Environmental Protection Agency

Emergency and Remedial Response

EPA/ROD/R05-85/023
September 1985

EPA

Superfund Record of Decision:

RODR0585023

New Lyme, OH

TECHNICAL REPORT DATA
(Please read Instructions on the reverse before completing)

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16. ABSTRACT

The New Lyme Landfill is located near State Route 11 on Dodgeville Road in Ashtabula County, approximately 20 miles south of the City of Ashtabula, Ohio. The landfill occupies about 40 acres of a 100-acre tract. Operations began at the site in 1969, and were initially managed by two farmers. In 1971, the landfill was licensed by the State of Ohio and operations were taken over by a licensed landfill operator. According to documentation, the New Lyme Landfill received household, industrial, commercial, and institutional wastes and construction and demolition debris. However, numerous violations of the license occurred, including: open dumping; improper spreading and compacting of wastes; no State approval for disposal of certain industrial wastes; and excavation of trenches into the shale bedrock. In August 1978, the landfill was closed by the Ashtabula County Health Department. Documents indicate that waste at the New Lyme Landfill site included: coal tar distillates, asbestos, coal tar, resins and resin tar, paint sludge, oils, paint lacquer thinner, peroxide, corrosive liquids, acetone, xylene, toluene, kerosene, naptha, benzene, linseed oil, mineral oil, fuel oil, chlorinated solvents, 2,4-D, and laboratory chemicals.

The selected remedial action includes: construction of a RCRA cap over the landfill installation of extraction/containment wells around the perimeter of the landfill to dewater the landfill and to eliminate leachate production; onsite treatment of

(continued on separage page)

17. KEY WORDS AND DOCUMENT ANALYSIS

a. DESCRIPTORS	b. IDENTIFIERS/OPEN ENDED TERMS	c. COSATI Field/Group
Record of Decision New Lyme, Ohio Contaminated Media: soil, gw, sediment Key contaminants: VOCs, asbestos, oils, sludge, solvents, toluene, resins and resin tar and laboratory chemicals		

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contaminated ground water and leachate using biological disc, sodium hydroxide precipitation and granular activated carbon; onsite consolidation of contaminated sediment; installation of gas vents; fencing of the site and installation of a ground water monitoring system. Total capital costs for the selected remedial action is estimated to be $10,798,000 with annual O&M costs of $252,000 for the duration that water treatment is necessary. After that time, the annual O&M costs are estimated to decrease to $44,000.

Record of Decision

Remedial Alternative Selection

SITE New Lyme, Ashtabula County, Ohio

DOCUMENTS REVIEWED

The following documents describing the analysis of the cost-effectiveness of the remedial action for the New Lyme site, New Lyme, Ohio have been reviewed:

- New Lyme Remedial Investigation Report, February 1985;
- New Lyme Feasibility Study, August 1985; and,
- Summary of Remedial Alternative Selection, New Lyme Site, September 1985.

DESCRIPTION OF SELECTED REMEDY

- Installation of RCRA cap over the landfill.
- Extraction/containment wells around perimeter of landfill to dewater landfill and eliminate leachate production. Wells must operate indefinitely to maintain effectiveness of remedy.
- Onsite treatment of contaminated groundwater and leachate using biological disc, sodium hydroxide precipitation, and granular activated carbon until leachate is no longer produced and treatment becomes unnecessary (after about 15 years).
- Onsite consolidation of contaminated sediment.
- Gas control, fence, groundwater monitoring.

DECLARATIONS

Consistent with the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), and the National Contingency Plan (40 CFR Part 300), it has been determined that taking source control action by capping the landfill and consolidating contaminated sediment under the cap, and taking management of migration action by extraction and onsite treatment of contaminated leachate and groundwater at the New Lyme site is a cost-effective remedy that provides adequate protection of public health, welfare and the environment. The State of Ohio has been consulted and agrees with the approved remedy. In addition, the action will require further operation and maintenance activities to ensure the continued effectiveness of the remedy. These activities will be considered part of the approved action for a period not to exceed one year.

It has also been determined that the action being taken is appropriate when balanced against the availability of Trust Fund monies for use at other sites.

Sept. 27, 1985
Date

Alan Levin (Acting)
Regional Administrator

SUMMARY OF REMEDIAL ALTERNATIVE SELECTION

NEW LYME LANDFILL

SITE LOCATION AND DESCRIPTION

The New Lyme Landfill is near State Route 11 on Dodgeville Road in Ashtabula County, approximately 20 miles south of the City of Ashtabula, Ohio. The landfill occupies about 40 acres of a 100-acre tract. The general site location is shown in Figure 1.

The landfill is bounded by Dodgeville Road and a wooded, marshy area associated with Lebanon Creek to the north and by wooded, marshy areas on the west and south. The site is surrounded on 3 sides by wetlands. Land adjacent to the eastern boundary has been cleared of trees and brush for agricultural use. Leachate seeps are evident along the northern, western, and southern boundaries of the landfill. Access to the landfill is by an unpaved road extending southward from Dodgeville Road. The closest residences lie within 1000 feet of the site. These households (approximately 10 residences) are presently using the groundwater as their drinking water source.

The site lies entirely within the Lebanon Creek Watershed. Surface drainage from the site can be divided into four subwatersheds. The northern portion of the site drains directly into Lebanon Creek. The remainder of the site drains southward to an unnamed tributary of Lebanon Creek. Lebanon Creek drains into Rock Creek, upstream of Lake Roaming Rock, a public water supply.

Bedrock at the site consists of the Ohio Shale Formation, gray siliceous shale, to depths in excess of 2,200 feet. The surface of the bedrock is weathered and fractured. The weathered zone was found to extend a minimum of 10 feet below the rock surface. Bedrock is overlain by glacial till, and ranges in composition from clayey silt to silty clay to sandy clay, and contains small quantities of pebbles. The total thickness of the till ranges from approximately 20 to 35 feet. The head data in the bedrock indicate that groundwater flows east to west beneath the site. The geologic conditions and the water level data indicate that both the shale and the course grained lenses within the till are under confined or semiconfined conditions. In several bedrock wells, water levels rise above the ground surface. The till appears to act as an aquitard at the site. Some groundwater flow occurs along fractures in the till. Coupled with the artesian conditions found generally across the site, and the upward vertical gradients found in the west and northeast, the fractures apparently allow groundwater to discharge to the surface in this general area. Relatively constant discharges at major leachate seeps over a wide range of climatic conditions indicate that the source of water for leachate formation is primarily groundwater opposed to direct recharge (Figure 2).

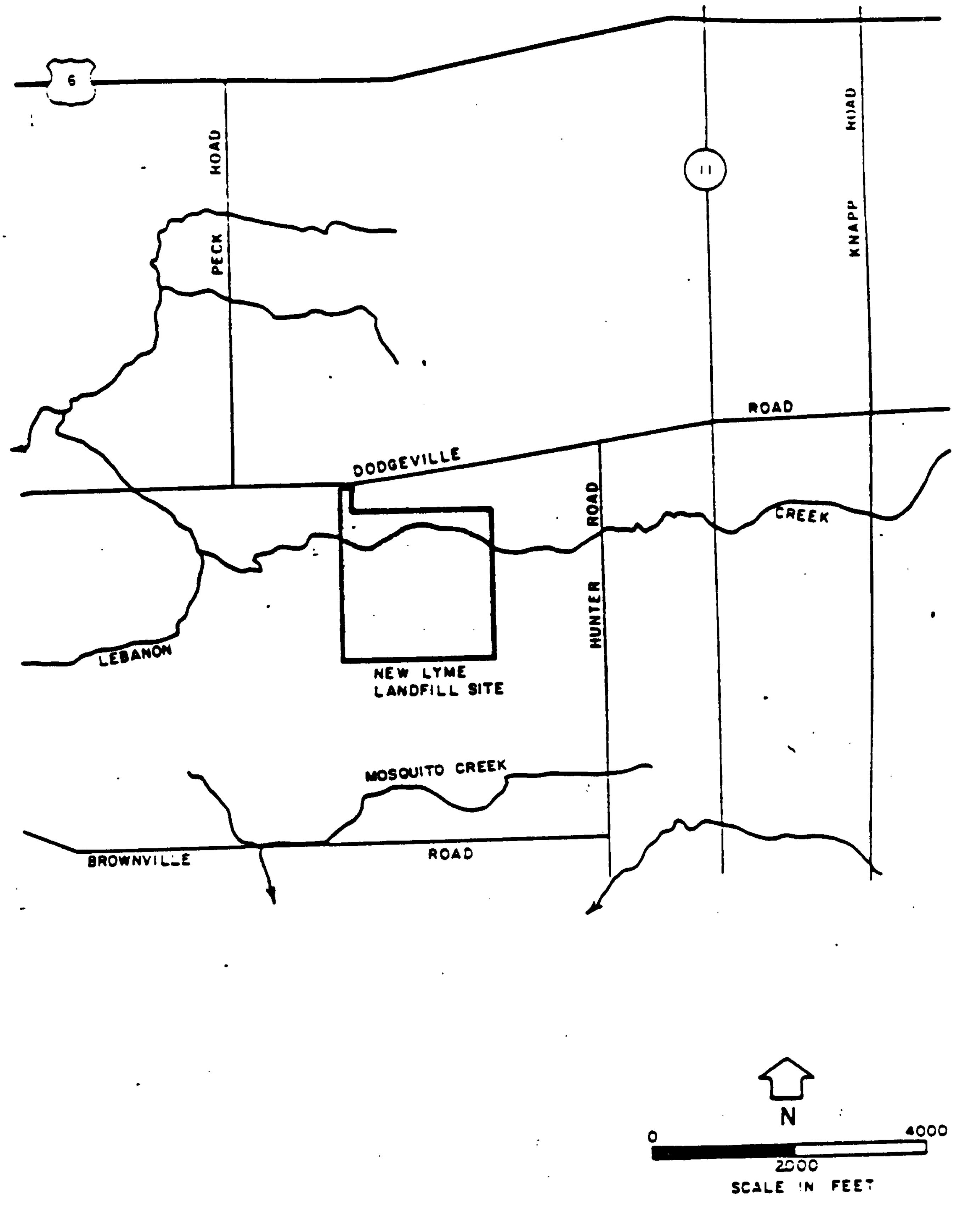

FIGURE 1
LOCATION MAP
NEW LYME LANDFILL

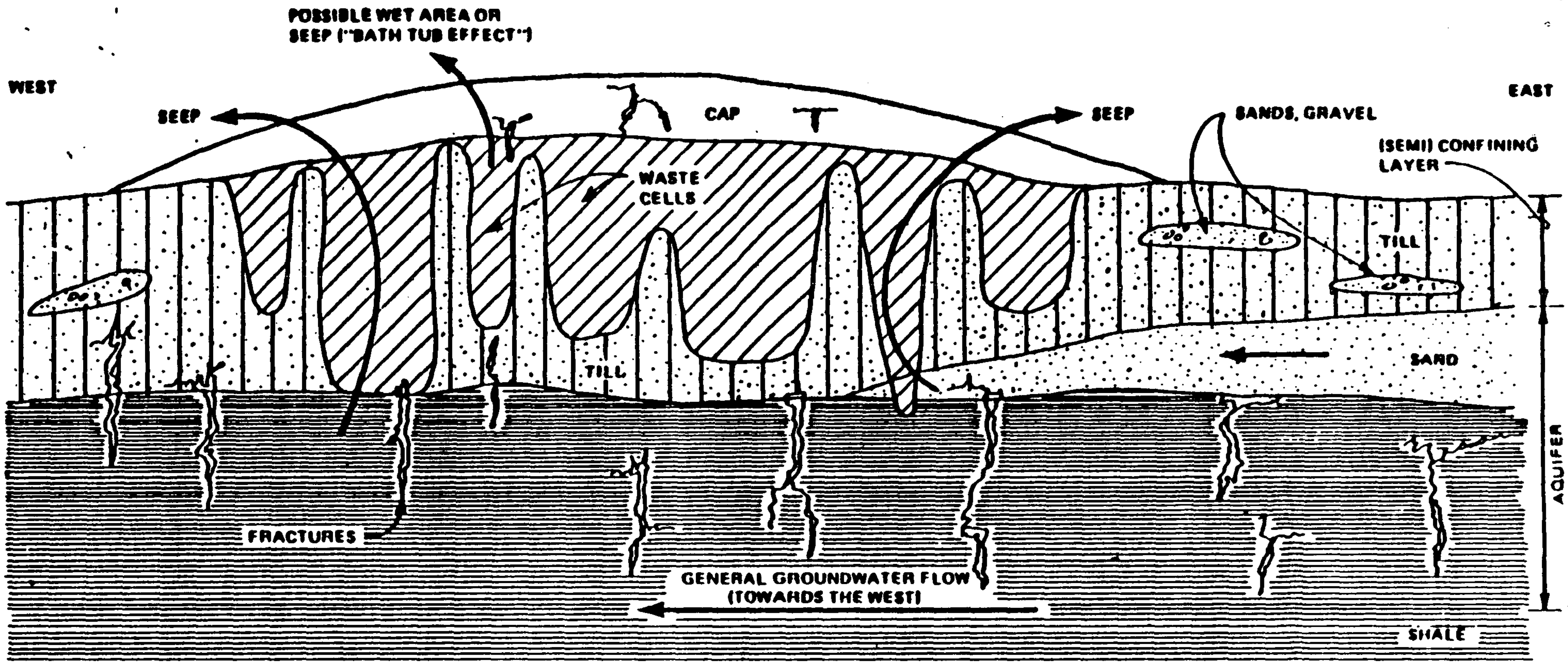

FIGURE 2
SCHEMATIC HYDROGEOLOGIC
CROSS SECTION
NEW LYME LANDFILL

SITE HISTORY

The landfill began operations in 1969. The site was initially managed by two farmers. In 1971, the landfill was licensed by the State of Ohio and operations were taken over by a licensed landfill operator. Violations of the license, the Ohio Revised Code, and the Ohio Administrative Code which occurred throughout the operation of the landfill included the following: water in the trenches; open dumping; uncontrolled access to the landfill; improper spreading and compaction of wastes; waste not being covered daily; inadequate equipment; no Ohio EPA approval for acceptance of certain industrial wastes; and excavation of trenches into the shale bedrock. In early August 1978, the landfill was closed by the Ashtabula County Health Department.

According to documentation, during its years of operation, the New Lyme Landfill received household, industrial, commerial, and institutional wastes and construction and demolition debris. Fifty 55-gallon drums of cyanide sludge are believed by the Ohio EPA to have been buried at the site.

Documents indicate that wastes at the New Lyme Landfill site include: coal tar distillates, asbestos, coal tar, resins and resin tar, paint sludge, oils, paint, lacquer thinner, peroxide, corrosive liquids, acetone, xylene, toluene, kerosene, naptha, benzene, linseed oil, mineral oil, fuel oil, chlorinated solvents, 2,4-D, and laboratory chemicals.

CURRENT SITE STATUS

Data collected during the remedial investigation (RI), conducted during the period of August 1983 to August 1984, has indicated contamination of various media at and in the vicinity of the New Lyme Landfill site. The quantity and type of contamination present is summarized in Table 1.

Potential risks from contaminated soil, leachate and groundwater at the site are based on the assumption that the site will be used in the future for both residential and industrial/commercial development. The potential human health and environmental effects of the site in the absence of any remedial action are estimated. These risks are theoretical quantifications, and are reported as excess lifetime cancer risks. Excess lifetime cancer risk is defined as the incremental increase in the probability of getting cancer compared to the probability if no exposure occurred. For example, a 10^{-6} excess lifetime cancer risk represents the exposure that could increase cancer by one case per million people exposed. The risk levels were calculated using U.S. EPA Carcinongen Assessment Group cancer potency values (U.S. EPA, December 1984).

Generally, due to incomplete record keeping and documentation, the site contains waste whose quantities, condition, and exact nature are not fully known. Based on the exposure assessment, exposure to environmental media contaminated by a release from the New Lyme Landfill site has the potential to result in current and future risks to public health and the environment. Assessing the site by using a 1×10^{-6} excess lifetime cancer risk as a level of concern for public health, exposure to leachate via wading, and ingestion of groundwater and soil present a risk to public health. An environmental threat to wetlands and surface waters is also posed by the continuing discharge of leachate from the site.

Table 1
SUMMARY - ANALYTICAL DATA

Concentrations (ug/kg in soil, ug/L in water)

	Leachate	Soil	Groundwater (Onsite)	Groundwater (Waste Cell)	Groundwater (Offsite & Upgradient	Surface Water	Sediment (at Leachate Sites)	Sediment (at Surface Water Sites)
VOC's								
Acrolein	234							
1,2-Dichloroethane	37.9-180		4					
1,1-Dichloroethane	30.8-23							
Trans-1,3-Dichloropropene	71.4							
Ethylbenzene	21.3-13700	5.8-182	15	430-9700	1.4		15-244	
Methylene Chloride	2870-44000		570	570-10000	50		541-1053	
Chloromethane	10.9-17.2							
Toluene	92.5-12600	0.8-79.6		130	200		118-1053	
Trichloroethene	15.2-162.4					13		
Vinyl Chloride	20-101			12				
2-Butanone	82.6-49400	2.6-22	74-240	6000-76000			2245-6555	
2-Hexanone	6.3-2780	3.9-18.4	37-39	1100-2300				
4-Methyl-2-Pentanone	2230-5610	6.8	22-46	1500-15000			855	
Xylene	41.4-415	3.1-70.9			1.3-1.4		14-418	
Fluorotrichloromethane		3.0-13.5						
Tetrachloroethene		12-26				40		
Styrene		3.1-70.9						
1,1,1-Trichloroethane		5.9-37.8						
Carbon Disulfide		5.4-19.5						
Acetone	0-328000			1000-46000	130	1170	1224-7444	
Chlorobenzene					3.5			
Trans-1,2-Dichloroethene							66-73	
SEMIVOLATILES								
P-Chloro-M-Cresol	10.8-11							
Pentachlorophenol	14-99.2							
Phenol	38400							
Benzoic Acid	11.4							
2-Methylphenol	14.6							
1,4-Dichloroebenzene	6							
N-Nitrosodiphenylamine	6.8-21.7							
Benzyl Alcohol	16							
PAH's	13.4-15	56-7700						
Phthalates	2.6-22.8	50-530			0.5-0.9			
Dibenzofuran		860						
OTHER								
PCB's		140-300						
Mercury		70-150						
Alpha-BHC	0.006							
Delta-BHC						0.009		

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There is also concern with offsite migration of leachate into surface water because Lebanon Creek drains into Rock Creek, upstream of Lake Roaming Rock, a water supply reservoir.

Soil

Surface and subsurface soil contains volatile organic compounds (VOCs) at concentrations in the part per billion range. Ingestion of contaminated soil from areas of maximum VOC concentrations may result in an excess lifetime cancer risk (above background) of 2×10^{-4}.

Groundwater

Volatile organic and phenolic compounds were found in two on-site groundwater monitoring wells in the low part per million range. The most widespread organic compounds in onsite groundwater samples were phthalates at concentrations below quantification limits. Ingestion of contaminated groundwater from the New Lyme Landfill site may result in a calculated excess cancer risk of 1×10^{-4}, the primary compounds of concern being tetrachloroethane, methylene chloride and chloroform. The residences around the site rely on the groundwater for their drinking water source. The residential wells are not presently affected by groundwater contamination from the site. Although it appears that the groundwater around the site is under an artesian head and that groundwater is flowing upward through the site as leachate, the local water supplies may be affected in the future if contaminants move offsite.

Leachate

Leachate includes both leachate seeps at the surface of the landfill and water that is either stagnant or moving very slowly in or out of buried waste trenches. Organic compounds identified in leachate water samples and the monitoring well screened within a waste trench consist primarily of volatile and phenolic compounds. Leachate water samples contain inorganic compounds, including heavy metals at concentrations that were generally an order-of-magnitude or more greater than metal concentrations found in surface water samples. Asbestos was also found in the leachate. It appears that groundwater is flowing upward and is the source of the leachate. Wading in these leachate seeps may result in absorption through the skin and a calculated excess lifetime cancer risk of 8×10^{-6}.

Sediment

Sediment in Lebanon Creek and associated wetlands, and sediment in leachate seeps may have been exposed to contaminants contained in surface runoff during site operations, and in leachate seep discharges. Organic compounds identified in leachate sediment samples consist primarily of volatile compounds. Several organic base/neutral and acid extractable compounds were also detected. All levels were below levels of quantification (low ppb's). Several organic acid extractable and base/neutral compounds were found below quantifiable levels in a downstream sample from Lebanon Creek. Ingestion of contaminated sediment may result in an excess lifetime cancer risk (above background) of less than 10^{-6}.

Surface Water

Organic priority pollutants occur at low part per billion levels in all samples taken upstream, downstream, onsite, and offsite. There is no apparent pattern to the distribution of low levels of organic contaminants. For compounds detected in downstream samples, no compound which has a standard or criteria for aquatic life protection exceeds that standard or criteria.

ENFORCEMENT (See Attachment 1)

ALTERNATIVES EVALUATION

The major objective of the feasibility study (FS) is to evaluate remedial alternatives using a cost-effective approach consistent with the goals and objectives of CERCLA. The National Oil and Hazardous Substances Contingency Plan (NCP), 40 CFR Part 300.68 defines a cost-effective remedial action as "the lowest cost alternative that is technologically feasible and reliable and which effectively mitigates and minimizes damage to and provides adequate protection of public health, welfare or the environment." The NCP outlines the procedures and criteria to be used in selecting the cost-effective alternative.

An environmental assessment presented in Chapter 2 of the FS determined that source control and offsite (management of migration) measures are necessary. A comprehensive list of appropriate remedial response technologies was identified, and each technology was screened based on the characteristics of the waste materials at the site, and applicability of the technology to site specific conditions. Applicable technologies were further screened to evaluate their use in remedial actions based on technical feasibility, including an assessment of performance, reliability, implementability and safety, order of magnitude cost, and public health, environmental and institutional impacts. This initial screening is consistent with Section 300.68(h) of the NCP. The following technologies are considered applicable to site conditions and problems:

- Soil/Sediment

  RCRA cap

  Multimedia cap

Landfill

Incineration

- Groundwater/Leachate

Vertical barrier

Treatment (onsite)

- Precipitation
- Air Stripping
- Filtration
- Granular Activated Carbon
- Biological

Treatment (offsite)

- POTW
- Treatment facility

Collection

- Extraction wells
- Subsurface drains

Technologies which were eliminated from further consideration include soil incineration, groundwater and leachate treatment at a POTW or hazardous waste facility, and onsite treatment using air stripping. Incineration was eliminated because of concerns including facility unavailability, extensive time for implementation, character of the residual ash (although potential exists for ash to be delisted, for the purpose of the FS, the ash was considered as if it is a hazardous waste), and cost ($750,000,000 to incinerate the entire landfill contents). Treatment at a POTW or hazardous waste facility was eliminated because of the unreliability of transporting truckloads on a daily basis for many years, and the substantial O&M costs (POTW - $500,000 per year, hazardous waste facility - $6,000,000 per year). Air stripping was eliminated from further evaluation because it does not remove refractory organic compounds, which are compounds of concern at the site.

Remedial action alternatives were developed from the technologies which survived the screening process taking into consideration the magnitude and extent of contamination, the waste characteristics, and the physical conditions of the site. The technical feasibility of each alternative was evaluated based upon performance, reliability, implementability and safety. The capital costs, annual operation and maintenance (O&M) costs, and present worth costs were estimated for each of the alternatives. The expected accuracies for cost estimates are within +50 and -30 percent of the actual cost. The individual alternatives were then evaluated for compliance with federal and state environmental laws and regulations, protection of human health and effects on institutional parameters. This detailed analysis of a limited number of alternatives is consistent with Section 300.68 (i) of the NCP.

Detailed Description/Evaluation of Alternatives

A comparative evaluation and description of the alternatives is presented below and summarized in Table 2. The environmental laws which may be applicable or relevant to the remedial alternatives are discussed in the section entitled Consistency with Other Environmental Laws.

Overview of Alternatives 2,3,4 and 5

Alternatives 2,3,4 and 5 all include either a RCRA or multimedia cap. The following is a detailed description of both of these caps.

A multimedia cap (loam/synthetic membrane/geotextile/sand), shown in Figure 3, consists of a 1-foot-thick sand drainage layer over the existing cap, overlain by a geotextile and synthetic membrane. One and one-half feet of loam will be used as the surface layer. The sand layer will provide a pathway for gas migration to the apex (high point) of the landfill where it can be vented. The sand layer can also be used as a pathway for groundwater/leachate migration in a surface or near surface collection system. The geotextile layer will bridge minor surface irregularities, withstand some of the tensile stresses (stresses which will cause the membrane to stretch) developed during construction, and be a clean surface on which the field seams of the synthetic membrane can be made. Manufacturers of the various synthetic liners have indicated that the service life of membranes range from 20 to 40 years when properly installed, covered with soil, and kept free from exposure to weathering, heat, and chemical attack. It is estimated that 1,700 gallons of water per day flow through the existing cap. With a multimedia cover it is expected that infiltration will be reduced to zero.

TABLE 2 FINAL EVALUATION MATRIX

(Page 1 of 3)

TECHNICAL				ENVIRONMENTAL				COST ($1,000's)		
Performance	Reliability	Implementability	Safety	Short Term (Construction)	Long Term (Operation)	Institutional	Public Health	Present Worth	Capital Cost	Annual O&M Cost
-- Poor Contaminant migration to offsite soils and groundwater are expected over a long-term period.	o Not Applicable	++ Easiest alternative to implement.	++ No construction required.	o Not Applicable	-- Site poses an environmental threat to neighboring communities.	-- Uncontrolled waste site. Site does not comply with RCRA or other federal and state environmental laws.	-- Migration of contaminants from site would continue unabated. Pathways of direct contact with contaminants is unmitigated. Excess lifetime cancer risks from residential soil and groundwater ingestion is greater than 1 x 10^{-6}.	-0	-0	-0
- Minimizes infiltration into the landfill, surface water run-off, and gas build-up beneath the cap. Groundwater movement into landfill is not controlled. Does not eliminate leachate seeps around the perimeter of the landfill.	+ Requires infrequent attention with little operations and maintenance. All remedial technologies have been proven reliable in the field under similar conditions. Typical of RCRA-type landfills. Monitoring of off-site locations required.	+ Alternative can be implemented in 6 months. Routine construction effort with immediate results following installation.	- Stringent safety procedures and precautions required during construction. Monitoring for airborne asbestos fibers would be a necessary precaution. Possible presence of cyanide in landfill may produce toxic gases. Potential for explosions to occur due to the presence of ignitable gases.	o Migration of waste contaminants is not expected to be a problem during construction except for groundwater. Short disruption of neighborhood due to increased truck traffic.	- New cap would reduce onsite problems of surface water run-off, uncontrolled gas migration. Contaminant migration to offsite would continue due to uncontrolled groundwater flow.	- Groundwater and surface waters may be in violation of the federal and state environmental laws.	- Potential offsite exposure of neighboring public to contaminated leachate by way of groundwater. Excess lifetime cancer risks from ingestion of leachate and groundwater is greater than 10^{-6}.	6,000	5,400	25
+ Alternative minimizes release of hazardous materials from landfill. Groundwater movement into landfill is controlled. Leachate production would be minimized and leachate seeps eliminated. The cap would minimize infiltration into the landfill, surface water run-off, and gas build-up beneath the cap. Cap offers a double layer of protection against failure. Collected leachate-groundwater would be treated and discharged. Leachate treatment may be reduced to a period of 15 years	o Requires dedicated personnel to maintain functions and regular operation and maintenance by trained personnel. All remedial technologies have been proven reliable in the field or under similar conditions.	o Can be implemented in 1 year. Additional hydrogeological data is needed to accurately place pumping wells. Excessive construction effort is not required. Immediate results can be achieved within implementation period. Pilot plant tests are necessary for water treatment.	- See Assembled Alternative 2.	o Production of limited amounts of dust, odors, contaminants, and noise. Short disruption of neighborhood due to increased truck traffic.	o Release of toxic contaminants would be reduced or eliminated. Future releases of contaminants can occur because the waste remains in place. Dewatering of approximately 15 acres of wetlands surrounding the landfill will occur. Leachate production would be reduced to a minimum. Treatment system may be turned off after 15 years of operating.	+ Treated leachate will meet the requirements of NPDES. Water will eventually be uncontaminated when the landfill is dewatered and leachate production is reduced.	+ Release of or exposure to contaminants should be eliminated. Excess lifetime cancer risks from ingestion of groundwater and leachate is reduced to less than 1 x 10^{-6}.	10,800	8,300	250

TABLE 2 FINAL EVALUATION MATRIX
(Page 2 of 3)

TECHNICAL				ENVIRONMENTAL				COST ($1,000's)		
Performance	Reliability	Implementability	Safety	Short Term (Construction)	Long Term (Operation)	Institutional	Public Health	Present Worth	Capital Cost	Annual O&M Cost
+ Type II cap offers a single layer of protection against failure. Otherwise, same as AA-3A.	-	o See Assembled Alternative 3A	-	-	o	o See Assembled Alternative 3A	+	9,000	6,700	250
o Minimizes release of hazardous materials from landfill. Controls groundwater movement. Leachate production would be reduced. Some infiltration into landfill will occur across slurry wall boundary. Cap would minimize infiltration into landfill from the top surface and surface water run-off would be controlled. Cap offers a double layer of protection against failure. Collected leachate would be treated and discharged. Extended treatment period required.	o Regular operations and maintenance required by trained personnel. Extensive monitoring may be required. Technologies have been proven reliable in the field or under similar conditions.	- Installation of slurry wall will require careful excavation, thorough mixing of materials, and effective placement of materials can be implemented in 1+ years. Materials may not be locally available.	- See Assembled Alternative 2.	o Production of limited amounts of dust, odors, contaminants, and noise. Short disruption of neighborhood due to increased truck traffic and heavy equipment.	o Release of toxic contaminants would be reduced or eliminated. Future releases of contaminants can occur because the waste remains in place. Long-term operation of treatment facility by state agency required.	o Treated leachate will meet NPDES requirements. Would be considered a hazardous waste facility.	+ Release of or exposure to contaminants should be eliminated. Excess lifetime cancer risks from ingestion of groundwater and leachate is reduced to less than 1×10^{-6}.	43,000	4,100	80
o Type II caps offers a single layer of protection against failure. Otherwise, same as AA-4A.	o	- See Assembled Alternative 4A	-	-	o See Assembled Alternative 4A	-	+	41,300	40,200	80
+ Cap would minimize infiltration into landfill from the top surface and surface water run-off would be reduced. Leachate production would not be reduced. Gas migration thru landfill would be controlled. Collected leachate is treated and discharged. Extended treatment period required.	o Regular operations and maintenance required by trained personnel. Extensive monitoring may be required. All remedial technologies have been proven in the field or under similar conditions.	o Alternative can be implemented in 6 months. 20 ft. perimeter drain may require care in construction and installation.	- See Assembled Alternative 2.	o Migration of waste contaminants is not expected to be a problem during construction. Short disruption of neighborhood due to increased truck traffic and noise.	o Leachate production will continue because the waste is still in place. Release of toxic contaminants should be reduced or eliminated. Long-term operation of treatment facility by state agency required.	o Discharge of treated leachate will meet the requirements of the NPDES program. Would be considered a hazardous waste facility.	+ Release of or exposure to contaminants should be reduced or eliminated. Excess lifetime cancer risks from ingestion of groundwater is reduced to less than 1×10^{-6}.	11,900	9,000	250

TABLE 2 FINAL EVALUATION MATRIX
(Page 3 of 3)

TECHNICAL				ENVIRONMENTAL				COST ($1,000's)		
Performance	Reliability	Implementability	Safety	Short Term (Construction)	Long Term (Operation)	Institutional	Public Health	Present Worth	Capital Cost	Annual O&M Cost
+ Type II caps offers a single layer of protection against failure. Otherwise, same as AA-5A.	o See Assembled Alternative 5A	o	-	o	o See Assembled Alternative 5A	o	+	10,100	7,300	250
								99,200	98,600	25
o Contents of landfill would be excavated to upgrade existing landfill to RCRA status with a leachate collection system. Should adequately control the release of hazardous materials. Performance of this alternative is limited by the effectiveness of the RCRA landfill to keep the water table beneath the landfill.	o Requires periodic operations and maintenance. RCRA landfills have been proven reliable in the field. Collected leachate would be treated on or off-site.	- Alternative requires 1 year or longer to implement. Depression of water table would be required during excavation. Dewatering would be required during excavation.	- In addition to Alternative A2, excavation would require extensive safety precautions and personnel protection due to the presence of acids, cyanides, asbestos, methane, and vocs.	- Extensive site excavation would generate dust, odors, noise, and surface water run-off. Large amount of excavated waste/debris would be generated for emplacement into redesigned landfill.	+ System would contain waste materials according to RCRA regulations. Leachate collection system would handle landfill generated liquids. Collected leachate would most probably be treated offsite.	- Alternative will meet RCRA approval with stipulations due to location in a wetland and above a Class II aquifer.	+ Release of or exposure to toxic substances is reduced or eliminated. Temporary short-term exposure risks to on-site personnel. Excess lifetime cancer risks from ingestion of groundwater is less than or equal to 1 x 10^{-8}.	262,800	262,800	-0
++ Excavation of landfill contents completely removes source of contamination.	++ Most reliable alternative. No operations and maintenance required.	-- Alternative requires 2 or more years to implement due to the large volume of waste, trucking logistics, etc. Depression of water table and dewatering would be required.	- Same as AA-6A.	-- Disruption of neighborhood and highway traffic due to truck transport of waste offsite. Extensive site excavation would generate dusts, odors, noise, and surface water run-off.	++ Removal of waste eliminates the migration of contaminants and barriers to future use of this site.	+ Must comply with DOT hazardous waste transport regulations for off-site disposal.	++ Source of exposure removed. Excess lifetime cancer risks from ingestion of groundwater is less than 1 x 10^{-6}.			

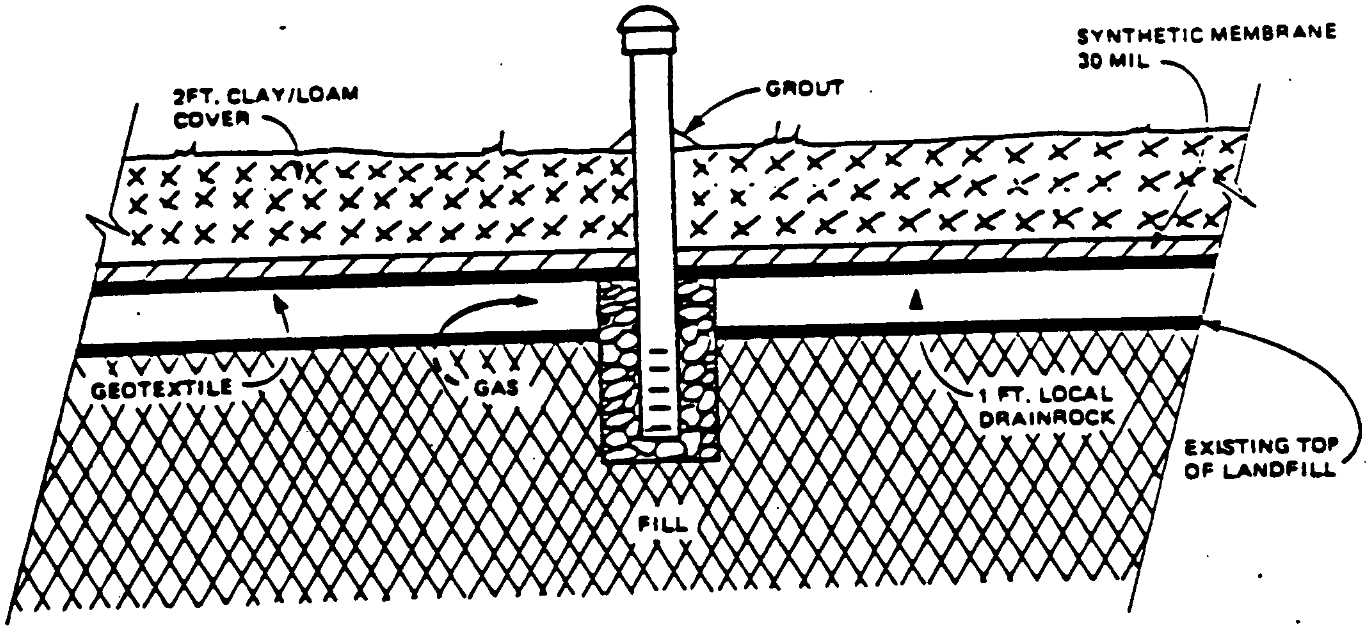


FIGURE 3
TYPE II CAP (LOAM/SYNTHETIC MEMBRANE/GEOTEXTILE/SAND)
NEW LYME LANDFILL

The RCRA cap (loam/gravel-sand/synthetic membrane/clay) shown in Figure 4 consists of a multilayer cap of 2 feet of loam or clay overlying 1 foot of a gravel/sand drainage layer over a minimum 20 millimeter synthetic membrane over 2 feet of clay. The primary difference between the RCRA cap and the multimedia cap is that the latter has a sand drainage and a geotextile layer beneath the synthetic membrane and additional clay is not installed over the existing cap.

The RCRA cap will prevent infiltration similarly to the multimedia cap. The RCRA cap has an advantage, however, in that there is extra protection against cap failure because of the clay layer.

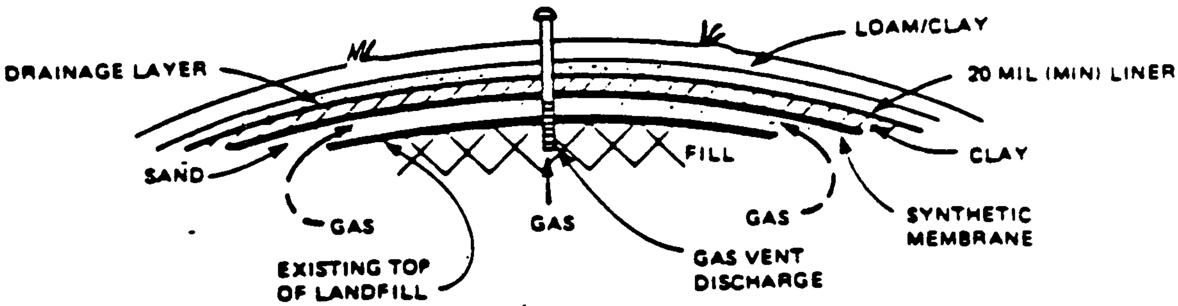
Alternatives 3,4 and 5 all include the following treatment system for leachate and groundwater as shown in Figure 5.

The landfill leachate is expected to contain significant amounts of biodegradable organic compounds. However, because the leachate is a result of the relatively rapid upflow of groundwater through the landfill, the contact time with the waste is reduced, and it should be more dilute than typical landfill leachate. The BOD removal can be addressed with a type of biological treatment system called the biodisc. Biological treatment may remove or significantly reduce the VOCs present in the leachate either by biodegradation or by volatilization. The construction cost of this system is $140,000, with an annual O&M cost of $20,000.

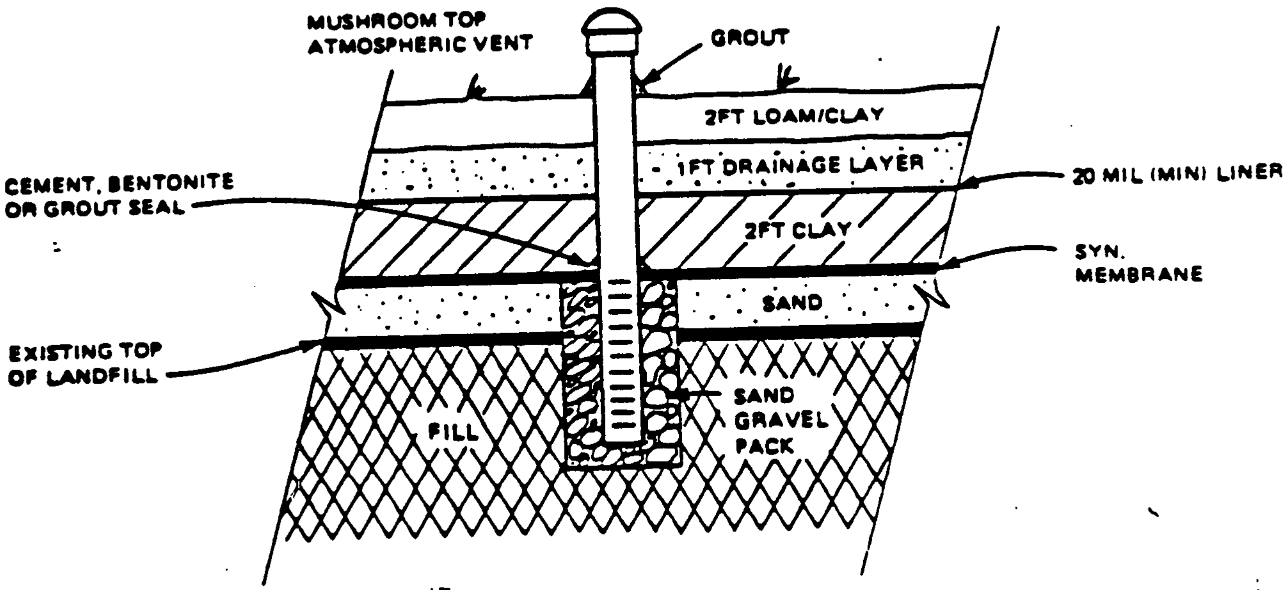
Granular activated carbon (GAC) has been widely used to remove refractory organic compounds which remain after biological treatment. GAC is effective on a wide range of organic compounds that pass through a biological treatment system. A packaged GAC adsorber system is recommended to minimize design and development requirements. The GAC adsorber system consists of two pressure adsorbers mounted on a skid. The adsorbers are operated downflow only in a series arrangement. The system has an installed cost of approximately $150,000 and an annual O&M cost of $80,000.

A treatment system installed will have to be designed to remove barium, iron, lead, manganese, and nickel. Chemical precipitation using sodium hydroxide with filtration and sedimentation is the recommended metals treatment process. Asbestos, also found in the leachate, can be removed by filtration. The metals treatment system has an estimated installed cost of $130,000 and an annual O&M cost of $110,000.

The pH adjustment system and other ancillary details (building, storage tanks) have a construction cost of $268,000 and an annual O&M cost of $6,400.



GAS VENT LOCATION
NTS



GAS VENT DETAIL
NTS

NTS - Not To Scale

FIGURE 4
TYPE I CAP AND GAS COLLECTION SYSTEM
NEW LYME LANDFILL

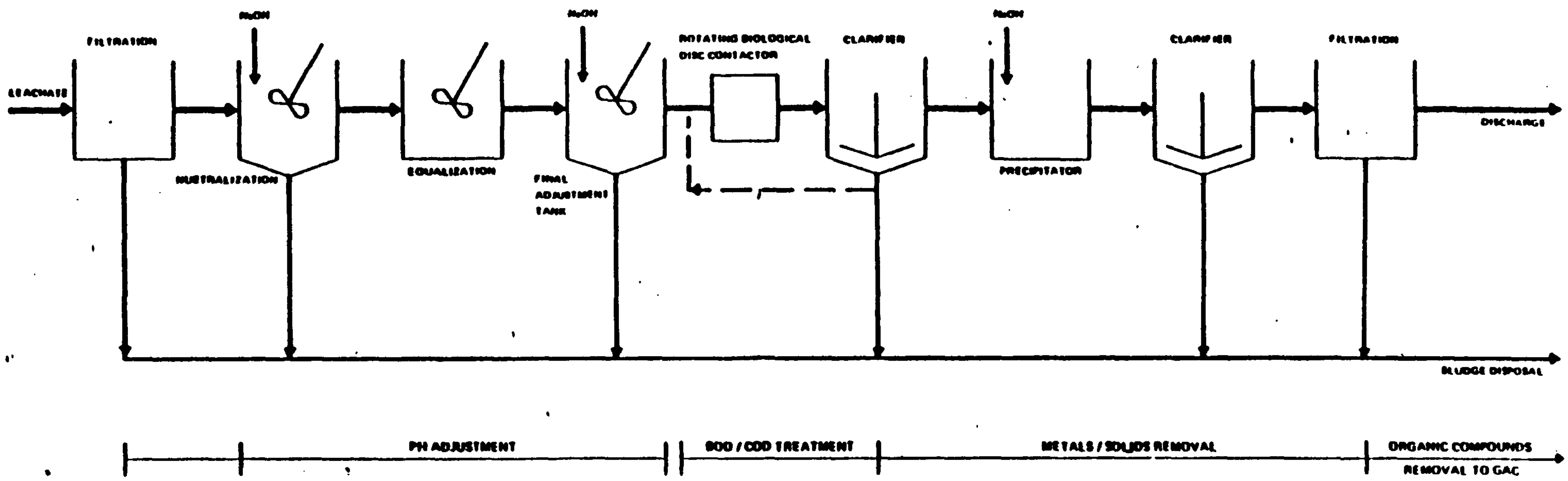


FIGURE 5
METALS PRECIPITATION - PH ADJUSTMENT FOR LEACHATE/ GROUNDWATER
NEW LYME

Sludges generated by the treatment system will contain oxides and hydroxides of iron, nickel, manganese, lead, arsenic, and other inorganic constituents. It is assumed that sludge, because of the metals content, will require disposal at a RCRA-licensed landfill. Actual production and analysis of the sludge is necessary to determine if other disposal options are feasible.

The construction worth cost of the treatment facility is $688,000 and annual O&M costs are $216,400.

Alternative 1

Under this alternative, no remedial action will be taken at the site. The threat to public health and the environment as described earlier and in FS Chapter 2, Exposure Assessment, will remain.

Alternative 2

Alternative 2 consists of a multimedia cap with gas control as described earlier. Implementation of this alternative eliminates exposure due to inhalation or ingestion of contaminated soil. It will also minimize the exposure to landfill gases and will manage the gas. However, contaminated groundwater and leachate will continue to leave the site since this alternative does not control upward flow of groundwater.

Monitoring wells will be installed upgradient east of the site, and at downgradient locations west of the site. The upgradient well will provide background water quality data for comparison with data collected downgradient. Sediment and surface water samples will be collected offsite to provide a means of evaluating contaminant migration resulting from surface water runoff and leachate seeps. Sediment and surface soil samples will also be periodically collected at selected points along the landfill perimeter to enable data comparison between onsite contaminants and contaminants, if any, found in groundwater and surface water.

A multimedia cap is an effective and proven technology. Gas vents will be installed into the cap to prevent gas buildup. Contaminated sediment will be consolidated under the cap.

The present worth cost of Alternative 2 is $6,014,000 with annual O&M costs of $25,000.

Alternatives 3A and 3B

Alternatives 3A and 3B, which include a RCRA or multimedia cap respectively, as described earlier, and extraction/containment wells, water treatment, monitoring, and gas migration control, address all exposure pathways of concern.

Implementation of either of these alternatives will eliminate the exposure pathways of direct contact with leachate seeps, ingestion and inhalation of soil, and exposure to groundwater.

Implementation of Alternative 3A will substantially comply with applicable and relevant environmental laws. The environmental laws which may be applicable or relevant are the Resource Conservation Recovery Act (RCRA), the Clean Water Act (CWA), the National Environmental Policy Act (NEPA) and Executive Orders for Wetlands. The cap described as part of Alternative 3B will not meet all the requirements of Part 264.310 for closure of a landfill if subsidence occurs such that the integrity of the cap is not maintained. The other elements of Alternative 3B substantially comply with the other applicable or relevant environmental laws. This is discussed later in this document in the section entitled Consistency With Other Environmental Laws.

As discussed earlier, caps are effective in reducing water infiltration through the top of the landfill, contaminant transport by surface water runoff, airborne emissions, and human contact. The caps are flexible, and this makes the caps less susceptible to cracking from settlement or frost heave. The landfill surface will need to be regraded during the construction of the cap to allow improved control of surface water runoff. Capping is a proven and reliable technology. It is estimated that one year is required for installation of either of these caps.

The landfill will be dewatered, and the flow will be controlled through the use of extraction/containment wells around the site perimeter. The extraction system will collect groundwater at a rate of 60,000 gallons per day. The wells will be used to inhibit the movement of groundwater into and through the landfill by intercepting groundwater before it enters the landfill. Pumping will lower the groundwater and effectively dewater the landfill. Leachate production will be minimized and the leachate seeps will be eliminated. This system does not differentiate between uncontaminated groundwater and leachate draining from the landfill. Because leachate and groundwater will both be collected, treatment of the water will be required. The need for treatment will decrease over time as the landfill will be gradually pumped dry (estimated to be 15 years). After such time, the extracted groundwater can be discharged directly to Lebanon Creek or the surrounding wetlands. In the interim, the collected water will be treated onsite with a biodisc, sodium hydroxide precipitation, and GAC as described earlier. A groundwater monitoring system as described under Alternative 2 will be established. The present worth cost of Alternative 3A is $10,798,000 with annual O&M costs of $252,000. The present worth cost of Alternative 3B is $9,017,000 with annual O&M costs of $252,000.

<u>Alternatives 4A and 4B</u>

Alternatives 4A and 4B which include a cap (either RCRA or multimedia respectively, as described for Alternatives 3A and 3B), gas collection, slurry wall, leachate collection, water treatment and site monitoring, address all exposure pathways of concern. Implementation of either of these alternatives will eliminate the exposure pathways of direct contact with leachate seeps, ingestion of soil, and groundwater.

Implementation of Altenative 4A will substantially comply with applicable and relevant environmental laws (RCRA, CWA, NEPA and Executive Orders for Wetlands) as discussed in the section entitled Consistency With Other Environmental Laws. The cap described as part of Alternative 4B may not meet all the requirements of Part 264.310 for closure of a landfill because of landfill subsidence. The other elements of Alternative 4B substantially comply with the other applicable or relevant environmental laws.

The effectiveness of capping the site was discussed earlier in this document.

A cement-bentonite slurry wall around the entire landfill is necessary to mitigate groundwater migration. To be effective, the slurry wall must penetrate through the fractured permeable zone of the underlying shale. The cost estimate is based on an average 90-foot wall (40 feet through the till and 50 feet into the shale). It is estimated that 1×10^{-6} cm/s is the lowest hydraulic conductivity to be reasonably achieved through a cement-bentonite slurry wall. This hydraulic conductivity, an order-of-magnitude less than estimated for the till, will result in a reduction in groundwater infiltration and the associated generation of leachate. Groundwater levels within the capped area will be an estimated one-foot below those outside of the slurry wall to maintain an inward hydraulic gradient. This one-foot difference results in an estimated 6,000 gallons per day of infiltration. Presently, it is estimated that groundwater flow into the landfill as a result of upward vertical gradients is about 40,000 gallons per day. This infiltration will pass through the toe of the landfill, and be collected by a gravel drainage blanket placed inside of the slurry wall around the landfill perimeter, and then collected in a sump and pumped to treatment. This technology has been proven effective and durable in hazardous waste applications. A groundwater monitoring system as described under Alternative 2 will be established.

The present worth cost of Alternative 4A is $43,033,000 and of Alternative 4B is $41,246,000. Annual O&M costs for either Alternative 4A or 4B is $80,000.

Alternatives 5A and 5B

Alternatives 5A and 5B include the construction of a RCRA or multimedia cap respectively, as described earlier, and the installation of vents to control gas migration, subsurface pipe drains for leachate collection, and site monitoring. This action will address all exposure pathways of concern (direct contact with leachate seeps, ingestion of soil and groundwater).

Implementation of Alternative 5A will substantially comply with applicable and relevant environmental laws (RCRA, CWA, NEPA and Executive Orders for Wetlands) as discussed in the section entitled Consistency With Other Environmental Laws. The cap described as part of Alternative 5B may not meet all the requirements of Part 264.310 for closure of a landfill because of landfill subsidence. The other elements of Alternative 5B substantially comply with the other applicable or relevant environmental laws.

Leachate generated by the landfill will be collected using subsurface pipe drains installed around the perimeter of the landfill to the depth of the fill. These drains may also collect some uncontaminated groundwater outside of the landfill before it passes through the landfill, reducing the amount of leachate. The drains will be approximately 20 feet below the ground surface. Water treatment will be required indefinitely because the leachate will be generated at a rate of 40,000 gallons per day from groundwater continuously coming into the landfill bottom. Treatment onsite will include biodisc, sodium hydroxide precipitation, and GAC as discussed earlier. It is expected that contruction of this alternative will take about six months.

The present worth cost of Alternative 5A is $11,868,000 with annual O&M costs of $252,000. The present worth cost of Alternative 5B is $10,084,000 with annual O&M costs of $252,000.

Alternative 6A

Alternative 6A includes excavation of the existing landfill and creation of an onsite RCRA-type landfill.

Alternative 6A will eliminate the identified exposure pathways of direct contact with leachate seeps, ingestion and inhalation of soil and sediment, and exposure to groundwater.

Implementation of this alternative will substantially comply with applicable and relevant environmental laws (RCRA, CWA, NEPA and Executive Orders for Wetlands) as discussed in the section entitled Consistency with Other Environmental Laws.

Onsite disposal of excavated materials will involve removing waste materials from the landfill so a bottom liner and leachate collection system can be constructed. Excavated materials will be stockpiled onsite in a bermed containment area and segregated by hazardous waste type. Water draining from the excavated materials will be collected and treated. Leachate generated through biodegradation within the landfill will be collected in the bottom drains and also treated. Stockpiled fill will be placed back into the landfill as each new cell in the bottom liner system is completed. Excavation and bottom construction will continue across the site until all materials are removed and the bottom liner completed. A RCRA cap will then be placed over the new landfill. A fence will be constructed around the site and a monitoring network established as discussed in Alternative 2.

The present worth cost of this alternative is $99,176,000 with annual O&M costs of $25,000.

Alternative 6B

Alternative 6B includes excavation of the existing landfill and offsite disposal in a RCRA compliant facility. This alternative will also eliminate all exposure pathways of concern.

Implementation of this alternative will substantially comply with applicable and relevant environmental laws (RCRA, CWA, NEPA and Executive Orders for Wetlands) as discussed in the section entitled Consistency with Other Environmental Laws.

The excavation will occur as described in Alternative 6A. The soil will be transported offsite and disposed of in a RCRA-compliant facility. The site will be backfilled with clean soil.

This alternative will require greater than two years to implement.

The present worth cost of this alternative is $262,818,000 with no annual O&M costs.

Consistency With Other Environmental Laws

The technical aspects of the remedial alternative implemented at the New Lyme site will be consistent with other applicable and relevant laws. Other environmental laws which may be applicable or relevant to the remedial alternatives evaluated are the Resource Conservation and Recovery Act, the Clean Water Act, the National Environmental Policy Act, and Executive Orders for Wetlands.

The provisions of RCRA applicable to remediation at New Lyme are the 40 CFR Part 264 technical standards for closure of a landfill, and the Subpart F, Groundwater Protection standards. RCRA requires removal of contaminated soil to background or to another standard protective of human health and the environment (closure as a storage unit by removal), or capping of the landfill (closure in place as a landfill).

The capping alternatives evaluated in the FS are consistent with those actions which would be taken during "closure" of a RCRA land disposal facility. To close a landfill, it is required that the cover be designed to provide long-term minimization of liquids through the landfill, promote drainage and require minimum maintenance, accommodate settling and have a permeability less than or equal to the permeability of any bottom liner or natural subsoils present. The RCRA cap described earlier will meet these requirements.

At New Lyme, there is concern that the multimedia cap may not accommodate settling of the landfill. Therefore, the multimedia cap at New Lyme may not meet all the requirements of RCRA closure. It is expected that natural subsidence will occur over time and, in addition, any groundwater system that changes the groundwater gradient (such as extraction wells) will cause more rapid settling. Although a synthetic liner will stretch to some degree to accommodate settling, damage to the synthetic liner may occur. The RCRA cap (synthetic and clay liner) has additional protection against failure due to landfill subsidence.

The alternative which fully contains the contaminated soil on-site is consistent with those actions necessary to build a new hazardous waste landfill, and to close such a landfill. For all new landfills, it is required that such a landfill or unit be constructed with two or more liners and a leachate collection system above and between such liners.

The complete soil removal alternative evaluated in the FS is consistent with that action which would be taken during closure of a RCRA storage facility. Closure of a storage facility requires either that all waste be removed, or if some waste residues are left, that the site be closed as a landfill unless it has been determined that wastes have been removed to levels such that the residue contamination poses no threat to health or the environment through any route of exposure.

The Groundwater Protection standards of RCRA will be applicable to the groundwater monitoring at the New Lyme site. 40 CFR Section 264.92 states that hazardous constituents entering the groundwater from a regulated unit must not exceed concentration limits in the uppermost aquifer underlying the waste management area beyond the point of compliance.

40 CFR Section 264.94 states that the concentration of a hazardous constituent must not exceed the background level of that constituent in the groundwater, or an alternate concentration limit (ACL) for that constituent which will not pose a substantial present or potential hazard to human health or the environment as long as the ACL is not exceeded. The hazardous constituents of concern are those hazardous substances which were detected in the groundwater during the RI.

The waste management area is that area of the site which will be covered by a cap. The point of compliance is at the hydraulically downgradient limit by the capped area and extends down into the uppermost aquifer underlying the unit.

At New Lyme, the most widespread organic compounds in onsite wells were phthalates [bis(2-ethylhexyl)phthalate, di-n-butyl phthalate], at concentrations below quantification limits. Volatile organic compounds (VOCs) were primarily found in the two monitoring wells associated with a waste cell, but some VOCs and phenolic compounds were also found below quantification limits in the other wells (phenol, chlorobenzene and acetone). No significant migration of contaminated groundwater was identified. Although no significant offsite groundwater migration has been detected, a monitoring system will be installed. Because of the artesian geological conditions at the site, it appears that groundwater flows upward through the landfill and discharges as leachate. Therefore, remediation of onsite groundwater contamination is expected to be accomplished through leachate collection.

Any discharge of treated groundwater and leachate at the site to Lebanon Creek will comply with substantive requirements of the Clean Water Act. During construction, care will be taken to avoid stormwater runoff from the site.

The functional equivalent of NEPA is carried out through the institutional/environmental/public health analysis of alternatives and public participation procedures.

Executive Order-11990 and Appendix A of 40 CFR Part 6, entitled "Statement of Procedures on Floodplain Management and Wetland Protection" may apply to remedial actions taken at New Lyme. The site does not lie in a floodplain but the site is surrounded by wetlands. If no practicable alternative exists outside the wetlands, the action should minimize potential harm and avoid adverse effects to the wetlands. Since the site is surrounded by wetlands, any remedial alternative will affect the wetlands to some degree. A Statement of Findings summarizing the effects of the recommended alternative on the wetlands is included in this document as Attachment 2. Section 404 of the CWA does not apply to the New Lyme site because nothing is expected to be introduced into the wetlands through implementation of remedial actions (no filling or dredging). If during design, it is determined that dredging or filling is necessary to properly install the cap, care will be taken to minimize adverse effects and substantive requirements of Section 404 will be met.

COMMUNITY RELATIONS

Limited community concern has been expressed at the New Lyme Landfill site. The Region has received no phone calls or correspondance from New Lyme citizens, although a few residents of Rock Creek (location of the Old Mill site, about ten miles away) fear that contamination from New Lyme will affect the Rock Creek water supply.

Three public meetings were held in New Lyme: the first in November 1983 to describe the RI/FS process, the second in February 1985 to describe the results from the RI; and the third in August 1985 to describe the recommended alternative and to receive public comments. Each meeting was attended by about 25 persons, including township and county officials.

At the initial meetings, the major concern of the residents was that material allegedly buried in the site, including drums of cyanide sludge, may eventually work their way into the local water supply. There was also concern about asbestos found in the leachate.

At the meeting held in August 1985 to take public comment on the recommended alternative, there were few questions and no public comments on the FS or proposed actions. A public comment period was held for 3 weeks following publication of the FS. No public comments were received.

Since publication of the FS, U.S. EPA has reevaluated the alternatives. The remedial alternative which is recommended in this document for implementation at the New Lyme site is different from the alternative which was originally recommended. A different cap, with an extra layer of clay, will be installed. Both caps were considered in the FS, and were described in some detail in documents provided to the public. Because the level of concern at the New Lyme site is limited, and the recommended alternative has not changed significantly, no additional public comment is planned. A fact sheet will be prepared to describe the selected alternative and will be available to the public along with this document.

COMPARISON OF ALTERNATIVES

Using the information presented earlier and summarized in Table 2, the relative advantages and disadvantages of each alternative are compared in order to recommend a "cost-effective" alternative as defined in the NCP.

The no action alternative does not prevent further contaminant migration from the site, does not mitigate the existing contamination at the site, and does not reduce current or future public health risks. There is a potential for exposure of the public to contaminants at the site at levels that may adversely affect public health and welfare. If no action is taken, groundwater will continue to come into the site and be discharged as contaminated surface water, and contaminated soil and sediment will continue to be generated due to stormwater runoff. Remedial action is therefore required to reduce or minimize this exposure. Thus, the no action alternative is not recommended for implementation at the site.

Alternative 2 does not mitigate offsite migration of groundwater or leachate. The present worth of Alternative 2 is $6,014,000, but the amount of contaminated water leaving the site will be reduced by only about 4 percent. The environmental and public health risks associated with surface water, groundwater, and leachate will not be significantly mitigated. Accordingly, Alternative 2 is not recommended for implementation at the site.

Both Alternatives 3A and 3B will address all of the exposure risks to public health and the environment at the site. Alternatives 3A and 3B differ only in the cap type. Alternative 3A has a RCRA cap (clay and synthetic) while Alternative 3B has a multimedia (synthetic) cap. The effectiveness of this alternative depends on the minimization of infiltration of groundwater and precipitation into the landfill. Although both caps effectively prevent the downward infiltration of stormwater into the landfill, the RCRA cap offers additional failure protection because it has two liners. The clay liner in the RCRA cap will provide more certainty of retaining the effectiveness of the remedy in case the synthetic liner should fail. The clay liner will also react better to subsidence in the landfill, which is expected to occur. Alternatives 3A and 3B have present worth costs of $10,789,000 and $9,017,000 respectively. Because the cap included as part of Alternative 3A provides additional protection against liner failure and is more reliable than the cap in Alternative 3B, Alternative 3B is not recommended for implementation at the site.

Similarly, Alternatives 5A and 5B differ only by the cap type. The present worth costs of Alternatives 5A and 5B are $11,868,000 and $10,084,000 respectively. Because of the additional reliability and protection against cap failure provided by the cap included as part of Alternative 5A, Alternative 5B is not recommended for implementation at the site.

Alternatives 4A and 4B also differ from each other by the type of cap. Alternatives 4A and 4B address all exposure risks to public health and the environment at a much greater cost than any of the other alternatives involving caps, because of the great expense of constructing a slurry wall. Alternatives 4A and 4B have present worth costs of $43,033,000 and $41,246,000 respectively with no additional public health or environmental benefits. Accordingly, neither Alternative 4A nor 4B are recommended for implementation at the site.

Alternative 6A will completely address the exposure risks to the public health and the environment at the site. All offsite migration will be prevented because all of the waste and contaminated soil and sediment will be placed in an onsite double-lined RCRA landfill. Alternative 6A has a present worth of $115,000,000. Alternative 6B will also completely eliminate the chance for offsite migration and the resulting exposure risk because all of the contaminated wastes, soil, and sediment will be removed from the site. Alternative 6B has a present worth of $257,700,000. Alternatives 6A and 6B are at least an order of magnitude more expensive than Alternatives 3A and 5A, with no significant reduction of exposure risk. Accordingly, Alternatives 6A and 6B are not recommended for implementation at the site.

Two alternatives remain for comparison.

- Alternative 3A - RCRA cap with extraction/containment wells, water treatment, monitoring, and gas migration control.
  - Present worth cost - $10,798,000
  - Annual O&M cost - $252,000
- Alternative 5A - RCRA cap with leachate collection, water treatment, monitoring and gas migration control.
  - Present worth cost - $11,868,000
  - Annual O&M cost - $252,000

These alternatives differ in the method by which the leachate migration is addressed, and in the cost. The environmental and public health benefits as measured by the elimination of contaminant migration from the site and minimization of the direct contact threat are the same for each alternative. In Alternative 5A the leachate will need to be collected (passive drainage system) and treated for an indefinite period of time. In Alternative 3A it is expected that after approximately 15 years the need for treatment will be minimized as the landfill will be gradually pumped dry. In this respect, Alternative 3A produces a greater benefit, as the treatment facility will not be needed and the water collected from the dewatering wells can be discharged directly to Lebanon Creek, because the water will be uncontaminated.

Continuous pumping of the landfill required by Alternative 3A may over time dewater approximately 15 acres of wetlands surrounding the site. The trench and drain system of Alternative 5A will collect much less water than the pumping wells of Alternative 3A. Only water which intrudes by going under the drain will be drawn from the wetland. As the wetlands dry out, the plant community will change from a wetland to an upland community. Since the New Lyme Landfill site is located in a wetland, both alternatives will affect, to a slight degree, the wetland. Neither of the alternatives will significantly diminish the natural or beneficial values of the wetlands relative to their current state. Since both reduce the migration of contaminants into the wetlands, the ability to support wildlife and the values as a wetland will be enhanced.

Although there is natural subsidence which occurs within all landfills, it is estimated that dewatering the landfill (Alternative 3A) will expedite this settling process. This may have an adverse impact on the integrity of the cap and may reqire more extensive O&M than with Alternative 5A. Because the cap will have both a clay liner and a synthetic liner, there is more protection in case a leak should occur in the synthetic liner. It is estimated that a maximum of five feet of settling will occur. The costs associated with the subsidence have been included in the O&M cost estimate.

Since the trench and drain collection system is a less active system than an extraction/containment system, the everyday problems and costs associated with O&M of the leachate collection system are somewhat less for Alternative 5A than for Alternative 3A.

As mentioned earlier, the greatest difference between these two alternatives is that the treatment system will eventually be unnecessary with Alternative 3A. This is an attractive benefit, as an onsite treatment facility is labor-intensive and costly.

Since the environmental and public health benefits are the same, and the present worth cost of Alternative 3A ($10,798,000) is less than the present worth cost of Alternative 5A ($11,868,000), and the O&M costs are the same, Alternative 3A is recommended for implementation at the site.

RECOMMENDED ALTERNATIVE

It is recommended that Alternative 3A in the FS be selected as the cost-effective alternative in accordance with Section 300.68 (j) of the NCP. This alternative is necessary to protect public health and the environment from risk created by further exposure to contaminated groundwater, leachate, sediment and soil. This alternative substantially complies with all other environmental laws and has a total present worth cost of $10,798,000.

DESCRIPTION OF RECOMMENDED ALTERNATIVE

This alternative includes the construction of a RCRA cap over the surface of the landfill, and the installation of gas vents. In addition, the landfill will be dewatered and groundwater flow will be controlled through the use of extraction/containment wells around the site perimeter. Contaminated sediment will be moved onsite and consolidated under the cap.

The cap will consist of a multilayer cap of 2 feet of loam or clay overlying 1 foot of a gravel/sand drainage layer over a synthetic membrane, over two feet of clay. This cap is expected to minimize infiltration through the landfill.

Approximately 40,000 gallons per day are estimated to flow from the aquifer into the landfill and out at the surface as leachate. Six extraction/containment wells (900 feet on center) drilled to a depth of 90 feet and pumping 7 gallons per minute will be installed around the landfill. With reversal of the gradient through the landfill, extracted groundwater is expected to include some leachate. Twenty feet of drawdown at the center of the landfill will lower the zone of saturation below the estimated landfill depth, eliminate upward vertical gradients, and reduce leachate production. Currently, based on the nature of the area (described as a marsh) and the measured upward gradients, groundwater appears to be flowing up into the landfill and generating leachate by flushing up through the buried wastes. Drawdown will eliminate the flushing action and will eventually dry out the landfill.

Based on pumping 7 gallons per minute from six wells, an estimated 3 months will be required to develop the steady-state, 20-foot drawdown. After approximately 15 years, leachate should not be generated because the landfill will have been dewatered. The withdrawal wells should be pumping 100 percent uncontaminated groundwater which will not require treatment. The wells will need to be operated indefinitely to maintain the effectiveness of this remedy.

While leachate is being removed, all water will be pumped from the wells to a central treatment/collection facility onsite. The preferred treatment system consists of pH adjustment, biodisc, metals removal by NaOH precipitation, and granular activated carbon finishing. Pilot and bench scale treatment plants will be developed to determine actual system design and performance. Following onsite treatment, the water will be discharged to Lebanon Creek or to the wetlands. Concentrations in the extracted groundwater may eventually, after leachate production ceases, be reduced to an acceptable level for direct discharge.

A groundwater monitoring system will be installed around the landfill.

Alternative 3A has a total present worth of $10,798,000 with annual O&M costs of $252,000 for the years that water treatment is necessary. After that time, the annual O&M costs will decrease to $44,000.

OPERATION AND MAINTENANCE

Each alternative was evaluated for present worth and O&M costs as shown in Tables 3 through 11. The O&M costs were estimated on an annual basis over 30 years. The O&M for the recommended alternative will require an offsite groundwater monitoring program consistent with RCRA closure regulations, cap repair and replacement as necessary, groundwater extraction to effectively dewater the landfill for an indefinite period of time, and operation of an onsite water (leachate and groundwater) treatment facility for as long as contaminated leachate is being produced. It is estimated that the water will need treatment for about 15 years. The cost of O&M is estimated to be $252,000 annually for the first 15 years and $44,000 annually thereafter. The State of Ohio will assume responsibility for long term O&M of the remedial action. The U.S. EPA will enter into a State Superfund Contract with the State of Ohio to formalize this agreement.

SCHEDULE

MILESTONES	DATE
- Approve Remedial Action (ROD)	September 1985
- Award IAG for Design	October 1985
- Begin Design	January 1986
- Complete Design	June 1986
- Award State Superfund Contract	June 1986
- Amend IAG for Construction	June 1986
- Begin Construction	October 1986
- Complete Construction	October 1987

FUTURE ACTIONS

Long-term O&M activities are necessary to maintain the effectiveness of the remedy. Since the source of contamination remains at the site, monitoring will need to continue for an indefinite period. The extraction/containment system will need to be operated indefinitely. The cap will require periodic repair and maintenance. The treatment system will need to be operated until it is determined that treatment is no longer necessary. Additional information on landfill gas production, composition, and monitoring will be gathered during the remedial design. Pilot studies will also be done as part of the design to optimize the treatment process and to assure that biological treatment will be effective.

Table 3
COST ESTIMATE SUMMARY
AA-2 TYPE II CAP WITH GAS MIGRATION CONTROL AND MONITORING

	COST COMPONENT	CONSTRUCTION COSTS	ANNUAL O&M COSTS	REPLACEMENT COSTS
1.	Site Preparation and Cap Construction for Type II Cap	2,928,000	10,000	342,000 [b]
2.	Monitoring Network and Fence	140,000	15,000	0
3.	Gas Migration Control	231,000	0	0
	CONSTRUCTION SUBTOTAL	3,299,000	25,000	342,000
	Bid Contingencies (15%)	495,000		
	Scope Contingencies (20%)	660,000		
	CONSTRUCTION TOTAL	4,454,000		
	Permitting and Legal (5%)	223,000		
	Services During Construction (8%)	356,000		
	TOTAL IMPLEMENTATION COSTS	5,033,000		
	Engineering Design Costs (8%)	403,000		
	TOTAL CAPITAL COSTS	5,436,000		
	Annual O&M Costs		25,000	
	Replacement Costs			342,000
	TOTAL PRESENT WORTH [a]	6,014,000		

[a] Total present worth costs are defined as the sum of the capital costs, the replacement costs, and the present worth of the annual O&M expenses over a 30-year period at 10 percent interest. The uniform present worth factor of 9.4269 was used.

[b] This cost includes repair of the cap due to subsidence at years 10 and 20, and replacement of the entire cap at the end of year 30.

Table 4
COST ESTIMATE SUMMARY
AA-3A TYPE I CAP WITH GAS MIGRATION CONTROL, MONITORING, DEWATERING WELLS, AND WATER TREATMENT

	COST COMPONENT	CONSTRUCTION COSTS	ANNUAL O&M COSTS	REPLACEMENT COSTS
1.	Site Preparation and Cap Construction for Type I Cap	3,940,000	10,000	460,000[b]
2.	Monitoring Network and Fence	140,000	15,000	0
3.	Gas Migration Control	231,000	0	0
4.	Water Treatment	324,000	208,000	19,000
5.	Ancillary Details[c]	258,000	6,000	0
6.	Dewatering Wells	81,300	13,000	0
7.	Electrical Power/Lighting Requirements	40,000	0	0
8.	Demobilization of Water Treatment System	27,000	0	0
	CONSTRUCTION SUBTOTAL	5,051,000	252,000	479,000
	Bid Contingencies (15%)	758,000		
	Scope Contingencies (20%)	1,010,000		
	CONSTRUCTION TOTAL	6,819,000		
	Permitting and Legal (5%)	341,000		
	Services During Construction (8%)	546,000		
	TOTAL IMPLEMENTATION COSTS	7,706,000		
	Engineering Design Costs (8%)	616,000		
	TOTAL CAPITAL COSTS	8,322,000		
	Annual O&M Costs		252,000	
	Replacement Costs			479,000
	TOTAL PRESENT WORTH[a] =	10,798,000		

[a] Total present worth costs are defined as the sum of the capital costs, the replacement costs, and the present worth of the annual O&M expenses for the water treatment system over a 15 year period and all other O&M expenses over a 30 year period, each at 10 percent interest. The uniform present worth factors used were 7.6061 and 9.4269 respectively.

[b] This cost includes repair of the cap due to subsidence at years 10 and 20, and replacement of the entire cap at the end of year 30.

[c] Ancillary details for the water treatment system include a storage tank, a building to house the water treatment system, and sludge removal.

Table 5
COST ESTIMATE SUMMARY
AA-3B TYPE II CAP WITH GAS MIGRATION CONTROL, MONITORING, DEWATERING WELLS, AND WATER TREATMENT

	COST COMPONENT	CONSTRUCTION COSTS	ANNUAL O&M COSTS	REPLACEMENT COSTS
1.	Site Preparation and Cap Construction for Type I Cap	2,928,000	10,000	342,000[b]
2.	Monitoring Network and Fence	140,000	15,000	0
3.	Gas Migration Control	231,000	0	0
4.	Water Treatment	324,000	208,000	19,000
5.	Ancillary Details[c]	268,000	6,400	0
6.	Dewatering Wells	81,300	13,000	0
7.	Electrical Power/Lighting Requirements	40,000	0	0
8.	Demobilization of Water Treatment System	27,000	0	0
	CONSTRUCTION SUBTOTAL	4,039,000	252,000	361,000
	Bid Contingencies (15%)	606,000		
	Scope Contingencies (20%)	808,000		
	CONSTRUCTION TOTAL	5,453,000		
	Permitting and Legal (5%)	273,000		
	Services During Construction (8%)	436,000		
	TOTAL IMPLEMENTATION COSTS	6,162,000		
	Engineering Design Costs (8%)	493,000		
	TOTAL CAPITAL COSTS	6,655,000		
	Annual O&M Costs		252,000	
	Replacement Costs			361,000
	TOTAL PRESENT WORTH[a] =	9,017,000		

[a] Total present worth costs are defined as the sum of the capital costs, the replacement costs, and the present worth of the annual O&M expenses for the water treatment system over a 15 year period and all other O&M expenses over a 30 year period, each at 10 percent interest. The uniform present worth factors used were 7.6061 and 9.4269 respectively.

[b] This cost includes repair of the cap due to subsidence at years 10 and 20, and replacement of the entire cap at the end of year 30.

[c] This cost includes repair of the cap due to subsidence at years 10 and 20, and replacement of the entire cap at the end of year 30.

Table -6
COST ESTIMATE SUMMARY
AA-4A TYPE I CAP WITH GAS MIGRATION CONTROL, MONITORING,
SLURRY WALLS, AND WATER TREATMENT

COST COMPONENT	CONSTRUCTION COSTS	ANNUAL O&M COSTS	REPLACEMENT COSTS
1. Site Preparation and Cap Construction for Type I Cap	3,940,000	10,000	460,000 [b]
2. Monitoring Network and Fence	140,000	15,000	0
3. Gas Migration Control	231,000	0	0
4. Water Treatment	81,000	52,000	5,000
5. Ancillary Details [c]	67,000	2,000	1,000
6. Slurry Wall Construction	20,898,000	0	0
7. Electrical Power/Lighting Requirements	20,000	0	0
8. Demobilization of Water Treatment System	7,000	0	0
CONSTRUCTION SUBTOTAL	25,384,000	79,000	466,000
Bid Contingencies (15%)	3,808,000		
Scope Contingencies (20%)	5,077,000		
CONSTRUCTION TOTAL	34,269,000		
Permitting and Legal (5%)	1,713,000		
Services During Construction (8%)	2,742,000		
TOTAL IMPLEMENTATION COSTS	38,724,000		
Engineering Design Costs (8%)	3,098,000		
TOTAL CAPITAL COSTS	41,822,000		
Annual O&M Costs		79,000	
Replacement Costs			466,000
TOTAL PRESENT WORTH [a] =	43,033,000		

[a] Total present worth costs are defined as the sum of the capital costs, the replacement costs, and the present worth of the annual O&M expenses over a 30-year period at 10 percent interest. The uniform present worth factor of 9.4269 was used.

[b] This cost includes repair of the cap due to subsidence at years 10 and 20, and replacement of the entire cap at the end of year 30.

[c] Ancillary details for the water treatment system include a storage tank, a building to house the water treatment system, and sludge removal.

Table -7
COST ESTIMATE SUMMARY
AA-4B TYPE II CAP WITH GAS MIGRATION CONTROL, MONITORING, SLURRY WALLS, AND WATER TREATMENT

	COST COMPONENT	CONSTRUCTION COSTS	ANNUAL O&M COSTS	REPLACEMENT COSTS
1.	Site Preparation and Cap Construction for Type II Cap	2,928,000	10,000	342,000 [b]
2.	Monitoring Network and Fence	140,000	15,000	0
3.	Gas Migration Control	231,000	0	0
4.	Water Treatment	81,000	52,000	5,000
5.	Ancillary Details [c]	67,000	2,000	1,000
6.	Slurry Wall Construction	20,898,000	0	0
7.	Electrical Power/Lighting Requirements	20,000	0	0
8.	Demobilization of Water Treatment System	7,000	0	0
	CONSTRUCTION SUBTOTAL	24,372,000	79,000	348,000
	Bid Contingencies (15%)	3,656,000		
	Scope Contingencies (20%)	4,874,000		
	CONSTRUCTION TOTAL	32,902,000		
	Permitting and Legal (5%)	1,645,000		
	Services During Construction (8%)	2,632,000		
	TOTAL IMPLEMENTATION COSTS	37,179,000		
	Engineering Design Costs (8%)	2,974,000		
	TOTAL CAPITAL COSTS	40,153,000		
	Annual O&M Costs		79,000	
	Replacement Costs			348,000
	TOTAL PRESENT WORTH [a] =	41,246,000		

[a] Total present worth costs are defined as the sum of the capital costs, the replacement costs, and the present worth of the annual O&M expenses over a 30-year period at 10 percent interest. The uniform present worth factor of 9.4269 was used.

[b] This cost includes repair of the cap due to subsidence at years 10 and 20, and replacement of the entire cap at the end of year 30.

[c] Ancillary details for the water treatment system include a storage tank, a building to house the water treatment system, and sludge removal.

Table -8
COST ESTIMATE SUMMARY
AA-5A TYPE I CAP WITH GAS MIGRATION CONTROL, MONITORING, LEACHATE COLLECTION, AND WATER TREATMENT

	COST COMPONENT	CONSTRUCTION COSTS	ANNUAL O&M COSTS	REPLACEMENT COSTS
1.	Site Preparation and Cap Construction for Type I Cap	3,940,000	10,000	460,000[b]
2.	Monitoring Network and Fence	140,000	15,000	0
3.	Gas Migration Control	231,000	0	0
4.	Water Treatment	324,000	208,000	23,000
5.	Ancillary Details[c]	268,000	6,400	2,000
6.	Leachate Collection	497,000	13,000	1,000
7.	Electrical/Power Requirements	40,000	0	0
8.	Demobilization of Water Treatment System	27,000	0	0
	CONSTRUCTION SUBTOTAL	5,467,000	252,000	486,000
	Bid Contingencies (15%)	820,000		
	Scope Contingencies (20%)	1,093,000		
	CONSTRUCTION TOTAL	7,380,000		
	Permitting and Legal (5%)	369,000		
	Services During Construction (8%)	590,000		
	TOTAL IMPLEMENTATION COSTS	8,339,000		
	Engineering Design Costs (8%)	667,000		
	TOTAL CAPITAL COSTS	9,006,000		
	Annual O&M Costs		252,000	
	Replacement Costs			486,000
	TOTAL PRESENT WORTH[a] =	11,868,000		

[a] Total present worth costs are defined as the sum of the capital costs, the replacement costs, and the present worth of the annual O&M expenses over a 30-year period at 10 percent interest. The uniform present worth factor of 9.4269 was used.

[b] This cost includes repair of the cap due to subsidence at years 10 and 20, and replacement of the entire cap at the end of year 30.

[c] Ancillary details for the water treatment system include a storage tank, a building to house the water treatment system, and sludge removal.

Table -9
COST ESTIMATE SUMMARY
AA-5B TYPE II CAP WITH GAS MIGRATION CONTROL, MONITORING, LEACHATE COLLECTION, AND WATER TREATMENT

COSTS COMPONENT	CONSTRUCTION COSTS	ANNUAL O&M COSTS	REPLACEMENT COSTS
1. Site Preparation and Cap Construction for Type II Cap	2,928,000	10,000	342,000 [b]
2. Monitoring Network and Fence	140,000	15,000	0
3. Gas Migration Control	231,000	0	0
4. Water Treatment	324,000	208,000	23,000
5. Ancillary Details [c]	268,000	6,400	2,000
6. Leachate Collection	497,000	13,000	1,000
7. Electrical/Power Requirements	40,000		
8. Demobilization of Treatment System	27,000	0	0
CONSTRUCTION SUBTOTAL	4,455,000	252,000	368,000
Bid Contingencies (15%)	668,000		
Scope Contingencies (20%)	891,000		
CONSTRUCTION TOTAL	6,014,000		
Permitting and Legal (5%)	301,000		
Services During Construction (8%)	481,000		
TOTAL IMPLEMENTATION COSTS	6,796,000		
Engineering Design Costs (8%)	544,000		
TOTAL CAPITAL COSTS	7,340,000		
Annual O&M Costs		252,000	
Replacement Costs			368,000
TOTAL PRESENT WORTH [a] =	10,084,000		

[a] Total present worth costs are defined as the sum of the capital costs, the replacement costs, and the present worth of the annual O&M expenses over a 30-year period at 10 percent interest. The uniform present worth factor of 9.4269 was used.

[b] This cost includes repair of the cap due to subsidence at years 10 and 20, and replacement of the entire cap at the end of year 30.

[c] Ancillary details for the water treatment system include a storage tank, a building to house the water treatment system, and sludge removal.

Table 10
COST ESTIMATE SUMMARY
AA-6A EXCAVATION WITH ONSITE DISPOSAL IN AN ONSITE RCRA-TYPE LANDFILL

	COST COMPONENT	CONSTRUCTION COSTS	ANNUAL O&M COSTS	REPLACEMENT COSTS
1.	Excavation	26,960,000	0	0
2.	Monitoring Network and Fence	140,000	15,000	0
3.	Gas Migration Control	231,000	0	0
4.	Stockpile Area	2,500,000	0	0
5.	Bottom Liner System	8,550,000	0	0
6.	Replacement of Materials	17,524,000	0	0
7.	Installation of a Type I Cap	3,940,000	10,000	342,000 [b]
	CONSTRUCTION SUBTOTAL	59,845,000	25,000	342,000
	Bid Contingencies (15%)	8,977,000		
	Scope Contingencies (20%)	11,969,000		
	CONSTRUCTION TOTAL	80,791,000		
	Permitting and Legal (5%)	4,040,000		
	Services During Construction (8%)	6,463,000		
	TOTAL IMPLEMENTATION COSTS	91,294,000		
	Engineering Design Costs (8%)	7,304,000		
	TOTAL CAPITAL COSTS	98,598,000		
	Annual O&M Costs		25,000	
	Replacement Costs			342,000
	TOTAL PRESENT WORTH [a] =	99,176,000		

[a] Total present worth costs are defined as the sum of the capital costs, the replacement costs, and the present worth of the annual O&M expenses over a 30-year period at 10 percent interest. The uniform present worth factor of 9.4269 was used.

[b] This cost includes repair of the cap due to subsidence at years 10 and 20, and replacement of the entire cap at the end of year 30.

Table 11
COST ESTIMATE SUMMARY
AA-6B EXCAVATION WITH OFFSITE DISPOSAL IN A RCRA-PERMITTED LANDFILL

COST COMPONENT	CONSTRUCTION COSTS	ANNUAL O&M COSTS	REPLACEMENT COSTS
1. Excavation	26,960,000	0	0
2. Offsite Disposal	80,700,000	0	0
3. Backfill Excavation	7,414,000	0	0
4. Topsoil for Vegetation Cover	1,420,000	0	0
5. Transportation Costs	43,028,000	0	0
CONSTRUCTION SUBTOTAL	159,522,000	0	0
Bid Contingencies (15%)	23,928,000		
Scope Contingencies (20%)	31,904,000		
CONSTRUCTION TOTAL	215,354,000		
Permitting and Legal (5%)	10,768,000		
Services During Construction (8%)	17,228,000		
TOTAL IMPLEMENTATION COSTS	243,350,000		
Engineering Design Costs (8%)	19,468,000		
TOTAL CAPITAL COSTS	262,818,000		
Annual O&M Costs		0	
Replacement Costs			0
TOTAL PRESENT WORTH[a] =	262,818,000		

[a] Total present worth costs are defined as the sum of the capital costs, the replacement costs, and the present worth of the annual O&M expenses over a 30-year period at 10 percent interest. The uniform present worth factor of 9.4269 was used.

Attachment 2

WETLANDS ASSESSMENT

STATEMENT OF FINDINGS

This "Statement of Findings" documents the wetlands assessment performed at the New Lyme site. The statement is in accordance with Excecutive Order 11990 - Protection of Wetlands, which requires Federal agencies to take action to minimize the destruction, loss or degradation of wetlands, and to preserve and enhance the beneficial value of wetlands.

The New Lyme site is surrounded on three sides by over 100 acres of wetlands. The recommended alternative for the remedial action proposes to cap the landfill and draw down the groundwater level below the bottom of the landfill. These remedial actions are being taken in an effort to reduce contaminated leachate and groundwater production by eliminating vertical infiltration through the landfill and by effectively dewatering the landfill itself. This action will affect the wetlands. Approximately 15 acres of wetlands around the site may be dewatered.

Because the site is located in a wetland, there are no alternative actions or locations to be considered for taking remedial action.

The proposed action will substantially comply with state and local wetlands protection standards.

Groundwater recharge of treated water through the wetland was considered and found to be infeasible because of the low permeability of the receiving till. The design for construction of the cap will include safeguards to minimize harm to the wetlands during operations. The dewatering and treatment system will end discharge of untreated leachate to Lebanon Creek and wetlands as well as remove contaminated groundwater. Continuous pumping of the dewatering wells may lower the water level under approximately 15 acres of wetlands surrounding the site. The vegetative and faunal communities adjacent to the site are adapted to the ephemeral nature of the wetlands and any visible difference in vegetative cover or faunal complement will be minimal during operation of the dewatering system. The wetlands may gradually dry out and the plant community adjacent to the site may gradually change from wetland to upland species.

Although there will be some impact on the wetlands because of implementation of this proposed remedial action, the overall effect is beneficial. The natural or beneficial value of the wetlands relative to its current state will be enhanced because the release of contaminants into the wetlands will be eliminated and the ability of the wetlands to support wildlife will be enhanced.