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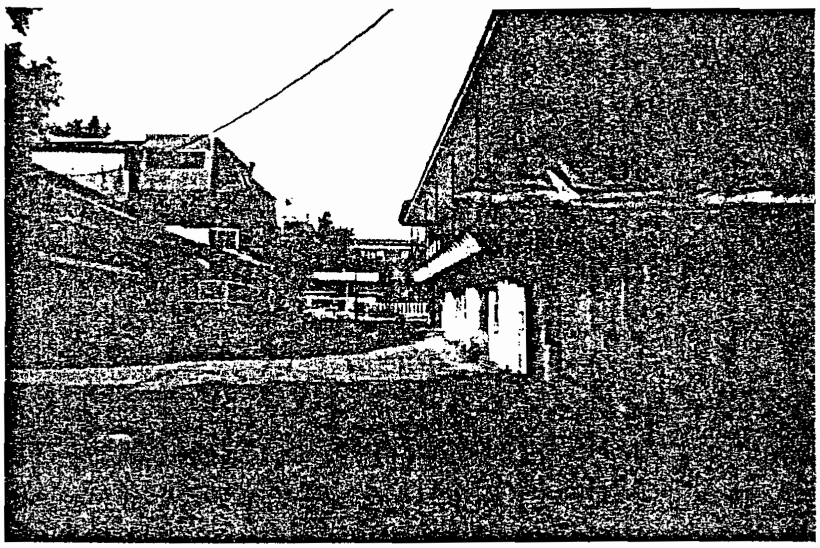
NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
DIVISION OF ENVIRONMENTAL REMEDIATION

FEASIBILITY STUDY REPORT
for the
93 MAIN STREET
Inactive Hazardous Waste Disposal Site



Site No. 7-04-027
City of Binghamton,
Broome County, NY

February 2000

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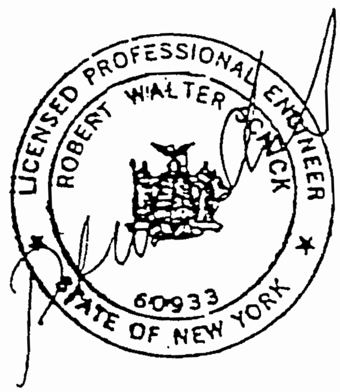

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1.0 Introduction

1.1 General

This Feasibility Study (FS) Report has been developed for the 93 Main Street site, a Class 2 inactive hazardous waste site located in the City of Binghamton, Broome County. The study was performed by the New York State Department of Environmental Conservation (NYSDEC) Division of Environmental Remediation (DER).

1.2 Project Goal and Objectives

The goal of the Feasibility Study (FS) is the identification and analysis of remedial alternatives for the site, which are consistent with the objectives of the 6NYCCR Part 375 and the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). 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 Section 6. Part 375 states a preference for remediation which permanently and significantly reduces the toxicity, mobility or volume of hazardous substances. As described in Part 375 1.10 (b), the overall goal is to restore the site to pre-disposal conditions, to the extent feasible and authorized by law. At a minimum, the remedy selected should eliminate or mitigate all significant threats to the public health and the environment.

1.3 Site Description

The 93 Main Street Site consists of four parcels of land, 89-91 and 93 main street and 25 and 25½ Arthur street, located in the City of Binghamton, Broome County. An abandoned former apartment building existed on the 93 Main Street parcel and a partially completed motel building existed on the 89-91 Main Street parcels. Both of these deteriorated structures were demolished by the city of Binghamton in September of 1999. The 93 Main Street parcel was at one time home to the McMahon Brothers Pest Control company. The 25½ Arthur street property contains a house that is currently occupied, while the 25 Arthur Street property is a vacant lot. The areas of contamination are centered around a dry well located on 89-91 Main Street and a drain on 93 Main Street. Figure 1 shows the properties described above. The surrounding area is a mix of residential and commercial buildings, all of which are served by the municipal water system.

1.4 Site History

1.4.1 Operating History

From the 1950's to the 1980's the McMahon Brothers Pest Control company operated at the 93 Main Street Site. It was reported that the site was used as a pesticide/herbicide storage and handling location for the company. There were also allegations of spills having taken place at the Site.

1.4.2 Remedial History

In 1995 Gaynor Associates of Cortland, NY performed a Phase II environmental audit on the 93 Main Street property for a financial institution. The results of the investigation revealed elevated concentrations of herbicides and pesticides in the soil, specifically 2,4,5-T at 12,000 μg/kg; 2,4-D at 4,030 μg/kg; and Chlordane at 15,000 μg/kg.

During the investigation, Gaynor determined that a back area of the building had been used by McMahon for pesticide storage and handling. This area had since been converted to apartments, and the concrete floor covered with tile or carpet. During the Gaynor study strong pesticide odors were noted in the abandoned apartments, which were in serious disrepair.

In 1995 the City, in response to these and other complaints, entered into a Voluntary Cleanup Agreement with the NYSDEC in order to perform a limited investigation of the site. This investigation focused on the rear of the 93 Main Street building and consisted of Geoprobe sampling of the soil and groundwater. The results of this investigation revealed elevated concentrations of pesticides/herbicides such as chlordane, aldrin, dieldrin, and 2,4,5-T in the Site's groundwater and/or soil. These pesticide concentrations exceeded, in some instances, the NYSDEC's groundwater standards by orders of magnitude. Soil guidance value exceedences were also significant. The presence of these pesticides indicate a threat to the area's sole source aquifer and was the basis for the Site's class "2" designation on the New York State Registry of Inactive Hazardous Waste Disposal Sites.

1.5 Nature and Extent of Contamination

The purpose of the RI was to characterize the nature and extent of contamination at the 93 Main Street Site. The investigation involved subsurface soil sampling, ground water sampling and test pit investigation. Immunoassay analysis of the subsurface soil revealed two highly localized areas of subsurface soils contaminated with pesticides, herbicides, volatile and semivolatile compounds in and around the drywell on 89-91 Main Street and in the drain on 93

Main Street. Based on observations during the subsurface soil sampling, the contamination on 93 Main Street extends radially six feet from the drain and is present from approximately four to twenty three feet below ground level. The hard till layer present at approximately twenty three feet appears to limit any further downward migration of the contamination. The contamination around the dry well, on 89-91 Main Street, extends from approximately four to six feet below ground level and two feet radially. Figure 3 shows the estimated limits of contamination.

Out of the five usable monitoring wells, installed during phase I of the RI, MW-1 and MW-6 are the only two contaminated. MW-6 was located directly in the area of highest contamination, around the drain on 93 Main Street, and exhibited levels many times higher than SCG's for volatiles, semivolatiles, and pesticides. MW-1 was located down gradient and northeast of MW-6 and only pesticide contamination was detected in MW-1, at levels significantly lower than those in MW-6.

Phase II of the RI, conducted immediately following the demolition of the buildings on the 93 and 89-91 Main street properties. Involved the investigation of the former garage area of the 93 Main Street building and the installation of four additional monitoring wells. The investigation of the former garage area involved the removal of the concrete slab that served as the floor of the garage and collection of subsurface soil samples using both a split spoon and backhoe. Lab analyses revealed that there is a third area of subsurface soil contamination located under the former garage area. The third area of contamination is approximately the same dimensions as the area of contamination around the drain on the 93 Main Street property, approximately 600 cubic yards.

During the phase II investigation contamination was also detected in two of the newly installed monitoring wells, MW-8 and MW-10. MW-8 and MW-10 are located down gradient to monitoring well 6 which exhibits the highest contamination. MW-8 and MW-10 were contaminated with pesticides. Overall pesticide levels in the water decline from MW-6 to MW-10. Figure 2 shows the location of all monitoring wells and sampling points, lab results are shown in appendix A.

1.6 Contaminant Fate and Transport

The contaminants of concern at the 93 Main Street site include petroleum products, pesticides, and herbicides. The pesticides/herbicides identified, as contaminants of concern, at the site are generally not water soluble and can persist in the environment for long periods of time.

At the 93 Main Street site, observations and data have shown that the pesticides/herbicides have indeed migrated downward into the groundwater. However, the insolubility of the contaminants and the slow groundwater flow have combined to limit the concentrations present; and extent of migration of these contaminants in the groundwater. Because of these conditions, groundwater contamination at the site is relatively localized.

How a contaminant is transported in the environment is important to consider when evaluating exposure pathways. Any remedy selected for the 93 Main Street site should address current and potential exposure pathways. An exposure pathway is the route by which an individual comes in contact with a contaminant. The five elements of an exposure pathway are 1) a source of contamination; 2) the environmental medium and transport mechanisms; 3) the point of exposure; 4) the route of exposure; and 5) the receptor population. In order for an individual to be exposed to contamination at the 93 Main Street site, a pathway must be complete. Pathways may be direct or indirect. Direct exposure pathways include dermal contact with, inhalation or ingestion of the contaminant. Ingestion of contaminated drinking water is an example of a complete direct exposure pathway. An example of an indirect exposure pathway is human consumption of fish which have been contaminated by eating smaller creatures living in contaminated sediments.

Potential human exposure pathways at the 93 Main Street site were assessed by the RI and determined to present minimal exposure since all contamination identified was well below the ground surface. There is little potential for trespassers at the site to be exposed to contaminated soils. Other pathways do not appear to be complete as possible receptor populations are not expected to come in contact with contaminated media or with concentration of contaminants which would pose a health risk. A more detailed human health evaluation can be found in the Remedial Investigation Report, August 1999.

It was concluded that there were also no wildlife habitats that could be potentially impacted by the migration of contaminants associated with the 93 Main Street site. However, the threat of the contaminants to the sole source aquifer is significant.

2.0 DEVELOPMENT OF PROPOSED REMEDIAL GOALS

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

In order to identify potential exposure pathways, applicable SCGs must be identified. 6 NYCRR Part 375-1.10(c)(1)(I) requires that remedial actions comply with SCGs "unless good cause exists why conformity should be dispensed with." Standards and Criteria are cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under federal or state law that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance. Guidance includes non-promulgated criteria and guidelines that are not legal requirements; however, the site's remedial program should be designed with consideration given to guidance that, based on professional judgement, is determined to be applicable to the site.

SCGs are categorized as chemical specific, location specific, or action specific. These categories are defined as the following:

Chemical Specific:	These are health or risk based numerical values or methodologies which, when applied to site specific conditions, result in the establishment of numerical values for the chemicals of interest. These values establish the acceptable amount or concentration of a chemical that may be found in or discharged to the environment.
Location Specific:	These are restrictions placed on the concentrations of hazardous substances or the conduct of activities solely because they occur in a specific location.
Action Specific:	These are usually technology or activity based requirements or limitations on actions taken with respect to hazardous waste management and site cleanup.

The following SCGs have been determined to be applicable for the 93 Main Street site:

Soil	- NYSDEC Division of Hazardous Waste Remediation Technical and Administrative Guidance Memorandum (TAGM) 4046, Determination of Soil Cleanup and Cleanup Levels - 6 NYCRR Part 371, Identification and listing of Hazardous Wastes - NYSDEC Division of Hazardous Substances Regulation TAGM 3028, "Contained in Criteria for Environmental Media." (11/92)
Waste	- 6 NYCRR Part 371, Listing of Hazardous Waste - NYSDEC Division of Hazardous Substances Regulation TAGM 3028, "Contained in Criteria for Environmental Media" (11/92)
Groundwater	- 6 NYCRR Part 700-705, Water Quality Regulations for Surface Water and Groundwater - NYSDEC Division of Water TOGS 1.1.1

2.2 Proposed Remedial Action Objectives

The goal of the FS 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 (August 1999).

In order to be protective of human health and the environment, the following Remedial Action Objectives (RAOs) have been chosen for this site:

- Reduce, control, or eliminate to the extent practicable the contamination present within the soils/waste on site.

- Eliminate the threat to the sole source aquifer by removing or treating the source of contamination and curtailing, to the extent possible, migration of contaminated groundwater off the site.

- Eliminate the potential for direct human or animal contact with the contaminated soils or groundwater at the site.

- Attain groundwater standards to the extent practicable.

2.3 Proposed Remedial Goals

Based on identified SCGs and RAOs, the following proposed remedial goals have been established for pesticide/herbicide and petroleum contaminated soils at the 93 Main Street site. Remedial alternatives were selected for their ability to achieve these remedial goals.

In addition to pesticides/herbicides a large portion of the contaminated soil contains petroleum products. The guidance values that will be used for petroleum compounds at the 93 Main Street site were adopted from the Spill Technology and Remediation Series (STARS) Memo #1, Petroleum-Contaminated Soil Guidance Policy and NYSDEC Division of Environmental Remediation Technical and Administrative Guidance Memorandum (TAGM) 4046, Determination of Soil Cleanup Objectives and Cleanup Levels.

STARS #1 establishes four different types of guidelines for petroleum contaminated soil. Any remediation of a petroleum spill must meet all four guidelines. These include protection of groundwater, protection of human health, protection of fish and wildlife, and protection against objectionable nuisance characteristics. Protection of groundwater is verified using Toxicity Characteristic Leaching Procedure (TCLP).

The remaining guidelines are compared to contaminant concentrations measured by EPA standard Method 8021 or 8270. Satisfactory protection of human health is indicated by human health guidance values. Protection of fish and wildlife is a concern when dealing with contaminated sediment; where sediment guidance values are applied. Finally, petroleum contaminated soil must not exhibit objectionable nuisance characteristics. The soil must not exhibit any discernable petroleum-type odors. In addition, the soil cannot contain any petroleum related contaminant above 10,000 μg/kg (10,000 ppb).

TAGM 4046 establishes a soil cleanup objective for particular contaminants which is protective of human health and the environment. In cases where the TAGM 4046 soil objective and the STARS objective were not the same, the more stringent value was chosen.

Based on these guidelines, the following remedial goals have been established:

1. Petroleum contaminated soil will be excavated and/or treated until no visible petroleum staining or discernable petroleum odors are observed.

2. Confirmatory samples will be analyzed for EPA standard Method 8021 and 8270. Concentrations measured will be compared to human health guidance values (see Appendix 2).

3. VOCs will be excavated and/or treated until the recommended soil cleanup goals, as stated in TAGM 4046 are met to the extent practicable.

4. Excavation and/or treatment will continue until concentrations are lower than applicable human health guidance values, TCLP values and the nuisance concentration of 10,000 ppb.

Table 1
Proposed Remedial Goals

Contaminant	Media of Concern	Remedial Goal	SCG Cited
Volatiles (PPB)			
1,2 - Dichloroethane	Groundwater	0.6 ppb	T.O.G.S. 1.1.1
Benzene	Groundwater	1 ppb	T.O.G.S. 1.1.1
Tetrachloroethene	Groundwater	5 ppb	T.O.G.S. 1.1.1
Toluene	Groundwater	5 ppb	T.O.G.S. 1.1.1
Chlorobenzene	Groundwater Soil	5 ppb 1700 ppb	T.O.G.S. 1.1.1 TAGM 4046
ethylbenzene	Groundwater Soil	5 ppb 5500 ppb	T.O.G.S. 1.1.1 TAGM 4046
Xylene	Groundwater Soil	5 ppb 1200 ppb	T.O.G.S. 1.1.1 TAGM 4046
Semivolatiles (PPB)			
1,2,4-Trichlorobenzene	Soil	3400 ppb	TAGM 4046

Table 1 - Continued Proposed Remedial Goals			
Contaminant	Media of Concern	Remedial Goal	SCG Cited
Semivolatiles (PPB)			
2,4 - Dichlorophenol	Groundwater	5 ppb	T.O.G.S. 1.1.1
Naphthalene	Groundwater Soil	10 ppb 13000 ppb	T.O.G.S. 1.1.1 TAGM 4046
2,4,5 - Trichlorophenol	Groundwater Soil	1 ppb 100 ppb	T.O.G.S. 1.1.1 TAGM 4046
Pentachlorophenol	Groundwater	1 ppb	T.O.G.S. 1.1.1
2-Methylnaphthalene	Soil	36400 ppb	TAGM 4046
4 - Nitrophenol	Soil	100 ppb	TAGM 4046
Benzo(a)anthracene	Soil	224 ppb	TAGM 4046
Chrysene	Soil	400 ppb	TAGM 4046
Benzo(b)fluoranthene	Soil	224 ppb	TAGM 4046
Benzo(k)fluoranthene	Soil	224 ppb	TAGM 4046
Benzo(a)pyrene	Soil	61 ppb	TAGM 4046
Dibenz(a,h)anthracene	Soil	14 ppb	TAGM 4046
Pesticides (PPB)			
alpha - BHC	Groundwater Soil	0.01 ppb 110 ppb	T.O.G.S. 1.1.1 TAGM 4046
Beta - BHC	Groundwater Soil	0.04 ppb 200 ppb	T.O.G.S. 1.1.1 TAGM 4046
delta - BHC	Groundwater Soil	0.04 ppb 300 ppb	T.O.G.S. 1.1.1 TAGM 4046
Gamma - BHC	Groundwater Soil	0.05 ppb 60 ppb	T.O.G.S. 1.1.1 TAGM 4046
Aldrin	Soil	41 ppb	TAGM 4046

Table 1 - Continued
Proposed Remedial Goals

Contaminant	Media of Concern	Remedial Goal	SCG Cited
Pesticides (PPB)			
Heptachlor	Groundwater	0.04 ppb	T.O.G.S. 1.1.1
Heptachlor Epoxide	Groundwater Soil	0.03 ppb 20 ppb	T.O.G.S. 1.1.1 TAGM 4046
4,4' - DDD	Groundwater Soil	0.3 ppb 2900 ppb	T.O.G.S. 1.1.1 TAGM 4046
4,4' - DDT	Groundwater Soil	0.2 ppb 2100 ppb	T.O.G.S. 1.1.1 TAGM 4046
Alpha - Chlordane	Groundwater	0.05 ppb	T.O.G.S. 1.1.1
gamma - Chlordane	Groundwater Soil	0.05 ppb 540 ppb	T.O.G.S. 1.1.1 TAGM 4046
Endosulfan - I	Soil	900 ppb	TAGM 4046
Endosulfan - II	Soil	900 ppb	TAGM 4046
Endrin	Soil	100 ppb	TAGM 4046
Herbicides (PPB)			
Dicamba	Groundwater	0.44 ppb	T.O.G.S. 1.1.1
Metals (PPB)			
Arsenic	Groundwater Soil	25 ppb 7.5 ppb	T.O.G.S. 1.1.1 TAGM.4046
Barium	Groundwater	1000 ppb	T.O.G.S. 1.1.1
Beryllium	Groundwater Soil	3 ppb 0.16 ppb	T.O.G.S. 1.1.1 TAGM 4046
Chromium	Groundwater	50 ppb	T.O.G.S. 1.1.1
Copper	Groundwater Soil	200 ppb 25 ppb	T.O.G.S. 1.1.1 TAGM 4046

Table 1 - Continued Proposed Remedial Goals			
Contaminant	Media of Concern	Remedial Goal	SCG Cited
Metals (PPB)			
Lead	Groundwater	25 ppb	T.O.G.S. 1.1.1
Magnesium	Groundwater	35000 ppb	T.O.G.S. 1.1.1
Zinc	Soil	20 ppb	TAGM 4046
Iron	Soil	2000 ppb	TAGM 4046
Nickel	Soil	13 ppb	TAGM 4046

3.0 PRELIMINARY SCREENING OF REMEDIAL TECHNOLOGIES

3.1 Remedial Technologies

Based upon currently available technologies to address pesticides/herbicides, and petroleum contaminated soil remediation, the remedial technologies which may be suitable for the 93 Main Street site are identified below:

A. On-Site Thermal Treatment Methods
   1. Thermal Desorption
   2. High Temperature Incineration

B. Off-Site Treatment Methods
   1. High Temperature Incineration
   2. Offsite Disposal

C. On-Site Physical/Chemical Treatment Methods
   1. Soil Washing
   2. Vitrification (Exsitu and Insitu)
   3. Aeration/Stripping (Exsitu and Insitu)
   4. Chemical Oxidation

D. Biological Treatment
   1. Bioremediation (Exsitu and Insitu)

E. On-Site Containment
   1. Capping
   2. Gradient Control
   3. Hazardous Waste Containment Cell

F. Institutional Controls

G. No Action

Based upon currently available technologies to address pesticides/herbicides, and petroleum contaminated groundwater, the remedial technologies which may be suitable for the 93 Main Street site are identified below:

A. Active Removal
   1. Pump and Treat

B. Biological Treatment
   1. Natural Attenuation

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 93 Main Street site there are a number of physical characteristics which will likely factor into the screening process. The type of soils, the commercial/residential nature of the neighborhood, the small area of the site, the close proximity of neighboring residential/commercial properties, and potential future site usage will be addressed as various alternatives are evaluated. Further, the estimated total volume of contaminated soil and the implementability of an insitu or exsitu remedy.

3.3 Preliminary Evaluation of Remedial Technologies

Screening various remedial technologies involves examining 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 2 evaluates the technologies considered and determines which technologies should be retained for detailed analysis.

TABLE 2 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 small scale 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. 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 Federal Land Disposal Regulations (LDR's).	Effectiveness: Incineration has been shown to be highly effective in destroying pesticides and petroleum contaminants in soil. Implementability: A mobile unit could not be installed on-site due to inadeqaute space. Significant regulatory operational requirements will have to be complied with. Evaluation: This alternative will not 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 destroying pesticides and petroleum contaminants. 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 fill material with particle sizes ranging from clay to cobbles, so a significant reduction in volume could occur. May not be effective in removing pesticide contamination. Implementability: This alternative would be difficult to implement due to the highly permanent nature of the material. Evaluation: This alternative will not be retained for further consideration.

TABLE 2, cont'd Preliminary Screening of Remedial Technologies		
Technology	Description	Evaluation
3. Stabilization: Concrete Matrix	Contaminated media is incorporated in a concrete matrix, significantly reducing the teachability of the hazardous constituents.	Effectiveness: Long term effectiveness is questionable. This alternative is not effective for petroleum contaminated soil since the concrete mixture would be fouled by the oil. Not suitable for particle sizes greater than ¼" or less than that passing the No. 200 sieve. Site fill ranges in size from sand to cobbles. Implementability: The presence of petroleum, as well as the extremes in particle sizes, would prevent a concrete mixture from properly setting. Evaluation: This alternative will not be retained for further consideration.
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: Technology limited to particle sizes less than 4". Minimum water content of 25% by weight. Groundwater will limit effectiveness. Implementability: A mobile treatment unit could be installed on-site. Presence of groundwater will interfere. Evaluation: This alternative will 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 heavier petroleum products or pesticides. Implementability: An air stripping system could be constructed on-site. Evaluation: This alternative will not be retained for further consideration.
6. Chemical Oxidation	An oxidizing agent, typically hydrogen peroxide, is used to break down contaminants into less hazardous compounds.	Effectiveness: In combination with catalyst becomes a strong oxidizer. Implementability: Chemical oxidation could be carried out on site. Evaluation: This alternative will be retained for further consideration.
Biological Treatment		
1. In-situ 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 and pesticide products. Implementability: Biological treatment could be carried out on site. Evaluation: This remedy will be retained for further evaluation.
2. Natural Attenuation (for groundwater)	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 be retained for further consideration for groundwater remediation.

TABLE 2, cont'd Preliminary Screening of Remedial Technologies		
Technology	Description	Evaluation
3. Ex-situ Bioremediation	Contaminated material is placed in a thin cell. Bio-organisms, fertilizer, and other additives are added and the contaminated soil is periodically tilled to enhance biodegradation.	**Effectiveness:** Same as bioremediation **Implementability:** A cell could be build onsite. **Evaluation:** This alternative will be retained for further consideration.
On-Site Containment		
1. Soil Cover	A layer of clean fill and/or vegetative cover is placed over a contaminated area to prevent dermal contact. This remedy does not prevent or inhibit infiltration.	**Effectiveness:** Would be effective at preventing dermal contact with contamination in surface soils. Would not address pesticde/petroleum contamination in subsurface and groundwater. **Implementability:** A soil cover could be constructed. **Evaluation:** Will be retained for further consideration.
2. 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. **Implementability:** A cap could be constructed. **Evaluation:** Would only be effective for preventing dermal contact with contamination. Offers no added protection over a soil cover at a much higher cost. Will not be retained for further consideration.
3. 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 the groundwater flow is controlled by the subsurface till layer this would have no impact on groundwater contamination. **Implementability:** Surface drainage pathways could be altered. **Evaluation:** Will not be retained for further consideration.
4. 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:** There is a low permeable layer within thirty feet of the ground surface to key into. **Implementability:** This alternative would be difficult to implement due to the depth of the impermeable layer and soil type. **Evaluation:** This alternative will not be retained for further consideration.
5. 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:** Would prevent dermal contact with contamination and protect groundwater. Would limit future use. **Implementability:** A containment cell could not reasonably be constructed on-site. **Evaluation:** This alternative will be not retained for further evaluation.

TABLE 2, cont'd Preliminary Screening of Remedial Technologies		
Technology	Description	Evaluation
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:** Contaminated media could be excavated and hauled to an offsite landfill. Some material may have to be treated prior to disposal to comply with Land Disposal Requirements (LDR's). **Evaluation:** This alternative will 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:** This alternative would not address the continuing threat to the sole source aquifer. Would limit future use of the site. **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.
Pump and Treat	Contaminated groundwater is pumped from the ground and treated to meet SCGs.	**Effectiveness:** Extensive pump and treat would have limited impact. Due to highly productive aquifer. **Implementability:** Easily implementable **Evaluation:** This alternative will be retained for future consideration as a comparison alternative.

3.4 Results of Preliminary Screening of Technologies

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

Soil

C. No Action
D. Thermal Desorption
E. Offsite Incineration
F. Offsite Disposal
G. Vitrification
H. Capping
I. Chemical Oxidation

Groundwater

A. No Action
B. Natural Attenuation
C. Pump and Treat

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/herbicide and petroleum contaminated soil. 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 the sole source aquifer by preventing migration of contaminated groundwater off site.

- Eliminate the potential for direct human or animal contact with the contaminated soils in site.

- Attain groundwater standards to the extent practicable.

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

There are two media which have been contaminated at the 93 Main Street site, subsurface soil and groundwater. Some soil on site is contaminated with primarily pesticide/herbicide products, while the majority of onsite contamination is a mixture of pesticide/herbicide and petroleum products. In total there are approximately 1200 cubic yards of contaminated soil on site, and approximately 500 cubic yards of this is solely contaminated with pesticides/herbicides. On-site thermal desorption, off-site incineration, offsite disposal, and bioremediation are viable technologies for pesticide/herbicide and petroleum product contamination.

4.2 Description of Alternatives and Evaluation Based on RAOs

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. All hazardous waste present on site would remain in its current state, with no actions to protect human health or the environment taking place.

Compliance with RAOs: This alternative would not reduce, control, or eliminate the contamination present. The threat to the sole source aquifer would not be eliminated. The future use of the site would be limited due to the presence of subsurface contamination. SCGs would not be attained by this alternative.

ALTERNATIVE 2 - Offsite Treatment/Disposal

Description: The soil from areas of the site exhibiting contamination greater than the site remedial goals would be excavated and hauled offsite for treatment and/or disposal. Soil contaminated with pesticides/herbicides and/or petroleum products would be excavated within the known limits of contamination. Confirmatory samples would be collected from the floor and walls of the excavation to determine whether remedial goals have been achieved and if further removal and sampling was necessary. Excavation would continue vertically and laterally until confirmatory samples demonstrate complete removal of contaminated soil above remedial goals. It is expected that only limited dewatering of the excavations would be necessary due to the relatively small amount of contaminated soil in contact with the groundwater. Water collected during excavation dewatering would be treated as necessary with either an onsite water treatment system or at an off site treatment facility. Active dewatering of the excavation would take place to recover contaminated groundwater as possible.

Contaminated soil that is disposed of off site must comply with applicable Federal and State regulations. In particular, any hazardous waste (as defined in 6NYCRR Part 371) disposed of must meet the requirements of the Federal and State Land Disposal Restrictions (LDRs). The Remedial Investigation determined that soil contaminated with pesticides/herbicides qualified as listed (D020, D016, D012, D031, D013) hazardous waste. Therefore, this waste cannot be disposed of until contaminant concentrations are below those required under the Federal LDRs. To meet those requirements, the waste would have to be incinerated prior to disposal in a hazardous waste landfill.

All excavations would be backfilled with clean fill. Six inches of top soil would be spread over the excavated areas. The site would then be seeded to promote vegetative cover to control erosion. The Remedial Investigation identified only limited groundwater contamination in the vicinity of the subsurface soil contamination. It is expected that with the removal of the contaminant source, groundwater contamination would attenuate below groundwater standards. To confirm this monitoring wells would be sampled for pesticides for a short time. The site would be periodically evaluated to determine whether a change in classification on the Registry of Inactive Hazardous Waste Disposal Sites was warranted.

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 prior to discharge to the environment. Excavation would be carried out in Level D personal protection, with contingency for Level C. A Community Air Monitoring Plan would be implemented to monitor VOCs and dust. Dust suppression equipment (water sprinklers) would remain on hand to prevent airborne migration of contaminated soil offsite. Other techniques would be used as necessary to prevent contaminants or nuisance odors from leaving the site. Temporary fencing and warning signs would be placed around the site during the remediation to keep trespassers out. This alternative would be implemented in approximately six months.

Compliance with RAOs: This alternative would remove the contamination present in the soil, eliminating the source of the threat to the sole source aquifer. The potential for human exposure to media containing site-related contaminants would also be eliminated. SCGs for groundwater quality are expected to be attained by this alternative. Future use of the site would be unrestricted.

ALTERNATIVE 3 - Vitrification

Description: Pesticide and petroleum contaminated soil from the drywell area (approximately 16 cubic yards) would be excavated and consolidated with the contaminated soil in the drain area. The contaminated soil would then be vitrified in-situ. Vitrification involves the electric melting of earthen materials at high temperature for the purposes of destroying organic contaminants and permanently immobilizing nonvolatile inorganic contaminants in a glassy, rock-like product, thereby rendering the treated product nonhazardous. The process typically operates in the range of 1600 to 2000°C for most earthen materials. Any off gas that is produced during treatment is collected by a special hood and treated. A large volume reduction (25-50% for soils) occurs due to elimination of void volume and vaporization of the organic content of the soil during processing. Only limited backfilling would be necessary to restore site grade since the vitrified product is left in place. Since the source area would be treated groundwater would be left to naturally attenuate. Air monitoring would be conducted during treatment. The site would be periodically evaluated to determine whether a change in classification on the Registry of Inactive Hazardous Waste Disposal Sites was warranted. Health and safety measures would be taken as in alternative 2. This alternative could be implemented in approximately nine months.

Compliance with RAOs: This alternative would eliminate the contamination present in the soil. There would be no potential for human exposure to media containing site related contaminants. The alternative would reduce the potential for off-site migration of site-related contaminants in groundwater. SCGs for groundwater quality would be attained by this alternative. Future use of the site would not be restricted.

ALTERNATIVE 4 - On-Site Thermal Desorption

Description: Soil would be excavated as described in Alternative 2 and stockpiled onsite.

The stockpiled pesticide and petroleum contaminated soil would be processed through a thermal desorption unit. Thermal desorption is an effective technology for the treatment of organic contaminated soils, sediments, and sludges which generates a lower volume of off-gas, has less environmental impact, and fewer permitting requirements than other onsite thermal treatment technologies. Thermal desorption technologies use heat to physically separate organic compounds from a media (such as soil) by heating to volatilize the contaminants. The heat is provided by hot oil, electric, or other source through a metal surface to the wastes. For heavy organic and chlorinated organic compounds, a thermal desorption unit capable of heating the process materials up to 1200°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. Once soil has been treated, it would be analyzed to determine the effectiveness of treatment. Soil that does not meet remedial goals would be re-treated until goals were achieved. Treated soil meeting the remedial goals would be used to fill the excavations. Groundwater would be collected and treated as in alternative 2, during excavation of the contaminated soil. Health and safety measures during excavation would be similar to Alternative 2 but would require an extensive air monitoring for the thermal unit.

Backfilling operations and five years of monitoring would occur as in Alternative 2. The site would be periodically evaluated to determine whether a change in classification on the Registry of Inactive Hazardous Waste Disposal Sites was warranted. This alternative could be implemented in approximately nine months.

Compliance with RAOs: This alternative would remove the contamination present in the soil, eliminating the source of the threat to the sole source aquifer. The potential for human exposure to media containing site-related contaminants would also be eliminated. SCGs for groundwater quality are expected to be attained by this alternative. Future use of the site would be unrestricted.

ALTERNATIVE 5 - Hydraulic Containment & Chemical Oxidation

Description: Soil from the drywell area would be excavated and consolidated, consistent with the remedy identified in Alternative 3.

This alternative would treat the remaining contaminated soil associated with the two drains in place. The contaminated subsurface soil would be flushed with a strong oxidizing agent which would chemically breakdown the organic contaminants in the soil. During the oxidation process carbon bonds within the contaminant are broken resulting in a less hazardous compound and ultimately breaking down into carbon dioxide and water, along with some halides (i.e., salts). A pump and treat system would be used to collect impacted groundwater and leachate generated during treatment. The water would then be treated with continued oxidation and/or carbon treatment and either discharged or reinjected. While it is expected complete hydraulic control would be achieved with a pump and treat system a grout wall, or other hydraulic barrier must be installed to achieve complete hydraulic containment of contaminated leachate/groundwater. Groundwater monitoring would be carried out periodically to ensure that the pump and treat system was operating properly. This alternative could be implemented in approximately six months.

Compliance with RAOs: This alternative would eliminate the contamination present in the soil. Potential for human exposure to media containing site related contaminants would be eliminated. This alternative reduces the potential for off-site migration of site-related contaminants in groundwater. SCGs for groundwater would be attained by this alternative. Future use of the site would not be restricted.

ALTERNATIVE 6 - Capping w/Pump and Treat

Description: Soil from the drywell area would be excavated and stockpiled as in alternative 3.

This alternative would leave the contaminated soil in place, while preventing dermal contact and reducing infiltration of surface run off. A low permeability barrier would be constructed over the contaminated soil in conjunction with a pump and treat system to address the contaminated groundwater. Although surface water infiltration would be minimized, groundwater would continue to be impacted since approximately two feet of contaminated soil is located below the water table. A pump and treat system would be used to collect impacted groundwater. The water would then be treated with granular activated carbon system and discharged. Groundwater monitoring would be carried out periodically to ensure that the pump and treat system was operating properly. This alternative could be implemented in approximately three months.

Compliance with RAOs: This alternative would not eliminate the contamination present in the soil. Potential for human exposure to media containing site related contaminants would be reduced but not eliminated. This alternative reduces the potential for off-site migration of site related contaminants in groundwater. SCGs for groundwater would not be attained by this alternative. Future use of the site would be restricted. Treatment would be carried on indefinitely since the source are would continue to impact groundwater

5.0 DETAILED ANALYSIS OF ALTERNATIVES

5.1 Description of Evaluation Criteria

In Section 5.2, each of the alternatives developed in Section 4 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 waste sites. Each alternative is analyzed with respect to:

- 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 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.

- 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 impact as a result of remedial actions, time until the remedial response objectives are achieved, and protection of workers during the remedial action.

- 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 the residual waste.

- Reduction of Toxicity, Mobility, and Volume: This evaluation criterion assesses the remedial alternative's use of technologies that permanently and significantly reduce the 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.

- 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.

- 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 the 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.

- 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 (i.e.,: economic impacts due to the presence of residual wastes). Cot 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.

- 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

Alternative 1 - No Action

Compliance with SCGs: Since the RI demonstrated high concentrations of pesticides and petroleum compounds which would be left behind in an uncontrolled environment, 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 hazardous waste would continue to impact the groundwater this alternative would not be protective of human health or the environment.

Short-term Impacts and Effectiveness: Since no remedial action is occurring, there are no increased risks cause 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 the remaining wastes remains. There would be no controls in place to manage the waste, allowing continued source of groundwater contamination. 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. Contamination could migrate to the aquifer.

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 to certain land uses. The economic impact of this alternative is uncertain.

<u>Alternative 2 - Offsite Treatment/Disposal</u>

Compliance with SCGs: Since this alternative would remove all site-related contamination, chemical-specific SCGs would be met. No location specific SCGs have been identified. This alternative would not contravene any action-specific SCGs since no contaminated soil would be left onsite.

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

Short-term Impacts and Effectiveness: There would be a potential for worker exposure during excavation of contaminated soil. This exposure could be significantly reduced through the use of dust suppression measures, proper decontamination procedures, and personal protection equipment. Dust suppression measures and site access restrictions would eliminate or greatly reduce any risk to the public or impacts to the environment during construction. There is potential risk to the public as a result of transporting contaminated soil to the disposal facility. These risks could be reduced by establishing hauling routes and emergency spill response procedures. This alternative would result in a large disruption to the surrounding neighborhood. During excavation, installation of sheet piling may result in damage to surrounding structures due to the geologic condition of the site.

Long-term Effectiveness and Permanence: Contaminants would be removed from the site, eliminating the need for any long-term future monitoring. Hazardous waste would be incinerated, permanently destroying contaminants. 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 groundwater monitoring showed the site to no longer be contravening groundwater standards.

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

Implementability: The equipment to excavate and haul contaminated soil is commercially available. There are facilities which will accept hazardous and non-hazardous waste for treatment and/or disposal. The technology for the remedy is readily available and could be implemented, however, the excavation of the contaminated soil presents a significant difficulty due to its' depth and the lack of sufficient area available for working.

Cost: The estimated capital cost for this alternative would be $1,828,754. The annual O&M cost would be $4,600. The present worth value of this alternative would be $1,848,760 using a 5% discount rate over five years. There would be no future land use cost, since contaminants would be expected to be removed and the site would be removed from the NYSDEC Registry of Inactive Hazardous Waste Disposal Sites, leaving it free for unrestricted use.

ALTERNATIVE 3 - Vitrification

Compliance with SCGs: This alternative would treat all pesticide/petroleum contaminated soil to below remedial goals. Applicable chemical-specific SCGs would be met for contaminated soil. No location-specific SCGs have been identified. This alternative would not contravene any action-specific SCGs.

Overall Protection of Human Health and the Environment: This alternative would eliminate all likely exposure pathways by treating pesticide/petroleum contaminated soil to below remedial goals. It is therefore highly protective of human health and the environment.

Short-term Impacts and Effectiveness: There would be minimal potential for worker exposure to contaminated soil since only excavation of the contaminated soil in the drywell area would take place. Exposure could be significantly reduced through the use of dust suppression measures, proper decontamination procedures, and personal protection equipment. There would be a potential risk to workers and the public should there be ineffective air control devices on the collection hood. However, the presence of appropriate controls and routine air monitoring would reduce the risk associated with air emissions. Should air control devices fail, the unit would be shut down. 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.

Long-term Effectiveness and Permanence: Organic compounds are destroyed during vitrification and inorganic materials are contained within the melt. The vitrified product has proven to be extremely resistant to leaching and effective at destroying organic compounds. Therefore, the 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 groundwater monitoring showed the site to no longer be contravening standards.

Reduction of Toxicity, Mobility, and Volume: The mobility, toxicity, and volume of pesticide and petroleum contaminated soil would be permanently reduced.

Implementability: The equipment needed to excavate the contaminated soil is commercially available. There are vendors who could bring a mobile treatment unit on site. The small number of vendors able to supply the technology for this remedy may inhibit its' implementability.

Cost: The estimated capital cost for this alternative would be $1,197,377. The annual O&M cost would be $4,600. The present worth value of this alternative would be $1,217,293 using a 5% discount rate over five years. There would be no future land use cost, since contaminants would be expected to be removed and the site would be removed from the NYSDEC Registry of Inactive Hazardous Waste Disposal Sites, leaving it free for unrestricted use.

ALTERNATIVE 4 - On-Site Thermal Desorption

Compliance with SCGs: This alternative would treat all pesticide and petroleum contaminated soils to below remedial goals. Applicable chemical-specific SCGs would be met for contaminated soil. No location specific SCGs have been identified. This alternative would not contravene any action-specific SCGs.

Overall Protection of Human Health and the Environment: This alternative would eliminate all likely exposure pathways by treating pesticide/petroleum contaminated soil to below remedial goals. It is therefore highly protective of human health and the environment.

Short-term Impacts and Effectiveness: There would be potential for worker exposure during excavation of contaminated soil. This exposure could be significantly reduced through the use of dust suppression measures, proper decontamination procedures, and personal protection equipment. There would be an increased risk to workers associated with the increased soil handling during treatment. In addition, there would be a potential risk to workers and the public should there be ineffective air control devices on the thermal unit. However, the presence of appropriate controls and routine air monitoring would reduce the risk associated with air emissions. Should air control devices fail, the unit would be shut down. 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. This alternative would result in a large disruption to the surrounding neighborhood. During excavation, installation of sheet piling may result in damage to surrounding structures due to the geologic condition of the site. The treatment process produces excess noise levels.

Long-term Effectiveness and Permanence: Hazardous waste would be incinerated, permanently destroying contaminants. 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 groundwater monitoring showed the site to no longer be contravening standards.

Reduction of Toxicity, Mobility, and Volume: The mobility, toxicity, and volume of chlorinated solvent and petroleum contaminated materials would be permanently reduced.

Implementability: The equipment needed to excavate the contaminated soil is commercially available. There are vendors who could bring a mobile treatment unit on site. The technology for the remedy is available and could be implemented, however, the excavation of the contaminated soil presents a significant difficulty due to its' depth and the lack of sufficient area available for working.

Cost: The estimated capital cost for this alternative would be$713,532. The annual O&M cost would be $4,600. The present worth value of this alternative would be $733,448 using a 5% discount rate over five years. There would be no future land use cost, since contaminants would be expected to be removed and the site would be removed from the NYSDEC Registry of Inactive Hazardous Waste Disposal Sites, leaving it free for unrestricted use.

<u>ALTERNATIVE 5 - Hydraulic Containment & Chemical Oxidation</u>

Compliance with SCGs: This alternative would treat all pesticide and petroleum contaminated soils to below remedial goals. Applicable chemical-specific SCGs would be met for contaminated soil. No location specific SCGs have been identified. This alternative would not contravene any action-specific SCGs.

Overall Protection of Human Health and the Environment: This alternative would eliminate all likely exposure pathways by treating pesticide/petroleum contaminated soil to below remedial goals. It is therefore highly protective of human health and the environment.

Short-term Impacts and Effectiveness: There would potential for worker exposure during excavation of the contaminated soil in the drywell area. This exposure could be significantly reduced through the use of dust suppression measures, proper decontamination procedures, and personal protection equipment. Dust suppression measures and site access restrictions would eliminate or greatly reduce any risk to the public or impacts to the environment during construction. There is some risk associated with handling of the oxidizing agents which would be reduced through implementation of a health and safety plan.

Long-term Effectiveness and Permanence: Hazardous waste would be oxidized, permanently destroying contaminants. 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 groundwater monitoring showed the site to no longer be contravening standards.

Reduction of Toxicity, Mobility, and Volume: The mobility, toxicity, or volume of pesticide/petroleum contaminated soil would be reduced.

Implementability: The equipment needed to excavate contaminated soil, install wells and construct the water treatment system and injection system is commercially available. The technology for the remedy is readily available and could be implemented.

Cost: The estimated capital cost for this alternative would be $230,063. The annual O&M cost would be $28,600. The present worth value of this alternative would be $450,903 using a 5% discount rate over five years. There would be no future land use cost, since contaminants would be expected to be removed and the site would be removed from the NYSDEC Registry of Inactive Hazardous Waste Disposal Sites, leaving it free for unrestricted use.

ALTERNATIVE 6 - Capping w/Pump and Treat

Compliance with SCGs: This alternative would consolidate pesticide and petroleum contaminated soil in the drain area. Since a cap, in conjunction with a pump and treat system, would eliminate all likely exposure pathways it would protect human health and the environment. However, applicable chemical-specific SCGs would not be met for contaminated soil. No location specific SCGs have been identified. This alternative would not contravene any action-specific- SCGs.

Overall Protection of Human Health and the Environment: This alternative would eliminate all likely exposure pathways by covering the contaminated soil and collecting and treating contaminated groundwater. It is moderately protective of human health and the environment.

Short-term Impacts and Effectiveness: There would be potential for worker exposure during excavation of the contaminated soil in the drywell area. This exposure could be significantly reduced through the use of dust suppression measures, proper decontamination procedures, and personal protection equipment. Dust suppression measures ant site access restrictions would eliminate or greatly reduce any risk to the public of impacts to the environment during construction.

Long-term Effectiveness and Permanence: Long-term monitoring would be needed. The source area would not be removed or treated. This alternative is not permanently effective. 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: The mobility, toxicity, or volume of pesticide/petroleum contaminated soil would not be reduced.

Implementability: The equipment needed to excavate contaminated soil, install wells and construct the water treatment system is commercially available. The technology for the remedy is readily available and could be implemented.

Cost: The estimated capital cost for this alternative would be \$135,836. The annual O&M cost would be \$28,600. The present worth value of this alternative would be \$576,550 using a 5% discount rate over five years. There would be no future land use cost, since contaminants would be expected to be removed and the site would be removed from the NYSDEC Registry of Inactive Hazardous Waste Disposal Sites, leaving it free for unrestricted use.

5.3 Comparative Analysis of Alternatives

Compliance with SCGs: The No Action and Cap/Pump and Treat alternatives would not meet SCGs since both alternatives leave high levels of pesticides and petroleum compounds on site.

The Vitrification, Low Temperature Thermal Desorption, Offsite Disposal, and Hydraulic Containment/Chemical Oxidation alternatives all meet applicable SCGs for contaminated soil since it would be treated to below remedial goals, eliminating likely exposure pathways.

Overall Protection of Human Health and the Environment: The No Action alternative would not be protective of human health and the environment since high concentrations of pesticides and petroleum compounds would be left on site. The Cap/Pump and Treat alternative would be slightly more protective since it would eliminate the likely exposure pathways. Offsite Disposal and Treatment, Vitrification, Low Temperature Thermal Desorption, and Hydraulic Containment/Chemical Oxidation would all be protective of human health and the environment since contaminated soil would be removed from the site and/or the pesticide/petroleum compounds would be destroyed.

Short-term Impacts and Effectiveness: The No Action alternative would cause little or no increased short-term impacts since no intrusive work would take place. All the remaining alternatives would involve some degree of excavation, although in Vitrification, Hydraulic Containment/Chemical Oxidation, and Cap/Pump and Treat the excavation is relatively minor, and handling of contaminated media. These actions could potentially impact worker health and safety, the environment, and the local community. On site thermal desorption would involve more extensive handling than Offsite Disposal and Treatment 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. The controls would include air monitoring, personal protective equipment, and dust suppression measures.

The Offsite Disposal and Treatment alternative 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 and Vitrification alternatives both utilize technologies that would create air emissions that must be treated. This poses a short-term risk should the air emissions control device be breached. This risk could be reduced through the use of air treatment devices, and establishment of emergency procedures to be utilized in the event of a release of air emissions.

Long-term Effectiveness and Permanence: The No Action alternative would not be effective in the long-term since high levels of pesticides/petroleum compounds would remain on site. The Cap/Pump and Treat alternative would only remain effective as long as the cap was intact and the pump and treat system was operating.

The Offsite Disposal and Treatment, Vitrification, Low Temperature Thermal Desorption, and Hydraulic Containment/Chemical Oxidation would be effective in the long-term since all likely exposure pathways would be eliminated. This would be achieved by removing and/or treating the contaminated soil.

Reduction of Toxicity, Mobility, and Volume: The No Action and Cap/Pump and Treat alternatives would not reduce the toxicity, mobility, or volume. The Offsite Disposal and Treatment, Vitrification, Low Temperature Thermal Desorption, and Hydraulic Containment/Chemical Oxidation alternatives would reduce the toxicity and volume of material contaminated with pesticides/petroleum compounds by destroying them.

Implementability: The No Action alternative would be the easiest to implement since no construction would be necessary. The Offsite Disposal and Treatment, Hydraulic Containment/Chemical Oxidation, and Cap/Pump and Treat would also be easily implemented since neither alternative requires specialized equipment. Thermal Desorption and Vitrification are slightly more involved due to the equipment that is used.

Cost: A summary of the costs are presented below. The costs are the present worth based on a 5% discount rate over five years. A five year period was chosen since operation and maintenance, which would consist of groundwater monitoring, is expected to end in that time with the exception of Alternative 5, which used 10 years, and Alternative 6 which used 30 years.

6.0 RECOMMENDED REMEDIAL ALTERNATIVE

6.1 Basis for Recommendation

The NYSDEC has performed a development and evaluation of remedial alternatives based on the guidance provided in 6 NYCRR Part 375-1.10. Based on this analysis, the NYSDEC is recommending Hydraulic Containment & Chemical Oxidation as the preferred remedial alternative.

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 potential future development at the site.

The conceptual design of the selected remedy includes the following components:

- Excavation and disposal of contaminated soil around drywell
- Construction of injection wells/infiltration galleries
- Construction of extraction wells and treatment system
- Backfilling Excavation
- Groundwater Monitoring Program

<u>Excavation and Disposal of Contaminated Soil Around Drywell</u>

The area surrounding the drywell on the 89-91 Main street property which has been identified as containing pesticide and petroleum contamination would be excavated to a depth of six feet. Confirmatory samples would be collected on the walls and floor of the excavation to insure that all contaminated soil above remedial objectives was removed. Contaminated soil will be treated on site and/or disposed of offsite as appropriate.

<u>Construction of Injection Wells/Infiltration Galleries</u>

Infiltration galleries would be constructed, in each of the remaining areas of concern, as necessary to facilitate application of the oxidizing agent to the contaminated subsurface soil. It is anticipated that injection wells would also be necessary to properly distribute the oxidizing agent to the lower portion of the contaminated subsurface soil. The infiltration galleries would consist of an excavated area directly above the area of subsurface soil which would be filled with gravel. to allow for rapid infiltration of the oxidizing agent. The injection wells would be constructed with materials amenable to the oxidizing agent to be used and would be capable of injecting the oxidizer under pressure, if necessary.

Construction of extraction wells and treatment system

Groundwater extraction wells would be constructed in order to create a hydraulic zone of containment large enough to collect any leachate produced either during treatment of the contaminated soil as well as the natural groundwater flow in the areas being treated. The extraction well(s) would also be connected to a treatment system which would allow for the removal of residual contamination by additional oxidation, carbon treatment or a combination of the two. In the event that hydraulic containment could not be achieved, alternative methods of groundwater control would be evaluated such as physical containment (i.e., slurry wall, grout curtain, etc.)

Groundwater Monitoring Program

Despite the high concentrations of pesticides and petroleum products in subsurface soils, the groundwater has remained relatively unimpacted. This is due to the relatively low solubility of the contaminants of concern in water. It is anticipated that the levels of contamination in groundwater would attenuate once the source of contamination, the subsurface soil, has been treated. To be sure this occurs , groundwater samples would be collected from impacted wells and analyzed for pesticides, VOCs, and SVOCs. Following implementation of the selected remedy the site would be reclassified as a class 4 (Properly closed -requiring further management). The site would be periodically evaluated to determine whether a change in classification (i.e.,. delisting) on the Registry of Inactive Hazardous Waste Disposal Sites was warranted.

Table 4
Summary of Remedial Costs

Alternative	Capital Cost	Annual O&M	Present Worth Cost
1. No Action	S0	S0	S0
2. Offsite Treatment/Disposal	S1,828,754	S4,600	S1,848,760
3. Vitrification	S1,197,377	S4,600	S1,217,293
4. On-Site Thermal Desorption	S713,532	S4,600	S733,448
5. Hydraulic Containment w/ Chemical Oxidation	S230,063	S28,600	S450,903
6. Capping w/Pump & Treat	S135,836	S28,600	S576,550

APPENDIX A

Lab Results

TABLE 3
GROUNDWATER SAMPLE ANALYTICAL RESULTS
93 MAIN STREET

Location I.D.			MSGP10WG	MSGPSB39WG	MSGPSB42WG	MW-1	MW-2
Sample I.D.			MSGP10WG	MSGPSB39WG	MSGPSB42WG	MS-931201-MW1	MS-931201-MW2
Matrix			Water	Water	Water	Water	Water
Date Sampled			11/03/98	11/05/93	11/05/93	12/01/93	12/01/93
Parameter	Units	Criteria*					
Volatiles							
Acetone	UG/L	50	NA	NA			
1,2-Dichloroethane	UG/L	0.6	NA	NA	5		
Benzene	UG/L	1	NA	NA			
4-Methyl-2-Pentanone	UG/L	50	NA	NA			
Tetrachloroethene	UG/L	5	NA	NA			
Toluene	UG/L	5	NA	NA			
Chlorobenzene	UG/L	5	NA	NA			
Ethylbenzene	UG/L	5	NA	NA			
Xylene (total)	UG/L	5	NA	NA			
Semivolatiles							
2,4-Dichlorophenol	UG/L	5	NA	NA			
Naphthalene	UG/L	10	NA	NA			
2-Methylnaphthalene	UG/L		NA	NA			
2,4,5-Trichlorophenol	UG/L	1	NA	NA			
Pentachlorophenol	UG/L	1	NA	NA			
bis(2-Ethylhexyl)phthalate	UG/L	5	NA	NA		2	2
PEST							
alpha-BHC	UG/L	0.01		0.64	0.057		
beta-BHC	UG/L	0.04		0.59	0.17	0.16	
delta-BHC	UG/L	0.04		0.95	0.14	0.11	
gamma-BHC (Lindane)	UG/L	0.05	1500	55	4.5		
Heptachlor	UG/L	0.04		1.0	0.22		
Aldrin	UG/L			0.80	0.25		
Heptachlor epoxide	UG/L	0.03			0.10	0.11	
Endosulfan I	UG/L	50			0.060		
Dieldrin	UG/L	0.004	190	12	11	9.5	
4,4'-DDE	UG/L	0.2			0.13	0.11	
Endrin	UG/L				0.73	0.30	
4,4'-DDD	UG/L	0.3	210	8.6	2.4		
Endosulfan sulfate	UG/L	50			0.14		
4,4'-DDT	UG/L	0.2	450	9	3.1		
Endrin ketone	UG/L	5			0.59	1.1	
alpha-Chlordane	UG/L	0.05	120	5.9	2.8	0.12	
gamma-Chlordane	UG/L	0.05	93	4.1	2.0	0.033	

* - T.O.G.S 1.1.1 (Revised June, 1998) Criteria.

Only detected results reported.

TABLE 3
GROUNDWATER SAMPLE ANALYTICAL RESULTS
93 MAIN STREET

Location I.D.			MSGP10WG	MSGPSB39WG	MSGPSB42WG	MW-1	MW-2
Sample I.D.			MSGP10WG	MSGPSB39WG	MSGPSB42WG	MS-931201-MW1	MS-931201-MW2
Matrix			Water	Water	Water	Water	Water
Date Sampled			11/03/93	11/05/93	11/05/93	12/01/93	12/01/93
Parameter	Units	Criteria*					
HERB							
Dicamba	UG/L	0.44	3.0			R	R
2,4-D	UG/L	50		1.2		R	R
Metals							
Aluminum	UG/L		NA	NA	61900	1350	1230
Arsenic	UG/L	25	NA	NA	106		6.0
Barium	UG/L	1000	NA	NA	1510	93.9	141
Beryllium	UG/L	3	NA	NA	6.2		
Calcium	UG/L		NA	NA	1190000	132000	155000
Chromium	UG/L	50	NA	NA	174	3.1	2.9
Cobalt	UG/L		NA	NA	R	12.7	15.0
Copper	UG/L	200	NA	NA	443	2.0	
Lead	UG/L	25	NA	NA	225		
Magnesium	UG/L	35000	NA	NA	233000	34300	23100
Manganese	UG/L		NA	NA	20500	797	851
Mercury	UG/L	0.7	NA	NA	6.7		
Nickel	UG/L	100	NA	NA	73.5	3.0	1.5
Potassium	UG/L		NA	NA	35900	12500	2370
Selenium	UG/L	10	NA	NA	8.2		
Sodium	UG/L	20000	NA	NA	33400	35300	11500
Vanadium	UG/L		NA	NA	147	8.6	5.7
Zinc	UG/L	2000	NA	NA	656	15.5	15.1
Cyanide	UG/L	200	NA	NA	10.9		

* - T.O.G.S 1.1.1 (Revised June, 1998) Criteria.

Only detected results reported.

- Concentration exceeds Criteria

TABLE 3
GROUNDWATER SAMPLE ANALYTICAL RESULTS
93 MAIN STREET

Location I.D.			MW-3	MW-4	MW-6	MW-6
Sample I.D.			MS-931202-MW3	MS-931202-MW4	MS-931201-MW6	MS-931201-MW6D
Matrix			Water	Water	Water	Water
Date Sampled			12/02/93	12/02/93	12/01/93	12/01/93
Parameter	Units	Criteria*				DUP
Volatiles						
Acetone	UG/L	50			24	21
1,2-Dichloroethane	UG/L	0.6			74	33
Benzene	UG/L	1			64	72
4-Methyl-2-Pentanone	UG/L	50			21	22
Tetrachloroethene	UG/L	5			23	34
Toluene	UG/L	5			73	89
Chlorobenzene	UG/L	5			110	120
Ethylbenzene	UG/L	5			110	120
Xylene (total)	UG/L	5			530	650
Semivolatiles						
2,4-Dichlorophenol	UG/L	5			1400	1000
Naphthalene	UG/L	10			140	51
2-Methylnaphthalene	UG/L				12	27
2,4,5-Trichlorophenol	UG/L	1			1500	1200
Pentachlorophenol	UG/L	1			25	
bis(2-Ethylhexyl)phthalate	UG/L	5	3	5		
PEST						
alpha-BHC	UG/L	0.01				
beta-BHC	UG/L	0.04				
delta-BHC	UG/L	0.04				
gamma-BHC (Lindane)	UG/L	0.05			91	75
Heptachlor	UG/L	0.04				
Aldrin	UG/L					
Heptachlor epoxide	UG/L	0.03				
Endosulfan I	UG/L	50				
Dieldrin	UG/L	0.004			13	12
4,4'-DDE	UG/L	0.2				
Endrin	UG/L					
4,4'-DDD	UG/L	0.3				
Endosulfan sulfate	UG/L	50				
4,4'-DDT	UG/L	0.2				
Endrin ketone	UG/L	5				
alpha-Chlordane	UG/L	0.05				
gamma-Chlordane	UG/L	0.05				

* - T.O.G.S 1.1.1 (Revised June, 1998) Criteria.

Only detected results reported.

TABLE 3
GROUNDWATER SAMPLE ANALYTICAL RESULTS
93 MAIN STREET

Location I.D.			MW-3	MW-4	MW-6	MW-6
Sample I.D.			MS-931202-MW3	MS-931202-MW4	MS-931201-MW6	MS-931201-MW6D
Matrix			Water	Water	Water	Water
Date Sampled			12/02/93	12/02/93	12/01/93	12/01/93
Parameter	Units	Criteria*				DUP
HERB						
Dicamba	UG/L	0.44			1.7	2.5
2,4-D	UG/L	50				
Metals						
Aluminum	UG/L		1720	218	1200	152
Arsenic	UG/L	25	4.1		19.2	19.0
Barium	UG/L	1000	75.5	53.9	104	114
Beryllium	UG/L	3				
Calcium	UG/L		99300	106000	123000	121000
Chromium	UG/L	50	3.5	0.72	3.4	1.4
Cobalt	UG/L		8.9	9.1	11.3	10.3
Copper	UG/L	200	2.7			
Lead	UG/L	25				
Magnesium	UG/L	35000	15500	16000	23000	22300
Manganese	UG/L		750	502	1770	1750
Mercury	UG/L	0.7				
Nickel	UG/L	100	1.5		3.0	1.9
Potassium	UG/L		6100	2730	15400	9440
Selenium	UG/L	10				
Sodium	UG/L	20000	19300	34500	60200	57400
Vanadium	UG/L		5.5	2.2	6.0	3.9
Zinc	UG/L	2000	26.3	10.0	25.3	17.0
Cyanide	UG/L	200		120		

* - T.O.G.S 1.1.1 (Revised June, 1998) Criteria.

Only detected results reported.

- Concentration exceeds Criteria

TABLE 3
SOIL SAMPLE ANALYTICAL RESULTS
93 MAIN STREET

Location I.D.			MSGPSB10	MSGPSB2	MSGPSB20	MSGPSB22	MSGPSB43
Sample I.D.			MSGPSB10	MSGPSB2	MSGPSB20	MSGPSB22	MSGPSB43
Matrix			Soil	Soil	Soil	Soil	Soil
Date Sampled			11/03/93	11/02/93	11/04/93	11/04/93	11/05/93
Parameter	Units	Criteria*					
PEST							
Heptachlor	UG/KG	100				6.9	
Aldrin	UG/KG	41	39000				
Heptachlor epoxide	UG/KG	20	8300	960			
Endosulfan I	UG/KG	900	8200				
Dieldrin	UG/KG	44	38000			16	17
4,4'-DDE	UG/KG	2100	24000	3300		19	4.5
Endrin	UG/KG	100	37000	6400		14	
Endosulfan II	UG/KG	900	1000				
4,4'-DDD	UG/KG	2900	330000	11000		41	5.3
Endosulfan sulfate	UG/KG	1000	560				
4,4'-DDT	UG/KG	2100	140000	5400		47	13
Endrin aldehyde	UG/KG		630				
alpha-Chlordane	UG/KG		250000	79000		350	15
gamma-Chlordane	UG/KG	540	240000	73000		250	12
HERB							
2,4,5-TP (Silvex)	UG/KG	700				NA	
2,4,5-T	UG/KG	1900			17	NA	7.3
Metals							
Aluminum	MG/KG		6330	5240	11100	NA	6700
Antimony	MG/KG		2.6	1.2		NA	1.1
Arsenic	MG/KG	7.5	33.6	9.2	8.2	NA	6.4
Barium	MG/KG	300	135	113	24.8	NA	93.0
Beryllium	MG/KG	0.16	0.44	0.23	0.46	NA	0.36
Cadmium	MG/KG	10	4.4	2.3	0.24	NA	0.34
Calcium	MG/KG		21600	25000	6120	NA	29500
Chromium	MG/KG	50	30.3	41.4	15.4	NA	10.4
Cobalt	MG/KG	30	3.4	7.2	10.2	NA	2.2
Copper	MG/KG	25	64.0	83.6	22.4	NA	24.4
Iron	MG/KG	2000	17200	34200	27000	NA	13000
Lead	MG/KG		476	572	3.2	NA	112
Magnesium	MG/KG		4730	5140	4720	NA	3220
Manganese	MG/KG		292	322	300	NA	532
Mercury	MG/KG	0.1	1.1	0.19		NA	0.26
Nickel	MG/KG	13				NA	

* - TAGM #4046 (Revised April, 1995) Criteria.

Only detected results reported.

TABLE 3
SOIL SAMPLE ANALYTICAL RESULTS
93 MAIN STREET

Location I.D.			MSGPSB10	MSGPSB2	MSGPSB20	MSGPSB22	MSGPSB43
Sample I.D.			MSGPSB10	MSGPSB2	MSGPSB20	MSGPSB22	MSGPSB43
Matrix			Soil	Soil	Soil	Soil	Soil
Date Sampled			11/03/93	11/02/93	11/04/93	11/04/93	11/05/93
Parameter	Units	Criteria*					
Volatiles							
Methylene Chloride	UG/KG	100			30	NA	11
Chlorobenzene	UG/KG	1700	3200	39		NA	
Ethylbenzene	UG/KG	5500	17000			NA	
Xylene (total)	UG/KG	1200	100000			NA	
Semivolatiles							
1,2,4-Trichlorobenzene	UG/KG	3400	24000			NA	
Naphthalene	UG/KG	13000	30000			NA	
2-Methylnaphthalene	UG/KG	36400	190000	46		NA	
2,4,5-Trichlorophenol	UG/KG	100	7000			NA	
Acenaphthylene	UG/KG	41000				NA	54
Acenaphthene	UG/KG	50000				NA	42
4-Nitrophenol	UG/KG	100	2500			NA	
Fluorene	UG/KG	50000				NA	55
Phenanthrene	UG/KG	50000	11000	340		NA	790
Anthracene	UG/KG	50000		60		NA	180
Carbazole	UG/KG			70		NA	47
Di-n-butylphthalate	UG/KG	8100	4000			NA	
Fluoranthene	UG/KG	50000		1100		NA	1200
Pyrene	UG/KG	50000		800		NA	1200
Butylbenzylphthalate	UG/KG	50000		57		NA	
Benzo(a)anthracene	UG/KG	224		510		NA	700
Chrysene	UG/KG	400		540		NA	570
bis(2-Ethylhexyl)phthalate	UG/KG	50000	7100	370		NA	97
Benzo(b)fluoranthene	UG/KG	224		830		NA	540
Benzo(k)fluoranthene	UG/KG	224		450		NA	180
Benzo(a)pyrene	UG/KG	61		530		NA	540
Indeno(1,2,3-cd)pyrene	UG/KG	3200		240		NA	180
Dibenz(a,h)anthracene	UG/KG	14		53		NA	57
Benzo(g,h,i)perylene	UG/KG	50000		220		NA	150
PEST							
alpha-BHC	UG/KG	110	5600				
beta-BHC	UG/KG	200	5600	320			
delta-BHC	UG/KG	300	12000	11000			3.1
gamma-BHC (Lindane)	UG/KG	60	44000	320			

* - TAGM #4046 (Revised April, 1995) Criteria.

Only detected results reported.

- Concentration exceeds Criteria.

TABLE 3
SOIL SAMPLE ANALYTICAL RESULTS
93 MAIN STREET

Location I.D.			MSGPSB10	MSGPSB2	MSGPSB20	MSGPSB22	MSGPSB43
Sample I.D.			MSGPSB10	MSGPSB2	MSGPSB20	MSGPSB22	MSGPSB43
Matrix			Soil	Soil	Soil	Soil	Soil
Date Sampled			11/03/98	11/02/98	11/04/98	11/04/98	11/05/98
Parameter	Units	Criteria*					
Metals							
Potassium	MG/KG		494	424	730	NA	602
Selenium	MG/KG	2		1.8	1.4	NA	
Silver	MG/KG		R	R	R	NA	R
Sodium	MG/KG		622	628	242	NA	220
Vanadium	MG/KG	150	19.2	33.2	15.8	NA	15.0
Zinc	MG/KG	20	404	416	69.3	NA	63.0
Cyanide	MG/KG		0.70	0.92	0.12	NA	0.50

* - TAGM #4046 (Revised April, 1995) Criteria.

Only detected results reported.

TABLE 3
SOIL SAMPLE ANALYTICAL RESULTS
93 MAIN STREET

Location I.D.			TEST PIT 1	TEST PIT 1	TEST PIT 5
Sample I.D.			MSTP1ASE	MSTP1DW	MS-981210-TP5
Matrix			Soil	Soil	Soil
Date Sampled			11/19/93	11/19/93	12/10/93
Parameter	Units	Criteria*			
Metals					
Potassium	MG/KG		573	600	579
Selenium	MG/KG	2			
Silver	MG/KG		0.63	0.59	R
Sodium	MG/KG		273	317	469
Vanadium	MG/KG	150	21.1	20.4	14.2
Zinc	MG/KG	20	151	185	194
Cyanide	MG/KG		R	R	0.50

* - TAGM #4046 (Revised April, 1995) Criteria.

Only detected results reported.

- Concentration exceeds Criteria.

TABLE 3
SUMMARY OF DETECTED ANALYTES
93 MAIN ST.

Location I.D.			MW-01	MW-06	MW-07	MW-08	MW-09
Sample I.D.			MW-1	MW-6	MW-7	MW-8	MW-9
Matrix			Water	Water	Water	Water	Water
Date Sampled			09/29/99	09/29/99	09/29/99	09/29/99	09/29/99
Parameter	Units	Criteria*					
Volatiles							
Acetone	UG/L	50				52	55
Chloroform	UG/L	7		2			
1,2-Dichloroethane	UG/L	0.5		31		6	
Methyl Ethyl Ketone (2-Butanone)	UG/L	50		1			
Benzene	UG/L	1		43			
4-Methyl-2-Pentanone	UG/L	NV		4			
...achloroethene	UG/L	5		15			
...ne	UG/L	5		13			
...enzene	UG/L	5		72			
...zene	UG/L	5		57			
...e (total)	UG/L	5		130			
Semivolatiles							
...enol	UG/L	1		2			
2-Chlorophenol	UG/L	1		5			
1,4-Dichlorobenzene	UG/L	3		4			
2-Methylphenol (o-cresol)	UG/L	1		2			
4-Methylphenol (p-cresol)	UG/L	1		4			
2,4-Dichlorophenol	UG/L	5		330		6	
2,4-Dimethylphenol	UG/L	50		2			
Naphthalene	UG/L	10		23			
2,4,5-Trichlorophenol	UG/L	1		440		5	
Pentachlorophenol	UG/L	1		12			
Phenanthrene	UG/L	50		3			
Fluoranthene	UG/L	50		4			
Pyrene	UG/L	50		3			
Butylbenzylphthalate	UG/L	50			1		
Di-n-butylphthalate	UG/L	50					1
Benzo(a)anthracene	UG/L	0.002		1			
Chrysene	UG/L	0.002		1			
bis(2-Ethylhexyl)phthalate	UG/L	5		7	2		
Benzo(b)fluoranthene	UG/L	0.002		2			
Benzo(a)pyrene	UG/L	ND		1			
Pesticides							
alpha-BHC	UG/L	0.01		1.5			

* -New York State Department of Environmental Conservation. 1998. Division of Water Technical and Operational Guidance Series (1.1.1), Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations. June, Class GA.

TABLE 3
SOIL SAMPLE ANALYTICAL RESULTS
93 MAIN STREET

Location I.D.			TEST PIT 1	TEST PIT 1	TEST PIT 5
Sample I.D.			MSTP1ASE	MSTP1DW	MS-981210-TP5
Matrix			Soil	Soil	Soil
Date Sampled			11/18/98	11/18/98	12/10/98
Parameter	Units	Criteria*			
Volatiles					
Methylene Chloride	UG/KG	100			
Chlorobenzene	UG/KG	1700			240
Ethylbenzene	UG/KG	5500			290
Xylene (total)	UG/KG	1200			2900
Semivolatiles					
1,2,4-Trichlorobenzene	UG/KG	3400			
Naphthalene	UG/KG	13000			
2-Methylnaphthalene	UG/KG	36400		300	6600
2,4,5-Trichlorophenol	UG/KG	100			
Acenaphthylene	UG/KG	41000			
Acenaphthene	UG/KG	50000			
4-Nitrophenol	UG/KG	100			
Fluorene	UG/KG	50000			
Phenanthrene	UG/KG	50000	87		
Anthracene	UG/KG	50000			
Carbazole	UG/KG				
Di-n-butylphthalate	UG/KG	8100			
Fluoranthene	UG/KG	50000	230	190	
Pyrene	UG/KG	50000	350	460	
Butylbenzylphthalate	UG/KG	50000	42		
Benzo(a)anthracene	UG/KG	224	130	100	
Chrysene	UG/KG	400	150	130	
bis(2-Ethylhexyl)phthalate	UG/KG	50000	160	230	
Benzo(b)fluoranthene	UG/KG	224	350	190	
Benzo(k)fluoranthene	UG/KG	224	140	83	
Benzo(a)pyrene	UG/KG	61	170	110	
Indeno(1,2,3-cd)pyrene	UG/KG	3200	64	83	
Dibenz(a,h)anthracene	UG/KG	14			
Benzo(g,h,i)perylene	UG/KG	50000	62	150	
PEST					
alpha-BHC	UG/KG	110			
beta-BHC	UG/KG	200			
delta-BHC	UG/KG	300	430	2500	4900
gamma-BHC (Lindane)	UG/KG	60			

* - TAGM #4046 (Revised April, 1995) Criteria.

Only detected results reported.

- Concentration exceeds Criteria.

TABLE 3
SOIL SAMPLE ANALYTICAL RESULTS
93 MAIN STREET

Location I.D.			TEST PIT 1	TEST PIT 1	TEST PIT 5
Sample I.D.			MSTP1ASE	MSTP1DW	MS-931210-TP5
Matrix			Soil	Soil	Soil
Date Sampled			11/18/93	11/18/93	12/10/93
Parameter	Units	Criteria*			
PEST					
Heptachlor	UG/KG	100	4600		22000
Aldrin	UG/KG	41	530		46000
Heptachlor epoxide	UG/KG	20			
Endosulfan I	UG/KG	900			
Dieldrin	UG/KG	44	630		97000
4,4'-DDE	UG/KG	2100			3900
Endrin	UG/KG	100	650		19000
Endosulfan II	UG/KG	900			
4,4'-DDD	UG/KG	2900	2900		69000
Endosulfan sulfate	UG/KG	1000			
4,4'-DDT	UG/KG	2100	4000		32000
Endrin aldehyde	UG/KG				
alpha-Chlordane	UG/KG		23000	55000	220000
gamma-Chlordane	UG/KG	540	21000	46000	230000
HERB					
2,4,5-TP (Silvex)	UG/KG	700	77		500
2,4,5-T	UG/KG	1900	230	73	190
Metals					
Aluminum	MG/KG		8090	6520	7770
Antimony	MG/KG				
Arsenic	MG/KG	7.5	6.6	6.1	19.1
Barium	MG/KG	300	69.2	55.8	51.2
Beryllium	MG/KG	0.16	0.40	0.34	0.43
Cadmium	MG/KG	10	0.81	0.71	2.2
Calcium	MG/KG		21900	27100	14000
Chromium	MG/KG	50	12.8	13.1	13.2
Cobalt	MG/KG	30	8.2	8.0	7.4
Copper	MG/KG	25	31.5	30.8	32.9
Iron	MG/KG	2000	20200	15100	13400
Lead	MG/KG		153	198	113
Magnesium	MG/KG		6270	7020	4890
Manganese	MG/KG		650	418	460
Mercury	MG/KG	0.1			0.17
Nickel	MG/KG	13	19.7	17.5	16.4

* - TAGM #4046 (Revised April, 1995) Criteria.

Only detected results reported.

TABLE 3.
SUMMARY OF DETECTED ANALYTES
93 MAIN ST.

Location I.D.			MW-01	MW-06	MW-07	MW-08	MW-09
Sample I.D.			MW-1	MW-6	MW-7	MW-8	MW-9
Matrix			Water	Water	Water	Water	Water
Date Sampled			09/29/99	09/29/99	09/29/99	09/29/99	09/29/99
Parameter	Units	Criteria*					
Pesticides							
beta-BHC	UG/L	0.04	0.14	0.39		0.097	
delta-BHC	UG/L	0.04	0.13	1.2		0.14	
gamma-BHC (Lindane)	UG/L	0.05		78		0.83	
Heptachlor epoxide	UG/L	0.03	0.071				
Dieldrin	UG/L	0.004	1.5	11		0.35	
Endrin	UG/L	ND	0.15				
Endrin ketone	UG/L	5	0.51	1.0		0.11	
alpha-Chlordane	UG/L	0.05	0.064	1.0			
gamma-Chlordane	UG/L	0.05	0.059	R			
Herbicides							
Dicamba	UG/L	0.44		NA		2.3	
2,4,5-TP (Silvex)	UG/L	0.26		NA		7.5	
2,4,5-T	UG/L	35		NA		0.35	

* -New York State Department of Environmental Conservation. 1998. Division of Water Technical and Operational Guidance Series (1.1.1). Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations. June, Class GA.

Only detected results reported.

- Concentration exceeds Standard or Guidance Value.

TABLE 3
SUMMARY OF DETECTED ANALYTES
93 MAIN ST.

Location I.D.			MW-10
Sample I.D.			MW-10
Matrix			Water
Date Sampled			09/29/99
Parameter	Units	Criteria*	
Volatiles			
Acetone	UG/L	50	
Chloroform	UG/L	7	3
1,2-Dichloroethane	UG/L	0.6	
Methyl Ethyl Ketone (2-Butanone)	UG/L	50	
Benzene	UG/L	1	
4-Methyl-2-Pentanone	UG/L	NV	
Tetrachloroethene	UG/L	5	
Toluene	UG/L	5	
Chlorobenzene	UG/L	5	
Ethylbenzene	UG/L	5	
Xylene (total)	UG/L	5	
Semivolatiles			
Phenol	UG/L	1	
2-Chlorophenol	UG/L	1	
1,4-Dichlorobenzene	UG/L	3	
2-Methylphenol (o-cresol)	UG/L	1	
4-Methylphenol (p-cresol)	UG/L	1	
2,4-Dichlorophenol	UG/L	5	
2,4-Dimethylphenol	UG/L	50	
Naphthalene	UG/L	10	
2,4,5-Trichlorophenol	UG/L	1	
Pentachlorophenol	UG/L	1	
Phenanthrene	UG/L	50	2
Fluoranthene	UG/L	50	
Pyrene	UG/L	50	
Butylbenzylphthalate	UG/L	50	
Di-n-butylphthalate	UG/L	50	
Benzo(a)anthracene	UG/L	0.002	
Chrysene	UG/L	0.002	
bis(2-Ethylhexyl)phthalate	UG/L	5	
Benzo(b)fluoranthene	UG/L	0.002	
Benzo(a)pyrene	UG/L	ND	
Pesticides			
alpha-BHC	UG/L	0.01	

* -New York State Department of Environmental Conservation. 1998. Division of Water Technical and Operational Guidance Series (1.1.1). Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations. June, Class GA.

TABLE 3
SUMMARY OF DETECTED ANALYTES
93 MAIN ST.

Location I.D.			MW-10
Sample I.D.			MW-10
Matrix			Water
Date Sampled			09/29/99
Parameter	Units	Criteria*	
Pesticides			
beta-BHC	UG/L	0.04	0.05
delta-BHC	UG/L	0.04	
gamma-BHC (Lindane)	UG/L	0.05	
Heptachlor epoxide	UG/L	0.03	0.094
Dieldrin	UG/L	0.004	0.27
Endrin	UG/L	ND	0.15
Endrin ketone	UG/L	5	
alpha-Chlordane	UG/L	0.05	
gamma-Chlordane	UG/L	0.05	
Herbicides			
Dicamba	UG/L	0.44	
2,4,5-TP (Silvex)	UG/L	0.26	
2,4,5-T	UG/L	35	

* -New York State Department of Environmental Conservation. 1998. Division of Water Technical and Operational Guidance Series (1.1.1). Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations. June, Class GA

Only detected results reported.

- Concentration exceeds Standard or Guidance Value.

TABLE 3
SUMMARY OF DETECTED ANALYTES
93 MAIN ST.

Location I.D.			BH-01	BH-01	BH-02	BH-03D	BH-04
Sample I.D.			BH-1 (13'-20')	BH-1 (4'-6')	BH-2 (2'-4')	BH-3D (6'-10')	BH-4 (6'-3')
Matrix			Soil	Soil	Soil	Soil	Soil
Date Sampled			09/23/99	09/23/99	09/23/99	09/23/99	09/23/99
Parameter	Units	Criteria*					
Pesticides							
alpha-BHC	UG/KG	110	360	79		3000	
gamma-BHC (Lindane)	UG/KG	60	1400	420		6400	23
Heptachlor	UG/KG	100	4900	160	450	150000	47
Aldrin	UG/KG	41			42		27
Heptachlor epoxide	UG/KG	20		45		7200	
Dieldrin	UG/KG	44	320				
4,4'-DDE	UG/KG	2100		70	620	12000	40
4,4'-DDD	UG/KG	2900	1900	R	290	52000	15
4,4'-DDT	UG/KG	2100	6300	1000	1300	150000	45
alpha-Chlordane	UG/KG	540	8500	210	940	230000	99
gamma-Chlordane	UG/KG	540	8500	250	1000	280000	96

* - NYSDEC TAGM: Determination of Soil Cleanup Objectives and Cleanup Levels; HWR-94-4046 April 1, 1995 (Revised).

APPENDIX B

Cost Estimates

ALTERNATIVE 2 - OFFSITE TREATMENT/DISPOSAL OF CONTAMINATED SOIL

	QUANTITY	UNIT	UNIT PRICE	REFERENCE	TOTAL COST
NSTRUCTION COSTS					
ization	1	LS	$28,270.60	2% of total construction cost. Means Remediation Estimating p.546-548	$28,271
Site Services (Survey, progress & record drawings, trailers, etc.	3	Month	$6,000.00	Engineer's estimate, approx. $200 per day.	$18,000
vation and Disposal Activities					
avate in Cobbles to 25'	1200	CY	$4.50	1998 Means Environmental Remediation Unit Price Book - Item 33 15 0203	$5,400
vy Wall Temporary Steel Sheeting to 25'	1000	SF	$20.55	1998 Means Environmental Remediation Unit Price Book - Item 33 15 0203	$20,550
Dewatering (incl. water treatment) during Excavation	1	LS	$10,000.00	1998 Means Environmental Remediation Unit Price Book - Item 33 15 0203	$10,000
l Waste	1200	CY	$103.81	1998 Means Environmental Remediation Unit Price Book - Item 33 15 0203	$124,572
neration	1800	TON	$650.00	1998 Means Environmental Remediation Unit Price Book - Item 33 14 0105	$1,170,000
dfill Treated Soil	1200	CY	$30.00	1998 Means Environmental Remediation Unit Price Book - Item 33 15 0203	$36,000
firmatory Sampling Pesticides	25	SAMPLE	$150.00	93 Main Street Work Plan,	$3,750
firmatory Sampling VOCs, SVOCs	25	SAMPLE	$225.00	93 Main Street Work Plan,	$5,625
avate Soil From Drywell Area	16	CY	$3.44	1998 Means Environmental Remediation Unit Price Book - Item 17 03 0201	$55
oration Activities					
kfill Excavations w/Clean Fill	1200	CY	$7.12	1996 Means Environmental Restoration Assemblies Cost Book	$8,544
vide/Place Topsoil (6") Cover	450	CY	$23.53	1998 Means Environmental Remediation Assemblies Book	$10,589
ed	1	ACRE	$445.32	1998 Means Environmental Remediation Assemblies Book	$445
obilization	1	LS	$21,202.95	1.5% of total construction cost. Means Remediation Estimating p.546-548	$21,203
TAL CONSTRUCTION COSTS					$1,463,003
GINEERING COSTS					
neering and Permitting (10% of total construction costs)	1	LS	$146,300.34		$146,300
ingency (15% of total construction costs)	1	LS	$219,450.51		$219,451
TAL ENGINEERING COSTS					$365,751
ERATION AND MAINTENANCE COST					
ndwater Monitoring (5 years @5%)	1	LS	$19,915.59		$19,916
TAL OPERATION AND MAINTENANCE COST					$19,916
TAL PROJECT COSTS					$1,848,670

ALTERNATIVE 3 - In-Situ VITRIFICATION

ITEM	QUANTITY	UNIT	UNIT PRICE	REFERENCE	TOTAL COST
CONSTRUCTION COSTS					
Mobilization	1	LS	$69,245.91	8% of construction cost.	$69,246
Daily Site Services (Survey, progress & record drawings, trailers, etc.)	5	Month	$6,000.00	Engineer's estimate, approx. $200 per day.	$30,000
Excavation and Disposal Activities					
Excavate Soil From Drywell Area	16	CY	$3.44	1998 Means Environmental Remediation Unit Price Book - Item 17 03 0276	$55
In-Situ Vitrification					
Setup ISV System	2	EACH	$2,650.00	1998 Means Environmental Remediation Unit Price Book - Item 33 15 0203	$5,300
Vitrify Soil	1800	TON	$450.00	1998 Means Environmental Remediation Unit Price Book - Item 33 14 0105	$810,000
Confirmatory Sampling Pesticides	15	SAMPLE	$150.00	93 Main Street Work Plan.	$2,250
Confirmatory Sampling VOCs, SVOCs	15	SAMPLE	$225.00	93 Main Street Work Plan.	$3,375
Restoration Activities					
Backfill Excavations w/Clean Fill	500	CY	$7.12	1996 Means Environmental Restoration Assemblies Cost Book	$3,560
Provide/Place Topsoil (6") Cover	450	CY	$23.53	1998 Means Environmental Remediation Assemblies Book	$10,589
Seed	1	ACRE	$445.32	1998 Means Environmental Remediation Assemblies Book	$445
Demobilization	1	LS	$23,081.97	5% of construction cost.	$23,082
TOTAL CONSTRUCTION COSTS					$957,902
ENGINEERING COSTS					
Engineering and Permitting	1	LS	$95,790.17	10% of construction costs	$95,790
Contingency	1	LS	$143,685.26	15% of construction costs	$143,685
TOTAL ENGINEERING COSTS					$239,475
OPERATION AND MAINTENANCE COST					
Groundwater Monitoring (5 years @5%)	1	LS	$19,915.59		$19,916
TOTAL OPERATION AND MAINTENANCE COST					$19,916
TOTAL PROJECT COSTS					$1,217,293

ALTERNATIVE 4 - On-Site Thermal Desorption

ITEM	QUANTITY	UNIT	UNIT PRICE	REFERENCE	TOTAL COST
CONSTRUCTION COSTS					
Mobilization	1	LS	$41,264.57	8% of construction cost.	$41,265
Daily Site Services (Survey, progress & record drawings, trailers, etc.)	5	Month	$6,000.00	Engineer's estimate, approx. $200 per day.	$30,000
Excavation and Disposal Activities					
Excavate in Cobbles to 25'	1200	CY	$4.50	1998 Means Environmental Remediation Unit Price Book - Item 33 06 1012	$5,400
Excavate Soil From Drywell Area	16	CY	$3.44	1998 Means Environmental Remediation Unit Price Book - Item 17 03 0276	$55
Heavy Wall Temporary Steel Sheeting to 25'	1000	SF	$20.55	1998 Means Environmental Remediation Unit Price Book - Item 33 06 1022	$20,550
Soil Dewatering (incl. water treatment) during Excavation	1	LS	$10,000.00	Saratoga Tree Nursery Feasibility Study	$10,000
Post Excavation Confirmatory Sampling Pesticides	25	SAMPLE	$150.00	93 Main Street Work Plan.	$3,750
Post Excavation Confirmatory Sampling VOCs, SVOCs	25	SAMPLE	$225.00	93 Main Street Work Plan.	$5,625
Thermal Desorption Unit Staging Pad					
Provide, Place, and Grade 3' High Earth Staging Pad	2600	CY	$7.00	1998 Means Environmental Restoration Unit Cost Book, item 17030423	$18,200
Provide and Place Geotextile Around Sides of Staging Pad (2"x1" mesh,	416	SY	$0.70	1998 Means Site Work & Landscape Cost Data, item 0227040100	$291
Provide and Place Chain Link Fence	700	LF	$19.09	1998 Means Site Work & Landscape Cost Data, item 0227000100	$13,363
Thermal Desorption					
Min. Mobilization/Demobilization Charge, <= 1000mi	1	EA	$5,000.00	1998 Means Environmental Restoration Unit Cost Book, item 33140201	$5,000
Permitting/Engineering for Site (incl. Treatability Study)	1	EA	$35,000.00	1998 Means Environmental Restoration Unit Cost Book, item 33140203	$35,000
Direct Fire Low Temperature Thermal Desorption	1800	TON	$200.00	1998 Means Environmental Restoration Unit Cost Book, item 33140204	$360,000
Restoration Activities					
Backfill Excavations w/ Treated Soil	1200	CY	$0.89	1998 Means Environmental Restoration Assemblies Cost Book	$1,068
Provide/Place Topsoil (6") Cover	300	CY	$23.53	1998 Means Environmental Remediation Assemblies Book	$7,059
Seed	1	ACRE	$445.32	1998 Means Environmental Remediation Assemblies Book	$445
Demobilization	1	LS	$13,755	5% of construction cost.	$13,755
TOTAL CONSTRUCTION COSTS					$570,826
ENGINEERING COSTS					
Engineering and Permitting	1	LS	$57,082.59	10% of total construction costs	$57,083
Contingency	1	LS	$85,623.89	15% of total construction costs	$85,624
TOTAL ENGINEERING COSTS					$142,706
OPERATION AND MAINTENANCE COST					
Groundwater Monitoring (5 years @5%)	1	LS	$19,915.59		$19,916
TOTAL OPERATION AND MAINTENANCE COST					$19,916
TOTAL PROJECT COSTS					$733,448

ALTERNATIVE 5 - HYDRAULIC CONTAINMENT & CHEMICAL OXIDATION

ITEM	QUANTITY	UNIT	UNIT PRICE	REFERENCE	TOTAL COST
CONSTRUCTION COSTS					
Mobilization	1	LS	$9,202.51	5% of construction cost.	$9,203
Daily Site Services (Survey, progress & record drawings, trailers, etc.)	12	Month	$6,000.00	Engineer's estimate, approx. $200 per day.	$72,000
Excavation					
Excavate Soil From Drywell Area	16	CY	$3.44	1998 Means Environmental Remediation Unit Price Book	$55
Excavate Soil For Infiltration Gallery	16	CY	$3.44	1998 Means Environmental Remediation Unit Price Book	$55
Injection Wells & Infiltration Galleries					
Stainless Steel Injection Well	3	LS	$3,500.00	1998 Means Environmental Remediation Unit Price Book	$10,500
Oxidizing Agent - H_2O_2					
Oxidizing with H_2O_2 (includes Fe)	300	CY	$50.00		$15,000
Diposal					
Incineration	24	TON	$650.00	1998 Means Environmental Remediation Unit Price Book	$15,600
Extraction Wells					
Drill With Hollow-Stem Auger for 6" well	60	LF	$65.13		$3,908
Split Spoon	60	LF	$32.57	1998 Means Site Work & Landscape Cost Data	$1,954
6" PVC, Schedule 40, Well Casing	40	LF	$14.25	1998 Means Site Work & Landscape Cost Data	$570
6" PVC, Schdeule 40, Well Screen	20	LF	$25.78	1998 Means Site Work & Landscape Cost Data	$516
6" PVC, Well Plug	2	EACH	$79.27	1998 Means Site Work & Landscape Cost Data	$159
6" Screen, Filter Pack	21	LF	$22.83	1998 Means Site Work & Landscape Cost Data	$479
Surface Pad 4'x4'x4"	2	EACH	$17.61	1998 Means Site Work & Landscape Cost Data	$35
6" Well Bentonite Seal	2	EACH	$131.89	1998 Means Site Work & Landscape Cost Data	$264
6" Well Portland Cement Grout	32	LF	$7.80	1998 Means Site Work & Landscape Cost Data	$250
6" Submersible Pump	2	EACH	$1,870.00	1998 Means Site Work & Landscape Cost Data	$3,740
Control Panel	1	EACH	$4,283.00	1998 Means Site Work & Landscape Cost Data	$4,283
Water Level Sensor	2	EACH	$549.15	1998 Means Site Work & Landscape Cost Data	$1,098
Carbon Treatment					
200 GPM, 6,000 Lb Fill, Stainless Steel, Permanent	2	EACH	$22,411.00	1998 Means Site Work & Landscape Cost Data	$44,822
Prefilter Housing and Cartridge up to 20 GPM	10	EACH	$319.76	1998 Means Site Work & Landscape Cost Data	$3,198
Sewer Connection Fee	1	EACH	$1,258.00	1998 Means Site Work & Landscape Cost Data	$1,258
Wastewater Disposal Fee	130	KGal	$1.50	1998 Means Site Work & Landscape Cost Data	$195
200 GPM Transfer Pump w/Motor, Valves, Piping	1	EACH	$4,112.00	1998 Means Site Work & Landscape Cost Data	$4,112
Demobilization	1	LS	$9,203	5% of construction cost.	$9,203
TOTAL CONSTRUCTION COSTS					$184,050
ENGINEERING COSTS					
Engineering and Permitting	1	LS	$18,405.02	10% of total construction costs	$18,405
Contingency	1	LS	$27,607.52	15% of total construction costs	$27,608
TOTAL ENGINEERING COSTS					$46,013
OPERATION AND MAINTENANCE COST					
Groundwater Monitoring (10 years @ 5%)	1	LS	$35,519.82		$35,520
GAC and Pump Maintenance (10 years @ 5%)	1	LS	$185,320.80		$185,321
TOTAL OPERATION AND MAINTENANCE COST					$220,841
TOTAL PROJECT COSTS					$450,903

ALTERNATIVE 6 - CAPPING/ PUMP AND TREAT

ITEM	QUANTITY	UNIT	UNIT PRICE	REFERENCE	TOTAL COST
CONSTRUCTION COSTS					
Mobilization	1	LS	$5,433.47	5% of construction cost.	$5,433
Daily Site Services (Survey, progress & record drawings, trailers, etc.)	3	Month	$6,000.00	Engineer's estimate, approx. $200 per day.	$18,000
Excavation					
Excavate Soil From Drywell Area	16	CY	$3.44	1998 Means Environmental Remediation Unit Price Book - Item 17 03 0276	$55
Cap Construction					
Jointed Mesh Reinforced Concrete	450	SY	$9.09	1998 Means Environmental Remediation Unit Price Book - Item 18 01 0314	$4,091
130 Mil Geotextile	450	SY	$1.56	1998 Means Environmental Remediation Unit Price Book - Item 33 08 0534	$702
Impervious Layer - Clay 10E-7 6" Lifts	75	CY	$17.11	1998 Means Environmental Remediation Unit Price Book - Item 33 08 0507	$1,283
20 Mil VLDPE	450	SY	$0.61	1998 Means Environmental Remediation Unit Price Book - Item 33 08 0541	$275
Slurry Wall					
Clay/Sand w/Boulders 20'-75' Slurry Wall Excavation	272	CY	$6.16	1998 Means Environmental Remediation Unit Price Book - Item 33 08 0541	$1,676
Clean Fill	205	CY	$7.12	1998 Means Environmental Remediation Unit Price Book - Item 17 03 0426	$1,460
Bentonite	145	TON	$54.06	1998 Means Environmental Remediation Unit Price Book - Item 33 08 0532	$7,839
Soil-Bentonite Backfill Mixing	350	CY	$2.64	1998 Means Environmental Remediation Unit Price Book - Item 17 03 0423	$924
Backfill Slurry Wall Trench	272	CY	$2.38	93 Main Street Workplan.	$647
Retaining Wall					
Continous Footing	2.59	CY	$101.29	1998 Means Environmental Remediation Unit Price Book - Item 33 13 2016	$262
Concrete Retaining Wall	5.2	CY	$118.56	1998 Means Site Work & Landscape Cost Data, item 0227000100	$617
Extraction Wells					
Drill With Hollow-Stem Auger for 6" well	60	LF	$65.13		$3,908
Split Spoon	60	LF	$32.57	1998 Means Site Work & Landscape Cost Data	$1,954
6" PVC, Schedule 40, Well Casing	40	LF	$14.25	1998 Means Site Work & Landscape Cost Data	$570
6" PVC, Schdeule 40, Well Screen	20	LF	$25.78	1998 Means Site Work & Landscape Cost Data	$516
6" PVC, Well Plug	2	EACH	$79.27	1998 Means Site Work & Landscape Cost Data	$159
6" Screen, Filter Pack	21	LF	$22.83	1998 Means Site Work & Landscape Cost Data	$479
Surface Pad 4'x4'x4"	2	EACH	$17.61	1998 Means Site Work & Landscape Cost Data	$35
6" Well Bentonite Seal	2	EACH	$131.89	1998 Means Site Work & Landscape Cost Data	$264
6" Well Portland Cement Grout	32	LF	$7.80	1998 Means Site Work & Landscape Cost Data	$250
6" Submersible Pump	2	EACH	$1,870.00	1998 Means Site Work & Landscape Cost Data	$3,740
Control Panel	1	EACH	$4,283.00	1998 Means Site Work & Landscape Cost Data	$4,283
Water Level Sensor	2	EACH	$549.15	1998 Means Site Work & Landscape Cost Data	$1,098
Carbon Treatment					
200 GPM, 6,000 Lb Fill, Stainless Steel, Permanent	2	EACH	$22,411.00	1998 Means Site Work & Landscape Cost Data	$44,822
Prefilter Housing and Cartridge up to 20 GPM	10	EACH	$319.76	1998 Means Site Work & Landscape Cost Data	$3,198
Sewer Connection Fee	1	EACH	$1,250.00	1998 Means Site Work & Landscape Cost Data	$1,250
Wastewater Disposal Fee	130	KGal	$1.50	1998 Means Site Work & Landscape Cost Data	$195
200 GPM Transfer Pump w/Motor, Valves, Piping	1	EACH	$4,112.00	1998 Means Site Work & Landscape Cost Data	$4,112
Demobilization	1	LS	$2,173	2% of construction cost	$2,173
TOTAL CONSTRUCTION COSTS					$108,669
ENGINEERING COSTS					
Engineering and Permitting	1	LS	$10,866.94	10% of total construction costs	$10,867
Contingency	1	LS	$16,300.41	15% of total construction costs	$16,300
TOTAL ENGINEERING COSTS					$27,167
OPERATION AND MAINTENANCE COST					
Groundwater Monitoring (30 years @ 5%)	1	LS	$70,713.27		$70,713
GAC and Pump Maintenance (30 years @ 5%)			$370,000.00		$370,000
TOTAL OPERATION AND MAINTENANCE COST					$440,713
TOTAL PROJECT COSTS					$576,550