative 3 - Commercial/Industrial Land Use - Ex-situ Thermal Treatment and Excavation/Off-site Disposal of Soil and Administrative LUCs.**

**Cost Estimate**

**CAPITAL COST**

**\$393,933**

Activity (unit)	Quantity	Unit Cost	Total
<b><u>Site Work</u></b>			
Civil Survey (day)	2.0	\$1,154.00	\$2,308
As Built Drawings (hrs)	16	\$70.00	\$1,120
Clearing (acre)	0.8	\$3,329.00	\$2,497
Sediment and Erosion Control (lf)	320	\$5.59	\$1,789
<b><u>Soil Excavation</u></b>			
Mobilization/Demobilization (ls)	1	\$5,000.00	\$5,000
Excavate Soil (day)	11	\$7,769.13	\$85,460
Standby Time (day)	3	\$1,026.00	\$3,078
Thermal Treatment of Contaminated Soil (cy)	2,452	\$41.00	\$100,532
Nonhazardous Transport and Offsite Disposal (ton)	28	\$52.00	\$1,444
<b><u>Waste Characterization and Confirmation Sampling</u></b>			
Sampling Labor (hrs.)	40	\$70.00	\$2,800
Truck Rental / Gas (event)	1	\$500.00	\$500
Sample Materials (ea)	48	\$35.00	\$1,680
Sample Analysis (event)	1	\$9,799.00	\$9,799
<b><u>Restoration</u></b>			
Native Soil Backfill (cy)	557	\$26.20	\$14,588
Seeding, Vegetative Cover (MSF)	38	\$63.21	\$2,376
SWPPP Inspections (hrs.)	4	\$70.00	\$280
<b><u>Plans and Reports</u></b>			
Remedial Action Completion Report (hrs)	280	\$90.00	\$25,200
<b>Subtotal</b>			<b>\$260,451</b>
Design		10%	\$26,045
Office Overhead		5%	\$13,023
Field Overhead		10%	\$26,045
<b>Subtotal</b>			<b>\$325,564</b>
Profit		6%	\$19,534
Contingency		15%	\$48,835
<b>Total</b>			<b>\$393,933</b>

**Feasibility Study for RVAAP Load Line 3**

**Alternative 3 - Commercial/Industrial Land Use - Ex-situ Thermal Treatment and Excavation/Off-site Disposal of Soil and Administrative LUCs.  
Cost Estimate**

**OPERATION AND MAINTENANCE**

**\$94,349**

Activity (unit)	Quantity	Unit Cost	Total Cost
<b><u>Site Inspection and Maintenance</u></b>			
Site Inspection (ea.)	30	\$280	\$8,400
<b><u>CERCLA Reviews</u></b>			
CERCLA 5-Year Reviews (ea)	6	\$8,200	\$49,200
Subtotal O&M			\$57,600
Design		15%	\$8,640
Office Overhead		5%	\$2,880
Field Overhead		10%	\$5,760
Subtotal			\$74,880
Profit		6%	\$4,493
Contingency		20%	\$14,976
Total			\$94,349

**TOTAL ALTERNATIVE CAPITAL AND O&M COST (Non Discounted Cost)**

**\$488,281**

## Feasibility Study for RVAAP Load Line 3

### Alternative 4 - Unrestricted (Residential) Land Use - Excavation and Off-site Disposal of Soil/Sediment. Key Parameters and Assumptions

#### Key Parameters and Assumptions:

Item	Unit	Value	Notes
<b><u>Capital Cost</u></b>			
<b><u>Site Work</u></b>			
Site Area	sf	69,435	
Civil Survey	day	4.0	Survey AOC areas and set monuments for land use controls.
Civil Survey	\$/day	1,154	RSMMeans 17123131100.
As Built Drawings	hours	32	
As Built Drawings	\$/hr	70	Develop plat map for incorporation into the Base Master Plan.
Clearing	day	1.50	Clearing including mob/demob for trees/brush cleared, chipped, & left onsite.
Clearing	\$/day	3,329	RSMMeans 022302000200.
Sediment and Erosion Control	lf	530	Includes silt fence and straw bales along down slope of excavation.
Sediment and Erosion Control	\$/lf	5.59	RSMMeans 312514161000 & 250.
<b><u>Soil Excavation</u></b>			
Soil Excavation Volume (In situ)	cy	11,082	Includes excavation of the AOC area based on the areas and depths presented in the volume summary table. In situ volumes include a 25% constructability factor.
Soil Excavation Volume (Ex situ)	cy	13,298	Includes soil volume to be transported and disposed. Ex situ volumes include 20% swell factor.
Soil Excavation Mass	tons	19,947	Includes soil mass to be transported and disposed.
Soil Excavation Surface Area	sf	69,435	
<b><u>Mobilization/Demobilization</u></b>			
	ls	5,000	Includes mob/demob of excavation equipment and preparing submittals.
<b><u>Excavate Soils</u></b>			
	cy/day	240	
	day	56	Includes 2 cy excavator, 5-22 cy trucks, 1 O.E., 5 T.D., 1 L.S. spotter, 2 L.S. to prep trucks/and misc. Reduced productivity by 50% for loading trucks, small/precise excavations, overburden stockpiling, and security/S&H requirements. Assume trucks are direct loaded. Average 240 cy/day. RSMMeans Crew B12-E.
	\$/day	7,769	
<b><u>Standby Time</u></b>			
	day	3	Assume equipment standby while analysis is being performed.
	\$/day	1026	Assume no additional hot spot excavation.
<b><u>Nonhazardous Waste</u></b>			
Transport and Offsite Disposal	tons	19,947	Based on shipping waste to American Landfill, Waynesburg, Ohio (approximately 80 mi RT). Assumes a minimum of 22 tons /load. Rate includes \$16.60/ton tax from Portage County.
	\$/ton	52.00	

## Feasibility Study for RVAAP Load Line 3

### Alternative 4 - Unrestricted (Residential) Land Use - Excavation and Off-site Disposal of Soil/Sediment. Key Parameters and Assumptions

#### Key Parameters and Assumptions:

<b><u>Waste Characterization and Confirmation Sampling</u></b>			
Waste Characterization Samples	ea	14	Includes composite samples for waste characterization (TCLP metals, TCLP SVOCs, TCLP pesticides, TCLP herbicides, reactive cyanide, reactive sulfide, and PCBs) and ISM samples for confirmation (PCB-1254, Explosives, Metals, Lead, and PAH).
Confirmation Sample Locations	ea	103	
Sampling Labor	hrs	80	Assumes 1 sampling technician to collect and ship samples.
Sampling Labor	\$/hr	70	
Truck Rental / Gas	\$/event	1,000	1 truck x \$100/day including fuel.
Sample Materials	ea	117	Reference ECHOS 33 02 0401/0402 for ISM, processing, disposable sampling and decontamination materials.
Sample Materials	\$/ea	35	
Analytical Cost	\$/event	30,832	Analyze samples for TCLP metals, TCLP SVOCs, TCLP pesticides, TCLP herbicides, reactive cyanide, reactive sulfide, and PCBs (\$553 ea) and PCB-1254, Explosives, Metals, Lead, and PAH (\$23,820 all areas).
<b><u>Restoration</u></b>			
Native Soil Backfill	cy	13,298	Includes native soil backfill. Assume productivity has been reduced by 25% to account for security and safety requirements.
Native Soil Backfill	\$/cy	26.20	
Seeding, Vegetative Cover	MSF	104	Seeding with mulch and fertilizer. Include restoration of excavated areas and equipment damage. RSMMeans 329219142200.
Seeding, Vegetative Cover	\$/MSF	63.21	
SWPPP Inspections	hrs	4	Assume one follow-up inspection.
SWPPP Inspections	\$/hr	70	
<b><u>Plans and Reports</u></b>			
Corrective Action Completion Report	hrs	280	Includes Construction QC data and preparing report.
Technical Labor	\$/hr	90	

## Feasibility Study for RVAAP Load Line 3

### Alternative 4 - Unrestricted (Residential) Land Use - Excavation and Off-site Disposal of Soil/Sediment. Cost Estimate

#### CAPITAL COST

**\$2,812,921**

Activity (unit)	Quantity	Unit Cost	Total
<b><u>Site Work</u></b>			
Civil Survey (day)	4.0	\$1,154.00	\$4,616
As Built Drawings (hrs)	32	\$70.00	\$2,240
Clearing (acre)	1.5	\$3,329.00	\$4,994
Sediment and Erosion Control (lf)	530	\$5.59	\$2,963
<b><u>Soil Excavation</u></b>			
Mobilization/Demobilization (ls)	1	\$5,000.00	\$5,000
Excavate Soil (days)	56	\$7,769.13	\$435,071
Standby Time (day)	3	\$1,026.00	\$3,078
Nonhazardous Transport and Offsite Disposal (ton)	19,947	\$52.00	\$1,037,244
<b><u>Confirmation Sampling</u></b>			
Sampling Labor (hrs)	80	\$70.00	\$5,600
Truck Rental / Gas (event)	1	\$1,000.00	\$1,000
Sample Materials (ea)	117	\$35.00	\$4,095
Sample Analysis (event)	1	\$30,832.00	\$30,832
<b><u>Restoration</u></b>			
Native Soil Backfill (cy)	13,298	\$26.20	\$348,408
Seeding, Vegetative Cover (MSF)	104	\$63.21	\$6,583
SWPPP Inspections (hrs)	4	\$70.00	\$280
<b><u>Plans and Reports</u></b>			
Remedial Action Completion Report (hrs)	280	\$90.00	\$25,200
Subtotal			\$1,917,204
Design		2%	\$38,344
Office Overhead		5%	\$95,860
Field Overhead		5%	\$95,860
Subtotal			\$2,147,268
Profit		6%	\$128,836
Contingency		25%	\$536,817
Total			\$2,812,921

**Feasibility Study for RVAAP Load Line 3**  
**Alternative 5 - Unrestricted (Residential) Land Use - Ex-situ Thermal Treatment and Excavation/Off-site Disposal**  
**of Soil/Sediment.**  
**Key Parameters and Assumptions**

**Key Parameters and Assumptions:**

Item	Unit	Value	Notes
<b><u>Capital Cost</u></b>			
<b><u>Site Work</u></b>			
Site Area	sf	69,435	
Civil Survey	day	4.0	Survey AOC areas and set monuments for land use controls. RSMMeans 17123131100.
Civil Survey	\$/day	1,154	
As Built Drawings	hours	32	
As Built Drawings	\$/hr	70	Develop plat map for incorporation into the Base Master Plan.
Clearing	day	1.50	Clearing including mob/demob for trees/brush cleared, chipped, & left onsite. RSMMeans 022302000200.
Clearing	\$/day	3,329	
Sediment and Erosion Control	lf	530	Includes silt fence and straw bales along down slope of excavation. RSMMeans 312514161000 & 250.
Sediment and Erosion Control	\$/lf	5.59	
<b><u>Soil Excavation</u></b>			
Soil Excavation Volume (In situ)	cy	11,082	Includes excavation of the AOC area based on the areas and depths presented in the summary table. In situ volumes include a 25% constructability factor.
Soil Excavation Volume (Ex situ)	cy	13,298	Includes soil volume to undergo thermal treatment. Ex situ volumes include a 25% constructability and 20% swell factor.
Soil Excavation Mass	tons	19,930	Includes soil mass to be treated
Soil Excavation Surface Area	sf	69,435	
<b><u>Mobilization/Demobilization</u></b>			
	ls	5,000	Includes mob/demob of excavation equipment and preparing submittals.
<b><u>Excavate Soils</u></b>			
	cy/day	240	Includes 2 cy excavator, 5-22 cy trucks, 1 O.E., 5 T.D., 1 L.S. spotter, 2 L.S. to prep trucks/and misc. Reduced productivity by 50% for loading trucks, small/precise excavations, overburden stockpiling, and security/S&H requirements. Assume trucks are direct loaded. Average 240 cy/day. RSMMeans Crew B12-E.
	day	56	
	\$/day	7,769	
<b><u>Standby Time</u></b>			
	day	3	Assume equipment standby while analysis is being performed.
	\$/day	1026	Assume no additional hot spot excavation.
<b><u>Thermal Treatment of Contaminated Soil</u></b>			
	cy	13,231	Source: Endpoint Technology cost estimate using Vapor Energy Generator (VEG) Soil Remediation.
	\$/cy	41.00	
<b><u>Nonhazardous Waste</u></b>			
Transport and Offsite Disposal	tons	84	Based on shipping waste to American Landfill, Waynesburg, Ohio (approximately 80 mi RT). Assumes a minimum of 22 tons /load. Rate includes \$16.60/ton tax from Portage County.
	\$/ton	52.00	

**Feasibility Study for RVAAP Load Line 3**  
**Alternative 5 - Unrestricted (Residential) Land Use - Ex-situ Thermal Treatment and Excavation/Off-site Disposal**  
**of Soil/Sediment.**  
**Key Parameters and Assumptions**

**Key Parameters and Assumptions:**

Item	Unit	Value	Notes
<b><u>Waste Characterization and Confirmation Sampling</u></b>			
Waste Characterization Samples	ea	14	Includes composite samples for waste characterization (TCLP metals, TCLP SVOCs, TCLP pesticides, TCLP herbicides, reactive cyanide, reactive sulfide, and PCBs) and ISM samples for confirmation (PCB-1254, Explosives, Metals, Lead, and PAH).
Confirmation Sample Locations	ea	103	
Sampling Labor	hrs	80	Assumes 1 sampling technician to collect and ship samples.
Sampling Labor	\$/hr	70	
Truck Rental / Gas	\$/event	1,000	1 truck x \$100/day including fuel.
Sample Materials	ea	117	Reference ECHOS 33 02 0401/0402 for ISM, processing, disposable sampling and decontamination materials.
Sample Materials	\$/ea	35	
Analytical Cost	\$/event	30,832	Analyze samples for TCLP metals, TCLP SVOCs, TCLP pesticides, TCLP herbicides, reactive cyanide, reactive sulfide, and PCBs (\$553 ea.) and PCB-1254, Explosives, Metals, Lead, and PAH (\$23,820 all areas).
<b><u>Restoration</u></b>			
Native Soil Backfill	cy	1,543	Includes 12-in lift of native fill assuming 20% swell. ECHOS 17030423 and RSMeans 312323160040, Unclassified Fill, 6" Lifts, offsite Source @ 20 miles, Includes delivery, spreading, and compaction.
Native Soil Backfill	\$/cy	26.20	
Seeding, Vegetative Cover	MSF	44	Seeding with mulch and fertilizer. Include restoration of excavated areas and equipment damage. RSMeans 329219142200.
Seeding, Vegetative Cover	\$/MSF	63.21	
SWPPP Inspections	hrs	4	Assume one follow-up inspection.
SWPPP Inspections	\$/hr	70	
<b><u>Plans and Reports</u></b>			
Remedial Action Completion Report	hrs	300	Includes Construction QC data and preparing report.
Technical Labor	\$/hr	90	

**Feasibility Study for RVAAP Load Line 3**

**Alternative 5 - Unrestricted (Residential) Land Use - Ex-situ Thermal Treatment and Excavation/Off-site Disposal of Soil/Sediment.**

**Cost Estimate**

**CAPITAL COST**

**\$1,726,374**

Activity (unit)	Quantity	Unit Cost	Total
<b><u>Site Work</u></b>			
Civil Survey (day)	4.0	\$1,154.00	\$4,616
As Built Drawings (hrs)	32	\$70.00	\$2,240
Clearing (acre)	1.5	\$3,329.00	\$4,994
Sediment and Erosion Control (lf)	530	\$5.59	\$2,963
<b><u>Soil Excavation</u></b>			
Mobilization/Demobilization (ls)	1	\$5,000.00	\$5,000
Excavate Soil (day)	56	\$7,769.13	\$435,071
Standby Time (day)	3	\$1,026.00	\$3,078
Thermal Treatment of Contaminated Soil (cy)	13,231	\$41.00	\$542,471
Nonhazardous Transport and Offsite Disposal (ton)	84	\$52.00	\$4,369
<b><u>Confirmation Sampling</u></b>			
Sampling Labor (hrs.)	80	\$70.00	\$5,600
Truck Rental / Gas (event)	1	\$1,000.00	\$1,000
Sample Materials (ea)	117	\$35.00	\$4,095
Sample Analysis (event)	1	\$30,832.00	\$30,832
<b><u>Restoration</u></b>			
Native Soil Backfill (cy)	1,543	\$26.20	\$40,427
Seeding, Vegetative Cover (MSF)	44	\$63.21	\$2,781
SWPPP Inspections (hrs.)	4	\$70.00	\$280
<b><u>Plans and Reports</u></b>			
Remedial Action Completion Report (hrs)	300	\$90.00	\$27,000
<b>Subtotal</b>			<b>\$1,116,816</b>
Design		5%	\$55,841
Office Overhead		5%	\$55,841
Field Overhead		8%	\$89,345
<b>Subtotal</b>			<b>\$1,317,843</b>
Profit		6%	\$79,071
Contingency		25%	\$329,461
<b>Total</b>			<b>\$1,726,374</b>

**Feasibility Study for RVAAP Load Line 4**  
**Ravenna Army Ammunition Plant (RVAAP), Ravenna, Ohio**  
**Summary of Alternatives**

RVAAP Load Line 4		Duration	Non Discounted Cost		
			Capital Cost	O&M Cost	Total
1	No Action.	0	\$0	\$0	\$0
2	Commercial/Industrial Land Use - Excavation and Off-site Disposal of Soil and Administrative LUCs.	30 yr	\$213,137	\$94,349	\$307,486
3	Commercial/Industrial Land Use - Ex-situ Thermal Treatment and Excavation/Off-site Disposal of Soil and Administrative LUCs.	30 yr	\$177,870	\$94,349	\$272,219
4	Unrestricted (Residential) Land Use - Excavation and Off-site Disposal of Soil/Sediment.	<1 yr	\$956,314	\$0	\$956,314
5	Unrestricted (Residential) Land Use - Ex-situ Thermal Treatment and Excavation/Off-site Disposal of Soil/Sediment.	<1 yr	\$679,844	\$0	\$679,844

Load Line 4 Phase Name	Non Discounted Cost			
	Alt. 2	Alt. 3	Alt. 4	Alt. 5
Remedial Design	\$20,005	\$21,492	\$26,455	\$31,563
Remedial Action	\$142,860	\$100,938	\$717,172	\$485,626
Completion Report	\$23,850	\$33,390	\$30,185	\$32,913
Contingency	\$26,422	\$22,050	\$182,503	\$129,741
<b>Total Capital Costs:</b>	<b>\$213,137</b>	<b>\$177,870</b>	<b>\$956,314</b>	<b>\$679,844</b>
Operations and Maintenance (O&M)	\$79,373	\$79,373	\$0	\$0
Contingency	\$14,976	\$14,976	\$0	\$0
<b>Total O&amp;M Costs:</b>	<b>\$94,349</b>	<b>\$94,349</b>	<b>\$0</b>	<b>\$0</b>
<b>Total Alternative Cost</b>	<b>\$307,486</b>	<b>\$272,219</b>	<b>\$956,314</b>	<b>\$679,844</b>

Notes:

1. The base year of comparison and cost data will be CY2016.
2. Costs were estimated for comparison purposes only and are believed to be accurate within a range of -30% to +50%. Use of these costs for other purposes, including but not limited to, budgetary or construction cost estimating is not appropriate.

**Feasibility Study for RVAAP Load Line 4**  
**Ravenna Army Ammunition Plant (RVAAP), Ravenna, Ohio**  
**Summary of AOC Areas and Volumes**

Load Line 4 Alternative	Area (SF)	In-situ		Ex-situ <sup>1,2</sup>		Total Waste Characterization Samples	Total Confirmation Sample Locations
		Volume (cy)	Volume with constructability (cy)	Volume (cy)	Weight (tons)		
Alternative 2	5,994	474	592	710	888	1	19
Alternative 3 - Thermal Treatment Volumes	5,594	459	573	688	860	1	19
Alternative 3 - Excavation/Off-site Disposal Volumes	400	15	19	22	28		
Alternative 4	31,337	2,940	3,674	4,409	5,512	5	76
Alternative 5 - Thermal Treatment Volumes	28,937	2,858	3,573	4,287	5,359	5	76
Alternative 5 - Excavation/Off-site Disposal Volumes	2,400	81	102	122	153		

<sup>1</sup> Constructability factor accounts for over excavation, sloping of sidewalls, and addresses limitations of removal equipment. The in situ volume was increased by 25% for a constructability factor.

<sup>2</sup> Includes 20% swell factor to account for soil expansion after excavating.

**Feasibility Study for RVAAP Load Line 4**  
**Alternative 2 - Commercial/Industrial Land Use - Excavation and Off-site Disposal of Soil and Administrative LUCs.**

**Key Parameters and Assumptions**

**Key Parameters and Assumptions:**

Item	Unit	Value	Notes
<b><u>Capital Cost</u></b>			
<b><u>Site Work</u></b>			
Site Area	sf	5,994	
Civil Survey	day	1.0	Survey AOC areas and set monuments for land use controls.
Civil Survey	\$/day	1,154	RSMMeans 17123131100.
As Built Drawings	hours	8	
As Built Drawings	\$/hr	70	Develop plat map for incorporation into the Base Master Plan.
Clearing	day	0.50	Clearing including mob/demob for trees/brush cleared, chipped, & left onsite. RSMMeans 022302000200.
Clearing	\$/day	3,329	
Sediment and Erosion Control	lf	160	Includes silt fence and straw bales along down slope of excavation. RSMMeans 312514161000 & 250.
Sediment and Erosion Control	\$/lf	5.59	
<b><u>Soil Excavation</u></b>			
Soil Excavation Volume (In situ)	cy	592	Includes excavation of the AOC area based on the areas and depths presented in the volume summary table. In situ volumes include a 25% constructability factor.
Soil Excavation Volume (Ex situ)	cy	710	Includes soil volume to be transported and disposed. Ex situ volumes include 20% swell factor.
Soil Excavation Mass	tons	888	Includes soil mass to be transported and disposed.
Soil Excavation Surface Area	sf	5,994	
<b><u>Mobilization/Demobilization</u></b>			
	ls	5,000	Includes mob/demob of excavation equipment and preparing submittals.
<b><u>Excavate Soils</u></b>			
	cy/day	240	Includes 2 cy excavator, 5-22 cy trucks, 1 O.E., 5 T.D., 1 L.S. spotter, 2 L.S. to prep trucks/and misc. Reduced productivity by 50% for loading trucks, small/precise excavations, overburden stockpiling, and security/S&H requirements. Assume trucks are direct loaded. Average 240 cy/day. RSMMeans Crew B12-E.
	day	3	
	\$/day	7,769	
<b><u>Standby Time</u></b>			
	day	3	Assume equipment standby while analysis is being performed.
	\$/day	1026	Assume no additional hot spot excavation.
<b><u>Nonhazardous Waste</u></b>			
Transport and Offsite Disposal	tons	888	Based on shipping waste to American Landfill, Waynesburg, Ohio (approximately 80 mi RT). Assumes a minimum of 22 tons /load. Rate includes \$16.60/ton tax from Portage County.
	\$/ton	52.00	

**Feasibility Study for RVAAP Load Line 4**  
**Alternative 2 - Commercial/Industrial Land Use - Excavation and Off-site Disposal of Soil and Administrative LUCs.**  
**Key Parameters and Assumptions**

**Key Parameters and Assumptions:**

Item	Unit	Value	Notes
<b><u>Waste Characterization and Confirmation Sampling</u></b>			
Waste Characterization Samples	ea	1	Includes composite samples for waste characterization (TCLP metals, TCLP SVOCs, TCLP pesticides, TCLP herbicides, reactive cyanide, reactive sulfide, and PCBs) and ISM samples for confirmation (PCB-1254, metals, and PAH).
Confirmation Sample Locations	ea	19	
Sampling Labor	hrs	20	Assumes 1 sampling technician to collect and ship samples.
Sampling Labor	\$/hr	70	
Truck Rental / Gas	\$/event	250	1 truck x \$100/day including fuel.
Sample Materials	ea	20	Reference ECHOS 33 02 0401/0402 for ISM, processing, disposable sampling and decontamination materials.
Sample Materials	\$/ea	35	
Analytical Cost	\$/event	4,173	Analyze samples for TCLP metals, TCLP SVOCs, TCLP pesticides, TCLP herbicides, reactive cyanide, reactive sulfide, and PCBs (\$553 ea) and PCB-1254, metals, and PAH (\$3,620 for all areas).
<b><u>Restoration</u></b>			
Native Soil Backfill	cy	710	Includes native soil backfill. Assume productivity has been reduced by 25% to account for security and safety requirements. Includes 12-in lift of native fill assuming 20% swell. RSMMeans 312323160040, Unclassified Fill, 6" Lifts, offsite Source @ 20 miles, Includes delivery, spreading, and compaction.
Native Soil Backfill	\$/cy	26.20	
Seeding, Vegetative Cover	MSF	9	Seeding with mulch and fertilizer. Include restoration of excavated areas and equipment damage. RSMMeans 329219142200.
Seeding, Vegetative Cover	\$/MSF	63.21	
SWPPP Inspections	hrs	4	Assume one follow-up inspection.
SWPPP Inspections	\$/hr	70	
<b><u>Plans and Reports</u></b>			
Remedial Action Completion Report	hrs	200	Includes Construction QC data and preparing report.
Technical Labor	\$/hr	90	

**Feasibility Study for RVAAP Load Line 4**  
**Alternative 2 - Commercial/Industrial Land Use - Excavation and Off-site Disposal of Soil and Administrative LUCs.**  
**Key Parameters and Assumptions**

**Key Parameters and Assumptions:**

Item	Unit	Value	Notes
<b><u>O&amp;M Cost (Years 0 to 30)</u></b>			
Site Inspection and Maintenance	years	30	
Site Inspection	events	30	
Site Inspections	hrs	4	Inspect site annually for compliance with land use controls and complete checklist.
Field Labor	\$/hr	70	
<b><u>CERCLA Reviews</u></b>			
CERCLA 5-Year Reviews	events	6	Assume 5 year reviews for 30 years.
CERCLA 5-Year Reviews	\$/event	8,200	Assume 80 hours/review @ \$90/hr. Add \$1,000 misc expenses.

**Feasibility Study for RVAAP Load Line 4**  
**Alternative 2 - Commercial/Industrial Land Use - Excavation and Off-site Disposal of Soil and Administrative LUCs.**  
**Cost Estimate**

**CAPITAL COST**

**\$213,137**

Activity (unit)	Quantity	Unit Cost	Total
<b>Site Work</b>			
Civil Survey (day)	1.0	\$1,154.00	\$1,154
As Built Drawings (hrs)	8	\$70.00	\$560
Clearing (acre)	0.5	\$3,329.00	\$1,665
Sediment and Erosion Control (lf)	160	\$5.59	\$894
<b>Soil Excavation</b>			
Mobilization/Demobilization (ls)	1	\$5,000.00	\$5,000
Excavate Soil (days)	3	\$7,769.13	\$23,307
Standby Time (day)	3	\$1,026.00	\$3,078
Nonhazardous Transport and Offsite Disposal (ton)	888	\$52.00	\$46,177
<b>Waste Characterization and Confirmation Sampling</b>			
Sampling Labor (hrs)	20	\$70.00	\$1,400
Truck Rental / Gas (event)	1	\$250.00	\$250
Sample Materials (ea)	20	\$35.00	\$700
Sample Analysis (event)	1	\$4,173.00	\$4,173
<b>Restoration</b>			
Native Soil Backfill (cy)	710	\$26.20	\$18,613
Seeding, Vegetative Cover (MSF)	9	\$63.21	\$568
SWPPP Inspections (hrs)	4	\$70.00	\$280
<b>Plans and Reports</b>			
Remedial Action Completion Report (hrs)	200	\$90.00	\$18,000
Subtotal			\$125,819
Design		15%	\$18,873
Office Overhead		10%	\$12,582
Field Overhead		15%	\$18,873
Subtotal			\$176,147
Profit		6%	\$10,569
Contingency		15%	\$26,422
Total			\$213,137

**OPERATION AND MAINTENANCE****\$94,349**

Activity (unit)	Quantity	Unit Cost	Total Cost
<b><u>Site Inspection and Maintenance</u></b>			
Site Inspection (ea)	30	\$280	\$8,400
<b><u>CERCLA Reviews</u></b>			
CERCLA 5-Year Reviews (ea)	6	\$8,200	\$49,200
Subtotal O&M			\$57,600
Design		15%	\$8,640
Office Overhead		5%	\$2,880
Field Overhead		10%	\$5,760
Subtotal			\$74,880
Profit		6%	\$4,493
Contingency		20%	\$14,976
Total			\$94,349

**TOTAL ALTERNATIVE CAPITAL AND O&M COST (Non Discounted Cost)****\$307,486**

**Feasibility Study for RVAAP Load Line 4**  
**Alternative 3 - Commercial/Industrial Land Use - Ex-situ Thermal Treatment and Excavation/Off-site Disposal of**  
**Soil and Administrative LUCs.**  
**Key Parameters and Assumptions**

**Key Parameters and Assumptions:**

Item	Unit	Value	Notes
<b><u>Capital Cost</u></b>			
<b><u>Site Work</u></b>			
Site Area	sf	5,994	
Civil Survey	day	1.0	Survey AOC areas and set monuments for land use controls.
Civil Survey	\$/day	1,154	RSMMeans 17123131100.
As Built Drawings	hours	8	
As Built Drawings	\$/hr	70	Develop plat map for incorporation into the Base Master Plan.
Clearing	day	0.50	Clearing including mob/demob for trees/brush cleared, chipped, & left onsite. RSMMeans 022302000200.
Clearing	\$/day	3,329	
Sediment and Erosion Control	lf	160	Includes silt fence and straw bales along down slope of excavation.
Sediment and Erosion Control	\$/lf	5.59	RSMMeans 312514161000 & 250.
<b><u>Soil Excavation</u></b>			
Soil Excavation Volume (In situ)	cy	592	Includes excavation of the AOC area based on the areas and depths presented in the volume summary table. In situ volumes include a 25% constructability factor.
Soil Excavation Volume (Ex situ)	cy	710	Includes soil volume to be transported and disposed. Ex situ volumes include 20% swell factor.
Soil Excavation Mass	tons	888	Includes soil mass to be treated
Soil Excavation Surface Area	sf	5,994	
<b><u>Mobilization/Demobilization</u></b>			
	ls	5,000	Includes mob/demob of excavation equipment and preparing submittals.
<b><u>Excavate Soils</u></b>			
	cy/day	240	Includes 2 cy excavator, 5-22 cy trucks, 1 O.E., 5 T.D., 1 L.S. spotter, 2 L.S. to prep trucks/and misc. Reduced productivity by 50% for loading trucks, small/precise excavations, overburden stockpiling, and security/S&H requirements. Assume trucks are direct loaded. Average 240 cy/day. RSMMeans Crew B12-E.
	day	3	
	\$/day	7,769	
<b><u>Standby Time</u></b>			
	day	3	Assume equipment standby while analysis is being performed.
	\$/day	1026	Assume no additional hot spot excavation.
<b><u>Thermal Treatment of Contaminated Soil</u></b>			
	cy	688	Source: Endpoint Technology cost estimate using Vapor Energy Generator (VEG) Soil Remediation.
	\$/cy	41.00	
<b><u>Nonhazardous Waste</u></b>			
Transport and Offsite Disposal	tons	28	Based on shipping waste to American Landfill, Waynesburg, Ohio (approximately 80 mi RT). Assumes a minimum of 22 tons /load. Rate includes \$16.60/ton tax from Portage County.
	\$/ton	52.00	

**Feasibility Study for RVAAP Load Line 4**  
**Alternative 3 - Commercial/Industrial Land Use - Ex-situ Thermal Treatment and Excavation/Off-site Disposal of**  
**Soil and Administrative LUCs.**  
**Key Parameters and Assumptions**

**Key Parameters and Assumptions:**

Item	Unit	Value	Notes
<b><u>Waste Characterization and Confirmation Sampling</u></b>			
Waste Characterization Samples	ea	1	Includes composite samples for waste characterization (TCLP metals, TCLP SVOCs, TCLP pesticides, TCLP herbicides, reactive cyanide, reactive sulfide, and PCBs) and ISM samples for confirmation (PCB-1254, RDX, TNT, Antimony, Lead).  Assumes 1 sampling technician to collect and ship samples.  1 truck x \$100/day including fuel.  Reference ECHOS 33 02 0401/0402 for ISM, processing, disposable sampling and decontamination materials.  Analyze samples for TCLP metals, TCLP SVOCs, TCLP pesticides, TCLP herbicides, reactive cyanide, reactive sulfide, and PCBs (\$553 ea) and PCB-1254, RDX, TNT, Antimony, Lead (\$3,620 all areas).
Confirmation Sample Locations	ea	19	
Sampling Labor	hrs	20	
Sampling Labor	\$/hr	70	
Truck Rental / Gas	\$/event	250	
Sample Materials	ea	20	
Sample Materials	\$/ea	35	
Analytical Cost	\$/event	4,173	
<b><u>Restoration</u></b>			
			Includes native soil backfill. Assume productivity has been reduced by 25% to account for security and safety requirements.
Native Soil Backfill	cy	133	Includes 12-in lift of native fill assuming 20% swell. RSM means 312323160040, Unclassified Fill, 6" Lifts, offsite Source @ 20 miles, Includes delivery, spreading, and compaction.
Native Soil Backfill	\$/cy	26.20	
Seeding, Vegetative Cover	MSF	9	Seeding with mulch and fertilizer. Include restoration of excavated areas and equipment damage. RSM means 329219142200.
Seeding, Vegetative Cover	\$/MSF	63.21	
SWPPP Inspections	hrs	4	Assume one follow-up inspection.
SWPPP Inspections	\$/hr	70	
<b><u>Plans and Reports</u></b>			
Remedial Action Completion Report	hrs	280	Includes Construction QC data and preparing report.
Technical Labor	\$/hr	90	

**Feasibility Study for RVAAP Load Line 4**  
**Alternative 3 - Commercial/Industrial Land Use - Ex-situ Thermal Treatment and Excavation/Off-site Disposal of**  
**Soil and Administrative LUCs.**  
**Key Parameters and Assumptions**

**Key Parameters and Assumptions:**

Item	Unit	Value	Notes
<b><u>O&amp;M Cost (Years 0 to 30)</u></b>			
<u>Site Inspection and Maintenance</u>	years	30	
Site Inspection	events	30	
Site Inspections	hrs	4	Inspect site annually for compliance with land use controls and complete checklist.
Field Labor	\$/hr	70	
<b><u>CERCLA Reviews</u></b>			
CERCLA 5-Year Reviews	events	6	Assume 5 year reviews for 30 years.
CERCLA 5-Year Reviews	\$/event	8,200	Assume 80 hours/review @ \$90/hr. Add \$1,000 misc expenses.

**Feasibility Study for RVAAP Load Line 4**

**Alternative 3 - Commercial/Industrial Land Use - Ex-situ Thermal Treatment and Excavation/Off-site Disposal of Soil and Administrative LUCs.**

**Cost Estimate**

**CAPITAL COST**

**\$177,870**

Activity (unit)	Quantity	Unit Cost	Total
<b><u>Site Work</u></b>			
Civil Survey (day)	1.0	\$1,154.00	\$1,154
As Built Drawings (hrs)	8	\$70.00	\$560
Clearing (acre)	0.5	\$3,329.00	\$1,665
Sediment and Erosion Control (lf)	160	\$5.59	\$894
<b><u>Soil Excavation</u></b>			
Mobilization/Demobilization (ls)	1	\$5,000.00	\$5,000
Excavate Soil (day)	3	\$7,769.13	\$23,307
Standby Time (day)	3	\$1,026.00	\$3,078
Thermal Treatment of Contaminated Soil (cy)	688	\$41.00	\$28,216
Nonhazardous Transport and Offsite Disposal (ton)	28	\$52.00	\$1,444
<b><u>Waste Characterization and Confirmation Sampling</u></b>			
Sampling Labor (hrs.)	20	\$70.00	\$1,400
Truck Rental / Gas (event)	1	\$250.00	\$250
Sample Materials (ea)	20	\$35.00	\$700
Sample Analysis (event)	1	\$4,173.00	\$4,173
<b><u>Restoration</u></b>			
Native Soil Backfill (cy)	133	\$26.20	\$3,490
Seeding, Vegetative Cover (MSF)	9	\$63.21	\$568
SWPPP Inspections (hrs.)	4	\$70.00	\$280
<b><u>Plans and Reports</u></b>			
Remedial Action Completion Report (hrs)	280	\$90.00	\$25,200
<b>Subtotal</b>			<b>\$101,379</b>
Design		20%	\$20,276
Office Overhead		10%	\$10,138
Field Overhead		15%	\$15,207
<b>Subtotal</b>			<b>\$147,000</b>
Profit		6%	\$8,820
Contingency		15%	\$22,050
<b>Total</b>			<b>\$177,870</b>

**Feasibility Study for RVAAP Load Line 4**

**Alternative 3 - Commercial/Industrial Land Use - Ex-situ Thermal Treatment and Excavation/Off-site Disposal of Soil and Administrative LUCs.  
Cost Estimate**

**OPERATION AND MAINTENANCE**

**\$94,349**

Activity (unit)	Quantity	Unit Cost	Total Cost
<b><u>Site Inspection and Maintenance</u></b>			
Site Inspection (ea.)	30	\$280	\$8,400
<b><u>CERCLA Reviews</u></b>			
CERCLA 5-Year Reviews (ea)	6	\$8,200	\$49,200
Subtotal O&M			\$57,600
Design		15%	\$8,640
Office Overhead		5%	\$2,880
Field Overhead		10%	\$5,760
Subtotal			\$74,880
Profit		6%	\$4,493
Contingency		20%	\$14,976
Total			\$94,349

**TOTAL ALTERNATIVE CAPITAL AND O&M COST (Non Discounted Cost)**

**\$272,219**

**Feasibility Study for RVAAP Load Line 4**  
**Alternative 4 - Unrestricted (Residential) Land Use - Excavation and Off-site Disposal of Soil/Sediment.**  
**Key Parameters and Assumptions**

**Key Parameters and Assumptions:**

Item	Unit	Value	Notes
<b><u>Capital Cost</u></b>			
<b><u>Site Work</u></b>			
Site Area	sf	31,337	
Civil Survey	day	2.0	Survey AOC areas and set monuments for land use controls.
Civil Survey	\$/day	1,154	RSMMeans 17123131100.
As Built Drawings	hours	16	
As Built Drawings	\$/hr	70	Develop plat map for incorporation into the Base Master Plan.
Clearing	day	0.75	Clearing including mob/demob for trees/brush cleared, chipped, &
Clearing	\$/day	3,329	left onsite. RSMMeans 022302000200.
Sediment and Erosion Control	lf	360	Includes silt fence and straw bales along down slope of
Sediment and Erosion Control	\$/lf	5.59	excavation. RSMMeans 312514161000 & 250.
<b><u>Soil Excavation</u></b>			
Soil Excavation Volume (In situ)	cy	3,674	Includes excavation of the AOC area based on the areas and depths presented in the volume summary table. In situ volumes include a 25% constructability factor.
Soil Excavation Volume (Ex situ)	cy	4,409	Includes soil volume to be transported and disposed. Ex situ volumes include 20% swell factor.
Soil Excavation Mass	tons	5,512	Includes soil mass to be transported and disposed.
Soil Excavation Surface Area	sf	31,337	
<b><u>Mobilization/Demobilization</u></b>			
	ls	5,000	Includes mob/demob of excavation equipment and preparing submittals.
<b><u>Excavate Soils</u></b>			
	cy/day	240	
	day	19	Includes 2 cy excavator, 5-22 cy trucks, 1 O.E., 5 T.D., 1 L.S. spotter, 2 L.S. to prep trucks/and misc. Reduced productivity by 50% for loading trucks, small/precise excavations, overburden stockpiling, and security/S&H requirements. Assume trucks are direct loaded. Average 240 cy/day. RSMMeans Crew B12-E.
	\$/day	7,769	
<b><u>Standby Time</u></b>			
	day	3	Assume equipment standby while analysis is being performed.
	\$/day	1026	Assume no additional hot spot excavation.
<b><u>Nonhazardous Waste</u></b>			
Transport and Offsite Disposal	tons	5,512	Based on shipping waste to American Landfill, Waynesburg, Ohio (approximately 80 mi RT). Assumes a minimum of 22 tons /load. Rate includes \$16.60/ton tax from Portage County.
	\$/ton	52.00	

**Feasibility Study for RVAAP Load Line 4**  
**Alternative 4 - Unrestricted (Residential) Land Use - Excavation and Off-site Disposal of Soil/Sediment.**  
**Key Parameters and Assumptions**

**Key Parameters and Assumptions:**

<b><u>Waste Characterization and Confirmation Sampling</u></b>			Includes composite samples for waste characterization (TCLP metals, TCLP SVOCs, TCLP pesticides, TCLP herbicides, reactive cyanide, reactive sulfide, and PCBs) and ISM samples for confirmation (PCB-1254, metals, and PAHs).  Assumes 1 sampling technician to collect and ship samples.  1 truck x \$100/day including fuel.  Reference ECHOS 33 02 0401/0402 for ISM, processing, disposable sampling and decontamination materials.  Analyze samples for TCLP metals, TCLP SVOCs, TCLP pesticides, TCLP herbicides, reactive cyanide, reactive sulfide, and PCBs (\$553 ea) and PCB-1254, RDX, TNT, Antimony, Lead, and PAH (\$17,530 all areas).
Waste Characterization Samples	ea	5	
Confirmation Sample Locations	ea	76	
Sampling Labor	hrs	80	
Sampling Labor	\$/hr	70	
Truck Rental / Gas	\$/event	1,000	
Sample Materials	ea	81	
Sample Materials	\$/ea	35	
Analytical Cost	\$/event	20,295	
<b><u>Restoration</u></b>			Includes native soil backfill. Assume productivity has been reduced by 25% to account for security and safety requirements.  Includes 12-in lift of native fill assuming 20% swell. RSMMeans 312323160040, Unclassified Fill, 6" Lifts, offsite Source @ 20 miles, Includes delivery, spreading, and compaction.  Seeding with mulch and fertilizer. Include restoration of excavated areas and equipment damage. RSMMeans 329219142200.
Native Soil Backfill	cy	4,409	
Native Soil Backfill	\$/cy	26.20	
Seeding, Vegetative Cover	MSF	47	
Seeding, Vegetative Cover	\$/MSF	63.21	
SWPPP Inspections	hrs	4	
SWPPP Inspections	\$/hr	70	
<b><u>Plans and Reports</u></b>			Assume one follow-up inspection.
Remedial Action Completion Report	hrs	280	
Technical Labor	\$/hr	90	
			Includes Construction QC data and preparing report.

**Feasibility Study for RVAAP Load Line 4**  
**Alternative 4 - Unrestricted (Residential) Land Use - Excavation and Off-site Disposal of Soil/Sediment.**  
**Cost Estimate**

**CAPITAL COST**

**\$956,314**

Activity (unit)	Quantity	Unit Cost	Total
<b><u>Site Work</u></b>			
Civil Survey (day)	2.0	\$1,154.00	\$2,308
As Built Drawings (hrs)	16	\$70.00	\$1,120
Clearing (acre)	0.8	\$3,329.00	\$2,497
Sediment and Erosion Control (lf)	360	\$5.59	\$2,012
<b><u>Soil Excavation</u></b>			
Mobilization/Demobilization (ls)	1	\$5,000.00	\$5,000
Excavate Soil (days)	19	\$7,769.13	\$147,613
Standby Time (day)	3	\$1,026.00	\$3,078
Nonhazardous Transport and Offsite Disposal (ton)	5,512	\$52.00	\$286,607
<b><u>Confirmation Sampling</u></b>			
Sampling Labor (hrs)	80	\$70.00	\$5,600
Truck Rental / Gas (event)	1	\$1,000.00	\$1,000
Sample Materials (ea)	81	\$35.00	\$2,835
Sample Analysis (event)	1	\$20,295.00	\$20,295
<b><u>Restoration</u></b>			
Native Soil Backfill (cy)	4,409	\$26.20	\$115,525
Seeding, Vegetative Cover (MSF)	47	\$63.21	\$2,971
SWPPP Inspections (hrs)	4	\$70.00	\$280
<b><u>Plans and Reports</u></b>			
Remedial Action Completion Report (hrs)	280	\$90.00	\$25,200
Subtotal			\$623,941
Design		4%	\$24,958
Office Overhead		5%	\$31,197
Field Overhead		8%	\$49,915
Subtotal			\$730,011
Profit		6%	\$43,801
Contingency		25%	\$182,503
Total			\$956,314

**Feasibility Study for RVAAP Load Line 4**  
**Alternative 5 - Unrestricted (Residential) Land Use - Ex-situ Thermal Treatment and Excavation/Off-site Disposal**  
**of Soil/Sediment.**  
**Key Parameters and Assumptions**

**Key Parameters and Assumptions:**

Item	Unit	Value	Notes
<b><u>Capital Cost</u></b>			
<b><u>Site Work</u></b>			
Site Area	sf	31,337	
Civil Survey	day	2.0	Survey AOC areas and set monuments for land use controls. RSMMeans 17123131100.
Civil Survey	\$/day	1,154	
As Built Drawings	hours	16	
As Built Drawings	\$/hr	70	Develop plat map for incorporation into the Base Master Plan.
Clearing	day	0.75	Clearing including mob/demob for trees/brush cleared, chipped, & left onsite. RSMMeans 022302000200.
Clearing	\$/day	3,329	
Sediment and Erosion Control	lf	360	Includes silt fence and straw bales along down slope of excavation. RSMMeans 312514161000 & 250.
Sediment and Erosion Control	\$/lf	5.59	
<b><u>Soil Excavation</u></b>			
Soil Excavation Volume (In situ)	cy	3,674	Includes excavation of the AOC area based on the areas and depths presented in the summary table. In situ volumes include a 25% constructability factor.
Soil Excavation Volume (Ex situ)	cy	4,409	Includes soil volume to undergo thermal treatment. Ex situ volumes include a 25% constructability and 20% swell factor.
Soil Excavation Mass	tons	5,512	Includes soil mass to be treated
Soil Excavation Surface Area	sf	31,337	
<b><u>Mobilization/Demobilization</u></b>			
	ls	5,000	Includes mob/demob of excavation equipment and preparing submittals.
<b><u>Excavate Soils</u></b>			
	cy/day	240	Includes 2 cy excavator, 5-22 cy trucks, 1 O.E., 5 T.D., 1 L.S. spotter, 2 L.S. to prep trucks/and misc. Reduced productivity by 50% for loading trucks, small/precise excavations, overburden stockpiling, and security/S&H requirements. Assume trucks are direct loaded. Average 240 cy/day. RSMMeans Crew B12-E.
	day	19	
	\$/day	7,769	
<b><u>Standby Time</u></b>			
	day	3	Assume equipment standby while analysis is being performed. Assume no additional hot spot excavation.
	\$/day	1026	
<b><u>Thermal Treatment of Contaminated Soil</u></b>			
	cy	4,287	Source: Endpoint Technology cost estimate using Vapor Energy Generator (VEG) Soil Remediation.
	\$/cy	41.00	
<b><u>Nonhazardous Waste</u></b>			
Transport and Offsite Disposal	tons	153	Based on shipping waste to American Landfill, Waynesburg, Ohio (approximately 80 mi RT). Assumes a minimum of 22 tons /load. Rate includes \$16.60/ton tax from Portage County.
	\$/ton	52.00	

**Feasibility Study for RVAAP Load Line 4**  
**Alternative 5 - Unrestricted (Residential) Land Use - Ex-situ Thermal Treatment and Excavation/Off-site Disposal**  
**of Soil/Sediment.**  
**Key Parameters and Assumptions**

**Key Parameters and Assumptions:**

Item	Unit	Value	Notes
<b><u>Waste Characterization and Confirmation Sampling</u></b>			
Waste Characterization Samples	ea	5	Includes composite samples for waste characterization (TCLP metals, TCLP SVOCs, TCLP pesticides, TCLP herbicides, reactive cyanide, reactive sulfide, and PCBs) and ISM samples for confirmation (PCB-1254, metals, and PAH).
Confirmation Sample Locations	ea	76	
Sampling Labor	hrs	80	Assumes 1 sampling technician to collect and ship samples.
Sampling Labor	\$/hr	70	
Truck Rental / Gas	\$/event	1,000	1 truck x \$100/day including fuel.
Sample Materials	ea	81	Reference ECHOS 33 02 0401/0402 for ISM, processing, disposable sampling and decontamination materials.
Sample Materials	\$/ea	35	
Analytical Cost	\$/event	20,295	Analyze samples for TCLP metals, TCLP SVOCs, TCLP pesticides, TCLP herbicides, reactive cyanide, reactive sulfide, and PCBs (\$553 ea.) and PCB-1254, metals, and PAH (\$17,530 all areas).
<b><u>Restoration</u></b>			
Native Soil Backfill	cy	696	Includes 12-in lift of native fill assuming 20% swell. ECHOS 17030423 and RSMeans 312323160040, Unclassified Fill, 6" Lifts, offsite Source @ 20 miles, Includes delivery, spreading, and compaction.
Native Soil Backfill	\$/cy	26.20	
Seeding, Vegetative Cover	MSF	44	Seeding with mulch and fertilizer. Include restoration of excavated areas and equipment damage. RSMeans 329219142200.
Seeding, Vegetative Cover	\$/MSF	63.21	
SWPPP Inspections	hrs	4	Assume one follow-up inspection.
SWPPP Inspections	\$/hr	70	
<b><u>Plans and Reports</u></b>			
Remedial Action Completion Report	hrs	300	Includes Construction QC data and preparing report.
Technical Labor	\$/hr	90	

**Feasibility Study for RVAAP Load Line 4**

**Alternative 5 - Unrestricted (Residential) Land Use - Ex-situ Thermal Treatment and Excavation/Off-site Disposal of Soil/Sediment.**

**Cost Estimate**

**CAPITAL COST**

**\$679,844**

Activity (unit)	Quantity	Unit Cost	Total
<b><u>Site Work</u></b>			
Civil Survey (day)	2.0	\$1,154.00	\$2,308
As Built Drawings (hrs)	16	\$70.00	\$1,120
Clearing (acre)	0.8	\$3,329.00	\$2,497
Sediment and Erosion Control (lf)	360	\$5.59	\$2,012
<b><u>Soil Excavation</u></b>			
Mobilization/Demobilization (ls)	1	\$5,000.00	\$5,000
Excavate Soil (day)	19	\$7,769.13	\$147,613
Standby Time (day)	3	\$1,026.00	\$3,078
Thermal Treatment of Contaminated Soil (cy)	4,287	\$41.00	\$175,772
Nonhazardous Transport and Offsite Disposal (ton)	153	\$52.00	\$7,944
<b><u>Confirmation Sampling</u></b>			
Sampling Labor (hrs.)	80	\$70.00	\$5,600
Truck Rental / Gas (event)	1	\$1,000.00	\$1,000
Sample Materials (ea)	81	\$35.00	\$2,835
Sample Analysis (event)	1	\$20,295.00	\$20,295
<b><u>Restoration</u></b>			
Native Soil Backfill (cy)	696	\$26.20	\$18,245
Seeding, Vegetative Cover (MSF)	44	\$63.21	\$2,781
SWPPP Inspections (hrs.)	4	\$70.00	\$280
<b><u>Plans and Reports</u></b>			
Remedial Action Completion Report (hrs)	300	\$90.00	\$27,000
<b>Subtotal</b>			<b>\$425,381</b>
Design		7%	\$29,777
Office Overhead		5%	\$21,269
Field Overhead		10%	\$42,538
<b>Subtotal</b>			<b>\$518,965</b>
Profit		6%	\$31,138
Contingency		25%	\$129,741
<b>Total</b>			<b>\$679,844</b>

**Feasibility Study for RVAAP Load Line 12**  
**Ravenna Army Ammunition Plant (RVAAP), Ravenna, Ohio**  
**Summary of Alternatives**

RVAAP Load Line 12		Duration	Non Discounted Cost		
			Capital Cost	O&M Cost	Total
1	No Action.	0	\$0	\$0	\$0
2	Commercial/Industrial Land Use - Excavation and Off-site Disposal of Soil and Administrative LUCs.	30 yr	\$161,306	\$94,349	\$255,654
3	Commercial/Industrial Land Use - Ex-situ Thermal Treatment and Excavation/Off-site Disposal of Soil and Administrative LUCs.	30 yr	\$148,230	\$94,349	\$242,579
4	Unrestricted (Residential) Land Use - Excavation and Off-site Disposal of Soil/Sediment.	<1 yr	\$260,196	\$0	\$260,196
5	Unrestricted (Residential) Land Use - Ex-situ Thermal Treatment and Excavation/Off-site Disposal of Soil/Sediment.	<1 yr	\$231,920	\$0	\$231,920

Load Line 12 Phase Name	Non Discounted Cost			
	Alt. 2	Alt. 3	Alt. 4	Alt. 5
Remedial Design	\$18,841	\$20,944	\$23,393	\$25,021
Remedial Action	\$97,664	\$74,185	\$155,092	\$125,433
Completion Report	\$24,804	\$34,726	\$32,054	\$37,206
Contingency	\$19,997	\$18,376	\$49,656	\$44,260
<b>Total Capital Costs:</b>	<b>\$161,306</b>	<b>\$148,230</b>	<b>\$260,196</b>	<b>\$231,920</b>
Operations and Maintenance (O&M)	\$79,373	\$79,373	\$0	\$0
Contingency	\$14,976	\$14,976	\$0	\$0
<b>Total O&amp;M Costs:</b>	<b>\$94,349</b>	<b>\$94,349</b>	<b>\$0</b>	<b>\$0</b>
<b>Total Alternative Cost</b>	<b>\$255,654</b>	<b>\$242,579</b>	<b>\$260,196</b>	<b>\$231,920</b>

Notes:

1. The base year of comparison and cost data will be CY2016.
2. Costs were estimated for comparison purposes only and are believed to be accurate within a range of -30% to +50%. Use of these costs for other purposes, including but not limited to, budgetary or construction cost estimating is not appropriate.

**Feasibility Study for RVAAP Load Line 12**  
**Ravenna Army Ammunition Plant (RVAAP), Ravenna, Ohio**  
**Summary of AOC Areas and Volumes**

Load Line 12 Alternative	Area (SF)	In-situ		Ex-situ <sup>1,2</sup>		Total Waste Characterization Samples	Total Confirmation Sample Locations
		Volume (cy)	Volume with constructability (cy)	Volume (cy)	Weight (tons)		
Alternative 2	2,633	248	310	372	465	1	19
Alternative 3 - Thermal Treatment Volumes	2,633	248	310	372	465	1	19
Alternative 3 - Excavation/Off-site Disposal Volumes	0	0	0	0	0		
Alternative 4	4,233	475	593	712	890	1	76
Alternative 5 - Thermal Treatment Volumes	4,233	475	593	712	890	1	76
Alternative 5 - Excavation/Off-site Disposal Volumes	0	0	0	0	0		

<sup>1</sup> Constructability factor accounts for over excavation, sloping of sidewalls, and addresses limitations of removal equipment. The in situ volume was increased by 25% for a constructability factor.

<sup>2</sup> Includes 20% swell factor to account for soil expansion after excavating.

**Feasibility Study for RVAAP Load Line 12**  
**Alternative 2 - Commercial/Industrial Land Use - Excavation and Off-site Disposal of Soil and Administrative LUCs.**

**Key Parameters and Assumptions**

**Key Parameters and Assumptions:**

Item	Unit	Value	Notes
<b><u>Capital Cost</u></b>			
<b><u>Site Work</u></b>			
Site Area	sf	2,633	
Civil Survey	day	1.0	Survey AOC areas and set monuments for land use controls.
Civil Survey	\$/day	1,154	RSMeans 17123131100.
As Built Drawings	hours	8	
As Built Drawings	\$/hr	70	Develop plat map for incorporation into the Base Master Plan.
Clearing	day	0.50	Clearing including mob/demob for trees/brush cleared, chipped, & left onsite. RSMeans 022302000200.
Clearing	\$/day	3,329	
Sediment and Erosion Control	lf	110	Includes silt fence and straw bales along down slope of excavation. RSMeans 312514161000 & 250.
Sediment and Erosion Control	\$/lf	5.59	
<b><u>Soil Excavation</u></b>			
Soil Excavation Volume (In situ)	cy	310	Includes excavation of the AOC area based on the areas and depths presented in the volume summary table. In situ volumes include a 25% constructability factor.
Soil Excavation Volume (Ex situ)	cy	372	Includes soil volume to be transported and disposed. Ex situ volumes include 20% swell factor.
Soil Excavation Mass	tons	465	Includes soil mass to be transported and disposed.
Soil Excavation Surface Area	sf	2,633	
<b><u>Mobilization/Demobilization</u></b>			
	ls	5,000	Includes mob/demob of excavation equipment and preparing submittals.
<b><u>Excavate Soils</u></b>			
	cy/day	240	Includes 2 cy excavator, 5-22 cy trucks, 1 O.E., 5 T.D., 1 L.S. spotter, 2 L.S. to prep trucks/and misc. Reduced productivity by 50% for loading trucks, small/precise excavations, overburden stockpiling, and security/S&H requirements. Assume trucks are direct loaded. Average 240 cy/day. RSMeans Crew B12-E.
	day	2	
	\$/day	7,769	
<b><u>Standby Time</u></b>			
	day	3	Assume equipment standby while analysis is being performed.
	\$/day	1026	Assume no additional hot spot excavation.
<b><u>Nonhazardous Waste</u></b>			
Transport and Offsite Disposal	tons	465	Based on shipping waste to American Landfill, Waynesburg, Ohio (approximately 80 mi RT). Assumes a minimum of 22 tons /load. Rate includes \$16.60/ton tax from Portage County.
	\$/ton	52.00	

**Feasibility Study for RVAAP Load Line 12**  
**Alternative 2 - Commercial/Industrial Land Use - Excavation and Off-site Disposal of Soil and Administrative LUCs.**

**Key Parameters and Assumptions**

**Key Parameters and Assumptions:**

Item	Unit	Value	Notes
<b><u>Waste Characterization and Confirmation Sampling</u></b>			
Waste Characterization Samples	ea	1	Includes composite samples for waste characterization (TCLP metals, TCLP SVOCs, TCLP pesticides, TCLP herbicides, reactive cyanide, reactive sulfide, and PCBs) and ISM samples for confirmation (PCB-1254, TNT, 2,6-DNT, and PAH).  Assumes 1 sampling technician to collect and ship samples.  1 truck x \$100/day including fuel.  Reference ECHOS 33 02 0401/0402 for ISM, processing, disposable sampling and decontamination materials.  Analyze samples for TCLP metals, TCLP SVOCs, TCLP pesticides, TCLP herbicides, reactive cyanide, reactive sulfide, and PCBs (\$553 ea) and PCB-1254, TNT, 2,6-DNT, and PAH (\$6,240 for all areas).
Confirmation Sample Locations	ea	19	
Sampling Labor	hrs	16	
Sampling Labor	\$/hr	70	
Truck Rental / Gas	\$/event	200	
Sample Materials	ea	20	
Sample Materials	\$/ea	35	
Analytical Cost	\$/event	6,793	
<b><u>Restoration</u></b>			
Native Soil Backfill	cy	372	Includes native soil backfill. Assume productivity has been reduced by 25% to account for security and safety requirements.  Includes 12-in lift of native fill assuming 20% swell. RSMMeans 312323160040, Unclassified Fill, 6" Lifts, offsite Source @ 20 miles, Includes delivery, spreading, and compaction.
Native Soil Backfill	\$/cy	26.20	
Seeding, Vegetative Cover	MSF	4	Seeding with mulch and fertilizer. Include restoration of excavated areas and equipment damage. RSMMeans 329219142200.
Seeding, Vegetative Cover	\$/MSF	63.21	
SWPPP Inspections	hrs	4	Assume one follow-up inspection.
SWPPP Inspections	\$/hr	70	
<b><u>Plans and Reports</u></b>			
Report	hrs	200	Includes Construction QC data and preparing report.
Technical Labor	\$/hr	90	

**Feasibility Study for RVAAP Load Line 12**  
**Alternative 2 - Commercial/Industrial Land Use - Excavation and Off-site Disposal of Soil and Administrative LUCs.**  
**Key Parameters and Assumptions**

**Key Parameters and Assumptions:**

Item	Unit	Value	Notes
<b><u>O&amp;M Cost (Years 0 to 30)</u></b>			
Site Inspection and Maintenance	years	30	Inspect site annually for compliance with land use controls and complete checklist.
Site Inspection	events	30	
Site Inspections	hrs	4	
Field Labor	\$/hr	70	
<b><u>CERCLA Reviews</u></b>			
CERCLA 5-Year Reviews	events	6	Assume 5 year reviews for 30 years.
CERCLA 5-Year Reviews	\$/event	8,200	Assume 80 hours/review @ \$90/hr. Add \$1,000 misc expenses.

**Feasibility Study for RVAAP Load Line 12**  
**Alternative 2 - Commercial/Industrial Land Use - Excavation and Off-site Disposal of Soil and Administrative**  
**LUCs.**  
**Cost Estimate**

**CAPITAL COST**

**\$161,306**

Activity (unit)	Quantity	Unit Cost	Total
<b>Site Work</b>			
Civil Survey (day)	1.0	\$1,154.00	\$1,154
As Built Drawings (hrs)	8	\$70.00	\$560
Clearing (acre)	0.5	\$3,329.00	\$1,665
Sediment and Erosion Control (lf)	110	\$5.59	\$615
<b>Soil Excavation</b>			
Mobilization/Demobilization (ls)	1	\$5,000.00	\$5,000
Excavate Soil (days)	2	\$7,769.13	\$15,538
Standby Time (day)	3	\$1,026.00	\$3,078
Nonhazardous Transport and Offsite Disposal (ton)	465	\$52.00	\$24,176
<b>Waste Characterization and Confirmation Sampling</b>			
Sampling Labor (hrs)	16	\$70.00	\$1,120
Truck Rental / Gas (event)	1	\$200.00	\$200
Sample Materials (ea)	20	\$35.00	\$700
Sample Analysis (event)	1	\$6,793.00	\$6,793
<b>Restoration</b>			
Native Soil Backfill (cy)	372	\$26.20	\$9,745
Seeding, Vegetative Cover (MSF)	4	\$63.21	\$250
SWPPP Inspections (hrs)	4	\$70.00	\$280
<b>Plans and Reports</b>			
Remedial Action Completion Report (hrs)	200	\$90.00	\$18,000
Subtotal			\$88,874
Design		20%	\$17,775
Office Overhead		15%	\$13,331
Field Overhead		15%	\$13,331
Subtotal			\$133,310
Profit		6%	\$7,999
Contingency		15%	\$19,997
Total			\$161,306

**OPERATION AND MAINTENANCE**

**\$94,349**

Activity (unit)	Quantity	Unit Cost	Total Cost
<b><u>Site Inspection and Maintenance</u></b>			
Site Inspection (ea)	30	\$280	\$8,400
<b><u>CERCLA Reviews</u></b>			
CERCLA 5-Year Reviews (ea)	6	\$8,200	\$49,200
Subtotal O&M			\$57,600
Design		15%	\$8,640
Office Overhead		5%	\$2,880
Field Overhead		10%	\$5,760
Subtotal			\$74,880
Profit		6%	\$4,493
Contingency		20%	\$14,976
Total			\$94,349

**TOTAL ALTERNATIVE CAPITAL AND O&M COST (Non Discounted Cost)**

**\$255,654**

**Feasibility Study for RVAAP Load Line 12**  
**Alternative 3 - Commercial/Industrial Land Use - Ex-situ Thermal Treatment and Excavation/Off-site Disposal of**  
**Soil and Administrative LUCs.**  
**Key Parameters and Assumptions**

**Key Parameters and Assumptions:**

Item	Unit	Value	Notes
<b><u>Capital Cost</u></b>			
<b><u>Site Work</u></b>			
Site Area	sf	2,633	
Civil Survey	day	1.0	Survey AOC areas and set monuments for land use controls.
Civil Survey	\$/day	1,154	RSMMeans 17123131100.
As Built Drawings	hours	8	
As Built Drawings	\$/hr	70	Develop plat map for incorporation into the Base Master Plan.
Clearing	day	0.50	Clearing including mob/demob for trees/brush cleared, chipped, & left onsite. RSMMeans 022302000200.
Clearing	\$/day	3,329	
Sediment and Erosion Control	lf	110	Includes silt fence and straw bales along down slope of excavation.
Sediment and Erosion Control	\$/lf	5.59	RSMMeans 312514161000 & 250.
<b><u>Soil Excavation</u></b>			
Soil Excavation Volume (In situ)	cy	310	Includes excavation of the AOC area based on the areas and depths presented in the volume summary table. In situ volumes include a 25% constructability factor.
Soil Excavation Volume (Ex situ)	cy	372	Includes soil volume to be transported and disposed. Ex situ volumes include 20% swell factor.
Soil Excavation Mass	tons	465	Includes soil mass to be treated
Soil Excavation Surface Area	sf	2,633	
<b><u>Mobilization/Demobilization</u></b>			
	ls	5,000	Includes mob/demob of excavation equipment and preparing submittals.
<b><u>Excavate Soils</u></b>			
	cy/day	240	Includes 2 cy excavator, 5-22 cy trucks, 1 O.E., 5 T.D., 1 L.S. spotter, 2 L.S. to prep trucks/and misc. Reduced productivity by 50% for loading trucks, small/precise excavations, overburden stockpiling, and security/S&H requirements. Assume trucks are direct loaded. Average 240 cy/day. RSMMeans Crew B12-E.
	day	2	
	\$/day	7,769	
<b><u>Standby Time</u></b>			
	day	3	Assume equipment standby while analysis is being performed.
	\$/day	1026	Assume no additional hot spot excavation.
<b><u>Thermal Treatment of Contaminated Soil</u></b>			
	cy	372	Source: Endpoint Technology cost estimate using Vapor Energy Generator (VEG) Soil Remediation.
	\$/cy	41.00	
<b><u>Nonhazardous Waste</u></b>			
Transport and Offsite Disposal	tons	0	Based on shipping waste to American Landfill, Waynesburg, Ohio (approximately 80 mi RT). Assumes a minimum of 22 tons /load.
	\$/ton	52.00	Rate includes \$16.60/ton tax from Portage County.

**Feasibility Study for RVAAP Load Line 12**  
**Alternative 3 - Commercial/Industrial Land Use - Ex-situ Thermal Treatment and Excavation/Off-site Disposal of**  
**Soil and Administrative LUCs.**  
**Key Parameters and Assumptions**

**Key Parameters and Assumptions:**

Item	Unit	Value	Notes
<b><u>Waste Characterization and Confirmation Sampling</u></b>			
Waste Characterization Samples	ea	1	Includes composite samples for waste characterization (TCLP metals, TCLP SVOCs, TCLP pesticides, TCLP herbicides, reactive cyanide, reactive sulfide, and PCBs) and ISM samples for confirmation (PCB-1254, TNT, 2,6-DNT, and PAH).  Assumes 1 sampling technician to collect and ship samples.  1 truck x \$100/day including fuel.  Reference ECHOS 33 02 0401/0402 for ISM, processing, disposable sampling and decontamination materials.  Analyze samples for TCLP metals, TCLP SVOCs, TCLP pesticides, TCLP herbicides, reactive cyanide, reactive sulfide, and PCBs (\$553 ea) and PCB-1254, TNT, 2,6-DNT, and PAH (\$6,240 all areas).
Confirmation Sample Locations	ea	19	
Sampling Labor	hrs	16	
Sampling Labor	\$/hr	70	
Truck Rental / Gas	\$/event	200	
Sample Materials	ea	20	
Sample Materials	\$/ea	35	
Analytical Cost	\$/event	6,893	
<b><u>Restoration</u></b>			
Native Soil Backfill	cy	59	Includes native soil backfill. Assume productivity has been reduced by 25% to account for security and safety requirements.  Includes 12-in lift of native fill assuming 20% swell. RSM means 312323160040, Unclassified Fill, 6" Lifts, offsite Source @ 20 miles, Includes delivery, spreading, and compaction.
Native Soil Backfill	\$/cy	26.20	
Seeding, Vegetative Cover	MSF	4	Seeding with mulch and fertilizer. Include restoration of excavated areas and equipment damage. RSM means 329219142200.
Seeding, Vegetative Cover	\$/MSF	63.21	
SWPPP Inspections	hrs	4	Assume one follow-up inspection.
SWPPP Inspections	\$/hr	70	
<b><u>Plans and Reports</u></b>			
Remedial Action Completion Report	hrs	280	Includes Construction QC data and preparing report.
Technical Labor	\$/hr	90	

**Feasibility Study for RVAAP Load Line 12**  
**Alternative 3 - Commercial/Industrial Land Use - Ex-situ Thermal Treatment and Excavation/Off-site Disposal of**  
**Soil and Administrative LUCs.**  
**Key Parameters and Assumptions**

**Key Parameters and Assumptions:**

Item	Unit	Value	Notes
<b><u>O&amp;M Cost (Years 0 to 30)</u></b>			
<u>Site Inspection and Maintenance</u>	years	30	
Site Inspection	events	30	
Site Inspections	hrs	4	Inspect site annually for compliance with land use controls and complete checklist.
Field Labor	\$/hr	70	
<b><u>CERCLA Reviews</u></b>			
CERCLA 5-Year Reviews	events	6	Assume 5 year reviews for 30 years.
CERCLA 5-Year Reviews	\$/event	8,200	Assume 80 hours/review @ \$90/hr. Add \$1,000 misc expenses.

**Feasibility Study for RVAAP Load Line 12**

**Alternative 3 - Commercial/Industrial Land Use - Ex-situ Thermal Treatment and Excavation/Off-site Disposal of Soil and Administrative LUCs.**

**Cost Estimate**

**CAPITAL COST**

**\$148,230**

Activity (unit)	Quantity	Unit Cost	Total
<b><u>Site Work</u></b>			
Civil Survey (day)	1.0	\$1,154.00	\$1,154
As Built Drawings (hrs)	8	\$70.00	\$560
Clearing (acre)	0.5	\$3,329.00	\$1,665
Sediment and Erosion Control (lf)	110	\$5.59	\$615
<b><u>Soil Excavation</u></b>			
Mobilization/Demobilization (ls)	1	\$5,000.00	\$5,000
Excavate Soil (day)	2	\$7,769.13	\$15,538
Standby Time (day)	3	\$1,026.00	\$3,078
Thermal Treatment of Contaminated Soil (cy)	372	\$41.00	\$15,250
Nonhazardous Transport and Offsite Disposal (ton)	0	\$52.00	\$0
<b><u>Waste Characterization and Confirmation Sampling</u></b>			
Sampling Labor (hrs.)	16	\$70.00	\$1,120
Truck Rental / Gas (event)	1	\$200.00	\$200
Sample Materials (ea)	20	\$35.00	\$700
Sample Analysis (event)	1	\$6,893.00	\$6,893
<b><u>Restoration</u></b>			
Native Soil Backfill (cy)	59	\$26.20	\$1,533
Seeding, Vegetative Cover (MSF)	4	\$63.21	\$250
SWPPP Inspections (hrs.)	4	\$70.00	\$280
<b><u>Plans and Reports</u></b>			
Remedial Action Completion Report (hrs)	280	\$90.00	\$25,200
<b>Subtotal</b>			<b>\$79,035</b>
Design		25%	\$19,759
Office Overhead		15%	\$11,855
Field Overhead		15%	\$11,855
<b>Subtotal</b>			<b>\$122,504</b>
Profit		6%	\$7,350
Contingency		15%	\$18,376
<b>Total</b>			<b>\$148,230</b>

**Feasibility Study for RVAAP Load Line 12**

**Alternative 3 - Commercial/Industrial Land Use - Ex-situ Thermal Treatment and Excavation/Off-site Disposal of Soil and Administrative LUCs.  
Cost Estimate**

**OPERATION AND MAINTENANCE**

**\$94,349**

Activity (unit)	Quantity	Unit Cost	Total Cost
<b><u>Site Inspection and Maintenance</u></b>			
Site Inspection (ea.)	30	\$280	\$8,400
<b><u>CERCLA Reviews</u></b>			
CERCLA 5-Year Reviews (ea)	6	\$8,200	\$49,200
Subtotal O&M			\$57,600
Design		15%	\$8,640
Office Overhead		5%	\$2,880
Field Overhead		10%	\$5,760
Subtotal			\$74,880
Profit		6%	\$4,493
Contingency		20%	\$14,976
Total			\$94,349

**TOTAL ALTERNATIVE CAPITAL AND O&M COST (Non Discounted Cost)**

**\$242,579**

## Feasibility Study for RVAAP Load Line 12

### Alternative 4 - Unrestricted (Residential) Land Use - Excavation and Off-site Disposal of Soil/Sediment. Key Parameters and Assumptions

#### Key Parameters and Assumptions:

Item	Unit	Value	Notes
<b><u>Capital Cost</u></b>			
<b><u>Site Work</u></b>			
Site Area	sf	4,233	
Civil Survey	day	1.0	Survey AOC areas and set monuments for land use controls.
Civil Survey	\$/day	1,154	RSMMeans 17123131100.
As Built Drawings	hours	8	
As Built Drawings	\$/hr	70	Develop plat map for incorporation into the Base Master Plan.
Clearing	day	0.50	Clearing including mob/demob for trees/brush cleared, chipped, & left onsite.
Clearing	\$/day	3,329	RSMMeans 022302000200.
Sediment and Erosion Control	lf	140	Includes silt fence and straw bales along down slope of excavation.
Sediment and Erosion Control	\$/lf	5.59	RSMMeans 312514161000 & 250.
<b><u>Soil Excavation</u></b>			
Soil Excavation Volume (In situ)	cy	593	Includes excavation of the AOC area based on the areas and depths presented in the volume summary table. In situ volumes include a 25% constructability factor.
Soil Excavation Volume (Ex situ)	cy	712	Includes soil volume to be transported and disposed. Ex situ volumes include 20% swell factor.
Soil Excavation Mass	tons	890	Includes soil mass to be transported and disposed.
Soil Excavation Surface Area	sf	4,233	
<b><u>Mobilization/Demobilization</u></b>			
	ls	5,000	Includes mob/demob of excavation equipment and preparing submittals.
<b><u>Excavate Soils</u></b>			
	cy/day	240	
	day	3	Includes 2 cy excavator, 5-22 cy trucks, 1 O.E., 5 T.D., 1 L.S. spotter, 2 L.S. to prep trucks/and misc. Reduced productivity by 50% for loading trucks, small/precise excavations, overburden stockpiling, and security/S&H requirements. Assume trucks are direct loaded. Average 240 cy/day. RSMMeans Crew B12-E.
	\$/day	7,769	
<b><u>Standby Time</u></b>			
	day	3	Assume equipment standby while analysis is being performed.
	\$/day	1026	Assume no additional hot spot excavation.
<b><u>Nonhazardous Waste</u></b>			
Transport and Offsite Disposal	tons	890	Based on shipping waste to American Landfill, Waynesburg, Ohio (approximately 80 mi RT). Assumes a minimum of 22 tons /load. Rate includes \$16.60/ton tax from Portage County.
	\$/ton	52.00	

## Feasibility Study for RVAAP Load Line 12

### Alternative 4 - Unrestricted (Residential) Land Use - Excavation and Off-site Disposal of Soil/Sediment. Key Parameters and Assumptions

#### Key Parameters and Assumptions:

<b><u>Waste Characterization and Confirmation Sampling</u></b>			
Waste Characterization Samples	ea	1	Includes composite samples for waste characterization (TCLP metals, TCLP SVOCs, TCLP pesticides, TCLP herbicides, reactive cyanide, reactive sulfide, and PCBs) and ISM samples for confirmation (PCB-1254, Explosives, and PAH).
Confirmation Sample Locations	ea	76	
Sampling Labor	hrs	60	Assumes 1 sampling technician to collect and ship samples.
Sampling Labor	\$/hr	70	
Truck Rental / Gas	\$/event	750	1 truck x \$100/day including fuel.
Sample Materials	ea	77	Reference ECHOS 33 02 0401/0402 for ISM, processing, disposable sampling and decontamination materials.
Sample Materials	\$/ea	35	
Analytical Cost	\$/event	13,113	Analyze samples for TCLP metals, TCLP SVOCs, TCLP pesticides, TCLP herbicides, reactive cyanide, reactive sulfide, and PCBs (\$553 ea) and PCB-1254, Explosives, and PAH (\$12,560 all areas).
<b><u>Restoration</u></b>			
Native Soil Backfill	cy	712	Includes native soil backfill. Assume productivity has been reduced by 25% to account for security and safety requirements.
Native Soil Backfill	\$/cy	26.20	
Seeding, Vegetative Cover	MSF	6	Seeding with mulch and fertilizer. Include restoration of excavated areas and equipment damage. RSMMeans 329219142200.
Seeding, Vegetative Cover	\$/MSF	63.21	
SWPPP Inspections	hrs	4	Assume one follow-up inspection.
SWPPP Inspections	\$/hr	70	
<b><u>Plans and Reports</u></b>			
Report	hrs	280	Includes Construction QC data and preparing report.
Technical Labor	\$/hr	90	

**Feasibility Study for RVAAP Load Line 12**

**Alternative 4 - Unrestricted (Residential) Land Use - Excavation and Off-site Disposal of Soil/Sediment.  
Cost Estimate**

**CAPITAL COST**

**\$260,196**

Activity (unit)	Quantity	Unit Cost	Total
<b><u>Site Work</u></b>			
Civil Survey (day)	1.0	\$1,154.00	\$1,154
As Built Drawings (hrs)	8	\$70.00	\$560
Clearing (acre)	0.5	\$3,329.00	\$1,665
Sediment and Erosion Control (lf)	140	\$5.59	\$783
<b><u>Soil Excavation</u></b>			
Mobilization/Demobilization (ls)	1	\$5,000.00	\$5,000
Excavate Soil (days)	3	\$7,769.13	\$23,307
Standby Time (day)	3	\$1,026.00	\$3,078
Nonhazardous Transport and Offsite Disposal (ton)	890	\$52.00	\$46,285
<b><u>Confirmation Sampling</u></b>			
Sampling Labor (hrs)	60	\$70.00	\$4,200
Truck Rental / Gas (event)	1	\$750.00	\$750
Sample Materials (ea)	77	\$35.00	\$2,695
Sample Analysis (event)	1	\$13,113.00	\$13,113
<b><u>Restoration</u></b>			
Native Soil Backfill (cy)	712	\$26.20	\$18,657
Seeding, Vegetative Cover (MSF)	6	\$63.21	\$401
SWPPP Inspections (hrs)	4	\$70.00	\$280
<b><u>Plans and Reports</u></b>			
Remedial Action Completion Report (hrs)	280	\$90.00	\$25,200
<b>Subtotal</b>			<b>\$147,128</b>
Design		15%	\$22,069
Office Overhead		10%	\$14,713
Field Overhead		10%	\$14,713
<b>Subtotal</b>			<b>\$198,623</b>
Profit		6%	\$11,917
Contingency		25%	\$49,656
<b>Total</b>			<b>\$260,196</b>

**Feasibility Study for RVAAP Load Line 12**  
**Alternative 5 - Unrestricted (Residential) Land Use - Ex-situ Thermal Treatment and Excavation/Off-site Disposal**  
**of Soil/Sediment.**  
**Key Parameters and Assumptions**

**Key Parameters and Assumptions:**

Item	Unit	Value	Notes
<b><u>Capital Cost</u></b>			
<b><u>Site Work</u></b>			
Site Area	sf	4,233	
Civil Survey	day	1.0	Survey AOC areas and set monuments for land use controls.
Civil Survey	\$/day	1,154	RSMeans 17123131100.
As Built Drawings	hours	8	
As Built Drawings	\$/hr	70	Develop plat map for incorporation into the Base Master Plan.
Clearing	day	0.50	Clearing including mob/demob for trees/brush cleared, chipped, & left onsite. RSMeans 022302000200.
Clearing	\$/day	3,329	
Sediment and Erosion Control	lf	140	Includes silt fence and straw bales along down slope of excavation. RSMeans 312514161000 & 250.
Sediment and Erosion Control	\$/lf	5.59	
<b><u>Soil Excavation</u></b>			
Soil Excavation Volume (In situ)	cy	593	Includes excavation of the AOC area based on the areas and depths presented in the summary table. In situ volumes include a 25% constructability factor.
Soil Excavation Volume (Ex situ)	cy	712	Includes soil volume to undergo thermal treatment. Ex situ volumes include a 25% constructability and 20% swell factor.
Soil Excavation Mass	tons	890	Includes soil mass to be treated
Soil Excavation Surface Area	sf	4,233	
<b><u>Mobilization/Demobilization</u></b>			
	ls	5,000	Includes mob/demob of excavation equipment and preparing submittals.
<b><u>Excavate Soils</u></b>			
	cy/day	240	Includes 2 cy excavator, 5-22 cy trucks, 1 O.E., 5 T.D., 1 L.S. spotter, 2 L.S. to prep trucks/and misc. Reduced productivity by 50% for loading trucks, small/precise excavations, overburden stockpiling, and security/S&H requirements. Assume trucks are direct loaded. Average 240 cy/day. RSMeans Crew B12-E.
	day	3	
	\$/day	7,769	
<b><u>Standby Time</u></b>			
	day	3	Assume equipment standby while analysis is being performed.
	\$/day	1026	Assume no additional hot spot excavation.
<b><u>Thermal Treatment of Contaminated Soil</u></b>			
	cy	712	Source: Endpoint Technology cost estimate using Vapor Energy Generator (VEG) Soil Remediation.
	\$/cy	41.00	
<b><u>Nonhazardous Waste</u></b>			
Transport and Offsite Disposal	tons	0	Based on shipping waste to American Landfill, Waynesburg, Ohio (approximately 80 mi RT). Assumes a minimum of 22 tons /load. Rate includes \$16.60/ton tax from Portage County.
	\$/ton	52.00	

## Feasibility Study for RVAAP Load Line 12

### Alternative 5 - Unrestricted (Residential) Land Use - Ex-situ Thermal Treatment and Excavation/Off-site Disposal of Soil/Sediment.

#### Key Parameters and Assumptions

#### Key Parameters and Assumptions:

Item	Unit	Value	Notes
<b><u>Waste Characterization and Confirmation Sampling</u></b>			
Waste Characterization Samples	ea	1	Includes composite samples for waste characterization (TCLP metals, TCLP SVOCs, TCLP pesticides, TCLP herbicides, reactive cyanide, reactive sulfide, and PCBs) and ISM samples for confirmation (PCB-1254, Explosives, and PAH).  Assumes 1 sampling technician to collect and ship samples.  1 truck x \$100/day including fuel.  Reference ECHOS 33 02 0401/0402 for ISM, processing, disposable sampling and decontamination materials.  Analyze samples for TCLP metals, TCLP SVOCs, TCLP pesticides, TCLP herbicides, reactive cyanide, reactive sulfide, and PCBs (\$553 ea.) and PCB-1254, Explosives, and PAH (\$12,560 all areas).  Includes 12-in lift of native fill assuming 20% swell. ECHOS 17030423 and RSMeans 312323160040, Unclassified Fill, 6" Lifts, offsite Source @ 20 miles, Includes delivery, spreading, and compaction.
Confirmation Sample Locations	ea	76	
Sampling Labor	hrs	60	
Sampling Labor	\$/hr	70	
Truck Rental / Gas	\$/event	750	
Sample Materials	ea	77	
Sample Materials	\$/ea	35	
Analytical Cost	\$/event	13,113	
<b><u>Restoration</u></b>			
Native Soil Backfill	cy	94	Includes 12-in lift of native fill assuming 20% swell. RSMeans 312323160040, Unclassified Fill, 6" Lifts, offsite Source @ 20 miles, Includes delivery, spreading, and compaction.
Native Soil Backfill	\$/cy	26.20	
Seeding, Vegetative Cover	MSF	44	Seeding with mulch and fertilizer. Include restoration of excavated areas and equipment damage. RSMeans 329219142200.
Seeding, Vegetative Cover	\$/MSF	63.21	
SWPPP Inspections	hrs	4	Assume one follow-up inspection.
SWPPP Inspections	\$/hr	70	
<b><u>Plans and Reports</u></b>			
Remedial Action Completion Report	hrs	300	Includes Construction QC data and preparing report.
Technical Labor	\$/hr	90	

**Feasibility Study for RVAAP Load Line 12**

**Alternative 5 - Unrestricted (Residential) Land Use - Ex-situ Thermal Treatment and Excavation/Off-site Disposal of Soil/Sediment.**

**Cost Estimate**

**CAPITAL COST**

**\$231,920**

Activity (unit)	Quantity	Unit Cost	Total
<b><u>Site Work</u></b>			
Civil Survey (day)	1.0	\$1,154.00	\$1,154
As Built Drawings (hrs)	8	\$70.00	\$560
Clearing (acre)	0.5	\$3,329.00	\$1,665
Sediment and Erosion Control (lf)	140	\$5.59	\$783
<b><u>Soil Excavation</u></b>			
Mobilization/Demobilization (ls)	1	\$5,000.00	\$5,000
Excavate Soil (day)	3	\$7,769.13	\$23,307
Standby Time (day)	3	\$1,026.00	\$3,078
Thermal Treatment of Contaminated Soil (cy)	712	\$41.00	\$29,195
Nonhazardous Transport and Offsite Disposal (ton)	0	\$52.00	\$0
<b><u>Confirmation Sampling</u></b>			
Sampling Labor (hrs.)	60	\$70.00	\$4,200
Truck Rental / Gas (event)	1	\$750.00	\$750
Sample Materials (ea)	77	\$35.00	\$2,695
Sample Analysis (event)	1	\$13,113.00	\$13,113
<b><u>Restoration</u></b>			
Native Soil Backfill (cy)	94	\$26.20	\$2,465
Seeding, Vegetative Cover (MSF)	44	\$63.21	\$2,781
SWPPP Inspections (hrs.)	4	\$70.00	\$280
<b><u>Plans and Reports</u></b>			
Remedial Action Completion Report (hrs)	300	\$90.00	\$27,000
<b>Subtotal</b>			<b>\$118,026</b>
Design		20%	\$23,605
Office Overhead		15%	\$17,704
Field Overhead		15%	\$17,704
<b>Subtotal</b>			<b>\$177,039</b>
Profit		6%	\$10,622
Contingency		25%	\$44,260
<b>Total</b>			<b>\$231,920</b>