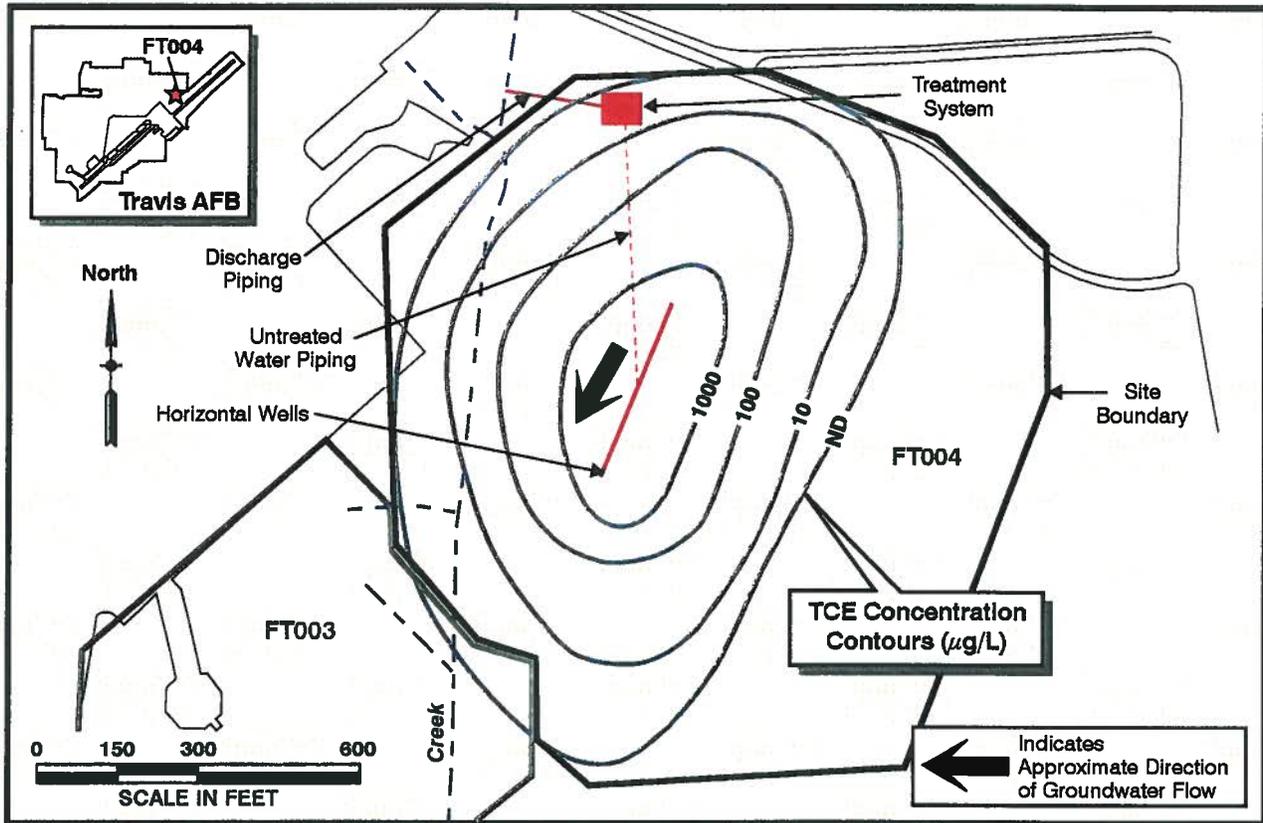


**APPENDIX B**  
**Group Cost Summaries**



FT004ALT.CDR - VMG 8/9/98 SAC 1

#### **Site Characteristics**

- Open field, less than 10% paved area
- TCE in groundwater — 830 µg/L average, 3,700 µg/L maximum
- TPH in groundwater — 1,000 µg/L average, 7,700 µg/L maximum
- Estimated mass of dissolved VOCs equals 230 lb; DNAPL may be present
- Ni in groundwater — 2,540 µg/L maximum
- Ar, Cr, Cu, Pb, Se, and Ag were measured at concentrations greater than NPDES discharge limits in some monitoring wells
- Depth to groundwater — 10 feet
- Depth to bedrock — 30 feet
- Silt and clay to 10 feet bgs
- Silty sand with minor gravel from 10 to 40 feet bgs
- Site also included in Group K for soil contamination

#### **Treatment Alternatives**

- Alternative #3: Air Stripper/Catalytic Oxidation, Ion Exchange, Activated Carbon
- Alternative #5: UV Oxidation, Ion Exchange, Activated Carbon
- Alternative #7: Ion Exchange, Activated Carbon

#### **Design Assumptions**

- Three horizontal wells, 300 feet in screened length each
- Extraction rate 45 gpm total, 15 gpm from each well
- 2,250 feet of untreated water piping (from well to treatment system) — 1 inch ID, sch 80 PVC
- 500 feet of discharge piping (to creek) — 2 inch ID, sch 80 PVC
- 300 feet from treatment system to existing power line
- 95 years to clean groundwater to MCLs, calculated using a contaminant transport model based on assumptions shown in Appendix C

*NOTE: The figure conceptually displays components for comparative purposes only. Actual layout may vary significantly from that shown and will be determined during the remedial design phase.*

**Figure B-1.**

**Conceptual Design for FT004 (Group A) Groundwater Treatment Alternatives, Travis AFB**

## Cost Summary for FT004 Alternatives

Alternative	Capital Costs	Operation and Maintenance Present Worth	Total
1	\$0	\$0	\$0
2	\$18,630	\$1,426,764	\$1,445,394
3	\$914,592	\$5,597,559	\$6,512,150
5	\$963,302	\$6,174,088	\$7,137,390
7	\$2,986,442	\$59,753,235	\$62,739,677

## Estimated Cost for FT004, Alternative 1

CAPITAL COSTS		
Process Option	Percentage	Capital Cost
No Action		\$0
<b>Construction Subtotal</b>		<b>\$0</b>
Bid Contingencies (% of Construction Subtotal)	15.0%	\$0
Scope Contingencies (% of Construction Subtotal)	20.0%	\$0
<b>Construction Total</b>		<b>\$0</b>
Other Direct Costs		
Engineering Design (% of Construction Total)	10.0%	\$0
Permitting and Legal (% of Construction Total)	5.0%	\$0
Startup and Shakedown (% of Construction Total)	10.0%	\$0
Bonding and Insurance (% of Construction Total)	3.0%	\$0
Construction Oversight (% of Construction Total)	5.0%	\$0
Field and Laboratory Testing (% of Construction Total)	5.0%	\$0
Reporting (% of Construction Total)	10.0%	\$0
Escalation (% of Construction Total, Based on Mid 1998 Start)	15.0%	\$0
<b>Total Capital Cost</b>		<b>\$0</b>

OPERATION AND MAINTENANCE				
Process Option	Annual O&M Cost	Process Option Service Time (yr)	Present Worth Factor	Process Option Present Worth
No Action	\$0	0.0	0.0000	\$0
<b>O&amp;M Subtotal</b>		<b>\$0</b>		<b>\$0</b>
Misc. O&M Costs (% Annual O&M Unless Otherwise Specified)	Percentage			
<i>See Global Cost Assumptions For Details on Calculations</i>				
No Action	21%	\$0	0.0	0.0000
<b>Total Operation and Maintenance Costs</b>				<b>\$0</b>

NET PRESENT WORTH	
Capital Costs	\$0
Operation and Maintenance Present Worth	\$0
<b>Total Alternative Cost</b>	<b>\$0</b>

## Estimated Cost for FT004, Alternative 2

CAPITAL COSTS				
Process Option	Quantity	Unit Cost	Percentage	Capital Cost
Institutional Controls	1	\$10,000	NA	\$10,000
Institutional Monitoring	1	\$0	NA	\$0
Reserved	1	\$0	NA	\$0
<b>Construction Subtotal</b>				<b>\$10,000</b>
Bid Contingencies (% of Construction Subtotal)			15.0%	\$1,500
Scope Contingencies (% of Construction Subtotal)			20.0%	\$2,000
<b>Construction Total</b>				<b>\$13,500</b>
Other Direct Costs				
Engineering Design (% of Construction Total)			10.0%	\$1,350
Permitting and Legal (% of Construction Total)			5.0%	\$675
Startup and Shakedown (% of Construction Total)			0.0%	\$0
Bonding and Insurance (% of Construction Total)			3.0%	\$405
Construction Oversight (% of Construction Total)			5.0%	\$675
Field and Laboratory Testing (% of Construction Total)			0.0%	\$0
Reporting (% of Construction Total)			0.0%	\$0
Escalation (% of Construction Total, Based on Mid 1998 Start)			15.0%	\$2,025
<b>Total Capital Cost</b>				<b>\$18,630</b>

OPERATION AND MAINTENANCE				
Process Option	Annual O&M Cost	Process Option Service Time (yr)	Present Worth Factor	Process Option Present Worth
Institutional Controls	\$0	95.0	19.8059	\$0
Institutional Monitoring	\$59,535	95.0	19.8059	\$1,179,144
Reserved	\$0	95.0	19.8059	\$0
<b>O&amp;M Subtotal</b>				<b>\$1,179,144</b>
<b>Misc. O&amp;M Costs (% Annual O&amp;M Unless Otherwise Specified)</b>		<b>Percentage</b>		
<i>See Global Cost Assumptions for Details on Calculations</i>				
Institutional Controls	21%	\$0	95.0	\$0
Institutional Monitoring	21%	\$12,502	95.0	\$247,620
Reserved	21%	\$0	95.0	\$0
<b>Total Operation and Maintenance Costs</b>				<b>\$1,426,764</b>

NET PRESENT WORTH	
Capital Costs	\$18,630
Operation and Maintenance Present Worth	\$1,426,764
<b>Total Alternative Cost</b>	<b>\$1,445,394</b>

**Estimated Cost for FT004, Alternative 3**

<b>CAPITAL COSTS</b>				
Process Option	Quantity	Unit Cost	Percentage	Capital Cost
Horizontal Extraction Wells	3	\$55,000	NA	\$165,000
Influent Piping	1	\$15,465	NA	\$15,465
Filtration	1	\$18,104	NA	\$18,104
Ion Exchange	1	\$23,700	NA	\$23,700
Air Stripper	1	\$29,288	NA	\$29,288
Catalytic Oxidation	1	\$73,584	NA	\$73,584
Activated Carbon	1	\$6,954	NA	\$6,954
Effluent Piping	1	\$3,890	NA	\$3,890
Utilities and Improvements	1	\$79,644	NA	\$79,644
Effluent Monitoring	1	\$0	NA	\$0
Plume Monitoring	1	\$0	NA	\$0
<b>Construction Subtotal</b>				<b>\$615,029</b>
Bid Contingencies (% of Construction Subtotal)			15.0%	\$62,344
Scope Contingencies (% of Construction Subtotal)			20.0%	\$83,126
<b>Construction Total</b>				<b>\$760,499</b>
<b>Other Direct Costs</b>				
Engineering Design (% of Construction Total)			10.0%	\$56,110
Permitting and Legal (% of Construction Total)			5.0%	\$28,055
Startup and Shakedown (% of Construction Total)			10.0%	\$56,110
Bonding and Insurance (% of Construction Total)			3.0%	\$16,833
Construction Oversight (% of Construction Total)			5.0%	\$28,055
Field and Laboratory Testing (% of Construction Total)			5.0%	\$28,055
Reporting (% of Construction Total)			10.0%	\$56,110
Escalation (% of Construction Total, Based on Mid 1998 Start)			15.0%	\$84,165
<b>Total Capital Cost</b>				<b>\$914,592</b>

<b>OPERATION AND MAINTENANCE</b>					
Process Option	Annual O&M Cost	Process Option Service Time (yr)	Process Option Present Worth Factor	Process Option Present Worth	
Horizontal Extraction Wells	\$3,000	95.0	19.8059	\$59,418	
Influent Piping	\$0	95.0	19.8059	\$0	
Filtration	\$810	95.0	19.8059	\$16,043	
Ion Exchange	\$146,400	95.0	19.8059	\$2,899,582	
Air Stripper	\$5,477	95.0	19.8059	\$108,477	
Catalytic Oxidation	\$30,064	95.0	19.8059	\$595,444	
Activated Carbon	\$7,322	95.0	19.8059	\$145,019	
Effluent Piping	\$0	95.0	19.8059	\$0	
Utilities and Improvements	\$0	95.0	19.8059	\$0	
Effluent Monitoring	\$27,195	95.0	19.8059	\$538,621	
Plume Monitoring	\$13,303	95.0	19.8059	\$263,478	
<b>O&amp;M Subtotal</b>				<b>\$4,477,072</b>	
<b>Misc. O&amp;M Costs (% Annual O&amp;M Unless Otherwise Specified)</b>		<b>Percentage</b>			
<b>See Global Cost Assumptions For Details on Calculations</b>					
Horizontal Extraction Wells	21%	\$630	95.0	19.8059	\$12,478
Influent Piping	21%	\$0	95.0	19.8059	\$0
Filtration	21%	\$170	95.0	19.8059	\$3,369
Ion Exchange	21%	\$30,744	95.0	19.8059	\$608,912
Air Stripper	21%	\$1,150	95.0	19.8059	\$22,780
Catalytic Oxidation	21%	\$6,313	95.0	19.8059	\$125,043
Activated Carbon	21%	\$1,538	95.0	19.8059	\$30,454
Effluent Piping	21%	\$0	95.0	19.8059	\$0
Utilities and Improvements	21%	\$0	95.0	19.8059	\$0
Effluent Monitoring	21%	\$5,711	95.0	19.8059	\$113,110
Plume Monitoring	21%	\$2,794	95.0	19.8059	\$55,330
<b>Total Operation and Maintenance Costs</b>				<b>\$5,597,559</b>	

<b>NET PRESENT WORTH</b>		
Capital Costs		\$914,592
Operation and Maintenance Present Worth		\$5,597,559
<b>Total Alternative Cost</b>		<b>\$6,512,151</b>

Estimated Cost for FT004, Alternative 5

CAPITAL COSTS				
Process Option	Quantity	Unit Cost	Percentage	Capital Cost
Horizontal Extraction Wells	3	\$55,000	NA	\$165,000
Influent Piping	1	\$15,465	NA	\$15,465
Filtration	1	\$18,104	NA	\$18,104
Ion Exchange	1	\$23,700	NA	\$23,700
Ultraviolet Oxidation	1	\$125,008	NA	\$125,008
Activated Carbon	1	\$6,954	NA	\$6,954
Effluent Piping	1	\$3,890	NA	\$3,890
Utilities and Improvements	1	\$79,644	NA	\$79,644
Effluent Monitoring	1	\$0	NA	\$0
Plume Monitoring	1	\$0	NA	\$0
<b>Construction Subtotal</b>				<b>\$437,726</b>
Bid Contingencies (% of Construction Subtotal)			15.0%	\$65,665
Scope Contingencies (% of Construction Subtotal)			20.0%	\$87,553
<b>Construction Total</b>				<b>\$590,944</b>
Other Direct Costs				
Engineering Design (% of Construction Total)			10.0%	\$59,098
Permitting and Legal (% of Construction Total)			5.0%	\$29,549
Startup and Shakedown (% of Construction Total)			10.0%	\$59,098
Bonding and Insurance (% of Construction Total)			3.0%	\$17,729
Construction Oversight (% of Construction Total)			5.0%	\$29,549
Field and Laboratory Testing (% of Construction Total)			5.0%	\$29,549
Reporting (% of Construction Total)			10.0%	\$59,098
Escalation (% of Construction Total, Based on Mid 1998 Start)			15.0%	\$88,647
<b>Total Capital Cost</b>				<b>\$663,302</b>

OPERATION AND MAINTENANCE					
Process Option	Annual O&M Cost	Process Option Service Time (Yr)	Present Worth Factor	Process Option Present Worth	
Horizontal Extraction Wells	\$3,000	95.0	19.8059	\$59,418	
Influent Piping	\$0	95.0	19.8059	\$0	
Filtration	\$810	95.0	19.8059	\$16,043	
Ion Exchange	\$146,400	95.0	19.8059	\$2,899,582	
Ultraviolet Oxidation	\$59,598	95.0	19.8059	\$1,180,391	
Activated Carbon	\$7,322	95.0	19.8059	\$145,019	
Effluent Piping	\$0	95.0	19.8059	\$0	
Utilities and Improvements	\$0	95.0	19.8059	\$0	
Effluent Monitoring	\$27,195	95.0	19.8059	\$538,621	
Plume Monitoring	\$13,303	95.0	19.8059	\$263,478	
<b>O&amp;M Subtotal</b>				<b>\$6,102,653</b>	
Misc O&M Costs (% Annual O&M Unless Otherwise Specified)		Percentage			
See Global Cost Assumptions For Details on Calculations					
Horizontal Extraction Wells	21%	\$630	95.0	19.8059	\$12,478
Influent Piping	21%	\$0	95.0	19.8059	\$0
Filtration	21%	\$170	95.0	19.8059	\$3,369
Ion Exchange	21%	\$30,744	95.0	19.8059	\$608,912
Ultraviolet Oxidation	21%	\$12,516	95.0	19.8059	\$247,882
Activated Carbon	21%	\$1,538	95.0	19.8059	\$30,454
Effluent Piping	21%	\$0	95.0	19.8059	\$0
Utilities and Improvements	21%	\$0	95.0	19.8059	\$0
Effluent Monitoring	21%	\$5,711	95.0	19.8059	\$113,110
Plume Monitoring	21%	\$2,794	95.0	19.8059	\$55,330
<b>Total Operation and Maintenance Costs</b>				<b>\$6,174,088</b>	

NET PRESENT WORTH	
Capital Costs	\$963,302
Operation and Maintenance Present Worth	\$6,174,088
<b>Total Alternative Cost</b>	<b>\$7,137,390</b>

**Estimated Cost for FT004, Alternative 7**

<b>CAPITAL COSTS</b>				
Process Option	Quantity	Unit Cost	Percentage	Capital Cost
Horizontal Extraction Wells	3	\$55,000	NA	\$165,000
Influent Piping	1	\$15,465	NA	\$15,465
Filtration	1	\$18,104	NA	\$18,104
Ion Exchange	1	\$23,700	NA	\$23,700
Activated Carbon Alt 7	1	\$1,051,362	NA	\$1,051,362
Effluent Piping	1	\$3,890	NA	\$3,890
Utilities and Improvements	1	\$79,644	NA	\$79,644
Effluent Monitoring	1	\$0	NA	\$0
Plume Monitoring	1	\$0	NA	\$0
<b>Construction Subtotal</b>				<b>\$1,351,165</b>
Bid Contingencies (% of Construction Subtotal)			15.0%	\$203,575
Scope Contingencies (% of Construction Subtotal)			20.0%	\$271,433
<b>Construction Total</b>				<b>\$1,826,173</b>
<b>Other Direct Costs</b>				
Engineering Design (% of Construction Total)			10.0%	\$183,217
Permitting and Legal (% of Construction Total)			5.0%	\$91,609
Startup and Shakedown (% of Construction Total)			10.0%	\$183,217
Bonding and Insurance (% of Construction Total)			3.0%	\$54,965
Construction Oversight (% of Construction Total)			5.0%	\$91,609
Field and Laboratory Testing (% of Construction Total)			5.0%	\$91,609
Reporting (% of Construction Total)			10.0%	\$183,217
Escalation (% of Construction Total, Based on Mid 1998 Start)			15.0%	\$274,826
<b>Total Capital Cost</b>				<b>\$2,986,442</b>

<b>OPERATION AND MAINTENANCE</b>					
Process Option	Annual O&M Cost	Present Option Service Time (yr)	Present Worth Factor	Present Worth	
Horizontal Extraction Wells	\$3,000	95.0	19.8059	\$59,418	
Influent Piping	\$0	95.0	19.8059	\$0	
Filtration	\$810	95.0	19.8059	\$16,043	
Ion Exchange	\$146,400	95.0	19.8059	\$2,899,582	
Activated Carbon Alt 7	\$2,302,633	95.0	19.8059	\$45,605,697	
Effluent Piping	\$0	95.0	19.8059	\$0	
Utilities and Improvements	\$0	95.0	19.8059	\$0	
Effluent Monitoring	\$27,195	95.0	19.8059	\$538,621	
Plume Monitoring	\$13,303	95.0	19.8059	\$263,478	
<b>O&amp;M Subtotal</b>				<b>\$49,342,839</b>	
<b>Misc. O&amp;M Costs (% Annual O&amp;M Unless Otherwise Specified)</b>					
<i>See Global Cost Assumptions For Details on Calculations</i>					
Horizontal Extraction Wells	21%	\$630	95.0	19.8059	\$12,478
Influent Piping	21%	\$0	95.0	19.8059	\$0
Filtration	21%	\$170	95.0	19.8059	\$3,369
Ion Exchange	21%	\$30,744	95.0	19.8059	\$608,912
Activated Carbon Alt 7	21%	\$483,553	95.0	19.8059	\$9,577,196
Effluent Piping	21%	\$0	95.0	19.8059	\$0
Utilities and Improvements	21%	\$0	95.0	19.8059	\$0
Effluent Monitoring	21%	\$5,711	95.0	19.8059	\$113,110
Plume Monitoring	21%	\$2,794	95.0	19.8059	\$55,330
<b>Total Operation and Maintenance Costs</b>				<b>\$59,753,235</b>	

<b>NET PRESENT WORTH</b>	
Capital Costs	\$2,986,442
Operation and Maintenance Present Worth	\$59,753,235
<b>Total Alternative Cost</b>	<b>\$62,739,677</b>

**Cost Estimate Summary Sheet**

**NEWIOU Feasibility Study, Travis AFB**

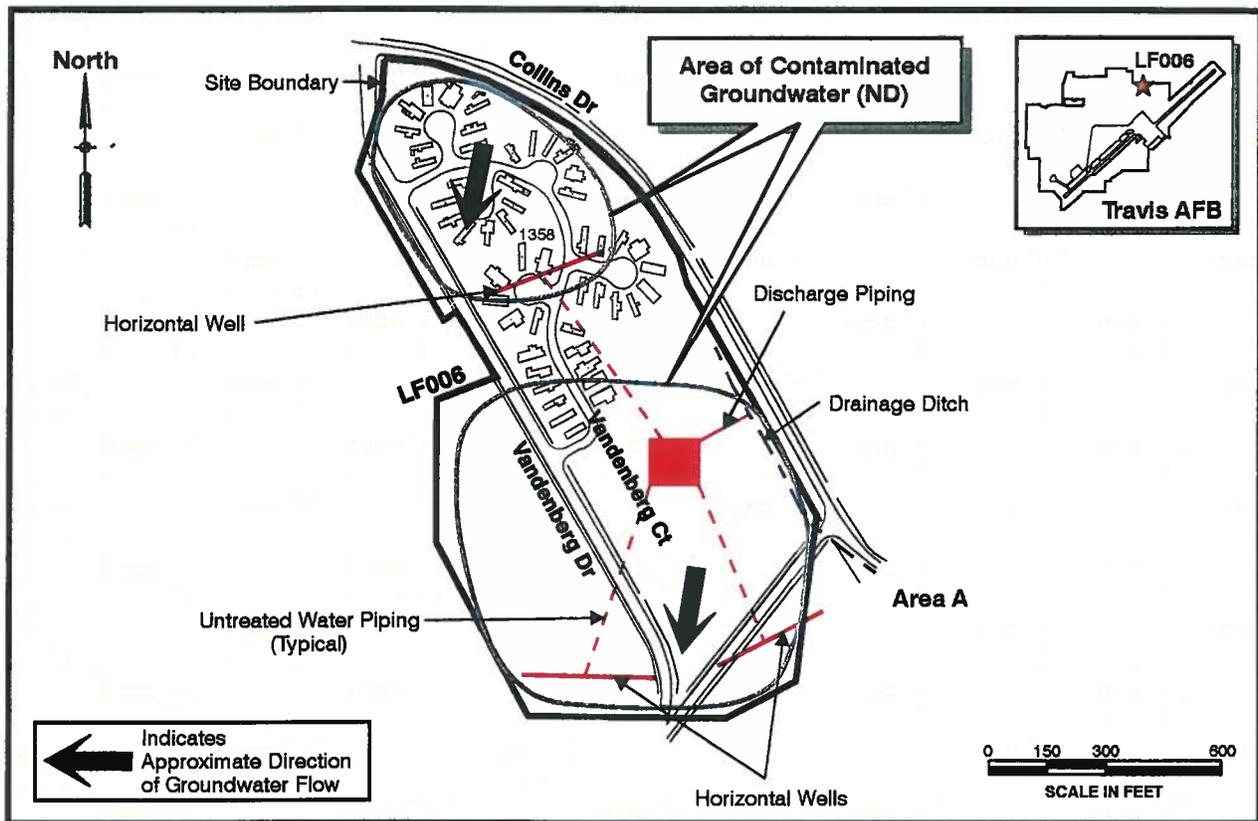
**Process Option Summary for FT004**

**Assumptions:**

- 1 Use RACER/ENVEST cost estimating model, Version 3.1 when practical
- 2 Compute monitoring and O&M for one year only; add costs for subsequent years using Alternative Cost Summary Sheets.
- 3 Horizontal extraction wells are 300 feet in length.

**Cost Summary:**

Item	Capital Cost	O&M Cost
Horizontal Extraction Wells	\$55,000	\$3,000
Influent Piping	\$15,465	\$0
Filtration	\$18,104	\$810
Ion Exchange	\$23,700	\$146,400
Air Stripper	\$29,288	\$5,477
Catalytic Oxidation	\$73,584	\$30,064
Ultraviolet Oxidation	\$125,008	\$59,598
Activated Carbon	\$6,954	\$7,322
Activated Carbon Alt 7	\$1,051,362	\$2,302,633
Effluent Piping	\$3,890	\$0
Utilities and Improvements	\$79,644	\$0
Clear and Grub	\$5,702	\$0
Electrical	\$9,693	\$0
Access Road	\$4,830	\$0
Communication Lines	\$3,471	\$0
Gas Service	\$3,126	\$0
Cleanup and Landscaping	\$1,150	\$0
Fencing	\$794	\$0
Surge Tank	\$7,700	\$0
Well Power and Comm lines	\$21,400	\$0
Control Panel	\$11,600	\$0
Treatment Unit Pad	\$10,178	\$0
Institutional Controls	\$10,000	\$0
Plume Monitoring	\$0	\$13,303
Effluent Monitoring	\$0	\$27,195
Institutional Monitoring	\$0	\$59,535



LF006ALT.CDR - VMG 9/10/98 SAC 1

#### **Site Characteristics**

- Mostly flat grassland
- Mobile homes cover approximately 40% of the study area (northwest portion)
- Drainage ditches transport surface water to the south and east
- Located over former burn/fill trenches
- TCE in groundwater — 5  $\mu\text{g/L}$  average, 20  $\mu\text{g/L}$  maximum
- TPH in groundwater — 120  $\mu\text{g/L}$  average, 330  $\mu\text{g/L}$  maximum
- Estimated mass of dissolved VOCs equals 0.4 lb
- Depth to groundwater — 10 feet
- Depth to bedrock — 50 feet
- Low permeability soils (clay) to about 25 feet bgs
- More permeable material (sands and silts) between 25 feet bgs and bedrock

#### **Treatment Alternatives**

- Alternative #3: Air Stripper/Catalytic Oxidation, Ion Exchange, Activated Carbon
- Alternative #5: UV Oxidation, Ion Exchange, Activated Carbon
- Alternative #7: Ion Exchange, Activated Carbon

#### **Design Assumptions**

- 3 horizontal wells, 300 feet in screened length each
- Extraction rate 45 gpm total, 15 gpm from each well
- 1,250 feet of conveyance piping (from well to treatment system) — 1 inch ID, sch 80 PVC
- 200 feet of discharge piping — 2 inch ID, sch 80 PVC
- 100 feet from treatment system to existing power line
- 9 years to clean groundwater to MCLs, calculated using a contaminant transport model based on assumptions shown in Appendix C

**NOTE:** The figure conceptually displays components for comparative purposes only. Actual layout may vary significantly from that shown and will be determined during the remedial design phase.

**Figure B-2.**  
**Conceptual Design for LF006 (Group A) Groundwater Treatment Alternatives, Travis AFB**

# Cost Summary for LF006 Alternatives

Alternative	Capital Costs	Operation and Maintenance Present Worth	Total
1	\$0	\$0	\$0
2	\$18,630	\$416,835	\$435,465
3	\$863,789	\$599,434	\$1,463,223
5	\$877,126	\$732,540	\$1,609,666
7	\$637,419	\$350,594	\$988,013

## Estimated Cost for LF006, Alternative 1

CAPITAL COSTS		
Process Option	Percentage	Capital Cost
No Action		\$0
<b>Construction Subtotal</b>		
Bid Contingencies (% of Construction Subtotal)	15.0%	\$0
Scope Contingencies (% of Construction Subtotal)	20.0%	\$0
<b>Construction Total</b>		
<b>Other Direct Costs</b>		
Engineering Design (% of Construction Total)	10.0%	\$0
Permitting and Legal (% of Construction Total)	5.0%	\$0
Startup and Shakedown (% of Construction Total)	10.0%	\$0
Bonding and Insurance (% of Construction Total)	3.0%	\$0
Construction Oversight (% of Construction Total)	5.0%	\$0
Field and Laboratory Testing (% of Construction Total)	5.0%	\$0
Reporting (% of Construction Total)	10.0%	\$0
Escalation (% of Construction Total, Based on Mid 1998 Start)	15.0%	\$0
<b>Total Capital Cost</b>		

OPERATION AND MAINTENANCE						
Process Option	Annual O&M Cost	Process Option Service Time (yr)	Present Worth Factor	Process Option Present Worth		
No Action	\$0	0.0	0.0000	\$0		
<b>O&amp;M Subtotal</b>						
<b>Misc. O&amp;M Costs (% Annual O&amp;M Unless Otherwise Specified)</b>						
No Action		21%	\$0	0.0	0.0000	\$0
<b>Total Operation and Maintenance Costs</b>						

NET PRESENT WORTH	
Capital Costs	\$0
Operation and Maintenance Present Worth	\$0
<b>Total Alternative Cost</b>	

**Estimated Cost for LF006, Alternative 2**

<b>CAPITAL COSTS</b>				
<b>Process Option</b>	<b>Quantity</b>	<b>Unit Cost</b>	<b>Percentage</b>	<b>Capital Cost</b>
Institutional Controls	1	\$10,000	NA	\$10,000
Institutional Monitoring	1	\$0	NA	\$0
Reserved	1	\$0	NA	\$0
<b>Construction Subtotal</b>				<b>\$10,000</b>
Bid Contingencies (% of Construction Subtotal)			15.0%	\$1,500
Scope Contingencies (% of Construction Subtotal)			20.0%	\$2,000
<b>Construction Total</b>				<b>\$13,500</b>
<b>Other Direct Costs</b>				
Engineering Design (% of Construction Total)			10.0%	\$1,350
Permitting and Legal (% of Construction Total)			5.0%	\$675
Startup and Shakedown (% of Construction Total)			0.0%	\$0
Bonding and Insurance (% of Construction Total)			3.0%	\$405
Construction Oversight (% of Construction Total)			5.0%	\$675
Field and Laboratory Testing (% of Construction Total)			0.0%	\$0
Reporting (% of Construction Total)			0.0%	\$0
Escalation (% of Construction Total, Based on Mid 1998 Start)			15.0%	\$2,025
<b>Total Capital Cost</b>				<b>\$18,630</b>

<b>OPERATION AND MAINTENANCE</b>				
<b>Process Option</b>	<b>Annual O&amp;M Cost</b>	<b>Process Option Service Time (yr)</b>	<b>Present Worth Factor</b>	<b>Process Option Present Worth</b>
Institutional Controls	\$0	7.0	5.7864	\$0
Institutional Monitoring	\$59,535	7.0	5.7864	\$344,492
Reserved	\$0	7.0	5.7864	\$0
<b>O&amp;M Subtotal</b>				<b>\$344,492</b>
<b>Misc. O&amp;M Costs (% Annual O&amp;M Unless Otherwise Specified)</b>		<b>Percentage</b>		
<b>See Global Cost Assumptions For Details on Calculations</b>				
Institutional Controls	21%	\$0	7.0	\$0
Institutional Monitoring	21%	\$12,502	7.0	\$72,343
Reserved	21%	\$0	7.0	\$0
<b>Total Operation and Maintenance Costs</b>				<b>\$416,835</b>

<b>NET PRESENT WORTH</b>	
Capital Costs	\$18,630
Operation and Maintenance Present Worth	\$416,835
<b>Total Alternative Cost</b>	<b>\$435,465</b>

Estimated Cost for LF006, Alternative 3

CAPITAL COSTS				
Process Option	Quantity	Unit Cost	Percentage	Capital Cost
Horizontal Extraction Wells	3	\$55,000	NA	\$165,000
Influent Piping	1	\$8,150	NA	\$8,150
Filtration	1	\$18,104	NA	\$18,104
Ion Exchange	1	\$23,700	NA	\$23,700
Air Stripper	1	\$29,288	NA	\$29,288
Catalytic Oxidation	1	\$73,584	NA	\$73,584
Activated Carbon	1	\$6,955	NA	\$6,955
Effluent Piping	1	\$1,487	NA	\$1,487
Utilities and Improvements	1	\$66,274	NA	\$66,274
Effluent Monitoring	1	\$0	NA	\$0
Plume Monitoring	1	\$0	NA	\$0
<b>Construction Subtotal</b>				<b>\$397,542</b>
Bid Contingencies (% of Construction Subtotal)			15.0%	\$58,881
Scope Contingencies (% of Construction Subtotal)			20.0%	\$78,508
<b>Construction Total</b>				<b>\$529,542</b>
Other Direct Costs				
Engineering Design (% of Construction Total)			10.0%	\$52,993
Permitting and Legal (% of Construction Total)			5.0%	\$26,497
Startup and Shakedown (% of Construction Total)			10.0%	\$52,993
Bonding and Insurance (% of Construction Total)			3.0%	\$15,898
Construction Oversight (% of Construction Total)			5.0%	\$26,497
Field and Laboratory Testing (% of Construction Total)			5.0%	\$26,497
Reporting (% of Construction Total)			10.0%	\$52,993
Escalation (% of Construction Total, Based on Mid 1998 Start)			15.0%	\$79,490
<b>Total Capital Cost</b>				<b>\$863,789</b>

OPERATION AND MAINTENANCE				
Process Option	Annual O&M Cost	Process Option Service Time (yr)	Present Worth Factor	Process Option Present Worth
Horizontal Extraction Wells	\$3,000	7.0	5.7864	\$17,359
Influent Piping	\$0	7.0	5.7864	\$0
Filtration	\$810	7.0	5.7864	\$4,687
Ion Exchange	\$3,480	7.0	5.7864	\$20,137
Air Stripper	\$5,477	7.0	5.7864	\$31,692
Catalytic Oxidation	\$30,064	7.0	5.7864	\$173,962
Activated Carbon	\$2,286	7.0	5.7864	\$13,228
Effluent Piping	\$0	7.0	5.7864	\$0
Utilities and Improvements	\$0	7.0	5.7864	\$0
Effluent Monitoring	\$27,195	7.0	5.7864	\$157,360
Plume Monitoring	\$13,303	7.0	5.7864	\$76,976
<b>Grand Subtotal:</b>				<b>\$495,400</b>
Misc. O&M Costs (% Annual O&M Unless Otherwise Specified)		Percentage		
See Global Cost Assumptions For Details on Calculations				
Horizontal Extraction Wells	21%	\$630	7.0	\$3,645
Influent Piping	21%	\$0	7.0	\$0
Filtration	21%	\$170	7.0	\$984
Ion Exchange	21%	\$731	7.0	\$4,229
Air Stripper	21%	\$1,150	7.0	\$6,655
Catalytic Oxidation	21%	\$6,313	7.0	\$36,532
Activated Carbon	21%	\$480	7.0	\$2,778
Effluent Piping	21%	\$0	7.0	\$0
Utilities and Improvements	21%	\$0	7.0	\$0
Effluent Monitoring	21%	\$5,711	7.0	\$33,046
Plume Monitoring	21%	\$2,794	7.0	\$16,165
<b>Total Operation and Maintenance Cost</b>			<b>\$87,469</b>	<b>\$599,434</b>

NET PRESENT WORTH	
Capital Costs	\$863,789
Operation and Maintenance Present Worth	\$599,434
<b>Total Alternative Cost</b>	<b>\$1,463,223</b>

Estimated Cost for LF006, Alternative 5

CAPITAL COSTS				
Process Option	Quantity	Unit Cost	Percentage	Capital Cost
Horizontal Extraction Wells	3	\$55,000	NA	\$165,000
Influent Piping	1	\$8,150	NA	\$8,150
Filtration	1	\$18,104	NA	\$18,104
Ion Exchange	1	\$23,700	NA	\$23,700
Ultraviolet Oxidation	1	\$108,933	NA	\$108,933
Activated Carbon	1	\$6,955	NA	\$6,955
Effluent Piping	1	\$1,487	NA	\$1,487
Utilities and Improvements	1	\$66,274	NA	\$66,274
Effluent Monitoring	1	\$0	NA	\$0
Plume Monitoring	1	\$0	NA	\$0
<b>Construction Subtotal</b>				<b>\$398,603</b>
Bid Contingencies (% of Construction Subtotal)			15.0%	\$59,790
Scope Contingencies (% of Construction Subtotal)			20.0%	\$79,721
<b>Construction Total</b>				<b>\$538,114</b>
<b>Other Direct Costs</b>				
Engineering Design (% of Construction Total)			10.0%	\$53,811
Permitting and Legal (% of Construction Total)			5.0%	\$26,906
Startup and Shakedown (% of Construction Total)			10.0%	\$53,811
Bonding and Insurance (% of Construction Total)			3.0%	\$16,143
Construction Oversight (% of Construction Total)			5.0%	\$26,906
Field and Laboratory Testing (% of Construction Total)			5.0%	\$26,906
Reporting (% of Construction Total)			10.0%	\$53,811
Escalation (% of Construction Total, Based on Mid 1998 Start)			15.0%	\$80,717
<b>Total Capital Cost</b>				<b>\$877,126</b>

OPERATION AND MAINTENANCE				
Process Option	Annual O&M Cost	Process Option Service Time (YE)	Present Worth Factor	Process Option Present Worth
Horizontal Extraction Wells	\$3,000	7.0	5.7864	\$17,359
Influent Piping	\$0	7.0	5.7864	\$0
Filtration	\$810	7.0	5.7864	\$4,687
Ion Exchange	\$3,480	7.0	5.7864	\$20,137
Ultraviolet Oxidation	\$54,552	7.0	5.7864	\$315,658
Activated Carbon	\$2,286	7.0	5.7864	\$13,228
Effluent Piping	\$0	7.0	5.7864	\$0
Utilities and Improvements	\$0	7.0	5.7864	\$0
Effluent Monitoring	\$27,195	7.0	5.7864	\$157,360
Plume Monitoring	\$13,303	7.0	5.7864	\$76,976
<b>O&amp;M Subtotal</b>				<b>\$605,405</b>
<b>Misc. O&amp;M Costs (% Annual O&amp;M Unless Otherwise Specified)</b>		<b>Percentage</b>		
<i>See Global Data Assumptions for Details on Calculations</i>				
Horizontal Extraction Wells	21%	\$630	7.0	\$3,645
Influent Piping	21%	\$0	7.0	\$0
Filtration	21%	\$170	7.0	\$984
Ion Exchange	21%	\$731	7.0	\$4,229
Ultraviolet Oxidation	21%	\$11,456	7.0	\$66,288
Activated Carbon	21%	\$480	7.0	\$2,778
Effluent Piping	21%	\$0	7.0	\$0
Utilities and Improvements	21%	\$0	7.0	\$0
Effluent Monitoring	21%	\$5,711	7.0	\$33,046
Plume Monitoring	21%	\$2,794	7.0	\$16,165
<b>Total Operation and Maintenance Costs</b>				<b>\$732,540</b>

NET PRESENT WORTH	
Capital Costs	\$877,126
Operation and Maintenance Present Worth	\$732,540
<b>Total Alternative Cost</b>	<b>\$1,609,666</b>

### Estimated Cost for LF006, Alternative 7

CAPITAL COSTS				
Process Option	Quantity	Unit Cost	Percentage	Capital Cost
Horizontal Extraction Wells	3	\$55,000	NA	\$165,000
Influent Piping	1	\$8,150	NA	\$8,150
Filtration	1	\$18,104	NA	\$18,104
Ion Exchange	1	\$23,700	NA	\$23,700
Activated Carbon Alt 7	1	\$6,955	NA	\$6,955
Effluent Piping	1	\$1,487	NA	\$1,487
Utilities and Improvements	1	\$66,274	NA	\$66,274
Effluent Monitoring	1	\$0	NA	\$0
Plume Monitoring	1	\$0	NA	\$0
<b>Construction Subtotal</b>				<b>\$289,670</b>
Bid Contingencies (% of Construction Subtotal)			15.0%	\$43,451
Scope Contingencies (% of Construction Subtotal)			20.0%	\$57,934
<b>Construction Total</b>				<b>\$391,055</b>
Other Direct Costs				
Engineering Design (% of Construction Total)			10.0%	\$39,105
Permitting and Legal (% of Construction Total)			5.0%	\$19,553
Startup and Shakedown (% of Construction Total)			10.0%	\$39,105
Bonding and Insurance (% of Construction Total)			3.0%	\$11,732
Construction Oversight (% of Construction Total)			5.0%	\$19,553
Field and Laboratory Testing (% of Construction Total)			5.0%	\$19,553
Reporting (% of Construction Total)			10.0%	\$39,105
Escalation (% of Construction Total, Based on Mid 1998 Start)			15.0%	\$58,658
<b>Total Capital Cost</b>				<b>\$637,419</b>

OPERATION AND MAINTENANCE					
Process Option	Annual O&M Cost	Process Option Service Time (yr)	Present Worth Factor	Process Option Present Worth	
Horizontal Extraction Wells	\$3,000	7.0	5.7864	\$17,359	
Influent Piping	\$0	7.0	5.7864	\$0	
Filtration	\$810	7.0	5.7864	\$4,687	
Ion Exchange	\$3,480	7.0	5.7864	\$20,137	
Activated Carbon Alt 7	\$2,286	7.0	5.7864	\$13,228	
Effluent Piping	\$0	7.0	5.7864	\$0	
Utilities and Improvements	\$0	7.0	5.7864	\$0	
Effluent Monitoring	\$27,195	7.0	5.7864	\$157,360	
Plume Monitoring	\$13,303	7.0	5.7864	\$76,976	
<b>O&amp;M Subtotal</b>				<b>\$289,747</b>	
<b>Misc. O&amp;M Costs (% Annual O&amp;M Unless Otherwise Specified)</b>		<b>Percentage</b>			
<i>See Global Cost Assumptions For Details on Calculations</i>					
Horizontal Extraction Wells	21%	\$630	7.0	5.7864	\$3,645
Influent Piping	21%	\$0	7.0	5.7864	\$0
Filtration	21%	\$170	7.0	5.7864	\$984
Ion Exchange	21%	\$731	7.0	5.7864	\$4,229
Activated Carbon Alt 7	21%	\$480	7.0	5.7864	\$2,778
Effluent Piping	21%	\$0	7.0	5.7864	\$0
Utilities and Improvements	21%	\$0	7.0	5.7864	\$0
Effluent Monitoring	21%	\$5,711	7.0	5.7864	\$33,046
Plume Monitoring	21%	\$2,794	7.0	5.7864	\$16,165
<b>Total Operation and Maintenance Costs</b>				<b>\$350,594</b>	

NET PRESENT WORTH	
Capital Costs	\$637,419
Operation and Maintenance Present Worth	\$350,594
<b>Total Alternative Cost</b>	<b>\$988,013</b>

LF006 Cost Summary Sheet

**Cost Estimate Summary Sheet**

**NEWIOU Feasibility Study, Travis AFB**

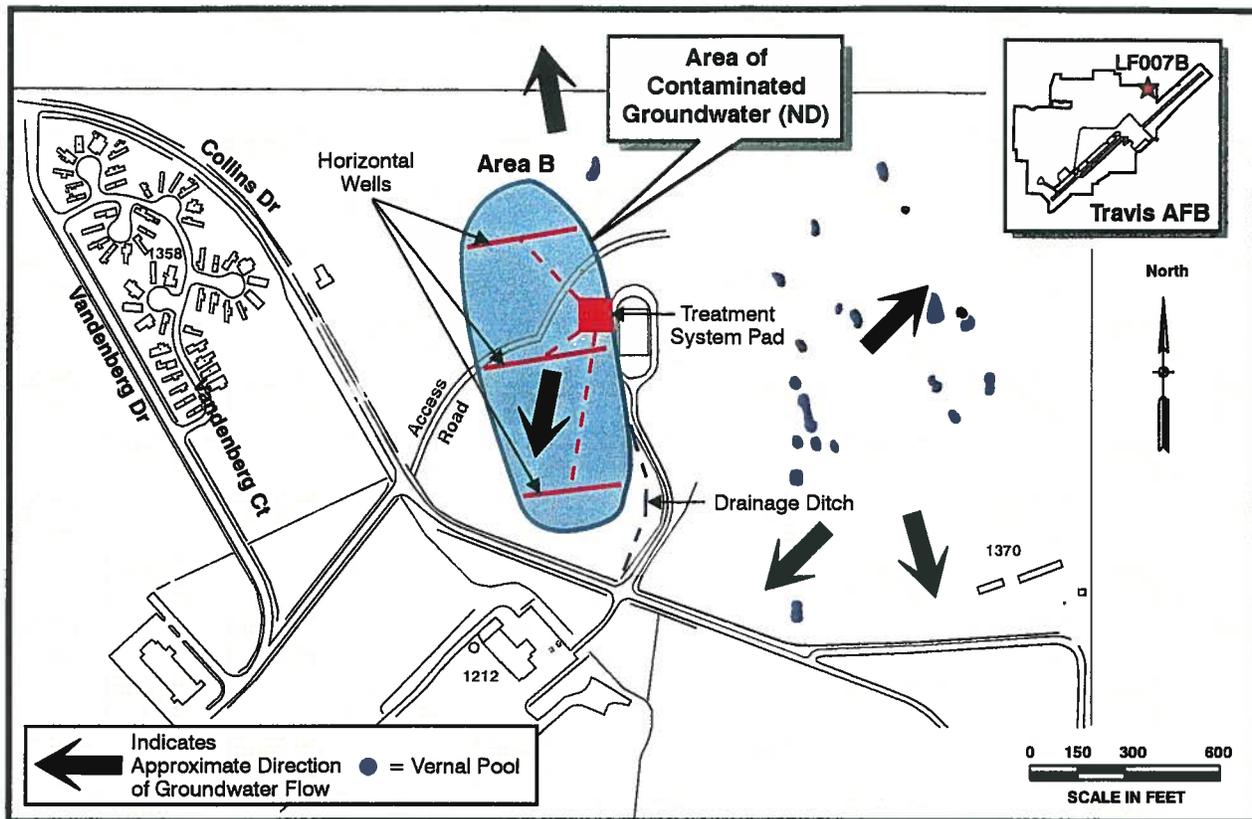
**Process Option Summary for LF006**

**Assumptions:**

- 1 Use RACER/ENVEST cost estimating model, Version 3.1 when practical
- 2 Compute monitoring and O&M for one year only; add costs for subsequent years using Alternative Cost Summary Sheets.
- 3 Horizontal extraction wells are 300 feet in length.
- 4 The UV oxidation item was costed using a max. TCE influent conc. of 20 ppb due to the low average value of 5 ppb

**Cost Summary:**

Item	Capital Cost	O&M Cost
Horizontal Extraction Wells	\$55,000	\$3,000
Influent Piping	\$8,150	\$0
Filtration	\$18,104	\$810
Ion Exchange	\$23,700	\$3,480
Air Stripper	\$29,288	\$5,477
Catalytic Oxidation	\$73,584	\$30,064
Ultraviolet Oxidation	\$108,933	\$54,552
Activated Carbon	\$6,955	\$2,286
Activated Carbon Alt 7	\$6,955	\$2,286
Effluent Piping	\$1,487	\$0
Utilities and Improvements	\$66,274	\$0
Clear and Grub	\$5,335	\$0
Electrical	\$7,893	\$0
Access Road	\$6,938	\$0
Communication Lines	\$1,191	\$0
Gas Service	\$1,595	\$0
Cleanup and Landscaping	\$1,150	\$0
Fencing	\$794	\$0
Surge Tank	\$7,700	\$0
Well Power and Comm Lines	\$11,900	\$0
Control Panel	\$11,600	\$0
Treatment Unit Pad	\$10,178	\$0
Institutional Controls	\$10,000	\$0
Plume Monitoring	\$0	\$13,303
Effluent Monitoring	\$0	\$27,195
Institutional Monitoring	\$0	\$59,535



LF007BGW.CDR - VMG 4/11/96 SAC 1

### Site Characteristics

- Mostly grassy flatlands
- Differential settling has resulted in adjacent depressions and ridges up to 6 feet tall
- Unpaved access road
- Benzene in groundwater — 30  $\mu\text{g/L}$  average, 59.3  $\mu\text{g/L}$  maximum
- Chlorobenzene in groundwater — 30  $\mu\text{g/L}$  average, 161  $\mu\text{g/L}$  maximum
- TPH in groundwater — 500  $\mu\text{g/L}$  average, 4,200  $\mu\text{g/L}$  maximum
- Estimated mass of dissolved VOCs equals 2.3 lb
- Depth to groundwater — 10 feet
- Depth to bedrock — 40 feet
- Backfill and landfill material ranging from 0 to 15 feet bgs
- Intermittent layers of clays and sands between landfill material and 25 feet bgs
- Intermittent layers of clays and silts from 25 to 50 feet bgs
- Site also included in Group L for soil contamination

### Treatment Alternatives

- Alternative #3: Air Stripper/Catalytic Oxidation, Ion Exchange, Activated Carbon
- Alternative #5: UV Oxidation, Ion Exchange, Activated Carbon
- Alternative #7: Ion Exchange, Activated Carbon

### Design Assumptions

- 3 horizontal wells, 300 feet in screened length each
- Extraction rate 45 gpm total, 15 gpm from each well
- 830 feet of conveyance piping (from well to treatment system) — 1 inch ID, sch 80 PVC
- 100 feet of discharge piping — 2 inch ID, sch 80 PVC
- 150 feet from treatment system to existing power line
- 3 years to clean groundwater to MCLs is calculated using a contaminant transport model based on assumptions shown in Appendix C

*NOTE: The figure conceptually displays components for comparative purposes only. Actual layout may vary significantly from that shown and will be determined during the remedial design phase.*

**Figure B-3.**

**Conceptual Design for LF007B (Group A) Groundwater Treatment Alternatives, Travis AFB**

## Cost Summary for LF007B Alternatives

Alternative	Capital Costs	Operation and Maintenance Present Worth	Total
1	\$0	\$0	\$0
2	\$18,630	\$196,176	\$214,806
3	\$772,853	\$287,236	\$1,060,090
5	\$816,064	\$361,532	\$1,177,596
7	\$552,680	\$196,367	\$749,046

**Estimated Cost for LF007B, Alternative 1**

<b>CAPITAL COSTS</b>		
Process Option	Percentage	Capital Cost
No Action		\$0
<b>Construction Subtotal</b>		<b>\$0</b>
Bid Contingencies (% of Construction Subtotal)	15.0%	\$0
Scope Contingencies (% of Construction Subtotal)	20.0%	\$0
<b>Construction Total</b>		<b>\$0</b>
<b>Other Direct Costs</b>		
Engineering Design (% of Construction Total)	10.0%	\$0
Permitting and Legal (% of Construction Total)	5.0%	\$0
Startup and Shakedown (% of Construction Total)	10.0%	\$0
Bonding and Insurance (% of Construction Total)	3.0%	\$0
Construction Oversight (% of Construction Total)	5.0%	\$0
Field and Laboratory Testing (% of Construction Total)	5.0%	\$0
Reporting (% of Construction Total)	10.0%	\$0
Escalation (% of Construction Total, Based on Mid 1998 Start)	15.0%	\$0
<b>Total Capital Cost</b>		<b>\$0</b>

<b>OPERATION AND MAINTENANCE</b>				
Process Option	Annual O&M Cost	Process Option Service Time (yr)	Present Worth Factor	Process Option Present Worth
No Action	\$0	0.0	0.0000	\$0
<b>O&amp;M Subtotal</b>		<b>\$0</b>		<b>\$0</b>
Misc. O&M Costs (% Annual O&M Unless Otherwise Specified)	Percentage			
<i>See Global Cost Assumptions For Details on Calculations</i>				
No Action	21%	\$0	0.0	0.0000
<b>Total Operation and Maintenance Costs</b>		<b>\$0</b>		<b>\$0</b>

<b>NET PRESENT WORTH</b>	
Capital Costs	\$0
Operation and Maintenance Present Worth	\$0
<b>Total Alternative Cost</b>	<b>\$0</b>

**Estimated Cost for LF007B, Alternative 2**

<b>CAPITAL COSTS</b>				
<b>Process Option</b>	<b>Quantity</b>	<b>Unit Cost</b>	<b>Percentage</b>	<b>Capital Cost</b>
Institutional Controls	1	\$10,000	NA	\$10,000
Institutional Monitoring	1	\$0	NA	\$0
Reserved	1	\$0	NA	\$0
<b>Construction Subtotal</b>				<b>\$10,000</b>
Bid Contingencies (% of Construction Subtotal)			15.0%	\$1,500
Scope Contingencies (% of Construction Subtotal)			20.0%	\$2,000
<b>Construction Total</b>				<b>\$13,500</b>
<b>Other Direct Costs</b>				
Engineering Design (% of Construction Total)			10.0%	\$1,350
Permitting and Legal (% of Construction Total)			5.0%	\$675
Startup and Shakedown (% of Construction Total)			0.0%	\$0
Bonding and Insurance (% of Construction Total)			3.0%	\$405
Construction Oversight (% of Construction Total)			5.0%	\$675
Field and Laboratory Testing (% of Construction Total)			0.0%	\$0
Reporting (% of Construction Total)			0.0%	\$0
Escalation (% of Construction Total, Based on Mid 1998 Start)			15.0%	\$2,025
<b>Total Capital Cost</b>				<b>\$18,630</b>

<b>OPERATION AND MAINTENANCE</b>				
<b>Process Option</b>	<b>Annual O&amp;M Cost</b>	<b>Process Option Service Time (yr)</b>	<b>Present Worth Factor</b>	<b>Process Option Present Worth</b>
Institutional Controls	\$0	3.0	2.7232	\$0
Institutional Monitoring	\$59,535	3.0	2.7232	\$162,129
Reserved	\$0	3.0	2.7232	\$0
<b>O&amp;M Subtotal</b>	<b>\$59,535</b>			<b>\$162,129</b>
<b>Misc. O&amp;M Costs (% Annual O&amp;M Unless Otherwise Specified)</b>		<b>Percentage</b>		
<i>See Global Cost Assumptions for Details on Calculations</i>				
Institutional Controls		21%	2.7232	\$0
Institutional Monitoring	\$12,502	21%	2.7232	\$34,047
Reserved	\$0	21%	2.7232	\$0
<b>Total Operation and Maintenance Costs</b>				<b>\$196,176</b>

<b>NET PRESENT WORTH</b>	
Capital Costs	\$18,630
Operation and Maintenance Present Worth	\$196,176
<b>Total Alternative Cost</b>	<b>\$214,806</b>

**Estimated Cost for LF007B, Alternative 3**

<b>CAPITAL COSTS</b>				
Process Option	Quantity	Unit Cost	Percentage	Capital Cost
Horizontal Extraction Wells	3	\$55,000	NA	\$165,000
Influent Piping	1	\$5,404	NA	\$5,404
Filtration	1	\$18,539	NA	\$18,539
Ion Exchange	1	\$0	NA	\$0
Air Stripper	1	\$26,472	NA	\$26,472
Catalytic Oxidation	1	\$73,584	NA	\$73,584
Activated Carbon	1	\$6,955	NA	\$6,955
Effluent Piping	1	\$738	NA	\$738
Utilities and Improvements	1	\$54,525	NA	\$54,525
Effluent Monitoring	1	\$0	NA	\$0
Plume Monitoring	1	\$0	NA	\$0
<b>Construction Subtotal</b>				<b>\$461,317</b>
Bid Contingencies (% of Construction Subtotal)			15.0%	\$52,683
Scope Contingencies (% of Construction Subtotal)			20.0%	\$70,243
<b>Construction Total</b>				<b>\$584,243</b>
<b>Other Direct Costs</b>				
Engineering Design (% of Construction Total)			10.0%	\$47,414
Permitting and Legal (% of Construction Total)			5.0%	\$23,707
Startup and Shakedown (% of Construction Total)			10.0%	\$47,414
Bonding and Insurance (% of Construction Total)			3.0%	\$14,224
Construction Oversight (% of Construction Total)			5.0%	\$23,707
Field and Laboratory Testing (% of Construction Total)			5.0%	\$23,707
Reporting (% of Construction Total)			10.0%	\$47,414
Escalation (% of Construction Total, Based on Mid 1998 Start)			15.0%	\$71,121
<b>Total Capital Cost</b>				<b>\$772,853</b>

<b>OPERATION AND MAINTENANCE</b>					
Process Option	Annual O&M Cost	Process Option Service Time (yr)	Process Option	Process Option	
			Present Worth Factor	Present Worth	
Horizontal Extraction Wells	\$3,000	3.0	2.7232	\$8,170	
Influent Piping	\$0	3.0	2.7232	\$0	
Filtration	\$810	3.0	2.7232	\$2,206	
Ion Exchange	\$0	3.0	2.7232	\$0	
Air Stripper	\$5,476	3.0	2.7232	\$14,913	
Catalytic Oxidation	\$30,064	3.0	2.7232	\$81,872	
Activated Carbon	\$7,322	3.0	2.7232	\$19,940	
Effluent Piping	\$0	3.0	2.7232	\$0	
Utilities and Improvements	\$0	3.0	2.7232	\$0	
Effluent Monitoring	\$27,195	3.0	2.7232	\$74,059	
Plume Monitoring	\$13,303	3.0	2.7232	\$36,227	
<b>O&amp;M Subtotal</b>				<b>\$237,366</b>	
<b>Minor O&amp;M Costs (% Annual O&amp;M Unless Otherwise Specified)</b>		<b>Percentage</b>			
<i>See Global Cost Assumptions For Details on Calculations</i>					
Horizontal Extraction Wells	21%	\$630	3.0	2.7232	\$1,716
Influent Piping	21%	\$0	3.0	2.7232	\$0
Filtration	21%	\$170	3.0	2.7232	\$463
Ion Exchange	21%	\$0	3.0	2.7232	\$0
Air Stripper	21%	\$1,150	3.0	2.7232	\$3,132
Catalytic Oxidation	21%	\$6,313	3.0	2.7232	\$17,193
Activated Carbon	21%	\$1,538	3.0	2.7232	\$4,187
Effluent Piping	21%	\$0	3.0	2.7232	\$0
Utilities and Improvements	21%	\$0	3.0	2.7232	\$0
Effluent Monitoring	21%	\$5,711	3.0	2.7232	\$15,552
Plume Monitoring	21%	\$2,794	3.0	2.7232	\$7,608
<b>Total Operation and Maintenance Costs</b>				<b>\$412,243</b>	

<b>NET PRESENT WORTH</b>	
Capital Costs	\$772,853
Operation and Maintenance Present Worth	\$287,236
<b>Total Alternative Cost</b>	<b>\$1,060,091</b>

Estimated Cost for LF007B, Alternative 5

CAPITAL COSTS				
Process Option	Quantity	Unit Cost	Percentage	Capital Cost
Horizontal Extraction Wells	3	\$55,000	NA	\$165,000
Influent Piping	1	\$5,404	NA	\$5,404
Filtration	1	\$18,539	NA	\$18,539
Ion Exchange	1	\$0	NA	\$0
Ultraviolet Oxidation	1	\$119,693	NA	\$119,693
Activated Carbon	1	\$6,955	NA	\$6,955
Effluent Piping	1	\$738	NA	\$738
Utilities and Improvements	1	\$54,525	NA	\$54,525
Effluent Monitoring	1	\$0	NA	\$0
Plume Monitoring	1	\$0	NA	\$0
<b>Construction Subtotal</b>				<b>\$390,954</b>
Bid Contingencies (% of Construction Subtotal)			15.0%	\$55,628
Scope Contingencies (% of Construction Subtotal)			20.0%	\$74,171
<b>Construction Total</b>				<b>\$500,653</b>
<b>Other Direct Costs</b>				
Engineering Design (% of Construction Total)			10.0%	\$50,065
Permitting and Legal (% of Construction Total)			5.0%	\$25,033
Startup and Shakedown (% of Construction Total)			10.0%	\$50,065
Bonding and Insurance (% of Construction Total)			3.0%	\$15,020
Construction Oversight (% of Construction Total)			5.0%	\$25,033
Field and Laboratory Testing (% of Construction Total)			5.0%	\$25,033
Reporting (% of Construction Total)			10.0%	\$50,065
Escalation (% of Construction Total, Based on Mid 1998 Start)			15.0%	\$75,098
<b>Total Capital Cost</b>				<b>\$816,864</b>

OPERATION AND MAINTENANCE				
Process Option	Annual O&M Cost	Promiss Option Service Time (yr)	Present Worth Factor	Process Option Present Worth
Horizontal Extraction Wells	\$3,000	3.0	2.7232	\$8,170
Influent Piping	\$0	3.0	2.7232	\$0
Filtration	\$810	3.0	2.7232	\$2,206
Ion Exchange	\$0	3.0	2.7232	\$0
Ultraviolet Oxidation	\$58,087	3.0	2.7232	\$158,185
Activated Carbon	\$7,322	3.0	2.7232	\$19,940
Effluent Piping	\$0	3.0	2.7232	\$0
Utilities and Improvements	\$0	3.0	2.7232	\$0
Effluent Monitoring	\$27,195	3.0	2.7232	\$74,059
Plume Monitoring	\$13,303	3.0	2.7232	\$36,227
<b>O&amp;M Subtotal</b>				<b>\$295,187</b>
<b>Minor O&amp;M Costs (% Annual O&amp;M Unless Otherwise Specified)</b>		<b>Percentage</b>		
<i>See Global Cost Assumptions For Details on Calculations</i>				
Horizontal Extraction Wells	21%	\$630	3.0	\$1,716
Influent Piping	21%	\$0	3.0	\$0
Filtration	21%	\$170	3.0	\$463
Ion Exchange	21%	\$0	3.0	\$0
Ultraviolet Oxidation	21%	\$12,198	3.0	\$33,219
Activated Carbon	21%	\$1,538	3.0	\$4,187
Effluent Piping	21%	\$0	3.0	\$0
Utilities and Improvements	21%	\$0	3.0	\$0
Effluent Monitoring	21%	\$5,711	3.0	\$15,552
Plume Monitoring	21%	\$2,794	3.0	\$7,608
<b>Total Operation and Maintenance Costs</b>				<b>\$361,532</b>

NET PRESENT WORTH	
Capital Costs	\$816,064
Operation and Maintenance Present Worth	\$361,532
<b>Total Alternative Cost</b>	<b>\$1,177,596</b>

**Estimated Cost for LF007B, Alternative 7**

<b>CAPITAL COSTS</b>				
Process Option	Quantity	Unit Cost	Percentage	Capital Cost
Horizontal Extraction Wells	3	\$55,000	NA	\$165,000
Influent Piping	1	\$5,404	NA	\$5,404
Filtration	1	\$18,539	NA	\$18,539
Ion Exchange	1	\$0	NA	\$0
Activated Carbon Alt 7	1	\$6,955	NA	\$6,955
Effluent Piping	1	\$738	NA	\$738
Utilities and Improvements	1	\$54,525	NA	\$54,525
Effluent Monitoring	1	\$0	NA	\$0
Plume Monitoring	1	\$0	NA	\$0
<b>Construction Subtotal</b>				<b>\$251,161</b>
Bid Contingencies (% of Construction Subtotal)			15.0%	\$37,674
Scope Contingencies (% of Construction Subtotal)			20.0%	\$50,232
<b>Construction Total</b>				<b>\$339,067</b>
<b>Other Direct Costs</b>				
Engineering Design (% of Construction Total)			10.0%	\$33,907
Permitting and Legal (% of Construction Total)			5.0%	\$16,953
Startup and Shakedown (% of Construction Total)			10.0%	\$33,907
Bonding and Insurance (% of Construction Total)			3.0%	\$10,172
Construction Oversight (% of Construction Total)			5.0%	\$16,953
Field and Laboratory Testing (% of Construction Total)			5.0%	\$16,953
Reporting (% of Construction Total)			10.0%	\$33,907
Escalation (% of Construction Total, Based on Mid 1998 Start)			15.0%	\$50,860
<b>Total Capital Cost</b>				<b>\$552,680</b>

<b>OPERATION AND MAINTENANCE</b>				
Process Option	Annual O&M Cost	Process Option Service Time (yr)	Present Worth Factor	Process Option Present Worth
Horizontal Extraction Wells	\$3,000	3.0	2.7232	\$8,170
Influent Piping	\$0	3.0	2.7232	\$0
Filtration	\$810	3.0	2.7232	\$2,206
Ion Exchange	\$0	3.0	2.7232	\$0
Activated Carbon Alt 7	\$15,285	3.0	2.7232	\$41,625
Effluent Piping	\$0	3.0	2.7232	\$0
Utilities and Improvements	\$0	3.0	2.7232	\$0
Effluent Monitoring	\$27,195	3.0	2.7232	\$74,059
Plume Monitoring	\$13,303	3.0	2.7232	\$36,227
<b>O&amp;M Subtotal</b>				<b>\$161,287</b>
<b>Misc. O&amp;M Costs (% Annual O&amp;M Unless Otherwise Specified)</b>		<b>Percentage</b>		
<i>See Global Cost Assumptions For Details on Calculations</i>				
Horizontal Extraction Wells	21%	\$630	3.0	\$1,716
Influent Piping	21%	\$0	3.0	\$0
Filtration	21%	\$170	3.0	\$463
Ion Exchange	21%	\$0	3.0	\$0
Activated Carbon Alt 7	21%	\$3,210	3.0	\$8,741
Effluent Piping	21%	\$0	3.0	\$0
Utilities and Improvements	21%	\$0	3.0	\$0
Effluent Monitoring	21%	\$5,711	3.0	\$15,552
Plume Monitoring	21%	\$2,794	3.0	\$7,608
<b>Total Operation and Maintenance Costs</b>				<b>\$196,367</b>

<b>NET PRESENT WORTH</b>	
Capital Costs	\$552,680
Operation and Maintenance Present Worth	\$196,367
<b>Total Alternative Cost</b>	<b>\$749,047</b>

**Cost Estimate Summary Sheet**

**NEWIOU Feasibility Study, Travis AFB**

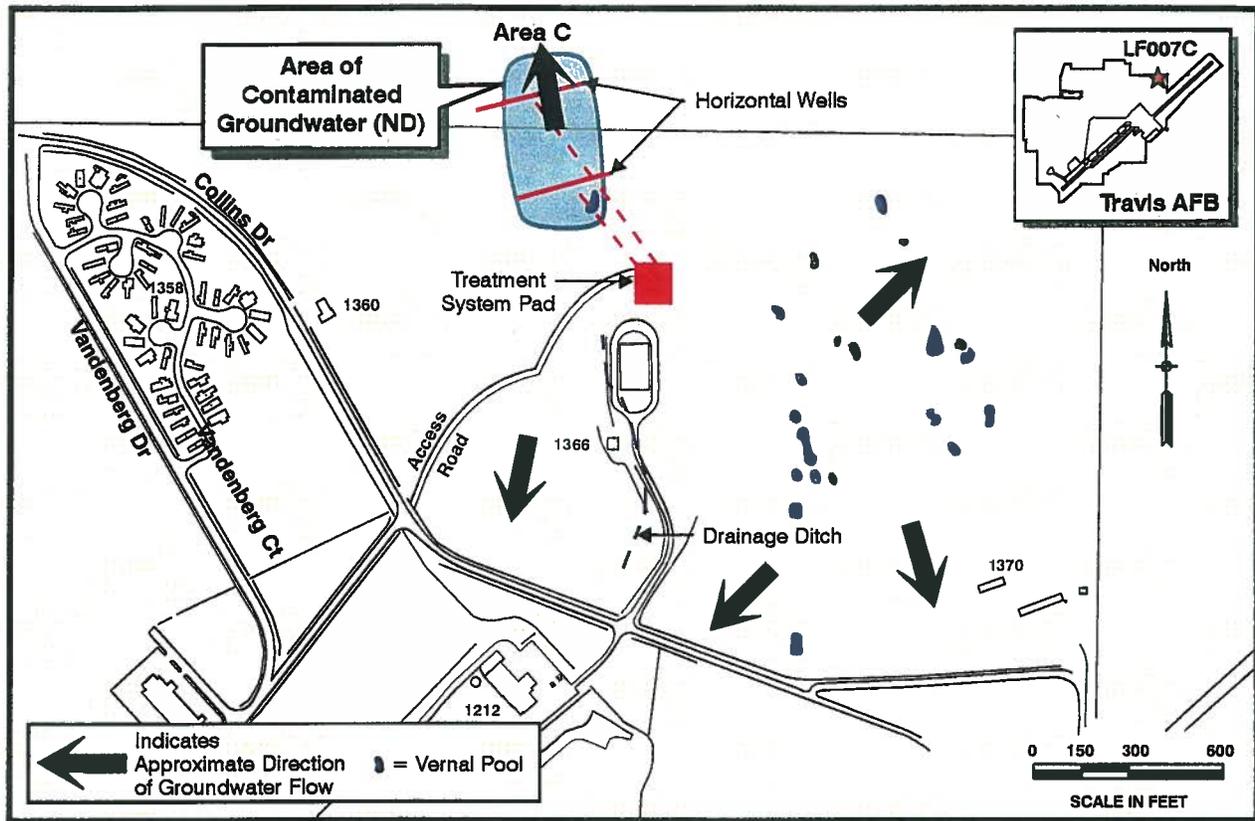
**Process Option Summary for LF007B**

**Assumptions:**

- 1 Use RACER/ENVEST cost estimating model, Version 3.1 when practical
- 2 Compute monitoring and O&M for one year only; add costs for subsequent years using Alternative Cost Summary Sheets.
- 3 Horizontal extraction wells are 300 feet in length.

**Cost Summary:**

Item	Capital Cost	O&M Cost
Horizontal Extraction Wells	\$55,000	\$3,000
Influent Piping	\$5,404	\$0
Filtration	\$18,539	\$810
Ion Exchange	\$0	\$0
Air Stripper	\$26,472	\$5,476
Catalytic Oxidation	\$73,584	\$30,064
Ultraviolet Oxidation	\$119,693	\$58,087
Activated Carbon	\$6,955	\$7,322
Activated Carbon Alt 7	\$6,955	\$15,285
Effluent Piping	\$738	\$0
Utilities and Improvements	\$54,525	\$0
Clear and Grub	\$4,315	\$0
Electrical	\$8,040	\$0
Access Road	\$0	\$0
Communication Lines	\$1,762	\$0
Gas Service	\$2,016	\$0
Cleanup and Landscaping	\$220	\$0
Fencing	\$794	\$0
Well Power and Comm Lines	\$7,900	\$0
Control Panel	\$11,600	\$0
Surge Tank	\$7,700	\$0
Treatment Unit Pad	\$10,178	\$0
Institutional Controls	\$10,000	\$0
Plume Monitoring	\$0	\$13,303
Effluent Monitoring	\$0	\$27,195
Institutional Monitoring	\$0	\$59,535



LF007CGW.CDR - VMG 9/10/96 SAC 1

#### **Site Characteristics**

- Low, grassy, flat swampy area
- Travis AFB boundary bisects the study area with east-west fence
- Northern half of study area is privately-owned property
- TCE in groundwater — 20  $\mu\text{g/L}$  average, 49.1  $\mu\text{g/L}$  maximum
- TPH in groundwater — 80  $\mu\text{g/L}$  average, 390  $\mu\text{g/L}$  maximum
- Estimated mass of dissolved VOCs equals 1.5 lb
- Depth to groundwater — varies from 1 to 10 feet, depending on season
- Depth to bedrock — 30 feet
- Low permeability soils (clay) to about 20 feet bgs
- Silt lenses between 20 feet bgs and bedrock
- Site also included in Group L for soil contamination

#### **Treatment Alternatives**

- Alternative #3: Air Stripper/Catalytic Oxidation, Ion Exchange, Activated Carbon
- Alternative #5: UV Oxidation, Ion Exchange, Activated Carbon
- Alternative #7: Ion Exchange, Activated Carbon

#### **Design Assumptions**

- 2 horizontal wells, 300 feet in screened length each
- Extraction rate 30 gpm total, 15 gpm from each well
- 1,250 feet of conveyance piping (from well to treatment system) — 1 inch ID, sch 80 PVC
- 400 feet of discharge piping — 1-1/2 inch ID, sch 80 PVC
- 200 feet from treatment system to existing power line
- 12 years to clean groundwater to MCL, calculated using a contaminant transport model based on assumptions shown in Appendix C

**NOTE:** The figure conceptually displays components for comparative purposes only. Actual layout may vary significantly from that shown and will be determined during the remedial design phase.

**Figure B-4.**  
**Conceptual Design for LF007C (Group A) Groundwater Treatment Alternatives, Travis AFB**

## Cost Summary for LF007C Alternatives

Alternative	Capital Costs	Operation and Maintenance Present Worth	Total
1	\$0	\$0	\$0
2	\$18,630	\$638,485	\$657,115
3	\$615,610	\$834,304	\$1,449,914
5	\$675,034	\$1,023,249	\$1,698,283
7	\$450,662	\$518,263	\$968,926

**Estimated Cost for LF007C, Alternative 1**

<b>CAPITAL COSTS</b>		
<b>Process Option</b>	<b>Percentage</b>	<b>Capital Cost</b>
No Action		\$0
<b>Construction Subtotal</b>		
Bid Contingencies (% of Construction Subtotal)	15.0%	\$0
Scope Contingencies (% of Construction Subtotal)	20.0%	\$0
<b>Construction Total</b>		
<b>Other Direct Costs</b>		
Engineering Design (% of Construction Total)	10.0%	\$0
Permitting and Legal (% of Construction Total)	5.0%	\$0
Startup and Shakedown (% of Construction Total)	10.0%	\$0
Bonding and Insurance (% of Construction Total)	3.0%	\$0
Construction Oversight (% of Construction Total)	5.0%	\$0
Field and Laboratory Testing (% of Construction Total)	5.0%	\$0
Reporting (% of Construction Total)	10.0%	\$0
Escalation (% of Construction Total, Based on Mid 1998 Start)	15.0%	\$0
<b>Total Capital Cost</b>		

<b>OPERATION AND MAINTENANCE</b>				
<b>Process Option</b>	<b>Annual O&amp;M Cost</b>	<b>Process Option Service Time (yr)</b>	<b>Present Worth Factor</b>	<b>Process Option Present Worth</b>
No Action	\$0	0.0	0.0000	\$0
<b>O&amp;M Subtotal</b>				
\$0				
<b>Misc O&amp;M Costs (% Annual O&amp;M Unless Otherwise Specified)</b>	<b>Percentage</b>			
<b>See Global Cost Assumptions For Details on Calculations</b>				
No Action	21%	\$0	0.0	0.0000
<b>Total Operation and Maintenance Costs</b>				
\$0				

<b>NET PRESENT WORTH</b>	
Capital Costs	\$0
Operation and Maintenance Present Worth	\$0
<b>Total Alternative Cost</b>	<b>\$0</b>

**Estimated Cost for LF007C, Alternative 2**

<b>CAPITAL COSTS</b>				
Process Option	Quantity	Unit Cost	Percentage	Capital Cost
Institutional Controls	1	\$10,000	NA	\$10,000
Institutional Monitoring	1	\$0	NA	\$0
Reserved	1	\$0	NA	\$0
<b>Construction Subtotal</b>				<b>\$16,000</b>
Bid Contingencies (% of Construction Subtotal)			15.0%	\$1,500
Scope Contingencies (% of Construction Subtotal)			20.0%	\$2,000
<b>Construction Total</b>				<b>\$19,500</b>
<b>Other Direct Costs</b>				
Engineering Design (% of Construction Total)			10.0%	\$1,350
Permitting and Legal (% of Construction Total)			5.0%	\$675
Startup and Shakedown (% of Construction Total)			0.0%	\$0
Bonding and Insurance (% of Construction Total)			3.0%	\$405
Construction Oversight (% of Construction Total)			5.0%	\$675
Field and Laboratory Testing (% of Construction Total)			0.0%	\$0
Reporting (% of Construction Total)			0.0%	\$0
Escalation (% of Construction Total, Based on Mid 1998 Start)			15.0%	\$2,025
<b>Total Capital Cost</b>				<b>\$18,630</b>

<b>OPERATION AND MAINTENANCE</b>				
Process Option	Annual O&M Cost	Process Option Service Time (yr)	Present Worth Factor	Process Option Present Worth
Institutional Controls	\$0	12.0	8.8633	\$0
Institutional Monitoring	\$59,535	12.0	8.8633	\$527,674
Reserved	\$0	12.0	8.8633	\$0
<b>O&amp;M Subtotal</b>				<b>\$527,674</b>
<b>Misc. O&amp;M Costs (% Annual O&amp;M Unless Otherwise Specified)</b>		<b>Percentage</b>		
<i>See Global Cost Assumptions For Details on Calculations</i>				
Institutional Controls		21%	\$0	\$0
Institutional Monitoring		21%	\$12,502	\$110,811
Reserved		21%	\$0	\$0
<b>Total Operation and Maintenance Costs</b>				<b>\$638,485</b>

<b>NET PRESENT WORTH</b>	
Capital Costs	\$18,630
Operation and Maintenance Present Worth	\$638,485
<b>Total Alternative Cost</b>	<b>\$657,115</b>

**Estimated Cost for LF007C, Alternative 3**

<b>CAPITAL COSTS</b>				
Process Option	Quantity	Unit Cost	Percentage	Capital Cost
Horizontal Extraction Wells	2	\$55,000	NA	\$110,000
Influent Piping	1	\$8,591	NA	\$8,591
Filtration	1	\$13,958	NA	\$13,958
Ion Exchange	1	\$0	NA	\$0
Air Stripper	1	\$23,969	NA	\$23,969
Catalytic Oxidation	1	\$50,990	NA	\$50,990
Activated Carbon	1	\$6,457	NA	\$6,457
Effluent Piping	1	\$3,102	NA	\$3,102
Utilities and Improvements	1	\$62,692	NA	\$62,692
Effluent Monitoring	1	\$0	NA	\$0
Plume Monitoring	1	\$0	NA	\$0
<b>Construction Subtotal</b>				<b>\$179,759</b>
Bid Contingencies (% of Construction Subtotal)			15.0%	\$41,964
Scope Contingencies (% of Construction Subtotal)			20.0%	\$55,952
<b>Construction Total</b>				<b>\$327,675</b>
<b>Other Direct Costs</b>				
Engineering Design (% of Construction Total)			10.0%	\$37,767
Permitting and Legal (% of Construction Total)			5.0%	\$18,884
Startup and Shakedown (% of Construction Total)			10.0%	\$37,767
Bonding and Insurance (% of Construction Total)			3.0%	\$11,330
Construction Oversight (% of Construction Total)			5.0%	\$18,884
Field and Laboratory Testing (% of Construction Total)			5.0%	\$18,884
Reporting (% of Construction Total)			10.0%	\$37,767
Escalation (% of Construction Total, Based on Mid 1998 Start)			15.0%	\$56,651
<b>Total Capital Cost</b>				<b>\$615,610</b>

<b>OPERATION AND MAINTENANCE</b>				
Process Option	Annual O&M Cost	Process Option Service Time (yr)	Present Worth Factor	Process Option Present Worth
Horizontal Extraction Wells	\$2,000	12.0	8.8633	\$17,727
Influent Piping	\$0	12.0	8.8633	\$0
Filtration	\$810	12.0	8.8633	\$7,179
Ion Exchange	\$0	12.0	8.8633	\$0
Air Stripper	\$5,375	12.0	8.8633	\$47,640
Catalytic Oxidation	\$24,094	12.0	8.8633	\$213,551
Activated Carbon	\$5,017	12.0	8.8633	\$44,467
Effluent Piping	\$0	12.0	8.8633	\$0
Utilities and Improvements	\$0	12.0	8.8633	\$0
Effluent Monitoring	\$27,195	12.0	8.8633	\$241,036
Plume Monitoring	\$13,303	12.0	8.8633	\$117,908
<b>O&amp;M Subtotal</b>	<b>\$77,394</b>			<b>\$689,598</b>
<b>Other O&amp;M Costs (% Annual O&amp;M Unless Otherwise Specified)</b>	<b>Percentage</b>			
<b>See Capital Cost Assumptions For Details on Calculations</b>				
Horizontal Extraction Wells	21%	\$420	12.0	\$3,723
Influent Piping	21%	\$0	12.0	\$0
Filtration	21%	\$170	12.0	\$1,508
Ion Exchange	21%	\$0	12.0	\$0
Air Stripper	21%	\$1,129	12.0	\$10,004
Catalytic Oxidation	21%	\$5,060	12.0	\$44,846
Activated Carbon	21%	\$1,054	12.0	\$9,338
Effluent Piping	21%	\$0	12.0	\$0
Utilities and Improvements	21%	\$0	12.0	\$0
Effluent Monitoring	21%	\$5,711	12.0	\$50,618
Plume Monitoring	21%	\$2,794	12.0	\$24,761
<b>Total Operation and Maintenance Costs</b>				<b>\$1,481,136</b>

<b>NET PRESENT WORTH</b>	
Capital Costs	\$615,610
Operation and Maintenance Present Worth	\$834,304
<b>Total Alternative Cost</b>	<b>\$1,449,914</b>

**Estimated Cost for LF007C, Alternative 5**

<b>CAPITAL COSTS</b>				
Process Option	Quantity	Unit Cost	Percentage	Capital Cost
Horizontal Extraction Wells	2	\$55,000	NA	\$110,000
Influent Piping	1	\$8,591	NA	\$8,591
Filtration	1	\$13,958	NA	\$13,958
Ion Exchange	1	\$0	NA	\$0
Ultraviolet Oxidation	1	\$101,964	NA	\$101,964
Activated Carbon	1	\$6,457	NA	\$6,457
Effluent Piping	1	\$3,102	NA	\$3,102
Utilities and Improvements	1	\$62,692	NA	\$62,692
Effluent Monitoring	1	\$0	NA	\$0
Plume Monitoring	1	\$0	NA	\$0
<b>Construction Subtotal</b>				<b>\$306,764</b>
Bid Contingencies (% of Construction Subtotal)			15.0%	\$46,015
Scope Contingencies (% of Construction Subtotal)			20.0%	\$61,353
<b>Construction Total</b>				<b>\$414,131</b>
<b>Other Direct Costs</b>				
Engineering Design (% of Construction Total)			10.0%	\$41,413
Permitting and Legal (% of Construction Total)			5.0%	\$20,707
Startup and Shakedown (% of Construction Total)			10.0%	\$41,413
Bonding and Insurance (% of Construction Total)			3.0%	\$12,424
Construction Oversight (% of Construction Total)			5.0%	\$20,707
Field and Laboratory Testing (% of Construction Total)			5.0%	\$20,707
Reporting (% of Construction Total)			10.0%	\$41,413
Escalation (% of Construction Total, Based on Mid 1998 Start)			15.0%	\$62,120
<b>Total Capital Cost</b>				<b>\$675,034</b>

<b>OPERATION AND MAINTENANCE</b>				
Process Option	Annual O&M Cost	Process Option Service Time (yr)	Present Worth Factor	Present Worth
Horizontal Extraction Wells	\$2,000	12.0	8.8633	\$17,727
Influent Piping	\$0	12.0	8.8633	\$0
Filtration	\$810	12.0	8.8633	\$7,179
Ion Exchange	\$0	12.0	8.8633	\$0
Ultraviolet Oxidation	\$47,087	12.0	8.8633	\$417,344
Activated Carbon	\$5,017	12.0	8.8633	\$44,467
Effluent Piping	\$0	12.0	8.8633	\$0
Utilities and Improvements	\$0	12.0	8.8633	\$0
Effluent Monitoring	\$27,195	12.0	8.8633	\$241,036
Plume Monitoring	\$13,303	12.0	8.8633	\$117,908
<b>O&amp;M Subtotal</b>				<b>\$645,661</b>
<b>Misc. O&amp;M Costs (% Annual O&amp;M Unless Otherwise Specified)</b>		<b>Percentage</b>		
<i>See Global Cost Assumptions For Details on Calculations</i>				
Horizontal Extraction Wells	21%	\$420	12.0	\$3,723
Influent Piping	21%	\$0	12.0	\$0
Filtration	21%	\$170	12.0	\$1,508
Ion Exchange	21%	\$0	12.0	\$0
Ultraviolet Oxidation	21%	\$9,888	12.0	\$87,642
Activated Carbon	21%	\$1,054	12.0	\$9,338
Effluent Piping	21%	\$0	12.0	\$0
Utilities and Improvements	21%	\$0	12.0	\$0
Effluent Monitoring	21%	\$5,711	12.0	\$50,618
Plume Monitoring	21%	\$2,794	12.0	\$24,761
<b>Total Operation and Maintenance Costs</b>				<b>\$1,023,249</b>

<b>ALTERNATIVE TOTAL</b>	
Capital Costs	\$675,034
Operation and Maintenance Present Worth	\$1,023,249
<b>Total Alternative Cost</b>	<b>\$1,698,283</b>

**Estimated Cost for LF007C, Alternative 7**

<b>CAPITAL COSTS</b>				
Process Option	Quantity	Unit Cost	Percentage	Capital Cost
Horizontal Extraction Wells	2	\$55,000	NA	\$110,000
Influent Piping	1	\$8,591	NA	\$8,591
Filtration	1	\$13,958	NA	\$13,958
Ion Exchange	1	\$0	NA	\$0
Activated Carbon Alt 7	1	\$6,457	NA	\$6,457
Effluent Piping	1	\$3,102	NA	\$3,102
Utilities and Improvements	1	\$62,692	NA	\$62,692
Effluent Monitoring	1	\$0	NA	\$0
Plume Monitoring	1	\$0	NA	\$0
<b>Construction Subtotal</b>				<b>\$244,800</b>
Bid Contingencies (% of Construction Subtotal)			15.0%	\$30,720
Scope Contingencies (% of Construction Subtotal)			20.0%	\$40,960
<b>Construction Total</b>				<b>\$316,480</b>
<b>Other Direct Costs</b>				
Engineering Design (% of Construction Total)			10.0%	\$27,648
Permitting and Legal (% of Construction Total)			5.0%	\$13,824
Startup and Shakedown (% of Construction Total)			10.0%	\$27,648
Bonding and Insurance (% of Construction Total)			3.0%	\$8,294
Construction Oversight (% of Construction Total)			5.0%	\$13,824
Field and Laboratory Testing (% of Construction Total)			5.0%	\$13,824
Reporting (% of Construction Total)			10.0%	\$27,648
Escalation (% of Construction Total, Based on Mid 1998 Start)			15.0%	\$41,472
<b>Total Capital Cost</b>				<b>\$450,662</b>

<b>OPERATION AND MAINTENANCE</b>					
Process Option	Annual O&M Cost	Process Option Service Time (yr)	Present Worth Factor	Process Option Present Worth	
Horizontal Extraction Wells	\$2,000	12.0	8.8633	\$17,727	
Influent Piping	\$0	12.0	8.8633	\$0	
Filtration	\$810	12.0	8.8633	\$7,179	
Ion Exchange	\$0	12.0	8.8633	\$0	
Activated Carbon Alt 7	\$5,017	12.0	8.8633	\$44,467	
Effluent Piping	\$0	12.0	8.8633	\$0	
Utilities and Improvements	\$0	12.0	8.8633	\$0	
Effluent Monitoring	\$27,195	12.0	8.8633	\$241,036	
Plume Monitoring	\$13,303	12.0	8.8633	\$117,908	
<b>O&amp;M Subtotal</b>				<b>\$418,317</b>	
<b>Misc. O&amp;M Costs (% Annual O&amp;M Unless Otherwise Specified)</b>		<b>Percentage</b>			
<b>See Global Cost Assumptions For Details on Calculations</b>					
Horizontal Extraction Wells	21%	\$420	12.0	8.8633	\$3,723
Influent Piping	21%	\$0	12.0	8.8633	\$0
Filtration	21%	\$170	12.0	8.8633	\$1,508
Ion Exchange	21%	\$0	12.0	8.8633	\$0
Activated Carbon Alt 7	21%	\$1,054	12.0	8.8633	\$9,338
Effluent Piping	21%	\$0	12.0	8.8633	\$0
Utilities and Improvements	21%	\$0	12.0	8.8633	\$0
Effluent Monitoring	21%	\$5,711	12.0	8.8633	\$50,618
Plume Monitoring	21%	\$2,794	12.0	8.8633	\$24,761
<b>Total Operation and Maintenance Costs</b>				<b>\$518,263</b>	

<b>NET PRESENT WORTH</b>	
Capital Costs	\$450,662
Operation and Maintenance Present Worth	\$518,263
<b>Total Alternative Cost</b>	<b>\$968,925</b>

**Cost Estimate Summary Sheet**

**NEWIOU Feasibility Study, Travis AFB**

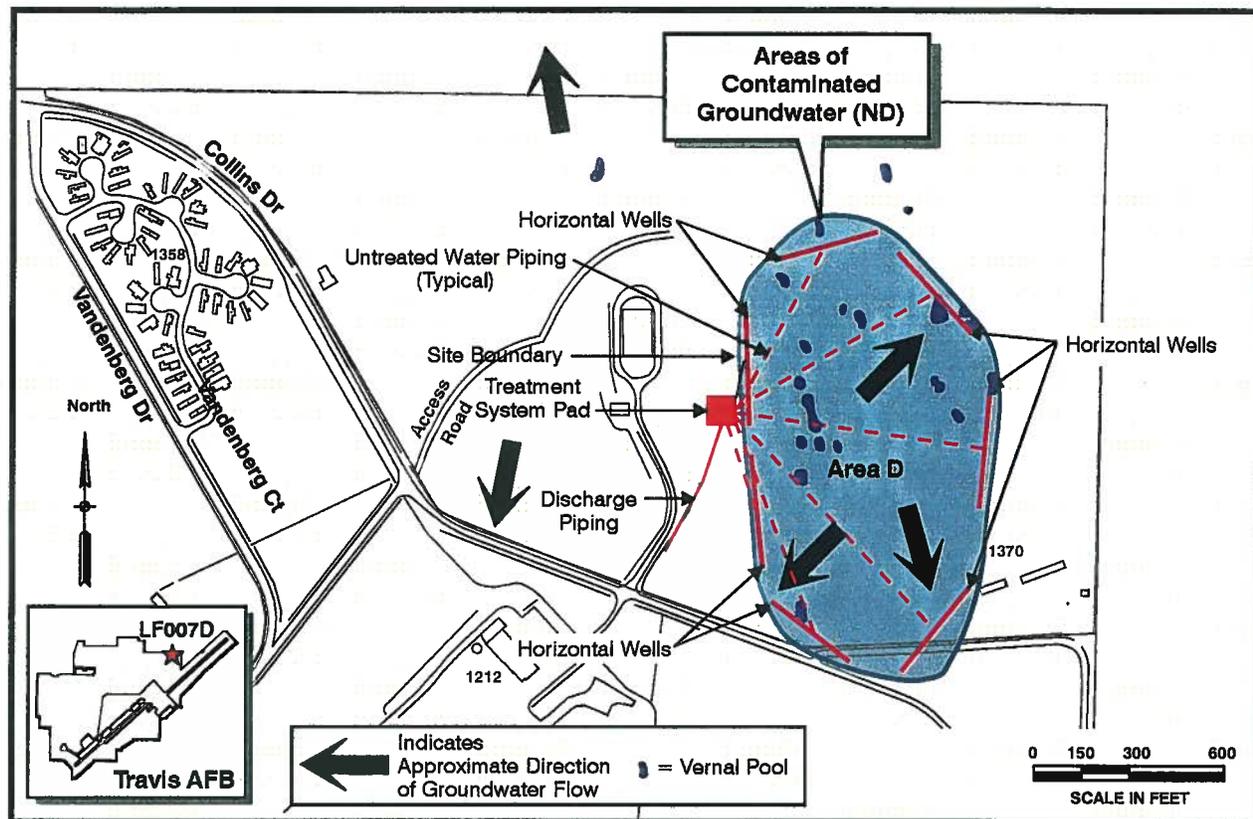
**Process Option Summary for LF007C**

**Assumptions:**

- 1 Use RACER/ENVEST cost estimating model, Version 3.1 when practical
- 2 Compute monitoring and O&M for one year only; add costs for subsequent years using Alternative Cost Summary Sheets.
- 3 Horizontal extraction wells are 300 feet in length.

**Cost Summary:**

Item	Capital Cost	O&M Cost
Horizontal Extraction Wells	\$55,000	\$2,000
Influent Piping	\$8,591	\$0
Filtration	\$13,958	\$810
Ion Exchange	\$0	\$0
Air Stripper	\$23,969	\$5,375
Catalytic Oxidation	\$50,990	\$24,094
Ultraviolet Oxidation	\$101,964	\$47,087
Activated Carbon	\$6,457	\$5,017
Activated Carbon Alt 7	\$6,457	\$5,017
Effluent Piping	\$3,102	\$0
Utilities and Improvments	\$62,692	\$0
Clear and Grub	\$5,702	\$0
Electrical	\$5,844	\$0
Access Road	\$4,830	\$0
Communication Lines	\$2,329	\$0
Gas Service	\$1,595	\$0
Cleanup and Landscaping	\$220	\$0
Fencing	\$794	\$0
Well Power and Comm Lines	\$11,900	\$0
Control Panel	\$11,600	\$0
Surge Tank	\$7,700	\$0
Treatment Unit Pad	\$10,178	\$0
Institutional Controls	\$10,000	\$0
Plume Monitoring	\$0	\$13,303
Effluent Monitoring	\$0	\$27,195
Institutional Monitoring	\$0	\$59,535



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#### Site Characteristics

- Southwestern portion of the study area is grassy flatland
- Ground surface is as much as 15 to 20 feet above natural ground surface (North-South trending)
- Differential settling in the remaining portions of the study area result in berms and trenches up to 6 feet deep
- Approximately 10 vernal pools in the study area
- 1,4 dichlorobenzene in groundwater — 10  $\mu\text{g/L}$  average, 49.3  $\mu\text{g/L}$  maximum
- bis (2-ethylhexyl) phthalate in groundwater — 10  $\mu\text{g/L}$  average, 124  $\mu\text{g/L}$  maximum
- Chlorobenzene in groundwater — 70  $\mu\text{g/L}$  average, 282  $\mu\text{g/L}$  maximum
- Benzene in groundwater — 5  $\mu\text{g/L}$  average, 25.8  $\mu\text{g/L}$  maximum
- TPH in groundwater — 1,000  $\mu\text{g/L}$  average, 6,500  $\mu\text{g/L}$  maximum
- Estimated mass of dissolved VOCs equals 26 lb
- Depth to groundwater — varies from 1 to 10 feet, depending on season
- Depth to bedrock — 0 to 20 feet
- Landfill and back fill material extends from ground surface to about 15 feet bgs
- Clay layer extends from about 15 feet bgs to bedrock
- Site also included in Group L for soil contamination

#### Treatment Alternatives

- Alternative #3: Air Stripper/Catalytic Oxidation, Ion Exchange, Activated Carbon
- Alternative #5: UV Oxidation, Ion Exchange, Activated Carbon
- Alternative #7: Ion Exchange, Activated Carbon

#### Design Assumptions

- 7 horizontal wells, 300 feet in screened length each
- Extraction rate 105 gpm total, 15 gpm from each well
- 4,700 feet of conveyance piping (from well to treatment system) — 1 inch ID, sch 80 PVC
- 200 feet of discharge piping — 3 inch ID, sch 80 PVC
- 200 feet from treatment system to existing power line
- 2 years to clean groundwater to MCLs, calculated using a contaminant transport model based on assumptions shown in Appendix C

*NOTE: The figure conceptually displays components for comparative purposes only. Actual layout may vary significantly from that shown and will be determined during the remedial design phase.*

**Figure B-5.**

**Conceptual Design for LF007D (Group A) Groundwater Treatment Alternatives, Travis AFB**

## Cost Summary for LF007D Alternatives

Alternative	Capital Costs	Operation and Maintenance Present Worth	Total
1	\$0	\$0	\$0
2	\$18,630	\$133,947	\$152,577
3	\$1,800,467	\$416,371	\$2,216,837
5	\$1,804,965	\$495,511	\$2,300,475
7	\$1,767,655	\$888,381	\$2,656,036

## Estimated Cost for LF007D, Alternative 1

CAPITAL COSTS		
Process Option	Percentage	Capital Cost
No Action		\$0
<b>Construction Subtotal</b>		
Bid Contingencies (% of Construction Subtotal)	15.0%	\$0
Scope Contingencies (% of Construction Subtotal)	20.0%	\$0
<b>Construction Total</b>		
<b>Other Direct Costs</b>		
Engineering Design (% of Construction Total)	10.0%	\$0
Permitting and Legal (% of Construction Total)	5.0%	\$0
Startup and Shakedown (% of Construction Total)	10.0%	\$0
Bonding and Insurance (% of Construction Total)	3.0%	\$0
Construction Oversight (% of Construction Total)	5.0%	\$0
Field and Laboratory Testing (% of Construction Total)	5.0%	\$0
Reporting (% of Construction Total)	10.0%	\$0
Escalation (% of Construction Total, Based on Mid 1998 Start)	15.0%	\$0
<b>Total Capital Cost</b>		
		\$0

OPERATION AND MAINTENANCE				
Process Option	Annual O&M Cost	Process Option Service Time (yr)	Present Worth Factor	Process Option Present Worth
No Action	\$0	0.0	0.0000	\$0
<b>O&amp;M Subtotal</b>				
	\$0			\$0
<b>Misc. O&amp;M Costs (% Annual O&amp;M Unless Otherwise Specified)</b>		<b>Percentage</b>		
<i>See Global Cost Assumptions For Details on Calculations</i>				
No Action	21%	\$0	0.0	0.0000
<b>Total Operation and Maintenance Costs</b>				
				\$0

NET PRESENT WORTH	
Capital Costs	\$0
Operation and Maintenance Present Worth	\$0
<b>Total Alternative Cost</b>	
	\$0

**Estimated Cost for LF007D, Alternative 2**

<b>CAPITAL COSTS</b>				
Process Option	Quantity	Unit Cost	Percentage	Capital Cost
Institutional Controls	1	\$10,000	NA	\$10,000
Institutional Monitoring	1	\$0	NA	\$0
Reserved	1	\$0	NA	\$0
<b>Construction Subtotal</b>				<b>\$10,000</b>
Bid Contingencies (% of Construction Subtotal)			15.0%	\$1,500
Scope Contingencies (% of Construction Subtotal)			20.0%	\$2,000
<b>Construction Total</b>				<b>\$13,500</b>
<b>Other Direct Costs</b>				
Engineering Design (% of Construction Total)			10.0%	\$1,350
Permitting and Legal (% of Construction Total)			5.0%	\$675
Startup and Shakedown (% of Construction Total)			0.0%	\$0
Bonding and Insurance (% of Construction Total)			3.0%	\$405
Construction Oversight (% of Construction Total)			5.0%	\$675
Field and Laboratory Testing (% of Construction Total)			0.0%	\$0
Reporting (% of Construction Total)			0.0%	\$0
Escalation (% of Construction Total, Based on Mid 1998 Start)			15.0%	\$2,025
<b>Total Capital Cost</b>				<b>\$18,630</b>

<b>OPERATION AND MAINTENANCE</b>				
Process Option	Annual O&M Cost	Process Option Service Time (yr)	Present Worth Factor	Process Option Present Worth
Institutional Controls	\$0	2.0	1.8594	\$0
Institutional Monitoring	\$59,535	2.0	1.8594	\$110,700
Reserved	\$0	2.0	1.8594	\$0
<b>O&amp;M Subtotal</b>				<b>\$110,700</b>
Min. O&M Cost (% Annual O&M Unless Otherwise Specified)		Percentage		
See Global Cost Assumptions For Details in Calculations				
Institutional Controls	\$0	21%	1.8594	\$0
Institutional Monitoring	\$12,502	21%	1.8594	\$23,247
Reserved	\$0	21%	1.8594	\$0
<b>Total Operation and Maintenance Costs</b>				<b>\$133,947</b>

<b>NET PRESENT WORTH</b>	
Capital Costs	\$18,630
Operation and Maintenance Present Worth	\$133,947
<b>Total Alternative Cost</b>	<b>\$152,577</b>

**Estimated Cost for LF007D, Alternative 3**

<b>CAPITAL COSTS</b>				
Process Option	Quantity	Unit Cost	Percentage	Capital Cost
Horizontal Extraction Wells	7	\$55,000	NA	\$385,000
Influent Piping	1	\$32,294	NA	\$32,294
Filtration	1	\$26,248	NA	\$26,248
Ion Exchange	1	\$119,000	NA	\$119,000
Air Stripper	1	\$33,709	NA	\$33,709
Catalytic Oxidation	1	\$89,034	NA	\$89,034
Activated Carbon	1	\$26,958	NA	\$26,958
Effluent Piping	1	\$1,872	NA	\$1,872
Utilities and Improvements	1	\$104,093	NA	\$104,093
Effluent Monitoring	1	\$0	NA	\$0
Plume Monitoring	1	\$0	NA	\$0
<b>Construction Subtotal</b>				<b>\$818,208</b>
Bid Contingencies (% of Construction Subtotal)			15.0%	\$122,731
Scope Contingencies (% of Construction Subtotal)			20.0%	\$163,642
<b>Construction Total</b>				<b>\$1,104,581</b>
<b>Other Direct Costs</b>				
Engineering Design (% of Construction Total)			10.0%	\$110,458
Permitting and Legal (% of Construction Total)			5.0%	\$55,229
Startup and Shakedown (% of Construction Total)			10.0%	\$110,458
Bonding and Insurance (% of Construction Total)			3.0%	\$33,137
Construction Oversight (% of Construction Total)			5.0%	\$55,229
Field and Laboratory Testing (% of Construction Total)			5.0%	\$55,229
Reporting (% of Construction Total)			10.0%	\$110,458
Escalation (% of Construction Total, Based on Mid 1998 Start)			15.0%	\$165,687
<b>Total Capital Cost</b>				<b>\$1,800,467</b>

<b>OPERATION AND MAINTENANCE</b>				
Process Option	Annual O&M Cost	Service Time (yr)	Present Worth Factor	Process Option Present Worth
Horizontal Extraction Wells	\$7,000	2.0	1.8594	\$13,016
Influent Piping	\$0	2.0	1.8594	\$0
Filtration	\$810	2.0	1.8594	\$1,506
Ion Exchange	\$60,000	2.0	1.8594	\$111,565
Air Stripper	\$6,286	2.0	1.8594	\$11,688
Catalytic Oxidation	\$43,494	2.0	1.8594	\$80,873
Activated Carbon	\$26,975	2.0	1.8594	\$50,158
Effluent Piping	\$0	2.0	1.8594	\$0
Utilities and Improvements	\$0	2.0	1.8594	\$0
Effluent Monitoring	\$27,195	2.0	1.8594	\$50,567
Plume Monitoring	\$13,303	2.0	1.8594	\$24,736
<b>O&amp;M Subtotal</b>	<b>\$185,063</b>			<b>\$344,109</b>
<b>Minor O&amp;M Costs (% Annual O&amp;M Unless Otherwise Specified)</b>				
See Global Ops Assumptions & or Details on Calculations	Percentage			
Horizontal Extraction Wells	21%	\$1,470	2.0	\$2,733
Influent Piping	21%	\$0	2.0	\$0
Filtration	21%	\$170	2.0	\$316
Ion Exchange	21%	\$12,600	2.0	\$23,429
Air Stripper	21%	\$1,320	2.0	\$2,455
Catalytic Oxidation	21%	\$9,134	2.0	\$16,983
Activated Carbon	21%	\$5,665	2.0	\$10,533
Effluent Piping	21%	\$0	2.0	\$0
Utilities and Improvements	21%	\$0	2.0	\$0
Effluent Monitoring	21%	\$5,711	2.0	\$10,619
Plume Monitoring	21%	\$2,794	2.0	\$5,195
<b>Total Operation and Maintenance Cost</b>				<b>\$416,371</b>

<b>NET PRESENT WORTH</b>	
Capital Costs	\$1,800,467
Operation and Maintenance Present Worth	\$416,371
<b>Total Alternative Cost</b>	<b>\$2,216,837</b>

Estimated Cost for LF007D, Alternative 5

CAPITAL COSTS				
Process Option	Quantity	Unit Cost	Percentage	Capital Cost
Horizontal Extraction Wells	7	\$55,000	NA	\$385,000
Influent Piping	1	\$32,294	NA	\$32,294
Filtration	1	\$26,248	NA	\$26,248
Ion Exchange	1	\$119,000	NA	\$119,000
Ultraviolet Oxidation	1	\$124,787	NA	\$124,787
Activated Carbon	1	\$26,958	NA	\$26,958
Effluent Piping	1	\$1,872	NA	\$1,872
Utilities and Improvements	1	\$104,093	NA	\$104,093
Effluent Monitoring	1	\$0	NA	\$0
Plume Monitoring	1	\$0	NA	\$0
<b>Construction Subtotal</b>				<b>\$877,252</b>
Bid Contingencies (% of Construction Subtotal)			15.0%	\$123,038
Scope Contingencies (% of Construction Subtotal)			20.0%	\$164,050
<b>Construction Total</b>				<b>\$1,164,340</b>
Other Direct Costs				
Engineering Design (% of Construction Total)			10.0%	\$110,734
Permitting and Legal (% of Construction Total)			5.0%	\$55,367
Startup and Shakedown (% of Construction Total)			10.0%	\$110,734
Bonding and Insurance (% of Construction Total)			3.0%	\$33,220
Construction Oversight (% of Construction Total)			5.0%	\$55,367
Field and Laboratory Testing (% of Construction Total)			5.0%	\$55,367
Reporting (% of Construction Total)			10.0%	\$110,734
Escalation (% of Construction Total, Based on Mid 1998 Start)			15.0%	\$166,101
<b>Total Capital Cost</b>				<b>\$1,804,965</b>

OPERATION AND MAINTENANCE				
Process Option	Annual O&M Cost	Process Option Service Time (yr)	Present Worth Factor	Process Option Present Worth
Horizontal Extraction Wells	\$7,000	2.0	1.8594	\$13,016
Influent Piping	\$0	2.0	1.8594	\$0
Filtration	\$810	2.0	1.8594	\$1,506
Ion Exchange	\$60,000	2.0	1.8594	\$111,565
Ultraviolet Oxidation	\$84,955	2.0	1.8594	\$157,966
Activated Carbon	\$26,975	2.0	1.8594	\$50,158
Effluent Piping	\$0	2.0	1.8594	\$0
Utilities and Improvements	\$0	2.0	1.8594	\$0
Effluent Monitoring	\$27,195	2.0	1.8594	\$50,567
Plume Monitoring	\$13,303	2.0	1.8594	\$24,736
<b>O&amp;M Subtotal</b>				<b>\$405,511</b>
Misc. O&M Costs (% Annual O&M Unless Otherwise Specified)		Percentage		
See Global Cost Assumptions For Details on Calculations				
Horizontal Extraction Wells	21%	\$1,470	2.0	\$2,733
Influent Piping	21%	\$0	2.0	\$0
Filtration	21%	\$170	2.0	\$316
Ion Exchange	21%	\$12,600	2.0	\$23,429
Ultraviolet Oxidation	21%	\$17,841	2.0	\$33,173
Activated Carbon	21%	\$5,665	2.0	\$10,533
Effluent Piping	21%	\$0	2.0	\$0
Utilities and Improvements	21%	\$0	2.0	\$0
Effluent Monitoring	21%	\$5,711	2.0	\$10,619
Plume Monitoring	21%	\$2,794	2.0	\$5,195
<b>Total Operation and Maintenance Costs</b>				<b>\$495,511</b>

NET PRESENT WORTH	
Capital Costs	\$1,804,965
Operation and Maintenance Present Worth	\$495,511
<b>Total Alternatives Cost</b>	<b>\$2,300,476</b>

**Estimated Cost for LF007D, Alternative 7**

<b>CAPITAL COSTS</b>				
Process Option	Quantity	Unit Cost	Percentage	Capital Cost
Horizontal Extraction Wells	7	\$55,000	NA	\$385,000
Influent Piping	1	\$32,294	NA	\$32,294
Filtration	1	\$26,248	NA	\$26,248
Ion Exchange	1	\$119,000	NA	\$119,000
Activated Carbon Alt 7	1	\$134,790	NA	\$134,790
Effluent Piping	1	\$1,872	NA	\$1,872
Utilities and Improvements	1	\$104,093	NA	\$104,093
Effluent Monitoring	1	\$0	NA	\$0
Plume Monitoring	1	\$0	NA	\$0
<b>Construction Subtotal</b>				<b>\$805,297</b>
Bid Contingencies (% of Construction Subtotal)			15.0%	\$120,495
Scope Contingencies (% of Construction Subtotal)			20.0%	\$160,659
<b>Construction Total</b>				<b>\$1,086,451</b>
<b>Other Direct Costs</b>				
Engineering Design (% of Construction Total)			10.0%	\$108,445
Permitting and Legal (% of Construction Total)			5.0%	\$54,223
Startup and Shakedown (% of Construction Total)			10.0%	\$108,445
Bonding and Insurance (% of Construction Total)			3.0%	\$32,534
Construction Oversight (% of Construction Total)			5.0%	\$54,223
Field and Laboratory Testing (% of Construction Total)			5.0%	\$54,223
Reporting (% of Construction Total)			10.0%	\$108,445
Escalation (% of Construction Total, Based on Mid 1998 Start)			15.0%	\$162,668
<b>Total Capital Cost</b>				<b>\$1,767,655</b>

<b>OPERATION AND MAINTENANCE</b>				
Process Option	Annual O&M Cost	Process Option Service Time (yr)	Present Worth Factor	Process Option Present Worth
Horizontal Extraction Wells	\$7,000	2.0	1.8594	\$13,016
Influent Piping	\$0	2.0	1.8594	\$0
Filtration	\$810	2.0	1.8594	\$1,506
Ion Exchange	\$60,000	2.0	1.8594	\$111,565
Activated Carbon Alt 7	\$286,548	2.0	1.8594	\$532,810
Effluent Piping	\$0	2.0	1.8594	\$0
Utilities and Improvements	\$0	2.0	1.8594	\$0
Effluent Monitoring	\$27,195	2.0	1.8594	\$50,567
Plume Monitoring	\$13,303	2.0	1.8594	\$24,736
<b>O&amp;M Subtotal</b>				<b>\$734,199</b>
<b>Min. O&amp;M Costs or Annual O&amp;M Unless Otherwise Specified</b>		<b>Percentage</b>		
<b>Site Global Cost Assumptions For Details on Calculations</b>				
Horizontal Extraction Wells	21%	\$1,470	2.0	\$2,733
Influent Piping	21%	\$0	2.0	\$0
Filtration	21%	\$170	2.0	\$316
Ion Exchange	21%	\$12,600	2.0	\$23,429
Activated Carbon Alt 7	21%	\$60,175	2.0	\$111,890
Effluent Piping	21%	\$0	2.0	\$0
Utilities and Improvements	21%	\$0	2.0	\$0
Effluent Monitoring	21%	\$5,711	2.0	\$10,619
Plume Monitoring	21%	\$2,794	2.0	\$5,195
<b>Total Operation and Maintenance Costs</b>				<b>\$888,381</b>

<b>NET PRESENT WORTH</b>	
Capital Costs	\$1,767,655
Operation and Maintenance Present Worth	\$888,381
<b>Total Alternative Cost</b>	<b>\$2,656,036</b>

**Cost Estimate Summary Sheet**

**NEWIOU Feasibility Study, Travis AFB**

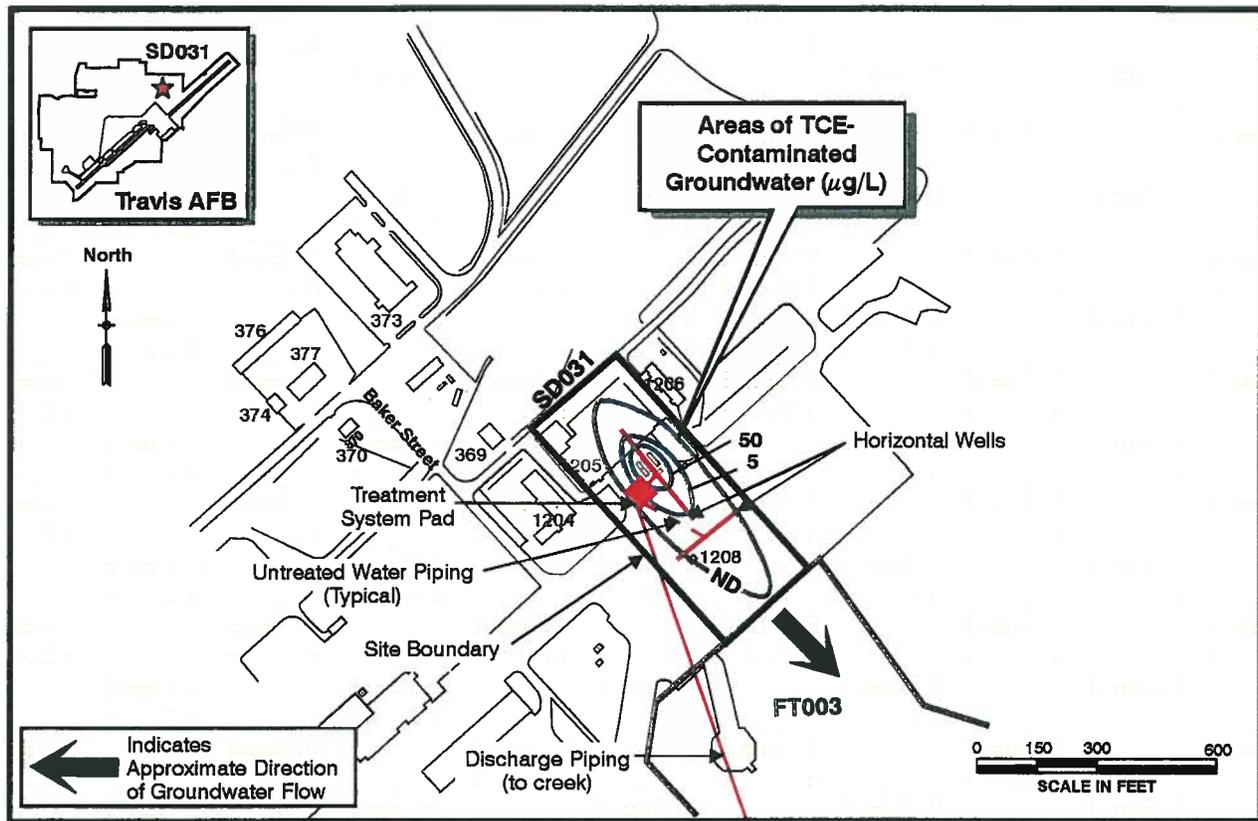
**Process Option Summary for LF007D**

**Assumptions:**

- 1 Use RACER/ENVEST cost estimating model, Version 3.1 when practical
- 2 Compute monitoring and O&M for one year only; add costs for subsequent years using Alternative Cost Summary Sheets.
- 3 Horizontal extraction wells are 300 feet in length.

**Cost Summary:**

Item	Capital Cost	O&M Cost
Horizontal Extraction Wells	\$55,000	\$7,000
Influent Piping	\$32,294	\$0
Filtration	\$26,248	\$810
Ion Exchange	\$119,000	\$60,000
Air Stripper	\$33,709	\$6,286
Catalytic Oxidation	\$89,034	\$43,494
Ultraviolet Oxidation	\$124,787	\$84,955
Activated Carbon	\$26,958	\$26,975
Activated Carbon Alt 7	\$134,790	\$286,548
Effluent Piping	\$1,872	\$0
Utilities and Improvements	\$104,093	\$0
Clear and Grub	\$5,702	\$0
Electrical	\$8,913	\$0
Access Road	\$10,262	\$0
Communication Lines	\$2,329	\$0
Gas Service	\$1,595	\$0
Cleanup and Landscaping	\$220	\$0
Fencing	\$794	\$0
Well Power and Comm Lines	\$44,800	\$0
Control Panel	\$11,600	\$0
Surge Tank	\$7,700	\$0
Treatment Unit Pad	\$10,178	\$0
Institutional Controls	\$10,000	\$0
Plume Monitoring	\$0	\$13,303
Effluent Monitoring	\$0	\$27,195
Institutional Monitoring	\$0	\$59,535



SD031GW.CDR - VMG 7/25/98 SAC 1

#### **Site Characteristics**

- Active generator maintenance shop, oil/water separator, and wash racks
- Paved access road, 75% paved area
- TCE in groundwater — 422 µg/L average, 8,100 µg/L maximum
- TCA in groundwater — 625 µg/L average, 12,000 µg/L maximum
- 1,1-DCE in groundwater — 380 µg/L average, 7,300 µg/L maximum
- TPH in groundwater — 2,000 µg/L average, 7,000 µg/L maximum
- Estimated mass of dissolved VOCs equals 34 lb; DNAPL may be present
- Depth to groundwater — 5 to 15 feet
- Depth to bedrock — 25 feet
- Silt and clay to 10 feet bgs with some fill
- Silty sand with minor gravel from 10 to 25 feet bgs

#### **Treatment Alternatives**

- Alternative #3: Air Stripper/Catalytic Oxidation, Ion Exchange, Activated Carbon
- Alternative #5: UV Oxidation, Ion Exchange, Activated Carbon
- Alternative #7: Ion Exchange, Activated Carbon

#### **Design Assumptions**

- 2 horizontal wells, 300 feet in screened length each
- Extraction rate 30 gpm total, 15 gpm from each well
- 260 feet of conveyance piping (from well to treatment system) — 1 inch ID, sch 80 PVC
- 600 feet of discharge piping — 1-½ inch ID, sch 80 PVC
- 150 feet from treatment system to existing power line
- 28 years to clean groundwater to MCLs, calculated using a contaminant transport model based on assumptions shown in Appendix C

*NOTE: The figure conceptually displays components for comparative purposes only. Actual layout may vary significantly from that shown and will be determined during the remedial design phase.*

**Figure B-6.**  
**Conceptual Design for SD031 (Group A) Groundwater Treatment Alternatives, Travis AFB**

## Cost Summary for SD031 Alternatives

Alternative	Capital Costs	Operation and Maintenance Present Worth	Total
1	\$0	\$0	\$0
2	\$18,630	\$1,073,222	\$1,091,852
3	\$619,381	\$1,899,892	\$2,519,273
5	\$703,649	\$2,322,528	\$3,026,178
7	\$2,576,264	\$35,139,134	\$37,715,398

**Estimated Cost for SD031, Alternative 1**

<b>CAPITAL COSTS</b>		
<b>Process Option</b>	<b>Percentage</b>	<b>Capital Cost</b>
No Action		\$0
<b>Construction Subtotal</b>		
Bid Contingencies (% of Construction Subtotal)	15.0%	\$0
Scope Contingencies (% of Construction Subtotal)	20.0%	\$0
<b>Construction Total</b>		
<b>Other Direct Costs</b>		
Engineering Design (% of Construction Total)	10.0%	\$0
Permitting and Legal (% of Construction Total)	5.0%	\$0
Startup and Shakedown (% of Construction Total)	10.0%	\$0
Bonding and Insurance (% of Construction Total)	3.0%	\$0
Construction Oversight (% of Construction Total)	5.0%	\$0
Field and Laboratory Testing (% of Construction Total)	5.0%	\$0
Reporting (% of Construction Total)	10.0%	\$0
Escalation (% of Construction Total, Based on Mid 1998 Start)	15.0%	\$0
<b>Total Capital Cost</b>		
		\$0

<b>OPERATION AND MAINTENANCE</b>				
<b>Process Option</b>	<b>Annual O&amp;M Cost</b>	<b>Process Option Service Time (yr)</b>	<b>Present Worth Factor</b>	<b>Process Option Present Worth</b>
No Action	\$0	0.0	0.0000	\$0
<b>O&amp;M Subtotal</b>				
	\$0			\$0
<b>Misc. O&amp;M Costs (% Annual O&amp;M Unless Otherwise Specified)</b>		<b>Percentage</b>		
<i>See Global Cost Assumptions for Details on Calculations</i>				
No Action		21%	\$0	0.0
<b>Total Operation and Maintenance Costs</b>				
				\$0

<b>NET PRESENT WORTH</b>	
Capital Costs	\$0
Operation and Maintenance Present Worth	\$0
<b>Total Alternative Cost</b>	
	\$0

**Estimated Cost for SD031, Alternative 2**

<b>CAPITAL COSTS</b>				
Process Option	Quantity	Unit Cost	Percentage	Capital Cost
Institutional Controls	1	\$10,000	NA	\$10,000
Institutional Monitoring	1	\$0	NA	\$0
Reserved	1	\$0	NA	\$0
<b>Construction Subtotal</b>				<b>\$10,000</b>
Bid Contingencies (% of Construction Subtotal)			15.0%	\$1,500
Scope Contingencies (% of Construction Subtotal)			20.0%	\$2,000
<b>Construction Total</b>				<b>\$13,500</b>
<b>Other Direct Costs</b>				
Engineering Design (% of Construction Total)			10.0%	\$1,350
Permitting and Legal (% of Construction Total)			5.0%	\$675
Startup and Shakedown (% of Construction Total)			0.0%	\$0
Bonding and Insurance (% of Construction Total)			3.0%	\$405
Construction Oversight (% of Construction Total)			5.0%	\$675
Field and Laboratory Testing (% of Construction Total)			0.0%	\$0
Reporting (% of Construction Total)			0.0%	\$0
Escalation (% of Construction Total, Based on Mid 1998 Start)			15.0%	\$2,025
<b>Total Capital Cost</b>				<b>\$18,630</b>

<b>OPERATION AND MAINTENANCE</b>				
Process Option	Annual O&M Cost	Process Option Service Time (yr)	Present Worth Factor	Process Option Present Worth
Institutional Controls	\$0	28.0	14.8981	\$0
Institutional Monitoring	\$59,535	28.0	14.8981	\$886,960
Reserved	\$0	28.0	14.8981	\$0
<b>O&amp;M Subtotal</b>				<b>\$886,960</b>
Misc. O&M Costs (by Annual O&M Unless Otherwise Specified)		Percentage		
<i>See Original Cost Assumptions For Details on Calculations</i>				
Institutional Controls	21%	\$0	28.0	14.8981
Institutional Monitoring	21%	\$12,502	28.0	14.8981
Reserved	21%	\$0	28.0	14.8981
<b>Total Operation and Maintenance Costs</b>				<b>\$1,073,222</b>

<b>NET PRESENT WORTH</b>	
Capital Costs	\$18,630
Operation and Maintenance Present Worth	\$1,073,222
<b>Total Alternative Cost</b>	<b>\$1,091,852</b>

**Estimated Cost for SD031, Alternative 3**

<b>CAPITAL COSTS</b>				
Process Option	Quantity	Unit Cost	Percentage	Capital Cost
Horizontal Extraction Wells	2	\$55,000	NA	\$110,000
Influent Piping	1	\$2,432	NA	\$2,432
Filtration	1	\$13,741	NA	\$13,741
Ion Exchange	1	\$18,200	NA	\$18,200
Air Stripper	1	\$23,752	NA	\$23,752
Catalytic Oxidation	1	\$50,990	NA	\$50,990
Activated Carbon	1	\$6,456	NA	\$6,456
Effluent Piping	1	\$5,525	NA	\$5,525
Utilities and Improvements	1	\$50,377	NA	\$50,377
Effluent Monitoring	1	\$0	NA	\$0
Plume Monitoring	1	\$0	NA	\$0
<b>Construction Subtotal</b>				<b>\$281,473</b>
Bid Contingencies (% of Construction Subtotal)			15.0%	\$42,221
Scope Contingencies (% of Construction Subtotal)			20.0%	\$56,295
<b>Construction Total</b>				<b>\$379,989</b>
<b>Other Direct Costs</b>				
Engineering Design (% of Construction Total)			10.0%	\$37,999
Permitting and Legal (% of Construction Total)			5.0%	\$18,999
Startup and Shakedown (% of Construction Total)			10.0%	\$37,999
Bonding and Insurance (% of Construction Total)			3.0%	\$11,400
Construction Oversight (% of Construction Total)			5.0%	\$18,999
Field and Laboratory Testing (% of Construction Total)			5.0%	\$18,999
Reporting (% of Construction Total)			10.0%	\$37,999
Escalation (% of Construction Total, Based on Mid 1998 Start)			15.0%	\$56,998
<b>Total Capital Cost</b>				<b>\$619,381</b>

<b>OPERATION AND MAINTENANCE</b>				
Process Option	Annual O&M Cost	Process Option Service Time (yr)	Present Worth Factor	Process Option Present Worth
Horizontal Extraction Wells	\$2,000	28.0	14.8981	\$29,796
Influent Piping	\$0	28.0	14.8981	\$0
Filtration	\$810	28.0	14.8981	\$12,067
Ion Exchange	\$27,600	28.0	14.8981	\$411,188
Air Stripper	\$5,375	28.0	14.8981	\$80,077
Catalytic Oxidation	\$24,094	28.0	14.8981	\$358,955
Activated Carbon	\$5,016	28.0	14.8981	\$74,729
Effluent Piping	\$0	28.0	14.8981	\$0
Utilities and Improvements	\$0	28.0	14.8981	\$0
Effluent Monitoring	\$27,195	28.0	14.8981	\$405,155
Plume Monitoring	\$13,303	28.0	14.8981	\$198,190
<b>O&amp;M Subtotal</b>				<b>\$1,576,158</b>
Min. O&M Cost (% Annual O&M Unless Otherwise Specified)		Percentage		
See Original Cost Assumptions for Details on Calculations				
Horizontal Extraction Wells	21%	\$420	28.0	\$6,257
Influent Piping	21%	\$0	28.0	\$0
Filtration	21%	\$170	28.0	\$2,534
Ion Exchange	21%	\$5,796	28.0	\$86,350
Air Stripper	21%	\$1,129	28.0	\$16,816
Catalytic Oxidation	21%	\$5,060	28.0	\$75,381
Activated Carbon	21%	\$1,053	28.0	\$15,693
Effluent Piping	21%	\$0	28.0	\$0
Utilities and Improvements	21%	\$0	28.0	\$0
Effluent Monitoring	21%	\$5,711	28.0	\$85,082
Plume Monitoring	21%	\$2,794	28.0	\$41,620
<b>Total Operation and Maintenance Cost</b>			<b>\$288,313</b>	<b>\$1,899,892</b>

<b>MINIMUMS PRESENT WORTH</b>	
Capital Costs	\$619,381
Operation and Maintenance Present Worth	\$1,899,892
<b>Total Alternative Cost</b>	<b>\$2,519,273</b>

Estimated Cost for SD031, Alternative 5

CAPITAL COSTS				
Process Option	Quantity	Unit Cost	Percentage	Capital Cost
Horizontal Extraction Wells	2	\$55,000	NA	\$110,000
Influent Piping	1	\$2,432	NA	\$2,432
Filtration	1	\$13,741	NA	\$13,741
Ion Exchange	1	\$18,200	NA	\$18,200
Ultraviolet Oxidation	1	\$113,037	NA	\$113,037
Activated Carbon	1	\$6,456	NA	\$6,456
Effluent Piping	1	\$5,525	NA	\$5,525
Utilities and Improvements	1	\$50,377	NA	\$50,377
Effluent Monitoring	1	\$0	NA	\$0
Plume Monitoring	1	\$0	NA	\$0
<b>Construction Subtotal</b>				<b>\$119,768</b>
Bid Contingencies (% of Construction Subtotal)			15.0%	\$47,965
Scope Contingencies (% of Construction Subtotal)			20.0%	\$63,954
<b>Construction Total</b>				<b>\$461,687</b>
<b>Other Direct Costs</b>				
Engineering Design (% of Construction Total)			10.0%	\$43,169
Permitting and Legal (% of Construction Total)			5.0%	\$21,584
Startup and Shakedown (% of Construction Total)			10.0%	\$43,169
Bonding and Insurance (% of Construction Total)			3.0%	\$12,951
Construction Oversight (% of Construction Total)			5.0%	\$21,584
Field and Laboratory Testing (% of Construction Total)			5.0%	\$21,584
Reporting (% of Construction Total)			10.0%	\$43,169
Escalation (% of Construction Total, Based on Mid 1998 Start)			15.0%	\$64,753
<b>Total Capital Cost</b>				<b>\$703,649</b>

OPERATION AND MAINTENANCE				
Process Option	Annual G&M Cost	Process Option Service Time (yr)	Present Worth Factor	Process Option Present Worth
Horizontal Extraction Wells	\$2,000	28.0	14.8981	\$29,796
Influent Piping	\$0	28.0	14.8981	\$0
Filtration	\$810	28.0	14.8981	\$12,067
Ion Exchange	\$27,600	28.0	14.8981	\$411,188
Ultraviolet Oxidation	\$52,914	28.0	14.8981	\$788,320
Activated Carbon	\$5,016	28.0	14.8981	\$74,729
Effluent Piping	\$0	28.0	14.8981	\$0
Utilities and Improvements	\$0	28.0	14.8981	\$0
Effluent Monitoring	\$27,195	28.0	14.8981	\$405,155
Plume Monitoring	\$13,303	28.0	14.8981	\$198,190
<b>G&amp;M Subtotal</b>				<b>\$1,919,445</b>
<b>Min. O&amp;M Cost (% Annual G&amp;M Unless Otherwise Specified)</b>		<b>Percentage</b>		
<i>See Global Cost Assumptions For Details on Calculations</i>				
Horizontal Extraction Wells	21%	\$420	28.0	\$6,257
Influent Piping	21%	\$0	28.0	\$0
Filtration	21%	\$170	28.0	\$2,534
Ion Exchange	21%	\$5,796	28.0	\$86,350
Ultraviolet Oxidation	21%	\$11,112	28.0	\$165,547
Activated Carbon	21%	\$1,053	28.0	\$15,693
Effluent Piping	21%	\$0	28.0	\$0
Utilities and Improvements	21%	\$0	28.0	\$0
Effluent Monitoring	21%	\$5,711	28.0	\$85,082
Plume Monitoring	21%	\$2,794	28.0	\$41,620
<b>Total Operation and Maintenance Costs</b>				<b>\$2,322,528</b>

NET PRESENT WORTH	
Capital Costs	\$703,649
Operation and Maintenance Present Worth	\$2,322,528
<b>Total Alternative Cost</b>	<b>\$3,026,178</b>

**Estimated Cost for SD031, Alternative 7**

<b>CAPITAL COSTS</b>				
Process Option	Quantity	Unit Cost	Percentage	Capital Cost
Horizontal Extraction Wells	2	\$55,000	NA	\$110,000
Influent Piping	1	\$2,432	NA	\$2,432
Filtration	1	\$13,741	NA	\$13,741
Ion Exchange	1	\$18,200	NA	\$18,200
Activated Carbon Alt 7	1	\$970,488	NA	\$970,488
Effluent Piping	1	\$5,525	NA	\$5,525
Utilities and Improvements	1	\$50,377	NA	\$50,377
Effluent Monitoring	1	\$0	NA	\$0
Plume Monitoring	1	\$0	NA	\$0
<b>Construction Subtotal</b>				<b>\$1,170,763</b>
Bid Contingencies (% of Construction Subtotal)			15.0%	\$175,614
Scope Contingencies (% of Construction Subtotal)			20.0%	\$234,153
<b>Construction Total</b>				<b>\$1,580,530</b>
<b>Other Direct Costs</b>				
Engineering Design (% of Construction Total)			10.0%	\$158,053
Permitting and Legal (% of Construction Total)			5.0%	\$79,027
Startup and Shakedown (% of Construction Total)			10.0%	\$158,053
Bonding and Insurance (% of Construction Total)			3.0%	\$47,416
Construction Oversight (% of Construction Total)			5.0%	\$79,027
Field and Laboratory Testing (% of Construction Total)			5.0%	\$79,027
Reporting (% of Construction Total)			10.0%	\$158,053
Escalation (% of Construction Total, Based on Mid 1998 Start)			15.0%	\$237,080
<b>Total Capital Costs</b>				<b>\$1,817,610</b>

<b>OPERATION AND MAINTENANCE</b>					
Process Option	Annual O&M Cost	Process Option Service Time (yr)	Present Worth Factor	Process Option Present Worth	
Horizontal Extraction Wells	\$2,000	28.0	14.8981	\$29,796	
Influent Piping	\$0	28.0	14.8981	\$0	
Filtration	\$810	28.0	14.8981	\$12,067	
Ion Exchange	\$27,600	28.0	14.8981	\$411,188	
Activated Carbon Alt 7	\$1,878,371	28.0	14.8981	\$27,984,210	
Effluent Piping	\$0	28.0	14.8981	\$0	
Utilities and Improvements	\$0	28.0	14.8981	\$0	
Effluent Monitoring	\$27,195	28.0	14.8981	\$405,155	
Plume Monitoring	\$13,303	28.0	14.8981	\$198,190	
<b>O&amp;M Subtotal</b>				<b>\$29,440,607</b>	
<b>Misc. O&amp;M Costs (% Annual O&amp;M Unless Otherwise Specified)</b>					
<i>See Global Cost Assumptions For Details on Calculations</i>					
Horizontal Extraction Wells	21%	\$420	28.0	14.8981	\$6,257
Influent Piping	21%	\$0	28.0	14.8981	\$0
Filtration	21%	\$170	28.0	14.8981	\$2,534
Ion Exchange	21%	\$5,796	28.0	14.8981	\$86,350
Activated Carbon Alt 7	21%	\$394,458	28.0	14.8981	\$5,876,684
Effluent Piping	21%	\$0	28.0	14.8981	\$0
Utilities and Improvements	21%	\$0	28.0	14.8981	\$0
Effluent Monitoring	21%	\$5,711	28.0	14.8981	\$85,082
Plume Monitoring	21%	\$2,794	28.0	14.8981	\$41,620
<b>Total Operation and Maintenance Costs</b>				<b>\$35,139,134</b>	

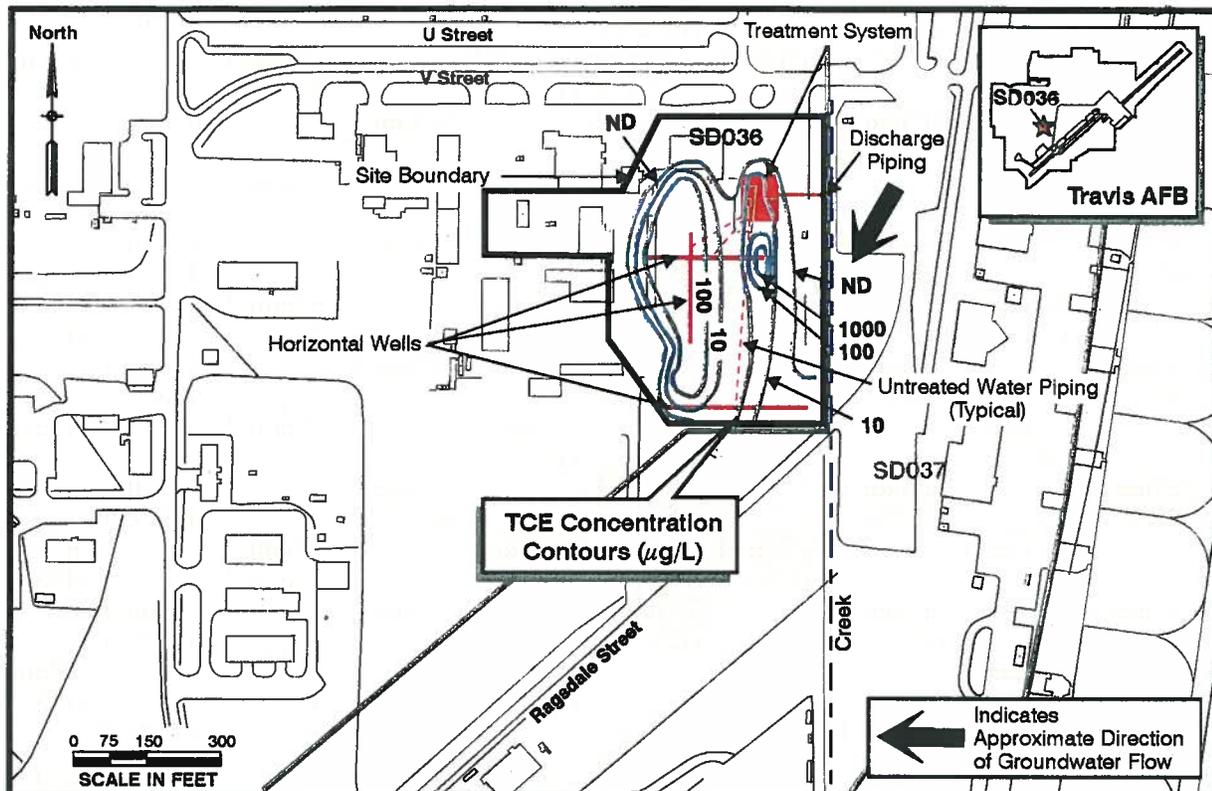
<b>NET PRESENT WORTH</b>	
Capital Costs	\$2,576,264
Operation and Maintenance Present Worth	\$35,139,134
<b>Total Alternative Cost</b>	<b>\$37,715,398</b>

**Cost Estimate Summary Sheet****NEWIOU Feasibility Study, Travis AFB****Process Option Summary for SD031****Assumptions:**

- 1 Use RACER/ENVEST cost estimating model, Version 3.1 when practical
- 2 Compute monitoring and O&M for one year only; add costs for subsequent years using Alternative Cost Summary Sheets.
- 3 Horizontal extraction wells are 300 feet in length.

**Cost Summary:**

Item	Capital Cost	O&M Cost
Horizontal Extraction Wells	\$55,000	\$2,000
Influent Piping	\$2,432	\$0
Filtration	\$13,741	\$810
Ion Exchange	\$18,200	\$27,600
Air Stripper	\$23,752	\$5,375
Catalytic Oxidation	\$50,990	\$24,094
Ultraviolet Oxidation	\$113,037	\$52,914
Activated Carbon	\$6,456	\$5,016
Activated Carbon Alt 7	\$970,488	\$1,878,371
Effluent Piping	\$5,525	\$0
Utilities and Improvements	\$50,377	\$0
Clear and Grub	\$957	\$0
Electrical	\$8,040	\$0
Access Road	\$3,500	\$0
Communication Lines	\$1,762	\$0
Gas Service	\$3,126	\$0
Cleanup and Landscaping	\$220	\$0
Fencing	\$794	\$0
Well Power and Comm Lines	\$2,500	\$0
Control Panel	\$11,600	\$0
Surge Tank	\$7,700	\$0
Treatment Unit Pad	\$10,178	\$0
Institutional Controls	\$10,000	\$0
Plume Monitoring	\$0	\$13,303
Effluent Monitoring	\$0	\$27,195
Institutional Monitoring	\$0	\$59,535



SD036ALT.CDR - VMG 7/25/98 SAC 1

#### **Site Characteristics**

- The site is paved and is surrounded by buildings
- The site is active
- Site is adjacent to SD037 — groundwater plumes are mixed
- VOCs also detected in soil gas
- TCE and 1,2-DCE in groundwater — 2,900 µg/L average TCE and DCE, 3,800 µg/L maximum 1,2-DCE
- TPH in groundwater — 4,400 µg/L maximum
- Estimated mass of dissolved VOCs equals 140 lb; DNAPL may be present
- Cu and Hg were measured at concentrations greater than NPDES discharge limits in some monitoring wells
- Depth to groundwater — 10 feet
- Depth to bedrock — >30 feet
- Two to four feet of asphalt and road base material
- Low permeability alluvium (clay) from 4 to 9.5 feet bgs
- Moderate permeability alluvium (clayey sand) from 8 to 18 feet bgs
- Thick, discontinuous sand units
- Site also included in Group O for soil contamination

#### **Treatment Alternatives**

- Alternative #3: Air Stripper/Catalytic Oxidation, Ion Exchange, Activated Carbon
- Alternative #5: UV Oxidation, Ion Exchange, Activated Carbon
- Alternative #7: Ion Exchange, Activated Carbon

#### **Design Assumptions**

- 3 horizontal wells, 300 feet in screened length each
- Extraction rate 45 gpm total, 15 gpm from each well
- 550 feet of untreated water piping (from well to treatment system) — 1 inch ID, sch 80 PVC
- 70 feet of discharge piping (to west branch of Union Creek) — 2 inch ID, sch 80 PVC
- 70 feet from treatment system to existing power line
- 60 years to clean groundwater to MCLs, calculated using a contaminant transport model based on assumptions shown in Appendix C

*NOTE: The figure conceptually displays components for comparative purposes only. Actual layout may vary significantly from that shown and will be determined during the remedial design phase.*

**Figure B-7.**

### **Conceptual Design for SD036 (Group B) Groundwater Treatment Alternatives, Travis AFB**

### Estimated Cost for SD036, Alternative 1

CAPITAL COSTS		
Process Option	Percentage	Capital Cost
No Action		\$0
<b>Construction Subtotal</b>		
Bid Contingencies (% of Construction Subtotal)	15.0%	\$0
Scope Contingencies (% of Construction Subtotal)	20.0%	\$0
<b>Construction Total</b>		
<b>Other Direct Costs</b>		
Engineering Design (% of Construction Total)	10.0%	\$0
Permitting and Legal (% of Construction Total)	5.0%	\$0
Startup and Shakedown (% of Construction Total)	10.0%	\$0
Bonding and Insurance (% of Construction Total)	3.0%	\$0
Construction Oversight (% of Construction Total)	5.0%	\$0
Field and Laboratory Testing (% of Construction Total)	5.0%	\$0
Reporting (% of Construction Total)	10.0%	\$0
Escalation (% of Construction Total, Based on Mid 1998 Start)	15.0%	\$0
<b>Total Capital Cost</b>		
		<b>\$0</b>

OPERATION AND MAINTENANCE				
Process Option	Annual O&M Cost	Process Option Service Time (yr)	Present Worth Factor	Process Option Present Worth
No Action	\$0	0.0	0.0000	\$0
<b>O&amp;M Subtotal</b>				
	<b>\$0</b>			<b>\$0</b>
Misc. O&M Costs (% Annual O&M Unless Otherwise Specified)	Percentage			
<i>See Global Cost Assumptions For Details on Calculations</i>				
No Action	21%	\$0	0.0	0.0000
<b>Total Operation and Maintenance Costs</b>				
				<b>\$0</b>

NET PRESENT WORTH	
Capital Costs	\$0
Operation and Maintenance Present Worth	\$0
<b>Total Alternative Cost</b>	
	<b>\$0</b>

**Estimated Cost for SD036, Alternative 2**

<b>CAPITAL COSTS</b>				
Process Option	Quantity	Unit Cost	Percentage	Capital Cost
Institutional Controls	1	\$10,000	NA	\$10,000
Institutional Monitoring	1	\$0	NA	\$0
Reserved	1	\$0	NA	\$0
<b>Construction Subtotal</b>				<b>\$10,000</b>
Bid Contingencies (% of Construction Subtotal)			15.0%	\$1,500
Scope Contingencies (% of Construction Subtotal)			20.0%	\$2,000
<b>Construction Total</b>				<b>\$13,500</b>
<b>Other Direct Costs</b>				
Engineering Design (% of Construction Total)			10.0%	\$1,350
Permitting and Legal (% of Construction Total)			5.0%	\$675
Startup and Shakedown (% of Construction Total)			0.0%	\$0
Bonding and Insurance (% of Construction Total)			3.0%	\$405
Construction Oversight (% of Construction Total)			5.0%	\$675
Field and Laboratory Testing (% of Construction Total)			0.0%	\$0
Reporting (% of Construction Total)			0.0%	\$0
Escalation (% of Construction Total, Based on Mid 1998 Start)			15.0%	\$2,025
<b>Total Capital Cost</b>				<b>\$18,630</b>

<b>OPERATION AND MAINTENANCE</b>					
Process Option	Annual O&M Cost	Process Option Service Time (yr)	Present Worth Factor	Process Option Present Worth	
Institutional Controls	\$0	60.0	18.9293	\$0	
Institutional Monitoring	\$59,535	60.0	18.9293	\$1,126,955	
Reserved	\$0	60.0	18.9293	\$0	
<b>O&amp;M Subtotal</b>				<b>\$1,126,955</b>	
Misc. O&M Costs (% Annual O&M Unless Otherwise Specified)		Percentage			
See Global Cost Assumptions For Details on Calculations					
Institutional Controls	21%	\$0	60.0	18.9293	\$0
Institutional Monitoring	21%	\$12,502	60.0	18.9293	\$236,661
Reserved	21%	\$0	60.0	18.9293	\$0
<b>Total Operation and Maintenance Costs</b>				<b>\$1,363,616</b>	

<b>NET PRESENT WORTH</b>	
Capital Costs	\$18,630
Operation and Maintenance Present Worth	\$1,363,616
<b>Total Alternative Cost</b>	<b>\$1,382,246</b>

**Estimated Cost for SD036, Alternative 3**

<b>CAPITAL COSTS</b>				
Process Option	Quantity	Unit Cost	Percentage	Capital Cost
Horizontal Extraction Wells	3	\$55,000	NA	\$165,000
Influent Piping	1	\$5,119	NA	\$5,119
Filtration	1	\$17,886	NA	\$17,886
Ion Exchange	1	\$23,700	NA	\$23,700
Air Stripper	1	\$26,037	NA	\$26,037
Catalytic Oxidation	1	\$73,584	NA	\$73,584
Activated Carbon	1	\$6,955	NA	\$6,955
Effluent Piping	1	\$763	NA	\$763
Utilities and Improvements	1	\$42,763	NA	\$42,763
Effluent Monitoring	1	\$0	NA	\$0
Plume Monitoring	1	\$0	NA	\$0
<b>Construction Subtotal</b>				<b>\$361,817</b>
Bid Contingencies (% of Construction Subtotal)			15.0%	\$54,271
Scope Contingencies (% of Construction Subtotal)			20.0%	\$72,361
<b>Construction Total</b>				<b>\$488,449</b>
<b>Other Direct Costs</b>				
Engineering Design (% of Construction Total)			10.0%	\$48,844
Permitting and Legal (% of Construction Total)			5.0%	\$24,422
Startup and Shakedown (% of Construction Total)			10.0%	\$48,844
Bonding and Insurance (% of Construction Total)			3.0%	\$14,653
Construction Oversight (% of Construction Total)			5.0%	\$24,422
Field and Laboratory Testing (% of Construction Total)			5.0%	\$24,422
Reporting (% of Construction Total)			10.0%	\$48,844
Escalation (% of Construction Total, Based on Mid 1998 Start)			15.0%	\$73,266
<b>Total Capital Cost</b>				<b>\$796,156</b>

<b>OPERATION AND MAINTENANCE</b>					
Process Option	Annual O&M Cost	Process Option Service Time (yr)	Present Worth Factor	Process Option Present Worth	
Horizontal Extraction Wells	\$3,000	60.0	18.9293	\$56,788	
Influent Piping	\$0	60.0	18.9293	\$0	
Filtration	\$810	60.0	18.9293	\$15,333	
Ion Exchange	\$3,960	60.0	18.9293	\$74,960	
Air Stripper	\$5,476	60.0	18.9293	\$103,657	
Catalytic Oxidation	\$30,064	60.0	18.9293	\$569,090	
Activated Carbon	\$7,323	60.0	18.9293	\$138,619	
Effluent Piping	\$0	60.0	18.9293	\$0	
Utilities and Improvements	\$0	60.0	18.9293	\$0	
Effluent Monitoring	\$27,195	60.0	18.9293	\$514,782	
Plume Monitoring	\$13,303	60.0	18.9293	\$251,816	
<b>O&amp;M Subtotal</b>	<b>\$91,331</b>			<b>\$1,745,945</b>	
<b>Alloc. O&amp;M Costs (% Annual O&amp;M Unless Otherwise Specified)</b>		<b>Percentage</b>			
<i>See Global Cost Assumptions for Details on Calculations</i>					
Horizontal Extraction Wells	21%	\$630	60.0	18.9293	\$11,925
Influent Piping	21%	\$0	60.0	18.9293	\$0
Filtration	21%	\$170	60.0	18.9293	\$3,220
Ion Exchange	21%	\$832	60.0	18.9293	\$15,742
Air Stripper	21%	\$1,150	60.0	18.9293	\$21,768
Catalytic Oxidation	21%	\$6,313	60.0	18.9293	\$119,509
Activated Carbon	21%	\$1,538	60.0	18.9293	\$29,110
Effluent Piping	21%	\$0	60.0	18.9293	\$0
Utilities and Improvements	21%	\$0	60.0	18.9293	\$0
Effluent Monitoring	21%	\$5,711	60.0	18.9293	\$108,104
Plume Monitoring	21%	\$2,794	60.0	18.9293	\$52,881
<b>Total Operation and Maintenance Costs</b>				<b>\$2,002,205</b>	

<b>NET PRESENT WORTH</b>	
Capital Costs	\$796,156
Operation and Maintenance Present Worth	\$2,087,305
<b>Total Alternative Cost</b>	<b>\$2,883,461</b>

Estimated Cost for SD036, Alternative 5

CAPITAL COSTS				
Process Option	Quantity	Unit Cost	Percentage	Capital Cost
Horizontal Extraction Wells	3	\$55,000	NA	\$165,000
Influent Piping	1	\$5,119	NA	\$5,119
Filtration	1	\$17,886	NA	\$17,886
Ion Exchange	1	\$23,700	NA	\$23,700
Ultraviolet Oxidation	1	\$130,776	NA	\$130,776
Activated Carbon	1	\$6,955	NA	\$6,955
Effluent Piping	1	\$763	NA	\$763
Utilities and Improvements	1	\$42,763	NA	\$42,763
Effluent Monitoring	1	\$0	NA	\$0
Plume Monitoring	1	\$0	NA	\$0
<b>Construction Subtotal</b>				<b>\$397,967</b>
Bid Contingencies (% of Construction Subtotal)			15.0%	\$58,944
Scope Contingencies (% of Construction Subtotal)			20.0%	\$78,592
<b>Construction Total</b>				<b>\$535,503</b>
<b>Other Direct Costs</b>				
Engineering Design (% of Construction Total)			10.0%	\$53,050
Permitting and Legal (% of Construction Total)			5.0%	\$26,525
Startup and Shakedown (% of Construction Total)			10.0%	\$53,050
Bonding and Insurance (% of Construction Total)			3.0%	\$15,915
Construction Oversight (% of Construction Total)			5.0%	\$26,525
Field and Laboratory Testing (% of Construction Total)			5.0%	\$26,525
Reporting (% of Construction Total)			10.0%	\$53,050
Escalation (% of Construction Total, Based on Mid 1998 Start)			15.0%	\$79,575
<b>Total Capital Cost</b>				<b>\$664,713</b>

OPERATION AND MAINTENANCE					
Process Option	Annual O&M Cost	Process Option Service Time (yr)	Present Worth Factor	Process Option Present Worth	
Horizontal Extraction Wells	\$3,000	60.0	18.9293	\$56,788	
Influent Piping	\$0	60.0	18.9293	\$0	
Filtration	\$810	60.0	18.9293	\$15,333	
Ion Exchange	\$3,960	60.0	18.9293	\$74,960	
Ultraviolet Oxidation	\$63,124	60.0	18.9293	\$1,194,892	
Activated Carbon	\$7,323	60.0	18.9293	\$138,619	
Effluent Piping	\$0	60.0	18.9293	\$0	
Utilities and Improvements	\$0	60.0	18.9293	\$0	
Effluent Monitoring	\$27,195	60.0	18.9293	\$514,782	
Plume Monitoring	\$13,303	60.0	18.9293	\$251,816	
<b>O&amp;M Subtotal</b>				<b>\$2,247,391</b>	
<b>Min. O&amp;M Costs (% Annual O&amp;M Unless Otherwise Specified)</b>		<b>Percentage</b>			
<b>See General Cost Assumptions For Details on Calculations</b>					
Horizontal Extraction Wells	21%	\$630	60.0	18.9293	\$11,925
Influent Piping	21%	\$0	60.0	18.9293	\$0
Filtration	21%	\$170	60.0	18.9293	\$3,220
Ion Exchange	21%	\$832	60.0	18.9293	\$15,742
Ultraviolet Oxidation	21%	\$13,256	60.0	18.9293	\$250,927
Activated Carbon	21%	\$1,538	60.0	18.9293	\$29,110
Effluent Piping	21%	\$0	60.0	18.9293	\$0
Utilities and Improvements	21%	\$0	60.0	18.9293	\$0
Effluent Monitoring	21%	\$5,711	60.0	18.9293	\$108,104
Plume Monitoring	21%	\$2,794	60.0	18.9293	\$52,881
<b>Total Operation and Maintenance Costs</b>				<b>\$2,719,301</b>	

NET PRESENT WORTH	
Capital Costs	\$864,713
Operation and Maintenance Present Worth	\$2,719,101
<b>Total Alternative Cost</b>	<b>\$3,583,814</b>

**Estimated Cost for SD036, Alternative 7**

<b>CAPITAL COSTS</b>				
Process Option	Quantity	Unit Cost	Percentage	Capital Cost
Horizontal Extraction Wells	3	\$55,000	NA	\$165,000
Influent Piping	1	\$5,119	NA	\$5,119
Filtration	1	\$17,886	NA	\$17,886
Ion Exchange	1	\$23,700	NA	\$23,700
Activated Carbon Alt 7	1	\$781,782	NA	\$781,782
Effluent Piping	1	\$763	NA	\$763
Utilities and Improvements	1	\$42,763	NA	\$42,763
Effluent Monitoring	1	\$0	NA	\$0
Plume Monitoring	1	\$0	NA	\$0
<b>Construction Subtotal</b>				<b>\$1,037,813</b>
Bid Contingencies (% of Construction Subtotal)			15.0%	\$155,552
Scope Contingencies (% of Construction Subtotal)			20.0%	\$207,403
<b>Construction Total</b>				<b>\$1,399,968</b>
<b>Other Direct Costs</b>				
Engineering Design (% of Construction Total)			10.0%	\$139,997
Permitting and Legal (% of Construction Total)			5.0%	\$69,998
Startup and Shakedown (% of Construction Total)			10.0%	\$139,997
Bonding and Insurance (% of Construction Total)			3.0%	\$41,999
Construction Oversight (% of Construction Total)			5.0%	\$69,998
Field and Laboratory Testing (% of Construction Total)			5.0%	\$69,998
Reporting (% of Construction Total)			10.0%	\$139,997
Escalation (% of Construction Total, Based on Mid 1998 Start)			15.0%	\$209,995
<b>Total Capital Cost</b>				<b>\$2,281,947</b>

<b>OPERATION AND MAINTENANCE</b>					
Process Option	Annual O&M Cost	Process Option Service Time (yr)	Present Worth Factor	Process Option Present Worth	
Horizontal Extraction Wells	\$3,000	60.0	18.9293	\$56,788	
Influent Piping	\$0	60.0	18.9293	\$0	
Filtration	\$810	60.0	18.9293	\$15,333	
Ion Exchange	\$3,960	60.0	18.9293	\$74,960	
Activated Carbon Alt 7	\$1,502,526	60.0	18.9293	\$28,441,750	
Effluent Piping	\$0	60.0	18.9293	\$0	
Utilities and Improvements	\$0	60.0	18.9293	\$0	
Effluent Monitoring	\$27,195	60.0	18.9293	\$514,782	
Plume Monitoring	\$13,303	60.0	18.9293	\$251,816	
<b>O&amp;M Subtotal</b>				<b>\$29,355,439</b>	
<b>Misc. O&amp;M Costs (% Annual O&amp;M Unless Otherwise Specified)</b>					
See Global Cost Assumptions For Details on Calculations		Percentage			
Horizontal Extraction Wells	21%	\$630	60.0	18.9293	\$11,925
Influent Piping	21%	\$0	60.0	18.9293	\$0
Filtration	21%	\$170	60.0	18.9293	\$3,220
Ion Exchange	21%	\$832	60.0	18.9293	\$15,742
Activated Carbon Alt 7	21%	\$315,530	60.0	18.9293	\$5,972,767
Effluent Piping	21%	\$0	60.0	18.9293	\$0
Utilities and Improvements	21%	\$0	60.0	18.9293	\$0
Effluent Monitoring	21%	\$5,711	60.0	18.9293	\$108,104
Plume Monitoring	21%	\$2,794	60.0	18.9293	\$52,881
<b>Total Operation and Maintenance Costs</b>				<b>\$35,520,069</b>	

<b>NET PRESENT WORTH</b>	
Capital Costs	\$2,281,947
Operation and Maintenance Present Worth	\$35,520,069
<b>Total Alternative Cost</b>	<b>\$37,802,016</b>

SD036 Cost Summary Sheet

Cost Estimate Summary Sheet

NEWIOU Feasibility Study, Travis AFB

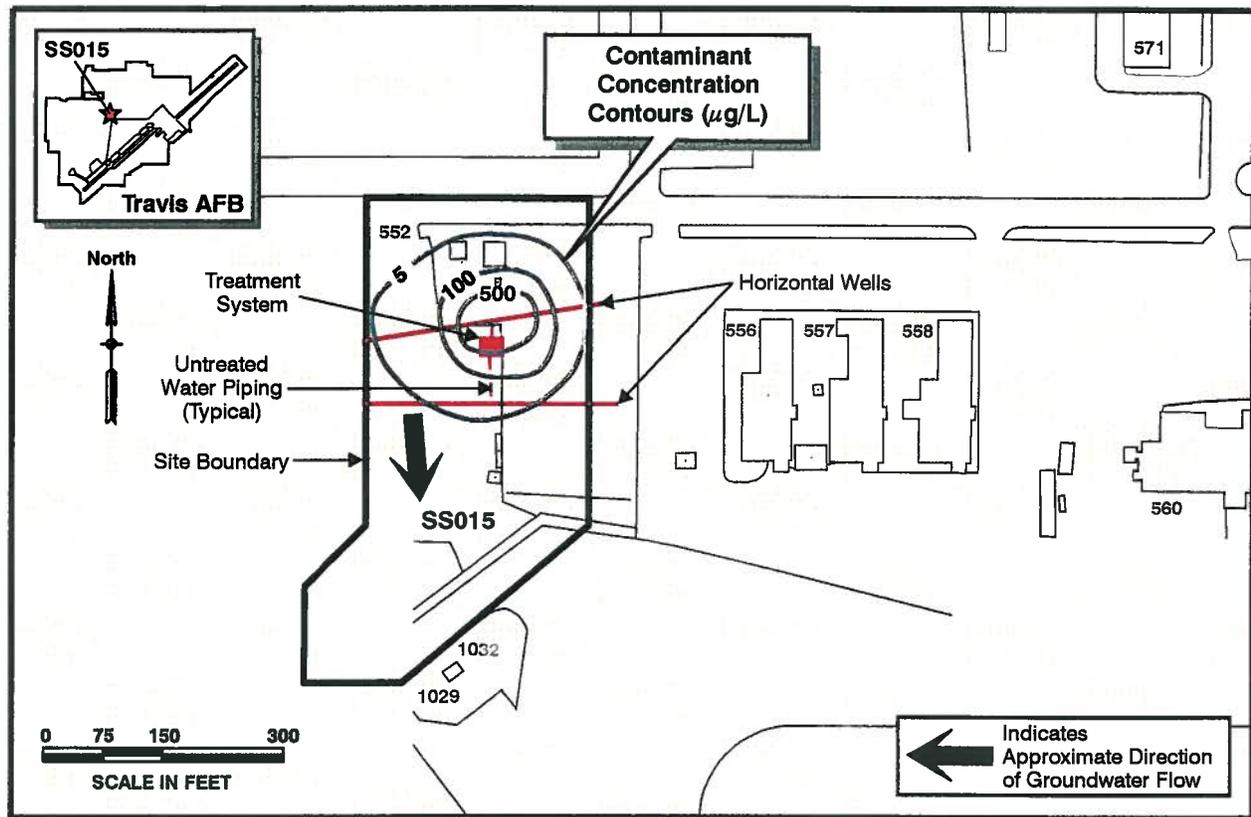
Process Option Summary for SD036

Assumptions:

- 1 Use RACER/ENVEST cost estimating model, Version 3.1 when practical
- 2 Compute monitoring and O&M for one year only; add costs for subsequent years using Alternative Cost Summary Sheets.
- 3 Horizontal extraction wells are 300 feet in length.

Cost Summary:

Item	Capital Costs	O&M Costs
Horizontal Extraction Wells	\$55,000	\$3,000
Influent Piping	\$5,119	\$0
Filtration	\$17,886	\$810
Ion Exchange	\$23,700	\$3,960
Air Stripper	\$26,037	\$5,476
Catalytic Oxidation	\$73,584	\$30,064
Ultraviolet Oxidation	\$130,776	\$63,124
Activated Carbon	\$6,955	\$7,323
Activated Carbon Alt 7	\$781,782	\$1,502,526
Effluent Piping	\$763	\$0
Utilities and Improvments	\$42,763	\$0
Clear and Grub	\$5,702	\$0
Electrical	\$7,804	\$0
Communication Lines	\$869	\$0
Gas Service	\$1,374	\$0
Cleanup and Landscaping	\$220	\$0
Fencing	\$794	\$0
Well Power and Comm Lines	\$5,200	\$0
Control Panel	\$11,600	\$0
Surge Tank	\$7,700	\$0
Treatment Unit Pad	\$1,500	\$0
Institutional Controls	\$10,000	\$0
Plume Monitoring	\$0	\$13,303
Effluent Monitoring	\$0	\$27,195
Institutional Monitoring	\$0	\$59,535
Reserved	\$0	\$0



SS015GW.CDR - VMG 4/11/98 SAC 1

### **Site Characteristics**

- Approximately 50% of the area is covered by pavement and buildings
- Site located in an active area of the Base
- TCE in groundwater — 156 µg/L average, 580 µg/L maximum
- TPH in groundwater — 4,300 µg/L maximum
- Estimated mass of dissolved VOCs equals 13 lb
- Depth to groundwater — 5 to 15 feet
- Depth to bedrock — 15 to 25 feet
- Low permeability soils (clay and silt) occur up to a depth of between 15 and 25 feet bgs
- More permeable materials (sand and silt) exist at various intervals, mostly between 10 and 15 feet bgs
- Site also included in Group N for soil contamination

### **Treatment Alternatives**

- Alternative #3: Air Stripper/Catalytic Oxidation, Ion Exchange, Activated Carbon
- Alternative #5: UV Oxidation, Ion Exchange, Activated Carbon
- Alternative #7: Ion Exchange, Activated Carbon

### **Design Assumptions**

- 2 horizontal wells, 300 feet in screened length each
- Extraction rate 30 gpm total, 15 gpm from each well
- 90 feet of untreated water piping (from well to treatment system) — 1 inch ID, sch 80 PVC
- 3,200 feet of discharge piping — 1-½ inch ID, sch 80 PVC
- 150 feet from treatment system to existing power line
- 17 years to clean groundwater to MCLs using a contaminant transport model based on assumptions shown in Appendix C

*NOTE: The figure conceptually displays components for comparative purposes only. Actual layout may vary significantly from that shown and will be determined during the remedial design phase.*

**Figure B-8.**  
**Conceptual Design for SS015 (Group B) Groundwater Treatment Alternatives, Travis AFB**

### Estimated Cost for SS015, Alternative 1

CAPITAL COSTS		
Process Option	Percentage	Capital Cost
No Action		\$0
<b>Construction Subtotal</b>		<b>\$0</b>
Bid Contingencies (% of Construction Subtotal)	15.0%	\$0
Scope Contingencies (% of Construction Subtotal)	20.0%	\$0
<b>Construction Total</b>		<b>\$0</b>
Other Direct Costs		
Engineering Design (% of Construction Total)	10.0%	\$0
Permitting and Legal (% of Construction Total)	5.0%	\$0
Startup and Shakedown (% of Construction Total)	10.0%	\$0
Bonding and Insurance (% of Construction Total)	3.0%	\$0
Construction Oversight (% of Construction Total)	5.0%	\$0
Field and Laboratory Testing (% of Construction Total)	5.0%	\$0
Reporting (% of Construction Total)	10.0%	\$0
Escalation (% of Construction Total, Based on Mid 1998 Start)	15.0%	\$0
<b>Total Capital Cost</b>		<b>\$0</b>

OPERATION AND MAINTENANCE				
Process Option	Annual O&M Cost	Process Option Service Time (yr)	Present Worth Factor	Process Option Present Worth
No Action	\$0	0.0	0.0000	\$0
<b>O&amp;M Subtotal</b>		<b>\$0</b>		<b>\$0</b>
Misc. O&M Costs (% Annual O&M Unless Otherwise Specified)	Percentage			
<i>See Global Cost Assumptions For Details on Calculations</i>				
No Action	21%	\$0	0.0	0.0000
<b>Total Operation and Maintenance Costs</b>				<b>\$0</b>

NET PRESENT WORTH	
Capital Costs	\$0
Operation and Maintenance Present Worth	\$0
<b>Total Alternative Cost</b>	<b>\$0</b>

**Estimated Cost for SS015, Alternative 2**

<b>CAPITAL COSTS</b>				
Process Option	Quantity	Unit Cost	Percentage	Capital Cost
Institutional Controls	1	\$10,000	NA	\$10,000
Institutional Monitoring	1	\$0	NA	\$0
Reserved	1	\$0	NA	\$0
<b>Construction Subtotal</b>				<b>\$10,000</b>
Bid Contingencies (% of Construction Subtotal)			15.0%	\$1,500
Scope Contingencies (% of Construction Subtotal)			20.0%	\$2,000
<b>Construction Total</b>				<b>\$13,500</b>
<b>Other Direct Costs</b>				
Engineering Design (% of Construction Total)			10.0%	\$1,350
Permitting and Legal (% of Construction Total)			5.0%	\$675
Startup and Shakedown (% of Construction Total)			0.0%	\$0
Bonding and Insurance (% of Construction Total)			3.0%	\$405
Construction Oversight (% of Construction Total)			5.0%	\$675
Field and Laboratory Testing (% of Construction Total)			0.0%	\$0
Reporting (% of Construction Total)			0.0%	\$0
Escalation (% of Construction Total, Based on Mid 1998 Start)			15.0%	\$2,025
<b>Total Capital Cost</b>				<b>\$18,630</b>

<b>OPERATION AND MAINTENANCE</b>				
Process Option	Annual O&M Cost	Process Option Service Time (yr)	Present Worth Factor	Process Option Present Worth
Institutional Controls	\$0	17.0	11.2741	\$0
Institutional Monitoring	\$59,535	17.0	11.2741	\$671,202
Reserved	\$0	17.0	11.2741	\$0
<b>O&amp;M Subtotal</b>				<b>\$671,202</b>
Misc. O&M Costs (% Annual O&M Unless Otherwise Specified)		Percentage		
See Global Cost Assumptions For Details on Calculations				
Institutional Controls	21%	\$0	17.0	\$0
Institutional Monitoring	21%	\$12,502	17.0	\$140,952
Reserved	21%	\$0	17.0	\$0
<b>Total Operation and Maintenance Costs</b>				<b>\$812,154</b>

<b>NET PRESENT WORTH</b>	
Capital Costs	\$18,630
Operation and Maintenance Present Worth	\$812,154
<b>Total Alternative Cost</b>	<b>\$830,784</b>

### Estimated Cost for SS015, Alternative 3

CAPITAL COSTS				
Process Option	Quantity	Unit Cost	Percentage	Capital Cost
Horizontal Extraction Wells	2	\$55,000	NA	\$110,000
Influent Piping	1	\$1,661	NA	\$1,661
Filtration	1	\$13,958	NA	\$13,958
Ion Exchange	1	\$23,700	NA	\$23,700
Air Stripper	1	\$23,969	NA	\$23,969
Catalytic Oxidation	1	\$50,525	NA	\$50,525
Activated Carbon	1	\$6,456	NA	\$6,456
Effluent Piping	1	\$59,563	NA	\$59,563
Utilities and Improvements	1	\$51,157	NA	\$51,157
Effluent Monitoring	1	\$0	NA	\$0
Plume Monitoring	1	\$0	NA	\$0
<b>Construction Subtotal</b>				<b>\$346,998</b>
Bid Contingencies (% of Construction Subtotal)			15.0%	\$51,148
Scope Contingencies (% of Construction Subtotal)			20.0%	\$68,198
<b>Construction Total</b>				<b>\$466,344</b>
Other Direct Costs				
Engineering Design (% of Construction Total)			10.0%	\$46,034
Permitting and Legal (% of Construction Total)			5.0%	\$23,017
Startup and Shakedown (% of Construction Total)			10.0%	\$46,034
Bonding and Insurance (% of Construction Total)			3.0%	\$13,810
Construction Oversight (% of Construction Total)			5.0%	\$23,017
Field and Laboratory Testing (% of Construction Total)			5.0%	\$23,017
Reporting (% of Construction Total)			10.0%	\$46,034
Escalation (% of Construction Total, Based on Mid 1998 Start)			15.0%	\$69,050
<b>Total Capital Cost</b>				<b>\$789,144</b>

OPERATION AND MAINTENANCE					
Process Option	Annual O&M Cost	Process Option Service Time (yr)	Present Worth Factor	Process Option Present Worth	
Horizontal Extraction Wells	\$2,000	17.0	11.2741	\$22,548	
Influent Piping	\$0	17.0	11.2741	\$0	
Filtration	\$810	17.0	11.2741	\$9,132	
Ion Exchange	\$26,400	17.0	11.2741	\$297,635	
Air Stripper	\$5,375	17.0	11.2741	\$60,598	
Catalytic Oxidation	\$21,111	17.0	11.2741	\$238,007	
Activated Carbon	\$5,016	17.0	11.2741	\$56,551	
Effluent Piping	\$0	17.0	11.2741	\$0	
Utilities and Improvements	\$0	17.0	11.2741	\$0	
Effluent Monitoring	\$27,195	17.0	11.2741	\$306,598	
Plume Monitoring	\$13,303	17.0	11.2741	\$149,979	
<b>O&amp;M Subtotal</b>				<b>\$1,141,948</b>	
Misc. O&M Costs (% Annual O&M Unless Otherwise Specified)		Percentage			
See Global Cost Assumptions For Details on Calculations					
Horizontal Extraction Wells	21%	\$420	17.0	11.2741	\$4,735
Influent Piping	21%	\$0	17.0	11.2741	\$0
Filtration	21%	\$170	17.0	11.2741	\$1,918
Ion Exchange	21%	\$5,544	17.0	11.2741	\$62,503
Air Stripper	21%	\$1,129	17.0	11.2741	\$12,726
Catalytic Oxidation	21%	\$4,433	17.0	11.2741	\$49,981
Activated Carbon	21%	\$1,053	17.0	11.2741	\$11,876
Effluent Piping	21%	\$0	17.0	11.2741	\$0
Utilities and Improvements	21%	\$0	17.0	11.2741	\$0
Effluent Monitoring	21%	\$5,711	17.0	11.2741	\$64,386
Plume Monitoring	21%	\$2,794	17.0	11.2741	\$31,496
<b>Total Operation and Maintenance Costs</b>				<b>\$1,386,668</b>	

NET PRESENT WORTH	
Capital Costs	\$750,346
Operation and Maintenance Present Worth	\$1,380,668
<b>Total Alternative Cost</b>	<b>\$2,131,015</b>

Estimated Cost for SS015, Alternative 5

CAPITAL COSTS				
Process Option	Quantity	Unit Cost	Percentage	Capital Cost
Horizontal Extraction Wells	2	\$55,000	NA	\$110,000
Influent Piping	1	\$1,661	NA	\$1,661
Filtration	1	\$13,958	NA	\$13,958
Ion Exchange	1	\$23,700	NA	\$23,700
Ultraviolet Oxidation	1	\$118,300	NA	\$118,300
Activated Carbon	1	\$6,456	NA	\$6,456
Effluent Piping	1	\$59,563	NA	\$59,563
Utilities and Improvements	1	\$51,157	NA	\$51,157
Effluent Monitoring	1	\$0	NA	\$0
Plume Monitoring	1	\$0	NA	\$0
<b>Construction Subtotal</b>				<b>\$384,995</b>
Bid Contingencies (% of Construction Subtotal)			15.0%	\$57,719
Scope Contingencies (% of Construction Subtotal)			20.0%	\$76,959
<b>Construction Total</b>				<b>\$519,673</b>
Other Direct Costs				
Engineering Design (% of Construction Total)			10.0%	\$51,947
Permitting and Legal (% of Construction Total)			5.0%	\$25,974
Startup and Shakedown (% of Construction Total)			10.0%	\$51,947
Bonding and Insurance (% of Construction Total)			3.0%	\$15,584
Construction Oversight (% of Construction Total)			5.0%	\$25,974
Field and Laboratory Testing (% of Construction Total)			5.0%	\$25,974
Reporting (% of Construction Total)			10.0%	\$51,947
Escalation (% of Construction Total, Based on Mid 1998 Start)			15.0%	\$77,921
<b>Total Capital Cost</b>				<b>\$846,741</b>

OPERATION AND MAINTENANCE				
Process Option	Annual O&M Cost	Process Option Service Time (yr)	Present Worth Factor	Process Option Present Worth
Horizontal Extraction Wells	\$2,000	17.0	11.2741	\$22,548
Influent Piping	\$0	17.0	11.2741	\$0
Filtration	\$810	17.0	11.2741	\$9,132
Ion Exchange	\$26,400	17.0	11.2741	\$297,635
Ultraviolet Oxidation	\$54,128	17.0	11.2741	\$610,243
Activated Carbon	\$5,016	17.0	11.2741	\$56,551
Effluent Piping	\$0	17.0	11.2741	\$0
Utilities and Improvements	\$0	17.0	11.2741	\$0
Effluent Monitoring	\$27,195	17.0	11.2741	\$306,598
Plume Monitoring	\$13,303	17.0	11.2741	\$149,979
<b>O&amp;M Subtotal</b>				<b>\$1,452,686</b>
Misc. O&M Costs (% Annual O&M Unless Otherwise Specified)		Percentage		
See Global Cost Assumptions For Details on Calculations				
Horizontal Extraction Wells	21%	\$420	17.0	\$4,735
Influent Piping	21%	\$0	17.0	\$0
Filtration	21%	\$170	17.0	\$1,918
Ion Exchange	21%	\$5,544	17.0	\$62,503
Ultraviolet Oxidation	21%	\$11,367	17.0	\$128,151
Activated Carbon	21%	\$1,053	17.0	\$11,876
Effluent Piping	21%	\$0	17.0	\$0
Utilities and Improvements	21%	\$0	17.0	\$0
Effluent Monitoring	21%	\$5,711	17.0	\$64,386
Plume Monitoring	21%	\$2,794	17.0	\$31,496
<b>Total Operation and Maintenance Costs</b>				<b>\$1,752,358</b>

NET PRESENT WORTH	
Capital Costs	\$846,741
Operation and Maintenance Present Worth	\$1,757,750
<b>Total Alternative Cost</b>	<b>\$2,604,491</b>

### Estimated Cost for SS015, Alternative 7

CAPITAL COSTS				
Process Option	Quantity	Unit Cost	Percentage	Capital Cost
Horizontal Extraction Wells	2	\$55,000	NA	\$110,000
Influent Piping	1	\$1,661	NA	\$1,661
Filtration	1	\$13,958	NA	\$13,958
Ion Exchange	1	\$23,700	NA	\$23,700
Activated Carbon Alt 7	1	\$188,706	NA	\$188,706
Effluent Piping	1	\$59,563	NA	\$59,563
Utilities and Improvements	1	\$51,157	NA	\$51,157
Effluent Monitoring	1	\$0	NA	\$0
Plume Monitoring	1	\$0	NA	\$0
<b>Construction Subtotal</b>				<b>\$448,706</b>
Bid Contingencies (% of Construction Subtotal)			15.0%	\$67,312
Scope Contingencies (% of Construction Subtotal)			20.0%	\$89,749
<b>Construction Total</b>				<b>\$605,766</b>
<b>Other Direct Costs</b>				
Engineering Design (% of Construction Total)			10.0%	\$60,581
Permitting and Legal (% of Construction Total)			5.0%	\$30,290
Startup and Shakedown (% of Construction Total)			10.0%	\$60,581
Bonding and Insurance (% of Construction Total)			3.0%	\$18,174
Construction Oversight (% of Construction Total)			5.0%	\$30,290
Field and Laboratory Testing (% of Construction Total)			5.0%	\$30,290
Reporting (% of Construction Total)			10.0%	\$60,581
Escalation (% of Construction Total, Based on Mid 1998 Start)			15.0%	\$90,871
<b>Total Capital Cost</b>				<b>\$987,463</b>

OPERATION AND MAINTENANCE					
Process Option	Amount O&M Cost	Process Option Service Time (yr)	Present Worth Factor	Process Option Present Worth	
Horizontal Extraction Wells	\$2,000	17.0	11.2741	\$22,548	
Influent Piping	\$0	17.0	11.2741	\$0	
Filtration	\$810	17.0	11.2741	\$9,132	
Ion Exchange	\$26,400	17.0	11.2741	\$297,635	
Activated Carbon Alt 7	\$356,630	17.0	11.2741	\$4,020,670	
Effluent Piping	\$0	17.0	11.2741	\$0	
Utilities and Improvements	\$0	17.0	11.2741	\$0	
Effluent Monitoring	\$27,195	17.0	11.2741	\$306,598	
Plume Monitoring	\$13,303	17.0	11.2741	\$149,979	
<b>O&amp;M Subtotal</b>				<b>\$476,350</b>	<b>\$5,486,563</b>
<b>Misc. O&amp;M Costs (% Annual O&amp;M Unless Otherwise Specified)</b>					
<i>See Global Cost Assumptions For Details on Calculations</i>					
Horizontal Extraction Wells	21%	\$420	17.0	11.2741	\$4,735
Influent Piping	21%	\$0	17.0	11.2741	\$0
Filtration	21%	\$170	17.0	11.2741	\$1,918
Ion Exchange	21%	\$5,544	17.0	11.2741	\$62,503
Activated Carbon Alt 7	21%	\$74,892	17.0	11.2741	\$844,341
Effluent Piping	21%	\$0	17.0	11.2741	\$0
Utilities and Improvements	21%	\$0	17.0	11.2741	\$0
Effluent Monitoring	21%	\$5,711	17.0	11.2741	\$64,386
Plume Monitoring	21%	\$2,794	17.0	11.2741	\$31,496
<b>Total Operation and Maintenance Costs</b>				<b>\$5,815,941</b>	

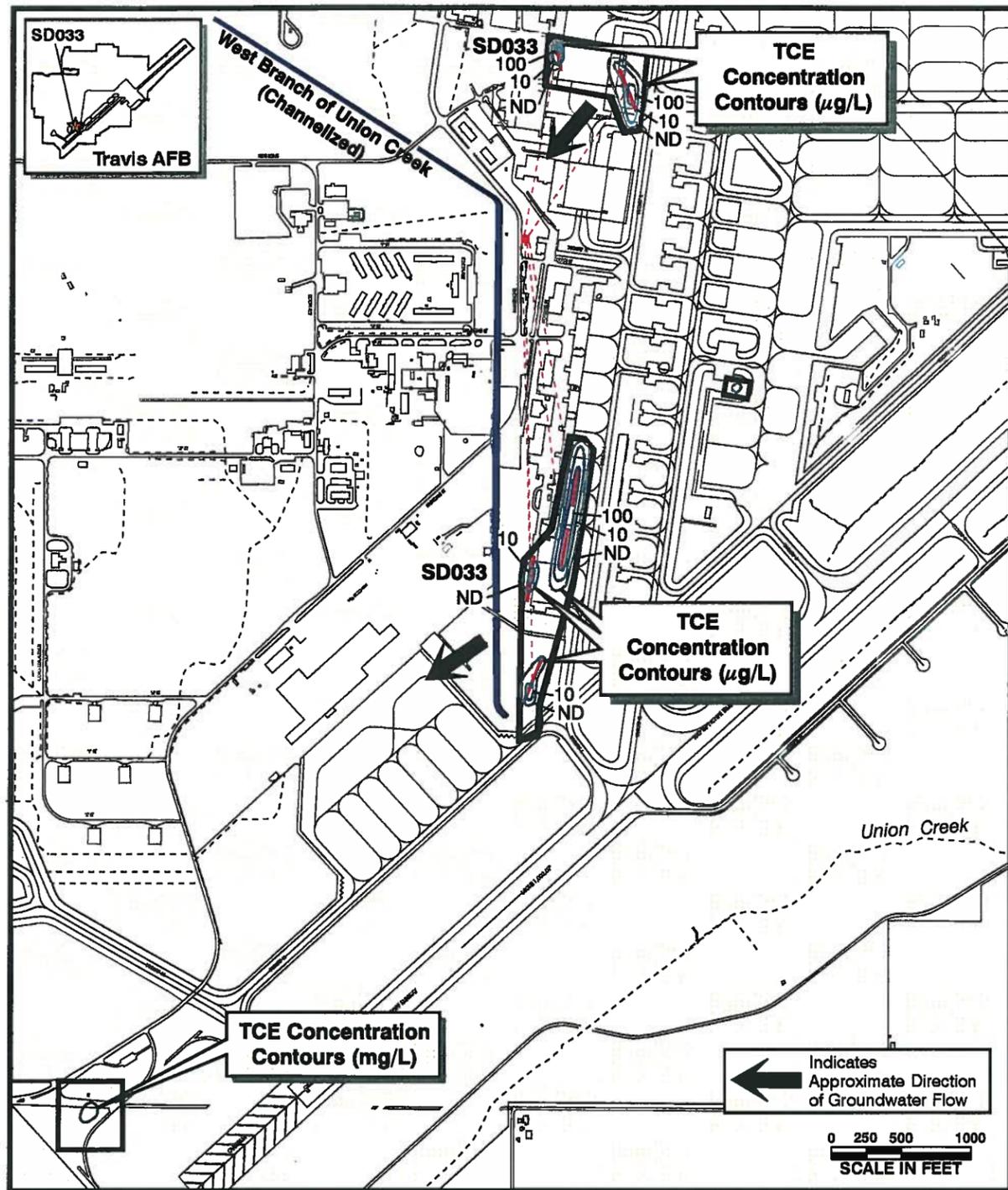
NET PRESENT WORTH	
Capital Costs	\$987,463
Operation and Maintenance Present Worth	\$5,815,941
<b>Total Alternative Cost</b>	<b>\$6,803,404</b>

**Cost Estimate Summary Sheet****NEWIOU Feasibility Study, Travis AFB****Process Option Summary for SS015****Assumptions:**

- 1 Use RACER/ENVEST cost estimating model, Version 3.1 when practical
- 2 Compute monitoring and O&M for one year only; add costs for subsequent years using Alternative Cost Summary Sheets.
- 3 Horizontal extraction wells are 300 feet in length.

**Cost Summary:**

Item	Capital Costs	O&M Costs
Horizontal Extraction Wells	\$55,000	\$2,000
Influent Piping	\$1,661	\$0
Filtration	\$13,958	\$810
Ion Exchange	\$23,700	\$26,400
Air Stripper	\$23,969	\$5,375
Catalytic Oxidation	\$50,525	\$21,111
Ultraviolet Oxidation	\$118,300	\$54,128
Activated Carbon	\$6,456	\$5,016
Activated Carbon Alt 7	\$188,706	\$356,630
Effluent Piping	\$59,563	\$0
Utilities and Improvements	\$51,157	\$0
Clear and Grub	\$5,702	\$0
Electrical	\$7,493	\$0
Access Road	\$2,792	\$0
Communication Lines	\$1,762	\$0
Gas Service	\$2,016	\$0
Cleanup and Landscaping	\$220	\$0
Fencing	\$794	\$0
Well Power and Comm Lines	\$900	\$0
Control Panel	\$11,600	\$0
Surge Tank	\$7,700	\$0
Treatment Unit Pad	\$10,178	\$0
Institutional Controls	\$10,000	\$0
Plume Monitoring	\$0	\$13,303
Effluent Monitoring	\$0	\$27,195
Institutional Monitoring	\$0	\$59,535



**Figure B-9.**  
**Conceptual Design for SD033 (Group B) Groundwater Treatment Alternatives, Travis AFB**

**Site Characteristics**

- Storm sewer system/Facility 810 are both facilities in use
- Contamination in sediment, surface soil, groundwater, and surface water
- DCE in groundwater — 20  $\mu\text{g/L}$  average, 381  $\mu\text{g/L}$  maximum
- TCE in groundwater — 125  $\mu\text{g/L}$  average, 941  $\mu\text{g/L}$  maximum
- TPH in groundwater — 1,400  $\mu\text{g/L}$  maximum
- Estimated mass of dissolved VOCs equals 5.6 lb
- VOC (chloromethane) detected in ambient air samples
- Flow in Union Creek is derived from surface runoff, and at times from groundwater
- Subsurface geology beneath storm sewer system varies
- Depth to groundwater — 13 to 18 feet
- Depth to bedrock — varies
- Site also included in Group J for surface water contamination, Group P for soil contamination, and Group R for sediment contamination

**Treatment Alternatives**

- Alternative #3: Air Stripper/Catalytic Oxidation, Ion Exchange, Activated Carbon
- Alternative #5: UV Oxidation, Ion Exchange, Activated Carbon
- Alternative #7: Ion Exchange, Activated Carbon

**Design Assumptions**

- 6 horizontal wells, 300 feet in screened length each
- Extraction rate 90 gpm total, 15 gpm from each well
- 12,650 feet of untreated water piping (from well to treatment system) — 1 inch ID, sch 80 PVC
- 50 feet of discharge piping — 3 inch ID, sch 80 PVC
- 100 feet from treatment system to existing power line
- 85 years to clean groundwater to MCLs, calculated using a contaminant transport model based on assumptions shown in Appendix C

**NOTE:** The figure conceptually displays components for comparative purposes only. Actual layout may vary significantly from that shown and will be determined during the remedial design phase.

## Cost Summary for SD033 Alternatives

Alternative	Capital Costs	Operation and Maintenance Present Worth	Total
1	\$0	\$0	\$0
2	\$18,630	\$1,417,970	\$1,436,600
3	\$2,585,466	\$3,493,205	\$6,078,672
5	\$2,694,486	\$4,570,158	\$7,264,643
7	\$2,301,518	\$2,804,906	\$5,106,424

## Estimated Cost for SD033, Alternative 1

CAPITAL COSTS		
Process Option	Percentage	Capital Cost
No Action		\$0
<b>Construction Subtotal</b>		
Bid Contingencies (% of Construction Subtotal)	15.0%	\$0
Scope Contingencies (% of Construction Subtotal)	20.0%	\$0
<b>Construction Total</b>		
<b>Other Direct Costs</b>		
Engineering Design (% of Construction Total)	10.0%	\$0
Permitting and Legal (% of Construction Total)	5.0%	\$0
Startup and Shakedown (% of Construction Total)	10.0%	\$0
Bonding and Insurance (% of Construction Total)	3.0%	\$0
Construction Oversight (% of Construction Total)	5.0%	\$0
Field and Laboratory Testing (% of Construction Total)	5.0%	\$0
Reporting (% of Construction Total)	10.0%	\$0
Escalation (% of Construction Total, Based on Mid 1998 Start)	15.0%	\$0
<b>Total Capital Cost</b>		<b>\$0</b>

OPERATION AND MAINTENANCE				
Process Option	Annual O&M Cost	Process Option Service Time (yr)	Present Worth Factor	Process Option Present Worth
No Action	\$0	0.0	0.0000	\$0
<b>O&amp;M Subtotal</b>		<b>\$0</b>		<b>\$0</b>
Misc. O&M Costs (% Annual O&M Unless Otherwise Specified)	Percentage			
<i>See Global Cost Assumptions For Details on Calculations</i>				
No Action	21%	\$0	0.0	0.0000
<b>Total Operation and Maintenance Costs</b>				<b>\$0</b>

NET PRESENT WORTH	
Capital Costs	\$0
Operation and Maintenance Present Worth	\$0
<b>Total Alternative Cost</b>	<b>\$0</b>

## Estimated Cost for SD033, Alternative 2

CAPITAL COSTS				
Process Option	Quantity	Unit Cost	Percentage	Capital Cost
Institutional Controls	1	\$10,000	NA	\$10,000
Institutional Monitoring	1	\$0	NA	\$0
Reserved	1	\$0	NA	\$0
<b>Construction Subtotal</b>				<b>\$10,000</b>
Bid Contingencies (% of Construction Subtotal)				\$1,500
Scope Contingencies (% of Construction Subtotal)				\$2,000
<b>Construction Total</b>				<b>\$13,500</b>
Other Direct Costs				
Engineering Design (% of Construction Total)				\$1,350
Permitting and Legal (% of Construction Total)				\$675
Startup and Shakedown (% of Construction Total)				\$0
Bonding and Insurance (% of Construction Total)				\$405
Construction Oversight (% of Construction Total)				\$675
Field and Laboratory Testing (% of Construction Total)				\$0
Reporting (% of Construction Total)				\$0
Escalation (% of Construction Total, Based on Mid 1998 Start)				\$2,025
<b>Total Capital Cost</b>				<b>\$18,630</b>

OPERATION AND MAINTENANCE					
Process Option	Annual O&M Cost	Process Option Service Time (yr)	Present Worth Factor	Present Option Present Worth	
Institutional Controls	\$0	85.0	19.6838	\$0	
Institutional Monitoring	\$59,535	85.0	19.6838	\$1,171,876	
Reserved	\$0	85.0	19.6838	\$0	
<b>O&amp;M Subtotal</b>				<b>\$1,171,876</b>	
Misc. O&M Costs (% Annual O&M Unless Otherwise Specified)		Percentage			
See Global Cost Assumptions For Details on Calculations					
Institutional Controls	\$0	21%	85.0	19.6838	\$0
Institutional Monitoring	\$12,502	21%	85.0	19.6838	\$246,094
Reserved	\$0	21%	85.0	19.6838	\$0
<b>Total Operation and Maintenance Costs</b>				<b>\$1,417,970</b>	

NET PRESENT WORTH	
Capital Costs	\$18,630
Operation and Maintenance Present Worth	\$1,417,970
<b>Total Alternative Cost</b>	<b>\$1,436,600</b>

**Estimated Cost for SD033, Alternative 3**

<b>CAPITAL COSTS</b>				
Process Option	Quantity	Unit Cost	Percentage	Capital Cost
Horizontal Extraction Wells	7	\$55,000	NA	\$385,000
Influent Piping	1	\$276,134	NA	\$276,134
Filtration	1	\$25,654	NA	\$25,654
Ion Exchange	1	\$119,000	NA	\$119,000
Air Stripper	1	\$38,382	NA	\$38,382
Catalytic Oxidation	1	\$90,656	NA	\$90,656
Activated Carbon	1	\$26,958	NA	\$26,958
Effluent Piping	1	\$467	NA	\$467
Utilities and Improvments	1	\$212,694	NA	\$212,694
Effluent Monitoring	1	\$0	NA	\$0
Plume Monitoring	1	\$0	NA	\$0
<b>Construction Subtotal</b>				<b>\$1,474,946</b>
Bid Contingencies (% of Construction Subtotal)			15.0%	\$176,242
Scope Contingencies (% of Construction Subtotal)			20.0%	\$234,989
<b>Construction Total</b>				<b>\$1,886,177</b>
<b>Other Direct Costs</b>				
Engineering Design (% of Construction Total)			10.0%	\$158,618
Permitting and Legal (% of Construction Total)			5.0%	\$79,309
Startup and Shakedown (% of Construction Total)			10.0%	\$158,618
Bonding and Insurance (% of Construction Total)			3.0%	\$47,585
Construction Oversight (% of Construction Total)			5.0%	\$79,309
Field and Laboratory Testing (% of Construction Total)			5.0%	\$79,309
Reporting (% of Construction Total)			10.0%	\$158,618
Escalation (% of Construction Total, Based on Mid 1998 Start)			15.0%	\$237,926
<b>Total Capital Cost</b>				<b>\$2,488,466</b>

<b>OPERATION AND MAINTENANCE</b>					
Process Option	Annual O&M Cost	Process Option Service Time (Yr)	Present Worth Factor	Process Option Present Worth	
Horizontal Extraction Wells	\$7,000	85.0	19.6838	\$137,787	
Influent Piping	\$0	85.0	19.6838	\$0	
Filtration	\$810	85.0	19.6838	\$15,944	
Ion Exchange	\$11,160	85.0	19.6838	\$219,671	
Air Stripper	\$6,287	85.0	19.6838	\$123,752	
Catalytic Oxidation	\$53,936	85.0	19.6838	\$1,061,666	
Activated Carbon	\$26,975	85.0	19.6838	\$530,971	
Effluent Piping	\$0	85.0	19.6838	\$0	
Utilities and Improvments	\$0	85.0	19.6838	\$0	
Effluent Monitoring	\$27,195	85.0	19.6838	\$535,301	
Plume Monitoring	\$13,303	85.0	19.6838	\$261,854	
<b>O&amp;M Subtotal</b>	<b>\$146,666</b>			<b>\$2,986,947</b>	
Misc. O&M Costs (% Annual O&M Unless Otherwise Specified)		Percentage			
See Global Cost Assumptions For Details on Calculations					
Horizontal Extraction Wells	21%	\$1,470	85.0	19.6838	\$28,935
Influent Piping	21%	\$0	85.0	19.6838	\$0
Filtration	21%	\$170	85.0	19.6838	\$3,348
Ion Exchange	21%	\$2,344	85.0	19.6838	\$46,131
Air Stripper	21%	\$1,320	85.0	19.6838	\$25,988
Catalytic Oxidation	21%	\$11,327	85.0	19.6838	\$222,950
Activated Carbon	21%	\$5,665	85.0	19.6838	\$111,504
Effluent Piping	21%	\$0	85.0	19.6838	\$0
Utilities and Improvments	21%	\$0	85.0	19.6838	\$0
Effluent Monitoring	21%	\$5,711	85.0	19.6838	\$112,413
Plume Monitoring	21%	\$2,794	85.0	19.6838	\$54,989
<b>Total Operation and Maintenance Costs</b>				<b>\$3,493,205</b>	

<b>NET PRESENT WORTH</b>	
Capital Costs	\$2,585,466
Operation and Maintenance Present Worth	\$3,493,205
<b>Total Alternative Cost</b>	<b>\$6,078,671</b>

**Estimated Cost for SD033, Alternative 5**

<b>CAPITAL COSTS</b>				
Process Option	Quantity	Unit Cost	Percentage	Capital Cost
Horizontal Extraction Wells	7	\$55,000	NA	\$385,000
Influent Piping	1	\$276,134	NA	\$276,134
Filtration	1	\$25,654	NA	\$25,654
Ion Exchange	1	\$119,000	NA	\$119,000
Ultraviolet Oxidation	1	\$178,581	NA	\$178,581
Activated Carbon	1	\$26,958	NA	\$26,958
Effluent Piping	1	\$467	NA	\$467
Utilities and Improvements	1	\$212,694	NA	\$212,694
Effluent Monitoring	1	\$0	NA	\$0
Plume Monitoring	1	\$0	NA	\$0
<b>Construction Subtotal</b>				<b>\$1,274,458</b>
Bid Contingencies (% of Construction Subtotal)			15.0%	\$183,673
Scope Contingencies (% of Construction Subtotal)			20.0%	\$244,898
<b>Construction Total</b>				<b>\$1,653,059</b>
<b>Other Direct Costs</b>				
Engineering Design (% of Construction Total)			10.0%	\$165,306
Permitting and Legal (% of Construction Total)			5.0%	\$82,653
Startup and Shakedown (% of Construction Total)			10.0%	\$165,306
Bonding and Insurance (% of Construction Total)			3.0%	\$49,592
Construction Oversight (% of Construction Total)			5.0%	\$82,653
Field and Laboratory Testing (% of Construction Total)			5.0%	\$82,653
Reporting (% of Construction Total)			10.0%	\$165,306
Escalation (% of Construction Total, Based on Mid 1998 Start)			15.0%	\$247,959
<b>Total Capital Cost</b>				<b>\$1,694,486</b>

<b>OPERATION AND MAINTENANCE</b>					
Process Option	Annual O&M Cost	Process Option Service Time (yrs)	Present Worth Factor	Process Option Present Worth	
Horizontal Extraction Wells	\$7,000	85.0	19.6838	\$137,787	
Influent Piping	\$0	85.0	19.6838	\$0	
Filtration	\$810	85.0	19.6838	\$15,944	
Ion Exchange	\$11,160	85.0	19.6838	\$219,671	
Ultraviolet Oxidation	\$105,440	85.0	19.6838	\$2,075,462	
Activated Carbon	\$26,975	85.0	19.6838	\$530,971	
Effluent Piping	\$0	85.0	19.6838	\$0	
Utilities and Improvements	\$0	85.0	19.6838	\$0	
Effluent Monitoring	\$27,195	85.0	19.6838	\$535,301	
Plume Monitoring	\$13,303	85.0	19.6838	\$261,854	
<b>O&amp;M Subtotal</b>				<b>\$3,778,990</b>	
<b>Misc. O&amp;M Costs (See Annual O&amp;M Unless Otherwise Specified)</b>		<b>Percentage</b>			
<b>See General Cost Assumptions For Details on Calculations</b>					
Horizontal Extraction Wells	21%	\$1,470	85.0	19.6838	\$28,935
Influent Piping	21%	\$0	85.0	19.6838	\$0
Filtration	21%	\$170	85.0	19.6838	\$3,348
Ion Exchange	21%	\$2,344	85.0	19.6838	\$46,131
Ultraviolet Oxidation	21%	\$22,142	85.0	19.6838	\$435,847
Activated Carbon	21%	\$5,665	85.0	19.6838	\$111,504
Effluent Piping	21%	\$0	85.0	19.6838	\$0
Utilities and Improvements	21%	\$0	85.0	19.6838	\$0
Effluent Monitoring	21%	\$5,711	85.0	19.6838	\$112,413
Plume Monitoring	21%	\$2,794	85.0	19.6838	\$54,989
<b>Total Operation and Maintenance Costs</b>				<b>\$4,270,358</b>	

<b>NET PRESENT WORTH</b>	
Capital Costs	\$2,694,486
Operation and Maintenance Present Worth	\$4,570,158
<b>Total Alternative Cost</b>	<b>\$7,264,644</b>

## Estimated Cost for SD033, Alternative 7

CAPITAL COSTS				
Process Option	Quantity	Unit Cost	Percentage	Capital Cost
Horizontal Extraction Wells	7	\$55,000	NA	\$385,000
Influent Piping	1	\$276,134	NA	\$276,134
Filtration	1	\$25,654	NA	\$25,654
Ion Exchange	1	\$119,000	NA	\$119,000
Activated Carbon Alt 7	1	\$26,958	NA	\$26,958
Effluent Piping	1	\$467	NA	\$467
Utilities and Improvements	1	\$212,694	NA	\$212,694
Effluent Monitoring	1	\$0	NA	\$0
Plume Monitoring	1	\$0	NA	\$0
<b>Construction Subtotal</b>				<b>\$1,045,907</b>
Bid Contingencies (% of Construction Subtotal)			15.0%	\$156,886
Scope Contingencies (% of Construction Subtotal)			20.0%	\$209,181
<b>Construction Total</b>				<b>\$1,411,974</b>
Other Direct Costs				
Engineering Design (% of Construction Total)			10.0%	\$141,197
Permitting and Legal (% of Construction Total)			5.0%	\$70,599
Startup and Shakedown (% of Construction Total)			10.0%	\$141,197
Bonding and Insurance (% of Construction Total)			3.0%	\$42,359
Construction Oversight (% of Construction Total)			5.0%	\$70,599
Field and Laboratory Testing (% of Construction Total)			5.0%	\$70,599
Reporting (% of Construction Total)			10.0%	\$141,197
Escalation (% of Construction Total, Based on Mid 1998 Start)			15.0%	\$211,796
<b>Total Capital Cost</b>				<b>\$2,301,518</b>

OPERATION AND MAINTENANCE					
Process Option	Annual O&M Cost	Process Option Service Time (yr)	Present Worth Factor	Process Option Present Worth	
Horizontal Extraction Wells	\$7,000	85.0	19.6838	\$137,787	
Influent Piping	\$0	85.0	19.6838	\$0	
Filtration	\$810	85.0	19.6838	\$15,944	
Ion Exchange	\$11,160	85.0	19.6838	\$219,671	
Activated Carbon Alt 7	\$58,299	85.0	19.6838	\$1,147,547	
Effluent Piping	\$0	85.0	19.6838	\$0	
Utilities and Improvements	\$0	85.0	19.6838	\$0	
Effluent Monitoring	\$27,195	85.0	19.6838	\$535,301	
Plume Monitoring	\$13,303	85.0	19.6838	\$261,854	
<b>O&amp;M Subtotal</b>				<b>\$1,177,167</b>	<b>\$1,177,167</b>
Misc. O&M Costs (% Annual O&M Unless Otherwise Specified)		Percentage			
See Global Cost Assumptions for Details on Calculations					
Horizontal Extraction Wells	21%	\$1,470	85.0	19.6838	\$28,935
Influent Piping	21%	\$0	85.0	19.6838	\$0
Filtration	21%	\$170	85.0	19.6838	\$3,348
Ion Exchange	21%	\$2,344	85.0	19.6838	\$46,131
Activated Carbon Alt 7	21%	\$12,243	85.0	19.6838	\$240,985
Effluent Piping	21%	\$0	85.0	19.6838	\$0
Utilities and Improvements	21%	\$0	85.0	19.6838	\$0
Effluent Monitoring	21%	\$5,711	85.0	19.6838	\$112,413
Plume Monitoring	21%	\$2,794	85.0	19.6838	\$54,989
<b>Total Operation and Maintenance Costs</b>				<b>\$2,804,906</b>	

NET PRESENT WORTH	
Capital Costs	\$2,301,518
Operation and Maintenance Present Worth	\$2,804,906
<b>Total Alternative Cost</b>	<b>\$5,106,424</b>

## Cost Estimate Summary Sheet

### NEWIOU Feasibility Study, Travis AFB

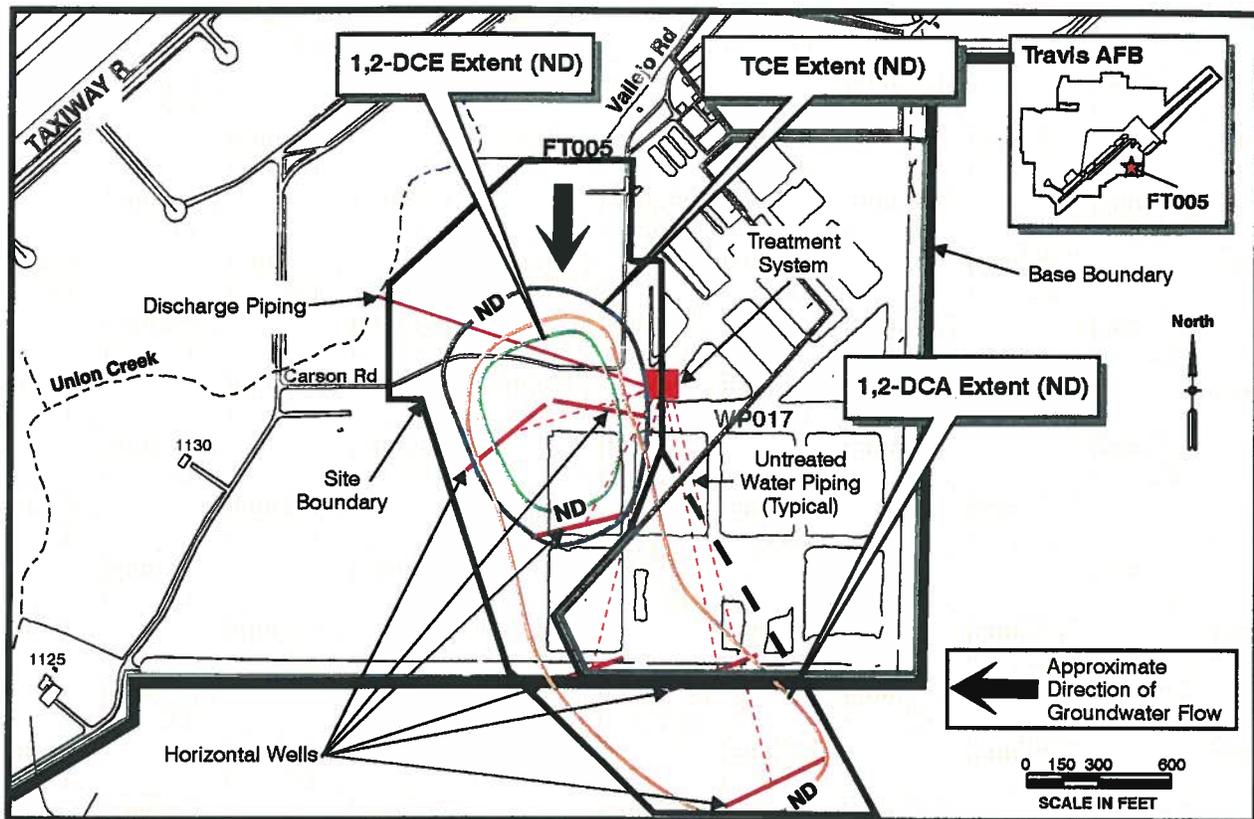
#### Process Option Summary for SD033

#### Assumptions:

- 1 Use RACER/ENVEST cost estimating model, Version 3.1 when practical
- 2 Compute monitoring and O&M for one year only; add costs for subsequent years using Alternative Cost Summary Sheets.
- 3 Horizontal extraction wells are 300 feet in length.

#### Cost Summary:

Item	Capital Costs	O&M Costs
Horizontal Extraction Wells	\$55,000	\$7,000
Influent Piping	\$276,134	\$0
Filtration	\$25,654	\$810
Ion Exchange	\$119,000	\$11,160
Air Stripper	\$38,382	\$6,287
Catalytic Oxidation	\$90,656	\$53,936
Ultraviolet Oxidation	\$178,581	\$105,440
Activated Carbon	\$26,958	\$26,975
Activated Carbon Alt 7	\$26,958	\$58,299
Effluent Piping	\$467	\$0
Utilities and Improvements	\$212,694	\$0
Clear and Grub	\$5,702	\$0
Electrical	\$5,844	\$0
Access Road	\$29,258	\$0
Communication Lines	\$620	\$0
Gas Service	\$1,230	\$0
Cleanup and Landscaping	\$220	\$0
Fencing	\$742	\$0
Well Power and Comm Lines	\$139,600	\$0
Control Panel	\$11,600	\$0
Surge Tank	\$7,700	\$0
Treatment Unit Pad	\$10,178	\$0
Institutional Controls	\$10,000	\$0
Plume Monitoring	\$0	\$13,303
Effluent Monitoring	\$0	\$27,195
Institutional Monitoring	\$0	\$59,535
Reserved		



FT005ALT.CDR - VMG 7/25/96 SAC 1

#### **Site Characteristics**

- Site is located in an area of Travis AFB that is inactive except for explosives detonation
- TCE in groundwater — 3.3  $\mu\text{g/L}$  average, 120  $\mu\text{g/L}$  maximum
- TPH in groundwater — 200  $\mu\text{g/L}$  average, 820  $\mu\text{g/L}$  maximum
- Estimated mass of dissolved VOCs equals 3.9 lb
- Ni in groundwater — 370  $\mu\text{g/L}$  maximum
- Cr, Cu, and Hg were measured at concentrations greater than NPDES discharge limits in some monitoring wells
- Depth to groundwater — 10 feet
- Depth to bedrock — 50 feet
- Permeable materials (sand and silt) occur through depths of 20 to 40 feet bgs
- Some low permeability soils (clay and silt) occur between 10 and 30 feet bgs
- Site also included in Group K for soil contamination
- The bold dashed line indicates where the FT005 groundwater contamination overlaps the soil site WP017

#### **Treatment Alternatives**

- Alternative #3: Air Stripper/Catalytic Oxidation, Ion Exchange, Activated Carbon
- Alternative #5: UV Oxidation, Ion Exchange, Activated Carbon
- Alternative #7: Ion Exchange, Activated Carbon

#### **Design Assumptions**

- 6 horizontal wells, 300 feet in screened length
- Extraction rate 90 gpm total, 15 gpm from each well
- 5,100 feet of untreated water piping (from well to treatment system) — 1 inch ID, sch 80 PVC
- 1,200 feet of discharge piping (to Union Creek) — 3 inch ID, sch 80 PVC
- 1,000 feet from treatment system to existing power line
- 15 years to clean groundwater to MCLs, calculated using a contaminant transport model based on assumption shown in Appendix C

*NOTE: The figure conceptually displays components for comparative purposes only. Actual layout may vary significantly from that shown and will be determined during the remedial design phase.*

**Figure B-10.**

**Conceptual Design for FT005 (Group C) Groundwater Treatment Alternatives, Travis AFB**

## Cost Summary for FT005 Alternatives

Alternative	Capital Costs	Operation and Maintenance Present Worth	Total
1	\$0	\$0	\$0
2	\$18,630	\$1,107,391	\$1,126,021
3	\$1,832,937	\$2,697,404	\$4,530,342
5	\$1,855,884	\$3,064,741	\$4,920,626
7	\$1,694,977	\$3,758,622	\$5,453,599

### Estimated Cost for FT005, Alternative 1

CAPITAL COSTS		
Process Option	Percentage	Capital Cost
No Action		\$0
<b>Construction Subtotal</b>		
Bid Contingencies (% of Construction Subtotal)	15.0%	\$0
Scope Contingencies (% of Construction Subtotal)	20.0%	\$0
<b>Construction Total</b>		
<b>Other Direct Costs</b>		
Engineering Design (% of Construction Total)	10.0%	\$0
Permitting and Legal (% of Construction Total)	5.0%	\$0
Startup and Shakedown (% of Construction Total)	10.0%	\$0
Bonding and Insurance (% of Construction Total)	3.0%	\$0
Construction Oversight (% of Construction Total)	5.0%	\$0
Field and Laboratory Testing (% of Construction Total)	5.0%	\$0
Reporting (% of Construction Total)	10.0%	\$0
Escalation (% of Construction Total, Based on Mid 1998 Start)	15.0%	\$0
<b>Total Capital Cost</b>		

OPERATION AND MAINTENANCE				
Process Option	Annual O&M Cost	Process Option Service Time (yr)	Present Worth Factor	Process Option Present Worth
No Action	\$0	0.0	0.0000	\$0
<b>O&amp;M Subtotal</b>				
<b>Misc. O&amp;M Costs (% Annual O&amp;M Unless Otherwise Specified)</b>				
	Percentage			
<i>See Global Cost Assumptions For Details on Calculations</i>				
No Action	31%	\$0	0.0	0.0000
<b>Total Operation and Maintenance Costs</b>				

NET PRESENT WORTH	
Capital Costs	\$0
Operation and Maintenance Present Worth	\$0
<b>Total Alternative Cost</b>	

### Estimated Cost for FT005, Alternative 2

CAPITAL COSTS				
Process Option	Quantity	Unit Cost	Percentage	Capital Cost
Institutional Controls	1	\$10,000	NA	\$10,000
Institutional Monitoring	1	\$0	NA	\$0
Reserved	1	\$0	NA	\$0
<b>Construction Subtotal</b>				<b>\$10,000</b>
Bid Contingencies (% of Construction Subtotal)			15.0%	\$1,500
Scope Contingencies (% of Construction Subtotal)			20.0%	\$2,000
<b>Construction Total</b>				<b>\$13,500</b>
Other Direct Costs				
Engineering Design (% of Construction Total)			10.0%	\$1,350
Permitting and Legal (% of Construction Total)			5.0%	\$675
Startup and Shakedown (% of Construction Total)			0.0%	\$0
Bonding and Insurance (% of Construction Total)			3.0%	\$405
Construction Oversight (% of Construction Total)			5.0%	\$675
Field and Laboratory Testing (% of Construction Total)			0.0%	\$0
Reporting (% of Construction Total)			0.0%	\$0
Escalation (% of Construction Total, Based on Mid 1998 Start)			15.0%	\$2,025
<b>Total Capital Cost</b>				<b>\$18,630</b>

OPERATION AND MAINTENANCE						
Process Option	Annual O&M Cost	Process Option Service Time (yr)	Present Worth Factor	Process Option Present Worth		
Institutional Controls	\$0	30.0	15.3725	\$0		
Institutional Monitoring	\$59,535	30.0	15.3725	\$915,199		
Reserved	\$0	30.0	15.3725	\$0		
<b>O&amp;M Subtotal</b>				<b>\$915,199</b>		
<b>Min. O&amp;M Costs (% Annual O&amp;M Unless Otherwise Specified)</b>		<b>Percentage</b>				
<i>See Global Cost Assumptions For Details on Calculations</i>						
Institutional Controls		21%	\$0	30.0	15.3725	\$0
Institutional Monitoring		21%	\$12,502	30.0	15.3725	\$192,192
Reserved		21%	\$0	30.0	15.3725	\$0
<b>Total Operation and Maintenance Costs</b>				<b>\$1,107,391</b>		

NET PRESENT WORTH	
Capital Costs	\$18,630
Operation and Maintenance Present Worth	\$1,107,391
<b>Total Alternative Cost</b>	<b>\$1,126,021</b>

**Estimated Cost for FT005, Alternative 3**

<b>CAPITAL COSTS</b>				
Process Option	Quantity	Unit Cost	Percentage	Capital Cost
Horizontal Extraction Wells	6	\$55,000	NA	\$330,000
Influent Piping	1	\$35,009	NA	\$35,009
Filtration	1	\$20,864	NA	\$20,864
Ion Exchange	1	\$166,000	NA	\$166,000
Air Stripper	1	\$37,951	NA	\$37,951
Catalytic Oxidation	1	\$89,726	NA	\$89,726
Activated Carbon	1	\$15,892	NA	\$15,892
Effluent Piping	1	\$9,337	NA	\$9,337
Utilities and Improvements	1	\$128,185	NA	\$128,185
Effluent Monitoring	1	\$0	NA	\$0
Plume Monitoring	1	\$0	NA	\$0
<b>Construction Subtotal</b>				<b>\$852,864</b>
Bid Contingencies (% of Construction Subtotal)			15.0%	\$124,945
Scope Contingencies (% of Construction Subtotal)			20.0%	\$166,593
<b>Construction Total</b>				<b>\$1,144,402</b>
<b>Other Direct Costs</b>				
Engineering Design (% of Construction Total)			10.0%	\$112,450
Permitting and Legal (% of Construction Total)			5.0%	\$56,225
Startup and Shakedown (% of Construction Total)			10.0%	\$112,450
Bonding and Insurance (% of Construction Total)			3.0%	\$33,735
Construction Oversight (% of Construction Total)			5.0%	\$56,225
Field and Laboratory Testing (% of Construction Total)			5.0%	\$56,225
Reporting (% of Construction Total)			10.0%	\$112,450
Escalation (% of Construction Total, Based on Mid 1998 Start)			15.0%	\$168,675
<b>Total Capital Cost</b>				<b>\$1,832,937</b>

<b>OPERATION AND MAINTENANCE</b>					
Process Option	Annual O&M Cost	Process Option Service Time (Yr)	Present Worth Factor	Process Option Present Worth	
Horizontal Extraction Wells	\$6,000	15.0	10.3797	\$62,278	
Influent Piping	\$0	15.0	10.3797	\$0	
Filtration	\$810	15.0	10.3797	\$8,408	
Ion Exchange	\$99,600	15.0	10.3797	\$1,033,814	
Air Stripper	\$5,881	15.0	10.3797	\$61,043	
Catalytic Oxidation	\$47,970	15.0	10.3797	\$497,912	
Activated Carbon	\$14,013	15.0	10.3797	\$145,450	
Effluent Piping	\$0	15.0	10.3797	\$0	
Utilities and Improvements	\$0	15.0	10.3797	\$0	
Effluent Monitoring	\$27,195	15.0	10.3797	\$282,275	
Plume Monitoring	\$13,303	15.0	10.3797	\$138,081	
<b>O&amp;M Subtotal</b>				<b>\$1,229,329</b>	
Misc. O&M Costs (% Annual O&M Unless Otherwise Specified)		Percentage			
See Global Cost Assumptions For Details on Calculations					
Horizontal Extraction Wells	21%	\$1,260	15.0	10.3797	\$13,078
Influent Piping	21%	\$0	15.0	10.3797	\$0
Filtration	21%	\$170	15.0	10.3797	\$1,766
Ion Exchange	21%	\$20,916	15.0	10.3797	\$217,101
Air Stripper	21%	\$1,235	15.0	10.3797	\$12,819
Catalytic Oxidation	21%	\$10,074	15.0	10.3797	\$104,562
Activated Carbon	21%	\$2,943	15.0	10.3797	\$30,545
Effluent Piping	21%	\$0	15.0	10.3797	\$0
Utilities and Improvements	21%	\$0	15.0	10.3797	\$0
Effluent Monitoring	21%	\$5,711	15.0	10.3797	\$59,278
Plume Monitoring	21%	\$2,794	15.0	10.3797	\$28,997
<b>Total Operation and Maintenance Costs</b>				<b>\$1,697,404</b>	

<b>NET PRESENT WORTH</b>	
Capital Costs	\$1,832,937
Operation and Maintenance Present Worth	\$2,697,404
<b>Total Alternative Cost</b>	<b>\$4,530,341</b>

**Estimated Cost for FT005, Alternative 5**

<b>CAPITAL COSTS</b>				
Process Option	Quantity	Unit Cost	Percentage	Capital Cost
Horizontal Extraction Wells	6	\$55,000	NA	\$330,000
Influent Piping	1	\$35,009	NA	\$35,009
Filtration	1	\$20,864	NA	\$20,864
Ion Exchange	1	\$166,000	NA	\$166,000
Ultraviolet Oxidation	1	\$138,105	NA	\$138,105
Activated Carbon	1	\$15,892	NA	\$15,892
Effluent Piping	1	\$9,337	NA	\$9,337
Utilities and Improvements	1	\$128,185	NA	\$128,185
Effluent Monitoring	1	\$0	NA	\$0
Plume Monitoring	1	\$0	NA	\$0
<b>Construction Subtotal</b>				<b>\$843,397</b>
Bid Contingencies (% of Construction Subtotal)			15.0%	\$126,509
Scope Contingencies (% of Construction Subtotal)			20.0%	\$168,678
<b>Construction Total</b>				<b>\$1,138,579</b>
<b>Other Direct Costs</b>				
Engineering Design (% of Construction Total)			10.0%	\$113,858
Permitting and Legal (% of Construction Total)			5.0%	\$56,929
Startup and Shakedown (% of Construction Total)			10.0%	\$113,858
Bonding and Insurance (% of Construction Total)			3.0%	\$34,157
Construction Oversight (% of Construction Total)			5.0%	\$56,929
Field and Laboratory Testing (% of Construction Total)			5.0%	\$56,929
Reporting (% of Construction Total)			10.0%	\$113,858
Escalation (% of Construction Total, Based on Mid 1998 Start)			15.0%	\$170,787
<b>Total Capital Cost</b>				<b>\$1,855,884</b>

<b>OPERATION AND MAINTENANCE</b>					
Process Option	Annual O&M Cost	Process Option Service Time (yr)	Present Worth Factor	Process Option Present Worth	
Horizontal Extraction Wells	\$6,000	15.0	10.3797	\$62,278	
Influent Piping	\$0	15.0	10.3797	\$0	
Filtration	\$810	15.0	10.3797	\$8,408	
Ion Exchange	\$99,600	15.0	10.3797	\$1,033,814	
Ultraviolet Oxidation	\$83,099	15.0	10.3797	\$862,539	
Activated Carbon	\$14,013	15.0	10.3797	\$145,450	
Effluent Piping	\$0	15.0	10.3797	\$0	
Utilities and Improvements	\$0	15.0	10.3797	\$0	
Effluent Monitoring	\$27,195	15.0	10.3797	\$282,275	
Plume Monitoring	\$13,303	15.0	10.3797	\$138,081	
<b>O&amp;M Subtotal</b>		<b>\$244,820</b>		<b>\$2,532,844</b>	
<b>Misc. O&amp;M Costs (1% Annual O&amp;M Unless Otherwise Specified)</b>					
See Global Cost Assumptions For Details on Calculations					
	Percentage				
Horizontal Extraction Wells	21%	\$1,260	15.0	10.3797	\$13,078
Influent Piping	21%	\$0	15.0	10.3797	\$0
Filtration	21%	\$170	15.0	10.3797	\$1,766
Ion Exchange	21%	\$20,916	15.0	10.3797	\$217,101
Ultraviolet Oxidation	21%	\$17,451	15.0	10.3797	\$181,133
Activated Carbon	21%	\$2,943	15.0	10.3797	\$30,545
Effluent Piping	21%	\$0	15.0	10.3797	\$0
Utilities and Improvements	21%	\$0	15.0	10.3797	\$0
Effluent Monitoring	21%	\$5,711	15.0	10.3797	\$59,278
Plume Monitoring	21%	\$2,794	15.0	10.3797	\$28,997
<b>Total Operation and Maintenance Costs</b>				<b>\$3,064,741</b>	

<b>NET PRESENT WORTH</b>	
Capital Costs	\$1,855,884
Operation and Maintenance Present Worth	\$3,064,741
<b>Total Alternative Cost</b>	<b>\$4,920,625</b>

## Estimated Cost for FT005, Alternative 7

CAPITAL COSTS				
Process Option	Quantity	Unit Cost	Percentage	Capital Cost
Horizontal Extraction Wells	6	\$55,000	NA	\$330,000
Influent Piping	1	\$35,009	NA	\$35,009
Filtration	1	\$20,864	NA	\$20,864
Ion Exchange	1	\$166,000	NA	\$166,000
Activated Carbon Alt 7	1	\$80,874	NA	\$80,874
Effluent Piping	1	\$9,337	NA	\$9,337
Utilities and Improvements	1	\$128,185	NA	\$128,185
Effluent Monitoring	1	\$0	NA	\$0
Plume Monitoring	1	\$0	NA	\$0
<b>Construction Subtotal</b>				<b>\$770,259</b>
Bid Contingencies (% of Construction Subtotal)			15.0%	\$115,540
Scope Contingencies (% of Construction Subtotal)			20.0%	\$154,054
<b>Construction Total</b>				<b>\$1,039,853</b>
<b>Other Direct Costs</b>				
Engineering Design (% of Construction Total)			10.0%	\$103,986
Permitting and Legal (% of Construction Total)			5.0%	\$51,993
Startup and Shakedown (% of Construction Total)			10.0%	\$103,986
Bonding and Insurance (% of Construction Total)			3.0%	\$31,196
Construction Oversight (% of Construction Total)			5.0%	\$51,993
Field and Laboratory Testing (% of Construction Total)			5.0%	\$51,993
Reporting (% of Construction Total)			10.0%	\$103,986
Escalation (% of Construction Total, Based on Mid 1998 Start)			15.0%	\$155,979
<b>Total Capital Cost</b>				<b>\$1,694,977</b>

OPERATION AND MAINTENANCE					
Process Option	Annual O&M Cost	Process Option Service Time (yr)	Present Worth Factor	Present Worth	Process Option Present Worth
Horizontal Extraction Wells	\$6,000	15.0	10.3797	\$62,278	\$62,278
Influent Piping	\$0	15.0	10.3797	\$0	\$0
Filtration	\$810	15.0	10.3797	\$8,408	\$8,408
Ion Exchange	\$99,600	15.0	10.3797	\$1,033,814	\$1,033,814
Activated Carbon Alt 7	\$152,360	15.0	10.3797	\$1,581,445	\$1,581,445
Effluent Piping	\$0	15.0	10.3797	\$0	\$0
Utilities and Improvements	\$0	15.0	10.3797	\$0	\$0
Effluent Monitoring	\$27,195	15.0	10.3797	\$282,275	\$282,275
Plume Monitoring	\$13,303	15.0	10.3797	\$138,081	\$138,081
<b>O&amp;M Subtotal</b>				<b>\$299,268</b>	<b>\$2,046,308</b>
<b>Misc. O&amp;M Costs (% Annual O&amp;M Unless Otherwise Specified)</b>					
<i>See Global Cost Assumptions For Details on Calculations</i>					
Horizontal Extraction Wells	21%	\$1,260	15.0	10.3797	\$13,078
Influent Piping	21%	\$0	15.0	10.3797	\$0
Filtration	21%	\$170	15.0	10.3797	\$1,766
Ion Exchange	21%	\$20,916	15.0	10.3797	\$217,101
Activated Carbon Alt 7	21%	\$31,996	15.0	10.3797	\$332,103
Effluent Piping	21%	\$0	15.0	10.3797	\$0
Utilities and Improvements	21%	\$0	15.0	10.3797	\$0
Effluent Monitoring	21%	\$5,711	15.0	10.3797	\$59,278
Plume Monitoring	21%	\$2,794	15.0	10.3797	\$28,997
<b>Total Operation and Maintenance Costs</b>				<b>\$3,195,622</b>	

NET PRESENT WORTH	
Capital Costs	\$1,694,977
Operation and Maintenance Present Worth	\$3,758,622
<b>Total Alternative Cost</b>	<b>\$5,453,600</b>

FT005 Cost Summary Sheet

**Cost Estimate Summary Sheet**

**NEWIOU Feasibility Study, Travis AFB**

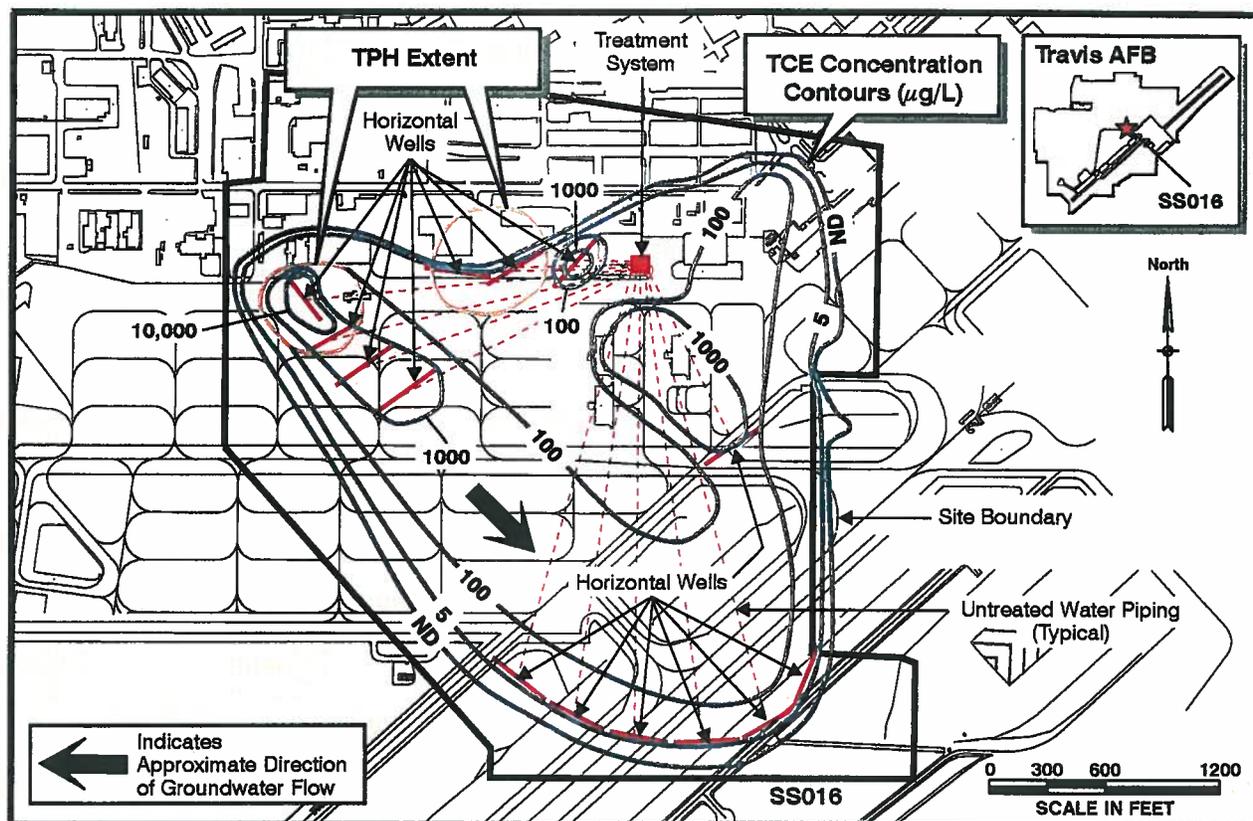
**Process Option Summary for FT005**

**Assumptions:**

- 1 Use RACER/ENVEST cost estimating model, Version 3.1 when practical
- 2 Compute monitoring and O&M for one year only; add costs for subsequent years using Alternative Cost Summary Sheets.
- 3 Horizontal extraction wells are 300 feet in length.

**Cost Summary:**

Item	Capital Costs	O&M Costs
Horizontal Extraction Wells	\$55,000	\$6,000
Influent Piping	\$35,009	\$0
Filtration	\$20,864	\$810
Ion Exchange	\$166,000	\$99,600
Air Stripper	\$37,951	\$5,881
Catalytic Oxidation	\$89,726	\$47,970
Ultraviolet Oxidation	\$138,105	\$83,099
Activated Carbon	\$15,892	\$14,013
Activated Carbon Alt 7	\$80,874	\$152,360
Effluent Piping	\$9,337	\$0
Utilities and Improvments	\$128,185	\$0
Clear and Grub	\$5,702	\$0
Electrical	\$13,609	\$0
Access Road	\$7,534	\$0
Communication Lines	\$11,267	\$0
Gas Service	\$10,051	\$0
Cleanup and Landscaping	\$1,150	\$0
Fencing	\$794	\$0
Well Power and Comm Lines	\$48,600	\$0
Control Panel	\$11,600	\$0
Surge Tank	\$7,700	\$0
Treatment Unit Pad	\$10,178	\$0
Institutional Controls	\$10,000	\$0
Plume Monitoring	\$0	\$13,303
Effluent Monitoring	\$0	\$27,195
Institutional Monitoring	\$0	\$59,535
Reserved	\$0	\$0



SS016ALT.CDR - VMG 9/10/99 SAC 1

#### Site Characteristics

- Approximately 100% of the area is covered by pavement and buildings
- Site located in an active area of Travis AFB (maintenance facilities and aircraft parking apron)
- TCE in groundwater in northwest portion of site — 10,000 µg/L average, 32,000 µg/L maximum (recent CPT data has detected TCE levels up to 180,000 µg/L, but results may not be representative; see Table 1-3)
- TCE in groundwater in the rest of the plume — 600 µg/L average, 5,000 µg/L maximum
- TPH in groundwater source areas — 4,000 µg/L average, 8,500 µg/L maximum
- Estimated mass of dissolved VOCs equals 1,200 lb; DNAPL may be present
- Ni in groundwater — 460 mg/L maximum
- Cd, Cr, Cu, Pb, Ag, and Zn were measured at concentrations greater than NPDES discharge limits in some monitoring wells
- Depth to groundwater — 10 feet
- Depth to bedrock — 30 feet
- Low permeability soils (clay and silt) to a depth of between 15 and 25 feet bgs
- More permeable material (sands and silts) below 15 to 25 feet bgs
- Site also included in Group N for soil contamination

#### Treatment Alternatives

- Alternative #3: Air Stripper/Catalytic Oxidation, Ion Exchange, Activated Carbon
- Alternative #5: UV Oxidation, Ion Exchange, Activated Carbon
- Alternative #7: Ion Exchange, Activated Carbon

#### Design Assumptions

- 14 horizontal wells, 300 feet in screened length — 4 OSA wells and 10 wells for the rest of the plume
- Extraction rate 210 gpm total, 15 gpm from each well
- 27,300 feet of untreated water piping (from wells to treatment system) — 1 inch ID, sch 80 PVC
- 50 feet of discharge piping (to existing irrigation system) — 3 inch ID, sch 80 PVC
- 10 feet from treatment system to existing power line
- 193 years to clean groundwater to MCLs, calculated using a contaminant transport model based on assumptions shown in Appendix C

*NOTE: The figure conceptually displays components for comparative purposes only. Actual layout may vary significantly from that shown and will be determined during the remedial design phase.*

**Figure B-11.**

**Conceptual Design for SS016 (Group D) Groundwater Treatment Alternatives, Travis AFB**

### Cost Summary for SS016 Alternatives (Source Area)

Alternative	Capital Costs	Operation and Maintenance Present Worth	Total
1	\$0	\$0	\$0
2	\$18,630	\$1,440,630	\$1,459,260
3	\$2,882,173	\$5,477,950	\$8,360,123
5	\$2,993,499	\$6,244,278	\$9,237,776
7	\$7,076,944	\$118,431,551	\$125,508,496

### Estimated Cost for SS016, Alternative 1

CAPITAL COSTS		
Process Option	Percentage	Capital Cost
No Action		\$0
<b>Construction Subtotal</b>		
Bid Contingencies (% of Construction Subtotal)	15.0%	\$0
Scope Contingencies (% of Construction Subtotal)	20.0%	\$0
<b>Construction Total</b>		
<b>Other Direct Costs</b>		
Engineering Design (% of Construction Total)	10.0%	\$0
Permitting and Legal (% of Construction Total)	5.0%	\$0
Startup and Shakedown (% of Construction Total)	10.0%	\$0
Bonding and Insurance (% of Construction Total)	3.0%	\$0
Construction Oversight (% of Construction Total)	5.0%	\$0
Field and Laboratory Testing (% of Construction Total)	5.0%	\$0
Reporting (% of Construction Total)	10.0%	\$0
Escalation (% of Construction Total, Based on Mid 1998 Start)	15.0%	\$0
<b>Total Capital Cost</b>		

OPERATION AND MAINTENANCE				
Process Option	Annual O&M Cost	Process Option Service Time (yr)	Present Worth Factor	Process Option Present Worth
No Action	\$0	0.0	0.0000	\$0
<b>O&amp;M Subtotal</b>				
\$0				
<b>Misc. O&amp;M Costs (% Annual O&amp;M Unless Otherwise Specified)</b>		<b>Percentage</b>		
See Global Cost Assumptions For Details on Calculations				
No Action		21%	\$0	0.0
<b>Total Operation and Maintenance Costs</b>				
\$0				

NET PRESENT WORTH	
Capital Costs	\$0
Operation and Maintenance Present Worth	\$0
<b>Total Alternative Cost</b>	
\$0	

**Estimated Cost for SS016, Alternative 2**

<b>CAPITAL COSTS</b>				
Process Option	Quantity	Unit Cost	Percentage	Capital Cost
Institutional Controls	1	\$10,000	NA	\$10,000
Institutional Monitoring	1	\$0	NA	\$0
Reserved	1	\$0	NA	\$0
<b>Construction Subtotal</b>				<b>\$10,000</b>
Bid Contingencies (% of Construction Subtotal)			15.0%	\$1,500
Scope Contingencies (% of Construction Subtotal)			20.0%	\$2,000
<b>Construction Total</b>				<b>\$13,500</b>
<b>Other Direct Costs</b>				
Engineering Design (% of Construction Total)			10.0%	\$1,350
Permitting and Legal (% of Construction Total)			5.0%	\$675
Startup and Shakedown (% of Construction Total)			0.0%	\$0
Bonding and Insurance (% of Construction Total)			3.0%	\$405
Construction Oversight (% of Construction Total)			5.0%	\$675
Field and Laboratory Testing (% of Construction Total)			0.0%	\$0
Reporting (% of Construction Total)			0.0%	\$0
Escalation (% of Construction Total, Based on Mid 1998 Start)			15.0%	\$2,025
<b>Total Capital Cost</b>				<b>\$18,630</b>

<b>OPERATION AND MAINTENANCE</b>				
Process Option	Annual O&M Cost	Process Option Service Time (yr)	Present Worth Factor	Process Option Present Worth
Institutional Controls	\$0	193.0	19.9984	\$0
Institutional Monitoring	\$59,535	193.0	19.9984	\$1,190,603
Reserved	\$0	193.0	19.9984	\$0
<b>O&amp;M Subtotal</b>				<b>\$1,190,603</b>
Misc. O&M Costs (% Annual O&M Unless Otherwise Specified)		Percentage		
See Global Cost Assumptions For Details on Calculations				
Institutional Controls	\$0	21%	19.9984	\$0
Institutional Monitoring	\$12,502	21%	19.9984	\$250,027
Reserved	\$0	21%	19.9984	\$0
<b>Total Operation and Maintenance Cost</b>				<b>\$1,440,630</b>

<b>NET PRESENT WORTH</b>	
Capital Costs	\$18,630
Operation and Maintenance Present Worth	\$1,440,630
<b>Total Alternative Cost</b>	<b>\$1,459,260</b>

**Estimated Cost for SS016, Alternative 3**

<b>CAPITAL COSTS</b>				
Process Option	Quantity	Unit Cost	Percentage	Capital Cost
Horizontal Extraction Wells	4	\$55,000	NA	\$220,000
Influent Piping	1	\$729,000	NA	\$729,000
Filtration	1	\$18,104	NA	\$18,104
Ion Exchange	1	\$119,000	NA	\$119,000
Air Stripper	1	\$29,288	NA	\$29,288
Catalytic Oxidation	1	\$74,508	NA	\$74,508
Activated Carbon	1	\$11,773	NA	\$11,773
Effluent Piping	1	\$371	NA	\$371
Utilities and Improvements	1	\$107,737	NA	\$107,737
Effluent Monitoring	1	\$0	NA	\$0
Plume Monitoring	1	\$0	NA	\$0
<b>Construction Subtotal</b>				<b>\$1,509,781</b>
Bid Contingencies (% of Construction Subtotal)			15.0%	\$196,467
Scope Contingencies (% of Construction Subtotal)			20.0%	\$261,956
<b>Construction Total</b>				<b>\$1,768,204</b>
<b>Other Direct Costs</b>				
Engineering Design (% of Construction Total)			10.0%	\$176,820
Permitting and Legal (% of Construction Total)			5.0%	\$88,410
Startup and Shakedown (% of Construction Total)			10.0%	\$176,820
Bonding and Insurance (% of Construction Total)			3.0%	\$53,046
Construction Oversight (% of Construction Total)			5.0%	\$88,410
Field and Laboratory Testing (% of Construction Total)			5.0%	\$88,410
Reporting (% of Construction Total)			10.0%	\$176,820
Escalation (% of Construction Total, Based on Mid 1998 Start)			15.0%	\$265,231
<b>Total Capital Cost</b>				<b>\$2,882,173</b>

<b>OPERATION AND MAINTENANCE</b>					
Process Option	Annual O&M Cost	Process Option Service Time (yr)	Present Worth Factor	Present Worth	Process Option Present Worth
Horizontal Extraction Wells	\$4,000	193.0	19.9984	\$79,993	\$79,993
Influent Piping	\$0	193.0	19.9984	\$0	\$0
Filtration	\$810	193.0	19.9984	\$16,199	\$16,199
Ion Exchange	\$128,400	193.0	19.9984	\$2,567,791	\$2,567,791
Air Stripper	\$5,476	193.0	19.9984	\$109,511	\$109,511
Catalytic Oxidation	\$36,030	193.0	19.9984	\$720,541	\$720,541
Activated Carbon	\$11,166	193.0	19.9984	\$223,302	\$223,302
Effluent Piping	\$0	193.0	19.9984	\$0	\$0
Utilities and Improvements	\$0	193.0	19.9984	\$0	\$0
Effluent Monitoring	\$27,195	193.0	19.9984	\$543,856	\$543,856
Plume Monitoring	\$13,303	193.0	19.9984	\$266,038	\$266,038
<b>O&amp;M Subtotal</b>				<b>\$4,307,037</b>	
<b>Misc. O&amp;M Costs (% Annual O&amp;M Unless Otherwise Specified)</b>		<b>Percentage</b>			
See Global Cost Assumptions For Details on Calculations					
Horizontal Extraction Wells	21%	\$840	193.0	19.9984	\$16,799
Influent Piping	21%	\$0	193.0	19.9984	\$0
Filtration	21%	\$170	193.0	19.9984	\$3,402
Ion Exchange	21%	\$26,964	193.0	19.9984	\$539,236
Air Stripper	21%	\$1,150	193.0	19.9984	\$22,997
Catalytic Oxidation	21%	\$7,566	193.0	19.9984	\$151,314
Activated Carbon	21%	\$2,345	193.0	19.9984	\$46,893
Effluent Piping	21%	\$0	193.0	19.9984	\$0
Utilities and Improvements	21%	\$0	193.0	19.9984	\$0
Effluent Monitoring	21%	\$5,711	193.0	19.9984	\$114,210
Plume Monitoring	21%	\$2,794	193.0	19.9984	\$55,868
<b>Total Operation and Maintenance Costs</b>				<b>\$5,477,950</b>	

<b>NET PRESENT WORTH</b>	
Capital Costs	\$2,882,173
Operation and Maintenance Present Worth	\$5,477,950
<b>Total Alternative Cost</b>	<b>\$8,360,123</b>

Estimated Cost for SS016, Alternative 5

CAPITAL COSTS				
Process Option	Quantity	Unit Cost	Percentage	Capital Cost
Horizontal Extraction Wells	4	\$55,000	NA	\$220,000
Influent Piping	1	\$729,000	NA	\$729,000
Filtration	1	\$18,104	NA	\$18,104
Ion Exchange	1	\$119,000	NA	\$119,000
Ultraviolet Oxidation	1	\$154,387	NA	\$154,387
Activated Carbon	1	\$11,773	NA	\$11,773
Effluent Piping	1	\$371	NA	\$371
Utilities and Improvements	1	\$107,737	NA	\$107,737
Effluent Monitoring	1	\$0	NA	\$0
Plume Monitoring	1	\$0	NA	\$0
<b>Construction Subtotal</b>				<b>\$1,693,372</b>
Bid Contingencies (% of Construction Subtotal)			15.0%	\$204,056
Scope Contingencies (% of Construction Subtotal)			20.0%	\$272,074
<b>Construction Total</b>				<b>\$1,836,412</b>
Other Direct Costs				
Engineering Design (% of Construction Total)			10.0%	\$183,650
Permitting and Legal (% of Construction Total)			5.0%	\$91,825
Startup and Shakedown (% of Construction Total)			10.0%	\$183,650
Bonding and Insurance (% of Construction Total)			3.0%	\$55,095
Construction Oversight (% of Construction Total)			5.0%	\$91,825
Field and Laboratory Testing (% of Construction Total)			5.0%	\$91,825
Reporting (% of Construction Total)			10.0%	\$183,650
Escalation (% of Construction Total, Based on Mid 1998 Start)			15.0%	\$275,475
<b>Total Capital Cost</b>				<b>\$2,993,499</b>

OPERATION AND MAINTENANCE					
Process Option	Annual O&M Cost	Process Option Service Time (yr)	Present Worth Factor	Process Option Present Worth	
Horizontal Extraction Wells	\$4,000	193.0	19.9984	\$79,993	
Influent Piping	\$0	193.0	19.9984	\$0	
Filtration	\$810	193.0	19.9984	\$16,199	
Ion Exchange	\$128,400	193.0	19.9984	\$2,567,791	
Ultraviolet Oxidation	\$73,175	193.0	19.9984	\$1,463,381	
Activated Carbon	\$11,166	193.0	19.9984	\$223,302	
Effluent Piping	\$0	193.0	19.9984	\$0	
Utilities and Improvements	\$0	193.0	19.9984	\$0	
Effluent Monitoring	\$27,195	193.0	19.9984	\$543,856	
Plume Monitoring	\$13,303	193.0	19.9984	\$266,038	
<b>O&amp;M Subtotal</b>				<b>\$5,169,569</b>	
Minor O&M Costs (% Annual O&M Unless Otherwise Specified)		Percentage			
See Global Cost Assumptions For Details on Calculations					
Horizontal Extraction Wells	21%	\$840	193.0	19.9984	\$16,799
Influent Piping	21%	\$0	193.0	19.9984	\$0
Filtration	21%	\$170	193.0	19.9984	\$3,402
Ion Exchange	21%	\$26,964	193.0	19.9984	\$539,236
Ultraviolet Oxidation	21%	\$15,367	193.0	19.9984	\$307,310
Activated Carbon	21%	\$2,345	193.0	19.9984	\$46,893
Effluent Piping	21%	\$0	193.0	19.9984	\$0
Utilities and Improvements	21%	\$0	193.0	19.9984	\$0
Effluent Monitoring	21%	\$5,711	193.0	19.9984	\$114,210
Plume Monitoring	21%	\$2,794	193.0	19.9984	\$55,868
<b>Total Operation and Maintenance Costs</b>				<b>\$6,244,278</b>	

NET PRESENT WORTH	
Capital Costs	\$2,993,499
Operation and Maintenance Present Worth	\$6,244,278
<b>Total Alternative Cost</b>	<b>\$9,237,776</b>

**Estimated Cost for SS016, Alternative 7**

<b>CAPITAL COSTS</b>				
Process Option	Quantity	Unit Cost	Percentage	Capital Cost
Horizontal Extraction Wells	4	\$55,000	NA	\$220,000
Influent Piping	1	\$729,000	NA	\$729,000
Filtration	1	\$18,104	NA	\$18,104
Ion Exchange	1	\$119,000	NA	\$119,000
Activated Carbon Alt 7	1	\$2,021,850	NA	\$2,021,850
Effluent Piping	1	\$371	NA	\$371
Utilities and Improvements	1	\$107,737	NA	\$107,737
Effluent Monitoring	1	\$0	NA	\$0
Plume Monitoring	1	\$0	NA	\$0
<b>Construction Subtotal</b>				<b>\$3,316,062</b>
Bid Contingencies (% of Construction Subtotal)			15.0%	\$482,409
Scope Contingencies (% of Construction Subtotal)			20.0%	\$643,212
<b>Construction Total</b>				<b>\$4,441,683</b>
<b>Other Direct Costs</b>				
Engineering Design (% of Construction Total)			10.0%	\$434,168
Permitting and Legal (% of Construction Total)			5.0%	\$217,084
Startup and Shakedown (% of Construction Total)			10.0%	\$434,168
Bonding and Insurance (% of Construction Total)			3.0%	\$130,251
Construction Oversight (% of Construction Total)			5.0%	\$217,084
Field and Laboratory Testing (% of Construction Total)			5.0%	\$217,084
Reporting (% of Construction Total)			10.0%	\$434,168
Escalation (% of Construction Total, Based on Mid 1998 Start)			15.0%	\$651,253
<b>Total Capital Cost</b>				<b>\$7,076,944</b>

<b>OPERATION AND MAINTENANCE</b>				
Process Option	Annual O&M Cost	Process Option Service Time (yr)	Present Worth Factor	Process Option Present Worth
Horizontal Extraction Wells	\$4,000	193.0	19.9984	\$79,993
Influent Piping	\$0	193.0	19.9984	\$0
Filtration	\$810	193.0	19.9984	\$16,199
Ion Exchange	\$128,400	193.0	19.9984	\$2,567,791
Activated Carbon Alt 7	\$4,720,556	193.0	19.9984	\$94,403,438
Effluent Piping	\$0	193.0	19.9984	\$0
Utilities and Improvements	\$0	193.0	19.9984	\$0
Effluent Monitoring	\$27,195	193.0	19.9984	\$543,856
Plume Monitoring	\$13,303	193.0	19.9984	\$266,038
<b>O&amp;M Subtotal</b>				<b>\$97,877,318</b>
<b>Min. O&amp;M Cost (% Annual O&amp;M Unless Otherwise Specified)</b>		<b>Percentage</b>		
<i>See Global Cost Assumptions For Details on Calculations</i>				
Horizontal Extraction Wells	21%	\$840	193.0	\$16,799
Influent Piping	21%	\$0	193.0	\$0
Filtration	21%	\$170	193.0	\$3,402
Ion Exchange	21%	\$26,964	193.0	\$539,236
Activated Carbon Alt 7	21%	\$991,317	193.0	\$19,824,722
Effluent Piping	21%	\$0	193.0	\$0
Utilities and Improvements	21%	\$0	193.0	\$0
Effluent Monitoring	21%	\$5,711	193.0	\$114,210
Plume Monitoring	21%	\$2,794	193.0	\$55,868
<b>Total Operation and Maintenance Costs</b>				<b>\$118,431,551</b>

<b>NET PRESENT WORTH</b>	
Capital Costs	\$7,076,944
Operation and Maintenance Present Worth	\$118,431,551
<b>Total Alternative Cost</b>	<b>\$125,508,495</b>

SS016 Cost Summary Sheet

**Cost Estimate Summary Sheet**

**NEWIOU Feasibility Study, Travis AFB**

**Process Option Summary for SS016**

**Assumptions:**

- 1 Use RACER/ENVEST cost estimating model, Version 3.1 when practical
- 2 Compute monitoring and O&M for one year only; add costs for subsequent years using Alternative Cost Summary Sheets.
- 3 Horizontal extraction wells are 300 feet in length.
- 4 Effluent and influent piping will be installed via horizontal drilling to avoid airfield operation disruptions - cost estimated at \$90/lf

**Cost Summary:**

Item	Capital Cost	O&M Cost
Horizontal Extraction Wells	\$55,000	\$4,000
Influent Piping	\$729,000	\$0
Filtration	\$18,104	\$810
Ion Exchange	\$119,000	\$128,400
Air Stripper	\$29,288	\$5,476
Catalytic Oxidation	\$74,508	\$36,030
Ultraviolet Oxidation	\$154,387	\$73,175
Activated Carbon	\$11,773	\$11,166
Activated Carbon Alt 7	\$2,021,850	\$4,720,556
Effluent Piping	\$371	\$0
Utilities and Improvements	\$107,737	\$0
Clear and Grub	\$0	\$0
Electrical	\$7,820	\$0
Access Road	\$0	\$0
Parking Lot	\$0	\$0
Communication Lines	\$620	\$0
Gas Service	\$2,253	\$0
Cleanup and Landscaping	\$1,150	\$0
Fencing	\$794	\$0
Well Power and Comm Lines	\$74,300	\$0
Control Panel	\$11,600	\$0
Surge Tank	\$7,700	\$0
Treatment Unit Pad	\$1,500	\$0
Institutional Controls	\$10,000	\$0
Plume Monitoring	\$0	\$13,303
Effluent Monitoring	\$0	\$27,195
Institutional Monitoring	\$0	\$59,535
Reserved	\$0	\$0

## Cost Summary for SS016 (Remainder of Plume) Alternatives

Alternative	Capital Costs	Operation and Maintenance Present Worth	Total
1	\$0	\$0	\$0
2	\$18,630	\$1,440,630	\$1,459,260
3	\$6,461,086	\$12,533,297	\$18,994,384
5	\$6,546,292	\$13,441,256	\$19,987,548
7	\$9,290,823	\$91,238,893	\$100,529,717

## Estimated Cost for SS016 (Remainder of Plume), Alternative 1

CAPITAL COSTS		
Process Option	Percentage	Capital Cost
No Action		\$0
<b>Construction Subtotal</b>		
Bid Contingencies (% of Construction Subtotal)	15.0%	\$0
Scope Contingencies (% of Construction Subtotal)	20.0%	\$0
<b>Construction Total</b>		
<b>Other Direct Costs</b>		
Engineering Design (% of Construction Total)	10.0%	\$0
Permitting and Legal (% of Construction Total)	5.0%	\$0
Startup and Shakedown (% of Construction Total)	10.0%	\$0
Bonding and Insurance (% of Construction Total)	3.0%	\$0
Construction Oversight (% of Construction Total)	5.0%	\$0
Field and Laboratory Testing (% of Construction Total)	5.0%	\$0
Reporting (% of Construction Total)	10.0%	\$0
Escalation (% of Construction Total, Based on Mid 1998 Start)	15.0%	\$0
<b>Total Capital Cost</b>		

OPERATION AND MAINTENANCE				
Process Option	Annual O&M Cost	Process Option Service Time (yr)	Present Worth Factor	Process Option Present Worth
No Action	\$0	0.0	0.0000	\$0
<b>O&amp;M Subtotal</b>				
<b>Misc. O&amp;M Costs (% Annual O&amp;M Unless Otherwise Specified)</b>				
<i>See Global Cost Assumptions For Details on Calculations</i>				
No Action	21%	\$0	0.0	\$0
<b>Total Operation and Maintenance Costs</b>				

NET PRESENT WORTH	
Capital Costs	\$0
Operation and Maintenance Present Worth	\$0
<b>Total Alternative Cost</b>	

**Estimated Cost for SS016 (Remainder of Plume), Alternative 2**

<b>CAPITAL COSTS</b>				
Process Option	Quantity	Unit Cost	Percentage	Capital Cost
Institutional Controls	1	\$10,000	NA	\$10,000
Institutional Monitoring	1	\$0	NA	\$0
Reserved	1	\$0	NA	\$0
<b>Construction Subtotal</b>				<b>\$10,000</b>
Bid Contingencies (% of Construction Subtotal)			15.0%	\$1,500
Scope Contingencies (% of Construction Subtotal)			20.0%	\$2,000
<b>Construction Total</b>				<b>\$13,500</b>
<b>Other Direct Costs</b>				
Engineering Design (% of Construction Total)			10.0%	\$1,350
Permitting and Legal (% of Construction Total)			5.0%	\$675
Startup and Shakedown (% of Construction Total)			0.0%	\$0
Bonding and Insurance (% of Construction Total)			3.0%	\$405
Construction Oversight (% of Construction Total)			5.0%	\$675
Field and Laboratory Testing (% of Construction Total)			0.0%	\$0
Reporting (% of Construction Total)			0.0%	\$0
Escalation (% of Construction Total, Based on Mid 1998 Start)			15.0%	\$2,025
<b>Total Capital Cost</b>				<b>\$18,630</b>

<b>OPERATION AND MAINTENANCE</b>				
Process Option	Annual O&M Cost	Process Option Service Time (yr)	Present Worth Factor	Process Option Present Worth
Institutional Controls	\$0	193.0	19.9984	\$0
Institutional Monitoring	\$59,535	193.0	19.9984	\$1,190,603
Reserved	\$0	193.0	19.9984	\$0
<b>O&amp;M Subtotal</b>				<b>\$1,190,603</b>
<b>Min. O&amp;M Costs (% Annual O&amp;M Unless Otherwise Specified)</b>		<b>Percentage</b>		
<i>See Global Cost Assumptions For Details on Calculations</i>				
Institutional Controls	\$0	21%	19.9984	\$0
Institutional Monitoring	\$12,502	21%	19.9984	\$250,027
Reserved	\$0	21%	19.9984	\$0
<b>Total Operation and Maintenance Costs</b>				<b>\$1,440,630</b>

<b>NET PRESENT WORTH</b>	
Capital Costs	\$18,630
Operation and Maintenance Present Worth	\$1,440,630
<b>Total Alternative Cost</b>	<b>\$1,459,260</b>

### Estimated Cost for SS016 (Remainder of Plume), Alternative 3

CAPITAL COSTS				
Process Option	Quantity	Unit Cost	Percentage	Capital Cost
Horizontal Extraction Wells	10	\$55,000	NA	\$550,000
Influent Piping	1	\$1,728,000	NA	\$1,728,000
Filtration	1	\$27,500	NA	\$27,500
Ion Exchange	1	\$242,000	NA	\$242,000
Air Stripper	1	\$49,393	NA	\$49,393
Catalytic Oxidation	1	\$93,429	NA	\$93,429
Activated Carbon	1	\$26,958	NA	\$26,958
Effluent Piping	1	\$371	NA	\$371
Effluent Monitoring	1	\$0	NA	\$0
Utilities and Improvements	1	\$218,539	NA	\$218,539
Plume Monitoring	1	\$0	NA	\$0
<b>Construction Subtotal</b>				<b>\$2,934,199</b>
Bid Contingencies (% of Construction Subtotal)			15.0%	\$440,429
Scope Contingencies (% of Construction Subtotal)			20.0%	\$587,238
<b>Construction Total</b>				<b>\$3,961,867</b>
<b>Other Direct Costs</b>				
Engineering Design (% of Construction Total)			10.0%	\$396,386
Permitting and Legal (% of Construction Total)			5.0%	\$198,193
Startup and Shakedown (% of Construction Total)			10.0%	\$396,386
Bonding and Insurance (% of Construction Total)			3.0%	\$118,916
Construction Oversight (% of Construction Total)			5.0%	\$198,193
Field and Laboratory Testing (% of Construction Total)			5.0%	\$198,193
Reporting (% of Construction Total)			10.0%	\$396,386
Escalation (% of Construction Total, Based on Mid 1998 Start)			15.0%	\$594,578
<b>Total Capital Cost</b>				<b>\$6,461,086</b>

OPERATION AND MAINTENANCE					
Process Option	Annual O&M Cost	Process Option Service Time (yr)	Present Worth Factor	Present Worth	Process Option Present Worth
Horizontal Extraction Wells	\$10,000	193.0	19.9984	\$199,984	\$199,984
Influent Piping	\$0	193.0	19.9984	\$0	\$0
Filtration	\$810	193.0	19.9984	\$16,199	\$16,199
Ion Exchange	\$320,400	193.0	19.9984	\$6,407,479	\$6,407,479
Air Stripper	\$7,299	193.0	19.9984	\$145,968	\$145,968
Catalytic Oxidation	\$71,846	193.0	19.9984	\$1,436,803	\$1,436,803
Activated Carbon	\$67,094	193.0	19.9984	\$1,341,771	\$1,341,771
Effluent Piping	\$0	193.0	19.9984	\$0	\$0
Effluent Monitoring	\$27,195	193.0	19.9984	\$543,856	\$543,856
Utilities and Improvements	\$0	193.0	19.9984	\$0	\$0
Plume Monitoring	\$13,303	193.0	19.9984	\$266,038	\$266,038
<b>O&amp;M Subtotal</b>				<b>\$317,947</b>	<b>\$1,035,897</b>
<b>Misc. O&amp;M Costs (% Annual O&amp;M Unless Otherwise Specified)</b>					
See Global Cost Assumptions For Details on Calculations		Percentage			
Horizontal Extraction Wells	21%	\$2,100	193.0	19.9984	\$41,997
Influent Piping	21%	\$0	193.0	19.9984	\$0
Filtration	21%	\$170	193.0	19.9984	\$3,402
Ion Exchange	21%	\$67,284	193.0	19.9984	\$1,345,571
Air Stripper	21%	\$1,533	193.0	19.9984	\$30,653
Catalytic Oxidation	21%	\$15,088	193.0	19.9984	\$301,729
Activated Carbon	21%	\$14,090	193.0	19.9984	\$281,772
Effluent Piping	21%	\$0	193.0	19.9984	\$0
Effluent Monitoring	21%	\$5,711	193.0	19.9984	\$114,210
Plume Monitoring	21%	\$2,794	193.0	19.9984	\$55,868
<b>Total Operation and Maintenance Costs</b>				<b>\$5,255,197</b>	

NET PRESENT WORTH	
Capital Costs	\$6,461,086
Operation and Maintenance Present Worth	\$12,533,297
<b>Total Alternative Cost</b>	<b>\$18,994,384</b>

**Estimated Cost for SS016 (Remainder of Plume), Alternative 5**

<b>CAPITAL COSTS</b>				
Process Option	Quantity	Unit Cost	Percentage	Capital Cost
Horizontal Extraction Wells	10	\$55,000	NA	\$550,000
Influent Piping	1	\$1,728,000	NA	\$1,728,000
Filtration	1	\$27,500	NA	\$27,500
Ion Exchange	1	\$242,000	NA	\$242,000
Ultraviolet Oxidation	1	\$181,543	NA	\$181,543
Activated Carbon	1	\$26,958	NA	\$26,958
Effluent Piping	1	\$371	NA	\$371
Utilities and Improvements	1	\$218,539	NA	\$218,539
Effluent Monitoring	1	\$0	NA	\$0
Plume Monitoring	1	\$0	NA	\$0
<b>Construction Subtotal</b>				<b>\$2,974,913</b>
Bid Contingencies (% of Construction Subtotal)			15.0%	\$446,237
Scope Contingencies (% of Construction Subtotal)			20.0%	\$594,982
<b>Construction Total</b>				<b>\$4,016,132</b>
<b>Other Direct Costs</b>				
Engineering Design (% of Construction Total)			10.0%	\$401,613
Permitting and Legal (% of Construction Total)			5.0%	\$200,806
Startup and Shakedown (% of Construction Total)			10.0%	\$401,613
Bonding and Insurance (% of Construction Total)			3.0%	\$120,484
Construction Oversight (% of Construction Total)			5.0%	\$200,806
Field and Laboratory Testing (% of Construction Total)			5.0%	\$200,806
Reporting (% of Construction Total)			10.0%	\$401,613
Escalation (% of Construction Total, Based on Mid 1998 Start)			15.0%	\$602,419
<b>Total Capital Cost</b>				<b>\$6,548,392</b>

<b>OPERATION AND MAINTENANCE</b>					
Process Option	Annual O&M Cost	Process Option Service Time (yr)	Present Worth Factor	Process Option Present Worth	
Horizontal Extraction Wells	\$10,000	193.0	19.9984	\$199,984	
Influent Piping	\$0	193.0	19.9984	\$0	
Filtration	\$810	193.0	19.9984	\$16,199	
Ion Exchange	\$320,400	193.0	19.9984	\$6,407,479	
Ultraviolet Oxidation	\$116,667	193.0	19.9984	\$2,333,150	
Activated Carbon	\$67,094	193.0	19.9984	\$1,341,771	
Effluent Piping	\$0	193.0	19.9984	\$0	
Utilities and Improvements	\$0	193.0	19.9984	\$0	
Effluent Monitoring	\$27,195	193.0	19.9984	\$543,856	
Plume Monitoring	\$13,303	193.0	19.9984	\$266,038	
<b>O&amp;M Subtotal</b>		<b>\$55,469</b>		<b>\$1,108,476</b>	
<b>Alloc. O&amp;M Costs (% Annual O&amp;M Unless Otherwise Specified)</b>		<b>Percentage</b>			
<i>See Global Cost Assumptions For Details on Calculations</i>					
Horizontal Extraction Wells	21%	\$2,100	193.0	19.9984	\$41,997
Influent Piping	21%	\$0	193.0	19.9984	\$0
Filtration	21%	\$170	193.0	19.9984	\$3,402
Ion Exchange	21%	\$67,284	193.0	19.9984	\$1,345,571
Ultraviolet Oxidation	21%	\$24,500	193.0	19.9984	\$489,962
Activated Carbon	21%	\$14,090	193.0	19.9984	\$281,772
Effluent Piping	21%	\$0	193.0	19.9984	\$0
Utilities and Improvements	21%	\$0	193.0	19.9984	\$0
Effluent Monitoring	21%	\$5,711	193.0	19.9984	\$114,210
Plume Monitoring	21%	\$2,794	193.0	19.9984	\$55,868
<b>Total Operation and Maintenance Costs</b>				<b>\$13,441,256</b>	

<b>NET PRESENT WORTH</b>	
Capital Costs	\$6,546,292
Operation and Maintenance Present Worth	\$13,441,256
<b>Total Alternative Cost</b>	<b>\$19,987,548</b>

### Estimated Cost for SS016 (Remainder of Plume), Alternative 7

CAPITAL COSTS				
Process Option	Quantity	Unit Cost	Percentage	Capital Cost
Horizontal Extraction Wells	10	\$55,000	NA	\$550,000
Influent Piping	1	\$1,728,000	NA	\$1,728,000
Filtration	1	\$27,500	NA	\$27,500
Ion Exchange	1	\$242,000	NA	\$242,000
Activated Carbon Alt 7	1	\$1,455,732	NA	\$1,455,732
Effluent Piping	1	\$371	NA	\$371
Utilities and Improvements	1	\$218,539	NA	\$218,539
Effluent Monitoring	1	\$0	NA	\$0
Plume Monitoring	1	\$0	NA	\$0
<b>Construction Subtotal</b>				<b>\$4,221,141</b>
Bid Contingencies (% of Construction Subtotal)			15.0%	\$633,321
Scope Contingencies (% of Construction Subtotal)			20.0%	\$844,428
<b>Construction Total</b>				<b>\$5,698,890</b>
<b>Other Direct Costs</b>				
Engineering Design (% of Construction Total)			10.0%	\$569,889
Permitting and Legal (% of Construction Total)			5.0%	\$284,995
Startup and Shakedown (% of Construction Total)			10.0%	\$569,889
Bonding and Insurance (% of Construction Total)			3.0%	\$170,997
Construction Oversight (% of Construction Total)			5.0%	\$284,995
Field and Laboratory Testing (% of Construction Total)			5.0%	\$284,995
Reporting (% of Construction Total)			10.0%	\$569,889
Escalation (% of Construction Total, Based on Mid 1998 Start)			15.0%	\$854,984
<b>Total Capital Cost</b>				<b>\$9,290,823</b>

OPERATION AND MAINTENANCE					
Process Option	Annual O&M Cost	Process Option Service Time (yr)	Present Worth Factor	Process Option Present Worth	
Horizontal Extraction Wells	\$10,000	193.0	19.9984	\$199,984	
Influent Piping	\$0	193.0	19.9984	\$0	
Filtration	\$810	193.0	19.9984	\$16,199	
Ion Exchange	\$320,400	193.0	19.9984	\$6,407,479	
Activated Carbon Alt 7	\$3,398,801	193.0	19.9984	\$67,970,489	
Effluent Piping	\$0	193.0	19.9984	\$0	
Utilities and Improvements	\$0	193.0	19.9984	\$0	
Effluent Monitoring	\$27,195	193.0	19.9984	\$543,856	
Plume Monitoring	\$13,303	193.0	19.9984	\$266,038	
<b>O&amp;M Subtotal</b>				<b>\$74,404,004</b>	
Misc. O&M Costs (% Annual O&M Unless Otherwise Specified)		Percentage			
See Global Cost Assumptions For Details on Calculations					
Horizontal Extraction Wells	21%	\$2,100	193.0	19.9984	\$41,997
Influent Piping	21%	\$0	193.0	19.9984	\$0
Filtration	21%	\$170	193.0	19.9984	\$3,402
Ion Exchange	21%	\$67,284	193.0	19.9984	\$1,345,571
Activated Carbon Alt 7	21%	\$713,748	193.0	19.9984	\$14,273,803
Effluent Piping	21%	\$0	193.0	19.9984	\$0
Utilities and Improvements	21%	\$0	193.0	19.9984	\$0
Effluent Monitoring	21%	\$5,711	193.0	19.9984	\$114,210
Plume Monitoring	21%	\$2,794	193.0	19.9984	\$55,868
<b>Total Operation and Maintenance Costs</b>				<b>\$91,238,893</b>	

NET PRESENT WORTH	
Capital Costs	\$9,290,823
Operation and Maintenance Present Worth	\$91,238,893
<b>Total Alternative Cost</b>	<b>\$100,529,717</b>

## Cost Estimate Summary Sheet

### NEWIOU Feasibility Study, Travis AFB

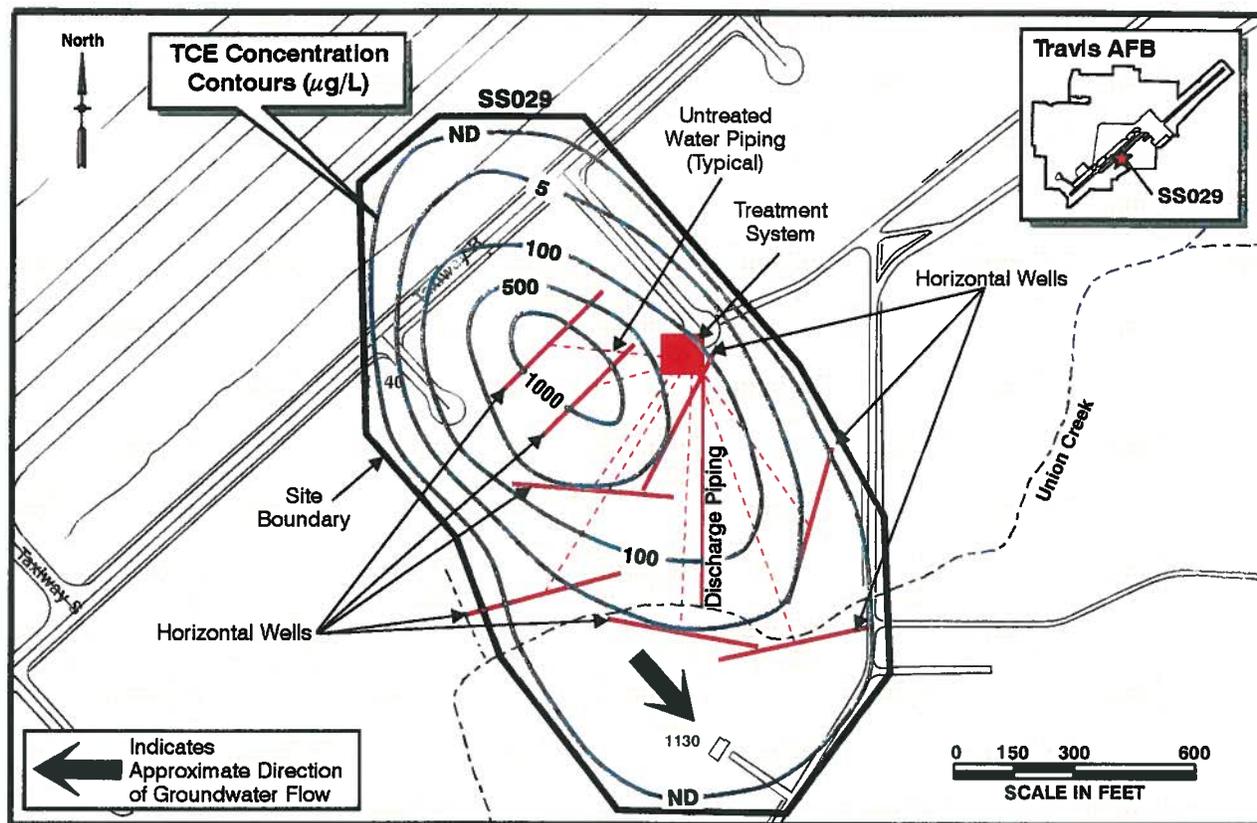
#### Process Option Summary for SS016 (Remainder of Plume)

#### Assumptions:

- 1 Use RACER/ENVEST cost estimating model, Version 3.1 when practical
- 2 Compute monitoring and O&M for one year only; add costs for subsequent years using Alternative Cost Summary Sheets.
- 3 Horizontal extraction wells are 300 feet in length.
- 4 Effluent and influent piping will be installed via horizontal drilling to avoid airfield operation disruptions - cost estimated at \$90/lf.

#### Cost Summary:

Item	Capital Cost	O&M Cost
Horizontal Extraction Wells	\$55,000	\$10,000
Influent Piping	\$1,728,000	\$0
Filtration	\$27,500	\$810
Ion Exchange	\$242,000	\$320,400
Air Stripper	\$49,393	\$7,299
Catalytic Oxidation	\$93,429	\$71,846
Ultraviolet Oxidation	\$181,543	\$116,667
Activated Carbon	\$26,958	\$67,094
Activated Carbon Alt 7	\$1,455,732	\$3,398,801
Effluent Piping	\$371	\$0
Utilities and Improvements	\$218,539	\$0
Clear and Grub	\$0	\$0
Electrical	\$7,745	\$0
Access Road	\$0	\$0
Communication Lines	\$620	\$0
Gas Service	\$1,595	\$0
Cleanup and Landscaping	\$1,150	\$0
Fencing	\$794	\$0
Well Power and Comm Lines	\$185,835	\$0
Control Panel	\$11,600	\$0
Surge Tank	\$7,700	\$0
Treatment Unit Pad	\$1,500	\$0
Institutional Controls	\$10,000	\$0
Plume Monitoring	\$0	\$13,303
Effluent Monitoring	\$0	\$27,195
Institutional Monitoring	\$0	\$59,535
Reserved	\$0	\$0



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#### **Site Characteristics**

- Open field is located between abandoned taxiway and Union Creek
- TCE in groundwater — 315 µg/L average, 1,300 µg/L maximum
- Estimated mass of dissolved VOCs equals 100 lb
- Depth to groundwater — 10 feet
- Depth to bedrock — 30 feet
- Top 10 feet of saturated alluvium is composed of clays and other low permeability material
- Bottom 10 feet of saturated alluvium is composed of sands and other moderate permeability material
- Site also included in Group M for soil contamination

#### **Treatment Alternatives**

- Alternative #4: Air Stripper/Catalytic Oxidation, Activated Carbon
- Alternative #6: UV Oxidation, Activated Carbon
- Alternative #8: Activated Carbon

#### **Design Assumptions**

- 8 horizontal wells, 300 feet in screened length
- Extraction rate 120 gpm total, 15 gpm from each well
- 3,550 feet of untreated water piping (from well to treatment system) — 1 inch ID, sch 80 PVC
- 600 feet of discharge piping (to Union Creek) — 3 inch ID, sch 80 PVC
- 350 feet from treatment system to existing power line
- 149 years to clean groundwater to MCLs, calculated using a contaminant transport model based on assumptions shown in Appendix C

*NOTE: The figure conceptually displays components for comparative purposes only. Actual layout may vary significantly from that shown and will be determined during the remedial design phase.*

**Figure B-12. Conceptual Design for SS029 (MW-329 Area) (Group E) Groundwater Treatment Alternatives, Travis AFB**

## Cost Summary for SS029 Alternatives

Alternative	Capital Costs	Operation and Maintenance Present Worth	Total
1	\$0	\$0	\$0
2	\$19,305	\$1,439,744	\$1,459,049
4	\$1,607,681	\$3,445,494	\$5,053,175
6	\$1,678,603	\$4,233,188	\$5,911,791
8	\$1,748,537	\$13,136,529	\$14,885,066

### Estimated Cost for SS029, Alternative 1

CAPITAL COSTS		
Process Option	Percentage	Capital Cost
No Action		\$0
<b>Construction Subtotal</b>		
Bid Contingencies (% of Construction Subtotal)	15.0%	\$0
Scope Contingencies (% of Construction Subtotal)	20.0%	\$0
<b>Construction Total</b>		
<b>Other Direct Costs</b>		
Engineering Design (% of Construction Total)	10.0%	\$0
Permitting and Legal (% of Construction Total)	5.0%	\$0
Startup and Shakedown (% of Construction Total)	10.0%	\$0
Bonding and Insurance (% of Construction Total)	3.0%	\$0
Construction Oversight (% of Construction Total)	5.0%	\$0
Field and Laboratory Testing (% of Construction Total)	5.0%	\$0
Reporting (% of Construction Total)	10.0%	\$0
Escalation (% of Construction Total, Based on Mid 1998 Start)	15.0%	\$0
<b>Total Capital Cost</b>		

OPERATION AND MAINTENANCE				
Process Option	Annual O&M Cost	Process Option Service Time (yr)	Present Worth Factor	Process Option Present Worth
No Action	\$0	0.0	0.0000	\$0
<b>O&amp;M Subtotal</b>				
\$0				
<b>Misc. O&amp;M Costs (% Annual O&amp;M Unless Otherwise Specified)</b>				
See Global Cost Assumptions for Details on Calculations				
No Action	21%	\$0	0.0	0.0000
<b>Total Operation and Maintenance Costs</b>				
\$0				

NET PRESENT WORTH	
Capital Costs	\$0
Operation and Maintenance Present Worth	\$0
<b>Total Alternative Cost</b>	
\$0	

**Estimated Cost for SS029, Alternative 2**

<b>CAPITAL COSTS</b>				
<b>Process Option</b>	<b>Quantity</b>	<b>Unit Cost</b>	<b>Percentage</b>	<b>Capital Cost</b>
Institutional Controls	1	\$10,000	NA	\$10,000
Institutional Monitoring	1	\$0	NA	\$0
Reserved	1	\$0	NA	\$0
<b>Construction Subtotal</b>				<b>\$10,000</b>
Bid Contingencies (% of Construction Subtotal)			15.0%	\$1,500
Scope Contingencies (% of Construction Subtotal)			20.0%	\$2,000
<b>Construction Total</b>				<b>\$13,500</b>
<b>Other Direct Costs</b>				
Engineering Design (% of Construction Total)			10.0%	\$1,350
Permitting and Legal (% of Construction Total)			5.0%	\$675
Startup and Shakedown (% of Construction Total)			0.0%	\$0
Bonding and Insurance (% of Construction Total)			3.0%	\$405
Construction Oversight (% of Construction Total)			0.0%	\$0
Field and Laboratory Testing (% of Construction Total)			0.0%	\$0
Reporting (% of Construction Total)			10.0%	\$1,350
Escalation (% of Construction Total, Based on Mid 1998 Start)			15.0%	\$2,025
<b>Total Capital Cost</b>				<b>\$19,305</b>

<b>OPERATION AND MAINTENANCE</b>					
<b>Process Option</b>	<b>Annual O&amp;M Cost</b>	<b>Process Option Service Time (Yrs)</b>	<b>Present Worth Factor</b>	<b>Process Option Present Worth</b>	
Institutional Controls	\$0	149.0	19.9861	\$0	
Institutional Monitoring	\$59,535	149.0	19.9861	\$1,189,871	
Reserved	\$0	149.0	19.9861	\$0	
<b>O&amp;M Subtotal</b>				<b>\$1,189,871</b>	
<b>Min. O&amp;M Costs (% Annual O&amp;M Unless Otherwise Specified)</b>		<b>Percentage</b>			
<i>See Global Cost Assumptions For Details on Calculations</i>					
Institutional Controls	21%	\$0	149.0	19.9861	\$0
Institutional Monitoring	21%	\$12,502	149.0	19.9861	\$249,873
Reserved	21%	\$0	149.0	19.9861	\$0
<b>Total Operation and Maintenance Cost</b>				<b>\$1,439,744</b>	

<b>NET PRESENT WORTH</b>	
Capital Costs	\$19,305
Operation and Maintenance Present Worth	\$1,439,744
<b>Total Alternative Cost</b>	<b>\$1,459,049</b>

**Estimated Cost for SS029, Alternative 4**

<b>CAPITAL COSTS</b>				
Process Option	Quantity	Unit Cost	Percentage	Capital Cost
Horizontal Extraction Wells	8	\$55,000	NA	\$440,000
Influent Piping	1	\$24,355	NA	\$24,355
Filtration	1	\$25,653	NA	\$25,653
Air Stripper	1	\$33,115	NA	\$33,115
Catalytic Oxidation	1	\$91,580	NA	\$91,580
Activated Carbon	1	\$26,958	NA	\$26,958
Effluent Piping	1	\$5,715	NA	\$5,715
Utilities and Improvements	1	\$83,222	NA	\$83,222
Effluent Monitoring	1	\$0	NA	\$0
Plume Monitoring	1	\$0	NA	\$0
<b>Construction Subtotal</b>				<b>\$726,878</b>
Bid Contingencies (% of Construction Subtotal)			15.0%	\$109,590
Scope Contingencies (% of Construction Subtotal)			20.0%	\$146,120
<b>Construction Total</b>				<b>\$982,588</b>
<b>Other Direct Costs</b>				
Engineering Design (% of Construction Total)			10.0%	\$98,631
Permitting and Legal (% of Construction Total)			5.0%	\$49,315
Startup and Shakedown (% of Construction Total)			10.0%	\$98,631
Bonding and Insurance (% of Construction Total)			3.0%	\$29,589
Construction Oversight (% of Construction Total)			5.0%	\$49,315
Field and Laboratory Testing (% of Construction Total)			5.0%	\$49,315
Reporting (% of Construction Total)			10.0%	\$98,631
Escalation (% of Construction Total, Based on Mid 1998 Start)			15.0%	\$147,946
<b>Total Capital Cost</b>				<b>\$1,607,664</b>

<b>OPERATION AND MAINTENANCE</b>					
Process Option	Annual O&M Cost	Process Option Service Time (Yrs)	Present Worth Factor	Present Worth	
Horizontal Extraction Wells	\$8,000	149.0	19.9861	\$159,889	
Influent Piping	\$0	149.0	19.9861	\$0	
Filtration	\$810	149.0	19.9861	\$16,189	
Air Stripper	\$6,286	149.0	19.9861	\$125,632	
Catalytic Oxidation	\$59,906	149.0	19.9861	\$1,197,286	
Activated Carbon	\$26,975	149.0	19.9861	\$539,124	
Effluent Piping	\$0	149.0	19.9861	\$0	
Utilities and Improvements	\$0	149.0	19.9861	\$0	
Effluent Monitoring	\$27,195	149.0	19.9861	\$543,521	
Plume Monitoring	\$13,303	149.0	19.9861	\$265,875	
<b>O&amp;M Subtotal</b>				<b>\$3,445,934</b>	
Misc. O&M Costs (% Annual O&M Unless Otherwise Specified)		Percentage			
See Global Cost Assumptions for Details on Calculations					
Horizontal Extraction Wells	21%	\$1,680	149.0	19.9861	\$33,577
Influent Piping	21%	\$0	149.0	19.9861	\$0
Filtration	21%	\$170	149.0	19.9861	\$3,400
Air Stripper	21%	\$1,320	149.0	19.9861	\$26,383
Catalytic Oxidation	21%	\$12,580	149.0	19.9861	\$251,430
Activated Carbon	21%	\$5,665	149.0	19.9861	\$113,216
Effluent Piping	21%	\$0	149.0	19.9861	\$0
Utilities and Improvements	21%	\$0	149.0	19.9861	\$0
Effluent Monitoring	21%	\$5,711	149.0	19.9861	\$114,139
Plume Monitoring	21%	\$2,794	149.0	19.9861	\$55,834
<b>Total Operation and Maintenance Costs</b>				<b>\$3,445,934</b>	

<b>NET PRESENT WORTH</b>	
Capital Costs	\$1,607,681
Operation and Maintenance Present Worth	\$3,445,494
<b>Total Alternative Cost</b>	<b>\$5,053,175</b>

Estimated Cost for SS029, Alternative 6

CAPITAL COSTS				
Process Option	Quantity	Unit Cost	Percentage	Capital Cost
Horizontal Extraction Wells	8	\$55,000	NA	\$440,000
Influent Piping	1	\$24,355	NA	\$24,355
Filtration	1	\$25,653	NA	\$25,653
Ultraviolet Oxidation	1	\$156,925	NA	\$156,925
Activated Carbon	1	\$26,958	NA	\$26,958
Effluent Piping	1	\$5,715	NA	\$5,715
Utilities and Improvements	1	\$83,222	NA	\$83,222
Effluent Monitoring	1	\$0	NA	\$0
Plume Monitoring	1	\$0	NA	\$0
<b>Construction Subtotal</b>				<b>\$762,818</b>
Bid Contingencies (% of Construction Subtotal)			15.0%	\$114,424
Scope Contingencies (% of Construction Subtotal)			20.0%	\$152,566
<b>Construction Total</b>				<b>\$1,029,808</b>
Other Direct Costs				
Engineering Design (% of Construction Total)			10.0%	\$102,982
Permitting and Legal (% of Construction Total)			5.0%	\$51,491
Startup and Shakedown (% of Construction Total)			10.0%	\$102,982
Bonding and Insurance (% of Construction Total)			3.0%	\$30,895
Construction Oversight (% of Construction Total)			5.0%	\$51,491
Field and Laboratory Testing (% of Construction Total)			5.0%	\$51,491
Reporting (% of Construction Total)			10.0%	\$102,982
Escalation (% of Construction Total, Based on Mid 1998 Start)			15.0%	\$154,473
<b>Total Capital Cost</b>				<b>\$1,471,443</b>

OPERATION AND MAINTENANCE					
Process Option	Annual O&M Cost	Process Option Service Time (Yr)	Present Worth Factor	Process Option Present Worth	
Horizontal Extraction Wells	\$8,000	149.0	19.9861	\$159,889	
Influent Piping	\$0	149.0	19.9861	\$0	
Filtration	\$810	149.0	19.9861	\$16,189	
Ultraviolet Oxidation	\$98,764	149.0	19.9861	\$1,973,905	
Activated Carbon	\$26,975	149.0	19.9861	\$539,124	
Effluent Piping	\$0	149.0	19.9861	\$0	
Utilities and Improvements	\$0	149.0	19.9861	\$0	
Effluent Monitoring	\$27,195	149.0	19.9861	\$543,521	
Plume Monitoring	\$13,303	149.0	19.9861	\$265,875	
<b>O&amp;M Subtotal</b>				<b>\$3,498,519</b>	
Misc. O&M Costs (% Annual O&M Unless Otherwise Specified)		Percentage			
See Global Cost Assumptions For Details on Calculations					
Horizontal Extraction Wells	21%	\$1,680	149.0	19.9861	\$33,577
Influent Piping	21%	\$0	149.0	19.9861	\$0
Filtration	21%	\$170	149.0	19.9861	\$3,400
Ultraviolet Oxidation	21%	\$20,740	149.0	19.9861	\$414,520
Activated Carbon	21%	\$5,665	149.0	19.9861	\$113,216
Effluent Piping	21%	\$0	149.0	19.9861	\$0
Utilities and Improvements	21%	\$0	149.0	19.9861	\$0
Effluent Monitoring	21%	\$5,711	149.0	19.9861	\$114,139
Plume Monitoring	21%	\$2,794	149.0	19.9861	\$55,834
<b>Total Operation and Maintenance Costs</b>				<b>\$4,233,188</b>	

NET PRESENT WORTH	
Capital Costs	\$1,678,603
Operation and Maintenance Present Worth	\$4,233,188
<b>Total Alternative Cost</b>	<b>\$5,911,791</b>

**Estimated Cost for SS029, Alternative 8**

<b>CAPITAL COSTS</b>				
Process Option	Quantity	Unit Cost	Percentage	Capital Cost
Horizontal Extraction Wells	8	\$55,000	NA	\$440,000
Influent Piping	1	\$24,355	NA	\$24,355
Filtration	1	\$25,653	NA	\$25,653
Activated Carbon Alt 8	1	\$215,664	NA	\$215,664
Effluent Piping	1	\$5,715	NA	\$5,715
Utilities and Improvements	1	\$83,222	NA	\$83,222
Effluent Monitoring	1	\$0	NA	\$0
Plume Monitoring	1	\$0	NA	\$0
<b>Construction Subtotal</b>				<b>\$794,609</b>
Bid Contingencies (% of Construction Subtotal)			15.0%	\$119,191
Scope Contingencies (% of Construction Subtotal)			20.0%	\$158,922
<b>Construction Total</b>				<b>\$1,072,722</b>
<b>Other Project Costs</b>				
Engineering Design (% of Construction Total)			10.0%	\$107,272
Permitting and Legal (% of Construction Total)			5.0%	\$53,636
Startup and Shakedown (% of Construction Total)			10.0%	\$107,272
Bonding and Insurance (% of Construction Total)			3.0%	\$32,182
Construction Oversight (% of Construction Total)			5.0%	\$53,636
Field and Laboratory Testing (% of Construction Total)			5.0%	\$53,636
Reporting (% of Construction Total)			10.0%	\$107,272
Escalation (% of Construction Total, Based on Mid 1998 Start)			15.0%	\$160,908
<b>Total Capital Cost</b>				<b>\$1,748,537</b>

<b>OPERATION AND MAINTENANCE</b>					
Process Option	Annual O&M Cost	Process Option Service Time (yr)	Present Worth Factor	Process Option Present Worth	
Horizontal Extraction Wells	\$8,000	149.0	19.9861	\$159,889	
Influent Piping	\$0	149.0	19.9861	\$0	
Filtration	\$810	149.0	19.9861	\$16,189	
Activated Carbon Alt 8	\$493,902	149.0	19.9861	\$9,871,162	
Effluent Piping	\$0	149.0	19.9861	\$0	
Utilities and Improvements	\$0	149.0	19.9861	\$0	
Effluent Monitoring	\$27,195	149.0	19.9861	\$543,521	
Plume Monitoring	\$13,303	149.0	19.9861	\$265,875	
<b>O&amp;M Subtotal</b>	<b>\$543,210</b>			<b>\$10,856,635</b>	
<b>Other O&amp;M Costs (% Annual O&amp;M Unless Otherwise Specified)</b>					
See Global Cost Assumptions For Details on Calculations					
Horizontal Extraction Wells	21%	\$1,680	149.0	19.9861	\$33,577
Influent Piping	21%	\$0	149.0	19.9861	\$0
Filtration	21%	\$170	149.0	19.9861	\$3,400
Activated Carbon Alt 8	21%	\$103,719	149.0	19.9861	\$2,072,944
Effluent Piping	21%	\$0	149.0	19.9861	\$0
Utilities and Improvements	21%	\$0	149.0	19.9861	\$0
Effluent Monitoring	21%	\$5,711	149.0	19.9861	\$114,139
Plume Monitoring	21%	\$2,794	149.0	19.9861	\$55,834
<b>Total Operation and Maintenance Costs</b>				<b>\$11,136,529</b>	

<b>NET PRESENT WORTH</b>	
Capital Costs	\$1,748,537
Operation and Maintenance Present Worth	\$13,136,529
<b>Total Alternative Cost</b>	<b>\$14,885,066</b>

SS029 Cost Summary Sheet

**Cost Estimate Summary Sheet**

**NEWIOU Feasibility Study, Travis AFB**

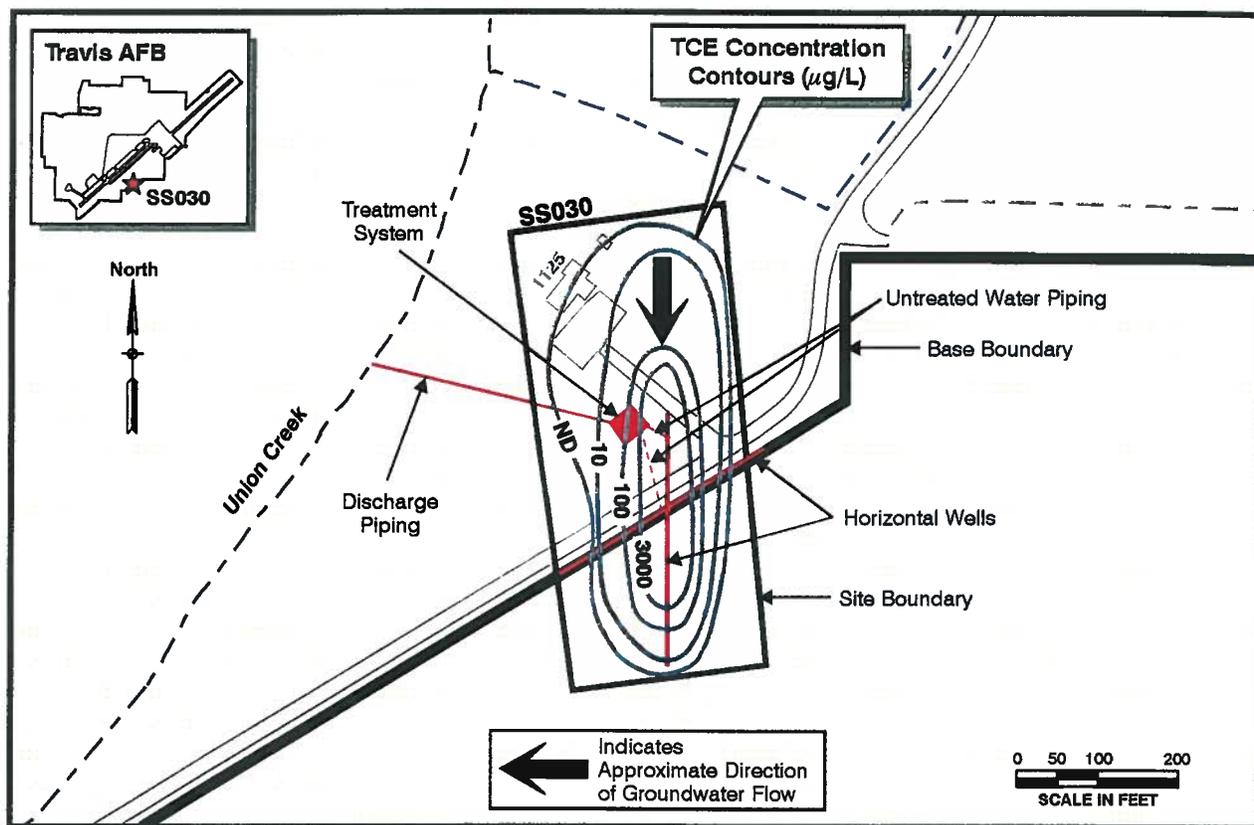
**Process Option Summary for SS029**

**Assumptions:**

- 1 Use RACER/ENVEST cost estimating model, Version 3.1 when practical
- 2 Compute monitoring and O&M for one year only; add costs for subsequent years using Alternative Cost Summary Sheets.
- 3 Horizontal extraction wells are 300 feet in length.

**Cost Summary:**

Item	Capital Cost	O&M Cost
Horizontal Extraction Wells	\$55,000	\$8,000
Influent Piping	\$24,355	\$0
Filtration	\$25,653	\$810
Air Stripper	\$33,115	\$6,286
Catalytic Oxidation	\$91,580	\$59,906
Ultraviolet Oxidation	\$156,925	\$98,764
Activated Carbon	\$26,958	\$26,975
Activated Carbon Alt 8	\$215,664	\$493,902
Effluent Piping	\$5,715	\$0
Utilities and Improvments	\$83,222	\$0
Clear and Grub	\$0	\$0
Electrical	\$9,777	\$0
Access Road	\$0	\$0
Communication Lines	\$3,922	\$0
Gas Service	\$4,301	\$0
Cleanup and Landscaping	\$1,150	\$0
Fencing	\$794	\$0
Well Power and Comm Lines	\$33,806	\$0
Control Panel	\$11,600	\$0
Surge Tank	\$7,700	\$0
Treatment Unit Pad	\$10,178	\$0
Institutional Controls	\$10,000	\$0
Plume Monitoring	\$0	\$13,303
Effluent Monitoring	\$0	\$27,195
Institutional Monitoring	\$0	\$59,535
Reserved	\$0	\$0



SS030ALT.CDR - VMG 7/25/98 SAC 1

#### **Site Characteristics**

- Approximately 25% of the area is covered by pavement or buildings
- TCE in groundwater — 958  $\mu\text{g/L}$  average, 3,860  $\mu\text{g/L}$  maximum
- Estimated mass of dissolved VOCs equals 18 lb; DNAPL may be present
- Nickel in groundwater — 903  $\mu\text{g/L}$  maximum
- Se and Ag were measured at concentrations greater than NPDES discharge limits in some monitoring wells
- Low permeability soils (clay and silt) to a depth of between 15 and 25 feet bgs
- More permeable materials (sands and silts) below 15 to 25 feet bgs
- Depth to groundwater — 10 feet
- Depth to bedrock — 25 feet
- Well pumping rates — MW-269 conventional pumping at 0.8 gpm, Two Phase Extraction at 3.7 gpm
- Site also included in Group M for soil contamination

#### **Treatment Alternatives**

- Alternative #3: Air Stripper/Catalytic Oxidation, Ion Exchange, Activated Carbon
- Alternative #5: UV Oxidation, Ion Exchange, Activated Carbon
- Alternative #7: Ion Exchange, Activated Carbon

#### **Design Assumptions**

- Two horizontal wells, 300 feet in screened length each
- Extraction rate 30 gpm total, 15 gpm from each well
- 150 feet of untreated water piping (from well to treatment system) — 1 inch ID, sch 80 PVC
- 350 feet of discharge piping (to Union Creek) — 1-½ inch ID, sch 80 PVC
- 100 feet from treatment system to existing power line
- 77 years to clean groundwater to MCLs, calculated using a contaminant transport model based on assumptions shown in Appendix C

**NOTE:** The figure conceptually displays components for comparative purposes only. Actual layout may vary significantly from that shown and will be determined during the remedial design phase.

**Figure B-13. Conceptual Design for SS030 (MW-269 Area) (Group F) Groundwater Treatment Alternatives, Travis AFB**

## Cost Summary for SS030 Alternatives

Alternative	Capital Costs	Operation and Maintenance Present Worth	Total
1	\$0	\$0	\$0
2	\$18,630	\$1,407,095	\$1,425,725
3	\$656,803	\$2,079,693	\$2,736,496
5	\$729,279	\$2,566,781	\$3,296,060
7	\$492,811	\$1,528,979	\$2,021,790

## Estimated Cost for SS030, Alternative 1

CAPITAL COSTS		
Process Option	Percentage	Capital Cost
No Action		\$0
<b>Construction Subtotal</b>		
Bid Contingencies (% of Construction Subtotal)	15.0%	\$0
Scope Contingencies (% of Construction Subtotal)	20.0%	\$0
<b>Construction Total</b>		
<b>Other Direct Costs</b>		
Engineering Design (% of Construction Total)	10.0%	\$0
Permitting and Legal (% of Construction Total)	5.0%	\$0
Startup and Shakedown (% of Construction Total)	10.0%	\$0
Bonding and Insurance (% of Construction Total)	3.0%	\$0
Construction Oversight (% of Construction Total)	5.0%	\$0
Field and Laboratory Testing (% of Construction Total)	5.0%	\$0
Reporting (% of Construction Total)	10.0%	\$0
Escalation (% of Construction Total, Based on Mid 1998 Start)	15.0%	\$0
<b>Total Capital Cost</b>		

OPERATION AND MAINTENANCE				
Process Option	Annual O&M Cost	Process Option Service Time (yr)	Present Worth Factor	Process Option Present Worth
No Action	\$0	0.0	0.0000	\$0
<b>O&amp;M Subtotal</b>		<b>\$0</b>		<b>\$0</b>
<b>Misc. O&amp;M Costs (% Annual O&amp;M Unless Otherwise Specified)</b>		<b>Percentage</b>		
See Global Cost Assumptions For Details on Calculations				
No Action	21%	\$0	0.0	0.0000
<b>Total Operation and Maintenance Costs</b>				

NET PRESENT WORTH	
Capital Costs	\$0
Operation and Maintenance Present Worth	\$0
<b>Total Alternative Cost</b>	<b>\$0</b>

## Estimated Cost for SS030, Alternative 2

CAPITAL COSTS				
Process Option	Quantity	Unit Cost	Percentage	Capital Cost
Institutional Controls	1	\$10,000	NA	\$10,000
Institutional Monitoring	1	\$0	NA	\$0
Reserved	1	\$0	NA	\$0
<b>Construction Subtotal</b>				<b>\$10,000</b>
Bid Contingencies (% of Construction Subtotal)			15.0%	\$1,500
Scope Contingencies (% of Construction Subtotal)			20.0%	\$2,000
<b>Construction Total</b>				<b>\$13,500</b>
Other Direct Costs				
Engineering Design (% of Construction Total)			10.0%	\$1,350
Permitting and Legal (% of Construction Total)			5.0%	\$675
Startup and Shakedown (% of Construction Total)			0.0%	\$0
Bonding and Insurance (% of Construction Total)			3.0%	\$405
Construction Oversight (% of Construction Total)			5.0%	\$675
Field and Laboratory Testing (% of Construction Total)			0.0%	\$0
Reporting (% of Construction Total)			0.0%	\$0
Escalation (% of Construction Total, Based on Mid 1998 Start)			15.0%	\$2,025
<b>Total Capital Cost</b>				<b>\$18,630</b>

OPERATION AND MAINTENANCE				
Process Option	Annual O&M Cost	Process Option Service Time (Yr)	Present Worth Factor	Process Option Present Worth
Institutional Controls	\$0	77.0	19.5329	\$0
Institutional Monitoring	\$59,535	77.0	19.5329	\$1,162,888
Reserved	\$0	77.0	19.5329	\$0
<b>O&amp;M Subtotal</b>				<b>\$1,162,888</b>
Misc. O&M Costs (% Annual O&M Unless Otherwise Specified)	Percentage			
<i>See Global Cost Assumptions For Details on Calculations</i>				
Institutional Controls	21%	\$0	77.0	\$0
Institutional Monitoring	21%	\$12,502	77.0	\$244,207
Reserved	21%	\$0	77.0	\$0
<b>Total Operation and Maintenance Costs</b>				<b>\$1,407,095</b>

NEED-BASED ALTERNATIVE COSTS	
Capital Costs	\$18,630
Operation and Maintenance Present Worth	\$1,407,095
<b>Total Alternative Cost</b>	<b>\$1,425,725</b>

**Estimated Cost for SS030, Alternative 3**

<b>CAPITAL COSTS</b>				
Process Option	Quantity	Unit Cost	Percentage	Capital Cost
Horizontal Extraction Wells	2	\$55,000	NA	\$110,000
Influent Piping	1	\$1,015	NA	\$1,015
Filtration	1	\$13,523	NA	\$13,523
Ion Exchange	1	\$35,500	NA	\$35,500
Air Stripper	1	\$23,534	NA	\$23,534
Catalytic Oxidation	1	\$50,990	NA	\$50,990
Activated Carbon	1	\$6,457	NA	\$6,457
Effluent Piping	1	\$2,734	NA	\$2,734
Utilities and Improvements	1	\$54,726	NA	\$54,726
Effluent Monitoring	1	\$0	NA	\$0
Plume Monitoring	1	\$0	NA	\$0
<b>Construction Subtotal</b>				<b>\$398,479</b>
Bid Contingencies (% of Construction Subtotal)			15.0%	\$44,772
Scope Contingencies (% of Construction Subtotal)			20.0%	\$59,696
<b>Construction Total</b>				<b>\$402,947</b>
<b>Other Direct Costs</b>				
Engineering Design (% of Construction Total)			10.0%	\$40,295
Permitting and Legal (% of Construction Total)			5.0%	\$20,147
Startup and Shakedown (% of Construction Total)			10.0%	\$40,295
Bonding and Insurance (% of Construction Total)			3.0%	\$12,088
Construction Oversight (% of Construction Total)			5.0%	\$20,147
Field and Laboratory Testing (% of Construction Total)			5.0%	\$20,147
Reporting (% of Construction Total)			10.0%	\$40,295
Escalation (% of Construction Total, Based on Mid 1998 Start)			15.0%	\$60,442
<b>Total Capital Cost</b>				<b>\$463,389</b>

<b>OPERATION AND MAINTENANCE</b>				
Process Option	Annual O&M Cost	Process Option Service Time (yr)	Present Worth Factor	Process Option Present Worth
Horizontal Extraction Wells	\$2,000	77.0	19.5329	\$39,066
Influent Piping	\$0	77.0	19.5329	\$0
Filtration	\$810	77.0	19.5329	\$15,822
Ion Exchange	\$10,200	77.0	19.5329	\$199,235
Air Stripper	\$5,375	77.0	19.5329	\$104,989
Catalytic Oxidation	\$24,094	77.0	19.5329	\$470,625
Activated Carbon	\$5,016	77.0	19.5329	\$97,977
Effluent Piping	\$0	77.0	19.5329	\$0
Utilities and Improvements	\$0	77.0	19.5329	\$0
Effluent Monitoring	\$27,195	77.0	19.5329	\$531,196
Plume Monitoring	\$13,303	77.0	19.5329	\$259,846
<b>O&amp;M Subtotal</b>	<b>\$47,993</b>			<b>\$1,716,756</b>
<b>Min. O&amp;M Costs (% Annual O&amp;M Unless Otherwise Specified)</b>		<b>Percentage</b>		
<i>See Global Cost Assumptions For Details on Calculations</i>				
Horizontal Extraction Wells	21%	\$420	77.0	\$8,204
Influent Piping	21%	\$0	77.0	\$0
Filtration	21%	\$170	77.0	\$3,323
Ion Exchange	21%	\$2,142	77.0	\$41,839
Air Stripper	21%	\$1,129	77.0	\$22,048
Catalytic Oxidation	21%	\$5,060	77.0	\$98,831
Activated Carbon	21%	\$1,053	77.0	\$20,575
Effluent Piping	21%	\$0	77.0	\$0
Utilities and Improvements	21%	\$0	77.0	\$0
Effluent Monitoring	21%	\$5,711	77.0	\$111,551
Plume Monitoring	21%	\$2,794	77.0	\$54,568
<b>Total Operation and Maintenance Costs</b>				<b>\$2,772,625</b>

<b>NET PRESENT WORTH</b>	
Capital Costs	\$656,803
Operation and Maintenance Present Worth	\$2,079,693
<b>Total Alternative Cost</b>	<b>\$2,736,496</b>

**Estimated Cost for SS030, Alternative 5**

<b>CAPITAL COSTS</b>				
Process Option	Quantity	Unit Cost	Percentage	Capital Cost
Horizontal Extraction Wells	2	\$55,000	NA	\$110,000
Influent Piping	1	\$1,015	NA	\$1,015
Filtration	1	\$13,523	NA	\$13,523
Ion Exchange	1	\$35,500	NA	\$35,500
Ultraviolet Oxidation	1	\$107,460	NA	\$107,460
Activated Carbon	1	\$6,457	NA	\$6,457
Effluent Piping	1	\$2,734	NA	\$2,734
Utilities and Improvements	1	\$54,726	NA	\$54,726
Effluent Monitoring	1	\$0	NA	\$0
Plume Monitoring	1	\$0	NA	\$0
<b>Construction Subtotal</b>				<b>\$331,415</b>
Bid Contingencies (% of Construction Subtotal)			15.0%	\$49,712
Scope Contingencies (% of Construction Subtotal)			20.0%	\$66,283
<b>Construction Total</b>				<b>\$447,410</b>
<b>Other Direct Costs</b>				
Engineering Design (% of Construction Total)			10.0%	\$44,741
Permitting and Legal (% of Construction Total)			5.0%	\$22,371
Startup and Shakedown (% of Construction Total)			10.0%	\$44,741
Bonding and Insurance (% of Construction Total)			3.0%	\$13,422
Construction Oversight (% of Construction Total)			5.0%	\$22,371
Field and Laboratory Testing (% of Construction Total)			5.0%	\$22,371
Reporting (% of Construction Total)			10.0%	\$44,741
Escalation (% of Construction Total, Based on Mid 1998 Start)			15.0%	\$67,112
<b>Total Capital Cost</b>				<b>\$729,279</b>

<b>OPERATION AND MAINTENANCE</b>					
Process Option	Annual O&M Cost	Process Option Service Time (yr)	Present Worth Factor	Process Option Present Worth	
Horizontal Extraction Wells	\$2,000	77.0	19.5329	\$39,066	
Influent Piping	\$0	77.0	19.5329	\$0	
Filtration	\$810	77.0	19.5329	\$15,822	
Ion Exchange	\$10,200	77.0	19.5329	\$199,235	
Ultraviolet Oxidation	\$50,078	77.0	19.5329	\$978,166	
Activated Carbon	\$5,016	77.0	19.5329	\$97,977	
Effluent Piping	\$0	77.0	19.5329	\$0	
Utilities and Improvements	\$0	77.0	19.5329	\$0	
Effluent Monitoring	\$27,195	77.0	19.5329	\$531,196	
Plume Monitoring	\$13,303	77.0	19.5329	\$259,846	
<b>O&amp;M Subtotal</b>				<b>\$2,191,079</b>	
Misc. O&M Costs (% Annual O&M Unless Otherwise Specified)		Percentage			
<i>See Global Cost Assumptions For Details on Calculations</i>					
Horizontal Extraction Wells	21%	\$420	77.0	19.5329	\$8,204
Influent Piping	21%	\$0	77.0	19.5329	\$0
Filtration	21%	\$170	77.0	19.5329	\$3,323
Ion Exchange	21%	\$2,142	77.0	19.5329	\$41,839
Ultraviolet Oxidation	21%	\$10,516	77.0	19.5329	\$205,415
Activated Carbon	21%	\$1,053	77.0	19.5329	\$20,575
Effluent Piping	21%	\$0	77.0	19.5329	\$0
Utilities and Improvements	21%	\$0	77.0	19.5329	\$0
Effluent Monitoring	21%	\$5,711	77.0	19.5329	\$111,551
Plume Monitoring	21%	\$2,794	77.0	19.5329	\$54,568
<b>Total Operation and Maintenance Costs</b>				<b>\$2,566,781</b>	

<b>NET PRESENT WORTH</b>	
Capital Costs	\$729,279
Operation and Maintenance Present Worth	\$2,566,781
<b>Total Alternative Cost</b>	<b>\$3,296,060</b>

**Estimated Cost for SS030, Alternative 7**

<b>CAPITAL COSTS</b>				
Process Option	Quantity	Unit Cost	Percentage	Capital Cost
Horizontal Extraction Wells	2	\$55,000	NA	\$110,000
Influent Piping	1	\$1,015	NA	\$1,015
Filtration	1	\$13,523	NA	\$13,523
Ion Exchange	1	\$35,500	NA	\$35,500
Activated Carbon Alt 7	1	\$6,456	NA	\$6,456
Effluent Piping	1	\$2,734	NA	\$2,734
Utilities and Improvements	1	\$54,726	NA	\$54,726
Effluent Monitoring	1	\$0	NA	\$0
Plume Monitoring	1	\$0	NA	\$0
<b>Construction Subtotal</b>				<b>\$245,954</b>
Bid Contingencies (% of Construction Subtotal)			15.0%	\$33,593
Scope Contingencies (% of Construction Subtotal)			20.0%	\$44,791
<b>Construction Total</b>				<b>\$324,338</b>
<b>Other Direct Costs</b>				
Engineering Design (% of Construction Total)			10.0%	\$30,234
Permitting and Legal (% of Construction Total)			5.0%	\$15,117
Startup and Shakedown (% of Construction Total)			10.0%	\$30,234
Bonding and Insurance (% of Construction Total)			3.0%	\$9,070
Construction Oversight (% of Construction Total)			5.0%	\$15,117
Field and Laboratory Testing (% of Construction Total)			5.0%	\$15,117
Reporting (% of Construction Total)			10.0%	\$30,234
Escalation (% of Construction Total, Based on Mid 1998 Start)			15.0%	\$45,351
<b>Total Capital Cost</b>				<b>\$492,811</b>

<b>OPERATION AND MAINTENANCE</b>					
Process Option	Annual O&M Cost	Process Option Service Time (yr)	Present Worth Factor	Process Option Present Worth	
Horizontal Extraction Wells	\$2,000	77.0	19.5329	\$39,066	
Influent Piping	\$0	77.0	19.5329	\$0	
Filtration	\$810	77.0	19.5329	\$15,822	
Ion Exchange	\$10,200	77.0	19.5329	\$199,235	
Activated Carbon Alt 7	\$11,184	77.0	19.5329	\$218,455	
Effluent Piping	\$0	77.0	19.5329	\$0	
Utilities and Improvements	\$0	77.0	19.5329	\$0	
Effluent Monitoring	\$27,195	77.0	19.5329	\$531,196	
Plume Monitoring	\$13,303	77.0	19.5329	\$259,846	
<b>O&amp;M Subtotal</b>	<b>\$44,592</b>			<b>\$1,248,619</b>	
<b>Misc. O&amp;M Costs (% Annual O&amp;M Unless Otherwise Specified)</b>					
See Global Cost Assumptions For Details on Calculations					
Horizontal Extraction Wells	21%	\$420	77.0	19.5329	\$8,204
Influent Piping	21%	\$0	77.0	19.5329	\$0
Filtration	21%	\$170	77.0	19.5329	\$3,323
Ion Exchange	21%	\$2,142	77.0	19.5329	\$41,839
Activated Carbon Alt 7	21%	\$2,349	77.0	19.5329	\$45,876
Effluent Piping	21%	\$0	77.0	19.5329	\$0
Utilities and Improvements	21%	\$0	77.0	19.5329	\$0
Effluent Monitoring	21%	\$5,711	77.0	19.5329	\$111,551
Plume Monitoring	21%	\$2,794	77.0	19.5329	\$54,568
<b>Total Operation and Maintenance Costs</b>				<b>\$1,528,979</b>	

<b>NET PRESENT WORTH</b>	
Capital Costs	\$492,811
Operation and Maintenance Present Worth	\$1,528,979
<b>Total Alternative Cost</b>	<b>\$2,021,790</b>

SS030 Cost Summary Sheet

Cost Estimate Summary Sheet

NEWIOU Feasibility Study, Travis AFB

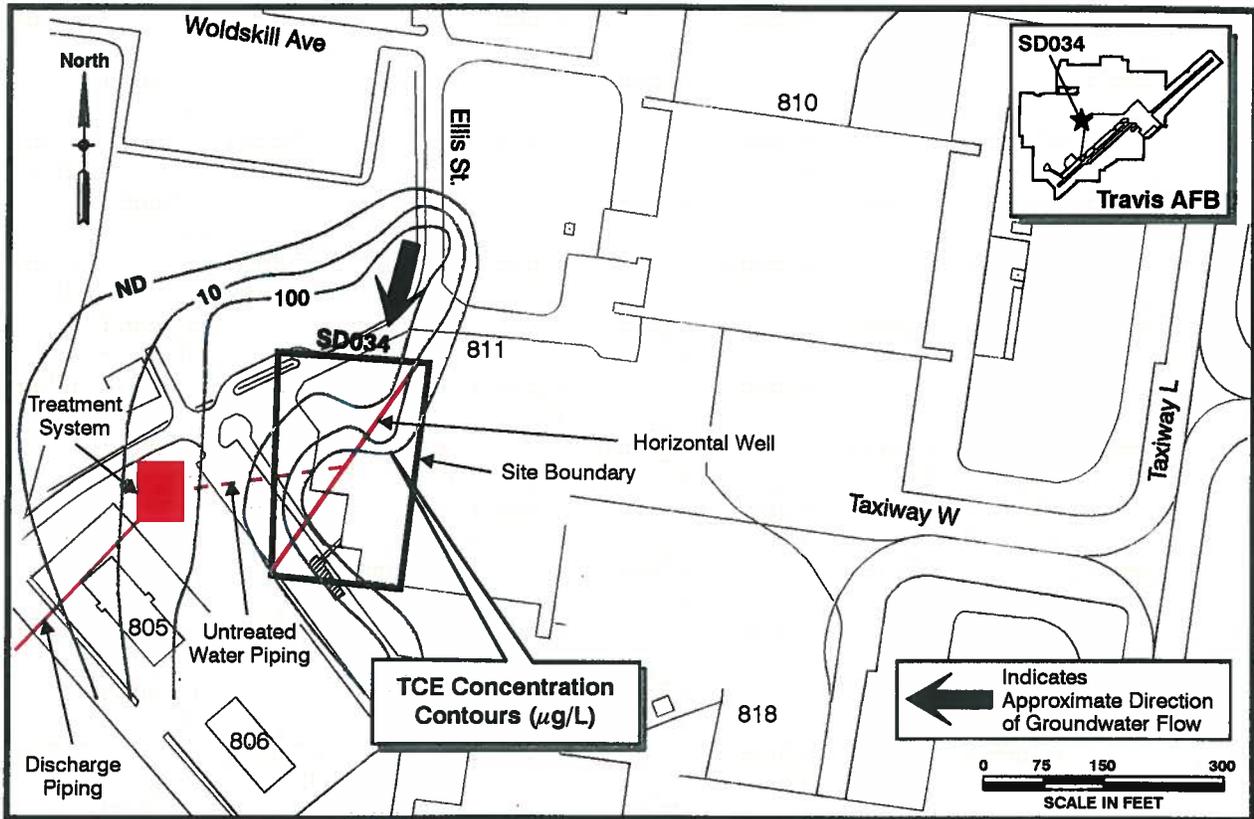
Process Option Summary for SS030

Assumptions:

- 1 Use RACER/ENVEST cost estimating model, Version 3.1 when practical
- 2 Compute monitoring and O&M for one year, only; add costs for subsequent years using Alternative Cost Summary Sheets.
- 3 Horizontal extraction wells are 300 feet in length.

Cost Summary:

Item	Capital Cost	O&M Cost
Horizontal Extraction Wells	\$55,000	\$2,000
Influent Piping	\$1,015	\$0
Filtration	\$13,523	\$810
Ion Exchange	\$35,500	\$10,200
Air Stripper	\$23,534	\$5,375
Catalytic Oxidation	\$50,990	\$24,094
Ultraviolet Oxidation	\$107,460	\$50,078
Activated Carbon	\$6,457	\$5,016
Activated Carbon Alt 7	\$6,456	\$11,184
Effluent Piping	\$2,734	\$0
Utilities and Improvements	\$54,726	\$0
Clear and Grub	\$5,702	\$0
Electrical	\$9,960	\$0
Access Road	\$3,456	\$0
Communication Lines	\$1,191	\$0
Gas Service	\$1,595	\$0
Cleanup and Landscaping	\$1,150	\$0
Fencing	\$794	\$0
Well Power and Comm Lines	\$1,400	\$0
Control Panel	\$11,600	\$0
Surge Tank	\$7,700	\$0
Treatment Unit Pad	\$10,178	\$0
Institutional Controls	\$10,000	\$0
Plume Monitoring	\$0	\$13,303
Effluent Monitoring	\$0	\$27,195
Institutional Monitoring	\$0	\$59,535
Reserved	\$0	\$0



SD034GW.CDR - VMG 4/11/96 SAC 1

#### **Site Characteristics**

- Includes an indoor washrack, an oil/water separator, and a concrete-lined overflow pond
- Approximately 75% of the area is covered with roadbase and asphalt
- DCE in groundwater — 80 µg/L average, 496 µg/L maximum
- TCE in groundwater — 120 µg/L average, 740 µg/L maximum
- TPH in groundwater — 5,000,000 µg/L average, 10,500,000 µg/L maximum, floating TPH (PD680) is present
- Estimated mass of dissolved VOCs equals 9.6 lb
- Chromium and mercury were measured at concentrations greater than NPDES limits
- Site is adjacent to SD037 — groundwater plumes are mixed
- Depth to groundwater — 13 feet
- Depth to bedrock — 16 feet
- Site also included in Group Q for soil contamination

#### **Treatment Alternatives**

- Alternative #3: Air Stripper/Catalytic Oxidation, Ion Exchange, Activated Carbon
- Alternative #5: UV Oxidation, Ion Exchange, Activated Carbon
- Alternative #7: Ion Exchange, Activated Carbon
- Alternative #9: Bioslurping, Recovered Product Recycling, Off-gas Catalytic Oxidation

#### **Design Assumptions**

- 1 horizontal well, 300 feet in screened length
- Extraction rate 15 gpm
- 210 feet of untreated water piping (from well to treatment system) — 1 inch ID, sch 80 PVC
- 240 feet of discharge piping — 1 inch ID, sch 80 PVC
- 100 feet from treatment system to existing power line
- 60 years to clean groundwater to MCLs is calculated using a contaminant transport model based on assumptions shown in Appendix C
- Bioslurping: 1 vertical well, 400 gpd water, 4 gpd TPH, 20 scfm air

*NOTE: The figure conceptually displays components for comparative purposes only. Actual layout may vary significantly from that shown and will be determined during the remedial design phase.*

**Figure B-14.**

**Conceptual Design for SD034 (Group G) Groundwater Treatment Alternatives, Travis AFB**

## Cost Summary for SD034 Alternatives

Alternative	Capital Costs	Operation and Maintenance Present Worth	Total
1	\$0	\$0	\$0
2	\$18,630	\$1,363,616	\$1,382,246
3	\$487,078	\$1,629,033	\$2,116,111
5	\$570,035	\$2,061,926	\$2,631,962
7	\$376,481	\$1,493,828	\$1,870,309
9	\$267,216	\$74,499	\$341,715

**Estimated Cost for SD034, Alternative 1**

<b>CAPITAL COSTS</b>		
Process Option	Percentage	Capital Cost
No Action		\$0
<b>Construction Subtotal</b>		
Bid Contingencies (% of Construction Subtotal)	15.0%	\$0
Scope Contingencies (% of Construction Subtotal)	20.0%	\$0
<b>Construction Total</b>		
<b>Other Direct Costs</b>		
Engineering Design (% of Construction Total)	10.0%	\$0
Permitting and Legal (% of Construction Total)	5.0%	\$0
Startup and Shakedown (% of Construction Total)	10.0%	\$0
Bonding and Insurance (% of Construction Total)	3.0%	\$0
Construction Oversight (% of Construction Total)	5.0%	\$0
Field and Laboratory Testing (% of Construction Total)	5.0%	\$0
Reporting (% of Construction Total)	10.0%	\$0
Escalation (% of Construction Total, Based on Mid 1998 Start)	15.0%	\$0
<b>Total Capital Cost</b>		
		\$0

<b>OPERATION AND MAINTENANCE</b>				
Process Option	Annual O&M Cost	Process Option Service Time (yr)	Present Worth Factor	Process Option Present Worth
No Action	\$0	0.0	0.0000	\$0
<b>O&amp;M Subtotal</b>				\$0
<b>Misc. O&amp;M Costs (% Annual O&amp;M Unless Otherwise Specified)</b>		<b>Percentage</b>		
See Global Cost Assumptions For Details on Calculations				
No Action		21%	\$0	0.0
<b>Total Operation and Maintenance Costs</b>				\$0

<b>NET PRESENT WORTH</b>	
Capital Costs	\$0
Operation and Maintenance Present Worth	\$0
<b>Total Alternative Cost</b>	
	\$0

Estimated Cost for SD034, Alternative 2

CAPITAL COSTS				
Process Option	Quantity	Unit Cost	Percentage	Capital Cost
Institutional Controls	1	\$10,000	NA	\$10,000
Institutional Monitoring	1	\$0	NA	\$0
Reserved	1	\$0	NA	\$0
<b>Construction Subtotal</b>				<b>\$10,000</b>
Bid Contingencies (% of Construction Subtotal)			15.0%	\$1,500
Scope Contingencies (% of Construction Subtotal)			20.0%	\$2,000
<b>Construction Total</b>				<b>\$13,500</b>
Other Direct Costs				
Engineering Design (% of Construction Total)			10.0%	\$1,350
Permitting and Legal (% of Construction Total)			5.0%	\$675
Startup and Shakedown (% of Construction Total)			0.0%	\$0
Bonding and Insurance (% of Construction Total)			3.0%	\$405
Construction Oversight (% of Construction Total)			5.0%	\$675
Field and Laboratory Testing (% of Construction Total)			0.0%	\$0
Reporting (% of Construction Total)			0.0%	\$0
Escalation (% of Construction Total, Based on Mid 1998 Start)			15.0%	\$2,025
<b>Total Capital Cost</b>				<b>\$18,630</b>

OPERATION AND MAINTENANCE				
Process Option	Annual O&M Cost	Process Option Service Time (Yr)	Present Worth Factor	Process Option Present Worth
Institutional Controls	\$0	60.0	18.9293	\$0
Institutional Monitoring	\$59,535	60.0	18.9293	\$1,126,955
Reserved	\$0	60.0	18.9293	\$0
<b>O&amp;M Subtotal</b>				<b>\$1,126,955</b>
Misc. O&M Costs (% Annual O&M Unless Otherwise Specified)		Percentage	See Global Cost Assumptions For Details on Calculations	
Institutional Controls	21%	\$0	60.0	18.9293
Institutional Monitoring	21%	\$12,502	60.0	18.9293
Reserved	21%	\$0	60.0	18.9293
<b>Total Operation and Maintenance Costs</b>				<b>\$1,363,616</b>

NET PRESENT WORTH	
Capital Costs	\$18,630
Operation and Maintenance Present Worth	\$1,363,616
<b>Total Alternative Cost</b>	<b>\$1,382,246</b>

Estimated Cost for SD034, Alternative 3

CAPITAL COSTS				
Process Option	Quantity	Unit Cost	Percentage	Capital Cost
Horizontal Extraction Wells	1	\$55,000	NA	\$55,000
Influent Piping	1	\$3,739	NA	\$3,739
Filtration	1	\$13,445	NA	\$13,445
Oil/Water Separator	1	\$13,844	NA	\$13,844
Ion Exchange	1	\$23,700	NA	\$23,700
Air Stripper	1	\$22,466	NA	\$22,466
Catalytic Oxidation	1	\$36,078	NA	\$36,078
Activated Carbon	1	\$4,142	NA	\$4,142
Effluent Piping	1	\$4,233	NA	\$4,233
Utilities and Improvements	1	\$44,702	NA	\$44,702
Effluent Monitoring	1	\$0	NA	\$0
Plume Monitoring	1	\$0	NA	\$0
<b>Construction Subtotal</b>				<b>\$221,509</b>
Bid Contingencies (% of Construction Subtotal)			15.0%	\$33,202
Scope Contingencies (% of Construction Subtotal)			20.0%	\$44,270
<b>Construction Total</b>				<b>\$299,981</b>
Other Direct Costs				
Engineering Design (% of Construction Total)			10.0%	\$29,882
Permitting and Legal (% of Construction Total)			5.0%	\$14,941
Startup and Shakedown (% of Construction Total)			10.0%	\$29,882
Bonding and Insurance (% of Construction Total)			3.0%	\$8,965
Construction Oversight (% of Construction Total)			5.0%	\$14,941
Field and Laboratory Testing (% of Construction Total)			5.0%	\$14,941
Reporting (% of Construction Total)			10.0%	\$29,882
Escalation (% of Construction Total, Based on Mid 1998 Start)			15.0%	\$44,823
<b>Total Capital Cost</b>				<b>\$487,078</b>

OPERATION AND MAINTENANCE					
Process Option	Annual O&M Cost	Process Option Service Time (yr)	Present Worth Factor	Present Worth	Process Option Present Worth
Horizontal Extraction Wells	\$1,000	60.0	18.9293	\$18,929	\$18,929
Influent Piping	\$0	60.0	18.9293	\$0	\$0
Filtration	\$810	60.0	18.9293	\$15,333	\$15,333
Oil/Water Separator	\$50	60.0	18.9293	\$946	\$946
Ion Exchange	\$2,400	60.0	18.9293	\$45,430	\$45,430
Air Stripper	\$5,004	60.0	18.9293	\$94,722	\$94,722
Catalytic Oxidation	\$18,124	60.0	18.9293	\$343,074	\$343,074
Activated Carbon	\$3,237	60.0	18.9293	\$61,274	\$61,274
Effluent Piping	\$0	60.0	18.9293	\$0	\$0
Utilities and Improvements	\$0	60.0	18.9293	\$0	\$0
Effluent Monitoring	\$27,195	60.0	18.9293	\$514,782	\$514,782
Plume Monitoring	\$13,303	60.0	18.9293	\$251,816	\$251,816
<b>O&amp;M Subtotal</b>	<b>\$71,123</b>			<b>\$1,346,308</b>	<b>\$1,346,308</b>
Misc. O&M Costs (% Annual O&M Unless Otherwise Specified)					
See Above Cost Assumptions For Details on Calculations	Percentage				
Horizontal Extraction Wells	21%	\$210	60.0	18.9293	\$3,975
Influent Piping	21%	\$0	60.0	18.9293	\$0
Filtration	21%	\$170	60.0	18.9293	\$3,220
Oil/Water Separator	21%	\$11	60.0	18.9293	\$199
Ion Exchange	21%	\$504	60.0	18.9293	\$9,540
Air Stripper	21%	\$1,051	60.0	18.9293	\$19,892
Catalytic Oxidation	21%	\$3,806	60.0	18.9293	\$72,046
Activated Carbon	21%	\$680	60.0	18.9293	\$12,868
Effluent Piping	21%	\$0	60.0	18.9293	\$0
Utilities and Improvements	21%	\$0	60.0	18.9293	\$0
Effluent Monitoring	21%	\$5,711	60.0	18.9293	\$108,104
Plume Monitoring	21%	\$2,794	60.0	18.9293	\$52,881
<b>Total Operation and Maintenance Costs</b>				<b>\$1,679,233</b>	<b>\$1,679,233</b>

NET PRESENT WORTH	
Capital Costs	\$487,078
Operation and Maintenance Present Worth	\$1,629,033
<b>Total Alternative Cost</b>	<b>\$2,116,111</b>

Estimated Cost for SD034, Alternative 5

CAPITAL COSTS				
Process Option	Quantity	Unit Cost	Percentage	Capital Cost
Horizontal Extraction Wells	1	\$55,000	NA	\$55,000
Influent Piping	1	\$3,739	NA	\$3,739
Filtration	1	\$13,445	NA	\$13,445
Oil/Water Separator	1	\$13,844	NA	\$13,844
Ion Exchange	1	\$23,700	NA	\$23,700
Ultraviolet Oxidation	1	\$96,243	NA	\$96,243
Activated Carbon	1	\$4,142	NA	\$4,142
Effluent Piping	1	\$4,233	NA	\$4,233
Utilities and Improvements	1	\$44,702	NA	\$44,702
Effluent Monitoring	1	\$0	NA	\$0
Plume Monitoring	1	\$0	NA	\$0
<b>Construction Subtotal</b>				<b>\$259,948</b>
Bid Contingencies (% of Construction Subtotal)			15.0%	\$38,857
Scope Contingencies (% of Construction Subtotal)			20.0%	\$51,810
<b>Construction Total</b>				<b>\$349,714</b>
<b>Other Direct Costs</b>				
Engineering Design (% of Construction Total)			10.0%	\$34,971
Permitting and Legal (% of Construction Total)			5.0%	\$17,486
Startup and Shakedown (% of Construction Total)			10.0%	\$34,971
Bonding and Insurance (% of Construction Total)			3.0%	\$10,491
Construction Oversight (% of Construction Total)			5.0%	\$17,486
Field and Laboratory Testing (% of Construction Total)			5.0%	\$17,486
Reporting (% of Construction Total)			10.0%	\$34,971
Escalation (% of Construction Total, Based on Mid 1998 Start)			15.0%	\$52,457
<b>Total Capital Cost</b>				<b>\$570,035</b>

OPERATION AND MAINTENANCE					
Process Option	Annual O&M Cost	Process Option Service Time (yrs)	Present Worth Factor	Process Option Present Worth	
Horizontal Extraction Wells	\$1,000	60.0	18.9293	\$18,929	
Influent Piping	\$0	60.0	18.9293	\$0	
Filtration	\$810	60.0	18.9293	\$15,333	
Oil/Water Separator	\$50	60.0	18.9293	\$946	
Ion Exchange	\$2,400	60.0	18.9293	\$45,430	
Reserved	\$0	60.0	18.9293	\$0	
Ultraviolet Oxidation	\$42,028	60.0	18.9293	\$795,560	
Activated Carbon	\$3,237	60.0	18.9293	\$61,274	
Effluent Piping	\$0	60.0	18.9293	\$0	
Utilities and Improvements	\$0	60.0	18.9293	\$0	
Effluent Monitoring	\$27,195	60.0	18.9293	\$514,782	
Plume Monitoring	\$13,303	60.0	18.9293	\$251,816	
<b>O&amp;M Subtotal</b>				<b>\$1,004,971</b>	
<b>Misc. O&amp;M Costs (% Annual O&amp;M Unless Otherwise Specified)</b>					
See Global Cost Assumptions For Details on Calculations					
Horizontal Extraction Wells	21%	\$210	60.0	18.9293	\$3,975
Influent Piping	21%	\$0	60.0	18.9293	\$0
Filtration	21%	\$170	60.0	18.9293	\$3,220
Oil/Water Separator	21%	\$11	60.0	18.9293	\$199
Ion Exchange	21%	\$504	60.0	18.9293	\$9,540
Reserved	21%	\$0	60.0	18.9293	\$0
Ultraviolet Oxidation	21%	\$8,826	60.0	18.9293	\$167,068
Activated Carbon	21%	\$680	60.0	18.9293	\$12,868
Effluent Piping	21%	\$0	60.0	18.9293	\$0
Utilities and Improvements	21%	\$0	60.0	18.9293	\$0
Effluent Monitoring	21%	\$5,711	60.0	18.9293	\$108,104
Plume Monitoring	21%	\$2,794	60.0	18.9293	\$52,881
<b>Total Operation and Maintenance Costs</b>				<b>\$2,061,926</b>	

NET PRESENT WORTH	
Capital Costs	\$570,035
Operation and Maintenance Present Worth	\$2,061,926
<b>Total Alternative Cost</b>	<b>\$2,631,961</b>

**Estimated Cost for SD034, Alternative 7**

<b>CAPITAL COSTS</b>				
Process Option	Quantity	Unit Cost	Percentage	Capital Cost
Horizontal Extraction Wells	1	\$55,000	NA	\$55,000
Influent Piping	1	\$3,739	NA	\$3,739
Filtration	1	\$13,445	NA	\$13,445
Oil/Water Separator	1	\$13,844	NA	\$13,844
Ion Exchange	1	\$23,700	NA	\$23,700
Activated Carbon Alt 7	1	\$12,426	NA	\$12,426
Effluent Piping	1	\$4,233	NA	\$4,233
Utilities and Improvements	1	\$44,702	NA	\$44,702
Effluent Monitoring	1	\$0	NA	\$0
Plume Monitoring	1	\$0	NA	\$0
<b>Construction Subtotal</b>				<b>\$173,043</b>
Bid Contingencies (% of Construction Subtotal)			15.0%	\$25,663
Scope Contingencies (% of Construction Subtotal)			20.0%	\$34,218
<b>Construction Total</b>				<b>\$232,924</b>
<b>Other Project Costs</b>				
Engineering Design (% of Construction Total)			10.0%	\$23,097
Permitting and Legal (% of Construction Total)			5.0%	\$11,549
Startup and Shakedown (% of Construction Total)			10.0%	\$23,097
Bonding and Insurance (% of Construction Total)			3.0%	\$6,929
Construction Oversight (% of Construction Total)			5.0%	\$11,549
Field and Laboratory Testing (% of Construction Total)			5.0%	\$11,549
Reporting (% of Construction Total)			10.0%	\$23,097
Escalation (% of Construction Total, Based on Mid 1998 Start)			15.0%	\$34,646
<b>Total Capital Cost</b>				<b>\$376,481</b>

<b>OPERATION AND MAINTENANCE</b>					
Process Option	Annual O&M Cost	Process Option Start-up Time (yr)	Present Worth Factor	Process Option Present Worth	
Horizontal Extraction Wells	\$1,000	60.0	18.9293	\$18,929	
Influent Piping	\$0	60.0	18.9293	\$0	
Filtration	\$810	60.0	18.9293	\$15,333	
Oil/Water Separator	\$50	60.0	18.9293	\$946	
Ion Exchange	\$2,400	60.0	18.9293	\$45,430	
Activated Carbon Alt 7	\$20,462	60.0	18.9293	\$387,331	
Effluent Piping	\$0	60.0	18.9293	\$0	
Utilities and Improvements	\$0	60.0	18.9293	\$0	
Effluent Monitoring	\$27,195	60.0	18.9293	\$514,782	
Plume Monitoring	\$13,303	60.0	18.9293	\$251,816	
<b>O&amp;M Subtotal</b>				<b>\$1,493,828</b>	
<b>Other O&amp;M Costs (% Annual O&amp;M Unless Otherwise Specified)</b>					
See Global Cost Assumptions for Details on Calculations					
Horizontal Extraction Wells	21%	\$210	60.0	18.9293	\$3,975
Influent Piping	21%	\$0	60.0	18.9293	\$0
Filtration	21%	\$170	60.0	18.9293	\$3,220
Oil/Water Separator	21%	\$11	60.0	18.9293	\$199
Ion Exchange	21%	\$504	60.0	18.9293	\$9,540
Activated Carbon Alt 7	21%	\$4,297	60.0	18.9293	\$81,340
Effluent Piping	21%	\$0	60.0	18.9293	\$0
Utilities and Improvements	21%	\$0	60.0	18.9293	\$0
Effluent Monitoring	21%	\$5,711	60.0	18.9293	\$108,104
Plume Monitoring	21%	\$2,794	60.0	18.9293	\$52,881
<b>Total Operation and Maintenance Costs</b>				<b>\$1,493,828</b>	

<b>NET PRESENT WORTH</b>	
Capital Costs	\$376,481
Operation and Maintenance Present Worth	\$1,493,828
<b>Total Alternative Cost</b>	<b>\$1,870,309</b>

Estimated Cost for SD034, Alternative 9

CAPITAL COSTS				
Process Option	Quantity	Unit Cost	Percentage	Capital Cost
Bioslurping	1	\$121,434	NA	\$121,434
Reserved	1	\$0	NA	\$0
<b>Construction Subtotal</b>				<b>\$121,434</b>
Bid Contingencies (% of Construction Subtotal)			15.0%	\$18,215
Scope Contingencies (% of Construction Subtotal)			20.0%	\$24,287
<b>Construction Total</b>				<b>\$163,936</b>
Other Direct Costs				
Engineering Design (% of Construction Total)			10.0%	\$16,394
Permitting and Legal (% of Construction Total)			5.0%	\$8,197
Startup and Shakedown (% of Construction Total)			10.0%	\$16,394
Bonding and Insurance (% of Construction Total)			3.0%	\$4,918
Construction Oversight (% of Construction Total)			5.0%	\$8,197
Field and Laboratory Testing (% of Construction Total)			5.0%	\$8,197
Reporting (% of Construction Total)			10.0%	\$16,394
Escalation (% of Construction Total, Based on Mid 1998 Start)			15.0%	\$24,590
<b>Total Capital Cost</b>				<b>\$267,916</b>

OPERATION AND MAINTENANCE					
Process Option	Annual O&M Cost	Process Option Service Time (yr)	Present Worth Factor	Process Option Present Worth	
Bioslurping	\$14,221	5.0	4.3295	\$61,569	
Reserved	\$0	5.0	4.3295	\$0	
<b>O&amp;M Subtotal</b>				<b>\$61,569</b>	
Min. O&M Costs (% Annual O&M Unless Otherwise Specified)		Percentage			
See Global Cost Assumptions For Details on Calculations					
Bioslurping	21%	\$2,986	5.0	4.3295	\$12,930
Reserved	21%	\$0	5.0	4.3295	\$0
<b>Total Operation and Maintenance Costs</b>				<b>\$74,499</b>	

NET PRESENT WORTH	
Capital Costs	\$267,216
Operation and Maintenance Present Worth	\$74,499
<b>Final Alternative Cost</b>	<b>\$341,714</b>

## Cost Estimate Summary Sheet

### NEWIOU Feasibility Study, Travis AFB

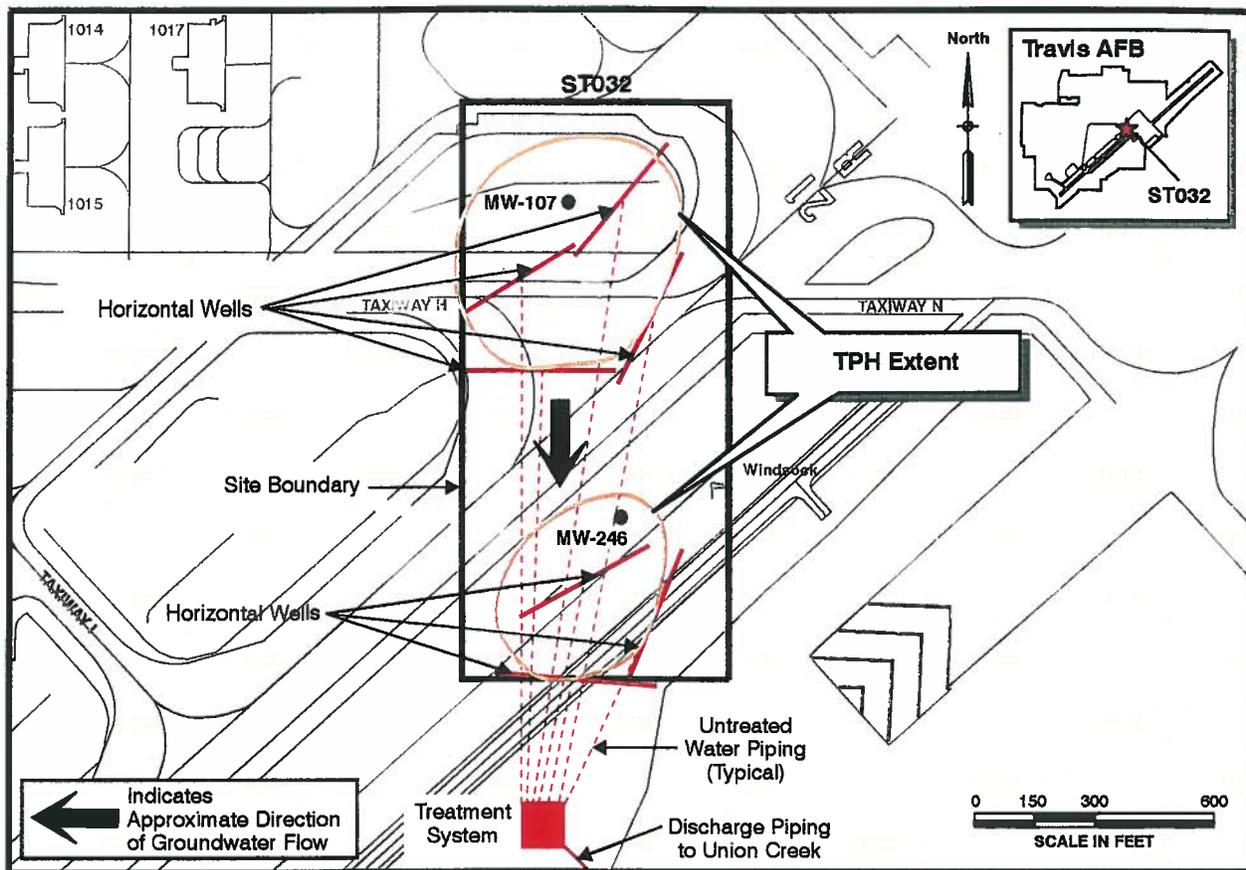
#### Process Option Summary for SD034

#### Assumptions:

- 1 Use RACER/ENVEST cost estimating model, Version 3.1 when practical
- 2 Compute monitoring and O&M for one year only; add costs for subsequent years using Alternative Cost Summary Sheets.
- 3 Horizontal extraction wells are 300 feet in length.
- 4 Vendor estimates are used for misc. bioslurping costs

#### Cost Summary:

Item	Capital Cost	O&M Cost
Horizontal Extraction Wells	\$55,000	\$1,000
Influent Piping	\$3,739	\$0
Filtration	\$13,445	\$810
Ion Exchange	\$23,700	\$2,400
Air Stripper	\$22,466	\$5,004
Catalytic Oxidation	\$36,078	\$18,124
Oil/Water Separator	\$13,844	\$50
Ultraviolet Oxidation	\$96,243	\$42,028
Activated Carbon	\$4,142	\$3,237
Activated Carbon Alt 7	\$12,426	\$20,462
Effluent Piping	\$4,233	\$0
Utilities and Improvments	\$44,702	\$0
Clear and Grub	\$0	\$0
Electrical	\$7,893	\$0
Access Road	\$0	\$0
Communication Lines	\$1,191	\$0
Gas Service	\$3,126	\$0
Cleanup and Landscaping	\$220	\$0
Fencing	\$794	\$0
Well Power and Comm Lines	\$2,000	\$0
Control Panel	\$11,600	\$0
Surge Tank	\$7,700	\$0
Treatment Unit Pad	\$10,178	\$0
Bioslurping	\$121,434	\$14,221
Extraction Well	\$13,834	\$133
Filtration	\$13,801	\$810
Oil/Water Separator	\$13,844	\$50
Storage Tank	\$7,699	\$77
Catalytic Oxidizer	\$32,256	\$12,751
Blowers, Pumps, and Misc.	\$40,000	\$400
Institutional Controls	\$10,000	\$0
Plume Monitoring	\$0	\$13,303
Effluent Monitoring	\$0	\$27,195
Institutional Monitoring	\$0	\$59,535
Reserved	\$0	\$0



ST032ALT.CDR - VMG 7/25/96 SAC 1

### Site Characteristics

- Grassy, open area between a runway and an abandoned taxiway
- Proximities to runway severely restrict land use (and potential remedial actions)
- 20% of MW-107 area covered by runway and taxiway
- 10% of MW-246 area covered by runway and taxiway
- TCE in groundwater — 10  $\mu\text{g/L}$  average, 20  $\mu\text{g/L}$  maximum
- TPH in groundwater — 15,000,000  $\mu\text{g/L}$  average, 29,000,000  $\mu\text{g/L}$  maximum, floating TPH is present
- Estimated mass of dissolved VOCs equals 180 lb
- Ca, Cr, Cu, Ni, and Ag were measured at concentrations greater than NPDES discharge limits in some monitoring wells
- Depth to groundwater — 7 feet
- Depth to bedrock — 30 feet
- Site also included in Group Q for soil contamination

### Treatment Alternatives

- Alternative #3: Air Stripper/Catalytic Oxidation, Ion Exchange, Activated Carbon
- Alternative #5: UV Oxidation, Ion Exchange, Activated Carbon
- Alternative #7: Ion Exchange, Activated Carbon
- Alternative #9: Bioslurping, Recovered Product Recycling, Off-gas Catalytic Oxidation

### Design Assumptions

- 7 horizontal wells, 300 feet in screened length
- Extraction rate 105 gpm total, 15 gpm from each well
- 6,700 feet of conveyance piping (from well to treatment system) — 1 inch ID, sch 80 PVC
- 750 feet of discharge piping (to Union Creek) — 3 inch ID, sch 80 PVC
- 700 feet from treatment system to existing power line
- 2 years to clean groundwater to MCLs, calculated using a contaminant transport model based on assumptions shown in Appendix C

*NOTE: The figure conceptually displays components for comparative purposes only. Actual layout may vary significantly from that shown and will be determined during the remedial design phase.*

**Figure B-15 .  
Conceptual Design for ST032 (Group G) Groundwater Treatment Alternatives, Travis AFB**

## Cost Summary for ST032 Alternatives

Alternative	Capital Costs	Operation and Maintenance Present Worth	Total
1	\$0	\$0	\$0
2	\$18,630	\$133,947	\$152,577
3	\$2,184,267	\$329,109	\$2,513,376
5	\$2,161,142	\$404,230	\$2,565,372
7	\$2,030,553	\$519,746	\$2,550,299
9	\$266,135	\$74,499	\$340,634

**Estimated Cost for ST032, Alternative 1**

<b>CAPITAL COSTS</b>		
Process Option	Percentage	Capital Cost
No Action		\$0
<b>Construction Subtotal</b>		
Bid Contingencies (% of Construction Subtotal)	15.0%	\$0
Scope Contingencies (% of Construction Subtotal)	20.0%	\$0
<b>Construction Total</b>		
<b>Other Direct Costs</b>		
Engineering Design (% of Construction Total)	10.0%	\$0
Permitting and Legal (% of Construction Total)	5.0%	\$0
Startup and Shakedown (% of Construction Total)	10.0%	\$0
Bonding and Insurance (% of Construction Total)	3.0%	\$0
Construction Oversight (% of Construction Total)	5.0%	\$0
Field and Laboratory Testing (% of Construction Total)	5.0%	\$0
Reporting (% of Construction Total)	10.0%	\$0
Escalation (% of Construction Total, Based on Mid 1998 Start)	15.0%	\$0
<b>Total Capital Cost</b>		

<b>OPERATION AND MAINTENANCE</b>				
Process Option	Annual O&M Cost	Process Option Service Time (yr)	Present Worth Factor	Process Option Present Worth
No Action	\$0	0.0	0.0000	\$0
<b>O&amp;M Subtotal</b>				
	\$0			\$0
<b>Misc. O&amp;M Costs (% Annual O&amp;M Unless Otherwise Specified)</b>		<b>Percentage</b>		
<i>See Global Cost Assumptions For Details on Calculations</i>				
No Action		21%	\$0	0.0
<b>Total Operation and Maintenance Costs</b>				

<b>NET PRESENT WORTH</b>	
Capital Costs	\$0
Operation and Maintenance Present Worth	\$0
<b>Total Alternative Cost</b>	

**Estimated Cost for ST032, Alternative 2**

<b>CAPITAL COSTS</b>				
Process Option	Quantity	Unit Cost	Percentage	Capital Cost
Institutional Controls	1	\$10,000	NA	\$10,000
Institutional Monitoring	1	\$0	NA	\$0
Reserved	1	\$0	NA	\$0
<b>Construction Subtotal</b>				<b>\$10,000</b>
Bid Contingencies (% of Construction Subtotal)			15.0%	\$1,500
Scope Contingencies (% of Construction Subtotal)			20.0%	\$2,000
<b>Construction Total</b>				<b>\$13,500</b>
<b>Other Direct Costs</b>				
Engineering Design (% of Construction Total)			10.0%	\$1,350
Permitting and Legal (% of Construction Total)			5.0%	\$675
Startup and Shakedown (% of Construction Total)			0.0%	\$0
Bonding and Insurance (% of Construction Total)			3.0%	\$405
Construction Oversight (% of Construction Total)			5.0%	\$675
Field and Laboratory Testing (% of Construction Total)			0.0%	\$0
Reporting (% of Construction Total)			0.0%	\$0
Escalation (% of Construction Total, Based on Mid 1998 Start)			15.0%	\$2,025
<b>Total Capital Cost</b>				<b>\$18,630</b>

<b>OPERATION AND MAINTENANCE</b>				
Process Option	Annual O&M Cost	Process Option Service Time (Yr)	Present Worth Factor	Process Option Present Worth
Institutional Controls	\$0	2.0	1.8594	\$0
Institutional Monitoring	\$59,535	2.0	1.8594	\$110,700
Reserved	\$0	2.0	1.8594	\$0
<b>O&amp;M Subtotal</b>				<b>\$110,700</b>
<i>(Min. O&amp;M Cost (% Annual O&amp;M Unless Otherwise Specified))</i>		<b>Percentage</b>		
<i>See Global Cost Assumptions For Details on Calculations</i>				
Institutional Controls	21%	\$0	2.0	\$0
Institutional Monitoring	21%	\$12,502	2.0	\$23,247
Reserved	21%	\$0	2.0	\$0
<b>Total Operation and Maintenance Cost</b>				<b>\$133,947</b>

<b>NET PRESENT WORTH</b>	
Capital Costs	\$18,630
Operation and Maintenance Present Worth	\$133,947
<b>Total Alternative Cost</b>	<b>\$152,577</b>

### Estimated Cost for ST032, Alternative 3

CAPITAL COSTS				
Process Option	Quantity	Unit Cost	Percentage	Capital Cost
Horizontal Extraction Wells	7	\$55,000	NA	\$385,000
Influent Piping	1	\$146,302	NA	\$146,302
Filtration	1	\$25,653	NA	\$25,653
Oil/Water Separator	1	\$23,429	NA	\$23,429
Ion Exchange	1	\$119,000	NA	\$119,000
Air Stripper	1	\$33,115	NA	\$33,115
Catalytic Oxidation	1	\$90,655	NA	\$90,655
Activated Carbon	1	\$26,958	NA	\$26,958
Effluent Piping	1	\$7,185	NA	\$7,185
Utilities and Improvements	1	\$135,326	NA	\$135,326
Effluent Monitoring	1	\$0	NA	\$0
Plume Monitoring	1	\$0	NA	\$0
<b>Construction Subtotal</b>				<b>\$991,623</b>
Bid Contingencies (% of Construction Subtotal)			15.0%	\$148,893
Scope Contingencies (% of Construction Subtotal)			20.0%	\$198,525
<b>Construction Total</b>				<b>\$1,339,041</b>
Other Direct Costs				
Engineering Design (% of Construction Total)			10.0%	\$134,004
Permitting and Legal (% of Construction Total)			5.0%	\$67,002
Startup and Shakedown (% of Construction Total)			10.0%	\$134,004
Bonding and Insurance (% of Construction Total)			3.0%	\$40,201
Construction Oversight (% of Construction Total)			5.0%	\$67,002
Field and Laboratory Testing (% of Construction Total)			5.0%	\$67,002
Reporting (% of Construction Total)			10.0%	\$134,004
Escalation (% of Construction Total, Based on Mid 1998 Start)			15.0%	\$201,006
<b>Total Capital Cost</b>				<b>\$1,540,267</b>

OPERATION AND MAINTENANCE				
Process Option	Annual O&M Cost	Process Option Service Time (Yr)	Present Worth Factor	Process Option Present Worth
Horizontal Extraction Wells	\$7,000	2.0	1.8594	\$13,016
Influent Piping	\$0	2.0	1.8594	\$0
Filtration	\$810	2.0	1.8594	\$1,506
Oil/Water Separator	\$76	2.0	1.8594	\$141
Ion Exchange	\$24,000	2.0	1.8594	\$44,626
Air Stripper	\$6,286	2.0	1.8594	\$11,688
Catalytic Oxidation	\$53,936	2.0	1.8594	\$100,289
Activated Carbon	\$26,975	2.0	1.8594	\$50,158
Effluent Piping	\$0	2.0	1.8594	\$0
Utilities and Improvements	\$0	2.0	1.8594	\$0
Reserved	\$0	2.0	1.8594	\$0
<b>O&amp;M Subtotal</b>		<b>\$146,278</b>		<b>\$371,091</b>
Min. O&M Costs (% Annual O&M Unless Otherwise Specified)				
See Capital Cost Assumptions For Details on Calculations				
Horizontal Extraction Wells	21%	\$1,470	2.0	\$2,733
Influent Piping	21%	\$0	2.0	\$0
Filtration	21%	\$170	2.0	\$316
Oil/Water Separator	21%	\$16	2.0	\$30
Ion Exchange	21%	\$5,040	2.0	\$9,371
Air Stripper	21%	\$1,320	2.0	\$2,455
Catalytic Oxidation	21%	\$11,327	2.0	\$21,061
Activated Carbon	21%	\$5,665	2.0	\$10,533
Effluent Piping	21%	\$0	2.0	\$0
Utilities and Improvements	21%	\$0	2.0	\$0
Reserved	21%	\$0	2.0	\$0
<b>Total Operation and Maintenance Costs</b>				<b>\$123,189</b>

NET PRESENT WORTH	
Capital Costs	\$2,184,267
Operation and Maintenance Present Worth	\$329,109
<b>Total Alternative Cost</b>	
	<b>\$2,513,376</b>

Estimated Cost for ST032, Alternative 5

CAPITAL COSTS				
Process Option	Quantity	Unit Cost	Percentage	Capital Cost
Horizontal Extraction Wells	7	\$55,000	NA	\$385,000
Influent Piping	1	\$146,302	NA	\$146,302
Filtration	1	\$25,653	NA	\$25,653
Ion Exchange	1	\$119,000	NA	\$119,000
Oil/Water Separator	1	\$23,429	NA	\$23,429
Ultraviolet Oxidation	1	\$113,261	NA	\$113,261
Activated Carbon	1	\$26,958	NA	\$26,958
Effluent Piping	1	\$7,185	NA	\$7,185
Utilities and Improvements	1	\$135,326	NA	\$135,326
Effluent Monitoring	1	\$0	NA	\$0
Plume Monitoring	1	\$0	NA	\$0
<b>Construction Subtotal</b>				<b>\$972,114</b>
Bid Contingencies (% of Construction Subtotal)			15.0%	\$147,317
Scope Contingencies (% of Construction Subtotal)			20.0%	\$196,423
<b>Construction Total</b>				<b>\$1,315,854</b>
Other Direct Costs				
Engineering Design (% of Construction Total)			10.0%	\$132,585
Permitting and Legal (% of Construction Total)			5.0%	\$66,293
Startup and Shakedown (% of Construction Total)			10.0%	\$132,585
Bonding and Insurance (% of Construction Total)			3.0%	\$39,776
Construction Oversight (% of Construction Total)			5.0%	\$66,293
Field and Laboratory Testing (% of Construction Total)			5.0%	\$66,293
Reporting (% of Construction Total)			10.0%	\$132,585
Escalation (% of Construction Total, Based on Mid 1998 Start)			15.0%	\$198,878
<b>Total Capital Cost</b>				<b>\$2,161,142</b>

OPERATION AND MAINTENANCE				
Process Option	Annual O&M Cost	Process Option Service Time (Yrs)	Present Worth Factor	Process Option Present Worth
Horizontal Extraction Wells	\$7,000	2.0	1.8594	\$13,016
Influent Piping	\$0	2.0	1.8594	\$0
Filtration	\$810	2.0	1.8594	\$1,506
Ion Exchange	\$24,000	2.0	1.8594	\$44,626
Oil/Water Separator	\$76	2.0	1.8594	\$141
Ultraviolet Oxidation	\$80,308	2.0	1.8594	\$149,326
Activated Carbon	\$26,975	2.0	1.8594	\$50,158
Effluent Piping	\$0	2.0	1.8594	\$0
Utilities and Improvements	\$0	2.0	1.8594	\$0
Effluent Monitoring	\$27,195	2.0	1.8594	\$50,567
Plume Monitoring	\$13,303	2.0	1.8594	\$24,736
<b>O&amp;M Subtotal</b>				<b>\$334,975</b>
Misc. O&M Costs (% Annual O&M Unless Otherwise Specified)		Percentage		
See Global Cost Assumptions For Details on Calculations				
Horizontal Extraction Wells	21%	\$1,470	2.0	\$2,733
Influent Piping	21%	\$0	2.0	\$0
Filtration	21%	\$170	2.0	\$316
Ion Exchange	21%	\$5,040	2.0	\$9,371
Oil/Water Separator	21%	\$16	2.0	\$30
Ultraviolet Oxidation	21%	\$16,865	2.0	\$31,358
Activated Carbon	21%	\$5,665	2.0	\$10,533
Effluent Piping	21%	\$0	2.0	\$0
Utilities and Improvements	21%	\$0	2.0	\$0
Effluent Monitoring	21%	\$5,711	2.0	\$10,619
Plume Monitoring	21%	\$2,794	2.0	\$5,195
<b>Total Operation and Maintenance Costs</b>				<b>\$404,230</b>

NET PRESENT WORTH	
Capital Costs	\$2,161,142
Operation and Maintenance Present Worth	\$404,230
<b>Total Alternative Cost</b>	<b>\$2,565,372</b>

**Estimated Cost for ST032, Alternative 7**

<b>CAPITAL COSTS</b>				
Process Option	Quantity	Unit Cost	Percentage	Capital Cost
Horizontal Extraction Wells	7	\$55,000	NA	\$385,000
Influent Piping	1	\$146,302	NA	\$146,302
Filtration	1	\$25,653	NA	\$25,653
Oil/Water Separator	1	\$23,429	NA	\$23,429
Ion Exchange	1	\$119,000	NA	\$119,000
Activated Carbon Alt 7	1	\$80,874	NA	\$80,874
Effluent Piping	1	\$7,185	NA	\$7,185
Utilities and Improvements	1	\$135,326	NA	\$135,326
Effluent Monitoring	1	\$0	NA	\$0
Plume Monitoring	1	\$0	NA	\$0
<b>Construction Subtotal</b>				<b>\$927,746</b>
Bid Contingencies (% of Construction Subtotal)			15.0%	\$138,415
Scope Contingencies (% of Construction Subtotal)			20.0%	\$184,554
<b>Construction Total</b>				<b>\$1,250,715</b>
<b>Other Direct Costs</b>				
Engineering Design (% of Construction Total)			10.0%	\$124,574
Permitting and Legal (% of Construction Total)			5.0%	\$62,287
Startup and Shakedown (% of Construction Total)			10.0%	\$124,574
Bonding and Insurance (% of Construction Total)			3.0%	\$37,372
Construction Oversight (% of Construction Total)			5.0%	\$62,287
Field and Laboratory Testing (% of Construction Total)			5.0%	\$62,287
Reporting (% of Construction Total)			10.0%	\$124,574
Escalation (% of Construction Total, Based on Mid 1998 Start)			15.0%	\$186,861
<b>Total Capital Cost</b>				<b>\$2,030,553</b>

<b>OPERATION AND MAINTENANCE</b>				
Process Option	Annual O&M Cost	Process Option Service Time (yr)	Present Worth Factor	Process Option Present Worth
Horizontal Extraction Wells	\$7,000	2.0	1.8594	\$13,016
Influent Piping	\$0	2.0	1.8594	\$0
Filtration	\$810	2.0	1.8594	\$1,506
Oil/Water Separator	\$76	2.0	1.8594	\$141
Ion Exchange	\$24,000	2.0	1.8594	\$44,626
Activated Carbon Alt 7	\$171,929	2.0	1.8594	\$319,687
Effluent Piping	\$0	2.0	1.8594	\$0
Utilities and Improvements	\$0	2.0	1.8594	\$0
Reserved	\$0	2.0	1.8594	\$0
<b>O&amp;M Subtotal</b>	<b>\$33,810</b>			<b>\$429,542</b>
<b>Max. O&amp;M Costs (% Annual O&amp;M Values Otherwise Specified)</b>				
<i>See Original Cost Assumptions For Details on Calculations</i>				
Horizontal Extraction Wells	21%	\$1,470	2.0	\$2,733
Influent Piping	21%	\$0	2.0	\$0
Filtration	21%	\$170	2.0	\$316
Oil/Water Separator	21%	\$16	2.0	\$30
Ion Exchange	21%	\$5,040	2.0	\$9,371
Activated Carbon Alt 7	21%	\$36,105	2.0	\$67,134
Effluent Piping	21%	\$0	2.0	\$0
Utilities and Improvements	21%	\$0	2.0	\$0
Reserved	21%	\$0	2.0	\$0
<b>Total Operation and Maintenance Costs</b>				<b>\$519,746</b>

<b>NET PRESENT WORTH</b>	
Capital Costs	\$2,030,553
Operation and Maintenance Present Worth	\$519,746
<b>Total Alternative Cost</b>	<b>\$2,550,299</b>

**Estimated Cost for ST032, Alternative 9**

<b>CAPITAL COSTS</b>				
Process Option	Quantity	Unit Cost	Percentage	Capital Cost
Bioslurping	1	\$120,943	NA	\$120,943
Reserved	1	\$0	NA	\$0
<b>Construction Subtotal</b>				<b>\$120,943</b>
Bid Contingencies (% of Construction Subtotal)			15.0%	\$18,141
Scope Contingencies (% of Construction Subtotal)			20.0%	\$24,189
<b>Construction Total</b>				<b>\$163,273</b>
<b>Other Direct Costs</b>				
Engineering Design (% of Construction Total)			10.0%	\$16,327
Permitting and Legal (% of Construction Total)			5.0%	\$8,164
Startup and Shakedown (% of Construction Total)			10.0%	\$16,327
Bonding and Insurance (% of Construction Total)			3.0%	\$4,898
Construction Oversight (% of Construction Total)			5.0%	\$8,164
Field and Laboratory Testing (% of Construction Total)			5.0%	\$8,164
Reporting (% of Construction Total)			10.0%	\$16,327
Escalation (% of Construction Total, Based on Mid 1998 Start)			15.0%	\$24,491
<b>Total Capital Cost</b>				<b>\$266,135</b>

<b>OPERATION AND MAINTENANCE</b>					
Process Option	Annual O&M Cost	Process Option Service Time (yr)	Present Worth Factor	Present Option Present Worth	
Bioslurping	\$14,221	5.0	4.3295	\$61,569	
Reserved	\$0	5.0	4.3295	\$0	
<b>O&amp;M Subtotal</b>				<b>\$61,569</b>	
Misc. O&M Costs (% of Annual O&M Unless Otherwise Specified)		Percentage			
See Global Cost Assumptions For Details on Calculations					
Bioslurping	21%	\$2,986	5.0	4.3295	\$12,930
Reserved	21%	\$0	5.0	4.3295	\$0
<b>Total Operation and Maintenance Costs</b>				<b>\$74,499</b>	

<b>NET PRESENT WORTH</b>	
Capital Costs	\$266,135
Operation and Maintenance Present Worth	\$74,499
<b>Total Alternative Cost</b>	<b>\$340,634</b>

## Cost Estimate Summary Sheet

## NEWIOU Feasibility Study, Travis AFB

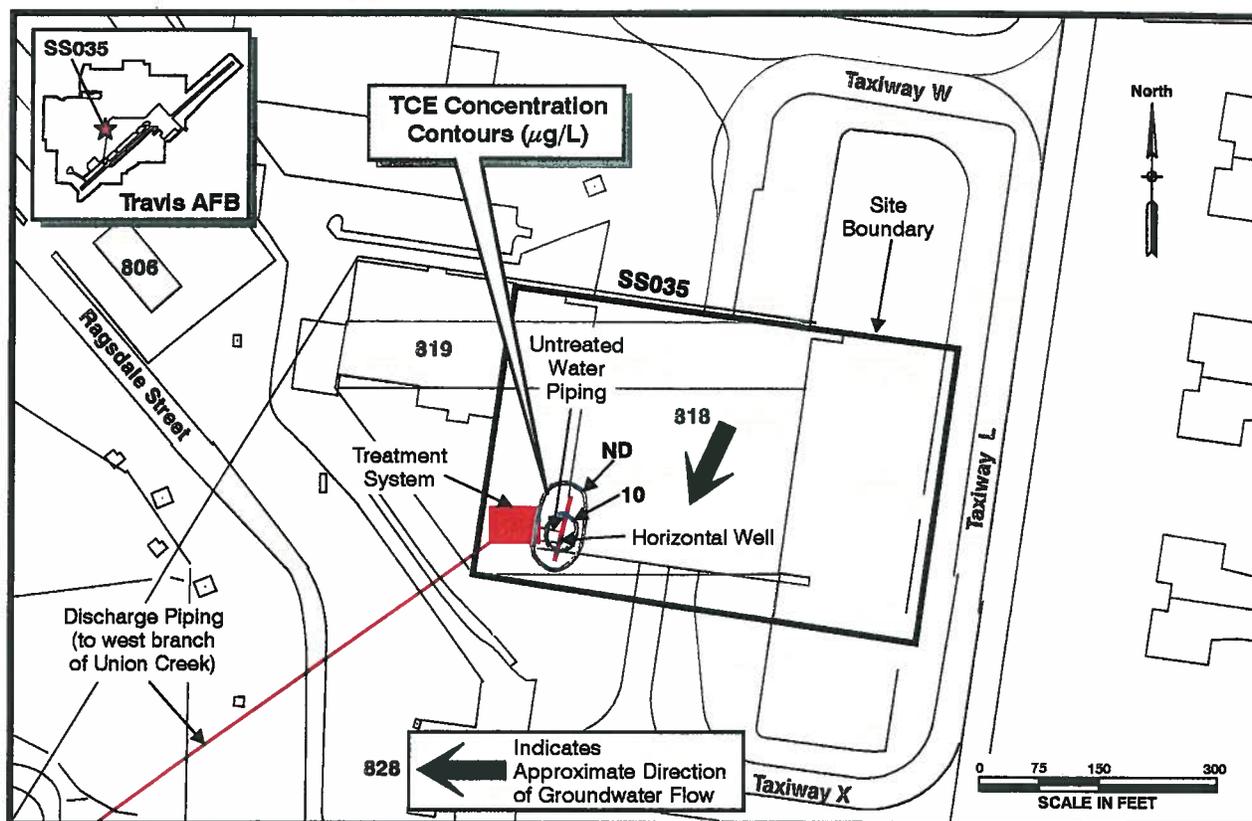
## Process Option Summary for ST032

## Assumptions:

- 1 Use RACER/ENVEST cost estimating model, Version 3.1 when practical
- 2 Compute monitoring and O&M for one year only; add costs for subsequent years using Alternative Cost Summary Sheets.
- 3 Horizontal extraction wells are 300 feet in length.

## Cost Summary:

Item	Capital Cost	O&M Cost
Horizontal Extraction Wells	\$55,000	\$7,000
Influent Piping	\$146,302	\$0
Filtration	\$25,653	\$810
Ion Exchange	\$119,000	\$24,000
Oil/Water Separator	\$23,429	\$76
Air Stripper	\$33,115	\$6,286
Catalytic Oxidation	\$90,655	\$53,936
Ultraviolet Oxidation	\$113,261	\$80,308
Activated Carbon	\$26,958	\$26,975
Activated Carbon Alt 7	\$80,874	\$171,929
Effluent Piping	\$7,185	\$0
Utilities and Improvements	\$135,326	\$0
Clear and Grub	\$5,702	\$0
Electrical	\$24,249	\$0
Access Road	\$3,456	\$0
Communication Lines	\$3,471	\$0
Gas Service	\$3,126	\$0
Cleanup and Landscaping	\$1,150	\$0
Fencing	\$794	\$0
Well Power and Comm Lines	\$63,900	\$0
Control Panel	\$11,600	\$0
Surge Tank	\$7,700	\$0
Treatment Unit Pad	\$10,178	\$0
Bioslurping	\$120,943	\$14,221
Extraction Well	\$13,343	\$133
Filtration	\$13,801	\$810
Oil/Water Separator	\$13,844	\$50
Storage Tank	\$7,699	\$77
Catalytic Oxidizer	\$32,256	\$12,751
Blowers, Pumps, and Misc.	\$40,000	\$400
Institutional Controls	\$10,000	\$0
Plume Monitoring	\$0	\$13,303
Effluent Monitoring	\$0	\$27,195
Institutional Monitoring	\$0	\$59,535
Reserved		



SS035ALTCDR - VMG 9/10/98 SAC 1

#### **Site Characteristics**

- Asphalt and roadbase covers most of the site
- Facility 818/819 includes a wash area, oil/water separator and sump, hydraulic lift storage area, and hazardous material accumulation area
- Site is adjacent to SD037, plumes overlap
- TCE in soil gas detected @ 1,100 ppbv
- TCE in groundwater — 5  $\mu\text{g/L}$  average, 21  $\mu\text{g/L}$  maximum
- TPH in groundwater — 160  $\mu\text{g/L}$  maximum
- Estimated mass of dissolved VOCs equals 0.007 lb
- Depth to groundwater — 15 feet
- Depth to bedrock — 14 feet
- Low permeability soils (clay and silt) to about 15 feet bgs
- More permeable material (sand lens) encountered at boring 818-B07
- Site also included in Group N for soil contamination

#### **Treatment Alternatives**

- Alternative #4: Air Stripper/Catalytic Oxidation, Activated Carbon
- Alternative #6: UV Oxidation, Activated Carbon
- Alternative #8: Activated Carbon

#### **Design Assumptions**

- $\frac{1}{4}$  of a horizontal well, 75 feet in screened length
- Extraction rate 4 gpm total
- 50 feet of untreated water piping (from well to treatment system) — 1 inch ID, sch 80 PVC
- 650 feet of discharge piping (to west branch of Union Creek) — 3 inch ID, sch 80 PVC
- 50 feet from treatment system to existing power line
- 3 years to clean groundwater to MCLs, calculated using a contaminant transport model based on assumptions shown in Appendix C

*NOTE: The figure conceptually displays components for comparative purposes only. Actual layout may vary significantly from that shown and will be determined during the remedial design phase.*

**Figure B-16.**  
**Conceptual Design for SS035 (Group H) Groundwater Treatment Alternatives, Travis AFB**

## Cost Summary for SS035 Alternatives

Alternative	Capital Costs	Operation and Maintenance Present Worth	Total
1	\$0	\$0	\$0
2	\$18,630	\$196,176	\$214,806
4	\$308,598	\$209,363	\$517,961
6	\$375,883	\$272,125	\$648,008
.8	\$187,890	\$147,605	\$335,495

### Estimated Cost for SS035, Alternative 1

CAPITAL COSTS		
Process Option	Percentage	Capital Cost
No Action		\$0
<b>Construction Subtotal</b>		
Bid Contingencies (% of Construction Subtotal)	15.0%	\$0
Scope Contingencies (% of Construction Subtotal)	20.0%	\$0
<b>Construction Total</b>		
<b>Other Direct Costs</b>		
Engineering Design (% of Construction Total)	10.0%	\$0
Permitting and Legal (% of Construction Total)	5.0%	\$0
Startup and Shakedown (% of Construction Total)	10.0%	\$0
Bonding and Insurance (% of Construction Total)	3.0%	\$0
Construction Oversight (% of Construction Total)	5.0%	\$0
Field and Laboratory Testing (% of Construction Total)	5.0%	\$0
Reporting (% of Construction Total)	10.0%	\$0
Escalation (% of Construction Total, Based on Mid 1998 Start)	15.0%	\$0
<b>Total Capital Cost</b>		

OPERATION AND MAINTENANCE				
Process Option	Annual O&M Cost	Process Option Service Time (yr)	Present Worth Factor	Process Option Present Worth
No Action	\$0	0.0	0.0000	\$0
<b>O&amp;M Subtotal</b>				
\$0				
<b>Minor O&amp;M Costs (% Annual O&amp;M Unless Otherwise Specified)</b>				
See Global Cost Assumptions For Details on Calculations		Percentage		
No Action		21%	\$0	0.0
<b>Total Operation and Maintenance Costs</b>				
\$0				

NET PRESENT WORTH	
Capital Costs	\$0
Operation and Maintenance Present Worth	\$0
<b>Total Alternative Cost</b>	
\$0	

**Estimated Cost for SS035, Alternative 2**

<b>CAPITAL COSTS</b>				
<i>Process Option</i>	<i>Quantity</i>	<i>Unit Cost</i>	<i>Percentage</i>	<i>Capital Cost</i>
Institutional Controls	1	\$10,000	NA	\$10,000
Institutional Monitoring	1	\$0	NA	\$0
Reserved	1	\$0	NA	\$0
<b>Construction Subtotal</b>				<b>\$18,000</b>
Bid Contingencies (% of Construction Subtotal)			15.0%	\$1,500
Scope Contingencies (% of Construction Subtotal)			20.0%	\$2,000
<b>Construction Total</b>				<b>\$21,500</b>
<b>Other Direct Costs</b>				
Engineering Design (% of Construction Total)			10.0%	\$1,350
Permitting and Legal (% of Construction Total)			5.0%	\$675
Startup and Shakedown (% of Construction Total)			0.0%	\$0
Bonding and Insurance (% of Construction Total)			3.0%	\$405
Construction Oversight (% of Construction Total)			5.0%	\$675
Field and Laboratory Testing (% of Construction Total)			0.0%	\$0
Reporting (% of Construction Total)			0.0%	\$0
Escalation (% of Construction Total, Based on Mid 1998 Start)			15.0%	\$2,025
<b>Total Capital Cost</b>				<b>\$24,630</b>

<b>OPERATION AND MAINTENANCE</b>				
<i>Process Option</i>	<i>Annual O&amp;M Cost</i>	<i>Process Option Service Time (yr)</i>	<i>Present Worth Factor</i>	<i>Process Option Present Worth</i>
Institutional Controls	\$0	3.0	2.7232	\$0
Institutional Monitoring	\$59,535	3.0	2.7232	\$162,129
Reserved	\$0	3.0	2.7232	\$0
<b>O&amp;M Subtotal</b>				<b>\$162,129</b>
<b>Misc. O&amp;M Costs (% Annual O&amp;M Unless Otherwise Specified)</b>		<b>Percentage</b>		
<i>See Global Cost Assumptions For Details on Calculations</i>				
Institutional Controls		21%		\$0
Institutional Monitoring		21%		\$34,047
Reserved		21%		\$0
<b>Total Operation and Maintenance Cost</b>				<b>\$196,176</b>

<b>NET PRESENT WORTH</b>	
Capital Costs	\$18,630
Operation and Maintenance Present Worth	\$196,176
<b>Total Alternative Cost</b>	<b>\$214,806</b>

**Estimated Cost for SS035, Alternative 4**

<b>CAPITAL COSTS</b>				
Process Option	Quantity	Unit Cost	Percentage	Capital Cost
Horizontal Extraction Wells	0.25	\$55,000	NA	\$13,750
Influent Piping	1	\$943	NA	\$943
Filtration	1	\$13,445	NA	\$13,445
Air Stripper	1	\$22,446	NA	\$22,446
Catalytic Oxidation	1	\$32,408	NA	\$32,408
Activated Carbon	1	\$4,904	NA	\$4,904
Effluent Piping	1	\$11,392	NA	\$11,392
Utilities and Improvements	1	\$40,952	NA	\$40,952
Effluent Monitoring	1	\$0	NA	\$0
Plume Monitoring	1	\$0	NA	\$0
<b>Construction Subtotal</b>				<b>\$186,240</b>
Bid Contingencies (% of Construction Subtotal)			15.0%	\$21,036
Scope Contingencies (% of Construction Subtotal)			20.0%	\$28,048
<b>Construction Total</b>				<b>\$195,324</b>
<b>Other Direct Costs</b>				
Engineering Design (% of Construction Total)			10.0%	\$18,932
Permitting and Legal (% of Construction Total)			5.0%	\$9,466
Startup and Shakedown (% of Construction Total)			10.0%	\$18,932
Bonding and Insurance (% of Construction Total)			3.0%	\$5,680
Construction Oversight (% of Construction Total)			5.0%	\$9,466
Field and Laboratory Testing (% of Construction Total)			5.0%	\$9,466
Reporting (% of Construction Total)			10.0%	\$18,932
Escalation (% of Construction Total, Based on Mid 1998 Start)			15.0%	\$28,399
<b>Total Capital Cost</b>				<b>\$308,598</b>

<b>OPERATION AND MAINTENANCE</b>				
Process Option	Annual O&M Cost	Process Option Service Time (yr)	Present Worth Factor	Present Worth Process Option Present Worth
Horizontal Extraction Wells	\$250	3.0	2.7232	\$681
Influent Piping	\$0	3.0	2.7232	\$0
Filtration	\$810	3.0	2.7232	\$2,206
Air Stripper	\$5,004	3.0	2.7232	\$13,627
Catalytic Oxidation	\$13,738	3.0	2.7232	\$37,412
Activated Carbon	\$3,237	3.0	2.7232	\$8,815
Effluent Piping	\$0	3.0	2.7232	\$0
Utilities and Improvements	\$0	3.0	2.7232	\$0
Effluent Monitoring	\$27,195	3.0	2.7232	\$74,059
Plume Monitoring	\$13,303	3.0	2.7232	\$36,227
<b>O&amp;M Subtotal</b>				<b>\$173,027</b>
<b>Misc. O&amp;M Costs (% Annual O&amp;M Unless Otherwise Specified)</b>				
See Global Assumptions For Details on Calculations				
Horizontal Extraction Wells	21%	\$53	3.0	\$143
Influent Piping	21%	\$0	3.0	\$0
Filtration	21%	\$170	3.0	\$463
Air Stripper	21%	\$1,051	3.0	\$2,862
Catalytic Oxidation	21%	\$2,885	3.0	\$7,857
Activated Carbon	21%	\$680	3.0	\$1,851
Effluent Piping	21%	\$0	3.0	\$0
Utilities and Improvements	21%	\$0	3.0	\$0
Effluent Monitoring	21%	\$5,711	3.0	\$15,552
Plume Monitoring	21%	\$2,794	3.0	\$7,608
<b>Total Operation and Maintenance Costs</b>				<b>\$209,363</b>

<b>ALTERNATIVE TOTALS</b>	
Capital Costs	\$308,598
Operation and Maintenance Present Worth	\$209,363
<b>Total Alternative Cost</b>	<b>\$517,961</b>

Estimated Cost for SS035, Alternative 6

CAPITAL COSTS				
Process Option	Quantity	Unit Cost	Percentage	Capital Cost
Horizontal Extraction Wells	0.25	\$55,000	NA	\$13,750
Influent Piping	1	\$943	NA	\$943
Filtration	1	\$13,445	NA	\$13,445
Ultraviolet Oxidation	1	\$85,431	NA	\$85,431
Activated Carbon	1	\$4,904	NA	\$4,904
Effluent Piping	1	\$11,392	NA	\$11,392
Utilities and Improvements	1	\$40,952	NA	\$40,952
Effluent Monitoring	1	\$0	NA	\$0
Plume Monitoring	1	\$0	NA	\$0
<b>Construction Subtotal</b>				<b>\$179,817</b>
Bid Contingencies (% of Construction Subtotal)			15.0%	\$25,623
Scope Contingencies (% of Construction Subtotal)			20.0%	\$34,163
<b>Construction Total</b>				<b>\$239,603</b>
<b>Other Direct Costs</b>				
Engineering Design (% of Construction Total)			10.0%	\$23,060
Permitting and Legal (% of Construction Total)			5.0%	\$11,530
Startup and Shakedown (% of Construction Total)			10.0%	\$23,060
Bonding and Insurance (% of Construction Total)			3.0%	\$6,918
Construction Oversight (% of Construction Total)			5.0%	\$11,530
Field and Laboratory Testing (% of Construction Total)			5.0%	\$11,530
Reporting (% of Construction Total)			10.0%	\$23,060
Escalation (% of Construction Total, Based on Mid 1998 Start)			15.0%	\$34,590
<b>Total Capital Cost</b>				<b>\$374,193</b>

OPERATION AND MAINTENANCE					
Process Option	Annual O&M Cost	Process Option Service Time (Yr)	Present Worth Factor	Present Worth	Process Option Present Worth
Horizontal Extraction Wells	\$250	3.0	2.7232	\$681	\$681
Influent Piping	\$0	3.0	2.7232	\$0	\$0
Filtration	\$810	3.0	2.7232	\$2,206	\$2,206
Ultraviolet Oxidation	\$37,789	3.0	2.7232	\$102,909	\$102,909
Activated Carbon	\$3,237	3.0	2.7232	\$8,815	\$8,815
Effluent Piping	\$0	3.0	2.7232	\$0	\$0
Utilities and Improvements	\$0	3.0	2.7232	\$0	\$0
Effluent Monitoring	\$27,195	3.0	2.7232	\$74,059	\$74,059
Plume Monitoring	\$13,303	3.0	2.7232	\$36,227	\$36,227
<b>O&amp;M Subtotal</b>				<b>\$27,584</b>	<b>\$27,584</b>
<b>Misc. O&amp;M Costs (% Annual O&amp;M Unless Otherwise Specified)</b>					
<i>See Global Cost Assumptions For Details on Calculations</i>					
	Percentage				
Horizontal Extraction Wells	21%	\$53	3.0	\$143	\$143
Influent Piping	21%	\$0	3.0	\$0	\$0
Filtration	21%	\$170	3.0	\$463	\$463
Ultraviolet Oxidation	21%	\$7,936	3.0	\$21,611	\$21,611
Activated Carbon	21%	\$680	3.0	\$1,851	\$1,851
Effluent Piping	21%	\$0	3.0	\$0	\$0
Utilities and Improvements	21%	\$0	3.0	\$0	\$0
Effluent Monitoring	21%	\$5,711	3.0	\$15,552	\$15,552
Plume Monitoring	21%	\$2,794	3.0	\$7,608	\$7,608
<b>Total Operation and Maintenance Costs</b>				<b>\$272,125</b>	

NET PRESENT WORTH	
Capital Costs	\$375,883
Operation and Maintenance Present Worth	\$272,125
<b>Total Alternative Cost</b>	<b>\$648,008</b>

**Estimated Cost for SS035, Alternative 8**

<b>CAPITAL COSTS</b>				
Process Option	Quantity	Unit Cost	Percentage	Capital Cost
Horizontal Extraction Wells	0.25	\$55,000	NA	\$13,750
Influent Piping	1	\$943	NA	\$943
Filtration	1	\$13,445	NA	\$13,445
Activated Carbon Alt 8	1	\$4,903	NA	\$4,903
Effluent Piping	1	\$11,392	NA	\$11,392
Utilities and Improvements	1	\$40,952	NA	\$40,952
Effluent Monitoring	1	\$0	NA	\$0
Plume Monitoring	1	\$0	NA	\$0
<b>Construction Subtotal</b>				<b>\$95,145</b>
Bid Contingencies (% of Construction Subtotal)			15.0%	\$12,808
Scope Contingencies (% of Construction Subtotal)			20.0%	\$17,077
<b>Construction Total</b>				<b>\$125,030</b>
<b>Other Direct Costs</b>				
Engineering Design (% of Construction Total)			10.0%	\$11,527
Permitting and Legal (% of Construction Total)			5.0%	\$5,763
Startup and Shakedown (% of Construction Total)			10.0%	\$11,527
Bonding and Insurance (% of Construction Total)			3.0%	\$3,458
Construction Oversight (% of Construction Total)			5.0%	\$5,763
Field and Laboratory Testing (% of Construction Total)			5.0%	\$5,763
Reporting (% of Construction Total)			10.0%	\$11,527
Escalation (% of Construction Total, Based on Mid 1998 Start)			15.0%	\$17,290
<b>Total Capital Cost</b>				<b>\$187,490</b>

<b>OPERATION AND MAINTENANCE</b>				
Process Option	Annual O&M Cost	Process Option Service Time (yr)	Present Worth Factor	Present Worth
Horizontal Extraction Wells	\$250	3.0	2.7232	\$681
Influent Piping	\$0	3.0	2.7232	\$0
Filtration	\$810	3.0	2.7232	\$2,206
Activated Carbon Alt 8	\$3,237	3.0	2.7232	\$8,815
Effluent Piping	\$0	3.0	2.7232	\$0
Utilities and Improvements	\$0	3.0	2.7232	\$0
Effluent Monitoring	\$27,195	3.0	2.7232	\$74,059
Plume Monitoring	\$13,303	3.0	2.7232	\$36,227
<b>O&amp;M Subtotal</b>				<b>\$111,988</b>
Note: O&M Costs are Annual O&M Unless Otherwise Specified				
See Global Cost Assumptions For Detailed Calculations				
	Percentage			
Horizontal Extraction Wells	21%	\$53	3.0	\$143
Influent Piping	21%	\$0	3.0	\$0
Filtration	21%	\$170	3.0	\$463
Activated Carbon Alt 8	21%	\$680	3.0	\$1,851
Effluent Piping	21%	\$0	3.0	\$0
Utilities and Improvements	21%	\$0	3.0	\$0
Effluent Monitoring	21%	\$5,711	3.0	\$15,552
Plume Monitoring	21%	\$2,794	3.0	\$7,608
<b>Total Operation and Maintenance Costs</b>				<b>\$147,605</b>

<b>NET PRESENT WORTH</b>	
Capital Costs	\$187,890
Operation and Maintenance Present Worth	\$147,605
<b>Total Alternative Cost</b>	<b>\$335,495</b>

SS035 Cost Summary Sheet

Cost Estimate Summary Sheet

NEWIOU Feasibility Study, Travis AFB

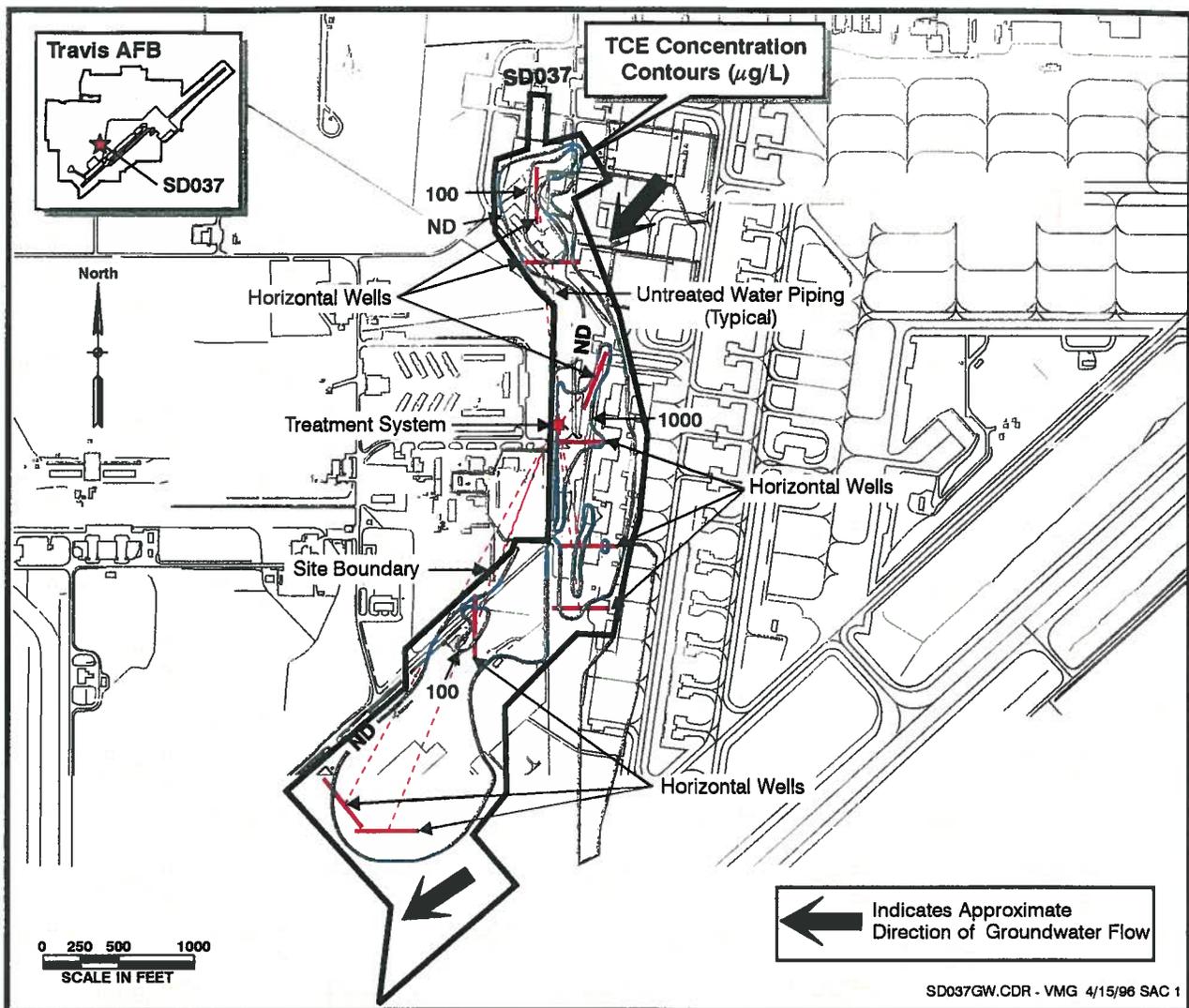
Process Option Summary for SS035

Assumptions:

- 1 Use RACER/ENVEST cost estimating model, Version 3.1 when practical
- 2 Compute monitoring and O&M for one year only; add costs for subsequent years using Alternative Cost Summary Sheets.
- 3 Horizontal extraction wells are 300 feet in length.

Cost Summary:

Item	Capital Cost	O&M Cost
Horizontal Extraction Wells	\$55,000	\$250
Influent Piping	\$943	\$0
Filtration	\$13,445	\$810
Air Stripper	\$22,446	\$5,004
Catalytic Oxidation	\$32,408	\$13,738
Ultraviolet Oxidation	\$85,431	\$37,789
Activated Carbon	\$4,904	\$3,237
Activated Carbon Alt 8	\$4,903	\$3,237
Effluent Piping	\$11,392	\$0
Utilities and Improvements	\$40,952	\$0
Clear and Grub	\$0	\$0
Electrical	\$7,745	\$0
Access Road	\$0	\$0
Communication Lines	\$620	\$0
Gas Service	\$1,595	\$0
Cleanup and Landscaping	\$220	\$0
Fencing	\$794	\$0
Well Power and Comm Lines	\$500	\$0
Control Panel	\$11,600	\$0
Surge Tank	\$7,700	\$0
Treatment Unit Pad	\$10,178	\$0
Institutional Controls	\$10,000	\$0
Plume Monitoring	\$0	\$13,303
Effluent Monitoring	\$0	\$27,195
Institutional Monitoring	\$0	\$59,535
Reserved	\$0	\$0



#### **Site Characteristics**

- The sanitary sewer system includes approximately 22,000 feet of piping, as well as associated oil water separators, sumps, and wash racks
- TCE in groundwater — 1,220  $\mu\text{g/L}$  average, 6,990  $\mu\text{g/L}$  maximum, DNAPL may be present
- TPH in groundwater — 100  $\mu\text{g/L}$  average
- Estimated mass of dissolved VOCs equals 390 lb
- Copper and silver were measured at concentrations greater than NPDES levels in some monitoring wells
- Depth to groundwater — 10 feet
- Depth to bedrock — 30 feet
- Subsurface geology beneath the sanitary sewer system varies
- In general, low permeability alluvium underlies the area with discontinuous permeable layers
- Weathered sandstone and shale interbed to form bedrock layer beneath the alluvium
- Site also included in Group P for soil contamination

#### **Treatment Alternatives**

- Alternative #3: Air Stripper/Catalytic Oxidation, Ion Exchange, Activated Carbon
- Alternative #5: UV Oxidation, Ion Exchange, Activated Carbon
- Alternative #7: Ion Exchange, Activated Carbon

#### **Design Assumptions**

- 9 horizontal wells, 300 feet in screened length
- Extraction rate 135 gpm total, 15 gpm from each well
- 7,050 feet of untreated water piping (from well to treatment system) — 1 inch ID, sch 80 PVC
- 50 feet of discharge piping (to west branch of Union Creek) — 3 inch ID, sch 80 PVC
- 100 feet from treatment system to existing power line
- 111 years to clean groundwater to MCLs is calculated using a contaminant transport model based on assumptions shown in Appendix C

**NOTE:** The figure conceptually displays components for comparative purposes only. Actual layout may vary significantly from that shown and will be determined during the remedial design phase.

**Figure B-17. Conceptual Design for SD037  
(Group I) Groundwater Treatment Alternatives, Travis AFB**

## Cost Summary for SD037 Alternatives

Alternative	Capital Costs	Operation and Maintenance Present Worth	Total
1	\$0	\$0	\$0
2	\$18,630	\$1,434,341	\$1,452,971
3	\$2,555,056	\$4,120,885	\$6,675,941
5	\$2,677,249	\$5,131,344	\$7,808,594
7	\$3,227,768	\$26,325,262	\$29,553,030

### Estimated Cost for SD037, Alternative 1

CAPITAL COSTS		
Process Option	Percentage	Capital Cost
No Action		\$0
<b>Construction Subtotal</b>		
Bid Contingencies (% of Construction Subtotal)	15.0%	\$0
Scope Contingencies (% of Construction Subtotal)	20.0%	\$0
<b>Construction Total</b>		
<b>Other Direct Costs</b>		
Engineering Design (% of Construction Total)	10.0%	\$0
Permitting and Legal (% of Construction Total)	5.0%	\$0
Startup and Shakedown (% of Construction Total)	10.0%	\$0
Bonding and Insurance (% of Construction Total)	3.0%	\$0
Construction Oversight (% of Construction Total)	5.0%	\$0
Field and Laboratory Testing (% of Construction Total)	5.0%	\$0
Reporting (% of Construction Total)	10.0%	\$0
Escalation (% of Construction Total, Based on Mid 1998 Start)	15.0%	\$0
<b>Total Capital Cost</b>		

OPERATION AND MAINTENANCE				
Process Option	Annual O&M Cost	Process Option Service Time (yr)	Present Worth Factor	Process Option Present Worth
No Action	\$0	0.0	0.0000	\$0
<b>O&amp;M Subtotal</b>				
<b>Misc. O&amp;M Costs (% Annual O&amp;M Unless Otherwise Specified)</b>				
See Global Cost Assumptions For Details on Calculations		Percentage		
No Action	21%	\$0	0.0	\$0
<b>Total Operation and Maintenance Costs</b>				

NET PRESENT WORTH	
Capital Costs	\$0
Operation and Maintenance Present Worth	\$0
<b>Total Alternative Cost</b>	

**Estimated Cost for SD037, Alternative 2**

<b>CAPITAL COSTS</b>				
<b>Process Option</b>	<b>Quantity</b>	<b>Unit Cost</b>	<b>Percentage</b>	<b>Capital Cost</b>
Institutional Controls	1	\$10,000	NA	\$10,000
Institutional Monitoring	1	\$0	NA	\$0
Reserved	1	\$0	NA	\$0
<b>Construction Subtotal</b>				<b>\$10,000</b>
Bid Contingencies (% of Construction Subtotal)			15.0%	\$1,500
Scope Contingencies (% of Construction Subtotal)			20.0%	\$2,000
<b>Construction Total</b>				<b>\$13,500</b>
<b>Other Direct Costs</b>				
Engineering Design (% of Construction Total)			10.0%	\$1,350
Permitting and Legal (% of Construction Total)			5.0%	\$675
Startup and Shakedown (% of Construction Total)			0.0%	\$0
Bonding and Insurance (% of Construction Total)			3.0%	\$405
Construction Oversight (% of Construction Total)			5.0%	\$675
Field and Laboratory Testing (% of Construction Total)			0.0%	\$0
Reporting (% of Construction Total)			0.0%	\$0
Escalation (% of Construction Total, Based on Mid 1998 Start)			15.0%	\$2,025
<b>Total Capital Cost</b>				<b>\$18,630</b>

<b>OPERATION AND MAINTENANCE</b>				
<b>Process Option</b>	<b>Annual O&amp;M Cost</b>	<b>Process Option Service Time (yr)</b>	<b>Present Worth Factor</b>	<b>Process Option Present Worth</b>
Institutional Controls	\$0	111.0	19.9111	\$0
Institutional Monitoring	\$59,535	111.0	19.9111	\$1,185,406
Reserved	\$0	111.0	19.9111	\$0
<b>O&amp;M Subtotal</b>				<b>\$1,185,406</b>
<b>Misc. O&amp;M Costs (% Annual O&amp;M Unless Otherwise Specified)</b>		<b>Percentage</b>		
<i>See Global Cost Assumptions For Details on Calculations</i>				
Institutional Controls	21%	\$0	111.0	19.9111
Institutional Monitoring	21%	\$12,502	111.0	19.9111
Reserved	21%	\$0	111.0	19.9111
<b>Total Operation and Maintenance Costs</b>				<b>\$1,207,908</b>

<b>NET PRESENT WORTH</b>	
Capital Costs	\$18,630
Operation and Maintenance Present Worth	\$1,434,341
<b>Total Alternative Cost</b>	<b>\$1,452,971</b>

**Estimated Cost for SD037, Alternative 3**

<b>CAPITAL COSTS</b>				
Process Option	Quantity	Unit Cost	Percentage	Capital Cost
Horizontal Extraction Wells	9	\$55,000	NA	\$495,000
Influent Piping	1	\$176,734	NA	\$176,734
Filtration	1	\$25,653	NA	\$25,653
Ion Exchange	1	\$210,000	NA	\$210,000
Air Stripper	1	\$33,115	NA	\$33,115
Catalytic Oxidation	1	\$92,504	NA	\$92,504
Activated Carbon	1	\$26,958	NA	\$26,958
Effluent Piping	1	\$1,482	NA	\$1,482
Utilities and Improvments	1	\$99,679	NA	\$99,679
Effluent Monitoring	1	\$0	NA	\$0
Plume Monitoring	1	\$0	NA	\$0
<b>Construction Subtotal</b>				<b>\$1,361,125</b>
Bid Contingencies (% of Construction Subtotal)			15.0%	\$174,169
Scope Contingencies (% of Construction Subtotal)			20.0%	\$232,225
<b>Construction Total</b>				<b>\$1,767,519</b>
<b>Other Direct Costs</b>				
Engineering Design (% of Construction Total)			10.0%	\$156,752
Permitting and Legal (% of Construction Total)			5.0%	\$78,376
Startup and Shakedown (% of Construction Total)			10.0%	\$156,752
Bonding and Insurance (% of Construction Total)			3.0%	\$47,026
Construction Oversight (% of Construction Total)			5.0%	\$78,376
Field and Laboratory Testing (% of Construction Total)			5.0%	\$78,376
Reporting (% of Construction Total)			10.0%	\$156,752
Escalation (% of Construction Total, Based on Mid 1998 Start)			15.0%	\$235,128
<b>Total Capital Cost</b>				<b>\$2,555,056</b>

<b>OPERATION AND MAINTENANCE</b>				
Process Option	Annual O&M Cost	Process Option Service Time (yr)	Present Worth Factor	Process Option Present Worth
Horizontal Extraction Wells	\$9,000	111.0	19.9111	\$179,200
Influent Piping	\$0	111.0	19.9111	\$0
Filtration	\$810	111.0	19.9111	\$16,128
Ion Exchange	\$21,600	111.0	19.9111	\$430,079
Air Stripper	\$6,286	111.0	19.9111	\$125,161
Catalytic Oxidation	\$65,876	111.0	19.9111	\$1,311,662
Activated Carbon	\$26,975	111.0	19.9111	\$537,101
Effluent Piping	\$0	111.0	19.9111	\$0
Utilities and Improvments	\$0	111.0	19.9111	\$0
Effluent Monitoring	\$27,195	111.0	19.9111	\$541,482
Plume Monitoring	\$13,303	111.0	19.9111	\$264,877
<b>O&amp;M Subtotal</b>	<b>\$173,645</b>			<b>\$1,405,690</b>
Misc. O&M Costs (% Annual O&M Unless Otherwise Specified)		Percentage		
<i>See Global Cost Assumptions For Details on Calculations</i>				
Horizontal Extraction Wells	21%	\$1,890	111.0	\$37,632
Influent Piping	21%	\$0	111.0	\$0
Filtration	21%	\$170	111.0	\$3,387
Ion Exchange	21%	\$4,536	111.0	\$90,317
Air Stripper	21%	\$1,320	111.0	\$26,284
Catalytic Oxidation	21%	\$13,834	111.0	\$275,449
Activated Carbon	21%	\$5,665	111.0	\$112,791
Effluent Piping	21%	\$0	111.0	\$0
Utilities and Improvments	21%	\$0	111.0	\$0
Effluent Monitoring	21%	\$5,711	111.0	\$113,711
Plume Monitoring	21%	\$2,794	111.0	\$55,624
<b>Total Operation and Maintenance Costs</b>				<b>\$1,461,314</b>

<b>ALTERNATIVE TOTALS</b>	
Capital Costs	\$2,555,056
Operation and Maintenance Present Worth	\$4,120,885
<b>Total Alternative Cost</b>	<b>\$6,675,941</b>

Estimated Cost for SD037, Alternative 5

CAPITAL COSTS				
Process Option	Quantity	Unit Cost	Percentage	Capital Cost
Horizontal Extraction Wells	9	\$55,000	NA	\$495,000
Influent Piping	1	\$176,734	NA	\$176,734
Filtration	1	\$25,653	NA	\$25,653
Ion Exchange	1	\$210,000	NA	\$210,000
Ultraviolet Oxidation	1	\$181,149	NA	\$181,149
Activated Carbon	1	\$26,958	NA	\$26,958
Effluent Piping	1	\$1,482	NA	\$1,482
Utilities and Improvements	1	\$99,679	NA	\$99,679
Effluent Monitoring	1	\$0	NA	\$0
Plume Monitoring	1	\$0	NA	\$0
<b>Construction Subtotal</b>				<b>\$1,216,455</b>
Bid Contingencies (% of Construction Subtotal)			15.0%	\$182,498
Scope Contingencies (% of Construction Subtotal)			20.0%	\$243,331
<b>Construction Total</b>				<b>\$1,642,284</b>
Other Direct Costs				
Engineering Design (% of Construction Total)			10.0%	\$164,248
Permitting and Legal (% of Construction Total)			5.0%	\$82,124
Startup and Shakedown (% of Construction Total)			10.0%	\$164,248
Bonding and Insurance (% of Construction Total)			3.0%	\$49,275
Construction Oversight (% of Construction Total)			5.0%	\$82,124
Field and Laboratory Testing (% of Construction Total)			5.0%	\$82,124
Reporting (% of Construction Total)			10.0%	\$164,248
Escalation (% of Construction Total, Based on Mid 1998 Start)			15.0%	\$246,373
<b>Total Capital Cost</b>				<b>\$1,877,149</b>

OPERATION AND MAINTENANCE					
Process Option	Annual O&M Cost	Process Option Service Time (Yr)	Present Worth Factor	Process Option Present Worth	
Horizontal Extraction Wells	\$9,000	111.0	19.9111	\$179,200	
Influent Piping	\$0	111.0	19.9111	\$0	
Filtration	\$810	111.0	19.9111	\$16,128	
Ion Exchange	\$21,600	111.0	19.9111	\$430,079	
Ultraviolet Oxidation	\$114,103	111.0	19.9111	\$2,271,914	
Activated Carbon	\$26,975	111.0	19.9111	\$537,101	
Effluent Piping	\$0	111.0	19.9111	\$0	
Utilities and Improvements	\$0	111.0	19.9111	\$0	
Effluent Monitoring	\$27,195	111.0	19.9111	\$541,482	
Plume Monitoring	\$13,303	111.0	19.9111	\$264,877	
<b>Total O&amp;M Annual</b>				<b>\$42,806</b>	
<b>Total O&amp;M Present Worth</b>				<b>\$826,780</b>	
Misc O&M Costs (% Annual O&M Unless Otherwise Specified)					
See Global Cost Assumptions For Details on Calculations					
Horizontal Extraction Wells	21%	\$1,890	111.0	19.9111	\$37,632
Influent Piping	21%	\$0	111.0	19.9111	\$0
Filtration	21%	\$170	111.0	19.9111	\$3,387
Ion Exchange	21%	\$4,536	111.0	19.9111	\$90,317
Ultraviolet Oxidation	21%	\$23,962	111.0	19.9111	\$477,102
Activated Carbon	21%	\$5,665	111.0	19.9111	\$112,791
Effluent Piping	21%	\$0	111.0	19.9111	\$0
Utilities and Improvements	21%	\$0	111.0	19.9111	\$0
Effluent Monitoring	21%	\$5,711	111.0	19.9111	\$113,711
Plume Monitoring	21%	\$2,794	111.0	19.9111	\$55,624
<b>Total Operation and Maintenance Costs</b>				<b>\$913,344</b>	

NET PRESENT WORTH	
Capital Costs	\$2,677,249
Operation and Maintenance Present Worth	\$5,131,344
<b>Total Alternative Cost</b>	<b>\$7,808,593</b>

**Estimated Cost for SD037, Alternative 7**

<b>CAPITAL COSTS</b>				
Process Option	Quantity	Unit Cost	Percentage	Capital Cost
Horizontal Extraction Wells	9	\$55,000	NA	\$495,000
Influent Piping	1	\$176,734	NA	\$176,734
Filtration	1	\$25,653	NA	\$25,653
Ion Exchange	1	\$210,000	NA	\$210,000
Activated Carbon Alt 7	1	\$458,286	NA	\$458,286
Effluent Piping	1	\$1,482	NA	\$1,482
Utilities and Improvements	1	\$99,679	NA	\$99,679
Effluent Monitoring	1	\$0	NA	\$0
Plume Monitoring	1	\$0	NA	\$0
<b>Construction Subtotal</b>				<b>\$1,466,834</b>
Bid Contingencies (% of Construction Subtotal)			15.0%	\$220,025
Scope Contingencies (% of Construction Subtotal)			20.0%	\$293,367
<b>Construction Total</b>				<b>\$1,980,226</b>
<b>Other Direct Costs</b>				
Engineering Design (% of Construction Total)			10.0%	\$198,023
Permitting and Legal (% of Construction Total)			5.0%	\$99,011
Startup and Shakedown (% of Construction Total)			10.0%	\$198,023
Bonding and Insurance (% of Construction Total)			3.0%	\$59,407
Construction Oversight (% of Construction Total)			5.0%	\$99,011
Field and Laboratory Testing (% of Construction Total)			5.0%	\$99,011
Reporting (% of Construction Total)			10.0%	\$198,023
Escalation (% of Construction Total, Based on Mid 1998 Start)			15.0%	\$297,034
<b>Total Capital Cost</b>				<b>\$3,227,768</b>

<b>OPERATION AND MAINTENANCE</b>				
Process Option	Annual O&M Cost	Process Option Service Time (yr)	Present Worth Factor	Process Option Present Worth
Horizontal Extraction Wells	\$9,000	111.0	19.9111	\$179,200
Influent Piping	\$0	111.0	19.9111	\$0
Filtration	\$810	111.0	19.9111	\$16,128
Ion Exchange	\$21,600	111.0	19.9111	\$430,079
Activated Carbon Alt 7	\$1,020,771	111.0	19.9111	\$20,324,649
Effluent Piping	\$0	111.0	19.9111	\$0
Utilities and Improvements	\$0	111.0	19.9111	\$0
Effluent Monitoring	\$27,195	111.0	19.9111	\$541,482
Plume Monitoring	\$13,303	111.0	19.9111	\$264,877
<b>O&amp;M Subtotal</b>				<b>\$21,746,615</b>
Misc. O&M Costs (% Annual O&M Unless Otherwise Specified)		Percentage		
See Global Cost Assumptions For Details on Calculations				
Horizontal Extraction Wells	21%	\$1,890	111.0	\$37,632
Influent Piping	21%	\$0	111.0	\$0
Filtration	21%	\$170	111.0	\$3,387
Ion Exchange	21%	\$4,536	111.0	\$90,317
Activated Carbon Alt 7	21%	\$214,362	111.0	\$4,268,176
Effluent Piping	21%	\$0	111.0	\$0
Utilities and Improvements	21%	\$0	111.0	\$0
Effluent Monitoring	21%	\$5,711	111.0	\$113,711
Plume Monitoring	21%	\$2,794	111.0	\$55,624
<b>Total Operation and Maintenance Costs</b>				<b>\$26,325,262</b>

<b>NET PRESENT WORTH</b>	
Capital Costs	\$3,227,768
Operation and Maintenance Present Worth	\$26,325,262
<b>Total Alternative Cost</b>	<b>\$29,553,030</b>

## Cost Estimate Summary Sheet

### NEWIOU Feasibility Study, Travis AFB

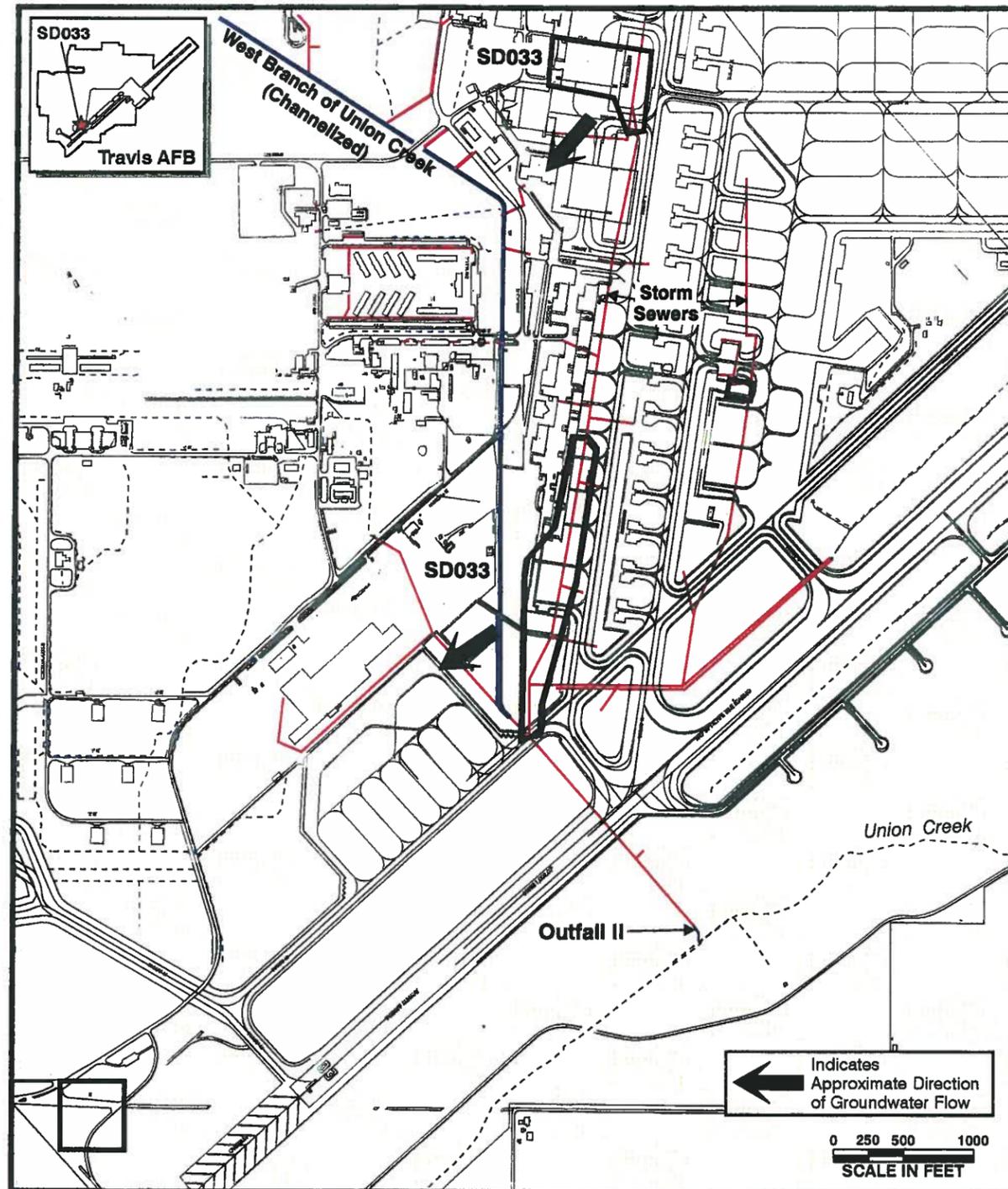
#### Process Option Summary for SD037

#### Assumptions:

- 1 Use RACER/ENVEST cost estimating model, Version 3.1 when practical
- 2 Compute monitoring and O&M for one year only; add costs for subsequent years using Alternative Cost Summary Sheets.
- 3 Horizontal extraction wells are 300 feet in length.

#### Cost Summary:

Item	Capital Cost	O&M Cost
Horizontal Extraction Wells	\$55,000	\$9,000
Influent Piping	\$176,734	\$0
Filtration	\$25,653	\$810
Ion Exchange	\$210,000	\$21,600
Air Stripper	\$33,115	\$6,286
Catalytic Oxidation	\$92,504	\$65,876
Ultraviolet Oxidation	\$181,149	\$114,103
Activated Carbon	\$26,958	\$26,975
Activated Carbon Alt 7	\$458,286	\$1,020,771
Effluent Piping	\$1,482	\$0
Utilities and Improvements	\$99,679	\$0
Clear and Grub	\$0	\$0
Electrical	\$7,893	\$0
Access Road	\$0	\$0
Communication Lines	\$1,191	\$0
Gas Service	\$1,595	\$0
Cleanup and Landscaping	\$220	\$0
Fencing	\$794	\$0
Well Power and Comm Lines	\$67,186	\$0
Control Panel	\$11,600	\$0
Surge Tank	\$7,700	\$0
Treatment Unit Pad	\$1,500	\$0
Institutional Controls	\$10,000	\$0
Plume Monitoring	\$0	\$13,303
Effluent Monitoring	\$0	\$27,195
Institutional Monitoring	\$0	\$59,535
Reserved	\$0	\$0



SD033SW.CDR - VMG 9/10/96 SAC 1

#### Site Characteristics

- Storm sewer system/Facility 810 active
- Contamination in sediment, soil gas, subsurface soil, surface soil, groundwater and surface water
- Surface water contaminated with TPH, TCE and lead (ecological risk)
- Flow in Union Creek is derived from surface runoff, and at times from groundwater
- Subsurface geology beneath storm sewer system varies
- Depth to groundwater — 13 to 18 feet
- Depth to bedrock — varies
- Site also included in Group R for sediment contamination, Group P for soil contamination, and Group B for groundwater contamination

#### Treatment Alternatives

- Alternative #12: Collection Sump, Ion Exchange, Activated Carbon, Discharge to Union Creek
- Alternative #13: Collection Sump, Activated Carbon, Discharge to Union Creek
- Alternative #14: Slip-lining and Collaring Storm Sewers

#### Design Assumptions

- Maximum flow rate of 1,500 gpm at Outfall II
- Length of storm sewer system in WIOU to be slip-lined — 6,150 feet (includes storm sewer system within SD034 and SD037)
- Collection sump and treatment site located at Outfall II

*NOTE: The figure conceptually displays components for comparative purposes only. Actual layout may vary significantly from that shown and will be determined during the remedial design phase.*

**Figure B-18.**  
**Conceptual Design for SD033 (Group J) Surface Water Treatment Alternatives, Travis AFB**

## Cost Summary for SD033 Alternatives

Alternative	Capital Costs	Operation and Maintenance Present Worth	Total
10	\$0	\$0	\$0
11	\$0	\$2,609,416	\$2,609,416
12	\$2,292,120	\$11,554,306	\$13,846,426
13	\$921,209	\$8,137,363	\$9,058,572
14	\$392,257	\$0	\$392,257
15	\$0	\$0	\$0

## Estimated Cost for SD033, Alternative 10

CAPITAL COSTS		
Process Option	Percentage	Capital Cost
No Action		\$0
<b>Construction Subtotal</b>		<b>\$0</b>
Bid Contingencies (% of Construction Subtotal)	15.0%	\$0
Scope Contingencies (% of Construction Subtotal)	20.0%	\$0
<b>Construction Total</b>		<b>\$0</b>
Other Direct Costs		
Engineering Design (% of Construction Total)	10.0%	\$0
Permitting and Legal (% of Construction Total)	5.0%	\$0
Startup and Shakedown (% of Construction Total)	10.0%	\$0
Bonding and Insurance (% of Construction Total)	3.0%	\$0
Construction Oversight (% of Construction Total)	5.0%	\$0
Field and Laboratory Testing (% of Construction Total)	5.0%	\$0
Reporting (% of Construction Total)	10.0%	\$0
Escalation (% of Construction Total, Based on Mid 1998 Start)	15.0%	\$0
<b>Total Capital Cost</b>		<b>\$0</b>

OPERATION AND MAINTENANCE				
Process Option	Annual O&M Cost	Process Option Service Time (yr)	Present Worth Factor	Process Option Present Worth
No Action	\$0	0.0	0.0000	\$0
<b>O&amp;M Subtotal</b>		<b>\$0</b>		<b>\$0</b>
Misc. O&M Costs (% Annual O&M Unless Otherwise Specified)	Percentage			
<i>See Global Cost Assumptions For Details on Calculations</i>				
No Action	21%	\$0	0.0	0.0000
<b>Total Operation and Maintenance Costs</b>				<b>\$0</b>

NET PRESENT WORTH	
Capital Costs	\$0
Operation and Maintenance Present Worth	\$0
<b>Total Alternative Cost</b>	<b>\$0</b>

**Estimated Cost for SD033, Alternative 11**

<b>CAPITAL COSTS</b>				
Process Option	Quantity	Unit Cost	Percentage	Capital Cost
Institutional Controls	1	\$0	NA	\$0
Reserved	1	\$0	NA	\$0
Reserved	1	\$0	NA	\$0
<b>Construction Subtotal</b>				
Bid Contingencies (% of Construction Subtotal)			15.0%	\$0
Scope Contingencies (% of Construction Subtotal)			20.0%	\$0
<b>Construction Total</b>				
<b>Other Direct Costs</b>				
Engineering Design (% of Construction Total)			10.0%	\$0
Permitting and Legal (% of Construction Total)			5.0%	\$0
Startup and Shakedown (% of Construction Total)			0.0%	\$0
Bonding and Insurance (% of Construction Total)			3.0%	\$0
Construction Oversight (% of Construction Total)			5.0%	\$0
Field and Laboratory Testing (% of Construction Total)			0.0%	\$0
Reporting (% of Construction Total)			0.0%	\$0
Escalation (% of Construction Total, Based on Mid 1998 Start)			15.0%	\$0
<b>Total Capital Cost</b>				

<b>OPERATION AND MAINTENANCE</b>					
Process Option	Annual O&M Cost	Process Option Service Time (yr)	Present Worth Factor	Process Option Present Worth	
Institutional Controls	\$146,333	30.0	15.3725	\$2,249,497	
Reserved	\$0	30.0	15.3725	\$0	
Reserved	\$0	30.0	15.3725	\$0	
<b>O&amp;M Subtotal</b>				<b>\$2,249,497</b>	
<b>Misc. O&amp;M Costs (% Annual O&amp;M Unless Otherwise Specified)</b>		<b>Percentage</b>			
<i>See Capital Cost Assumptions For Details on Calculations</i>					
Institutional Controls	16%	\$23,413	30.0	15.3725	\$359,920
Reserved	16%	\$0	30.0	15.3725	\$0
Reserved	16%	\$0	30.0	15.3725	\$0
<b>Total Operation and Maintenance Costs</b>				<b>\$2,609,416</b>	

<b>NET PRESENT WORTH</b>	
Capital Costs	\$0
Operation and Maintenance Present Worth	\$2,609,416
<b>Total Alternative Cost</b>	<b>\$2,609,416</b>

**Estimated Cost for SD033, Alternative 12**

<b>CAPITAL COSTS</b>				
Process Option	Quantity	Unit Cost	Percentage	Capital Cost
Collection Sump	1	\$2,500	NA	\$2,500
Influent Piping	1	\$500	NA	\$500
Filtration	1	\$25,000	NA	\$25,000
Ion Exchange	1	\$598,000	NA	\$598,000
Activated Carbon	1	\$398,136	NA	\$398,136
Effluent Piping	1	\$1,500	NA	\$1,500
Utilities and Improvements	1	\$16,000	NA	\$16,000
Effluent Monitoring	1	\$0	NA	\$0
Reserved	1	\$0	NA	\$0
<b>Construction Subtotal</b>				<b>\$1,041,636</b>
Bid Contingencies (% of Construction Subtotal)			15.0%	\$156,245
Scope Contingencies (% of Construction Subtotal)			20.0%	\$208,327
<b>Construction Total</b>				<b>\$1,406,208</b>
<b>Other Direct Costs</b>				
Engineering Design (% of Construction Total)			10.0%	\$140,621
Permitting and Legal (% of Construction Total)			5.0%	\$70,310
Startup and Shakedown (% of Construction Total)			10.0%	\$140,621
Bonding and Insurance (% of Construction Total)			3.0%	\$42,186
Construction Oversight (% of Construction Total)			5.0%	\$70,310
Field and Laboratory Testing (% of Construction Total)			5.0%	\$70,310
Reporting (% of Construction Total)			10.0%	\$140,621
Escalation (% of Construction Total, Based on Mid 1998 Start)			15.0%	\$210,931
<b>Total Capital Cost</b>				<b>\$2,292,120</b>

<b>OPERATION AND MAINTENANCE</b>				
Process Option	Annual O&M Cost	Process Option Service Time (yr)	Present Worth Factor	Process Option Present Worth
Collection Sump	\$250	30.0	15.3725	\$3,843
Influent Piping	\$250	30.0	15.3725	\$3,843
Filtration	\$2,500	30.0	15.3725	\$38,431
Ion Exchange	\$181,200	30.0	15.3725	\$2,785,488
Activated Carbon	\$290,394	30.0	15.3725	\$4,464,068
Effluent Piping	\$250	30.0	15.3725	\$3,843
Utilities and Improvements	\$0	30.0	15.3725	\$0
Effluent Monitoring	\$146,333	30.0	15.3725	\$2,249,497
Reserved	\$0	30.0	15.3725	\$0
<b>O&amp;M Subtotal</b>				<b>\$9,549,913</b>
<b>Misc O&amp;M Costs (% Annual O&amp;M Unless Otherwise Specified)</b>		<b>Percentage</b>		
<i>See Global Cost Assumptions For Details on Calculations</i>				
Collection Sump	21%	\$53	30.0	\$807
Influent Piping	21%	\$53	30.0	\$807
Filtration	21%	\$525	30.0	\$8,071
Ion Exchange	21%	\$38,052	30.0	\$584,953
Activated Carbon	21%	\$60,983	30.0	\$937,454
Effluent Piping	21%	\$53	30.0	\$807
Utilities and Improvements	21%	\$0	30.0	\$0
Effluent Monitoring	21%	\$30,730	30.0	\$472,394
Reserved	21%	\$0	30.0	\$0
<b>Total Operation and Maintenance Costs</b>				<b>\$11,554,306</b>

<b>NET PRESENT WORTH</b>	
Capital Costs	\$2,292,120
Operation and Maintenance Present Worth	\$11,554,306
<b>Total Alternative Cost</b>	<b>\$13,846,426</b>

**Estimated Cost for SD033, Alternative 13**

<b>CAPITAL COSTS</b>				
Process Option	Quantity	Unit Cost	Percentage	Capital Cost
Collection Sump	1	\$2,500	NA	\$2,500
Influent Piping	1	\$500	NA	\$500
Activated Carbon	1	\$398,136	NA	\$398,136
Effluent Piping	1	\$1,500	NA	\$1,500
Utilities and Improvements	1	\$16,000	NA	\$16,000
Effluent Monitoring	1	\$0	NA	\$0
Reserved	1	\$0	NA	\$0
<b>Construction Subtotal</b>				<b>\$418,636</b>
Bid Contingencies (% of Construction Subtotal)			15.0%	\$62,795
Scope Contingencies (% of Construction Subtotal)			20.0%	\$83,727
<b>Construction Total</b>				<b>\$565,158</b>
<b>Other Direct Costs</b>				
Engineering Design (% of Construction Total)			10.0%	\$56,516
Permitting and Legal (% of Construction Total)			5.0%	\$28,258
Startup and Shakedown (% of Construction Total)			10.0%	\$56,516
Bonding and Insurance (% of Construction Total)			3.0%	\$16,955
Construction Oversight (% of Construction Total)			5.0%	\$28,258
Field and Laboratory Testing (% of Construction Total)			5.0%	\$28,258
Reporting (% of Construction Total)			10.0%	\$56,516
Escalation (% of Construction Total, Based on Mid 1998 Start)			15.0%	\$84,774
<b>Total Capital Cost</b>				<b>\$921,209</b>

<b>OPERATION AND MAINTENANCE</b>				
Process Option	Annual O&M Cost	Process Option Service Time (yr)	Present Worth Factor	Process Option Present Worth
Collection Sump	\$250	30.0	15.3725	\$3,843
Influent Piping	\$250	30.0	15.3725	\$3,843
Activated Carbon	\$290,394	30.0	15.3725	\$4,464,068
Effluent Piping	\$250	30.0	15.3725	\$3,843
Utilities and Improvements	\$0	30.0	15.3725	\$0
Effluent Monitoring	\$146,333	30.0	15.3725	\$2,249,497
Reserved	\$0	30.0	15.3725	\$0
<b>O&amp;M Subtotal</b>				<b>\$6,725,094</b>
<b>Misc. O&amp;M Costs (% Annual O&amp;M Unless Otherwise Specified)</b>		<b>Percentage</b>		
<i>See Global Cost Assumptions For Details on Calculations</i>				
Collection Sump	21%	\$53	30.0	\$807
Influent Piping	21%	\$53	30.0	\$807
Activated Carbon	21%	\$60,983	30.0	\$937,454
Effluent Piping	21%	\$53	30.0	\$807
Utilities and Improvements	21%	\$0	30.0	\$0
Effluent Monitoring	21%	\$30,730	30.0	\$472,394
Reserved	21%	\$0	30.0	\$0
<b>Total Operation and Maintenance Costs</b>				<b>\$8,137,363</b>

<b>NET PRESENT WORTH</b>	
Capital Costs	\$921,209
Operation and Maintenance Present Worth	\$8,137,363
<b>Total Alternative Cost</b>	<b>\$9,058,572</b>

## Estimated Cost for SD033, Alternative 14

CAPITAL COSTS				
Process Option	Quantity	Unit Cost	Percentage	Capital Cost
Slip Line Storm Sewer	1	\$196,325	NA	\$196,325
Reserved	1	\$0	NA	\$0
<b>Construction Subtotal</b>				<b>\$196,325</b>
Bid Contingencies (% of Construction Subtotal)			15.0%	\$29,449
Scope Contingencies (% of Construction Subtotal)			20.0%	\$39,265
<b>Construction Total</b>				<b>\$365,039</b>
<b>Other Direct Costs</b>				
Engineering Design (% of Construction Total)			10.0%	\$26,504
Permitting and Legal (% of Construction Total)			5.0%	\$13,252
Startup and Shakedown (% of Construction Total)			0.0%	\$0
Bonding and Insurance (% of Construction Total)			3.0%	\$7,951
Construction Oversight (% of Construction Total)			5.0%	\$13,252
Field and Laboratory Testing (% of Construction Total)			0.0%	\$0
Reporting (% of Construction Total)			10.0%	\$26,504
Escalation (% of Construction Total, Based on Mid 1998 Start)			15.0%	\$39,756
<b>Total Capital Cost</b>				<b>\$392,257</b>

OPERATION AND MAINTENANCE					
Process Option	Annual O&M Cost	Process Option Service Time (yr)	Present Worth Factor	Process Option Present Worth	
Slip Line Storm Sewer	\$0	30.0	15.3725	\$0	
Reserved	\$0	30.0	15.3725	\$0	
<b>O&amp;M Subtotal</b>				<b>\$0</b>	
Misc. O&M Costs (If Annual O&M Unless Otherwise Specified)		Percentage			
See Global Cost Assumptions For Details on Calculations					
Slip Line Storm Sewer		16%			
Reserved		16%			
<b>Total Operation and Maintenance Costs</b>				<b>\$0</b>	

NET PRESENT WORTH	
Capital Costs	\$392,257
Operation and Maintenance Present Worth	\$0
<b>Total Alternative Cost</b>	<b>\$392,257</b>

### Estimated Cost for SD033, Alternative 15

CAPITAL COSTS				
Process Option	Quantity	Unit Cost	Percentage	Capital Cost
Source Control	1	\$0	NA	\$0
Reserved	1	\$0	NA	\$0
<b>Construction Subtotal</b>				<b>\$0</b>
Bid Contingencies (% of Construction Subtotal)			15.0%	\$0
Scope Contingencies (% of Construction Subtotal)			20.0%	\$0
<b>Construction Total</b>				<b>\$0</b>
Other Direct Costs				
Engineering Design (% of Construction Total)			10.0%	\$0
Permitting and Legal (% of Construction Total)			5.0%	\$0
Startup and Shakedown (% of Construction Total)			10.0%	\$0
Bonding and Insurance (% of Construction Total)			3.0%	\$0
Construction Oversight (% of Construction Total)			5.0%	\$0
Field and Laboratory Testing (% of Construction Total)			5.0%	\$0
Reporting (% of Construction Total)			10.0%	\$0
Escalation (% of Construction Total, Based on Mid 1998 Start)			15.0%	\$0
<b>Total Capital Cost</b>				<b>\$0</b>

OPERATION AND MAINTENANCE				
Process Option	Annual O&M Cost	Process Option Service Time (yr)	Present Worth Factor	Process Option Present Worth
Source Control	\$0	30.0	15.3725	\$0
Reserved	\$0	30.0	15.3725	\$0
<b>O&amp;M Subtotal</b>				<b>\$0</b>
Misc. O&M Costs (% Annual O&M Unless Otherwise Specified)		Percentage		
<i>See Global Cost Assumptions For Details on Calculations</i>				
Source Control	21%	\$0	30.0	15.3725
Reserved	21%	\$0	30.0	15.3725
<b>Total Operation and Maintenance Costs</b>				<b>\$0</b>

NET PRESENT WORTH	
Capital Costs	\$0
Operation and Maintenance Present Worth	\$0
<b>Total Alternative Cost</b>	<b>\$0</b>

## Cost Estimate Summary Sheet

### NEWIOU Feasibility Study, Travis AFB

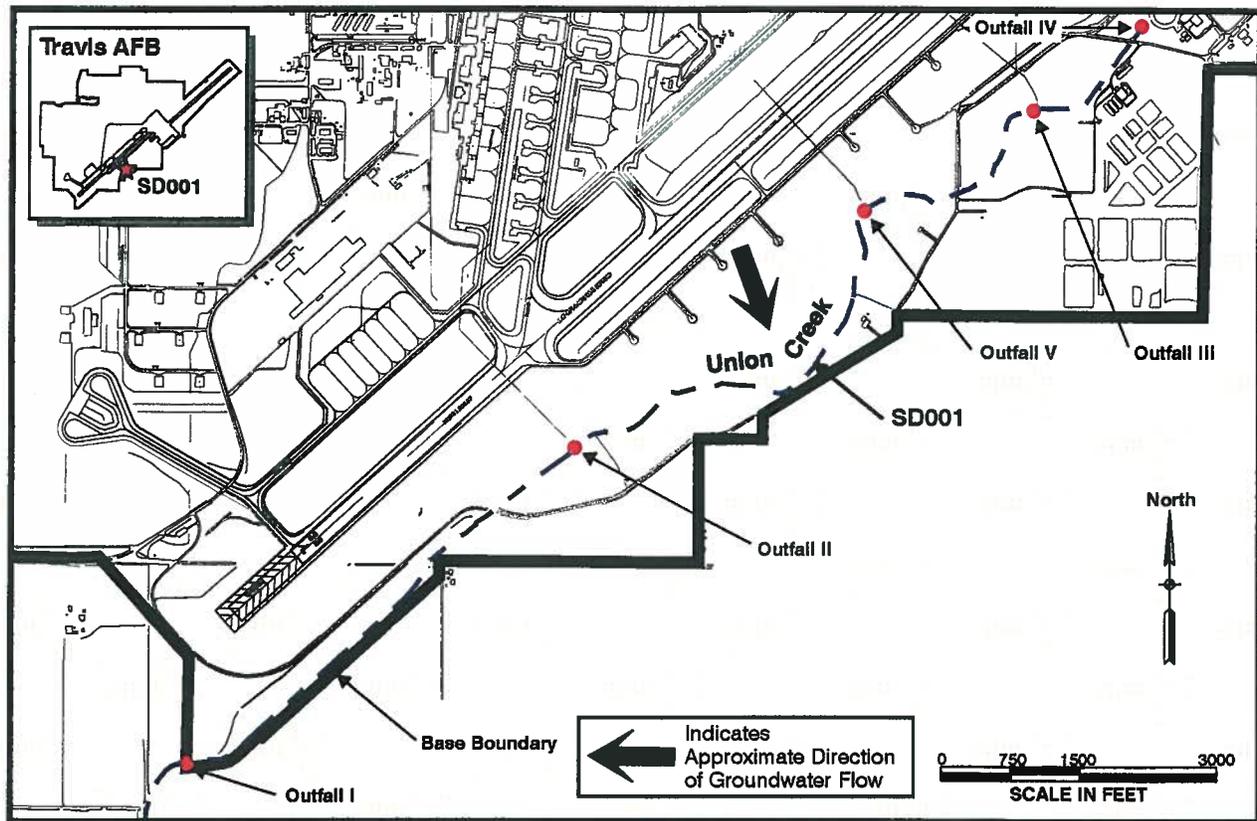
#### Process Option Summary for SD033

#### Assumptions:

- 1 Use RACER/ENVEST cost estimating model, Version 3.1 when practical
- 2 Compute monitoring and O&M for one year only; add costs for subsequent years using Alternative Cost Summary Sheets.
- 3 Horizontal extraction wells are 300 feet in length.

#### Cost Summary:

Item	Capital Cost	O&M Cost
Collection Sump	\$2,500	\$250
Influent Piping	\$500	\$250
Filtration	\$25,000	\$2,500
Ion Exchange	\$598,000	\$181,200
Activated Carbon	\$398,136	\$290,394
Effluent Piping	\$1,500	\$250
Utilities and Improvements	\$16,000	\$0
Clear and Grub	\$1,500	\$0
Electrical	\$3,000	\$0
Access Road	\$5,000	\$0
Cleanup and Landscaping	\$2,500	\$0
Fencing	\$2,500	\$0
Treatment Unit Pad	\$1,500	\$0
Institutional Controls	\$0	\$146,333
Creek Monitoring	\$0	\$0
Effluent Monitoring	\$0	\$146,333
Slip Line Storm Sewer	\$196,325	\$0
Source Control		
Reserved	\$0	\$0



SD001SW.CDR - VMG 8/10/88 SAC 1

#### **Site Characteristics**

- Site includes open drainages/creek in the southern portion of EIOU
- Aluminum in sediment — 46,700 mg/kg maximum (1988)
- Copper in sediment — 237 mg/kg maximum (1988)
- Chromium in sediment — 496 mg/kg maximum (1988)
- PAH (Benzo(a)pyrene) in sediment — 25 mg/kg (1988)
- Storm sewer systems discharge into Union Creek at Outfalls II, III and IV
- Union Creek exits Travis AFB at the southwest tip and flows south to Hill Slough, which discharges into Suisun Marsh, and ultimately to Suisun Bay
- Existing treatment plant at Outfall III treats surface water runoff from Storm Sewer III for VOCs
- Metals concentrations in treated water from Outfall III treatment plant sometimes exceed NPDES levels
- Site also included in Group R for sediment contamination

#### **Treatment Alternatives**

- Alternative #12: Collection Sump, Ion Exchange, Activated Carbon, Discharge to Union Creek
- Alternative #13: Collection Sump, Activated Carbon, Discharge to Union Creek
- Alternative #14: Slip-lining and Collaring Storm Sewers

#### **Design Assumptions**

- Maximum flow rate of 1,500 gpm at Outfall III
- Length of storm sewer system in EIOU to be slip-lined — 30,000 feet
- Collection and treatment located at Outfall III

*NOTE: The figure conceptually displays components for comparative purposes only. Actual layout may vary significantly from that shown and will be determined during the remedial design phase.*

**Figure B-19.**  
**Conceptual Design for SD001 (Group J) Surface Water Treatment Alternatives, Travis AFB**

## Cost Summary for SD001 Alternatives

Alternative	Capital Costs	Operation and Maintenance Present Worth	Total
10	\$0	\$0	\$0
11	\$0	\$2,609,416	\$2,609,416
12	\$2,292,120	\$11,554,306	\$13,846,426
13	\$921,209	\$8,137,363	\$9,058,572
14	\$392,257	\$0	\$392,257
15	\$0	\$0	\$0

**Estimated Cost for SD001, Alternative 10**

<b>CAPITAL COSTS</b>		
Process Option	Percentage	Capital Cost
No Action		\$0
<b>Construction Subtotal</b>		<b>\$0</b>
Bid Contingencies (% of Construction Subtotal)	15.0%	\$0
Scope Contingencies (% of Construction Subtotal)	20.0%	\$0
<b>Construction Total</b>		<b>\$0</b>
<b>Other Direct Costs</b>		
Engineering Design (% of Construction Total)	10.0%	\$0
Permitting and Legal (% of Construction Total)	5.0%	\$0
Startup and Shakedown (% of Construction Total)	10.0%	\$0
Bonding and Insurance (% of Construction Total)	3.0%	\$0
Construction Oversight (% of Construction Total)	5.0%	\$0
Field and Laboratory Testing (% of Construction Total)	5.0%	\$0
Reporting (% of Construction Total)	10.0%	\$0
Escalation (% of Construction Total, Based on Mid 1998 Start)	15.0%	\$0
<b>Total Capital Cost</b>		<b>\$0</b>

<b>OPERATION AND MAINTENANCE</b>				
Process Option	Annual O&M Cost	Process Option Service Time (yr)	Present Worth Factor	Process Option Present Worth
No Action	\$0	0.0	0.0000	\$0
<b>O&amp;M Subtotal</b>		<b>\$0</b>		<b>\$0</b>
<b>Misc. O&amp;M Costs (% Annual O&amp;M Unless Otherwise Specified)</b>		<b>Percentage</b>		
<i>See Global Cost Assumptions For Details on Calculations</i>				
No Action		21%	\$0	0.0
<b>Total Operation and Maintenance Costs</b>				<b>\$0</b>

<b>NET PRESENT WORTH</b>	
Capital Costs	\$0
Operation and Maintenance Present Worth	\$0
<b>Total Alternative Cost</b>	<b>\$0</b>

**Estimated Cost for SD001, Alternative 11**

<b>CAPITAL COSTS</b>				
Process Option	Quantity	Unit Cost	Percentage	Capital Cost
Institutional Controls	1	\$0	NA	\$0
Reserved	1	\$0	NA	\$0
Reserved	1	\$0	NA	\$0
<b>Construction Subtotal</b>				
Bid Contingencies (% of Construction Subtotal)			15.0%	\$0
Scope Contingencies (% of Construction Subtotal)			20.0%	\$0
<b>Construction Total</b>				
<b>Other Direct Costs</b>				
Engineering Design (% of Construction Total)			10.0%	\$0
Permitting and Legal (% of Construction Total)			5.0%	\$0
Startup and Shakedown (% of Construction Total)			0.0%	\$0
Bonding and Insurance (% of Construction Total)			3.0%	\$0
Construction Oversight (% of Construction Total)			0.0%	\$0
Field and Laboratory Testing (% of Construction Total)			0.0%	\$0
Reporting (% of Construction Total)			10.0%	\$0
Escalation (% of Construction Total, Based on Mid 1998 Start)			15.0%	\$0
<b>Total Capital Cost</b>				

<b>OPERATION AND MAINTENANCE</b>				
Process Option	Annual O&M Cost	Process Option Service Time (yr)	Present Worth Factor	Process Option Present Worth
Institutional Controls	\$146,333	30.0	15.3725	\$2,249,497
Reserved	\$0	30.0	15.3725	\$0
Reserved	\$0	30.0	15.3725	\$0
<b>O&amp;M Subtotal</b>				<b>\$2,249,497</b>
<b>Misc. O&amp;M Costs (% Annual O&amp;M Unless Otherwise Specified)</b>				
See Global Cost Assumptions For Details on Calculations				
Institutional Controls	16%	\$23,413	30.0	\$359,920
Reserved	16%	\$0	30.0	\$0
Reserved	16%	\$0	30.0	\$0
<b>Total Operation and Maintenance Costs</b>				<b>\$2,609,416</b>

<b>NET PRESENT WORTH</b>	
Capital Costs	\$0
Operation and Maintenance Present Worth	\$2,609,416
<b>Total Alternative Cost</b>	<b>\$2,609,416</b>

**Estimated Cost for SD001, Alternative 12**

<b>CAPITAL COSTS</b>				
Process Option	Quantity	Unit Cost	Percentage	Capital Cost
Collection Sump	1	\$2,500	NA	\$2,500
Influent Piping	1	\$500	NA	\$500
Filtration	1	\$25,000	NA	\$25,000
Ion Exchange	1	\$598,000	NA	\$598,000
Activated Carbon	1	\$398,136	NA	\$398,136
Effluent Piping	1	\$1,500	NA	\$1,500
Utilities and Improvements	1	\$16,000	NA	\$16,000
Effluent Monitoring	1	\$0	NA	\$0
Reserved	1	\$0	NA	\$0
<b>Construction Subtotal</b>				<b>\$1,641,636</b>
Bid Contingencies (% of Construction Subtotal)			15.0%	\$156,245
Scope Contingencies (% of Construction Subtotal)			20.0%	\$208,327
<b>Construction Total</b>				<b>\$1,999,999</b>
<b>Other Direct Costs</b>				
Engineering Design (% of Construction Total)			10.0%	\$140,621
Permitting and Legal (% of Construction Total)			5.0%	\$70,310
Startup and Shakedown (% of Construction Total)			10.0%	\$140,621
Bonding and Insurance (% of Construction Total)			3.0%	\$42,186
Construction Oversight (% of Construction Total)			5.0%	\$70,310
Field and Laboratory Testing (% of Construction Total)			5.0%	\$70,310
Reporting (% of Construction Total)			10.0%	\$140,621
Escalation (% of Construction Total, Based on Mid 1998 Start)			15.0%	\$210,931
<b>Total Capital Cost</b>				<b>\$2,192,138</b>

<b>OPERATION AND MAINTENANCE</b>					
Process Option	Annual O&M Cost	Process Option Service Time (yr)	Present Worth Factor	Process Option Present Worth	
Collection Sump	\$250	30.0	15.3725	\$3,843	
Influent Piping	\$250	30.0	15.3725	\$3,843	
Filtration	\$2,500	30.0	15.3725	\$38,431	
Ion Exchange	\$181,200	30.0	15.3725	\$2,785,488	
Activated Carbon	\$290,394	30.0	15.3725	\$4,464,068	
Effluent Piping	\$250	30.0	15.3725	\$3,843	
Utilities and Improvements	\$0	30.0	15.3725	\$0	
Effluent Monitoring	\$146,333	30.0	15.3725	\$2,249,497	
Reserved	\$0	30.0	15.3725	\$0	
<b>O&amp;M Subtotal</b>				<b>\$671,677</b>	<b>\$9,549,613</b>
<b>Misc. O&amp;M Costs (% Annual O&amp;M Unless Otherwise Specified)</b>		<b>Percentage</b>			
<i>See Global Cost Assumptions For Details in Calculations</i>					
Collection Sump	21%	\$53	30.0	15.3725	\$807
Influent Piping	21%	\$53	30.0	15.3725	\$807
Filtration	21%	\$525	30.0	15.3725	\$8,071
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Utilities and Improvements	21%	\$0	30.0	15.3725	\$0
Effluent Monitoring	21%	\$30,730	30.0	15.3725	\$472,394
Reserved	21%	\$0	30.0	15.3725	\$0
<b>Total Operation and Maintenance Costs</b>				<b>\$11,554,306</b>	

<b>NET PRESENT WORTH</b>	
Capital Costs	\$2,292,120
Operation and Maintenance Present Worth	\$11,554,306
<b>Total Alternative Cost</b>	<b>\$13,846,426</b>

**Estimated Cost for SD001, Alternative 13**

<b>CAPITAL COSTS</b>				
<b>Process Option</b>	<b>Quantity</b>	<b>Unit Cost</b>	<b>Percentage</b>	<b>Capital Cost</b>
Collection Sump	1	\$2,500	NA	\$2,500
Influent Piping	1	\$500	NA	\$500
Activated Carbon	1	\$398,136	NA	\$398,136
Effluent Piping	1	\$1,500	NA	\$1,500
Utilities and Improvements	1	\$16,000	NA	\$16,000
Effluent Monitoring	1	\$0	NA	\$0
Reserved	1	\$0	NA	\$0
<b>Construction Subtotal</b>				<b>\$418,636</b>
Bid Contingencies (% of Construction Subtotal)			15.0%	\$62,795
Scope Contingencies (% of Construction Subtotal)			20.0%	\$83,727
<b>Construction Total</b>				<b>\$564,158</b>
<b>Other Direct Costs</b>				
Engineering Design (% of Construction Total)			10.0%	\$56,516
Permitting and Legal (% of Construction Total)			5.0%	\$28,258
Startup and Shakedown (% of Construction Total)			10.0%	\$56,516
Bonding and Insurance (% of Construction Total)			3.0%	\$16,955
Construction Oversight (% of Construction Total)			5.0%	\$28,258
Field and Laboratory Testing (% of Construction Total)			5.0%	\$28,258
Reporting (% of Construction Total)			10.0%	\$56,516
Escalation (% of Construction Total, Based on Mid 1998 Start)			15.0%	\$84,774
<b>Total Capital Cost</b>				<b>\$921,209</b>

<b>OPERATION AND MAINTENANCE</b>				
<b>Process Option</b>	<b>Annual O&amp;M Cost</b>	<b>Process Option Service Time (yr)</b>	<b>Present Worth Factor</b>	<b>Process Option Present Worth</b>
Collection Sump	\$250	30.0	15.3725	\$3,843
Influent Piping	\$250	30.0	15.3725	\$3,843
Activated Carbon	\$290,394	30.0	15.3725	\$4,464,068
Effluent Piping	\$250	30.0	15.3725	\$3,843
Utilities and Improvements	\$0	30.0	15.3725	\$0
Effluent Monitoring	\$146,333	30.0	15.3725	\$2,249,497
Reserved	\$0	30.0	15.3725	\$0
<b>O&amp;M Subtotal</b>				<b>\$6,725,094</b>
<b>Min. O&amp;M Costs (% Annual O&amp;M Unless Otherwise Specified)</b>		<b>Percentage</b>		
<i>See Global Cost Assumptions For Details on Calculations</i>				
Collection Sump	21%	\$53	30.0	\$807
Influent Piping	21%	\$53	30.0	\$807
Activated Carbon	21%	\$60,983	30.0	\$937,454
Effluent Piping	21%	\$53	30.0	\$807
Utilities and Improvements	21%	\$0	30.0	\$0
Effluent Monitoring	21%	\$30,730	30.0	\$472,394
Reserved	21%	\$0	30.0	\$0
<b>Total Operation and Maintenance Costs</b>				<b>\$8,137,363</b>

<b>NET PRESENT WORTH</b>	
Capital Costs	\$921,209
Operation and Maintenance Present Worth	\$8,137,363
<b>Total Alternative Cost</b>	<b>\$9,058,572</b>

### Estimated Cost for SD001, Alternative 14

CAPITAL COSTS				
Process Option	Quantity	Unit Cost	Percentage	Capital Cost
Slip Line Storm Sewer	1	\$196,325	NA	\$196,325
Reserved	1	\$0	NA	\$0
<b>Construction Subtotal</b>				<b>\$196,325</b>
Bid Contingencies (% of Construction Subtotal)			15.0%	\$29,449
Scope Contingencies (% of Construction Subtotal)			20.0%	\$39,265
<b>Construction Total</b>				<b>\$265,039</b>
Other Direct Costs				
Engineering Design (% of Construction Total)			10.0%	\$26,504
Permitting and Legal (% of Construction Total)			5.0%	\$13,252
Startup and Shakedown (% of Construction Total)			0.0%	\$0
Bonding and Insurance (% of Construction Total)			3.0%	\$7,951
Construction Oversight (% of Construction Total)			5.0%	\$13,252
Field and Laboratory Testing (% of Construction Total)			0.0%	\$0
Reporting (% of Construction Total)			10.0%	\$26,504
Escalation (% of Construction Total, Based on Mid 1998 Start)			15.0%	\$39,756
<b>Total Capital Cost</b>				<b>\$392,257</b>

OPERATION AND MAINTENANCE				
Process Option	Annual O&M Cost	Process Option Service Time (yr)	Present Worth Factor	Process Option Present Worth
Slip Line Storm Sewer	\$0	30.0	15.3725	\$0
Reserved	\$0	30.0	15.3725	\$0
<b>O&amp;M Subtotal</b>				<b>\$0</b>
Misc. O&M Costs (% Annual O&M Unless Otherwise Specified)		Percentage		
See Global Cost Assumptions For Details on Calculations.				
Slip Line Storm Sewer		16%		
Reserved		16%		
<b>Total Operation and Maintenance Costs</b>				<b>\$0</b>

NET PRESENT WORTH	
Capital Costs	\$392,257
Operation and Maintenance Present Worth	\$0
<b>Total Alternative Cost</b>	<b>\$392,257</b>

**Estimated Cost for SD001, Alternative 15**

<b>CAPITAL COSTS</b>				
Process Option	Quantity	Unit Cost	Percentage	Capital Cost
Source Control	1	\$0	NA	\$0
Reserved	1	\$0	NA	\$0
<b>Construction Subtotal</b>				\$0
Bid Contingencies (% of Construction Subtotal)			15.0%	\$0
Scope Contingencies (% of Construction Subtotal)			20.0%	\$0
<b>Construction Total</b>				\$0
<b>Other Direct Costs</b>				
Engineering Design (% of Construction Total)			10.0%	\$0
Permitting and Legal (% of Construction Total)			5.0%	\$0
Startup and Shakedown (% of Construction Total)			10.0%	\$0
Bonding and Insurance (% of Construction Total)			3.0%	\$0
Construction Oversight (% of Construction Total)			5.0%	\$0
Field and Laboratory Testing (% of Construction Total)			5.0%	\$0
Reporting (% of Construction Total)			10.0%	\$0
Escalation (% of Construction Total, Based on Mid 1998 Start)			15.0%	\$0
<b>Total Capital Cost</b>				\$0

<b>OPERATION AND MAINTENANCE</b>				
Process Option	Annual O&M Cost	Process Option Service Time (yr)	Present Worth Factor	Process Option Present Worth
Source Control	\$0	30.0	15.3725	\$0
Reserved	\$0	30.0	15.3725	\$0
<b>O&amp;M Subtotal</b>				\$0
<b>Misc. O&amp;M Costs (% Annual O&amp;M Unless Otherwise Specified)</b>		<b>Percentage</b>		
<i>See Global Cost Assumptions For Details in Calculations</i>				
Source Control		21%		
Reserved		21%		
<b>Total Operation and Maintenance Costs</b>				\$0

<b>NET PRESENT WORTH</b>	
Capital Costs	\$0
Operation and Maintenance Present Worth	\$0
<b>Total Alternative Cost</b>	\$0

SD001 Cost Summary Sheet

Cost Estimate Summary Sheet

NEWIOU Feasibility Study, Travis AFB

Process Option Summary for SD001

Assumptions:

- 1 Use RACER/ENVEST cost estimating model, Version 3.1 when practical
- 2 Compute monitoring and O&M for one year only; add costs for subsequent years using Alternative Cost Summary Sheets.
- 3 Horizontal extraction wells are 300 feet in length.

Cost Summary:

Item	Capital Cost	O&M Cost
Collection Sump	\$2,500	\$250
Influent Piping	\$500	\$250
Filtration	\$25,000	\$2,500
Ion Exchange	\$598,000	\$181,200
Activated Carbon	\$398,136	\$290,394
Effluent Piping	\$1,500	\$250
Utilities and Improvments	\$16,000	\$0
Clear and Grub	\$1,500	\$0
Electrical	\$3,000	\$0
Access Road	\$5,000	\$0
Cleanup and Landscaping	\$2,500	\$0
Fencing	\$2,500	\$0
Treatment Unit Pad	\$1,500	\$0
Institutional Controls	\$0	\$146,333
Creek Monitoring	\$0	\$0
Effluent Monitoring	\$0	\$146,333
Slip Line Storm Sewer	\$196,325	\$0
Source Control	\$0	\$0
Reserved	\$0	\$0

### Cost Summary for FT003 Alternatives

Alternative	Health-Based Cleanup			Incremental Ecological-Based Cleanup			Grand Total
	Capital Costs	Operation and Maintenance Present Worth	Subtotal	Capital Costs	Operation and Maintenance Present Worth	Subtotal	
16	\$0	\$0	\$0	\$0	\$0	\$0	\$0
17	\$40,043	\$72,766	\$112,809	\$0	\$72,766	\$72,766	\$185,575
18	\$2,697,929	\$0	\$2,697,929	\$1,635,884	\$0	\$1,635,884	\$4,333,813
19	\$1,878,264	\$53,905	\$1,932,169	\$516,734	\$53,905	\$570,639	\$2,502,808
20	\$37,601,766	\$0	\$37,601,766	\$5,129,713	\$0	\$5,129,713	\$42,731,479

**Estimated Cost for FT003, Health-Based Alternative 16**

<b>CAPITAL COSTS</b>		
<b>Process Option</b>	<b>Percentage</b>	<b>Capital Cost</b>
No Action		\$0
<b>Construction Subtotal</b>		
Bid Contingencies (% of Construction Subtotal)	15.0%	\$0
Scope Contingencies (% of Construction Subtotal)	20.0%	\$0
<b>Construction Total</b>		
<b>Other Direct Costs</b>		
Engineering Design (% of Construction Total)	10.0%	\$0
Permitting and Legal (% of Construction Total)	5.0%	\$0
Startup and Shakedown (% of Construction Total)	10.0%	\$0
Bonding and Insurance (% of Construction Total)	3.0%	\$0
Construction Oversight (% of Construction Total)	5.0%	\$0
Field and Laboratory Testing (% of Construction Total)	5.0%	\$0
Reporting (% of Construction Total)	10.0%	\$0
Escalation (% of Construction Total, Based on Mid 1998 Start)	15.0%	\$0
<b>Total Capital Cost</b>		
		\$0

<b>OPERATION AND MAINTENANCE</b>				
<b>Process Option</b>	<b>Annual O&amp;M Cost</b>	<b>Process Option Service Time (yr)</b>	<b>Present Worth Factor</b>	<b>Process Option Present Worth</b>
No Action	\$0	0.0	0.0000	\$0
<b>O&amp;M Subtotal</b>				
	\$0			\$0
<b>Misc. O&amp;M Costs (% Annual O&amp;M Unless Otherwise Specified)</b>		<b>Percentage</b>		
<i>See Global Cost Assumptions For Details on Calculations</i>				
No Action		21%	\$0	0.0
<b>Total Operation and Maintenance Costs</b>				
				\$0

<b>NET PRESENT WORTH</b>	
Capital Costs	\$0
Operation and Maintenance Present Worth	\$0
<b>Total Alternative Cost</b>	
	\$0

**Estimated Cost for FT003, Ecological-Based Alternative 16**

<b>CAPITAL COSTS</b>		
<b>Process Option</b>	<b>Percentage</b>	<b>Capital Cost</b>
No Action		\$0
<b>Construction Subtotal</b>		<b>\$0</b>
Bid Contingencies (% of Construction Subtotal)	15.0%	\$0
Scope Contingencies (% of Construction Subtotal)	20.0%	\$0
<b>Construction Total</b>		<b>\$0</b>
<b>Other Direct Costs</b>		
Engineering Design (% of Construction Total)	10.0%	\$0
Permitting and Legal (% of Construction Total)	5.0%	\$0
Startup and Shakedown (% of Construction Total)	10.0%	\$0
Bonding and Insurance (% of Construction Total)	3.0%	\$0
Construction Oversight (% of Construction Total)	5.0%	\$0
Field and Laboratory Testing (% of Construction Total)	5.0%	\$0
Reporting (% of Construction Total)	10.0%	\$0
Escalation (% of Construction Total, Based on Mid 1998 Start)	15.0%	\$0
<b>Total Capital Cost</b>		<b>\$0</b>

<b>OPERATION AND MAINTENANCE</b>						
<b>Process Option</b>	<b>Annual O&amp;M Cost</b>	<b>Process Option Service Time (yr)</b>	<b>Present Worth Factor</b>	<b>Process Option Present Worth</b>		
No Action	\$0	0.0	0.0000	\$0		
<b>G&amp;M Subtotal</b>		<b>\$0</b>		<b>\$0</b>		
<b>Misc. O&amp;M Costs (% Annual O&amp;M Unless Otherwise Specified)</b>		<b>Percentage</b>				
<i>See Global Cost Assumptions For Details on Calculations</i>						
No Action		21%	\$0	0.0	0.0000	\$0
<b>Total Operation and Maintenance Costs</b>						<b>\$0</b>

<b>NET PRESENT WORTH</b>	
Capital Costs	\$0
Operation and Maintenance Present Worth	\$0
<b>Total Alternative Cost</b>	<b>\$0</b>

**Estimated Cost for FT003, Health-Based Alternative 17**

<b>CAPITAL COSTS</b>		
Process Option		Capital Cost
Fencing		\$21,494
Monitoring		\$0
Reserved		\$0
<b>Construction Subtotal</b>		<b>\$21,494</b>
Bid Contingencies (% of Construction Subtotal)	15.0%	\$3,224
Scope Contingencies (% of Construction Subtotal)	20.0%	\$4,299
<b>Construction Total</b>		<b>\$29,017</b>
<b>Other Direct Costs</b>		
Engineering Design (% of Construction Total)	10.0%	\$2,902
Permitting and Legal (% of Construction Total)	5.0%	\$1,451
Startup and Shakedown (% of Construction Total)	0.0%	\$0
Bonding and Insurance (% of Construction Total)	3.0%	\$871
Construction Oversight (% of Construction Total)	5.0%	\$1,451
Field and Laboratory Testing (% of Construction Total)	0.0%	\$0
Reporting (% of Construction Total)	0.0%	\$0
Escalation (% of Construction Total, Based on Mid 1998 Start)	15.0%	\$4,353
<b>Total Capital Cost</b>		<b>\$40,043</b>

<b>OPERATION AND MAINTENANCE</b>					
Process Option		Annual O&M Cost	Process Option Service Time (yr)	Present Worth Factor	Process Option Present Worth
Fencing		\$0	30.0	15.3725	\$0
Monitoring		\$3,912	30.0	15.3725	\$60,137
Reserved		\$0	30.0	15.3725	\$0
<b>O&amp;M Subtotal</b>		<b>\$3,912</b>			<b>\$60,137</b>
<b>Minor O&amp;M Costs (9% Annual O&amp;M Unless Otherwise Specified)</b>		<b>Percentage</b>			
See Global Cost Assumptions for Detail on Calculations					
Fencing	21%	\$0	30.0	15.3725	\$0
Monitoring	21%	\$822	30.0	15.3725	\$12,629
Reserved	21%	\$0	30.0	15.3725	\$0
<b>Total Operation and Maintenance Costs</b>					<b>\$72,766</b>

<b>NET PRESENT WORTH</b>	
Capital Costs	\$40,043
Operation and Maintenance Present Worth	\$72,766
<b>Total Alternative Cost</b>	<b>\$112,809</b>

**Estimated Cost for FT003, Ecological-Based Alternative 17**

<b>CAPITAL COSTS</b>		
Process Option		Capital Cost
Fencing		\$0
Monitoring		\$0
Reserved		\$0
<b>Construction Subtotal</b>		<b>\$0</b>
Bid Contingencies (% of Construction Subtotal)	15.0%	\$0
Scope Contingencies (% of Construction Subtotal)	20.0%	\$0
<b>Construction Total</b>		<b>\$0</b>
<b>Other Direct Costs</b>		
Engineering Design (% of Construction Total)	10.0%	\$0
Permitting and Legal (% of Construction Total)	5.0%	\$0
Startup and Shakedown (% of Construction Total)	0.0%	\$0
Bonding and Insurance (% of Construction Total)	3.0%	\$0
Construction Oversight (% of Construction Total)	5.0%	\$0
Field and Laboratory Testing (% of Construction Total)	0.0%	\$0
Reporting (% of Construction Total)	0.0%	\$0
Escalation (% of Construction Total, Based on Mid 1998 Start)	15.0%	\$0
<b>Total Capital Cost</b>		<b>\$0</b>

<b>OPERATION AND MAINTENANCE</b>					
Process Option		Annual O&M Cost	Process Option Service Time (yr)	Present Worth Factor	Process Option Present Worth
Fencing		\$0	30.0	15.3725	\$0
Monitoring		\$3,912	30.0	15.3725	\$60,137
Reserved		\$0	30.0	15.3725	\$0
<b>O&amp;M Subtotal</b>		<b>\$3,912</b>			<b>\$60,137</b>
Misc. O&M Costs (% Annual O&M Unless Otherwise Specified)	Percentage				
See Global Cost Assumptions for Details on Calculations					
Fencing	21%	\$0	30.0	15.3725	\$0
Monitoring	21%	\$822	30.0	15.3725	\$12,629
Reserved	21%	\$0	30.0	15.3725	\$0
<b>Total Operation and Maintenance Costs</b>					<b>\$72,766</b>

<b>NET PRESENT WORTH</b>	
Capital Costs	\$0
Operation and Maintenance Present Worth	\$72,766
<b>Total Alternative Cost</b>	<b>\$72,766</b>

**Estimated Cost for FT003, Health-Based Alternative 18**

<b>CAPITAL COSTS</b>		
<b>Process Option</b>		<b>Capital Cost</b>
Demolition & Clearing		\$21,080
Excavation		\$32,643
Transportation Alt 18		\$405,600
Landfill Disposal		\$884,087
Cleanup & Improvements		\$6,905
Reserved		\$0
<b>Construction Subtotal</b>		<b>\$1,350,315</b>
Bid Contingencies (% of Construction Subtotal)	15.0%	\$202,547
Scope Contingencies (% of Construction Subtotal)	20.0%	\$270,063
<b>Construction Total</b>		<b>\$1,822,925</b>
<b>Other Direct Costs</b>		
Engineering Design (% of Construction Total)	5.0%	\$91,146
Permitting and Legal (% of Construction Total)	5.0%	\$91,146
Startup and Shakedown (% of Construction Total)	0.0%	\$0
Bonding and Insurance (% of Construction Total)	3.0%	\$54,688
Construction Oversight (% of Construction Total)	5.0%	\$91,146
Field and Laboratory Testing (% of Construction Total)	5.0%	\$91,146
Reporting (% of Construction Total)	10.0%	\$182,293
Escalation (% of Construction Total, Based on Mid 1998 Start)	15.0%	\$273,439
<b>Total Capital Cost</b>		<b>\$2,697,929</b>

<b>OPERATION AND MAINTENANCE</b>				
<b>Process Option</b>	<b>Annual O&amp;M Cost</b>	<b>Process Option Service Time (Yr)</b>	<b>Present Worth Factor</b>	<b>Process Option Present Worth</b>
Demolition & Clearing	\$0	30.0	15.3725	\$0
Excavation	\$0	30.0	15.3725	\$0
Transportation Alt 18	\$0	30.0	15.3725	\$0
Landfill Disposal	\$0	30.0	15.3725	\$0
Cleanup & Improvements	\$0	30.0	15.3725	\$0
Reserved	\$0	30.0	15.3725	\$0
<b>O&amp;M Subtotal</b>				
<b>Min. O&amp;M Costs (% Annual O&amp;M Unless Otherwise Specified)</b>		<b>Percentage</b>		
<b>See Global Cost Assumptions for Demolition Calculation</b>				
Demolition & Clearing	16%	\$0	30.0	15.3725
Excavation	16%	\$0	30.0	15.3725
Transportation Alt 18	16%	\$0	30.0	15.3725
Landfill Disposal	16%	\$0	30.0	15.3725
Cleanup & Improvements	16%	\$0	30.0	15.3725
Reserved	16%	\$0	30.0	15.3725
<b>Total Operation and Maintenance Costs</b>				

<b>NET PRESENT WORTH</b>	
Capital Costs	\$2,697,929
Operation and Maintenance Present Worth	\$0
<b>Total Present Worth</b>	<b>\$2,697,929</b>

**Estimated Cost for FT003, Ecological-Based Alternative 18**

<b>CAPITAL COSTS</b>		
<b>Process Option</b>		<b>Capital Cost</b>
Demolition & Clearing		\$7,068
Excavation		\$4,438
Transportation Alt 18		\$53,300
Landfill Disposal		\$120,197
Cleanup & Improvements		\$3,452
Reserved		\$0
<b>Construction Subtotal</b>		<b>\$188,455</b>
Bid Contingencies (% of Construction Subtotal)	15.0%	\$28,268
Scope Contingencies (% of Construction Subtotal)	20.0%	\$37,691
<b>Construction Total</b>		<b>\$254,414</b>
<b>Other Direct Costs</b>		
Engineering Design (% of Construction Total)	500.0%	\$1,272,071
Permitting and Legal (% of Construction Total)	5.0%	\$12,721
Startup and Shakedown (% of Construction Total)	0.0%	\$0
Bonding and Insurance (% of Construction Total)	3.0%	\$7,632
Construction Oversight (% of Construction Total)	5.0%	\$12,721
Field and Laboratory Testing (% of Construction Total)	5.0%	\$12,721
Reporting (% of Construction Total)	10.0%	\$25,441
Escalation (% of Construction Total, Based on Mid 1998 Start)	15.0%	\$38,162
<b>Total Capital Cost</b>		<b>\$1,635,884</b>

<b>OPERATION AND MAINTENANCE</b>					
<b>Process Option</b>		<b>Annual O&amp;M Cost</b>	<b>Process Option Service Time (yr)</b>	<b>Present Worth Factor</b>	<b>Process Option Present Worth</b>
Demolition & Clearing		\$0	30.0	15.3725	\$0
Excavation		\$0	30.0	15.3725	\$0
Transportation Alt 18		\$0	30.0	15.3725	\$0
Landfill Disposal		\$0	30.0	15.3725	\$0
Cleanup & Improvements		\$0	30.0	15.3725	\$0
Reserved		\$0	30.0	15.3725	\$0
<b>O&amp;M Subtotal</b>		<b>\$0</b>			<b>\$0</b>
<b>Alloc. O&amp;M Costs (% Annual O&amp;M Unless Otherwise Specified)</b>	<b>Percentage</b>				
<i>See Global Cost Assumptions For Details on Calculations</i>					
Demolition & Clearing	16%	\$0	30.0	15.3725	\$0
Excavation	16%	\$0	30.0	15.3725	\$0
Transportation Alt 18	16%	\$0	30.0	15.3725	\$0
Landfill Disposal	16%	\$0	30.0	15.3725	\$0
Cleanup & Improvements	16%	\$0	30.0	15.3725	\$0
Reserved	16%	\$0	30.0	15.3725	\$0
<b>Total Operation and Maintenance Costs</b>					<b>\$0</b>

<b>NET PRESENT WORTH</b>	
Capital Costs	\$1,635,884
Operation and Maintenance Present Worth	\$0
<b>Total Alternative Cost</b>	<b>\$1,635,884</b>

**Estimated Cost for FT003, Health-Based Alternative 19**

<b>CAPITAL COSTS</b>		
Process Option		Capital Cost
Demolition & Clearing		\$21,080
Capping		\$881,366
Cleanup & Improvements		\$6,905
Soil Vapor Monitoring		\$0
Reserved		\$0
<b>Construction Subtotal</b>		<b>\$909,351</b>
Bid Contingencies (% of Construction Subtotal)	15.0%	\$136,403
Scope Contingencies (% of Construction Subtotal)	20.0%	\$181,870
<b>Construction Total</b>		<b>\$1,227,624</b>
<b>Other Direct Costs</b>		
Engineering Design (% of Construction Total)	10.0%	\$122,762
Permitting and Legal (% of Construction Total)	5.0%	\$61,381
Startup and Shakedown (% of Construction Total)	0.0%	\$0
Bonding and Insurance (% of Construction Total)	3.0%	\$36,829
Construction Oversight (% of Construction Total)	5.0%	\$61,381
Field and Laboratory Testing (% of Construction Total)	5.0%	\$61,381
Reporting (% of Construction Total)	10.0%	\$122,762
Escalation (% of Construction Total, Based on Mid 1998 Start)	15.0%	\$184,144
<b>Total Capital Cost</b>		<b>\$1,878,264</b>

<b>OPERATION AND MAINTENANCE</b>				
Process Option	Annual O&M Cost	Process Option Service Time (yr)	Present Worth Factor	Process Option Present Worth
Demolition & Clearing	\$0	30.0	15.3725	\$0
Capping	\$0	30.0	15.3725	\$0
Cleanup & Improvements	\$0	30.0	15.3725	\$0
Soil Vapor Monitoring	\$2,898	30.0	15.3725	\$44,549
Reserved	\$0	30.0	15.3725	\$0
<b>0/ Reserved</b>	<b>\$2,898</b>			<b>\$44,549</b>
Misc. O&M Costs (i.e. Annual O&M Entries Otherwise Specified)		Percentage		
See Global Data Assumptions For Detail on Calculations				
Demolition & Clearing		21%		
Capping	\$0	21%	15.3725	\$0
Cleanup & Improvements	\$0	21%	15.3725	\$0
Soil Vapor Monitoring	\$609	21%	15.3725	\$9,355
Reserved	\$0	21%	15.3725	\$0
<b>Total Operation and Maintenance Costs</b>				<b>\$53,905</b>

<b>NET PRESENT WORTH</b>	
Capital Costs	\$1,878,264
Operation and Maintenance Present Worth	\$53,905
<b>Total Alternative Cost</b>	<b>\$1,932,169</b>

**Estimated Cost for FT003, Ecological-Based Alternative 19**

<b>CAPITAL COSTS</b>		
<b>Process Option</b>		<b>Capital Cost</b>
Demolition & Clearing		\$7,068
Capping		\$239,654
Cleanup & Improvements		\$3,452
Soil Vapor Monitoring		\$0
Reserved		\$0
<b>Construction Subtotal</b>		<b>\$250,174</b>
Bid Contingencies (% of Construction Subtotal)	15.0%	\$37,526
Scope Contingencies (% of Construction Subtotal)	20.0%	\$50,035
<b>Construction Total</b>		<b>\$337,735</b>
<b>Other Direct Costs</b>		
Engineering Design (% of Construction Total)	10.0%	\$33,773
Permitting and Legal (% of Construction Total)	5.0%	\$16,887
Startup and Shakedown (% of Construction Total)	0.0%	\$0
Bonding and Insurance (% of Construction Total)	3.0%	\$10,132
Construction Oversight (% of Construction Total)	5.0%	\$16,887
Field and Laboratory Testing (% of Construction Total)	5.0%	\$16,887
Reporting (% of Construction Total)	10.0%	\$33,773
Escalation (% of Construction Total, Based on Mid 1998 Start)	15.0%	\$50,660
<b>Total Capital Cost</b>		<b>\$516,764</b>

<b>OPERATION AND MAINTENANCE</b>				
<b>Process Option</b>	<b>Annual O&amp;M Cost</b>	<b>Process Option Service Time (yr)</b>	<b>Present Worth Factor</b>	<b>Process Option Present Worth</b>
Demolition & Clearing	\$0	30.0	15.3725	\$0
Capping	\$0	30.0	15.3725	\$0
Cleanup & Improvements	\$0	30.0	15.3725	\$0
Soil Vapor Monitoring	\$2,898	30.0	15.3725	\$44,549
Reserved	\$0	30.0	15.3725	\$0
<b>G Reserved</b>	<b>\$2,898</b>			<b>\$44,549</b>
<b>Min. O&amp;M Cost (% Annual O&amp;M Unless Otherwise Specified)</b>	<b>Percentage</b>			
<i>See Global Cost Assumptions For Details on Calculations</i>				
Demolition & Clearing	21%	\$0	30.0	\$0
Capping	21%	\$0	30.0	\$0
Cleanup & Improvements	21%	\$0	30.0	\$0
Soil Vapor Monitoring	21%	\$609	30.0	\$9,355
Reserved	21%	\$0	30.0	\$0
<b>Total Operation and Maintenance Cost</b>				<b>\$53,905</b>

<b>NET PRESENT WORTH</b>	
Capital Costs	\$516,734
Operation and Maintenance Present Worth	\$53,905
<b>Total Alternative Cost</b>	<b>\$570,639</b>

**Estimated Cost for FT003, Health-Based Alternative 20**

<b>CAPITAL COSTS</b>			
Process Option			Capital Cost
Demolition & Clearing			\$21,080
Excavation			\$32,643
Transportation Alt 20			\$707,200
Thermal Destruction/Landfill Disposal			\$16,320,000
Cleanup & Improvements			\$6,905
Reserved			\$0
<b>Construction Subtotal</b>			<b>\$17,087,828</b>
Bid Contingencies (% of Construction Subtotal)	15.0%		\$2,563,174
Scope Contingencies (% of Construction Subtotal)	20.0%		\$3,417,566
<b>Construction Total</b>			<b>\$23,068,568</b>
<b>Other/Indirect Costs</b>			
Engineering Design (% of Construction Total)	5.0%		\$1,153,428
Permitting and Legal (% of Construction Total)	10.0%		\$2,306,857
Startup and Shakedown (% of Construction Total)	10.0%		\$2,306,857
Bonding and Insurance (% of Construction Total)	3.0%		\$692,057
Construction Oversight (% of Construction Total)	5.0%		\$1,153,428
Field and Laboratory Testing (% of Construction Total)	5.0%		\$1,153,428
Reporting (% of Construction Total)	10.0%		\$2,306,857
Escalation (% of Construction Total, Based on Mid 1998 Start)	15.0%		\$3,460,285
<b>Total Capital Cost</b>			<b>\$37,601,766</b>

<b>OPERATION AND MAINTENANCE</b>					
Process Option		Annual O&M Cost	Process Option Service Time (yr)	Present Worth Factor	Process Option Present Worth
Demolition & Clearing		\$0	30.0	15.3725	\$0
Excavation		\$0	30.0	15.3725	\$0
Transportation Alt 20		\$0	30.0	15.3725	\$0
Thermal Destruction/Landfill Disposal		\$0	30.0	15.3725	\$0
Cleanup & Improvements		\$0	30.0	15.3725	\$0
Reserved		\$0	30.0	15.3725	\$0
<b>O&amp;M Summary</b>		<b>\$0</b>			<b>\$0</b>
Misc. O&M Costs (% Annual O&M Rates Other-wise Specified)		Percentage			
<i>See Global Cost Assumptions for Details on Calculations</i>					
Demolition & Clearing	16%	\$0	30.0	15.3725	\$0
Excavation	16%	\$0	30.0	15.3725	\$0
Transportation Alt 20	16%	\$0	30.0	15.3725	\$0
Thermal Destruction/Landfill Disposal	16%	\$0	30.0	15.3725	\$0
Cleanup & Improvements	16%	\$0	30.0	15.3725	\$0
Reserved	16%	\$0	30.0	15.3725	\$0
<b>Total Operation and Maintenance Costs</b>					<b>\$0</b>

<b>NET PRESENT WORTH</b>	
Capital Costs	\$37,601,766
Operation and Maintenance Present Worth	\$0
<b>Total Alternative Cost</b>	<b>\$37,601,766</b>

**Estimated Cost for FT003, Ecological-Based Alternative 20**

<b>CAPITAL COSTS</b>		
<b>Process Option</b>		<b>Capital Cost</b>
Demolition & Clearing		\$7,068
Excavation		\$4,438
Transportation Alt 20		\$96,200
Thermal Destruction/Landfill Disposal		\$2,220,000
Cleanup & Improvments		\$3,452
Reserved		\$0
<b>Construction Subtotal</b>		<b>\$2,331,158</b>
Bid Contingencies (% of Construction Subtotal)	15.0%	\$349,674
Scope Contingencies (% of Construction Subtotal)	20.0%	\$466,232
<b>Construction Total</b>		<b>\$3,147,063</b>
<b>Other Direct Costs</b>		
Engineering Design (% of Construction Total)	5.0%	\$157,353
Permitting and Legal (% of Construction Total)	10.0%	\$314,706
Startup and Shakedown (% of Construction Total)	10.0%	\$314,706
Bonding and Insurance (% of Construction Total)	3.0%	\$94,412
Construction Oversight (% of Construction Total)	5.0%	\$157,353
Field and Laboratory Testing (% of Construction Total)	5.0%	\$157,353
Reporting (% of Construction Total)	10.0%	\$314,706
Escalation (% of Construction Total, Based on Mid 1998 Start)	15.0%	\$472,059
<b>Total Capital Cost</b>		<b>\$5,429,713</b>

<b>OPERATION AND MAINTENANCE</b>					
<b>Process Option</b>		<b>Annual O&amp;M Cost</b>	<b>Process Option Service Time (yr)</b>	<b>Present Worth Factor</b>	<b>Process Option Present Worth</b>
Demolition & Clearing		\$0	30.0	15.3725	\$0
Excavation		\$0	30.0	15.3725	\$0
Transportation Alt 20		\$0	30.0	15.3725	\$0
Thermal Destruction/Landfill Disposal		\$0	30.0	15.3725	\$0
Cleanup & Improvments		\$0	30.0	15.3725	\$0
Reserved		\$0	30.0	15.3725	\$0
<b>O&amp;M Subtotal</b>		<b>\$0</b>			<b>\$0</b>
<b>Misc. O&amp;M Costs (% Annual O&amp;M Unless Otherwise Specified)</b>		<b>Percentage</b>			
<i>See Global Cost Assumptions For Details on Calculations</i>					
Demolition & Clearing	16%	\$0	30.0	15.3725	\$0
Excavation	16%	\$0	30.0	15.3725	\$0
Transportation Alt 20	16%	\$0	30.0	15.3725	\$0
Thermal Destruction/Landfill Disposal	16%	\$0	30.0	15.3725	\$0
Cleanup & Improvments	16%	\$0	30.0	15.3725	\$0
Reserved	16%	\$0	30.0	15.3725	\$0
<b>Total Operation and Maintenance Costs</b>					<b>\$0</b>

<b>NET PRESENT WORTH</b>	
Capital Costs	\$5,129,713
Operation and Maintenance Present Worth	\$0
<b>Total Alternative Cost</b>	<b>\$5,129,713</b>

**Cost Estimate Summary Sheet**

**NEWIOU Feasibility Study, Travis AFB**

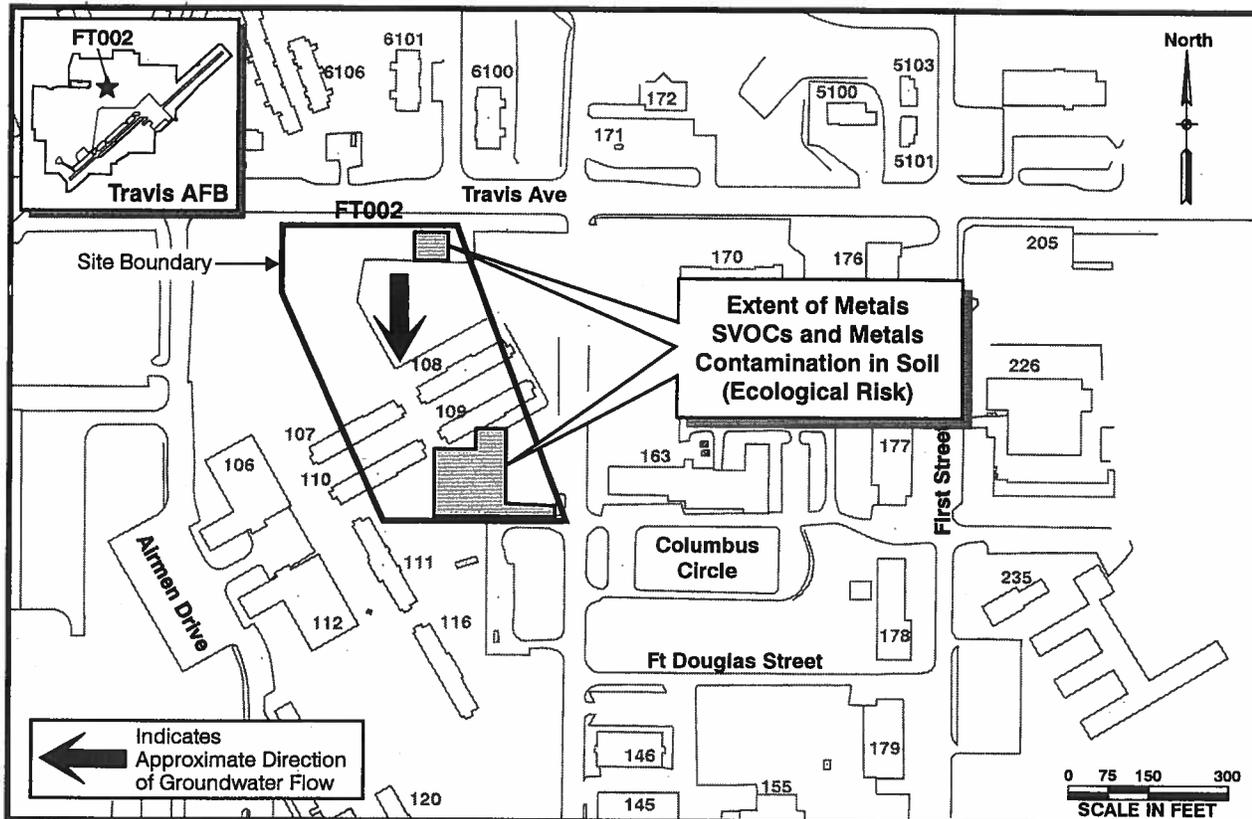
**Process Option Summary for FT003**

**Assumptions:**

- 1 Use RACER/ENVEST cost estimating model, Version 3.1 when practical
- 2 Compute monitoring and O&M for one year only; add costs for subsequent years using Alternative Cost Summary Sheets.
- 3 Soil disposal costs do not include transportation from TAFB or treatment facility to landfill
- 4 Capping costs include vents, etc.
- 5 Thermal treatment cost is \$600/ton and includes subsequent disposal

**Cost Summary:**

Item	Health-Based		Ecological-Based	
	Capital Cost	O&M Cost	Capital Cost	O&M Cost
<b>Demolition &amp; Clearing</b>	<b>\$21,080</b>	<b>\$0</b>	<b>\$7,068</b>	<b>\$0</b>
Demolition, Curbs	\$0	\$0	\$0	\$0
Demolition, Pavements	\$0	\$0	\$0	\$0
Clear and Grub	\$21,080	\$0	\$7,068	\$0
<b>Capping</b>	<b>\$881,366</b>	<b>\$0</b>	<b>\$239,654</b>	<b>\$0</b>
<b>Excavation</b>	<b>\$32,643</b>	<b>\$0</b>	<b>\$4,438</b>	<b>\$0</b>
<b>Transportation Alt 18</b>	<b>\$405,600</b>	<b>\$0</b>	<b>\$53,300</b>	<b>\$0</b>
<b>Transportation Alt 20</b>	<b>\$707,200</b>	<b>\$0</b>	<b>\$96,200</b>	<b>\$0</b>
<b>Thermal Destruction/Landfill Disposal</b>	<b>\$16,320,000</b>	<b>\$0</b>	<b>\$2,220,000</b>	<b>\$0</b>
<b>Landfill Disposal</b>	<b>\$884,087</b>	<b>\$0</b>	<b>\$120,197</b>	<b>\$0</b>
Class I Landfill	\$0	\$0	\$0	\$0
Class II Landfill	\$884,087	\$0	\$120,197	\$0
<b>Cleanup &amp; Improvements</b>	<b>\$6,905</b>	<b>\$0</b>	<b>\$3,452</b>	<b>\$0</b>
Cleanup and Landscaping	\$6,905	\$0	\$3,452	\$0
Improvements & Utilities	\$0	\$0	\$0	\$0
<b>Soil Vapor Monitoring</b>	<b>\$0</b>	<b>\$2,898</b>	<b>\$0</b>	<b>\$2,898</b>
<b>Monitoring</b>	<b>\$0</b>	<b>\$3,912</b>	<b>\$0</b>	<b>\$3,532</b>
<b>Fencing</b>	<b>\$21,494</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>
<b>Reserved</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>



FT002S.CDR - VMG 8/9/96 SAC 1

#### **Site Characteristics**

- Dormitory area and parking lot with paved access road
- 75% paved area
- Depth to groundwater — 5 to 15 feet
- Depth to bedrock — 10 to 15 feet
- Silt and clay to less than 5 feet bgs
- Silty sand with minor gravel from 5 to 15 feet bgs

#### **Treatment Alternatives**

- Alternative #18: Backhoe, Disposal at Existing Off-site Landfill
- Alternative #19: Soil and Bentonite Cap
- Alternative #20: Backhoe, Ex-situ High Temperature Thermal Treatment, Disposal at Existing Off-site Landfill

#### **Design Assumptions**

- 26,000 ft<sup>2</sup> soil area that contains soil contaminants in concentrations that exceed ecological risk
- Soils contaminated with SVOCs and metals to a depth of 1 foot (ecological risk)
- 1,000 cubic yards of soil within limits for Class II landfill (ecological risk), assuming dioxins treated

*NOTE: The figure conceptually displays components for comparative purposes only. Actual layout may vary significantly from that shown and will be determined during the remedial design phase.*

**Figure B-21.  
Conceptual Design for FT002 (Group K) Soil Treatment Alternatives, Travis AFB**

**Cost Summary for FT002 Alternatives**

Alternative	Health-Based Cleanup			Incremental Ecological-Based Cleanup			Grand Total
	Capital Costs	Operation and Maintenance Present Worth	Subtotal	Capital Costs	Operation and Maintenance Present Worth	Subtotal	
16	\$0	\$0	\$0	\$0	\$0	\$0	\$0
17	\$0	\$0	\$0	\$12,741	\$0	\$12,741	\$12,741
18	\$0	\$0	\$0	\$300,479	\$0	\$300,479	\$300,479
19	\$0	\$0	\$0	\$331,108	\$53,905	\$385,013	\$385,013
20	\$0	\$0	\$0	\$2,758,569	\$0	\$2,758,569	\$2,758,569

**Estimated Cost for FT002, Health-Alternative 16**

<b>CAPITAL COSTS</b>		
<b>Process Option</b>	<b>Percentage</b>	<b>Capital Cost</b>
No Action		\$0
<b>Construction Subtotal</b>		
Bid Contingencies (% of Construction Subtotal)	15.0%	\$0
Scope Contingencies (% of Construction Subtotal)	20.0%	\$0
<b>Construction Total</b>		
<b>Other Direct Costs</b>		
Engineering Design (% of Construction Total)	10.0%	\$0
Permitting and Legal (% of Construction Total)	5.0%	\$0
Startup and Shakedown (% of Construction Total)	10.0%	\$0
Bonding and Insurance (% of Construction Total)	3.0%	\$0
Construction Oversight (% of Construction Total)	5.0%	\$0
Field and Laboratory Testing (% of Construction Total)	5.0%	\$0
Reporting (% of Construction Total)	10.0%	\$0
Escalation (% of Construction Total, Based on Mid 1998 Start)	15.0%	\$0
<b>Total Capital Cost</b>		
		\$0

<b>OPERATION AND MAINTENANCE</b>				
<b>Process Option</b>	<b>Annual O&amp;M Cost</b>	<b>Process Option Service Time (yr)</b>	<b>Present Worth Factor</b>	<b>Process Option Present Worth</b>
No Action	\$0	0.0	0.0000	\$0
<b>O&amp;M Subtotal</b>				
	\$0			\$0
<b>Misc. O&amp;M Costs (% Annual O&amp;M Unless Otherwise Specified)</b>	<b>Percentage</b>			
<i>See Global Cost Assumptions For Details on Calculations</i>				
No Action	21%	\$0	0.0	0.0000
<b>Total Operation and Maintenance Costs</b>				
				\$0

<b>NET PRESENT WORTH</b>	
Capital Costs	\$0
Operation and Maintenance Present Worth	\$0
<b>Total Alternative Cost</b>	<b>\$0</b>

**Estimated Cost for FT002, Ecological-Based Alternative 16**

<b>CAPITAL COSTS</b>		
Process Option	Percentage	Capital Cost
No Action		\$0
<b>Construction Subtotal</b>		<b>\$0</b>
Bid Contingencies (% of Construction Subtotal)	15.0%	\$0
Scope Contingencies (% of Construction Subtotal)	20.0%	\$0
<b>Construction Total</b>		<b>\$0</b>
<b>Other Direct Costs</b>		
Engineering Design (% of Construction Total)	10.0%	\$0
Permitting and Legal (% of Construction Total)	5.0%	\$0
Startup and Shakedown (% of Construction Total)	10.0%	\$0
Bonding and Insurance (% of Construction Total)	3.0%	\$0
Construction Oversight (% of Construction Total)	5.0%	\$0
Field and Laboratory Testing (% of Construction Total)	5.0%	\$0
Reporting (% of Construction Total)	10.0%	\$0
Escalation (% of Construction Total, Based on Mid 1998 Start)	15.0%	\$0
<b>Total Capital Cost</b>		<b>\$0</b>

<b>OPERATION AND MAINTENANCE</b>				
Process Option	Annual O&M Cost	Process Option Service Time (yr)	Present Worth Factor	Process Option Present Worth
No Action	\$0	0.0	0.0000	\$0
<b>O&amp;M Subtotal</b>		<b>\$0</b>		<b>\$0</b>
Misc. O&M Costs (% Annual O&M Unless Otherwise Specified)	Percentage			
<i>See Global Cost Assumptions For Details on Calculations.</i>				
No Action	21%	\$0	0.0	0.0000
<b>Total Operation and Maintenance Costs</b>		<b>\$0</b>		<b>\$0</b>

<b>NET PRESENT WORTH</b>	
Capital Costs	\$0
Operation and Maintenance Present Worth	\$0
<b>Total Alternative Cost</b>	<b>\$0</b>

**Estimated Cost for FT002, Health-Based Alternative 17**

<b>CAPITAL COSTS</b>			
Process Option			Capital Cost
Fencing			\$0
Monitoring			\$0
Reserved			\$0
<b>Construction Subtotal</b>			
Bid Contingencies (% of Construction Subtotal)	15.0%		\$0
Scope Contingencies (% of Construction Subtotal)	20.0%		\$0
<b>Construction Total</b>			
<b>Other Direct Costs</b>			
Engineering Design (% of Construction Total)	10.0%		\$0
Permitting and Legal (% of Construction Total)	5.0%		\$0
Startup and Shakedown (% of Construction Total)	0.0%		\$0
Bonding and Insurance (% of Construction Total)	3.0%		\$0
Construction Oversight (% of Construction Total)	5.0%		\$0
Field and Laboratory Testing (% of Construction Total)	0.0%		\$0
Reporting (% of Construction Total)	0.0%		\$0
Escalation (% of Construction Total, Based on Mid 1998 Start)	15.0%		\$0
<b>Total Capital Cost</b>			

<b>OPERATION AND MAINTENANCE</b>					
Process Option	Annual O&M Cost	Process Option Service Time (yr)	Present Worth Factor	Process Option Present Worth	
Fencing	\$0	30.0	15.3725	\$0	
Monitoring	\$0	30.0	15.3725	\$0	
Reserved	\$0	30.0	15.3725	\$0	
<b>O&amp;M Subtotal</b>					
Note: O&M Costs OK Annual O&M Unless Otherwise Specified					
See Global Cost Assumptions For Details on Calculations					
Fencing	21%	\$0	30.0	15.3725	\$0
Monitoring	21%	\$0	30.0	15.3725	\$0
Reserved	21%	\$0	30.0	15.3725	\$0
<b>Total Operation and Maintenance Cost</b>					

<b>NET PRESENT WORTH</b>	
Capital Costs	\$0
Operation and Maintenance Present Worth	\$0
<b>Total Alternative Cost</b>	<b>\$0</b>

**Estimated Cost for FT002, Ecological-Based Alternative 17**

<b>CAPITAL COSTS</b>			
Process Option			Capital Cost
Fencing			\$6,839
Monitoring			\$0
Reserved			\$0
<b>Construction Subtotal</b>			<b>\$6,839</b>
Bid Contingencies (% of Construction Subtotal)	15.0%		\$1,026
Scope Contingencies (% of Construction Subtotal)	20.0%		\$1,368
<b>Construction Total</b>			<b>\$9,233</b>
<b>Other Direct Costs</b>			
Engineering Design (% of Construction Total)	10.0%		\$923
Permitting and Legal (% of Construction Total)	5.0%		\$462
Startup and Shakedown (% of Construction Total)	0.0%		\$0
Bonding and Insurance (% of Construction Total)	3.0%		\$277
Construction Oversight (% of Construction Total)	5.0%		\$462
Field and Laboratory Testing (% of Construction Total)	0.0%		\$0
Reporting (% of Construction Total)	0.0%		\$0
Escalation (% of Construction Total, Based on Mid 1998 Start)	15.0%		\$1,385
<b>Total Capital Cost</b>			<b>\$12,741</b>

<b>OPERATION AND MAINTENANCE</b>					
Process Option		Annual O&M Cost	Process Option Service Time (yr)	Present Worth Factor	Process Option Present Worth
Fencing		\$0	30.0	15.3725	\$0
Monitoring		\$0	30.0	15.3725	\$0
Reserved		\$0	30.0	15.3725	\$0
<b>O&amp;M Subtotal</b>		<b>\$0</b>			<b>\$0</b>
<b>Minor O&amp;M Costs (% Annual O&amp;M Unless Otherwise Specified)</b>		<b>Percentage</b>			
See Global Cost Assumptions For Details on Calculations					
Fencing	21%	\$0	30.0	15.3725	\$0
Monitoring	21%	\$0	30.0	15.3725	\$0
Reserved	21%	\$0	30.0	15.3725	\$0
<b>Total Operation and Maintenance Costs</b>					<b>\$0</b>

<b>NET PRESENT WORTH</b>	
Capital Costs	\$12,741
Operation and Maintenance Present Worth	\$0
<b>Total Alternative Cost</b>	<b>\$12,741</b>

**Estimated Cost for FT002, Health-Based Alternative 18**

<b>CAPITAL COSTS</b>			
Process Option			Capital Cost
Demolition & Clearing			\$0
Excavation			\$0
Transportation			\$0
Landfill Disposal, Alt 18			\$0
Cleanup & Improvements			\$0
<b>Construction Subtotal</b>			<b>\$0</b>
Bid Contingencies (% of Construction Subtotal)	15.0%		\$0
Scope Contingencies (% of Construction Subtotal)	20.0%		\$0
<b>Construction Total</b>			<b>\$0</b>
<b>Other Direct Costs</b>			
Engineering Design (% of Construction Total)	5.0%		\$0
Permitting and Legal (% of Construction Total)	5.0%		\$0
Startup and Shakedown (% of Construction Total)	0.0%		\$0
Bonding and Insurance (% of Construction Total)	3.0%		\$0
Construction Oversight (% of Construction Total)	5.0%		\$0
Field and Laboratory Testing (% of Construction Total)	5.0%		\$0
Reporting (% of Construction Total)	10.0%		\$0
Escalation (% of Construction Total, Based on Mid 1998 Start)	15.0%		\$0
<b>Total Capital Cost</b>			<b>\$0</b>

<b>OPERATION AND MAINTENANCE</b>					
Process Option		Annual O&M Cost	Process Option Service Time (yr)	Present Worth Factor	Process Option Present Worth
Demolition & Clearing		\$0	30.0	15.3725	\$0
Excavation		\$0	30.0	15.3725	\$0
Transportation		\$0	30.0	15.3725	\$0
Landfill Disposal, Alt 18		\$0	30.0	15.3725	\$0
Cleanup & Improvements		\$0	30.0	15.3725	\$0
<b>O&amp;M Subtotal</b>		<b>\$0</b>			<b>\$0</b>
<b>Use O&amp;M Costs (If Annual O&amp;M Values Differ, Otherwise Specified)</b>		<b>Percentage</b>			
<b>See Global Cost Assumptions and Detail on Calculations</b>					
Demolition & Clearing	16%	\$0	30.0	15.3725	\$0
Excavation	16%	\$0	30.0	15.3725	\$0
Transportation	16%	\$0	30.0	15.3725	\$0
Landfill Disposal, Alt 18	16%	\$0	30.0	15.3725	\$0
Cleanup & Improvements	16%	\$0	30.0	15.3725	\$0
<b>Total Operation and Maintenance Costs</b>					<b>\$0</b>

<b>NET PRESENT WORTH</b>	
Capital Costs	\$0
Operation and Maintenance Present Worth	\$0
<b>Total Alternatives Cost</b>	<b>\$0</b>

**Estimated Cost for FT002, Ecological-Based Alternative 18**

<b>CAPITAL COSTS</b>			
<b>Process Option</b>			<b>Capital Cost</b>
Demolition & Clearing			\$2,823
Excavation			\$2,333
Transportation			\$50,544
Landfill Disposal, Alt 18			\$63,180
Cleanup & Improvements			\$31,510
Reserved			\$0
<b>Construction Subtotal</b>			<b>\$150,390</b>
Bid Contingencies (% of Construction Subtotal)	15.0%		\$22,559
Scope Contingencies (% of Construction Subtotal)	20.0%		\$30,078
<b>Construction Total</b>			<b>\$203,027</b>
<b>Other Direct Costs</b>			
Engineering Design (% of Construction Total)	5.0%		\$10,151
Permitting and Legal (% of Construction Total)	5.0%		\$10,151
Startup and Shakedown (% of Construction Total)	0.0%		\$0
Bonding and Insurance (% of Construction Total)	3.0%		\$6,091
Construction Oversight (% of Construction Total)	5.0%		\$10,151
Field and Laboratory Testing (% of Construction Total)	5.0%		\$10,151
Reporting (% of Construction Total)	10.0%		\$20,303
Escalation (% of Construction Total, Based on Mid 1998 Start)	15.0%		\$30,454
<b>Total Capital Cost</b>			<b>\$300,479</b>

<b>OPERATION AND MAINTENANCE</b>					
<b>Process Option</b>		<b>Annual O&amp;M Cost</b>	<b>Process Option Service Time (yr)</b>	<b>Present Worth Factor</b>	<b>Process Option Present Worth</b>
Demolition & Clearing		\$0	30.0	15.3725	\$0
Excavation		\$0	30.0	15.3725	\$0
Transportation		\$0	30.0	15.3725	\$0
Landfill Disposal, Alt 18		\$0	30.0	15.3725	\$0
Cleanup & Improvements		\$0	30.0	15.3725	\$0
<b>O&amp;M Subtotal</b>		<b>\$0</b>			<b>\$0</b>
<b>Misc. O&amp;M Costs (% Annual O&amp;M Below Criteria Specified)</b>	<b>Percentage</b>				
<b>See Global Cost Assumptions for Details on Calculations</b>					
Demolition & Clearing	16%	\$0	30.0	15.3725	\$0
Excavation	16%	\$0	30.0	15.3725	\$0
Transportation	16%	\$0	30.0	15.3725	\$0
Landfill Disposal, Alt 18	16%	\$0	30.0	15.3725	\$0
Cleanup & Improvements	16%	\$0	30.0	15.3725	\$0
<b>Total Operation and Maintenance Costs</b>					<b>\$0</b>

<b>NET PRESENT WORTH</b>	
Capital Costs	\$300,479
Operation and Maintenance Present Worth	\$0
<b>Total Alternative Cost</b>	<b>\$300,479</b>

Estimated Cost for FT002, Health-Based Alternative 19

CAPITAL COSTS			
Process Option			Capital Cost
Demolition & Clearing			\$0
Capping			\$0
Cleanup & Improvements			\$0
Soil Gas Monitoring			\$0
Reserved			\$0
<b>Construction Subtotal</b>			<b>\$0</b>
Bid Contingencies (% of Construction Subtotal)	15.0%		\$0
Scope Contingencies (% of Construction Subtotal)	20.0%		\$0
<b>Construction Total</b>			<b>\$0</b>
Other Direct Costs			
Engineering Design (% of Construction Total)	10.0%		\$0
Permitting and Legal (% of Construction Total)	5.0%		\$0
Startup and Shakedown (% of Construction Total)	0.0%		\$0
Bonding and Insurance (% of Construction Total)	3.0%		\$0
Construction Oversight (% of Construction Total)	5.0%		\$0
Field and Laboratory Testing (% of Construction Total)	5.0%		\$0
Reporting (% of Construction Total)	10.0%		\$0
Escalation (% of Construction Total, Based on Mid 1998 Start)	15.0%		\$0
<b>Total Capital Cost</b>			<b>\$0</b>

OPERATION AND MAINTENANCE					
Process Option		Annual O&M Cost	Process Option Service Time (yr)	Present Worth Factor	Process Option Present Worth
Demolition & Clearing		\$0	30.0	15.3725	\$0
Capping		\$0	30.0	15.3725	\$0
Cleanup & Improvements		\$0	30.0	15.3725	\$0
Soil Gas Monitoring		\$0	30.0	15.3725	\$0
Reserved		\$0	30.0	15.3725	\$0
<b>O &amp; Reserved</b>		<b>\$0</b>			<b>\$0</b>
Misc. O&M Costs (% Annual O&M Unless Otherwise Specified)	Percentage				
See Global Cost Assumptions for Details on Calculations					
Demolition & Clearing	21%	\$0	30.0	15.3725	\$0
Capping	21%	\$0	30.0	15.3725	\$0
Cleanup & Improvements	21%	\$0	30.0	15.3725	\$0
Soil Gas Monitoring	21%	\$0	30.0	15.3725	\$0
Reserved	21%	\$0	30.0	15.3725	\$0
<b>Total Operation and Maintenance Costs</b>					<b>\$0</b>

NET PRESENT WORTH	
Capital Costs	\$0
Operation and Maintenance Present Worth	\$0
<b>Total Alternative Cost</b>	<b>\$0</b>

**Estimated Cost for FT002, Ecological-Based Alternative 19**

<b>CAPITAL COSTS</b>		
<b>Process Option</b>		<b>Capital Cost</b>
Demolition & Clearing		\$2,823
Capping		\$125,971
Cleanup & Improvements		\$31,510
Soil Gas Monitoring		\$0
<b>Construction Subtotal</b>		<b>\$160,304</b>
Bid Contingencies (% of Construction Subtotal)	15.0%	\$24,046
Scope Contingencies (% of Construction Subtotal)	20.0%	\$32,061
<b>Construction Total</b>		<b>\$216,411</b>
<b>Other Direct Costs</b>		
Engineering Design (% of Construction Total)	10.0%	\$21,641
Permitting and Legal (% of Construction Total)	5.0%	\$10,821
Startup and Shakedown (% of Construction Total)	0.0%	\$0
Bonding and Insurance (% of Construction Total)	3.0%	\$6,492
Construction Oversight (% of Construction Total)	5.0%	\$10,821
Field and Laboratory Testing (% of Construction Total)	5.0%	\$10,821
Reporting (% of Construction Total)	10.0%	\$21,641
Escalation (% of Construction Total, Based on Mid 1998 Start)	15.0%	\$32,462
<b>Total Capital Cost</b>		<b>\$331,108</b>

<b>OPERATION AND MAINTENANCE</b>				
<b>Process Option</b>	<b>Annual O&amp;M Cost</b>	<b>Process Option Service Time (yr)</b>	<b>Present Worth Factor</b>	<b>Process Option Present Worth</b>
Demolition & Clearing	\$0	30.0	15.3725	\$0
Capping	\$0	30.0	15.3725	\$0
Cleanup & Improvements	\$0	30.0	15.3725	\$0
Soil Gas Monitoring	\$2,898	30.0	15.3725	\$44,549
Reserved	\$0	30.0	15.3725	\$0
<b>Reserved</b>	<b>\$2,898</b>			<b>\$44,549</b>
<b>Misc. O&amp;M Costs (% Annual O&amp;M Unless Otherwise Specified)</b>	<b>Percentage</b>			
<i>See Global Cost Assumptions For Details on Calculations</i>				
Demolition & Clearing	21%	\$0	30.0	15.3725
Capping	21%	\$0	30.0	15.3725
Cleanup & Improvements	21%	\$0	30.0	15.3725
Soil Gas Monitoring	21%	\$609	30.0	15.3725
Reserved	21%	\$0	30.0	15.3725
<b>Total Operation and Maintenance Costs</b>				<b>\$53,905</b>

<b>NET PRESENT WORTH</b>	
Capital Costs	\$331,108
Operation and Maintenance Present Worth	\$53,905
<b>Total Alternative Cost</b>	<b>\$385,013</b>

### Estimated Cost for FT002, Health-Based Alternative 20

CAPITAL COSTS			
Process Option			Capital Cost
Demolition & Clearing			\$0
Excavation			\$0
Transportation			\$0
Thermal Destruction/Landfill Disposal			\$0
Reserved			\$0
Reserved			\$0
Cleanup & Improvements			\$0
Reserved			\$0
<b>Construction Subtotal</b>			<b>\$0</b>
Bid Contingencies (% of Construction Subtotal)		15.0%	\$0
Scope Contingencies (% of Construction Subtotal)		20.0%	\$0
<b>Construction Total</b>			<b>\$0</b>
Other Direct Costs			
Engineering Design (% of Construction Total)		5.0%	\$0
Permitting and Legal (% of Construction Total)		10.0%	\$0
Startup and Shakedown (% of Construction Total)		10.0%	\$0
Bonding and Insurance (% of Construction Total)		3.0%	\$0
Construction Oversight (% of Construction Total)		5.0%	\$0
Field and Laboratory Testing (% of Construction Total)		5.0%	\$0
Reporting (% of Construction Total)		10.0%	\$0
Escalation (% of Construction Total, Based on Mid 1998 Start)		15.0%	\$0
<b>Total Capital Cost</b>			<b>\$0</b>

OPERATION AND MAINTENANCE					
Process Option		Annual O&M Cost	Process Option Service Time (yr)	Present Worth Factor	Process Option Present Worth
Demolition & Clearing		\$0	30.0	15.3725	\$0
Excavation		\$0	30.0	15.3725	\$0
Transportation		\$0	30.0	15.3725	\$0
Thermal Destruction/Landfill Disposal		\$0	30.0	15.3725	\$0
Reserved		\$0	30.0	15.3725	\$0
Reserved		\$0	30.0	15.3725	\$0
Cleanup & Improvements		\$0	30.0	15.3725	\$0
Reserved		\$0	30.0	15.3725	\$0
<b>O&amp;M Subtotal</b>		<b>\$0</b>			<b>\$0</b>
Misc. O&M Costs (% Annual O&M Unless Otherwise Specified)			Percentage		
See Global Cost Assumptions for Detailed Calculations					
Demolition & Clearing	16%	\$0	30.0	15.3725	\$0
Excavation	16%	\$0	30.0	15.3725	\$0
Transportation	16%	\$0	30.0	15.3725	\$0
Thermal Destruction/Landfill Disposal	16%	\$0	30.0	15.3725	\$0
Reserved	16%	\$0	30.0	15.3725	\$0
Reserved	16%	\$0	30.0	15.3725	\$0
Cleanup & Improvements	16%	\$0	30.0	15.3725	\$0
Reserved	16%	\$0	30.0	15.3725	\$0
<b>Total Operation and Maintenance Costs</b>					<b>\$0</b>

NET PRESENT WORTH	
Capital Costs	\$0
Operation and Maintenance Present Worth	\$0
<b>Total Alternative Cost</b>	
	<b>\$0</b>

Estimated Cost for FT002, Ecological-Based Alternative 20

CAPITAL COSTS		
Process Option		Capital Cost
Demolition & Clearing		\$2,823
Excavation		\$2,333
Transportation		\$50,544
Thermal Destruction/Landfill Disposal		\$1,166,400
Reserved		\$0
Reserved		\$0
Cleanup & Improvements		\$31,510
Reserved		\$0
<b>Construction Subtotal</b>		<b>\$1,253,610</b>
Bid Contingencies (% of Construction Subtotal)	15.0%	\$188,042
Scope Contingencies (% of Construction Subtotal)	20.0%	\$250,722
<b>Construction Total</b>		<b>\$1,692,374</b>
Other Direct Costs		
Engineering Design (% of Construction Total)	5.0%	\$84,619
Permitting and Legal (% of Construction Total)	10.0%	\$169,237
Startup and Shakedown (% of Construction Total)	10.0%	\$169,237
Bonding and Insurance (% of Construction Total)	3.0%	\$50,771
Construction Oversight (% of Construction Total)	5.0%	\$84,619
Field and Laboratory Testing (% of Construction Total)	5.0%	\$84,619
Reporting (% of Construction Total)	10.0%	\$169,237
Escalation (% of Construction Total, Based on Mid 1998 Start)	15.0%	\$253,856
<b>Total Capital Cost</b>		<b>\$2,758,569</b>

OPERATION AND MAINTENANCE					
Process Option	Annual O&M Cost	Process Option Service Time (yr)	Present Worth Factor	Process Option Present Worth	
Demolition & Clearing	\$0	30.0	15.3725	\$0	
Excavation	\$0	30.0	15.3725	\$0	
Transportation	\$0	30.0	15.3725	\$0	
Thermal Destruction/Landfill Disposal	\$0	30.0	15.3725	\$0	
Reserved	\$0	30.0	15.3725	\$0	
Reserved	\$0	30.0	15.3725	\$0	
Cleanup & Improvements	\$0	30.0	15.3725	\$0	
Reserved	\$0	30.0	15.3725	\$0	
<b>O&amp;M Subtotal</b>		<b>\$0</b>		<b>\$0</b>	
<b>Annual O&amp;M Costs (% Annual O&amp;M Unless Otherwise Specified)</b>		<b>Percentage</b>			
<i>See Global Cost Assumptions For Details on Calculations</i>					
Demolition & Clearing	16%	\$0	30.0	15.3725	\$0
Excavation	16%	\$0	30.0	15.3725	\$0
Transportation	16%	\$0	30.0	15.3725	\$0
Thermal Destruction/Landfill Disposal	16%	\$0	30.0	15.3725	\$0
Reserved	16%	\$0	30.0	15.3725	\$0
Reserved	16%	\$0	30.0	15.3725	\$0
Cleanup & Improvements	16%	\$0	30.0	15.3725	\$0
Reserved	16%	\$0	30.0	15.3725	\$0
<b>Total Operation and Maintenance Costs</b>					<b>\$0</b>

NET PRESENT WORTH	
Capital Costs	\$2,758,569
Operation and Maintenance Present Worth	\$0
<b>Total Alternative Cost</b>	<b>\$2,758,569</b>

**Cost Estimate Summary Sheet**

**NEWIOU Feasibility Study, Travis AFB**

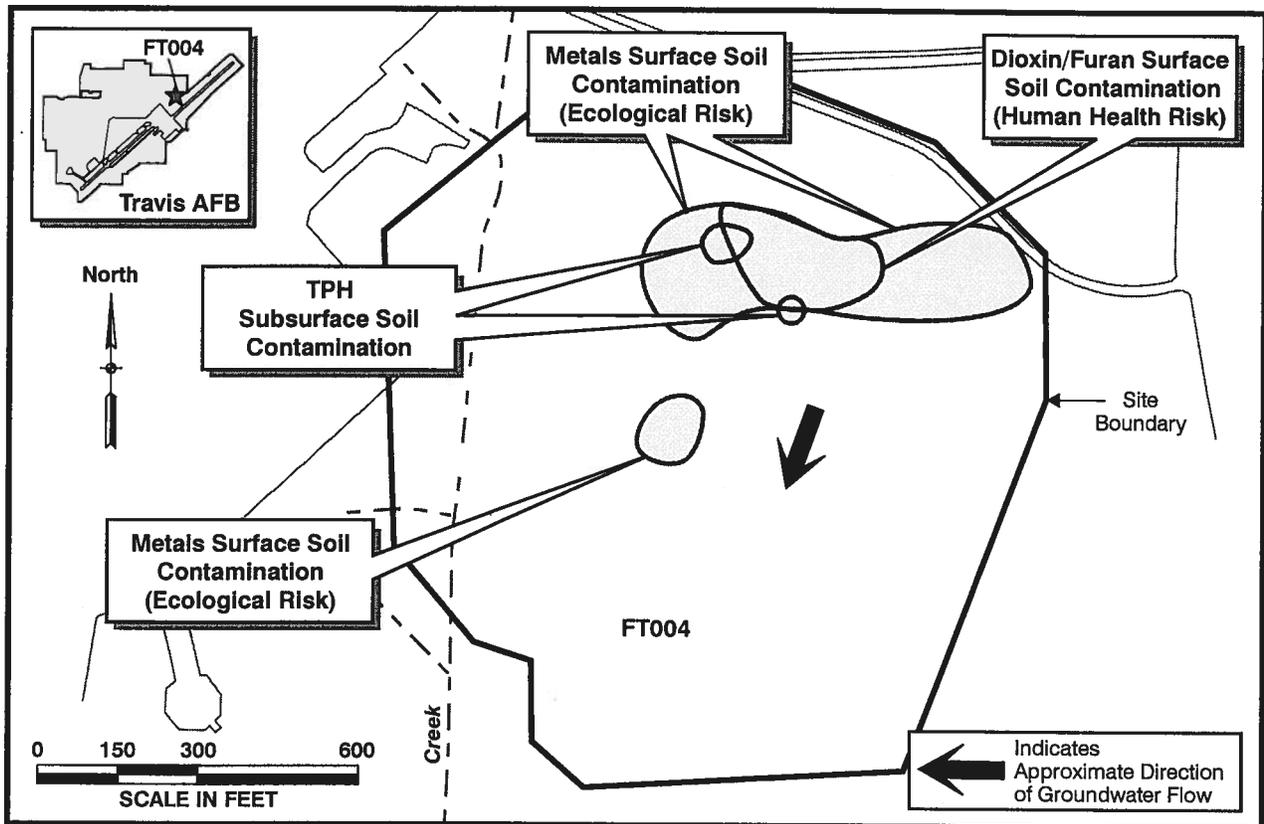
**Process Option Summary for FT002**

**Assumptions:**

- 1 Use RACER/ENVEST cost estimating model, Version 3.1 when practical
- 2 Compute monitoring and O&M for one year only; add costs for subsequent years using Alternative Cost Summary Sheets.
- 3 Soil disposal costs do not include transportation from TAFB or treatment facility to landfill
- 4 Capping costs include vents, etc.
- 5 Thermal treatment cost is \$600/ton and includes subsequent disposal
- 6 Class I disposal cost of \$245/ton, Class II disposal cost of \$32.50/ton

**Cost Summary:**

Item	Health-Based		Ecological-Based	
	Capital Cost	O&M Cost	Capital Cost	O&M Cost
Demolition & Clearing	\$0	\$0	\$2,823	\$0
Demolition, Curbs	\$0	\$0	\$325	\$0
Demolition, Pavements	\$0	\$0	\$2,498	\$0
Clear and Grub	\$0	\$0	\$0	\$0
Capping	\$0	\$0	\$125,971	\$0
Excavation	\$0	\$0	\$2,333	\$0
Transportation	\$0	\$0	\$50,544	\$0
Thermal Destruction/Landfill Disposal	\$0	\$0	\$1,166,400	\$0
Landfill Disposal, Alt 18	\$0	\$0	\$63,180	\$0
Class I Landfill	\$0	\$0	\$0	\$0
Class II Landfill	\$0	\$0	\$63,180	\$0
Cleanup & Improvements	\$0	\$0	\$31,510	\$0
Cleanup and Landscaping	\$0		\$220	
Improvements & Utilities	\$0		\$31,290	
Monitoring	\$0	\$0	\$0	\$3,820
Soil Gas Monitoring	\$0	\$0	\$0	\$2,898
Fencing	\$0	\$0	\$6,839	\$0
Reserved	\$0	\$0	\$0	\$0



FT004S.CDR - VMG 8/9/96 SAC 1

#### **Site Characteristics**

- Open field, less than 10% paved area
- Depth to groundwater — 10 feet
- Depth to bedrock — 30 feet
- Silt and clay to 10 feet bgs
- Silty sand with minor gravel from 10 to 40 feet bgs
- Site also included in Group A for groundwater contamination

#### **Treatment Alternatives**

- Alternative #18: Backhoe, Disposal at Existing Off-site Landfill
- Alternative #19: Soil and Bentonite Cap
- Alternative #20: Backhoe, Ex-situ High Temperature Thermal Treatment, Disposal at Existing Off-site Landfill

#### **Design Assumptions**

- 34,000 ft<sup>2</sup> — area which contains contaminated soil (human health risk)
- 66,000 ft<sup>2</sup> — area which contains contaminated soil (ecological risk)
- Soils contaminated with dioxin/furans to a depth of 1 foot (human health risk)
- Soils contaminated with metals and pesticides to a depth of 1 foot (ecological risk)
- Soils contaminated with TPH to a depth of 6.5 feet (exceeds LUFT manual)
- 2,150 cubic yards of soil within limits for Class II landfill (exceeds LUFT manual)
- 12,800 cubic yards of soil within limits for Class II landfill (ecological risk)
- 1,500 cubic yards of soil estimated to require thermal destruction, due to dioxins, as an element of Alternative 18

*NOTE: The figure conceptually displays components for comparative purposes only. Actual layout may vary significantly from that shown and will be determined during the remedial design phase.*

**Figure B-22.**  
**Conceptual Design for FT004 (Group K) Soil Treatment Alternatives, Travis AFB**

**Cost Summary for FT004 Alternatives**

Alternative	Health-Based Cleanup			Incremental Ecological-Based Cleanup			Grand Total
	Capital Costs	Operation and Maintenance Present Worth	Subtotal	Capital Costs	Operation and Maintenance Present Worth	Subtotal	
16	\$0	\$0	\$0	\$0	\$0	\$0	\$0
17	\$10,921	\$102,266	\$113,187	\$0	\$102,266	\$102,266	\$215,454
18	\$489,011	\$0	\$489,011	\$2,461,148	\$0	\$2,461,148	\$2,950,159
19	\$298,012	\$53,905	\$351,917	\$3,501,762	\$53,905	\$3,555,667	\$3,907,584
20	\$5,946,644	\$0	\$5,946,644	\$35,403,398	\$0	\$35,403,398	\$41,350,042

**Estimated Cost for FT004, Health-Based Alternative 16**

<b>CAPITAL COSTS</b>		
<b>Process Option</b>	<b>Percentage</b>	<b>Capital Cost</b>
No Action		\$0
<b>Construction Subtotal</b>		
Bid Contingencies (% of Construction Subtotal)	15.0%	\$0
Scope Contingencies (% of Construction Subtotal)	20.0%	\$0
<b>Construction Total</b>		
<b>Other Direct Costs</b>		
Engineering Design (% of Construction Total)	10.0%	\$0
Permitting and Legal (% of Construction Total)	5.0%	\$0
Startup and Shakedown (% of Construction Total)	10.0%	\$0
Bonding and Insurance (% of Construction Total)	3.0%	\$0
Construction Oversight (% of Construction Total)	5.0%	\$0
Field and Laboratory Testing (% of Construction Total)	5.0%	\$0
Reporting (% of Construction Total)	10.0%	\$0
Escalation (% of Construction Total, Based on Mid 1998 Start)	15.0%	\$0
<b>Total Capital Cost</b>		
		\$0

<b>OPERATION AND MAINTENANCE</b>				
<b>Process Option</b>	<b>Annual O&amp;M Cost</b>	<b>Process Option Service Time (yr)</b>	<b>Present Worth Factor</b>	<b>Process Option Present Worth</b>
No Action	\$0	0.0	0.0000	\$0
<b>O&amp;M Subtotal</b>				
	\$0			\$0
<b>Misc. O&amp;M Costs (% Annual O&amp;M Unless Otherwise Specified)</b>	<b>Percentage</b>			
<i>See Global Cost Assumptions For Details on Calculations</i>				
No Action	21%	\$0	0.0	0.0000
<b>Total Operation and Maintenance Costs</b>				
				\$0

<b>NET PRESENT WORTH</b>	
Capital Costs	\$0
Operation and Maintenance Present Worth	\$0
<b>Total Alternative Cost</b>	
	\$0

**Estimated Cost for FT004, Ecological-Based Alternative 16**

<b>CAPITAL COSTS</b>		
<b>Process Option</b>	<b>Percentage</b>	<b>Capital Cost</b>
No Action		\$0
<b>Construction Subtotal</b>		
Bid Contingencies (% of Construction Subtotal)	15.0%	\$0
Scope Contingencies (% of Construction Subtotal)	20.0%	\$0
<b>Construction Total</b>		
<b>Other Direct Costs</b>		
Engineering Design (% of Construction Total)	10.0%	\$0
Permitting and Legal (% of Construction Total)	5.0%	\$0
Startup and Shakedown (% of Construction Total)	10.0%	\$0
Bonding and Insurance (% of Construction Total)	3.0%	\$0
Construction Oversight (% of Construction Total)	5.0%	\$0
Field and Laboratory Testing (% of Construction Total)	5.0%	\$0
Reporting (% of Construction Total)	10.0%	\$0
Escalation (% of Construction Total, Based on Mid 1998 Start)	15.0%	\$0
<b>Total Capital Cost</b>		

<b>OPERATION AND MAINTENANCE</b>				
<b>Process Option</b>	<b>Annual O&amp;M Cost</b>	<b>Process Option Service Time (yr)</b>	<b>Present Worth Factor</b>	<b>Process Option Present Worth</b>
No Action	\$0	0.0	0.0000	\$0
<b>O&amp;M Subtotal</b>				
	\$0			\$0
<b>Misc. O&amp;M Costs (% Annual O&amp;M Unless Otherwise Specified)</b>	<b>Percentage</b>			
<i>See Global Cost Assumptions For Details on Calculations</i>				
No Action	21%	\$0	0.0	0.0000
<b>Total Operation and Maintenance Costs</b>				
				\$0

<b>NET PRESENT WORTH</b>	
Capital Costs	\$0
Operation and Maintenance Present Worth	\$0
<b>Total Alternative Cost</b>	<b>\$0</b>

**Estimated Cost for FT004, Health-Based Alternative 17**

<b>CAPITAL COSTS</b>			
Process Option			Capital Cost
Fencing			\$5,862
Monitoring			\$0
Reserved			\$0
<b>Construction Subtotal</b>			<b>\$5,862</b>
Bid Contingencies (% of Construction Subtotal)	15.0%		\$879
Scope Contingencies (% of Construction Subtotal)	20.0%		\$1,172
<b>Construction Total</b>			<b>\$7,914</b>
<b>Other Direct Costs</b>			
Engineering Design (% of Construction Total)	10.0%		\$791
Permitting and Legal (% of Construction Total)	5.0%		\$396
Startup and Shakedown (% of Construction Total)	0.0%		\$0
Bonding and Insurance (% of Construction Total)	3.0%		\$237
Construction Oversight (% of Construction Total)	5.0%		\$396
Field and Laboratory Testing (% of Construction Total)	0.0%		\$0
Reporting (% of Construction Total)	0.0%		\$0
Escalation (% of Construction Total, Based on Mid 1998 Start)	15.0%		\$1,187
<b>Total Capital Cost</b>			<b>\$10,921</b>

<b>OPERATION AND MAINTENANCE</b>					
Process Option		Annual O&M Cost	Process Option Service Time (yr)	Present Worth Factor	Process Option Present Worth
Fencing		\$0	30.0	15.3725	\$0
Monitoring		\$5,498	30.0	15.3725	\$84,518
Reserved		\$0	30.0	15.3725	\$0
<b>O&amp;M Subtotal</b>		<b>\$5,498</b>			<b>\$84,518</b>
Min. O&M Cost (% Annual O&M Unless Otherwise Specified)		Percentage			
See Global Cost Assumptions for Detailed Calculations					
Fencing	21%	\$0	30.0	15.3725	\$0
Monitoring	21%	\$1,155	30.0	15.3725	\$17,749
Reserved	21%	\$0	30.0	15.3725	\$0
<b>Total Operation and Maintenance Costs</b>					<b>\$102,266</b>

<b>NET PRESENT WORTH</b>	
Capital Costs	\$10,921
Operation and Maintenance Present Worth	\$102,266
<b>Total Alternative Cost</b>	<b>\$113,187</b>

**Estimated Cost for FT004, Ecological-Based Alternative 17**

<b>CAPITAL COSTS</b>			
<b>Process Option</b>			<b>Capital Cost</b>
Fencing			\$0
Monitoring			\$0
Reserved			\$0
<b>Construction Subtotal</b>			<b>\$0</b>
Bid Contingencies (% of Construction Subtotal)	15.0%		\$0
Scope Contingencies (% of Construction Subtotal)	20.0%		\$0
<b>Construction Total</b>			<b>\$0</b>
<b>Other Direct Costs</b>			
Engineering Design (% of Construction Total)	10.0%		\$0
Permitting and Legal (% of Construction Total)	5.0%		\$0
Startup and Shakedown (% of Construction Total)	0.0%		\$0
Bonding and Insurance (% of Construction Total)	3.0%		\$0
Construction Oversight (% of Construction Total)	5.0%		\$0
Field and Laboratory Testing (% of Construction Total)	0.0%		\$0
Reporting (% of Construction Total)	0.0%		\$0
Escalation (% of Construction Total, Based on Mid 1998 Start)	15.0%		\$0
<b>Total Capital Cost</b>			<b>\$0</b>

<b>OPERATION AND MAINTENANCE</b>					
<b>Process Option</b>		<b>Annual O&amp;M Cost</b>	<b>Process Option Service Time (yr)</b>	<b>Present Worth Factor</b>	<b>Process Option Present Worth</b>
Fencing		\$0	30.0	15.3725	\$0
Monitoring		\$5,498	30.0	15.3725	\$84,518
Reserved		\$0	30.0	15.3725	\$0
<b>O&amp;M Subtotal</b>		<b>\$5,498</b>			<b>\$84,518</b>
<b>Misc. O&amp;M Costs (% Annual O&amp;M Unless Otherwise Specified)</b>		<b>Percentage</b>			
<i>See Global Cost Assumptions For Details on Calculations</i>					
Fencing	21%	\$0	30.0	15.3725	\$0
Monitoring	21%	\$1,155	30.0	15.3725	\$17,749
Reserved	21%	\$0	30.0	15.3725	\$0
<b>Total Operation and Maintenance Costs</b>					<b>\$102,266</b>

<b>NET PRESENT WORTH</b>	
Capital Costs	\$0
Operation and Maintenance Present Worth	\$102,266
<b>TOTAL ALTERNATIVE COST</b>	<b>\$102,266</b>

**Estimated Cost for FT004, Health-Based Alternative 18**

<b>CAPITAL COSTS</b>		
<i>Project Option</i>		<i>Capital Cost</i>
Demolition & Clearing		\$4,315
Excavation		\$5,141
Landfill Disposal		\$139,244
Transportation Alt 18		\$94,900
Cleanup & Improvements		\$1,150
Reserved		\$0
<b>Construction Subtotal</b>		<b>\$244,750</b>
Bid Contingencies (% of Construction Subtotal)	15.0%	\$36,713
Scope Contingencies (% of Construction Subtotal)	20.0%	\$48,950
<b>Construction Total</b>		<b>\$330,413</b>
<b>Other Project Costs</b>		
Engineering Design (% of Construction Total)	5.0%	\$16,521
Permitting and Legal (% of Construction Total)	5.0%	\$16,521
Startup and Shakedown (% of Construction Total)	0.0%	\$0
Bonding and Insurance (% of Construction Total)	3.0%	\$9,912
Construction Oversight (% of Construction Total)	5.0%	\$16,521
Field and Laboratory Testing (% of Construction Total)	5.0%	\$16,521
Reporting (% of Construction Total)	10.0%	\$33,041
Escalation (% of Construction Total, Based on Mid 1998 Start)	15.0%	\$49,562
<b>Total Project Cost</b>		<b>\$489,011</b>

<b>OPERATION AND MAINTENANCE</b>					
<i>Project Option</i>		<i>Annual O&amp;M Cost</i>	<i>Process Option Service Time (yr)</i>	<i>Present Worth Factor</i>	<i>Process Option Present Worth</i>
Demolition & Clearing		\$0	30.0	15.3725	\$0
Excavation		\$0	30.0	15.3725	\$0
Landfill Disposal		\$0	30.0	15.3725	\$0
Transportation Alt 18		\$0	30.0	15.3725	\$0
Cleanup & Improvements		\$0	30.0	15.3725	\$0
Reserved		\$0	30.0	15.3725	\$0
<b>O&amp;M Subtotal</b>		<b>\$0</b>			<b>\$0</b>
<i>(Use O&amp;M Cost or Annual O&amp;M unless Otherwise Specified)</i>					
<i>See Global Cost Assumptions for Details on Calculations</i>					
Demolition & Clearing	16%	\$0	30.0	15.3725	\$0
Excavation	16%	\$0	30.0	15.3725	\$0
Landfill Disposal	16%	\$0	30.0	15.3725	\$0
Transportation Alt 18	16%	\$0	30.0	15.3725	\$0
Cleanup & Improvements	16%	\$0	30.0	15.3725	\$0
Reserved	16%	\$0	30.0	15.3725	\$0
<b>Total Operation and Maintenance Costs</b>		<b>\$0</b>			<b>\$0</b>

<b>NET PRESENT WORTH</b>	
Capital Costs	\$489,011
Operation and Maintenance Present Worth	\$0
<b>Total Alternative Cost</b>	<b>\$489,011</b>

**Estimated Cost for FT004, Ecological-Based Alternative 18**

<b>CAPITAL COSTS</b>		
Process Option		Capital Cost
Demolition & Clearing		\$25,429
Excavation		\$30,733
Landfill Disposal		\$832,347
Transportation Alt 18		\$332,939
Cleanup & Improvements		\$10,358
Reserved		\$0
<b>Construction Subtotal</b>		<b>\$1,231,806</b>
Bid Contingencies (% of Construction Subtotal)	15.0%	\$184,771
Scope Contingencies (% of Construction Subtotal)	20.0%	\$246,361
<b>Construction Total</b>		<b>\$1,662,938</b>
<b>Other Direct Costs</b>		
Engineering Design (% of Construction Total)	5.0%	\$83,147
Permitting and Legal (% of Construction Total)	5.0%	\$83,147
Startup and Shakedown (% of Construction Total)	0.0%	\$0
Bonding and Insurance (% of Construction Total)	3.0%	\$49,888
Construction Oversight (% of Construction Total)	5.0%	\$83,147
Field and Laboratory Testing (% of Construction Total)	5.0%	\$83,147
Reporting (% of Construction Total)	10.0%	\$166,294
Escalation (% of Construction Total, Based on Mid 1998 Start)	15.0%	\$249,441
<b>Total Capital Cost</b>		<b>\$2,461,148</b>

<b>OPERATION AND MAINTENANCE</b>					
Process Option	Annual O&M Cost	Process Option Service Time (yr)	Present Worth Factor	Process Option Present Worth	
Demolition & Clearing	\$0	30.0	15.3725	\$0	
Excavation	\$0	30.0	15.3725	\$0	
Landfill Disposal	\$0	30.0	15.3725	\$0	
Transportation Alt 18	\$0	30.0	15.3725	\$0	
Cleanup & Improvements	\$0	30.0	15.3725	\$0	
Reserved	\$0	30.0	15.3725	\$0	
<b>O&amp;M Subtotal</b>	<b>\$0</b>			<b>\$0</b>	
<b>Misc. O&amp;M Costs (% Annual O&amp;M Unless Otherwise Specified)</b>	<b>Percentage</b>				
<i>See Global Cost Assumptions For Details on Calculations</i>					
Demolition & Clearing	16%	\$0	30.0	15.3725	\$0
Excavation	16%	\$0	30.0	15.3725	\$0
Landfill Disposal	16%	\$0	30.0	15.3725	\$0
Transportation Alt 18	16%	\$0	30.0	15.3725	\$0
Cleanup & Improvements	16%	\$0	30.0	15.3725	\$0
Reserved	16%	\$0	30.0	15.3725	\$0
<b>Total Operation and Maintenance Costs</b>				<b>\$0</b>	

<b>NET PRESENT WORTH</b>	
Capital Costs	\$2,461,148
Operation and Maintenance Present Worth	\$0
<b>Total Alternative Cost</b>	<b>\$2,461,148</b>

**Estimated Cost for FT004, Health-Based Alternative 19**

<b>CAPITAL COSTS</b>			
<b>Process Option</b>			<b>Capital Cost</b>
Demolition & Clearing			\$4,315
Capping			\$138,816
Cleanup & Improvements			\$1,150
Soil Vapor Monitoring			\$0
Reserved			\$0
<b>Construction Subtotal</b>			<b>\$144,281</b>
Bid Contingencies (% of Construction Subtotal)	15.0%		\$21,642
Scope Contingencies (% of Construction Subtotal)	20.0%		\$28,856
<b>Construction Total</b>			<b>\$194,779</b>
<b>Other Direct Costs</b>			
Engineering Design (% of Construction Total)	10.0%		\$19,478
Permitting and Legal (% of Construction Total)	5.0%		\$9,739
Startup and Shakedown (% of Construction Total)	0.0%		\$0
Bonding and Insurance (% of Construction Total)	3.0%		\$5,843
Construction Oversight (% of Construction Total)	5.0%		\$9,739
Field and Laboratory Testing (% of Construction Total)	5.0%		\$9,739
Reporting (% of Construction Total)	10.0%		\$19,478
Escalation (% of Construction Total, Based on Mid 1998 Start)	15.0%		\$29,217
<b>Total Capital Cost</b>			<b>\$398,012</b>

<b>OPERATION AND MAINTENANCE</b>					
<b>Process Option</b>		<b>Annual O&amp;M Cost</b>	<b>Process Option Service Time (yr)</b>	<b>Present Worth Factor</b>	<b>Process Option Present Worth</b>
Demolition & Clearing		\$0	30.0	15.3725	\$0
Capping		\$0	30.0	15.3725	\$0
Cleanup & Improvements		\$0	30.0	15.3725	\$0
Soil Vapor Monitoring		\$2,898	30.0	15.3725	\$44,549
Reserved		\$0	30.0	15.3725	\$0
<b>O&amp;M Subtotal</b>		<b>\$2,898</b>			<b>\$44,549</b>
<b>Misc. O&amp;M Costs (% Annual O&amp;M Unless Otherwise Specified)</b>	<b>Percentage</b>				
<b>See Global Cost Assumptions For Details on Calculations</b>					
Demolition & Clearing	21%	\$0	30.0	15.3725	\$0
Capping	21%	\$0	30.0	15.3725	\$0
Cleanup & Improvements	21%	\$0	30.0	15.3725	\$0
Soil Vapor Monitoring	21%	\$609	30.0	15.3725	\$9,355
Reserved	21%	\$0	30.0	15.3725	\$0
<b>Total Operation and Maintenance Costs</b>					<b>\$53,905</b>

<b>NET PRESENT WORTH</b>	
Capital Costs	\$298,012
Operation and Maintenance Present Worth	\$53,905
<b>Total Alternative Cost</b>	<b>\$351,917</b>

**Estimated Cost for FT004, Ecological-Based Alternative 19**

<b>CAPITAL COSTS</b>		
Process Option		Capital Cost
Demolition & Clearing		\$25,429
Capping		\$1,659,571
Cleanup & Improvements		\$10,358
Soil Vapor Monitoring		\$0
Reserved		\$0
<b>Construction Subtotal</b>		<b>\$1,695,358</b>
Bid Contingencies (% of Construction Subtotal)	15.0%	\$254,304
Scope Contingencies (% of Construction Subtotal)	20.0%	\$339,072
<b>Construction Total</b>		<b>\$2,288,733</b>
<b>Other Direct Costs</b>		
Engineering Design (% of Construction Total)	10.0%	\$228,873
Permitting and Legal (% of Construction Total)	5.0%	\$114,437
Startup and Shakedown (% of Construction Total)	0.0%	\$0
Bonding and Insurance (% of Construction Total)	3.0%	\$68,662
Construction Oversight (% of Construction Total)	5.0%	\$114,437
Field and Laboratory Testing (% of Construction Total)	5.0%	\$114,437
Reporting (% of Construction Total)	10.0%	\$228,873
Escalation (% of Construction Total, Based on Mid 1998 Start)	15.0%	\$343,310
<b>Total Capital Cost</b>		<b>\$3,501,762</b>

<b>OPERATION AND MAINTENANCE</b>				
Process Option	Annual O&M Cost	Process Option Service Time (yr)	Present Worth Factor	Process Option Present Worth
Demolition & Clearing	\$0	30.0	15.3725	\$0
Capping	\$0	30.0	15.3725	\$0
Cleanup & Improvements	\$0	30.0	15.3725	\$0
Soil Vapor Monitoring	\$2,898	30.0	15.3725	\$44,549
Reserved	\$0	30.0	15.3725	\$0
<b>O&amp;M Subtotal</b>				<b>\$44,549</b>
<b>Other O&amp;M Costs (by Annual O&amp;M Values Otherwise Specified)</b>		Percentage		
<i>See Global Cost Assumptions for Details on Calculation</i>				
Demolition & Clearing	21%	\$0	30.0	\$0
Capping	21%	\$0	30.0	\$0
Cleanup & Improvements	21%	\$0	30.0	\$0
Soil Vapor Monitoring	21%	\$609	30.0	\$9,355
Reserved	21%	\$0	30.0	\$0
<b>Total Operation and Maintenance Costs</b>				<b>\$53,905</b>

<b>NET PRESENT WORTH</b>	
Capital Costs	\$3,501,762
Operation and Maintenance Present Worth	\$53,905
<b>Total Alternative Cost</b>	<b>\$3,555,667</b>

**Estimated Cost for FT004, Health-Based Alternative 20**

<b>CAPITAL COSTS</b>		
<b>Process Option</b>		<b>Capital Cost</b>
Demolition & Clearing		\$4,315
Excavation		\$5,141
Transportation Alt 20		\$111,800
Thermal Destruction/Landfill Disposal		\$2,580,000
Cleanup & Improvements		\$1,150
Reserved		\$0
<b>Construction Subtotal</b>		<b>\$2,701,406</b>
Bid Contingencies (% of Construction Subtotal)	15.0%	\$405,361
Scope Contingencies (% of Construction Subtotal)	20.0%	\$540,481
<b>Construction Total</b>		<b>\$3,647,248</b>
<b>Other Direct Costs</b>		
Engineering Design (% of Construction Total)	5.0%	\$182,412
Permitting and Legal (% of Construction Total)	10.0%	\$364,825
Startup and Shakedown (% of Construction Total)	10.0%	\$364,825
Bonding and Insurance (% of Construction Total)	3.0%	\$109,447
Construction Oversight (% of Construction Total)	5.0%	\$182,412
Field and Laboratory Testing (% of Construction Total)	5.0%	\$182,412
Reporting (% of Construction Total)	10.0%	\$364,825
Escalation (% of Construction Total, Based on Mid 1998 Start)	15.0%	\$547,237
<b>Total Capital Cost</b>		<b>\$5,946,644</b>

<b>OPERATION AND MAINTENANCE</b>					
<b>Process Option</b>		<b>Annual O&amp;M Cost</b>	<b>Process Option Service Time (yr)</b>	<b>Present Worth Factor</b>	<b>Process Option Present Worth</b>
Demolition & Clearing		\$0	30.0	15.3725	\$0
Excavation		\$0	30.0	15.3725	\$0
Transportation Alt 20		\$0	30.0	15.3725	\$0
Thermal Destruction/Landfill Disposal		\$0	30.0	15.3725	\$0
Cleanup & Improvements		\$0	30.0	15.3725	\$0
Reserved		\$0	30.0	15.3725	\$0
<b>O&amp;M Subtotal</b>		<b>\$0</b>			<b>\$0</b>
<b>Other O&amp;M Costs (% Annual O&amp;M Basis, Otherwise Specified)</b>	<b>Percentage</b>				
<i>See Global Cost Assumptions For Details on Calculations</i>					
Demolition & Clearing	16%	\$0	30.0	15.3725	\$0
Excavation	16%	\$0	30.0	15.3725	\$0
Transportation Alt 20	16%	\$0	30.0	15.3725	\$0
Thermal Destruction/Landfill Disposal	16%	\$0	30.0	15.3725	\$0
Cleanup & Improvements	16%	\$0	30.0	15.3725	\$0
Reserved	16%	\$0	30.0	15.3725	\$0
<b>Total Operation and Maintenance Cost</b>					<b>\$0</b>

<b>Capital Costs</b>	<b>\$5,946,644</b>
<b>Operation and Maintenance Present Worth</b>	<b>\$0</b>
<b>Total Alternative Cost</b>	<b>\$5,946,644</b>

Estimated Cost for FT004, Ecological-Based Alternative 20

CAPITAL COSTS		
Process Option		Capital Cost
Demolition & Clearing		\$25,429
Excavation		\$30,733
Transportation Alt 20		\$655,877
Thermal Destruction/Landfill Disposal		\$15,366,400
Cleanup & Improvements		\$10,358
Reserved		\$0
<b>Construction Subtotal</b>		<b>\$16,088,797</b>
Bid Contingencies (% of Construction Subtotal)	15.0%	\$2,413,320
Scope Contingencies (% of Construction Subtotal)	20.0%	\$3,217,759
<b>Construction Total</b>		<b>\$21,719,876</b>
Other Direct Costs		
Engineering Design (% of Construction Total)	5.0%	\$1,085,994
Permitting and Legal (% of Construction Total)	10.0%	\$2,171,988
Startup and Shakedown (% of Construction Total)	10.0%	\$2,171,988
Bonding and Insurance (% of Construction Total)	3.0%	\$651,596
Construction Oversight (% of Construction Total)	5.0%	\$1,085,994
Field and Laboratory Testing (% of Construction Total)	5.0%	\$1,085,994
Reporting (% of Construction Total)	10.0%	\$2,171,988
Escalation (% of Construction Total, Based on Mid 1998 Start)	15.0%	\$3,257,981
<b>Total Capital Cost</b>		<b>\$35,403,398</b>

OPERATION AND MAINTENANCE					
Process Option	Annual O&M Cost	Process Option Service Time (Yr)	Present Worth Factor	Process Option Present Worth	
Demolition & Clearing	\$0	30.0	15.3725	\$0	
Excavation	\$0	30.0	15.3725	\$0	
Transportation Alt 20	\$0	30.0	15.3725	\$0	
Thermal Destruction/Landfill Disposal	\$0	30.0	15.3725	\$0	
Cleanup & Improvements	\$0	30.0	15.3725	\$0	
Reserved	\$0	30.0	15.3725	\$0	
<b>O&amp;M Subtotal</b>	<b>\$0</b>			<b>\$0</b>	
Misc. O&M Costs (% Annual O&M Unless Otherwise Specified)	Percentage				
See Global Cost Assumptions for Details on Calculations					
Demolition & Clearing	16%	\$0	30.0	15.3725	\$0
Excavation	16%	\$0	30.0	15.3725	\$0
Transportation Alt 20	16%	\$0	30.0	15.3725	\$0
Thermal Destruction/Landfill Disposal	16%	\$0	30.0	15.3725	\$0
Cleanup & Improvements	16%	\$0	30.0	15.3725	\$0
Reserved	16%	\$0	30.0	15.3725	\$0
<b>Total Operation and Maintenance Costs</b>				<b>\$0</b>	

NET PRESENT WORTH	
Capital Costs	\$35,403,398
Operation and Maintenance Present Worth	\$0
<b>Total Alternative Cost</b>	<b>\$35,403,398</b>

Cost Estimate Summary Sheet

NEWIOU Feasibility Study, Travis AFB

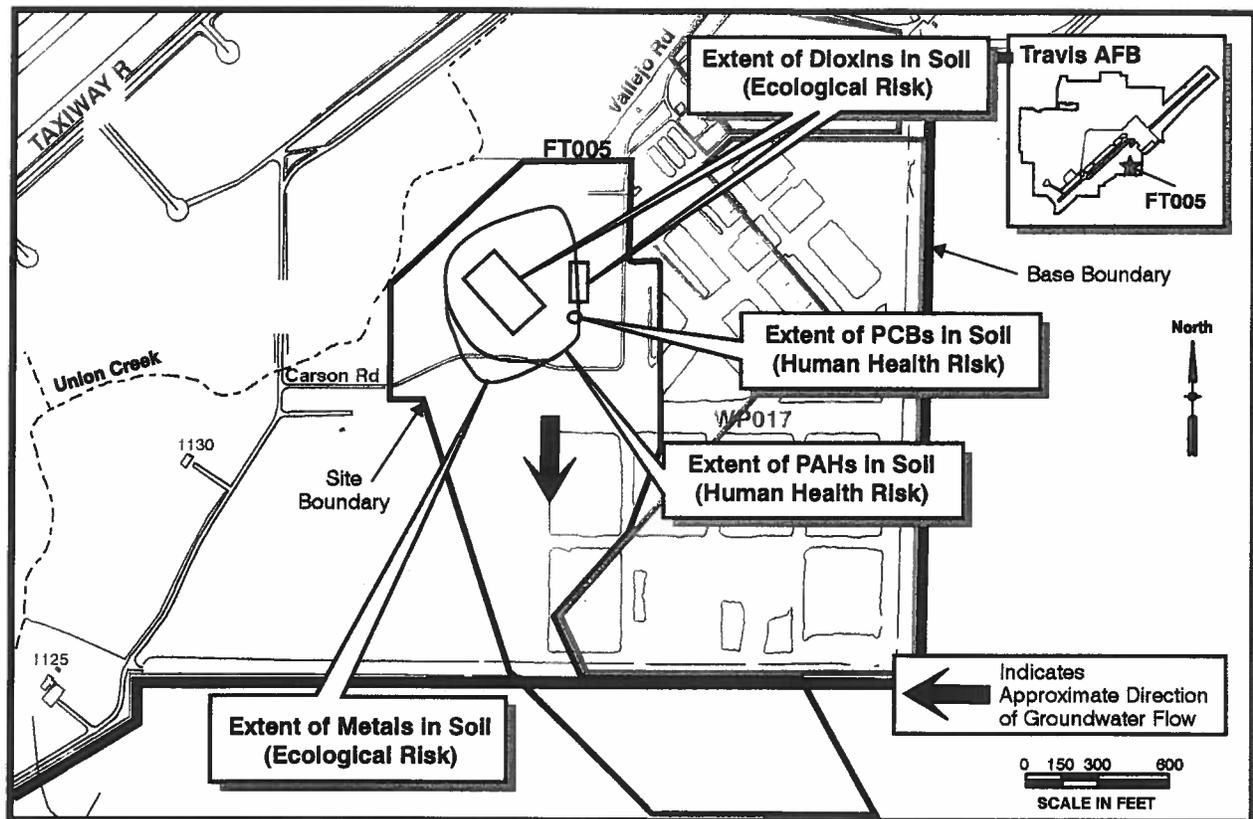
Process Option Summary for FT004

Assumptions:

- 1 Use RACER/ENVEST cost estimating model, Version 3.1 when practical
- 2 Compute monitoring and O&M for one year only; add costs for subsequent years using Alternative Cost Summary Sheets.
- 3 Soil disposal costs do not include transportation from TAFB or treatment facility to landfill
- 4 Capping costs include vents, etc.
- 5 Thermal treatment cost is \$600/ton and includes subsequent disposal
- 6 Class I disposal cost of \$245/ton, Class II disposal cost of \$32.50/ton

Cost Summary:

Item	Health-Based		Ecological-Based	
	Capital Cost	O&M Cost	Capital Cost	O&M Cost
Demolition & Clearing	\$4,315	\$0	\$25,429	\$0
Demolition, Curbs	\$0	\$0	\$0	\$0
Demolition, Pavements	\$0	\$0	\$0	\$0
Clear and Grub	\$4,315	\$0	\$25,429	\$0
Capping	\$138,816	\$0	\$1,659,571	\$0
Excavation	\$5,141	\$0	\$30,733	\$0
Transportation Alt 18	\$94,900	\$0	\$332,939	\$0
Transportation Alt 20	\$111,800	\$0	\$655,877	\$0
Thermal Destruction/Landfill Disposal	\$2,580,000	\$0	\$15,366,400	\$0
Landfill Disposal	\$139,244	\$0	\$832,347	\$0
Class I Landfill	\$0	\$0	\$0	\$0
Class II Landfill	\$139,244	\$0	\$832,347	\$0
Cleanup & Improvements	\$1,150	\$0	\$10,358	\$0
Cleanup and Landscaping	\$1,150	\$0	\$10,358	\$0
Improvements & Utilities	\$0	\$0	\$0	\$0
Soil Vapor Monitoring	\$0	\$2,898	\$0	\$2,898
Monitoring	\$0	\$5,498	\$0	\$3,322
Fencing	\$5,862	\$0	\$0	\$0
Reserved	\$0	\$0	\$0	\$0



FT005SS.CDR - VMG 8/9/96 SAC 1

**Site Characteristics**

- Site is located in an inactive area of Travis AFB
- Depth to groundwater — 5 to 20 feet
- Depth to bedrock — 30 to 50 feet
- Permeable materials (sand and silt) occur through depths of 20 to 40 feet bgs
- Some low permeability soils (clay and silt) occur between 10 and 30 feet bgs
- Site also included in Group C for groundwater contamination

**Treatment Alternatives**

- Alternative #18: Backhoe, Disposal at Existing Off-site Landfill
- Alternative #19: Soil and Bentonite Cap
- Alternative #20: Backhoe, Ex-situ High Temperature Thermal Treatment, Disposal at Existing Off-site Landfill

**Design Assumptions**

- 285,000 ft<sup>2</sup> — area which contains contaminated soil (human health risk)
- PAH-contaminated soil to a depth of 3 feet (human health risk)
- PCB-contaminated soil to a depth of 1 foot (human health risk)
- 32,500 ft<sup>2</sup> — area which contains contaminated soil (ecological risk)
- Pesticides, metals, and dioxins contaminated soil to a depth of 1 foot (ecological risk)
- 30,000 cubic yards of soil within limits for Class II landfill (exceeds LUFT manual)
- 1,200 cubic yards of soil within limits for Class II landfill (ecological risk)
- 1,950 cubic yards of soil estimated to require thermal destruction, due to dioxins, as an element of Alternative 18

*NOTE: The figure conceptually displays components for comparative purposes only. Actual layout may vary significantly from that shown and will be determined during the remedial design phase.*

**Figure B-23.**  
**Conceptual Design for FT005 (Group K) Soil Treatment Alternatives, Travis AFB**

### Cost Summary for FT005 Alternatives

Alternative	Health-Based Cleanup			Incremental Ecological-Based Cleanup			Grand Total
	Capital Costs	Operation and Maintenance Present Worth	Subtotal	Capital Costs	Operation and Maintenance Present Worth	Subtotal	
16	\$0	\$0	\$0	\$0	\$0	\$0	\$0
17	\$32,763	\$106,470	\$139,233	\$0	\$106,470	\$106,470	\$245,703
18	\$6,418,413	\$0	\$6,418,413	\$305,714	\$0	\$305,714	\$6,724,127
19	\$3,064,851	\$53,905	\$3,118,756	\$386,971	\$53,905	\$440,876	\$3,559,632
20	\$92,816,423	\$0	\$92,816,423	\$3,382,411	\$0	\$3,382,411	\$96,198,834

Estimated Cost for FT005, Health-Based Alternative 16

CAPITAL COSTS		
Process Option	Percentage	Capital Cost
No Action		\$0
<b>Construction Subtotal</b>		<b>\$0</b>
Bid Contingencies (% of Construction Subtotal)	15.0%	\$0
Scope Contingencies (% of Construction Subtotal)	20.0%	\$0
<b>Construction Total</b>		<b>\$0</b>
Other Direct Costs		
Engineering Design (% of Construction Total)	10.0%	\$0
Permitting and Legal (% of Construction Total)	5.0%	\$0
Startup and Shakedown (% of Construction Total)	10.0%	\$0
Bonding and Insurance (% of Construction Total)	3.0%	\$0
Construction Oversight (% of Construction Total)	5.0%	\$0
Field and Laboratory Testing (% of Construction Total)	5.0%	\$0
Reporting (% of Construction Total)	10.0%	\$0
Escalation (% of Construction Total, Based on Mid 1998 Start)	15.0%	\$0
<b>Total Capital Cost</b>		<b>\$0</b>

OPERATION AND MAINTENANCE				
Process Option	Annual O&M Cost	Process Option Service Time (yr)	Present Worth Factor	Process Option Present Worth
No Action	\$0	0.0	0.0000	\$0
<b>O&amp;M Subtotal</b>				<b>\$0</b>
Misc. O&M Costs (% Annual O&M Unless Otherwise Specified)	Percentage			
See Global Cost Assumptions For Details on Calculations				
No Action	21%	\$0	0.0	0.0000
<b>Total Operation and Maintenance Costs</b>				<b>\$0</b>

NET PRESENT WORTH	
Capital Costs	\$0
Operation and Maintenance Present Worth	\$0
<b>Total Alternative Cost</b>	<b>\$0</b>

Estimated Cost for FT005, Ecological-Based Alternative 16

CAPITAL COSTS		
Process Option	Percentage	Capital Cost
No Action		\$0
<b>Construction Subtotal</b>		
Bid Contingencies (% of Construction Subtotal)	15.0%	\$0
Scope Contingencies (% of Construction Subtotal)	20.0%	\$0
<b>Construction Total</b>		
<b>Other Direct Costs</b>		
Engineering Design (% of Construction Total)	10.0%	\$0
Permitting and Legal (% of Construction Total)	5.0%	\$0
Startup and Shakedown (% of Construction Total)	10.0%	\$0
Bonding and Insurance (% of Construction Total)	3.0%	\$0
Construction Oversight (% of Construction Total)	5.0%	\$0
Field and Laboratory Testing (% of Construction Total)	5.0%	\$0
Reporting (% of Construction Total)	10.0%	\$0
Escalation (% of Construction Total, Based on Mid 1998 Start)	15.0%	\$0
<b>Total Capital Cost</b>		
		\$0

OPERATION AND MAINTENANCE				
Process Option	Annual O&M Cost	Process Option Service Time (yr)	Present Worth Factor	Process Option Present Worth
No Action	\$0	0.0	0.0000	\$0
<b>O&amp;M Subtotal</b>				
	\$0			\$0
Misc. O&M Costs (% Annual O&M Unless Otherwise Specified)	Percentage			
See Global Cost Assumptions For Details on Calculations				
No Action	21%	\$0	0.0	0.0000
<b>Total Operation and Maintenance Costs</b>				
				\$0

NET PRESENT WORTH	
Capital Costs	\$0
Operation and Maintenance Present Worth	\$0
<b>Total Alternative Cost</b>	
	\$0

**Estimated Cost for FT005, Health-Based Alternative 17**

<b>CAPITAL COSTS</b>			
Process Option			Capital Cost
Fencing			\$17,586
Monitoring			\$0
Reserved			\$0
<b>Construction Subtotal</b>			<b>\$17,586</b>
Bid Contingencies (% of Construction Subtotal)	15.0%		\$2,638
Scope Contingencies (% of Construction Subtotal)	20.0%		\$3,517
<b>Construction Total</b>			<b>\$23,741</b>
<b>Other Direct Costs</b>			
Engineering Design (% of Construction Total)	10.0%		\$2,374
Permitting and Legal (% of Construction Total)	5.0%		\$1,187
Startup and Shakedown (% of Construction Total)	0.0%		\$0
Bonding and Insurance (% of Construction Total)	3.0%		\$712
Construction Oversight (% of Construction Total)	5.0%		\$1,187
Field and Laboratory Testing (% of Construction Total)	0.0%		\$0
Reporting (% of Construction Total)	0.0%		\$0
Escalation (% of Construction Total, Based on Mid 1998 Start)	15.0%		\$3,561
<b>Total Capital Cost</b>			<b>\$32,763</b>

<b>OPERATION AND MAINTENANCE</b>					
Process Option		Annual O&M Cost	Process Option Service Time (yr)	Present Worth Factor	Process Option Present Worth
Fencing		\$0	30.0	15.3725	\$0
Monitoring		\$5,724	30.0	15.3725	\$87,992
Reserved		\$0	30.0	15.3725	\$0
<b>O&amp;M Subtotal</b>		<b>\$5,724</b>			<b>\$87,992</b>
Misc. O&M Costs (% Annual O&M Unless Otherwise Specified)			Percentage		
See Global Cost Assumptions For Details on Calculations					
Fencing	21%	\$0	30.0	15.3725	\$0
Monitoring	21%	\$1,202	30.0	15.3725	\$18,478
Reserved	21%	\$0	30.0	15.3725	\$0
<b>Total Operation and Maintenance Costs</b>					<b>\$106,470</b>

<b>NET PRESENT WORTH</b>	
Capital Costs	\$32,763
Operation and Maintenance Present Worth	\$106,470
<b>Total Alternative Cost</b>	<b>\$139,233</b>

**Estimated Cost for FT005, Ecological-Based Alternative 17**

<b>CAPITAL COSTS</b>			
Process Option			Capital Cost
Fencing			\$0
Monitoring			\$0
Reserved			\$0
<b>Construction Subtotal</b>			<b>\$0</b>
Bid Contingencies (% of Construction Subtotal)	15.0%		\$0
Scope Contingencies (% of Construction Subtotal)	20.0%		\$0
<b>Construction Total</b>			<b>\$0</b>
<b>Other Direct Costs</b>			
Engineering Design (% of Construction Total)	10.0%		\$0
Permitting and Legal (% of Construction Total)	5.0%		\$0
Startup and Shakedown (% of Construction Total)	0.0%		\$0
Bonding and Insurance (% of Construction Total)	3.0%		\$0
Construction Oversight (% of Construction Total)	5.0%		\$0
Field and Laboratory Testing (% of Construction Total)	0.0%		\$0
Reporting (% of Construction Total)	0.0%		\$0
Escalation (% of Construction Total, Based on Mid 1998 Start)	15.0%		\$0
<b>Total Capital Cost</b>			<b>\$0</b>

<b>OPERATION AND MAINTENANCE</b>				
Process Option	Annual O&M Cost	Process Option Service Time (yr)	Present Worth Factor	Process Option Present Worth
Fencing	\$0	30.0	15.3725	\$0
Monitoring	\$5,724	30.0	15.3725	\$87,992
Reserved	\$0	30.0	15.3725	\$0
<b>O&amp;M Subtotal</b>				<b>\$87,992</b>
<b>Unit O&amp;M Cost (% Annual O&amp;M Unless Otherwise Specified)</b>		<b>Percentage</b>		
See Global Cost Assumptions For Details on Calculations				
Fencing		21%		
Monitoring		21%		
Reserved		21%		
<b>Total Operation and Maintenance Costs</b>				<b>\$106,470</b>

<b>NET PRESENT WORTH</b>	
Capital Costs	\$0
Operation and Maintenance Present Worth	\$106,470
<b>Total Alternative Cost</b>	<b>\$106,470</b>

**Estimated Cost for FT005, Health-Based Alternative 18**

<b>CAPITAL COSTS</b>		
<b>Process Option</b>		
		<b>Capital Cost</b>
Demolition & Clearing		\$22,623
Excavation		\$80,667
Transportation Alt 18		\$915,200
Landfill Disposal		\$2,184,722
Cleanup & Improvements		\$9,207
Reserved		\$0
<b>Construction Subtotal</b>		
Bid Contingencies (% of Construction Subtotal)	15.0%	\$481,863
Scope Contingencies (% of Construction Subtotal)	20.0%	\$642,484
<b>Construction Total</b>		
<b>Other Direct Costs</b>		
Engineering Design (% of Construction Total)	5.0%	\$216,838
Permitting and Legal (% of Construction Total)	5.0%	\$216,838
Startup and Shakedown (% of Construction Total)	0.0%	\$0
Bonding and Insurance (% of Construction Total)	3.0%	\$130,103
Construction Oversight (% of Construction Total)	5.0%	\$216,838
Field and Laboratory Testing (% of Construction Total)	5.0%	\$216,838
Reporting (% of Construction Total)	10.0%	\$433,677
Escalation (% of Construction Total, Based on Mid 1998 Start)	15.0%	\$650,515
<b>Total Capital Cost</b>		
		<b>\$6,418,413</b>

<b>OPERATION AND MAINTENANCE</b>					
		Annual O&M Cost	Process Option Service Time (Yr)	Present Worth Factor	Process Option Present Worth
<b>Process Option</b>					
Demolition & Clearing		\$0	30.0	15.3725	\$0
Excavation		\$0	30.0	15.3725	\$0
Transportation Alt 18		\$0	30.0	15.3725	\$0
Landfill Disposal		\$0	30.0	15.3725	\$0
Reserved		\$0	30.0	15.3725	\$0
<b>CM&amp;M Subtotal</b>					
		\$0			\$0
<b>Min O&amp;M Cost (By Annual O&amp;M Values Otherwise Specified)</b>					
<b>See Global Cost Assumptions for Details on Calculations</b>					
	Percentage				
Demolition & Clearing	16%	\$0	30.0	15.3725	\$0
Excavation	16%	\$0	30.0	15.3725	\$0
Transportation Alt 18	16%	\$0	30.0	15.3725	\$0
Landfill Disposal	16%	\$0	30.0	15.3725	\$0
Reserved	16%	\$0	30.0	15.3725	\$0
<b>Total Operation and Maintenance Costs</b>					
					<b>\$0</b>

<b>NET PRESENT WORTH</b>	
Capital Costs	\$6,418,413
Operation and Maintenance Present Worth	\$0
<b>Total Alternative Cost</b>	
<b>\$6,418,413</b>	

**Estimated Cost for FT005, Ecological-Based Alternative 18**

<b>CAPITAL COSTS</b>		
Process Option		Capital Cost
Demolition & Clearing		\$22,623
Excavation		\$2,880
Transportation Alt 18		\$40,300
Landfill Disposal		\$78,000
Cleanup & Improvements		\$9,207
Reserved		\$0
<b>Construction Subtotal</b>		<b>\$153,010</b>
Bid Contingencies (% of Construction Subtotal)	15.0%	\$22,952
Scope Contingencies (% of Construction Subtotal)	20.0%	\$30,602
<b>Construction Total</b>		<b>\$206,564</b>
<b>Other Project Costs</b>		
Engineering Design (% of Construction Total)	5.0%	\$10,328
Permitting and Legal (% of Construction Total)	5.0%	\$10,328
Startup and Shakedown (% of Construction Total)	0.0%	\$0
Bonding and Insurance (% of Construction Total)	3.0%	\$6,197
Construction Oversight (% of Construction Total)	5.0%	\$10,328
Field and Laboratory Testing (% of Construction Total)	5.0%	\$10,328
Reporting (% of Construction Total)	10.0%	\$20,656
Escalation (% of Construction Total, Based on Mid 1998 Start)	15.0%	\$30,985
<b>Total Capital Cost</b>		<b>\$305,714</b>

<b>OPERATION AND MAINTENANCE</b>					
Process Option		Annual O&M Cost	Process Option Service Time (yr)	Present Worth Factor	Process Option Present Worth
Demolition & Clearing		\$0	30.0	15.3725	\$0
Excavation		\$0	30.0	15.3725	\$0
Transportation Alt 18		\$0	30.0	15.3725	\$0
Landfill Disposal		\$0	30.0	15.3725	\$0
Cleanup & Improvements		\$0	30.0	15.3725	\$0
Reserved		\$0	30.0	15.3725	\$0
<b>O&amp;M Subtotal</b>		<b>\$0</b>			<b>\$0</b>
<b>Min. O&amp;M Costs (% Annual O&amp;M Rates Otherwise Specified)</b>					
<b>See Global Estimate Assumptions for Detailed Estimation</b>					
Demolition & Clearing	16%	\$0	30.0	15.3725	\$0
Excavation	16%	\$0	30.0	15.3725	\$0
Transportation Alt 18	16%	\$0	30.0	15.3725	\$0
Landfill Disposal	16%	\$0	30.0	15.3725	\$0
Cleanup & Improvements	16%	\$0	30.0	15.3725	\$0
Reserved	16%	\$0	30.0	15.3725	\$0
<b>Total Operations and Maintenance Costs</b>		<b>\$0</b>			<b>\$0</b>

<b>NET PRESENT WORTH</b>	
Capital Costs	\$305,714
Operation and Maintenance Present Worth	\$0
<b>Total Net Present Worth</b>	<b>\$305,714</b>

**Estimated Cost for FT005, Health-Based Alternative 19**

<b>CAPITAL COSTS</b>		
Process Option		Capital Cost
Demolition & Clearing		\$22,623
Capping		\$1,452,000
Cleanup & Improvements		\$9,207
Soil Vapor Monitoring		\$0
Reserved		\$0
<b>Construction Subtotal</b>		<b>\$1,483,830</b>
Bid Contingencies (% of Construction Subtotal)	15.0%	\$222,575
Scope Contingencies (% of Construction Subtotal)	20.0%	\$296,766
<b>Construction Total</b>		<b>\$1,903,171</b>
<b>Other Direct Costs</b>		
Engineering Design (% of Construction Total)	10.0%	\$200,317
Permitting and Legal (% of Construction Total)	5.0%	\$100,159
Startup and Shakedown (% of Construction Total)	0.0%	\$0
Bonding and Insurance (% of Construction Total)	3.0%	\$60,095
Construction Oversight (% of Construction Total)	5.0%	\$100,159
Field and Laboratory Testing (% of Construction Total)	5.0%	\$100,159
Reporting (% of Construction Total)	10.0%	\$200,317
Escalation (% of Construction Total, Based on Mid 1998 Start)	15.0%	\$300,476
<b>Total Capital Cost</b>		<b>\$3,064,851</b>

<b>OPERATION AND MAINTENANCE</b>					
Process Option	Annual O&M Cost	Process Option Service Time (yr)	Present Worth Factor	Process Option Present Worth	
Demolition & Clearing	\$0	30.0	15.3725	\$0	
Capping	\$0	30.0	15.3725	\$0	
Cleanup & Improvements	\$0	30.0	15.3725	\$0	
Soil Vapor Monitoring	\$2,898	30.0	15.3725	\$44,549	
Reserved	\$0	30.0	15.3725	\$0	
<b>O&amp;M Subtotal</b>				<b>\$44,549</b>	
Yearly O&M Cost (or Annual O&M Unless Otherwise Specified)	Percentage				
<i>See Global Cost Assumptions For Details on Calculation</i>					
Demolition & Clearing	21%	\$0	30.0	15.3725	\$0
Capping	21%	\$0	30.0	15.3725	\$0
Cleanup & Improvements	21%	\$0	30.0	15.3725	\$0
Soil Vapor Monitoring	21%	\$609	30.0	15.3725	\$9,355
Reserved	21%	\$0	30.0	15.3725	\$0
<b>Total Operation and Maintenance Costs</b>					<b>\$53,905</b>

<b>NET PRESENT WORTH</b>	
Capital Costs	\$3,064,851
Operation and Maintenance Present Worth	\$53,905
<b>Total Alternative Cost</b>	<b>\$3,118,756</b>

**Estimated Cost for FT005, Ecological-Based Alternative 19**

<b>CAPITAL COSTS</b>		
<b>Process Option</b>		<b>Capital Cost</b>
Demolition & Clearing		\$22,623
Capping		\$155,520
Cleanup & Improvements		\$9,207
Soil Vapor Monitoring		\$0
Reserved		\$0
<b>Construction Subtotal</b>		<b>\$187,350</b>
Bid Contingencies (% of Construction Subtotal)	15.0%	\$28,103
Scope Contingencies (% of Construction Subtotal)	20.0%	\$37,470
<b>Construction Total</b>		<b>\$252,923</b>
<b>Other Direct Costs</b>		
Engineering Design (% of Construction Total)	10.0%	\$25,292
Permitting and Legal (% of Construction Total)	5.0%	\$12,646
Startup and Shakedown (% of Construction Total)	0.0%	\$0
Bonding and Insurance (% of Construction Total)	3.0%	\$7,588
Construction Oversight (% of Construction Total)	5.0%	\$12,646
Field and Laboratory Testing (% of Construction Total)	5.0%	\$12,646
Reporting (% of Construction Total)	10.0%	\$25,292
Escalation (% of Construction Total, Based on Mid 1998 Start)	15.0%	\$37,938
<b>Total Capital Cost</b>		<b>\$386,971</b>

<b>OPERATION AND MAINTENANCE</b>					
<b>Process Option</b>		<b>Annual O&amp;M Cost</b>	<b>Process Option Service Time (yr)</b>	<b>Present Worth Factor</b>	<b>Process Option Present Worth</b>
Demolition & Clearing		\$0	30.0	15.3725	\$0
Capping		\$0	30.0	15.3725	\$0
Cleanup & Improvements		\$0	30.0	15.3725	\$0
Soil Vapor Monitoring		\$2,898	30.0	15.3725	\$44,549
Reserved		\$0	30.0	15.3725	\$0
<b>O&amp;M Subtotal</b>		<b>\$2,898</b>			<b>\$44,549</b>
<b>Other O&amp;M Data (% Annual O&amp;M Unless Otherwise Specified)</b>	<b>Percentage</b>				
<b>See Global List Assumptions For Details and Calculations</b>					
Demolition & Clearing	21%	\$0	30.0	15.3725	\$0
Capping	21%	\$0	30.0	15.3725	\$0
Cleanup & Improvements	21%	\$0	30.0	15.3725	\$0
Soil Vapor Monitoring	21%	\$609	30.0	15.3725	\$9,355
Reserved	21%	\$0	30.0	15.3725	\$0
<b>Total Operation and Maintenance Costs</b>					<b>\$53,905</b>

<b>NET PRESENT WORTH</b>	
Capital Costs	\$386,971
Operation and Maintenance Present Worth	\$53,905
<b>Total Alternative Cost</b>	<b>\$440,876</b>

**Estimated Cost for FT005, Health-Based Alternative 20**

<b>CAPITAL COSTS</b>		
<b>Process Option</b>		
		<b>Capital Cost</b>
Demolition & Clearing		\$22,623
Excavation		\$80,667
Transportation Alt 20		\$1,747,200
Thermal Destruction/Landfill Disposal		\$40,320,000
Reserved		\$0
Reserved		\$0
Cleanup & Improvements		\$9,207
Reserved		\$0
<b>Construction Subtotal</b>		<b>\$42,179,697</b>
Bid Contingencies (% of Construction Subtotal)	15.0%	\$6,326,955
Scope Contingencies (% of Construction Subtotal)	20.0%	\$8,435,939
<b>Construction Total</b>		<b>\$56,941,591</b>
<b>Other Direct Costs</b>		
Engineering Design (% of Construction Total)	5.0%	\$2,847,130
Permitting and Legal (% of Construction Total)	10.0%	\$5,694,259
Startup and Shakedown (% of Construction Total)	10.0%	\$5,694,259
Bonding and Insurance (% of Construction Total)	3.0%	\$1,708,278
Construction Oversight (% of Construction Total)	5.0%	\$2,847,130
Field and Laboratory Testing (% of Construction Total)	5.0%	\$2,847,130
Reporting (% of Construction Total)	10.0%	\$5,694,259
Escalation (% of Construction Total, Based on Mid 1998 Start)	15.0%	\$8,541,389
<b>Total Capital Cost</b>		<b>\$92,816,423</b>

<b>OPERATION AND MAINTENANCE</b>				
	Annual O&M Cost	Process Option Service Time (yr)	Present Worth Factor	Process Option Present Worth
<b>Process Option</b>				
Demolition & Clearing	\$0	30.0	15.3725	\$0
Excavation	\$0	30.0	15.3725	\$0
Transportation Alt 20	\$0	30.0	15.3725	\$0
Thermal Destruction/Landfill Disposal	\$0	30.0	15.3725	\$0
Reserved	\$0	30.0	15.3725	\$0
Reserved	\$0	30.0	15.3725	\$0
Cleanup & Improvements	\$0	30.0	15.3725	\$0
Reserved	\$0	30.0	15.3725	\$0
<b>O&amp;M Subtotal</b>		<b>\$0</b>	<b>15.3725</b>	<b>\$0</b>
<b>Other O&amp;M Costs (% Annual O&amp;M Unless Otherwise Specified)</b>		<b>Percentage</b>		
<i>See Global Cost Assumptions For Details on Calculations</i>				
Demolition & Clearing	16%	\$0	30.0	15.3725
Excavation	16%	\$0	30.0	15.3725
Transportation Alt 20	16%	\$0	30.0	15.3725
Thermal Destruction/Landfill Disposal	16%	\$0	30.0	15.3725
Reserved	16%	\$0	30.0	15.3725
Reserved	16%	\$0	30.0	15.3725
Cleanup & Improvements	16%	\$0	30.0	15.3725
Reserved	16%	\$0	30.0	15.3725
<b>Total Operation and Maintenance Costs</b>				<b>\$0</b>

<b>NET PRESENT WORTH</b>	
Capital Costs	\$92,816,423
Operation and Maintenance Present Worth	\$0
<b>Total Alternative Cost</b>	<b>\$92,816,423</b>

**Estimated Cost for FT005, Ecological-Based Alternative 20**

<b>CAPITAL COSTS</b>		
Process Option		Capital Cost
Demolition & Clearing		\$22,623
Excavation		\$2,880
Transportation Alt 20		\$62,400
Thermal Destruction/Landfill Disposal		\$1,440,000
Reserved		\$0
Reserved		\$0
Cleanup & Improvments		\$9,207
Reserved		\$0
<b>Construction Subtotal</b>		<b>\$1,537,110</b>
Bid Contingencies (% of Construction Subtotal)	15.0%	\$230,567
Scope Contingencies (% of Construction Subtotal)	20.0%	\$307,422
<b>Construction Total</b>		<b>\$2,075,099</b>
<b>Other Direct Costs</b>		
Engineering Design (% of Construction Total)	5.0%	\$103,755
Permitting and Legal (% of Construction Total)	10.0%	\$207,510
Startup and Shakedown (% of Construction Total)	10.0%	\$207,510
Bonding and Insurance (% of Construction Total)	3.0%	\$62,253
Construction Oversight (% of Construction Total)	5.0%	\$103,755
Field and Laboratory Testing (% of Construction Total)	5.0%	\$103,755
Reporting (% of Construction Total)	10.0%	\$207,510
Escalation (% of Construction Total, Based on Mid 1998 Start)	15.0%	\$311,265
<b>Total Capital Cost</b>		<b>\$3,382,411</b>

<b>OPERATION AND MAINTENANCE</b>					
Process Option	Annual O&M Cost	Process Option Service Time (Yr)	Present Worth Factor	Process Option Present Worth	
Demolition & Clearing	\$0	30.0	15.3725	\$0	
Excavation	\$0	30.0	15.3725	\$0	
Transportation Alt 20	\$0	30.0	15.3725	\$0	
Thermal Destruction/Landfill Disposal	\$0	30.0	15.3725	\$0	
Reserved	\$0	30.0	15.3725	\$0	
Reserved	\$0	30.0	15.3725	\$0	
Cleanup & Improvments	\$0	30.0	15.3725	\$0	
Reserved	\$0	30.0	15.3725	\$0	
<b>O&amp;M Subtotal</b>	<b>\$0</b>			<b>\$0</b>	
Misc. O&M Costs (% Annual O&M Unless Otherwise Specified)	Percentage				
<i>See Global Cost Assumptions For Details on Calculations</i>					
Demolition & Clearing	16%	\$0	30.0	15.3725	\$0
Excavation	16%	\$0	30.0	15.3725	\$0
Transportation Alt 20	16%	\$0	30.0	15.3725	\$0
Thermal Destruction/Landfill Disposal	16%	\$0	30.0	15.3725	\$0
Reserved	16%	\$0	30.0	15.3725	\$0
Reserved	16%	\$0	30.0	15.3725	\$0
Cleanup & Improvments	16%	\$0	30.0	15.3725	\$0
Reserved	16%	\$0	30.0	15.3725	\$0
<b>Total Operation and Maintenance Costs</b>				<b>\$0</b>	

<b>NET PRESENT WORTH</b>	
Capital Costs	\$3,382,411
Operation and Maintenance Present Worth	\$0
<b>Total Alternative Cost</b>	<b>\$3,382,411</b>

**Cost Estimate Summary Sheet**

**NEWIOU Feasibility Study, Travis AFB**

**Process Option Summary for FT005**

**Assumptions:**

- 1 Use RACER/ENVEST cost estimating model, Version 3.1 when practical
- 2 Compute monitoring and O&M for one year only; add costs for subsequent years using Alternative Cost Summary Sheets.
- 3 Soil disposal costs do not include transportation from TAFB or treatment facility to landfill
- 4 Capping costs include vents, etc.
- 5 Thermal treatment cost is \$600/ton and includes subsequent disposal
- 6 Class I disposal cost of \$245/ton, Class II disposal cost of \$32.50/ton

**Cost Summary:**

Item	Health-Based		Ecological-Based	
	Capital Cost	O&M Cost	Capital Cost	O&M Cost
Demolition & Clearing	\$22,623	\$0	\$22,623	\$0
Demolition, Curbs	\$0	\$0	\$0	\$0
Demolition, Pavements	\$0	\$0	\$0	\$0
Clear and Grub	\$22,623	\$0	\$22,623	\$0
Capping	\$1,452,000	\$0	\$155,520	\$0
Excavation	\$80,667	\$0	\$2,880	\$0
Transportation Alt 18	\$915,200	\$0	\$40,300	\$0
Transportation Alt 20	\$1,747,200	\$0	\$62,400	\$0
Thermal Destruction/Landfill Disposal	\$40,320,000	\$0	\$1,440,000	\$0
Landfill Disposal	\$2,184,722	\$0	\$78,000	\$0
Class I Landfill	\$0	\$0	\$0	\$0
Class II Landfill	\$2,184,722	\$0	\$78,000	\$0
Cleanup & Improvments	\$9,207	\$0	\$9,207	\$0
Cleanup and Landscaping	\$9,207	\$0	\$9,207	\$0
Improvments & Utilities	\$0	\$0	\$0	\$0
Soil Vapor Monitoring	\$0	\$2,898	\$0	\$2,898
Monitoring	\$0	\$5,724	\$0	\$2,532
Fencing	\$17,586	\$0	\$0	\$0
Reserved	\$0	\$0	\$0	\$0