NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
DIVISION OF ENVIRONMENTAL REMEDIATION

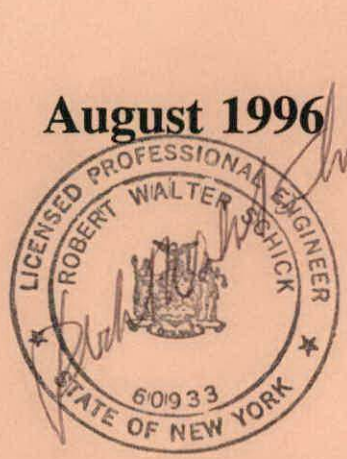
FEASIBILITY STUDY REPORT

for the

SARATOGA TREE NURSERY
Inactive Hazardous Waste Disposal Site

Site No. 5-46-043
Saratoga Springs,
Saratoga County, NY

August 1996



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1.0 INTRODUCTION

1.1 General

This Feasibility Study (FS) Report has been developed for the Saratoga Tree Nursery site, a Class 2 inactive hazardous waste site located in the City of Saratoga Springs, Saratoga County. The study was performed by New York State Department of Environmental Conservation's (NYSDEC) Division of Hazardous Waste Remediation.

1.2 Project Goals and Objectives

The goal of the FS for this site is the identification and analysis of remedial alternatives for the site, which are consistent with the objectives of the Comprehension Environmental Response, Compensation and Liability Act (CERCLA) Section 121 and 6NYCRR Part 375. The primary objective is the selection of remedial alternatives which are protective of human health and the environment. The remedial technologies are selected based on the nature and extent of the site contamination as described in the site Remedial Investigation (RI) Report, prepared by the NYSDEC (April 1996).

Based on the above discussion, the Remedial Action Objectives (RAOs) for this site are as follows:

- Reduce, control, or eliminate to the extent practicable the contamination present within the soils/waste present at the site.
- Eliminate the threat to surface waters by eliminating any future contaminated surface run-off from the contaminated soils on site.
- Eliminate the potential for direct human or animal contact with the contaminated soils on site.
- Prevent, to the extent possible, continued migration of contaminants to groundwater and prevent contamination of downgradient water supply wells.
- Prevent migration of contaminants to off-site residential properties by wind or surface water erosion.
- Provide for attainment of SCGs for groundwater quality to the extent practicable.

The selected remedy shall achieve cleanup standards for the contaminants of concern identified in site soils and sediments at this site, as defined in Section 2.

1.3 Site Description

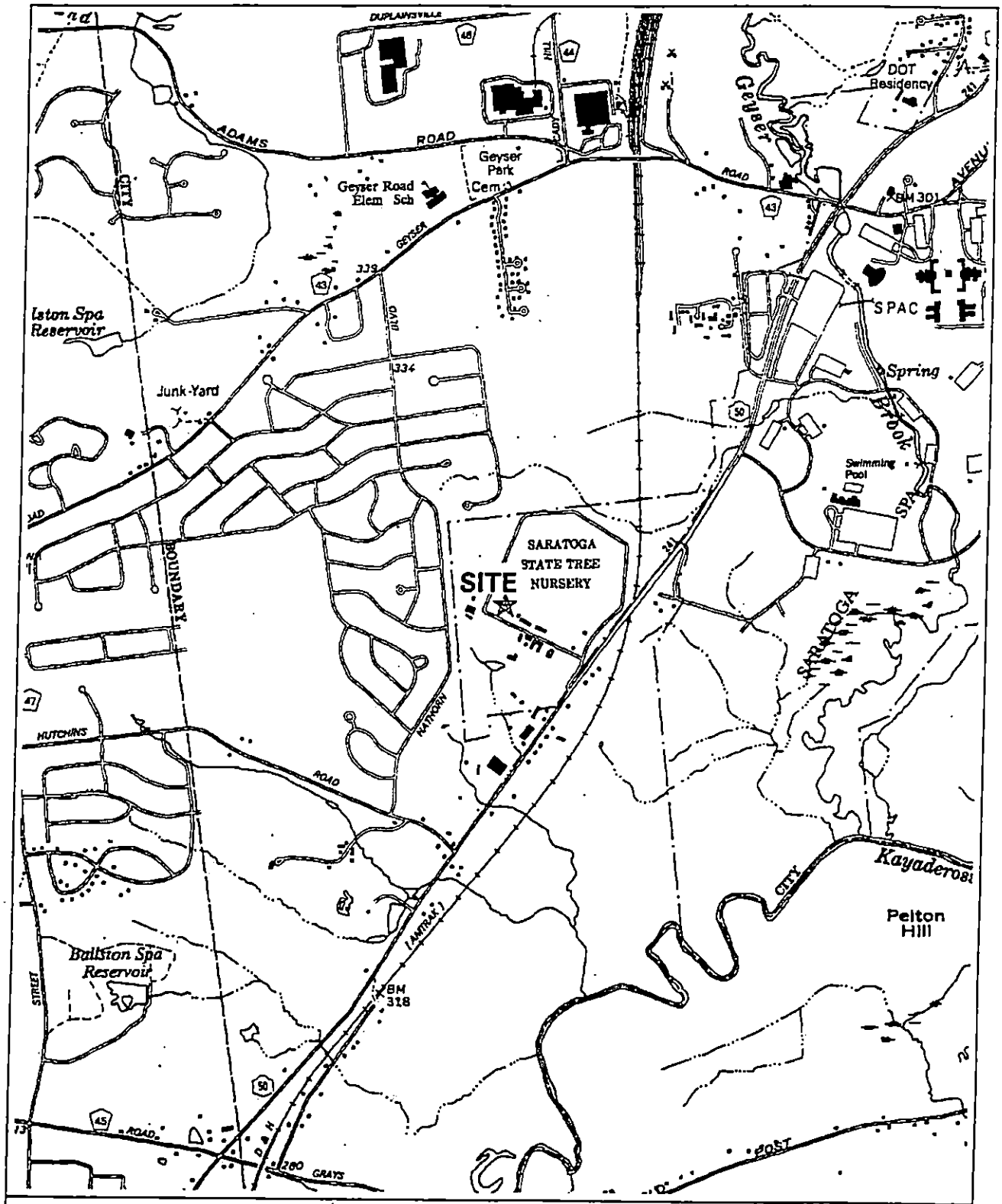
The Saratoga Tree Nursery, Site ID No. 5-46-043, is located at 431 Route 50 South in the City of Saratoga Springs, Saratoga County. The site is situated on the west side of Route 50, west of the Deleware and Hudson tracks. The site is located in a commercial/residential setting. Site topography is relatively flat, gently sloping to the southeast. The Nursery is one of two State-operated Nursery facilities in the City of Saratoga which are used for the production of tree and shrub seedlings for conservation plantings throughout New York State. Figure 1 shows the site location.

1.4 Site History

The State of New York has operated a Tree Nursery at the Route 50 location since 1911. Approximately 30 acres of the total 130 acre site have been used for Nursery related activities. About 100 acres remain forested, having never been developed for Nursery use. Two ponds and a small creek are located on the Nursery property (ref. Figure 2). Since 1969, only 12 acres of the original 30 have been used for Nursery production. The Nursery facility was originally operated by the Conservation Department before being renamed as the Department of Environmental Conservation in 1970. Because of the acreage available and the proximity to the Saratoga County Airport, the facility was also used as a pesticide storage and mixing facility by the Bureau of Forest Insect and Disease Control. From the 1940s until 1966, the Bureau used the facility as a storage site for DDT powder and as a formulation/transfer station for DDT emulsion used in aerial spraying operations. These spraying operations were part of an effort to control the gypsy moth population in Saratoga County and surrounding regions. DDT, or dichlorodiphenyltrichloroethane, is a highly effective insecticide which was widely used throughout the United States, until its ban in 1972. The formulation process used by the Bureau involved dissolving DDT powder in fuel oil and using the solution to create an oil/water emulsion. The DDT emulsion was pumped into tanker trucks which were dispatched to waiting aircraft.

It is reported that following daily operations, the tanker trucks returned to the site and were rinsed and flushed with water to remove the residual emulsion. It is reported that the rinsing operations were conducted in the vicinity of the present Mechanic Shop (ref. Figure 2). It is believed contaminated rinse waters flowed to a low area at the western edge of the Route 50 facility. NYSDEC believes that the flushing of the tanker trucks and disposal of the residual emulsion is the primary source of the DDT contamination which has since been discovered in this area.

It has been reported that six underground storage tanks were utilized as part of the pesticide mixing process. These tanks were reportedly located in the area west of the loading dock (ref Figure 2). These tanks are believed to have been used for storage of fuel oil, DDT and the oil/water emulsion. These tanks have since been removed. A barn, also located west of the loading dock, was reported



Site Location Map

546043 Saratoga Tree Nursery

NYSDOT Planimetric Quadrangle(s):

N

0 500 1000 1500 2000

FEET

Scale 1:24,000

March 13, 1996

FIGURE 1

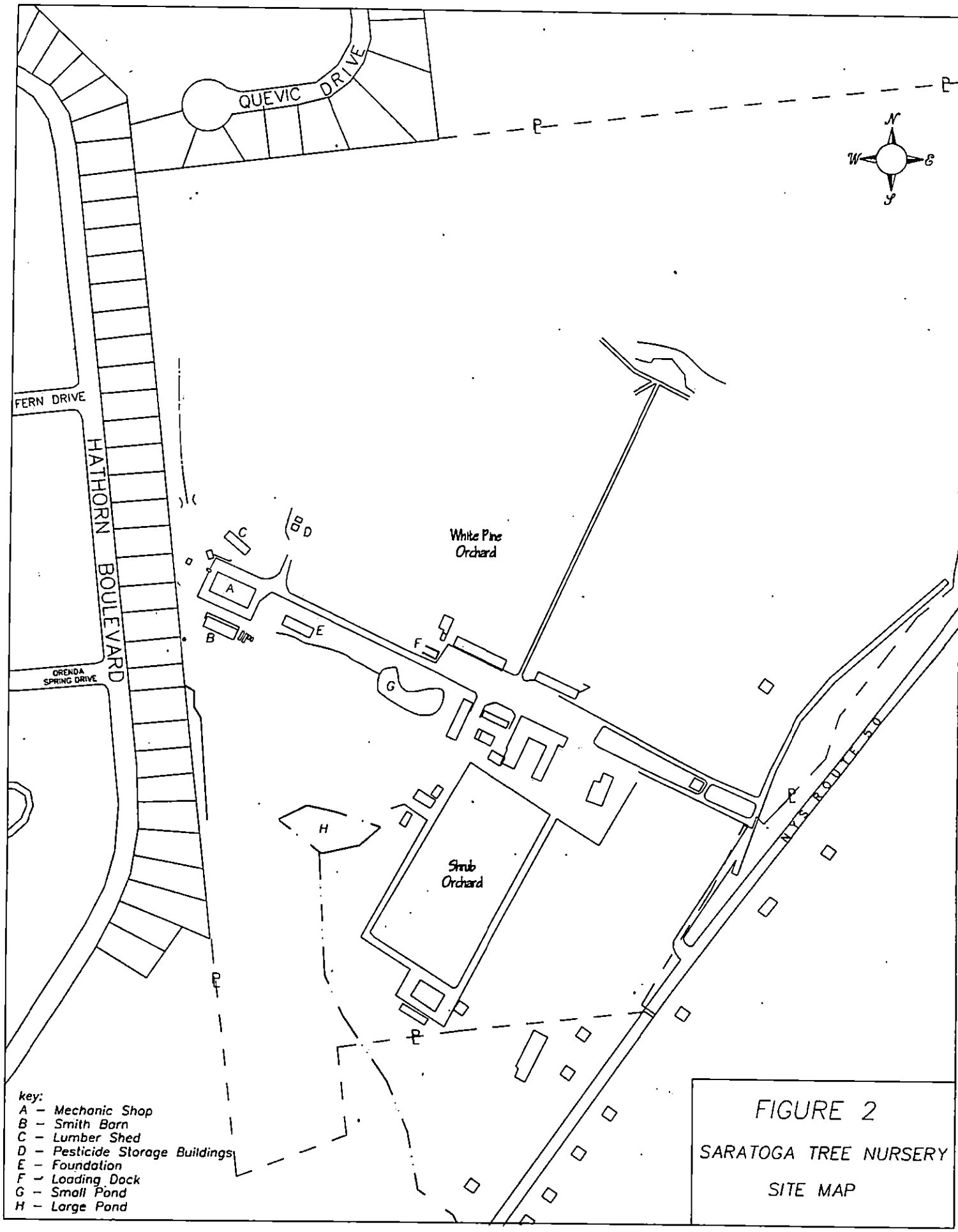


FIGURE 2

SARATOGA TREE NURSERY

SITE MAP

to have been used for storage of DDT and other pesticides, during the period associated with pesticide mixing operations at the Nursery. Only the building foundation remains currently.

Through the early 1980s, pesticides awaiting final disposition are reported to have been stored in a number of on-site structures including: two small storage buildings, the Lumber Barn, the Mechanic Shop, the loading dock, the Smith Barn and in the former storage building of which only a foundation remains (ref. Figure 2). These, as well as an alleged disposal in the wood pallet/shade frame disposal area, are the only areas where DDT is reported to have been stored or handled at the Nursery facility.

In May of 1994, DDT was detected in soil samples collected at the Route 50 facility. The samples were collected as part of routine sampling for petroleum contamination required when the existing underground fuel tanks near the Mechanic Shop were replaced. Based on this discovery, Nursery staff requested the assistance of the NYSDEC Division of Hazardous Waste Remediation (DHWR), to further evaluate the nature and extent of the identified contamination.

The findings of the investigations which have since been conducted by the DHWR are detailed below. Based on the findings of these investigations, the Saratoga Tree Nursery - Route 50 facility, was listed as a class 2 site on the State's Registry of Inactive Hazardous Waste Disposal Sites in January of 1996.

1.5 Nature and Extent of Contamination

The purpose of the RI was to characterize the nature and extent of contamination at the Saratoga Tree Nursery Site. The investigation involved an extensive soil sampling program, groundwater monitoring, test pit excavations, surface water sampling and sediment sampling. The findings of the RI revealed widespread contamination by DDT in soil in the area reportedly used for disposal of DDT rinsate following daily operations (AOC 1), the pesticide storage buildings (AOC 4) and the former mixing areas (AOC 5 and AOC 6). The RI revealed that the uppermost 8" of sediments in the small pond near AOC 6 have been contaminated with DDT. Isolated areas of lead and arsenic contamination were identified in AOC 4. The RI also showed that there are a number of areas at the site which will require no further action. These include the area in the vicinity of the Smith Barn (AOC 2), the Lumber Shed (AOC 3) and the shade frame/wood pallet disposal area (AOC 7). An isolated area of contamination was observed beneath the tank trailers adjacent to the Smith Barn, however, which will require remedial action. The contents of these tank trailers will have to be removed and the trailers decontaminated, as part of any remedial program. Accordingly, the tanks and related areas will now represent the extent of contamination within AOC 2, eliminating the Smith Barn from further consideration. Table 1 shows the contaminant concentration range by media and the associated frequency of detection. Figure 3 shows the location of the Areas of Concern (AOCs).

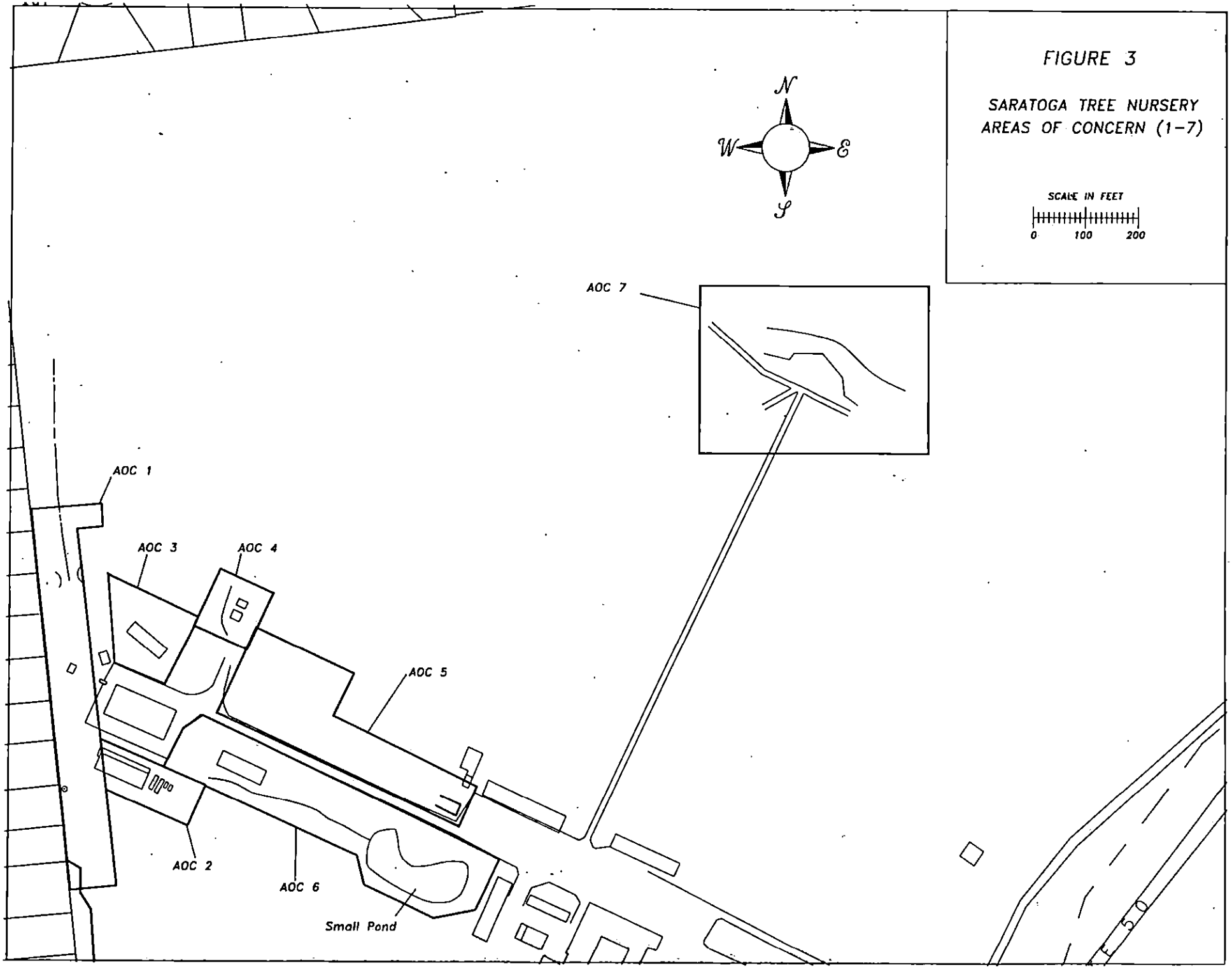


FIGURE 3
SARATOGA TREE NURSERY
AREAS OF CONCERN (1-7)
SCALE IN FEET
0
100
200
N
W
E
S
AOC 7
AOC 1
AOC 3
AOC 4
AOC 5
AOC 2
AOC 6
Small Pond
50

TABLE 1					
Saratoga Tree Nursery - Nature and Extent of Contamination					
Media	Class	Contaminant of Concern	Concentration Range	SCG	Frequency Exceeding SCGs
Soil	Pesticides	DDT, DDD, DDE	ND->10,000 ppm	DDT: 2.1 ppm DDD: 2.9 ppm DDE: 2.1 ppm	155 of 418
	Metals	Lead	ND-11,000 ppm	500	1 of 47
		Arsenic	ND-3,800 ppm	SB	11 of 47
Sediment	Pesticides	DDT, DDD, DDE	ND-223 ppm	0.05 ppm	15 of 18
Groundwater	Pesticides	DDT	ND-0.44 ppb	ND	5 of 10
		DDD	ND-1.5 ppb	ND	4 of 10
		DDE	ND-0.06 ppb	ND	2 of 10
	Metals	Lead	ND	25 ppb	0 of 10
		Arsenic	ND	25 ppb	0 of 10
	Volatiles	Chloroform	ND-28 ppb	7 ppb	1 of 10
	Semi-volatiles	Phenanthrene	ND-48 ppb	50 ppb	0 of 5
		Various (non-target)	ND-630 ppb	50 ppb	2 of 5
Surface Water	Pesticides	DDT	ND	0.001 ppb (D)	0 of 2
		DDD	ND-0.015J ppb	0.001 ppb (D)	1 of 2
		DDE	ND-0.002J ppb	0.001 ppb (D)	1 of 2

KEY: SB - Site Background (Typ. Range for Albany Area - Arsenic: 0.1-6.5 ppm).
ND - Non Detect.
J - Value reported is an estimate.
D - SCG corresponds to Class D surface waters.
SCG - State standards, criteria and guidelines.

The RI revealed that, in general, the depth of the DDT contamination in soil is shallow, typically within two feet of the ground surface. These findings are consistent with the reported mixing, handling and rinsing activities associated with the site. Drilling and test pitting revealed that there are areas of the site, however, where DDT extends to depths of eight feet or more. While these areas of the site make up a relatively small portion of the total area requiring action, they will

require special consideration in light of the shallow water table and high DDT concentrations associated with these areas.

Figure 4 graphically depicts the volume of contaminated soil and sediment relative to the concentration of DDT detected. As illustrated by the graph, approximately 10,000 cubic yards of soil and sediment exceeded a concentration of 100 ppm and approximately 13,000 cubic yards of material exceeded a concentration of 10 ppm. To assess the general soil quality outside the 10 ppm contour (ref. Figure 5), the average concentration of DDT in soil was calculated for each sample interval. Average concentrations were found to be 1.84 ppm, 1.71 ppm and 0.91 ppm for the depths of 0-6", 6-12" and 12-24", respectively.

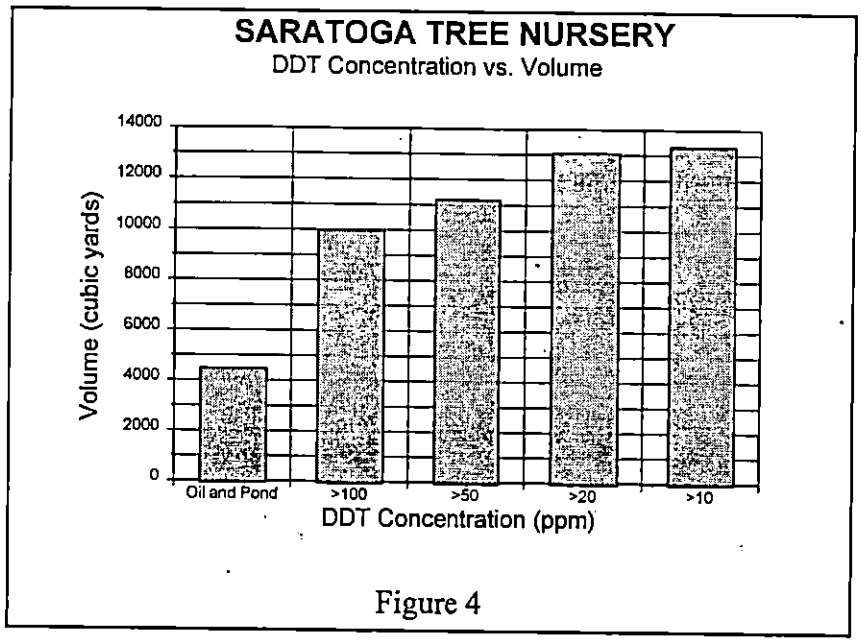


Figure 4

The RI revealed that groundwater contamination by DDT and its breakdown products exists at the site, but that the groundwater contamination is not widespread. Groundwater contamination was observed in five of the onsite monitoring wells including a shallow well/deep well couplet. Data supports that the deeper contamination observed, in both groundwater and soil, is attributable to the presence of petroleum contamination in these areas. Evidence of petroleum, either visual or analytical, was encountered in nearly every instance where DDT was detected at deeper intervals.

It appears that the presence of DDT at deeper intervals is the result of transport in emulsion with petroleum, which functions as a carrier. DDT is a relatively insoluble compound in water with a strong tendency to adhere to soil particles, however, it dissolves fairly readily into oil, which is why fuel oil was used as a mixing/emulsifying agent. It is for this reason that those areas where DDT was observed at deeper intervals (in soil and groundwater) are believed to be the result of the petroleum, which also exists, and which has combined with the DDT to serve as a carrier. Figure

6 illustrates the estimated limits of those areas where petroleum contamination was apparent during sampling.

1.6 Contaminant Fate and Transport

Potential Routes of Migration

The solubility of DDT in water ranges from 0.0031-0.0034 mg/L (or ppm), which means that DDT has the potential to dissolve in groundwater at concentrations as high as 3.4 ppb. Therefore, groundwater has the potential to act as a route of migration by advection, which is the migration of a contaminant attributed to the flowing of groundwater. DDT, however, binds tightly to soil and is not easily mobilized. This was demonstrated in the RI results, where DDT was present in soils at concentrations greater than 10,000 ppm and was observed in groundwater in concentrations ranging from non-detectable levels to 0.44 ppb, which is well below the solubility limit of DDT in water. Groundwater contamination with DDT is limited to areas also contaminated with petroleum (which acts as a carrier agent for DDT and increases it's mobility). The fact that DDT is not present in wells located downgradient of the contaminated wells over twenty years since use of DDT has ceased is an indication of the low mobility of the compound. Since DDT is only present in groundwater at levels much lower than it's solubility limit and has not migrated offsite in approximately thirty years, significant groundwater migration of DDT appears unlikely. To be conservative, the alternative selected should minimize the potential of DDT migration by addressing areas of subsurface petroleum contamination.

Migration by surface water can occur when contaminated soil is eroded and transported by surface runoff or transport by a stream. In addition, migration of contaminants could occur in the two ponds due to hydrodynamic dispersion, which results from mechanical mixing and/or molecular diffusion of contaminants. The RI demonstrated contaminant transport via surface runoff into the small pond. In addition, the creek showed low levels of DDT attributable to surface runoff. These areas will be addressed by the remedies developed as part of the FS.

Migration of DDT in soil can potentially occur by erosional forces (wind, water, etc.) or leaching via infiltration of rainwater. Since DDT binds tightly to soil and has a low solubility, migration by leaching is an unlikely pathway. This is further supported by the RI, which showed that after approximately thirty years, the contamination is generally limited to the top foot of soil, unless a carrier such as petroleum is present which increases the mobility of the DDT. Migration via erosional forces is a migration route that will have to be addressed by the chosen alternative.

Persistence

Theoretically, DDT should demonstrate a 75-100% disappearance from soils in 4-30 years as the DDT degrades due to photo oxidation by ultraviolet light. Results from the RI, however, show levels of DDT in soils greater than 10,000 ppm (or one percent). Since levels in soils are still very

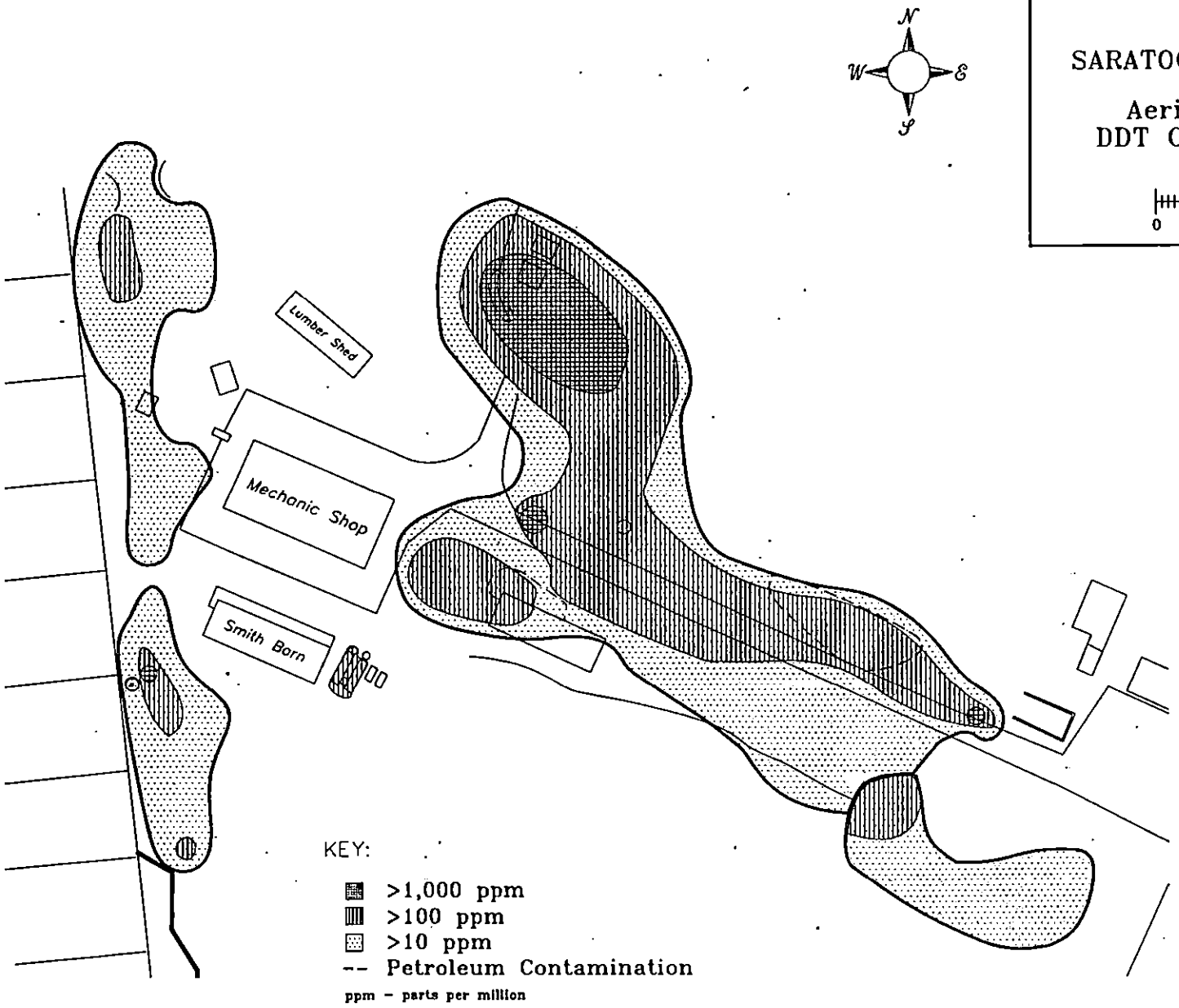


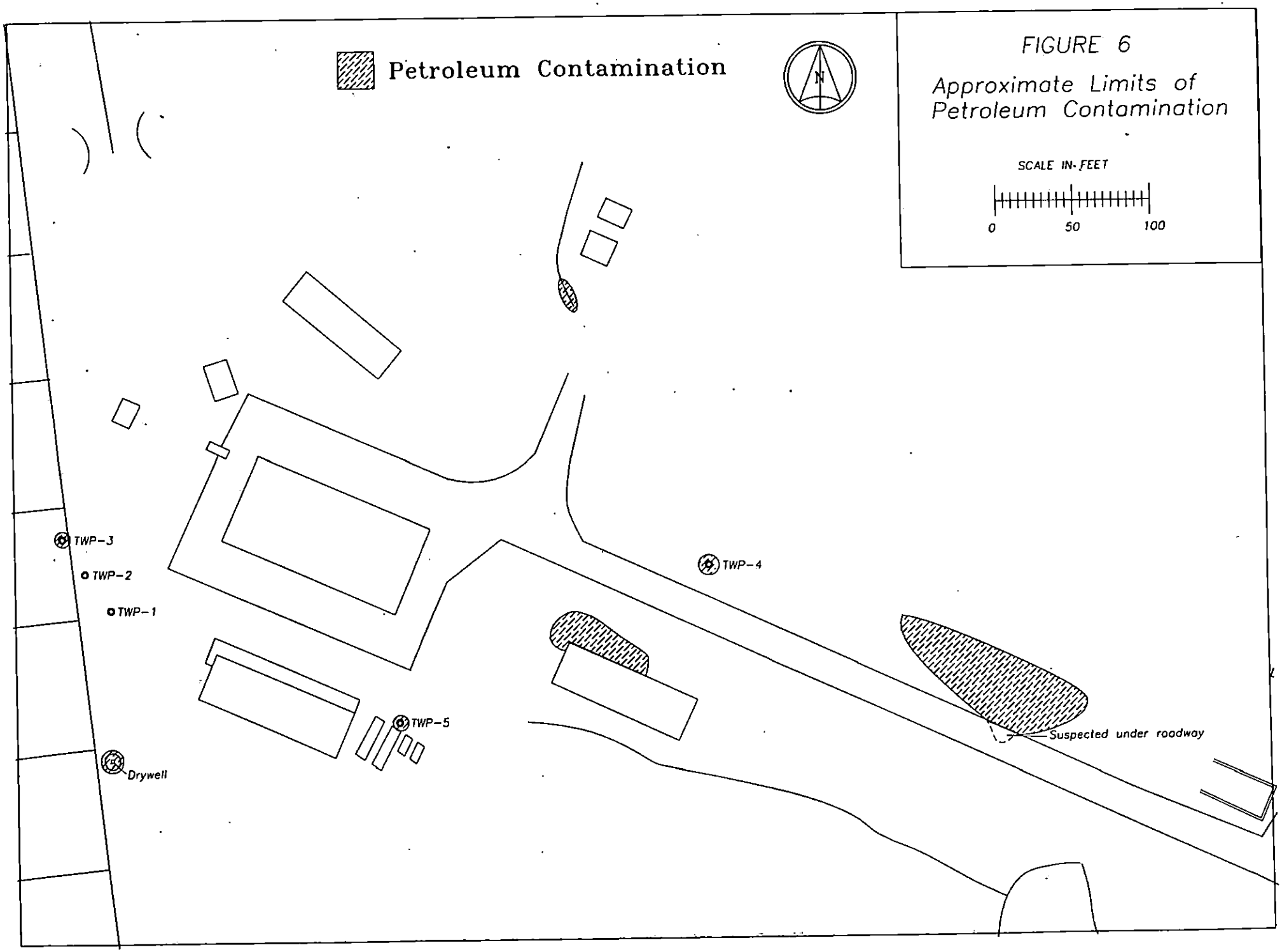
FIGURE 5

SARATOGA TREE NURSERY

Aerial Extent of
DDT Contamination

Scale In Feet

0 50 100 150


Petroleum Contamination
N
FIGURE 6
Approximate Limits of Petroleum Contamination
SCALE IN FEET
0
50
100
TWP-3
TWP-2
TWP-1
TWP-4
TWP-5
Drywell
Suspected under roadway

high over thirty years after the use ceased, DDT degradation has not been as complete under site conditions as the theoretical degradation rates would suggest.

1.7 Identification of Standards, Criteria, and Guidance (SCGs)

A site's program should be designed with consideration being given to guidance determined, after the exercise of engineering judgement, to be applicable on a case by case basis. SCGs are applicable or relevant and appropriate New York State Standards, Criteria, and Guidelines. SCGs also include federal standards that are more stringent than New York State guidelines (6NYCRR Part 375-1.10(ii)). They generally include cleanup standards, control standards, or other environmental protection requirements established under state or federal law; and memoranda, criteria, or guidance developed by the NYSDEC or USEPA.

There are three general categories of SCGs; action-specific, location-specific, and chemical-specific. Action specific SCGs restrict certain treatment or disposal activities. Location-specific SCGs place restrictions on activities within, and/or allowable contaminant concentrations in environmentally sensitive areas. Chemical-specific SCGs establish cleanup objectives based on contaminant exposure to humans or the environment. Table 2 lists the identified SCGs applicable to the site.

Landfill Disposal Restrictions (LDRs), codified in 40 CFR, Part 268 and 6NYCRR, Part 376, set treatment standards that must be met for the soil and sediments to be eligible for land disposal. For the LDRs to be applicable to a remedial action, the remedial action must constitute placement of a restricted hazardous waste. Placement occurs if the response includes land disposal of waste (e.g., disposal in a landfill, surface impoundment, waste piles, etc.). For on-site disposal, placement occurs when wastes are moved from one area of contamination (or unit) into another. Placement does not occur when wastes are treated in-situ, capped, or consolidated within one area of contamination.

LDR treatment standards have been developed for RCRA hazardous wastes. These treatment standards are set at levels considered to be protective of human health and the environment. These treatment standards specify the concentration limits that the waste must meet prior to land disposal. For the contaminants of concern at this site, the LDR treatment standards in mg/kg or ppm are as follows: DDT (.087), DDD (.087) and DDE (.087).

The LDR treatment standards are based on the best demonstrated available technology (BDAT) to address the contamination. In the case of DDT and it's breakdown products, the LDRs are based on levels achievable by incineration of the waste. The degree of treatment specified by LDRs may not be attainable by alternate treatment technologies and are in many instances well below levels required to be protective of human health or the environment. This was recognized by the United States Environmental Protection Agency (USEPA) when it promulgated Corrective Action

Management Unit (CAMU) regulation under federal regulation 40 CFR Parts 260, 264, 265, 268, and 270 on February 16, 1994.

The CAMU rule was designed to provide procedural relief for remedial activities by allowing for the implementation of alternative cost effective treatment remedies which are protective of human health and the environment, without triggering LDRs. When an area is designated a CAMU by the NYSDEC, placement of remediation wastes within that CAMU does not constitute land disposal of hazardous waste. "Remediation wastes" are defined as all solid waste, hazardous waste, media (including groundwater, surface water, soils, and sediment) and debris, which contain listed hazardous wastes or which themselves exhibit a hazardous waste characteristic. A CAMU must be protective of human health and the environment and should reduce the toxicity, mobility, or volume of wastes before disposal. Several of the alternatives that will be evaluated by this FS would require the designation of a CAMU to occur.

The basis for establishing cleanup goals in New York State is detailed in TAGM 4030, *Selection of Remedial Actions at Inactive Hazardous Waste Sites*, and TAGM 4046, *Determination of Soil Cleanup Objectives and Cleanup Levels.*

2.0 DEVELOPMENT OF REMEDIAL OBJECTIVES

2.1 Proposed Remedial Objectives

DDT is often evaluated in conjunction with its breakdown products (DDD and DDE) as was the case in the RI and is in this FS. The remedial objectives selected for these compounds must be protective of the public and the environment. The DHWR Technical and Administrative Guidance Memorandum (TAGM) No. HWR-94-4046, "*Determination of Soil Cleanup Objectives and Cleanup Levels*", provides a basis for the development of soil cleanup levels at individual hazardous waste disposal sites. The TAGM presents remedial objectives for various cleanup scenarios and evaluates various contaminant specific criteria. The TAGM also evaluates groundwater/drinking water quality standards, detection limits, human health based levels that correspond to cancer risks and human health based levels for systematic toxicants (permissible exposure). Further, the ability of contamination to leach from soil to groundwater, which is associated with the percentage of organic carbon present in the affected media, is also taken into consideration. The TAGM recommends acceptable levels of DDT, DDD and DDE in soil, which would be protective of groundwater quality. These concentrations are 2.5 ppm, 7.7 ppm and 4.4 ppm, respectively, or a combined total of 14.6 ppm. Health-based cleanup objectives for these three compounds are also presented, these are reported at 2.1 ppm, 2.9 ppm and 2.1 ppm respectively, or a combined total of 7.1 ppm.

Based upon the evaluation of both human health and environmental factors presented in the TAGM, other applicable SCGs, the present site usage, the media impacted, and the potential pathways of

exposure, the remedial objective proposed to address the on-site soil contamination will be a combined total of 10 ppm (DDT, DDD and DDE) at this site. This number is more stringent than that recommended in the TAGM for the protection of groundwater, more stringent than that recommended based on permissible exposure (40 ppm) and slightly less stringent than that recommended based on cancer risk. The NYSDOH has indicated that a clean-up goal of 10 ppm would be protective of human health in an unrestricted setting. While soils below 10 ppm can pose a risk to wildlife, a 10 ppm cleanup goal at this site would significantly reduce the volume of contaminated soil to which wildlife is exposed, such that no significant risk is expected to remain. Further, because excavations would be backfilled with clean fill, exposures to residual concentrations (10 ppm and lower) would be minimized. Figure 5 shows the aerial extent of contamination above the remedial action objective of 10 ppm.

TABLE 2
Applicable Standards, Criteria, and Guidance

SCG	Type	Media
New York Environmental Conservation Law	A, L, C	air, water, land
New York Oil Spill, Control, and Compensation Act	A, L, C	water, land
New York Solid and Hazardous Waste Management Laws	A, L, C	air, water, land
New York Rules for Inactive Hazardous Waste Disposal Sites, 6-NYCRR Part 375	A	air, water, land
Final Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage and Disposal Facilities; 6 NYCRR Subpart 373-2	A, L, C	air, water, land
Identification and Listing of Hazardous Wastes, 6 NYCRR Part 371	C	air, water, land
New York Rules on Releases Registration and Listing of Hazardous Substances 6 NYCRR Part 595	A, L, C	air, water, land
New York Water Pollution Control Regulations, 6 NYCRR Part 611	A, L, C	water
New York Public Water Supply Regulations, 6 NYCRR Part 5	C	water
New York Water Classifications and Quality Standards, 6 NYCRR Parts 701 and 703	A, L, C	water
New York Air Pollution Control Regulations, 6 NYCRR Parts 200, 201, and 212	A	air
NYSDEC TAGM 4046, Determination of Soil Cleanup Objectives and Cleanup Levels	A, L, C	water, land
New York Air Guide-1, Guidelines for the Control of Toxic Ambient Air Contaminants	A, L, C	air
NYSDEC TAGM 4030, Selection of Remedial Actions at Inactive Hazardous Waste Sites	A, L, C	air
NYSDEC TAGM 4038, Remediation of Inactive Hazardous Waste Sites	A, L, C	air, water, land
Spill Technology and Remediation Series (STARS) Memorandum #1	A, L, C	water, land
TOG 1.1.1, Ambient Water Quality Standards and Criteria Values	A, L, C	water
National Oil and Hazardous Substances Contingency Plan (NCP), CERCLA 40 CFR 300	A, L, C	land
Safe Drinking Water Act drinking water standards, Maximum Contaminant Levels (MCLs), 40 CFR 141-143 USC Section 300f	C	water
Pretreatment Standards under the Clean Water Act, 33 USC Section 1317, regulations 40 CFR 403	A, L, C	water
Resource Conservation and Recovery Act (RCRA), Subtitle C, 42 USC Section 6901, regulations 40 CFR 260-281	A, L, C	air, land
Clean Water Act National Pollutant Discharge Elimination System, 33 USC Section 1342, regulations 40 CFR 403	L, C	water

A: Action Specific SCG
L: Location Specific SCG
C: Chemical Specific SCG

3.0 PRELIMINARY SCREENING OF REMEDIAL TECHNOLOGIES

3.1 Remedial Technologies for Soils Containing Pesticides

Based upon the currently available technologies for pesticide contaminated soil remediation, the remedial technologies which may be suitable for the Saratoga Tree Nursery site are identified below:

A. On-Site Thermal Treatment Methods
   1. Thermal Desorption
   2. Thermal Desorption with Base Catalyzed Decomposition
   3. High Temperature Incineration

B. Off-Site Thermal Treatment Methods
   1. High Temperature Incineration

C. On-Site Physical/Chemical Treatment Methods
   1. Soil Washing
   2. Solvent Extraction
   3. Stabilization: Concrete Matrix
   4. Vitrification
   5. Aeration/Stripping

D. Biological Treatment
   1. Bioremediation
   2. Natural Attenuation

E. On-Site Containment
   1. Capping
   2. Gradient Control
   3. Groundwater Flow Barrier
   4. Hazardous Waste Containment Cell

F. On-Site Consolidation

G. Institutional Controls

H. No Action

3.2 Site-Specific Considerations

The appropriateness of any specific remedial alternative is intimately connected to the specific characteristics of the site under consideration. In the case of the Saratoga Tree Nursery site, there are a number of physical characteristics which will likely factor into the screening process. The type of soils, the shallow water table, the adjacent residential community, the adjacent creek, and the present site usage will be addressed as various alternatives are evaluated. Further, the estimated total volume of contaminated soil and sediments (13,000 cubic yards) will also factor into the screening process. Perhaps having a greater influence in the screening process, however, is the fact that the contaminated soil and sediments must be managed as hazardous waste (ref. 6NYCRR Part 371.4(d)) due to the pesticide contamination. Part 371 specifies that a media contaminated by a listed hazardous waste is itself a hazardous waste. Therefore, Land Disposal Restrictions as set forth by the Hazardous and Solid Waste Amendments (HSWA) to the Resource Conservation and Recovery Act (RCRA), may be applicable, depending on the remedial alternative selected. The applicability of LDRs will be discussed in more detail in the detailed evaluation of alternatives.

3.3 Preliminary Evaluation of Remedial Technologies

Screening various remedial technologies involves examination a particular technologies' effectiveness (short-term and long-term) and implementability, as well as its ability to meet the remedial action objectives. The effectiveness of a given technology will be measured by that technology's ability to meet the established treatment standards. Table 3 evaluates the technologies considered and determines which technologies would be retained for detailed analysis.

TABLE 3
Preliminary Screening of Remedial Technologies

Technology	Description	Evaluation
On-Site Thermal Treatment Methods		
1. Thermal Desorption	Thermal desorption technologies utilize low temperatures (300-1200° F) to physically separate contaminants from a media, such as soil. Organic compounds are condensed and recovered from the off-gas. These compounds would require further treatment and/or disposal as a hazardous waste	**Effectiveness:** Thermal desorption has been shown to be effective in removing pesticides and petroleum products from a soil matrix. **Implementability:** A mobile treatment unit could be temporarily installed on-site. Regulatory operational requirements are not overly involved. **Evaluation:** This alternative will be retained for further consideration.
2. Thermal Desorption with Base Catalyzed Decomposition (BCD)	This technology is used in conjunction with a thermal desorption unit. Organic compounds that have been separated from a media are collected in a reactor. Hydrogen radicals are generated from a hydrogen donating catalyst to completely replace chlorine ions in chlorinated hydrocarbons.	**Effectiveness:** Base Catalyzed Decomposition has been shown to be effective in reducing pesticides and petroleum products below "contained-in" criteria. **Implementability:** A mobile treatment unit could be temporarily installed on-site. Regulatory operational requirements are not overly involved. **Evaluation:** This alternative will be retained for further consideration.

TABLE 3, Con't Preliminary Screening of Remedial Technolgies		
Technology	Description	Evaluation
3. High Temperature Incineration	Incineration uses high temperatures (2000-2500° F) to oxidize contaminants in a media. Further treatment of air emissions is often required. Contaminants are destroyed in this process, leaving concentrations typically below LDR's.	**Effectiveness:** Incineration has been shown to be highly effective in reducing pesticide and petroleum concentrations below LDR's. **Implementability:** A mobile unit could be installed on-site. Significant regulatory operational requirements will have to be complied with. **Evaluation:** This alternative will be retained for further consideration.
Off-Site Thermal Treatment Methods		
1. High Temperature Incineration	Waste is hauled to an off-site incinerator. The incineration process is the same as stated above.	**Effectiveness:** Incineration has been shown to be highly effective in reducing pesticide and petroleum concentrations below LDR's. **Implementability:** Contaminated media could be excavated and hauled to an off-site incinerator. Contaminants are destroyed to below LDR's. Permitting requirements make this alternative costly. **Evaluation:** This alternative will be retained for further consideration.
On-Site Physical/Chemical Treatment Methods		
1. Soil Washing	Water and mechanical action is used to remove contaminants that physically adhere to a media. It also segregates fine particles from coarse particles, making use of the fact that contaminants tend to bind to finer matrix constituents (clays, silts). Spent wash water will require further treatment.	**Effectiveness:** The contaminated matrix is a uniform sand, so no reduction in volume would occur. Furthermore, DDT strongly adheres to soil, making its removal by this alternative unlikely. **Implementability:** This alternative could be implemented. **Evaluation:** This alternative will be removed from further consideration.
2. Solvent Extraction	This extraction procedure operates on the principle that organic compounds of concern prefer to exist in a solvent rather than in its current matrix. The contaminated matrix is washed in a solvent which removes contaminants. The waste solvent solution requires further treatment.	**Effectiveness:** Solvent extraction may be effective at removing pesticides and petroleum from soil. **Implementability:** A unit could be installed on-site. **Evaluation:** Although possibly effective and implementable, solvent extraction involves the use of undesirable solvents and may not meet treatment criteria. Furthermore, thermal desorption can remove contaminants without solvents at a cost below that of solvent extraction. This alternative will not be retained for further consideration.
3. Stabilization: Concrete Matrix	Contaminated media is incorporated in a concrete matrix, significantly reducing the leachability of the hazardous constituents.	**Effectiveness:** Would likely immobilize DDT in matrix. Long term effectiveness is questionable. This alternative is not effective for petroleum contaminated soil since the concrete mixture would be fouled by the oil. TCLP analysis would be performed on concrete to determine effectiveness. **Implementability:** A concrete mixture could be made and placed on-site. **Evaluation:** Alternative will be retained for further consideration.

TABLE 3, Con't
Preliminary Screening of Remedial Technolgies

Technology	Description	Evaluation
4. Vitrification	High temperatures, created by electrodes, are utilized to melt the contaminated matrix into a stable glass and crystalline structure, significantly reducing the leach ability of the hazardous constituents.	**Effectiveness**: Potentially effective for pesticides and petroleum products. **Implementability**: A mobile treatment unit could be installed on-site. Technology has had little success in the past, and here groundwater may be present. **Evaluation**: This alternative will not be retained for further consideration.
5. Aeration/Stripping	An air stream or mixing process is used to volatilize hazardous constituents from the contaminated matrix.	**Effectiveness**: Effective for removing lighter petroleum hydrocarbons. This technology is not effective at removing pesticides. **Implementability**: An air stripping system could be constructed on-site. **Evaluation**: This alternative will not be retained for further consideration.
Biological Treatment		
1. Bioremediation	Microorganisms are used to degrade organic contaminants. Contaminants are used by the organisms as a food source, leaving the end products of CO_2 and water.	**Effectiveness**: Bioremediation has been shown to be effective for petroleum products. However, this remedy would be ineffective at destroying pesticides. **Implementability**: Conditions could be optimized for microbial action. **Evaluation**: Since this remedy is ineffective for pesticides, this alternative will not be retained for further evaluation.
2. Natural Attenuation	This technology recognizes that naturally occurring organisms reduce organic contaminants in-situ. Native organisms utilize contaminants as a food source, producing CO_2 and water. Continued monitoring is required until concentrations are below levels of concern.	**Effectiveness**: Same as bioremediation **Implementability**: Since only monitoring is required, the alternative is easily implemented **Evaluation**: This alternative will not be retained for further consideration.
On-Site Containment		
1. Capping	A low permeability barrier is placed over contaminated areas to reduce surface water infiltration. This reduces the mobilization of contaminants into the groundwater. Continued monitoring is required.	**Effectiveness**: Would reduce infiltration of surface runoff. Because of shallow groundwater which flows through the contaminated zone, this remedy is unlikely to prevent groundwater contamination. **Implementability**: A cap could be constructed. **Evaluation**: Will not be retained for further consideration.
2. Gradient Control	Surface topography is altered to channel away surface drainage from contaminated areas of a site. This reduces infiltration of surface water, thereby reducing mobilization of contaminants into the groundwater. Continued monitoring is required.	**Effectiveness**: Since overburden is a clean sand, there is very little surface runoff (precipitation seeps directly into the ground). This remedy would not significantly reduce the mobility of the contaminants. **Implementability**: Surface drainage pathways could be altered. **Evaluation**: Will not be retained for further consideration.
3. Groundwater Flow Barrier	A low permeability vertical barrier, such as a slurry wall, is placed around a zone of contamination and keyed into an aquitard. This reduces the inflow of groundwater, thereby reducing the mobilization of contaminants offsite in groundwater. Continued monitoring is required.	**Effectiveness**: The overburden consists of highly permeable sand. Therefore, no shallow low permeability unit is available to key into, making this alternative ineffective. **Implementability**: With no shallow aquitard to key into, this alternative could not be reasonably implemented. **Evaluation**: This alternative will not be retained for further consideration.

TABLE 3, Con't Preliminary Screening of Remedial Technologies		
Technology	Description	Evaluation
4. Hazardous Waste Containment Cell	A landfill, or cell, is constructed according to RCRA and State Requirements. Contaminated soil is placed within the cell, eliminating any routes of exposure to humans or the environment. Continued monitoring is required.	**Effectiveness:** This alternative would eliminate exposure routes to pesticides and petroleum products. **Implementability:** A containment cell could be constructed on-site. **Evaluation:** This alternative will be retained for further evaluation.
On-Site Consolidation	All contaminated media is excavated and consolidated in one area of contamination. Continued monitoring is required.	**Effectiveness:** Consolidation would reduce the extent of contamination but would not reduce the amount of hazardous material on-site. **Implementability:** Soil could be excavated and consolidated in one area of the site. **Evaluation:** This alternative will be retained for further consideration.
Off-Site Containment 1. Hazardous Waste Landfill	All contaminated media is excavated and hauled to a permitted hazardous waste landfill for disposal.	**Effectiveness:** This alternative would reduce the mobility of contaminants and remove any exposure routes to the hazardous waste. **Implementability:** LDR's do not permit the land disposal of hazardous waste without treatment. **Evaluation:** This alternative will not be retained for further consideration.
Institutional Controls 1. Deed Restrictions	Restrictions are written into the deed of the property limiting future use of the site. Fencing would be used to restrict access.	**Effectiveness:** Deed restrictions would reduce future exposure routes since the site would only be used for industrial/non-residential purposes. **Implementability:** Deed restrictions could be added to the existing property deed. **Evaluation:** This alternative will be retained for further consideration.
No Action	No further action is taken and the site is left in its present condition.	**Effectiveness:** Taking no action would not reduce the toxicity, mobility, or volume of hazardous waste. All exposure routes would remain. **Implementability:** Easily implementable **Evaluation:** This alternative will be retained for future consideration as a comparison alternative.

3.4 Results of Preliminary Screening of Remedial Technologies

Based on the preliminary screening, the following technologies have been retained for the detailed analysis of remedies for this site.

1. No Action
2. Deed Restrictions
3. Consolidation
4. On-Site Containment

5. Stabilization: Concrete Matrix
6. Thermal Desorption
7. On-Site High Temperature Incineration
8. Off-Site High Temperature Incineration

Alternatives were developed based on the above analysis, and may consist of a combination of applicable technologies.

4.0 DEVELOPMENT OF REMEDIAL ALTERNATIVES

4.1 Development of Alternatives

The general technologies evaluated and retained have been assembled into specific remedial alternatives to address the pesticide-contaminated soil, sediment, and groundwater at this site. The alternatives are developed, consistent with the National Contingency Plan (NCP) and NYSDEC standards, to ensure that relevant information regarding the remedial options is available to develop an implementable, cost-effective remedial plan. The following range of alternatives will be developed:

- The no-action alternative;
- Alternatives that involve little or no treatment, but provide protection of human health and the environment by preventing or minimizing exposure to contaminants through the use of institutional controls or containment; and
- Alternatives that remove or destroy the contaminants of concern to the maximum extent possible, thereby eliminating or minimizing the need for long-term management.

With the exception of the No-Action alternative which serves as a baseline alternative for comparison, alternatives must meet the following Remedial Action Objectives (RAOs):

- Reduce, control, or eliminate to the extent practicable the contamination present within the soils/waste on site.
- Eliminate the threat to surface waters by eliminating any future contaminated surface run-off from the contaminated soils present at the site.
- Eliminate the potential for direct human or animal contact with the contaminated soils on site.

- Prevent, to the extent possible, continued migration of contaminants to groundwater and prevent contamination of downgradient water supply wells.

- Prevent migration of contaminants to off-site residential properties by wind or surface water erosion.

- Provide for attainment of SCGs for groundwater quality to the extent practicable.

The following presents the rationale used in the development of remedial alternatives. The alternatives developed are discussed in detail in Section 4.2.

The minimal action alternative developed for this site incorporated the use of deed restrictions, groundwater monitoring, and access control. The remedial investigation demonstrated a very limited migration of DDT in groundwater approximately thirty years. Deed restrictions and access controls would minimize exposures to contaminated media. Although the attainment of RAOs using these technologies alone is questionable, monitoring would provide a means of evaluating the long-term effectiveness of this alternative for all RAOs except eliminating the threat to surface waters by eliminating future contaminated surface run-off from contaminated soils. The Deed Restrictions with Monitoring alternative does not provide a means to monitor contaminated surface run-off and there would therefore be no way of verifying whether this RAO has been obtained.

To provide a more certain attainment of RAOs, in particular the prevention of groundwater migration of contaminants, media contaminated with both petroleum and DDT could be removed and treated onsite or disposed of offsite. The remedial investigation found that DDT contamination of groundwater at the site likely only occurs in the presence of petroleum. In addition, soils contaminated with only DDT could be consolidated to one place onsite and covered with a geomembrane and soil cap. Access control would reduce exposure to contaminated media and groundwater monitoring would provide a means of evaluating the long-term effectiveness of the alternative. Two alternatives have been developed based on these assumptions; Consolidation with On-Site Treatment and Consolidation with Off-Site Treatment.

Theoretically, DDT is soluble at levels as high as 3.4 ppb in water. Since this level is above groundwater standards, two alternatives were developed to further immobilize DDT and provide a more certain attainment of RAOs. Stabilization, in which DDT contaminated soil is encapsulated in a concrete matrix was developed into an alternative. Containment, in which a containment cell conforming to the requirements of 6 NYCRR Subpart 373 is constructed, was also developed. Both alternatives provide monitoring to evaluate their long-term effectiveness.

Three "permanent solution" alternatives were developed for evaluation. To eliminate the need for future long-term monitoring and ensure the permanent attainment of all site RAOs, alternatives to destroy contaminants above clean-up objectives were developed. These alternatives include Onsite Thermal Desorption, On-Site Incineration, and Off-Site Incineration. These alternatives would

involve excavation of contaminated soil and sediments. It is believed that portions of the contaminated area, specifically the petroleum contaminated soil, is the source of the observed groundwater contamination. It is anticipated that once soil contaminated above the site clean-up goal is removed and treated, any residual groundwater contamination would attenuate. Groundwater would be monitored in the short-term to ensure attainment of RAOs. Long-term monitoring of the site would not be necessary and the site could be removed from the NYS Registry of Inactive Hazardous Waste Disposal Sites.

4.2 Description of Alternatives and Evaluation Based on RAOs

4.2.1 Alternative 1 - No Action

Description: The no-action alternative serves as a baseline to evaluate the other alternatives. It would not include any type of institutional or remedial actions, or any continuing groundwater, surface water or sediment monitoring.

Compliance with RAOs: This alternative does not reduce, control, or eliminate the contamination present. The threat to surface water contamination from runoff is not eliminated. There is still a potential for human exposure to media containing site-related contaminants. The alternative does nothing to eliminate the potential for off-site migration of site-related contaminants in groundwater or by wind and surface erosion. SCGs for groundwater quality will not be attained by this alternative.

4.2.2 Alternative 2 - Deed Restrictions with Monitoring

Description: Within the limits of current statutory authority, the Department would seek to maintain warnings on the deed to alert any future owners of this property of the presence of hazardous waste in the soil and sediments and the contamination detected in two of the on-site buildings. Access to all contaminated areas would be limited by fencing. Furthermore, the site would remain on the NYS Registry of Inactive Hazardous Waste Sites as a Class 4 site, which should also serve as a warning to the current property owner of the presence of pesticide contaminated soil. To monitor for possible contaminant migration in groundwater, surface water or sediments, this alternative would include sampling ten groundwater monitoring wells and the adjacent creek annually for 30 years.

Compliance with RAOs: This alternative does not reduce, control, or eliminate the contamination present. The threat to surface water contamination from runoff is not eliminated. There is a reduced, but still present potential for human exposure to media containing site-related contaminants. The alternative does nothing to eliminate the potential for off-site migration of site-related contaminants

in groundwater or by wind and surface erosion. SCGs for groundwater quality will not be attained by this alternative.

4.2.3 Alternative 3A - Consolidation with Off-Site Treatment and Disposal

Description: Areas exhibiting soil contamination with DDT and its breakdown products greater than the site remedial goal of 10 ppm would be excavated and consolidated into one area of contamination on the site. Approximately 4000 cubic yards of soil exhibiting petroleum contamination would be excavated and segregated for offsite treatment and disposal. Confirmatory samples collected from the floor and walls of the areas to be excavated would determine whether further removal was necessary. Excavation would continue vertically and laterally until confirmatory samples demonstrate complete removal of contaminated soil above the remedial goals. The estimated 250 cubic yards of contaminated soils removed during the offsite Interim Remedial Measure (IRM) would be added to the consolidation pile.

The small pond would be dewatered. Samples would be collected from the pond water to determine whether or not it is contaminated. If samples show the water is not contaminated, the water would be discharged to a site drainage area. If samples show the water is contaminated, water would be treated with activated carbon and discharged to a site drainage area. The top foot of the pond sediment would be removed, dewatered as necessary, and added to the onsite stockpile of contaminated soil. Confirmatory samples would determine the lateral and vertical extent of excavation.

A decontamination pad and pressure wash station would be constructed so all excavation equipment could be properly decontaminated. Showers would be on site for personnel decontamination. All decontamination water would be containerized and treated with activated carbon prior to discharge. Excavation would be carried out in Level D personal protection, with a contingency for level C. Dust suppression equipment (water sprinklers) would remain on hand to prevent airborne migration of contaminated soil offsite. Temporary fencing and warning signs would be placed around excavations to reduce the risk of people or animals from falling into excavations.

The two tanker trailers and two tanks used for pesticide mixing and transportation would be emptied of any residual DDT contaminated and pressure washed. Waste liquids would be containerized for offsite disposal. The tanker trailers and tanks would be disposed of as non-hazardous scrap metal.

The contents of the two small pesticide storage buildings would be removed and disposed of appropriately. The wood building would be torn down and disposed of as non-hazardous waste. The concrete floor would be removed and added to the consolidation pile.

Soils contaminated with both pesticides and petroleum would be sent offsite for incineration and disposal as hazardous waste. Soils contaminated with only pesticides would be consolidated within

one area of contamination on-site. The consolidation pile would be graded, compacted, and capped to eliminate possible routes of exposure (direct contact, dust inhalation, run-off to surface water, leaching to groundwater). The cover would consist of a two foot soil cover and geomembrane. The geomembrane would segregate waste from the soil cover, as well as prevent the release of contamination should the soil cover be compromised. Eighteen inches of clean fill and six inches of topsoil would be used as a soil cover. The entire cap would be seeded to promote vegetation, thereby reducing erosion. A six foot high chain link fence would be constructed to prevent access to the consolidation pile.

LDRs do not apply as this alternative does not constitute "placement" of restricted waste (as defined by the USEPA). Because LDRs would not apply, pre-treatment of the contaminated media would not be required. The area of the site where the consolidation pile is placed would remain on the NYS Registry of Inactive Hazardous Waste Sites as a Class 4 site. It is estimated that approximately 1.33 acres of land will be required for the consolidation pile.

To be consistent with the intent of 6 NYCRR Subpart 373-2, *Final Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage and Disposal Facilities*, an extensive operation and maintenance program would be required for this alternative. Nursery personnel would have to complete a program of classroom instruction or on-the-job training that teaches them duties required under Subpart 373. The program must be directed by a person trained in hazardous waste management procedures. Personnel must also complete an annual review of this training. Trained personnel must conduct weekly inspections of the cap and keep a detailed log documenting observations made during inspections, as well as the nature and date of any repairs to the cap (373-2.2(h)). Ten wells would be established to monitor groundwater quality and give indication of contaminant migration in the groundwater. Groundwater samples would be collected every six months and analyzed for TCL pesticides. The cap would have to be maintained (ie: mowing) as well as occasionally repaired for erosional damage. On March 1 of every year an annual report would be submitted detailing results of the monitoring and any other notable observations (373-2.6(I)).

Compliance with RAOs: This alternative controls the contamination present by consolidating and capping contaminated soil. The threat to surface water contamination from runoff, offsite migration of contaminants by wind and surface erosion, and the potential for human exposure to media containing site-related contaminants are reduced since all contamination will be covered with a soil and geomembrane cap. The alternative reduces the potential for off-site migration of site-related contaminants in groundwater by removing petroleum contaminated soil and reducing surface water infiltration. It is uncertain whether SCGs for groundwater quality will be attained by this alternative.

4.2.4 Alternative 3B - Consolidation with On-Site Treatment

Description: This alternative is identical to Alternative 3A, except that petroleum contaminated soil would be treated by an on-site thermal desorption unit. The thermal desorption process is described in detail under Alternative 6 - On-Site Thermal Desorption.

Compliance with RAOs: This alternative controls the contamination present by consolidating and capping contaminated soil. The threat to surface water contamination from runoff, offsite migration of contaminants by wind and surface erosion, and the potential for human exposure to media containing site-related contaminants are reduced since all contamination will be covered with a soil and geomembrane cap. The alternative reduces the potential for off-site migration of site-related contaminants in groundwater by removing petroleum contaminated soil and reducing surface water infiltration. It is uncertain whether SCGs for groundwater quality will be attained by this alternative.

4.2.5 Alternative 4 - On-Site Containment

Description: Areas exhibiting soil contamination with DDT and its breakdown products greater than the site cleanup goal of 10 ppm would be excavated and stockpiled for containment on-site. Areas exhibiting petroleum contamination would likely be excavated to a depth of eight feet. Confirmatory samples collected on the floor and walls of the excavation would determine whether further removal is necessary. Excavation would continue vertically and laterally until confirmatory samples demonstrate complete removal of contaminated soil above cleanup goals. Soils removed during the offsite Interim Remedial Measure (IRM) would be added to this soil stockpile.

The small pond would be dewatered. Samples would be collected from the pond water to determine whether or not it is contaminated. If samples show the water is not contaminated, the water would be discharged to the environment. If samples show the water is contaminated, water would be treated with activated carbon and discharged to the environment. The top foot of the pond sediment would be removed, dewatered as necessary, and added to the onsite stockpile of contaminated soil. Confirmatory samples would determine the lateral and vertical extent of excavation. The total estimated volume of soil, sediment, and waste is 13,000 cubic yards.

A decontamination pad and pressure wash station would be constructed so all excavation equipment could be properly decontaminated. Showers would be on site for personnel decontamination. All decontamination water would be containerized and treated with activated carbon prior to discharge to the environment. Excavation would be carried out in Level D personal protection, with a contingency for level C. Dust suppression equipment (water sprinklers) would remain on hand to prevent airborne migration of contaminated soil offsite. Temporary fencing and warning signs would be placed around excavations to reduce the risk of people or animals from falling into excavations.

The four tanker trailers used for pesticide mixing and transportation would be emptied of any residual DDT contaminated and pressure washed. Waste liquids would be containerized and disposed of offsite. Tanker trailers would be disposed of as non-hazardous scrap metal.

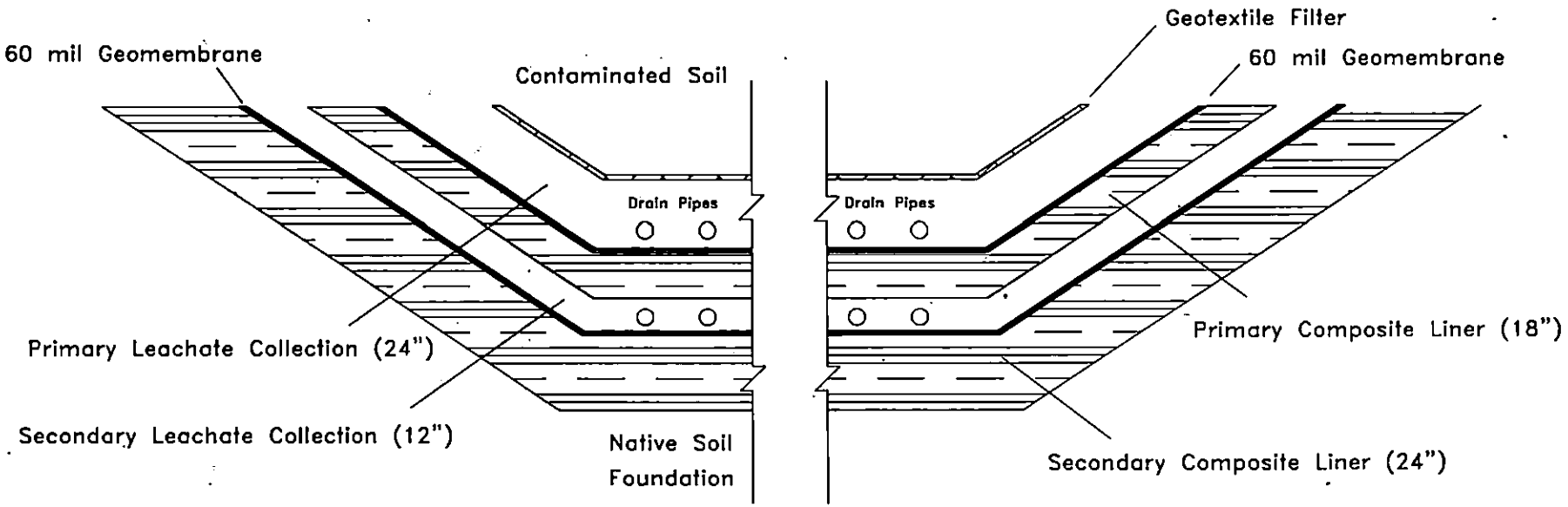
The contents of the two pesticide storage buildings would be removed and disposed of appropriately. The wood building would be torn down and disposed of in the containment cell. The concrete floor would be broken up and disposed of in the containment cell.

A containment cell meeting the requirements of 6 NYCRR Subpart 373-2 would be constructed to encapsulate all soil contaminated above the site cleanup goal. Because of the high water table, the containment cell would be constructed at the ground surface. The major requirements of such containment cells include an impervious cap; a double composite liner; a leachate detection, collection and removal system; run-on and run-off control systems; and wind dispersion controls. The entire cap would be seeded to promote vegetation, thereby reducing erosion. A six foot high chain link fence would be constructed to prevent access to the containment cell. A conceptual drawing of the cell liner is shown in Figure 7.

The containment cell would be designated a CAMU since LDRs would be exceeded. This area of the site would remain on the NYS Registry of Inactive Hazardous Waste Sites as a Class 4 site. The containment cell would occupy approximately 1.12 acres.

To be consistent with the intent of 6 NYCRR Subpart 373-2, *Final Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage and Disposal Facilities*, an extensive operation and maintenance program would be required for this alternative. Nursery personnel would have to complete a program of classroom instruction or on-the-job training that teaches them duties required under Subpart 373. The program must be directed by a person trained in hazardous waste management procedures. Personnel must also complete an annual review of this training. Trained personnel must complete weekly inspections of the cap and keep a detailed log documenting observations made during inspections, as well as the nature and date of any repairs to the cap (373-2.2(h)). Ten wells would be established to monitor groundwater quality and give indication of contaminant migration in the groundwater. Samples would be sampled every six months and analyzed for TCL volatiles, semi-volatiles, pesticides/PCBs, and TAL metals. The cap would have to be maintained (ie: mowing) as well as occasionally repaired for erosional damage. On March 1 of every year an annual report would be submitted to the NYSDEC Commissioner detailing results of the monitoring and any other notable observations (373-2.6(I)).

Compliance with RAOs: This alternative controls the contamination present by containing contaminated soil in a cell in accordance with Subpart 373. The threat to surface water contamination from runoff, offsite migration of contaminants by wind and surface erosion, and the potential for human exposure to media containing site-related contaminants are eliminated since all contamination will be covered with a soil and geomembrane cap. The alternative reduces the



CONCEPTUAL CONTAINMENT CELL LINER DETAIL

DIVISION OF ENVIRONMENTAL REMEDIATION

DATE: 6/96 DRAWING: FIGURE 7

SARATOGA TREE NURSERY Sheet

potential for off-site migration of site-related contaminants in groundwater and would meet SCGs for groundwater by containing all contaminated media in a hazardous waste containment cell.

4.2.6 Alternative 5 - Stabilization

Description: Contaminated soil and sediment would be excavated and stockpiled, decontamination measures would be taken, the tanker trailers and tanks would be properly dealt with, and the pesticide buildings would be properly demolished as described in the Consolidation alternatives.

Approximately 4000 cubic yards of soils contaminated with both pesticides and petroleum would be sent offsite for incineration and disposal as hazardous waste. Soils contaminated with only pesticides (approximately 12,200 cubic yards) would be stabilized in a concrete matrix and placed on site. By mixing the contaminated soil in a concrete matrix, the potential for migration of contaminants would be greatly reduced. Pieces of the concrete matrix would be pulverized and analyzed using the Toxicity Characteristic Leachate Procedure (TCLP). The extraction would be analyzed for pesticides and metals to determine whether or not DDT, lead, or arsenic would likely leach out of the concrete matrix.

The concrete would be placed on-site in an approximately one acre area and designated a CAMU since concentrations would exceed LDRs. The site would remain on the NYS Registry of Inactive Hazardous Waste Sites as a Class 4 site.

To be consistent with the intent of 6 NYCRR Subpart 373-2, *Final Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage and Disposal Facilities*, an operation and maintenance program would be required for this alternative. Ten wells would be established to monitor groundwater quality and give indication of contaminant migration in the groundwater. Samples would be sampled every six months and analyzed for TCL pesticides/PCBs. On March 1 of every year an annual report would be submitted to the NYSDEC Commissioner detailing results of the monitoring and any other notable observations (373-2.6(I)).

Compliance with RAOs: Media contaminated with both pesticides and petroleum would be eliminated by this alternative, and media contaminated with only pesticides would be controlled by stabilizing contaminated soil in a concrete matrix. The threat to surface water contamination from runoff, offsite migration of contaminants by wind and surface erosion, and the potential for human exposure to media containing site-related contaminants would be reduced since all contamination would be immobilized in a concrete matrix. The alternative would reduce the potential for off-site migration of site-related contaminants in groundwater and would meet SCGs for groundwater by stabilizing or treating offsite all contaminated media.

4.1.7 Alternative 6- On-Site Thermal Desorption

Description: Contaminated soil and sediment would be excavated and stockpiled, decontamination measures would be taken, the tanker trailers and tanks would be properly dealt with, and the pesticide buildings would be properly demolished as described in the Consolidation alternatives.

The approximately 16,200 cubic yards of stockpiled soil would be processed through a thermal desorption unit, followed by base catalyzed decomposition to destroy the pesticides. Thermal desorption is an effective technology for the treatment of organic contaminated soil, sediment, and sludge which generates a lower volume of off-gas, has less environmental impact, and fewer permitting requirements than many other on-site treatment technologies. Thermal desorption technologies use indirect heat to physically separate organic compounds from a media (such as soil) through thermal desorption. The indirect heat is provided by hot oil, electric, other source through a metal surface to the wastes. For heavy organic and chlorinated organic compounds (including DDT), a medium temperature thermal desorption unit capable of heating the process materials up to 950°F may be required. The organic compounds that have been desorped are condensed and recovered from the off-gas. The recovered contaminants are then either treated further on-site or sent off-site for treatment and disposal. Since thermal desorption would not be effective in removing lead and arsenic, samples of the treated soil originating from AOC 4 would be analyzed for metals and disposed of offsite, if necessary.

For this alternative, Base Catalyzed Decomposition (BCD) would be used for on-site treatment of recovered contaminants from the thermal desorption unit. BCD is a process that generates hydrogen radicals from a hydrogen donor to completely replace halogen ions in a halogenated hydrocarbon. In the case of DDT, the halogen ion being replaced is the chloride ion.

Once soil has been treated, it would be analyzed to determine the effectiveness of treatment. If LDR's have not been achieved, the area where soil is backfilled would be designated a CAMU. If LDR's have been achieved, a CAMU would not be necessary. Once backfilling and proper compaction has been completed, the area would be restored by grading and seeding. The site would then be eligible for removal from the NYS Registry of Inactive Hazardous Waste Sites. While there are no maintenance requirements for this alternative, a short-term groundwater monitoring program is anticipated to confirm groundwater contamination has attenuated.

Compliance with RAOs: All site-related contamination would be eliminated by this alternative. The threat to surface water contamination from runoff, offsite migration of contaminants by wind and surface erosion, and the potential for human exposure to media containing site-related contaminants would be eliminated since all contamination would be destroyed. The alternative would eliminate the potential for off-site migration of site-related contaminants in groundwater and would meet SCGs for groundwater by removing the source of contamination.

4.1.8 Alternative 7 - On-Site High Temperature Incineration

Description: In this alternative, the procedure would be essentially that described in Alternative 6, except that the treatment process would be on-site high temperature incineration. Incineration would not be effective in removing lead and arsenic, samples of the treated soil originating from AOC 4 would be analyzed for metals and disposed of offsite, if necessary.

Upon completion of this alternative, the site would be eligible for removal from the NYS Registry of Inactive Hazardous Waste Sites. While there are no maintenance requirements for this alternative, a short-term groundwater monitoring program is anticipated to confirm groundwater contamination has attenuated.

Compliance with RAOs: All site-related contamination would be eliminated by this alternative. The threat to surface water contamination from runoff, offsite migration of contaminants by wind and surface erosion, and the potential for human exposure to media containing site-related contaminants would be eliminated since all contamination would be destroyed. The alternative would eliminate the potential for off-site migration of site-related contaminants in groundwater and would meet SCGs for groundwater by removing the source of contamination.

4.1.9 Alternative 8 - Off-Site High Temperature Incineration

Description: In this alternative, all contaminated soil and waste would be removed as described in Alternative 6. Contaminated soil and waste would then be shipped off-site for incineration and disposal in a hazardous waste landfill. Clean fill and topsoil would be imported to bring excavated areas to their original grade. The site would be eligible for removal from the NYS Registry of Inactive Hazardous Waste Sites. While there are no maintenance requirements for this alternative, a short-term groundwater monitoring program is anticipated to confirm groundwater contamination has attenuated.

Compliance with RAOs: All site-related contamination would be eliminated by this alternative. The threat to surface water contamination from runoff, offsite migration of contaminants by wind and surface erosion, and the potential for human exposure to media containing site-related contaminants would be eliminated since all contamination would be destroyed. The alternative would eliminate the potential for off-site migration of site-related contaminants in groundwater and would meet SCGs for groundwater by removing the source of contamination.

5.0 DETAILED ANALYSIS OF ALTERNATIVES

5.1 Description of Evaluation Criteria

In Section 5.2, each of the alternatives retained by the screening process in Section 3 is analyzed with respect to the criteria presented in the NYSDEC's Division of Hazardous Waste Remediation TAGM No. 4030, which defines the selection process for remedial actions at inactive hazardous waste sites. Each alternative is analyzed with respect to:

1. Compliance with SCGs: This evaluation criterion determines how each alternative complies with applicable or relevant and appropriate SCGs, as discussed and identified in Section 1.7. The actual determination of which requirements are applicable or relevant and appropriate is made by the NYSDEC in consultation with the NYSDOH. If an SCG is not met, the basis for one of the four waivers allowed under 6NYCRR Part 375-1.10(c)(I) is discussed. If an alternative does not meet the SCGs and a waiver is not appropriate or justifiable, such an alternative should not be considered further.

2. Short-term Impacts and Effectiveness: This evaluation criterion assesses the effects of the alternative during the construction and implementation phase. Alternatives are evaluated with respect to their effects on human health and the environment during implementation of the remedial action. The aspects evaluated include: protection of the community during remedial actions, environmental impacts as a result of remedial actions, time until the remedial response objectives are achieved, and protection of workers during the remedial action.

3. Long-term Effectiveness and Permanence: This evaluation criterion addresses the results of a remedial action in terms of its permanence and quantity/nature of waste or residual remaining at the site after response objectives have been met. The primary focus of this evaluation is the extent and effectiveness of the controls that may be required to manage the waste or residual remaining at the site and operating system necessary for the remedy to remain effective. The factors being evaluated include the: permanence of the remedial alternative, magnitude of the remaining risk, adequacy of controls used to manage residual waste, and the reliability of controls used to manage residual waste.

4. Reduction of Toxicity, Mobility, and Volume: This evaluation criterion assesses the remedial alternative's use of technologies that permanently and significantly reduce toxicity, mobility, or volume of the hazardous wastes as their principal element. The NYSDEC's policy is to give preference to alternatives that eliminate any significant threats at a site through destruction of toxic contaminants, reduction of the total mass of toxic contaminants, irreversible reduction in the contaminants mobility, or reduction of the total volume of contaminated media. This evaluation includes: the amount of the hazardous materials that

will be destroyed or treated, the degree of expected reduction in toxicity, mobility, or volume measured as a percentage, the degree in which the treatment will be irreversible, and the type and quantity of treatment residuals that will remain following treatment.

5. Implementability: This criterion addresses the technical and administrative feasibility of implementing an alternative and the availability of various services and materials required during its implementation. The evaluation includes: feasibility of construction and operation; the reliability of the technology; the ease of undertaking additional remedial action; monitoring considerations; activities needed to coordinate with other offices or agencies; availability of adequate off-site treatment, storage, and disposal services; availability of equipment; and the availability of services and materials.

6. Overall Protection of Human Health and the Environment: This criterion serves as a final check to assess whether each alternative meets the requirements that are protective of human health and the environment. The overall assessment of protection is based on a composite of factors assessed under other evaluation criteria; especially long-term effectiveness and performance, short-term effectiveness, and compliance with SCGs. This evaluation focuses on how a specific alternative achieves protection over time and how site risks are reduced. The analysis includes how each source of contamination is to be eliminated, reduced or controlled for each alternative.

7. Cost: Cost estimates are prepared and evaluated for each alternative. The cost estimates include capital costs, operation and maintenance costs, future capital costs, and cost of future land use (ie: economic impacts due to the presence of residual wastes). Cost estimates are evaluated based on their present worth over a period of thirty years. A cost sensitivity analysis is performed which includes the following factors: the effective life of the remedial action, the O&M costs, the duration of the cleanup, the volume of contaminated material, other design parameters, and the discount rate.

8. Community Acceptance: After completion of the FS, a Proposed Remedial Action Plan (PRAP) is prepared and released to the public for comment. Concerns of the community regarding the RI/FS reports and the PRAP are evaluated. A "Responsiveness Summary" will be prepared that presents the public comments received and how the Department will address the concerns raised. If the final remedy selected differs significantly from the proposed remedy, notices to the public will be issued describing the differences and reasons for the changes.

5.2 Evaluation of Remedial Alternatives

5.2.1 Alternative 1 - No Action

Compliance with SCGs: Since the RI demonstrated high concentrations of DDT in on-site soils over 30 years since its disposal, this alternative would not meet chemical-specific SCGs in a reasonable time frame. Since there is no monitoring involved in this alternative, the compliance of chemical-specific SCGs could not be verified. No location specific SCGs have been identified. Since no action is being taken, action-specific SCGs do not apply.

Overall Protection of Human Health and the Environment: Although this alternative does not result in any increased short-term risks, it does not comply with chemical-specific SCGs, and is not effective in the long term. Since DDT is very persistent in the environment, is present in surface soils at high concentrations, has been shown to be mobile in the presence of petroleum in groundwater, and may come in direct contact with nursery employees and the public, this alternative would not be protective of human health or the environment.

Short-term Impacts and Effectiveness: Since no remedial action is occurring, their are no increased risks caused by the implementation of a remedial action.

Long-term Effectiveness and Permanence: Because of the lack of monitoring associated with this alternative, the potential for increased risk caused by remaining waste remains. There would be no controls in place to manage the waste, allowing continued exposure to high concentrations of DDT by nursery employees and the public. The site would remain on the NYSDEC Registry of Inactive Hazardous Waste Disposal Sites as a Class 4 site (site is properly closed - requires continued management).

Reduction of Toxicity, Mobility, and Volume: There would be no reduction in the toxicity, mobility, or volume of waste.

Implementability: Since there are no technical or administrative actions required, this alternative is easily implemented.

Cost: There are no capital or operation and maintenance costs associated with this alternative. There would be a future land use cost, in that the site would remain on the NYSDEC Registry of Inactive Hazardous Waste Disposal Sites and could not be used for certain land uses. The economic impact of this alternative is uncertain.

5.2.2 Alternative 2 - Deed Restrictions with Monitoring

Compliance with SCGs: Since the RI demonstrated high concentrations of DDT in on-site soils over 30 years since its disposal, this alternative would not meet chemical-specific SCGs in a reasonable time frame. In addition, groundwater standards for DDT have been contravened. No location specific SCGs have been identified. This alternative would not contravene any action-specific SCGs.

Overall Protection of Human Health and the Environment: Although this alternative does not cause any increased short-term risks, reduces the routes of exposure and provides for monitoring of groundwater and stream quality, it does not comply with chemical-specific SCGs and is not effective in the long term. Since DDT is very persistent in the environment, is present in surface soils at high concentrations, has been shown to be mobile in the presence of petroleum in groundwater, and may come in direct contact with nursery employees and the public, this alternative would not be protective of human health or the environment.

Short-term Impacts and Effectiveness: Controls could be used to address any worker exposure during the installation of the monitoring wells and fence. It is unlikely that there would be any increased risk to the public or impacts to the environment during construction. The alternative could be implemented in a short time period.

Long-term Effectiveness and Permanence: The wastes would remain on-site in high concentrations and could be transported off-site via wind erosion, groundwater, or stream transport. Monitoring would be in place for groundwater and stream transport, but would not address wind transport. Although the fencing would act as a deterrent, it would not eliminate risk of exposure of workers or the public to contaminated surface soils from this pathway. The site would remain on the NYSDEC Registry of Inactive Hazardous Waste Disposal Sites as a Class 4 site (site is properly closed - requires continued management).

Reduction of Toxicity, Mobility, and Volume: There would be no reduction in the toxicity, mobility, or volume of waste.

Implementability: Materials for monitoring wells and fencing are commercially available. There would be no activities that would need coordination with other agencies during construction. This alternative would require annual sampling of groundwater and surface water, as well as occasional repair to the fence for an extended period of time.

Cost: The estimated capital cost for this alternative is $ 79,000. The annual O&M cost is $ 26,000. The present worth value of this alternative is $ 437,000 using a 6% discount rate over thirty years. There would be a future land use cost, in that the site would remain on the NYSDEC Registry of Inactive Hazardous Waste Disposal Sites and could not be used for certain land uses. The economic impact of this alternative is uncertain.

5.2.3 Alternative 3A - Consolidation with Off-Site Treatment and Disposal

Compliance with SCGs: Since this alternative leaves soil contaminated with high levels of DDT on-site, chemical-specific SCGs would not be meet. No location specific SCGs have been identified. This alternative would not contravene any action-specific SCGs.

Overall Protection of Human Health and the Environment: The short term risks associated with this alternative could be easily mitigated with proper controls. This alternative eliminates exposure to surface soils and the potential for wind and erosional dispersion of contaminants, reduces contaminant mobility by reducing surface water infiltration, and provides for monitoring of groundwater. There is some risk because contaminants would remain onsite, DDT is very persistent in the environment, has the potential to leach into the groundwater, and could come in contact with nursery employees or the public should the cap be compromised.

Short-term Impacts and Effectiveness: There is potential for worker exposure during excavation and consolidation of the DDT contaminated soil, installation of the cap, installation of monitoring wells, and when dealing with the pesticide storage buildings and tanker trailers. This exposure could be significantly reduced through the use of dust suppression measures and personal protection equipment. Soil hauled offsite for treatment and disposal will present a short-term risk to the public. Dust suppression measures, properly covering trucks hauling contaminated soil, and site access restrictions would eliminate or greatly reduce any increased risk to the public or impacts to the environment during construction. The alternative could be implemented in approximately six to nine months.

Long-term Effectiveness and Permanence: This alternative would be highly effective and reliable at reducing exposure to humans and the environment to surface soils. Since petroleum contaminated soil would be removed and a cap would be in place to cover the remaining volume, the mobility of contaminants in groundwater would be reduced. However, long-term management would be required to ensure the integrity of the cap. A risk would remain since the wastes would remain on-site in high concentrations. Since the water table is within five feet of the ground surface, groundwater monitoring would be required identify groundwater transport of contaminants. The cap reduces infiltration, but does not address the potential for the generation of leachate. The site would remain on the NYSDEC Registry of Inactive Hazardous Waste Disposal Sites as a Class 4 site (site is properly closed - requires continued management).

Reduction of Toxicity, Mobility, and Volume: Soil contaminated with both petroleum and DDT would be taken off-site for treatment, thereby reducing the volume of contaminated soil. The remaining soil would remain on-site and its toxicity and volume would not be reduced. The cap would reduce, but not permanently eliminate, the mobility of the remaining contaminants.

Implementability: The equipment and material needed to construct a consolidation pile and cap are commercially available. Adequate commercial incineration capacity is available for wastes to be treated offsite. The remedy could be easily implemented. There are no anticipated administrative or legal barriers to the implementation of this alternative. This alternative would require semi-annual sampling of groundwater, weekly inspections of the cap and fence, occasional repairs to the cap and fence, and the submittal of an annual report detailing the year's monitoring and repair efforts.

Cost: The estimated capital cost for this alternative is $ 5,817,000. The annual O&M cost is $ 19,400. The present worth value of this alternative is $ 6,110,000 using a 6% discount rate over thirty years. There would be a future land use cost, in that the site would remain on the NYSDEC Registry of Inactive Hazardous Waste Disposal Sites and could not be used for certain land uses. The economic impact of this alternative is uncertain.

5.2.4 Alternative 3B - On-Site Consolidation with On-Site Treatment

Compliance with SCGs: Since this alternative leaves soil contaminated with high levels of DDT on-site, chemical-specific SCGs would not be meet. No location specific SCGs have been identified. This alternative would not contravene any action-specific SCGs.

Overall Protection of Human Health and the Environment: The short term risks associated with this alternative could be easily mitigated with proper controls. This alternative eliminates exposure to surface soils and the potential for wind dispersion of contaminants, reduces contaminant mobility by eliminating surface water infiltration, and provides for monitoring of groundwater. There is some risk because contaminants would remain onsite. DDT is very persistent in the environment, has the potential to leach into the groundwater, and could come in contact with nursery employees or the public should the cap be compromised.

Short-term Impacts and Effectiveness: There is potential for worker exposure during excavation and consolidation of the DDT contaminated soil, handling and treatment of DDT and petroleum contaminated soil, installation of the cap, installation of monitoring wells, and when dealing with the pesticide storage buildings and tanker trailers. This exposure could be significantly reduced through the use of dust suppression measures and personal protection equipment. Dust suppression measures and site access restrictions would eliminate or greatly reduce any increased risk to the public or impacts to the environment during construction. The alternative could be implemented in six to twelve months.

Long-term Effectiveness and Permanence: This alternative would be effective at reducing exposure to humans and the environment to surface soils. Since petroleum contaminated soil would be treated and a cap would be in place over the remaining contaminated soils, the mobility of contaminants would be reduced in groundwater. However, long-term management would be required to ensure the integrity of the cap. A risk would remain since the wastes would remain on-

site in high concentrations. Since the water table is within five feet of the ground surface, groundwater monitoring would be required to identify groundwater transport of contaminants. The cap reduces surface water infiltration, but does not address the potential for the generation of leachate. The site would remain on the NYSDEC Registry of Inactive Hazardous Waste Disposal Sites as a Class 4 site (site is properly closed - requires continued management).

Reduction of Toxicity, Mobility, and Volume: Soil contaminated with both petroleum and DDT would be treated, thereby reducing the volume of contaminated soil. The remaining soil would remain on-site and its toxicity and volume would not be reduced. The cap would reduce, but not permanently eliminate, the mobility of the remaining contaminants.

Implementability: The equipment and material needed to construct a consolidation pile and cap are commercially available. Adequate commercial venders are available to provide thermal desorption units. The remedy, although more involved than previous remedies due to onsite treatment of soils, could be implemented without significant difficulty. There are no anticipated administrative or legal barriers to the implementation of this alternative. This alternative would require semi-annual sampling of groundwater, weekly inspections of the cap and fence, occasional repairs to the cap and fence, and the submittal of an annual report detailing the years monitoring and repair efforts.

Cost: The estimated capital cost for this alternative is $ 2,422,000. The annual O&M cost is $ 19,400. The present worth value of this alternative is $ 2,690,000 using a 6% discount rate over thirty years. There would be a future land use cost, in that the site would remain on the NYSDEC Registry of Inactive Hazardous Waste Disposal Sites and could not be used for certain land uses. The economic impact of this alternative is uncertain.

5.2.5 Alternative 4 - On-Site Containment

Compliance with SCGs: Since this alternative leaves soil contaminated with high levels of DDT on-site, chemical-specific SCGs would not be meet. No location specific SCGs have been identified. This alternative constructs a containment cell in compliance with 6 NYCRR Subpart 373-2 and would meet action-specific SCGs.

Overall Protection of Human Health and the Environment: The short term risks associated with this alternative could be easily mitigated with proper controls. This alternative eliminates exposure to surface soils and the potential for wind dispersion of contaminants, reduces contaminant mobility by eliminating surface water infiltration and groundwater infiltration, and provides for monitoring of groundwater. There is some risk because contaminants would remain onsite. DDT is very persistent in the environment, has the potential to leach into the groundwater should the liner be compromised, and could come in contact with nursery employees or the public should the cap or liner be breached.

Short-term Impacts and Effectiveness: There is potential for worker exposure during excavation and consolidation of DDT contaminated soil, installation of the cap, and when dealing with the pesticide storage buildings and tanker trailers. This exposure could be significantly reduced through the use of dust suppression measures and personal protection equipment. Dust suppression measures and site access restrictions would eliminate or greatly reduce any increased risk to the public or impacts to the environment during construction. The alternative could be implemented in six to twelve months.

Long-term Effectiveness and Permanence: This alternative would be highly effective and reliable at reducing exposure to humans and the environment. Since a RCRA liner and cap would be in place, the mobility of contaminants would be significantly reduced. The cap and liner prevent infiltration of surface runoff and groundwater respectively. However, long-term management of the cap, leachate collection system, and groundwater monitoring system would be required to ensure the integrity of the containment cell. A potential risk would remain since the wastes would remain on-site in high concentrations. The site would remain on the NYSDEC Registry of Inactive Hazardous Waste Disposal Sites as a Class 4 site (site is properly closed - requires continued management).

Reduction of Toxicity, Mobility, and Volume: Contaminated soil would remain on-site and its toxicity and volume would not be reduced. The cap would reduce, but not permanently eliminate, the mobility of the remaining contaminants.

Implementability: The equipment and material needed to construct a containment cell are commercially available. This is the most complicated remedy to design and extensive quality assurance measures would be required during construction. There are no anticipated administrative or legal barriers to the implementation of this alternative. This alternative would require semi-annual sampling of groundwater, weekly inspections of the cap and fence, occasional repairs to the cap and fence, operation of the leachate collection system, and the submittal of an annual report detailing the years monitoring and repair efforts.

Cost: The estimated capital cost for this alternative is $ 3,876,000. The annual O&M cost is $ 34,300. The present worth value of this alternative is $ 4,348,000 using a 6% discount rate over thirty years. There would be a future land use cost, in that the site would remain on the NYSDEC Registry of Inactive Hazardous Waste Disposal Sites and could not be used for certain land uses. The economic impact of this alternative is uncertain.

5.2.6 Alternative 5 - Stabilization

Compliance with SCGs: Since this alternative leaves soil contaminated with high levels of DDT on-site, chemical-specific SCGs would not be meet. No location specific SCGs have been identified. The location of the stabilized media would be designated a CAMU and would therefore not contravene any action-specific SCGs.

Overall Protection of Human Health and the Environment: The short term risks to the public and workers associated with this alternative could be easily mitigated with proper controls. This alternative eliminates exposure to surface soils and the potential for wind dispersion of contaminants, immobilizes contaminants, and provides for monitoring of groundwater. There is some risk because contaminants would remain onsite and could leach out into the environment.

Short-term Impacts and Effectiveness: There is potential for worker exposure during excavation and consolidation of DDT contaminated soil, installation of the cap, stabilization of contaminated media, and when dealing with the pesticide storage buildings and tanker trailers. This exposure could be significantly reduced through the use of dust suppression measures and personal protection equipment. Soil hauled offsite for treatment and disposal will present a short-term risk to the public. Dust suppression measures, properly covering trucks hauling contaminated soil, and site access restrictions would eliminate or greatly reduce any increased risk to the public or impacts to the environment during construction. The alternative could be implemented in approximately six to nine months.

Long-term Effectiveness and Permanence: This alternative would be effective and reliable at reducing exposure to humans and the environment. The contaminated soil would be contained in a concrete matrix with the contaminants immobilized. However, contaminants would still be in contact with groundwater resulting in some potential risk. The site would remain on the NYSDEC Registry of Inactive Hazardous Waste Disposal Sites as a Class 4 site (site is properly closed - requires continued management).

Reduction of Toxicity, Mobility, and Volume: Soil contaminated with both petroleum and DDT would be treated, thereby reducing the volume of contaminated soil. The soil contaminated with only DDT would remain on-site and its toxicity and volume would not be reduced. However, the concrete matrix would limit the mobility of the contaminants.

Implementability: The equipment and material needed to excavate contaminated soil, and mix and place concrete are commercially available. Adequate commercial incineration capacity is available for wastes to be treated offsite. The remedy could be implemented with available technology. There are no anticipated administrative or legal barriers to the implementation of this alternative. This alternative would require semi-annual sampling of groundwater.

Cost: The estimated capital cost for this alternative is $ 7,368,000. The annual O&M cost is $ 9,600. The present worth value of this alternative is $ 7,500,000 using a 6% discount rate over thirty years. There would be a future land use cost, in that the site would remain on the NYSDEC Registry of Inactive Hazardous Waste Disposal Sites and could not be used for certain land uses. The economic impact of this alternative is uncertain.

.2.7 Alternative 6 - Thermal Desorption

Compliance with SCGs: Since this alternative destroys all site-related contamination, chemical-specific SCGs would be meet. No location specific SCGs have been identified. This alternative would not contravene any action-specific SCGs since treated soil would either meet LDRs, or be placed in a location designated as a CAMU.

Overall Protection of Human Health and the Environment: This alternative destroys all site-related contaminants above levels of concern and is highly protective of human health and the environment.

Short-term Impacts and Effectiveness: There is potential for worker exposure during excavation and treatment of DDT contaminated soil, and when dealing with the pesticide storage buildings and tanker trailers. This exposure could be significantly reduced through the use of dust suppression measures and personal protection equipment. Dust suppression measures and site access restrictions would eliminate or greatly reduce any increased risk to the public or impacts to the environment during construction. The Thermal Desorption alternative utilizes a technology that will create air emissions that must be treated. This poses a short-term risk should the air emissions control device be breached. The alternative could be implemented in approximately nine to twelve months.

Long-term Effectiveness and Permanence: Contaminants would be permanently destroyed, eliminating the need for any future monitoring. Therefore, this alternative is permanently effective in the long-term. The site would likely be removed from the NYSDEC Registry of Inactive Hazardous Waste Disposal Sites when monitoring showed the site to no longer be a threat to human health or the environment.

Reduction of Toxicity, Mobility, and Volume: The mobility, toxicity, and volume of contaminated materials will be permanently reduced.

Implementability: The equipment needed to excavate and stockpile contaminated soil is commercially available. There are vendors who can supply the thermal desorption unit. The technology for the remedy is readily available and could be implemented. There would be no activities that would need coordination with other agencies during construction.

Cost: The estimated capital cost for this alternative is $ 3,839,000. The annual O&M cost is $ 6,800. The present worth value of this alternative is $3,867,000 using a 6% discount rate over thirty years. There would be no future land use cost, since contaminants would be destroyed and the site would be removed from the NYSDEC Registry of Inactive Hazardous Waste Disposal Sites and would be free for unrestricted use.

5.2.8 Alternative 7 - On-Site High Temperature Incineration

Compliance with SCGs: Since this alternative destroys all site-related contamination, chemical-specific SCGs would be meet. No location specific SCGs have been identified. Treated soil would meet LDRs, and therefore would not contravene any action-specific SCGs.

Overall Protection of Human Health and the Environment: This alternative destroys all site-related contaminants and therefore is highly protective of human health and the environment.

Short-term Impacts and Effectiveness: The most serious short-term risk associated with incineration is the possibility of contaminant emissions to the air. There is potential for worker exposure during excavation and treatment of DDT contaminated soil, and when dealing with the pesticide storage buildings and tanker trailers. These exposures could be significantly reduced through the use of appropriate air filtering devices, stack testing, dust suppression measures, and personal protection equipment. Proper treatment of air emissions, dust suppression measures, and site access restrictions would reduce any increased risk to the public or impacts to the environment during construction. The alternative could be implemented in approximately twelve to eighteen months.

Long-term Effectiveness and Permanence: Contaminants would be permanently destroyed, eliminating the need for any future monitoring. Therefore, this alternative is permanently effective in the long-term.

Reduction of Toxicity, Mobility, and Volume: The mobility, toxicity, and volume of contaminated materials will be permanently reduced.

Implementability: The remedy could be implemented from a technical standpoint, but would require extensive regulatory considerations. Complying with these regulations would require extensive coordination with other agencies before and during implementation.

Cost: The estimated capital cost for this alternative is $ 11,040,000. The annual O&M cost is $ 6,800. The present worth value of this alternative is $ 11,069,000 using a 6% discount rate over thirty years. There would be no future land use cost, since contaminants would be destroyed and the site would be removed from the NYSDEC Registry of Inactive Hazardous Waste Disposal Sites and would be free for unrestricted use.

5.2.9 Alternative 8 - Off-Site High Temperature Incineration

Compliance with SCGs: Since this alternative destroys all site-related contamination, chemical-specific SCGs would be meet. No location specific SCGs have been identified. Treated soil would meet LDRs, and therefore would not contravene any action-specific SCGs.

Overall Protection of Human Health and the Environment: This alternative destroys all site-related contaminants and therefore is highly protective of human health and the environment.

Short-term Impacts and Effectiveness: There is potential for worker exposure during excavation and hauling of DDT contaminated soil, and when dealing with the pesticide storage buildings and tanker trailers. A risk to the public is present during the hauling of contaminated soil for offsite treatment and disposal. Exposure could be significantly reduced through the use of dust suppression measures, proper covering of trucks, and personal protection equipment. Dust suppression measures and site access restrictions would eliminate or greatly reduce any increased risk to the public or impacts to the environment during construction. The alternative could be implemented in approximately three to six months.

Long-term Effectiveness and Permanence: Contaminants would be permanently destroyed, eliminating the need for any future monitoring. Therefore, this alternative is permanently effective in the long-term.

Reduction of Toxicity, Mobility, and Volume: The mobility, toxicity, and volume of contaminated materials will be permanently reduced.

Implementability: The remedy could be easily implemented.

Cost: The estimated capital cost for this alternative is $ 22,436,000. The annual O&M cost is $ 6,800. The present worth value of this alternative is $22,465,000 using a 6% discount rate over thirty years. There would be no future land use cost, since contaminants would be destroyed and the site would be removed from the NYSDEC Registry of Inactive Hazardous Waste Disposal Sites and would be free for unrestricted use.

5.3 Comparative Analysis of Alternatives

Compliance With SCGs

The No Action and Deed Restriction with Monitoring alternatives do not meet SCGs since they leave high levels of DDT onsite, in the presence of petroleum. Consolidation with Off-Site Treatment and Disposal, Consolidation with On-Site Treatment, On-Site Containment, Stabilization, Thermal Desorption, On-Site High Temperature Incineration, and Off-Site High Temperature Incineration meet SCGs since either a CAMU would be implemented or the contaminants would be destroyed. The applicability of LDRs and/or the need of a CAMU are outlined in Figure 8, Evaluation of Treatment/Disposal Alternatives.

Overall Protection of Human Health and the Environment

The No Action and Deed Restriction with Monitoring alternatives would not be protective of human health and the environment. The remaining alternatives would be protective of human health and

the environment. However, would be some risk involved in Consolidation (On-Site Treatment and Off-Site Treatment and Disposal) since high levels of DDT would remain untreated in contact with groundwater, and a lesser risk for the Stabilization alternative since stabilized contaminated media would be in contact with groundwater. If monitoring showed migration of DDT in the groundwater, further measures would have to be implemented to remediate the situation.

Short-Term Impacts and Effectiveness

The No Action and Deed Restriction with Monitoring alternatives would cause little or no increased short-term impacts since minimal intrusive work would take place. All the remaining alternatives would involve the excavation and handling of contaminated media. These actions could potentially impact worker health and safety, the environment, and the local community. Consolidation with On-Site Treatment, Stabilization, Thermal Desorption, and On-Site Incineration would involve more extensive soil handling than Consolidation with Off-Site Treatment and Disposal or On-Site Containment, since material would be stockpiled and processed for treatment over a longer period of time. However, the use of engineering controls would minimize and/or eliminate any possible impact. These controls would include air monitoring, personal protective equipment, and dust suppression measures.

Consolidation with Off-Site Treatment and Disposal and Off-Site Incineration would involve hauling contaminated materials offsite. This would involve a short-term risk due to possible spilling of contaminated media offsite. This could be mitigated by properly covering contaminated media and by establishing proper emergency spill response measures.

The Thermal Desorption alternative utilizes a technology that will create air emissions that must be treated. This poses a short-term risk should the air emissions control device be breached. On-Site Incineration poses an even greater short-term risk of releasing hazardous waste in air emissions. This risk may be reduced through the use of air treatment devices.

Long-Term Effectiveness and Permanence

The No Action and Deed Restriction with Monitoring alternatives are not effective in the long-term since high levels of DDT in the presence of petroleum would remain onsite.

Consolidation with On-Site Treatment and Consolidation with Off-Site Treatment and Disposal may be effective in the long-term since petroleum contaminated soil would be treated, surface exposure routes would be minimized, and the spread of contaminants would be minimized. There would, however, be some risk that contaminants could migrate in groundwater. Groundwater monitoring would have to be maintained and further measures would be necessary if groundwater contamination persisted.

Containment and Stabilization alternatives are more effective in the long term than Consolidation since contaminants would be encapsulated and would no longer be mobile. Although groundwater

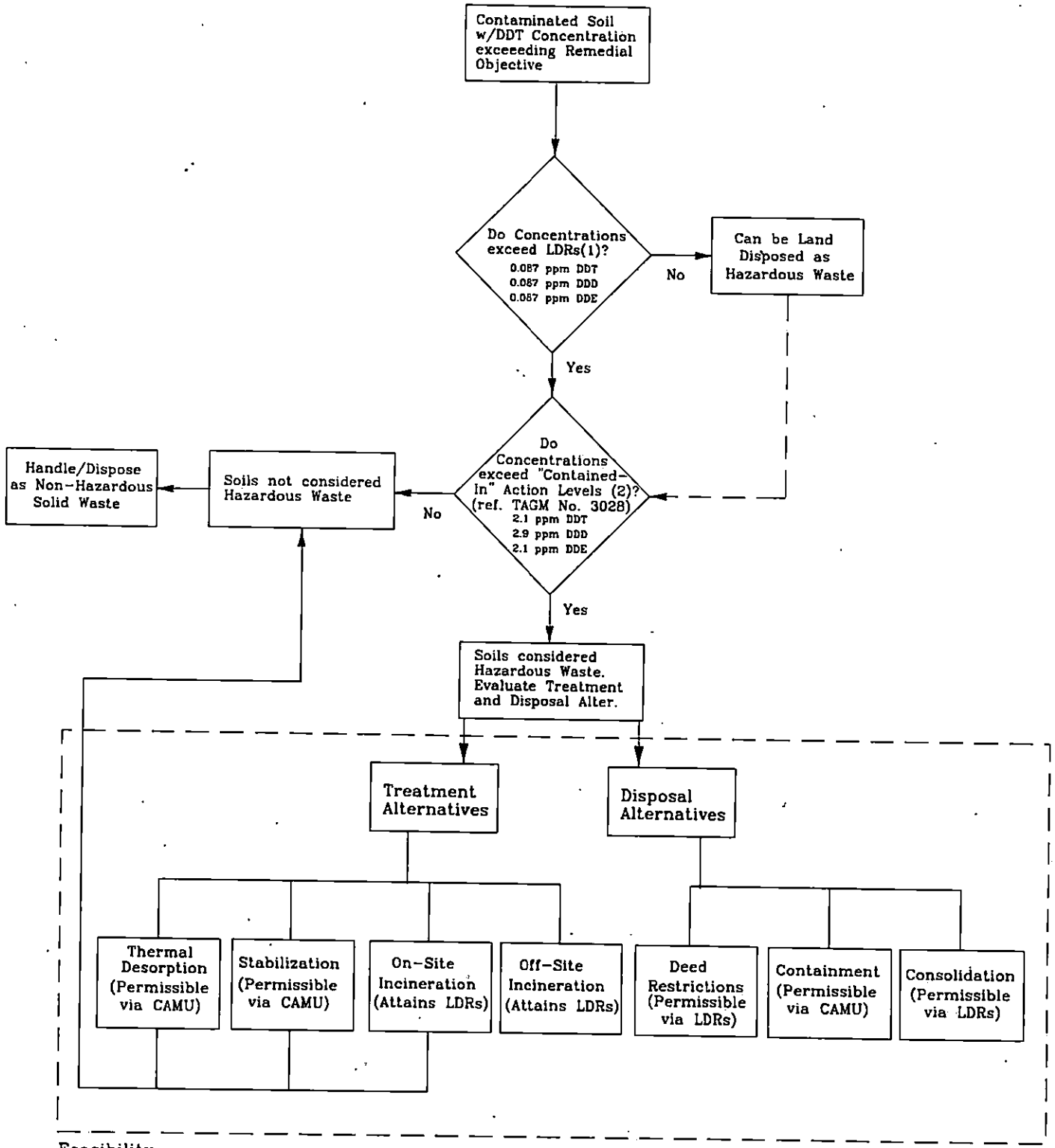


Figure 8

(1) LDRs – Land Disposal Restrictions: Treatment Standards for Hazardous Wastes destined for land disposal (ref. 6 NYCRR Part 376).

(2) TAGM 3028 – "Contained-In" Criteria: Environmental media containing hazardous contituents must be managed as hazardous wastes unless or until the media contain hazardous constituent concentrations which are at or below action level concentrations.

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monitoring would still be necessary, a greater degree of certainty to the effectiveness of these alternatives is present.

No Action, Deed Restriction with Monitoring, Consolidation with On-Site Treatment, Consolidation with Off-site Treatment and Disposal, Containment, and Stabilization alternatives require that the site remain on the NYS Registry of Inactive Hazardous Waste Disposal Sites as a Class 4 site.

Thermal Desorption, On-Site Incineration, and Off-Site Incineration offer the greatest degree of long term effectiveness since contaminants would be destroyed. These alternatives would require groundwater monitoring to ensure that groundwater SCGs were attained. If groundwater SCGs were attained, the site could be delisted from the NYS Registry of Inactive Hazardous Waste Disposal Sites.

Reduction of Toxicity, Mobility, and Volume

The No Action and Deed Restriction with Monitoring alternatives do not reduce toxicity, mobility, or volume. The Containment, Consolidation with On-Site Treatment, and Consolidation with Off-Site Treatment and Disposal alternatives reduce the volume of contaminated material by destroying soil contaminated by both pesticides and petroleum. The majority of the soil, however, will remain onsite with no change to its toxicity or volume, and only temporary reduction to its mobility. Stabilization will permanently reduce the mobility of the contaminants, but will not affect the toxicity or volume. Thermal Desorption, On-Site Incineration, and Off-Site Incineration will reduce the toxicity, mobility, and volume by destroying all contaminants.

Implementability

The No Action and Deed Restriction with Monitoring alternatives are the easiest to implement since little or no construction is necessary. The Consolidation with On-Site Treatment, Consolidation with Off-Site Treatment and Disposal, Off-Site Incineration, and Thermal Desorption alternatives are also easily implemented since they are easily engineered, materials and vendors are readily available, and there are no significant regulatory requirements. The stabilization and containment alternatives would require more engineering and a greater amount of quality control, but materials are readily available and there are no significant permit requirements needed for their implementation. Regulatory requirements for operation of an on-site incinerator are extensive. For these reasons, On-Site Incineration is the least implementable alternative.

Cost

A summary of the costs are presented below. The costs are the present worth based on a 6% discount rate over 30 years.

Table 4
Summary of Remedial Alternative Costs

Alternative		Capital Cost	Annual O&M	Present Worth Cost
1.	No Action	$ 0	$ 0	$ 0
2.	Deed Restrictions with Monitoring	$ 79,000	$ 26,000	$ 437,000
3a.	Consolidation with Off-Site Treatment and Disposal	$ 5,817,000	$ 19,400	$ 6,085,000
3b.	Consolidation with On-Site Treatment	$ 2,422,000	$ 19,400	$ 2,690,000
4.	On-Site Containment	$ 3,876,000	$ 34,500	$ 4,348,000
5.	Stabilization	$ 7,368,000	$ 9,500	$ 7,500,000
6.	Thermal Desorption	$ 3,839,000	$ 6,800	$ 3,867,000
7.	On-Site High Temperature Incineration	$ 11,040,000	$ 6,800	$ 11,069,000
8.	Off-Site High Temperature Incineration	$ 22,436,000	$ 6,800	$ 22,465,000

Table 5
Summary of Alternative Comparison

Alternative	Capital Cost	O&M	Present Worth	SCGs	Short-term	Long-term	Toxicity, Mobility, Volume	Implementability	Overall Protection	Meets RAOs
1. No Action	$ 0	$ 0	$ 0	U	E	U	U	E	U	U
2. Deed Restrictions with Monitoring	$ 79,000	$ 26,000	$ 437,000	U	E	U	U	E	U	U
3a. Consolidation with Off-Site Treatment and Disposal	$ 5,817,000	$ 19,400	$ 6,085,000	S	S	S	S	E	S	S
3b. Consolidation with On-Site Treatment	$ 2,422,000	$ 19,400	$ 2,690,000	S	S	S	S	E	S	S
4. On-Site Containment	$ 3,876,000	$34,500	$ 4,348,000	S	S	E	S	S	E	S
5. Stabilization	$ 7,368,000	$ 9,500	$ 7,500,000	S	S	E	S	S	S	S
6. Thermal Desorption	$ 3,839,000	$ 6,800	$ 3,867,000	E	S	E	E	E	E	E
7. On-Site High Temperature Incineration	$ 11,040,000	$ 6,800	$ 11,069,000	E	S	E	E	U	E	E
8. Off-Site High Temperature Incineration	$ 22,436000	$ 6,800	$ 22,465,000	E	S	E	E	E	E	E

U: Unsatisfactory. Does not meet criteria.
S: Satisfactory. Probably meets criteria. Some amount of uncertainty.
E: Excellent. Meets or exceeds criteria. High degree of certainty.

6.0 RECOMMENDED REMEDIAL ALTERNATIVE

The NYSDEC has performed a development and evaluation of remedial alternatives based on the guidance provided in TAGM 4030, *Selection of Remedial Actions at Hazardous Waste Sites*. Based on this analysis, the NYSDEC is recommending Thermal Desorption (Alternative 6) as the preferred remedial alternative.

6.1 Basis For Recommendation

The following alternatives were rejected:

No Action: This alternative is not protective of human health or the environment, does not meet/satisfy SCGs, and does not satisfy the RAOs.

Deed Restrictions with Monitoring: This alternative is not protective of human health or the environment, does not meet/satisfy SCGs, and does not satisfy the RAOs.

Consolidation with Off-Site Treatment and Disposal: This alternative is less protective of the environment than alternatives with a lower cost.

Stabilization: This alternative is less protective of the environment than alternatives with a lower cost.

On-Site Containment: This alternative is less protective of the environment than alternatives with a lower cost.

On-Site High Temperature Incineration: This alternative does not provide any additional protection of human health or the environment when compared to thermal desorption, has permitting difficulties, and has a significantly higher cost than other comparable alternatives.

Off-Site High Temperature Incineration: This alternative is rejected because it does not provide any additional protection of human health or the environment when compared to thermal desorption, and has the highest cost of the alternatives evaluated.

This evaluation left Thermal Desorption and Consolidation with On-Site Treatment as possible alternatives. Consolidation with On-Site Treatment has the advantage of being less expensive than Thermal Desorption. It should be noted however, that this cost savings does not reflect the cost of future land use, which cannot be accurately quantified because of the unknown future use of the property. In addition, the effectiveness of consolidation in protecting human health and the environment is much more uncertain. Although the RI suggests that DDT may not migrate in groundwater in the absence of petroleum, this cannot be confirmed at this stage. If the consolidation

alternative were implemented and groundwater monitoring reveled contravention of groundwater standards, an additional remedial measure would be necessary to mitigate that contamination. This scenario would make the Consolidation with On-Site Treatment much more expensive than Thermal Desorption.

CERCLA and 6 NYCRR 375-1.10 state a preference for remediation which permanently and significantly reduces the toxicity, mobility, or volume of hazardous substances. The NYSDEC gives preference to destructive technologies, since they permanently eliminate the cause of contamination. Consolidation with On-Site Treatment would leave contaminated soil on site that would require extensive monitoring and reporting. Thermal Desorption would eliminate the source of contamination and is a permanent remedy, requiring no future monitoring. Furthermore, by eliminating the source of contamination, the site would be free for unrestricted use and would be removed from the NYS Registry of Inactive Hazardous Waste Sites.

6.2 Conceptual Design

The implementation of the remedy is discussed below in general terms. The remedial design (RD) will address the components of the remedy in detail. During the RD it may be deemed appropriate to modify various components of the conceptual design to best accommodate the treatment unit and associated equipment as well as ongoing Nursery operations.

The conceptual design of the selected remedy includes on-site treatment of contaminated soil and sediment in a thermal desorption unit. Proper disposal the tanker trailers and pesticide storage buildings are also included in this design. There may be a need for treatment of contaminated water generated during dewatering activities.

The following areas would be marked out on site:

- Limits of exclusion zone
- Areas to be excavated
- Location of thermal desorption unit
- Location of soil dewatering and staging area
- Location of contractor trailers
- Location of decontamination trailer and area
- Location of water storage and treatment unit

Once these areas were established, the appropriate clearing and grubbing activities would commence. This would include the removal of trees in the White Pine Orchard, as shown on Figure 9. The dirt road to be used as temporary access to the mechanic shop would be improved by grading and adding crushed stone (if necessary). Temporary fencing would be erected to delineate the exclusion zone. The exclusion zone would include the soil staging and treatment area, all contaminated areas, and

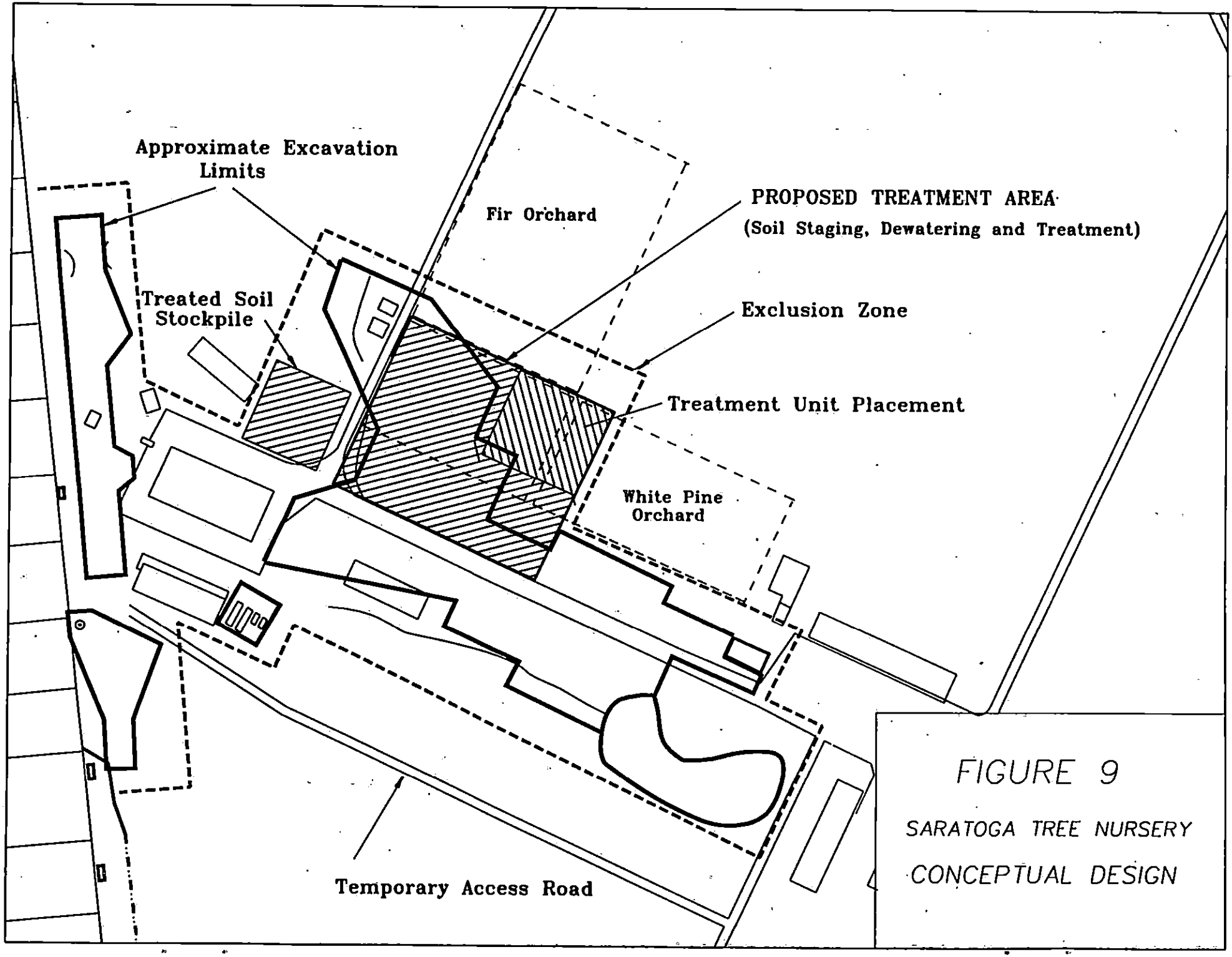

FIGURE 9

SARATOGA TREE NURSERY

CONCEPTUAL DESIGN

hauling roads used during remediation. Although access to the mechanic shop would be maintained, access to the shop would be limited to an as-needed basis only. Once exclusion zones are established, only personnel involved in the remedial action and who have proper training would be allowed in the exclusion areas.

A dewatering and staging area for contaminated soil and sediment would be constructed and would consist of a concrete slab sloped to a drain and sump. A mechanical means of dewatering sediment and soil could be employed if deemed necessary. Contaminated soil from the treatment area would be excavated and stockpiled in the staging area. Once confirmatory sampling has shown that soil contaminated above cleanup objectives have been removed from the treatment area, the thermal desorption unit, contractor trailers, and decontamination facilities would be mobilized on-site. Test runs would then begin to optimize the thermal desorption unit for site conditions.

Once decontamination facilities are established, pesticides in the pesticide storage buildings would be disposed off site. The walls and floor of the buildings would be cleaned and the wash water would be treated or disposed off site. The buildings would then be demolished and sent to a non-hazardous construction debris landfill. The two tanker trailers and two storage tanks located by the Smith barn would be emptied of their pesticide/petroleum residue and triple rinsed. The residue and wash water would be treated or sent off site for proper disposal. The tanker trailers and storage tanks would then be recycled as scrap metal.

The small pond would be dewatered by pumping pond water into temporary basin or holding tanks. Once dewatered, the top foot of pond sediment would be removed and hauled in a lined dump truck to the dewatering and staging area. When the sediment removal is complete, confirmatory samples on the floor and walls of the excavation would be collected. Excavation would continue until confirmatory samples show all sediment contaminated above cleanup objectives has been removed. Samples of the pond water would then be collected for analysis. If samples show the water is not contaminated, the water would be discharged to the pond. If samples show the water is contaminated, the water will be treated with activated carbon prior to its discharge to the pond.

Excavation and staging of contaminated soil would begin by removing soil to an appropriate depth based on data from the RI from affected portions of AOC 1. Using a combination of backhoes, bulldozers, and front end loaders; soil would be excavated and placed in dump trucks. Trucks would be covered and follow established haul roads to the staging area. Next, any areas of petroleum contamination would be excavated until all visually contaminated soil was removed (approximate depth of eight feet). To insure stability of the excavation walls, sheet piling or trench boxes may be necessary. Every effort would be made to perform this work when the groundwater table is low, however the high groundwater table typical on the site may make it necessary to carry out dewatering activities. Water generated during dewatering would be treated and disposed of on site. Soil saturated with water and/or petroleum would be loaded on to a lined truck and taken to the dewatering and staging area for treatment. Once confirmatory samples have demonstrated complete cleanup of affected areas, soil within fifteen feet of the excavation limits would be pushed into the

deeper excavations to further limit exposure to humans or wildlife from residual levels of DDT. AOCs 2, 4, 5, and 6 would be remediated in a manner consistent with AOC 1.

As soil is stockpiled in the staging area, it would be screened and fed into the thermal desorption unit. A schematic of a typical thermal desorption unit, as described in Section 4.1.7, is shown in Figure 10. The thermal desorption unit would be equipped with an air collection and carbon

adsorption system to capture emissions from the treatment process. Contaminants removed during the thermal desorption process would be treated and disposed of offsite, or treated onsite by base catalyzed decomposition (see Section 4.1.7 for a description of the process). Confirmatory samples would be collected from treated soil. If samples show the soil has been treated to below the cleanup goal of 10 ppm, the soil would be stockpiled in a clean area for backfill in the excavated areas.

Once a significant amount of treated soil has been stockpiled, backfilling operations would commence. Backfilled areas would be properly compacted and graded to pre-remedial site conditions or other elevations deemed appropriate to promote drainage or accommodate planned future use of the area. Areas would be seeded or paved. Ceder trees would be re-planted as necessary along the western nursery boundary to re-establish the visual barrier disturbed during remedial activities. The thermal desorption unit, contractor trailers, and decontamination facilities would be demobilized and/or removed. Finally, all access control devices would be removed, completing the remedial action.

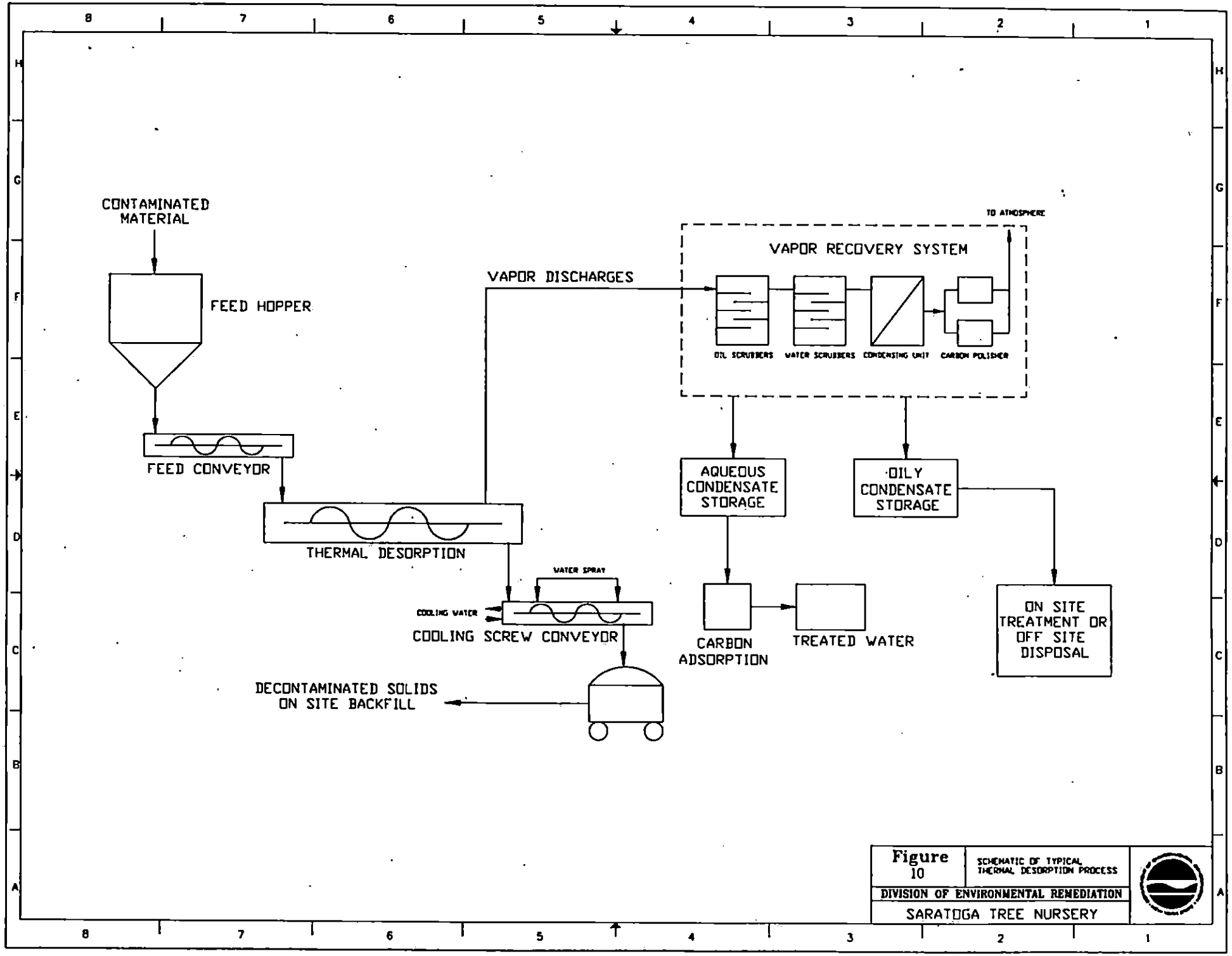

Figure 10	SCHEMATIC OF TYPICAL THERMAL DESORPTION PROCESS
DIVISION OF ENVIRONMENTAL REMEDIATION	
SARATOGA TREE NURSERY	

APPENDIX

COST ESTIMATES FOR REMEDIAL ALTERNATIVES

ALTERNATIVE 2: DEED RESTRICTIONS WITH MONITORING

#	Item	Quantity	Unit	Unit Cost	Cost
	Construction Costs				
1	Provide/Install Fence (6' Galvanized)	4100	LF	$13.72	$56,252
2	Monitoring Well Installation	7	WELL	$1,000	$7,000
	TOTAL CONSTRUCTION COSTS				$63,252
	Engineering Costs				
	Engineering and permitting (10% of total direct costs)				$6,325
	Contingency (15% of total direct costs)				$9,488
	TOTAL ENGINEERING COSTS				$15,813
	Operation and Maintenance Costs				
3	Analytical testing (30 yrs. @ 6%)	1	LS	$357,800	$357,800
	TOTAL OPERATION AND MAINTENANCE COSTS				$357,800
	TOTAL PROJECT COSTS				$436,865

NOTES

1 Unit cost from 1996 Means Environmental Restoration Unit Cost Book

3 Assumes DEC personnel sample wells and prepare summary report. Cost present worth over 30 yrs. at 6%
Two samples per well per year @ $1000/sample

ALTERNATIVE 3A: CONSOLIDATION WITH OFF-SITE TREATMENT AND DISPOSAL

Item No.	Item	Quantity	Unit	Unit Cost	Cost
	Construction Costs				
1	Mobilization				
2	Site Preperation (clearing, grubbing, and erosion control)	1	LS	$5,000	$5,000
3	Miscellaneous Requirements(Survey, Progress&Record	9	Month	$4,000	$36,000
4	Decontamination Plan	8	Month	$17,300	$138,400
5	Excavate/Load Soil	14000	CY	$10	$140,000
6	Excavate/Load Sediment	1,000	CY	$25	$25,000
7	Post-excavation confirmatory samples (pesticides)	100	SAMPLE	$40	$4,000
8	Soil/Sed. Dewatering (incl. water trmt.)	1	LS	$10,000	$10,000
9	Place/Backfill Excavated Material	11,500	CY	$4.86	$55,890
10	Off-Site Treatment of Oil-Contaminated Soil	3,500	CY	$1,097	$3,839,500
11	Provide/Place Topsoil (12") Cover	4,700	CY	$30.20	$141,940
12	Provide/Place 60 Mil Geomembrane	6,500	SY	$14.58	$94,770
13	Restore Excavated Area				
14	Backfill Excavations with Clean (Gravel) Fill	15,000	CY	$7.12	$106,800
15	Seed	3	ACRE	$391	$1,173
16	Replace Roadway Base (18" Gravel Base)	800	CY	$14.78	$11,824
17	RePave Roadway	13,245	SF	$1	$13,245
18	Replant Cedar Trees	20	TREE	$130	$2,600
19	Provide/Install Fence (6' Galvanized)	1000	LF	$13.72	$13,720
20	Tanker Trailer Decomissioning				
21	Power wash tanker trailers	1,400	SF	$1.67	$2,338
22	Treat/Dispose of liquid hazardous waste	250	GAL	$14	$3,500
23	Scrap tanker trailers	NA	NA	NC	$0
24	Demolish pesticide buildings	12,000	CF	$0.09	$1,080
25	Monitoring well installation	7	WELL	$1,000	$7,000
	TOTAL CONSTRUCTION COSTS				$4,653,780
	Engineering Costs				
	Engineering and permitting (10% of total direct costs)				$465,378
	Contingency (15% of total direct costs)				$698,067
	TOTAL ENGINEERING COSTS				$1,163,445
	Operation and Maintenance Costs				
28	Monitoring/Inspection and reporting (30 yrs. @ 6%)	1	LS	$114,000	$114,000
29	Analytical testing (30 yrs. @ 6%)	1	LS	$115,500	$115,500
30	Other	1	LS	$38,000	$38,000
	TOTAL OPERATION AND MAINTENANCE COSTS				$267,500
	TOTAL PROJECT COSTS				$6,084,725

NOTES (refer to item no.):

3 Cost from Metro-North Railroad Construction Bids. Includes NYS Licensed survey, progress drawings, record material order submittals, site meetings, and other miscellaneous items.
4 Cost from Metro-North Railroad Construction Bids. Includes preparation and submittal of decontamination plan equipment for decon and washwater collection, sampling required to certify decon effectiveness, and disposal
7 Unit cost approx for DDT Immunoassay Test Kit
9 Unit cost from 1996 Means Environmental Restoration Assemblies Cost Book
10 Est. from Westinghouse OU-1 FS
11 Unit cost from 1996 Means Environmental Restoration Assemblies Cost Book
12 Unit cost from 1996 Means Environmental Restoration Unit Cost Book
14 Unit cost from 1996 Means Environmental Restoration Assemblies Cost Book
15 Unit cost from 1996 Means Environmental Restoration Assemblies Cost Book
16 Unit cost from 1996 Means Environmental Restoration Assemblies Cost Book
17 Unit cost from 1996 Means Environmental Restoration Assemblies Cost Book
18 Tree replacement costs as per 1996 Means Site Work & Landscape Cost Data, Douglas Pyramidal Arborvitae, 7-8' ($80/tree+50/planting= $130/planted tree)
19 Unit cost from 1996 Means Environmental Restoration Unit Cost Book
21 Unit cost from 1996 Means Environmental Restoration Assemblies Cost Book
22 Unit cost from Clean Harbours, Inc.
23 Can be reclaimed as scrap at no cost
28 Weekly inspections of cap. Annual training of inspector. Annual report to Commisioner
29 Assumes DEC personnel sample wells and prepare summary report. Two samples per well @ $200.sample.
30 Cap maintenance by DEC personnel

ALTERNATIVE 3B: CONSOLIDATION WITH ON-SITE TREATMENT

Item No.	Item	Quantity	Unit	Unit Cost	Cost
	Construction Costs				
1	Mobilization				
2	Site Preperation (clearing, grubbing, and erosion control)	1	LS	$5,000	$5,000
3	Miscellaneous Requirements(Survey, Progress&Record Drawings,etc.	9	Month	$4,000	$36,000
4	Decontamination Plan	8	Month	$17,300	$138,400
5	Excavate/Load Soil	14000	CY	$10	$140,000
6	Excavate/Load Sediment	1,000	CY	$25	$25,000
7	Post-excavation confirmatory samples (pesticides)	100	SAMPLE	$40	$4,000
8	Soil/Sed. Dewatering (incl. water trmt.)	1	LS	$10,000	$10,000
9	Place/Backfill Excavated Material	11,500	CY	$4.86	$55,890
10	Off-Site Treatment of Oil-Contaminated Soil				
11	Mobilization: Desorption Unit	1	LS	$300,000	$300,000
12	Treatment of Soil	3,500	CY	$230	$805,000
13	Post Treatment Confirmatory Sampling	35	SAMPLE	$40	$1,400
14	Backfill With Treated Soil	3,500	CY	$4.86	$17,010
15	Provide/Place 60 Mil Geomembrane	6,500	SY	$14.58	$94,770
16	Provide/Place Topsoil (12") Cover	4,700	CY	$30.20	$141,940
17	Restore Excavated Area				
18	Backfill Excavations with Clean (Gravel) Fill	15,000	CY	$7.12	$106,800
19	Seed	3	ACRE	$391	$1,173
20	Replace Roadway Base (18" Gravel Base)	800	CY	$14.78	$11,824
21	RePave Roadway	13,245	SF	$1	$13,245
22	Replant Cedar Trees	20	TREE	$130	$2,600
23	Provide/Install Fence (6' Galvanized)	1000	LF	$13.72	$13,720
24	Tanker Trailer Decomissioning				
25	Power wash tanker trailers	1,400	SF	$1.67	$2,338
26	Treat/Dispose of liquid hazardous waste	250	GAL	$14	$3,500
27	Scrap tanker trailers	NA	NA	NC	$0
28	Demolish pesticide buildings	12,000	CF	$0.09	$1,080
30	Monitoring well installation	7	WELL	$1,000	$7,000
	TOTAL CONSTRUCTION COSTS				$1,937,690
	Engineering Costs				
	Engineering and permitting (10% of total direct costs)				$193,769
	Contingency (15% of total direct costs)				$290,654
	TOTAL ENGINEERING COSTS				$484,423
	Operation and Maintenance Costs				
31	Monitoring/Inspection and reporting (30 yrs. @ 6%)	1	LS	$114,000	$114,000
32	Analytical testing (30 yrs. @ 6%)	1	LS	$115,500	$115,500
33	Other	1	LS	$38,000	$38,000
	TOTAL OPERATION AND MAINTENANCE COSTS				$267,500
	TOTAL PROJECT COSTS				$2,689,613

NOTES (refer to item no.):

3 Cost from Metro-North Railroad Construction Bids. Includes NYS Licensed survey, progress drawings, record drawings, sch material order submittals, site meetings, and other miscellaneous items.
4 Cost from Metro-North Railroad Construction Bids. Includes preparation and submittal of decontamination plan, labor and equipment for decon and washwater collection, sampling required to certify decon effectiveness, and disposal of decon wate
7 Unit cost approx for DDT Immunoassay Test Kit
9 Unit cost from 1996 Means Environmental Restoration Assemblies Cost Book
15 Unit cost from 1996 Means Environmental Restoration Unit Cost Book
16 Unit cost from 1996 Means Environmental Restoration Assemblies Cost Book
18 Unit cost from 1996 Means Environmental Restoration Assemblies Cost Book
19 Unit cost from 1996 Means Environmental Restoration Assemblies Cost Book
20 Unit cost from 1996 Means Environmental Restoration Assemblies Cost Book
21 Unit cost from 1996 Means Environmental Restoration Assemblies Cost Book
22 Tree replacement costs as per 1996 Means Site Work & Landscape Cost Data, Douglas Pyramidal Arborvitae, 7-8' ($80/tree+50/planting= $130/planted tree)
23 Unit cost from 1996 Means Environmental Restoration Unit Cost Book
25 Unit cost from 1996 Means Environmental Restoration Assemblies Cost Book
26 Unit cost from Clean Harbours, Inc.
27 Can be reclaimed as scrap at no cost
31 Weekly inspections of cap. Annual training of inspector. Annual report to Commisioner
32 Assumes DEC personnel sample wells and prepare summary report. Two samples per well @ $200.sample. Cost present
33 Cap maintenance by DEC personnel

ALTERNATIVE 4: ON-SITE CONTAINMENT

Item No.	Item	Quantity	Unit	Unit Cost	Cost
	Construction Costs				
1	Mobilization				
2	Site Preperation (clearing, grubbing, and erosion control)	1	LS	$10,000	$10,000
3	Miscellaneous Requirements(Survey, Progress&Record Drawings,etc.	9	Month	$4,000	$36,000
4	Temporary Facilities	8	Month	$58,000	$464,000
5	Decontamination Plan	8	Month	$17,300	$138,400
6	Cell Construction				
7	Excavate/Load Soil	14000	CY	$10	$140,000
8	Excavate/Load Sediment	1,000	CY	$25	$25,000
9	Post-excavation confirmatory samples (pesticides)	100	SAMPLE	$40	$4,000
10	Soil/Sed. Dewatering (incl. water trmt.)	1	LS	$10,000	$10,000
11	Provide/Place Select Barrier Soil/Fill (18" @ 6" lifts)	50,000	CY	$14.78	$739,000
12	Provide/Place 10E-7 Clay	12,000	CY	$12.10	$145,200
13	Provide/Place 60 Mil Geomembrane	20,000	SY	$14.58	$291,600
14	Provide/Place 10E-2 Soil (Sand, hand-backfilled)	6,200	CY	$24.38	$151,156
15	Provide/Place 6" ID PVC Piping	225	LF	$5.44	$1,224
16	Provide/Place Geotextile Filter (130 mil)	11,000	SY	$2.29	$25,190
17	Place Fill/Waste (6" lifts)	13,500	CY	$4.86	$65,610
18	Provide/Place Geotextile Filter (60 mil)	8,000	SY	$1.29	$10,320
19	Provide/Place 10E-3 Soil (Gravel, 6" lifts)	2,000	CY	$14.78	$29,560
20	Install Gas Venting Pipes (6" PVC)	100	LF	$5.44	$544
21	Provide/Place Geonet (Geotextile 2 sides)	8,000	SY	$5.94	$47,520
22	Provide/Place Topsoil (6") Cover	16,000	CY	$30.20	$483,200
23	Provide/Install Fencing (6' Galvanized)	1,200	LF	$13.72	$16,464
24	Restore Excavated Area				
25	Backfill Excavations with Clean (Gravel) Fill	15,000	CY	$7.12	$106,800
26	Seed	3	ACRE	$391	$1,173
27	Replace Roadway Base (18" Gravel Base)	800	CY	$14.78	$11,824
28	RePave Roadway	13,245	SF	$1	$13,245
29	Replant Cedar Trees	20	TREE	$130	$2,600
30	Tanker Trailer Decomissioning				
31	Power wash tanker trailers	1,400	SF	$1.67	$2,338
32	Treat/Dispose of liquid hazardous waste	250	GAL	$14	$3,500
33	Scrap tanker trailers	NA	NA	NC	$0
34	Demolish pesticide buildings	12,000	CF	$0.09	$1,080
35	Monitoring well installation	5	WELL	$1,000	$5,000
	TOTAL CONSTRUCTION COSTS				$2,981,548
	Engineering Costs				
	Engineering and permitting (15% of total direct costs)				$447,232
	Contingency (15% of total direct costs)				$447,232
	TOTAL ENGINEERING COSTS				$894,464
	Operation and Maintenance Costs				
36	Monitoring/Inspection and reporting (30 yrs. @ 6%)	1	LS	$114,000	$114,000
37	Analytical testing (30 yrs. @ 6%)	1	LS	$302,700	$302,700
38	Other	1	LS	$55,500	$55,500
	TOTAL OPERATION AND MAINTENANCE COSTS				$472,200
	TOTAL PROJECT COSTS				$4,348,212

NOTES (refer to item no.):

3 Cost from Metro-North Railroad Construction Bids. Includes NYS Licensed survey, progress drawings, record drawings, sched material order submittals, site meetings, and other miscellaneous items.

4 Cost from Metro-North Railroad Construction Bids. Includes temperary warning tape, fencing, signs and access control; tempo facilities during construction (water, electricity, telephone, sanitary, contractor and engineer trailers); trash removal; security; erosion and sedimentation control, staging, stockpiling, and loading areas; dust suppression; and landfill cover during construct

5 Cost from Metro-North Railroad Construction Bids. Includes preparation and submittal of decontamination plan, labor and equipment for decon and washwater collection, sampling required to certify decon effectiveness, and disposal of decon water.

9 Unit cost approx for DDT Immunoassay Test Kit

11 Unit cost from 1996 Means Environmental Restoration Unit Cost Book

12 Unit cost from 1996 Means Environmental Restoration Unit Cost Book

13 Unit cost from 1996 Means Environmental Restoration Unit Cost Book

14 Unit cost from 1996 Means Environmental Restoration Unit Cost Book

15 Unit cost from 1996 Means Environmental Restoration Unit Cost Book

16 Unit cost from 1996 Means Environmental Restoration Unit Cost Book

18 Unit cost from 1996 Means Environmental Restoration Unit Cost Book

19 Unit cost from 1996 Means Environmental Restoration Unit Cost Book

21 Unit cost from 1996 Means Environmental Restoration Unit Cost Book

22 Unit cost from 1996 Means Environmental Restoration Unit Cost Book

23 Unit cost from 1996 Means Environmental Restoration Unit Cost Book

24 Unit cost from 1996 Means Environmental Restoration Unit Cost Book

25 Unit cost from 1996 Means Environmental Restoration Unit Cost Book

26 Unit cost from 1996 Means Environmental Restoration Unit Cost Book

29 Unit cost from 1996 Means Environmental Restoration Unit Cost Book

31 Unit cost from Clean Harbours, Inc.

33 Can be reclaimed as scrap at no cost

34 Unit cost from 1996 Means Environmental Restoration Unit Cost Book

35 Unit cost from 1996 Means Environmental Restoration Unit Cost Book

36 Weekly inspections of cap. Annual training of inspector. Annual report to Commisioner

37 Assumes DEC personnel sample wells and prepare summary report. Two samples per well @ $1000.sample.

38 Cap maintenance by DEC personnel

ALTERNATIVE 5: STABILIZATION

#	Item	Quantity	Unit	Unit Cost	Cost
	Construction Costs				
1	Mobilization/Demobilization	NA	NA	$0	$0
2	Site Preperation (clearing, grubbing, and erosion control)	1	LS	$5,000	$5,000
3	Decontamination Plan	8	Month	$17,300	$138,400
4	Excavate and haul soil	14,000	CY	$10	$140,000
5	Excavate and haul sediment	1,000	CY	$25	$25,000
6	Post-excavation confirmatory samples (pesticides)	100	SAMPLE	$40	$4,000
7	Soil/sediment dewatering & water treatment	1	LS	$10,000	$10,000
8	Treatment of Soil				
9	Coarse Aggregate	20,520	CY	$21	$437,281
10	Portland Cement	6,750	TONS	$150	$1,012,500
11	6" Structural Slab	400	SF	$4	$1,656
12	Water Tank	6	MO	$1,498	$8,988
13	Water Pump, 3" Self-Priming w/10 HP Motor	1	EA	$3,710	$3,710
14	10 CY Mixing System	6	MO	$4,965	$29,790
15	Belt Feeder for 10 CY Mixing System	1	EA	$12,236	$12,236
16	Dust Collection w/2HP Blower and Controls	1	EA	$3,567	$3,567
17	7.5 HP Sludge Pump, 1" Max. Partical Size	6	MO	$999	$5,994
18	Operational Labor	1,040	HR	$44	$45,760
19	High Pressure Water System	1	EA	$2,748	$2,748
20	Placement	27,000	CY	$4.76	$128,520
21	Offsite Incineration/Disposal of Oil/Petrol. Cont. Soil	3,500	CY	$1,097	$3,839,500
22	Post-treatment confirmatory samples (pesticides)	40	SAMPLE	$200	$8,000
23	Restore excavated area				
24	Seed	3	ACRE	$391	$1,173
25	Replace Roadway Base (18" Gravel Base)	800	CY	$14.78	$11,824
26	Pave	0	SF	$0	$0
27	Replant Cedar Trees	20	TREE	$130	$2,600
28	Tanker Trailer Decomissioning				
29	Power wash tanker trailers	1,400	SF	$1.67	$2,338
30	Treat/Dispose of liquid hazardous waste	250	GAL	$14	$3,500
31	Scrap tanker trailers	NA	NA	NC	$0
32	Demolish pesticide buildings	12,000	CF	$0.09	$1,080
33	Dispose of pesticide buildings	450	CY	$8.53	$3,838
34	Monitoring Well Installation	5	WELL	$1,000	$5,000
	TOTAL CONSTRUCTION COSTS				$5,894,004
	Engineering Costs				
	Engineering and permitting (10% of total direct costs)				$589,400
	Contingency (15% of total direct costs)				$884,101
	TOTAL ENGINEERING COSTS				$1,473,501
	Operation and Maintenance Costs				
35	Monitoring/Inspection and reporting (30 yrs. @ 6%)	1	LS	$28,100	$28,100
36	Analytical testing (30 yrs. @ 6%)	1	LS	$104,500	$104,500
37	Other	1	LS	$0	$0
	TOTAL OPERATION AND MAINTENANCE COSTS				$132,600
	TOTAL PROJECT COSTS				**$7,500,105**

NOTES

1 Cost included in items 9-20
3 Cost from Metro-North Railroad Construction Bids. Includes preparation and submittal of decontamination plan, l equipment for decon and washwater collection, sampling required to certify decon effectiveness, and disposal of
6 Unit cost approx for DDT Immunoassay Test Kit
9 Unit costs as per 1996 Means Site Work & Landscape Cost Data
10 Unit costs as per 1996 Means Site Work & Landscape Cost Data
11 Unit cost from 1996 Means Environmental Restoration Unit Cost Book
12 Unit cost from 1996 Means Environmental Restoration Unit Cost Book
13 Unit cost from 1996 Means Environmental Restoration Unit Cost Book
14 Unit cost from 1996 Means Environmental Restoration Unit Cost Book
15 Unit cost from 1996 Means Environmental Restoration Unit Cost Book
16 Unit cost from 1996 Means Environmental Restoration Unit Cost Book
17 Unit cost from 1996 Means Environmental Restoration Unit Cost Book
18 Unit cost from 1996 Means Environmental Restoration Unit Cost Book
19 Unit cost from 1996 Means Environmental Restoration Unit Cost Book
20 Unit costs as per 1996 Means Site Work & Landscape Cost Data
21 Unit cost from Westinghouse OU1 FS estimate
22 TCLP extration method with an analysis for DDT. TCL Pesticides cost approx. $200.
24 Unit cost as per 1996 Means Environmental Restoration Assemblies Cost Book
25 Unit cost as per 1996 Means Environmental Restoration Assemblies Cost Book
26 Assume road replaced with stabilized mixture
27 Tree replacement costs as per 1996 Means Site Work & Landscape Cost Data, Douglas Pyramidal Arborvitae, 7-8' ($80/tree+50/planting= $130/planted tree)
29 Unit cost from 1996 Means Environmental Restoration Unit Cost Book
30 Unit cost from Clean Harbours, Inc.
31 Can be reclaimed as scrap at no cost
32 Unit cost from 1996 Means Environmental Restoration Unit Cost Book
33 Unit cost from 1996 Means Environmental Restoration Unit Cost Book
35 Annual report to Commisioner
36 Assumes DEC personnel sample wells and prepare summary report. Two samples per well @ $200.sample. Co

ALTERNATIVE 6: THERMAL DESORPTION

Item No.	Item	Quantity	Unit	Unit Cost	Cost
	Direct Construction Costs				
1	Mobilization/Demobilization	NA	LS	NA	$0
2	Site Preperation (clearing, grubbing, and erosion control)	1	LS	$5,000	$5,000
3	Decontamination Plan	8	Month	$17,300	$138,400
4	Excavate/Load Soil	14,000	CY	$10	$140,000
5	Excavate/Load Sediment	1,000	CY	$25	$25,000
6	Post-excavation confirmatory samples (pesticides)	100	SAMPLE	$40	$4,000
7	Soil/sediment dewatering & water treatment	1	LS	$10,000	$10,000
8	Treatment of Soil/Sediment/Concrete/Oil	15,000	CY	$175	$2,625,000
9	Post-treatment confirmatory samples (pesticides)	150	SAMPLE	$40	$6,000
10	Backfill with treated soil (6" Lifts)	15,000	CY	$4.86	$72,900
11	Restore excavated area				
12	Seed	3	ACRE	$391	$1,173
13	Replace Roadway Base (18" Gravel Base)	800	CY	$14.78	$11,824
14	Repave Roadway	13,245	SF	$1	$13,245
15	Replant Cedar Trees	20	TREE	$130	$2,600
16	Tanker Trailer Decomissioning				
17	Power wash tanker trailers	1,400	SF	$1.67	$2,338
18	Treat/Dispose of liquid hazardous waste	250	GAL	$14	$3,500
19	Scrap tanker trailers	NA	NA	NC	$0
20	Demolish pesticide buildings	12,000	CF	$0.09	$1,080
21	Dispose of pesticide buildings	450	CY	$8.53	$3,838
22	Monitoring well installition	5	WELL	1000	$5,000
	TOTAL DIRECT COSTS				$3,070,899
	Indirect Costs				
	Engineering and permitting (10% of total direct costs)				$307,090
	Contingency (15% of total direct costs)				$460,635
	TOTAL ENGINEERING COSTS				$767,725
	OPERATION AND MAINTENANCE				
23	Analytical testing (5 yrs. @ 6%)	1	LS	28600	$28,600
	TOTAL PROJECT COSTS				**$3,867,223**

NOTES (refer to item no.):

1 Estimate from ETG Environmental included mob/demob in unit cost (item 8)
3 Cost from Metro-North Railroad Construction Bids. Includes preparation and submittal of decontamination plan, la equipment for decon and washwater collection, sampling required to certify decon effectiveness, and disposal of de
6 Unit cost approx for DDT Immunoassay Test Kit
8 Estimate from ETG Environmental, 200-300/Ton, 155-230/CY, Use 175
9 1 sample per 100 CY as per Almy Bros. project, unit cost approx for DDT Immunoassay Test Kit
10 Unit cost from 1996 Means Environmental Restoration Unit Cost Book
12 Unit cost from 1996 Means Environmental Restoration Unit Cost Book
14 Estimated cost from Almy Bros. FS
15 Tree replacement costs as per 1996 Means Site Work & Landscape Cost Data, Douglas Pyramidal Arborvitae, 7-8' ($80/tree+50/planting= $130/planted tree)
17 Unit cost from 1996 Means Environmental Restoration Assemblies Cost Book
18 Quote from Clean Harbours Inc. for offsite disposal
19 Can be reclaimed as scrap at no cost
20 Unit cost from 1996 Means Environmental Restoration Unit Cost Book
21 Unit cost from 1996 Means Environmental Restoration Unit Cost Book

ALTERNATIVE 7: ON-SITE HIGH TEMPERATURE INCINERATION

Item No.	Item	Quantity	Unit	Unit Cost	Cost
	Construction Costs				
1	Mobilization/Demobilization	1	LS	$1,065,000	$1,065,000
2	Site Preperation (clearing, grubbing, and erosion control)	1	LS	$5,000	$5,000
3	Decontamination Plan	8	Month	$17,300	$138,400
4	Excavate and haul soil	14,000	CY	$10	$140,000
5	Excavate and haul sediment	1,000	CY	$25	$25,000
6	Post-excavation confirmatory samples (pesticides)	100	SAMPLE	$40	$4,000
7	Soil/sediment dewatering & water treatment (incl. decon water)	1	LS	$10,000	$10,000
8	Incineration of Soil/Sediment/Concrete/Oil	15,000	CY	$425	$6,375,000
9	Post-treatment confirmatory samples (pesticides)	150	SAMPLE	$40	$6,000
10	Backfill with treated soil (6" Lifts)	15,000	CY	$4.86	$72,900
11	Restore excavated area				
12	Seed	3	ACRE	$391	$1,173
13	Replace Roadway Base (18" Gravel Base)	800	CY	$14.78	$11,824
14	RePave Roadway	13,245	SF	$1	$13,245
15	Replant Cedar Trees	20	TREE	$130	$2,600
16	Tanker Trailer Decomissioning				
17	Power wash tanker trailers	1,400	SF	$1.67	$2,338
18	Treat/Dispose of liquid hazardous waste	250	GAL	$14	$3,500
19	Scrap tanker trailers	NA	NA	NC	$0
20	Demolish pesticide buildings	12,000	CF	$0.09	$1,080
21	Dispose of pesticide buildings	450	CY	$8.53	$3,838
22	Monitoring well installation	5	WELL	1000	$5,000
	TOTAL CONSTRUCTION COSTS				$7,885,899
	Engineering Costs				
	Engineering and permitting (25% of total direct costs)				$1,971,475
	Contingency (15% of total direct costs)				$1,182,885
	TOTAL ENGINEERING COSTS				$3,154,359
	OPERATION AND MAINTENANCE				
23	Analytical testing (5 yrs. @ 6%)	1	LS	28600	$28,600
	TOTAL PROJECT COSTS				**$11,068,858**

NOTES (refer to item no.):

1 Estimate from Westinghouse feasibility study
3 Cost from Metro-North Railroad Construction Bids. Includes preparation and submittal of decontamination plan, labo equipment for decon and washwater collection, sampling required to certify decon effectiveness, and disposal of dec
6 Unit cost approx for DDT Immunoassay Test Kit
8 Unit cost from Westinghouse OU-1 FS ($325/ton = $425/cy)
9 1 sample per 100 CY as per Almy Bros. project, unit cost approx for DDT Immunoassay Test Kit
10 Estimate from Westighouse OU-1 FS
12 Unit cost from 1996 Means Environmental Restoration Assemblies Cost Book
14 Estimated cost from Almy Bros. FS
15 Tree replacement costs as per 1996 Means Site Work & Landscape Cost Data, Douglas Pyramidal Arborvitae, 7-8' ($80/tree+50/planting= $130/planted tree)
17 Unit cost from 1996 Means Environmental Restoration Assemblies Cost Book
18 Unit cost from Clean Harbours, Inc.
19 Can be reclaimed as scrap at no cost
20 Unit cost from 1996 Means Environmental Restoration Assemblies Cost Book
21 Unit cost from 1996 Means Environmental Restoration Unit Cost Book

ALTERNATIVE 8: OFF-SITE HIGH TEMPERATURE INCINERATION

Item No.	Item	Quantity	Unit	Unit Cost	Cost
	Construction Costs				
1	Mobilization/Demobilization	1	LS	$0	$0
2	Site Preperation (clearing, grubbing, and erosion control)	1	LS	$5,000	$5,000
3	Decontamination Plan	8	Month	$17,300	$138,400
4	Excavate/Load soil	14,000	CY	$10	$140,000
5	Excavate/Load sediment	1,000	CY	$25	$25,000
6	Post-excavation confirmatory samples (pesticides)	100	SAMPLE	$40	$4,000
7	Soil/sediment dewatering & water treatment (incl. decon water)	1	LS	$10,000	$10,000
8	Hauling Cont. Soil	15,000	CY	$68	$1,020,000
9	Offsite Incineration/Disposal of Cont. Soil	15,000	CY	$1,097	$16,455,000
10	Restore excavated area				
11	Backfill Excavations with Clean (Gravel) Fill	15,000	CY	$7.12	$106,800
12	Seed	3	ACRE	$391	$1,173
13	Replace Roadway Base (16" Gravel Base)	800	CY	$14.78	$11,824
14	RePave Roadway	13,245	SF	$1	$13,245
15	Replant Cedar Trees	20	TREE	$130	$2,600
16	Tanker Trailer Decomissioning				
17	Power wash tanker trailers	1,400	SF	$1.67	$2,338
18	Treat/Dispose of liquid hazardous waste	250	GAL	$14	$3,500
19	Scrap tanker trailers	NA	NA	NC	$0
20	Demolish pesticide buildings	12,000	CF	$0.09	$1,080
21	Dispose of pesticide buildings	450	CY	$8.53	$3,838
22	Monitoring well installation	5	WELL	1000	$5,000
	TOTAL CONSTRUCTION COSTS				$17,948,799
	Engineering Costs				
	Engineering and permitting (10% of total direct costs)				$1,794,880
	Contingency (15% of total direct costs)				$2,692,320
	TOTAL ENGINEERING COSTS				$4,487,200
	OPERATION AND MAINTENANCE				
23	Analytical testing (5 yrs. @ 6%)	1	LS	28600	$28,600
	TOTAL PROJECT COSTS				**$22,464,598**

NOTES (refer to item no.):

1 Included in other costs
3 Cost from Metro-North Railroad Construction Bids. Includes preparation and submittal of decontamination plan, la equipment for decon and washwater collection, sampling required to certify decon effectiveness, and disposal of de
6 Unit cost approx for DDT Immunoassay Test Kit
8 Estimate from Westighouse OU-1 FS
9 Estimate from Westighouse OU-1 FS
11 Unit cost from 1996 Means Environmental Restoration Assemblies Cost Book
12 Unit cost from 1996 Means Environmental Restoration Assemblies Cost Book
14 Estimated cost from Almy Bros. FS
15 Tree replacement costs as per 1996 Means Site Work & Landscape Cost Data, Douglas Pyramidal Arborvitae, 7-8' ($80/tree+50/planting= $130/planted tree)
17 Unit cost from 1996 Means Environmental Restoration Assemblies Cost Book
18 Quote from Clean Harbours Inc.
19 Can be reclaimed as scrap at no cost
20 Unit cost from 1996 Means Environmental Restoration Assemblies Cost Book
21 Unit cost from 1996 Means Environmental Restoration Unit Cost Book