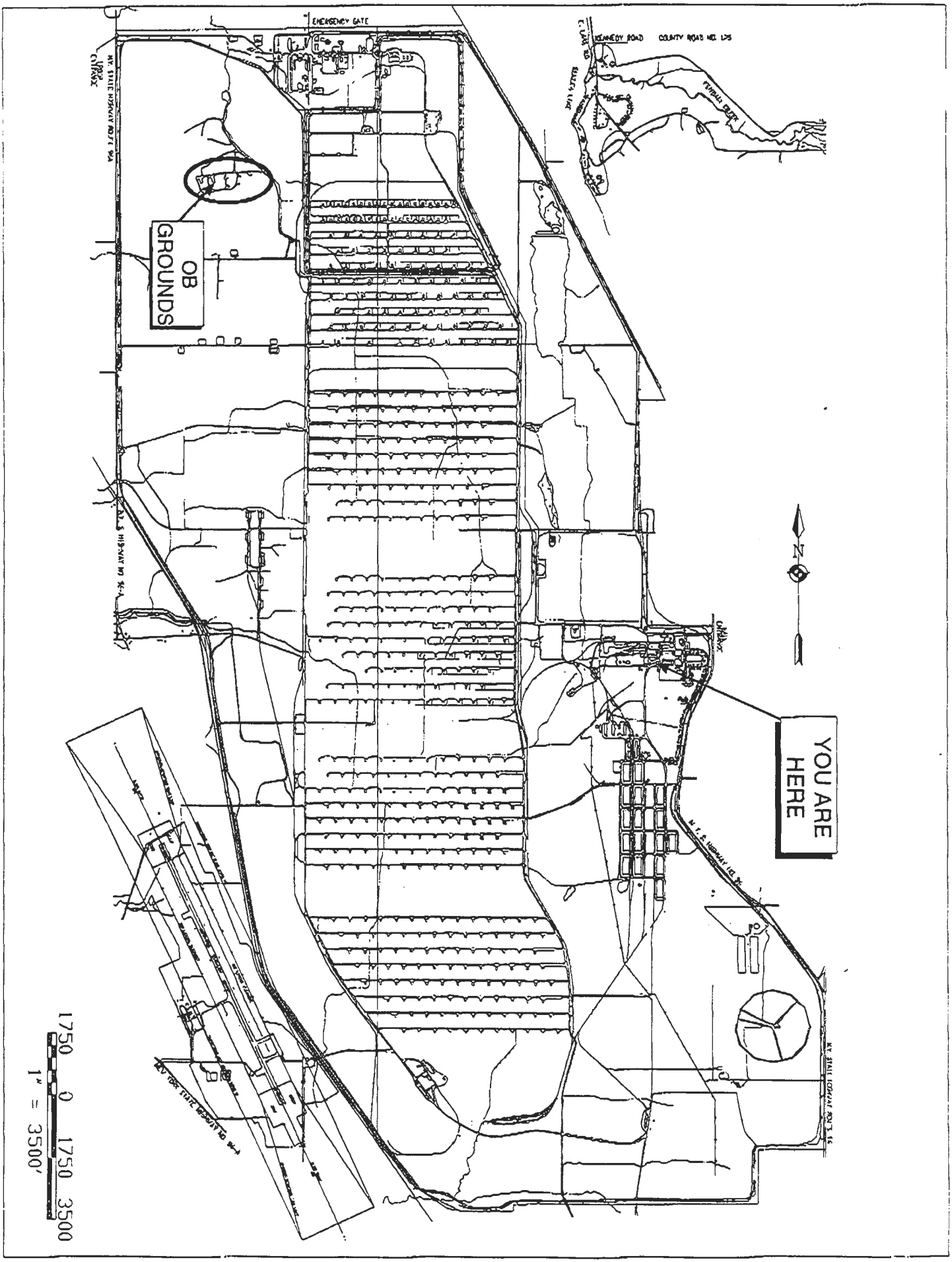
104-48

Open Burning Grounds
Peer Review Presentation

Presented by
Stephen M. Absolom

Site Background

Open Burning Grounds


EMERGENCY GATE
KENNEDY ROAD
COUNTY ROAD NO. 125
OB GROUNDS
YOU ARE HERE
N
1750 0 1750 3500
1" = 3500'

Site Background
Open Burning Grounds

- Operated as Munitions Destruction Area, under Interim Status provisions of RCRA
- Munitions were burned on 9 pads
- Preliminary investigations identified burning residues in mid-1980's
- From 1987, burning was performed in 40 ft. aboveground steel tray
- Identified as a SWMU, SEAD-23
- One of the first RIs performed under CERCLA

Project Schedule

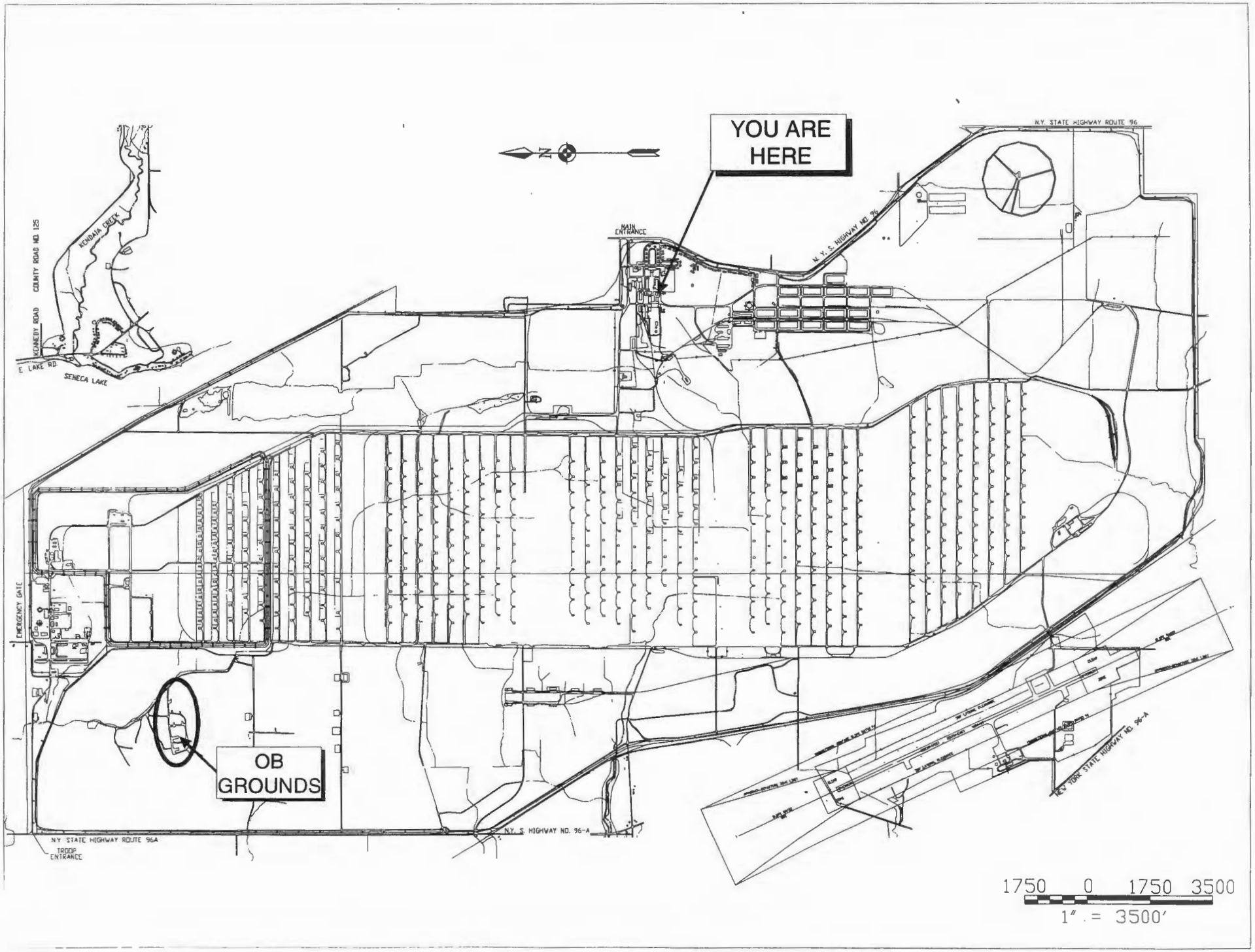
Open Burning Grounds

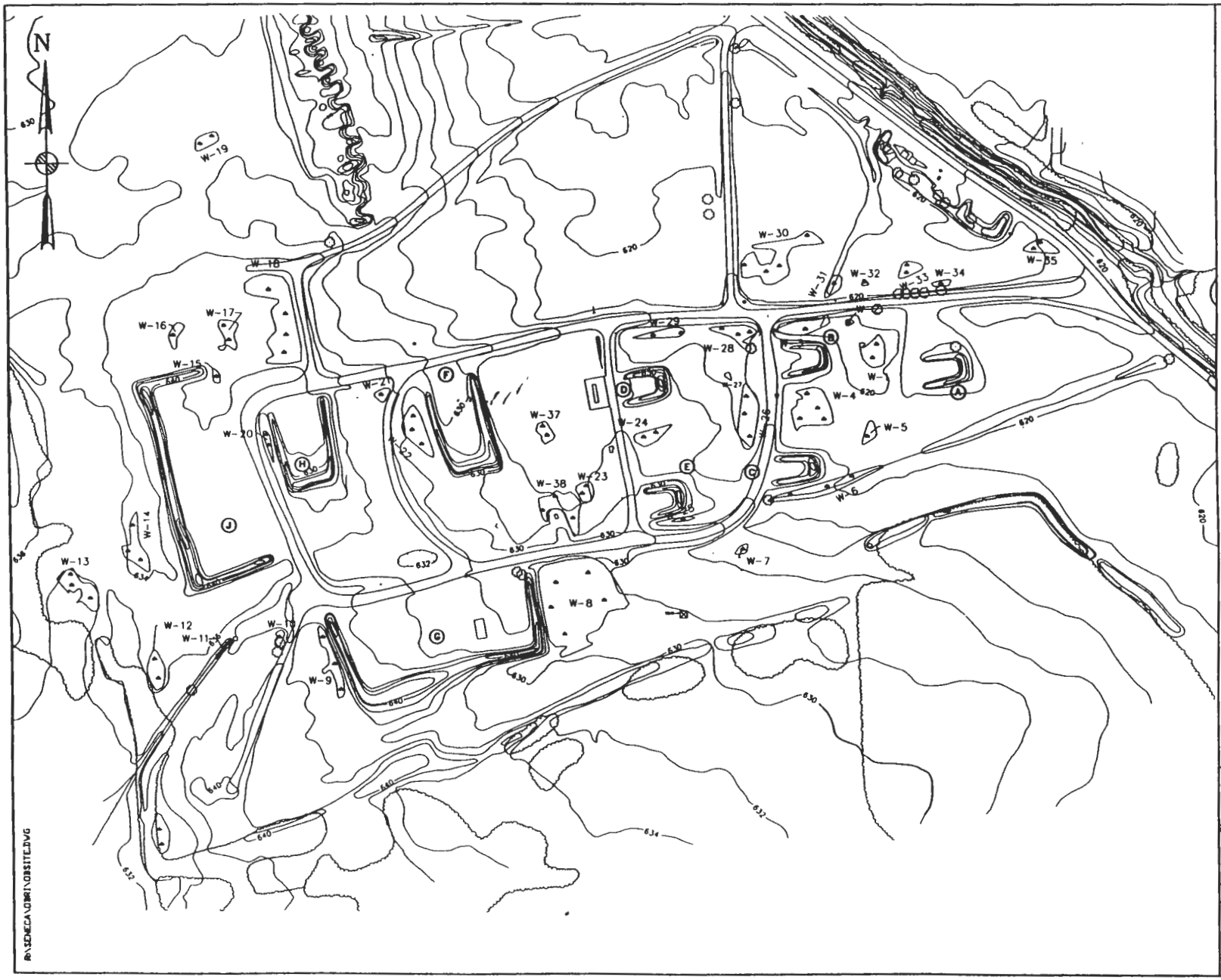
Project Schedule
Open Burning Grounds

• RI complete	Sep 1994
• FS complete	Dec 1996
• Proposed Remedial Action Plan	Jan 1997
• ROD (Draft)	Apr 1997
• Remedial Design (start)	Sep 1997
• Remedial Action (start)	Mar 1997

Site Characterization

Open Burning Grounds


YOU ARE HERE
N
N.Y. STATE HIGHWAY ROUTE 96
MAIN ENTRANCE
N. Y. S. HIGHWAY NO. 96
KENDAIA CREEK
COUNTY ROAD NO. 125
KENNEDY ROAD
E. LAKE RD.
SENECA LAKE
EMERGENCY GATE
OB GROUNDS
NY STATE HIGHWAY ROUTE 96A
TROOP ENTRANCE
N.Y. S. HIGHWAY NO. 96-A
NEW YORK STATE HIGHWAY NO. 96-A
1750 0 1750 3500
1" = 3500'


N
W-19
W-18
W-16
W-17
W-15
W-20
W-21
W-37
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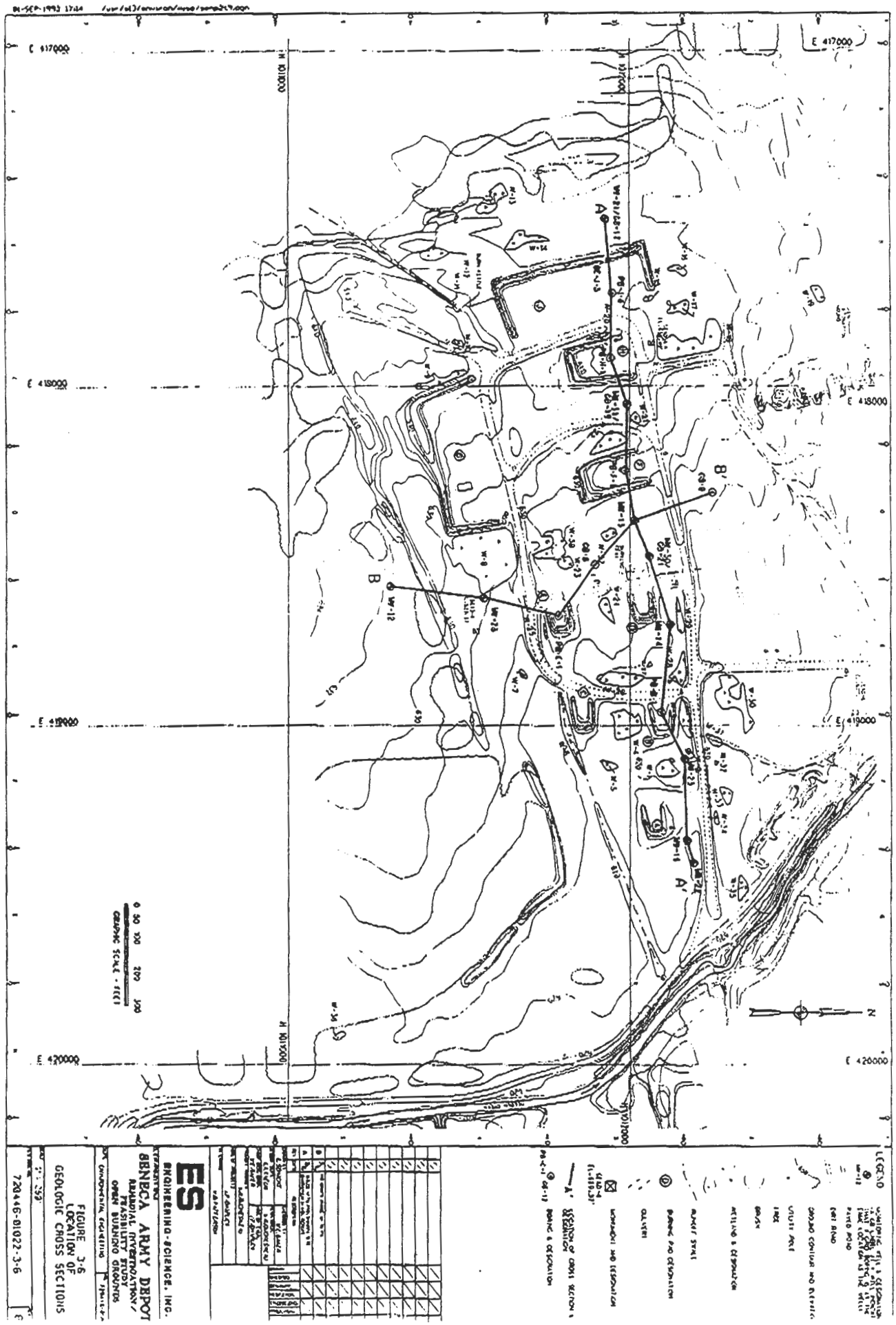
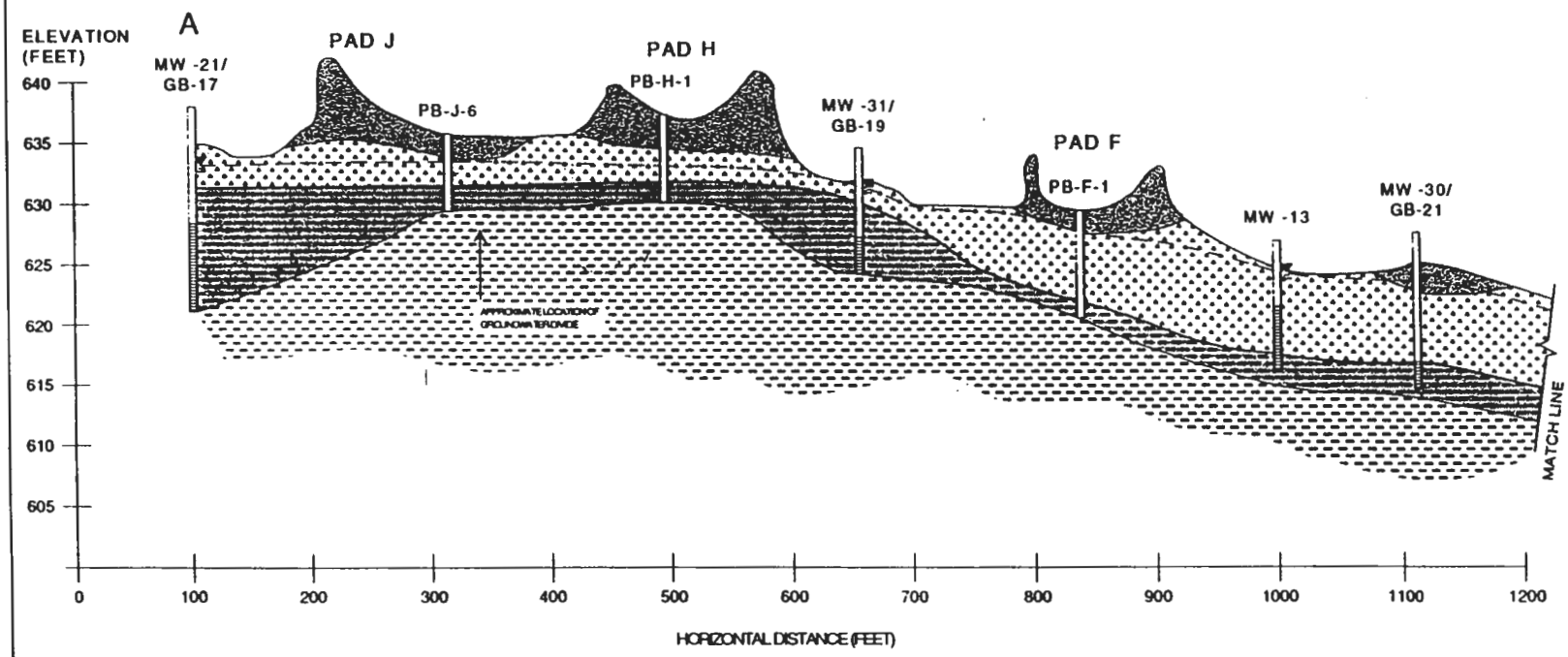
W-36
W-4
W-5
W-6
W-7
W-8
W-9
W-10
W-11
W-12
W-13
W-14
620
630
632
640
634
LEGEND
BURNING PAD DESIGNATION
PAD OR GRID BORING
GROUND CONTOUR AND ELEVATION
W-1
WETLAND & DESIGNATION
UTILITY POLE
TREE
BRUSH
PARSONS
PARSONS ENGINEERING SCIENCE, INC.
CLIENT/PROJECT TITLE
SENECA ARMY DEPOT ACTIVITY
RECORD OF DECISION
OPEN BURNING GROUNDS
DEPT
ENVIRONMENTAL ENGINEERING
Drg No.
720468-01005
FIGURE 2-3
SITE PLAN
SCALE
1" = 200'
DATE
FEBRUARY 1997
REV
A
R:\SENECA\DWG\OBSITE.DWG


E 417000
E 418000
E 419000
E 420000
N 101000
N 100500
A
A'
B
B'
N
0 50 100 200 300
GRAPHIC SCALE - FEET
LEGEND
ES
ENGINEERING-SCIENCE, INC.
SENECA ARMY DEPOT
REMEDIAL INVESTIGATION/
FEASIBILITY STUDY
OTHER BURIAL GROUNDS
FIGURE 3-6
LOCATION OF
GEOLOGIC CROSS SECTIONS
720446-B1022-3-6

CROSS SECTION A - A'



LEGEND:

- FILL
- TILL
- WEATHERED SHALE
- COMPETENT SHALE
- GROUNDWATER TABLE

NOTES:

1. Lithologic units are based on descriptions supplied by Engineering-Science, Inc. Interpretations are based on extrapolations between widely spaced boreholes, actual conditions may vary.
2. Groundwater table based on depth to water measurements made in January 1992.

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SENECA ARMY DEPOT ACTIVITY
RECORD OF DECISION
OPEN BURNING GROUNDS

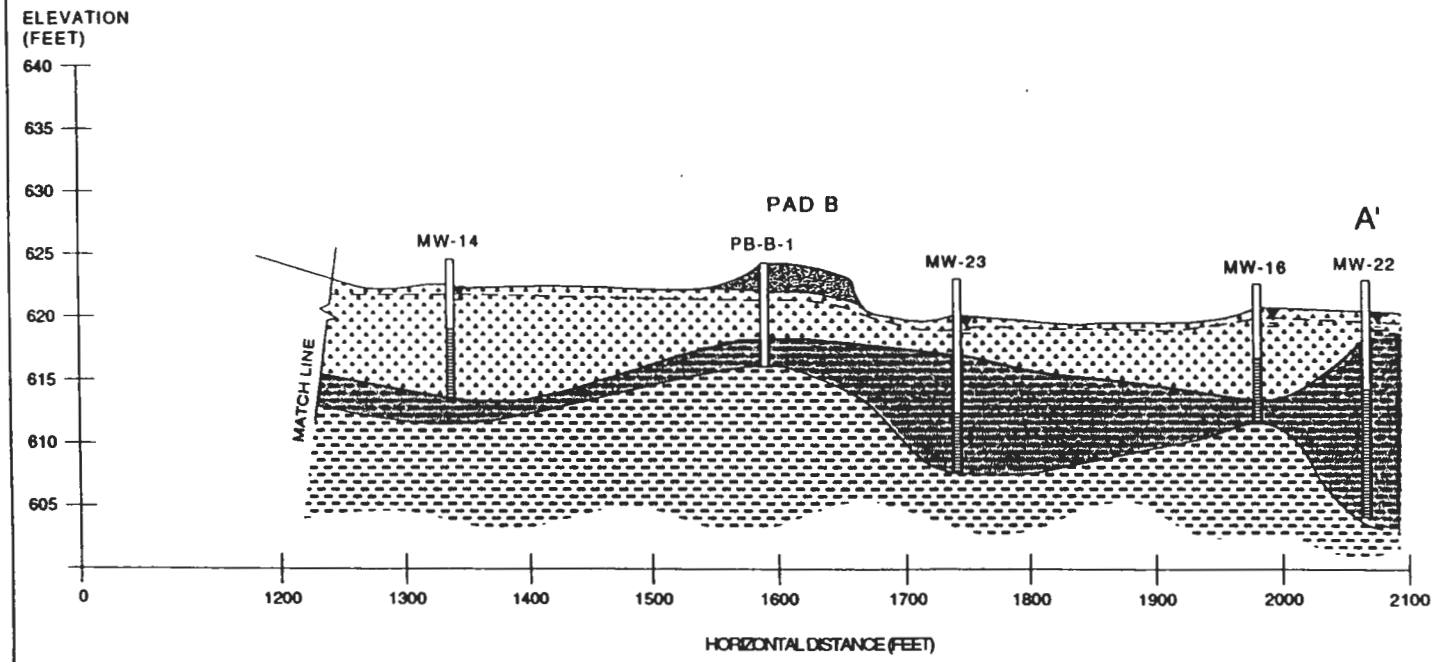
ENVIRONMENTAL ENGINEERING

FIGURE 2-4

GEOLOGIC CROSS-SECTION A-A'

FEBRUARY 1997

CROSS SECTION A - A' (continued)



LEGEND:

- FILL
- TILL
- WEATHERED SHALE
- COMPETENT SHALE
- — ▽ — GROUNDWATER TABLE

NOTES:

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2. Groundwater table based on depth to water measurements made in January 1992.

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SENECA ARMY DEPOT ACTIVITY
RECORD OF DECISION
OPEN BURNING GROUNDS

DWN: ENVIRONMENTAL ENGINEERING | DWG NO: 720446-01026

FIGURE 2-4

GEOLOGIC CROSS-SECTION A-A'

SCALE: AS SHOWN | DATE: FEBRUARY 1997


N
APPROXIMATE GROUNDWATER DIVIDE
LEGEND:
BURNING PAD DESIGNATION
PAD OR GRID BORING
GROUND CONTOUR AND ELEVATION
W-1
WETLAND & DESIGNATION
616.82
MONITORING WELL & DESIGNATION AND MSL ELEVATION DATUM
UTILITY POLE
TREE
BRUSH
744
GROUNDWATER ELEVATION CONTOUR MSL DATUM
GENERAL GROUNDWATER FLOW DIRECTION
125' 0 125' 250'
1" = 250'
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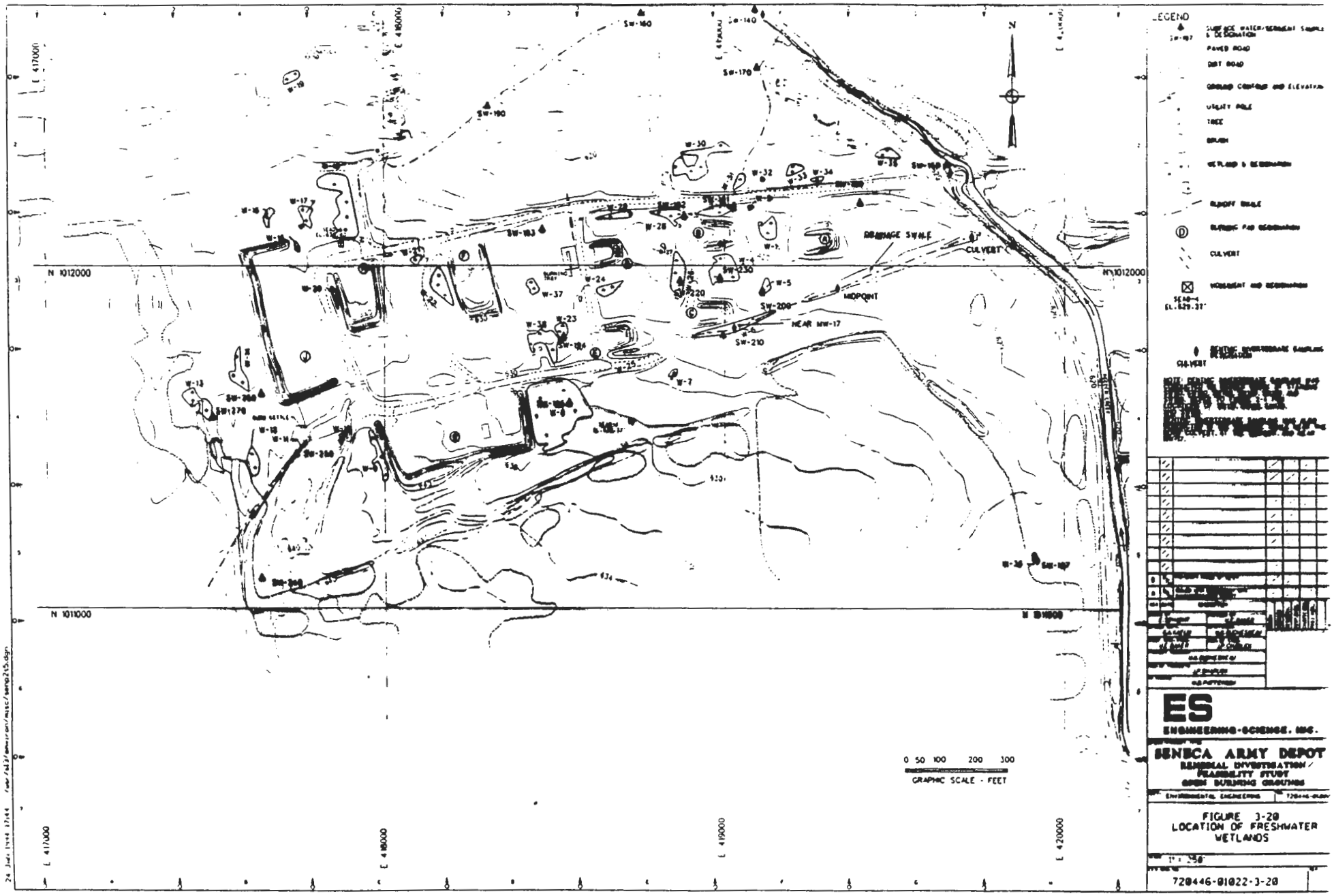
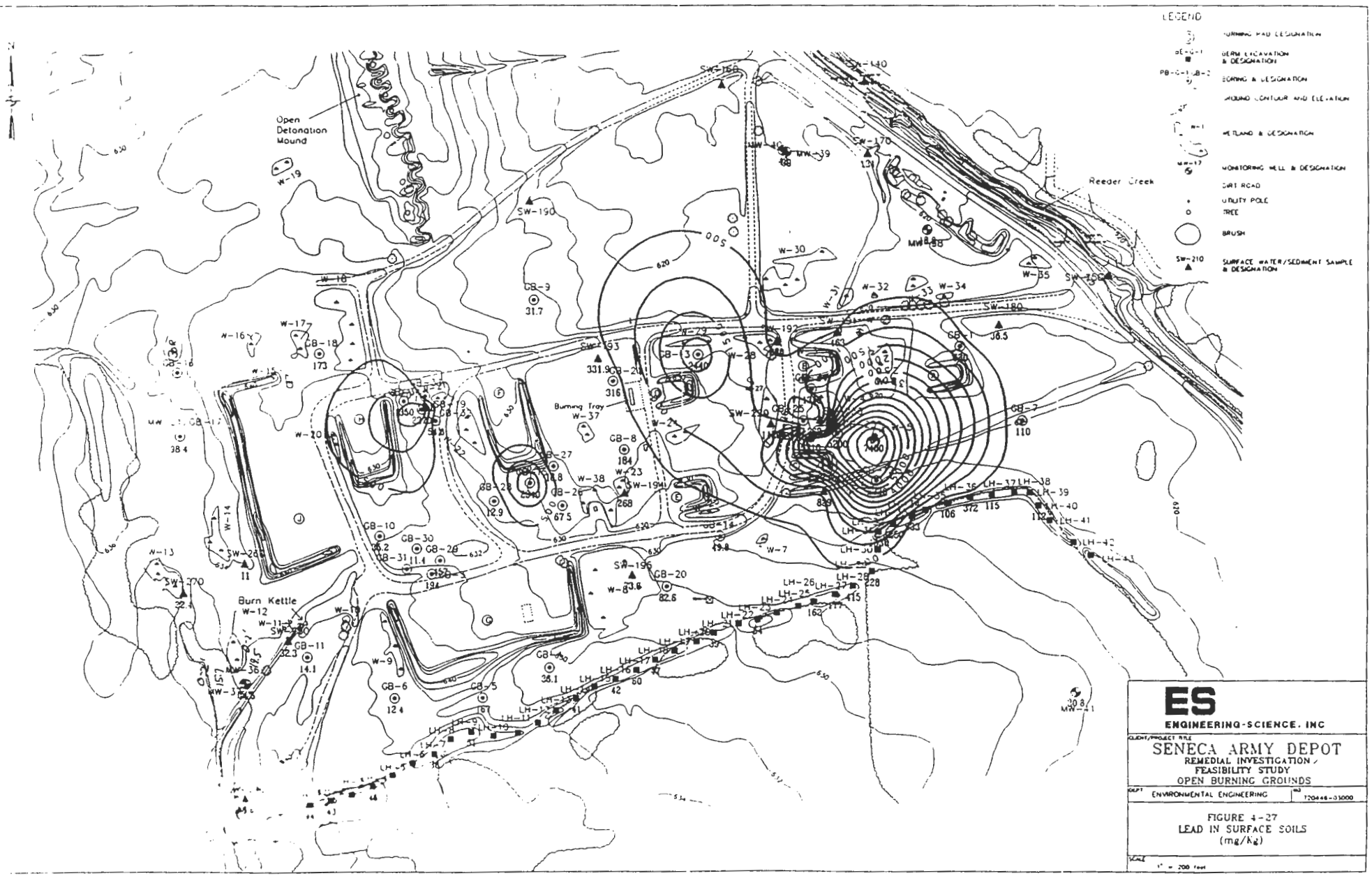
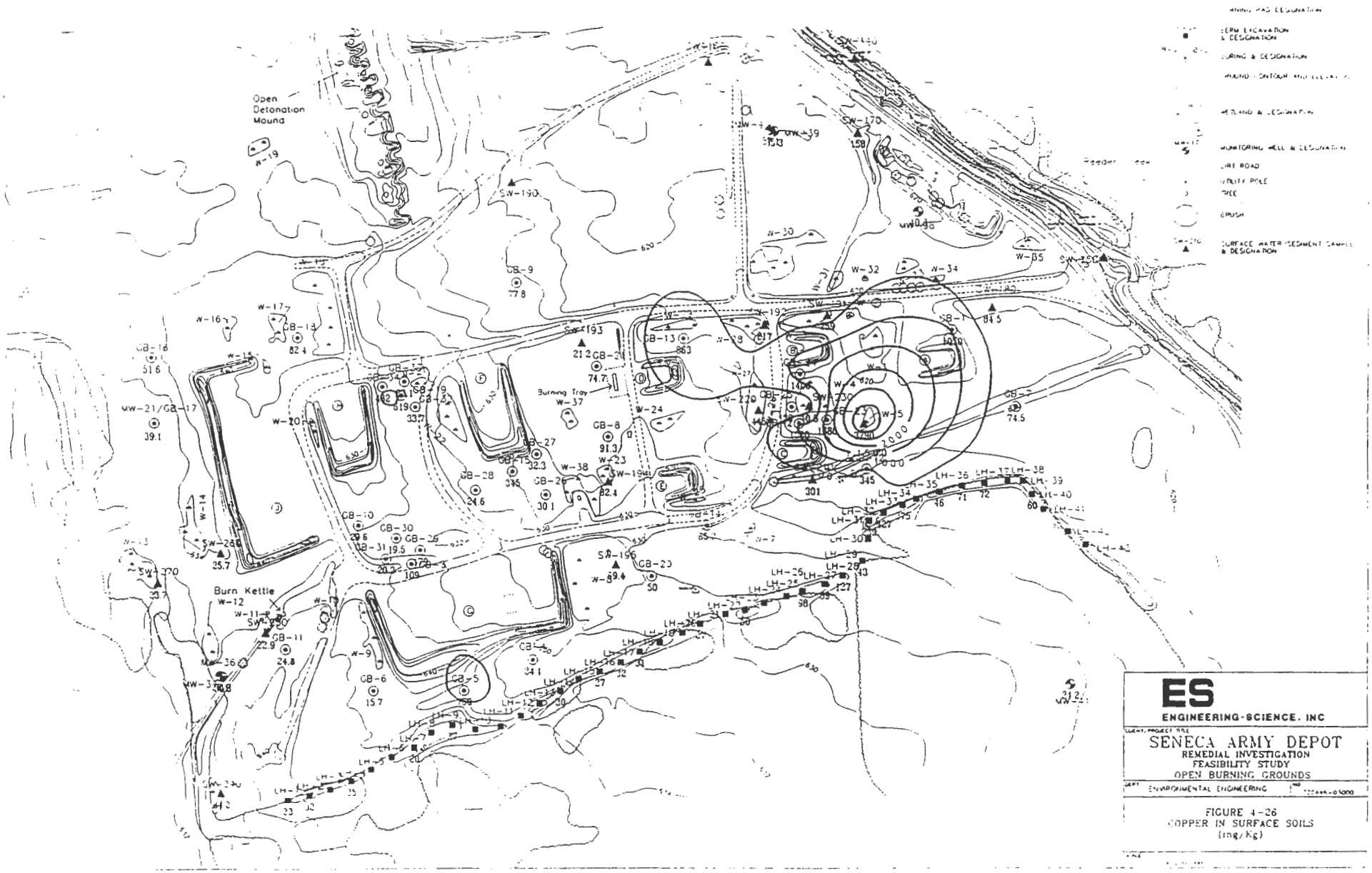
RECORD OF DECISION
OPEN BURNING GROUNDS
DEPT
ENVIRONMENTAL ENGINEERING
DWG No.
720446-01036
FIGURE 2-5 GROUNDWATER ELEVATIONS, TILL/WEATHERED SHALE AQUIFER APRIL 1993
SCALE
1" = 250'
DATE
FEBRUARY 1997
REV
R:\SENECA\OBR1\OBSITE.DVG


LEGEND
SURFACE WATER/SEDIMENT SAMPLE & DESIGNATION
PAVED ROAD
DIRT ROAD
GROUND CONTOUR AND ELEVATION
UTILITY POLE
TREE
BRUSH
WETLAND & DESIGNATION
RUNOFF SWALE
SURFACE PAD DESIGNATION
CULVERT
SEDIMENT AND DESIGNATION
SEAD-4 EL. 629.31'
GROUNDWATER SAMPLING DESIGNATION
DRAINAGE SWALE
CULVERT
MIDPOINT
NEAR MW-17
N 1012000
N 1011000
E 417000
E 418000
E 419000
E 420000
0 50 100 200 300
GRAPHIC SCALE - FEET
ES
ENGINEERING-SCIENCE, INC.
SENECA ARMY DEPOT
REMEDIAL INVESTIGATION/
FEASIBILITY STUDY
OPEN BURNING GROUNDS
ENVIRONMENTAL ENGINEERING
FIGURE 3-20
LOCATION OF FRESHWATER
WETLANDS
720446-01022-3-20

Summary Statistics of Soil Data
Open Burning Grounds

COMPOUND	MAXIMUM (mg/Kg)	95th UCL OF THE MEAN (mg/Kg)	NYSDEC SOIL CLEANUP CRITERIA (mg/Kg)
Semivolatiles			
Benzo(a)anthracene	3.9	0.35	0.220
Benzo(a)pyrene	3.7	0.35	0.061
Dibenz(a,h)anthracene	0.7	0.30	0.014
Explosives			
RDX	4.8	0.09	NA
1,3,5-Trinitrobenzene	7.8	0.11	NA
Tetryl	1.0	0.15	NA
2,4,5-Trinitrotoluene	80	0.13	NA
4-amino-2,6-Dinitrotoluene	8.9	0.13	NA
2-amino-4,6-Dinitrotoluene	11	0.14	NA
Metals			
Barium	34,400	1445.67	300
Copper	38,100	678.04	25
Lead	56,700	2836.27	30
Zinc	127,000	884.31	89.1


LEGEND
BURNING PAD DESIGNATION
BERM EXCAVATION & DESIGNATION
BORING & DESIGNATION
GROUND CONTOUR AND ELEVATION
WETLAND & DESIGNATION
MONITORING WELL & DESIGNATION
DIRT ROAD
UTILITY POLE
TREE
BRUSH
SURFACE WATER/SEDIMENT SAMPLE & DESIGNATION
Open Detonation Mound
Reeder Creek
Burning Tray W-37
Burn Kettle W-12
ES
ENGINEERING-SCIENCE, INC
SENECA ARMY DEPOT
REMEDIAL INVESTIGATION / FEASIBILITY STUDY
OPEN BURNING GROUNDS
ENVIRONMENTAL ENGINEERING
720446-03000
FIGURE 4-27
LEAD IN SURFACE SOILS
(mg/Kg)
1" = 200 feet



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ENGINEERING-SCIENCE, INC

CLIENT/PROJECT TITLE
SENECA ARMY DEPOT
REMEDIAL INVESTIGATION
FEASIBILITY STUDY
OPEN BURNING GROUNDS

DEPT ENVIRONMENTAL ENGINEERING

FIGURE 4-26
COPPER IN SURFACE SOILS
(mg/Kg)

TABLE

AREAS FOR SOIL REMEDIATION

SENECA ARMY DEPOT
OB GROUNDS

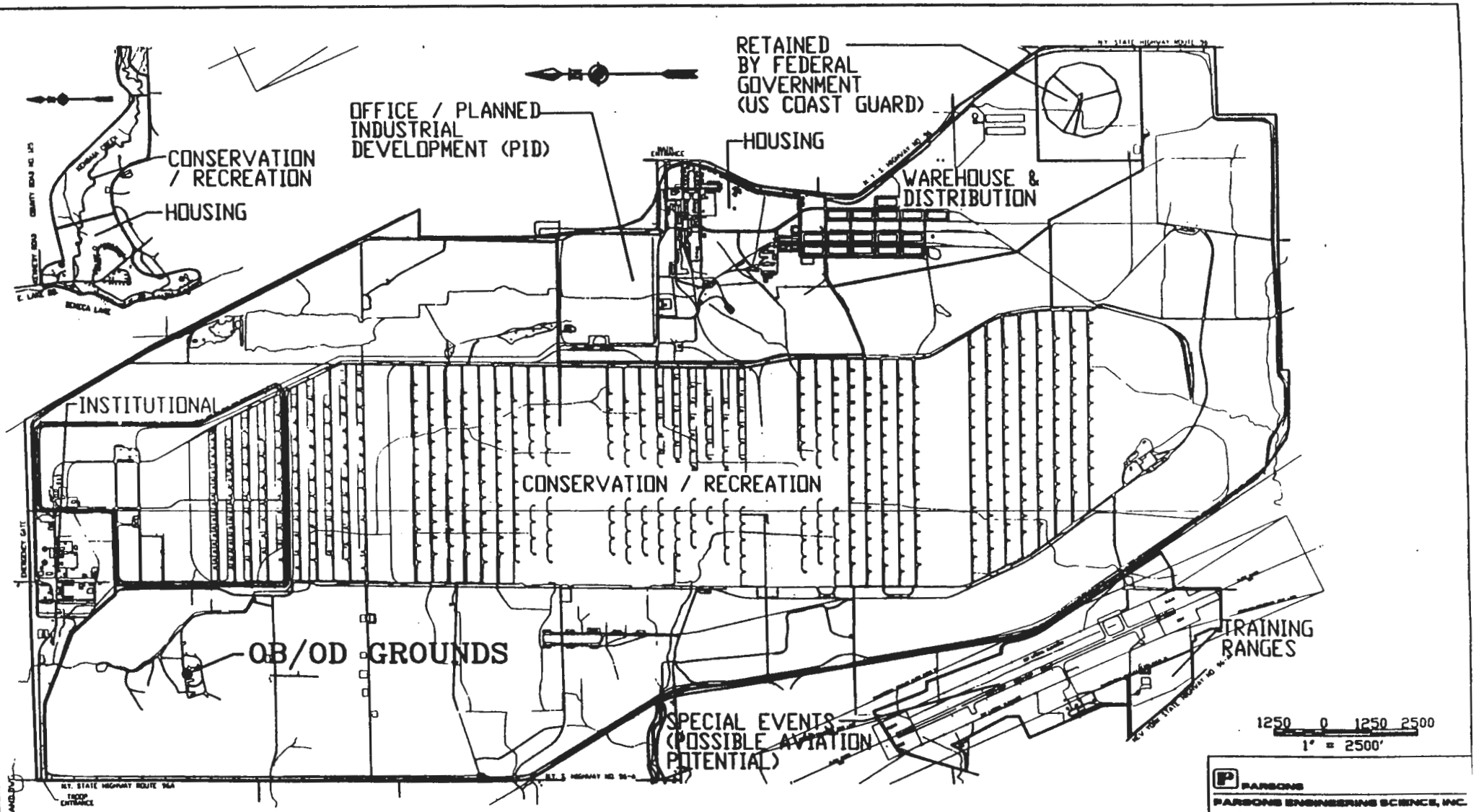
CASE	LOGIC	DESCRIPTION OF AREA TO BE REMEDIATED	TOTAL AREA-ft2	AVERAGE DEPTH-ft	TOTAL VOLUME-yd3	SAMPLING LOCATIONS TO BE EXCAVATED
1	Soils exceeding the TCLP limits	Pad B - Whole berm	1,640	3.3	200	BE-B-1 thru 4
		Pad B - Whole pad from 0 to 2 feet	2,800	2.0	207	PB-B-1
		Pad B - Whole pad from 2 to 9 feet	2,800	7.0	726	
		Pad F - Southeast side of berm	7,000	4.6	1,193	BE-F-1, 2, 5 & 6
		Pad F - Whole pad from 0 to 2 feet	12,000	2.0	889	PB-F-1 thru 6
		Pad H - South side of berm	1,700	7.2	453	BE-H-2 & 3
		Pad H - Half of eastern berm	1,050	2.0	78	BE-H-5
		TOTAL			3,746	
				Cumulative Total	3,746	
2	Reeder Creek sediments with lead and copper concs. above criteria Low hill soils with lead concs. above 500 mg/kg	Reeder Creek sediments North of OD Grounds	7,000	1.0	259	SW-120 ,300 ,310 , & 320
		Reeder Creek sediments near OB Grounds and upstream	7,200	1.0	267	SW-140, 150
		Eastern portion of Low Hill	2,500	4.0	370	LH-31 &32 &33
		TOTAL			896	
				Cumulative Total	4,643	
3	All berms with lead concs. above 500 mg/kg	Pad A - North half of berm	1,280	3.3	156	BE-A-1 & 3
		Pad C - Eastern half of berm	920	3.8	129	BE-C-2,3,6
		Pad D - North section of berm	1,430	4.3	228	BE-D-1 & 3
		Pad G - South side of berm	11,000	5.9	2,404	BE-G-2, 3, 4,5,6,9,10 & 11
		Pad J - Hot spots around BEJ-10 and BEJ-14	1,110	4.6	189	BE-J-10/14
		Pad E-Northern half of berm	3,600	2.0	267	BE-E-1 &BE-E-3
		Pad G - Northwestern tip of berm	800	4.0	119	BE-G-14
		Pad J - Hot spot in Western berm around BE-J-5	600	4.0	89	BE-J-5
		Pad J - Hot spot in Southern berm around BE-J-8	1,500	2.0	111	BE-J-8 *
		Pad J - Hot spot in Northern berm around BE-J-13	1800	2.0	133	BE-J-13 *
		TOTAL			3,825	
				Cumulative Total	8,468	
4	All pads surface soils with lead concs. above 500 mg/kg	Pad A - Whole pad from 0 to 2 feet	2,240	2.0	166	PB-A-1 & 2
		Pad C - Whole pad from 0 to 2 feet	2,100	2.0	156	PB-C-3,4,&5, PB-C-1 &2 *
		Pad G - Hot spot around PBG-7	9,200	2.0	681	PB-G-7, PB-G-6 *, GAE-G-2 *
		Pad J - Hot spot around PB-J-4,5 7	14,350	2.0	1,063	PB-J-4,5 &7
		Pad J - Remainder of pad from 0 to 2 feet	45,650	2.0	3,381	PB-J-1., 2, 3, 6, 8, 9, &10, GAE-J-1 *
		Pad G - Hot spots around PBG-1 & PB-G-4	8,500	2.0	630	PB-G-1 & PB-G-4
		Pad D - Whole pad from 0 to 4 feet	2,000	4.0	296	PB-D-1-3
		Pad G - Around PB-G-1 from 2 to 4 feet	3,500	2.0	259	PB-G-1-3
		Pad H - Around PB-H-2 from 0 to 4 feet	3,200	4.0	474	PB-H-2
		TOTAL			7,107	
				Cumulative Total	15,574	
5	All grid soils with lead concs. above 500 mg/kg	Pad A - Hot spot around GB-1(Northern end of Pad A))	400	2.0	30	GB-1
		Pad B - Hot spot around GB-24 (Southern end of Pad B))	2,400	2.0	178	GB-24
		Pad C - Hot spot around Pad C	21,200	2.0	1,570	GB-2,GB-23,GB-12, SD-200,SD-210,SD-220
		Pad D - Hot spot around GB-13 (NE end of Pad D)	1,600	2.0	119	GB-13
		Pad F - Hot spot around GB-15 (Southern end of Pad F)	2,500	2.0	185	GB-15
		Pad H - Hot spot around Northeastern end of Pad H	3,500	2.0	259	GB-19,GB-34
		TOTAL			2,341	
				Cumulative Total	17,915	

* Included due to high metals content

Reuse Implications

Open Burning Grounds

Open Burning Grounds, Seneca Army Depot



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PARSONS ENGINEERING SCIENCE, INC.

SENECA ARMY DEPOT ACTIVITY

ENVIRONMENTAL ENGINEERING

OB GROUNDS
SITE LOCATION AND
LAND USE

1" = 2500'

FEBRUARY 1997

Risk Assessment

Open Burning Grounds

Human Health Risk Assessment
Exposed Populations

- Current Land Use Scenarios
  - Off-Site Residential
  - On-Site Worker
- Future Land Use Scenario
  - On-Site Residential

SUMMARY OF BASELINE HUMAN HEALTH RISK ASSESSMENT OPEN BURNING GROUNDS

EXPOSURE SCENARIO	TOTAL HAZARD INDEX	TOTAL CANCER RISK
Current on-site industrial workers	0.25	6.3×10^{-6}
Current local off-site residents	0.007	3.9×10^{-7}
Future on-site residents	0.33	1.0×10^{-5}
EPA target value	1.0	$10^{-4} \times 10^{-6}$

Ecological Risk Assessment

- Qualitative
- Quantitative
  - Aquatic Life
  - Small Mammals
  - Vegetation

Ecological Risk Assessment

- Findings from sampling
- Elevated ecological risk
- Run-off accumulation

Technology Selection

Open Burning Grounds

Threshold Criteria Used to Evaluate Each Alternative

- Each Alternative Must:
  - Be Protective of Human Health and the Environment
  - Be In Compliance with All Applicable, Relevant and Appropriate Requirements (ARARs)

Primary Balancing Criteria Used to Select the Optimal Alternative

- Long Term Effectiveness and Permanence
- Reduction of Toxicity, Mobility and Volume through Treatment
- Short Term Effectiveness
- Implementability
- Cost

Modifying Criteria Used to Adjust Final Alternative Selection

- Acceptance with State and Local Community

TABLE 3-2
SCREENING OF ALTERNATIVES

ALT.	TECHNOL. AND PROCESS.	EFFECTIVENESS									IMPLEMENTIBILITY				COST		SCORE
		PROTECTIVENESS				REDUCTIONS			PER-	ARAR	TECH. FEASIB.		ADM. FEASIB.				
		Human Health		Environment													
		short-term	long-term	short-term	long-term	Tox.	Mob	Vol.	MAN-ENCE	COMP-LIANCE	CON-STRUC.	LONG-TERM MONIT.	AGENCY APPROV	AVAIL.	CAPIT.	O&M	
1	No Action Alternative	1	1	1	1	1	1	1	1	1	6	6	1	6	6	6	40
2	Containment Alternative Consolidate/Slurry Wall/Cap	6	2	6	2	2	2	5	4	2	4	1	4	3	5	1	49
3	In-situ Treatment Alternative Solidify soils in-place/soil cover	5	3	5	3	5	5	2	5	3	2	2	5	1	1	3	50
4	Off-site Disposal Alternative Excavation/solidification/ Off-site disposal	2	4	4	4	3	3	3	2	4	5	5	2	5	4	5	55
5	On-site Disposal Alternative Excavation/solidification/ on-site Subtitle D landfill	4	5	2	5	4	4	4	3	5	3	3	3	4	3	2	54
6	Innovative Treatment Alternative Excavation/wash/backfill coarse frac./treat fine frac./either backfill fine fract. or /residual to off-site landfill	3	6	3	6	6	6	6	6	6	1	4	6	2	2	4	67

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Summary of Remedial Alternatives

- **Alternative 1:** No Action
- **Alternative 4:** Excavation and Disposal, Off-site, in Licensed Landfill
- **Alternative 5:** Excavation, Disposal, On-site, in a constructed On-site Landfill
- **Alternative 6:** Excavation, Soil Washing and Backfill

Common Aspects of Each Alternative

- UXO Clearance and Disposal
- Excavation of Soils with Lead above 500 mg/kg
- Excavation of Sediments in Reeder Creek above 31 mg/kg Lead and 16 mg/kg Copper
- Vegetative Cover of Soils above 60 mg/kg
- Groundwater and Sediment Monitoring Program
- Surface Water Runoff Control

Table 10-1

Individual Evaluation of Alternatives
SEDA - OB Grounds

Criteria	Alternative 1 No Action	Alternative 4 Excavation/Solidification Off-site Landfill	Alternative 5 Excavation/Solidification On-site Landfill	Alternative 6 Excavation/Soil Washing
OVERALL PROTECTIVENESS OF HUMAN HEALTH AND THE ENVIRONMENT				
Human Health Protection (EPA target range is 1 x 10E-4 to 1 x 10E-6 for carcinogenic risk and an HI < 1.0 for noncarcinogenic risk)	Risk to future on-site residential exposure 1 x 10E-5 HI = 0.33	Risk to future on-site residential exposure 9 x 10E-6 HI = 0.11	Risk for future on-site residential exposure 9 x 10E-6 HI = 0.11	Risk to future on-site residential exposure 9 x 10E-6 HI = 0.11
Exposure Pathway - Direct Contact and Ingestion of Soils with concentrations >500 mg/kg for lead.	Not protective; Soils with lead concentrations >500 mg/kg remain in-place.	Protective of human health; Soils with lead concentrations >500 mg/kg removed.	Protective of human health; Soils with lead concentrations >500 mg/kg removed.	Protective of human health; Soils with lead conc.. >500 mg/kg removed
Protection of Ecological Receptors	Does not protect receptors in Reeder Creek; Sediments > NYSDEC Sediment Criteria Remain.	Protects ecological receptors; Sediments > NYSDEC Criteria removed from Reeder Creek.	Protects ecological receptors; Sediments > NYSDEC Criteria removed from Reeder Creek.	Protects ecological receptors; Sediments > NYSDEC Criteria removed from Reeder Creek.
COMPLIANCE WITH ARARs	Does not comply with NYSDEC Class GA standard for lead.	Does not comply with NYSDEC Class GA standard for lead.	Does not comply with NYSDEC Class GA standard for lead.	Does not comply with NYSDEC Class GA standard for lead.
LONG-TERM EFFECTIVENESS AND PERMANENCE				
Magnitude of Residual Risk	Sources have not been removed. Potential threat will remain.	No residual risk will exist as no impacted soils will remain on-site.	No residual risk will exist , providing landfill does not leak.	Treatment residuals consisting of coarse fraction will remain on-site but will be tested to assure that no unacceptable levels of lead remain.
Permanence	Not a permanent solution.	Once soils removed from site, remedial action considered permanent.	Once soils are placed in the on-site landfill, the remedial action would be permanent, providing no releases occur.	Upon completion this action will be considered permanent.

Table 10-1

Individual Evaluation of Alternatives
SEDA - OB Grounds

Criteria	Alternative 1 No Action	Alternative 4 Excavation/Solidification Off-site Landfill	Alternative 5 Excavation/Solidification On-site Landfill	Alternative 6 Excavation/Soil Washing
REDUCTION OF TOXICITY, MOBILITY, OR VOLUME THROUGH TREATMENT				
Reduction of Toxicity, Mobility, or Volume	Little to none; Some attenuation is expected due to natural mechanisms.	Toxicity and mobility reduced through treatment and landfilling. Treated soil will have larger volume than untreated soil, but treated soil will not be a hazardous waste.	Very effective in reducing mobility and toxicity of constituents. Treated soil will have larger volume than untreated soil, but treated soil will not be haz. waste.	Very effective in reducing volume, toxicity, and mobility. Solidification reduces toxicity and mobility. Soil washing reduces the volume.
SHORT-TERM EFFECTIVENESS				
Community Protection	Most protective under current conditions; i.e., least short-term effects.	Least protective due to increase in dust and potential for vehicular accidents due to transportation of waste materials to an off-site landfill.	Most protective of remedial actions as no transportation of waste materials off-site will occur. Some dust will be produced during filling and construction of landfill.	Moderately protective as some transportation of waste materials off-site will occur. Hazardous materials (acids) may be transported on-site for extraction.
Worker Protection	Not applicable.	Least protective due to increase in dust and potential for vehicular accidents due to transportation of waste materials to an off-site landfill. Protection required from exposure.	Most protective of remedial actions as no transportation of waste materials off-site will occur. Some dust will be produced during filling and construction of landfill. Protection required from exposure.	Moderately protective ; Excavation and off-site transportation of waste materials increase potential for worker exposure and risk. Use of hazardous materials will also increase potential for worker exposure.
Environmental Impacts	Not applicable.	Excavation will increase potential for runoff to Reeder Creek.	Excavation will increase potential for runoff to Reeder Creek.	Least protective due to increased potential for spills during washing.
Time Until Action is Complete	Not applicable	Treatability studies: 2 to 3 months Remedial action: 1 to 3 months Quickest to attain remedial goals.	Permitting an on-site landfill will require substantial time. Once permitting is approved : Treatability studies: 2-3 months Remedial action: 2 to 3 months	Mob. & Prove-out: 1 to 2 months Soil Washing: 1 to 3 months Backfilling & Demob.: 1month. Moderate time required to attain goals, due to soil washing process rate.

Table 10-1

Individual Evaluation of Alternatives
SEDA - OB Grounds

Criteria	Alternative 1 No Action	Alternative 4 Excavation/Solidification Off-site Landfill	Alternative 5 Excavation/Solidification On-site Landfill	Alternative 6 Excavation/Soil Washing
IMPLEMENTABILITY				
Technical Feasibility	No obstacles.	Most feasible, standard excavation equipment required. Solidification is routinely applied technology.	Moderately feasible, due to the potential technical issues associated with landfill siting.	Soil washing is feasible but least feasible of the three remedial actions as this technology is considered the most innovative and least proven for OB site conditions.
Ease of Doing More Action if Needed	Least interference as nothing is to be done.	Least interference of remedial actions as no permanent structure left on-site	Most interference as on-site landfill will hamper any future actions.	Moderate level of interference as some equipment slabs and roadways may interfere with future actions.
Ability to Obtain Approvals and Coordinates with Other Agencies	No approval necessary	Landfill space is abundant in the region. Permitting will not be req. providing the waste meets the requirements of the landfill. Standard bill of lading required to transport waste materials to facility. Most likely to be approved.	NYSDEC permit req'd for Subtitle D landfill construction. Permitting may take 6 months to a year, or more. Least likely to be approved.	Moderately likely to be approved as this alternative will involve the construction of a waste treatment facility.
Availability of Services and Materials	No services or capacities required	Most available, Subtitle D landfills located nearby. Treatability studies will be req'd for stabilization process.	Moderately available, requires specialized materials and installation contractors.	Least available, as technology is available from small, specialized group of soil washing contractors.
COST				
Capital Cost	$0	$3.6 to $5.2 Million *	$5.2 Million	$10.6 Million
Annual O&M Cost	$0	$45,300	$49,100	$45,300
30 Year Present Worth Cost	$0	$4.1 to $5.7 Million *	$5.7 Million	$11.1 Million

* These costs include the $1.19 million dollar estimate for the additional 28.8 acres of 9" cover.

Preferred Remedial Alternative

- Solidification of soils with TCLP exceedances
- Excavation and off-site disposal of soils and sediment
- Vegetative soil cover for remaining soils
- Construction Time:
  - Treatability Testing for Solidification: 3 months
  - Remedial Action: 12 to 18 months
- Present worth cost: $4.1 to $5.7 million

Cost

Open Burning Grounds

COST ESTIMATES FOR ALTERNATIVES

Alternative	Total Present Worth Cost ($ Millions)	Capital Cost ($ Millions)	Present Worth O&M Costs ($ Millions)
4 Off-site Disposal	$4.1 to $5.7	$3.6 to $5.2	$0.503
5 On-site Disposal	$5.7	$5.2	$0.544
6 Soil Washing	$11.1	$10.6	$0.503

Cost Estimate Remediation

• Total cost programmed	**$6.0 million**
• Total cost estimated:	**$5.8 million**
• UXO clearance	$ 175K
• Excavation/solidification	606K
• Landfill cost	1,851K
• Earth cover	1,059K
• Misc: Mobilization/Engineering	554K
• Contingency	849K
• S&A (10%)	509K
• Inflation: FY98 (0.03)	168K
• Total	$ 5,800K

Open Burning Grounds, Seneca Army Depot

Cost Estimate
Operations & Maintenance

- Cost: $45,266 per year
  - Sample 8 monitoring wells
  - Sample Reeder Creek

Initiatives to Reduce Cost

- RCRA Closure
- Generic RI/FS Workplan

Summary

Open Burning Grounds

Alternative 4 : Off-Site Disposal

- All Soils & Sediments Disposed of in Off-site Landfill
- Excavate and Solidify Soils Above TCLP Limits
- Long Term Effectiveness and Permanence
  - » Effective & Permanent , ranked lower than Soil Washing
- Reduction of Toxicity, Mobility and Volume
  - » Reduction achieved, ranked lower than Soil Washing
- Most Short Term Impacts due traffic, dust & noise
- Ranked Highest for Implementability
  - » Excavation and disposal is proved and readily available
- Most Cost Effective Alternative

Summary

- Ecological Risk
- Regulator Agreement
- RCRA Closure