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LANDFILL REMEDIATION FEASIBILITY STUDY

**DEVENS, MASSACHUSETTS** 

VOLUME II OF II

APPENDICES A THROUGH F

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U.S. ARMY ENVIRONMENTAL CENTER ABERDEEN PROVING GROUND, MARYLAND

JANUARY 1997

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AEC Form 45, 1 Feb 93 replaces THAMA Form 45 which is obsolete.

#### BCT PLAN OF ACTION

ABB Environmental Services, Inc.

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#### BCT PLAN OF ACTION MANAGEMENT OF DEBRIS DISPOSAL AREAS FORT DEVENS, MASSACHUSETTS

Prepared by U.S. Army for BCT Meeting of March 31, 1995

**MARCH 1995** 

#### BCT PLAN OF ACTION MANAGEMENT OF DEBRIS DISPOSAL AREAS

#### INTRODUCTION

During the collection of information for preparation of the Master Environmental Plan (MEP) and subsequent studies, the Army has identified a number of demolition debris disposal areas throughout Fort Devens. These disposal areas are in addition to the Shepley's Hill Landfill which has served as the primary solid waste disposal location at the installation. This 80-acre facility (AOC 5) is closing under a state-approved Resource Conservation and Recovery Act (RCRA) Subtitle D Closure Plan and is being further studied under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA - "Superfund").

The disposal areas have been the subject of investigations under CERCLA for the past three years. Table 1 presents information on the seven most significant disposal areas which are the primary focus of this discussion. The debris disposal areas have been found to pose varying risks to public health and the environment. The Army has determined from discussions with both federal and state regulatory agencies that all disposal areas must be managed, with the minimum requirements being those outlined in the Massachusetts solid waste management regulations. The Army and its contractors have been developing management options based on the degree of threat, cost, and technical practicality.

At one point in the assessment process, the Army considered nominating the lowest risk disposal areas for No Further Action (NFA) under CERCLA and managing them under the State solid waste regulations. However, it was finally decided to address all the disposal areas under CERCLA due to the benefits of: (1) a consistent administrative approach for all sites; (2) similarity of waste material; and (3) the administrative difficulty in mixing CERCLA and non-CERCLA waste.

The management of the debris disposal areas is being further influenced by property reuse considerations. The Massachusetts Government Land Bank (MGLB) and its consultants have indicated that water supply and wastewater resources, as well as property values, will be affected by the management options chosen for the disposal areas.

Additionally, the Army has recognized the potential positive impacts of managing debris disposal areas in a holistic manner, in particular the cost savings from lower operating and maintenance requirements at a consolidated disposal area.

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#### PURPOSE

The purpose of this Plan of Action is to identify and evaluate options, and document BCT decisions relative to disposal area management that will:

- 1. provide the optimum combination of protectiveness and cost;
- 2. accelerate restoration;
- 3. attain the highest public acceptance;
- 4. reduce the Army's long-term CERCLA liability; and
- 5. to the extent practical, alleviate land use restrictions.

#### BACKGROUND

The following information summarizes the current situation at Shepley's Hill Landfill and the significant debris disposal areas at Fort Devens (see also Table 1).

<u>AOC 5 - Shepley's Hill Landfill.</u> The RI/FS work effort is complete and the Army has prepared a Proposed Plan for comment. The plan calls for some important cap improvements, groundwater monitoring, and a contingency for groundwater extraction and treatment if the present closure proves ineffective in mitigating the off-site migration of contaminants (primarily arsenic) in groundwater.

The plan relies on regulatory acceptance of closure of the landfill under the Massachusetts solid waste regulations. At this time, the state agency has identified some deficiencies in the submittal of closure documentation by the Army. EPA has stated that it is unwilling to execute the ROD until all State requirements are satisfied.

<u>SA 6 - South Post Farm Dump.</u> The Army has characterized this small disposal area by test pitting. However, analytical samples have not been collected. Since this area contains only 500 cubic yards of waste, the Army has decided that its removal is the most effective solution.

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<u>AOC 9 - North Post Landfill.</u> SI work has been completed and data indicate that there is little ecological risk posed by the approximately 56,000 cubic yards of waste. However, contaminant levels in groundwater monitoring wells above MCLs are a concern to EPA.

The MGLB is evaluating the potential physical and environmental impacts from continued use and improvements to the wastewater treatment facility. A key concern is that increased water infiltration may force groundwater into the disposal area material, potentially exacerbating contaminant release.

The AOC 9 area, due to its location near the wastewater treatment facility and remote installation location, has limited future use potential and is a candidate site for consolidating debris from other locations.

<u>AOC 11 - Lovell St. Landfill.</u> RI work is ongoing at this 35,000 cubic yard disposal area located in a meander of the Nashua River. In-place closure of the disposal area may prove technically difficult and environmentally unsuitable.

<u>SA 12 - Range Control Landfill.</u> SI work has been completed and data indicate that there is little risk posed by the approximately 9,000 cubic yards of waste which has been discarded over a steep embankment into the Nashua River wetland. Since in-place closure of the disposal area at the steep grade appears impractical, the Army has decided that its removal is the most effective solution.

<u>SA 13 - Lake George St. Landfill.</u> This 10,000 cubic yard debris disposal area poses no significant risk as shown by SI efforts. In-place closure of such a small area appears impractical and, therefore, removal of the waste is the recommended Army solution.

<u>AOC 40 - Cold Spring Brook Landfill.</u> The Army's RI/FS efforts were recently completed and a Proposed Plan was being drafted when the regulatory agencies and the MGLB questioned the adequacy of the waste characterization. The primary issue for those parties is the proximity of the landfill to the Patton Road Well. The BCT tentatively agreed that inplace closure of the 100,000 cubic yards of waste material with an enhanced RCRA Subtitle D (composite) cap with pre-design investigations directed at defining waste extent and characteristics will satisfy MADEP and USEPA concerns and allow the ROD process to proceed.

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<u>AOC 41 - South Post Farm Dump.</u> SI efforts were completed in the debris area and RI efforts are ongoing for groundwater contamination. This 1,500 cubic yard debris disposal area poses no significant risk. In-place closure of such a small area appears impractical and, therefore, removal of the waste is the recommended Army solution.

#### DISPOSAL OPTION DEVELOPMENT

The Army's available data and information indicate that in-place containment of the larger dumps (9,40) would be more cost-effective than excavation and consolidation at a central facility or, alternatively, excavation and off-site disposal.

Specifically, the FS for AOC 40 showed that there would be an approximate \$3 million difference between closure in-place and disposal at a specially constructed consolidation facility. (An economy of scale was built in, at MADEP's request, considering an amortized rate per yard based on construction and use of a consolidation facility which would accommodate more than double the capacity needed for AOC 40.) Based on this information alone, it has been difficult for the Army to justify the \$3 million expense to satisfy the MGLB's water supply concerns.

At the request of the Fort Devens Deputy Installation Commander, a matrix of six debris disposal options and evaluation criteria was developed in cooperation with the regulatory agencies and the MGLB (see Table 2). The options and evaluation criteria were established during a "brainstorming" session at the BCT meeting of January 25, 1995.

Some important assumptions in the development of options include:

- 1. Based on previous siting studies for Fort Devens, there are only two adequate waste consolidation locations: the North Post Landfill and the area near Shepley's Hill Landfill.
- 2. The consolidation facility must have a bottom liner, leachate collection, and a single top liner (Subtitle D) to meet MADEP requirements.
- 3. Consolidation on top of the closed Shepley's Hill Landfill is not technically and economically justifiable due to waste settling issues. Therefore, the Army has established that any consolidation facility would be built as a separate unit next to the main landfill.
- 4. Based on MADEP solid waste requirements (and settlement issues), consolidation at the North Post Landfill would require excavation of AOC 9, construction of a bottom liner and leachate collection system, and replacement of the AOC 9 material in the

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new facility. No consideration has been given to construction of the consolidation facility directly on top of portions of the undisturbed North Post Landfill.

- 5. The smaller debris disposal areas (6,12,13,41) will be addressed as a single "bundle" of wastes. Engineering and design associated with these four areas will be coordinated and a single solution for all four will be established.
- 6. As per discussions with the regulatory agencies, an enhanced Subtitle D cap will be required for in-place containment of AOC 40. Subtitle D caps are assumed here for in-place containment of AOCs 9 and 11. However, AOC 9 could require closure with a Subtitle C cap, depending upon the outcome of further investigations.
- 7. Excavation and relocation of debris disposal areas will eliminate the need for environmental monitoring at the excavation site.
- 8. The consolidation facility will not accept hazardous waste and, therefore, will be designed as a Subtitle D facility. Hazardous waste, encountered during excavation, will be managed at an off-site RCRA-approved facility.
- 9. The Army will consider (but may reject) landfill reclamation based on technical practicality and cost-effectiveness.

Based on meetings and discussions, the regulatory agencies and the MGLB have expressed preference for Option No.2, excavation of all the debris disposal areas and consolidation at the Shepley's Hill Landfill area facility.

#### **OPTIONS ANALYSIS**

The matrix of Table 2 evaluates each of the six options against ten evaluation criteria which were established during the BCT brainstorming session.

<u>Long-term Effectiveness.</u> This criterion represents the overall effectiveness of the option to meet its goal of protection of public health and the environment. Due to the generally low existing risk levels and the sophisticated design required by the applicable regulations, all options will be highly effective. However, removal of debris provides a level of reliability which is greater than in-place closure, assuming the possibility of an unexpected release from a landfilled container or flooding in the Nashua. The long-term effectiveness of any option which leaves AOC 9 in-place may be affected by the expansion of the wastewater treatment facility.

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<u>Short-term Impacts.</u> This criterion addresses the effects of construction activities on the public and the environment. In short, higher levels of excavation and hauling activity associated with debris disposal consolidation will have greater impacts, such as dust and noise generation.

<u>Infrastructure Impacts.</u> This criterion primarily addresses the effects of implementation on the building of new roads and facilities. Two locations are affected most: AOC 40 due to planned Patton Road improvements; and AOC 9 due to planned continued use and improvements to the wastewater infiltration system. Although these issues can be handled during in-place closure engineering, the overall impacts are lessened by disposal area removal.

<u>Water Supply Impacts.</u> This criterion is directed primarily at potential impacts on Patton Well from AOC 40. Although investigations have shown only low-level metals contamination of groundwater in the vicinity of the debris, debris removal will reduce any uncertainty and eliminate the need for any contingency planning.

<u>Implementability</u>. This criterion addresses the ease of construction, including meeting regulatory and administrative process requirements. In general, in-place containment is easier to implement than excavation, hauling, and construction of a new consolidation landfill. However, there are uncertainties associated with controlling groundwater infiltration of the waste at AOC 9 and controlling erosion of AOC 11 waste during Nashua River flood conditions. The U.S. Fish & Wildlife Service has expressed concern about in-place closure of AOC 11 in the Nashua River area.

<u>Landfill Management</u>. This criterion considers the administrative difficulties associated with the long-term management of closed landfill facilities. In short, more landfills require more complicated logistical efforts.

<u>Cost.</u> Costs include capital and O&M. Table 3 shows the level of detail that has been used in the analysis.

Land Reuse Potential. In general, in-place closure restricts land reuse.

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<u>Public Acceptance.</u> This criterion is a general assessment of the public's preference. Experience has shown that excavation and consolidation of debris is preferred by the public. However, experience has also shown that the public is adverse to the unwise expenditure of public funds.

#### CONCLUSIONS

Of primary importance to the BCT is that, although the site-specific FS for AOC 40 showed an approximate \$3 million difference between in-place closure and moving waste to a consolidation landfill, Tables 2 and 3 show that when considering the management of all debris disposal areas on Fort Devens, the overall cost difference between Option No.1 (low cost option) and Option No.2 remains at about \$3 million. This is due to the following basic costing issues:

- 1. Due to economy of scale, it is \$800,000 less expensive to consolidate the debris area bundle with other waste than to dispose of the 20,000 yards off-site.
- 2. It is equally expensive to remove AOC 11 as to cap in-place due the logistics of working in the Nashua River floodplain.
- 3. It is approximately \$800,000 more expensive to excavate and consolidate AOC 9 than to close it in place.

In addition to being more costly, disposal area excavation/consolidation poses other disadvantages, including higher hazard potential for site workers, the potential for noise and dust generation, impacts on existing roadways, and a longer implementation schedule associated with the design and construction of the consolidation facility.

The advantages of consolidation include the elimination of any environmental monitoring, insurance against future subsurface container releases at each disposal area and flooding of the Nashua River near AOC 11. Another key advantage to the BCT is quick community acceptance which will reduce delays in the ROD and remedial action process. The administrative issues related to long-term monitoring at many closed landfills will also be mitigated.

Other advantages of consolidation over in-place closure relate to infrastructure, water supply, and land reuse impacts. Although these factors do not directly affect the Army which is closing Fort Devens, there is still an indirect affect due to community acceptance of the remedy.

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#### RECOMMENDATIONS

Based on the analysis presented in Table 2, considering the stated advantages to consolidation of debris disposal areas, it may be practical for the BCT to consider the implementation of Option 2. However, this will result in an approximately \$3 million incremental cost over the low cost Option No.1.

The incremental cost for excavation and consolidation can be offset by savings in a number of areas, contingent upon regulatory agency and MGLB acceptance. Many of the cost saving considerations were discussed and agreed to at the BCT meeting of March 15, 1995. These considerations, which include many of the assumptions outlined in the Disposal Option Development section of this Plan of Action are outlined below:

- 1. Consolidation on top of the closed Shepley's Hill Landfill is not technically and economically justifiable due to waste settling issues. Therefore, any consolidation facility would be built as a separate unit next to the main landfill.
- 2. Excavation and relocation of debris disposal areas will eliminate the need for environmental monitoring at the excavation site.
- 3. The Army will consider (but may reject) landfill reclamation based on technical practicality and cost-effectiveness.
- 4. The consolidation facility will not be designed for hazardous waste disposal and, therefore, will be designed with a Subtitle D cap. Hazardous waste, encountered during excavation, will be managed at an off-site RCRA-approved facility.
- 5. A single consolidation FS/PP/ROD will suffice to administratively manage all the debris disposal areas under CERCLA, with the AOC 40 FS incorporated by reference.
- 6. Because Option 2 includes the excavation and removal of landfilled materials at AOC 09, the need to conduct a formal RI at this disposal area can be eliminated.
- 7. The regulatory agencies agree that, with the removal of debris and associated residual contamination, no additional sampling will be necessary in these areas.
- 8. Certain contaminated and uncontaminated soils can be used in the consolidation facility if the waste meets MADEP solid waste disposal policy limits.
- 9. Interim storage of contaminated and uncontaminated soils to be discarded in the landfill will be allowed at Building 202 as long as the appropriate containment and

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control efforts exist. MADEP agreed that soils contaminated with PCBs at concentrations less than 50 ppm can be stockpiled as long as it is properly controlled.

10. The MGLB will consider providing financial assistance to help offset the cost differential between Option 1 and the selected Option 2.

#### Fort Devens, Massachusetts

USEPA and MADEP signatures constitute concurrence with this BCT Plan of Action.

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JAMES C. CHAMBERS BRAC Environmental Coordinator

Date

Date

U.S. ENVIRONMENTAL PROTECTION AGENCY

une

JAMES P. BYRNE Fort Devens Remedial Project Manager

[] Non-concur (Please provide reasons for non-concurrence in writing)

MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION

hyme Wels

Date

Date

M Concur

D. LYNNE WELSH

[] Non-concur (Please provide reasons for non-concurrence in writing)

In addition, MGLB signature constitutes concurrence with this BCT Plan of Action

DAVID S. KNISELY <sup>1</sup> Counsel, Massachusetts Government Land Bank

Section Chief, Federal Facilities - CERO

X Concur

[] Non-concur (Please provide reasons for non-concurrence in writing)

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SA/AOC No.	Name	Estimated Volume (cy)	Current Ştatus
6	South Post Farm Dump	500	Test pitting complete. Removal recommended.
9	North Post Landfill	56,000	SI complete. Ready to initiate RI/FS.
11	Lovell St. Landfill	35,000	RI near completion.
12	Range Control Landfill	9,000	SI complete. Removal recommended.
13	Lake George St. Landfill	10.000	Si complete. Removal recommended.
40	Cold Spring Brook Landfül	40,000	RI/FS complete. Ready to issue Proposed Plan.
41	South Post Farm Dump	1, <b>5</b> 00	SI complete. Removal recommended for debris area. RI ongoing for groundwater.

#### TABLE 1 DEBRIS DISPOSAL AREA SUMMARY

SOLID WASTE LANDFILL MANAGEMENT OPTIONS	FT. DEVENS, MASSACHUSET IS
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'Н		OPTION	LONG - TERM BFECTIVENESS	SIONT-TERM MPACTS	NEBASTRUCTURE, MPACTS	WATEN SUPPLY MPACTS	MPLEMENTABILITY
	••	Cap in Place: 9, 11, 40 Off-Site Disposal 13, 41) 13, 41)	Landiiii cap prevents leachate generation, thereby protecting groundwater quality. Low-tech maintenance. Effectiveness measured by post-closure groundwater monitoring. Expected cap itie is 30 years minimum.	Ci the options, No. 1 offers least amount of adverse short-tarm impacts because only 10% of landilled waste is relocated. One-time noise and dust impects from construction equipment can be mitigated.	Patton Road Improve-ment must be over AOC 40 cap. Uncertainties related to sand filter beds at AOC 9 remain.	ADC 40, within Zone H of Patton supply well, would be capped in place.	No significant obstactes to implementation. Could be completed within a single construction season. Englneering measures potentially required at AOC 9 to control groundwater table elevation. Capping AOC 40 in place could potentially hinder alr quality mitigation measures by conflicting with Patton Road expansion.
	• ni	Consolidate near SHL: 9, 11, 40, Bundle	Degree of groundwater protection similar to all other options. Peliability of remedy improved over cap in-place. Reduces uncertainty from flooding at AOC 11.	Greatest one-time noise and traffic-released impacts to on-post and off-post residents.	Eliminates design problems for Patton Road Improvement. Eliminates uncertainties related to sand filler beds at AOC 9.	Etiminates groundwater and water supply concerns at AOCa B and 40.	Additional time required to relocate 211,000 cy of solid waste, may require two construction seasons. Potential wetlands restoration at AOC 9.
אברוברטיאא	•••	Cap in Place: 11 Consolidate at MPL: 9, 40, Bundle	Degree of groundwater protection similar to all other options. Fails to address potential flooding at AOC 11.	Decreased one-time noise and traffic-related impacts to on-post and off-post residents relative to Option 2.	Eliminates design problems for Patton Road Improvement. Uncertain-ties related to sand Illier beds at AOC 9 remain.	Eliminates water supply concerns at AOC 40. Waste location relative to groundwater table is an Issue at AOC 9.	See Option 1.
нм ся_яян	•	Consolidate at NPL: 9, 11, 40, Bundle	Degree of groundwater protection similar to all other options.	Slightly increased traffic-related impacts relative to Option 3 because more waste is relocated.	Eliminates design problems for Patton Road improvement. Uncertain ties related to sand filter beds at AOC 9 remain.	Eliminates water supply concerns at AOC 40. Waste tocation relative to groundwater table is en Issue at AOC 9.	See Dption 1
70.1	• • ທີ	Cap in Place: 9, 11 Consolidate near Shti: 40, Bundie	Degree of groundwater protection similar to all other options. Fails to address potential flooding at AOC 11.	Impacts similar to Option 3.	Eliminates design problems for Patton Road Improvement. Uncertain-ties related to sand filter beds at AOC 9 remain.	Eliminates water supply concerns at AOC 40. Weste location relative to groundwater table is an issue at AOC 9.	Potential engineering measures to control groundwater table elevation at AOC 9.
	ب ب م	Cap In Place: 40 Consolidate near SHL: 9, 11, Bundle	Degree of groundwaler protection similar to all other options. Eliminates uncertainties related to aend filler beds at AOC9. Reduces uncertainty from flooding at AOC 11.	Slightly less impact than Option 5.	Infrastructure Impacts on Patton Road Improve-ment. Eliminates uncertainitist related to sand filter beds at AOC 9.	AOC 40, within Zone II of Patton supply well, would be capped in place.	Potential engineering measures to control groundwater table elevation et AOC 9. Capping AOC 40 in place could potentially hinder air quelity mildgation measures by conflicting with Pation Road expaneton.

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Рапе 1

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# TABLE 2 (CONT.) Solid Waste Landfill Management Options Pr. Devens, Massachusetts

Probably more favored than Option 1.	Restricts re-use potential at 40, SHL	\$10.4 M	Results in two landities (40, SHL) to be managed.	• Cap in Place: 40 • Consolidate Near SHL: 9, 11, Bundle	ю
Probably more favored than Option 1.	Restricts re-use potential at 9, 11, SHL.	\$12.5 M	Results in three landitils (9, 11, SHL) to be managed.	<ul> <li>Cap In Place: 9, 11</li> <li>Consolidate Near SHL: 40, Bundle</li> </ul>	ഹ
Probably more favored than Option 3.	Restricts re-use potential at 9, SHL	\$11.8 M	Results in two landfills (9, SHL) to be managed.	Consolidate at NPL: 9, 11, 40, Bundle	4
Probably more favored than Option 1.	Restricts re-use potential at 9, 11, SHL.	\$12.1 M	Results in three landiffs (9, 11, SHL) to be managed.	Cap in Place: 11     Consolidate at NPL: 9, 40, Bundle	ri
Probably most lavored.	Offers most potential re-use area (orthy SHL restricted).	<b>\$</b> 12.4 M	Results in one landill area (SHL) to be managed.	<ul> <li>Consolidate Near SHL: 9, 11, 40, Bundle</li> </ul>	ri i
Probably least favored.	Offers least armount of potential re-use area (9, 11, 40, and SHL Is restricted).	<b>\$</b> 9.4 M	Results in four separate landfills (9, 11, 40, SHL) to be managed.	<ul> <li>Cap kn Place: 9, 11, 40</li> <li>Off-Site Disposal: Bundle (6, 12, 13, 41)</li> </ul>	-
PUBLIC ACCEPTANCE	LAND RE-USE POTENTIAL	COST	LANDERL MANAGEMENT	6	

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		DISPOSAL	AREA MAN	AGEMENT	OPTIONS			
			COST DET.	AIL	_			
		SA 9	AOC 11	AOC 40	Bundle	Volume		
<u> 0P</u>	IION	56000	35000	100000	20000	Total	<u> </u>	
1	Cap in place, cy	56,000	35,000	100,000	0	191,000		
	CIP S	\$2,050,000	\$1,740,000	\$2,437,000	20		\$6,227,000	
	Sed/drum removal	.30	20	\$1,323,000	20		\$1,323,000	
	Excav volume, cy	0	0	0	20,000	20,000		
	Excav. & Haul	<b>S</b> 0	<b>S</b> 0	<b>S</b> 0	<b>S</b> 0		<b>S</b> 0	
	Site Restor, & Cont.	<b>\$</b> 0	<b>2</b> 0	<b>S</b> 0	<b>\$226,57</b> 0		\$226,570	
	Off-site disposal, cy	0	0	0	20,000	20,000		
	Excav, haul, dispose off-						\$1.620,320	\$9,396,890
2	Cap in place, cy	0	0	0	0	0		
	CIP S	<b>\$</b> 0	<b>S</b> 0	<b>S</b> 0	<b>S</b> 0		<b>\$</b> 0	
	Sed/drum removal	<b>S</b> 0	<b>S</b> 0	\$1,735,150	<b>\$</b> 0		\$1,735,150	
	Excav volume, cy	56,000	35,000	100.000	20.000	211.000		
	Excav. & Haul	\$456,400	\$285,250	\$815.000	\$203.000		\$1,759,650	
	Site Restor. & Cont.	\$634,396	\$396,498	\$1.132.850	\$226,570		\$2,390,314	
	Consolidate volume, cv	56.000	35.000	100.000	20,000	211.000	••••••	
	Consol. \$						\$6,552,000	\$12,437,114
-	<b>A</b> · · ·							
3	Cap in place, cy	0	35,000	0	0	35,000		
	CIP S	50	\$1,740,000	<b>\$</b> 0	<b>\$</b> 0		\$1,740.000	
	Sed/drum removal	50	20	\$1,735,150	<b>2</b> 0		<b>\$1,735,150</b>	
	Excav volume, cy	56,000	0	100,000	20,000	176,000		
	Excav. & Haul	\$456,400	<b>S</b> 0	\$815,000	\$203,000		<b>\$</b> 1,474,400	
	Site Restor, & Cont.	50	20	\$1,132,850	\$226,570		\$1,359,420	
	Consolidate volume, cy	56,000	0	100,000	20,000	176,000		
	Consol. 3						\$5,800,000	\$12,108,970
4	Cap in place, cy	0	0	0	0	0		
	CIP S	<b>S</b> 0	<b>S</b> 0	<b>S</b> 0	<b>\$</b> 0		<b>\$</b> 0	
	Sed/drum removal	\$0	\$0	\$1,735,150	<b>\$</b> 0		\$1,735,150	
	Excav volume, cy	56,000	35,000	100,000	20,000	211,000		
	Excav. & Haul	\$456,400	\$285,250	\$815,000	\$203,000		\$1,759,650	
	Site Restor. & Cont.	<b>\$</b> 0	\$396,498	\$1,132.850	\$226,570		\$1,755,918	
	Consolidate volume, cy	<b>56,00</b> 0	<b>35,0</b> 00	100,000	20,000	211,000		
	Consol. S						\$6,552,000	\$11,802,718
5	Can in place, cy	56 000	35 000	n	0	01 000		
5	CIP S	\$2 050 000	\$1 740 000	• •	• •	91,000	\$2 700 000	
	Sed/drum removal	\$0	\$1,740,000	\$1 735 150	<b>3</b> 0 <b>\$</b> 0		\$1,735,150	
	Excav volume cv	<b>3</b> 0	<b>J</b> 0	100 000	20,000	120.000	91,799,190	
	Excav & Haul	<b>\$</b> 0	\$0	\$815,000	\$203,000	120,000	\$1.018.000	
	Site Restor & Cont	\$0 \$0	50 \$0	C1 132 850	\$205,000		\$1,010,000	
	Consolidate volume ev	30	<b>J</b> U 0	100 000	3220,370	120 000	31,3.9,420	
	Consol. S	U	U	100,000	20,000	120,000	\$4.600.000	\$12,502,570
							•	
6	Cap in place	0	0	100.000	0	100,000		
	CIP S	<b>\$</b> 0	<b>\$</b> 0	\$2,437,000	<b>S</b> 0		<b>\$2,437,000</b>	
	Sed/drum removal	<b>S</b> 0	<b>\$</b> 0	<b>\$1,323,000</b>	<b>\$</b> 0		\$1,323,000	
	Haul volume	56,000	35,000	0	20,000	111,000		
	Excav. & Haul	\$456,400	\$285,250	<b>S</b> 0	\$203,000		\$944.650	
	Site Restor. & Cont.	\$634,396	\$396,498	<b>S</b> 0	<b>\$226,57</b> 0		\$1,257,464	
	Consolidate volume	56.000	35,000	0	20.000	111.000		

TABLE 3

Consol. S Notes:

In-place cap for AOC 40 is enhanced "D" cap (i.e., composite cap).

CIP \$ include 25 % contingency, plus 30 % for healty & safety, administrative, engineering, and services during construction.

Sed/drum removal includes sed/drum removal costs at CSBL plus associated wetland.

restoration (includes contingencies, health & safety, administrative, etc.).

Estimated waste excavation cost is \$ 2.75/cy

Estimated waste haul cost is \$ 5.40/cy for four mile distance using 20-cy trucks (applies to AOCs 9 and 11).

\$4.400.000 \$10.362.114

Estimated waste haul cost is \$ 7.40/cy for for "Bundle" using 20-cy trucks (6 mile typical).

Site restoration and contingency includes site restoration plus 25 % contingency for excavation, hauling.

and restoration, and 30 % for healty & safety, administrative, engineering, and services during construction.

Ton-miles 07-Mar-95

#### **APPENDIX B**

#### WASTE VOLUME CALCULATIONS SEVEN DEVENS LANDFILLS

ABB Environmental Services, Inc.

W007959APP.B

8712-04



#### **MEMORANDUM**

#### PROJECT: Landfill Remediation Feasibility Study Devens, Massachusetts BY: Mike Donnelly

DATE: January 9, 1997

SUBJECT: Debris Volume at AOC 9

#### Previous Debris Volume Estimates

For the draft Consolidation Landfill FS, 1995, ABB-ES estimated the debris volume of AOC 9 at 56,000 cy, based on 8 test pits conducted in 1992 and 1994. The AOC 9 landfill is a cluster of 5 areas that covers about 7.5 acres. Most of the waste was in one main 6.2 acre area. The average depth of waste was about 5 feet.

In 1996, SEA Consultants reported the results of their investigation of AOC 9 to the Massachusetts Government Land Bank. Part of the investigation included making 21 test pits, and evaluating the test pit data to re-estimate the area and volume of AOC 9. SEA reported the area at 8.5 acres, the volume at 154,000 cy, and an average depth of about 11 feet.

ABB-ES has examined the information in the SEA report and the results of all of the test pit data to date. Figure 1 of the SEA report is attached to this memo to illustrate the test pit locations. A new set of ABB-ES calculations is also attached.

#### **Evaluation of Recent Data**

Of the 5 waste areas that make up AOC 9, the smallest 4 areas contribute about 15 % of the total debris volume. The 15 % ratio applies to ABB-ESs earlier estimate and SEAs more recent estimate. After reviewing the test pit depths for the 4 smallest areas, ABB-ES agrees with SEAs reported debris area of 2.3 acres and volume of about 22,000 cy.

The largest area contains about 85 % of the debris volume and ABB-ES has looked closely at the debris depths from all test pits. Because the area is irregular, five subareas were created to facilitate volume calculations. The subareas and test pit depths are shown on the attached Figure 1. The attached volaoc9.doc

1/21/97

calculations are referenced to the subarea and its average debris depth. For the 6.2 acre area, the debris volume is 80,000 cy and the average depth is about 8 feet.

The total debris volume for the entire AOC 9 is 102,000 cy that, with a contingency factor, becomes 112,000 cy.

volaoc9.doc 1/21/97



#### **MEMORANDUM**

PROJECT: Landfill Remediation Feasibility Study Devens, Massachusetts

BY: Mike Donnelly

DATE: January 9, 1997

SUBJECT: Landfill Debris Volumes

#### Summary of Debris Volumes

This memorandum summarizes debris volumes in the seven landfills of the Landfill Remediation Feasibility Study in the tabulation below. Landfill information includes volumes that help estimate the cost of excavating, hauling and placing debris in a new consolidation landfill, and areas that help estimate the cost of capping in place. Some of the landfills have new volumes revised for this report using recent data. New calculations for the revised volumes at each landfill are included in this appendix as listed below. Other debris volumes presented here are taken from several documents, and the sources of the volumes are listed separately below.

LANDFILL DEDNIS VOLUMES				
Landfill	Area (acres)	Average Depth (ft)	Volume (cy)	
SA 6	0.2	3	500	
SA 12	0.5	12	8,700	
SA 13	0.6	10	10,000	
AOC 41	0.2	5	1,500	
AOC 9	8.5	8	112,000	
AOC 11	2.5	9	35,000	
AOC 40	4.1	17	110,000	

LANDFILL DEBRIS VOLUMES

volsum.doc 1/21/97

#### Sources of Debris Volumes

All of the landfill volumes were reported in the Draft Consolidated Landfill Feasibility Report, ABB-ES 1996. The source document for the landfill volumes and test pit logs are tabulated below. However, revised landfill volumes are created in this Landfill Remediation FS for AOC 9 and 40, and the volume documentation is included as part of this appendix. Volume calculations for the consolidation landfill are part of this appendix also.

Landfill	Source of Debris Volume	Location of Test Pit Logs
SA 6	ABB-ES 1994, Data Package to USACE,	ABB-ES 1994, Data Package to USACE,
	December 23, 1994	December 23, 1994
SA 12	ABB-ES 1994, Data Package to USACE,	ABB-ES 1995, Revised Final Groups 2 & 7 Site
	December 23, 1994	Investigation
SA 13	ABB-ES 1994, Data Package to USACE,	ABB-ES 1995, Revised Final Groups 2 & 7 SI
	December 23, 1994	
AOC 9	ABB-ES 1997, Landfill Remediation FS,	ABB-ES 1996, Revised Final SI Report- Groups
	Appendix B-2	3, 5 & 6
AOC 11	ADL 1994, Draft RI AOC-11 Debris Disposal	ADL 1994, Draft RI AOC-11 Debris Disposal
AOC 40	ABB-ES 1997, Landfill Remediation FS,	ABB-ES 1994, Final FS AOC 40
	Appendix B-3	
AOC 41	ABB-ES 1994, Job file notebook, November 7,	ABB-ES 1995, Revised Final Groups 2 & 7 SI
	1994	
Consolidation	ABB-ES 1997, Landfill Remediation FS,	ABB-ES 1996, Draft Consolidated Landfill FS
landfill	Appendix B-4	

volsum.doc 1/21/97







ABB Environmental Services, Inc.

FORM 00.01 REV. 4/81



#### **MEMORANDUM**

PROJECT:Landfill Remediation Feasibility Study<br/>Devens, MassachusettsBY:Mike Donnelly

DATE: January 9, 1997

SUBJECT: Debris Volume at AOC 40

#### Previous Debris Volume Estimates

For the Final Feasibility Study Report, Cold Spring Brook Landfill Operable Unit, ABB-ES estimated the debris volume of AOC 40 at 100,000 cy. The estimate was calculated by cross-section areas using existing grades and an assumed bottom elevation. The calculations produced a volume of 86,000 cy. An extra 10,000 cy (equal to 2 feet of depth) was added as a contingency. The total was rounded to 100,000 cy.

In 1996, SEA Consultants reported the results of their investigation of AOC 40 to the Massachusetts Government Land Bank. The investigation included 8 test pits, and an evaluation of the area and volume of AOC 40. SEA averaged the test pit depths and adjusted ABB-ES' volume upward to 160,000 cy. This increase is too high because the thickness of the debris varies over the site, and the average of the test pit depths does not represent the average for the entire site.

Revised Debris Estimate

SEA's test pit depths indicate that the actual bottom of debris is lower than previously assumed. The calculated increase in volume adds about 17,000 cy to the initial calculation of 86,000 cy. The revised estimate, 103,000 cy, is rounded up to 110,000 cy as a contingency.





#### **MEMORANDUM**

PROJECT:	Landfill Remediation Feasibility Study Devens, Massachusetts
BY:	Mike Donnelly
DATE:	January 9, 1997

SUBJECT: Consolidation Landfill Volumes

#### Summary of Consolidation Landfill Volumes

The estimated volumes of debris placed in the Consolidation Landfill for the various Alternatives are summarized below. A total landfill volume is presented that includes daily cover and final cover. The daily cover volume is equal to 10 percent of the debris, and the final cover volume is based on the landfill area and a thickness of 5 feet. The five feet includes the minimum four foot cap thickness plus one extra foot for grading.

	Alternatives 4 & 5	Alternative 6	Alternative 8	Alternative 9
SA 6			500	500
SA 12			9,000	9,000
SA 13			10,000	10,000
AOC 41			1,500	1,500
AOC 9	112,000	112,000	112,000	112,000
AOC 11		35,000		35,000
AOC 40	<u>110,000</u>	110,000	110,000	110,000
<b>Total Debris</b>	222,000	257,000	243,000	278,000
Daily Cover (10%)	22,000	26,000	24,000	28,000
Final Cover (5 ft)	<u>60,000</u>	<u>60,000</u>	<u>60,000</u>	<u>60,000</u>
Total LF Volume	304,000	343,000	327,000	366,000

#### CONSOLIDATION VOLUMES (cy)

#### Consolidation Landfill Layout

The footprint of the Consolidation Landfill maximizes the available land between the Shepley's Landfill Phase II Closure on the West, the Reservation Boundary on the East and Plow Shop Pond to the



North. Set backs are 250 feet from the pond, 100 feet from the Reservation Boundary, and 50 feet from the edge of the Shepley's Landfill cap. The foot print is slightly irregular but the dimensions approximate a square 550 feet by 550 feet at existing grade. At the center of the landfill, existing grade is elevation 238 and the top of the composite liner is at elevation 230. Groundwater at the center of the landfill is at elevation 220.

Maximum sideslopes of the landfill, above and below grade, are 3 horizontal to 1 vertical. For volume calculations, the sideslope has a 10 foot wide bench every vertical rise of 15 feet. A minimum top slope is 5 %. The composite liner slopes downward at a 2% grade towards the northeast corner.

Attached are volume calculations of the landfill at increasing height intervals. These volumes are plotted on a volume versus elevation curve. The landfill height for the various alternatives is determined by plotting the landfill volume on the curve and reading the corresponding elevation. The minimum landfill height is Alternative 4 at elevation 270, and the maximum landfill height is Alternative 9 at elevation 290.

PROJECT LE conselidation F4. DEVENS



Volume Calculations: Assimptions : -Base clev. (GD) = 238' - 3:1 5: destopes, benches @ 15' - AND Area & boul = 550 KS50 = - V= 1/3 (A, +A2 + TA, #2) × H/27 302,500 V Grade Dimension Area Volume 550x550 302,500 238 142,055 ~ 400×460 211,000 v 253 440 ×440 197,000 253 87,055 350×350 /22,500 -330×330 /08,900 21,8 2118 45,500 283 240×241 57,400. 220 8220 48,400 283 17,388 16,900 298 ·130×130

Beter Grade - Ave elev. = 230 -> 31 langer - 3:1 5 laper

555 x 550 302,500 238 82,035 252,004 502 × 502 230

ABB Environmental Services, Inc.

FORM 00.01 REV. 4/81







WETLANDS DELINEATION AT AOC 41

ABB Environmental Services, Inc.

W007959APP.B

8712-04



#### Inter-Office Correspondence

TO: FROM:	Mark Stelmack John A. Bleiler and Nancy E. Roka	L'S
DATE: PROJECT NUMBER:	July 7, 1995	
SUBJECT:	Wetland Delineation for Study Area 41 Fort Devens, MA	

#### **1.0 Introduction**

This internal memorandum summarizes the results of wetlands identification and delineation activities conducted at Study Area (SA) 41 at Fort Devens.

#### 2.0 Wetland Characterization

On June 29, 1995 ABB-ES ecologists identified and delineated two inland wetland resource areas at SA 41. Wetlands were identified and delineated pursuant to federal (Section 404 of the Clean Water Act) and state regulations (Massachusetts Wetlands Protection Act (M.G.L. c. 131, s.40) and Regulations (310 CMR 10.00)).

The Clean Water Act defines wetlands as:

"..areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions." (40 CFR 230.3)

All federally jurisdictional wetlands were identified and delineated as specified in the 1987 *Corps of Engineers Wetlands Delineation Manual* (Final Report, U.S. Department of the Army). Criteria for vegetation, hydrology, and soils must be met in order for an area to be considered a federal jurisdictional wetland.

Delineation under the Massachusetts regulations was performed according to the following definition:

"The boundary of Bordering Vegetated Wetlands is the line within which 50 percent or more of the vegetational community consists of the wetland plant species identified in the Act" (310 CMR 10.55).



Each identified wetland area was delineated with sequentially numbered wetland delineation flagging. The following text briefly summarizes our findings at SA 41. If required to meet your reporting or permitting needs, additional information --including field logbooks and field data forms-- are also available.

SA 41 is located on South Post, due east of the impact area in between an access road and New Cranberry Pond (approximately 75 feet to the south). The site is less than an acre in size and consists of landfill debris deposited upgradient of a basin, which may be a former borrow pit. Although New Cranberry Pond is nearby, a berm supporting upland vegetation exists between the two areas; no drainage pathways connecting the pond with the SA41 basin were observed.

Two wetland areas were identified at SA41: the basin downgradient of SA 41 and the border of New Cranberry Pond. The basin was evaluated for wetland hydrology, hydric soils, and hydrophytic vegetation. The border between upland and New Cranberry Pond is distinctly marked by topography and wetland vegetation, therefore, vegetation and hydrology were the primary criteria used to delineate this wetland boundary.

#### 2.1 SA 41 Basin

Vegetation within the basin includes several hydrophytic species, as well as some transitional upland species. Within the wooded overstory, red maple (*Acer rubrum*) and swamp white oak (*Quercus bicolor*) are present. The sparse shrub layer consists of several saplings of the tree species listed above, as well as steeplebush (*Spirea tomentosa*), red oak (*Quercus rubra*), and northern arrowwood (*Viburnum recognitum*). Herbaceous growth is sparse, but is dominated by various sedges (*Carex lurida, Carex stricta*) with other species bordering the edge of the depression including spotted Joe-Pye weed (*Eupatorium maculatum*), black cherry (*Prunus serotina*), quaking aspen (*Populus tremuloides*), and royal fern (*Osmunda regalis*).

Water-stained leaves were observed in the SA 41 basin, indicating the presence of wetland hydrology. Although no standing water was present during the field visit, it is possible that during the spring and early summer, this basin may provide vernal pool habitat. No other signs of wetlands hydrology were observed at SA 41.

Hydric soils were identified in the lowest area of the depression under 1 to 2 inches of stained leaf litter. The top three inches were a poorly-drained dark brown sandy silty loam overlying well-drained medium sand with numerous iron depletions (gleyed) and concretions down to at least 22 inches. The presence of mottles indicates that the water table is fluctuating at or near the surface during a significant portion of the year.

The SA 41 basin meets all three criteria for classification as a federally jurisdictional wetland: vegetation is dominated by >50% hydrophytes, hydric soils are present, and signs of wetland hydrology are present.

Since the SA 41 basin does not border a creek, river, stream, pond, or lake, it is not classified as a state-jurisdictional Bordering Vegetated Wetland (BVW). However, under the Massachusetts wetland regulations, the basin area at SA 41 may be defined as an "Isolated Land Subject to Flooding" (ILSF). The definition of ILSF under 310 CMR 10.57 (2)(b) is as follows:

"An Isolated Land Subject to Flooding is an isolated depression or closed basin without an inlet or an outlet. It is an area which at least once a year confines standing water to a volume of at least 1/4 acre-feet and to an average depth of at least six (6) inches."

This definition of ILSF is dependent on an estimate of the volume of water the depression can hold, as determined by engineering calculations. Therefore, ABB-ES ecologists did not determine whether or not state jurisdictional wetlands are present at SA 41 (i.e., whether or not the site contains ILSF).

A transect was established perpendicular to the SA 41 wetland boundary, and data regarding the hydrology, soils, and vegetation in the upland area and the bottom of the basin were recorded on U.S. Army Corps of Engineer (USACE) data forms. The wetland at SA 41 was delineated with orange surveyor's flagging labeled "A1" to "A6".

#### 2.2 New Cranberry Pond Border

The wetland boundary between upland and New Cranberry Pond is well-defined by topography and vegetation. A joint federal/state wetland delineation line was established at this portion of the site. The boundary was marked using pink surveyor's flagging labeled "B1" to "B8 end".

Various wetland plant species used to demarcate the wetland boundary include tussock sedge (*Carex stricta*), knotweed/smartweed (*Polygonum spp.*), blue-joint (*Calamagrostis canadensis*), silky dogwood (*Cornus amomum*), tall meadow rue (*Thalictrum polygamum*), sedges (*Carex spp., Carex lurida*), speckled alder (*Alnus rugosa*), reed canary grass (*Phalaris arundinacea*), northern arrowwood, marsh St. Johnswort (*Hypericum virginicum*), soft rush (*Juncus effusus*), common winterberry (*Ilex verticillata*), honeysuckle (*Lonicera sp.*), sensitive fern (*Onoclea sensibilis*), yellow loosestrife (*Lysimachia terrestris*), and fowl meadow grass (*Glyceria spp.*).

Upland species also used to define the wetland boundary include timothy grass (*Phleum pratense*), bush clover (*Lespedeza capitata*), daisy fleabane (*Erigeron annuus*), yellow clover (*Trifolium agrarium*), big tooth aspen (*Populus grandidentata*), honeysuckle, black oak (*Quercus velutina*), white pine (*Pinus strobus*), European buckthorn (*Rhamnus frangula*), quaking aspen, goldenrod (*Solidago spp.*), grey birch (*Betula populifolia*), black cherry, bristly dewberry (*Rubus hispidus*), tartarian honeysuckle (*Lonicera tartarica*), and common buckthorn (*Rhamnus cathartica*).


### 3.0 Summary

The SA 41 basin is classified as a federal jurisdictional wetland, although the hydrologic indicators were weak. Although SA 41 is not a BVW, it is a well defined basin and may qualify as a state jurisdictional ILSF. The boundary delineated by wetland flags A1 through A6 represents the federal wetland boundary at SA 41.

The area along New Cranberry Pond classifies as both a federal and state jurisdictional wetland, and is delineated by wetland flags B1 through B8 end.

With the exception of ILSF, the Massachusetts Wetlands Protection Act provides a 100-foot buffer zone outside of the above-described wetland resource areas. Any activity within the 100-foot buffer zone must not destroy or impair any of these protected wetlands. In addition, land at SA 41 within the 100-year floodplain elevation is considered to be Bordering Land Subject to Flooding under the Massachusetts Wetlands Act. This resource area does not have a 100-foot buffer zone, but is also subject to protection.

Please don't hesitate to contact either of us if you have questions regarding wetlands at the landfill site. We would appreciate the opportunity to review the site plan.







# ABB Environmental Services, Inc.

511 Congress Street/P.O. Box 7050 Portland, Maine 04112 (207) 775-5401

## MEMORANDUM

PROJECT NO.: <u>8712-04</u> DATE: January 14, 1997
CLIENT: U.S. Army Corps of Engineers
PROJECT DESCRIPTION: Ft. Devens - Landfill Remediation - Area of Contamination 41
TO: Mark Stelmack
FROM: Mark Peters
SUBJECT: "Isolated Land Subject To Flooding" Calculations for AOC 41 Depression

Attached are stormwater calculations to determine if the depression located at Area of Contamination 41 meets the definition of an "Isolated Land Subject to Flooding" (ILSF). The definition of an ILSF under 310 CMR 10.57 (2)(b) is as follows:

"An Isolated Land Subject to Flooding is an isolated depression or closed basin without an inlet or outlet. It is an area which at least once a year confines standing water to a volume of at least 1/4 acre-feet and to an average depth of at least six (6) inches."

The calculations were conducted using HydroCAD, a computer software program which utilizes TR-55 and TR-20 methods developed by the U.S. Soil Conservation Service. The volume and depth of standing water in the depression at AOC 41 were calculated for a 1-year, 24-hour storm event (2.6 inches of rain). From well boring logs, a Hydrologic Soil Group between A and B was used to determine the runoff curve number (CN) of 55 with wooded cover for the contributing drainage area. A CN of 98 (nearly impervious) was used for the identified wetland area located in the depression.

Based on the calculations, the depression at AOC 41 does not meet the definition of an ILSF. The total volume of water ponded during a 1-year, 24-hour storm event is only 0.01 acre-feet, which is less than the 0.25 acre-feet requirement in the regulations. In addition, the total depression storage volume (defined as the elevation at which the depression would overflow, which is elevation 226) is only 0.08 acre-feet. Although the peak depth of ponded water for this storm event is 0.7 feet, the average depth of water over the entire depression is only 1.4 inches, which is less than the 6-inch depth requirement in the regulations.

ata for FT DEVENS - AOC 41	Page 1
TYPE III 24-HOUR RAINFALL= 2.6 IN	<u> </u>
vdroCAD 4.52 000677 (c) 1986-1996 Applied Microcomputer Systems	14 Jan 97
ATERSHED ROUTING ====================================	
( ) CONTEIRUTING DROID	Jage Area
To DEPRESSION Loca	TED AT AOC 41
$\downarrow$	
$\tilde{\wedge}$	
1 DEPRESSION VOLUM	n E
(pond)	
	-

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Data for FT DEVENS - AOC 41	Page 2
TYPE III 24-HOUR RAINFALL= 2.6 IN	
Prepared by Applied Microcomputer Systems	14 Jan 97
HydroCAD 4.52 000677 (c) 1986-1996 Applied Microcomputer Systems	

RUNOFF BY SCS TR-20 METHOD: TYPE III 24-HOUR RAINFALL= 2.6 IN, SCS U.H.

# RUNOFF SPAN = 5-20 HRS, dt= .10 HRS, 151 POINTS

SUBCAT	AREA	Тс		WGT ' D		PEAK	Tpeak	VOL
NUMBER	(ACRE)	(MIN)	GROUND COVERS (&CN)	- <u>CN</u>	<u> </u>	(CFS)	<u>(HRS)</u>	<u>(AF)</u>
1	.43	8.6	9898 91855	59	-	.03	12.35	.01
			GROUP (HE	(Fair ci ig) of 1	over A to B	апо Ну 3.	1020041C	Soil
			L WETLAND DREA	(2日,2	<b>rs</b> o)	- Assun	ngo near	> Impserious

Data	for FT D	EVENS - J	AOC 41	NTFAT.T 2	6 TN					Page 3
Prepa	red by A	nlied M:	icrocomp	uter Syst	iems					14 Jan 97
Hydro	CAD 4.52	000677	(c) 19	<u>86-1996</u>	Applied	Micro	computer	Syste	ms	
		1	POND ROU	TING BY S	STOR-IN	D METH	סמ			
POND	START	FLOOD	PEAK	PEAK		- PEAK	FLOW		001	ut
NO.	ELEV.	ELEV.	ELEV.	STORAGE	Qin	Qout	Qpri	Qsec	ATTEN	. LAG
	(FT)	(FT)	(FT)	(AF)	(CFS)	(CFS)	(CFS)	(CFS)	(%)	(MIN)
1	223.8	226.0	224.5	.01	.03	0.00			100	458.8
			1	t	Prak	STORAGE	Vocume	, FOR	A 1-	YEAR, 24-HOUR
					STORM	. Even	r is L	< 0.	25 A	CRE-FELT (AF)
			L F	eok Dep	74 OP	STONO	ing w	ster 1	5 229	.5 - 223.8 = 0.7
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								(	monro	over Flow

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$$\frac{(43565 \text{ Acec} \times 0.01)}{3790 \text{ SF} (\text{sge page 5})} = 0.115 - 1.4''$$

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Data for FT DEVENS - AOC 41Page 4TYPE III 24-HOUR RAINFALL= 2.6 INPrepared by Applied Microcomputer SystemsPrepared by Applied Microcomputer Systems14 Jan 97HydroCAD 4.52 000677 (c) 1986-1996 Applied Microcomputer Systems14 Jan 97

# SUBCATCHMENT 1 AOC 41 DEPRESSION

PEAK= .03 CFS @ 12.35 HRS, VOLUME= .01 AF

ACRES	CN		
.04	98	WETLAND DEPRESSION	TYPE III 24 HOTE
.39	55	WOODS (FAIR - HSG A/B)	PATNERII - 2 6 TN
.43	59	,- <b>,-</b> ,	SPAN= 5-20 HRS, dt=.1 HRS

Method Comment	<b>-</b> / / .
TR-55 SHEET FLOW Segment ID: Woods: Light underbrush n= 4 L-55 D2 2 3	TC (min)
SHALLOW CONCENTRATED/UPLAND FLOW Segment ID: Unpaved Kv=16.1345 L=50' s=.24 '/' V=7.	. in s=.07 '/' : b .1 .9 fps
SHALLOW CONCENTRATED/UPLAND FLOW Segment ID: Unpaved Kv=16.1345 L=75' s=.07 '/' V=4.	c .3 27 fps
Total Lengt	h= 180 ft Total Tc= 8.6

Data for FT DEVENS - AOC 41 Page 5 TYPE III 24-HOUR RAINFALL= 2.6 IN Prepared by Applied Microcomputer Systems 14 Jan 97 HydroCAD 4.52 000677 (c) 1986-1996 Applied Microcomputer Systems

.01 AF Qin = .03 CFS @ 12.35 HRS, VOLUME= Qout= 0.00 CFS @ 20.00 HRS, VOLUME= 0.00 AF, ATTEN=100%, LAG= 458.8 MIN

ELEVATION	AREA	INC.STOR	CUM.STOR	STOR-IND METHOD
(FT)	(SF)	(CF)	(CF)	PEAK STORAGE = 233 CF
223.8	0	0	0	PEAK ELEVATION= 224.5 FT
224.0	90	9	9	FLOOD ELEVATION= 226.0 FT
224.5	705	199	208	START ELEVATION= 223.8 FT
225.0	1695	600	808	SPAN= 5-20 HRS, dt=.1 HRS
225.5	2565	1065	1873	Tdet= 289.8 MIN (0 AF)
<b></b> 226.0	3790	1589	3462 🛥	- DEPRESSION OVERFLOW ELEKOTION

#	ROUTE	INVERT	OUTLET DEVICES	
1	P	223.8'	EXFILTRATION	
			V= 1.E-6 FPM over SURFACE AREA	

POND 1 TOTAL DISCHARGE (CFS) VE ELEVATION

FEET	0,0	.1	.2	. 3	.4	.5	.6	.7	. 8	.9
223.8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
224.8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
225.8	0.00	0.00	0.00							





# COSTS AND MATERIALS USAGE

ABB Environmental Services, Inc.

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W007959APP.B

8712-04

PROJECT:	JOB #		8712-04							
LOCATION:	ALTERNATIVE 2: NO FURTHER ACTION AT SA LIMITED REMOVAL AT AOC 11; CAP-IN-PLACE AOC 9, 40 DEVENS, MASSACHUSETTS	LIMITED REMOVAL AT AOC 11; DATE CAP-IN-PLACE AOC 9, 40 EVENS, MASSACHUSETTS BB ENVIRONMENTAL SERVICES INC								
ENGINEER:	ABB ENVIRONMENTAL SERVICES, INC.									
ESTIMATOR:	P. R. MARTIN									
	COST SUMMARY TABLE				= -					
	DESCRIPTION	QTY	UNIT	UNIT COST		TOTAL				
DIRECT COS	 TS			,*********************						
NO FURTH	IER ACTION									
	SA 6			\$		0				
	SA 12					0				
	SA 13					0				
						U				
						44.000				
CAP IN PL	ACE									
	AOC 9					3,301,000				
	AOC 40					1,758,000				
	TOTAL DIRECT COSTS				\$	5,103,000				
INDIRECT CO	DSTS			F 000		255 000				
				5.00%	Ş	255,000				
	LEGAL, ADMIN, PERIVITTING			10.00%		510 000				
	SERVICES DURING CONSTRUCTION			10.00%		510,000				
	TOTAL INDIRECT COSTS				\$	1,530,000				
	TOTAL CAPITAL (DIRECT + INDIRECT) COST				Ş	6,633,000				
UPERATING										
TOTAL AN	NNUAL O&M COSTS FOR AOC 11 - 2 YEARS				\$	4,000				
TOTAL AN	NNUAL O&M COSTS FOR AOC 9 AND 40 - 30 YEA	RS				72,000				
TOTAL A	DDITIONAL ANNUAL O&M COSTS FOR AOC 40 - 5	YEARS				13,000				
	TOTAL PRESENT WORTH OF OPERATING AND M	AINTENANCE CO	OSTS		\$	953,000				

 TOTAL COSTS
 \$ 7,586,000

Page 1

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PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY ALTERNATIVE 2: NO FURTHER ACTION AT SA 6, 12, 13, AND AOC 41	JOB #	8712-04
	LIMITED REMOVAL AT AOC 11; CAP-IN-PLACE AOC 9, 40	DATE	24-Jan-97
LOCATION:	DEVENS, MASSACHUSETTS		
ENGINEER:	ABB ENVIRONMENTAL SERVICES, INC.		

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	======================================	======	= = =	=======	= = =	
	DESCRIPTION	QTY	UNIT	UNIT COST	т	OTAL
SA 6					\$	0
SA 12						0
SA 13						0
AOC 41						0

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PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY	JOB #	8712-04
	ALTERNATIVE 2: NO FURTHER ACTION AT SA 6, 12, 13, AND AOC 41;		
	LIMITED REMOVAL AT AOC 11;	DATE	24-Jan-97
	CAP-IN-PLACE AOC 9, 40		
LOCATION:	DEVENS, MASSACHUSETTS		
ENGINEER:	ABB ENVIRONMENTAL SERVICES, INC.		

LIMITED REMOVAL AT AOC 11, DISPOSAL AT AOC 9		;		= = :	
DESCRIPTION	ΩΤΥ	UNIT	UNIT COST	-	TOTAL
MOB/DEMOB - IN or OUT					
DUMP TRUCKS	4	EA	385.00	\$	1,540
BACKHOE	2	EA	730.00		1,460
ROLLER	2	EA	785.00		1,570
TOILET - 1 EA	1	WK	25.00		25
WATER COOLER - 1 EA	1	WK	25.00		25
WATER	5	DAY	15.00		75
PICK-UP (2 EA)	0.5	MON	1000.00		500
FOREMEN	50	MNHR	55.00		2,750
					-
EXCAVATION OF DEBRIS -	5	DAY	1460.00		7,300
BACKHOE & OPERATOR					-
	10	DAY	770.00		7,700
LANDINE - DOWN MOOK & DRIVER - 2 EA					-
					-
					-
					-
					-
					-
					-
					-
					-
					-
					-
					-
					-
					-
				 &	22 045

PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY	JOB #	8712-04
	ALTERNATIVE 2: NO FURTHER ACTION AT SA 6, 12, 13, AND AOC 41;		
	LIMITED REMOVAL AT AOC 11;	DATE	24-Jan-97
	CAP-IN-PLACE AOC 9, 40		
LOCATION:	DEVENS, MASSACHUSETTS		
ENGINEER:	ABB ENVIRONMENTAL SERVICES, INC.		

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LIMITED REMOVAL AT AOC 11, DISPOSAL AT AOC 9				= =	=====
DESCRIPTION	ΩΤΥ	UNIT	UNIT COST		TOTAL
TOTAL PREVIOUS PAGE				\$	22,945
BACKFILL PURCHASED FROM OFF-SITE (INCLUDING 30% SWELL FACTOR) SITE RESTORATION	625	CY	10.00		6,250 - - -
BACKFILL, GRADE, COMPACT FERTILIZE, SEED, MULCH	2 5000	DAY SY	1570.00 0.50		3,140 2,500 - -
UNDEVELOPED DESIGN DETAILS ~25%					9,165
TOTAL AOC 11				\$	44,000

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PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY	JOB #	8712-04
	ALTERNATIVE 2: NO FURTHER ACTION AT SA 6, 12, 13, AND AOC 41;		
	LIMITED REMOVAL AT AOC 11;	DATE	24-Jan-97
	CAP-IN-PLACE AOC 9, 40		
LOCATION:	DEVENS, MASSACHUSETTS		
ENGINEER:	ABB ENVIRONMENTAL SERVICES, INC.		

	======	= = =	* = = = = = = =	= =	
MOB/DEMOB			UNIT		
DESCRIPTION	QTY	UNIT	COST		TOTAL
MOB/DEMOB EQUIPMENT (IN OR OUT)		**********	·		
FRONT END LOADER (2 EA)	4	EA	410.00	\$	1,640
DUMP TRUCK (5 EA)	10	EA	385.00		3,850
BACK HOE	2	EA	730.00		1,460
DOZER (5 EA)	10	EA	880.00		8,800
ROLLER (5 EA)	10	EA	785.00		7,850
					-
					-
OFFICE TRAILER	5	MON	150.00		750
STORAGE TRAILER	5	MON	100.00		500
SET UP TRAILER	2	EA	500.00		1,000
					-
TOILET - 2 EA	44	WΚ	25.00		1,100
WATER COOLER - 2 EA	44	WΚ	25.00		1,100
WATER	220	DAY	15.00		3,300
TELEPHONE SERVICE	5	MON	<b>500.0</b> 0		2,500
ELECTRICITY	5	MON	250.00		1,250
PICK-UP (2 EA)	10	MON	1000.00		10,000
PUMPS, TOOLS, MINOR EQUIPMENT	5	MON	500.00		2,500
SITE SUPERINTENDANT ( 5 MON * 210 HR/MON)	1050	MNHR	65.00		68,250
FOREMEN (5 MON * 210 HR/MON)	1050	MNHR	55.00		57,750
CLERK/TYPIST (5 MON * 168 HR/MON)	840	MNHR	25.00		21,000

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\$ 194,600

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TOTAL MOB/DEMOB

PROJECT: LANDFILL REMEDIATION FEASIBILITY STUDY			JOB #		8712-04	
ALTERNATIVE 2: NO FURTHER ACTION AT SA 6, 12, 13, AND AOC 41; LIMITED REMOVAL AT AOC 11; DATE CAP-IN-PLACE AOC 9, 40 LOCATION: DEVENS, MASSACHUSETTS ENGINEER: ABB ENVIRONMENTAL SERVICES, INC.				24-Jan-97		
ESTIMATOR	: P. R. MARTIN					
			=== :		-	
SITE P	REPARATION, DEBRIS EXCAVATION, & CAP CONSTRU DESCRIPTION	CTION QTY	UNIT	UNIT COST		TOTAL
	SITE PREPARATION					
ACCESS RO	AD - 500 LF x 20' WIDE					
GRADE R	OAD BED - DOZER & OPERATOR	1	DAY	1760.00	\$	1,760
GRAVEL -	12" THICK	400	CY	10.00		4,000
SPREAD 8	COMPACT - ROLLER & OPERATOR	0.5	DAY	1570.00		785
GEOFABR		1100	SY	1.00		1,100
CLEAR TREE	S FROM SITE	3	AC	6900.00		20,700
ERUSION CO		700	LF	5.00		3,500
		10		1760.00		17 600
	OPERATOR	80	HR	33.50		2 680
LADONEN		00	•••	00.00		
	TOTAL SITE PREPARATION				\$	52,125
EX	(CAVATE DEBRIS AREA I. II. III. & IV & PLACE IN AREA	v				
BACKHOE &	OPERATOR	30	DAY	1460.00	\$	43,800
LABORER		240	HR	33.50		8,040
DUMP TRUC	K & DRIVER - 3 EA	90	DAY	770.00		69,300
DOZER & OP	PERATOR	30	DAY	1760.00		52,800
LABORER		240	HR	33.50		8,040
	TOTAL EXCAVATE DEBRIS				\$	181,980
	CAP CONSTRUCTION					
SUBGRADE S	SOIL	50800	CY	10.00	\$	508,000
TEXTURED O	GEOMEMBRANE	371000	SF	0.80		296,800
DRAINAGE S		18200	CY SE	17.00		309,400
GEUTEXTILE		371000	or CV	10.10		282 000
		9500	CY	14.00		133.000
SPREAD & C	OMPACT - ROLLER & OPERATOR	132	DAY	1570.00		207,240
					 \$	1.773.540
					-	, <b>,.</b>
	NOTE: SOIL CAP MATERIAL QUANTITIES INCLUDE A	30% SWELL F	ACTOR.			
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						-

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PROJECT: LANDFILL REMEDIATION FEASIBILITY STUDY			JOB #	8712-04	
	LIMITED REMOVAL AT AOC 11;	6, 12, 13, AND AC	JC 41;	DATE	24-Jan-97
	DEVENS MASSACHUSETTS				
ENGINEER:	ABB ENVIRONMENTAL SERVICES INC				
endinteen.					
ESTIMATOR	: P. R. MARTIN				
SITE RESTOR		CONTROLS		UNIT	
SHE RESTO		OTY	UNIT	COST	TOTAL
		····			 
	SITE RESTORATION				
DEBRIS A	REA I - IV FILL MATERIAL	25250	CY	10.00	\$ 252,500
DEBRIS A	REA I - IV VEGETATIVE SOIL	2700	CY	14.00	37,800
CHAIN LI	NK FENCE	2500	LF	13.00	32,500
12' SWIN	G GATE	2	EA	800.00	1,600
FERTILIZE	E, SEED, MULCH	62000	SY	0.50	31,000
SPREAD &	& COMPACT - ROLLER & OPERATOR	35	DAY	1570.00	54,950
	TOTAL SITE RESTORATION				\$ 410,350
MONITORIN	g wells - 4" dia x 30' deep	4	EA	4500.00	\$ 18,000
	NAL CONTROLS	1	LS	10000.00	\$ 10,000

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PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY	JOB #	8712-04
	ALTERNATIVE 2: NO FURTHER ACTION AT SA 6, 12, 13, AND AOC 41;	DATE	24. lan-97
	CAP-IN-PLACE AOC 9, 40	DATE	24-Jan-51
LOCATION:	DEVENS, MASSACHUSETTS		
ENGINEER:	ABB ENVIRONMENTAL SERVICES, INC.		

CAP IN PLACE AOC 9		= = =	= = = = = = = = =	_ ~
DESCRIPTION	ΩΤΥ	UNIT	COST	TOTAL
TOTAL MOB/DEMOB				\$ 194,600
TOTAL SITE PREPARATION				52,125
TOTAL DEBRIS EXCAVATION				181,980
TOTAL CAP CONSTRUCTION				1,773,540
TOTAL SITE RESTORATION				410,350
TOTAL MONITORING WELLS				18,000
TOTAL INSTITUTIONAL CONTROLS				10,000
UNDEVELOPED DESIGN DETAILS ~25%				660,405
TOTAL AOC 9				\$ 3,301,000



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PROJECT: LANDFILL REMEDIATION FEASIBILITY STUDY			JOB #	8712-04
ALTERNATIVE 2: NO FURTHER ACTION AT SA 6, 1 LIMITED REMOVAL AT AOC 11;	2, 13, AND AC	DC 41;	DATE	24-Jan-97
LOCATION: DEVENS, MASSACHUSETTS ENGINEER: ABB ENVIRONMENTAL SERVICES, INC.				
ESTIMATOR: P. R. MARTIN				
		=== :		
SITE PREPARATION AND MOBILIZATION DESCRIPTION	ΩΤΥ	UNIT	UNIT COST	TOTAL
ACCESS ROAD SEDIMENT AREA 1				
CLEAR & GRUB LIGHT VEGETATION	0.1	AC	4300.00	\$ 430
GRADE- DOZER & OPERATOR	0.25	DAY	1760.00	440
GRAVEL - 12" THICK	360	CY	10.00	3,600
FILTER FABRIC	550	SY	1.00	550
SPREAD & COMPACT ACCESS ROAD SEDMENT AREA 2	0.5	DAY	1570.00	765
	0 1	<u>۸</u> ۲	4300.00	430
GBADE- DOZER & OPERATOR	0.25	DAY	1760.00	440
GRAVEL - 24" THICK	340	CY	10.00	3,400
SPREAD & COMPACT	0.5	DAY	1570.00	785
FILTER FABRIC	550	SY	1.00	550
ACCESS ROAD FOR CAPPING - 500 LF				-
CLEAR & GRUB LIGHT VEGETATION	0.35	AC	4300.00	1,505
GRADE- DOZER & OPERATOR	0.5	DAY	1760.00	880
GRAVEL - 24" THICK	1450	CY	10.00	14,500
FILTER FABRIC	2000	SY	1.00	2,000
SPREAD & COMPACT	2	DAY	1570.00	3,140
PARKING AREA	0.05		4200.00	1 075
	0.25		4300.00	1,075
GRADE- DOZER & OPERATOR	0.5	DAT	1760.00	880
SEDIMENT DEWATERING PAD				-
CLEAR & GRUB LIGHT VEGETATION	0.25	AC	4300.00	1,075
GRADE- DOZER & OPERATOR	0.5	DAY	1760.00	880
GRAVEL - 12" THICK	400	CY	10.00	4,000
SPREAD & COMPACT	0.5	DAY	1570.00	785
LINER	10000	SF	0.60	6,000
SUMP & SUMP PUMP	1	LS	2500.00	2,500
DECON AREA - 10'x20'	3	EA	1000.00	3,000
				-
				-
				· -
				-
CAP ΜΑΤΕΡΙΑΙ S STOCKPI Ε ΔΡΕΔ				-
CLEAR & GRUB LIGHT VEGETATION	1	AC	4300.00	4,300
GRADE- DOZER & OPERATOR	2	DAY	1760.00	3,520
 T	OTAL THIS PA	GE		\$ 61,450

PROJECT: LOCATION: ENGINEER:	LANDFILL REMEDIATION FEASIBILITY STUDY ALTERNATIVE 2: NO FURTHER ACTION AT SA & LIMITED REMOVAL AT AOC 11; CAP-IN-PLACE AOC 9, 40 DEVENS, MASSACHUSETTS ABB ENVIRONMENTAL SERVICES, INC.	6, 12, 13, AND A	OC 41;	JOB # DATE		8712-04 24-Jan-97
ESTIMATOR:	P. R. MARTIN					
				= = = = = = = = = = = = = = = = = = =	# #	
	DESCRIPTION	QTY	UNIT	COST		TOTAL
SITE PREPAR	RATION		*********		\$	61,450
MOBILIZATIO	DN /IENT (IN OR OUT)					
FRONT EN	ID LOADER	2	EA	410.00		820
DUMP TR	UCK	6	EA	385.00		2,310
BACKHOE		2	EA	730.00		1,460
DOZER		2	EA	880.00		1,760
CRANE &	CLAMSHELL BUCKET	2	EA	640.00		1,280
ROLLER		2	EA	785.00		1,570
FRAC TAN	NK	4	EA	250.00		1,000
DEWATER	RING PUMP & HOSE	2	EA	100.00		200
	LER	4	MON	150.00		600
STOBAGE TE	SAILER	4	MON	150.00		600
TRAILER DEL	IVERY SET-UP REMOVAL	2	EA	300.00		600
TOILET - 2 E	Α	36	WK	25.00		900
WATER COO	DLER - 2 EA	36	WK	25.00		900
WATER		180	DAY	15.00		2,700
TELEPHONE	SERVICE	4	MON	500.00		2,000
ELECTRICITY	,	4	MON	250.00		1,000
PICK-UP (2 E	A)	8	MON	1000.00		8,000
OFFICE EQUI	PMENT	4	MON	1000.00		4,000
PUMPS, TOO	DLS, MINOR EQUIPMENT	1	LS	2500.00		2,500
LABORER (2	MEN*10 DAY/MAN*8 HB/DAY)	160	MNHR	33.50		- 5,360
CARPENTER	(2 MEN*10 DAY/MAN*8 HR/DAY)	160	MNHR	48.00		7,680
ELECTRICIAN	V (2 MEN*10 DAY/MAN*8 HR/DAY)	160	MNHR	50.50		8,080
	NTENDANT (4 MON*210HB/MON)	840	MNHR	65.00		54,600
FOREMAN //	MON*210HB/MON	840	MNHR	55.00		46,200
CI FRK /TVPIS	ST (4 MON*168HB/MON)	672	MNHR	25.00		16,800
GEERING FILLIG			-			-
						-
						-
						-

# TOTAL SITE PREPARATION AND MOBILIZATION

\$ 234,370

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PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY	JOB #	8712-04
	ALTERNATIVE 2: NO FURTHER ACTION AT SA 6, 12, 13, AND AOC 41;		
	LIMITED REMOVAL AT AOC 11;	DATE	24-Jan-97
	CAP-IN-PLACE AOC 9, 40		
LOCATION:	DEVENS, MASSACHUSETTS		
ENGINEER:	ABB ENVIRONMENTAL SERVICES, INC.		

CAP IN PLACE AOC 40 SEDIMENT REMOVAL AND DISPOSAL		= = =	UNIT	
DESCRIPTION	YTC	UNIT	COST	 TOTAL
CONSTRUCT SILT BARRIER AROUND CONTAMINATED AREAS	400	LF	25.00	\$ 10,000
EXCAVATE WITH CLAMSHELL 1200 CY SEDIMENTS + 1600 CY ACCESS ROADS/WORK PLATFORM	28 IS	DAY	1280.00	- 35,840 -
HAUL SEDIMENTS TO DEWATERING PAD (2 EA DUMP TRUCK & DRIVER)	56	DAY	770.00	43,120 -
LOAD DRY SEDIMENTS FOR TRANSPORTATION TO DISPOSAL AREA (FRONT END LOADER & OPERATOR)	14	DAY	825.00	11,550 - -
LABORERS - 2 EA FOR 35 DAYS	560	MNHR	33.50	- 18,760
TCLP TESTING	2	SMPL	1400.00	- 2,800
ON-SITE STABILIZATION OF SEDIMENTS WITH SAND	600	CY	15.00	9,000 -
TRANSPORTATION & DISPOSAL AT AOC 9 (3 EA DUMP TRUCK & DRIVER)	42	DAY	770.00	32,340 - -
TREATMENT OF WATER	1	LS	21800.00	- 21,800
PUMP WATER FROM DEWATERING PAD TO POND	28	DAY	50.00	1,400 -
				-
				-
				-
TOTAL SEDIMENT REMOVAL AND DISPOSAL				\$ 186,610

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PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY	JOB #	8712-04
	ALTERNATIVE 2: NO FURTHER ACTION AT SA 6, 12, 13, AND AOC 41;		
	LIMITED REMOVAL AT AOC 11;	DATE	24-Jan-97
	CAP-IN-PLACE AOC 9, 40		
LOCATION:	DEVENS, MASSACHUSETTS		
ENGINEER:	ABB ENVIRONMENTAL SERVICES, INC.		

WETLAND RESTORATION	1.5	A.C.		
		AC	50000.00	\$ 75,000
MONITORING WELLS - 4" DIA x 30' DEEP	2	EA	4500.00	\$ 9,000 -
DRUM REMOVAL AND DISPOSAL				-
BACKHOE & OPERATOR	3	DAY	1460.00	\$ 4,380
LABORER - 2 EA, 3 DAYS	48	MNHR	33.50	1,608
TRANSPORT DRUMS TO AOC 9 DUMP TRUCK & DRIVER	3	DAY	770.00	2,310
TCLP TESTING OF DRUM CONTENTS	2	EA	1400.00	2,800

TOTAL DRUM REMOVAL AND DISPOSAL

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\$ 11,098

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PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY	JOB #	8712-04
	ALTERNATIVE 2: NO FURTHER ACTION AT SA 6, 12, 13, AND AOC 41;		
	LIMITED REMOVAL AT AOC 11;	DATE	24-Jan-97
	CAP-IN-PLACE AOC 9, 40		
LOCATION:	DEVENS, MASSACHUSETTS		
ENGINEER:	ABB ENVIRONMENTAL SERVICES, INC.		

				= =	
CAP CONSTRUCTION, INSTITUTIONAL CONTROLS			UNIT		
DESCRIPTION	QTY	UNIT	COST		TOTAL
CAP CONSTRUCTION					
SILT FENCE ALONG TOE OF LANDFILL	1500	LF	5.00	\$	7,500
CLEAR & GRUB SITE	4.4	AC	6900.00		30,360
LONG STICK EXCAVATOR	5	DAY	1750.00		8,750
GRADE SITE - DOZER & OPERATOR	5	DAY	1760.00		8,800
CUT LANDFILL WASTE WITH DOZER	7	DAY	1760.00		12,320
IMPORTED FILL	2500	CY	10.00		25,000
SPREAD & COMPACT WASTE & FILL	14	DAY	1570.00		21, <del>9</del> 80
SUBGRADE FILL	7100	CY	10.00		71,000
SPREAD & COMPACT SUBGRADE FILL	9	DAY	1570.00		14,130
TEXTURED GEOMEMBRANE	192000	SF	0.80		153,600
10-3 SAND DRAINAGE LAYER	9250	CY	17.00		157,250
SPREAD & COMPACT DRAINAGE LAYER	13	DAY	1570.00		20,410
GEOTEXTILE FILTER FABRIC	192000	SF	0.10		19,200
MOISTURE RETENTION LAYER	13900	CY	10.00		139,000
SPREAD & COMPACT MOISTURE RETENTION LAYER	18	DAY	1570.00		28,260
VEGETATIVE MATERIAL	4600	CY	14.00		64,400
SPREAD & COMPACT VEGETATIVE LAYER	6	DAY	1570.00		9,420
SEED, FERTILIZE, MULCH	4.4	AC	2000.00		8,800
RIPRAP	2250	CY	30.00		67,500
GUARD RAIL ALONG ROAD	1000	LF	12.50		12,500
TOTAL CAP CONSTRUCTION				\$	880,180

INSTITUTIONAL CONTROLS

1 LS 10000.00 \$ 10,000

NOTE: SOIL CAP MATERIAL QUANTITIES INCLUDE A 30% SWELL FACTOR.

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PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY	JOB #	8712-04
	ALTERNATIVE 2: NO FURTHER ACTION AT SA 6, 12, 13, AND AOC 41;		
	LIMITED REMOVAL AT AOC 11;	DATÉ	24-Jan-97
	CAP-IN-PLACE AOC 9, 40		-
LOCATION:	DEVENS, MASSACHUSETTS		
ENGINEER:	ABB ENVIRONMENTAL SERVICES, INC.		

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CAP IN PLACE AOC 40		===		= =	
SUMMARY SHEET DESCRIPTION	ΩΤΥ	UNIT	COST		TOTAL
TOTAL SITE PREPARATION AND MOBILIZATION	********************			\$	234,370
TOTAL SEDIMENT REMOVAL & DISPOSAL					186,610
TOTAL WETLAND RESTORATION					75,000
TOTAL MONITORING WELLS					9,000
TOTAL DRUM REMOVAL & DISPOSAL					11,098
TOTAL CAP CONSTRUCTION					880,180
TOTAL INSTITUTIONAL CONTROLS					10,000
UNDEVELOPED DESIGN DETAILS ~25%					351,742
TOTAL SA 13				\$	1,758,000



PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY	JOB #	8712-04
	LIMITED REMOVAL AT AOC 11; CAP-IN-PLACE AOC 9, 40	DATE	24-Jan-97
LOCATION: ENGINEER:	DEVENS, MASSACHUSETTS ABB ENVIRONMENTAL SERVICES, INC.		

		= = =		
ANNUAL O&M COSTS				
LIMITED REMOVAL AT AOC 11			UNIT	
DESCRIPTION	ΩΤΥ	UNIT	COST	TOTAL
O&M COSTS TWICE PER YEAR FOR TWO YEARS FOR SITE RESTO	ORATION			
DUMP TRUCK & DRIVER	2	DAY	770.00	\$ 1,540
MATERIALS	1	LS	500.00	<b>50</b> 0
LABORER - 2 EA	32	MNHR	33.50	1,072



\$ 4,000

TOTAL ANNUAL O&M COSTS

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PROJECT:LANDFILL REMEDIATION FEASIBILITY STUDY ALTERNATIVE 2: NO FURTHER ACTION AT SA 6, 12, 13, AND AOC 41; LIMITED REMOVAL AT AOC 11; CAP-IN-PLACE AOC 9, 40LOCATION:DEVENS, MASSACHUSETTS ENGINEER:ENGINEER:ABB ENVIRONMENTAL SERVICES, INC.ESTIMATOR:P. R. MARTIN					8712-04 24-Jan-97
	ANNUAL O&M COSTS AOC 9 CAP IN PLACE DESCRIPTION		UNIT	= = = = = = = = UNIT COST	= = = = = = = = TOTAL
LANDFILL CC GENER/ DUM FROI LAB( MAT	OVER MAINTENANCE AL REPAIR 1P TRUCK & DRIVER NT END LOADER & OPER ORER - 2 EA TERIALS	2 2 32 1	DAY DAY MNHR LS	770.00 825.00 33.50 1000.00	\$
	TION - 1 DAY @ 2 MEN/DAY	16	MNHR	75.00	- 1,200 - 2,500
ENVIRONMEI GROUNDV 4 WELL SAM	NTAL MONITORING WATER SAMPLE COLLECTION LS, SEMI-ANNUALLY (INCLUDES WELL PURGE, IPLE COLLECTION, AND SHIPPING)	2	LS	1800.00	3,600
GROUNDV 4 SAMI EQUI INOF	WATER SAMPLE ANALYSIS PLES PLUS 2 SAMPLE QA/QC IVALENT SEMI-ANNUALLY, SVOCs, RGANICS, WATER QUALITY PARAMETERS	12	SMPL	900.00	10,800
FIVE YEAR E PUBLIC	DUCATIONAL PROGRAM MEETING - ANNUALIZED	0.1739	LS	5000.00	869
TWO YEAR D MADEP	DATA REPORT TO - ANNUALIZED	0.4831	LS	1000.00	483
FIVE YEAF	R SITE REVIEW - ANNUALIZED	0.1739	LS	15000.00	2,608

TOTAL ANNUAL O&M COSTS

\$ 27,323

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PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY	JOB #	8712-04
	ALTERNATIVE 2: NO FURTHER ACTION AT SA 6, 12, 13, AND AOC 41;		
	LIMITED REMOVAL AT AOC 11;	DATE	24-Jan-97
	CAP-IN-PLACE AOC 9, 40		
LOCATION:	DEVENS, MASSACHUSETTS		
ENGINEER:	ABB ENVIRONMENTAL SERVICES, INC.		

ANNUAL O&M COSTS AOC 40 CAP IN PLACE DESCRIPTION		=	UNIT COST	_ =	= = = = = = = = TOTAL
0&M COSTS OCCUBING OVER FIVE YEARS					
WETLANDS RESTORATION MONITORING (5 YEARS)					
1 DAY @ 2 MEN/DAY, SEMI-ANNUALLY	32	MNHR	75.00	\$	2,400
BIOMONITORING, BIENNIALLY					-
FOR 5 YEARS	0.4831	LS	15000.00		7,246
FIVE YEAR SITE REVIEW - ANNUALIZED					-
	0.1739	LS	2500.00		435

TOTAL ANNUAL 0&M COSTS FOR 5 YEAR ACTIVITIES AT AOC 40	\$	10,081
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O&M COSTS OCCURING OVER THIRTY YEARS				
LANDFILL COVER MAINTENANCE				
GENERAL REPAIR				
DUMP TRUCK & DRIVER	1	DAY	770.00	\$ 770
FRONT END LOADER & OPER	1	DAY	825.00	825
LABORER - 2 EA	16	MNHR	33.50	536
MATERIALS	1	LS	500.00	500
				-
INSPECTION - 0.5 DAY @ 2 MEN/DAY	8	MNHR	75.00	600
				-
MOWING - TRACTOR & OPERATOR	1	DAY	500.00	500
	SUBTOTAL THIS	S PAGE		\$ 3.731

PROJECT: LANDFILL REMEDIATION FEASIBILITY STUDY ALTERNATIVE 2: NO FURTHER ACTION AT SA 6, LIMITED REMOVAL AT AOC 11; CAP-IN-PLACE AOC 9, 40 LOCATION: DEVENS, MASSACHUSETTS ENGINEER: ABB ENVIRONMENTAL SERVICES, INC. ESTIMATOR: P. R. MARTIN	8712-04 24-Jan-97			
ANNUAL O&M COSTS AOC 40 CAP IN PLACE DESCRIPTION	QTY	= = = : UNIT	UNIT COST	TOTAL
O&M COSTS OCCURING OVER THIRTY YEARS - TOTAL FROM PREV	VIOUS PAGE			\$ 3,731
ENVIRONMENTAL MONITORING SEDIMENT SAMPLE COLLECTION 4 LOCATIONS, ONCE EVERY 5 YEARS	0.1739	LS	1200.00	209 -
SEDIMENT SAMPLE ANALYSIS, ONCE EVERY 5 YEARS, 4 SAMPLES PLUS 1 QA/QC, SVOCs AND INORGANICS ANNUALIZED	0.8695	SMPL	715.00	622 - - -
GROUNDWATER SAMPLE COLLECTION 7 WELLS, SEMI-ANNUALLY (INCLUDES WELL PURGE, SAMPLE COLLECTION, AND SHIPPING)	2	LS	2700.00	5,400 - -
GROUNDWATER SAMPLE ANALYSIS 7 SAMPLES PLUS 2 SAMPLE QA/QC EQUIVALENT SEMI-ANNUALLY, SVOCs, INORGANICS, WATER QUALITY PARAMETERS	18	SMPL	900.00	16,200
FIVE YEAR EDUCATIONAL PROGRAM PUBLIC MEETING - ANNUALIZED	0.1739	LS	5000.00	869
TWO YEAR DATA REPORT TO MADEP - ANNUALIZED	0.4831	LS	1000.00	- 483 - -
FIVE YEAR SITE REVIEW - ANNUALIZED	0.1739	LS	15000.00	- - 2,608 -
TOTAL ANNUAL O&M COSTS FOR 30 YEAR ACTIVITI	ES			\$ 30,122

	PROJECT: LANDFILL REMEDIATION FEASIBILITY STUDY			JOB #		8712-04	
	LOCATION: ENGINEER:	ALTERNATIVE 2: NO FORTHER ACTION AT SA 6 LIMITED REMOVAL AT AOC 11; CAP-IN-PLACE AOC 9, 40 DEVENS, MASSACHUSETTS ABB ENVIRONMENTAL SERVICES, INC.	, 12, 13, AND A	AUC 41;	DATE		24-Jan-97
	ESTIMATOR:	: P. R. MARTIN					
	=====	ANNUAL CAP IN PLACE 0&M COSTS SUMMARY SHEET DESCRIPTION	= = = = = = = = = = = = = = = = = = =	= = = = UNIT	UNIT COST	= =	= = = = = = TOTAL
	TOTAL AOC	ANNUAL O&M COSTS - FOR 30 YEARS 9				\$	27,323
	TOTAL AOC	40					30,122
ļ		UNDEVELOPED DESIGN DETAILS ~25%					14,555
-		TOTAL ANNUAL O&M COSTS - 30 YEARS				\$	72,000
		ANNUAL O&M COSTS - FOR 5 YEARS					
	TOTAL AOC	40				\$	10,081
		UNDEVELOPED DESIGN DETAILS ~25%					2,919
		TOTAL ANNUAL O&M COSTS - 5 YEARS				\$	13,000

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PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY ALTERNATIVE 3: NO FURTHER ACTION SAS 6, 12, 13, AOC 41:	JOB #	8712-04
LOCATION:	CAP-IN-PLACE AOCs 9, 11, 40 DEVENS, MASSACHUSETTS	DATE	24-Jan-97

ENGINEER: ABB ENVIRONMENTAL SERVICES, INC.

ESTIMATOR: P. R. MARTIN

	COST SUMMARY TABLE					
	DESCRIPTION	ΩΤΥ	UNIT	UNIT COST		TOTAL
DIRECT CO			***			
NO FURTH	ER ACTION					
	SA 6			\$		0
	SA 12					0
	SA 13					0
						0
						3,301,000
	AOC 40					1,269,000
	TOTAL DIRECT COSTS				\$	6,328,000
	COSTS					
1	HEALTH AND SAFETY			5 00%	è	316.000
	LEGAL, ADMIN, PERMITTING			5.00%	Ŷ	316,000
	ENGINEERING			10.00%		633,000
	SERVICES DURING CONSTRUCTION			10.00%		633,000
	TOTAL INDIRECT COSTS				\$	1,898,000
	TOTAL CAPITAL (DIRECT + INDIRECT) COST				\$	8,226,000
OPERATING	G AND MAINTENANCE COSTS					
TOTAL A	NNUAL O&M COSTS FOR AOC 9, 11, 40 - 30 YEARS				\$	99,000
TOTAL A	ADDITIONAL ANNUAL O&M COSTS FOR AOC 40 - 5 YEA	NRS				13,000
	TOTAL PRESENT WORTH OF OPERATING AND MAIN		STS		\$	1,281,000
	TOTAL COSTS				\$	9,507,000

PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY	JOB #	8712-04
LOCATION:	CAP-IN-PLACE AOCs 9, 11, 40 DEVENS, MASSACHUSETTS	DATE	24-Jan-97
ENGINEER:	ABB ENVIRONMENTAL SERVICES, INC.		

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	NO FURTHER ACTION		===		= = =	
	DESCRIPTION	ΩΤΥ	UNIT	UNIT COST	TOTAL	
SA 6					\$	0
SA 12						0
SA 13						0
AOC 41						0

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PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY	JOB #	8712-04
LOCATION:	ALTERNATIVE 3: NO FURTHER ACTION SAs 6, 12, 13, AOC 41; CAP-IN-PLACE AOCs 9, 11, 40 DEVENS, MASSACHUSETTS	DATE	24-Jan-97

ENGINEER: ABB ENVIRONMENTAL SERVICES, INC.

#### ESTIMATOR: P. R. MARTIN

CAP IN PLACE AOC 9		===		 
	ΟΤΥ	LINET	UNIT	τοται
MOB/DEMOB EQUIPMENT (IN OR OUT)				
FRONT END LOADER (2 EA)	4	EA	410.00	\$ 1,640
DUMP TRUCK (5 EA)	10	EA	385.00	3,850
BACK HOE	2	EA	730.00	1,460
DOZER (5 EA)	10	EA	880.00	8,800
ROLLER (5 EA)	10	EA	785.00	7,850
				-
	_			-
OFFICE TRAILER	5	MON	150.00	750
STORAGE TRAILER	5	MON	100.00	500
SET UP TRAILER	2	EA	500.00	1,000
TOILET - 2 FA	44	Wκ	25.00	1.100
WATER COOLER - 2 FA	44	WK	25.00	1,100
WATER	220	DAY	15.00	3,300
TELEPHONE SERVICE	5	MON	500.00	2,500
ELECTRICITY	5	MON	250.00	1,250
PICK-UP (2 EA)	10	MON	1000.00	10,000
	-		500.00	-
PUMPS, TOOLS, MINOR EQUIPMENT	5	MON	500.00	2,500
SITE SUPERINTENDANT ( 5 MON * 210 HR/MON)	1050	MNHR	65.00	68,250
FOREMEN (5 MON * 210 HR/MON)	1050	MNHR	55.00	57,750
CLERK/TYPIST (5 MON * 168 HR/MON)	840	MNHR	25.00	21,000
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TOTAL MOB/DEMOB

\$ 194,600

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PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY			JOB #		8712-04
	ALTERNATIVE 3: NO FURTHER ACTION SAs 6, 12, 13 CAP-IN-PLACE AOCs 9, 11, 40	, AOC 41;		DATE		24-Jan-97
LOCATION:	DEVENS, MASSACHUSETTS					
ENGINEER:	ABB ENVIRONMENTAL SERVICES, INC.					
ESTIMATOR:	P. R. MARTIN					
				= = = = = = = = =	= =	
SITE P	CAP IN PLACE AOC 9 REPARATION DEBRIS EXCAVATION & CAP CONSTRU			UNIT		
017211	DESCRIPTION	QTY	UNIT	COST		TOTAL
	SITE PREPARATION	**********************		# * = = = # # # ho = = = = = = ± = # = = = = = = = = = = =		
ACCESS ROA	AD - 500 LF x 20' WIDE					
GRADE RO	DAD BED - DOZER & OPERATOR	1	DAY	1760.00	\$	1,760
GRAVEL -	12" THICK	400	CY	10.00		4,000
SPREAD 8	COMPACT - ROLLER & OPERATOR	0.5	DAY	1570.00		785
GEOFABR	IC	1100	SY	1.00		1,100
CLEAR TREE	S FROM SITE	3	AC	6900.00		20,700
ROSION CO		700	LF	5.00		3,500
	DRAINAGE SWALE CONSTRUCTION	10		1760.00		17 600
	OPERATOR	10		1760.00		2 690
LABORER		80	пк	33.50		2,000
	TOTAL SITE PREPARATION				\$	52,125
EX	CAVATE DEBRIS AREA I, II, III, & IV & PLACE IN AREA	V	DAV	1460.00	~	12 000
BACKHOE &	OPERATOR	30	DAY	1460.00	Ş	43,800
ABORER		240		33.50		6,040
		90		1760.00		52 800
	ERATOR	30		33.50		52,800 8 040
ABURER		240	пn	55.50		-
	TOTAL EXCAVATE DEBRIS				\$	<b>1</b> 81, <b>9</b> 80
	CAP CONSTRUCTION					
UBGRADE S	SOIL	50800	CY	10.00	\$	508,000
EXTURED G	GEOMEMBRANE	371000	SF	0.80		296,800
RAINAGE S	OIL	18200	CY	17.00		309,400
EOTEXTILE	FABRIC	371000	SF	0.10		37,100
IOISTURE R	ETENTION SOIL	28200	CY	10.00		282,000
/EGETATIVE	SOIL	9500	CY	14.00		133,000
SPREAD & C	OMPACT - ROLLER & OPERATOR	132	DAY	1570.00		207,240
	TOTAL CAP CONSTRUCTION				\$	1,773,540
	NOTE: SOIL CAP MATERIAL QUANTITIES INCLUDE A	30% SWELL F	ACTOR.			
						-

PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY	JOB #	8712-04
	ALTERNATIVE 3: NO FURTHER ACTION SAs 6, 12, 13, AOC 41;	DATE	24- lan-97
LOCATION:	DEVENS, MASSACHUSETTS	DATE	24-341-37

ENGINEER: ABB ENVIRONMENTAL SERVICES, INC.

ESTIMATOR: P. R. MARTIN

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CAP IN PLACE AOC 9					
SITE RESTORATION, MONITORING WELLS, & INSTITUTIONAL CO			UNIT		
DESCRIPTION	QTY	UNIT	COST		TOTAL
DEBRIS AREA I - IV FILL MATERIAL	25250	CY	10.00	\$	252,500
DEBRIS AREA I - IV VEGETATIVE SOIL	2700	CY	14.00	•	37.800
CHAIN LINK FENCE	2500	LF	13.00		32,500
12' SWING GATE	2	EA	800.00		1,600
FERTILIZE, SEED, MULCH	62000	SY	0.50		31,000
SPREAD & COMPACT - ROLLER & OPERATOR	35	DAY	1570.00		54,950
TOTAL SITE RESTORATION				\$	410,350
MONITORING WELLS - 4" DIA x 30' DEEP	4	EA	4500.00	\$	18,000
INSTITUTIONAL CONTROLS	1	LS	10000.00	\$	10,000

PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY	JOB #	8712-04	
LOCATION:	CAP-IN-PLACE AOCs 9, 11, 40 DEVENS, MASSACHUSETTS	DATE	24-Jan-97	
ENGINEER:	ABB ENVIRONMENTAL SERVICES, INC.		· .	

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CAP IN PLACE AOC 9 SUMMARY SHEET		= = =	UNIT	e =	
DESCRIPTION	QTY	UNIT	COST		TOTAL
TOTAL MOB/DEMOB				\$	194,600
TOTAL SITE PREPARATION					52,125
TOTAL DEBRIS EXCAVATION					181,980
TOTAL CAP CONSTRUCTION					1,773,540
TOTAL SITE RESTORATION					410,350
TOTAL MONITORING WELLS					18,000
TOTAL INSTITUTIONAL CONTROLS					10,000
UNDEVELOPED DESIGN DETAILS ~25%					660,405
TOTAL AOC 9				\$	3,301,000

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PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY	JOB #	8712-04
LOCATION:	ALTERNATIVE 3: NO FURTHER ACTION SAs 6, 12, 13, AOC 41; CAP-IN-PLACE AOCs 9, 11, 40 DEVENS, MASSACHUSETTS	DATE	24-Jan-97

ENGINEER: ABB ENVIRONMENTAL SERVICES, INC.

#### ESTIMATOR: P. R. MARTIN

CAP IN PLACE AOC 11		= = =		= =	
MOB/DEMOB			UNIT		
DESCRIPTION	QTY	UNIT	COST		TOTAL
MOB/DEMOB EQUIPMENT (IN OR OUT)					
FRONT END LOADER	2	EA	410.00	\$	820
DUMP TRUCK	2	EA	385.00		770
BACK HOE	2	EA	730.00		1,460
DOZER (2 EA)	4	EA	880.00		3,520
ROLLER (2 EA)	4	EA	785.00		3,140
					-
OFFICE TRAILER	3	MON	150.00		450
STORAGE TRAILER	3	MON	100.00		300
SET UP TRAILER	2	EA	500.00		1,000
ΤΟΙΙ ΕΤ - 2 ΕΔ	24	wк	25.00		- 600
WATER COOLER - 2 FA	24	WK	25.00		600
WATER	60	DAY	15.00		900
TELEPHONE SERVICE	3	MON	500.00		1,500
ELECTRICITY	3	MON	250.00		750
PICK-UP (2 EA)	6	MON	1000.00		6,000
PUMPS, TOOLS, MINOR EQUIPMENT	3	MON	500.00		1,500
SITE SUPERINTENDANT ( 3 MON * 210 HR/MON)	630	MNHR	65.00		40,950
FOREMEN (3 MON * 210 HR/MON)	630	MNHR	55.00		34,650
CLERK/TYPIST (3 MON * 168 HR/MON)	504	MNHR	25.00		12,600
					-

TOTAL MOB/DEMOB

\$ 111,510

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PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY	2 13 400 41.		JOB #		8712-04
LOCATION:	CAP-IN-PLACE AOCs 9, 11, 40 DEVENS, MASSACHUSETTS	2, 13, AUC 41,		DATE		24-Jan-97
ENGINEER:	ABB ENVIRONMENTAL SERVICES, INC.					
ESTIMATOR:	P. R. MARTIN					
	=======================================		=== :			=====
SITE	CAP IN PLACE AOC 11 PREPARATION, CAP CONSTRUCTION, SITE RESTO	RATION		UNIT		
*******	DESCRIPTION	QTY	UNIT	COST		TOTAL
	SITE PREPARATION		+	************		
ACCESS ROA	AD - 850 LF x 20' WIDE					
GRADE RO	DAD BED - DOZER & OPERATOR	2	DAY	1760.00	\$	3,520
GRAVEL -	12" THICK	<b>6</b> 50	CY	10.00		6,500
SPREAD &		1	DAY	1570.00		1,570
		1900	SY	2.00		3,800
CLEAR TREE:	S FROM SITE	0.5	AC	4300.00		2,150
ERUSION CO	NTROL	900	LF	5.00		4,500
						-
GRADING & I	DRAINAGE SWALE CONSTRUCTION					-
DOZER & (	OPERATOR	3	DAY	1760.00		5,280
LABORER		24	HR	33.50		804
	TOTAL SITE PREPARATION				\$	28,124
SUBGRADE S	SOIL	23550	CY	10.00	ŝ	235,500
TEXTURED G	EOMEMBRANE	115650	SF	0.80	•	92,520
DRAINAGE S	OIL	5900	CY	17.00		100,300
GEOTEXTILE	FABRIC	115650	SF	0.10		11,565
MOISTURE RE	ETENTION SOIL	9220	CY	10.00		92,200
RIPRAP		7450	CY	30.00		223,500
SPREAD & CO	ОМРАСТ	45	DAY	1570.00		70,650
	TOTAL CAP CONSTRUCTION				\$	826,235
	NOTE: ALL CAP MATERIAL QUANTITIES INCLUDE	A 30% SWELL FA	CTOR.			-
	SITE RESTORATION					-
CHAIN LIN	K FENCE	1600	LF	13.00	\$	20,800
12' SWING	GATE	1	EA	800.00		800
	TOTAL SITE RESTORATION			-	\$	21,600
						-
						-
						-
	******					

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PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY			JOB #		8712-04
LOCATION:	CAP-IN-PLACE AOCs 9, 11, 40 DEVENS, MASSACHUSETTS	3, AUC 41;		DATE		24-Jan-97
ENGINEER:	ABB ENVIRONMENTAL SERVICES, INC.					
ESTIMATOR:	P. R. MARTIN					
	======================================		= = =	=======	= =	
	MONITORING WELLS & INSTITUTIONAL CONTROLS DESCRIPTION	ΟΤΥ	UNIT	UNIT COST		TOTAL
MONITORING	G WELLS - 4" DIA x 30' DEEP	4	EA	4500.00	\$	18,000

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LS

10000.00 \$

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10,000

INSTITUTIONAL CONTROLS	INSTIT	UTIONAL	CONTROLS
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PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY	JOB #	8712-04
	ALTERNATIVE 3: NO FURTHER ACTION SAs 6, 12, 13, AOC 41; CAP-IN-PLACE AOCs 9, 11, 40	DATE	24-Jan-97
LOCATION:	DEVENS, MASSACHUSETTS		

ENGINEER: ABB ENVIRONMENTAL SERVICES, INC.

ESTIMATOR: P. R. MARTIN

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CAP IN PLACE AOC 11		= = =		= =	
DESCRIPTION	QTY	UNIT	COST		TOTAL
TOTAL MOB/DEMOB				\$	111,510
TOTAL SITE PREPARATION					28,124
TOTAL CAP CONSTRUCTION					826,235
TOTAL SITE RESTORATION					21,600
TOTAL MONITORING WELLS					18,000
TOTAL INSTITUTIONAL CONTROLS					10,000
UNDEVELOPED DESIGN DETAILS ~25%					253,531
TOTAL AOC 11				\$	1,269,000

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		TOTAL THIS PA	GE		\$	61,450
CLEAR GRADE	& GRUB LIGHT VEGETATION E- DOZER & OPERATOR 	1 2	DAY	4300.00 1760.00		4,300 3,520
CAP MAT	ERIALS STOCKPILE AREA	-	• •	4000.00		-
						-
						-
						-
DECON A	REA - 10'x20'	3	EA	1000.00		3,000
SUMP	& SUMP PUMP	1	LS	2500.00		2,500
LINER		10000	SF	0.60		6,000
SPREA	D & COMPACT	0.5	DAY	1570.00		785
GRAVE	EL - 12" THICK	400	CY	10.00		4,000
GRADE	- DOZER & OPERATOR	0.5	DAY	1760.00		880
CLEAR	& GRUB LIGHT VEGETATION	0.25	AC	4300.00		1,075
SEDIMEN	T DEWATERING PAD					-
GRADE	- DOZER & OPERATOR	0.5	DAY	1760.00		880
CLEAR	& GRUB LIGHT VEGETATION	0.25	AC	4300.00		1,075
PARKING	AREA					
SPREA	D & COMPACT	2	DAY	1570.00		3,140
FILTER	FABRIC	2000	SY	1.00		2.000
GRAVE	- 24" THICK	1450	CY	10.00		14.500
		0.35		4300.00		1,505
AUCESS I	RUAD FUR CAPPING - 500 LF	0.05		4200.00		- 1 EOE
FILTER		550	SY	1.00		550
SPREA	D & COMPACT	0.5	DAY	1570.00		785
GRAVE	EL - 24" THICK	340	CY	10.00		3,400
GRADE	E- DOZER & OPERATOR	0.25	DAY	1760.00		440
CLEAR	& GRUB LIGHT VEGETATION	0.1	AC	4300.00		430
ACCESS I	ROAD SEDIMENT AREA 2					
SPREA	D & COMPACT	0.5	DAY	1570.00		785
FILTER	FABRIC	550	SY	1.00		550
GRAVE	EL - 12" THICK	360	CY	10.00		3,600
GRADE	- DOZER & OPERATOR	0.25	DAY	1760.00	Ŧ	440
CLEAR	& GRUB LIGHT VEGETATION	0.1	AC	4300.00	s	430
SITE PREPAR	RADON ROAD SEDIMENT AREA 1					
					••••••	
	SITE PREPARATION AND MOBILIZATION DESCRIPTION	ΩΤΥ	UNIT	UNIT COST		TOTAL
== = = = = =	CAP IN PLACE AOC 40					* = = = =
ESTIMATOR	P. R. MARTIN					
	ADD ENVIRONMENTAL SERVICES, INC.					
	CAP-IN-PLACE AUCS 9, 11, 40 DEVENS MASSACHUSETTS			DATE		24-Jan-97
	ALTERNATIVE 3: NO FURTHER ACTION SAs 6, 12	2, 13, AOC 41;				04 4 07
PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY			JOB #		8712-04

PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY	13 400 41.		JOB #		8712-04
	CAP-IN-PLACE AOCS 9, 11, 40	13, AUC 41,		DATE		24-Jan-97
LOCATION:	DEVENS, MASSACHUSETTS					
ENGINEER:	ABB ENVIRONMENTAL SERVICES, INC.					
ESTIMATOR:	P. R. MARTIN					
		******			= =	z
	SITE PREPARATION AND MOBILIZATION DESCRIPTION	ΩΤΥ	UNIT	UNIT COST		TOTAL
					 د	61 450
SHE PREPAR	ATION				Ŷ	01,450
MOBILIZATIO	DN					
EQUIPN	MENT (IN OR OUT)	_				
FRONT EN	ID LOADER	2	EA	410.00		820
DUMP TR	JCK	6	EA	385.00		2,310
BACKHOE		2	EA	730.00		1,460
DOZER	OLAMOUTU DUOKET	2	EA	880.00		1,760
CRANE &	CLAMSHELL BUCKET	2	EA	040.00		1,280
ROLLER	112	2	EA	785.00		1,570
		4	EA	250.00		200
DEWATER	ING FUMP & HUSE	2	EA	100.00		-
OFFICE TRAI	I FB	4	MON	150.00		600
STORAGE TE	BALLER	4	MON	150.00		600
TRAILER DEL	IVERY, SET-UP, REMOVAL	2	EA	300.00		600
TOILET - 2 E	Α	36	WK	25.00		900
WATER COO	LER - 2 EA	36	WK	25.00		900
WATER		180	DAY	15.00		2,700
TELEPHONE	SERVICE	4	MON	500.00		2,000
ELECTRICITY	,	4	MON	250.00		1,000
PICK-UP (2 E	A)	8	MON	1000.00		8,000
OFFICE EQUI	PMENT	4	MON	1000.00		4,000
PUMPS, TOC	DLS, MINOR EQUIPMENT	1	LS	2500.00		2,500
		160	MNHR	33 50		5.360
CARDENITER	1000000000000000000000000000000000000	160	MNHR	48.00		7,680
ELECTRICIAN	(2 MEN*10 DAY/MAN*8 HR/DAY)	160	MNHR	50.50		8,080
						-
SITE SUPERI	NTENDANT (4 MON*210HR/MON)	840	MNHR	65.00		54,600
FOREMAN (4	MON*210HR/MON)	840	MNHR	55.00		46,200
CLERK/TYPIS	ST (4 MON*168HR/MON)	672	MNHR	25.00		10,800
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## TOTAL SITE PREPARATION AND MOBILIZATION

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\$ 234,370

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PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY	JOB #	8712-04
LOCATION:	ALTERNATIVE 3: NO FURTHER ACTION SAs 6, 12, 13, AOC 41; CAP-IN-PLACE AOCs 9, 11, 40 DEVENS, MASSACHUSETTS	DATE	24-Jan-97

ENGINEER: ABB ENVIRONMENTAL SERVICES, INC.

ESTIMATOR: P. R. MARTIN

	*==**==	21 Dr. 20		= =	
SEDIMENT REMOVAL AND DISPOSAL DESCRIPTION	QTY	UNIT	UNIT COST		TOTAL
CONSTRUCT SILT BARRIER AROUND CONTAMINATED AREAS	400	LF	25.00	\$	10,000
EXCAVATE WITH CLAMSHELL 1200 CY SEDIMENTS + 1600 CY ACCESS ROADS/WORK PLA	28 TFORMS	DAY	1280.00		35,840
HAUL SEDIMENTS TO DEWATERING PAD (2 EA DUMP TRUCK & DRIVER)	56	DAY	770.00		43,120 -
LOAD DRY SEDIMENTS FOR TRANSPORTATION TO DISPOSAL AREA (FRONT END LOADER & OPERATOR)	14	DAY	825.00		- 11,550 - -
LABORERS - 2 EA FOR 35 DAYS	560	MNHR	33.50		- 18,760
TCLP TESTING	2	SMPL	1400.00		- 2,800
ON-SITE STABILIZATION OF SEDIMENTS WITH SAND	600	CY	15.00		9,000 -
TRANSPORTATION & DISPOSAL AT AOC 9 (3 EA DUMP TRUCK & DRIVER)	42	DAY	770.00		32,340 - -
TREATMENT OF WATER	1	LS	21800.00		- 21,800
PUMP WATER FROM DEWATERING PAD TO POND	28	DAY	50.00		1,400 - - -
					-
TOTAL SEDIMENT REMOVAL AND DISPOSAL				\$	186,610

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PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY	JOB #	8712-04
LOCATION:	ALTERNATIVE 3: NO FURTHER ACTION SAs 6, 12, 13, AOC 41; CAP-IN-PLACE AOCs 9, 11, 40 DEVENS, MASSACHUSETTS	DATE	24-Jan-97

ENGINEER: ABB ENVIRONMENTAL SERVICES, INC.

ESTIMATOR: P. R. MARTIN

		= = =		= =	=====
WETLAND RESTORATION, MONITORING WELLS, DRUM REMOVAL A DESCRIPTION	ND DISPOSAI QTY		UNIT COST		TOTAL
WETLAND RESTORATION	1.5	AC	50000.00	\$	75,000
MONITORING WELLS - 4" DIA x 30' DEEP	2	EA	4500.00	\$	9,000 - -
DRUM REMOVAL AND DISPOSAL					-
BACKHOE & OPERATOR LABORER - 2 EA, 3 DAYS	3 48	DAY MNHR	1460.00 33.50	\$	4,380 1,608
TRANSPORT DRUMS TO AOC 9 DUMP TRUCK & DRIVER	3	DAY	770.00		2,310
TCLP TESTING OF DRUM CONTENTS	2	EA	1400.00		2,800
					-
					-

TOTAL DRUM REMOVAL AND DISPOSAL

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\$ 11,098

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PROJECT: LANDFILL REMEDIATION FEASIBILITY STUDY					JOB #		8712-04
	CAP-IN-PLACE AOCs 9, 11, 40 LOCATION: DEVENS, MASSACHUSETTS						24-Jan-97
	ENGINEER	ABB ENVIRONMENTAL SERVICES INC					
	LINGINEEN.	ADD ENVIRONMENTAL SERVICES, INC.					
	ESTIMATOR:	P. R. MARTIN					
						= =	
		CAP IN PLACE AUC 40			LINIT		
		DESCRIPTION	ΩΤΥ	UNIT	COST		TOTAL
	**************						
		CAP CONSTRUCTION					
	SILT FENCE		1500	LF	5.00	Ş	7,500
	CLEAR & GR		4.4	AC	6900.00		30,360
			5	DAY	1750.00		8,750
			5		1760.00		0,000 12,220
			2500		10.00		12,320
			2500		1570.00		25,000
	SIRCADE E		7100		10.00		21,980
			/100		1670.00		14 130
	TEXTURED C		192000	OA1 CE	1970.00		153 600
			9250	or CV	17.00		157 250
	SPREAD & C		3230		1670.00		20 410
			192000	SF	0.10		19 200
			13900	CY	10.00		139,000
	SPREAD & C	OMPACT MOSITURE BENTENTION LAYER	18	DAY	1570.00		28,260
	VEGETATIVE	MATERIAI	4600	CY	14.00		64,400
	SPBEAD & C		6	DAY	1570.00		9,420
	SEED, FERTIL		4.4	AC	2000.00		8,800
	RIPRAP	,	2250	CY	30.00		67,500
	GUARD RAIL	ALONG ROAD	1000	LF	12.50		12,500
		TOTAL CAP CONSTRUCTION				\$	880,180
	INSTITUTION	NAL CONTROLS	1	LS	10000.00	\$	10,000

NOTE: CAP SOIL MATERIAL QUANTITIES INCLUDE A 30% SWELL FACTOR

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PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY	JOB #	8712-04
	ALTERNATIVE 3: NO FURTHER ACTION SAs 6, 12, 13, AOC 41; CAP-IN-PLACE AOCs 9, 11, 40	DATE	24-Jan-97
LOCATION:	DEVENS, MASSACHUSETTS		

ENGINEER: ABB ENVIRONMENTAL SERVICES, INC.

# ESTIMATOR: P. R. MARTIN

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CAP IN PLACE AOC 40 SUMMARY SHEET	======		= = = = = = = = = = = = = = = = = = =	= =	
DESCRIPTION	QTY	UNIT	COST		TOTAL
TOTAL SITE PREPARATION AND MOBILIZATION				\$	234,370
TOTAL SEDIMENT REMOVAL & DISPOSAL					186,610
TOTAL WETLAND RESTORATION					75,000
TOTAL MONITORING WELLS					9,000
TOTAL DRUM REMOVAL & DISPOSAL		·			11,098
TOTAL CAP CONSTRUCTION					880,180
TOTAL INSTITUTIONAL CONTROLS					10,000
UNDEVELOPED DESIGN DETAILS ~25%					351,742
TOTAL SA 13				\$	1,758,000

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PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY	12 400 41		JOB #		8712-04
LOCATION:	CAP-IN-PLACE AOCs 9, 11, 40 DEVENS, MASSACHUSETTS	13, AUC 41;		DATE		24-Jan-97
ENGINEER:	ABB ENVIRONMENTAL SERVICES, INC.					
ESTIMATOR	: P. R. MARTIN					
	ANNUAL O&M COSTS CAP IN PLACE AOC 9 DESCRIPTION	======= QTY	=	UNIT COST	= =	TOTAL
				· ••••••••••••••••••••••••••••••••••••		
GENER GENER DUN FRO LAB MAT	AL REPAIR AL REPAIR MP TRUCK & DRIVER NT END LOADER & OPER ORER - 2 EA FERIALS	2 2 32 1	DAY DAY MNHR LS	770.00 825.00 33.50 1000.00	\$	1,540 1,650 1,072 1,000
INSPEC	CTION - 1 DAY @ 2 MEN/DAY	16	MNHR	75.00		1,200
MOWI	NG - TRACTOR & OPERATOR	5	DAY	500.00		2,500
ENVIRONME GROUND 4 WEL SAM	INTAL MONITORING WATER SAMPLE COLLECTION LS, SEMI-ANNUALLY (INCLUDES WELL PURGE, IPLE COLLECTION, AND SHIPPING)	2	LS	1800.00		3,600 - -
GROUND' 4 SAM EQU INO	WATER SAMPLE ANALYSIS IPLES PLUS 2 SAMPLE QA/QC IIVALENT SEMI-ANNUALLY, SVOCs, RGANICS, WATER QUALITY PARAMETERS	12	SMPL	900.00		10,800
FIVE YEAR E PUBLIC	EDUCATIONAL PROGRAM C MEETING - ANNUALIZED	0.1739	LS	5000.00		869
TWO YEAR MADE	DATA REPORT TO P - ANNUALIZED	0.4831	LS	1000.00		483
FIVE YEA	R SITE REVIEW - ANNUALIZED	0.1739	LS	15000.00		2,608

TOTAL ANNUAL O&M COSTS

\$ 27,323

PROJECT: LOCATION: ENGINEER: ESTIMATOR:	LANDFILL REMEDIATION FEASIBILITY STUDY ALTERNATIVE 3: NO FURTHER ACTION SAs 6, 12, CAP-IN-PLACE AOCs 9, 11, 40 DEVENS, MASSACHUSETTS ABB ENVIRONMENTAL SERVICES, INC. P. R. MARTIN	, 13, AOC 41;		JOB # DATE	8712-04 24-Jan-97	
	ANNUAL O&M COSTS CAP IN PLACE AOC 11 DESCRIPTION	0TY	= = = = UNIT	UNIT COST	TOTAL	
LANDFILL CC GENERA DUM FROM LABC MAT	OVER MAINTENANCE AL REPAIR IP TRUCK & DRIVER NT END LOADER & OPER ORER - 2 EA TERIALS TION - 0.5 DAY @ 2 MEN/DAY	1 1 16 1 8	DAY DAY MNHR LS MNHR	770.00 825.00 33.50 500.00 75.00	\$ 770 825 536 500 - 600 -	
ENVIRONMEN GROUNDV 4 WELL SAM	NTAL MONITORING VATER SAMPLE COLLECTION S, SEMI-ANNUALLY (INCLUDES WELL PURGE, IPLE COLLECTION, AND SHIPPING)	<b>2</b>	LS	1800.00	3,600 - -	
GROUNDV 4 SAMF EQUI INOR	VATER SAMPLE ANALYSIS PLES PLUS 2 SAMPLE QA/QC IVALENT SEMI-ANNUALLY, SVOCs, IGANICS, WATER QUALITY PARAMETERS	12	SMPL	900.00	10,800	
FIVE YEAR EI PUBLIC	DUCATIONAL PROGRAM MEETING - ANNUALIZED	0.1739	LS	5000.00	869	
TWO YEAR D MADEP	DATA REPORT TO - ANNUALIZED	0.4831	LS	1000.00	483	
FIVE YEAF	R SITE REVIEW - ANNUALIZED	0.1739	LS	15000.00	2,608	

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TOTAL ANNUAL O&M COSTS

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\$ 21,592

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PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY	2 12 000 414		JOB #		8712-04
	CAP-IN-PLACE AOCs 9, 11, 40	2, 13, AUC 41;		DATE		24-Jan-97
LOCATION:	DEVENS, MASSACHUSETTS					
ENGINEER:	ABB ENVIRONMENTAL SERVICES, INC.					
ESTIMATOR:	P. R. MARTIN					
			===		= =	
	ANNUAL O&M COSTS					
	DESCRIPTION	QTY	UNIT	COST	•	TOTAL
O&M COSTS	OCCURING OVER FIVE YEARS		**********	********************		
WETLAND	S RESTORATION MONITORING (5 YEARS)					
1 DAY	@ 2 MEN/DAY, SEMI-ANNUALLY	32	MNHR	75.00	Ş	2,400
BIOMONIT	ORING, BIENNIALLY					-
FOR 5	YEARS	0.4831	LS	15000.00		7,246
FIVE YEAF	SITE REVIEW - ANNUALIZED					-
		0.1739	LS	2500.00		435
	TOTAL ADDITIONAL ANNUAL O&M COSTS FOR	AOC 40 - 5 YEARS			\$	10,081
O&M COSTS LANDFILL	OCCURING OVER THIRTY YEARS COVER MAINTENANCE					
GENER	AL REPAIR					
DUM		1	DAY	770.00	\$	770
	DRER - 2 EA	16	MNHR	33.50		536
MAT	ERIALS	1	LS	500.00		500
INSPEC	TION - 0.5 DAY @ 2 MEN/DAY	8	MNHR	75.00		- 600
MOWIN	IG - TRACTOR & OPERATOR	1	DAY	500.00		500
		SUBTOTAL THIS	S PAGE		\$	3,731



PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY	JOB #	8712-04
	ALTERNATIVE 3: NO FURTHER ACTION SAs 6, 12, 13, AOC 41; CAP-IN-PLACE AOCs 9, 11, 40	DATE	24-Jan-97
LUCATION:	DEVENS, MASSACHUSETTS		

ENGINEER: ABB ENVIRONMENTAL SERVICES, INC.

ESTIMATOR: P. R. MARTIN

ANNUAL O&M COSTS CAP IN PLACE AOC 40 DESCRIPTION		= = =		= = :	= = = = = = FOTAI
O&M COSTS OCCURING OVER THIRTY YEARS - TOTAL FROM PR	EVIOUS PAGE			\$	3,731
ENVIRONMENTAL MONITORING					
SEDIMENT SAMPLE COLLECTION 4 LOCATIONS, ONCE EVERY 5 YEARS	0.1739	LS	1200.00		209 -
SEDIMENT SAMPLE ANALYSIS, ONCE EVERY 5 YEARS, 4 SAMPLES PLUS 1 QA/QC, SVOCs AND INORGANICS ANNUALIZED	0.8695	SMPL	715.00		622 - - -
GROUNDWATER SAMPLE COLLECTION 7 WELLS, SEMI-ANNUALLY (INCLUDES WELL PURGE, SAMPLE COLLECTION, AND SHIPPING)	2	LS	2700.00		5,400 - -
GROUNDWATER SAMPLE ANALYSIS 7 SAMPLES PLUS 2 SAMPLE QA/QC EQUIVALENT SEMI-ANNUALLY, SVOCs, INORGANICS, WATER QUALITY PARAMETERS	18	SMPL	900.00		16,200
FIVE YEAR EDUCATIONAL PROGRAM PUBLIC MEETING - ANNUALIZED	0.1739	LS	5000.00		869
TWO YEAR DATA REPORT TO MADEP - ANNUALIZED	0.4831	LS	1000.00		483 - -
FIVE YEAR SITE REVIEW - ANNUALIZED	0.1739	LS	15000.00		- 2,608 -

## TOTAL ANNUAL O&M COSTS FOR 30 YEAR ACTIVITIES

30,122

\$

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PROJECT:   LANDFILL REMEDIATION FEASIBILITY STUDY   JOB     ALTERNATIVE 3: NO FURTHER ACTION SAS 6, 12, 13, AOC 41;   DAT     CAP-IN-PLACE AOCs 9, 11, 40   DAT     LOCATION:   DEVENS, MASSACHUSETTS     ENGINEER:   ABB ENVIRONMENTAL SERVICES, INC.				JOB # DATE	8712-04 24-Jan-97
ESTIMATOR:	P. R. MARTIN				
	ANNUAL O&M COSTS CAP IN PLACE SUMMARY SHEET DESCRIPTION	е е е е е е е е е е е е е е е е е е е	= = = UNIT	UNIT COST	 = = = = = = TOTAL
TOTAL AOC	ANNUAL O&M COSTS - FOR 30 YEARS 9	J			\$ 27,323
TOTAL AOC	11				21,592
TOTAL AOC	40				30,122
	• • •				
	UNDEVELOPED DESIGN DETAILS ~25%				 19,963
	TOTAL ANNUAL O&M COSTS - 30 YEARS				\$ 99,000
	ANNUAL O&M COSTS - FOR 5 YEARS				
TOTAL AOC	40				\$ 10,081
	UNDEVELOPED DESIGN DETAILS ~25%			,	 2,919
	TOTAL ADDITIONAL ANNUAL O&M COSTS FOR A	DC 40 - 5 YEARS			\$ 13,000

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PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY			JOB #	87	12-04
	ALTERNATIVE 4: NO FURTHER ACTION AT SAS 6, 12 LIMITED REMOVAL AT AOC 11; EXCAVATE AND CONSOLIDATE AOCs 9, 40	, 13, AOC 4 <sup>-</sup>	1;	DATE	24-J	an-97
LOCATION: ENGINEER:	DEVENS, MASSACHUSETTS ABB ENVIRONMENTAL SERVICES, INC.			0,112		
ESTIMATOR:	P. R. MARTIN					
	COST SUMMARY TABLE					- = =
	DESCRIPTION	QTY	UNIT	UNIT COST	тоти	AL
DIRECT COS						
NO FURTH	IER ACTION			•		
	SA 6			Ş		(
	SA 12					
	5A 13 AOC 41					Č
					4.	4.000
EXCAVAT	E AND CONSOLIDATE				•	
	AOC 9				3,83	5,000
	AOC 40				3,370	0,000
	CONSOLIDATION LANDFILL CONSTRUCTION				5,240	),000
	TOTAL DIRECT COSTS				\$ 12,48	9,000
	DCTC					
	HEALTH AND SAFETY			5.00%	\$ 624	4,000
	LEGAL, ADMIN, PERMITTING			5.00%	624	4,000
	ENGINEERING			10.00%	1,249	9,000
	SERVICES DURING CONSTRUCTION			10.00%	1,24	9,000
	TOTAL INDIRECT COSTS				\$ 3,74	6,000
	TOTAL CAPITAL (DIRECT + INDIRECT) COST				\$ 16,23	5,000
OPERATING	AND MAINTENANCE COSTS					
	TOTAL ANNUAL 0&M COSTS FOR AOC 11 - 2 YRS				\$ 4	4,00
	TOTAL ANNUAL 0&M COSTS FOR NEW LANDFILL - 3	30 YRS			2	3,00
	TOTAL ADDITIONAL ANNUAL O&M COSTS FOR AOC	: 40 - 5 YRS			2	9,00
	TOTAL PRESENT WORTH OF OPERATING AND MAIN	TENANCE CO	OSTS		\$ 41	1,000
					\$ 16 64	6.00

PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY ALTERNATIVE 4: NO FURTHER ACTION AT SAS 6, 12, 13, AOC 41:	JOB #	8712-04
	LIMITED REMOVAL AT AOC 11; EXCAVATE AND CONSOLIDATE AOCs 9, 40	DATE	24-Jan-97
LOCATION:	DEVENS, MASSACHUSETTS		
ENGINEER:	ABB ENVIRONMENTAL SERVICES, INC.		

	NO FURTHER ACTION	======	= = =	======#	= = =	
	DESCRIPTION	QTY	UNIT	UNIT COST	т	OTAL
SA 6					\$	0
SA 12						0
SA 13						0
AOC 41						. 0

PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY	JOB #	8712-04
	ALTERNATIVE 4: NO FURTHER ACTION AT SAs 6, 12, 13, AOC 41;		
	LIMITED REMOVAL AT AOC 11;		
	EXCAVATE AND CONSOLIDATE AOCs 9, 40	DATE	24-Jan-97
LOCATION:	DEVENS, MASSACHUSETTS		
ENGINEER:	ABB ENVIRONMENTAL SERVICES, INC.		

MOB/DEMOB     INN AND OUT)       ROLLER     2     EA     785.00     \$     1,570       DUMP TRUCKS     4     EA     385.00     1,540       BACKHOE     2     EA     730.00     1,460       TOILET - 1 EA     1     WK     25.00     25       WATER COLER - 1 EA     1     WK     25.00     25       WATER     5     DAY     15.00     75       PICK-UP (2 EA)     0.5     MON     1000.00     500       FOREMEN     50     MNHR     55.00     2,750       EXCAVATION OF DEBRIS - BACKHOE & OPERATOR     5     DAY     1460.00     7,300       BACKHOE & OPERATOR     10     DAY     770.00     7,700       LANDFILL - DUMP TRUCK & DRIVER - 2 EA     -     -     -       -     -     -     -     -       -     -     -     -     -       -     -     -     -     -       -     -     -     -     - <	DESCRIPTION	ΟΤΥ	UNIT	UNIT COST		TOTAL
MOBIDEMOB (IN AND OT))     2     EA     785.00     \$     1.570       DUMP TRUCKS     4     EA     385.00     1,540       BACKHOE     2     EA     730.00     1,460       TOILET - 1 EA     1     WK     25.00     25       WATER COLER - 1 EA     1     WK     25.00     25       WATER COLER - 1 EA     1     WK     25.00     25       WATER COLER - 1 EA     1     WK     25.00     25       WATER COLER - 1 EA     1     WK     25.00     25       WATER COLER - 1 EA     1     WK     25.00     25       WATER COLER - 1 EA     0.5     MON     1000.00     500       FOREMEN     50     MNHR     55.00     2,750       EXCAVATION OF DEBRIS - BACKHOE & OPERATOR     5     DAY     1460.00     7,300       TRANSPORT TO ON-SITE CONSOLIDATION LANDFILL - DUMP TRUCK & DRIVER - 2 EA     -     -     -       -     -     -     -     -     -       -     -						
DUMP TRUCKS   4   EA   385.00   1.540     BACKHOE   2   EA   730.00   1.460     TOILET - 1 EA   1   WK   25.00   25     WATER COOLER - 1 EA   1   WK   25.00   25     WATER   5   DAY   15.00   75     PICK-UP (2 EA)   0.5   MON   1000.00   500     FOREMEN   50   MNHR   55.00   2,750     EXCAVATION OF DEBRIS - BACKHOE & OPERATOR   5   DAY   1460.00   7,300     TRANSPORT TO ON-SITE CONSOLIDATION LANDFILL - DUMP TRUCK & DRIVER - 2 EA   10   DAY   770.00   7,700		2	E۸	785.00	Ś	1 570
BACKHOE     2     EA     730.00     1,460       TOILET - 1 EA     1     WK     25.00     25       WATER     5     DAY     15.00     75       PICK-UP (2 EA)     0.5     MON     1000.00     500       FOREMEN     50     MNHR     55.00     2,750       EXCAVATION OF DEBRIS - BACKHOE & OPERATOR     5     DAY     1460.00     7,300       TRANSPORT TO ON-SITE CONSOLIDATION LANDFILL - DUMP TRUCK & DRIVER - 2 EA     10     DAY     770.00     7,700       -     -     -     -     -     -     -       -     -     -     -     -     -     -		4	FA	385.00	Ŧ	1,540
TOILET - 1 EA   1   WK   25.00   25     WATER   5   DAY   15.00   75     PICK-UP (2 EA)   0.5   MON   1000.00   500     FOREMEN   50   MNHR   55.00   2,750     EXCAVATION OF DEBRIS - BACKHOE & OPERATOR   5   DAY   1460.00   7,300     TRANSPORT TO ON-SITE CONSOLIDATION LANDFILL - DUMP TRUCK & DRIVER - 2 EA   10   DAY   770.00   7,700	BACKHOE	2	EA	730.00		1,460
WATER     1     WK     25.00     25       WATER     5     DAY     15.00     75       PICK-UP (2 EA)     0.5     MON     1000.00     500       FOREMEN     50     MNHR     55.00     2,750       EXCAVATION OF DEBRIS - BACKHOE & OPERATOR     5     DAY     1460.00     7,300       TRANSPORT TO ON-SITE CONSOLIDATION LANDFILL - DUMP TRUCK & DRIVER - 2 EA     10     DAY     770.00     7,700       .     .     .     .     .     .     .       .     .     .     .     .     .     .       .     .     .     .     .     .     .       .     .     .     .     .     .     .       .     .     .     .     .     .     .     .       .     .     .     .     .     .     .     .       .     .     .     .     .     .     .     .       .	TOILET - 1 EA	1	wκ	25.00		- 25
NATER     5     DAY     15.00     75       PICK-UP (2 EA)     0.5     MON     1000.00     500       COREMEN     50     MNHR     55.00     2,750       EXCAVATION OF DEBRIS - BACKHOE & OPERATOR     5     DAY     1460.00     7,300       IRANSPORT TO ON-SITE CONSOLIDATION LANDFILL - DUMP TRUCK & DRIVER - 2 EA     10     DAY     770.00     7,700	NATER COOLER - 1 EA	1	WΚ	25.00		25
NCK-UP (2 EA) 0.5 MON 1000.00 500 COREMEN 50 MNHR 55.00 2,750 EXCAVATION OF DEBRIS - BACKHOE & OPERATOR TRANSPORT TO ON-SITE CONSOLIDATION LANDFILL - DUMP TRUCK & DRIVER - 2 EA TRANSPORT TO ON-SITE CONSOLIDATION LANDFILL - DUMP TRUCK & DRIVER - 2 EA TRANSPORT TO ON-SITE CONSOLIDATION LANDFILL - DUMP TRUCK & DRIVER - 2 EA TRANSPORT TO ON-SITE CONSOLIDATION LANDFILL - DUMP TRUCK & DRIVER - 2 EA TRANSPORT TO ON-SITE CONSOLIDATION TRANSPORT TO ON-SI	VATER	5	DAY	15.00		75
SOREMEN   50 MNHR   55.00   2,750     EXCAVATION OF DEBRIS - BACKHOE & OPERATOR   5 DAY   1460.00   7,300     IRANSPORT TO ON-SITE CONSOLIDATION LANDFILL - DUMP TRUCK & DRIVER - 2 EA   10 DAY   770.00   7,700	PICK-UP (2 EA)	0.5	MON	1000.00		500
EXCAVATION OF DEBRIS - BACKHOE & OPERATOR IRANSPORT TO ON-SITE CONSOLIDATION LANDFILL - DUMP TRUCK & DRIVER - 2 EA	OREMEN	50	MNHR	55.00		2,750
EXCAVATION OF DEBRIS - BACKHOE & OPERATOR TRANSPORT TO ON-SITE CONSOLIDATION LANDFILL - DUMP TRUCK & DRIVER - 2 EA						-
BACKHOE & OPERATOR TRANSPORT TO ON-SITE CONSOLIDATION 10 DAY 770.00 7,700 LANDFILL - DUMP TRUCK & DRIVER - 2 EA	EXCAVATION OF DEBRIS -	5	DAY	1460.00		- 7,300
TRANSPORT TO ON-SITE CONSOLIDATION 10 DAY 770.00 7,700 LANDFILL - DUMP TRUCK & DRIVER - 2 EA	BACKHOE & OPERATOR	-				-
LANDFILL - DUMP TRUCK & DRIVER - 2 EA	TRANSPORT TO ON-SITE CONSOLIDATION	10	DAY	770.00		7,700
	LANDFILL - DUMP TRUCK & DRIVER - 2 EA					-
						-
						-
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						-
						-
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TOTAL THIS PAGE

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\$

22,945

PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY	12 13. AOC 41.		JOB #		8712-04
LOCATION: ENGINEER:	LIMITED REMOVAL AT AOC 11; EXCAVATE AND CONSOLIDATE AOCs 9, 40 DEVENS, MASSACHUSETTS ABB ENVIRONMENTAL SERVICES, INC.	12, 10, 100 41,		DATE		24-Jan-97
ESTIMATOR	: P. R. MARTIN					
= = = = = = = LIMITED REN		= = = = = = = = = DFILL	===	= = = = = = = = = = = = = = = = = = =	= =	= = =
	DESCRIPTION	QTY	UNIT	COST		TOTAL
TOTAL PREV	/IOUS PAGE				\$	22,945
BACKFILL PURCHAS (INCLUDIN	ED FROM OFF-SITE	625	CY	10.00		6,250
SITE RESTOF BACKFILL FERTILIZE	RATION ., GRADE, COMPACT ., SEED, MULCH	2 5000	DAY SY	1570.00 0.50		3,140 2,500 -
	UNDEVELOPED DESIGN DETAILS ~25%					- - 9,165
	TOTAL AOC 11				\$	44,000

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\$

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PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY ALTERNATIVE 4: NO FURTHER ACTION AT SAs 6, 12, 13, AOC 41:	JOB #	8712-04
	LIMITED REMOVAL AT AOC 11; EXCAVATE AND CONSOLIDATE AOCs 9, 40	DΔTE	24. lan-97
LOCATION:	DEVENS, MASSACHUSETTS	DATE	24 341-37
ENGINEER:	ABB ENVIRONMENTAL SERVICES, INC.		

EXCAVATE AND CONSOLIDATE AOC 9	= = = = = = = = =	= = =		= =	
DESCRIPTION	ΩΤΥ	UNIT	UNIT COST		TOTAL
MOB/DEMOB (IN and OUT)					
DUMP TRUCKS	32	EA	385.00	\$	12.320
BACKHOE	4	EA	730.00	•	2.920
ROLLER	8	EA	785.00		6,280
OFFICE TRAILER	、 5	MON	150.00		750
STORAGE TRAILER	5	MON	100.00		500
SET UP TRAILER	2	EA	500.00		1,000
TOILET - 2 EA	44	WΚ	25.00		- 1,100
WATER COOLER - 2 EA	44	WΚ	25.00		1,100
WATER	220	DAY	15.00		3,300
TELEPHONE SERVICE	5	MON	500.00		2,500
ELECTRICITY	5	MON	250.00		1,250
PICK-UP (2 EA)	10	MON	1000.00		10,000
PUMPS, TOOLS, MINOR EQUIPMENT	1	LS	2500.00		- 2,500
SITE SUPERINTENDANT ( 5 MON * 210 HR/MON)	1050	MNHR	65.00		- 68.250
FOREMEN (5 MON * 210 HR/MON)	1050	MNHR	55.00		57,750
CLERK/TYPIST (5 MON * 168 HR/MON)	840	MNHR	25.00		21,000
CLEAR TREES	2.5	AC	6900.00		- 17,250
EROSION CONTROL	700	LF	5.00		- 3,500
UXO CLEARANCE	70	DAY	1800.00		- 126,000
					-
					-
EXCAVATION OF 112000 CY OF DEBRIS					-
BACKHOE & OPERATOR (2 EA)	140	DAY	1460.00		204,400
TRANSPORT TO ON-SITE CONSOLIDATION LANDFILL (50% SWELL	. FACTOR INCL	UDED)			
DUMP TRUCK & OPERATOR (16 EA)	1120	DAY	770.00		862,400
SPREAD OVER ON-SITE CONSOLIDATION LANDFILL & COMPACT					-
ROLLER & OPERATOR (4 EA)	280	DAY	1570.00		439,600
					-
			*****		-
	IUTAL THIS PA	GE		\$	1,845,670

PROJECT: LANDFILL REMEDIATION ALTERNATIVE 4: NO FUR LIMITED REMOVAL AT EXCAVATE AND CONS LOCATION: DEVENS, MASSACHUSET ENGINEER: ABB ENVIRONMENTAL SE ESTIMATOR: P. B. MARTIN	FEASIBILITY STUDY ITHER ACTION AT SAs 6, 12, 13, AOC 41; AOC 11; SOLIDATE AOCs 9, 40 TS ERVICES, INC.		JOB # DATE	8712-04 24-Jan-97	
EXCAVATE AND CO	DNSOLIDATE AOC 9	= = = UNIT	UNIT COST	= = = = = = = = = = = = = = = = = = =	
TOTAL PREVIOUS PAGE				\$ 1,845,670	
BACKFILL (112,000 * 1.3 = 145,600 ( AVAILABLE FROM CONSOLIDATION LANDFILL EXCAVATION LOAD STOCKPILED BACKFILL HAUL & DUMP	CY REQUIRED) 88750 110 330	CY DAY DAY	0.00 825.00 770.00	0 90,750 254,100	
PURCHASED FROM OFF-SITE (INCLUDING 30% SWELL FACTOR)	56850	CY	10.00	568,500 -	
SITE RESTORATION BACKFILL, GRADE, COMPACT (2 EA) FERTILIZE, SEED, MULCH WETLAND RESTORATION UNDEVELOPED DESIGN D TOTAL AOC 9	) 182 36300 0.1 )ETAILS ~25%	DAY SY AC	1570.00 0.50 50000.00	285,740 18,150 5,000 - 767,090 \$ 3,835,000	



PROJECT: LANDFILL REMEDIATION FEASIBILITY STUDY ALTERNATIVE 4: NO FURTHER ACTION AT SAs 6,	12, 13, AOC 41;		JOB #		8712-04
LIMITED REMOVAL AT AOC 11; EXCAVATE AND CONSOLIDATE AOCs 9, 40 LOCATION: DEVENS, MASSACHUSETTS ENGINEER: ABB ENVIRONMENTAL SERVICES, INC.			DATE		24-Jan-97
ESTIMATOR: P. R. MARTIN					
EXCAVATE AND CONSOLIDATE AOC 40		= = =		= =	=====
DESCRIPTION	ΩΤΥ	UNIT	UNIT COST		TOTAL
SITE PREPARATION	• • • • • • • • • • • • • • • • • • •				
ACCESS ROAD - 600 LF (SEDIMENT REMOVAL AREA I)					
CLEAR & GRUB LIGHT VEGETATION	0.3	AC	4300.00	\$	1,290
GRADE - DOZER & OPERATOR	0.5	DAY	1760.00		880
GRAVEL - 12" THICK	450		10.00		4,500
	0.5	DAY	1570.00		1 350
	1350	31	1.00		-
CLEAR & GRUB LIGHT VEGETATION	0.25	AC.	4300.00		1.075
GRADE - DOZER & OPERATOR	0.5	DAY	1760.00		880
GRAVEL - 12" THICK	400	CY	10.00		4,000
SPREAD & COMPACT	0.5	DAY	1570.00		785
SEDIMENT DEWATERING PAD					-
CLEAR & GRUB LIGHT VEGETATION	0.25	AC	4300.00		1,075
GRADE - DOZER & OPERATOR	0.5	DAY	1760.00		880
GRAVEL - 12" THICK	400	CY	10.00		4,000
SPREAD & COMPACT	0.5	DAY	1570.00		785
LINER	10000	SF	1.00		10,000
SUMP & SUMP PUMP	1	LS	2500.00		2,500
DECON AREA - 10'x20'	3	EA	5000.00		15,000
					•
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					-
					-
					-
WORK PLATFORM (SEDIMENT REMOVAL AREA II)					-
GRADE - DOZER & OPERATOR	0.25	DAY	1760.00		440
GRAVEL - 12" THICK	150	CY	10.00		1,500
SPREAD & COMPACT	0.25		15/0.00		393
FILTER FABRIC	450	51	1.00		450
					-
					-
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					-
	TOTAL SITE PRI	PARATIO	 DN	\$	52,568
		**********	********************		



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PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY	JOB #	8712-04
	ALTERNATIVE 4: NO FURTHER ACTION AT SAs 6, 12, 13, AOC 41;		
	LIMITED REMOVAL AT AOC 11;		
	EXCAVATE AND CONSOLIDATE AOCs 9, 40	DATE	24-Jan-97
LOCATION:	DEVENS, MASSACHUSETTS		
ENGINEER:	ABB ENVIRONMENTAL SERVICES, INC.		

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EXCAVATE AND CONSOLIDATE AOC 40		= = =		= =	
MOBILIZATION			UNIT		
DESCRIPTION	QTY	UNIT	COST		TOTAL
EQUIPMENT (IN AND OUT)					
FRAC TANK	8	EA	250.00	\$	2,000
DEWATERING PUMP & HOSE	4	EA	100.00		400
DUMP TRUCKS	16	EA	385.00		6,160
BACKHOE	2	EA	730.00		1,460
ROLLER	4	EA	785.00		3,140
CLAM SHELL	2	EA	640.00		1,280
OFFICE TRAILER	7	MON	150.00		1,050
STORAGE TRAILER	7	MON	150.00		1.050
TRAILER DELIVERY, SET-UP, REMOVAL	2	EA	300.00		600
TOILET - 2 EA	60	WK	25.00		1,500
WATER COOLER - 2 EA	60	WΚ	25.00		1,500
WATER	300	DAY	15.00		4,500
TELEPHONE SERVICE	7	MON	500.00		3,500
ELECTRICITY	7	MON	250.00		1,750
PICK-UP (2 EA)	14	MON	1000.00		14,000
OFFICE EQUIPMENT	7	MON	1000.00		7,000
PUMPS, TOOLS, MINOR EQUIPMENT	1	LS	5000.00		5,000
LABORER (2 MEN*10 DAY/MAN*8 HR/DAY)	160	MNHR	33.50		5,360
CARPENTER (2 MEN*10 DAY/MAN*8 HR/DAY)	160	MNHR	48.00		7,680
ELECTRICIAN (2 MEN*10 DAY/MAN*8 HR/DAY)	160	MNHR	50.50		8,080
SITE SUPERINTENDANT (7 MON*210HR/MON)	1470	MNHR	65.00		95,550
FOREMAN (7 MON*210HR/MON)	1470	MNHR	55.00		80,850
CLERK/TYPIST (7 MON*168HR/MON)	1176	MNHR	25.00		29,400

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PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY ALTERNATIVE 4: NO FURTHER ACTION AT SAS 6, 12, 13, AOC 41:	JOB #	8712-04
	LIMITED REMOVAL AT AOC 11; EXCAVATE AND CONSOLIDATE AOCs 9, 40	DATE	24-Jan-97
LOCATION:	DEVENS, MASSACHUSETTS		
ENGINEER:	ABB ENVIRONMENTAL SERVICES, INC.		

		= = =			
SEDIMENT REMOVAL AND DISPOSAL DESCRIPTION	QTY	UNIT	UNIT COST		TOTAL
CONSTRUCT SILT FENCE AROUND CONTAMINATED AREAS	650	LF	5.00	\$	3,250 -
EXCAVATE WITH CLAMSHELL 1200 CY SEDIMENTS + 600 CY ACCESS ROADS/WORK PLATE	19 ORMS	DAY	1280.00		- 24,320 -
HAUL SEDIMENTS TO DEWATERING PAD (2 EA DUMP TRUCK & DRIVER)	38	DAY	770.00		29,260 -
LOAD DRY SEDIMENTS FOR TRANSPORTATION TO DISPOSAL AREA (FRONT END LOADER & OPERATOR)	10	DAY	825.00		- 8,250 - -
LABORERS - 2 EA FOR 25 DAYS	400	MNHR	33.50		- 13,400
TCLP TESTING	2	SMPL	1500.00		3,000
ON-SITE STABILIZATION OF SEDIMENTS WITH SAND	400	CY	15.00		6,000 -
TRANSPORTATION AND DISPOSAL AT CONSOLIDATION LANDFIL (3 EA DUMP TRUCK & DRIVER)	L 30	DAY	770.00		- 23,100 -
TRANSPORTATION OF WATER	140000	GAL		POSA	- .L
TREATMENT OF DEWATERING WATER	1	LS	21800.00		- 21,800
PUMP WATER FROM DEWATERING PAD TO PONDS	12	DAY	50.00		- 600 -
					-
					-
					-
					-
					-
TOTAL SEDIMENT REMOVAL AND DISPOSAL	*****			\$	132,980

PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY ALTERNATIVE 4: NO FURTHER ACTION AT SAs 6, LIMITED REMOVAL AT AOC 11;	12, 13, AOC 41;		JOB #		8712-04
LOCATION:	EXCAVATE AND CONSOLIDATE AOCs 9, 40 DEVENS, MASSACHUSETTS			DATE	2	24-Jan-97
ENGINEER:	ABB ENVIRONMENTAL SERVICES, INC.					
ESTIMATOR	: P. R. MARTIN					
	EXCAVATE AND CONSOLIDATE AOC 40	======	= = =		= = =	
	DRUM REMOVAL AND DISPOSAL DESCRIPTION	QTY	UNIT	UNIT COST	т	OTAL
BACKHOE	& OPERATOR	3	DAY	1460.00	\$	4,380
LABORER	- 2 EA, 3 DAYS	48	MNHR	33.50		1,608 -
						-
TRANSPO CONSO	RT DRUMS TO ELIDATION LANDFILL - DUMP TRUCK & DRIVER	3	DAY	770.00		2,310
TCLP TES	TING OF DRUM CONTENTS	2	EA	1500.00		- 3,000
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TOTAL DRUM REMOVAL AND DISPOSAL

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11,298

\$

PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY	JOB #	8712-04
	ALTERNATIVE 4: NO FURTHER ACTION AT SAs 6, 12, 13, AOC 41;		
	LIMITED REMOVAL AT AOC 11;		
	EXCAVATE AND CONSOLIDATE AOCs 9, 40	DATE	24-Jan-97
LOCATION:	DEVENS, MASSACHUSETTS		
ENGINEER:	ABB ENVIRONMENTAL SERVICES, INC.		

FXCAVATE AND CONSOLIDATE AOC 40			*==**==	= =	
EXCAVATION AND BACKFILL DESCRIPTION	ΟΤΥ	UNIT	UNIT COST		TOTAL
CLEAR & GRUB SITE	4	AC	4300.00	\$	17,200
EROSION CONTROL	500	LF	5.00		2,500
SUMP PUMP & HOSES	6	MON	2500.00		15,000
UXO CLEARANCE	138	DAY	1800.00		248,400
EXCAVATION OF 110000 CY OF DEBRIS BACKHOE & OPERATOR TRANSPORT TO ON-SITE CONSOLIDATION LANDFILL (50% SWELL	138 FACTOR INCL	DAY UDED)	1460.00		201,480
DUMP TRUCK & DRIVER (8 EA)	1100	DAY	770.00		847,000 -
SPREAD OVER ON-SITE CONSOLIDATION LANDFILL & COMPACT ROLLER & OPERATOR (2 EA)	276	DAY	1570.00		- 433,320 -
BACKFILL PURCHASED FROM OFF-SITE (INCLUDING 30% SWELL FACTOR)	18710	CY	10.00		- 187,100 -
SITE RESTORATION BACKFILL, GRADE, COMPACT FERTILIZE, SEED, MULCH	24 19360	DAY SY	1570.00 0.50		37,680 9,680
WETLANDS RESTORATION	4	AC	50000.00		200,000
MONITORING WELLS, 4" DIA x 30' DP	2	EA	2400.00		4,800
GUIDE RAIL ALONG ROAD	1000	LF	12.50		12,500

TOTAL EXCAVATION AND BACKFILL \_\_\_\_\_

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\$ 2,216,660 ......

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PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY ALTERNATIVE 4: NO FURTHER ACTION AT SAS 6. 1	12. 13. AOC 41:		JOB #	8712	2-04
LOCATION: ENGINEER:	LIMITED REMOVAL AT AOC 11; EXCAVATE AND CONSOLIDATE AOCs 9, 40 DEVENS, MASSACHUSETTS ABB ENVIRONMENTAL SERVICES, INC.			DATE	24-Jan	-97
ESTIMATOR:	P. R. MARTIN					
	EXCAVATE AND CONSOLIDATE AOC 40		= = = =			: =:
*****	DESCRIPTION	QTY	UNIT	COST	TOTAL	
TOTAL SITE	PREPARATION				\$ 52,5	68
TOTAL MOBI	LIZATION				282,8	10
	MENT REMOVAL AND DISPOSAL				132,9	180
TOTAL DRUM	I REMOVAL AND DISPOSAL				11,2	98
TOTAL EXCA	VATION AND BACKFILL				2,216,6	60
	UNDEVELOPED DESIGN DETAILS ~25%				673,6	85
	TOTAL AOC 40				\$ 3,370,0	00

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	PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY	JOB #	8712-04
		ALTERNATIVE 4: NO FURTHER ACTION AT SAs 6, 12, 13, AOC 41;		
		LIMITED REMOVAL AT AOC 11;		
		EXCAVATE AND CONSOLIDATE AOCs 9, 40	DATE	24-Jan-97
,	LOCATION:	DEVENS, MASSACHUSETTS		
	ENGINEER:	ABB ENVIRONMENTAL SERVICES, INC.		

CONSOLIDATION LANDFILL CONSTRUCTION	ON			
DESCRIPTION	ΩΤΥ	UNIT	UNIT COST	TOTAL
MOBILIZATION				 ,,********************************
DUMP TRUCKS - 16 EA	32	EA	385.00	\$ 12,320
BACKHOE - 2 EA	4	EA	730.00	2,920
ROLLER - 2 EA	4	EA	785.00	3,140
DOZER	2	EA	880.00	1,760
				-
OFFICE TRAILER	9	MON	150.00	1,350
STORAGE TRAILER	9	MON	150.00	1,350
TRAILER DELIVERY, SET-UP, REMOVAL	2	EA	300.00	600
TOILET - 2 EA	80	WK	25.00	2,000
WATER COOLER - 2 EA	80	WK	25.00	2,000
WATER	400	DAY	15.00	6,000
TELEPHONE SERVICE	9	MON	500.00	4,500
ELECTRICITY	9	MON	250.00	2,250
PICK-UP (2 EA)	18	MON	1000.00	18,000
OFFICE EQUIPMENT	9	MON	1000.00	9,000
PUMPS, TOOLS, MINOR EQUIPMENT	1	LS	5000.00	5,000
LABORER (2 MEN*10 DAY/MAN*8 HR/DAY)	160	MNHR	33.50	5,360
CARPENTER (2 MEN*10 DAY/MAN*8 HR/DAY)	160	MNHR	48.00	7,680
ELECTRICIAN (2 MEN*10 DAY/MAN*8 HR/DAY)	160	MNHR	50.50	8,080
				-
SITE SUPERINTENDANT (9 MON*210HR/MON)	1890	MNHR	65.00	122,850
FOREMAN (9 MON*210HR/MON)	1890	MNHR	55.00	103,950
CLERK/TYPIST (9 MON*168HR/MON)	1512	MNHR	25.00	37,800
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PROJECT: LANDFILL REMEDIATION FEASIBILITY STUDY ALTERNATIVE 4: NO FURTHER ACTION AT SAS 6, 12, 13, AOC 41;					8712-04	
LOCATION: ENGINEER:	LIMITED REMOVAL AT AOC 11; EXCAVATE AND CONSOLIDATE AOCs 9, 40 DEVENS, MASSACHUSETTS ABB ENVIRONMENTAL SERVICES, INC.			DATE	24-Jan-97	
ESTIMATOR:	P. R. MARTIN					
	CONSOLIDATION LANDFILL CONSTRUCTION SITE PREPARATION	======	= = =			
	UESUMIT HUIN	ui t				
CLEAR & GRI	JB SITE	10	AC	4300.00	\$ 43,000	
					•	
					-	
	ACCESS ROAD IMPROVEMENTS					
CRUSHED ST 2' DIA RCP C	ONE, 2' DEEP × 24' WIDE ULVERT	1800 40	CY LF	30.00 50.00	54,000 2,000	
					-	
SILT FENCE HAY BALES		2800 500	LF EA	5.00 5.00	14,000 2,500	
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******		TOTAL SITE PRE	PARATI	 ON	\$ 115,500	

PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY ALTERNATIVE 4: NO FURTHER ACTION AT SAS 6, 1	2. 13. AOC 41:		JOB #	8712-04
	LIMITED REMOVAL AT AOC 11; EXCAVATE AND CONSOLIDATE AOCs 9, 40 DEVENS, MASSACHUSETTS	_,,,		DATE	24-Jan-97
ENGINEER:	ABB ENVIRONMENTAL SERVICES, INC.				
ESTIMATOR	R: P. R. MARTIN				
			=== :		
	CONSOLIDATION LANDFILL CONSTRUCTION				
	DESCRIPTION	ΩΤΥ	UNIT	COST	TOTAL
	······································				
EXCAVATE	LANDFILL BASE & BY-PASS DITCH BACK HOE & OPERATOR (2 EA)	126	DAY	1460.00	183 960
HAUL TO O	N-SITE STOCKPILE (23250 CY)	120	BAT	1400.00	100,000
	DUMP TRUCK & DRIVER (3 EA)	45	DAY	770.00	34,650
HAUL TO A	OC-9 & STOCKPILE (88750 CY)				
		880	DAY	770.00	677,600
DOZEN & O		55	DAT	1760.00	90,800
CLAY		31850	CY	10.00	- 318.500
GEOMEMBF	ANE	330000	SF	0.65	214,500
FILTER FAB	RIC	330000	SF	0.10	33,000
10-2 SAND	DRAINAGE LAYER	15925	CY	12.00	191,100
10-3 SAND	DRAINAGE LAYER	15925	CY	17.00	270,725
ROLLER & C	DPERATOR	80	DAY	1570.00	125,600
					-
6" DIA PERI	F PVC PIPE	2500	LE	6.00	15.000
12" DIA SO	LID WALL PVC PIPE	1600	LF	15.00	24,000
6"x12" PV0	CWYE	5	EA	500.00	2,500
					-
5' DIA PREC	CAST MANHOLE	10	VLF	250.00	2,500
FRAME, CO	VER, ETC.	1	LS	300.00	300
CONCRETE	FILL PAD, SUMP, ELECTRICAL	1	LS	35000.00	35,000
CONTRO	LS, ALARM, FILL PIPING, BOLLARDS				-
HAUL LEAC 10 HR/D/	HATE TO BASE TREATMENT PLANT AY * 5 DAY/WK * 52 WK	2600	HR	100.00	260,000 -
					-
NOTE:	ALL LINER SOIL MATERIAL QUANTITIES INCLUDE A 30% SWELL FACTOR				-

TOTAL LINER CONSTRUCTION ---

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\$ 2,485,735

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PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY	JOB #	8712-04
	ALTERNATIVE 4: NO FURTHER ACTION AT SAs 6, 12, 13, AOC 41;		
	LIMITED REMOVAL AT AOC 11;		
	EXCAVATE AND CONSOLIDATE AOCs 9, 40	DATE	24-Jan-97
LOCATION:	DEVENS, MASSACHUSETTS		
ENGINEER:	ABB ENVIRONMENTAL SERVICES, INC.		

CONSOLIDATION LANDFILL CONSTRUCTION		= = =		= =	
FINAL COVER CONSTRUCTION DESCRIPTION	QTY	UNIT	UNIT COST		TOTAL
SUBGRADE BUFFER	15925	CY	10.00	\$	159,250
TEXTURED GEOMEMBRAND	330000	SF	0.80		264,000
FILTER FABRIC	330000	SF	0.10		33,000
10-3 SAND DRAINAGE LAYER	15925	CY	17.00		270,725
MOISTURE RETENTION LAYER	23900	CY	10.00		239,000
VEGETATIVE LAYER	7950	CY	14.00		111,300
ROLLER & OPERATOR	80	DAY	1570.00		125,600
HYDROSEEDING					-
SEED, FERTILIZE, MULCH	10	AC	2000.00		20,000
MONITORING WELLS	4	EA	2500.00		10,000
					-

## NOTE: ALL FINAL COVER SOIL MATERIAL QUANTITIES INCLUDE A 30% SWELL FACTOR

TOTAL FINAL COVER CONSTRUCTION \$ 1,232,875

PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY AI TERNATIVE 4: NO FURTHER ACTION AT SAS 6	12 13 AOC 41:		JOB #		8712-04
LOCATION: ENGINEER:	LIMITED REMOVAL AT AOC 11; EXCAVATE AND CONSOLIDATE AOCs 9, 40 DEVENS, MASSACHUSETTS ABB ENVIRONMENTAL SERVICES, INC.	.2, .0,		DATE		24-Jan-97
ESTIMATOR	R: P. R. MARTIN					
	CONSOLIDATION LANDFILL CONSTRUCTION	=======	z = =		= =	
	DESCRIPTION	ΩΤΥ	UNIT	UNIT COST		TOTAL
TOTAL MOE	BILIZATION				\$	357,910
TOTAL SITE	PREPARATION					115,500
TOTAL LINE	ER CONSTRUCTION					2,485,735
TOTAL FINA	AL COVER CONSTRUCTION					1,232,875

.

UNDEVELOPED DESIGN DETAILS ~25%

TOTAL CONSOLIDATION LANDFILL CONSTRUCTION

1,047,980

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\$ 5,240,000

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PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY ALTERNATIVE 4: NO FURTHER ACTION AT SAs 6, 1	2, 13, AOC 41	;	JOB #		8712-04
LOCATION: ENGINEER:	LIMITED REMOVAL AT AOC 11; EXCAVATE AND CONSOLIDATE AOCs 9, 40 DEVENS, MASSACHUSETTS ABB ENVIRONMENTAL SERVICES, INC.			DATE		24-Jan-97
ESTIMATOR	: P. R. MARTIN					
	ANNUAL O&M COSTS		= = =		= =	
	AOC 11 DESCRIPTION	ΩΤΥ	UNIT	COST		TOTAL
O&M COSTS DUMP TR	5 TWICE PER YEAR FOR TWO YEARS FOR SITE RESTO UCK & DRIVER	RATION 2	DAY	770.00	\$	1,540

1

LS

32 MNHR

500.00

33.50

UNDEVELOPED	DESIGN	DFTAILS	~25%
	DLOIGN	DLIALU	20/0

888 \$ 4,000

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500

1,072

TOTAL ANNUAL O&M COSTS

MATERIALS

LABORER - 2 EA

PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY ALTERNATIVE 4: NO FURTHER ACTION AT SAs 6, 12, 13, AOC 41:	JOB #	8712-04
LOCATION: ENGINEER:	LIMITED REMOVAL AT AOC 11; EXCAVATE AND CONSOLIDATE AOCs 9, 40 DEVENS, MASSACHUSETTS ABB ENVIRONMENTAL SERVICES, INC.	DATE	24-Jan-97

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ANNUAL O&M COSTS AT CONSOLIDATION LANDFILL		===		= =	= = = = =
DESCRIPTION	QTY	UNIT	UNIT COST		TOTAL
O&M COSTS OCCURING OVER THIRTY YEARS FOR CONSOLIDATIO	N LANDFILL		••••••		******
FIVE YEAR SITE REVIEW - ANNUALIZED	0.1810	LS	10000.00	\$	1,810
ENVIRONMENTAL MONITORING					-
GROUNDWATER, 4 WELLS, SEMI-ANNUALLY					_
GENERAL PARAMETERS & METALS	8	SMPL	940.00		7,520
LANDFILL COVER MAINTENANCE					-
INSPECTION - 2 DAY @ 2 MEN/DAY	32	MNHR	75.00		2,400
					-
	1	DAY	770.00		770
FRONT END LOADER & OPERATOR	1	DAY	825.00		825
LABORER - 2 EA	16	MNHR	33.50		536
MATERIALS	1	LS	500.00		500
MOWING	2	EVENT	1000.00		2,000
BI-ANNUAL REPORT TO DEP - ANNUALIZED	0.4878	LS	2500.00		1,220
AYER WWTP USER FEE	600	CCF	2.00		1,200
UNDEVELOPED DESIGN DETAILS ~25%					4,220
TOTAL ANNUAL O&M COSTS FOR 30 YEAR ACTIVITI	ES			\$	23,000

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PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY	12 13 AOC 41.		JOB #		8712-04
	LIMITED REMOVAL AT AOC 11; EXCAVATE AND CONSOLIDATE AOCs 9, 40	12, 10, 400 41,		DATE		24-Jan-97
LOCATION: ENGINEER:	DEVENS, MASSACHUSETTS ABB ENVIRONMENTAL SERVICES, INC.					
ESTIMATOR	: P. R. MARTIN					
	======================================		===		= =	=====
	DESCRIPTION	ΩΤΥ	UNIT	UNIT COST		TOTAL
O&M COSTS	COCCURING OVER FIVE YEARS FOR CSB LANDFILL T. 2 SAMPLES AT 2 LOCATIONS, ONE TIME ONLY A	 YEAR 5				
META	LS - ANNUALIZED	0.7239	SMPL	625.00	\$	452
GROUND	WATER MONITORING, 2 WELLS, SEMI-ANNUALLY					-
GENER	AL PARAMETERS & METALS	4	SMPL	1020.00		4,080
SAMPLE ( PURGE	COLLECTION (INCLUDES WELL , SAMPLE COLLECTION, AND SHIPMENT)	2	LS	2500		5,000
	S RESTORATION MONITORING					-
1 DAY	@ 2 MEN/DAY, SEMI-ANNUALLY	32	MNHR	75.00		2,400
BIO MONI	TORING, BI-ANNUALLY	0.4878	LS	15000.00		7,317
FIVE YEAI PUBLIC	R EDUCATION PROGRAM ONCE MEETING - ANNUALIZED	0.1810	LS	2500.00		452
FIVE YEAI	R SITE REVIEW - ANNUALIZED	0.1810	LS	20000.00		3,619
	UNDEVELOPED DESIGN DETAILS ~25%					5,679
	TOTAL ADDITIONAL ANNUAL O&M COSTS FOR AC	0C 40 - 5 YEAR			\$	29,000

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PROJECT:		JOB #	8712-04
	CAP-IN-PLACE SAs 6, 12, 13, AOC 41;		
	EXCAVATE AND CONSOLIDATE AOCs 9, 40	DATE	24-Jan-97
ENGINEER:	ABB ENVIRONMENTAL SERVICES, INC.		

	COST SUMMARY TABLE					
	DESCRIPTION	ΩΤΥ	UNIT	UNIT COST		TOTAL
DIRECT COS						
LIMITED	REMOVAL AT AOC 11				ŝ	44.00
CAP IN P	LACE				•	
	SA 6					159,00
	SA 12					507,000
	SA 13					395,000
	AOC 41					175,000
EXCAVA	TE AND CONSOLIDATE					
	AOC 9					3,835,000
	AOC 40					3.370.000
	CONSOLIDATION LANDFILL CONSTRUCTION					5,240,000
	TOTAL DIRECT COSTS				\$ 1	13,725,000
INDIRECT CO	OSTS					
	HEALTH AND SAFETY			5.00%	\$	686,000
	LEGAL, ADMIN, PERMITTING			5.00%		686,000
	ENGINEERING			10.00%		1,373,000
	SERVICES DURING CONSTRUCTION			10.00%		1,373,000
	TOTAL INDIRECT COSTS				\$	4,118,000
	TOTAL CAPITAL (DIRECT + INDIRECT) COST				\$ <sup>-</sup>	17,843,000
OPERATING	AND MAINTENANCE COSTS					
0. 2.0	TOTAL ANNUAL O&M COSTS FOR AOC 11 - 2 YR	s			Ś	4.000
	TOTAL ANNUAL 0&M COSTS FOR CAP-IN-PLACE	•			\$	109,000
	TOTAL ANNUAL ORM COSTS FOR NEW LANDER	- 30 VBS			Ś	23.000
	TOTAL ADDITIONAL ANNUAL 0&M COSTS FOR A	OC 40 - 5 YRS			\$	29,000
	TOTAL PRESENT WORTH OF OPERATING AND MA	INTENANCE CO	STS		\$	1,764,000
	TOTAL COSTS				ŝ	19.607.00
PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY	JOB #	8712-04			
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	ALTERNATIVE 5: LIMITED REMOVAL AT AOC 11;					
	CAP-IN-PLACE SAs 6, 12, 13, AOC 41;					
	EXCAVATE AND CONSOLIDATE AOCs 9, 40	DATE	24-Jan-97			
LOCATION:	DEVENS, MASSACHUSETTS					
ENGINEER:	ABB ENVIRONMENTAL SERVICES, INC.					

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LIMITED REMOVAL AND DISPOSAL IN CONSOLIDATION LAND	DFILL AOC 11				
DESCRIPTION	ΩΤΥ	UNIT	UNIT COST		TOTAL
MOB/DEMOB (IN and OUT)				*	*************
DUMP TRUCKS	4	EA	385.00	\$	1,540
BACKHOE	2	EA	730.00		1,460
ROLLER	2	EA	785.00		1,570
TOILET - 1 EA	1	WK	25.00		25
WATER COOLER - 1 EA	1	WK	25.00		25
WATER	5	DAY	15.00		75
PICK-UP (2 EA)	0.5	MON	1000.00		500
FOREMEN	50	MNHR	55.00		2,750
					-
EXCAVATION OF DEBRIS -	5	DAY	1460.00		7,300
BACKHOE & OPERATOR					-
TRANSPORT TO ON-SITE CONSOLIDATION LANDFILL - DUMP TRUCK & DRIVER - 2 EA	10	DAY	770.00		7,700 -
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	PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY	JOB #	8712-04
		ALTERNATIVE 5: LIMITED REMOVAL AT AOC 11;		
		CAP-IN-PLACE SAs 6, 12, 13, AOC 41;		
k		EXCAVATE AND CONSOLIDATE AOCs 9, 40	DATE	24-Jan-97
)	LOCATION:	DEVENS, MASSACHUSETTS		
	ENGINEER:	ABB ENVIRONMENTAL SERVICES, INC.		

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LIMITED REMOVAL AND DISPOSAL IN CONSOLIDATION LANDFILL AOC 11					
DESCRIPTION	ΔΤΥ	UNIT	UNIT COST		TOTAL
TOTAL PREVIOUS PAGE				\$	22,945
BACKFILL PURCHASED FROM OFF-SITE (INCLUDING 30% SWELL FACTOR)	625	CY	10.00		6,250 -
SITE RESTORATION BACKFILL, GRADE, COMPACT FERTILIZE, SEED, MULCH	2 5000	DAY SY	1570.00 0.50		3,140 2,500 - -
UNDEVELOPED DESIGN DETAILS ~25%					- 9,165
TOTAL AOC 11				\$	44,000

Page 3

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PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY	JOB #	8712-04
	ALTERNATIVE 5: LIMITED REMOVAL AT AOC 11;		
	CAP-IN-PLACE SAs 6, 12, 13, AOC 41;		
	EXCAVATE AND CONSOLIDATE AOCs 9, 40	DATE	24-Jan-97
LOCATION:	DEVENS, MASSACHUSETTS		•
ENGINEER:	ABB ENVIRONMENTAL SERVICES, INC.		

CAP IN PLACE SA 6	== ======			= =	=====
MOB/DEMOB	,		UNIT		
DESCRIPTION	QTY	UNIT	COST		TOTAL
MOB/DEMOB EQUIPMENT (IN OR OUT)	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	**********		******	
FRONT END LOADER	2	EA	410.00	\$	820
DUMP TRUCK	2	EA	385.00		770
BACK HOE	2	EA	730.00		1,460
DOZER	2	EA	880.00		1,760
ROLLER	2	EA	785.00		1,570
					-
	1	MON	150.00		- 150
STOBAGE TRAILER	1	MON	100.00		100
SET UP TRAILER	2	EA	500.00		1.000
	-	_, ,	•••••		-
TOILET - 2 EA	8	WК	25.00		200
WATER COOLER - 2 EA	8	WК	25.00		200
WATER	40	DAY	15.00		600
TELEPHONE SERVICE	1	MON	500.00		500
ELECTRICITY	1	MON	250.00		250
PICK-UP (2 EA)	2	MON	1000.00		2,000
					-
PUMPS, TOOLS, MINOR EQUIPMENT	1	MON	500.00		500
• •					-
SITE SUPERINTENDANT ( 1 MON * 210 HR/MON)	210	MNHR	65.00		13,650
FOREMEN (1 MON * 210 HR/MON)	210	MNHR	55.00		11,550
CLERK/TYPIST (1 MON * 168 HR/MON)	168	MNHR	25.00		4,200

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TOTAL MOB/DEMOB

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\$ 41,280

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PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY ALTERNATIVE 5: LIMITED REMOVAL AT AOC 11:	JOB #	8712-04
	CAP-IN-PLACE SAs 6, 12, 13, AOC 41; EXCAVATE AND CONSOLIDATE AOCs 9, 40	DATE	24- Jap-97
LOCATION:	DEVENS, MASSACHUSETTS		24-3811-37

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SITE PREPARATION & CAP CONSTRUCTION			UNIT		
DESCRIPTION	ΩΤΥ	UNIT	COST		TOTAL
SITE PREPARATION					
ACCESS ROAD - 675 LF x 15' WIDE					
GRADE ROAD BED - DOZER & OPERATOR	1	DAY	1760.00	\$	1,760
GRAVEL - 12" THICK	375	CY	10.00		3,750
SPREAD & COMPACT	0.5	DAY	1570.00		785
GEOFABRIC	1125	SY	1.00		1,125
CLEAR TREES FROM SITE	0.25	AC	6900.00		1,725
ARCHAEOLOGICAL SURVEY OF LANDFILL					-
PROJECT MANAGER	1	DAY	425.00		425
PRINCIPAL INVESTIGATOR	1	DAY	385.00		385
PROJECT ARCHAEOLOGIST	7	DAY	280.00		1,960
ASSISTANT ARCHAEOLOGIST	6	DAY	195.00		1,170
WORK PROCESSOR	1	DAY	185.00		185
ODCs	1	LS	100.00		100
MILAGE	1000	MILE	0.25		250
PER DIEM	5	DAY	60.00		300
UXO CLEARANCE	2	DAY	1800.00		3,600
GRADING & DRAINAGE SWALE CONSTRUCTION					-
DOZER & OPERATOR	1	DAY	1760.00		1,760
LABORER	8	HR	33.50		268
TOTAL SITE PREPARATION				\$	19,548
CAP CONSTRUCTION					
SUBGRADE SOIL	520	CY	10.00	\$	5,200
TEXTURED GEOMEMBRANE	6750	SF	0.80		5,400
DRAINAGE SOIL	365	CY	17.00		6,205
GEOTEXTILE FABRIC LAYER	6750	SF	0.10		675
MOISTURE RETENTION SOIL	650	CY	10.00		6,500
VEGETATIVE SOIL	230	CY	14.00		3,220
SPREAD & COMPACT	3	DAY	1570.00		4,710
TOTAL CAP CONSTRUCTION				\$	31,910
NOTE: CAP SOIL MATERIAL QUANTITIES INCLUDE	A 30% SWELL F	ACTOR.			

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PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY			JOB #		8712-04	
LOCATION: ENGINEER:	CAP-IN-PLACE SAS 6, 12, 13, AOC 41; EXCAVATE AND CONSOLIDATE AOCS 9, 40 DEVENS, MASSACHUSETTS ABB ENVIRONMENTAL SERVICES, INC.			DATE		24-Jan-97	
ESTIMATOR:	P. R. MARTIN						
	CAP IN PLACE SA 6		= = =		= =	====	
SITE RESTOR	ATION, MONITORING WELLS, INSTITUTIONAL CON DESCRIPTION	TROLS QTY	UNIT	UNIT COST		TOTAL	
	SITE RESTORATION						
Chain Lin 12' Swing Fertilize	IK FENCE G GATE , SEED, MULCH	400 1 1000	LF EA SY	13.00 800.00 0.50	\$	5,200 800 500	
	TOTAL SITE RESTORATION		·		\$	6,500	
MONITORING	G WELLS - 4" DIA x 30' DEEP	. 4	EA	4500.00	\$	18,000	
INSTITUTION	JAL CONTROLS	1	LS	10000.00	\$	10,000	

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PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY	JOB #	8712-04
	CAP-IN-PLACE SAs 6, 12, 13, AOC 41;		
LOCATION:	EXCAVATE AND CONSOLIDATE AOCs 9, 40 DEVENS, MASSACHUSETTS	DATE	24-Jan-97
ENGINEER:	ABB ENVIRONMENTAL SERVICES, INC.		

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CAP IN PLACE SA 6		===		= =	
SUMMARY SHEET DESCRIPTION	ΩΤΥ	UNIT	UNIT COST		TOTAL
TOTAL MOB/DEMOB				\$	41,280
TOTAL SITE PREPARATION					19,548
TOTAL CAP CONSTRUCTION					31,910
TOTAL SITE RESTORATION					6,500
TOTAL MONITORING WELLS					18,000
TOTAL INSTITUTIONAL CONTROLS					10,000
UNDEVELOPED DESIGN DETAILS ~25%					31,762
TOTAL SA 6				\$	159,000

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PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY	JOB #	8712-04
	ALTERNATIVE 5: LIMITED REMOVAL AT AOC 11;		
	CAP-IN-PLACE SAs 6, 12, 13, AOC 41;		
	EXCAVATE AND CONSOLIDATE AOCs 9, 40	DATE	24-Jan-97
LOCATION:	DEVENS, MASSACHUSETTS		
ENGINEER:	ABB ENVIRONMENTAL SERVICES, INC.		•

CAP IN PLACE SA 12 MOB/DEMOB			= = = = = = = = = = = = = = = = = = =	= =	
DESCRIPTION	QTY	UNIT	COST		TOTAL
MOB/DEMOB EQUIPMENT (IN OR OUT)		*********			
FRONT END LOADER	2	EA	410.00	\$	820
DUMP TRUCK	2	EA	385.00		770
BACK HOE	2	EA	730.00		1,460
DOZER (2 EA)	4	EA	880.00		3,520
ROLLER (2 EA)	4	EA	785.00		3,140
					-
	2	MON	150.00		- 300
STORAGE TRAILER	2	MON	100.00		200
SET UP TRAILER	2	EA	500.00		1,000
	_				-
TOILET - 2 EA	16	WK	25.00		400
WATER COOLER - 2 EA	16	WΚ	25.00		400
WATER	40	DAY	15.00		600
TELEPHONE SERVICE	2	MON	500.00		1,000
ELECTRICITY	2	MON	250.00		500
PICK-UP (2 EA)	4	MON	1000.00		4,000
PUMPS, TOOLS, MINOR EQUIPMENT	2	MON	500.00		1,000
SITE SUPERINTENDANT ( 2 MON * 210 HR/MON)	420	MNHR	65.00		27,300
FOREMEN (2 MON * 210 HR/MON)	420	MNHR	55.00		23,100
CLERK/TYPIST (2 MON * 168 HR/MON)	336	MNHR	25.00		8,400
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TOTAL MOB/DEMOB

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\$77,910

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PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY	JOB #	8712-04
	ALTERNATIVE 5: LIMITED REMOVAL AT AOC 11;		
	CAP-IN-PLACE SAs 6, 12, 13, AOC 41;		
	EXCAVATE AND CONSOLIDATE AOCs 9, 40	DATE	24-Jan-97
LOCATION:	DEVENS, MASSACHUSETTS		
ENGINEER:	ABB ENVIRONMENTAL SERVICES, INC.		

		=== :		= =	
SITE PREPARATION, CAP CONSTRUCTION, SITE RESTOR	RATION		UNIT		
DESCRIPTION	QTY	UNIT	COST		TOTAL
SITE PREPARATION					
ACCESS ROAD - 300 LF x 20' WIDE					
GRADE ROAD BED - DOZER & OPERATOR	0.5	DAY	1760.00	\$	880
GRAVEL - 12" THICK	80	CY	10.00		800
SPREAD & COMPACT	0.25	DAY	1570.00		393
GEOFABRIC	700	SY	1.00		700
CLEAR TREES FROM SITE	0.5	AC	6900.00		3,450
EROSION CONTROL	325	LF	5.00		1,625
UXO CLEARANCE	15	DAY	1800.00		27,000
GRADING & DRAINAGE SWALE CONSTRUCTION					-
DOZER & OPERATOR	2	DAY	1760.00		3,520
LABORER	16	HR	33.50		536
TOTAL SITE PREPARATION				\$	38,904
CAP CONSTRUCTION					
SUBGRADE SOIL	9450	CY	10.00	\$	94,500
TEXTURED GEOMEMBRANE	40950	SF	0.80		32,760
DRAINAGE SOIL	2050	CY	17.00		34,850
GEOTEXTILE FABRIC LAYER	40950	SF	0.10		4,095
MOISTURE RETENTION SOIL	3200	CY	10.00		32,000
VEGETATIVE SOIL	1150	CY	14.00		16,100
SPREAD & COMPACT	20	DAY	1570.00		31,400
TOTAL CAP CONSTRUCTION				\$	245,705
NOTE: CAP SOIL MATERIAL QUANTITIES INCLUD	PE A 30% SWELL F	ACTOR.			-
					-
	1000	1 E	13.00	ŝ	13.000
	1	FA	800.00	•	800
FERTILIZE, SEED, MULCH	2400	SY	0.50		1,200
TOTAL SITE RESTORATION				\$	15,000
					•

PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY ALTERNATIVE 5: LIMITED REMOVAL AT AOC 11;				JOB #		8712-04	
LOCATION: ENGINEER:	CAP-IN-PLACE SAs 6, 12, 13, AOC 41; EXCAVATE AND CONSOLIDATE AOCs 9, 40 DEVENS, MASSACHUSETTS ABB ENVIRONMENTAL SERVICES, INC.				DATE		24-Jan-97	
ESTIMATOR	: P. R. MARTIN							
~====	CAP IN PLACE SA 12					= =	_ = = = =	
	MONITORING WELLS & INSTITUTIONAL CONTROLS DESCRIPTION	ΩΤΥ		UNIT	UNIT COST		TOTAL	
MONITORING	G WELLS - 4" DIA x 30' DEEP		4	EA	4500.00	\$	18,000	
INSTITUTION	VAL CONTROLS		1	LS	10000.00	\$	10,000	

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PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY	JOB #	8712-04
	ALTERNATIVE 5: LIMITED REMOVAL AT AOC 11;		
	CAP-IN-PLACE SAs 6, 12, 13, AOC 41;		
	EXCAVATE AND CONSOLIDATE AOCs 9, 40	DATE	24-Jan-97
LOCATION:	DEVENS, MASSACHUSETTS		
ENGINEER:	ABB ENVIRONMENTAL SERVICES, INC.		

CAP IN PLACE SA 12		******* <b>***</b> ***					
SUMMARY SHEET DESCRIPTION		ΩΤΥ	UNIT	UNIT COST		TOTAL	
TOTAL MOB/DEMOB					\$	77,910	
TOTAL SITE PREPARATION						38,904	
TOTAL CAP CONSTRUCTION						245,705	
TOTAL SITE RESTORATION						15,000	
TOTAL MONITORING WELLS						18,000	
TOTAL INSTITUTIONAL CONTROLS						10,000	
UNDEVELOPED DESIGN DETAILS ~25%						101,482	
TOTAL SA 12					\$	507,000	

PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY	JOB #	8712-04
	ALTERNATIVE 5: LIMITED REMOVAL AT AOC 11;		
	CAP-IN-PLACE SAs 6, 12, 13, AOC 41;		
	EXCAVATE AND CONSOLIDATE AOCs 9, 40	DATE	24-Jan-97
LOCATION:	DEVENS, MASSACHUSETTS		
ENGINEER:	ABB ENVIRONMENTAL SERVICES, INC.		

				= =	
MOB/DEMOB DESCRIPTION	ΟΤΥ		UNIT		ΤΟΤΑΙ
	····				
MOB/DEMOB EQUIPMENT (IN OR OUT)					
FRONT END LOADER	2	EA	410.00	\$	820
DUMP TRUCK	2	EA	385.00		770
BACK HOE	2	EA	730.00		1,460
DOZER	2	EA	880.00		1,760
ROLLER	2	EA	785.00		1,570
					-
					-
OFFICE TRAILER	1.5	MON	150.00		225
STORAGE TRAILER	1.5	MON	100.00		150
SET UP TRAILER	2	EA	500.00		1,000
					-
TOILET - 2 EA	12	WK	25.00		300
WATER COOLER - 2 EA	12	WΚ	25.00		300
WATER	60	DAY	15.00		900
TELEPHONE SERVICE	· 1.5	MON	500.00		750
ELECTRICITY	1.5	MON	250.00		375
PICK-UP (2 EA)	3	MON	1000.00		3,000
					-
PUMPS, TOOLS, MINOR EQUIPMENT	1.5	MON	500.00		750
					-
SITE SUPERINTENDANT ( 1.5 MON * 210 HR/MON)	315	MNHR	65.00		20,475
FOREMEN (1.5 MON * 210 HR/MON)	315	MNHR	55.00		17,325
CLERK/TYPIST (1.5 MON * 168 HR/MON)	252	MNHR	25.00		6,300
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PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY ALTERNATIVE 5: LIMITED REMOVAL AT AOC 11:	JOB #	8712-04
	CAP-IN-PLACE SAs 6, 12, 13, AOC 41; EXCAVATE AND CONSOLIDATE AOCs 9, 40	DATE	24- Ian-97
LOCATION: ENGINEER:	DEVENS, MASSACHUSETTS ABB ENVIRONMENTAL SERVICES INC	DATE	24-5an-57

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	= =	
UNIT COST		TOTAL
1760.00	ŝ	880
10.00	•	1.500
1570.00		393
1.00		450
6900.00		3,450
5.00		- 1,500
		-
1760.00		1.760
33.50		268
	 \$	10,201
		·
10.00	\$	56,000
0.80		33,680
17.00		35,700
0.10		4,210
10.00		33,500
14.00		16,100
1570.00		25,120
	\$	204,310
l.		-
		-
13.00	Ś	- 11 700
800.00	¥	800
0.50		2,650
	 ¢	
	Ŷ	15,150
		\$

PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY				JOB #		8712-04	
LOCATION: ENGINEER:	CAP-IN-PLACE SAS 6, 12, 13, AOC 41; EXCAVATE AND CONSOLIDATE AOCs 9, 40 DEVENS, MASSACHUSETTS ABB ENVIRONMENTAL SERVICES, INC.				DATE		24-Jan-97	
ESTIMATOR	P. R. MARTIN							
	CAP IN PLACE SA 13					=		
	DESCRIPTION	QTY		UNIT	COST		TOTAL	
MONITORING	G WELLS - 4" DIA x 30' DEEP		4	EA	4500.00	\$	18,000	
INSTITUTION	NAL CONTROLS		1	LS	10000.00	\$	10,000	

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PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY	JOB #	8712-04
	ALTERNATIVE 5: LIMITED REMOVAL AT AOC 11;		
	CAP-IN-PLACE SAs 6, 12, 13, AOC 41;		
	EXCAVATE AND CONSOLIDATE AOCs 9, 40	DATE	24-Jan-97
LOCATION:	DEVENS, MASSACHUSETTS		
ENGINEER:	ABB ENVIRONMENTAL SERVICES, INC.		

CAP IN PLACE SA 13		= = =		= =	====
SUMMARY SHEET DESCRIPTION	ΩΤΥ	UNIT	UNIT COST		TOTAL
TOTAL MOB/DEMOB			**********************	\$	58,230
TOTAL SITE PREPARATION					10,201
TOTAL CAP CONSTRUCTION					204,310
TOTAL SITE RESTORATION					15,150
TOTAL MONITORING WELLS					18,000
TOTAL INSTITUTIONAL CONTROLS					10,000
UNDEVELOPED DESIGN DETAILS ~25%					79,110
TOTAL SA 13				\$	395,000

PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY ALTERNATIVE 5: LIMITED REMOVAL AT AOC 11:	JOB #	8712-04
	CAP-IN-PLACE SAs 6, 12, 13, AOC 41; EXCAVATE AND CONSOLIDATE AOCs 9, 40	DATE	24-Jan-97
LOCATION:	DEVENS, MASSACHUSETTS		•
ENGINEER:	ABB ENVIRONMENTAL SERVICES, INC.		

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CAP IN PLACE AOC 41 MOB/DEMOB			UNIT	
DESCRIPTION	QTY	UNIT	COST	TOTAL
 MOB/DEMOB EQUIPMENT (IN OR OUT)				 ******
FRONT END LOADER	2	EA	410.00	\$ 820
DUMP TRUCK	2	EA	385.00	770
BACK HOE	2	EA	730.00	1,460
DOZER	2	EA	880.00	1,760
ROLLER	2	EA	785.00	1,570
				-
OFFICE TRAILER	1	MON	150.00	- 150
STORAGE TRAILER	1	MON	100.00	100
SET UP TRAILER	2	EA	500.00	1,000
				-
TOILET - 2 EA	8	WK	25.00	200
WATER COOLER - 2 EA	8	WK	25.00	200
WATER	40	DAY	15.00	600
TELEPHONE SERVICE	1	MON	500.00	500
ELECTRICITY	1	MON	250.00	250
PICK-UP (2 EA)	2	MON	1000.00	2,000
PUMPS, TOOLS, MINOR EQUIPMENT	1	MON	500.00	500
SITE SUPERINTENDANT ( 1 MON * 210 HR/MON)	210	MNHR	65.00	13,650
FOREMEN (1 MON * 210 HR/MON)	210	MNHR	55.00	11,550
CLERK/TYPIST (1 MON * 168 HR/MON)	168	MNHR	25.00	4,200
				-

TOTAL MOB/DEMOB

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\$ 41,280

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PROJECT:	ANDELL REMEDIATION FEASIBILITY STUDY	IOR #	9712-04
	ALTERNATIVE 5: LIMITED REMOVAL AT AOC 11	<b>30</b> B #	0712-04
	CAP-IN-PLACE SAs 6, 12, 13, AOC 41:		
	EXCAVATE AND CONSOLIDATE AOCs 9, 40	DATE	24-Jan-97
LOCATION:	DEVENS, MASSACHUSETTS		2.000.07
ENGINEER:	ABB ENVIRONMENTAL SERVICES, INC.		

CAP IN PLACE AOC 41			======	= =	
SITE PREPARATION, CAP CONSTRUCTION, SITE RESTORAT DESCRIPTION	ΊΟΝ ΩΤΥ	UNIT	UNIT COST		TOTAL
ACCESS ROAD - 350 LF x 20' WIDE					
GRADE ROAD BED - DOZER & OPERATOR	05	ΠΑΥ	1760.00	Ś	880
GRAVEL - 12" THICK	270	CY	10.00	•	2.700
GEOFABRIC	800	SY	1.00		800
SPREAD & COMPACT	0.5	DAY	1570.00		785
CLEAR TREES FROM SITE	0.5	AC	6900.00		3 450
EROSION CONTROL	150	IF	5 00		750
GRADING & DRAINAGE SWALE CONSTRUCTION	100	Ξ.	5.00		-
DOZER & OPERATOR	1	ΠΔΥ	1760.00		1 760
LABORER	8	HR	33 50		268
UXO CLEARANCE	2	DAY	1800.00		3 600
	-	DAI	1000.00		0,000
TOTAL SITE PREPARATION				\$	14,993
SUBGRADE SOIL	625	CY	10.00	\$	6,250
	10400	SF	0.80		8,320
DRAINAGE SOIL	565	CY	17.00		9,605
GEOTEXTILE FABRIC LAYER	10400	SF	0.10		1,040
MOISTURE RETENTION SOIL	990	CY	10.00		9,900
VEGETATIVE SOIL	300	CY	14.00		4,200
SPREAD & COMPACT	5	DAY	1570.00		7,850
TOTAL CAP CONSTRUCTION				\$	47,165
NOTE: CAP SOIL MATERIAL QUANTITIES INCLUDE A	30% SWELL F	ACTOR.			
SITE RESTORATION					
CHAIN LINK FENCE	550	LF	13.00	\$	7,150
12' SWING GATE	1	EA	800.00		800
FERTILIZE, SEED, MULCH	1600	SY	0.50		800
					0 750

PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY				JOB #	8712-04
LOCATION: ENGINEER:	CAP-IN-PLACE SAS 6, 12, 13, AOC 41; EXCAVATE AND CONSOLIDATE AOCs 9, 40 DEVENS, MASSACHUSETTS ABB ENVIRONMENTAL SERVICES, INC.				DATE	24-Jan-97
ESTIMATOR	: P. R. MARTIN					
	CAP IN PLACE AOC 41 MONITORING WELLS & INSTITUTIONAL CONTROLS		=		= = = = = = = = = =	 
	DESCRIPTION	QTY		UNIT	COST	TOTAL
MONITORING	G WELLS - 4" DIA x 30' DEEP		4	EA	4500.00	\$ 18,000
INSTITUTION	NAL CONTROLS		1	LS	10000.00	\$ 10,000

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PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY ALTERNATIVE 5: LIMITED REMOVAL AT AOC 11	JOB #	8712-04
	CAP-IN-PLACE SAs 6, 12, 13, AOC 41; EXCAVATE AND CONSOLIDATE AOCs 9, 40	DATE	24- Jap-97
LOCATION: ENGINEER:	DEVENS, MASSACHUSETTS ABB ENVIRONMENTAL SERVICES, INC.	DATE	24-Jail-97

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CAP IN PLACE AOC 41	======		======	= =	====
SUMMARY SHEET DESCRIPTION	ΩΤΥ	UNIT	UNIT COST		TOTAL
TOTAL MOB/DEMOB				\$	41,280
TOTAL SITE PREPARATION					14,993
TOTAL CAP CONSTRUCTION					47,165
TOTAL SITE RESTORATION					8,750
TOTAL MONITORING WELLS					18,000
TOTAL INSTITUTIONAL CONTROLS					10,000
UNDEVELOPED DESIGN DETAILS ~25%					34,812
TOTAL SA 13				\$	175,000

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		10D #	0712 04
PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY	JUB #	0/12-04
	ALTERNATIVE 5: LIMITED REMOVAL AT AOC 11;		
	CAP-IN-PLACE SAs 6, 12, 13, AOC 41;		
	EXCAVATE AND CONSOLIDATE AOCs 9, 40	DATE	24-Jan-97
LOCATION:	DEVENS, MASSACHUSETTS		
ENGINEER:	ABB ENVIRONMENTAL SERVICES, INC.		

ΩΤΥ	UNIT	COST	Ţ	OTAL
32	EA	385.00	\$	12,320
4	EA	730.00		2,920
8	EA	785.00		6,280
5	MON	150.00		750
5	MON	100.00		500
2	EA	500.00		1,000
44	wк	25.00		1,100
44	WK	25.00		1,100
220	DAY	15.00		3,300
5	MON	500.00		2,500
5	MON	250.00		1,250
10	MON	1000.00		10,000
1	LS	2500.00		2,500
1050	MNHR	65.00		- 68,250
1050	MNHR	55.00		57,750
840	MNHR	25.00		21,000
2.5	AC	6900.00		17,250
700	LF	5.00		3,500
70	DAY	1800.00		126,000 -
				-
				-
4 4 0		1460.00		204 400
		1460.00		204,400
FACTOR INCL		770.00		062 400
1120	DAY	770.00		
200	DAV	1570.00		420 600
280	DAT	1570.00		-
				-
OTAL THIS PA			\$ 1,	,845,670
	OTY 32 4 8 5 2 44 44 44 220 5 5 10 10 10 10 50 840 2.5 700 70 70 70 70 70 70 70 70 70 70 70 70	QTY       UNIT         32       EA         4       EA         5       MON         5       MON         2       EA         44       WK         44       WK         20       DAY         5       MON         2       EA         44       WK         20       DAY         5       MON         10       MON         1       LS         1050       MNHR         1050       MNHR         1050       MNHR         2.5       AC         700       LF         70       DAY         120       DAY         280       DAY         280       DAY	OTY         UNIT         COST           32         EA         385.00           4         EA         730.00           8         EA         785.00           5         MON         150.00           5         MON         100.00           2         EA         500.00           44         WK         25.00           44         WK         25.00           220         DAY         15.00           5         MON         500.00           10         MON         1000.00           1         LS         2500.00           10         MON         1000.00           1         LS         2500.00           1050         MNHR         65.00           1050         MNHR         55.00           840         MNHR         25.00           2.5         AC         6900.00           700         LF         5.00           700         LF         5.00           700         DAY         1800.00           140         DAY         770.00           280         DAY         1570.00	QTY         UNIT         COST         T           32         EA         385.00         \$           4         EA         730.00         \$           8         EA         785.00         \$           5         MON         150.00         \$           4         EA         785.00         \$           4         WK         25.00         \$           44         WK         25.00         \$           220         DAY         15.00         \$           5         MON         500.00         \$           10         MON         1000.00         \$           5         MON         50.00         \$           10         MON         1000.00         \$           1         LS         2500.00         \$           1050         MNHR         65.00         \$           1050         MNHR         55.00         \$           2.5         AC         6900.00         \$           70         LF         5.00         \$           70         DAY         1800.00         \$           FACTOR INCLUDED)         770.00         \$         \$

PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY	JOB #	8712-04
	ALTERNATIVE 5: LIMITED REMOVAL AT AOC 11;		
	CAP-IN-PLACE SAs 6, 12, 13, AOC 41;		
	EXCAVATE AND CONSOLIDATE AOCs 9, 40	DATE	24-Jan-97
LOCATION:	DEVENS, MASSACHUSETTS		
ENGINEER:	ABB ENVIRONMENTAL SERVICES, INC.		

FXCAVATE AND CONSOLIDATE AOC 9		= = =		
DESCRIPTION	ΩΤΥ	UNIT	UNIT COST	TOTAL
TOTAL PREVIOUS PAGE				\$ 1,845,670
BACKFILL (112,000 * 1.3 = 145,600 CY REQUIRED) AVAILABLE FROM CONSOLIDATION LANDFILL EXCAVATION LOAD STOCKPILED BACKFILL HAUL & DUMP	88750 110 330	CY DAY DAY	0.00 825.00 770.00	0 90,750 254,100
PURCHASED FROM OFF-SITE (INCLUDING 30% SWELL FACTOR)	56850	CY	10.00	568,500 -
SITE RESTORATION BACKFILL, GRADE, COMPACT (2 EA) FERTILIZE, SEED, MULCH WETLAND RESTORATION	182 36300 0.1	DAY SY AC	1570.00 0.50 50000.00	285,740 18,150 5,000
UNDEVELOPED DESIGN DETAILS ~25%				767,090
TOTAL AOC 9				\$ 3,835,000

PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY ALTERNATIVE 5: LIMITED REMOVAL AT AOC 11; CAP-IN-PLACE SAS 6, 12, 13, AOC 41;			JOB #		8712-04
Location: Engineer:	EXCAVATE AND CONSOLIDATE AOCs 9, 40 DEVENS, MASSACHUSETTS ABB ENVIRONMENTAL SERVICES, INC.			DATE		24-Jan-97
<b>ESTIMATOR</b> :	P. R. MARTIN					
					=	
	EXCAVATE AND CONSOLIDATE AOC 40 SITE PREPARATION DESCRIPTION	ΔΤΥ	UNIT	UNIT COST		TOTAL
ACCESS F	ROAD - 600 I E (SEDIMENT REMOVAL AREA I)					
CLEAR	& GBUB LIGHT VEGETATION	0.3	AC	4300.00	Ś	1.290
GRADE	- DOZER & OPERATOR	0.5	DAY	1760.00	•	880
GRAVE	- 12" THICK	450	CY	10.00		4,500
SPREAD	D & COMPACT	0.5	DAY	1570.00		785
FILTER	FABBIC	1350	SY	1.00		1,350
PARKING	AREA		•			-
CLEAR	& GRUB LIGHT VEGETATION	0.25	AC	4300.00		1,075
GRADE	- DOZER & OPERATOR	0.5	DAY	1760.00		880
GRAVE	L - 12" THICK	400	CY	10.00		4,000
SPREAD	D & COMPACT	0.5	DAY	1570.00		785
SEDIMENT	DEWATERING PAD					-
CLEAR	& GRUB LIGHT VEGETATION	0.25	AC	4300.00		1,075
GRADE	- DOZER & OPERATOR	0.5	DAY	1760.00		880
GRAVE	L - 12" THICK	400	CY	10.00		4,000
SPREAD	D & COMPACT	0.5	DAY	1570.00		785
LINER		10000	SF	1.00		10,000
SUMP 8	& SUMP PUMP	1	LS	2500.00		2,500
				5000.00		-
DECON AF	REA - 10'x20'	. 3	EA	5000.00		15,000
						-
						-
						-
						-
						-
	ATEORM (SEDIMENT REMOVAL AREA II)					-
GRADE	- DOZER & OPERATOR	0.25	DAY	1760.00		440
GRAVE	L - 12" THICK	150	CY	10.00		1,500
SPREAD	D & COMPACT	0.25	DAY	1570.00		393
FILTER	FABRIC	450	SY	1.00		450
						-
						-
						-
						-
						-
						-
						-
·		TOTAL SITE PRE	 PARATIO	N	\$	52,568
					*	

	PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY	JOB #	8712-04
		ALTERNATIVE 5: LIMITED REMOVAL AT AOC 11;		
		CAP-IN-PLACE SAs 6, 12, 13, AOC 41;		
k		EXCAVATE AND CONSOLIDATE AOCs 9, 40	DATE	24-Jan-97
	LOCATION:	DEVENS, MASSACHUSETTS		
	ENGINEER:	ABB ENVIRONMENTAL SERVICES, INC.		

EXCAVATE AND CONSULTATION         UNIT         UNIT           DESCRIPTION         QTY         UNIT         COST         TOTAL           EQUIPMENT (IN and OUT)         FRAC TANK         8         EA         250.00         \$         2.00           DEWATERING PUMP & HOSE         4         EA         100.00         4C           DUMP TRUCKS         16         EA         385.00         6,16           BACKHOE         2         EA         730.00         1,46           ROLLER         4         EA         785.00         3,14           CLAM SHELL         2         EA         640.00         1,28           OFFICE TRAILER         7         MON         150.00         1,05           STORAGE TRAILER         7         MON         150.00         1,05           TRAILER DELIVERY, SET-UP, REMOVAL         2         EA         300.00         60           TELEPHONE SERVICE         7         MON         500.00         3,50           TELEPHONE SERVICE         7         MON         500.00         1,70           ELECTRICITY         7         MON         1000.00         14,00           OFFICE EQUIPMENT         7         MON         1000.00<			= = =		= =	
DESCRIPTION         OTY         UNIT         COST         TOTAL           EQUIPMENT (IN and OUT)         FRAC TANK         8         EA         250.00         \$         2.00           DEWATERING PUMP & HOSE         4         EA         100.00         40           DUMP TRUCKS         16         EA         385.00         6,16           BACKHOE         2         EA         730.00         1,46           ROLLER         4         EA         785.00         3,14           CLAM SHELL         2         EA         640.00         1,28           OFFICE TRAILER         7         MON         150.00         1,05           STORAGE TRAILER         7         MON         150.00         1,05           TORALE TOLIVERY, SET-UP, REMOVAL         2         EA         300         0.60           TOILET - 2 EA         60         WK         25.00         1,50           WATER         300         DAY         15.00         3,50           TELEPHONE SERVICE         7         MON         250.00         1,75           PICK-UP (2 EA)         14         MON         1000.00         1,400           OFFICE EQUIPMENT         7         MON	MOBILIZATION			UNIT		
EOUIPMENT (IN and OUT)         FRAC TANK         8         EA         250.00         \$         2.00           DEWATERING PUMP & HOSE         4         EA         100.00         4C           DUMP TRUCKS         16         EA         385.00         6,16           BACKHOE         2         EA         730.00         1,46           ROLLER         2         EA         730.00         1,46           CLAM SHELL         2         EA         730.00         1,65           OFFICE TRAILER         7         MON         150.00         1,05           STORAGE TRAILER         7         MON         150.00         1,05           TOILET - 2 EA         60         WK         25.00         1,50           WATER COOLER - 2 EA         60         WK         25.00         1,50           WATER COOLER - 2 EA         60         WK         25.00         1,50           WATER         300         DAY         15.00         4,50           ELECTRICITY         7         MON         500.00         3,50           PICK-UP (2 EA)         14         MON         1000.00         7,00           PUMPS, TOOLS, MINOR EQUIPMENT         1         LS	DESCRIPTION	QTY	UNIT	COST		TOTAL
FRAC TANK         8         EA         250.00         \$         2,00           DEWATERING PUMP & HOSE         4         EA         100.00         4C           DUMP TRUCKS         16         EA         385.00         6,16           BACKHOE         2         EA         730.00         1,46           ROLLER         2         EA         785.00         3,14           CLAM SHELL         2         EA         640.00         1,28           OFFICE TRAILER         7         MON         150.00         1,05           STORAGE TRAILER         7         MON         150.00         1,05           TOILET - 2 EA         60         WK         25.00         1,55           WATER COOLER - 2 EA         60         WK         25.00         1,56           WATER COOLER - 2 EA         60         WK         25.00         1,50           VATER         300         DAY         15.00         4,50           TELEPHONE SERVICE         7         MON         500.00         3,50           ELECTRICITY         7         MON         1000.00         1,400           OFFICE EQUIPMENT         7         MON         1000.00         5,36	EQUIPMENT (IN and OUT)	· ·				
DEWATERING PUMP & HOSE         4         EA         100.00         40           DUMP TRUCKS         16         EA         385.00         6,16           BACKHOE         2         EA         730.00         1,46           ROLLER         2         EA         785.00         3,14           CLAM SHELL         2         EA         640.00         1,28           OFFICE TRAILER         7         MON         150.00         1,05           STORAGE TRAILER         7         MON         150.00         1,05           TRAILER DELIVERY, SET-UP, REMOVAL         2         EA         300.00         60           TOILET - 2 EA         60         WK         25.00         1,50           WATER         300         DAY         15.00         4,55           WATER         300         DAY         15.00         4,55           VECK-UP (2 EA)         7         MON         250.00         1,75           PICK-UP (2 EA)         14         MON         1000.00         14,00           OFFICE EQUIPMENT         7         MON         1000.00         7,60           PUMPS, TOOLS, MINOR EQUIPMENT         1         LS         5000.00         5,00	FRAC TANK	8	EA	250.00	\$	2,000
DUMP TRUCKS         16         EA         385.00         6,16           BACKHOE         2         EA         730.00         1,46           ROLLER         4         EA         785.00         3,14           CLAM SHELL         2         EA         730.00         1,46           OFFICE TRAILER         7         MON         150.00         1,05           STORAGE TRAILER         7         MON         150.00         1,05           TRAILER DELIVERY, SET-UP, REMOVAL         2         EA         300.00         6C           TOILET - 2 EA         60         WK         25.00         1,5C           WATER COCLER - 2 EA         60         WK         25.00         1,5C           WATER         300         DAY         15.00         4,5C           TELEPHONE SERVICE         7         MON         500.00         3,5C           ELECTRICITY         7         MON         1000.00         14,0C           OFFICE EQUIPMENT         7         MON         1000.00         7,00C           PUMPS, TOOLS, MINOR EQUIPMENT         1         LS         5000.00         5,36C           CARPENTER (2 MEN*10 DAY/MAN*8 HR/DAY)         160         MNHR <td< td=""><td>DEWATERING PUMP &amp; HOSE</td><td>4</td><td>EA</td><td>100.00</td><td></td><td>400</td></td<>	DEWATERING PUMP & HOSE	4	EA	100.00		400
BACKHOE         2         EA         730.00         1.46           ROLLER         4         EA         785.00         3.14           CLAM SHELL         2         EA         640.00         1.28           OFFICE TRAILER         7         MON         150.00         1.05           STORAGE TRAILER         7         MON         150.00         1.05           TRAILER DELIVERY, SET-UP, REMOVAL         2         EA         300.00         6C           VATER         60         WK         25.00         1.50           WATER         300         DAY         15.00         4.50           VATER         300         DAY         15.00         4.50           VECK-UP (2 EA)         60         WK         25.00         1.55           PICK-UP (2 EA)         7         MON         500.00         3.55           ELECTRICITY         7         MON         1000.00         14.00           OFFICE EQUIPMENT         7         MON         1000.00         14.00           OFFICE EQUIPMENT         7         MON         1000.00         5.00           LABORER (2 MEN*10 DAY/MAN*8 HR/DAY)         160         MNHR         33.50         5.36	DUMP TRUCKS	16	EA	385.00		6,160
ROLLER         4         EA         785.00         3,14           CLAM SHELL         2         EA         640.00         1,28           OFFICE TRAILER         7         MON         150.00         1,05           STORAGE TRAILER         7         MON         150.00         1,05           TRAILER DELIVERY, SET-UP, REMOVAL         2         EA         300.00         60           VATER COOLER - 2 EA         60         WK         25.00         1,50           WATER COOLER - 2 EA         60         WK         25.00         1,50           WATER COOLER - 2 EA         60         WK         25.00         1,50           WATER         300         DAY         15.00         4,50           TELEPHONE SERVICE         7         MON         250.00         1,75           PICK-UP (2 EA)         14         MON         1000.00         14,00           OFFICE EQUIPMENT         1         LS         5000.00         5,00           PUMPS, TOOLS, MINOR EQUIPMENT         1         LS         5000.00         5,00           LABORER (2 MEN*10 DAY/MAN*8 HR/DAY)         160         MNHR         33.50         5,36           CARPENTER N2 (2 MEN*10 DAY/MAN*8 HR/DAY)	BACKHOE	2	EA	730.00		1,460
CLAM SHELL         2         EA         640.00         1,28           OFFICE TRAILER         7         MON         150.00         1,05           STORAGE TRAILER         7         MON         150.00         1,05           TRAILER DELIVERY, SET-UP, REMOVAL         2         EA         300.00         60           TOILET - 2 EA         60         WK         25.00         1,50           WATER COOLER - 2 EA         60         WK         25.00         1,50           WATER         300         DAY         15.00         4,50           TELEPHONE SERVICE         7         MON         500.00         3,50           ELECTRICITY         7         MON         1000.00         14,00           OFFICE EQUIPMENT         7         MON         1000.00         7,00           PUCK-UP (2 EA)         14         MON         1000.00         7,00           PUMPS, TOOLS, MINOR EQUIPMENT         1         LS         5000.00         5,00           LABORER (2 MEN*10 DAY/MAN*8 HR/DAY)         160         MNHR         48.00         7,68           ELECTRICIAN (2 MEN*10 DAY/MAN*8 HR/DAY)         160         MNHR         55.00         8,08           SITE SUPERINTENDANT (7 MON*	ROLLER	4	EA	785.00		3,140
OFFICE TRAILER         7         MON         150.00         1.05           STORAGE TRAILER         7         MON         150.00         1.05           TRAILER DELIVERY, SET-UP, REMOVAL         2         EA         300.00         60           TOILET - 2 EA         60         WK         25.00         1,50           WATER COOLER - 2 EA         60         WK         25.00         1,50           WATER         300         DAY         15.00         4,50           TELEPHONE SERVICE         7         MON         500.00         3,50           ELECTRICITY         7         MON         1000.00         14,00           OFFICE EQUIPMENT         7         MON         1000.00         14,00           OFFICE EQUIPMENT         7         MON         1000.00         7,00           PUMPS, TOOLS, MINOR EQUIPMENT         1         LS         5000.00         5,00           LABORER (2 MEN*10 DAY/MAN*8 HR/DAY)         160         MNHR         33.50         5,36           CARPENTER (2 MEN*10 DAY/MAN*8 HR/DAY)         160         MNHR         50.50         8,08           ELECTRICIAN (2 MEN*10 DAY/MAN*8 HR/DAY)         160         MNHR         55.00         8,08	CLAM SHELL	2	EA	640.00		1,280
STORAGE TRAILER       7       MON       150.00       1,05         TRAILER DELIVERY, SET-UP, REMOVAL       2       EA       300.00       60         TOILET - 2 EA       60       WK       25.00       1,50         WATER COOLER - 2 EA       60       WK       25.00       1,50         WATER       300       DAY       15.00       4,50         TELEPHONE SERVICE       7       MON       500.00       3,50         ELECTRICITY       7       MON       1000.00       14,00         OFFICE EQUIPMENT       7       MON       1000.00       7,00         PUMPS, TOOLS, MINOR EQUIPMENT       1       LS       5000.00       5,00         LABORER (2 MEN*10 DAY/MAN*8 HR/DAY)       160       MNHR       33.50       5,36         CARPENTER (2 MEN*10 DAY/MAN*8 HR/DAY)       160       MNHR       48.00       7,68         ELECTRICIAN (2 MEN*10 DAY/MAN*8 HR/DAY)       160       MNHR       50.50       8,08         SITE SUPERINTENDANT (7 MON*210HR/MON)       1470       MNHR       65.00       95,55         FOREMAN (7 MON*210HR/MON)       1470       MNHR       55.00       80,85         CLERK/TYPIST (7 MON*168HR/MON)       1176       MNHR       25.	OFFICE TRAILER	7	MON	150.00		1,050
TRAILER DELIVERY, SET-UP, REMOVAL       2       EA       300.00       6C         TOILET - 2 EA       60       WK       25.00       1,5C         WATER COOLER - 2 EA       60       WK       25.00       1,5C         WATER       300       DAY       15.00       4,5C         TELEPHONE SERVICE       7       MON       500.00       3,5C         ELECTRICITY       7       MON       250.00       1,7C         PICK-UP (2 EA)       14       MON       1000.00       14,0C         OFFICE EQUIPMENT       7       MON       1000.00       7,0C         PUMPS, TOOLS, MINOR EQUIPMENT       1       LS       5000.00       5,0C         LABORER (2 MEN*10 DAY/MAN*8 HR/DAY)       160       MNHR       33.50       5,3C         CARPENTER (2 MEN*10 DAY/MAN*8 HR/DAY)       160       MNHR       48.00       7,6B         ELECTRICIAN (2 MEN*10 DAY/MAN*8 HR/DAY)       160       MNHR       50.50       8,0B         SITE SUPERINTENDANT (7 MON*210HR/MON)       1470       MNHR       55.00       80,85         CLERK/TYPIST (7 MON*168HR/MON)       1470       MNHR       25.00       29,4C	STORAGE TRAILER	7	MON	150.00		1,050
TOILET - 2 EA       60       WK       25.00       1,50         WATER COOLER - 2 EA       60       WK       25.00       1,50         WATER       300       DAY       15.00       4,50         TELEPHONE SERVICE       7       MON       500.00       3,50         ELECTRICITY       7       MON       1000.00       14,00         OFFICE EQUIPMENT       7       MON       1000.00       7,00         PUMPS, TOOLS, MINOR EQUIPMENT       1       LS       5000.00       5,00         LABORER (2 MEN*10 DAY/MAN*8 HR/DAY)       160       MNHR       33.50       5,36         CARPENTER (2 MEN*10 DAY/MAN*8 HR/DAY)       160       MNHR       48.00       7,66         ELECTRICIAN (2 MEN*10 DAY/MAN*8 HR/DAY)       160       MNHR       50.50       8,08         SITE SUPERINTENDANT (7 MON*210HR/MON)       1470       MNHR       65.00       95,55         FOREMAN (7 MON*210HR/MON)       1470       MNHR       55.00       29,40         CLERK/TYPIST (7 MON*168HR/MON)       1176       MNHR       25.00       29,40	TRAILER DELIVERY, SET-UP, REMOVAL	2	EA	300.00		600
WATER COOLER - 2 EA       60       WK       25.00       1,50         WATER       300       DAY       15.00       4,50         TELEPHONE SERVICE       7       MON       500.00       3,50         ELECTRICITY       7       MON       250.00       1,75         PICK-UP (2 EA)       14       MON       1000.00       14,00         OFFICE EQUIPMENT       7       MON       1000.00       7,00         PUMPS, TOOLS, MINOR EQUIPMENT       1       LS       5000.00       5,00         LABORER (2 MEN*10 DAY/MAN*8 HR/DAY)       160       MNHR       33.50       5,36         CARPENTER (2 MEN*10 DAY/MAN*8 HR/DAY)       160       MNHR       48.00       7,68         ELECTRICIAN (2 MEN*10 DAY/MAN*8 HR/DAY)       160       MNHR       50.50       8,08         SITE SUPERINTENDANT (7 MON*210HR/MON)       1470       MNHR       55.00       29,40         CLERK/TYPIST (7 MON*168HR/MON)       1176       MNHR       25.00       29,40	TOILET - 2 EA	60	WK	25.00		1,500
WATER         300         DAY         15.00         4,50           TELEPHONE SERVICE         7         MON         500.00         3,50           ELECTRICITY         7         MON         250.00         1,75           PICK-UP (2 EA)         14         MON         1000.00         14,00           OFFICE EQUIPMENT         7         MON         1000.00         7,00           PUMPS, TOOLS, MINOR EQUIPMENT         1         LS         5000.00         5,00           LABORER (2 MEN*10 DAY/MAN*8 HR/DAY)         160         MNHR         33.50         5,36           CARPENTER (2 MEN*10 DAY/MAN*8 HR/DAY)         160         MNHR         48.00         7,68           ELECTRICIAN (2 MEN*10 DAY/MAN*8 HR/DAY)         160         MNHR         50.50         8,08           SITE SUPERINTENDANT (7 MON*210HR/MON)         1470         MNHR         55.00         80,85           CLERK/TYPIST (7 MON*168HR/MON)         1176         MNHR         25.00         29,40           -         -         -         -         -         -           -         -         -         -         -         -	WATER COOLER - 2 EA	60	WK	25.00		1,500
TELEPHONE SERVICE       7       MON       500.00       3,50         ELECTRICITY       7       MON       250.00       1,75         PICK-UP (2 EA)       14       MON       1000.00       14,00         OFFICE EQUIPMENT       7       MON       1000.00       7,000         PUMPS, TOOLS, MINOR EQUIPMENT       1       LS       5000.00       5,000         LABORER (2 MEN*10 DAY/MAN*8 HR/DAY)       160       MNHR       33.50       5,360         CARPENTER (2 MEN*10 DAY/MAN*8 HR/DAY)       160       MNHR       48.00       7,688         ELECTRICIAN (2 MEN*10 DAY/MAN*8 HR/DAY)       160       MNHR       50.50       8,085         SITE SUPERINTENDANT (7 MON*210HR/MON)       1470       MNHR       65.00       95,555         FOREMAN (7 MON*210HR/MON)       1470       MNHR       25.00       29,400         CLERK/TYPIST (7 MON*168HR/MON)       1176       MNHR       25.00       29,400	WATER	300	DAY	15.00		4,500
ELECTRICITY       7       MON       250.00       1,75         PICK-UP (2 EA)       14       MON       1000.00       14,00         OFFICE EQUIPMENT       7       MON       1000.00       7,00         PUMPS, TOOLS, MINOR EQUIPMENT       1       LS       5000.00       5,00         LABORER (2 MEN*10 DAY/MAN*8 HR/DAY)       160       MNHR       33.50       5,30         CARPENTER (2 MEN*10 DAY/MAN*8 HR/DAY)       160       MNHR       48.00       7,68         ELECTRICIAN (2 MEN*10 DAY/MAN*8 HR/DAY)       160       MNHR       50.50       8,08         SITE SUPERINTENDANT (7 MON*210HR/MON)       1470       MNHR       65.00       95,55         FOREMAN (7 MON*210HR/MON)       1470       MNHR       55.00       80,85         CLERK/TYPIST (7 MON*168HR/MON)       1176       MNHR       25.00       29,40	TELEPHONE SERVICE	7	MON	500.00		3,500
PICK-UP (2 EA)       14       MON       1000.00       14,00         OFFICE EQUIPMENT       7       MON       1000.00       7,00         PUMPS, TOOLS, MINOR EQUIPMENT       1       LS       5000.00       5,00         LABORER (2 MEN*10 DAY/MAN*8 HR/DAY)       160       MNHR       33.50       5,36         CARPENTER (2 MEN*10 DAY/MAN*8 HR/DAY)       160       MNHR       48.00       7,68         ELECTRICIAN (2 MEN*10 DAY/MAN*8 HR/DAY)       160       MNHR       50.50       8,08         SITE SUPERINTENDANT (7 MON*210HR/MON)       1470       MNHR       65.00       95,55         FOREMAN (7 MON*210HR/MON)       1470       MNHR       55.00       80,85         CLERK/TYPIST (7 MON*168HR/MON)       1176       MNHR       25.00       29,40	ELECTRICITY	7	MON	250.00		1,750
OFFICE EQUIPMENT       7       MON       1000.00       7,00         PUMPS, TOOLS, MINOR EQUIPMENT       1       LS       5000.00       5,00         LABORER (2 MEN*10 DAY/MAN*8 HR/DAY)       160       MNHR       33.50       5,36         CARPENTER (2 MEN*10 DAY/MAN*8 HR/DAY)       160       MNHR       48.00       7,68         ELECTRICIAN (2 MEN*10 DAY/MAN*8 HR/DAY)       160       MNHR       50.50       8,08         SITE SUPERINTENDANT (7 MON*210HR/MON)       1470       MNHR       65.00       95,55         FOREMAN (7 MON*210HR/MON)       1470       MNHR       55.00       80,85         CLERK/TYPIST (7 MON*168HR/MON)       1176       MNHR       25.00       29,40         -       -       -       -       -         -       -       -       -       -         -       -       -       -       -         -       -       -       -       -         -       -       -       -       -         -       -       -       -       -         -       -       -       -       -         -       -       -       -       -         -	PICK-UP (2 EA)	14	MON	1000.00		14,000
PUMPS, TOOLS, MINOR EQUIPMENT       1       LS       5000.00       5,00         LABORER (2 MEN*10 DAY/MAN*8 HR/DAY)       160       MNHR       33.50       5,36         CARPENTER (2 MEN*10 DAY/MAN*8 HR/DAY)       160       MNHR       48.00       7,68         ELECTRICIAN (2 MEN*10 DAY/MAN*8 HR/DAY)       160       MNHR       50.50       8,08         SITE SUPERINTENDANT (7 MON*210HR/MON)       1470       MNHR       65.00       95,55         FOREMAN (7 MON*210HR/MON)       1470       MNHR       55.00       80,85         CLERK/TYPIST (7 MON*168HR/MON)       1176       MNHR       25.00       29,40         -	OFFICE EQUIPMENT	7	MON	1000.00		7,000
LABORER (2 MEN*10 DAY/MAN*8 HR/DAY) CARPENTER (2 MEN*10 DAY/MAN*8 HR/DAY) ELECTRICIAN (2 MEN*10 DAY/MAN*8 HR/DAY) SITE SUPERINTENDANT (7 MON*210HR/MON) FOREMAN (7 MON*210HR/MON) CLERK/TYPIST (7 MON*168HR/MON) 1470 MNHR 55.00 1176 MNHR 25.00 29,40 - - - - - - - - - - - - -	PUMPS, TOOLS, MINOR EQUIPMENT	1	LS	5000.00		5,000
CARPENTER (2 MEN*10 DAY/MAN*8 HR/DAY)       160 MNHR       48.00       7,68         ELECTRICIAN (2 MEN*10 DAY/MAN*8 HR/DAY)       160 MNHR       50.50       8,08         SITE SUPERINTENDANT (7 MON*210HR/MON)       1470 MNHR       65.00       95,55         FOREMAN (7 MON*210HR/MON)       1470 MNHR       55.00       80,88         CLERK/TYPIST (7 MON*168HR/MON)       1176 MNHR       25.00       29,40         -         -         -         -         -         -         -         -         -	LABORER (2 MEN*10 DAY/MAN*8 HR/DAY)	160	MNHR	33.50		5,360
ELECTRICIAN (2 MEN*10 DAY/MAN*8 HR/DAY) SITE SUPERINTENDANT (7 MON*210HR/MON) FOREMAN (7 MON*210HR/MON) CLERK/TYPIST (7 MON*168HR/MON) 1176 MNHR 25.00 - - - - - - -	CARPENTER (2 MEN*10 DAY/MAN*8 HR/DAY)	160	MNHR	48.00		7,680
SITE SUPERINTENDANT (7 MON*210HR/MON)       1470       MNHR       65.00       95,55         FOREMAN (7 MON*210HR/MON)       1470       MNHR       55.00       80,85         CLERK/TYPIST (7 MON*168HR/MON)       1176       MNHR       25.00       29,40         -       -       -       -       -         -       -       -       -       -         -       -       -       -       -         -       -       -       -       -         -       -       -       -       -         -       -       -       -       -         -       -       -       -       -         -       -       -       -       -         -       -       -       -       -         -       -       -       -       -         -       -       -       -       -         -       -       -       -       -         -       -       -       -       -         -       -       -       -       -         -       -       -       -       -         -	ELECTRICIAN (2 MEN*10 DAY/MAN*8 HR/DAY)	160	MNHR	50.50		8,080
FOREMAN (7 MON*210HR/MON) 1470 MNHR 55.00 80,85 CLERK/TYPIST (7 MON*168HR/MON) 1176 MNHR 25.00 29,40 - - - - -	SITE SUPERINTENDANT (7 MON*210HR/MON)	1470	MNHR	65.00		95,550
CLERK/TYPIST (7 MON*168HR/MON) 1176 MNHR 25.00 29,40 - - - - - -	FOREMAN (7 MON*210HR/MON)	1470	MNHR	55.00		80,850
	CLERK/TYPIST (7 MON*168HR/MON)	1176	MNHR	25.00		29,400
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TOTAL MOBILIZATION \$ 282,810

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PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY	JOB #	8712-04
	ALTERNATIVE 5: LIMITED REMOVAL AT AOC 11;		
	CAP-IN-PLACE SAs 6, 12, 13, AOC 41;		
	EXCAVATE AND CONSOLIDATE AOCs 9, 40	DATE	24-Jan-97
LOCATION:	DEVENS, MASSACHUSETTS		
ENGINEER:	ABB ENVIRONMENTAL SERVICES, INC.		

SEDIMENT REMOVAL AND DISPOSAL DESCRIPTION	ΩΤΥ	UNIT	UNIT COST	٦	FOTAL
CONSTRUCT SILT FENCE AROUND CONTAMINATED AREAS	650	LF	5.00	\$	3,250 -
EXCAVATE WITH CLAMSHELL 1200 CY SEDIMENTS + 600 CY ACCESS ROADS/WORK PLATFOR	19 MS	DAY	1280.00		- 24,320 -
HAUL SEDIMENTS TO DEWATERING PAD (2 EA DUMP TRUCK & DRIVER)	38	DAY	770.00		29,260 -
LOAD DRY SEDIMENTS FOR TRANSPORTATION TO DISPOSAL AREA (FRONT END LOADER & OPERATOR)	10	DAY	825.00		- 8,250 - -
LABORERS - 2 EA FOR 25 DAYS	400	MNHR	33.50		- 13,400
TCLP TESTING	2	SMPL	1500.00		3,000
ON-SITE STABILIZATION OF SEDIMENTS WITH SAND	400	СҮ	15.00		- 6,000 -
TRANSPORTATION AND DISPOSAL AT CONSOLIDATION LANDFILL (3 EA DUMP TRUCK & DRIVER)	30	DAY	770.00		- 23,100 -
TRANSPORTATION OF WATER	140000	GAL	INCL WITH DISPO	DSAL	-
TREATMENT OF DEWATERING WATER	1	LS	21800.00		21,800
PUMP WATER FROM DEWATERING PAD TO PONDS	12	DAY	50.00		- 600 - -
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TOTAL SEDIMENT REMOVAL AND DISPOSAL				\$	132,980

PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY	JOB #	8712-04
	ALTERNATIVE 5: LIMITED REMOVAL AT AOC 11;		
	CAP-IN-PLACE SAs 6, 12, 13, AOC 41;		
	EXCAVATE AND CONSOLIDATE AOCs 9, 40	DATE	24-Jan-97
LOCATION:	DEVENS, MASSACHUSETTS		
ENGINEER:	ABB ENVIRONMENTAL SERVICES, INC.		

EXCAVATE AND CONSOLIDATE AOC 40					
DRUM REMOVAL AND DISPOSAL DESCRIPTION	ΩΤΥ	UNIT	UNIT COST		TOTAL
BACKHOE & OPERATOR	3	DAY	1460.00	\$	4,380
LABORER - 2 EA, 3 DAYS	48	MNHR	33.50		1,608 -
					-
TRANSPORT DRUMS TO CONSOLIDATION LANDFILL - DUMP TRUCK & DRIVER	3	DAY	770.00		2,310 -
TCLP TESTING OF DRUM CONTENTS	2	EA	1500.00		3,000

TOTAL DRUM REMOVAL AND DISPOSAL

\$ 11,298

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PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY	JOB #	8712-04
	CAP-IN-PLACE SAS 6, 12, 13, AOC 41; EXCAVATE AND CONSOLIDATE AOCs 9, 40	DATE	24-Jan-97
LOCATION: ENGINEER:	DEVENS, MASSACHUSETTS ABB ENVIRONMENTAL SERVICES, INC.		· · · ·

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FXCAVATE AND CONSOLIDATE AOC 40		= = =		 
EXCAVATE AND CONSCEIDATE ACC 40			UNIT	
DESCRIPTION	QTY	UNIT	COST	 TOTAL
CLEAR & GRUB SITE	4	AC	4300.00	\$ 17,200
EROSION CONTROL	500	LF	5.00	2,500
SUMP PUMP & HOSES	6	MON	2500.00	15,000
UXO CLEARANCE	138	DAY	1800.00	- 248,400
EXCAVATION OF 110000 CY OF DEBRIS				-
BACKHOE & OPERATOR	138	DAY	1460.00	201,480
TRANSPORT TO ON-SITE CONSOLIDATION LANDFILL (50% SWEL	L FACTOR INCLU	JDED)		
DUMP TRUCK & DRIVER (8 EA)	1100	DAY	770.00	847,000
SPREAD OVER ON-SITE CONSOLIDATION LANDFILL & COMPACT				-
ROLLER & OPERATOR (2 EA)	276	DAY	1570.00	433,320
BACKFILL PURCHASED FROM OFF-SITE				-
(INCLUDING 30% SWELL FACTOR)	18710	CY	10.00	187,100
SITE RESTORATION				-
BACKFILL, GRADE, COMPACT	24	DAY	1570.00	37,680
FERTILIZE, SEED, MULCH	19360	SY	0.50	9,680
WETLANDS RESTORATION	4	AC	50000.00	200,000
MONITORING WELLS, 4" DIA x 30' DP	2	EA	2400.00	4,800
GUIDE RAIL ALONG ROAD	1000	LF	12.50	12,500

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PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY ALTERNATIVE 5: LIMITED REMOVAL AT AOC 11;	JOB #	8712-04
	CAP-IN-PLACE SAs 6, 12, 13, AOC 41; EXCAVATE AND CONSOLIDATE AOCs 9, 40	DATE	24-Jan-97
LOCATION:	DEVENS, MASSACHUSETTS		
ENGINEER:	ABB ENVIRONMENTAL SERVICES, INC.		

EXCAVATE AND CONSOLIDATE AOC 40		= = =	= = = = = = = =	
DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL
TOTAL SITE PREPARATION				\$ 52,568
TOTAL MOBILIZATION				- 282,810
TOTAL SEDIMENT REMOVAL AND DISPOSAL				- 132,980
TOTAL DRUM REMOVAL AND DISPOSAL				- 11,298
TOTAL EXCAVATION AND BACKFILL				- 2,216,660
UNDEVELOPED DESIGN DETAILS ~25%				- 673,685
TOTAL AOC 40				\$ 3,370,000

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PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY	JOB #	8712-04
	ALTERNATIVE 5: LIMITED REMOVAL AT AOC 11;		
	CAP-IN-PLACE SAs 6, 12, 13, AOC 41;		
	EXCAVATE AND CONSOLIDATE AOCs 9, 40	DATE	24-Jan-97
LOCATION:	DEVENS, MASSACHUSETTS		
ENGINEER:	ABB ENVIRONMENTAL SERVICES, INC.		

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			UNIT		
DESCRIPTION	ΩΤΥ	UNIT	COST		TOTAL
MOBILIZATION					
DUMP TRUCKS - 16 EA	32	EA	385.00	\$	12,320
BACKHOE - 2 EA	4	EA	730.00		2,920
ROLLER - 2 EA	4	EA	785.00		3,140
DOZER	2	EA	880.00		1,760
					-
OFFICE TRAILER	9	MON	150.00		1,350
STORAGE TRAILER	9	MON	150.00		1,350
TRAILER DELIVERY, SET-UP, REMOVAL	2	EA	300.00		600
TOILET - 2 EA	80	WΚ	25.00		2,000
WATER COOLER - 2 EA	80	WK	25.00		2,000
WATER	400	DAY	15.00		6,000
TELEPHONE SERVICE	9	MON	500.00		4,500
ELECTRICITY	9	MON	250.00		2,250
PICK-UP (2 EA)	18	MON	1000.00		18,000
OFFICE EQUIPMENT	9	MON	1000.00		9,000
PUMPS, TOOLS, MINOR EQUIPMENT	1	LS	5000.00		5,000
LABORER (2 MEN*10 DAY/MAN*8 HR/DAY)	160	MNHR	33.50		5,360
CARPENTER (2 MEN*10 DAY/MAN*8 HR/DAY)	160	MNHR	48.00		7,680
ELECTRICIAN (2 MEN*10 DAY/MAN*8 HR/DAY)	160	MNHR	50.50		8,080
SITE SUPERINTENDANT (9 MON*210HR/MON)	1890	MNHR	65.00		122,850
FOREMAN (9 MON*210HR/MON)	1890	MNHR	55.00		103,950
CLERK/TYPIST (9 MON*168HR/MON)	1512	MNHR	25.00		37,800 ,
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	TOTAL MODILIZ			ċ	257 010

#### TOTAL MOBILIZATION

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\$ 357,910

PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY	JOB #	8712-04
	ALTERNATIVE 5: LIMITED REMOVAL AT AOC 11;		
	CAP-IN-PLACE SAs 6, 12, 13, AOC 41;		
	EXCAVATE AND CONSOLIDATE AOCs 9, 40	DATE	24-Jan-97
LOCATION:	DEVENS, MASSACHUSETTS		
ENGINEER:	ABB ENVIRONMENTAL SERVICES, INC.		

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CONSOLIDATION LANDFILL CONSTRUCTION				= =	
SITE PREPARATION DESCRIPTION	ΩΤΥ	UNIT	COST		TOTAL
CLEAR & GRUB SITE	10	AC	4300.00	\$	43,000
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					-
ACCESS ROAD IMPROVEMENTS CRUSHED STONE 2' DEEP x 24' WIDE	1800	CY	30.00		54.000
2' DIA RCP CULVERT	40	LF	50.00		2,000
EROSION CONTROL					-
SILT FENCE	2800	LF	5.00		14,000
HAY BALES	500	EA	5.00		2,500
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	TOTAL SITE PR	EPARAT	ION	\$	115,500

PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY ALTERNATIVE 5: LIMITED REMOVAL AT AOC 11; CAP-IN-PLACE SAs 6, 12, 13, AOC 41:			JOB #		8712-04
LOCATION: ENGINEER:	EXCAVATE AND CONSOLIDATE AOCs 9, 40 DEVENS, MASSACHUSETTS ABB ENVIRONMENTAL SERVICES, INC.			DATE	:	24-Jan-97
ESTIMATOR:	P. R. MARTIN					
	CONSOLIDATION LANDFILL CONSTRUCTION		= = =			* = = = =
	LINER CONSTRUCTION			UNIT	_	
	DESCRIPTION	QTY	UNIT	COST		FOTAL
EXCAVATE L	ANDFILL BASE & BY-PASS DITCH					
HAUL TO ON	BACK HOE & OPERATOR (2 EA) I-SITE STOCKPILE (23250 CY)	126	DAY	1460.00	\$	183,960
HAUL TO AC	DUMP TRUCK & DRIVER (3 EA) C-9 & STOCKPILE (88750 CY)	45	DAY	770.00		34,650
	DUMP TRUCK & DRIVER (16 EA)	880	DAY	770.00		677,600
DOZER & OP	ERATOR	55	DAY	1760.00		96,800
						-
		31850	CY	10.00		-
GEOMEMBRA	ANE	330000	SF	0.65		214.500
FILTER FABR	IC	330000	SF	0.10		33,000
10-2 SAND 0	DRAINAGE LAYER	15925	CY	12.00		191,100
10-3 SAND [	DRAINAGE LAYER	15925	CY	17.00		270,725
ROLLER & OF	PERATOR	80	DAY	1570.00		125,600
						-
	DRAINAGE PIPING					-
6" DIA PERF	PVC PIPE	2500	LF	6.00		15,000
12" DIA SOL	ID WALL PVC PIPE	1600	LF	15.00		24,000
6"x12" PVC	WYE	5	EA	500.00		2,500
	LEACHATE PUMPING CHAMBER					-
5' DIA PRECA	AST MANHOLE	10	VLF	250.00		2,500
FRAME, COV	ER, ETC.	1	LS	300.00		300
CONCRETE F	ILL PAD, SUMP, ELECTRICAL	1	LS	35000.00		35,000
CONTROL	S, ALARM, FILL PIPING, BOLLARDS					-
HAUL LEACH 10 HR/DA	IATE TO BASE TREATMENT PLANT Y * 5 DAY/WK * 52 WK	2600	HR	100.00		260,000

#### ALL LINER SOIL MATERIAL QUANTITIES NOTE: INCLUDE A 30% SWELL FACTOR

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# TOTAL LINER CONSTRUCTION \$ 2,485,735

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	PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY	JOB #	8712-04
		ALTERNATIVE 5: LIMITED REMOVAL AT AOC 11;		
		CAP-IN-PLACE SAs 6, 12, 13, AOC 41;		
		EXCAVATE AND CONSOLIDATE AOCs 9, 40	DATE	24-Jan-97
,	LOCATION:	DEVENS, MASSACHUSETTS		
	ENGINEER:	ABB ENVIRONMENTAL SERVICES, INC.		

	CONSOLIDATION LANDFILL CONSTRUCTION					
	FINAL COVER CONSTRUCTION DESCRIPTION	ΩΤΥ	UNIT	UNIT COST		TOTAL
SUBGRADE	BUFFER	15925	CY	10.00	\$	159,250
TEXTURED	GEOMEMBRAND	330000	SF	0.80		264,000
FILTER FAB	RIC	330000	SF	0.10		33,000
10-3 SAND	DRAINAGE LAYER	15925	CY	17.00		270,725
MOISTURE I	RETENTION LAYER	23900	CY	10.00		239,000
VEGETATIV		7950	CY	14.00		111,300
ROLLER & O	PPERATOR	80	DAY	1570.00		125,600
	HYDROSEEDING					-
SEED, FERT	ILIZE, MULCH	10	AC	2000.00		20,000
MONITORIN	IG WELLS	4	EA	2500.00		10,000
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NOTE:	ALL FINAL COVER SOIL MATERIAL QUANTITIES					-
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					. <u></u> .	1 222 875
<b>b</b>						

PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY ALTERNATIVE 5: LIMITED REMOVAL AT AOC 11;	JOB #	8712-04
	CAP-IN-PLACE SAs 6, 12, 13, AOC 41; EXCAVATE AND CONSOLIDATE AOCs 9, 40	DATE	24-Jan-97
LOCATION:	DEVENS, MASSACHUSETTS		
ENGINEER:	ABB ENVIRONMENTAL SERVICES, INC.		

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DESCRIPTION	<b>Ω</b> ΤΥ	UNIT	UNIT COST	TOTAL
TOTAL MOBILIZATION				\$ 357,910
TOTAL SITE PREPARATION				115,500
TOTAL LINER CONSTRUCTION				2,485,735
TOTAL FINAL COVER CONSTRUCTION				1,232,875

UNDEVELOPED DESIGN DETAILS ~25%	1,047,980
TOTAL CONSOLIDATION LANDFILL CONSTRUCTION	\$ 5,240,000

PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY ALTERNATIVE 5: LIMITED REMOVAL AT AOC 11:	JOB #	8712-04
	CAP-IN-PLACE SAS 6, 12, 13, AOC 41; EXCAVATE AND CONSOLIDATE AOCS 9, 40	DATE	24-Jan-97
ENGINEER:	ABB ENVIRONMENTAL SERVICES, INC.		

ANNUAL O&M COSTS	======	===		
AOC 11 LIMITED REMOVAL DESCRIPTION	ΩΤΥ	UNIT	UNIT COST	TOTAL
O&M COSTS TWICE PER YEAR FOR TWO YEARS FOR SITE RESTO DUMP TRUCK & DRIVER	DRATION 2		770.00	\$ 1.540
MATERIALS LABORER - 2 EA	1 32	LS MNHR	500.00 33.50	500 1,072

# UNDEVELOPED DESIGN DETAILS ~25%

# TOTAL ANNUAL O&M COSTS

888 -----4,000

\$

PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY ALTERNATIVE 5: LIMITED REMOVAL AT AOC 11; CAP-IN-PLACE SAs 6, 12, 13, AOC 41;			JOB #	8712-04
LOCATION:	EXCAVATE AND CONSOLIDATE AOCs 9, 40 DEVENS, MASSACHUSETTS			DATE	24-Jan-97
ENGINEER:	ABB ENVIRONMENTAL SERVICES, INC.				
ESTIMATOR	R: P. R. MARTIN				
	ANNUAL O&M COSTS		= = =		
	CAP IN PLACE SA 6			UNIT	
•	DESCRIPTION	ΩΤΥ	UNIT	COST	TOTAL
	OVER MAINTENANCE				
GENER	AL REPAIR				
DUM	/IP TRUCK & DRIVER	1	DAY	770.00	\$770
FRO	NT END LOADER & OPER	1	DAY	825.00	825
LAB	ORER - 2 EA	16	MNHR	33.50	536
MAT	TERIALS	1	LS	500.00	500
INSPEC	CTION - 0.5 DAY @ 2 MEN/DAY	8	MNHR	75.00	600
MOWIN	NG - TRACTOR & OPERATOR	0.5	DAY	500.00	250
ENVIRONME	NTAL MONITORING				
GROUND	WATER SAMPLE COLLECTION	2	LS	1800.00	3,600
4 WELL	LS, SEMI-ANNUALLY (INCLUDES WELL PURGE,				-
SAN	IPLE COLLECTION, AND SHIPPING)				-
GROUND	WATER SAMPLE ANALYSIS				
4 SAM	PLES PLUS 2 SAMPLE QA/QC	12	SMPL	900.00	10,800
EQU	IVALENT SEMI-ANNUALLY, SVOCs,				
INOF	RGANICS, WATER QUALITY PARAMETERS				
FIVE YEAR E	DUCATIONAL PROGRAM	0.1739	LS	5000.00	869
PUBLIC	MEETING - ANNUALIZED				
TWO YEAR	DATA REPORT TO	0.4831	LS	1000.00	483
MADEP	P - ANNUALIZED				
FIVE YEAF	R SITE REVIEW - ANNUALIZED	0.1739	LS	15000.00	2,608

TOTAL ANNUAL O&M COSTS

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\$21,842

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PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY	JOB #	8712-04
	ALTERNATIVE 5: LIMITED REMOVAL AT AOC 11;		
	CAP-IN-PLACE SAs 6, 12, 13, AOC 41;		
	EXCAVATE AND CONSOLIDATE AOCs 9, 40	DATE	24-Jan-97
LOCATION:	DEVENS, MASSACHUSETTS		
ENGINEER:	ABB ENVIRONMENTAL SERVICES, INC.		

		= = =		= =	
ANNUAL O&M COSTS					
CAP IN PLACE SA 12			UNIT		
DESCRIPTION	QTY	UNIT	COST		TOTAL
LANDFILL COVER MAINTENANCE					
GENERAL REPAIR					
DUMP TRUCK & DRIVER	1	DAY	770.00	\$	770
FRONT END LOADER & OPER	1	DAY	825.00		825
LABORER - 2 EA	16	MNHR	33.50		536
MATERIALS	1	LS	500.00		500
INSPECTION - 0.5 DAY @ 2 MEN/DAY	8	MNHR	75.00		600
MOWING - TRACTOR & OPERATOR	0.5	DAY	500.00		250
ENVIRONMENTAL MONITORING					
GROUNDWATER SAMPLE COLLECTION	2	LS	1800.00		3,600
4 WELLS, SEMI-ANNUALLY (INCLUDES WELL PURGE,					-
SAMPLE COLLECTION, AND SHIPPING)					-
GROUNDWATER SAMPLE ANALYSIS					
4 SAMPLES PLUS 2 SAMPLE QA/QC	12	SMPL	900.00		10,800
EQUIVALENT SEMI-ANNUALLY, SVOCs,					
INORGANICS, WATER QUALITY PARAMETERS					
FIVE YEAR EDUCATIONAL PROGRAM	0.1739	LS	5000.00		869
PUBLIC MEETING - ANNUALIZED					
TWO YEAR DATA REPORT TO	0.4831	LS	1000.00		483
MADEP - ANNUALIZED					
FIVE YEAR SITE REVIEW - ANNUALIZED	0.1739	LS	15000.00		2,608
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TOTAL ANNUAL O&M COSTS

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\$ 21,842

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PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY ALTERNATIVE 5: LIMITED REMOVAL AT AOC 11;			JOB #	871:	2-04
LOCATION: ENGINEER:	EXCAVATE AND CONSOLIDATE AOCs 9, 40 DEVENS, MASSACHUSETTS ABB ENVIRONMENTAL SERVICES, INC.			DATE	24-Jan	-97
ESTIMATOR	: P. R. MARTIN					
	ANNUAL O&M COSTS		= = =			= #
	CAP IN PLACE SA 13 DESCRIPTION	ΩΤΥ	UNIT	UNIT COST	TOTAL	
GENER.	AL KEPAIK 19 TRUCK & DRIVER	1	ΠΔΥ	770.00	s 7	770
FRO	NT END LOADER & OPER	1	DAY	825.00		325
LAB	ORER - 2 EA	16	MNHR	33.50	Į	536
MAT	FERIALS	1	LS	500.00	Ę	500
INSPEC	TION - 0.5 DAY @ 2 MEN/DAY	8	MNHR	75.00	6	- 500 -
MOWIN	IG - TRACTOR & OPERATOR	0.5	DAY	500.00	2	250
ENVIRONME	NTAL MONITORING					
GROUNDV 4 WELL SAN	WATER SAMPLE COLLECTION LS, SEMI-ANNUALLY (INCLUDES WELL PURGE, IPLE COLLECTION, AND SHIPPING)	2	LS	1800.00	3,6	-
CDOUND						-
4 SAMI EQU	VATER SAMPLE ANALYSIS PLES PLUS 2 SAMPLE QA/QC IVALENT SEMI-ANNUALLY, SVOCs, PCANICS, WATER OLIALITY PARAMETERS	12	SMPL	900.00	10,8	00
	RUNATIONAL PROCESS	0 1720	16	E000.00	c	260
PUBLIC	MEETING - ANNUALIZED	0.1739	LJ	5000.00	c	
TWO YEAR I MADEP	DATA REPORT TO - ANNUALIZED	0.4831	LS	1000.00	4	183
FIVE YEAR	R SITE REVIEW - ANNUALIZED	0.1739	LS	15000.00	2,6	608

TOTAL ANNUAL O&M COSTS

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\$ 21,842

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PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY ALTERNATIVE 5: LIMITED REMOVAL AT AOC 11;			JOB #		8712-04
LOCATION: ENGINEER:	CAP-IN-PLACE SAS 6, 12, 13, AUC 41; EXCAVATE AND CONSOLIDATE AOCs 9, 40 DEVENS, MASSACHUSETTS ABB ENVIRONMENTAL SERVICES, INC.			DATE		24-Jan-97
ESTIMATOR	P. R. MARTIN					
=====			= = =			
	CAP IN PLACE AOC 41 DESCRIPTION	ΩΤΥ	UNIT	UNIT COST		TOTAL
	OVER MAINTENANCE					
GENER,	AL REPAIR	1		770.00	ŝ	770
FROM		1		825.00	•	825
LAB	ORFR - 2 FA	16	MNHR	33.50		536
MAT	FERIALS	1	LS	500.00	•	500
INSPEC	TION - 0.5 DAY @ 2 MEN/DAY	8	MNHR	75.00		600
MOWIN	NG - TRACTOR & OPERATOR	0.5	DAY	500.00		250
ENVIRONME	NTAL MONITORING					
GROUND\ 4 WELL SAM	WATER SAMPLE COLLECTION LS, SEMI-ANNUALLY (INCLUDES WELL PURGE, IPLE COLLECTION, AND SHIPPING)	2	LS	1800.00		3,600 - -
Ground 4 Sam Equ Inof	WATER SAMPLE ANALYSIS PLES PLUS 2 SAMPLE QA/QC IVALENT SEMI-ANNUALLY, SVOCs, RGANICS, WATER QUALITY PARAMETERS	12	SMPL	900.00		- 10,800
FIVE YEAR E PUBLIC	EDUCATIONAL PROGRAM C MEETING - ANNUALIZED	0.1739	LS	5000.00		869
TWO YEAR I MADEF	DATA REPORT TO - ANNUALIZED	0.4831	LS	1000.00		483
FIVE YEA	R SITE REVIEW - ANNUALIZED	0.1739	LS	15000.00		2,608 -

TOTAL ANNUAL O&M COSTS

21,842

\$

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PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY	JOB #	8712-04
	ALTERNATIVE 5: LIMITED REMOVAL AT AOC 11;		
	CAP-IN-PLACE SAs 6, 12, 13, AOC 41;		
	EXCAVATE AND CONSOLIDATE AOCs 9, 40	DATE	24-Jan-97
LOCATION:	DEVENS, MASSACHUSETTS		
ENGINEER:	ABB ENVIRONMENTAL SERVICES, INC.		

	CAP IN PLACE ANNUAL O&M COSTS	******			= =	
	DESCRIPTION	QTY	UNIT	COST		TOTAL
TOTAL SA 6	ANNUAL O&M COSTS - FOR 30 YEARS				\$	21,842
TOTAL SA 12						21,842
TOTAL SA 13						21,842
TOTAL AOC 41						21,842

UNDEVELOPED DESIGN DETAILS ~25%	21,632	
TOTAL ANNUAL O&M COSTS - 30 YEARS	\$ 109,000	

PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY	JOB #	8712-04
	ALTERNATIVE 5: LIMITED REMOVAL AT AOC 11;		
	CAP-IN-PLACE SAs 6, 12, 13, AOC 41;		
	EXCAVATE AND CONSOLIDATE AOCs 9, 40	DATE	24-Jan-97
LOCATION:	DEVENS, MASSACHUSETTS		
ENGINEER:	ABB ENVIRONMENTAL SERVICES, INC.		

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ANNOAL ORIN COSTS AOC 40 DESCRIPTION	ΔΤΥ	UNIT	UNIT COST		TOTAL
O&M COSTS OCCURING OVER FIVE YEARS FOR CSB LANDFILL SEDIMENT, 2 SAMPLES AT 2 LOCATIONS, ONE TIME ONLY AT METALS - ANNUALIZED	T YEAR 5 0.7239	SMPL	625.00	\$	452
GROUNDWATER MONITORING, 2 WELLS, SEMI-ANNUALLY GENERAL PARAMETERS & METALS	4	SMPL	1020.00		4,080
SAMPLE COLLECTION (INCLUDES WELL PURGE, SAMPLE COLLECTION, AND SHIPMENT)	2	LS	2500		5,000
WETLANDS RESTORATION MONITORING 1 DAY @ 2 MEN/DAY, SEMI-ANNUALLY	32	MNHR	75.00		- 2,400
BIO MONITORING, BI-ANNUALLY	0.4878	LS	15000.00		7,317
FIVE YEAR EDUCATION PROGRAM ONCE PUBLIC MEETING - ANNUALIZED	0.1810	LS	2500.00		- 452
FIVE YEAR SITE REVIEW - ANNUALIZED	0.1810	LS	20000.00		3,619
UNDEVELOPED DESIGN DETAILS ~25%					5,679
TOTAL ADDITIONAL ANNUAL O&M COSTS FOR A	DC 40 - 5 YEARS			\$	29,000



PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY	JOB #	8712-04
	ALTERNATIVE 5: LIMITED REMOVAL AT AOC 11;		
	CAP-IN-PLACE SAs 6, 12, 13, AOC 41;		
	EXCAVATE AND CONSOLIDATE AOCs 9, 40	DATE	24-Jan-97
LOCATION:	DEVENS, MASSACHUSETTS		
ENGINEER:	ABB ENVIRONMENTAL SERVICES, INC.		

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		= = =		= =	====
			UNIT		
DESCRIPTION	QTY	UNIT	COST		TOTAL
0&M COSTS OCCURING OVER THIRTY YEARS FOR CONSOLIDATIO	ON LANDFILL	*******			
FIVE YEAR SITE REVIEW - ANNUALIZED	0.1810	LS	10000.00	\$	1,810
ENVIRONMENTAL MONITORING					-
GROUNDWATER, 4 WELLS, SEMI-ANNUALLY					-
GENERAL PARAMETERS & METALS	8	SMPL	940.00		7,520
LANDFILL COVER MAINTENANCE					-
INSPECTION - 2 DAY @ 2 MEN/DAY	32	MNHR	75.00		2,400
GENERAL REPAIR					-
DUMP TRUCK & DRIVER	1	DAY	770.00		770
FRONT END LOADER & OPERATOR	1	DAY	825.00		825
LABORER - 2 EA	16	MNHR	33.50		536
MATERIALS	1	LS	500.00		500
MOWING	2	EVENT	1000.00		2,000
BI-ANNUAL REPORT TO DEP - ANNUALIZED	0.4878	LS	2500.00		- 1,220
AYER WWTP USER FEE	600	CCF	2.00		1,200
UNDEVELOPED DESIGN DETAILS ~25%					4,220
TOTAL ANNUAL O&M COSTS FOR 30 YEAR ACTIVIT	IES			\$	23,000

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PROJECT: LANDFILL REMEDIATION FEASIBILITY STUDY JOB # ALTERNATIVE 6: CAP-IN-PLACE SAs 6, 12, 13 AND AOC 41:				8712-0		
	EXCAVATE AND CONSOLIDATE AOCs 9, 11, 40					
LOCATION:	DEVENS, MASSACHUSETTS			DATE		24-Jan-97
ENGINEER:	ABB ENVIRONMENTAL SERVICES, INC.					
ESTIMATOR	P. R. MARTIN		۵			
		======			= =	
	COST SOMMART TABLE			UNIT		
	DESCRIPTION	QTY	UNIT	COST		TOTAL
DIRECT COS	TS					
CAP IN PL	ACE					
	SA 6				\$	159,00
	SA 12					507,00
	SA 13					395,00
	AOC 41					175,00
EXCAVAT	E AND CONSOLIDATE					
	AOC 9					3,835,00
	AOC 11					1,571,00
CONCOLU						5,570,00
CONSOLI	DATION LANDFILL CONSTRUCTION					
	TOTAL DIRECT COSTS				\$ 1!	5,252,00
	) STS					
	HEALTH AND SAFETY			5.00%	ŝ	763.00
	LEGAL ADMIN PERMITTING			5.00%	•	763,00
	ENGINEERING			10.00%		1,525,00
	SERVICES DURING CONSTRUCTION			10.00%		1,525,00
	TOTAL INDIRECT COSTS				\$	4,576,00
					6 1	a 020 AA
	TOTAL CAPITAL (DIRECT + INDIRECT) COST				γI	9,020,00
OPERATING	AND MAINTENANCE COSTS					
	TOTAL ANNUAL O&M COSTS FOR CAP-IN-PLACE				Ş	109,00
	TOTAL ANNULAL ORM COSTS FOR NEW/ LANDELL	30 YBS				23.00
	TOTAL ADDITIONAL ANNUAL O&M COSTS FOR AC	0C 40 - 5 YRS				29,00
	TOTAL PRESENT WORTH OF OPERATING AND MAI	NTENANCE CO	OSTS		\$	1,757,00
					\$ 7	1 585 00

PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY	JOB #	8712-04
	ALTERNATIVE 6: CAP-IN-PLACE SAs 6, 12, 13 AND AOC 41;		
	EXCAVATE AND CONSOLIDATE AOCs 9, 11, 40		
LOCATION:	DEVENS, MASSACHUSETTS	DATE	24-Jan-97

## ESTIMATOR: P. R. MARTIN

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CAP IN PLACE SA 6		= = =	======	======
MOB/DEMOB			UNIT	
DESCRIPTION	ΩΤΥ	UNIT	COST	TOTAL
MOB/DEMOB EQUIPMENT (IN OR OUT)				
FRONT END LOADER	2	EA	410.00	\$ 820
DUMP TRUCK	2	EA	385.00	770
BACK HOE	2	EA	730.00	1,460
DOZER	2	EA	880.00	1,760
ROLLER	2	EA	785.00	1,570
				-
OFFICE TRAILER	1	MON	150.00	150
STORAGE TRAILER	1	MON	100.00	100
SET UP TRAILER	2	EA	500.00	1,000
			05.00	-
TOILET - 2 EA	8	WK	25.00	200
WATER COOLER - 2 EA	8	WK	25.00	200
	40	DAY	15.00	600
	1	MON	500.00	500
	1	MON	250.00	250
PICK-UP (2 EA)	2	MON	1000.00	2,000
PUMPS, TOOLS, MINOR EQUIPMENT	1	MON	500.00	500
SITE SUPERINTENDANT ( 1 MON * 210 HR/MON)	210	MNHR	65.00	13,65Ó
FOREMEN (1 MON * 210 HR/MON)	210	MNHR	55.00	11,550
CLERK/TYPIST (1 MON * 168 HR/MON)	168	MNHR	25.00	4,200
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TOTAL MOB/DEMOB

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41,280

\$

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PROJECT: LANDFILL REMEDIATION FEASIBILITY STUDY JOB #				8712-04		
	EXCAVATE AND CONSOLIDATE AOCs 9, 11, 40	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,		DATE		24- Jan-97
LOCATION.				DATE		24 001 07
ENGINEER:	ABB ENVIRONMENTAL SERVICES, INC.					
ESTIMATOR	P. R. MARTIN					
	* = = = = = = = = = = = = = = = = = = =				= =	
	CAP IN PLACE SA 6 SITE PREPARATION & CAP CONSTRUCTION			UNIT		
	DESCRIPTION	QTY	UNIT	COST		TOTAL
***************	SITE PREPARATION		<i></i>			
ACCESS RO	AD - 675 LF x 15' WIDE					
GRADE R	OAD BED - DOZER & OPERATOR	1	DAY	1760.00	\$	1,760
GRAVEL -	- 12" THICK	375	CY	10.00		3,750
SPREAD &	& COMPACT	0.5	DAY	1570.00		785
GEOFABR	RIC	1125	SY	1.00		1,125
CLEAR TREE	S FROM SITE	0.25	AC	6900.00		1,725
ARCHAEOLO	DGICAL SURVEY OF LANDFILL					-
PROJECT	MANAGER	1	DAY	425.00		425
PRINCIPA	L INVESTIGATOR	1	DAY	385.00		385
PROJECT	ARCHAEOLOGIST	7	DAY	280.00		1,960
ASSISTAI	NT ARCHAEOLOGIST	6	DAY	195.00		1,170
Work Pr	ROCESSOR	1	DAY	185.00		185
ODCs		1	LS	100.00		100
MILAGE		1000	MILE	0.25		250
PER DIEM	1	5	DAY	60.00		300
UXO CLEAR	ANCE	2	DAY	1800.00		3,600
GRADING &	DRAINAGE SWALE CONSTRUCTION					-
DOZER &	OPERATOR	1	DAY	1760.00		1,760
LABORER		8	HR	33.50		268
	TOTAL SITE PREPARATION				\$	19,548
	CAP CONSTRUCTION					
SUBGRADE	SOIL	520	CY	10.00	\$	5,200
TEXTURED	GEOMEMBRANE	6750	SF	0.80		5,400
DRAINAGE S	SOIL	365	CY	17.00		6,205
GEOTEXTILE	E FABRIC LAYER	6750	SF	0.10		675
MOISTURE F	RETENTION SOIL	650	CY	10.00		6,500
VEGETATIV	E SOIL	230	CY	14.00		3,220
SPREAD & C	COMPACT	3	DAY	1570.00		4,710
	TOTAL CAP CONSTRUCTION				\$	31,910
	NOTE: CAP SOIL MATERIAL QUANTITIES INCLUDE	A 30% SWELL F	ACTOR.			
				****************		*===*==

PROJECT: LANDFILL REMEDIATION FEASIBILITY STUDY				JOB #		8712-04	
LOCATION:	EXCAVATE AND CONSOLIDATE AOCs 9, 11, 40 DEVENS, MASSACHUSETTS	,		DATE		24-Jan-97	
ENGINEER:	ABB ENVIRONMENTAL SERVICES, INC.						
ESTIMATOR	: P. R. MARTIN						
CAP IN PLACE SA 6							
	DESCRIPTION	QTY	UNIT	COST		TOTAL	
	SITE RESTORATION						
CHAIN LIN 12' SWIN FERTILIZE	NK FENCE G GATE , SEED, MULCH	400 1 1000	LF EA SY	13.00 800.00 0.50	\$	5,200 800 500	
	TOTAL SITE RESTORATION				\$	6,500	
MONITORING	G WELLS - 4" DIA x 30' DEEP	4	EA	4500.00	\$	18,000	
INSTITUTION	VAL CONTROLS	1	LS	10000.00	\$	10,000	

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PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY ALTERNATIVE 6: CAP-IN-PLACE SAs 6, 12, 13 AND AOC 41:	JOB #	8712-04
	EXCAVATE AND CONSOLIDATE AOCs 9, 11, 40		
LOCATION:	DEVENS, MASSACHUSETTS	DATE	24-Jan-97

ESTIMATOR: P. R. MARTIN

CAP IN PLACE SA 6 SUMMARY SHEFT			E E E E E E E E E E E E E E E E E E E	= =	= = = = =
DESCRIPTION	ΩΤΥ	UNIT	COST		TOTAL
TOTAL MOB/DEMOB				\$	41,280
TOTAL SITE PREPARATION					19,548
TOTAL CAP CONSTRUCTION					31,910
TOTAL SITE RESTORATION					6,500
TOTAL MONITORING WELLS					18,000
TOTAL INSTITUTIONAL CONTROLS					10,000
UNDEVELOPED DESIGN DETAILS ~25%					31,762
TOTAL SA 6				\$	159,000



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PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY ALTERNATIVE 6: CAP-IN-PLACE SAs 6, 12, 13 AND AOC 41:	JOB #	8712-04
LOCATION:	EXCAVATE AND CONSOLIDATE AOCs 9, 11, 40 DEVENS, MASSACHUSETTS	DATE	24-Jan-97
ENGINEER:	ABB ENVIRONMENTAL SERVICES, INC.		

CAP IN PLACE SA 12	*====**	= = =	======	= =	
MOB/DEMOB			UNIT		
DESCRIPTION	QTY	UNIT	COST		TOTAL
MOB/DEMOB EQUIPMENT (IN OR OUT)					
FRONT END LOADER	2	EA	410.00	\$	820
DUMP TRUCK	2	EA	385.00		770
BACK HOE	2	EA	730.00		1,460
DOZER (2 EA)	4	EA	880.00		3,520
ROLLER (2 EA)	4	EA	785.00		3,140
					-
					-
OFFICE TRAILER	2	MON	150.00		300
STORAGE TRAILER	2	MON	100.00		200
SET UP TRAILER	2	EA	500.00		1,000
ΤΟΗ ΕΤ - 2 ΕΔ	16		25.00		-
	10	WK	25.00		400
WATER	40	ΠΔΥ	15.00		600
TELEPHONE SERVICE		MON	500.00		1.000
ELECTRICITY	2	MON	250.00		500
PICK-UP (2 EA)	4	MON	1000.00		4,000
					-
PUMPS, TOOLS, MINOR EQUIPMENT	2	MON	500.00		1,000
SITE SUPERINTENDANT ( 2 MON * 210 HR/MON)	420	MNHR	65.00		- 27.300
FOREMEN (2 MON * 210 HR/MON)	420	MNHR	55.00		23,100
CIERK/TYPIST (2 MON * 168 HR/MON)	336	MNHR	25.00		8,400
	500		20.00		-

TOTAL MOB/DEMOB

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\$77,910

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PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY ALTERNATIVE 6: CAP-IN-PLACE SAs 6, 12, 13	AND AOC 41;		JOB #		8712-04
LOCATION:	EXCAVATE AND CONSOLIDATE AOCs 9, 11 DEVENS, MASSACHUSETTS	, 40		DATE		24-Jan-97
ENGINEER:	ABB ENVIRONMENTAL SERVICES, INC.					
ESTIMATOR:	P. R. MARTIN					
			= = =			=====
SITE	CAP IN PLACE SA 12 PREPARATION, CAP CONSTRUCTION, SITE RES DESCRIPTION	TORATION QTY	UNIT	UNIT COST		TOTAL
	SITE PREPARATION					
ACCESS ROA	AD - 300 LF x 20' WIDE					
GRADE RO	DAD BED - DOZER & OPERATOR	0.5	DAY	1760.00	\$	880
GRAVEL -	12" THICK	80	CY	10.00		800
SPREAD &	COMPACT	0.25	DAY	1570.00		393
GEOFABR	IC	700	SY	1.00		/00
CLEAR TREE	S FROM SITE	0.5	AC	6900.00		3,450
EROSION CO	INTROL	325	LF	5.00		1,625
UXO CLEAR	ANCE	15	DAY	1800.00		27,000
						-
		2		1760.00		3 520
LABORER	OFENATOR	16	HR	33.50		536
EADONEN		10				20 004
	TOTAL SITE PREPARATION				Ş	38,904
•	CAP CONSTRUCTION					
SUBGRADE	SOIL	9450	CY	10.00	\$	94,500
TEXTURED O	GEOMEMBRANE	40950	SF	0.80		32,760
DRAINAGE S	SOIL	2050	CY	17.00		34,850
GEOTEXTILE	FABRIC LAYER	40950	SF	0.10		4,095
MOISTURE F	RETENTION SOIL	3200	CY	10.00		32,000
VEGETATIVE	E SOIL	1150	CY	14.00		16,100
SPREAD & C	COMPACT	20	DAY	1570.00		31,400
	TOTAL CAP CONSTRUCTION				\$	245,705
	NOTE: CAP SOIL MATERIAL QUANTITIES INCL	UDE A 30% SWELL F	ACTOR.			-
						-
	SITE RESTORATION					
CHAIN LI	NK FENCE	1000	LF	13.00	Ş	13,000
12' SWIN	IG GATE	1	EA	800.00		008
FERTILIZE	E, SEED, MULCH	2400	51	0.50		1,200
	TOTAL SITE RESTORATION				\$	15,000
						-

PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY				JOB #		8712-04	
LOCATION:	EXCAVATE AND CONSOLIDATE AOCs 9, 11, 40 DEVENS, MASSACHUSETTS	AUC 41;			DATE		24-Jan-97	
ENGINEER:	ABB ENVIRONMENTAL SERVICES, INC.							
ESTIMATOR:	P. R. MARTIN							
	CAP IN PLACE SA 12					= =	====	
	MONITORING WELLS & INSTITUTIONAL CONTROLS DESCRIPTION	ΩΤΥ		UNIT	UNIT COST		TOTAL	
MONITORING	G WELLS - 4" DIA x 30' DEEP		4	EA	4500.00	\$	18,000	
INSTITUTION	JAL CONTROLS		1	LS	10000.00	\$	10,000	

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PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY	JOB #	8712-04
LOCATION:	EXCAVATE AND CONSOLIDATE AOCs 9, 11, 40 DEVENS, MASSACHUSETTS	DATE	24-Jan-97

ESTIMATOR: P. R. MARTIN

CAP IN PLACE SA 12		===	= = = = = = = = = = = = = = = = = = =	= #	
DESCRIPTION	ΩΤΥ	UNIT	COST		TOTAL
TOTAL MOB/DEMOB				\$	77,910
TOTAL SITE PREPARATION					38,904
TOTAL CAP CONSTRUCTION					245,705
TOTAL SITE RESTORATION					15,000
TOTAL MONITORING WELLS					18,000
TOTAL INSTITUTIONAL CONTROLS					10,000
UNDEVELOPED DESIGN DETAILS ~25%					101,482
TOTAL SA 12				\$	507,000

PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY ALTERNATIVE 6: CAP-IN-PLACE SAs 6, 12, 13 AND AOC 41:	JOB #	8712-04
LOCATION:	EXCAVATE AND CONSOLIDATE AOCs 9, 11, 40 DEVENS, MASSACHUSETTS	DATE	24-Jan-97
ENGINEER:	ABB ENVIRONMENTAL SERVICES, INC.		

CAP IN PLACE SA 13		= = =	= = = = = = = = =   INIT		
DESCRIPTION	ΟΤΥ	UNIT	COST	тоти	٩L
MOB/DEMOB EQUIPMENT (IN OR OUT)					********
FRONT END LOADER	2	EA	410.00	\$	820
DUMP TRUCK	2	EA	385.00		770
BACK HOE	2	EA	730.00		1,460
DOZER	2	EA	880.00		1,760
ROLLER	2	EA	785.00		1,570
					-
OFFICE TRAILER	1.5	MON	150.00		225
STORAGE TRAILER	1.5	MON	100.00		150
SET UP TRAILER	2	EA	500.00		000, 1
	10	MK	25.00		- 300
	12	W/K	25.00		300
WATER COOLER - 2 EA	60	ΠΔΥ	15.00		900
	1.5	MON	500.00		750
FLECTRICITY	1.5	MON	250.00		375
PICK-UP (2 EA)	3	MON	1000.00	3	3,000
	1 5		E00.00		- 750
PUMPS, TOOLS, MINOR EQUIPMENT	1.5	MUN	500.00		-
SITE SUPERINTENDANT ( 1.5 MON * 210 HR/MON)	315	MNHR	65.00	20	),475
FOREMEN (1.5 MON * 210 HR/MON)	315	MNHR	55.00	17	7,325
CLERK/TYPIST (1.5 MON * 168 HR/MON)	252	MNHR	25.00	e	5,300
					-

TOTAL MOB/DEMOB

\$ 58,230

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	TOTAL SITE RESTORATION				\$	15,150 -
FERTILIZE	E, SEED, MULCH	5300	SY	0.50		2,650
12' SWIN	IG GATE	1	EA	800.00		800
CHAIN LI	SITE RESTORATION	900	LF	13.00	\$	- 11,700
	NOTE: SOIL CAP MATERIAL QUANTITIES INCL	UDE A 30% SWELL F	ACTOR.			- -
	TOTAL CAP CONSTRUCTION				\$	<b>204,76</b> 0 -
SPREAD & C	COMPACT	16	DAY	1570.00		25,120
VEGETATIVE	E SOIL	1150	CY	14.00		16,100
MOISTURE F	RETENTION SOIL	3350	CY	10.00		33,500
GEOTEXTILE	FABRIC LAYER	42600	SF	0.10		4,260
DRAINAGE S	SOIL	2100	CY	17.00		35,700
TEXTURED (	GEOMEMBRANE	42600	SF	0.80	•	34,080
SUBGRADE		5600	CY	10.00	ŝ	56.000
)	TOTAL SITE PREPARATION				\$	10,201
LABORER		8	HR	33.50		268 -
GRADING & DOZER &	DRAINAGE SWALE CONSTRUCTION OPERATOR	1	DAY	1760.00		- 1,760
EROSION CO	DNTROL	300	LF	5.00		1,500
CLEAR TREE	S FROM SITE	0.5	AC	6900.00		3,450
GEOFABR	IC	450	SY	1.00		450
SPREAD &	& COMPACT	0.25	DAY	1570.00		393
GRAVEL -	12" THICK	150	CY	10.00		1,500
ACCESS ROA	AD - 200 LF x 20' WIDE DAD BED - DOZER & OPERATOR	0.5	DAY	1760.00	\$	880
	SITE PREPARATION					
SITE	CAP IN PLACE SA 13 PREPARATION, CAP CONSTRUCTION, SITE REST DESCRIPTION	CORATION QTY		UNIT COST	= =	TOTAL
ESTIMATOR:						
ENGINEER:	ABB ENVIRONMENTAL SERVICES, INC.					
LOCATION:	DEVENS, MASSACHUSETTS			DATE		24-Jan-97
	ALTERNATIVE 6: CAP-IN-PLACE SAS 6, 12, 13 A EXCAVATE AND CONSOLIDATE AOCS 9, 11,	AND AOC 41; 40				04 1 07
PROJECT:	LANDFILL REMEDIATION PEASIBILITY STUDY			JUB #		0/12-04

PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY	00.44			JOB #		8712-04
LOCATION:	EXCAVATE AND CONSOLIDATE AOCs 9, 11, 40 DEVENS, MASSACHUSETTS	00 41;			DATE		24-Jan-97
ENGINEER:	ABB ENVIRONMENTAL SERVICES, INC.						
ESTIMATOR:	P. R. MARTIN						
	CAP IN PLACE SA 13 MONITORING WELLS & INSTITUTIONAL CONTROLS	= = = = =	: =	= = =		= =	
					4500.00		101AL
	J WELLS - 4 DIA X JU DEEP		4	EA	4500.00	÷	18,000
INSTITUTION	IAL CONTROLS		1	LS	10000.00	\$	10,000

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PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY	JOB #	8712-04
LOCATION:	EXCAVATE AND CONSOLIDATE AOCs 9, 11, 40 DEVENS, MASSACHUSETTS	DATE	24-Jan-97

ESTIMATOR: P. R. MARTIN

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CAP IN PLACE SA 13			 = =	=====
SUMMARY SHEET DESCRIPTION	QTY	UNIT		TOTAL
TOTAL MOB/DEMOB	· ••••••		 \$	58,230
TOTAL SITE PREPARATION				10,201
TOTAL CAP CONSTRUCTION				204,760
TOTAL SITE RESTORATION				15,150
TOTAL MONITORING WELLS				18,000
TOTAL INSTITUTIONAL CONTROLS				10,000
UNDEVELOPED DESIGN DETAILS ~25%				78,660
TOTAL SA 13			\$	395,000

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PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY ALTERNATIVE 6: CAP-IN-PLACE SAs 6, 12, 13 AND	AOC 41;		JOB #	8712-04	
LOCATION:	EXCAVATE AND CONSOLIDATE AOCs 9, 11, 40 DEVENS, MASSACHUSETTS			DATE	24-Jan-97	(
ENGINEER:	ABB ENVIRONMENTAL SERVICES, INC.					
ESTIMATOR:	P. R. MARTIN					
=====						
	DESCRIPTION	QTY	UNIT	COST	TOTAL	
MOR/DEMOR			,	*		
FRONT EN	ID LOADER	2	FA	410.00	\$ 820	
DUMP TRU		2	EA	385.00	770	
BACK HO		2	EA	730.00	1,460	
DOZER		2	EA	880.00	1,760	
ROLLER		2	EA	785.00	1,570	
					-	
OFFICE TRAI	I FB	1	MON	150.00	- 150	
STORAGE TE	BAILEB	1	MON	100.00	100	
SET UP TRAI	LER	2	EA	500.00	1,000	
		-			-	
TOILET - 2 E	A	8	WΚ	25.00	200	
WATER COO	LER - 2 EA	8	WΚ	25.00	200	
WATER		40	DAY	15.00	600	
TELEPHONE	SERVICE	1	MON	500.00	500	1
ELECTRICITY		1	MON	250.00	250	
PICK-UP (2 E	A)	2	MON	1000.00	2,000	
PUMPS TOO		1	MON	500.00	- 500	
		•		000.00		
SITE SUPERI	NTENDANT ( 1 MON * 210 HR/MON)	210	MNHR	65.00	13,650	
FOREMEN (1	MON * 210 HR/MON)	210	MNHR	55.00	11,550	
CLERK/TYPIS	T (1 MON * 168 HR/MON)	168	MNHR	25.00	4,200	
					•	

TOTAL MOB/DEMOB

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\$ 41,280

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PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY ALTERNATIVE 6: CAP-IN-PLACE SAs 6, 12, 13 AN	D AOC 41;		JOB #		8712-04
LOCATION:	EXCAVATE AND CONSOLIDATE AOCs 9, 11, 40 DEVENS, MASSACHUSETTS	)		DATE		24-Jan-97
ENGINEER:	ABB ENVIRONMENTAL SERVICES, INC.					
ESTIMATOR:	P. R. MARTIN					
		******	= = =			====
	CAP IN PLACE AOC 41					
SITE	PREPARATION, CAP CONSTRUCTION, SITE RESTOR DESCRIPTION	RATION QTY	UNIT	UNIT COST		TOTAL
•						
ACCESS BOA	$AD = 350 \text{ LE } \times 20^{\circ} \text{ WIDE}$					
GRADE BO	DAD BED - DOZER & OPERATOR	0.5	DAY	1760.00	\$	880
GRAVEL -	12" THICK	270	CY	10.00	•	2,700
GEOFABR	IC	800	SY	1.00		800
SPREAD 8	COMPACT	0.5	DAY	1570.00		785
CLEAR TREE	S FROM SITE	0.5	AC	6900.00		3,450
EROSION CO	NTROL	150	LF	5.00		750
GRADING &	DRAINAGE SWALE CONSTRUCTION					-
DOZER &	OPERATOR	1	DAY	1760.00		1,760
LABORER		8	HR	33.50		268
UXO CLEARA	ANCE	2	DAY	1800.00		3,600
	TOTAL SITE PREPARATION				\$	14,993
	SOIL	625	CY	10.00	Ś	6.250
TEXTURED	SEOMEMBRANE	10400	SF	0.80	•	8,320
DRAINAGES	SOIL	565	CY	17.00		9,605
GEOTEXTILE		10400	SF	0.10		1,040
MOISTURE R	RETENTION SOIL	990	CY	10.00		9,900
VEGETATIVE	E SOIL	300	CY	14.00		4,200
SPREAD & C	OMPACT	5	DAY	1570.00		7,850
	TOTAL CAP CONSTRUCTION				\$	47,165
	NOTE: CAP SOIL MATERIAL QUANTITIES INCLUD	e a 30% Swell f	ACTOR.			
	SITE RESTORATION					
CHAIN LIN	NK FENCE	550	LF	13.00	\$	7,150
12' SWIN	G GATE	1	EA	800.00		800
FERTILIZE	, SEED, MULCH	1600	SY	0.50		800
	TOTAL SITE RESTORATION				\$	8,750
						- 
<b>D</b>						y = = g = = = y = 7 = = = y =

PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY				JOB #		8712-04
	ALTERNATIVE 6: CAP-IN-PLACE SAs 6, 12, 13 AND A EXCAVATE AND CONSOLIDATE AOCs 9, 11, 40	AOC 41;					
LOCATION:	DEVENS, MASSACHUSETTS				DATE		24-Jan-97
ENGINEER:	ABB ENVIRONMENTAL SERVICES, INC.						
ESTIMATOR	: P. R. MARTIN						
=====			=	= = =		= =	=====
	CAP IN PLACE AOC 41						
	MONITORING WELLS & INSTITUTIONAL CONTROLS	071			UNIT		
	DESCRIPTION	UIY		UNH	COST		TOTAL
MONITORING	G WELLS - 4" DIA x 30' DEEP		4	EA	4500.00	\$	18,000
INSTITUTION	VAL CONTROLS		1	LS	10000.00	\$	10,000

PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY ALTERNATIVE 6: CAP-IN-PLACE SAs 6, 12, 13 AND AOC 41;	JOB #	8712-04
LOCATION:	EXCAVATE AND CONSOLIDATE AOCs 9, 11, 40 DEVENS, MASSACHUSETTS	DATE	24-Jan-97
ENGINEER:	ABB ENVIRONMENTAL SERVICES, INC.		

CAP IN PLACE AOC 41		= = =		= =	====
SUMMARY SHEET DESCRIPTION	ΩΤΥ	UNIT	UNIT COST		TOTAL
TOTAL MOB/DEMOB			*	\$	41,280
TOTAL SITE PREPARATION					14,993
TOTAL CAP CONSTRUCTION					47,165
TOTAL SITE RESTORATION					8,750
TOTAL MONITORING WELLS					18,000
TOTAL INSTITUTIONAL CONTROLS					10,000
UNDEVELOPED DESIGN DETAILS ~25%					34,812
TOTAL SA 13				\$	175,000

PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY ALTERNATIVE 6: CAP-IN-PLACE SAs 6, 12, 13 ANI	D AOC 41;		JOB #	8712-	04
	EXCAVATE AND CONSOLIDATE AOCs 9, 11, 40	)				
LUCATION:	DEVENS, MASSACHUSETTS			DATE	24-Jan-S	3/
ENGINEER:	ABB ENVIRONMENTAL SERVICES, INC.					
ESTIMATOR	P. R. MARTIN					
			:			
	EXCAVATE AND CONSOLIDATE AUC 9			UNIT		
	DESCRIPTION	QTY	UNIT	COST	TOTAL	
MOB/DEMOB		* *********************				
DUMP TR	UCKS	32	EA	385.00	\$ 12,32	20
BACKHOE		4	EA	730.00	2,92	20
ROLLER		8	EA	785.00	6,28	80
OFFICE TRAI	LER	5	MON	150.00	75	50
STORAGE TF	RAILER	5	MON	100.00	50	00
SET UP TRAI	LER	2	EA	500.00	1,00	00
TOILET - 2 E	A	44	WK	25.00	1.10	0
WATER COO	LER - 2 EA	44	WK	25.00	1.10	0
WATER		220	DAY	15.00	3,30	0
TELEPHONE	SERVICE	5	MON	500.00	2,50	0
ELECTRICITY	,	5	MON	250.00	1,25	0
PICK-UP (2 E	A)	10	MON 1000.00	10,00	0	
PUMPS, TOO	ILS, MINOR EQUIPMENT	1	LS	2500.00	- 2,50	0
SITE SUPERIN	NTENDANT ( 5 MON * 210 HB/MON)	1050	MNHR	65.00	68.25	0
FOREMEN (5	MON * 210 HR/MON)	1050	MNHR	55.00	57,75	0
CLERK/TYPIS	T (5 MON * 168 HR/MON)	840	MNHR	25.00	21,00	0
CLEAR TREES	5	2.5	AC	6900.00	- 17,25	0
EROSION CO	NTROL	700	LF	5.00	- 3,50	0
						_
UXO CLEARA	ANCE	70	DAY	1800.00	126,00	0
					-	
					-	
					-	
EXCAVATION		140	DAV	1460.00	204 40	^
BACKHUE	& UPERATUR (2 EA)			1400.00	204,40	0
DUMP TRU	JCK & OPERATOR (16 EA)	1120	DAY	770.00	862,40	0
					-	
SPREAD OVE	R ON-SITE CONSOLIDATION LANDFILL & COMPACT					~
ROLLER &	OPERATOR (4 EA)	280	DAY	1570.00	439,60	U
					-	
					-	
		TOTAL THIS PA	GE		\$ 1,845,67	0

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PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY ALTERNATIVE 6: CAP-IN-PLACE SAs 6, 12, 13 AND	AOC 41;		JOB #		8712-04
LOCATION:	EXCAVATE AND CONSOLIDATE AOCs 9, 11, 40 DEVENS, MASSACHUSETTS			DATE		24-Jan-97
ENGINEER:	ABB ENVIRONMENTAL SERVICES, INC.					
ESTIMATOR:	P. R. MARTIN					
	EXCAVATE AND CONSOLIDATE AOC 9		=== :	= = = = = = = = = = = = = = = = = = =	= =	
	DESCRIPTION	QTY	UNIT	COST		TOTAL
TOTAL PREV	/IOUS PAGE				\$	1,845,670
BACKFILL (1 AVAILABL LOAD ST( HAUL & D	12,000 * 1.3 = 145,600 CY REQUIRED) LE FROM CONSOLIDATION LANDFILL EXCAVATION OCKPILED BACKFILL DUMP	88750 110 330	CY DAY DAY	0.00 825.00 770.00		0 90,750 254,100 -
PURCHAS (INCLUDIN	SED FROM OFF-SITE NG 30% SWELL FACTOR)	56850	СҮ	10.00		568,500 -
SITE RESTOI BACKFILL FERTILIZE WETLAND	RATION ., GRADE, COMPACT (2 EA) E, SEED, MULCH D RESTORATION UNDEVELOPED DESIGN DETAILS ~25%	182 36300 0.1	DAY SY AC	1570.00 0.50 50000.00		285,740 18,150 5,000 - 767,090
	TOTAL AOC 9				\$	3,835,000



PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY ALTERNATIVE 6: CAP-IN-PLACE SAS 6, 12, 13 AND A EXCAVATE AND CONSOLIDATE AOCS 9, 11, 40	OC 41;		JOB #	8712-04	
LOCATION:	DEVENS, MASSACHUSETTS			DATE	24-Jan-97	(
ENGINEER:	ABB ENVIRONMENTAL SERVICES, INC.					
ESTIMATOR:	P. R. MARTIN					
	EXCAVATE AND CONSOLIDATE ACC TT			UNIT		
	DESCRIPTION	QTY	UNIT	COST	 TOTAL	
MOB/DEMOB	(IN AND OUT)					
DUMP TRU	JCKS	6	EA	385.00	\$ 2,310	
BACKHOE		2	EA	730.00	1,460	
ROLLER		4	EA	785.00	3,140	
OFFICE TRAIL	_ER	3	MON	150.00	450	
STORAGE TR	AILER	3	MON	100.00	300	
SET UP TRAI	LER	2	EA	500.00	1,000	
TOILET - 2 EA	A	24	wк	25.00	- 600	
WATER COO	ER - 2 EA	24	WK	25.00	600	
WATER		120	DAY	15.00	1,800	
<b>TELEPHONE</b>	SERVICE	3	MON	500.00	1,500	
ELECTRICITY		3	MON	250.00	750	
PICK-UP (2 E	۹)	3	MON	1000.00	3,000	
SITE SUPERIN	TENDANT (3 MON * 210 HR/MON)	630	MNHR	65.00	- 40,950	
FOREMEN (3	MON * 210 HR//MON)	630	MNHR	55.00	34,650	
CLERK/TYPIS	T (3 MON * 168 HR/MON)	504	MNHR	25.00	12,600	
ACCESS ROA	D - 850 LF x 20' WIDE					
GRADE RC	AD BED - DOZER & OPERATOR	2	DAY	1760.00	3,520	
GRAVEL -	12" THICK	650	CY	10.00	6,500	
SPREAD &	COMPACT	1	DAY	1570.00	1,570	
GEOFABBI	C	1900	SY	1.00	1,900	
CLEAR TREES	5 5	0.5	AC	4300.00	2,150	
UXO CLEARA	NCE	45	DAY	1800.00	81,000	
					-	
					-	
EROSION CO	NTROL	900	LF	5.00	- 4,500	
					-	
EXCAVATION	OF 35000 CY OF DEBRIS				-	
BACKHOE	& OPERATOR	45	DAY	1460.00	65,700	
TRANSPORT	TO ON-SITE CONSOLIDATION LANDFILL (50% SWELL F	ACTOR INCL	UDED)			
DUMP TRI	ICK & DRIVER	360	DAY	770.00	277,200	
SPREAD OVE	R ON-SITE CONSOLIDATION LANDFILL & COMPACT				-	
ROLLER &	OPERATOR (2 EA)	90	DAY	1570.00	141,300 -	
•	 TC	TAL THIS PA			\$ 690,450	
	***************************************				 	

PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY ALTERNATIVE 6: CAP-IN-PLACE SAs 6, 12, 13 AND	AOC 41;		JOB #		8712-04
LOCATION:	EXCAVATE AND CONSOLIDATE AOCs 9, 11, 40 DEVENS, MASSACHUSETTS			DATE		24-Jan-97
ENGINEER:	ABB ENVIRONMENTAL SERVICES, INC.					
ESTIMATOR	: P. R. MARTIN					
=====	EXCAVATE AND CONSOLIDATE AOC 11		= = =		= =	
				UNIT		
	DESCRIPTION	ΩΤΥ	UNIT	COST		TOTAL
TOTAL PREV	/IOUS PAGE		*******	- MU42200022222226237999	\$	690,450
REMOVE AC	CESS ROAD					-
FRONT EN	ND LOADER & OPERATOR	2	DAY	825.00		1,650
DUMP TR	UCK & DRIVER (2 EA)	4	DAY	785.00		3,140
LABORER	(2 EA)	32	HR	33.50		1,072
BACKFILL PL	JRCHASED FROM OFF-SITE					-
(INCLUDIN	NG 30% SWELL FACTOR)	45500	CY	10.00		455,000
SITE RESTOR	RATION					-
BACKFILL	, GRADE, COMPACT (2 EA)	60	DAY	1570.00		94,200
FERTILIZE	, SEED, MULCH	12100	SY	0.50		6,050
WETLAND	D RESTORATION	0.1	AC	50000.00		5,000
	UNDEVELOPED DESIGN DETAILS ~25%					- 314,438
	TOTAL AOC 11				 \$	1,571,000

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PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY ALTERNATIVE 6: CAP-IN-PLACE SAs 6, 12, 13 AN	ND AOC 41;		JOB #		8712-04
LOCATION:	EXCAVATE AND CONSOLIDATE AOCs 9, 11, 40 DEVENS, MASSACHUSETTS	0		DATE		24-Jan-97
ENGINEER:	ABB ENVIRONMENTAL SERVICES, INC.					
ESTIMATOR:	P. R. MARTIN					
	EXCAVATE AND CONSOLIDATE AOC 40		= = =	======	= =	* * * * =
	DESCRIPTION	ΩΤΥ	UNIT	UNIT COST		TOTAL
SITE PREPAR	ATION			••••		
ACCESS R	OAD - 600 LF (SEDIMENT REMOVAL AREA I)					
CLEAR 8	& GRUB LIGHT VEGETATION	0.3	AC	4300.00	\$	1,290
GRADE -	- DOZER & OPERATOR	0.5	DAY	1760.00		880
GRAVEL	- 12" THICK	450	CY	10.00		4,500
SPREAD		0.5	DAY	1570.00		785
FILTER F	ABRIC	1350	SY	1.00		1,350
PARKING A						-
CLEAR &		0.25	AC	4300.00		1,075
		0.5	DAY	1760.00		880
		400	CY	10.00		4,000
SPREAD		0.5	DAY	1570.00		785
						-
		0.25	AC	4300.00		1,075
		0.5	DAY	1760.00		880
SPREAD		400	CY	10.00		4,000
	& COMPACT	0.5	DAY	1570.00		785
		10000	SF	1.00		10,000
SOME OF		i	LS	2500.00		2,500
DECON ARE	EA - 10'x20'	3	EA	5000.00		15,000
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	· · · · ·					
WORK PLAT	TFORM (SEDIMENT REMOVAL AREA II)					-
GRADE -	DOZER & OPERATOR	0.25	DAY	1760.00		440
GRAVEL	- 12" THICK	150	CY	10.00		1,500
SPREAD	& COMPACT	0.25	DAY	1570.00		393
FILTER F	ABRIC	450	SY	1.00		450
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		TOTAL SITE PRE	PARATIO	N	\$	52,568

PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY ALTERNATIVE 6: CAP-IN-PLACE SAs 6, 12, 13 AND	) AOC 41;		JOB #		8712-04
LOCATION:	EXCAVATE AND CONSOLIDATE AOCs 9, 11, 40 DEVENS, MASSACHUSETTS			DATE		24-Jan-97
ENGINEER:	ABB ENVIRONMENTAL SERVICES, INC.					
ESTIMATOR:	: P. R. MARTIN					
	EXCAVATE AND CONSOLIDATE AOC 40					
	MOBILIZATION	OTV		UNIT		TOTAL
	DESCRIPTION	UTY	UNI 1		*****	
EQUIPMENT	(IN AND OUT)					
FRAC TAN	NK	8	EA	250.00	\$	2,000
DEWATER	RING PUMP & HOSE	4	EA	100.00		400
DUMP TR	UCKS	16	EA	385.00		6,160
BACKHOE		2	EA	730.00		1,460
ROLLER		4	EA	785.00		3,140
CLAM SH	ELL	2	EA	640.00		1,280
OFFICE TRAI	ILER	7	MON	150.00		1,050
STORAGE TH	RAILER	7	MON	150.00		1,050
TRAILER DEL	LIVERY, SET-UP, REMOVAL	2	EA	300.00		600
TOILET - 2 E	Α	60	WK	25.00		1,500
WATER COO	DLER - 2 EA	60	WK	25.00		1,500
WATER		300	DAY	15.00		4,500
TELEPHONE	SERVICE	7	MON	500.00		3,500
ELECTRICITY	(	7	MON	250.00		1,750
PICK-UP (2 E	EA)	14	MON	1000.00		14,000
OFFICE EQUI	IPMENT	7	MON	1000.00		7,000
PUMPS, TOC	DLS, MINOR EQUIPMENT	1	LS	5000.00		5,000
LABORER (2	MEN*10 DAY/MAN*8 HR/DAY)	160	MNHR	33.50		5,360
CARPENTER	(2 MEN*10 DAY/MAN*8 HR/DAY)	160	MNHR	48.00		7,680
ELECTRICIAN	N (2 MEN*10 DAY/MAN*8 HR/DAY)	160	MNHR	50.50		8,080
SITE SUPERI	NTENDANT (7 MON*210HR/MON)	1470	MNHR	65.00		95,550
FOREMAN (7	7 MON*210HR/MON)	1470	MNHR	55.00		80,850
CLERK/TYPIS	ST (7 MON*168HR/MON)	1176	MNHR	25.00		29,400
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PROJECT: L	ANDFILL REMEDIATION FEASIBILITY STUDY ALTERNATIVE 6: CAP-IN-PLACE SAs 6, 12, 13 AND AO	C 41;		JOB #		8712-04
LOCATION: D	EXCAVATE AND CONSOLIDATE AOCs 9, 11, 40 DEVENS, MASSACHUSETTS			DATE		24-Jan-97
ENGINEER: A	ABB ENVIRONMENTAL SERVICES, INC.					
ESTIMATOR: P	P. R. MARTIN					
	EXCAVATE AND CONSOLIDATE AOC 40 SEDIMENT REMOVAL AND DISPOSAL DESCRIPTION	QTY	= = = UNIT	UNIT COST	= =	TOTAL
CONSTRUCT S	ATED AREAS	650	LF	5.00	\$	3,250 -
EXCAVATE WI 1200 CY SE	TH CLAMSHELL DIMENTS + 600 CY ACCESS ROADS/WORK PLATFOR	19 MS	DAY	1280.00		- 24,320 -
HAUL SEDIMEN (2 EA DUMP	NTS TO DEWATERING PAD TRUCK & DRIVER)	38	DAY	770.00		29,260 -
LOAD DRY SED TRANSPORT (FRONT END	DIMENTS FOR TATION TO DISPOSAL AREA D LOADER & OPERATOR)	10	DAY	825.00		8,250 - -
LABORERS - 2	EA FOR 25 DAYS	400	MNHR	33.50		13,400
TCLP TESTING		2	SMPL	1500.00		3,000
ON-SITE STABI WITH SAND	LIZATION OF SEDIMENTS	400	CY	15.00		6,000
TRANSPORTAT (3 EA DUMP	TION AND DISPOSAL AT CONSOLIDATION LANDFILL TRUCK & DRIVER)	30	DAY	770.00		23,100
TRANSPORTAT	TION OF WATER	140000	GAL	INCL WITH DISP	os	- AL
TREATMENT O	F DEWATERING WATER	1	LS	21800.00		21,800
PUMP WATER I TO PONDS	FROM DEWATERING PAD	12	DAY	50.00		- 600 - -
						-
						-
						-
						-
 T	OTAL SEDIMENT REMOVAL AND DISPOSAL				\$	132,980

PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY ALTERNATIVE 6: CAP-IN-PLACE SAs 6, 12, 13 AND AOC 41;	JOB #	8712-04
LOCATION:	EXCAVATE AND CONSOLIDATE AOCs 9, 11, 40 DEVENS, MASSACHUSETTS	DATE	24-Jan-97

## ESTIMATOR: P. R. MARTIN

EXCAVATE AND CONSOLIDATE AOC 40 DRUM REMOVAL AND DISPOSAL DESCRIPTION	= = = = = = = = = = = = = = = = = = =	= = = UNIT	UNIT COST	= =	TOTAL
BACKHOE & OPERATOR	3	DAY	1460.00	\$	4,380
LABORER - 2 EA, 3 DAYS	48	MNHR	33.50		- 1,608 -
TRANSPORT DRUMS TO CONSOLIDATION LANDFILL - DUMP TRUCK & DRIVER	3	DAY	770.00		- 2,310 -
TCLP TESTING OF DRUM CONTENTS	2	EA	1500.00		3,000
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TOTAL DRUM REMOVAL AND DISPOSAL			***************************************	\$	11,298

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PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY ALTERNATIVE 6: CAP-IN-PLACE SAs 6, 12, 13 AND AOC 41;	JOB #	8712-04
LOCATION:	EXCAVATE AND CONSOLIDATE AOCs 9, 11, 40 DEVENS, MASSACHUSETTS	DATE	24-Jan-97

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#### ESTIMATOR: P. R. MARTIN

EXCAVATE AND CONSOLIDATE AOC 40		===		= =	
EXCAVATION AND BACKFILL			UNIT		
DESCRIPTION	QTY	UNIT	COST		TOTAL
CLEAR & GRUB SITE	4	AC	4300.00	\$	17,200
EROSION CONTROL	500	LF	5.00		2,500
SUMP PUMP & HOSES	6	MON	2500.00		15,000
UXO CLEARANCE	138	DAY	1800.00		248,400
EXCAVATION OF 110000 CY OF DEBRIS					-
BACKHOE & OPERATOR	138	DAY	1460.00		201,480
TRANSPORT TO ON-SITE CONSOLIDATION LANDFILL (50% SWEL	L FACTOR INCL	UDED)			
DUMP TRUCK & DRIVER (8 EA)	1100	DAY	770.00		847,000
SPREAD OVER ON-SITE CONSOLIDATION LANDFILL & COMPACT					-
ROLLER & OPERATOR (2 EA)	276	DAY	1570.00		433,320
BACKFILL PURCHASED FROM OFF-SITE					-
(INCLUDING 30% SWELL FACTOR)	18710	CY	10.00		187,100
SITE RESTORATION					-
BACKFILL, GRADE, COMPACT	24	DAY	1570.00		37,680
FERTILIZE, SEED, MULCH	19360	SY	0.50		9,680
WETLANDS RESTORATION	4	AC	50000.00		200,000
MONITORING WELLS, 4" DIA x 30' DP	2	EA	2400.00		4,800
GUIDE RAIL ALONG ROAD	1000	LF	12.50		12,500

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PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY ALTERNATIVE 6: CAP-IN-PLACE SAs 6, 12, 13 ANI	D AOC 41;		JOB #	8712-04
LOCATION:	EXCAVATE AND CONSOLIDATE AOCs 9, 11, 40 DEVENS, MASSACHUSETTS	)		DATE	24-Jan-97
ENGINEER:	ABB ENVIRONMENTAL SERVICES, INC.				
ESTIMATOR	: P. R. MARTIN				
	EXCAVATE AND CONSOLIDATE AOC 40				
	DESCRIPTION	ΟΤΥ	UNIT	UNIT COST	TOTAL
TOTAL SITE	PREPARATION				\$ 52,568
TOTAL MOB	ILIZATION				- 282,810
TOTAL SEDI	MENT REMOVAL AND DISPOSAL				- 132,980
TOTAL DRU	M REMOVAL AND DISPOSAL				- 11,298
TOTAL EXC	AVATION AND BACKFILL				- 2,216,660
	UNDEVELOPED DESIGN DETAILS ~25%				- 673,685
	TOTAL AOC 40			-	\$ 3,370,000

PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY ALTERNATIVE 6: CAP-IN-PLACE SAs 6, 12, 13 AND AOC 41;	JOB #	8712-04
LOCATION:	EXCAVATE AND CONSOLIDATE AOCs 9, 11, 40 DEVENS, MASSACHUSETTS	DATE	24-Jan-97

#### ESTIMATOR: P. R. MARTIN

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DESCRIPTION     OTY     UNIT     COST     TOTAL       MOBILIZATION     DUMP TRUCKS - 16 EA     32     EA     385.00     \$12,320       BACKHOE - 2 EA     4     EA     730.00     2,920       ROLLER - 2 EA     4     EA     785.00     3,140       DOZER     2     EA     880.00     1,760       OFFICE TRAILER     9     MON     150.00     1,350       STORAGE TRAILER     9     MON     150.00     1,350       TRAILER DELIVERY, SET-UP, REMOVAL     2     EA     300.00     600       TOLET - 2 EA     80     WK     25.00     2,000       WATER     400     DAY     15.00     6,000       TELEPHONE SERVICE     9     MON     250.00     2,2000       UMATER     18     MON     1000.00     18,000       DECK-UP (2 EA)     9     MON     250.00     2,250       DECK-UP (2 EA)     18     MON     1000.00     5,000       DUMPS, TOOLS, MINOR EQUIPMENT     1			= = =		= =	
DESCRIPTION     QTY     UNIT     COST     TOTAL       MOBILIZATION     DUMP TRUCKS - 18 EA     32     EA     385.00     \$     12,320       BACKHOP - 2 EA     4     EA     730.00     2,920     ROLLER - 2 EA     4     EA     785.00     3,140       DOZER     2     EA     880.00     1,760     1,350       STORAGE TRAILER     9     MON     150.00     1,350       TTALLED DELIVERY, SET-UP, REMOVAL     2     EA     300.00     600       WATER     80     WK     25.00     2,000     2,000       WATER     400     DAY     15.00     6,000     2,500     2,000       WATER     9     MON     500.00     2,500     2,000     2,500     2,000       DICK-UP (2 EA)     9     MON	CONSOLIDATION LANDFILL CONSTRUCTION			UNIT		
MOBILIZATION DUMP TRUCKS - 16 EA     32     EA     385.00     \$ 12.320       BACKHOE - 2 EA     4     EA     730.00     2,920       ROLLER - 2 EA     4     EA     730.00     2,920       DOZER     2     EA     880.00     1,760       OFFICE TRAILER     9     MON     150.00     1,350       STORAGE TRAILER     9     MON     150.00     1,350       TRAILER DELIVERY, SET-UP, REMOVAL     2     EA     300.00     600       TOLET - 2 EA     80     WK     25.00     2,000       WATER COLER - 2 EA     80     WK     25.00     2,000       WATER COLER - 2 EA     80     WK     25.00     2,000       WATER COLER - 2 EA     80     WK     25.00     2,000       WATER COLER - 2 EA     80     WK     25.00     2,000       WATER COLER - 2 EA     80     WK     25.00     2,250       PICK-UP (2 EA)     9     MON     1000.00     18.000       OFFICE EOLIPMENT     9 <td< th=""><th>DESCRIPTION</th><th>QTY</th><th>UNIT</th><th>COST</th><th></th><th>TOTAL</th></td<>	DESCRIPTION	QTY	UNIT	COST		TOTAL
DUMP TRUCKS - 16 EA     32     EA     385.00     \$     12.320       BACKHOE - 2 EA     4     EA     730.00     2,920       ROLLER - 2 EA     4     EA     730.00     2,920       DOZER     2     EA     880.00     1,760       DOZER     2     EA     880.00     1,760       OFFICE TRAILER     9     MON     150.00     1,350       STORAGE TRAILER     9     MON     150.00     1,350       TRAILER DELIVERY, SET-UP, REMOVAL     2     EA     300.00     600       VATER     80     WK     25.00     2,000       WATER     400     DAY     15.00     4,500       ELECTRICITY     9     MON     500.00     2,250       PICK-UP (2 EA)     18     MON     1000.00     9,000       OFFICE EQUIPMENT     9     MON     1000.00     5,000       LABORER (2 MEN*10 DAY/MAN*8 HR/DAY)     160     MNHR     48.00     7,680       CARPENTER (2 MEN*10 DAY/MAN*8 HR/DAY)     160	MOBILIZATION					
BACKHOE - 2 EA     4     EA     730.00     2,920       ROLLER - 2 EA     4     EA     785.00     3,140       DOZER     2     EA     880.00     1,760       OFFICE TRAILER     9     MON     150.00     1,350       STORAGE TRAILER     9     MON     150.00     1,350       TRAILER DELIVERY, SET-UP, REMOVAL     2     EA     300.00     600       VATER COOLER - 2 EA     80     WK     25.00     2,000       WATER COOLER - 2 EA     80     WK     25.00     2,000       WATER COOLER - 2 EA     80     WK     25.00     2,000       WATER COOLER - 2 EA     80     WK     25.00     2,000       WATER COOLER - 2 EA     9     MON     500.00     4,500       ELECTRICITY     9     MON     260.00     2,250       PICK-UP (2 EA)     18     MON     1000.00     9,000       PICK-UP (2 EA)     18     MON 1000.00     5,000     5,000       LABORER (2 MEN*10 DAY/MAN*8 HR/DAY)     160 <td>DUMP TRUCKS - 16 EA</td> <td>32</td> <td>EA</td> <td>385.00</td> <td>\$</td> <td>12,320</td>	DUMP TRUCKS - 16 EA	32	EA	385.00	\$	12,320
ROLLER - 2 EA     4     EA     785.00     3,140       DOZER     2     EA     880.00     1,760       OFFICE TRAILER     9     MON     150.00     1,350       STORAGE TRAILER     9     MON     150.00     1,350       TRAILER DELIVERY, SET-UP, REMOVAL     2     EA     300.00     600       TOILET - 2 EA     80     WK     25.00     2,000       WATER     400     DAY     15.00     6,000       TELEPHONE SERVICE     9     MON     500.00     2,250       PICK-UP (2 EA)     18     MON     1000.00     18,000       OFFICE EQUIPMENT     9     MON     1000.00     18,000       PUMPS, TOOLS, MINOR EQUIPMENT     1     LS     5000.00     5,000       LABORER (2 MEN*10 DAY/MAN*8 HR/DAY)     160     MNHR     33.50     5,360       CARPENTER (2 MEN*10 DAY/MAN*8 HR/DAY)     160     MNHR     50.50     8,080       SITE SUPERINTENDANT (9 MON*210HR/MON)     1890     MNHR     65.00     122,850	BACKHOE - 2 EA	4	EA	730.00		2,920
DOZER     2     EA     880.00     1,760       OFFICE TRAILER     9     MON     150.00     1,350       STORAGE TRAILER     9     MON     150.00     1,350       TRAILER DELIVERY, SET-UP, REMOVAL     2     EA     300.00     600       WATER     80     WK     25.00     2,000       WATER     400     DAY     15.00     6,000       WATER     9     MON     500.00     4,500       FLEPHONE SERVICE     9     MON     250.00     2,200       PICK-UP (2 EA)     18     MON     1000.00     9,000       PICK-UP (2 EA)     18     MON     1000.00     9,000       PUMPS, TOOLS, MINOR EQUIPMENT     1     LS     5000.00     5,000       LABORER (2 MEN*10 DAY/MAN*8 HR/DAY)     160     MNHR     48.00     7,680       ELECTRICIAN (2 MEN*10 DAY/MAN*8 HR/DAY)     160     MNHR     50.50     122,850       FOREMAN (9 MON*210HR/MON)     1890     MNHR     65.00     122,850       FOREMAN (9 MON*168HR/M	ROLLER - 2 EA	4	EA	785.00		3,140
OFFICE TRAILER     9     MON     150.00     1,350       STORAGE TRAILER     9     MON     150.00     1,350       TRAILER DELIVERY, SET-UP, REMOVAL     2     EA     300.00     600       TOILET - 2 EA     80     WK     25.00     2,000       WATER     400     DAY     15.00     6,000       TELEPHONE SERVICE     9     MON     500.00     4,500       ELECTRICITY     9     MON     260.00     2,250       OFFICE EQUIPMENT     9     MON     260.00     2,250       OFFICE EQUIPMENT     9     MON     1000.00     18,000       PICK-UP (2 EA)     18     MON     1000.00     9,000       PUMPS, TOOLS, MINOR EQUIPMENT     1     LS     5000.00     5,000       LABORER (2 MEN*10 DAY/MAN*8 HR/DAY)     160     MNHR     33.50     5,360       CARPENTER (2 MEN*10 DAY/MAN*8 HR/DAY)     160     MNHR     50.50     8,080       SITE SUPERINTENDANT (9 MON*210HR/MON)     1890     MNHR     55.00     122,850 <t< th=""><th>DOZER</th><th>2</th><th>EA</th><th>880.00</th><th></th><th>1,760 -</th></t<>	DOZER	2	EA	880.00		1,760 -
OFFICE TRAILER     9     MON     150.00     1,350       STORAGE TRAILER     9     MON     150.00     1,350       TRAILER DELIVERY, SET-UP, REMOVAL     2     EA     300.00     600       TOILET - 2 EA     80     WK     25.00     2,000       WATER COLER - 2 EA     80     WK     25.00     2,000       WATER COLER - 2 EA     80     WK     25.00     2,000       WATER COLER - 2 EA     80     WK     25.00     2,000       WATER COLER - 2 EA     9     MON     500.00     4,500       ELECTRICITY     9     MON     150.00     2,250       PICK-UP (2 EA)     18     MON     1000.00     18,000       OFFICE EQUIPMENT     1     LS     5000.00     5,000       LABORER (2 MEN*10 DAY/MAN*8 HR/DAY)     160     MNHR     48.00     7,680       CARPENTER 10 MAN*10 MAN*8 HR/DAY)     160     MNHR     48.00     7,680       ELECTRICIAN (2 MEN*10 DAY/MAN*8 HR/DAY)     180     MNHR     65.00     122,850						-
STORAGE TRAILER   9   MON   150.00   1,350     TRAILER DELIVERY, SET-UP, REMOVAL   2   EA   300.00   600     TOILET - 2 EA   80   WK   25.00   2,000     WATER COOLER - 2 EA   80   WK   25.00   2,000     WATER COOLER - 2 EA   80   WK   25.00   2,000     WATER   400   DAY   15.00   6,000     TELEPHONE SERVICE   9   MON   500.00   2,250     PICK-UP (2 EA)   18   MON   1000.00   18,000     OFFICE EQUIPMENT   9   MON   1000.00   9,000     PUMPS, TOOLS, MINOR EQUIPMENT   1   LS   5000.00   5,000     LABORER (2 MEN*10 DAY/MAN*8 HR/DAY)   160   MNHR   48.00   7,680     CARPENTER (2 MEN*10 DAY/MAN*8 HR/DAY)   160   MNHR   48.00   7,680     SITE SUPERINTENDANT (9 MON*210HR/MON)   1890   MNHR   65.00   122.850     FOREMAN (9 MON*210HR/MON)   1890   MNHR   25.00   37,800     CLERK/TYPIST (9 MON*168HR/MON)   1512   MNHR   25.00 </td <td>OFFICE TRAILER</td> <td>9</td> <td>MON</td> <td>150.00</td> <td></td> <td>1,350</td>	OFFICE TRAILER	9	MON	150.00		1,350
TRAILER DELIVERY, SET-UP, REMOVAL   2   EA   300.00   600     TOILET - 2 EA   80   WK   25.00   2,000     WATER   400   DAY   15.00   6,000     TELEPHONE SERVICE   9   MON   500.00   4,500     ELECTRICITY   9   MON   250.00   2,250     PICK-UP (2 EA)   18   MON   1000.00   18,000     OFFICE EQUIPMENT   9   MON   1000.00   9,000     PUMPS, TOOLS, MINOR EQUIPMENT   1   LS   5000.00   5,000     LABORER (2 MEN*10 DAY/MAN*8 HR/DAY)   160   MNHR   48.00   7,680     CARPENTER (2 MEN*10 DAY/MAN*8 HR/DAY)   160   MNHR   48.00   7,680     SITE SUPERINTENDANT (9 MON*210HR/MON)   1890   MNHR   65.00   122,850     FOREMAN (9 MON*210HR/MON)   1890   MNHR   55.00   103,950     CLERK/TYPIST (9 MON*168HR/MON)   1512   MNHR   25.00   37,800	STORAGE TRAILER	9	MON	150.00		1,350
TOILET - 2 EA   80   WK   25.00   2,000     WATER COOLER - 2 EA   80   WK   25.00   2,000     WATER   400   DAY   15.00   6,000     TELEPHONE SERVICE   9   MON   550.00   2,250     PICK-UP (2 EA)   18   MON   1000.00   9,000     PUMPS, TOOLS, MINOR EQUIPMENT   9   MON   1000.00   9,000     PUMPS, TOOLS, MINOR EQUIPMENT   1   LS   5000.00   5,000     LABORER (2 MEN*10 DAY/MAN*8 HR/DAY)   160   MNHR   48.00   7,680     ELECTRICIAN (2 MEN*10 DAY/MAN*8 HR/DAY)   160   MNHR   48.00   7,680     SITE SUPERINTENDANT (9 MON*210HR/MON)   1890   MNHR   55.00   103.950     SITE SUPERINTENDANT (9 MON*210HR/MON)   1890   MNHR   55.00   103.950     CLERK/TYPIST (9 MON*168HR/MON)   1512   MNHR   25.00   37.800	TRAILER DELIVERY, SET-UP, REMOVAL	2	EA	300.00		600
WATER COOLER - 2 EA     80     WK     25.00     2,000       WATER     400     DAY     15.00     6,000       TELEPHONE SERVICE     9     MON     500.00     4,500       ELECTRICITY     9     MON     250.00     2,250       PICK-UP (2 EA)     18     MON     1000.00     18,000       OFFICE EQUIPMENT     9     MON     1000.00     9,000       PUMPS, TOOLS, MINOR EQUIPMENT     1     LS     5000.00     5,000       LABORER (2 MEN*10 DAY/MAN*8 HR/DAY)     160     MNHR     33.50     5,360       CARPENTER (2 MEN*10 DAY/MAN*8 HR/DAY)     160     MNHR     50.50     8,080       ELECTRICIAN (2 MEN*10 DAY/MAN*8 HR/DAY)     160     MNHR     50.50     8,080       SITE SUPERINTENDANT (9 MON*210HR/MON)     1890     MNHR     55.00     103,950       CLERK/TYPIST (9 MON*168HR/MON)     1512     MNHR     25.00     37,800	TOILET - 2 EA	80	WΚ	25.00		2,000
WATER     400     DAY     15.00     6,000       TELEPHONE SERVICE     9     MON     500.00     4,500       ELECTRICITY     9     MON     1000.00     18,000       PICK-UP (2 EA)     18     MON     1000.00     18,000       OFFICE EQUIPMENT     9     MON     1000.00     9,000       PUMPS, TOOLS, MINOR EQUIPMENT     1     LS     5000.00     5,000       LABORER (2 MEN*10 DAY/MAN*8 HR/DAY)     160     MNHR     48.00     7,680       ELECTRICIAN (2 MEN*10 DAY/MAN*8 HR/DAY)     160     MNHR     50.50     8,080       SITE SUPERINTENDANT (9 MON*210HR/MON)     1890     MNHR     65.00     122,850       FOREMAN (9 MON*210HR/MON)     1890     MNHR     55.00     103,950       CLERK/TYPIST (9 MON*168HR/MON)     1512     MNHR     25.00     37,800	WATER COOLER - 2 EA	80	WK	25.00		2,000
TELEPHONE SERVICE     9     MON     500.00     4,500       ELECTRICITY     9     MON     250.00     2,250       PICK-UP (2 EA)     18     MON     1000.00     18,000       OFFICE EQUIPMENT     9     MON     1000.00     9,000       PUMPS, TOOLS, MINOR EQUIPMENT     1     LS     5000.00     5,000       LABORER (2 MEN*10 DAY/MAN*8 HR/DAY)     160     MNHR     33.50     5,360       CARPENTER (2 MEN*10 DAY/MAN*8 HR/DAY)     160     MNHR     48.00     7,680       ELECTRICIAN (2 MEN*10 DAY/MAN*8 HR/DAY)     160     MNHR     50.50     8,080       SITE SUPERINTENDANT (9 MON*210HR/MON)     1890     MNHR     65.00     122,850       FOREMAN (9 MON*210HR/MON)     1890     MNHR     55.00     103,950       CLERK/TYPIST (9 MON*168HR/MON)     1512     MNHR     25.00     37,800	WATER	400	DAY	15.00		6,000
ELECTRICITY     9     MON     250.00     2,250       PICK-UP (2 EA)     18     MON     1000.00     18,000       OFFICE EQUIPMENT     9     MON     1000.00     9,000       PUMPS, TOOLS, MINOR EQUIPMENT     1     LS     5000.00     5,000       LABORER (2 MEN*10 DAY/MAN*8 HR/DAY)     160     MNHR     33.50     5,360       CARPENTER (2 MEN*10 DAY/MAN*8 HR/DAY)     160     MNHR     48.00     7,680       ELECTRICIAN (2 MEN*10 DAY/MAN*8 HR/DAY)     160     MNHR     50.50     8,080       SITE SUPERINTENDANT (9 MON*210HR/MON)     1890     MNHR     65.00     122,850       FOREMAN (9 MON*210HR/MON)     1890     MNHR     55.00     103,950       CLERK/TYPIST (9 MON*168HR/MON)     1512     MNHR     25.00     37,800       -     -     -     -     -     -       -     -     -     -     -     -	TELEPHONE SERVICE	9	MON	500.00		4,500
PICK-UP (2 EA)   18   MON   1000.00   18,000     OFFICE EQUIPMENT   9   MON   1000.00   9,000     PUMPS, TOOLS, MINOR EQUIPMENT   1   LS   5000.00   5,000     LABORER (2 MEN*10 DAY/MAN*8 HR/DAY)   160   MNHR   33.50   5,360     CARPENTER (2 MEN*10 DAY/MAN*8 HR/DAY)   160   MNHR   48.00   7,680     ELECTRICIAN (2 MEN*10 DAY/MAN*8 HR/DAY)   160   MNHR   50.50   8,080     SITE SUPERINTENDANT (9 MON*210HR/MON)   1890   MNHR   65.00   122,850     FOREMAN (9 MON*210HR/MON)   1890   MNHR   55.00   103,950     CLERK/TYPIST (9 MON*168HR/MON)   1512   MNHR   25.00   37,800	ELECTRICITY	9	MON	250.00		2,250
OFFICE EQUIPMENT     9 MON     1000.00     9,000       PUMPS, TOOLS, MINOR EQUIPMENT     1 LS     5000.00     5,000       LABORER (2 MEN*10 DAY/MAN*8 HR/DAY)     160 MNHR     33.50     5,360       CARPENTER (2 MEN*10 DAY/MAN*8 HR/DAY)     160 MNHR     48.00     7,680       ELECTRICIAN (2 MEN*10 DAY/MAN*8 HR/DAY)     160 MNHR     50.50     8,080       SITE SUPERINTENDANT (9 MON*210HR/MON)     1890 MNHR     65.00     122,850       FOREMAN (9 MON*210HR/MON)     1890 MNHR     55.00     103,950       CLERK/TYPIST (9 MON*168HR/MON)     1512 MNHR     25.00     37,800	PICK-UP (2 EA)	18	MON	1000.00		18,000
PUMPS, TOOLS, MINOR EQUIPMENT 1 LS 5000.00 5,000 LABORER (2 MEN*10 DAY/MAN*8 HR/DAY) CARPENTER (2 MEN*10 DAY/MAN*8 HR/DAY) 160 MNHR 48.00 7,680 ELECTRICIAN (2 MEN*10 DAY/MAN*8 HR/DAY) 160 MNHR 50.50 8,080 SITE SUPERINTENDANT (9 MON*210HR/MON) 1890 MNHR 65.00 122,850 FOREMAN (9 MON*210HR/MON) 1890 MNHR 55.00 103,950 CLERK/TYPIST (9 MON*168HR/MON) 1512 MNHR 25.00 37,800 - -	OFFICE EQUIPMENT	9	MON	1000.00		9,000
LABORER (2 MEN*10 DAY/MAN*8 HR/DAY) CARPENTER (2 MEN*10 DAY/MAN*8 HR/DAY) ELECTRICIAN (2 MEN*10 DAY/MAN*8 HR/DAY) SITE SUPERINTENDANT (9 MON*210HR/MON) FOREMAN (9 MON*210HR/MON) CLERK/TYPIST (9 MON*168HR/MON) 1512 MNHR 55.00 103,950 CLERK/TYPIST (9 MON*168HR/MON) 55.00 1512 MNHR 55.00 103,950 1512 MNHR 55.00 103,950 1512 MNHR 55.00 103,950 1	PUMPS, TOOLS, MINOR EQUIPMENT	1	LS	5000.00		5,000
CARPENTER (2 MEN*10 DAY/MAN*8 HR/DAY) ELECTRICIAN (2 MEN*10 DAY/MAN*8 HR/DAY) SITE SUPERINTENDANT (9 MON*210HR/MON) FOREMAN (9 MON*210HR/MON) CLERK/TYPIST (9 MON*168HR/MON) 1512 MNHR 25.00 103,950 CLERK/TYPIST (9 MON*168HR/MON) - - - - - - - - - - - - -	LABORER (2 MEN*10 DAY/MAN*8 HR/DAY)	160	MNHR	33.50		5,360
ELECTRICIAN (2 MEN*10 DAY/MAN*8 HR/DAY) SITE SUPERINTENDANT (9 MON*210HR/MON) FOREMAN (9 MON*210HR/MON) CLERK/TYPIST (9 MON*168HR/MON) 1512 MNHR 25.00 - - - - - - - - - - - - -	CARPENTER (2 MEN*10 DAY/MAN*8 HR/DAY)	160	MNHR	48.00		7,680
SITE SUPERINTENDANT (9 MON*210HR/MON) FOREMAN (9 MON*210HR/MON) CLERK/TYPIST (9 MON*168HR/MON) 1512 MNHR 25.00 37,800 - - - - - - - - - - - - -	ELECTRICIAN (2 MEN*10 DAY/MAN*8 HR/DAY)	160	MNHR	50.50		8,080
FOREMAN (9 MON*210HR/MON) 1890 MNHR 55.00 103,950 CLERK/TYPIST (9 MON*168HR/MON) 1512 MNHR 25.00 37,800 - - - - - - - - - - - - - - - - - -	SITE SUPERINTENDANT (9 MON*210HR/MON)	1890	MNHR	65.00		122,850
CLERK/TYPIST (9 MON*168HR/MON) 1512 MNHR 25.00 37,800 	FOREMAN (9 MON*210HR/MON)	1890	MNHR	55.00		103,950
	CLERK/TYPIST (9 MON*168HR/MON)	1512	MNHR	25.00		37,800
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TOTAL MOBILIZATION \$ 357,910 

		TOTAL SITE PR	EPARATIO	N	\$	115,500
						-
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						-
						-
						-
						-
						-
						-
						-
HAT BALLS		300	27	0.00		-
SILT FENCE	EROSION CONTROL	2800	LF EA	5.00		- 14,000 2,500
2' DIA RCP (		40	LF	50.00		2,000
CRUSHED ST	ACCESS ROAD IMPROVEMENTS TONE, 2' DEEP x 24' WIDE	1800	CY	30.00		54,000
						-
					·	-
CLEAN & GN		10	AC	4300.00	¥	-
			•••••	4300.00		43.000
	CONSOLIDATION LANDFILL CONSTRUCTION SITE PREPARATION DESCRIPTION		unit	UNIT COST	= =	= = = = = = TOTAL
ESTIMATOR	P. R. MARTIN					
ENGINEER:	ABB ENVIRONMENTAL SERVICES, INC.					
LOCATION:	EXCAVATE AND CONSOLIDATE AOCs 9, 11, 40 DEVENS, MASSACHUSETTS			DATE		24-Jan-97
	ALTERNATIVE 6: CAP-IN-PLACE SAS 6, 12, 13 ANL	AUC 41;				

PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY ALTERNATIVE 6: CAP-IN-PLACE SAs 6, 12, 13 ANI EXCAVATE AND CONSOLIDATE ACCs 9, 11, 40	D AOC 41;		JOB #		8712-04	F
LOCATION:	DEVENS, MASSACHUSETTS			DATE		24-Jan-97	(
ENGINEER:	ABB ENVIRONMENTAL SERVICES, INC.						
ESTIMATOR:	P. R. MARTIN						
				= = = = = = = = = =	= =	====	
	DESCRIPTION	QTY	UNIT	COST		TOTAL	
					*****		
EXCAVATEL	ANDFILL BASE & BY-PASS DITCH BACK HOE & OPERATOR (2 EA)	126	DAY	1460.00	\$	183,960	
HAUL TO ON	-SITE STOCKPILE (23250 CY)						
HAUL TO AO	DUMP TRUCK & DRIVER (3 EA) C-9 & STOCKPILE (88750 CY)	45	DAY	770.00		34,650	
	DUMP TRUCK & DRIVER (16 EA)	880	DAY	770.00		677.600	
DOZER & OPE	ERATOR	55	DAY	1760.00		96,800	
CLAY		21950	CV	10.00		-	
GEOMEMBRA	NE	330000	SF	0.65		214 500	
FILTER FABRI	C	330000	SF	0.10		33.000	
10-2 SAND D	RAINAGE LAYER	15925	CY	12.00		191,100	
10-3 SAND D	RAINAGE LAYER	15925	CY	17.00		270,725	
ROLLER & OP	ERATOR	80	DAY	1570.00		125,600	
						-	
6" DIA PERE I		2500	16	6.00		15 000	
12" DIA SOLI	D WALL PVC PIPE	1600		15.00		24 000	
6"x12" PVC	MYE	5	EA	500.00		2,500	
	LEACHATE PUMPING CHAMBER					-	
5' DIA PRECA	ST MANHOLE	10	VLF	250.00		2,500	
FRAME, COVE	ER, ETC.	1	LS	300.00		300	
CONCRETE FI	LL PAD, SUMP, ELECTRICAL	1	LS	35000.00		35,000	
CONTROLS	5, ALARM, FILL PIPING, BOLLARDS			100.00		-	
HAUL LEACH	ATE TO BASE TREATMENT PLANT / * 5 DAY/WK * 52 WK	2600	HR	100.00		260,000 -	

#### NOTE: ALL LINER SOIL MATERIAL QUANTITIES INCLUDE A 30% SWELL FACTOR

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# TOTAL LINER CONSTRUCTION \$ 2,485,735

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	PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY			JOB #	8712-04
		ALTERNATIVE 6: CAP-IN-PLACE SAs 6, 12, 13 AND EXCAVATE AND CONSOLIDATE AOCs 9, 11, 40	D AOC 41;			
	LOCATION:	DEVENS, MASSACHUSETTS			DATE	24-Jan-97
	ENGINEER:	ABB ENVIRONMENTAL SERVICES, INC.				
	ESTIMATOR	: P. R. MARTIN				
		CONSOLIDATION LANDFILL CONSTRUCTION		= = =		
		FINAL COVER CONSTRUCTION DESCRIPTION	ΩΤΥ	UNIT	UNIT COST	 TOTAL
	SUBGRADE	BUFFER	15925	CY	10.00	\$ 159,250
	TEXTURED (	GEOMEMBRAND	330000	SF	0.80	264,000
	FILTER FAB	RIC	330000	SF	0.10	33,000
	10-3 SAND	DRAINAGE LAYER	15925	CY	17.00	270,725
	MOISTURE F	RETENTION LAYER	23900	CY	10.00	239,000
	VEGETATIVI	E LAYER	7950	CY	14.00	111,300
	ROLLER & O	PERATOR	80	DAY	1570.00	125,600
						-
	SEED, FERTI	LIZE, MULCH	10	AC	2000.00	20,000
	MONITORIN	G WELLS	4	EA	2500.00	10,000
						-
	•					-
						-
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	NOTE:	ALL FINAL COVER SOIL MATERIAL QUANTITIES				-
		INCLUDE A 50 % SWELL FACTOR				-
						-
ø			TOTAL FINAL C	OVER C	ONSTRUCTION	\$ 1,232,875
	<b>J</b>					 

PROJECT: LANDFILL REMEDIATION FEASIBILITY STUDY ALTERNATIVE 6: CAP-IN-PLACE SAs 6, 12, 13 AND AOC 41;			JOB #	8712	8712-04				
EXCAVATE AND CONSOLIDATE AOCs 9, 11, 40 LOCATION: DEVENS, MASSACHUSETTS					24-Jan-	97			
ENGINEER:									
ESTIMATOR: P. R. MARTIN									
	CONSOLIDATION LANDFILL CONSTRUCTION	=======	= = =			=			
	DESCRIPTION	ΟΤΥ		UNIT	τοται				
						***			
TOTAL MOBILIZATION				\$ 357,9	10				
TOTAL SITE PREPARATION					115,5	00			
TOTAL LINER CONSTRUCTION					2,485,7	35			
TOTAL FINAL COVER CONSTRUCTION					1,232,8	75			

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UNDEVELOPED DESIGN DETAILS ~25%		1,047, <b>9</b> 80
TOTAL CONSOLIDATION LANDFILL CONSTRUCTION	\$	5,240,000

	PROJECT:	T: LANDFILL REMEDIATION FEASIBILITY STUDY ALTERNATIVE 6: CAP-IN-PLACE SAs 6, 12, 13 AND AOC 41;		JOB #	8712-04	
	LOCATION:	EXCAVATE AND CONSOLIDATE AOCs 9, 11, 4 DEVENS, MASSACHUSETTS	0		DATE	24-Jan-97
	ENGINEER	ARB ENVIRONMENTAL SERVICES INC				
	ENGINEER					
	ESTIMATOR:	P. R. MARTIN				
				=== :		
		ANNUAL U&M COSTS S& 6			UNIT	
		DESCRIPTION	ΟΤΥ		COST	TOTAL
		OVER MAINTENANCE				
	GENER	AL REPAIR				
	DUM	1P TRUCK & DRIVER	1	DAY	770.00	\$770
	FRO	NT END LOADER & OPER	1	DAY	825.00	825
	LAB	ORER - 2 EA	16	MNHR	33.50	536
	MAT	ERIALS	1	LS	500.00	500
	INSPEC	TION - 0.5 DAY @ 2 MEN/DAY	8	MNHR	75.00	600
	MOWIN	IG - TRACTOR & OPERATOR	0.5	DAY	500.00	- 250
	ENVIRONME	NTAL MONITORING				
	GROUNDV	WATER SAMPLE COLLECTION	2	LS	1800.00	3,600
	4 WELL SAN	S, SEMI-ANNUALLY (INCLUDES WELL PURGE, IPLE COLLECTION, AND SHIPPING)				-
-						-
	GROUND	WATER SAMPLE ANALYSIS				10 000
	4 SAM		12	SMPL	900.00	10,800
	EQU	IVALENT SEMI-ANNUALLY, SVUCS,				
	INOF	GANICS, WATER QUALITY PARAMETERS				
	FIVE YEAR E	DUCATIONAL PROGRAM	0.1739	LS	5000.00	869
	PUBLIC	MEETING - ANNUALIZED				
	TWO YEAR I	DATA REPORT TO	0.4831	LS	1000.00	483
	MADEF	- ANNUALIZED				
	FIVE YEAI	R SITE REVIEW - ANNUALIZED	0.1739	LS	15000.00	2,608

TOTAL ANNUAL O&M COSTS

\$21,842

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PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY ALTERNATIVE 6: CAP-IN-PLACE SAs 6, 12, 13 AN	D AOC 41;		JOB #		8712-04
LOCATION:	EXCAVATE AND CONSOLIDATE AOCs 9, 11, 40 DEVENS, MASSACHUSETTS	0		DATE	24	-Jan-97
ENGINEER:	ABB ENVIRONMENTAL SERVICES, INC.					
ESTIMATOR:	P. R. MARTIN					
<i>_</i>			======		===:	
	ANNUAL O&M COSTS					
	SA 12			UNIT		
	DESCRIPTION	QTY	UNIT	COST	то	•••••
LANDFILL CO	OVER MAINTENANCE					
DUM		1	DAY	770.00	\$	770
FROM		1	DAY	825.00		825
	NER - 2 FA	16	MNHR	33.50		536
		1	10	500.00		500
MAT		•	L3	500.00		-
INSPEC	TION - 0.5 DAY @ 2 MEN/DAY	8	MNHR	75.00		600
MOWIN	IG - TRACTOR & OPERATOR	0.5	DAY	500.00		250
ENVIRONME				1000.00		2 600
GROUNDV 4 WELL SAM	VATER SAMPLE COLLECTION S, SEMI-ANNUALLY (INCLUDES WELL PURGE, PLE COLLECTION, AND SHIPPING)	2	15	1800.00		-
groundv 4 Samf Equi Inor	VATER SAMPLE ANALYSIS PLES PLUS 2 SAMPLE QA/QC VALENT SEMI-ANNUALLY, SVOCs, IGANICS, WATER QUALITY PARAMETERS	12	SMPL	900.00		- 10,800
FIVE YEAR EI PUBLIC	DUCATIONAL PROGRAM MEETING - ANNUALIZED	0.1739	LS	5000.00		869
TWO YEAR D MADEP	OATA REPORT TO - ANNUALIZED	0.4831	LS	1000.00		483
FIVE YEAF	R SITE REVIEW - ANNUALIZED	0.1739	LS	15000.00		2,608 -

TOTAL ANNUAL O&M COSTS

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\$ 21,842

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PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY ALTERNATIVE 6: CAP-IN-PLACE SAs 6, 12, 13 AND	AOC 41;		JOB #		8712-04
LOCATION:	EXCAVATE AND CONSOLIDATE AOCs 9, 11, 40 DEVENS, MASSACHUSETTS			DATE		24-Jan-97
ENGINEEN:	ADD ENVIRONMENTAL SERVICES, INC.					
ESTIMATOR:	P. R. MARTIN					
					= =	
	ANNUAL O&M COSTS					
		ΟΤΥ				ΤΟΤΑΙ
	DESCRIPTION					
LANDFILL CO	OVER MAINTENANCE					
GENER			DAV	770.00	~	770
		1		825.00	ş	825
	ORER - 2 EA	16	MNHR	33 50		536
MAT	ERIALS	1	LS	500.00		500
		0		75.00		-
INSPEC		0		75.00		-
MOWIN	IG - TRACTOR & OPERATOR	0.5	DAY	500.00		250
ENVIRONME	NTAL MONITORING					
GROUNDV	VATER SAMPLE COLLECTION	2	LS	1800.00		<b>3,60</b> 0
4 WELL SAM	.S, SEMI-ANNUALLY (INCLUDES WELL PURGE, IPLE COLLECTION, AND SHIPPING)					-
GROUNDV	NATER SAMPLE ANALYSIS					-
4 SAM	PLES PLUS 2 SAMPLE QA/QC	12	SMPL	900.00		10,800
EQU	IVALENT SEMI-ANNUALLY, SVOCs,					
INOF	RGANICS, WATER QUALITY PARAMETERS					
FIVE YEAR E	DUCATIONAL PROGRAM	0.1739	LS	5000.00		869
PUBLIC	MEETING - ANNUALIZED					
TWO YEAR I	DATA REPORT TO	0.4831	LS	1000.00		483
MADEF	- ANNUALIZED					
FIVE YEAI	R SITE REVIEW - ANNUALIZED	0.1739	LS	15000.00		2,608
						-

TOTAL ANNUAL O&M COSTS

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\$ 21,842

PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY ALTERNATIVE 6: CAP-IN-PLACE SAs 6, 12, 13 AM	ND AOC 41;		JOB #		8712-04	
LOCATION:	EXCAVATE AND CONSOLIDATE AOCs 9, 11, 4 DEVENS, MASSACHUSETTS	0		DATE		24-Jan-97	(
ENGINEER:	ABB ENVIRONMENTAL SERVICES, INC.						
ESTIMATOR	P. R. MARTIN						
			:		= =		
				LINIT			
	DESCRIPTION	QTY	UNIT	COST		TOTAL	
LANDFILL CO	OVER MAINTENANCE						
DUM		1	DAY	770.00	\$	770	
FRO	NT END LOADER & OPER	1	DAY	825.00	-	825	
LAB	ORER - 2 FA	16	MNHR	33.50		536	
MAT			15	500.00		500	
		·	20			-	
INSPEC	TION - 0.5 DAY @ 2 MEN/DAY	8	MNHR	75.00		600	
MOWIN	IG - TRACTOR & OPERATOR	0.5	DAY	500.00		250	
ENVIRONME GROUNDV 4 WELL SAM	NTAL MONITORING WATER SAMPLE COLLECTION .S, SEMI-ANNUALLY (INCLUDES WELL PURGE, IPLE COLLECTION, AND SHIPPING)	2	LS	1800.00		3,600 - -	ł
groundv 4 Sami Equ Inof	WATER SAMPLE ANALYSIS PLES PLUS 2 SAMPLE QA/QC IVALENT SEMI-ANNUALLY, SVOCs, RGANICS, WATER QUALITY PARAMETERS	12	SMPL	900.00		- 10,800	
FIVE YEAR E PUBLIC	DUCATIONAL PROGRAM MEETING - ANNUALIZED	0.1739	LS	5000.00		869	
TWO YEAR I MADEP	DATA REPORT TO - ANNUALIZED	0.4831	LS	1000.00		483	
FIVE YEAF	R SITE REVIEW - ANNUALIZED	0.1739	LS	15000.00		2,608 -	

TOTAL ANNUAL O&M COSTS

\$ 21,842

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PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY ALTERNATIVE 6: CAP-IN-PLACE SAS 6, 12, 13 AND	AOC 41;	JOB #	8712-04
LOCATION:	DEVENS, MASSACHUSETTS		DATE	24-Jan-97
ENGINEER:	ABB ENVIRONMENTAL SERVICES, INC.			
ESTIMATOR:	P. R. MARTIN			
	ANNUAL O&M COSTS SUMMARY SHEET FOR CAP IN PLACE OPTIONS DESCRIPTION	ΩTY	UNIT COST	 TOTAL
TOTAL SA 6	ANNUAL O&M COSTS - FOR 30 YEARS			\$ 21,842
TOTAL SA 1	2			21,842
TOTAL SA 1	3			21,842
TOTAL AOC	41			21,842

UNDEVELOPED DESIGN DETAILS ~25%	21,632
TOTAL ANNUAL O&M COSTS - 30 YEARS	\$ 109,000

PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY	JOB #	8712-04
LOCATION:	EXCAVATE AND CONSOLIDATE AOCs 9, 11, 40 DEVENS, MASSACHUSETTS	DATE	24-Jan-97
ENGINEER:	ABB ENVIRONMENTAL SERVICES, INC.		

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ANNUAL 0&M COSTS CONSOLIDATION LANDFILL		= = =		= =	
			UNIT		
DESCRIPTION	QTY	UNIT	COST		TOTAL
0&M COSTS OCCURING OVER THIRTY YEARS FOR CONSOLIDAT	ION LANDFILL				
FIVE YEAR SITE REVIEW - ANNUALIZED	0.1810	LS	10000.00	\$	1,810
ENVIRONMENTAL MONITORING					-
GROUNDWATER, 4 WELLS, SEMI-ANNUALLY					-
GENERAL PARAMETERS & METALS	8	SMPL	940.00		7,520
LANDFILL COVER MAINTENANCE	,				-
INSPECTION - 2 DAY @ 2 MEN/DAY	32	MNHR	75.00		2,400
GENERAL REPAIR					-
DUMP TRUCK & DRIVER	1	DAY	770.00		770
FRONT END LOADER & OPERATOR	1	DAY	825.00		825
LABORER - 2 EA	16	MNHR	33.50		536
MATERIALS	1	LS	500.00		500
MOWING	2	EVENT	1000.00		2,000
BI-ANNUAL REPORT TO DEP - ANNUALIZED	0.4878	LS	2500.00		1,220
AYER WWTP USER FEE	600	CCF	2.00		1,200
UNDEVELOPED DESIGN DETAILS ~25%					4,220
TOTAL ANNUAL O&M COSTS FOR 30 YEAR ACTIVI	TIES			\$	23,000

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PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY ALTERNATIVE 6: CAP-IN-PLACE SAs 6, 12, 13 AND	) AOC 41;		JOB #		8712-04
LOCATION:	EXCAVATE AND CONSOLIDATE AOCs 9, 11, 40 DEVENS, MASSACHUSETTS			DATE		24-Jan-97
ENGINEER:	ABB ENVIRONMENTAL SERVICES, INC.					
ESTIMATOR:	P. R. MARTIN					
	ANNUAL O&M COSTS AOC 40	===#==#		* = = = = = =	= =	
	DESCRIPTION	QTY	UNIT	COST		TOTAL
O&M COSTS SEDIMENT META	GOCCURING OVER FIVE YEARS FOR CSB LANDFILL T, 2 SAMPLES AT 2 LOCATIONS, ONE TIME ONLY A SLS - ANNUALIZED	T YEAR 5 0.7239	SMPL	625.00	\$	452
GROUNDV GENER/	WATER MONITORING, 2 WELLS, SEMI-ANNUALLY AL PARAMETERS & METALS	4	SMPL	1020.00		4,080
Sample ( Purge,	Collection (Includes Well , Sample Collection, and Shipment)	2	LS	2500		5,000
WETLAND 1 DAY	DS RESTORATION MONITORING @ 2 MEN/DAY, SEMI-ANNUALLY	32	MNHR	75.00		2,400
BIO MONI	TORING, BI-ANNUALLY	0.4878	LS	15000.00		7,317
FIVE YEAI PUBLIC	R EDUCATION PROGRAM ONCE MEETING - ANNUALIZED	0.1810	LS	2500.00		- 452
FIVE YEAI	R SITE REVIEW - ANNUALIZED	0.1810	LS	20000.00		3,619
	UNDEVELOPED DESIGN DETAILS ~25%					5,679
	TOTAL ADDITIONAL ANNUAL O&M COSTS FOR A	DC 40 - 5 YEARS			\$	29,000

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	PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY			JOB #		8712-04
	LOCATION:	ALTERNATIVE 7: CAP-IN-PLACE ALL SEVEN DISPOSAL AREAS DEVENS, MASSACHUSETTS			DATE		24-Jan-97
	ENGINEER:	ABB ENVIRONMENTAL SERVICES, INC.					
	ESTIMATOR:	P. R. MARTIN					
		COST SUMMARY TABLE		===	=======	====	
		DESCRIPTION	ΩΤΥ	UNIT	COST		TOTAL
	DIRECT COST	 S					
		SA 6				\$	159,000
		AOC 9					3,301,000
		AOC 11					1,269,000
		SA 12					507,000
		SA 13					395,000
		AOC 40					1,758,000
		AOC 41					175,000
		TOTAL DIRECT COSTS				\$	7,564,000
	INDIRECT CO	STS					
		HEALTH AND SAFETY			5.00%	\$	378,000
_		LEGAL, ADMIN, PERMITTING			5.00%		378,000
	l	ENGINEERING			10.00%		756,000
		SERVICES DURING CONSTRUCTION			10.00%		756,000
		TOTAL INDIRECT COSTS				\$	2,268,000
		TOTAL CAPITAL (DIRECT + INDIRECT) COST				\$	9,832,000
	OPERATING A	AND MAINTENANCE COSTS					
	TOTAL AN	NUAL O&M COSTS - 30 YEARS				\$	208,000
	TOTAL AD	DITIONAL ANNUAL O&M COSTS FOR AOC 40 - 5 YF	RS			\$	13,000

TOTAL PRESENT WORTH OF OPERATING AND MAINTENANCE COSTS \$ 2,634,000

TOTAL COSTS

\$ 12,466,000

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PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY	•	JOB #	8712-04
	ALTERNATIVE 7: CAP-IN-PLACE ALL SEVEN DISPOSAL AREAS		DATE	24-Jan-97
LOCATION:	DEVENS, MASSACHUSETTS			

ESTIMATOR: P. R. MARTIN

		= = =		= =	
MOR/DEMOR					
DESCRIPTION	QTY	UNIT	COST		TOTAL
MOB/DEMOB EQUIPMENT (IN OR OUT)					
FRONT END LOADER	2	EA	410.00	\$	820
DUMP TRUCK	2	EA	385.00		770
BACK HOE	2	EA	730.00		1,460
DOZER	2	EA	880.00		1,760
ROLLER	2	EA	785.00		1,570
OFFICE TRAILER	1	MON	150.00		- 150
STORAGE TRAILER	1	MON	<b>100.0</b> 0		100
SET UP TRAILER	2	EA	500.00		1,000
TOILET - 2 EA	8	wк	25.00		200
WATER COOLER - 2 EA	8	WK	25.00		200
WATER	40	DAY	15.00		600
TELEPHONE SERVICE	1	MON	500.00		500
ELECTRICITY	1	MON	250.00		250
PICK-UP (2 EA)	2	MON	1000.00		2,000
PUMPS, TOOLS, MINOR EQUIPMENT	1	MON	500.00		500
SITE SUPERINTENDANT ( 1 MON * 210 HR/MON)	210	MNHR	65.00		- 13,650
FOREMEN (1 MON * 210 HR/MON)	210	MNHR	55.00		11,550
CLERK/TYPIST (1 MON * 168 HR/MON)	168	MNHR	25.00		4,200 -

TOTAL MOB/DEMOB

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41,280

\$

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PROJECT:				JOB #		8712-04
LOCATION:	ALL SEVEN DISPOSAL AREAS DEVENS, MASSACHUSETTS			DATE		24-Jan-97
ENGINEER:	ABB ENVIRONMENTAL SERVICES, INC.					
ESTIMATOR:	P. R. MARTIN					
*****			_ = =	=====	= =	
	SITE PREPARATION & CAP CONSTRUCTION DESCRIPTION	ΩΤΥ	UNIT	UNIT COST		TOTAL
*********************	SITE PREPARATION					
ACCESS ROA	AD - 675 LF x 15' WIDE					
GRADE RO	DAD BED - DOZER & OPERATOR	1	DAY	1760.00	\$	1,760
GRAVEL -	12" THICK	375	CY	10.00		3,750
SPREAD &	COMPACT	0.5	DAY	1570.00		785
GEOFABRI	C	1125	SY	1.00		1,125
CLEAR TREES	S FROM SITE	0.25	AC	6900.00		1,725
ARCHAEOLO						-
PROJECT	MANAGER	1	DAY	425.00		425
PRINCIPAL		1	DAY	385.00		385
PROJECT		/	DAY	280.00		1,960
ASSISTAN		5	DAY	195.00		1,170
	UCESSUR	1		185.00		105
		1000		100.00		250
		1000		60.00		300
UXO CLEARA	ANCE	2	DAY	1800.00		3,600
						-
		1	ΠΑΥ	1760.00		1 760
LABORER	OFENATOR	8	HR	33.50		268
						-
	TOTAL SITE PREPARATION				\$	19,548
	CAP CONSTRUCTION					
SUBGRADE	SOIL	520	CY	10.00	\$	5.200
	FOMEMBRANE	6750	SF	0.80	·	5,400
DRAINAGES	SOIL	365	CY	17.00		6,205
GEOTEXTILE	FABRIC LAYER	6750	SF	0.10		675
MOISTURE R	ETENTION SOIL	650	CY	10.00		6,500
VEGETATIVE	E SOIL	230	CY	14.00		3,220
SPREAD & C	ОМРАСТ	3	DAY	1570.00	••••	4,710
TOTAL CAP	TOTAL CAP CONSTRUCTION				\$	31,910
NOTE: CAP	NOTE: CAP SOIL MATERIAL QUANTITIES INCLUD	E A 30% SWELL F	ACTOR.			
				***==****		

PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY			JOB #		8712-04
	ALTERNATIVE 7: CAP-IN-PLACE ALL SEVEN DISPOSAL AREAS			DATE		24-Jan-97
LOCATION:	DEVENS, MASSACHUSETTS					
ENGINEER:	ABB ENVIRONMENTAL SERVICES, INC.					
ESTIMATOR:	P. R. MARTIN					
			===			
	CAP IN PLACE SA 6					
SITE RESTOR	DESCRIPTION	QTY	UNIT	COST		TOTAL
	SITE RESTORATION			· ····	****	
CHAIN LIN	K FENCE	400	LF	13.00	\$	5,200
12' SWING FERTILIZE,	SEED, MULCH	1000	EA SY	0.50		500
	TOTAL SITE RESTORATION				\$	6,500
MONITORING	WELLS - 4" DIA x 30' DEEP	4	EA	4500.00	\$	18,000
INSTITUTION	AL CONTROLS	1	LS	10000.00	\$	10,000

PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY	JOB #	8712-04
	ALTERNATIVE 7: CAP-IN-PLACE ALL SEVEN DISPOSAL AREAS	DATE	24-Jan-97
LOCATION:	DEVENS, MASSACHUSETTS		

ESTIMATOR: P. R. MARTIN

CAP IN PLACE SA 6		===		= =	****
DESCRIPTION	QTY	UNIT	COST		TOTAL
TOTAL MOB/DEMOB	, ,,			\$	41,280
TOTAL SITE PREPARATION					19,548
TOTAL CAP CONSTRUCTION					31,910
TOTAL SITE RESTORATION					6,500
TOTAL MONITORING WELLS					18,000
TOTAL INSTITUTIONAL CONTROLS					10,000
UNDEVELOPED DESIGN DETAILS ~25%					31,762
TOTAL SA 6				\$	159,000

PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY	JOB #	8712-04
LOCATION:	ALTERNATIVE 7: CAP-IN-PLACE ALL SEVEN DISPOSAL AREAS DEVENS, MASSACHUSETTS	DATE	24-Jan-97

## ESTIMATOR: P. R. MARTIN

CAP IN PLACE AOC 9		= = =		= =	=====
MOB/DEMOB			UNIT		
DESCRIPTION	QTY	UNIT	COST		TOTAL
MOB/DEMOB EQUIPMENT (IN OR OUT)					
FRONT END LOADER (2 EA)	4	EA	410.00	\$	1,640
DUMP TRUCK (5 EA)	10	EA	385.00		3,850
BACK HOE	2	EA	730.00		1,460
DOZER (5 EA)	10	EA	880.00		8,800
ROLLER (5 EA)	10	EA	785.00		7,850
					-
OFFICE TRAILER	5	MON	150.00		750
STORAGE TRAILER	5	MON	100.00		500
SET UP TRAILER	2	EA	500.00		1,000
					2
TOILET - 2 EA	44	WΚ	25.00		1,100
WATER COOLER - 2 EA	44	WK	25.00		1,100
WATER	220	DAY	15.00		3,300
TELEPHONE SERVICE	5	MON	500.00		2,500
ELECTRICITY	5	MON	250.00		1,250
PICK-UP (2 EA)	10	MON	1000.00		10,000
PUMPS, TOOLS, MINOR EQUIPMENT	5	MON	500.00		2,500
SITE SUPERINTENDANT ( 5 MON * 210 HR/MON)	1050	MNHR	65.00		- 68,250
FOREMEN (5 MON * 210 HR/MON)	1050	MNHR	55.00		57,750
CLERK/TYPIST (5 MON * 168 HR/MON)	840	MNHR	25.00		21,000

TOTAL MOB/DEMOB

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\$ 194,600

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PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY ALTERNATIVE 7: CAP-IN-PLACE	JOB #	8712-04
LOCATION:	ALL SEVEN DISPOSAL AREAS DEVENS, MASSACHUSETTS	DATE	24-Jan-97

ESTIMATOR: P. R. MARTIN

CAP IN PLACE AOC 9	=====	= = =		=	
SITE PREPARATION, DEBRIS EXCAVATION, & CAP CONSTR	UCTION		UNIT		
DESCRIPTION	QTY	UNIT	COST		TOTAL
SITE PREPARATION		89992222 <b>2</b> 9			
ACCESS ROAD - 500 LF x 20' WIDE					
GRADE ROAD BED - DOZER & OPERATOR	1	DAY	1760.00	\$	1,760
GRAVEL - 12" THICK	400	CY	10.00		4,000
SPREAD & COMPACT - ROLLER & OPERATOR	0.5	DAY	1570.00		785
GEOFABRIC	1100	SY	1.00		1,100
CLEAR TREES FROM SITE	3	AC	6900.00		20,700
EROSION CONTROL	700	LF	5.00		3,500
GRADING & DRAINAGE SWALE CONSTRUCTION					-
DOZER & OPERATOR	10	DAY	1760.00		17,600
LABORER	80	HR	33.50		2,680
TOTAL SITE PREPARATION				\$	52,125
EXCAVATE DEBRIS AREA I, II, III, & IV & PLACE IN AREA BACKHOE & OPERATOR LABORER DUMP TRUCK & DRIVER - 3 EA DOZER & OPERATOR LABORER	A V 30 240 90 30 240	DAY HR DAY DAY HR	1460.00 33.50 770.00 1760.00 33.50	\$	43,800 8,040 69,300 52,800 8,040
TOTAL EXCAVATE DEBRIS				\$	181,980
CAP CONSTRUCTION					
SUBGRADE SOIL	50800	CY	10.00	\$	508,000
TEXTURED GEOMEMBRANE	371000	SF	0.80		296,800
DRAINAGE SOIL	18200	CY	17.00		309,400
GEOTEXTILE FABRIC LAYER	371000	SF	0.10		37,100
MOISTURE RETENTION SOIL	28200	CY	10.00		282,000
VEGETATIVE SOIL	9500	CY	14.00		133,000
SPREAD & COMPACT - ROLLER & OPERATOR	132	DAY	1570.00		207,240
TOTAL CAP CONSTRUCTION				\$	1,773,540
NOTE: SOIL CAP MATERIAL QUANTITIES INCLUDE	A 30% SWELL F	ACTOR.			
					-
	*****				-

PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY			JOB #		8712-04	
LOCATION:	ALTERNATIVE 7: CAP-IN-PLACE ALL SEVEN DISPOSAL AREAS DEVENS, MASSACHUSETTS			DATE		24-Jan-97	(
ENGINEER:	ABB ENVIRONMENTAL SERVICES, INC.						
ESTIMATOR:	P. R. MARTIN						
			= = =		= =		
	ATION MONITOPING WELLS & INSTITUTIONAL CO			LINUT			
SHERESTON	DESCRIPTION	QTY	UNIT	COST		TOTAL	
4-************************************	SITE RESTORATION	*					
DEBRIS AF	REA I - IV FILL MATERIAL	25250	CY	10.00	\$	252,500	
DEBRIS AF	REA I - IV VEGETATIVE SOIL	2700	CY	14.00		37,800	
CHAIN LIN	K FENCE	2500	LF	13.00		32,500	
12' SWING	GATE	2	EA	800.00		1,600	
FERTILIZE,	SEED, MULCH	62000	SY	0.50		31,000	
SPREAD &	COMPACT - ROLLER & OPERATOR	35	DAY	1570.00		54,950	
	TOTAL SITE RESTORATION				\$	410,350	
MONITORING	WELLS - 4" DIA x 30' DEEP	4	EA	4500.00	\$	18,000	
INSTITUTION	AL CONTROLS	1	LS	10000.00	\$	10,000	

PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY	JOB #	8712-04
LOCATION:	ALTERNATIVE 7: CAP-IN-PLACE ALL SEVEN DISPOSAL AREAS DEVENS, MASSACHUSETTS	DATE	24-Jan-97
ENGINEER:	ABB ENVIRONMENTAL SERVICES, INC.		

CAP IN PLACE AOC 9 SUMMARY SHFFT			= = = = = = = = = = = = = = = = = = =	= =	
DESCRIPTION	ΩΤΥ	UNIT	COST	•	TOTAL
TOTAL MOB/DEMOB				\$	194,600
TOTAL SITE PREPARATION					52,125
TOTAL DEBRIS EXCAVATION					<b>181,9</b> 80
TOTAL CAP CONSTRUCTION					1,773,540
TOTAL SITE RESTORATION					410,350
TOTAL MONITORING WELLS					18,000
TOTAL INSTITUTIONAL CONTROLS					10,000
UNDEVELOPED DESIGN DETAILS ~25%					660,405
TOTAL AOC 9				\$ 3	3,301,000

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PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY ALTERNATIVE 7: CAP-IN-PLACE	JOB #	8712-04
LOCATION:	ALL SEVEN DISPOSAL AREAS TION: DEVENS, MASSACHUSETTS	DATE	24-Jan-97

ESTIMATOR: P. R. MARTIN

CAP IN PLACE AOC 11		= = =		-	
MOB/DEMOB			UNIT		
DESCRIPTION	ΩΤΥ	UNIT	COST		TOTAL
MOB/DEMOB EQUIPMENT (IN OR OUT)	***************************************	**********			
FRONT END LOADER	2	EA	410.00	\$	820
DUMP TRUCK	2	EA	385.00	-	770
BACK HOE	2	EA	730.00		1,460
DOZER (2 EA)	4	EA	880.00		3.520
ROLLER (2 EA)	4	EA	785.00		3,140
					-
			450.00		-
	3	MON	150.00		450
	3	MON	100.00		300
SET OF TRALER	2	EA	500.00		1,000
TOILET - 2 EA	24	wκ	25.00		600
WATER COOLER - 2 EA	24	WΚ	25.00		600
WATER	60	DAY	15.00		900
TELEPHONE SERVICE	3	MON	500.00		1,500
ELECTRICITY	3	MON	250.00		750
PICK-UP (2 EA)	6	MON	1000.00		6,000
PUMPS, TOOLS, MINOR EQUIPMENT	3	MON	500.00		1,500
SITE SUPERINTENDANT ( 3 MON * 210 HR/MON)	630	MNHR	65.00		- 40,950
FOREMEN (3 MON * 210 HR/MON)	630	MNHR	55.00		34,650
CLERK/TYPIST (3 MON * 168 HR/MON)	504	MNHR	25.00		12,600

TOTAL MOB/DEMOB

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\$ 111,510

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PROJECT:	LANDFILL REM ALTERNATIVE	IEDIATION FEASIBILITY STUDY			JOB #		8712-04
LOCATION:	ALL SEVEN DEVENS, MAS	DISPOSAL AREAS SACHUSETTS			DATE		24-Jan-97
ENGINEER:	ABB ENVIRON	MENTAL SERVICES, INC.					
ESTIMATOR:	P. R. MARTIN						
=====	======						
SITE	PREPARATION,	CAP CONSTRUCTION, SITE RESTOR DESCRIPTION	RATION QTY	UNIT	UNIT COST		TOTAL
	SITE PREPARA	TION					
ACCESS ROA	D - 850 LF x 20	)' WIDE					
GRADE RC	AD BED - DOZE	R & OPERATOR	2	DAY	1760.00	\$	3,520
GRAVEL -	12" THICK		650	CY	10.00		6,500
SPREAD &	COMPACT		1	DAY	1570.00		1,570
			1900	SY	2.00		3,800
EPOSION COL			0.5	AC	4300.00		2,150
	NTROL		900	LF	5.00		4,500
GRADING & [	DRAINAGE SWA	LE CONSTRUCTION					-
DOZER & (	OPERATOR		3	DAY	1760.00		5 280
LABORER			24	HR	33.50		804
	TOTAL SITE PR	REPARATION				\$	28,124
							-
		CAP CONSTRUCTION					
SUBGRADE S			23550	CY	10.00	Ş	235,500
DRAINAGE S			115650	SF	0.80		92,520
CENTEXTILE			5900		17.00		11 5 65
			115050	3F CV	10.10		11,000
RIPRAP			5220 7450		30.00		223 500
SPREAD & CO	OMPACT		45	DAY	1570.00		70.650
		MSTRUCTION				Ş	020,235
	NOTE: ALL CA	P MATERIAL QUANTITIES INCLUDE	E A 30% SWELL FA	CTOR.			-
		SITE RESTORATION					-
CHAIN LIN	k fence		1600	LF	13.00	\$	20,800
12' SWING	GATE		1	EA	800.00	•	800
	TOTAL SITE RE	STORATION				\$	21,600
							-
							-
							-
							-

PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY				JOB #		8712-04
LOCATION:	ALTERNATIVE 7: CAP-IN-PLACE ALL SEVEN DISPOSAL AREAS DEVENS, MASSACHUSETTS				DATE	:	24-Jan-97
ENGINEER:	ABB ENVIRONMENTAL SERVICES, INC.						
ESTIMATOR:	P. R. MARTIN						
	CAP IN PLACE AOC 11 MONITORING WELLS & INSTITUTIONAL CONTROLS DESCRIPTION	= = = = = = = QTY	=	= = = UNIT	UNIT COST	= = =	= = = = = TOTAL
MONITORING	WELLS - 4" DIA x 30' DEEP		4	EA	4500.00	\$	18,000

INSTITUTIONAL CONTROLS	1 LS	10000.00	\$ 10,000

PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY ALTERNATIVE 7: CAP-IN-PLACE	JOB #	8712-04
LOCATION:	ALL SEVEN DISPOSAL AREAS DEVENS, MASSACHUSETTS	DATE	24-Jan-97

ESTIMATOR: P. R. MARTIN

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CAP IN PLACE AOC 11				= :	
SUMMARY SHEET DESCRIPTION	ΟΤΥ	UNIT	UNIT COST		TOTAL
TOTAL MOB/DEMOB				\$	111,510
TOTAL SITE PREPARATION					28,124
TOTAL CAP CONSTRUCTION					826,235
TOTAL SITE RESTORATION					21,600
TOTAL MONITORING WELLS					18,000
TOTAL INSTITUTIONAL CONTROLS					10,000
UNDEVELOPED DESIGN DETAILS ~25%					253,531
TOTAL AOC 11				\$	1,269,000

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PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY	JOB #	8712-04
	ALTERNATIVE 7: CAP-IN-PLACE ALL SEVEN DISPOSAL AREAS	DATE	24-Jan-97
LOCATION:	DEVENS, MASSACHUSETTS		

## ESTIMATOR: P. R. MARTIN

CAP IN PLACE SA 12				= =	
MOB/DEMOB			UNIT		
DESCRIPTION	QTY	UNIT	COST		TOTAL
MOB/DEMOB EQUIPMENT (IN OR OUT)	*				
FRONT END LOADER	2	EA	410.00	\$	820
DUMP TRUCK	2	EA	385.00		770
BACK HOE	2	EA	730.00		1,460
DOZER (2 EA)	4	EA	880.00		3,520
ROLLER (2 EA)	4	ΕA	785.00		3,140
					-
OFFICE TRAILER	2	MON	150.00		300
STORAGE TRAILER	2	MON	100.00		200
SET UP TRAILER	2	EA	500.00		1,000
					-
TOILET - 2 EA	16	WK	25.00		400
WATER COOLER - 2 EA	16	WK	25.00		400
WATER	40	DAY	15.00		600
TELEPHONE SERVICE	2	MON	500.00		1,000
ELECTRICITY	2	MON	250.00		500
PICK-UP (2 EA)	4	MON	1000.00		4,000
PUMPS, TOOLS, MINOR EQUIPMENT	2	MON	500.00		1,000
SITE SUPERINTENDANT ( 2 MON * 210 HR/MON)	420	MNHR	65.00		27,300
FOREMEN (2 MON * 210 HR/MON)	420	MNHR	55.00		23,100
CLERK/TYPIST (2 MON * 168 HR/MON)	336	MNHR	25.00		8,400

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TOTAL MOB/DEMOB

\$77,910 -

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PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY	/		JOB #		8712-0
				D 4 7 5		
LOCATION:	DEVENS, MASSACHUSETTS			DATE		24-Jan-97
ENGINEER:	ABB ENVIRONMENTAL SERVICES, INC.					
ESTIMATOR:	P. R. MARTIN					
		== =======	=== :		= =	
SITE I		STORATION				
	DESCRIPTION	QTY	UNIT	COST		TOTAL
	SITE PREPARATION					
ACCESS ROA	D - 300 LF x 20' WIDE					
GRADE RO	AD BED - DOZER & OPERATOR	0.5	DAY	1760.00	\$	880
GRAVEL -		80	CY	10.00		800
SPREAD &	COMPACI	0.25	DAY	1570.00		393
		700	SY	1.00		700
EPOSION CON		0.5	AC	6900.00		3,450
		325	LF	5.00		1,625
UNU CLEANA	INCE	15	DAY	1800.00		27,000
GRADING & D	DRAINAGE SWALE CONSTRUCTION					-
DOZER & C	DPERATOR	2	DAY	1760.00		3 520
LABORER		16	HR	33.50		536
	TOTAL SITE PREPARATION				\$	38,904
						-
	CAP CONSTRUCTION					
SUBGRADE S	OIL	9450	CY	10.00	\$	94,500
TEXTURED GI	EOMEMBRANE	40950	SF	0.80		32,760
DRAINAGE SC		2050	CY	17.00		34,850
GEOTEXTILE		40950	SF	0.10		4,095
	TENTION SOIL	3200	CY	10.00		32,000
	SUIL	1150	CY	14.00		16,100
SPREAD & CU	JMPACI	20	DAY	1570.00		31,400
	TOTAL CAP CONSTRUCTION				\$	245,705
	NOTE: CAP SOIL MATERIAL QUANTITIES INC	LUDE A 30% SWELL F	ACTOR.			-
						-
						-
						-
CHAIN LINI	C FENCE	1000	IF	13.00	Ś	13 000
12' SWING	GATE	1000	FA	800.00	Ŧ	800
FERTILIZE,	SEED, MULCH	2400	SY	0.50		1,200
	TOTAL SITE RESTORATION				\$	15,000
						-
					*****	

PROJECT:	OJECT: LANDFILL REMEDIATION FEASIBILITY STUDY			JOB #		8712-04	
LOCATION:	ALTERNATIVE 7: CAP-IN-PLACE ALL SEVEN DISPOSAL AREAS DEVENS, MASSACHUSETTS				DATE		24-Jan-97
ENGINEER:	ABB ENVIRONMENTAL SERVICES, INC.						
ESTIMATOR:	P. R. MARTIN						
	CAP IN PLACE SA 12		=		======	= =	
	MONITORING WELLS & INSTITUTIONAL CONTROLS DESCRIPTION	ΩΤΥ		UNIT	UNIT COST		TOTAL
MONITORING	WELLS - 4" DIA x 30' DEEP		4	EA	4500.00	\$	18,000
INSTITUTION	AL CONTROLS		1	LS	10000.00	\$	10,000

PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY	JOB #	8712-04
	ALTERNATIVE 7: CAP-IN-PLACE ALL SEVEN DISPOSAL AREAS	DATE	24-Jan-97
LOCATION:	DEVENS, MASSACHUSETTS		
ENGINEER:	ABB ENVIRONMENTAL SERVICES, INC.		

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SUMMARY SHEET DESCRIPTION	ΩΤΥ	UNIT	UNIT COST		TOTAL
TOTAL MOB/DEMOB				\$	77,910
TOTAL SITE PREPARATION					38,904
TOTAL CAP CONSTRUCTION					245,705
TOTAL SITE RESTORATION					15,000
TOTAL MONITORING WELLS					18,000
TOTAL INSTITUTIONAL CONTROLS					10,000
UNDEVELOPED DESIGN DETAILS ~25%					101,482
TOTAL SA 12				\$	507,000

PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY	JOB #	8712-04
	ALTERNATIVE 7: CAP-IN-PLACE ALL SEVEN DISPOSAL AREAS	DATE	24- Ian-97
LOCATION:	DEVENS, MASSACHUSETTS	0,112	2,001107

ESTIMATOR: P. R. MARTIN

CAP IN PLACE SA 13		= = =		====	
DESCRIPTION	ΩΤΥ	UNIT	COST	тот	AL
MOB/DEMOB EQUIPMENT (IN OR OUT)					
FRONT END LOADER	2	EA	410.00	\$	820
DUMP TRUCK	2	EA	385.00		770
BACK HOE	2	EA	730.00		1,460
DOZER	2	EA	880.00		1,760
ROLLER	2	EA	785.00		1,570 -
OFFICE TRAILER	1.5	MON	150.00		- 225
STORAGE TRAILER	1.5	MON	100.00		150
SET UP TRAILER	2	EA	500.00		1,000
TOILET - 2 EA	12	wк	25.00		- 300
WATER COOLER - 2 EA	12	WΚ	25.00		300
WATER	60	DAY	15.00		900
TELEPHONE SERVICE	1.5	MON	500.00		750
ELECTRICITY	1.5	MON	250.00		375
PICK-UP (2 EA)	3	MON	1000.00		3,000
PUMPS, TOOLS, MINOR EQUIPMENT	1.5	MON	500.00		- 750
SITE SUPERINTENDANT ( 1.5 MON * 210 HR/MON)	315	MNHR	65.00	2	- 0,475
FOREMEN (1.5 MON * 210 HR/MON)	315	MNHR	55.00	1	7,325
CLERK/TYPIST (1.5 MON * 168 HR/MON)	252	MNHR	25.00		6,300

TOTAL MOB/DEMOB

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\$ 58,230

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PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY			JOB #		8712-04
LOCATION:	ALL SEVEN DISPOSAL AREAS DEVENS, MASSACHUSETTS			DATE		24-Jan-97
ENGINEER:	ABB ENVIRONMENTAL SERVICES, INC.					
ESTIMATOR:	P. R. MARTIN					
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SITE	CAP IN PLACE SA 13 PREPARATION, CAP CONSTRUCTION, SITE RESTORATI DESCRIPTION	ΟΝ ΩΤΥ	UNIT	UNIT COST		TOTAL
	SITE PREPARATION					
ACCESS ROA	ND - 200 LF x 20' WIDE					
GRADE RC	DAD BED - DOZER & OPERATOR	0.5	DAY	1760.00	Ş	1 500
GRAVEL -		150	CY	10.00		1,500
SPREAD &	COMPACI	0.25		1570.00		393
		450	51	00.00		2 450
CLEAR TREE	S FROM SITE	0.5	AL	6900.00		- 3,450
EROSION CO	NTROL	300	LF	5.00		1,500
GRADING & I	DRAINAGE SWALE CONSTRUCTION					-
DOZER &	OPERATOR	1	DAY	1760.00		1,760
LABORER		8	HR	33.50		268
	TOTAL SITE PREPARATION				\$	10,201
SUBGRADE S		5600	CY	10.00	\$	56,000
TEXTURED G	EOMEMBRANE	42100	SF	0.80		33,680
DRAINAGE S	OIL	2100	CY	17.00		35,700
GEOTEXTILE	FABRIC LAYER	42100	SF	0.10		4,210
MOISTURE R	ETENTION SOIL	3350	CY	10.00		33,500
VEGETATIVE	SOIL	1150	CY	14.00		16,100
SPREAD & C	OMPACT	16	DAY	1570.00		25,120
	TOTAL CAP CONSTRUCTION				\$	<b>204,31</b> 0
	NOTE: SOIL CAP MATERIAL QUANTITIES INCLUDE A	30% SWELL F	ACTOR.			-
						-
	SITE RESTURATION	900	IF	13.00	ŝ	11 700
		500	FA	800.00	Ŧ	800
FERTILIZE	, SEED, MULCH	5300	SY	0.50		2,650
					 \$	15 150
					•	-

PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY				JOB #		8712-04
LOCATION:	ALTERNATIVE 7: CAP-IN-PLACE ALL SEVEN DISPOSAL AREAS DEVENS, MASSACHUSETTS				DATE		24-Jan-97
ENGINEER:	ABB ENVIRONMENTAL SERVICES, INC.						
ESTIMATOR:	P. R. MARTIN						
	CAP IN PLACE SA 13 MONITORING WELLS & INSTITUTIONAL CONTROLS DESCRIPTION	QTY		= = = = UNIT	UNIT COST	= =	TOTAL
MONITORING	5 WELLS - 4" DIA x 30' DEEP		4	EA	4500.00	\$	18,000
INSTITUTION	AL CONTROLS		1	LS	10000.00	\$	10,000

PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY ALTERNATIVE 7: CAP-IN-PLACE	JOB #	8712-04
LOCATION:	ALL SEVEN DISPOSAL AREAS DEVENS, MASSACHUSETTS	DATE	24-Jan-97
ENGINEER:	ABB ENVIRONMENTAL SERVICES, INC.		

CAP IN PLACE SA 13 SUMMARY SHEET	≠=====	= = =	= =	= = = = = TOTA1
DESCRIPTION	UIY	UNIT	 	
TOTAL MOB/DEMOB			\$	58,230
TOTAL SITE PREPARATION				10,201
TOTAL CAP CONSTRUCTION				204,310
TOTAL SITE RESTORATION				15,150
TOTAL MONITORING WELLS				18,000
TOTAL INSTITUTIONAL CONTROLS				10,000
UNDEVELOPED DESIGN DETAILS ~25%				79,110
TOTAL SA 13			\$	395,000

ALL SEVEN DISPOSAL AREAS         DATE         24-Jan-37           LOCATION:         DEVENS, MASSACHUSETTS         ENGINEER:         ABB ENVIRONMENTAL SERVICES, INC.           ESTIMATOR:         P. R. MARTIN         UNIT         COST         TOTAL           CAP IN PLACE AOC 40 SITE PREPARATION         OTY         UNIT         COST         TOTAL           SITE PREPARATION         AND MOBILIZATION DESCRIPTION         OTY         UNIT         COST         TOTAL           SITE PREPARATION         O.1         AC         4300.00         \$         430           ACCES ROAD SEDIMENT AREA 1           CLEAR & GRUE LIGHT VEGETATION         O.1         AC         4300.00         \$         430           GRADE DOZER & OPERATOR         O.25         DAY         1760.00         3.600           ROPERATOR         O.1         AC         4300.00         \$         430           CLEAR & GRUE LIGHT VEGETATION         O.1         AC         4300.00         440           GRADE DOZER & OPERATOR         O.25         DAY         1570.00         785           CLEAR & GRUE LIGHT VEGETATION         O.1         AC         4300.00         1.505	PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY ALTERNATIVE 7: CAP-IN-PLACE			JOB #	8712-04	
ENGINEER:         ABB ENVIRONMENTAL SERVICES, INC.           ESTIMATOR:         P. R. MARTIN           CAP: IN PLACE AOC 40 SITE PREPARATION AND MOBILIZATION DESCRIPTION         UNIT OTY         UNIT COST         TOTAL           SITE PREPARATION ACCESS ROAD SEDIMENT AREA 1 CLEAR & GRUB LIGHT VEGETATION CEAR & GRUB LIGHT VEGETATION         0.1         AC         4300.00         \$         430           GRADE: DOZER & OPERATOR         0.25         DAY         1760.00         440           GRAVEL: 12' THICK         360         CY         10.00         3.600           FILTER FABRIC         550         SY         1.00         360           CLEAR & GRUB LIGHT VEGETATION         0.1         AC         4300.00         430           GRADE: DOZER & OPERATOR         0.25         DAY         1570.00         340           SPREAD & COMPACT         0.5         DAY         1570.00         340           SPREAD & COMPACT         0.5         DAY         1570.00         3400           SPREAD & COMPACT         0.5         DAY         1570.00         3400           SPREAD & COMPACT         0.5         DAY         1760.00         880           GRAVEL: 24' THICK         3400         CY         10.00         1.4500	LOCATION:	ALL SEVEN DISPOSAL AREAS DEVENS, MASSACHUSETTS			DATE	24-Jan-97	
ESTIMATOR: P. R. MARTIN  CAP IN PLACE AOC 40 SITE PREPARATION AND MOBILIZATION DESCRIPTION OTY UNIT COST TOTAL  SITE PREPARATION ACCESS ROAD SEDIMENT AREA 1 CLEAR & GRUB LIGHT VEGETATION GRADE- DOZER & OPERATOR CLEAR & GRUB LIGHT VEGETATION CLEAR & OPERATOR CLEAR & GRUB LIGHT VEGETATION CLEAR & OPERATOR CLEAR & GRUB LIGHT VEGETATION CLEAR & GRUB LIGHT VEGETATION CLEAR & OPERATOR CLEAR & GRUB LIGHT VEGETATION CLEAR & OPERATOR CLEAR & GRUB LIGHT VEGETATION CLEAR & GRUB LIGHT VEGETATION CLEAR & GRUB LIGHT VEGETATION CLEAR & OPERATOR CLEAR & GRUB LIGHT VEGETATION CLEAR & OPERATOR CLEAR & GRUB LIGHT VEGETATION CLEAR & GRUB LIGHT VEGETATION CLEAR & OPERATOR CLEAR & OPERATOR CLEAR & OPERATOR CL	ENGINEER:	ABB ENVIRONMENTAL SERVICES, INC.					
CAP IN PLACE AOC 40 SITE PREPARATION AND MOBILIZATION DESCRIPTION         UNIT         COST         TOTAL           SITE PREPARATION ACCESS ROAD SEDIMENT AREA 1 CLEAR & GRUB LIGHT VEGETATION         0.1         AC         4300.00         \$         430           GRADE-DOZER & OPERATOR         0.25         DAY         1760.00         3.600           GRADE-LOZER & OPERATOR         0.25         DAY         1760.00         440           GRADE-DOZER & OPERATOR         0.25         DAY         1570.00         785           ACCESS ROAD SEDIMENT AREA 2         0.5         DAY         1570.00         785           CLEAR & GRUB LIGHT VEGETATION         0.1         AC         4300.00         430           GRADE-DOZER & OPERATOR         0.25         DAY         1760.00         440           GRADE-DOZER & OPERATOR         0.5         DAY         1760.00         840           GRADE-DZER & OPERATOR         0.5         DAY         1760.00         840           GRAD	ESTIMATOR:	P. R. MARTIN					
CAP IN PLACE ACC 40         UNIT         UNIT           SITE PREPARATION         OTY         UNIT         COST         TOTAL           SITE PREPARATION         ACCESS ROAD SEDIMENT AREA 1         CLEAR & GRUB LIGHT VEGETATION         0.1         AC         4300.00         \$         430           GRADE - DOZER & OPERATOR         0.25         DAY         1760.00         440           GRADE - DOZER & OPERATOR         0.25         DAY         1760.00         440           GRADE - 127 'HICK         360         CV         1.00         3.600           FILTER FABRIC         550         SY         1.00         550           SPREAD & COMPACT         0.5         DAY         1570.00         785           ACCESS ROAD SEDIMENT AREA 2         0.1         AC         4300.00         430           GRADE- DOZER & OPERATOR         0.25         DAY         1760.00         440           GRAVEL - 24' THICK         340         CY         10.00         3.400           SPREAD & COMPACT         0.5         DAY         1760.00         880           GRAVEL - 24' THICK         1450         CY         10.00         1.450           GRADE OCAPING - 500 LF         -         -         -						======	
SITE PREPARATION         ACCESS ROAD SEDIMENT AREA 1           CLEAR & GRUB LIGHT VEGETATION         0.1 AC         4300.00 \$         430           GRADE- DOZER & OPERATOR         0.25 DAY         1760.00         440           GRAVEL - 12" THICK         360 CY         1.00         3.600           FILTER FABRIC         550 SY         1.00         550           SPREAD & COMPACT         0.5 DAY         1570.00         430           CACESS ROAD SEDIMENT AREA 2         CLEAR & GRUB LIGHT VEGETATION         0.1 AC         4300.00         430           GRADE- DOZER & OPERATOR         0.25 DAY         1760.00         440           GRADE- DOZER & OPERATOR         0.25 DAY         1760.00         440           GRADE- DOZER & OPERATOR         0.5 DAY         1570.00         785           ACCESS ROAD SCOMPACT         0.5 DAY         1570.00         785           FLITER FABRIC         2000 SY         1.00         550           ACCESS ROAD FOR CAPPING - 500 LF         -         -         -           CLEAR & GRUB LIGHT VEGETATION         0.35 AC         4300.00         1.505           GRAVEL - 24 THICK         1450 CY         1.00         2.000           SPREAD & COMPACT         2         20AY         1570		SITE PREPARATION AND MOBILIZATION DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL	
ACCESS ROAD SEDIMENT AREA 1 CLEAR & GRUB LIGHT VEGETATION 0.1 AC 4300.00 \$ 430 GRADE- DOZER & OPERATOR 0.25 DAY 1760.00 440 GRAVEL - 12" THICK 360 CY 10.00 3.600 FIUTER FABRIC 550 SY 1.00 785 ACCESS ROAD SEDIMENT AREA 2 CLEAR & GRUB LIGHT VEGETATION 0.1 AC 4300.00 430 GRADE DOZER & OPERATOR 0.25 DAY 1760.00 440 GRADE L - 24" THICK 340 CY 10.00 3.400 SPREAD & COMPACT 0.5 DAY 1760.00 785 FILTER FABRIC 550 SY 1.00 550 ACCESS ROAD FOR CAPPING - 500 LF CLEAR & GRUB LIGHT VEGETATION 0.35 AC 4300.00 1.505 GRADE DOZER & OPERATOR 0.5 DAY 1760.00 880 GRAVEL - 24" THICK 1450 CY 10.00 14.500 FILTER FABRIC 2000 SY 1.00 2.000 SPREAD & COMPACT 2 DAY 1570.00 3.440 GRAVEL - 24" THICK 1450 CY 10.00 14.500 FILTER FABRIC 2000 SY 1.00 2.000 SPREAD & COMPACT 2 DAY 1570.00 880 GRADE DOZER & OPERATOR 0.5 DAY 1760.00 880 GRADE DOZER & OPERATOR 0.5 DAY 1760.00 880 GRADE L 24" THICK 1450 CY 10.00 14.500 FILTER FABRIC 2000 SY 1.00 2.000 SPREAD & COMPACT 2 DAY 1570.00 3.440 CLEAR & GRUB LIGHT VEGETATION 0.25 AC 4300.00 1.075 GRADE DOZER & OPERATOR 0.5 DAY 1760.00 880 SEDIMENT DEWATERING PAD CLEAR & GRUB LIGHT VEGETATION 0.5 DAY 1760.00 880 SEDIMENT DEWATERING PAD CLEAR & GRUB LIGHT VEGETATION 0.5 DAY 1760.00 880 SEDIMENT DEWATERING PAD CLEAR & GRUB LIGHT VEGETATION 0.5 DAY 1760.00 880 SEDIMENT DEWATERING PAD CLEAR & GRUB LIGHT VEGETATION 0.5 DAY 1760.00 880 SEDIMENT DEWATERING PAD CLEAR & GRUB LIGHT VEGETATION 0.5 DAY 1760.00 785 LINER 10000 SF 0.60 6.000 SUMP & SUMP PUMP 1 LS 2500.00 2.500 JECON AREA - 10'X20' 3 EA 1000.00 3.000 CLEAR & GRUB LIGHT VEGETATION 1 AC 4300.00 4.000 GRADE - DOZER & OPERATOR 1 AC 4300.00 4.000 GRADE - DOZER & OPERATOR 1 AC 4300.00 3.000 CLEAR & GRUB LIGHT VEGETATION 1 AC 4300.00 3.000 SUMP & SUMP PUMP 1 LS 2500.00 2.500 JECON AREA - 10'X20' 3 EA 1000.00 3.000 TOTAL THIS PAGE \$ 0 A 4.300.00 3.520 CAP MATERIALS STOCKPILE AREA CLEAR & GRUB LIGHT VEGETATION 1 AC 4300.00 3.520 COM AREA - 10'X20' 3 EA 1000.00 3.520 COM AREA - 10'X20' 3 EA 1000.00 3.520 CAP MATERIALS S	SITE PREPAR	ATION					
CLEAR & GRUB LIGHT VEGETATION         0.1         AC         4300.00 \$         430           GRADEL - 12" THICK         360         CY         10.00         3,600           FILTER FABRIC         550         SY         1.00         550           SPREAD & COMPACT         0.5         DAY         1760.00         440           CLEAR & GRUB LIGHT VEGETATION         0.1         AC         4300.00         430           CLEAR & GRUB LIGHT VEGETATION         0.1         AC         4300.00         430           GRADE- DOZER & OPERATOR         0.25         DAY         1760.00         440           GRAVEL - 24" THICK         340         CY         10.00         3,400           SPREAD & COMPACT         0.5         DAY         1760.00         4850           ACCESS ROAD FOR CAPPING - 500 LF         -         -         -         -           CLEAR & GRUB LIGHT VEGETATION         0.35         AC         4300.00         1,505           GRADE - DOZER & OPERATOR         0.35         AC         4300.00         1,505           GRADE - DOZER & OPERATOR         0.35         AC         4300.00         1,505           GRADE - DOZER & OPERATOR         0.25         AC         4300.00	ACCESS R	OAD SEDIMENT AREA 1					
GRADE: DOZER & OPERATOR         0.25         DAY         1760.00         440           GRAVE: 12" THICK         360         CY         10.00         3.600           FILTER FABRIC         550         SY         1.00         550           SPREAD & COMPACT         0.5         DAY         1970.00         785           ACCESS ROAD SEDIMENT AREA 2	CLEAR	& GRUB LIGHT VEGETATION	0.1	AC	4300.00	\$ 430	
GRAVEL 12 'THICK         360         CY         10.00         3.600           FILTER FABRIC         550         SY         1.00         550           SPREAD & COMPACT         0.5         DAY         1570.00         785           ACCESS ROAD SEDIMENT AREA 2	GRADE-	DOZER & OPERATOR	0.25	DAY	1760.00	440	
FILTER FABRIC       550       SY       1.00       590         ACCESS ROAD SEDIMENT AREA 2       0.5       DAY       1570.00       785         ACCESS ROAD SEDIMENT AREA 2       0.1       AC       4300.00       430         GRADEL DOZER & OPERATOR       0.25       DAY       1760.00       440         GRAVEL - 24" THICK       340       CY       10.00       3.400         SPREAD & COMPACT       0.5       DAY       1570.00       785         FILTER FABRIC       0.5       DAY       1570.00       785         FILTER FABRIC       0.5       DAY       1570.00       785         CLEAR & GRUB LIGHT VEGETATION       0.35       AC       4300.00       1.505         GRADEL - 24" THICK       1450       CY       1.00       14.500         GRAVEL - 24" THICK       1450       CY       1.00       2.000         SPREAD & COMPACT       2       DAY       1570.00       1.00       2.000         SPREAD & COMPACT       2       DAY       1570.00       3.140         PARKING AREA       0.25       AC       4300.00       1.075         GRADE- DOZER & OPERATOR       0.5       DAY       1760.00       880	GRAVEL	12" THICK	360	CY	10.00	3,600	
SPREAD & COMPACT         0.5         DAY         1570.00         785           ACCESS ROAD SEDIMENT AREA 2         0.1         AC         4300.00         430           GRADE DOZER & OPERATOR         0.25         DAY         1760.00         440           GRAVEL -24" THICK         340         CY         10.00         3400           SPREAD & COMPACT         0.5         DAY         1570.00         785           FILTER FABRIC         550         SY         1.00         550           ACCESS ROAD FOR CAPPING - 500 LF         -         -         -         -           CLEAR & GRUB LIGHT VEGETATION         0.35         AC         4300.00         1,505           GRADE - DOZER & OPERATOR         0.5         DAY         1760.00         880           GRAVEL - 24" THICK         1450         CY         10.00         14,500           FILTER FABRIC         2000         SY         1.00         2,000           SPREAD & COMPACT         2         DAY         1570.00         3,140           PARKING AREA         0.5         DAY         1760.00         880           SEDIMENT DEWATENING PAD         0.25         AC         4300.00         1.075           GRADE - D	FILTER I	FABRIC	550	SY	1.00	550	
ACCESS ROAD SEDIMENT AREA 2         CLEAR & GRUB LIGHT VEGETATION       0.1       AC       4300.00       430         GRADE- DOZER & OPERATOR       0.25       DAY       1760.00       440         GRAVEL - 24" THICK       340       CV       10.00       3,400         SPREAD & COMPACT       0.5       DAY       1570.00       785         FILTER FABRIC       550       SY       1.00       550         ACCESS ROAD FOR CAPPING - 500 LF	SPREAD	& COMPACT	0.5	DAY	1570.00	785	
CLEAR & GRUB LIGHT VEGETATION         0.1         AC         4300.00         430           GRAVEL - 22* THICK         340         CY         10.00         3.400           SPREAD & COMPACT         0.5         DAY         1570.00         785           FILTER FABRIC         550         SY         1.00         550           ACCESS ROAD FOR CAPPING - 500 LF         -         -         -           CLEAR & GRUB LIGHT VEGETATION         0.35         AC         4300.00         1,505           GRAVEL - 24* THICK         1450         CY         10.00         14,500           FILTER FABRIC         2000         SY         1.00         2,000           SPREAD & COMPACT         2         DAY         1570.00         3,140           PARKING AREA         2         DAY         1570.00         3,140           SEDIMENT DEWATERING PAD         0.25         AC         4300.00         1,075           GRADE- DOZER & OPERATOR         0.5         DAY         1760.00         880           SEDIMENT DEWATERING PAD         -         -         -         -           CLEAR & GRUB LIGHT VEGETATION         0.25         AC         4300.00         1,075           GRADE - DOZER & OPERAT	ACCESS R		0.1	• •	4200.00	420	
GRADE-DOZER & OPERATOR         0.02         0.07         1760.00         3.400           GRAVEL - 24* THICK         340         CY         10.00         3.400           SPREAD & COMPACT         0.5         DAY         1570.00         785           FILTER FABRIC         550         SY         1.00         550           ACCESS ROAD FOR CAPPING - 500 LF         500         ST         1.00         1505           CLEAR & GRUB LIGHT VEGETATION         0.35         AC         4300.00         1.505           GRAVEL - 24* THICK         1450         CY         10.00         14,500           FILTER FABRIC         2000         SY         1.00         2,000           SPREAD & COMPACT         2         DAY         1570.00         3140           PARKING ARA         2         DAY         1570.00         3140           PARKING AREA         0.5         DAY         1760.00         880           SEDIMENT DEWATERING PAD         0.25         AC         4300.00         1.075           GRAVEL - 12* THICK         400         CY         10.00         4.000           SUMP ACMPACT         0.5         DAY         1760.00         880           GRAVEL - 12* THICK			0.1		4300.00	430	
DIRVLE         OR         OI         TRAD         OID         TRAD           SPREAD & COMPACT         0.5         DAY         1570.00         785           FILTER FABRIC         550         SY         1.00         550           ACCESS ROAD FOR CAPPING         0.01         500         1.00         550           CLEAR & GRUB LIGHT VEGETATION         0.35         AC         4300.00         1.505           GRADE- DOZER & OPERATOR         0.5         DAY         1760.00         880           GRAVEL - 24' THICK         1450         CY         10.00         14,500           FILTER FABRIC         2000         SY         1.00         2,000           SPREAD & COMPACT         2         DAY         1570.00         3,140           PARKING AREA         -         -         -         -           CLEAR & GRUB LIGHT VEGETATION         0.25         AC         4300.00         1,075           GRADE- DOZER & OPERATOR         0.5         DAY         1760.00         880           SEDIMENT DEWATERING PAD         -         -         -         -           CLEAR & GRUB LIGHT VEGETATION         0.25         DAY         1760.00         880           GRAVEL 1	GRAVE		340	CV	10.00	3 400	
BILE REFABRIC         550         SY         1.00         550           ACCESS ROAD FOR CAPPING - 500 LF         550         14         500         1000         50         50         50         10         50         50         10         50         50         10	SPREAD		0.5	DAY	1570.00	785	
ACCESS ROAD FOR CAPPING - 500 LF CLEAR & GRUB LIGHT VEGETATION GRADE- DOZER & OPERATOR GRADE- 24" THICK 1450 CY 10.00 14,500 FILTER FABRIC 2000 SY 1.00 2,000 SPREAD & COMPACT 2 DAY 1570.00 3,140 PARKING AREA CLEAR & GRUB LIGHT VEGETATION CLEAR & DPERATOR SEDIMENT DEWATERING PAD CLEAR & OPERATOR CLEAR & O	FILTER	FABRIC	550	SY	1.00	550	
CLEAR & GRUB LIGHT VEGETATION         0.35         AC         4300.00         1,505           GRADE- DOZER & OPERATOR         0.5         DAY         1760.00         880           GRADE- DOZER & OPERATOR         0.5         DAY         1760.00         14,500           FILTER FABRIC         2000         SY         1.00         2,000           SPREAD & COMPACT         2         DAY         1570.00         3,140           PARKING AREA         0.25         AC         4300.00         1,075           GRADE- DOZER & OPERATOR         0.25         AC         4300.00         1,075           GRADE- DOZER & OPERATOR         0.5         DAY         1760.00         880           SEDIMENT DEWATERING PAD         -         -         -         -           CLEAR & GRUB LIGHT VEGETATION         0.25         AC         4300.00         1,075           GRADE- DOZER & OPERATOR         0.5         DAY         1760.00         880           GRADE - DOZER & OPERATOR         0.5         DAY         1760.00         880           GRADE - DOZER & OPERATOR         0.5         DAY         1570.00         785           LINER         100000         SF         0.60         66,000         3,	ACCESS R	OAD FOR CAPPING - 500 LF				-	
GRADE- DOZER & OPERATOR         0.5         DAY         1760.00         880           GRAVEL - 24" THICK         1450         CY         10.00         14,500           FILTER FABRIC         2000         SY         1.00         2,000           SPREAD & COMPACT         2         DAY         1570.00         3,140           PARKING AREA         2         DAY         1570.00         3,140           CLEAR & GRUB LIGHT VEGETATION         0.25         AC         4300.00         1,075           GRADE- DOZER & OPERATOR         0.5         DAY         1760.00         880           SEDIMENT DEWATERING PAD         -         -         -         -           CLEAR & GRUB LIGHT VEGETATION         0.25         AC         4300.00         1,075           GRADE- DOZER & OPERATOR         0.5         DAY         1760.00         880           SEDIMENT DEWATERING PAD         -         -         -         -         -           CLEAR & GRUB LIGHT VEGETATION         0.5         DAY         1760.00         880           SEDIMENT DEWATERING PAD         -         -         -         -         -           LINER         100000         SF         0.60         6,000	CLEAR &	& GRUB LIGHT VEGETATION	0.35	AC	4300.00	1,505	
GRAVEL - 24" THICK         1450         CY         10.00         14,500           FILTER FABRIC         2000         SY         1.00         2,000           SPREAD & COMPACT         2         DAY         1570.00         3,140           PARKING AREA         0.25         AC         4300.00         1,075           GRADE DOZER & OPERATOR         0.5         DAY         1760.00         880           SEDIMENT DEWATERING PAD         -         -         -         -           CLEAR & GRUB LIGHT VEGETATION         0.25         AC         4300.00         1,075           GRADE DOZER & OPERATOR         0.5         DAY         1760.00         880           SEDIMENT DEWATERING PAD         -         -         -         -           CLEAR & GRUB LIGHT VEGETATION         0.25         AC         4300.00         1,075           GRADE DOZER & OPERATOR         0.5         DAY         1760.00         880           GRAVEL - 12" THICK         400         CY         10.00         4,000           SUMP & SUMP PUMP         1         LS         2500.00         2,500           DECON AREA - 10'x20'         3         EA         1000.00         3,000           GRADE - DOZ	GRADE-	DOZER & OPERATOR	0.5	DAY	1760.00	880	
FILTER FABRIC       2000       SY       1.00       2,000         SPREAD & COMPACT       2       DAY       1570.00       3,140         PARKING AREA       2       DAY       1570.00       3,140         PARKING AREA       0.25       AC       4300.00       1,075         GRADE- DOZER & OPERATOR       0.5       DAY       1760.00       880         SEDIMENT DEWATERING PAD       -       -       -       -         CLEAR & GRUB LIGHT VEGETATION       0.25       AC       4300.00       1,075         GRADE- DOZER & OPERATOR       0.5       DAY       1760.00       880         GRADE- DOZER & OPERATOR       0.5       DAY       1760.00       880         GRAVEL - 12" THICK       400       CY       10.00       4,000         SPREAD & COMPACT       0.5       DAY       1570.00       785         LINER       10000       SF       0.60       6,000         SUMP & SUMP PUMP       1       LS       2500.00       2,500         DECON AREA - 10'x20'       3       EA       1000.00       3,000         GRADE - DOZER & OPERATOR       1       AC       4300.00       4,300         GRADE - DOZER & OPERATOR	GRAVEL	24" THICK	1450	CY	10.00	14,500	
SPREAD & COMPACT         2         DAY         1570.00         3,140           PARKING AREA         0.25         AC         4300.00         1,075           GRADE- DOZER & OPERATOR         0.5         DAY         1760.00         880           SEDIMENT DEWATERING PAD         -         -         -         -           CLEAR & GRUB LIGHT VEGETATION         0.25         AC         4300.00         1,075           GRADE- DOZER & OPERATOR         0.5         DAY         1760.00         880           SEDIMENT DEWATERING PAD         -         -         -         -           CLEAR & GRUB LIGHT VEGETATION         0.25         AC         4300.00         1,075           GRADE- DOZER & OPERATOR         0.5         DAY         1760.00         880           GRAVEL - 12" THICK         400         CY         10.00         4,000           SPREAD & COMPACT         0.5         DAY         1570.00         785           LINER         10000         SF         0.60         6,000           SUMP & SUMP PUMP         1         LS         2500.00         2,500           DECON AREA - 10'x20'         3         EA         1000.00         3,520           CLEAR & GRUB LIGHT	FILTER I	FABRIC	2000	SY	1.00	2,000	
PARKING AREA         0.25         AC         4300.00         1,075           GRADE- DOZER & OPERATOR         0.5         DAY         1760.00         880           SEDIMENT DEWATERING PAD         -         -         -         -           CLEAR & GRUB LIGHT VEGETATION         0.25         AC         4300.00         1,075           GRADE- DOZER & OPERATOR         0.5         DAY         1760.00         880           SEDIMENT DEWATERING PAD         -         -         -         -           CLEAR & GRUB LIGHT VEGETATION         0.25         AC         4300.00         1,075           GRADE- DOZER & OPERATOR         0.5         DAY         1760.00         880           GRAVEL - 12" THICK         400         CY         10.00         4,000           SPREAD & COMPACT         0.5         DAY         1570.00         785           LINER         10000         SF         0.60         6,000           SUMP & SUMP PUMP         1         LS         2500.00         2,500           DECON AREA - 10'x20'         3         EA         1000.00         3,000           CLEAR & GRUB LIGHT VEGETATION         1         AC         4300.00         4,300           GRADE-	SPREAD	0 & COMPACT	2	DAY	1570.00	3,140	
CLEAR & GRUB LIGHT VEGETATION       0.25       AC       4300.00       1,075         GRADE- DOZER & OPERATOR       0.5       DAY       1760.00       880         SEDIMENT DEWATERING PAD       -       -       -       -         CLEAR & GRUB LIGHT VEGETATION       0.25       AC       4300.00       1,075         GRADE- DOZER & OPERATOR       0.5       DAY       1760.00       880         GRAVEL - 12" THICK       400       CY       10.00       4,000         SPREAD & COMPACT       0.5       DAY       1570.00       785         LINER       10000       SF       0.60       6,000         SUMP & SUMP PUMP       1       LS       2500.00       2,500         DECON AREA - 10'x20'       3       EA       1000.00       3,000         -         CAP MATERIALS STOCKPILE AREA       -       -         CLEAR & GRUB LIGHT VEGETATION       1       AC       4300.00       4,300         GRADE- DOZER & OPERATOR       2       DAY       1760.00       3,520	PARKING A	AREA					
GRADE- DOZER & OPERATOR         0.5         DAY         1760.00         880           SEDIMENT DEWATERING PAD         -	CLEAR &	& GRUB LIGHT VEGETATION	0.25	AC	4300.00	1,075	
SEDIMENT DEWATERING PAD         .           CLEAR & GRUB LIGHT VEGETATION         0.25         AC         4300.00         1,075           GRADE- DOZER & OPERATOR         0.5         DAY         1760.00         880           GRAVEL - 12" THICK         400         CY         10.00         4,000           SPREAD & COMPACT         0.5         DAY         1570.00         785           LINER         10000         SF         0.60         6,000           SUMP & SUMP PUMP         1         LS         2500.00         2,500           DECON AREA - 10'x20'         3         EA         1000.00         3,000           CAP MATERIALS STOCKPILE AREA         -         -         -         -           CLEAR & GRUB LIGHT VEGETATION         1         AC         4300.00         4,300           GRADE- DOZER & OPERATOR         2         DAY         1760.00         3,520	GRADE-	DOZER & OPERATOR	0.5	DAY	1760.00	880	
CLEAR & GRUB LIGHT VEGETATION       0.25       AC       4300.00       1,079         GRADE - DOZER & OPERATOR       0.5       DAY       1760.00       880         GRAVEL - 12" THICK       400       CY       10.00       4,000         SPREAD & COMPACT       0.5       DAY       1570.00       785         LINER       10000       SF       0.60       6,000         SUMP & SUMP PUMP       1       LS       2500.00       2,500         DECON AREA - 10'x20'       3       EA       1000.00       3,000         CAP MATERIALS STOCKPILE AREA         CLEAR & GRUB LIGHT VEGETATION       1       AC       4300.00       4,300         GRADE - DOZER & OPERATOR       2       DAY       1760.00       3,520	SEDIMENT	DEWATERING PAD			4000.00	-	
GRADE- DOZER & OPERATOR       0.5       DAT       1700.00       4,000         GRAVEL - 12" THICK       400       CY       10.00       4,000         SPREAD & COMPACT       0.5       DAY       1570.00       785         LINER       10000       SF       0.60       6,000         SUMP & SUMP PUMP       1       LS       2500.00       2,500         DECON AREA - 10'x20'       3       EA       1000.00       3,000	CLEAR &		0.25		4300.00	1,079	
GHAVEL - 12       THICK       400       C1       10.00       785         SPREAD & COMPACT       0.5       DAY       1570.00       785         LINER       10000       SF       0.60       6,000         SUMP & SUMP PUMP       1       LS       2500.00       2,500         DECON AREA - 10'x20'       3       EA       1000.00       3,000         -         CAP MATERIALS STOCKPILE AREA       -       -         CLEAR & GRUB LIGHT VEGETATION       1       AC       4300.00       4,300         GRADE- DOZER & OPERATOR       1       AC       4300.00       3,520	GRADE		400		10.00	4 000	
SINER       10000       SF       0.60       6,000         SUMP & SUMP PUMP       1       LS       2500.00       2,500         DECON AREA - 10'x20'       3       EA       1000.00       3,000         -         CAP MATERIALS STOCKPILE AREA       -         CLEAR & GRUB LIGHT VEGETATION       1       AC       4300.00       4,300         GRADE- DOZER & OPERATOR       2       DAY       1760.00       3,520	SPREAD		0.5	DAY	1570.00	785	
SUMP & SUMP PUMP       1       LS       2500.00       2,500         DECON AREA - 10'x20'       3       EA       1000.00       3,000         -       -       -       -       -         CAP MATERIALS STOCKPILE AREA       -       -       -         CLEAR & GRUB LIGHT VEGETATION       1       AC       4300.00       4,300         GRADE- DOZER & OPERATOR       2       DAY       1760.00       3,520	LINER		10000	SF	0.60	6,000	
DECON AREA - 10'x20'       3       EA       1000.00       3,000         -       -       -       -       -         CAP MATERIALS STOCKPILE AREA       -       -       -         CLEAR & GRUB LIGHT VEGETATION       1       AC       4300.00       4,300         GRADE- DOZER & OPERATOR       2       DAY       1760.00       3,520	SUMP 8		1	LS	2500.00	2,500	
CAP MATERIALS STOCKPILE AREA CLEAR & GRUB LIGHT VEGETATION GRADE- DOZER & OPERATOR 1 AC 4300.00 4,300 2 DAY 1760.00 3,520 TOTAL THIS PAGE \$ 61,450	DECON AR	IEA - 10'x20'	3	EA	1000.00	3,000	
CAP MATERIALS STOCKPILE AREA CLEAR & GRUB LIGHT VEGETATION GRADE- DOZER & OPERATOR TOTAL THIS PAGE \$ 61,450						-	
CAP MATERIALS STOCKPILE AREA CLEAR & GRUB LIGHT VEGETATION GRADE- DOZER & OPERATOR 1 AC 4300.00 4,300 2 DAY 1760.00 3,520 TOTAL THIS PAGE \$ 61,450						-	
CAP MATERIALS STOCKPILE AREA CLEAR & GRUB LIGHT VEGETATION 1 AC 4300.00 4,300 GRADE- DOZER & OPERATOR 2 DAY 1760.00 3,520 TOTAL THIS PAGE \$ 61,450						-	
CAP MATERIALS STOCKPILE AREA CLEAR & GRUB LIGHT VEGETATION 1 AC 4300.00 4,300 GRADE- DOZER & OPERATOR 2 DAY 1760.00 3,520 TOTAL THIS PAGE \$ 61,450						-	
CAP MATERIALS STOCKPILE AREA1AC4300.004,300CLEAR & GRUB LIGHT VEGETATION1AC4300.004,300GRADE- DOZER & OPERATOR2DAY1760.003,520TOTAL THIS PAGE\$61,450						-	
CLEAR & GRUB LIGHT VEGETATION         1         AC         4300.00         4,300           GRADE- DOZER & OPERATOR         2         DAY         1760.00         3,520           TOTAL THIS PAGE         \$         61,450						-	
GRADE- DOZER & OPERATOR2 DAY1760.003,520TOTAL THIS PAGE\$ 61,450	CAP MATE		1	AC	4300.00	4,300	
TOTAL THIS PAGE \$ 61,450	GRADE-	DOZER & OPERATOR	2	DAY	1760.00	3,520	
			TOTAL THIS PA	GE		\$ 61,450	

PROJECT:				JOB #		8712-04
LOCATION:	ALL SEVEN DISPOSAL AREAS DEVENS, MASSACHUSETTS			DATE		24-Jan-97
ENGINEER:	ABB ENVIRONMENTAL SERVICES, INC.					
ESTIMATOR:	P. R. MARTIN					
		<b>a</b> =====			= =	
	SITE PREPARATION AND MOBILIZATION DESCRIPTION	ΩΤΥ	UNIT	UNIT COST		TOTAL
SITE PREPAR	ATION	·*	***********		\$	61,450
MOBILIZATIC	DN .					
EQUIPM	IENT (IN OR OUT)					
FRONT EN	DLOADER	2	EA	410.00		820
DUMP TRU	JCK	6	EA	385.00		2,310
BACKHOE		2	EA	730.00		1,400
DUZER		2	EA	880.00		1,700
	CLAMSHELL BUCKET	2	EA	795.00		1,200
FOLLER		2		785.00		1,000
		4	EA	100.00		200
DEWATER	ING FOMF & HOSE	2	LA	100.00		-
OFFICE TRAII	LER	4	MON	150.00		600
STORAGE TR	AILER	4	MON	150.00		600
TRAILER DEL	IVERY, SET-UP, REMOVAL	2	EA	300.00		600
TOILET - 2 E	A	36	WK	25.00		900
WATER COO	LER - 2 EA	36	WK	25.00		900
WATER		180	DAY	15.00		2,700
TELEPHONE S	SERVICE	4	MON	500.00		2,000
ELECTRICITY		4	MON	250.00		1,000
PICK-UP (2 E	A)	8	MON	1000.00		8,000
OFFICE EQUI	PMENT	4	MON	1000.00		4,000
PUMPS, TOO	ls, minor equipment	1	LS	2500.00		2,500
LABORER (2	MEN*10 DAY/MAN*8 HR/DAY)	160	MNHR	33.50		5,360
CARPENTER	(2 MEN*10 DAY/MAN*8 HR/DAY)	160	MNHR	48.00		7,680
ELECTRICIAN	I (2 MEN*10 DAY/MAN*8 HR/DAY)	160	MNHR	50.50		8,080
SITE SUPERI	TENDANT (4 MON*210HR/MON)	840	MNHR	65.00		54,600
FOREMAN (4	MON*210HR/MON)	840	MNHR	55.00		46,200
CLERK/TYPIS	T (4 MON*168HR/MON)	672	MNHR	25.00		16,800
						-
						-
	TOTAL SITE PREPARATION AND MOBILIZATION				\$	234,370

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PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY	JOB #	8712-04
	ALTERNATIVE 7: CAP-IN-PLACE ALL SEVEN DISPOSAL AREAS	DATE	24-Jan-97
LOCATION:	DEVENS, MASSACHUSETTS		

ESTIMATOR: P. R. MARTIN

CAP IN PLACE AOC 40				= =	
SEDIMENT REMOVAL AND DISPOSAL DESCRIPTION	QTY	UNIT	UNIT COST		TOTAL
CONSTRUCT SILT BARRIER AROUND CONTAMINATED AREAS	400	LF	25.00	\$	10,000
EXCAVATE WITH CLAMSHELL 1200 CY SEDIMENTS + 1600 CY ACCESS ROADS/WORK PLAT	28 FORMS	DAY	1280.00		35,840 -
HAUL SEDIMENTS TO DEWATERING PAD (2 EA DUMP TRUCK & DRIVER)	56	DAY	770.00		43,120 -
LOAD DRY SEDIMENTS FOR TRANSPORTATION TO DISPOSAL AREA (FRONT END LOADER & OPERATOR)	14	DAY	825.00		11,550 - -
LABORERS - 2 EA FOR 35 DAYS	560	MNHR	33.50		- 18,760
TCLP TESTING	2	SMPL	1400.00		2,800
ON-SITE STABILIZATION OF SEDIMENTS WITH SAND	600	CY	15.00		9,000 -
TRANSPORTATION & DISPOSAL AT AOC 9 (3 EA DUMP TRUCK & DRIVER)	42	DAY	770.00		32,340 - -
TREATMENT OF WATER	1	LS	21800.00		- 21,800
PUMP WATER FROM DEWATERING PAD TO POND	28	DAY	50.00		1,400
					-
					-
					-
TOTAL SEDIMENT REMOVAL AND DISPOSAL				\$	186,610

PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY ALTERNATIVE 7: CAP-IN-PLACE	JOB	# 8712-04
LOCATION:	ALL SEVEN DISPOSAL AREAS DEVENS, MASSACHUSETTS	DATE	24-Jan-97
ENGINEER:	ABB ENVIRONMENTAL SERVICES, INC.		

DESCRIPTION	ΔΤΥ	UNIT	COST	TOTAL
WETLAND RESTORATION	1.5	AC	50000.00	\$ 75,000
MONITORING WELLS - 4" DIA x 30' DEEP	2	EA	4500.00	\$ 9,000 - -
DRUM REMOVAL AND DISPOSAL				-
BACKHOE & OPERATOR	3	DAY	1460.00	\$ 4,380
LABORER - 2 EA, 3 DAYS	48	MNHR	33.50	1,608
TRANSPORT DRUMS TO AOC 9 DUMP TRUCK & DRIVER	3	DAY	770.00	2,310
TCLP TESTING OF DRUM CONTENTS	2	EA	1400.00	2,800
				-
				-

TOTAL DRUM REMOVAL AND DISPOSAL

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11,098

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PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY	JOB #	8712-04
LOCATION:	ALL SEVEN DISPOSAL AREAS DEVENS, MASSACHUSETTS	DATE	24-Jan-97
ENGINEER:	ABB ENVIRONMENTAL SERVICES, INC.		

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CAP IN PLACE AOC 40					
CAP CONSTRUCTION, INSTITUTIONAL CONTROLS			UNIT		
DESCRIPTION	QTY	UNIT	COST		TOTAL
CAP CONSTRUCTION	************************		/		
SILT FENCE ALONG TOE OF LANDFILL	1500	LF	5.00	\$	7,500
CLEAR & GRUB SITE	4.4	AC	6900.00		30,360
LONG STICK EXCAVATOR	5	DAY	1750.00		8,750
GRADE SITE - DOZER & OPERATOR	5	DAY	1760.00		8,800
CUT LANDFILL WASTE WITH DOZER	7	DAY	1760.00		12,320
IMPORTED FILL	2500	CY	10.00		25,000
SPREAD & COMPACT WASTE & FILL	14	DAY	1570.00		21,980
SUBGRADE FILL	7100	CY	10.00		71,000
SPREAD & COMPACT SUBGRADE FILL	9	DAY	1570.00		14,130
TEXTURED GEOMEMBRANE	192000	SF	0.80		153,600
10-3 SAND DRAINAGE LAYER	9250	CY	17.00		157,250
SPREAD & COMPACT DRAINAGE LAYER	13	DAY	1570.00		20,410
GEOTEXTILE FILTER FABRIC	192000	SF	0.10		19,200
MOISTURE RETENTION LAYER	13900	CY	10.00		139,000
SPREAD & COMPACT MOISTURE RENTENTION LAYER	18	DAY	1570.00		28,260
VEGETATIVE MATERIAL	4600	CY	14.00		64,400
SPREAD & COMPACT VEGETATIVE LAYER	6	DAY	1570.00		9,420
SEED, FERTILIZE, MULCH	4.4	AC	2000.00		8,800
RIPRAP	2250	CY	30.00		67,500
GUARD RAIL ALONG ROAD	1000	LF	12.50		12,500
					990 190
TOTAL CAP CONSTRUCTION				Ş	880,180

INSTITUTIONAL CONTROLS

1 LS 10000.00 \$ 10,000

NOTE: CAP SOIL MATERIAL QUANTITIES INCLUDE A 30% SWELL FACTOR

PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY	JOB #	8712-04
	ALTERNATIVE 7: CAP-IN-PLACE ALL SEVEN DISPOSAL AREAS	DATE	24-Jan-97
LOCATION:	DEVENS, MASSACHUSETTS		

ESTIMATOR: P. R. MARTIN

CAP IN PLACE AOC 40		= = =		= =	
DESCRIPTION	QTY	UNIT	COST		TOTAL
TOTAL SITE PREPARATION AND MOBILIZATION		/=====		\$	234,370
TOTAL SEDIMENT REMOVAL & DISPOSAL					186,610
TOTAL WETLAND RESTORATION					75,000
TOTAL MONITORING WELLS					9,000
TOTAL DRUM REMOVAL & DISPOSAL					11,098
TOTAL COVER PLACEMENT					880,180
TOTAL INSTITUTIONAL CONTROLS					10,000
UNDEVELOPED DESIGN DETAILS ~25%					351,742
TOTAL SA 13				\$	1,758,000



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PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY	JOB #	8712-04
	ALTERNATIVE 7: CAP-IN-PLACE ALL SEVEN DISPOSAL AREAS	DATE	24-Jan-97
LOCATION:	DEVENS, MASSACHUSETTS		

ESTIMATOR: P. R. MARTIN

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MOB/DEMOB			UNIT		
DESCRIPTION	ΩΤΥ	UNIT	COST		TOTAL
MOB/DEMOB EQUIPMENT (IN OR OUT)		<u>.</u>			/
FRONT END LOADER	2	EA	410.00	\$	820
DUMP TRUCK	2	EA	385.00		770
BACK HOE	2	EA	730.00		1,460
DOZER	2	EA	880.00		1,760
ROLLER	2	EA	785.00		1,570
					-
OFFICE TRAILER	1	MON	150.00		150
STORAGE TRAILER	1	MON	100.00		100
SET UP TRAILER	2	EA	500.00		1,000
	· .				-
TOILET - 2 EA	8	WK	25.00		200
WATER COOLER - 2 EA	8	WK	25.00		200
WATER	40	DAY	15.00		600
TELEPHONE SERVICE	1	MON	500.00		500
ELECTRICITY	1	MON	250.00		250
PICK-UP (2 EA)	2	MON	1000.00		2,000
PUMPS, TOOLS, MINOR EQUIPMENT	1	MON	500.00		500
SITE SUPERINTENDANT ( 1 MON * 210 HR/MON)	210	MNHR	65.00		13,650
FOREMEN (1 MON * 210 HR/MON)	210	MNHR	55.00		11,550
CLERK/TYPIST (1 MON * 168 HR/MON)	168	MNHR	25.00		4,200
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TOTAL MOB/DEMOB

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\$ 41,280

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PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY			JOB #	8712-04
LOCATION:	ALL SEVEN DISPOSAL AREAS			DATE	24-Jan-97
ENGINEER					
ESTIMATOR	P. R. MARTIN				
LonimAton.					
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SITE	CAP IN PLACE AOC 41 PREPARATION, CAP CONSTRUCTION, SITE RESTORA	TION		UNIT	
	DESCRIPTION	QTY	UNIT	COST	TOTAL

SITE PREPARATION					
ACCESS ROAD - 350 LF x 20' WIDE					
GRADE ROAD BED - DOZER & OPERATOR	0.5	DAY	1760.00	\$	880
GRAVEL - 12" THICK	270	CY	10.00		2,700
GEOFABRIC	800	SY	1.00		800
SPREAD & COMPACT	0.5	DAY	1570.00		785
CLEAR TREES FROM SITE	0.5	AC	6900.00		3,450
EROSION CONTROL	150	LF	5.00		750
GRADING & DRAINAGE SWALE CONSTRUCTION					-
DOZER & OPERATOR	1	DAY	1760.00		1.760
LABORER	8	HR	33.50		268
UXO CLEARANCE	2	DAY	1800.00		3,600
TOTAL SITE PREPARATION				\$	14,993
		<b>.</b>			
	625	CY	10.00	Ş	6,250
	10400	SF	0.80		8,320
	565	CY	17.00		9,605
GEOTEXTILE FABRIC LAYER	. 10400	SF	0.10		1,040
MOISTURE RETENTION SOIL	990	CY	10.00		9,900
VEGETATIVE SOIL	300	CY	14.00		4,200
SPREAD & COMPACT	5	DAY	1570.00		7,850
TOTAL CAP CONSTRUCTION				\$	47,165

NOTE: CAP SOIL MATERIAL QUANTITIES INCLUDE A 30% SWELL FACTOR.

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	5	SITE RESTORAT	ION				
CHAIN LIN	IK FENCE			550	LF	13.00	\$ 7,150
12' SWINC	G GATE			1	EA	800.00	800
FERTILIZE,	SEED, MULCH			1600	SY	0.50	800
							 -
	TOTAL SITE RES	TORATION					\$ 8,750
							-

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PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY			JOB #	8712-04
LOCATION:	ALTERNATIVE 7: CAP-IN-PLACE ALL SEVEN DISPOSAL AREAS DEVENS, MASSACHUSETTS			DATE	24-Jan-97
ENGINEER:	ABB ENVIRONMENTAL SERVICES, INC.				
ESTIMATOR:	P. R. MARTIN			·	
	CAP IN PLACE AOC 41 MONITORING WELLS & INSTITUTIONAL CONTROLS DESCRIPTION		= = = UNIT	UNIT COST	= = = = = = = = = = TOTAL
MONITORING	WELLS - 4" DIA x 30' DEEP	4	EA	4500.00	\$ 18,000

INSTITUTIONAL CONTROLS

LS 10000.00 \$ 10,000

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PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY	JOB #	8712-04
	ALTERNATIVE 7: CAP-IN-PLACE ALL SEVEN DISPOSAL AREAS	DATE	24-Jan-97
LOCATION:	DEVENS, MASSACHUSETTS		
ENGINEER:	ABB ENVIRONMENTAL SERVICES, INC.		

CAP IN PLACE AOC 41		= = =		 ====
SUMMARY SHEET DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL
TOTAL MOB/DEMOB				\$ 41,280
TOTAL SITE PREPARATION				14,993
TOTAL CAP CONSTRUCTION				47,165
TOTAL SITE RESTORATION				8,750
TOTAL MONITORING WELLS				18,000
TOTAL INSTITUTIONAL CONTROLS				10,000
UNDEVELOPED DESIGN DETAILS ~25%				34,812
TOTAL SA 13				\$ 175,000

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PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY			JOB #	8712-04
LOCATION:	ALL SEVEN DISPOSAL AREAS DEVENS, MASSACHUSETTS			DATE	24-Jan-97
ENGINEER:	ABB ENVIRONMENTAL SERVICES, INC.				
ESTIMATOR:	P. R. MARTIN				
		======	=== :		
	ANNUAL O&M COSTS				
	DESCRIPTION	ΩΤΥ	UNIT	COST	TOTAL
LANDFILL CO	VER MAINTENANCE				
GENERA	L REPAIR				
DUMI	P TRUCK & DRIVER	1	DAY	770.00	\$770
FRON	IT END LOADER & OPER	1	DAY	825.00	825
LABO	RER - 2 EA	16	MNHR	33.50	536
MATE	ERIALS	1	LS	500.00	500
INSPECT	FION - 0.5 DAY @ 2 MEN/DAY	8	MNHR	75.00	600
MOWING	G - TRACTOR & OPERATOR	0.5	DAY	500.00	250
					-
GROUNDW		2	15	1800.00	3,600
4 WELLS	S SEMI-ANNUALLY (INCLUDES WELL PURGE	2	10	1000.00	-
SAM	PLE COLLECTION, AND SHIPPING)				-
	- ,				-
GROUNDW	ATER SAMPLE ANALYSIS				
4 SAMP	LES PLUS 2 SAMPLE QA/QC	12	SMPL	900.00	10,800
EQUIV	VALENT SEMI-ANNUALLY, SVOCs,				
INOR	GANICS, WATER QUALITY PARAMETERS				
FIVE YEAR ED PUBLIC	DUCATIONAL PROGRAM MEETING - ANNUALIZED	0.1739	LS	5000.00	869
TWO YEAR D	ATA REPORT TO - ANNUALIZED	0.4831	LS	1000.00	483
FIVE YEAR	SITE REVIEW - ANNUALIZED	0.1739	LS	15000.00	2,608

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\$21,842

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PROJECT: LOCATION: ENGINEER: ESTIMATOR:	LANDFILL REMEDIATION FEASIBILITY STUDY ALTERNATIVE 7: CAP-IN-PLACE ALL SEVEN DISPOSAL AREAS DEVENS, MASSACHUSETTS ABB ENVIRONMENTAL SERVICES, INC. P. R. MARTIN			JOB # DATE	8712-04 24-Jan-97
	ANNUAL O&M COSTS AOC 9 DESCRIPTION		= = = UNIT	UNIT COST	= = = = = = = = = = = = = = = = = = =
LANDFILL CC GENERA DUM FROM LABC MAT INSPEC	OVER MAINTENANCE AL REPAIR P TRUCK & DRIVER JT END LOADER & OPER DRER - 2 EA ERIALS TION - 1 DAY @ 2 MEN/DAY G - TRACTOR & OPERATOR	2 2 32 1 16 5	DAY DAY MNHR LS MNHR DAY	770.00 825.00 33.50 1000.00 75.00 500.00	\$ 1,540 1,650 1,072 1,000 - 1,200 - 2,500
ENVIRONMEN GROUNDV 4 WELL SAM	VTAL MONITORING VATER SAMPLE COLLECTION S, SEMI-ANNUALLY (INCLUDES WELL PURGE, PLE COLLECTION, AND SHIPPING)	2	LS	1800.00	3,600
GROUNDV 4 SAMF EQUI INOR	VATER SAMPLE ANALYSIS PLES PLUS 2 SAMPLE QA/QC VALENT SEMI-ANNUALLY, SVOCs, GANICS, WATER QUALITY PARAMETERS	12	SMPL	900.00	- 10,800
FIVE YEAR EI PUBLIC	DUCATIONAL PROGRAM MEETING - ANNUALIZED	0.1739	LS	5000.00	869
TWO YEAR D MADEP	OATA REPORT TO - ANNUALIZED	0.4831	LS	1000.00	483
FIVE YEAF	R SITE REVIEW - ANNUALIZED	0.1739	LS	15000.00	2,608

\$ 27,323



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PROJECT:				JOB #	8712-04
LOCATION:	ALL SEVEN DISPOSAL AREAS DEVENS, MASSACHUSETTS			DATE	24-Jan-97
ENGINEER:	ABB ENVIRONMENTAL SERVICES, INC.				-
ESTIMATOR:	P. R. MARTIN				
	ANNUAL 0&M COSTS AOC 11 DESCRIPTION		= = = UNIT	UNIT COST	TOTAL
LANDFILL CO GENERA DUMI FRON LABO MATE INSPECT	VER MAINTENANCE L REPAIR P TRUCK & DRIVER IT END LOADER & OPER IRER - 2 EA ERIALS FION - 0.5 DAY @ 2 MEN/DAY	1 1 16 1 8	DAY DAY MNHR LS MNHR	770.00 825.00 33.50 500.00 75.00	\$ 770 825 536 500 - 600 - -
ENVIRONMEN GROUNDW 4 WELLS SAMF GROUNDW 4 SAMP	ITAL MONITORING ATER SAMPLE COLLECTION 5, SEMI-ANNUALLY (INCLUDES WELL PURGE, PLE COLLECTION, AND SHIPPING) ATER SAMPLE ANALYSIS LES PLUS 2 SAMPLE QA/QC	2	LS SMPL	1800.00 900.00	3,600 - - - 10,800
EQUIN	VALENT SEMI-ANNUALLY, SVOCs, GANICS, WATER QUALITY PARAMETERS				
Five year ed Public I	DUCATIONAL PROGRAM MEETING - ANNUALIZED	0.1739	LS	5000.00	869
TWO YEAR D MADEP	ATA REPORT TO - ANNUALIZED	0.4831	LS	1000.00	483
FIVE YEAR	SITE REVIEW - ANNUALIZED	0.1739	LS	15000.00	2,608

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\$ 21,592

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PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY			JOB #		8712-04
LOCATION:	ALTERNATIVE 7: CAP-IN-PLACE ALL SEVEN DISPOSAL AREAS DEVENS, MASSACHUSETTS			DATE		24-Jan-97
ENGINEER:	ABB ENVIRONMENTAL SERVICES, INC.					
ESTIMATOR:	P. R. MARTIN					
	ANNUAL O&M COSTS SA 12 DESCRIPTION		= = = (INIT	UNIT	= =	= = = = = = = TOTAL
LANDFILL CO GENERA	VER MAINTENANCE					
DUM	P TRUCK & DRIVER	1	DAY	770.00	\$	770
FROM	IT END LOADER & OPER	1	DAY	825.00		825
LABC	DRER - 2 EA	16	MNHR	33.50		536
MAT	ERIALS	1	LS	500.00		- 500
INSPEC <sup>-</sup>	TION - 0.5 DAY @ 2 MEN/DAY	8	MNHR	75.00		600
MOWIN	G - TRACTOR & OPERATOR	0.5	DAY	500.00		. 250
ENVIRONMEN	TAL MONITORING		_			
GROUNDW 4 WELLS SAM	VATER SAMPLE COLLECTION S, SEMI-ANNUALLY (INCLUDES WELL PURGE, PLE COLLECTION, AND SHIPPING)	2	LS	1800.00		3,600 - -
						-
GROUNDW 4 SAMF EQUI INOR	VATER SAMPLE ANALYSIS PLES PLUS 2 SAMPLE QA/QC VALENT SEMI-ANNUALLY, SVOCs, IGANICS, WATER QUALITY PARAMETERS	12	SMPL	900.00		10,800
		0.1739	LS	5000.00		869
I UDLIC						
TWO YEAR D MADEP	OATA REPORT TO - ANNUALIZED	0.4831	LS	1000.00		483
FIVE YEAF	R SITE REVIEW - ANNUALIZED	0.1739	LS	15000.00		2,608

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\$ 21,842

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PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY ALTERNATIVE 7: CAP-IN-PLACE			JOB #		8712-04
LOCATION:	ALL SEVEN DISPOSAL AREAS DEVENS, MASSACHUSETTS			. DATE	2	24-Jan-97
ENGINEER:	ABB ENVIRONMENTAL SERVICES, INC.					
ESTIMATOR:	P. R. MARTIN					
	ANNUAL O&M COSTS SA 13 DESCRIPTION	= = = = = = = = = = = = = = = = = = =	= = = UNIT	UNIT COST	= = = T	- = = = <i>=</i> OTAL
LANDFILL CO GENERA DUMI FRON	VER MAINTENANCE L REPAIR P TRUCK & DRIVER T END LOADER & OPER	1		770.00 825.00 33 50	\$	770 825 536
MATE	ERIALS	1	LS	500.00		500
INSPECT	TION - 0.5 DAY @ 2 MEN/DAY	8	MNHR	75.00		600
MOWING	G - TRACTOR & OPERATOR	0.5	DAY	500.00		250
ENVIRONMEN GROUNDW 4 WELLS SAMF	ITAL MONITORING ATER SAMPLE COLLECTION 5, SEMI-ANNUALLY (INCLUDES WELL PURGE, PLE COLLECTION, AND SHIPPING)	2	LS	1800.00		3,600
GROUNDW 4 SAMP EQUIV INOR(	'ATER SAMPLE ANALYSIS LES PLUS 2 SAMPLE QA/QC /ALENT SEMI-ANNUALLY, SVOCs, GANICS, WATER QUALITY PARAMETERS	12	SMPL	900.00		10,800
FIVE YEAR ED PUBLIC	DUCATIONAL PROGRAM MEETING - ANNUALIZED	0.1739	LS	5000.00		869
TWO YEAR D	ATA REPORT TO - ANNUALIZED	0.4831	LS	1000.00		483
FIVE YEAR	SITE REVIEW - ANNUALIZED	0.1739	LS	15000.00		2,608

\$ 21,842

PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY	JOB #	8712-04
LOCATION:	ALL SEVEN DISPOSAL AREAS DEVENS, MASSACHUSETTS	DATE	24-Jan-97

ENGINEER: ABB ENVIRONMENTAL SERVICES, INC.

		= = =		= =	# =
AOC 40			UNIT		
DESCRIPTION	QTY	UNIT	COST		TOTAL
0&M COSTS OCCURING OVER FIVE YEARS					
WETLANDS RESTORATION MONITORING (5 YEARS)					
1 DAY @ 2 MEN/DAY, SEMI-ANNUALLY	32	MNHR	75.00	\$	2,400
BIOMONITORING, BIENNIALLY					-
FOR 5 YEARS	0.4831	LS	15000.00		7,246
FIVE YEAR SITE REVIEW - ANNUALIZED					-
	0.1739	LS	2500.00		435
TOTAL ADDITIONAL ANNUAL O&M COSTS FOR A	AOC 40 - 5 YEARS			\$	10,081
O&M COSTS OCCURING OVER THIRTY YEARS LANDFILL COVER MAINTENANCE GENERAL REPAIR					
DUMP TRUCK & DRIVER	1	DAY	770.00	\$	770
FRONT END LOADER & OPER	1	DAY	825.00		825
LABORER - 2 EA	16	MNHR	33.50		536
MATERIALS	1	LS	500.00		500
INSPECTION - 0.5 DAY @ 2 MEN/DAY	8	MNHR	75.00		600
MOWING - TRACTOR & OPERATOR	1	DAY	500.00		- 500
	SUBTOTAL THI	S PAGE		\$	3,731



PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY			JOB #	8712-04
LOCATION:	ALTERNATIVE 7: CAP-IN-PLACE ALL SEVEN DISPOSAL AREAS DEVENS, MASSACHUSETTS			DATE	24-Jan-97
ENGINEER:	ABB ENVIRONMENTAL SERVICES, INC.				
ESTIMATOR:	P. R. MARTIN				
	ANNUAL O&M COSTS AOC 40 DESCRIPTION	= = = = = = = = = = = = = = = = = = =	= = = = UNIT	UNIT COST	= = = = = = = = = = = = = = = = = = =
O&M COSTS	OCCURING OVER THIRTY YEARS - TOTAL FROM PREV	IOUS PAGE			\$ 3,731
ENVIRONN	IENTAL MONITORING				
SEDIME 4 LO	NT SAMPLE COLLECTION CATIONS, ONCE EVERY 5 YEARS	0.1739	LS	1200.00	209
SEDIME ONCI SVOC	NT SAMPLE ANALYSIS, E EVERY 5 YEARS, 4 SAMPLES PLUS 1 QA/QC, Cs AND INORGANICS ANNUALIZED	0.8695	SMPL	715.00	622 - - - -
GROUNDW 7 WELL SAM	ATER SAMPLE COLLECTION S, SEMI-ANNUALLY (INCLUDES WELL PURGE, PLE COLLECTION, AND SHIPPING)	2	LS	2700.00	5,400 - -
GROUNDW 7 SAMF EQUI INOR	/ATER SAMPLE ANALYSIS PLES PLUS 2 SAMPLE QA/QC VALENT SEMI-ANNUALLY, SVOCs, GANICS, WATER QUALITY PARAMETERS	18	SMPL	900.00	16,200
FIVE YEAR PUBLIC	EDUCATIONAL PROGRAM MEETING - ANNUALIZED	0.1739	LS	5000.00	869
TWO YEAF MADEP	R DATA REPORT TO - ANNUALIZED	0.4831	LS	1000.00	483 - - -
FIVE YEAR	SITE REVIEW - ANNUALIZED	0.1739	LS	15000.00	- 2,608 -
	TOTAL ANNUAL O&M COSTS FOR 30 YEAR ACTIVITI	ES			\$ 30,122

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PROJECT: LOCATION: ENGINEER:	LANDFILL REMEDIATION FEASIBILITY STUDY ALTERNATIVE 7: CAP-IN-PLACE ALL SEVEN DISPOSAL AREAS DEVENS, MASSACHUSETTS ABB ENVIRONMENTAL SERVICES, INC.			JOB # DATE	2	8712-04 24-Jan-97
ESTIMATOR:	P. R. MARTIN					
	ANNUAL O&M COSTS AOC 41 DESCRIPTION	QTY	= = = UNIT	UNIT COST	= = = T	- = = = = = OTAL
LANDFILL CO GENERA DUMI FROM LABC MATI INSPEC <sup></sup> MOWIN	VER MAINTENANCE AL REPAIR P TRUCK & DRIVER IT END LOADER & OPER DRER - 2 EA ERIALS TION - 0.5 DAY @ 2 MEN/DAY G - TRACTOR & OPERATOR	1 16 1 8 0.5	DAY DAY MNHR LS MNHR DAY	770.00 825.00 33.50 500.00 75.00 500.00	\$	770 825 536 500 - 600 - 250
ENVIRONMEN GROUNDW 4 WELL SAM	NTAL MONITORING VATER SAMPLE COLLECTION S, SEMI-ANNUALLY (INCLUDES WELL PURGE, PLE COLLECTION, AND SHIPPING)	2	LS	1800.00		3,600 - -
GROUNDW 4 SAMF EQUI INOR	VATER SAMPLE ANALYSIS PLES PLUS 2 SAMPLE QA/QC VALENT SEMI-ANNUALLY, SVOCs, GANICS, WATER QUALITY PARAMETERS	12	SMPL	900.00		- 10,800
FIVE YEAR EI PUBLIC	DUCATIONAL PROGRAM MEETING - ANNUALIZED	0.1739	LS	5000.00		869
TWO YEAR D MADEP	OATA REPORT TO - ANNUALIZED	0.4831	LS	1000.00		483
FIVE YEAF	SITE REVIEW - ANNUALIZED	0.1739	LS	15000.00		2,608

21,842

\$

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PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY	JOB #	8712-04
	ALTERNATIVE 7: CAP-IN-PLACE ALL SEVEN DISPOSAL AREAS	DATE	24-Jan-97
LOCATION:	DEVENS, MASSACHUSETTS		ł

ENGINEER: ABB ENVIRONMENTAL SERVICES, INC.

#### ESTIMATOR: P. R. MARTIN

ANNUAL O&M COSTS		===	= = = = = = = = = = = = = = = = = = =	= =	====
DESCRIPTION	QTY	UNIT	COST		TOTAL
ANNUAL O&M COSTS - FOR 30 YEARS TOTAL SA 6				\$	21,842
TOTAL AOC 9					27,323
TOTAL AOC 11					21,592
TOTAL SA 12					21,842
TOTAL SA 13					21,842
TOTAL AOC 40					30,122
TOTAL AOC 41					21,842
UNDEVELOPED DESIGN DETAILS ~25%					41,595
TOTAL ANNUAL O&M COSTS - 30 YEARS				\$	208,000

#### ADDITIONAL ANNUAL O&M COSTS - FOR 5 YEARS

TOTAL AOC 40	\$ 10,081
UNDEVELOPED DESIGN DETAILS ~25%	 2,919
TOTAL ADDITIONAL ANNUAL O&M COSTS FOR AOC 40 - 5 YEARS	\$ 13,000

PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY ALTERNATIVE 8: LIMITED REMOVAL AT AOC 11	JOB #	8712-04
	EXCAVATE AND CONSOLIDATE AOC 9, 40, 41, and SA 6, 12, 13; AND	DATE	24-Jan-97
LOCATION: ENGINEER:	DEVENS, MASSACHUSETTS ABB ENVIRONMENTAL SERVICES, INC.		

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	COST SI IMMARY TABLE	======	= = =	=======	=	
-	DESCRIPTION	ΩΤΥ	UNIT	UNIT COST		TOTAL
DIRECT COST	TS	*************************	************	*		
LIMITED R	EMOVAL AT AOC 11				\$	44,000
EXCAVAT	E AND CONSOLIDATE					
	SA 6					64,000
	AOC 9					3,835,000
	SA 12		•			490,000 502 000
	SA 13					3 370 000
						93,000
•	CONSOLIDATION LANDFILL CONSTRUCTION					5,240,000
						12 629 000
	IOTAL DIRECT COSTS				ş	13,030,000
INDIRECT CO	ISTS					
ļ	HEALTH AND SAFETY			5.00%	\$	682,000
	LEGAL, ADMIN, PERMITTING			5.00%		682,000
	ENGINEERING			10.00%		1,364,000
	SERVICES DURING CONSTRUCTION			10.00%		1,364,000
,	TOTAL INDIRECT COSTS				\$	4,092,000
	TOTAL CAPITAL (DIRECT + INDIRECT) COST				\$	17,730,000
OPERATING A	AND MAINTENANCE COSTS					
	TOTAL ANNUAL O&M COSTS FOR AOC 11 FOR 2 1	RS			Ş	4,000
	TOTAL ANNUAL OWM COSTS FOR NEW LANDFILL				Ş A	23,000
	TOTAL ADDITIONAL ANNOAL DAW COSTS FOR AC	10 40 - 5 Th5			¥	29,000
	TOTAL PRESENT WORTH OF OPERATING AND MAI	NTENANCE COS	TS		\$	411,000
	TOTAL COSTS				\$	18,141,000

PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY	JOB #	8712-04
	ALTERNATIVE 8: LIMITED REMOVAL AT AOC 11		
	EXCAVATE AND CONSOLIDATE		
	AOC 9, 40, 41, and SA 6, 12, 13; AND	DATE	24-Jan-97
LOCATION:	DEVENS, MASSACHUSETTS		
ENGINEER:	ABB ENVIRONMENTAL SERVICES, INC.		

MOB/DEMOB (IN and OUT) DUMP TRUCKS					
MOB/DEMOB (IN and OUT) DUMP TRUCKS	4				
DOMF TROCKS		EA	295.00	ė 1 I	540
BACKHOE	2		720.00	v 1, 1 /	460
ROLLER	2	EA	785.00	-, · 1 ا	570
NOLLEN	2	EA	785.00	1,	-
FOILET - 1 EA	1	WK	25.00		25
NATER COOLER - 1 EA	1	WK	25.00		25
NATER	5	DAY	15.00		75
PICK-UP (2 EA)	0.5	MON	1000.00	5	500
OREMEN	50	MNHR	55.00	2,7	/50
					-
XCAVATION OF DEBRIS -	5	DAY	1460.00	7,3	100
BACKHOE & OPERATOR					-
	10	DAY	770.00	7,7	'00
LANDFILL - DUMP TRUCK & DRIVER - 2 EA					-
					_
					-
				-	-
				-	-
	-			-	
				-	•
				-	
				-	
				-	
				-	
				-	

TOTAL THIS PAGE

\$ 22,945

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PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY	JOB #	8712-04
	ALTERNATIVE 8: LIMITED REMOVAL AT AOC 11		
	EXCAVATE AND CONSOLIDATE		
	AOC 9, 40, 41, and SA 6, 12, 13; AND	DATE	24 <i>-</i> Jan-97
LOCATION:	DEVENS, MASSACHUSETTS		
ENGINEER:	ABB ENVIRONMENTAL SERVICES, INC.		

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DESCRIPTION	ΟΤΥ	UNIT	UNIT COST	TOTAL
TOTAL PREVIOUS PAGE				\$ 22,945
BACKFILL PURCHASED FROM OFF-SITE (INCLUDING 30% SWELL FACTOR)	625	CY	10.00	6,250
SITE RESTORATION BACKFILL, GRADE, COMPACT FERTILIZE, SEED, MULCH	2 5000	DAY SY	1570.00 0.50	3,140 2,500 -
UNDEVELOPED DESIGN DETAILS ~25%				 9,165

PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY	JOB #	8712-04
	ALTERNATIVE 8: LIMITED REMOVAL AT AOC 11		
	EXCAVATE AND CONSOLIDATE		
	AOC 9, 40, 41, and SA 6, 12, 13; AND	DATE	24-Jan-97
LOCATION:	DEVENS, MASSACHUSETTS		
ENGINEER:	ABB ENVIRONMENTAL SERVICES, INC.		

	· = = = = = = = = = = = = = = = = = = =			= =	=====
DESCRIPTION	ΩΤΥ	UNIT	UNIT COST		TOTAL
MOB/DEMOB	***********				
BACKHOE TO SA 6	2	EA	730.00	\$	1,460
DOZER & ROLLER TO SA 6	2	EA	660.00		1,320
DUMP TRUCK	6	EA	385.00		2,310
ACCESS ROAD - 675 LF x 15' WIDE					
GRADE ROAD BED - DOZER & OPERATOR	1	DAY	1760.00		1,760
GRAVEL - 12" THICK	1125	SY	5.00		5.625
GEOFABRIC	1125	SY	2.00		2,250
CLEAR TREES FROM SITE	0.25	AC	6000.00		1,500
ARCHAEOLOGICAL SURVEY OF LANDFILL					-
PROJECT MANAGER	1	DAY	405.00		405
PRINCIPAL INVESTIGATOR	1	DAY	365.00		365
PROJECT ARCHAEOLOGIST	7	DAY	265.00		1,855
ASSISTANT ARCHAEOLOGIST	6	DAY	185.00		1,110
WORK PROCESSOR	1	DAY	175.00		175
ODCs	1	LS	100.00		100
MILAGE	1000	MILE	0.25		250
PER DIEM	5	DAY	60.00		300
UXO CLEARANCE	2	DAY	1800.00		3,600
FOREMAN	100	HR	55.00		5,500 -
BACKHOF & OPERATOR	2		1460.00		2 9 20
LABORER	16		1400.00		2,520
DUMP TRUCK & DRIVER - 3 EA	· 6	DAY	770.00		4,620
SPREAD & COMPACT AT ON-SITE CONSOLIDATION LAN	OFILL (INLC 50% SWELL	FACTOR			-
ROLLER & OPERATOR	2	DAY	1570.00		3,140
REMOVE ACCESS ROAD (~70 LF)					-
BACKHOE & OPERATOR	0.5	DAY	1460.00		730
DUMP TRUCK & DRIVER	0.5	DAY	770.00		385
LABORER	4	HR	33.50		134
					•
	TUTAL THIS PA	GE		Ş	42,350

PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY	JOB #	8712-04
	EXCAVATE AND CONSOLIDATE AOC 9, 40, 41, and SA 6, 12, 13; AND	DATE	24-Jan-97
LOCATION: ENGINEER:	DEVENS, MASSACHUSETTS ABB ENVIRONMENTAL SERVICES, INC.		

EXCAVATE AND CONSOLIDATE SA 6		= = =		<b>.</b>	=====
DESCRIPTION	QTY	UNIT	UNIT COST		TOTAL
TOTAL PREVIOUS PAGE	#********			\$	42,350
BACKFILL PURCHASED FORM OFF-SITE (INCLUDING 30% SWELL FACTOR)	650	CY	10.00		6,500 - -
SITE RESTORATION					-
BACKFILL, GRADE, COMPACT	1	DAY	1570.00		1,570
FERTILIZE, SEED, MULCH	1200	SY	0.50		600 - -
UNDEVELOPED DESIGN DETAILS ~25%					12,980
TOTAL SA 6				\$	64,000

PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY	JOB #	8712-04
	ALTERNATIVE 8: LIMITED REMOVAL AT AOC 11		
	EXCAVATE AND CONSOLIDATE		
	AOC 9, 40, 41, and SA 6, 12, 13; AND	DATE	24-Jan-97
LOCATION:	DEVENS, MASSACHUSETTS		
ENGINEER:	ABB ENVIRONMENTAL SERVICES, INC.		

		= = =		
EXCAVATE AND CONSOLIDATE ACC 9			UNIT	
DESCRIPTION	ΩΤΥ	UNIT	COST	TOTAL
MOB/DEMOB (IN and OUT)				
DUMP TRUCKS	32	EA	385.00	\$ 12,320
BACKHOE	4	EA	730.00	2,920
ROLLER	8	EA	785.00	6,280
OFFICE TRAILER	. 5	MON	150.00	750
STORAGE TRAILER	5	MON	100.00	500
SET UP TRAILER	2	EA	500.00	1,000
TOILET - 2 EA	44	WK	25.00	1,100
WATER COOLER - 2 EA	44	WΚ	25.00	1,100
WATER	220	DAY	15.00	3,300
TELEPHONE SERVICE	5	MON	500.00	2,500
ELECTRICITY	5	MON	250.00	1,250
PICK-UP (2 EA)	10	MON	1000.00	10,000
PUMPS, TOOLS, MINOR EQUIPMENT	1	LS	2500.00	2,500
SITE SUPERINTENDANT ( 5 MON * 210 HR/MON)	1050	MNHR	65.00	- 68,250
FOREMEN (5 MON * 210 HR/MON)	1050	MNHR	55.00	57,750
CLERK/TYPIST (5 MON * 168 HR/MON)	840	MNHR	25.00	21,000
CLEAR TREES	2.5	AC	6900.00	17,250
EROSION CONTROL	700	LF	5.00	3,500
UXO CLEARANCE	70	DAY	1800.00	126,000
				-
				-
EXCAVATION OF 112000 CY OF DEBRIS				-
BACKHOE & OPERATOR (2 EA)	140	DAY	1460.00	204,400
TRANSPORT TO ON-SITE CONSOLIDATION LANDFILL (50% SWEI	LL FACTOR INCL	JDED)		
DUMP TRUCK & OPERATOR (16 EA)	1120	DAY	770.00	862,400
SPREAD OVER ON-SITE CONSOLIDATION LANDFILL & COMPACT				-
ROLLER & OPERATOR (4 EA)	280	DAY	1570.00	439,600
				-
			*******	-
	TOTAL THIS PA	GE		\$ 1,845,670

PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY ALTERNATIVE 8: LIMITED REMOVAL AT AOC 11 EXCAVATE AND CONSOLIDATE			JOB #	8712-04
LOCATION: ENGINEER:	AOC 9, 40, 41, and SA 6, 12, 13; AND DEVENS, MASSACHUSETTS ABB ENVIRONMENTAL SERVICES, INC.			DATE	24-Jan-97
ESTIMATOR:	P. R. MARTIN				
	EXCAVATE AND CONSOLIDATE AOC 9		= = =		
	DESCRIPTION	OTV		COST	τοται
		Q11	UNIT		TOTAL
TOTAL PREV	IOUS PAGE				\$ 1,845,670
TOTAL PREV BACKFILL (1 AVAILABL LOAD STO HAUL & D	TIOUS PAGE 12,000 * 1.3 = 145,600 CY REQUIRED) E FROM CONSOLIDATION LANDFILL EXCAVATION OCKPILED BACKFILL UMP	88750 110 330	CY DAY DAY	0.00 825.00 770.00	\$ 1,845,670 0 90,750 254,100 -

PURCHASED FROM OFF-SITE (INCLUDING 30% SWELL FACTOR)	56850	CY	10.00	568,500 -
SITE RESTORATION				-
BACKFILL, GRADE, COMPACT (2 EA)	182	DAY	1570.00	285,740
FERTILIZE, SEED, MULCH	36300	SY	0.50	18,150
WETLAND RESTORATION	0.1	AC	50000.00	- 5,000
UNDEVELOPED DESIGN DETAILS ~25%				767,090
TOTAL AOC 9				\$ 3,835,000

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PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY	JOB #	8712-04
	EXCAVATE AND CONSOLIDATE AOC 9, 40, 41, and SA 6, 12, 13; AND	DATE	24-Jan-97
LOCATION: ENGINEER:	DEVENS, MASSACHUSETTS ABB ENVIRONMENTAL SERVICES. INC.		

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EXCAVATE AND CONSOLIDATE SA 12					
DESCRIPTION	QTY	UNIT	COST		TOTAL
MOB/DEMOB (IN and OUT)					
DUMP TRUCKS	10	EA	385.00	\$	3,850
BACKHOE	2	EA	730.00		1,460
ROLLER	2	EA	785.00		1,570
OFFICE TRAILER	1.5	MON	150.00		225
STORAGE TRAILER	1.5	MON	100.00		150
SET UP TRAILER	2	EA	500.00		1,000
TOILET - 2 EA	12	wк	25.00		- 300
WATER COOLER - 2 EA	12	WK	25.00		300
WATER	60	DAY	15.00		<b>90</b> 0
TELEPHONE SERVICE	1.5	MON	500.00		750
ELECTRICITY	1.5	MON	250.00		375
PICK-UP (2 EA)	3	MON	1000.00		3,000
SITE SUPERINTENDANT (1.5 MON * 210 HR/MON)	315	MNHR	65.00		- 20,475
FOREMEN (1.5 MON * 210 HR/MON)	315	MNHR	55.00		17,325
CLERK/TYPIST (1.5 MON * 168 HR/MON)	252	MNHR	25.00		6,300
ACCESS ROAD - 300 LF x 20' WIDE					
GRADE ROAD BED - DOZER & OPERATOR	0.5	DAY	1760.00		880
GRAVEL - 12" THICK	250	CY	10.00		2,500
SPREAD & COMPACT	.0.25	DAY	1570.00		393
GEOFABRIC	700	SY	1.00		700
CLEAR TREES	0.5	AC	6900.00		3,450
EROSION CONTROL	325	LF	5.00		1,625
UXO CLEARANCE	15	DAY	1800.00		27,000
					- -
					-
EXCAVATION OF 9000 CY OF DEBRIS					-
BACKHOE & OPERATOR			1460.00		17,520
DUMP TRUCK & DRIVER (12 EA)	144	DAY	770.00		110,880
					-
					-
	TOTAL THIS PA	GE		\$	222,928

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PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY	JOB #	8712-04
	ALTERNATIVE 8: LIMITED REMOVAL AT AOC 11		
	EXCAVATE AND CONSOLIDATE		
	AOC 9, 40, 41, and SA 6, 12, 13; AND	DATE	24-Jan-97
LOCATION:	DEVENS, MASSACHUSETTS		
ENGINEER:	ABB ENVIRONMENTAL SERVICES, INC.		

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EXCAVATE AND CONSOLIDATE SA 12				= =	
			UNIT		
DESCRIPTION	ΔΤΥ	UNIT	COST		TOTAL
TOTAL PREVIOUS PAGE				\$	222,928
SPREAD OVER ON-SITE CONSOLIDATION LANDFILL & COMPACT					-
ROLLER & OPERATOR	12	DAY	1570.00		18,840
BACKFILL PURCHASED FROM OFF-SITE					-
(INCLUDING 30% SWELL FACTOR)	11700	CY	10.00		117,000
					-
SITE RESTORATION					-
BACKFILL, GRADE, COMPACT	15	DAY	1570.00		23,550
FERTILIZE, SEED, MULCH	2400	SY	0.50		1,200
WETLANDS RESTORATION	0.1	AC	50000.00		5,000
REMOVE ACCESS ROAD					-
BACKHOE & OPERATOR	1	DAY	1460.00		1,460
DUMP TRUCK & DRIVER (2 EA)	2	DAY	770.00		1,540
LABORER (2 EA)	16	HR	33.50		536
UNDEVELOPED DESIGN DETAILS ~25%					97,947
TOTAL SA 12				\$	490,000

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PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY	JOB #	8712-04
	ALTERNATIVE 8: LIMITED REMOVAL AT AOC 11		
	EXCAVATE AND CONSOLIDATE		
	AOC 9, 40, 41, and SA 6, 12, 13; AND	DATE	24-Jan-97
LOCATION:	DEVENS, MASSACHUSETTS		
ENGINEER:	ABB ENVIRONMENTAL SERVICES, INC.		

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EXCAVATE AND CONSOLIDATE SA 13			UNIT		
DESCRIPTION	ΩΤΥ	UNIT	COST		TOTAL
MOB/DEMOB (IN and OUT)			• ••••••••••••••••••••••••••••••••••••		
DUMP TRUCKS	6	EA	385.00	\$	2,310
BACKHOE	2	EA	730.00		1,460
ROLLER	2	EA	785.00		1,570
OFFICE TRAILER	1.5	MON	150.00		225
STORAGE TRAILER	1.5	MON	100.00		150
SET UP TRAILER	2	EA	500.00		1,000
TOILET - 2 EA	12	wк	25.00		300
WATER COOLER - 2 EA	12	WK	25.00		300
WATER	60	DAY	15.00		900
TELEPHONE SERVICE	1.5	MON	500.00		750
ELECTRICITY	1.5	MON	250.00		375
PICK-UP (2 EA)	3	MON	1000.00		3,000
SITE SUPERINTENDANT (1.5 MON * 210 HR/MON)	315	MNHR	65.00		- 20,475
FOREMEN (1.5 MON * 210 HR/MON)	315	MNHR	55.00		17,325
CLERK/TYPIST (1.5 MON * 168 HR/MON)	252	MNHR	25.00		6,300
ACCESS ROAD - 200 LF x 20' WIDE					
GRADE ROAD BED - DOZER & OPERATOR	0.5	DAY	1760.00		880
GRAVEL - 12" THICK	150	CY	10.00		1,500
SPREAD & COMPACT	0.25	DAY	1570.00		393
GEOFABRIC	450	SY	1.00		450
CLEAR TREES	0.5	AC	6900.00		3,450
EROSION CONTROL	300	LF	5.00		1,500
UXO CLEARANCE	15	DAY	1800.00		27,000
EXCAVATION OF 10000 CY OF DEBRIS					-
BACKHOE & OPERATOR	13	DAY	1460.00		18,980
TRANSPORT TO ON-SITE CONSOLIDATION LANDFILL (50% SWELI	L FACTOR INCLU	JDED)			
DUMP TRUCK & OPERATOR (10 EA)	130	DAY	770.00		100,100
REMOVE ACCESS ROAD					-
BACKHOE & OPERATOR	1	DAY	1460.00		1,460
DUMP TRUCK & DRIVER (2 EA)	2	DAY	770.00		1,540
LABORER (2 EA)	16	HR	33.50		536 -
······································	TOTAL THIS PA	 GE		\$	214,229

PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY ALTERNATIVE 8: LIMITED REMOVAL AT AOC 11	JOB #	8712-04
	EXCAVATE AND CONSOLIDATE AOC 9, 40, 41, and SA 6, 12, 13; AND	DATE	24-Jan-97
LOCATION:	DEVENS, MASSACHUSETTS ABB ENVIRONMENTAL SERVICES, INC.		

EXCAVATE AND CONSOLIDATE SA 13				 
DESCRIPTION	ΩΤΥ	UNIT	UNIT COST	TOTAL
TOTAL PREVIOUS PAGE		*******		\$ 214,229
SPREAD OVER ON-SITE CONSOLIDATION LANDFILL & COMPACT ROLLER & OPERATOR	20	DAY	1570.00	- 31,400
BACKFILL PURCHASED FROM OFF-SITE (INCLUDING 30% SWELL FACTOR)	13000	СҮ	10.00	130,000
SITE RESTORATION BACKFILL, GRADE, COMPACT FERTILIZE, SEED, MULCH	16 2400	DAY SY	1570.00 0.50	25,120 1,200 -
UNDEVELOPED DESIGN DETAILS ~25%				 100,052
TOTAL SA 13				\$ 502,000

PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY	JOB #	8712-04
	ALTERNATIVE 8: LIMITED REMOVAL AT AOC 11		
	EXCAVATE AND CONSOLIDATE		
	AOC 9, 40, 41, and SA 6, 12, 13; AND	DATE	24-Jan-97
LOCATION:	DEVENS, MASSACHUSETTS		
ENGINEER:	ABB ENVIRONMENTAL SERVICES, INC.		

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DESCRIPTION	ΩΤΥ	UNIT	COST		TOTAL
ACCESS BOAD - 600 LE (SEDIMENT REMOVAL AREA I)					
CLEAR & GRUB LIGHT VEGETATION	0.3	AC	4300.00	\$	1.290
GRADE - DOZER & OPERATOR	0.5	DAY	1760.00	•	880
GRAVEL - 12" THICK	450	CY	10.00		4,500
SPREAD & COMPACT	0.5	DAY	1570.00		785
FILTER FABRIC	1350	SY	1.00		1,350
PARKING AREA					-
CLEAR & GRUB LIGHT VEGETATION	0.25	AC	4300.00		1,075
GRADE - DOZER & OPERATOR	0.5	DAY	1760.00		880
GRAVEL - 12" THICK	400	CY	10.00		4,000
SPREAD & COMPACT	0.5	DAY	1570.00		785
SEDIMENT DEWATERING PAD					-
CLEAR & GRUB LIGHT VEGETATION	0.25	AC	4300.00		1,075
GRADE - DOZER & OPERATOR	0.5	DAY	1760.00		880
GRAVEL - 12" THICK	400	CY	10.00		4,000
	0.5	DAY	1570.00		785
	10000	SF	1.00		10,000
SUMP & SUMP PUMP	1	LS	2500.00		2,500
DECON AREA - 10'x20'	3	EA	5000.00		- 15,000
					-
					-
					-
					-
					-
					-
WORK PLATFORM (SEDIMENT REMOVAL AREA II)					-
GRADE - DOZER & OPERATOR	0.25	DAY	1760.00		440
GRAVEL - 12" THICK	150	CY	10.00		1,500
SPREAD & COMPACT	0.25	DAY	1570.00		393
FILTER FABRIC	450	SY	1.00		450
					-
					-
					-
					-
					-
					-
					-
	TOTAL SITE PRE	PARATIC	N	\$	52,568

PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY	JOB #	8712-04
	ALTERNATIVE 8: LIMITED REMOVAL AT AOC 11		
	EXCAVATE AND CONSOLIDATE		
	AOC 9, 40, 41, and SA 6, 12, 13; AND	DATE	24-Jan-97
LOCATION:	DEVENS, MASSACHUSETTS		
ENGINEER:	ABB ENVIRONMENTAL SERVICES, INC.		

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EXCAVATE AND CONSOLIDATE AOC 40			UNIT		
DESCRIPTION	QTY	UNIT	COST		TOTAL
EQUIPMENT (IN and OUT)					
FRAC TANK	8	EA	250.00	\$	2,000
DEWATERING PUMP & HOSE	4	EA	100.00		400
DUMP TRUCKS	16	EA	385.00		6,160
BACKHOE	2	EA	730.00		1,460
ROLLER	4	EA	785.00		3,140
CLAM SHELL	2	EA	640.00		1,280
OFFICE TRAILER	7	MON	150.00		1,050
STORAGE TRAILER	7	MON	150.00		1,050
TRAILER DELIVERY, SET-UP, REMOVAL	2	EA	300.00		600
TOILET - 2 EA	60	WΚ	25.00		1,500
WATER COOLER - 2 EA	60	WK	25.00		1,500
WATER	300	DAY	15.00		4,500
TELEPHONE SERVICE	7	MON	500.00		3,500
ELECTRICITY	7	MON	250.00		1,750
PICK-UP (2 EA)	14	MON	1000.00		14,000
OFFICE EQUIPMENT	7	MON	1000.00		7,000
PUMPS, TOOLS, MINOR EQUIPMENT	1	LS	5000.00		5,000
LABORER (2 MEN*10 DAY/MAN*8 HR/DAY)	160	MNHR	33.50		5,360
CARPENTER (2 MEN*10 DAY/MAN*8 HR/DAY)	160	MNHR	48.00		7,680
ELECTRICIAN (2 MEN*10 DAY/MAN*8 HR/DAY)	160	MNHR	50.50		8,080
SITE SUPERINTENDANT (7 MON*210HR/MON)	1470	MNHR	65.00		95,550
FOREMAN (7 MON*210HR/MON)	1470	MNHR	55.00		80,850
CLERK/TYPIST (7 MON*168HR/MON)	1176	MNHR	25.00		29,400
					-
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· ·					-
					-
					-

TOTAL MOBILIZATION \$ 282,810

PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY	JOB #	8712-04
	EXCAVATE AND CONSOLIDATE AOC 9, 40, 41, and SA 6, 12, 13; AND	DATE	24-Jan-97
LOCATION: ENGINEER:	DEVENS, MASSACHUSETTS ABB ENVIRONMENTAL SERVICES, INC.		

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EXCAVATE AND CONSOLIDATE AOC 40 SEDIMENT REMOVAL AND DISPOSAL DESCRIPTION	ΩΤΥ	UNIT	UNIT COST		TOTAL
CONSTRUCT SILT FENCE AROUND CONTAMINATED AREAS	650	LF	5.00	\$	3,250
EXCAVATE WITH CLAMSHELL 1200 CY SEDIMENTS + 600 CY ACCESS ROADS/WORK PLATFO	19 RMS	DAY	1280.00		24,320 -
HAUL SEDIMENTS TO DEWATERING PAD (2 EA DUMP TRUCK & DRIVER)	38	DAY	770.00		29,260 -
LOAD DRY SEDIMENTS FOR TRANSPORTATION TO DISPOSAL AREA (FRONT END LOADER & OPERATOR)	10	DAY	825.00		8,250 - -
LABORERS - 2 EA FOR 25 DAYS	400	MNHR	33.50		13,400
TCLP TESTING	2	SMPL	1500.00		3,000
ON-SITE STABILIZATION OF SEDIMENTS WITH SAND	400	CY	15.00		6,000 -
TRANSPORTATION AND DISPOSAL AT CONSOLIDATION LANDFILL (3 EA DUMP TRUCK & DRIVER)	30	DAY	770.00		- 23,100 -
TRANSPORTATION OF WATER	140000	GAL	INCL WITH DISP	OSA	- L
TREATMENT OF DEWATERING WATER	1	LS	21800.00		- 21,800
PUMP WATER FROM DEWATERING PAD TO PONDS	12	DAY	50.00		- 600 - - - -
					- - - -
TOTAL SEDIMENT REMOVAL AND DISPOSAL				\$	132,980

	PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY	JOB #	8712-04
		EXCAVATE AND CONSOLIDATE ACC 9, 40, 41, and SA 6, 12, 13; AND	DATE	24-Jan-97
,	LOCATION: ENGINEER:	DEVENS, MASSACHUSETTS ABB ENVIRONMENTAL SERVICES, INC.		

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DRUM REMOVAL AND DISPOSAL DESCRIPTION	ΩΤΥ	UNIT	UNIT COST	T	OTAL •••
BACKHOE & OPERATOR	3	DAY	1460.00	\$	4,380
LABORER - 2 EA, 3 DAYS	48	MNHR	33.50		- 1,608 -
					-
TRANSPORT DRUMS TO CONSOLIDATION LANDFILL - DUMP TRUCK & DRIVER	3	DAY	770.00		2,310
TCLP TESTING OF DRUM CONTENTS	2	EA	1500.00		3,000
					-
					-

TOTAL DRUM REMOVAL AND DISPOSAL

PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY	JOB #	8712-04
	ALTERNATIVE 8: LIMITED REMOVAL AT AOC 11		
	EXCAVATE AND CONSOLIDATE		
	AOC 9, 40, 41, and SA 6, 12, 13; AND	DATE	24-Jan-97
LOCATION:	DEVENS, MASSACHUSETTS		
ENGINEER:	ABB ENVIRONMENTAL SERVICES, INC.		

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EXCAVATE AND CONSOLIDATE AOC 40 EXCAVATION AND BACKFILL DESCRIPTION	ΔΤΥ	UNIT	UNIT COST		TOTAL
CLEAR & GRUB SITE	4	AC	4300.00	\$	17,200
EROSION CONTROL	500	LF	5.00		2,500
SUMP PUMP & HOSES	6	MOŃ	2500.00		15,000
UXO CLEARANCE	138	DAY	1800.00		248,400
EXCAVATION OF 110000 CY OF DEBRIS BACKHOE & OPERATOR TRANSPORT TO ON-SITE CONSOLIDATION LANDFILL (50% SWEL DUMP TRUCK & DRIVER (8 EA)	138 L FACTOR INCLU 1100	DAY JDED) DAY	1460.00 770.00		- 201,480 847,000
SPREAD OVER ON-SITE CONSOLIDATION LANDFILL & COMPACT ROLLER & OPERATOR (2 EA)	276	DAY	1570.00		- - 433,320 -
BACKFILL PURCHASED FROM OFF-SITE (INCLUDING 30% SWELL FACTOR)	18710	CY	10.00		- 187,100 -
SITE RESTORATION BACKFILL, GRADE, COMPACT FERTILIZE, SEED, MULCH	24 19360	DAY SY	1570.00 0.50		- 37,680 9,680
WETLANDS RESTORATION	4	AC	50000.00		200,000
MONITORING WELLS, 4" DIA x 30' DP	2	EA	2400.00		4,800
GUIDE RAIL ALONG ROAD	1000	LF	12.50		12,500

TOTAL EXCAVATION AND BACKFILL

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\$ 2,216,660 \_\_\_\_\_

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PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY	JOB #	8712-04
	ALTERNATIVE 8: LIMITED REMOVAL AT AOC 11		
	EXCAVATE AND CONSOLIDATE		
	AOC 9, 40, 41, and SA 6, 12, 13; AND	DATE	24-Jan-97
LOCATION:	DEVENS, MASSACHUSETTS		
ENGINEER:	ABB ENVIRONMENTAL SERVICES, INC.		

EXCAVATE AND CONSOLIDATE AOC 40				
DESCRIPTION	ΔΤΥ	UNIT	UNIT COST	TOTAL
TOTAL SITE PREPARATION				\$ 52,568
TOTAL MOBILIZATION				282,810
TOTAL SEDIMENT REMOVAL AND DISPOSAL				- 132,980
TOTAL DRUM REMOVAL AND DISPOSAL				- 11,298
TOTAL EXCAVATION AND BACKFILL				- 2,216,660
UNDEVELOPED DESIGN DETAILS ~25%				- 673,685
TOTAL AOC 40				\$ 3,370,000

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PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY ALTERNATIVE 8: LIMITED REMOVAL AT AOC 11	JOB #	8712-04
	EXCAVATE AND CONSOLIDATE AOC 9, 40, 41, and SA 6, 12, 13; AND	DATE	24-Jan-97
LOCATION: ENGINEER:	DEVENS, MASSACHUSETTS ABB ENVIRONMENTAL SERVICES, INC.		

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			UNIT		
DESCRIPTION	ΩΤΥ	UNIT	COST		TOTAL
MOB/DEMOB (IN and OUT)			. <b>_</b> #+ <u>_</u> #+ <del>#</del> #+ <del>#</del> #############################	*******	
BACKHOE TO AOC 41	2	EA	730.00	\$	1,460
DOZER & ROLLER TO AOC 41	2	EA	660.00		1,320
FOREMAN	100	HR	55.00		5,500
ACCESS ROAD - 350 LF x 20' WIDE					-
GRADE ROAD BED - DOZER & OPERATOR	0.5	DAY	1760.00		880
GRAVEL - 12" THICK	800	SY	5.00		4,000
GEOFABRIC	800	SY	2.00		1,600
CLEAR TREES	0.5	AC	6000.00		3,000
EROSION CONTROL	150	LF	5.00		750
UXO CLEARANCE	3	DAY	1800.00		5,400
EXCAVATION OF 1500 CY OF DEBRIS					-
BACKHOE & OPERATOR	2	DAY	1460.00		2,920
TRANSPORT TO ON-SITE CONSOLIDATION LANDFILL (50% SWELL F	ACTOR INCLU	JDED)			
DUMP TRUCK & DRIVER (10 EA)	20	DAY	770.00		15,400
SPREAD OVER ON-SITE CONSOLIDATION LANDFILL & COMPACT					-
ROLLER & OPERATOR	3	DAY	1570.00		4,710
BACKFILL PURCHASED FROM OFF-SITE					-
(INCLUDING 30% FACTOR)	1950	CY	10.00		19,500
SITE RESTORATION					-
BACKFILL, GRADE, COMPACT	3	DAY	1570.00		4,710
FERTILIZE, SEED, MULCH	700	SY	0.50		350
REMOVE ACCESS ROAD (~110 LF)					-
FRONT END LOADER & OPERATOR	1	DAY	825.00		825
DUMP TRUCK & DRIVER (2 EA)	2	DAY	770.00		1,540
LABORER (2 EA)	16	HR	33.50		536
UNDEVELOPED DESIGN DETAILS ~25%					18,599
TOTAL AOC 41				\$	93.000

PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY ALTERNATIVE 8: LIMITED REMOVAL AT AOC 11	JOB #	8712-04
	EXCAVATE AND CONSOLIDATE AOC 9, 40, 41, and SA 6, 12, 13; AND	DATE	24-Jan-97
LOCATION: ENGINEER:	DEVENS, MASSACHUSETTS ABB ENVIRONMENTAL SERVICES, INC.		

CONSOLIDATION LANDFILL CONSTRUCTIO	== ======= DN	= = =	*==*==*	# 3	
DESCRIPTION	ΩΤΥ	UNIT	UNIT COST		TOTAL
MOBILIZATION			•	*-	*****************
DUMP TRUCKS - 16 EA	32	EA	385.00	\$	12,320
BACKHOE - 2 EA	4	EA	730.00		2,920
ROLLER - 2 EA	4	EA	785.00		3,140
DOZER	2	EA	880.00		1,760 - -
OFFICE TRAILER	9	MON	150.00		1,350
STORAGE TRAILER	9	MON	150.00		1,350
TRAILER DELIVERY, SET-UP, REMOVAL	2	EA	300.00		600
TOILET - 2 EA	80	WK	25.00		2,000
WATER COOLER - 2 EA	80	WK	25.00		2,000
WATER	400	DAY	15.00		6,000
relephone service	9	MON	500.00		4,500
ELECTRICITY	9	MON	250.00		2,250
PICK-UP (2 EA)	18	MON	1000.00		18,000
	9	MON	1000.00		9,000
PUMPS, TOOLS, MINOR EQUIPMENT	1	· LS	5000.00		5,000
LABORER (2 MEN*10 DAY/MAN*8 HR/DAY)	160	MNHR	33.50		5.360
CARPENTER (2 MEN*10 DAY/MAN*8 HR/DAY)	160	MNHR	48.00	•	7,680
ELECTRICIAN (2 MEN*10 DAY/MAN*8 HR/DAY)	160	MNHR	50.50		8,080
SITE SUPERINTENDANT (9 MON*210HR/MON)	1890	MNHR	65.00	•	- 122,850
FOREMAN (9 MON*210HR/MON)	1890	MNHR	55.00		103,950
CLERK/TYPIST (9 MON*168HR/MON)	1512	MNHR	25.00		37,800
					-
					-
					-
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PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY ALTERNATIVE 8: LIMITED REMOVAL AT AOC 11 EXCAVATE AND CONSOLIDATE			JOB #	8712-04
LOCATION: ENGINEER:	AOC 9, 40, 41, and SA 6, 12, 13; AND DEVENS, MASSACHUSETTS ABB ENVIRONMENTAL SERVICES, INC.			DATE	24-Jan-97
ESTIMATOR	: P. R. MARTIN				
*****	CONSOLIDATION LANDFILL CONSTRUCTION SITE PREPARATION DESCRIPTION	е е е е е е е е е е QTY	unit	UNIT COST	TOTAL
CLEAR & GR	RUB SITE	10	AC	4300.00	\$ 43,000
					-
					-
					-
	ACCESS ROAD IMPROVEMENTS				
Crushed St 2' dia RCP (	TONE, 2' DEEP x 24' WIDE CULVERT	1800 40	CY LF	30.00 50.00	54,000 2,000
	EROSION CONTROL				•
SILT FENCE HAY BALES		2800 500	LF EA	5.00 5.00	14,000 2,500 -
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TOTAL SITE PREPARATION

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\$ 115,500

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PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY ALTERNATIVE 8: LIMITED REMOVAL AT AOC 11 EXCAVATE AND CONSOLIDATE			JOB #		8712-04
LOCATION: ENGINEER:	AOC 9, 40, 41, and SA 6, 12, 13; AND DEVENS, MASSACHUSETTS ABB ENVIRONMENTAL SERVICES, INC.			DATE		24-Jan-97
ESTIMATOR	P. R. MARTIN					
					= =	**
	CONSOLIDATION LANDFILL CONSTRUCTION					
	LINER CONSTRUCTION DESCRIPTION	ΩΤΥ	UNIT	COST		TOTAL
FXCAVATE		***************************************	********		_,	******
HAUL TO ON	BACK HOE & OPERATOR (2 EA) J-SITE STOCKPILE (23250 CY)	126	DAY	1460.00	\$	183,960
HAUL TO AC	DUMP TRUCK & DRIVER (3 EA) C-9 & STOCKPILE (88750 CY)	45	DAY	770.00		34,650
	DUMP TRUCK & DRIVER (16 EA)	880	DAY	770.00		677,600
DOZER & OP	ERATOR	55	DAY	1760.00		96,800
CLAY		31850	CY	10.00		- 318,500
GEOMEMBR	ANE	330000	SF	0.65		214,500
FILTER FABR	IIC	330000	SF	0.10		33,000
10-2 SAND I	DRAINAGE LAYER	15925	CY	12.00		191,100
10-3 SAND I	DRAINAGE LAYER	15925	CY	17.00		270,725
ROLLER & O	PERATOR	80	DAY	1570.00		125,600 -
	DRAINAGE PIPING					-
6" DIA PERF	PVC PIPE	2500	LF	6.00		15,000
12" DIA SOL	ID WALL PVC PIPE	1600	LF	15.00		24,000
6"x12" PVC	WYE	5	EA	500.00		2,500
	LEACHATE PUMPING CHAMBER					-
5' DIA PRECA	ÁST MANHOLE	10	VLF	250.00		2,500
FRAME, COV	/ER, ETC.	1	LS	300.00		300
CONCRETE F CONTROL	ILL PAD, SUMP, ELECTRICAL S, ALARM, FILL PIPING, BOLLARDS	1	LS	35000.00		35,000
HAUL LEACH 10 HR/DA	ATE TO BASE TREATMENT PLANT Y * 5 DAY/WK * 52 WK	2600	HR	100.00		260,000 -
NOTE:	ALL LINER SOIL MATERIAL QUANTITIES					-

INCLUDE A 30% SWELL FACTOR

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TOTAL LINER CONSTRUCTION \$ 2,485,735 ----\_\_\_\_

PROJECT:		JOB #	8712-04
	EXCAVATE AND CONSOLIDATE		
	AOC 9, 40, 41, and SA 6, 12, 13; AND	DATE	24-Jan-97
LOCATION:	DEVENS, MASSACHUSETTS		
ENGINEER:	ABB ENVIRONMENTAL SERVICES, INC.		

CONSOLIDATION LANDFILL CONSTRUCTION				 *****
FINAL COVER CONSTRUCTION DESCRIPTION	QTY	UNIT	UNIT COST	 TOTAL
SUBGRADE BUFFER	15925	CY	10.00	\$ 159,250
TEXTURED GEOMEMBRAND	330000	SF	0.80	264,000
FILTER FABRIC	330000	SF	0.10	33,000
10-3 SAND DRAINAGE LAYER	15925	CY	17.00	270,725
MOISTURE RETENTION LAYER	23900	CY	10.00	239,000
VEGETATIVE LAYER	7950	CY	14.00	111,300
ROLLER & OPERATOR	80	DAY	1570.00	125,600
				-
HYDROSEEDING				-
SEED, FERTILIZE, MULCH	10	AC	2000.00	20,000
MONITORING WELLS	4	EA	2500.00	10,000

### NOTE: ALL FINAL COVER SOIL MATERIAL QUANTITIES INCLUDE A 30% SWELL FACTOR

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TOTAL FINAL COVER CONSTRUCTION \$ 1,232,875

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PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY ALTERNATIVE 8: LIMITED REMOVAL AT AOC 11			JOB #	8712-04
LOCATION: ENGINEER:	AOC 9, 40, 41, and SA 6, 12, 13; AND DEVENS, MASSACHUSETTS ABB ENVIRONMENTAL SERVICES, INC.			DATE	24-Jan-97
ESTIMATO	R: P. R. MARTIN				
=====	CONSOLIDATION LANDFILL CONSTRUCTION			SEESERS :	
	DESCRIPTION	QTY	UNIT	COST	TOTAL
TOTAL MO	BILIZATION			:	\$ 357,910
TOTAL SITE	E PREPARATION				115,500
TOTAL LINE	ER CONSTRUCTION				2,485,735
TOTAL FIN	AL COVER CONSTRUCTION				1,232,875

UNDEVELOPED DESIGN DETAILS ~25%	1,047,980
TOTAL CONSOLIDATION LANDFILL CONSTRUCTION	\$ 5,240,000
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PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY	JOB #	8712-04
	EXCAVATE AND CONSOLIDATE AOC 9, 40, 41, and SA 6, 12, 13; AND	DATE	24-Jan-97
LOCATION: ENGINEER:	DEVENS, MASSACHUSETTS ABB ENVIRONMENTAL SERVICES, INC.		

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ANNUAL O&M COSTS				
LIMITED REMOVAL AT AOC 11			UNIT	
DESCRIPTION	QTY	UNIT	COST	TOTAL
O&M COSTS TWICE PER YEAR FOR TWO YEARS FOR SITE RESTO	RATION			
DUMP TRUCK & DRIVER	2	DAY	770.00	\$ 1,540
MATERIALS	1	LS	500.00	500
LABORER - 2 EA	32	MNHR	33.50	1,072

888 4,000

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LINDEVEL	OPED	DESIGN	DETAIL	S ~ 25%
UNDEVEL	UPED	DESIGN	DEIAIL	.S Z970

TOTAL ANNUAL O&M COSTS

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PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY	JOB #	8712-04
	ALTERNATIVE 8: LIMITED REMOVAL AT AOC 11		
	EXCAVATE AND CONSOLIDATE		
	AOC 9, 40, 41, and SA 6, 12, 13; AND	DATE	24-Jan-97
LOCATION:	DEVENS, MASSACHUSETTS		
ENGINEER:	ABB ENVIRONMENTAL SERVICES, INC.		

		= = =		= = :	
ANNUAL O&M COSTS					
- CONSOLIDATION LANDFILL			UNIT		
DESCRIPTION	QTY	UNIT	COST	-	TOTAL
O&M COSTS OCCURING OVER THIRTY YEARS FOR CONSOLIDATIO	N LANDFILL				
FIVE YEAR SITE REVIEW - ANNUALIZED	0.1810	LS	10000.00	\$	1,810
ENVIRONMENTAL MONITORING					-
GROUNDWATER, 4 WELLS, SEMI-ANNUALLY					-
GENERAL PARAMETERS & METALS	8	SMPL	940.00		7,520
LANDFILL COVER MAINTENANCE					-
INSPECTION - 2 DAY @ 2 MEN/DAY	32	MNHR	75.00		2,400
GENERAL REPAIR					-
DUMP TRUCK & DRIVER	1	DAY	770.00		770
FRONT END LOADER & OPERATOR	1	DAY	825.00		825
LABORER - 2 EA	16	MNHR	33.50		536
MATERIALS	1	LS	500.00		500
MOWING	2	EVENT	1000.00		2,000
BI-ANNUAL REPORT TO DEP - ANNUALIZED	0.4878	LS	2500.00		1,220
AYER WWTP USER FEE	600	CCF	2.00		1,200
UNDEVELOPED DESIGN DETAILS ~25%					4,220
TOTAL ANNUAL O&M COSTS FOR 30 YEAR ACTIVITI	ES			\$	23,000

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PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY	JOB #	8712-04
	ALTERNATIVE 8: LIMITED REMOVAL AT AOC 11		
	EXCAVATE AND CONSOLIDATE		
	AOC 9, 40, 41, and SA 6, 12, 13; AND	DATE	24-Jan-97 🥄
LOCATION:	DEVENS, MASSACHUSETTS		
ENGINEER:	ABB ENVIRONMENTAL SERVICES, INC.		

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AOC 40			UNIT		
DESCRIPTION	ΟΤΥ	UNIT	COST		TOTAL
0&M COSTS OCCURING OVER FIVE YEARS FOR CSB LANDFILL					
SEDIMENT, 2 SAMPLES AT 2 LOCATIONS, ONE TIME ONLY AT	YEAR 5				
METALS - ANNUALIZED	0.7239	SMPL	625.00	\$	452
GROUNDWATER MONITORING, 2 WELLS, SEMI-ANNUALLY					-
GENERAL PARAMETERS & METALS	4	SMPL	1020.00		4,080
SAMPLE COLLECTION (INCLUDES WELL	2	LS	2500.00		5,000
PURGE, SAMPLE COLLECTION, AND SHIPMENT)					-
WETLANDS RESTORATION MONITORING					-
1 DAY @ 2 MEN/DAY, SEMI-ANNUALLY	32	MNHR	75.00		2,400
BIO MONITORING, BI-ANNUALLY	0.4878	LS	15000.00		7,317
FIVE YEAR EDUCATION PROGRAM ONCE PUBLIC MEETING - ANNUALIZED	0.1810	LS	2500.00		- 452
FIVE YEAR SITE REVIEW - ANNUALIZED	0.1810	LS	20000.00		3,619
UNDEVELOPED DESIGN DETAILS ~25%					5,679
TOTAL ADDITIONAL ANNUAL O&M COSTS FOR AC	C 40 - 5 YEARS			\$	29,000
PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY ALTERNATIVE 9: EXCAVATE AND CONSOLIDATE	JOB #	8712-04		
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LOCATION:	ALL SEVEN DISPOSAL AREAS DEVENS, MASSACHUSETTS	DATE	24-Jan-97		

ESTIMATOR: P. R. MARTIN

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	COST SUMMARY TABLE					
	DESCRIPTION	ΩΤΥ	UNIT	UNIT COST		TOTAL
DIRECT COS	 TS					
	SA 6				\$	64,000
	AOC 9					3,835,000
	AOC 11					1,571,000
	SA 12					490,000
	SA 13					502,000
	AOC 40					3,370,000
	AOC 41					93,000
	CONSOLIDATION LANDFILL CONSTRUCTION					5,240,000
	TOTAL DIRECT COSTS				\$`	15,165,000
INDIRECT CO	DSTS					
	HEALTH AND SAFETY			5.00%	\$	758,000
	LEGAL, ADMIN, PERMITTING			5.00%		758,000
	ENGINEERING			10.00%		1,517,000
	SERVICES DURING CONSTRUCTION			10.00%		1,517,000
	TOTAL INDIRECT COSTS				\$	4,550,000
	TOTAL CAPITAL (DIRECT + INDIRECT) COST				\$	19,715,000
OPERATING A	AND MAINTENANCE COSTS				\$	23.000
	TOTAL ADDITIONAL ANNUAL O&M COSTS FOR AC	0C 40 - 5 YEARS	i		·	29,000
					_	
	IUTAL PRESENT WORTH OF OPERATING AND MAI	NIENANCE COS	15		Ş	480,000
	TOTAL COSTS				\$2	20,195,000
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PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY ALTERNATIVE 9: EXCAVATE AND CONSOLIDATE	JOB #	8712-04
LOCATION:	ALL SEVEN DISPOSAL AREAS DEVENS, MASSACHUSETTS	DATE	24-Jan-97
ENGINEER:	ABB ENVIRONMENTAL SERVICES, INC.		

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ESTIMATOR: P. R. MARTIN

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EXCAVATE AND CONSOLIDATE SA 6			LINIT	
DESCRIPTION	QTY	UNIT	COST	TOTAL
MOB/DEMOB		*************		 
BACKHOE TO SA 6	2	EA	730.00	\$ 1,460
DOZER & ROLLER TO SA 6	2	EA	660.00	1,320
DUMP TRUCK	6	EA	385.00	2,310
ACCESS ROAD - 675 LF x 15' WIDE				
GRADE ROAD BED - DOZER & OPERATOR	· 1	DAY	1760.00	1,760
GRAVEL - 12" THICK	1125	SY	5.00	5,625
GEOFABRIC	1125	SY	2.00	2,250
CLEAR TREES FROM SITE	0.25	AC	6000.00	1,500
ARCHAEOLOGICAL SURVEY OF LANDFILL				-
PROJECT MANAGER	1	DAY	405.00	405
PRINCIPAL INVESTIGATOR	1	DAY	365.00	365
PROJECT ARCHAEOLOGIST	7	DAY	265.00	1,855
ASSISTANT ARCHAEOLOGIST	6	DAY	185.00	1,110
WORK PROCESSOR	1	DAY	175.00	175
ODCs	1	LS	100.00	100
MILAGE	1000	MILE	0.25	250
PER DIEM	5	DAY	60.00	300
UXO CLEARANCE	2	DAY	1800.00	3,600
FOREMAN	100	HR	55.00	5,500 -
BACKHOE & OPERATOR	2	DAY	1460.00	2.920
LABORER	16	HR	33.50	536
DUMP TRUCK & DRIVER - 3 EA	6	DAY	770.00	4,620
SPREAD & COMPACT AT ON-SITE CONSOLIDATION LANDFILL (	INLC 50% SWELL	FACTOR	()	-
ROLLER & OPERATOR	2	DAY	1570.00	3,140
REMOVE ACCESS ROAD (~70 LF)				-
BACKHOE & OPERATOR	0.5	DAY	1460.00	730
DUMP TRUCK & DRIVER	0.5	DAY	770.00	385
LABORER	4	HR	33.50	134
				 -
	TOTAL THIS PA	GE	- <u></u>	\$ 42,350

PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY ALTERNATIVE 9: EXCAVATE AND CONSOLIDATE	JOB #	8712-04
LOCATION:	ALL SEVEN DISPOSAL AREAS DEVENS, MASSACHUSETTS	DATE	24-Jan-97

ESTIMATOR: P. R. MARTIN

EXCAVATE AND CONSOLIDATE SA 6		===			
DESCRIPTION	ΩΤΥ	UNIT	UNIT COST		TOTAL
TOTAL PREVIOUS PAGE			• ••••••••••••••••••••••••••••••••••••	\$	42,350
BACKFILL PURCHASED FORM OFF-SITE (INCLUDING 30% SWELL FACTOR)	650	СҮ	10.00		6,500 - -
SITE RESTORATION					-
BACKFILL, GRADE, COMPACT	1	DAY	1570.00		1,570
FERTILIZE, SEED, MULCH	1200	SY	0.50		600 - -
UNDEVELOPED DESIGN DETAILS ~25%					- 12,980
TOTAL SA 6				\$	64,000

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PROJECT:		JOB #	8712-04
LOCATION:	ALL SEVEN DISPOSAL AREAS DEVENS, MASSACHUSETTS	DATE	24-Jan-97

ESTIMATOR: P. R. MARTIN

	======	===		= =	
EXCAVATE AND CONSOLIDATE AUC 9			UNIT		
DESCRIPTION	QTY	UNIT	COST		TOTAL
MOB/DEMOB (IN and OUT)					
DUMP TRUCKS	32	EA	385.00	\$	12,320
BACKHOE	4	EA	730.00		2,920
ROLLER	8	EA	785.00		6,280
OFFICE TRAILER	5	MON	150.00		750
STORAGE TRAILER	5	MON	100.00		500
SET UP TRAILER	2	EA	500.00		1,000
TOILET - 2 EA	44	wк	25.00		1,100
WATER COOLER - 2 EA	44	WΚ	25.00		1,100
WATER	220	DAY	15.00		3,300
TELEPHONE SERVICE	5	MON	500.00		2,500
ELECTRICITY	5	MON	250.00		1,250
PICK-UP (2 EA)	10	MON	1000.00		10,000
PUMPS, TOOLS, MINOR EQUIPMENT	1	LS	2500.00		2,500
SITE SUPERINTENDANT ( 5 MON * 210 HR/MON)	1050	MNHR	65.00		68,250
FOREMEN (5 MON * 210 HR/MON)	1050	MNHR	55.00		57,750
CLERK/TYPIST (5 MON * 168 HR/MON)	840	MNHR	25.00	•	21,000
CLEAR TREES	2.5	AC	6900.00		17,250
EROSION CONTROL	700	LF	5.00		3,500
UXO CLEARANCE	70	DAY	1800.00		126,000
					-
					-
EXCAVATION OF 112000 CY OF DEBRIS					-
BACKHOE & OPERATOR (2 EA)	140	DAY	1460.00		204,400
TRANSPORT TO ON-SITE CONSOLIDATION LANDFILL (50% SWE	LL FACTOR INCL	JDED)			
DUMP TRUCK & OPERATOR (16 EA)	1120	DAY	770.00		862,400
SPREAD OVER ON-SITE CONSOLIDATION LANDFILL & COMPACT	r				-
ROLLER & OPERATOR (4 EA)	280	DAY	1570.00		439,600
					-
	TOTAL THIS PA	 GE		<u></u>	1,845.670
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PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY ALTERNATIVE 9: EXCAVATE AND CONSOLIDATE	JOB #	8712-04
LOCATION:	ALL SEVEN DISPOSAL AREAS DEVENS, MASSACHUSETTS	DATE	24-Jan-97
ENGINEER:	ABB ENVIRONMENTAL SERVICES, INC.		

EXCAVATE AND CONSOLIDATE AOC 9		= = =		
DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL
TOTAL PREVIOUS PAGE				\$ 1,845,670
BACKFILL (112,000 * 1.3 = 145,600 CY REQUIRED) AVAILABLE FROM CONSOLIDATION LANDFILL EXCAVATION LOAD STOCKPILED BACKFILL HAUL & DUMP	88750 110 330	CY DAY DAY	0.00 825.00 770.00	0 90,750 254,100 -
PURCHASED FROM OFF-SITE (INCLUDING 30% SWELL FACTOR)	56850	СҮ	10.00	568,500 -
SITE RESTORATION BACKFILL, GRADE, COMPACT (2 EA) FERTILIZE, SEED, MULCH WETLAND RESTORATION	182 36300 0.1	DAY SY AC	1570.00 0.50 50000.00	- 285,740 18,150 5,000 -
UNDEVELOPED DESIGN DETAILS ~25%				767,090
TOTAL AOC 9				\$ 3,835,000



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PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY ALTERNATIVE 9: EXCAVATE AND CONSOLIDATE	JOB #	8712-04
LOCATION:	ALL SEVEN DISPOSAL AREAS DEVENS, MASSACHUSETTS	DATE	24-Jan-97
ENGINEER:	ABB ENVIRONMENTAL SERVICES, INC.		

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EXCAVATE AND CONSOLIDATE AUC TT			LINIT		
DESCRIPTION	ΩΤΥ	UNIT	COST		TOTAL
MOB/DEMOB (IN AND OUT)				****	
DUMP TRUCKS	6	EA	385.00	\$	2,310
BACKHOE	2	EA	730.00		1,460
ROLLER	4	EA	785.00		3,140
OFFICE TRAILER	. 3	MON	150.00		450
STORAGE TRAILER	3	MON	100.00		300
SET UP TRAILER	2	EA	500.00		1,000
TOILET - 2 EA	24	wк	25.00		- 600
WATER COOLER - 2 EA	24	WK	25.00		600
WATER	120	DAY	15.00		1,800
TELEPHONE SERVICE	3	MON	500.00		1,500
ELECTRICITY	3	MON	250.00		750
PICK-UP (2 EA)	3	MON	1000.00		3,000
SITE SUPERINTENDANT (3 MON * 210 HR/MON)	630	MNHR	65.00		- 40,950
FOREMEN (3 MON * 210 HR//MON)	630	MNHR	55.00		34,650
CLERK/TYPIST (3 MON * 168 HR/MON)	504	MNHR	25.00		12,600
ACCESS ROAD - 850 LF x 20' WIDE					
GRADE ROAD BED - DOZER & OPERATOR	2	DAY	1760.00		3,520
GRAVEL - 12" THICK	650	CY	10.00		6,500
SPREAD & COMPACT	1	DAY	1570.00		1,570
GEOFABRIC	1900	SY	1.00		1,900
CLEAR TREES	0.5	AC	4300.00		2,150
UXO CLEARANCE	45	DAY	1800.00		81,000
					-
EROSION CONTROL	900	LF	5.00		- 4,500
EXCAVATION OF 35000 CY OF DEBRIS					-
BACKHOE & OPERATOR	45	DAY	1460.00		65,700
TRANSPORT TO ON-SITE CONSOLIDATION LANDFILL (50% SWEL	L FACTOR INCLU	JDED)			
DUMP TRUCK & DRIVER	360	DAY	770.00		277,200
SPREAD OVER ON-SITE CONSOLIDATION LANDFILL & COMPACT					-
ROLLER & OPERATOR (2 EA)	90	DAY	1570.00		141,300
	TOTAL THIS PA	 GE		\$	690,450

PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY ALTERNATIVE 9: EXCAVATE AND CONSOLIDATE	JOB #	8712-04
LOCATION:	ALL SEVEN DISPOSAL AREAS DEVENS, MASSACHUSETTS	DATE	24-Jan-97
ENGINEER:	ABB ENVIRONMENTAL SERVICES, INC.		

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EXCAVATE AND CONSOLIDATE AOC 11				= =	
			UNIT		
DESCRIPTION	QTY	UNIT	COST		TOTAL
TOTAL PREVIOUS PAGE	· ····································			\$	690,450
REMOVE ACCESS ROAD					-
FRONT END LOADER & OPERATOR	2	DAY	825.00		1,650
DUMP TRUCK & DRIVER (2 EA)	4	DAY	785.00		3,140
LABORER (2 EA)	32	HR	33.50		1,072
BACKFILL PURCHASED FROM OFF-SITE					-
(INCLUDING 30% SWELL FACTOR)	45500	CY	10.00		455,000
SITE RESTORATION					-
BACKFILL, GRADE, COMPACT (2 EA)	60	DAY	1570.00		94,200
FERTILIZE, SEED, MULCH	12100	SY	0.50		6,050
WETLAND RESTORATION	0.1	AC	50000.00		5,000
					-
UNDEVELOPED DESIGN DETAILS ~25%					- 314,438
TOTAL AOC 11				\$	1,571,000

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PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY ALTERNATIVE 9: EXCAVATE AND CONSOLIDATE	JOB #	8712-04
LOCATION:	ALL SEVEN DISPOSAL AREAS DEVENS, MASSACHUSETTS	DATE	24-Jan-97
ENGINEER:	ABB ENVIRONMENTAL SERVICES, INC.		

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				= :	
EXCAVATE AND CONSOLIDATE SA 12			LINIT		
DESCRIPTION	ΩΤΥ	UNIT	COST		TOTAL
MOB/DEMOB (IN and OUT)		*********			
DUMP TRUCKS	10	EA	385.00	\$	3,850
BACKHOE	2	EA	730.00		1,460
ROLLER	2	EA	785.00		1,570
OFFICE TRAILER	1.5	MON	150.00		225
STORAGE TRAILER	1.5	MON	100.00		150
SET UP TRAILER	2	EA	500.00		1,000
TOILET - 2 EA	12	WΚ	25.00		300
WATER COOLER - 2 EA	12	WΚ	25.00		300
WATER	60	DAY	15.00		900
TELEPHONE SERVICE	1.5	MON	500.00		750
ELECTRICITY	1.5	MON	250.00		375
PICK-UP (2 EA)	3	MON	1000.00		3,000
SITE SUPERINTENDANT (1.5 MON * 210 HR/MON)	315	MNHR	65.00		- 20,475
FOREMEN (1.5 MON * 210 HR/MON)	315	MNHR	55.00		17,325
CLERK/TYPIST (1.5 MON * 168 HR/MON)	252	MNHR	25.00		6,300
ACCESS ROAD - 300 LF x 20' WIDE					
GRADE ROAD BED - DOZER & OPERATOR	0.5	DAY	1760.00		880
GRAVEL - 12" THICK	250	CY	10.00		2,500
SPREAD & COMPACT	0.25	DAY	1570.00		393
GEOFABRIC	700	SY	1.00		700
CLEAR TREES	0.5	AC	6900.00		3,450
EROSION CONTROL	325	LF	5.00		1,625
UXO CLEARANCE	15	DAY	1800.00		27,000
					-
EXCAVATION OF 9000 CY OF DEBRIS					-
BACKHOE & OPERATOR TRANSPORT TO ON-SITE CONSOLIDATION LANDERLY (50% SWEL	12		1460.00		17,520
DUMP TRUCK & DRIVER (12 FA)	144	DAY	770.00		110 880
	1		,,0.00		-
					-
	TOTAL THIS PA	 GE		 \$	222.928

PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY ALTERNATIVE 9: EXCAVATE AND CONSOLIDATE	JOB #	8712-04
LOCATION:	ALL SEVEN DISPOSAL AREAS DEVENS, MASSACHUSETTS	DATE	24-Jan-97

ESTIMATOR: P. R. MARTIN

EXCAVATE AND CONSOLIDATE SA 12		= = =	******	= =	******
DESCRIPTION	QTY	UNIT	UNIT COST		TOTAL
TOTAL PREVIOUS PAGE	-*			\$	222,928
SPREAD OVER ON-SITE CONSOLIDATION LANDFILL & COMPACT ROLLER & OPERATOR	12	DAY	1570.00		- 18,840
BACKFILL PURCHASED FROM OFF-SITE (INCLUDING 30% SWELL FACTOR)	11700	CY	10.00		- - 117,000
SITE RESTORATION					-
BACKFILL, GRADE, COMPACT	15	DAY	1570.00		23,550
FERTILIZE, SEED, MULCH	2400	SY	0.50		1.200
WETLANDS RESTORATION	0.1	AC	50000.00		5,000
REMOVE ACCESS ROAD					-
BACKHOE & OPERATOR	1	DAY	1460.00		1,460
DUMP TRUCK & DRIVER (2 EA)	2	DAY	770.00		1,540
LABORER (2 EA)	16	HR	33.50		536
UNDEVELOPED DESIGN DETAILS ~25%					97,947
TOTAL SA 12				\$	490,000

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PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY	JOB #	8712-04
	ALTERNATIVE 9: EXCAVATE AND CONSOLIDATE		
	ALL SEVEN DISPOSAL AREAS		
LOCATION:	DEVENS, MASSACHUSETTS	DATE	24-Jan-97

ESTIMATOR: P. R. MARTIN

				= =	
			UNIT		
DESCRIPTION	ΟΤΥ	UNIT	COST		TOTAL
MOB/DEMOB (IN and OUT)	*****************				
DUMP TRUCKS	6	EA	385.00	\$	2,310
BACKHOE	2	EA	730.00		1,460
ROLLER	2	EA	785.00		1,570
OFFICE TRAILER	1.5	MON	150.00		225
STORAGE TRAILER	1.5	MON	100.00		150
SET UP TRAILER	2	EA	500.00		1,000
TOILET - 2 EA	12	WK	25.00		300
WATER COOLER - 2 EA	12	WK	25.00		300
WATER	60	DAY	15.00		900
TELEPHONE SERVICE	1.5	MON	500.00		750
ELECTRICITY	1.5	MON	250.00		375
PICK-UP (2 EA)	3	MON	1000.00		3,000
SITE SUPERINTENDANT (1.5 MON * 210 HR/MON)	315	MNHR	65.00		- 20,475
FOREMEN (1.5 MON * 210 HR/MON)	315	MNHR	55.00		17,325
CLERK/TYPIST (1.5 MON * 168 HR/MON)	252	MNHR	25.00		6,300
ACCESS ROAD - 200 LF x 20' WIDE					
GRADE ROAD BED - DOZER & OPERATOR	0.5	DAY	1760.00		880
GRAVEL - 12" THICK	150	CY	10.00		1,500
SPREAD & COMPACT	0.25	DAY	1570.00		393
GEOFABRIC	450	SY	1.00		450
CLEAR TREES	0.5	AC	6900.00		3,450
EROSION CONTROL	300	LF	5.00		1,500
UXO CLEARANCE	15	DAY	1800.00		- 27,000
EXCAVATION OF 10000 CY OF DEBRIS					-
BACKHOE & OPERATOR	13	DAY	1460.00		18,980
TRANSPORT TO ON-SITE CONSOLIDATION LANDFILL (50% SWEL	L FACTOR INCLU	JDED)			
DUMP TRUCK & OPERATOR (10 EA)	130	DAY	770.00		100,100
REMOVE ACCESS ROAD					-
BACKHOE & OPERATOR	1	DAY	1460.00		1,460
DUMP TRUCK & DRIVER (2 EA)	2	DAY	770.00		1,540
LABORER (2 EA)	16	HR	33.50		536
	TOTAL THIS PAG	GE		\$	214,229

PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY ALTERNATIVE 9: EXCAVATE AND CONSOLIDATE	JOB #	8712-04
LOCATION:	ALL SEVEN DISPOSAL AREAS DEVENS, MASSACHUSETTS	DATE	24-Jan-97

ESTIMATOR: P. R. MARTIN

EXCAVATE AND CONSOLIDATE SA 13				= =	
DESCRIPTION	ΩΤΥ	UNIT	UNIT COST		TOTAL
TOTAL PREVIOUS PAGE				\$	214,229
SPREAD OVER ON-SITE CONSOLIDATION LANDFILL & COMPACT ROLLER & OPERATOR	20	DAY	1570.00		- 31,400
BACKFILL PURCHASED FROM OFF-SITE (INCLUDING 30% SWELL FACTOR)	13000	ĊY	10.00		- 130,000
SITE RESTORATION BACKFILL, GRADE, COMPACT	16	DAY	1570.00		25,120
FERTILIZE, SEED, MULCH	2400	SY	0.50		1,200
UNDEVELOPED DESIGN DETAILS ~25%					- - 100,052
TOTAL SA 13				\$	502,000

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ROJECT:     LANDFILL REMEDIATION FEASIBILITY STUDY ALTERNATIVE 9: EXCAVATE AND CONSOLIDATE ALL SEVEN DISPOSAL AREA OCATION:     JØB #     8712-4 ALTERNATIVE 9: EXCAVATE AND CONSOLIDATE ALL SEVEN DISPOSAL AREA STIMATOR: P. R. MARTIN       DATE     24-Jan-9 DATE       STIMATOR: P. R. MARTIN       EXCAVATE AND CONSOLIDATE ACC 40 STIFE PREPARATION DESCRIPTION     UNIT       COLTAL SERVICES, INC.       STIE PREPARATION DESCRIPTION     UNIT       COLSPAN & GONSOLIDATE ACC 40 STIFE PREPARATION DESCRIPTION       COLSPAN & GONSOLIDATE ACC 40 STIFE PREPARATON       OLY UNIT       COST       COLSPAN & GENATOR GRADE - DOZER & OPERATOR       OLY 1950.00       CALVATE AND CONSOLIDATE ACC 40 STIFE ABRIC       COMPACT							•
ALTERNATIVE 9: EXCAVATE AND CONSOLIDATE ALL SEVEN DISPOSAL AREAS OCATION: DEVENS, MASSACHUSETTS     DATE     24-Jan-31       DATE     24-Jan-31       NGINEER:     ABB ENVIRONMENTAL SERVICES, INC.       STIMATOR:     P. R. MARTIN       EXCAVATE AND CONSOLIDATE AOC 40 SITE PREPARATION DESCRIPTION     UNIT       CLEAR & GRUB LIGHT VEGETATION DESCRIPTION     UNIT       ACCESS ROAD - 600 LF (SEDIMENT REMOVAL AREA I) CLEAR & GRUB LIGHT VEGETATION     0.3     AC     4300.00     \$     1.280 GRADE - DOZER & OPERATOR     0.5     DAY     1750.00     788 GRAVEL 12' THICK     450     CY     10.00     4.50 GRAVEL 12' THICK     1.350     SY     1.00     1.356 GRAVEL 12' THICK     1.350     SY     1.00     1.356 GRAVEL 12' THICK     400     CY     10.00     4.50 GRAVEL 12' THICK     400     CY     1.00     4.50 GRAVEL 12' THICK     4.50 GRAVEL 12' THICK     4.50 GRAVEL 12' THICK     4.50 GRAVEL 12' THICK     5.5		LANDEUL REMEDIATION FEASIBILITY STUDY			JOB #		8712-04
ALL SEVEN DISPOSAL AREAS OCCATION: DEVENS, MASSACHUSETTS     DATE     24-Jan-9       NGINEER: ABB ENVIRONMENTAL SERVICES, INC.     STIMATOR: P. R. MARTIN     UNIT     UNIT       EXCAVATE AND CONSOLIDATE AOC 40 STREP PREPARATION DESCRIPTION     UTV     UNIT     COST       ACCESS ROAD - 600 LF (SEDIMENT REMOVAL AREA I) CLEAR & GRUB LIGHT VEGETATION GRADE - DOZER & OPERATOR     0.3     AC     4300.00     \$     1.290       GRADE - DOZER & OPERATOR     0.5     DAY     1760.00     880     500       GRADE - DOZER & OPERATOR     0.5     DAY     1570.00     786     780       CLEAR & GRUB LIGHT VEGETATION CLEAR & GRUB LIGHT VEGETATION     0.25     AC     4300.00     1.072       GRADE - DOZER & OPERATOR     0.5     DAY     1570.00     786       SEDIMENT DEWATERING PAD     -     -     786       CLEAR & GRUB LIGHT VEGETATION     0.25     AC     4300.00     1.072       GRADE - DOZER & OPERATOR     0.5     DAY     1760.00     886       GRAVEL - 12" THICK     400     CY     10.00     4.000       SEDIMENT DEWATERING PAD     -     -	1002011	ALTERNATIVE 9: EXCAVATE AND CONSOLIDATE					
DCCATION:     DEVENS, MASSACHUSETTS     DATE     24-Jan-9       NGINEER:     ABB ENVIRONMENTAL SERVICES, INC.     STIMATOR: P. R. MARTIN     UNIT		ALL SEVEN DISPOSAL AREAS					
NGINEER:     ABB ENVIRONMENTAL SERVICES, INC.       STIMATOR:     P. R. MARTIN       EXCAVATE AND CONSOLIDATE AOC 40 STRE PREPARATION DESCRIPTION     UNIT     UNIT       ACCESS ROAD - 600 LF (SEDIMENT REMOVAL AREA I) CLEAR & GRUB LIGHT VEGETATION GRADE - DOZER & OPERATOR     0.3     AC     4300.00     \$     1.290 (BRADE - DOZER & OPERATOR     0.5     DAY     1760.00     880 (BRAVEL - 12' THICK     450     CY     10.00     4.500 (BRADE - DOZER & OPERATOR     0.25     AC     4300.00     1.797 (BRADE - DOZER & OPERATOR     0.25     AC     4300.00     1.780 (BRADE - DOZER & OPERATOR     0.5     DAY     1760.00     880 (BRAVEL - 12' THICK     400     CY     10.00     4.500 (BRADE - DOZER & OPERATOR     0.5     DAY     1760.00     880 (BRAVEL - 12' THICK     400     CY     10.00     4.000 (BRADE - DOZER & OPERATOR     0.5     DAY     1570.00     788 (BRAVEL - 12' THICK     400     CY     10.00     4.000 (BRADE - DOZER & OPERATOR     0.5     DAY     1570.00     788 (BRADE - DOZER & OPERATOR     0.5     DAY     1570.00     788 (DRADE - DOZER & OPERATOR     0.25     DAY     1570.00     1.000 (DRADE - DOZER & OPERATOR     <	.OCATION:	DEVENS, MASSACHUSETTS			DATE		24-Jan-97
NUMBER:     ABB ENVIRONMENTAL SERVICES, INC.       STIMATOR: P. R. MARTIN     EXCAVATE AND CONSOLIDATE AOC 40 SITE PREPARATION     UNIT       ACCESS ROAD - 600 LF (SEDIMENT REMOVAL AREA I) CLEAR & GRUB LIGHT VEGETATION     0.3     AC     4300.00     \$     1.290       GRADE - DOZER & OPERATOR     0.5     DAY     1760.00     880       GRADE - DOZER & OPERATOR     0.5     DAY     1770.00     781       FILTER FABRIC     1350     SY     1.00     1.350       PARKING AREA     0.25     AC     4300.00     1.071       CLEAR & GRUB LIGHT VEGETATION     0.25     AC     4300.00     1.075       GRADE - DOZER & OPERATOR     0.5     DAY     1760.00     880       GRADE - DOZER & OPERATOR     0.5     DAY     1760.00     880       GRADE - DOZER & OPERATOR     0.5     DAY     1760.00     880       GRADE - DOZER & OPERATOR     0.5     DAY     1760.00     880       GRADE - DOZER & OPERATOR     0.5     DAY     1760.00     800       SEDIMENT REMOVAL AREA III     0.5     DAY     1							
STIMATOR: P. R. MARTIN       EXCAVATE AND CONSOLIDATE AOC 40 SITE PREPARATION     UNIT     UNIT       ACCESS ROAD - 600 LF (SEDIMENT REMOVAL AREA I) CLEAR & GRUB LIGHT VEGETATION     0.3     AC     4300.00     \$       ACCESS ROAD - 600 LF (SEDIMENT REMOVAL AREA I) CLEAR & GRUB LIGHT VEGETATION     0.3     AC     4300.00     \$       AGROBE - DOZER & OPERATOR     0.5     DAY     1760.00     880       GRADE - DOZER & OPERATOR     0.5     DAY     1760.00     880       GRADE - DOZER & OPERATOR     0.5     DAY     1760.00     880       GRADE - DOZER & OPERATOR     0.25     AC     4300.00     1.07       FILTER FABRIC     10.00     A00     1.00     1.00     1.00     1.00     1.00     1.00     1.00     1.00     1.00     1.00	INGINEER:	ABB ENVIRONMENTAL SERVICES, INC.					
EXCAVATE AND CONSOLIDATE AOC 40 SITE PREPARATION DESCRIPTION     UNIT     UNIT       ACCESS ROAD - 600 LF (SEDIMENT REMOVAL AREA I) CLEAR & GRUB LIGHT VEGETATION     0.3     AC     4300.00     \$     1.290       GRADE - DOZER & OPERATOR     0.5     DAY     1760.00     880       GRADE - DOZER & OPERATOR     0.5     DAY     1760.00     880       GRAVEL - 12" THICK     450     CY     10.00     4.500       SPREAD & COMPACT     0.5     DAY     1570.00     788       FILTER FABRIC     1350     SY     1.00     1.350       GRAVEL - 12" THICK     400     CY     10.00     4.000       GRAVEL - 12" THICK     400     CY     10.00     4.000       SIDIMENT DEWATERING PAD     0.5     DAY     1570.00     788       CLEAR & GRUB LIGHT VEGETATION     0.25     AC     4300.00     1.072       GRAVEL - 12" THICK     400     CY     10.00     4.000       SUMP ADWATERING PAD     0.5     DAY     1570.00     788       GRADE DOZER & OPERATOR     0.5     DAY	ESTIMATOR:	: P. R. MARTIN					
EXCAVATE AND CONSOLIDATE AOC 40 SITE PREPARATION     UNIT     COST     TOTAL       ACCESS ROAD - 600 LF (SEDIMENT REMOVAL AREA I)     0TY     UNIT     COST     TOTAL       ACCESS ROAD - 600 LF (SEDIMENT REMOVAL AREA I)     0.3     AC     4300.00     \$     1.290       CLEAR & GRUB LIGHT VEGETATION     0.3     AC     4300.00     \$     1.290       GRADE - DOZER & OPERATOR     0.5     DAY     1760.00     880       GRADE - DOZER & OPERATOR     0.5     DAY     1570.00     788       FILTER FABRIC     1350     SY     1.00     4.500       CLEAR & GRUB LIGHT VEGETATION     0.25     AC     4300.00     1.075       GRADE - DOZER & OPERATOR     0.5     DAY     1570.00     788       GRADE - DOZER & OPERATOR     0.5     DAY     1570.00     788       CLEAR & GRUB LIGHT VEGETATION     0.25     AC     4300.00     1.077       CEAR & GRUE LIGHT VEGETATION     0.25     DAY     1570.00     788       CEIDAR & GRUB LIGHT VEGETATION     0.25     DAY     1570.00     1.00				=== =		æ =	=====
STEE PREPARATION     UNIT     UNIT     TOTAL       ACCESS ROAD - 600 LF (SEDIMENT REMOVAL AREA I)     0.3 AC     4300.00 \$     1.290       CLEAR & GRUE LIGHT VEGETATION     0.3 AC     4300.00 \$     1.290       GRADE - DOZER & OPERATOR     0.5 DAY     1760.00     880       GRAVEL - 12" THICK     450 CY     10.00     4,500       SPREAD & COMPACT     0.5 DAY     1570.00     788       FILTER FABRIC     1350 SY     1.00     1.350       CALEAR & GRUB LIGHT VEGETATION     0.25 AC     4300.00     1.077       GRADE - DOZER & OPERATOR     0.5 DAY     1760.00     880       GRADE - DOZER & OPERATOR     0.5 DAY     1760.00     880       GRADE - DOZER & OPERATOR     0.5 DAY     1760.00     880       SEDIMENT DEWATERING PAD     0.5 DAY     1760.00     800       CLEAR & GRUB LIGHT VEGETATION     0.25 AC     4300.00     1.072       GRADE - DOZER & OPERATOR     0.5 DAY     1760.00     400       SUMP & SUMP PUMP     1     LS     2500.00     2.500       DECON AREA - 10'X20'		EXCAVATE AND CONSOLIDATE AOC 40					
DESCRIPTION     OTY     UNIT     COST     T07AL       ACCESS ROAD - 600 LF (SEDIMENT REMOVAL AREA I) CLEAR & GRUB LIGHT VEGETATION     0.3     AC     4300.00     \$     1.290       GRADE - DOZER & OPERATOR     0.5     DAY     1760.00     4.500     88       GRAVE - 12" THICK     450     CY     10.00     4.500     788       PILTER FABRIC     1350     SY     1.00     1.350     SY     1.00     1.350       CARA & GRUB LIGHT VEGETATION     0.25     AC     4300.00     1.07     788       GRADE - DOZER & OPERATOR     0.5     DAY     1570.00     788     786       GRADE - DOZER & GREATOR     0.5     DAY     1760.00     880     680     1.07     788     776     788     776     788     776     788     776     788     776     788     776     788     776     788     776     788     776     788     776     788     776     788     776     788     776     788     776     788     77600		SITE PREPARATION			UNIT		
ACCESS ROAD - 600 LF (SEDIMENT REMOVAL AREA I) CLEAR & GRUB LIGHT VEGETATION GRADE - DOZER & OPERATOR GRAVEL - 12' THICK SPREAD & COMPACT FILTER FABRIC CLEAR & GRUB LIGHT VEGETATION CLEAR & GRUB LIGHT VEGETATIO		DESCRIPTION	<u> </u>		COST		TOTAL
ACCESS ROAD - 600 LF GEDIMENT REMOVAL AREA I) CLEAR & GRUB LIGHT VEGETATION GRADE - DOZER & OPERATOR GRAVEL - 12' THICK SPREAD & COMPACT FILTER FABRIC PARKING AREA CLEAR & GRUB LIGHT VEGETATION CLEAR & OPERATOR GRADE - DOZER & OPERATOR GRADE - DOZER & OPERATOR GRADE - LOZER & OPERATOR GRAVEL - 12' THICK SPREAD & COMPACT LINER LINER LINER LINER SUMP PUMP 1 LS 2500.00 SUMP & SUMP PUMP 1 LS 2500.00 CY 10.00 SUMP & SUMP PUMP 1 LS 2500.00 CY 10.00 SUMP & SUMP PUMP 1 LS 2500.00 CY 10.00 SUMP & SUMP PUMP 1 LS 2500.00 CY 10.00 A400 GRAVEL - 12' THICK 450 SY 1.00 15.00 CY 10.00 SPREAD & COMPACT CLEAR & OPERATOR CHEAR & OPERATOR CHEAR & OPERATOR CHEAR & OPERATOR CLEAR & OPERATOR CLEAR & OPERATOR CLEAR & COMPACT CLEAR & COMPACT CLEAR & OPERATOR CLEAR & OPE							
CLEAR & GRUB LIGHT VEGETATION     0.3     X     450.00     Y     1.25       GRADE - 12" THICK     450     CY     10.00     4.50       SPREAD & COMPACT     0.5     DAY     1570.00     788       FILTER FABRIC     1350     SY     1.00     1.35       CLEAR & GRUB LIGHT VEGETATION     0.25     AC     4300.00     1.07       GRADE - DOZER & OPERATOR     0.5     DAY     1760.00     880       GRADE - DOZER & OPERATOR     0.5     DAY     1760.00     880       GRADE - DOZER & OPERATOR     0.5     DAY     1760.00     880       SEDIMENT DEWATERING PAD     -     -     -     -       CLEAR & GRUB LIGHT VEGETATION     0.25     AC     4300.00     1.077       GRADE - DOZER & OPERATOR     0.5     DAY     1760.00     880       GRAVEL - 12" THICK     400     CY     10.00     4.000       SUMP & SUMP PUMP     1     LS     2500.00     2.500     -       DECON AREA - 10'x20'     3     EA     5000.00	ACCESS R	ROAD - 600 LF (SEDIMENT REMOVAL AREA I)	0.3	AC	4300.00	¢	1 290
OFAULE - 12" THICK     450     CY     10.00     450       SPREAD & COMPACT     0.5     DAY     1570.00     785       FILTER FABRIC     1350     SY     1.00     1.356       PARKING AREA     -     -     -       CLEAR & GRUB LIGHT VEGETATION     0.25     AC     4300.00     1.075       GRADE - DOZER & OPERATOR     0.5     DAY     1760.00     886       GRAVEL - 12" THICK     400     CY     10.00     4.000       SPREAD & COMPACT     0.5     DAY     1760.00     886       GRAVEL - 12" THICK     400     CY     10.00     4.000       SEDIMENT DEWATERING PAD     -     -     -     -       CLEAR & GRUB LIGHT VEGETATION     0.25     AC     4300.00     1.076       GRADE - DOZER & OPERATOR     0.5     DAY     1760.00     880       SUMP PUMP     1     LS     2500.00     2.500       DECON AREA - 10'x20'     3     EA     5000.00     -       GRADE - DOZER & OPERATOR     0.25			0.3		4300.00	Ŷ	1,230
ONAVEL 12     TINCK     430     C     TOXO     430       SPREAD & COMPACT     0.5     DAY     1570.00     788       PARKING AREA     1350     SY     1.00     1.350       CLEAR & GRUB LIGHT VEGETATION     0.25     AC     4300.00     1.075       GRADE - DOZER & OPENATOR     0.5     DAY     1760.00     880       GRAVEL 12* THICK     400     CY     10.00     4.000       SEDIMENT DEWATERING PAD     0.5     DAY     1570.00     880       CLEAR & GRUB LIGHT VEGETATION     0.25     AC     4300.00     1.077       GRADE - DOZER & OPENATOR     0.5     DAY     1570.00     880       GRAVEL - 12* THICK     400     CY     10.00     4.000       SPREAD & COMPACT     0.5     DAY     1570.00     2.500       LINER     10000     SF     1.00     10.000       SUMP & SUMP PUMP     1     LS     2500.00     2.500       DECON AREA - 10'x20'     3     EA     5000.00     1.500	GRAVE		0.9	CV	10.00		4 500
SINEAD & CONTACT   13.0   1.350   The second	SPREAT		490		1570.00		4,500
THEIT FAIL   1,500   51   1,000   1,000     PARKING AREA		FARRIC	1350	SV	1 00		1 350
CLEAR & GRUB LIGHT VEGETATION     0.25     AC     4300.00     1.075       GRADE - DOZER & OPERATOR     0.5     DAY     1760.00     880       GRAVEL - 12" THICK     400     CY     10.00     4.000       SPREAD & COMPACT     0.5     DAY     1760.00     880       CLEAR & GRUB LIGHT VEGETATION     0.25     AC     4300.00     1.075       SEDIMENT DEWATERING PAD     - </td <td>PARKING</td> <td>AREA</td> <td>1550</td> <td>51</td> <td>1.00</td> <td></td> <td>-</td>	PARKING	AREA	1550	51	1.00		-
GRADE - DOZER & OPERATOR     0.5     DAY     1760.00     880       GRADE - 12" THICK     400     CY     10.00     4.00       SPEAD & COMPACT     0.5     DAY     1570.00     788       SEDIMENT DEWATERING PAD     -     -     -     -       CLEAR & GRUB LIGHT VEGETATION     0.25     AC     4300.00     1.07       GRADE - DOZER & OPERATOR     0.5     DAY     1760.00     880       GRADE - DOZER & OPERATOR     0.5     DAY     1760.00     880       GRADE - DOZER & OPERATOR     0.5     DAY     1760.00     880       GRAVEL - 12" THICK     400     CY     10.00     4.000       SUMP & SUMP PUMP     1     LS     2500.00     2.500       DECON AREA - 10'x20'     3     EA     5000.00     15.000       GRADE - DOZER & OPERATOR     0.25     DAY     1760.00     440       GRADE - 10'x20'     3     EA     5000.00     1.500       SPREAD & COMPACT     0.25     DAY     1760.00     440 <t< td=""><td>CLEAR</td><td>&amp; GRUB LIGHT VEGETATION</td><td>0.25</td><td>AC.</td><td>4300.00</td><td></td><td>1.075</td></t<>	CLEAR	& GRUB LIGHT VEGETATION	0.25	AC.	4300.00		1.075
GRAVEL - 12" THICK   400   CY   10.00   4.000     SPREAD & COMPACT   0.5   DAY   1570.00   785     SEDIMENT DEWATERING PAD   -   -   -   -     CLEAR & GRUB LIGHT VEGETATION   0.25   AC   4300.00   1.075     GRADE - DOZER & OPERATOR   0.5   DAY   1570.00   886     GRAVEL - 12" THICK   400   CY   10.00   4.000     SPREAD & COMPACT   0.5   DAY   1570.00   886     GRAVEL - 12" THICK   400   CY   10.00   4.000     SUMP & SUMP PUMP   1   LS   2500.00   2.500     DECON AREA - 10'x20'   3   EA   5000.00   15,000     GRAVEL - 12" THICK   150   CY   10.00   1,500     SPREAD & COMPACT   0.25   DAY   1570.00   393     FILTER FABRIC	GRADE	- DOZER & OPERATOR	0.5	DAY	1760.00		880
SPREAD & COMPACT     0.5     DAY     1570.00     785       SEDIMENT DEWATERING PAD     0.5     DAY     1570.00     1.07       CLEAR & GRUB LIGHT VEGETATION     0.25     AC     4300.00     1.07       GRADE - DOZER & OPERATOR     0.5     DAY     1760.00     880       GRAVEL - 12" THICK     400     CY     10.00     4.000       SPREAD & COMPACT     0.5     DAY     1570.00     785       LINER     10000     SF     1.00     10.000     785       DECON AREA - 10'x20'     3     EA     5000.00     15.000     -       WORK PLATFORM (SEDIMENT REMOVAL AREA II)     -     -     -     -       GRADE - DOZER & OPERATOR     0.25     DAY     1760.00     4400       GRAVEL - 12" THICK     150     CY     10.00     1,500       SPREAD & COMPACT     0.25     DAY     1570.00     393       FILTER FABRIC     450     SY     1.00     450       -     -     -     -     -     - </td <td>GRAVE</td> <td>L - 12" THICK</td> <td>400</td> <td>CY</td> <td>10.00</td> <td></td> <td>4,000</td>	GRAVE	L - 12" THICK	400	CY	10.00		4,000
SEDIMENT DEWATERING PAD	SPREAD	D & COMPACT	0.5	DAY	1570.00		785
CLEAR & GRUB LIGHT VEGETATION   0.25   AC   4300.00   1,075     GRADE - DOZER & OPERATOR   0.5   DAY   1760.00   880     GRAVEL - 12" THICK   400   CY   10.00   4,000     SPREAD & COMPACT   0.5   DAY   1570.00   785     LINER   10000   SF   1.00   10,000     SUMP & SUMP PUMP   1   LS   2500.00   2,500     DECON AREA - 10'x20'   3   EA   5000.00   15,000     GRADE - DOZER & OPERATOR   0.25   DAY   1760.00   4400     GRAVEL - 12" THICK   100   0.25   DAY   1760.00   4400     GRADE - DOZER & OPERATOR   0.25   DAY   1760.00   4400     GRAVEL - 12" THICK   150   CY   10.00   1,500     SPREAD & COMPACT   0.25   DAY   1570.00   333     FILTER FABRIC   450   SY   1.00   450     -   -   -   -   -     -   -   -   -   -     GRADE - DOZER & OPERATOR   0.25	SEDIMENT	DEWATERING PAD					-
GRADE - DOZER & OPERATOR   0.5   DAY   1760.00   886     GRAVEL - 12" THICK   400   CY   10.00   4,000     SPREAD & COMPACT   0.5   DAY   1570.00   785     LINER   10000   SF   1.00   10,000     SUMP & SUMP PUMP   1   LS   2500.00   2,500     DECON AREA - 10'x20'   3   EA   5000.00   15,000     WORK PLATFORM (SEDIMENT REMOVAL AREA II)   -   -   -     GRADE - DOZER & OPERATOR   0.25   DAY   1760.00   4400     GRAVEL - 12" THICK   150   CY   10.00   1,500     SPREAD & COMPACT   0.25   DAY   1760.00   440     GRAVEL - 12" THICK   150   CY   10.00   1,500     SPREAD & COMPACT   0.25   DAY   1570.00   393     FILTER FABRIC   450   SY   1.00   450     -   -   -   -   -     -   -   -   -   -     GRADE - DOZER & OPERATOR   SY   1.00   450   - </td <td>CLEAR</td> <td>&amp; GRUB LIGHT VEGETATION</td> <td>0.25</td> <td>AC</td> <td>4300.00</td> <td></td> <td>1,075</td>	CLEAR	& GRUB LIGHT VEGETATION	0.25	AC	4300.00		1,075
GRAVEL - 12" THICK   400   CY   10.00   4,000     SPREAD & COMPACT   0.5   DAY   1570.00   785     LINER   10000   SF   1.00   10,000     SUMP & SUMP PUMP   1   LS   2500.00   2,500     DECON AREA - 10'x20'   3   EA   5000.00   15,000     WORK PLATFORM (SEDIMENT REMOVAL AREA II)   -   -   -     GRADE - DOZER & OPERATOR   0.25   DAY   1760.00   4400     GRAVEL - 12" THICK   150   CY   10.00   1,500     SPREAD & COMPACT   0.25   DAY   1760.00   4400     GRAVEL - 12" THICK   150   CY   10.00   1,500     SPREAD & COMPACT   0.25   DAY   1570.00   393     FILTER FABRIC   450   SY   1.00   450     -   -   -   -   -   -     -   -   -   -   -   -     ITTER FABRIC   450   SY   1.00   450   -     -   -   -   -	GRADE	- DOZER & OPERATOR	0.5	DAY	1760.00		· 880
SPREAD & COMPACT     0.5     DAY     1570.00     785       LINER     10000     SF     1.00     10,000       SUMP & SUMP PUMP     1     LS     2500.00     2,500       DECON AREA - 10'x20'     3     EA     5000.00     15,000       WORK PLATFORM (SEDIMENT REMOVAL AREA II)     -     -     -       GRADE - DOZER & OPERATOR     0.25     DAY     1760.00     4400       GRAVE - 12" THICK     150     CY     10.00     1,500       SPREAD & COMPACT     0.25     DAY     1760.00     4400       GRAVE - 12" THICK     150     CY     10.00     1,500       SPREAD & COMPACT     0.25     DAY     1570.00     393       FILTER FABRIC     450     SY     1.00     450       -     -     -     -     -     -       -     -     -     -     -     -       GRAVE - 12" THICK     150     SY     1.00     450       -     -     -     -	GRAVE	L - 12" THICK	400	CY	10.00		4,000
LINER 10000 SF 1.00 10,000 SUMP & SUMP PUMP 1 LS 2500.00 2,500 DECON AREA - 10'x20' 3 EA 5000.00 15,000 GRADE - DOZER & OPERATOR 0.25 DAY 1760.00 440 GRAVEL - 12" THICK 150 CY 10.00 1,500 SPREAD & COMPACT 0.25 DAY 1570.00 393 FILTER FABRIC 450 SY 1.00 450	SPREAD	D & COMPACT	0.5	DAY	1570.00		785
SUMP & SUMP PUMP   1   LS   2500.00   2,500     DECON AREA - 10'x20'   3   EA   5000.00   15,000     WORK PLATFORM (SEDIMENT REMOVAL AREA II)   -   -   -     GRADE - DOZER & OPENATOR   0.25   DAY   1760.00   440     GRAVEL - 12" THICK   150   CY   10.00   1,500     SPREAD & COMPACT   0.25   DAY   1570.00   393     FILTER FABRIC   450   SY   1.00   450     TOTAL SITE PREPARATION   \$   52,568	LINER		10000	SF	1.00		10,000
DECON AREA - 10'x20' WORK PLATFORM (SEDIMENT REMOVAL AREA II) GRADE - DOZER & OPERATOR GRAVEL - 12" THICK SPREAD & COMPACT FILTER FABRIC TOTAL SITE PREPARATION 3 EA 5000.00 15,000  	SUMP 8	SUMP PUMP	1	LS	2500.00		2,500
WORK PLATFORM (SEDIMENT REMOVAL AREA II) GRADE - DOZER & OPERATOR 0.25 DAY 1760.00 440 GRAVEL - 12" THICK 150 CY 10.00 1,500 SPREAD & COMPACT 0.25 DAY 1570.00 393 FILTER FABRIC 450 SY 1.00 450 - - - - - - - - - - - - -	DECON AF	REA - 10'x20'	3	EA	5000.00		15,000
WORK PLATFORM (SEDIMENT REMOVAL AREA II)     -       GRADE - DOZER & OPERATOR     0.25     DAY     1760.00     440       GRAVEL - 12" THICK     150     CY     10.00     1,500       SPREAD & COMPACT     0.25     DAY     1570.00     393       FILTER FABRIC     450     SY     1.00     450       TOTAL SITE PREPARATION     \$ 52,568							-
WORK PLATFORM (SEDIMENT REMOVAL AREA II)     -       GRADE - DOZER & OPERATOR     0.25 DAY     1760.00     440       GRAVEL - 12" THICK     150 CY     10.00     1,500       SPREAD & COMPACT     0.25 DAY     1570.00     393       FILTER FABRIC     450 SY     1.00     450       TOTAL SITE PREPARATION     \$ 52,568							-
WORK PLATFORM (SEDIMENT REMOVAL AREA II)     -       GRADE - DOZER & OPERATOR     0.25     DAY     1760.00     440       GRAVEL - 12" THICK     150     CY     10.00     1,500       SPREAD & COMPACT     0.25     DAY     1570.00     393       FILTER FABRIC     450     SY     1.00     450       TOTAL SITE PREPARATION     \$ 52,568							_
WORK PLATFORM (SEDIMENT REMOVAL AREA II)     -       GRADE - DOZER & OPERATOR     0.25     DAY     1760.00     440       GRAVEL - 12" THICK     150     CY     10.00     1,500       SPREAD & COMPACT     0.25     DAY     1570.00     393       FILTER FABRIC     450     SY     1.00     450       TOTAL SITE PREPARATION     \$ 52,568							-
WORK PLATFORM (SEDIMENT REMOVAL AREA II)     -       GRADE - DOZER & OPERATOR     0.25     DAY     1760.00     440       GRAVEL - 12" THICK     150     CY     10.00     1,500       SPREAD & COMPACT     0.25     DAY     1570.00     393       FILTER FABRIC     450     SY     1.00     450       TOTAL SITE PREPARATION     \$ 52,568							-
WORK PLATFORM (SEDIMENT REMOVAL AREA II)     -       GRADE - DOZER & OPERATOR     0.25     DAY     1760.00     440       GRAVEL - 12" THICK     150     CY     10.00     1,500       SPREAD & COMPACT     0.25     DAY     1570.00     393       FILTER FABRIC     450     SY     1.00     450							-
GRADE - DOZER & OPERATOR   0.25   DAY   1760.00   440     GRAVEL - 12" THICK   150   CY   10.00   1,500     SPREAD & COMPACT   0.25   DAY   1570.00   393     FILTER FABRIC   450   SY   1.00   450	WORK PLA	TFORM (SEDIMENT REMOVAL AREA II)					-
GRAVEL - 12" THICK   150 CY   10.00   1,500     SPREAD & COMPACT   0.25 DAY   1570.00   393     FILTER FABRIC   450 SY   1.00   450     -     -     -     TOTAL SITE PREPARATION   \$ 52,568	GRADE	- DOZER & OPERATOR	0.25	DAY	1760.00		440
SPREAD & COMPACT     0.25     DAY     1570.00     393       FILTER FABRIC     450     SY     1.00     450       -       -       -       -       -       TOTAL SITE PREPARATION     \$ 52,568	GRAVEL	L - 12" THICK	150	CY	10.00		1,500
FILTER FABRIC   450 SY   1.00   450     -   -   -   -	SPREAD	) & COMPACT	0.25	DAY	1570.00		393
	FILTER I	FABRIC	450	SY	1.00		450
TOTAL SITE PREPARATION \$ 52,568							•
TOTAL SITE PREPARATION \$ 52,568							-
TOTAL SITE PREPARATION \$ 52,568							-
TOTAL SITE PREPARATION \$ 52,568							-
TOTAL SITE PREPARATION \$ 52,568							-
TOTAL SITE PREPARATION \$ 52,568							-
TOTAL SITE PREPARATION \$ 52,568							
			TOTAL SITE PRE	PARATION		\$	52,568

PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY ALTERNATIVE 9: EXCAVATE AND CONSOLIDATE	JOB #	8712-04
	ALL SEVEN DISPOSAL AREAS	DATE	24 400 07
LOCATION:	DEVENS, MASSACHUSETTS	DATE	24-Jan-97

#### ESTIMATOR: P. R. MARTIN

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DESCRIPTION	QTY	UNIT	COST	TOTAL
EQUIPMENT (IN and OUT)	. <i></i>	*****		
FRAC TANK	8	EA	250.00	\$ 2,000
DEWATERING PUMP & HOSE	4	EA	100.00	400
DUMP TRUCKS	16	EA	385.00	6,160
BACKHOE	. 2	EA	730.00	1,460
ROLLER	4	EA	785.00	3,140
CLAM SHELL	2	EA	640.00	1,280
OFFICE TRAILER	7	MON	150.00	1,050
STORAGE TRAILER	7	MON	150.00	1,050
TRAILER DELIVERY, SET-UP, REMOVAL	2	EA	300.00	600
TOILET - 2 EA	60	WK	25.00	1,500
WATER COOLER - 2 EA	60	WΚ	25.00	1,500
WATER	300	DAY	15.00	4,500
TELEPHONE SERVICE	7	MON	500.00	3,500
ELECTRICITY	7	MON	250.00	1,750
PICK-UP (2 EA)	14	MON	1000.00	14,000
OFFICE EQUIPMENT	7	MON	1000.00	7,000
PUMPS, TOOLS, MINOR EQUIPMENT	1	LS	5000.00	5,000
				-
LABORER (2 MEN*10 DAY/MAN*8 HR/DAY)	160	MNHR	33.50	5,360
CARPENTER (2 MEN*10 DAY/MAN*8 HR/DAY)	160	MNHR	48.00	7,680
ELECTRICIAN (2 MEN*10 DAY/MAN*8 HR/DAY)	160	MNHR	50.50	8,080
SITE SUPERINTENDANT (7 MON*210HR/MON)	1470	MNHR	65.00	95,550
FOREMAN (7 MON*210HR/MON)	1470	MNHR	55.00	80,850
CLERK/TYPIST (7 MON*168HR/MON)	1176	MNHR	25.00	29,400
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TOTAL MOBILIZATION

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\$ 282,810

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PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY	JOB #	8712-04
LOCATION:	ALL SEVEN DISPOSAL AREAS DEVENS, MASSACHUSETTS	DATE	24-Jan-97

ESTIMATOR: P. R. MARTIN

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EXCAVATE AND CONSOLIDATE AOC 40 SEDIMENT REMOVAL AND DISPOSAL DESCRIPTION	QTY	UNIT UNIT COST		T	OTAL
CONSTRUCT SILT FENCE AROUND CONTAMINATED AREAS	650	LF	5.00	\$	3,250
EXCAVATE WITH CLAMSHELL 1200 CY SEDIMENTS + 600 CY ACCESS ROADS/WORK PLATFORM	19 IS	DAY	1280.00		24,320 -
HAUL SEDIMENTS TO DEWATERING PAD (2 EA DUMP TRUCK & DRIVER)	38	DAY	770.00		29,260 -
LOAD DRY SEDIMENTS FOR TRANSPORTATION TO DISPOSAL AREA (FRONT END LOADER & OPERATOR)	10	DAY	825.00		8,250 - -
LABORERS - 2 EA FOR 25 DAYS	400	MNHR	33.50		13,400
TCLP TESTING	2	SMPL	1500.00		3,000
ON-SITE STABILIZATION OF SEDIMENTS WITH SAND	400	CY	15.00		6,000
TRANSPORTATION AND DISPOSAL AT CONSOLIDATION LANDFILL (3 EA DUMP TRUCK & DRIVER)	30	DAY	770.00		- 23,100 -
TRANSPORTATION OF WATER	140000	GAL	INCL WITH DISP	OSAL	-
TREATMENT OF DEWATERING WATER	1	LS	21800.00		- 21,800
PUMP WATER FROM DEWATERING PAD TO PONDS	12	DAY	50.00		- 600 - - - -
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TOTAL SEDIMENT REMOVAL AND DISPOSAL

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\$ 132,980

PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY ALTERNATIVE 9: EXCAVATE AND CONSOLIDATE			JOB #		8712-04
LOCATION:	ALL SEVEN DISPOSAL AREAS DEVENS, MASSACHUSETTS			DATE		24-Jan-97
ENGINEER:	ABB ENVIRONMENTAL SERVICES, INC.					
ESTIMATOR	: P. R. MARTIN					
	EXCAVATE AND CONSOLIDATE AOC 40 DRUM REMOVAL AND DISPOSAL DESCRIPTION	QTY	unit	UNIT COST	= =	= = = = = = TOTAL
BACKHOE	& OPERATOR	3	DAY	1460.00	\$	4,380
LABORER	- 2 EA, 3 DAYS	48	MNHR	33.50		1,608
						-
TRANSPO CONSO	RT DRUMS TO DLIDATION LANDFILL - DUMP TRUCK & DRIVER	3	DAY	770.00		2,310
TCLP TES	TING OF DRUM CONTENTS	2	EA	1500.00		3,000
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	TOTAL DRUM REMOVAL AND DISPOSAL		<b></b>		\$	11,298
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PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY ALTERNATIVE 9: EXCAVATE AND CONSOLIDATE	JOB #	8712-04
LOCATION:	ALL SEVEN DISPOSAL AREAS DEVENS, MASSACHUSETTS	DATE	24-Jan-97

#### ESTIMATOR: P. R. MARTIN

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EXCAVATE AND CONSOLIDATE ACC 40 EXCAVATION AND BACKFILL			UNIT			
DESCRIPTION		UNI1			101AL	
CLEAR & GRUB SITE	4	AC	4300.00	\$	17,200	
EROSION CONTROL	500	LF	5.00		2,500	
SUMP PUMP & HOSES	6	MON	2500.00		15,000	
UXO CLEARANCE	138	DAY	1800.00		248,400	
EXCAVATION OF 110000 CY OF DEBRIS	138	DAY	1460.00		- - 201,480	
TRANSPORT TO ON-SITE CONSOLIDATION LANDFILL (50% SWEI	L FACTOR INCL	JDED)	770.00		047.000	
DUMP TRUCK & DRIVER (8 EA)	1100	DAY	//0.00		847,000	
SPREAD OVER ON-SITE CONSOLIDATION LANDFILL & COMPACT	070	DAV	1570.00		-	
ROLLER & OPERATOR (2 EA)	276	DAY	1570.00		433,320	
BACKFILL PURCHASED FROM OFF-SITE					-	
(INCLUDING 30% SWELL FACTOR)	18710	CY	10.00		187,100	
SITE RESTORATION					-	
BACKFILL, GRADE, COMPACT	24	DAY	1570.00		37,680	
FERTILIZE, SEED, MULCH	19360	SY	0.50		<b>9,68</b> 0	
WETLANDS RESTORATION	4	AC	50000.00		200,000	
MONITORING WELLS, 4" DIA x 30' DP	2	EA	2400.00		4,800	
GUIDE RAIL ALONG ROAD	1000	LF	12.50		12,500	

TOTAL EXCAVATION AND BACKFILL

\$ 2,216,660

	PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY ALTERNATIVE 9: EXCAVATE AND CONSOLIDATE	JOB #	8712-04
	LOCATION:	ALL SEVEN DISPOSAL AREAS DEVENS, MASSACHUSETTS	DATE	24-Jan-97
•	ENGINEER:	ABB ENVIRONMENTAL SERVICES, INC.		

EXCAVATE AND CONSOLIDATE AOC 40					
DESCRIPTION	ΔΤΥ	UNIT	COST		TOTAL
TOTAL SITE PREPARATION				\$	52,568
TOTAL MOBILIZATION					282,810
TOTAL SEDIMENT REMOVAL AND DISPOSAL					132,980
TOTAL DRUM REMOVAL AND DISPOSAL					11,298
TOTAL EXCAVATION AND BACKFILL				2	2,216,660
UNDEVELOPED DESIGN DETAILS ~25%					- 673,685
TOTAL AOC 40				\$ 3	3,370,000

PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY ALTERNATIVE 9: EXCAVATE AND CONSOLIDATE	JOB #	8712-04
LOCATION:	ALL SEVEN DISPOSAL AREAS DEVENS, MASSACHUSETTS	DATE	24-Jan-97
ENGINEER:	ABB ENVIRONMENTAL SERVICES, INC.		

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EXCAVATE AND CONSOLIDATE AUC 41			UNIT		
DESCRIPTION	ΩΤΥ	UNIT	COST		TOTAL
MOB/DEMOB (IN and OUT)		<u> </u>	- <u></u>		
BACKHOE TO AOC 41	2	EA	730.00	\$	1,460
DOZER & ROLLER TO AOC 41	2	EA	660.00		1,320
ACCESS ROAD - 350 LF x 20' WIDE					-
GRADE ROAD BED - DOZER & OPERATOR	0.5	DAY	1760.00		880
GRAVEL - 12" THICK	800	SY	5.00		4,000
GEOFABRIC	800	SY	2.00		1,600
CLEAR TREES	0.5	AC	6000.00		3,000
EROSION CONTROL	150	LF	5.00		- 750
FOREMAN	100	HR	55.00		- 5,500
UXO CLEARANCE	3	DAY	1800.00		- 5,400
EXCAVATION OF 1500 CY OF DEBRIS					-
BACKHOE & OPERATOR	2	DAY	1460.00		2,920
TRANSPORT TO ON-SITE CONSOLIDATION LANDFILL (50% SWELL FA	ACTOR INCLU	JDED)			
DUMP TRUCK & DRIVER (10 EA)	20	DAY	770.00		15,400
SPREAD OVER ON-SITE CONSOLIDATION LANDFILL & COMPACT					-
ROLLER & OPERATOR	3	DAY	1570.00		4,710
BACKFILL PURCHASED FROM OFF-SITE					-
(INCLUDING 30% FACTOR)	1950	CY	10.00		19,500
SITE RESTORATION					-
BACKFILL, GRADE, COMPACT	3	DAY	1570.00		4,710
FERTILIZE, SEED, MULCH	700	SY	0.50		350
REMOVE ACCESS ROAD (~110 LF)					-
FRONT END LOADER & OPERATOR	1	DAY	825.00		825
DUMP TRUCK & DRIVER (2 EA)	2	DAY	770.00		1,540
LABORER (2 EA)	16	HR	33.50		536
UNDEVELOPED DESIGN DETAILS ~25%					18,599
TOTAL AOC 41				\$	93,000

PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY ALTERNATIVE 9: EXCAVATE AND CONSOLIDATE	JOB #	8712-04
LOCATION:	ALL SEVEN DISPOSAL AREAS DEVENS, MASSACHUSETTS	DATE	24-Jan-97
ENGINEER:	ABB ENVIRONMENTAL SERVICES, INC.		

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CONSOLIDATION LANDFILL CONSTRUCTION			UNIT	
DESCRIPTION	QTY	UNIT	COST	 TOTAL
MOBILIZATION				
DUMP TRUCKS - 16 EA	32	EA	385.00	\$ 12,320
BACKHOE - 2 EA	4	EA	730.00	2,920
ROLLER - 2 EA	4	EA	785.00	3,140
DOZER	2	EA	880.00	1,760
				-
OFFICE TRAILER	9	MON	150.00	1,350
STORAGE TRAILER	9	MON	150.00	1,350
TRAILER DELIVERY, SET-UP, REMOVAL	2	EA	300.00	600
TOILET - 2 EA	80	WK	25.00	2,000
WATER COOLER - 2 EA	80	WK	25.00	2,000
WATER	400	DAY	15.00	6,000
ELEPHONE SERVICE	9	MON	500.00	4,500
ELECTRICITY	9	MON	250.00	2,250
PICK-UP (2 EA)	18	MON	1000.00	18,000
OFFICE EQUIPMENT	9	MON	1000.00	<del>9</del> ,000
PUMPS, TOOLS, MINOR EQUIPMENT	1	LS	5000.00	5,000
LABORER (2 MEN*10 DAY/MAN*8 HR/DAY)	160	MNHR	33.50	5,360
CARPENTER (2 MEN*10 DAY/MAN*8 HR/DAY)	160	MNHR	48.00	7,680
ELECTRICIAN (2 MEN*10 DAY/MAN*8 HR/DAY)	160	MNHR	50.50	8,080
SITE SUPERINTENDANT (9 MON*210HR/MON)	1890	MNHR	65.00	122,850
FOREMAN (9 MON*210HR/MON)	1890	MNHR	55.00	103,950
CLERK/TYPIST (9 MON*168HR/MON)	1512	MNHR	25.00	37,800
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TOTAL MOBILIZATION

\$ 357,910

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PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY ALTERNATIVE 9: EXCAVATE AND CONSOLIDATE			JOB #	8712-04
LOCATION:	ALL SEVEN DISPOSAL AREAS DEVENS, MASSACHUSETTS			DATE	24-Jan-97
ENGINEER:	ABB ENVIRONMENTAL SERVICES, INC.				
ESTIMATOR	P. R. MARTIN				
	CONSOLIDATION LANDFILL CONSTRUCTION SITE PREPARATION DESCRIPTION	0TY	= = = = UNIT	UNIT	TOTAL
CLEAR & GR	UB SITE	10	AC	4300.00	\$ 43,000
					-
					-
					-
					-
		1000	01	20.00	F4 000
2' DIA RCP C	CULVERT	40	LF	50.00	2,000
	EROSION CONTROL				-
SILT FENCE HAY BALES		2800 500	LF EA	5.00 5.00	14,000 2,500
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PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY ALTERNATIVE 9: EXCAVATE AND CONSOLIDATE			JOB #		8712-04
LOCATION:	ALL SEVEN DISPOSAL AREAS DEVENS, MASSACHUSETTS			DATE		24-Jan-97
ENGINEER:	ABB ENVIRONMENTAL SERVICES, INC.					
ESTIMATOR:	P. R. MARTIN					
	CONSOLIDATION LANDFILL CONSTRUCTION		===		= :	
	LINER CONSTRUCTION DESCRIPTION		UNIT	UNIT COST		TOTAL
EXCAVATE L	ANDFILL BASE & BY-PASS DITCH					
HAUL TO ON	BACK HOE & OPERATOR (2 EA) -SITE STOCKPILE (23250 CY)	126	DAY	1460.00	\$	183,960
		45	DAY	770.00		34,650
	DUMP TRUCK & DRIVER (16 FA)	880	DAY	770.00		677.600
DOZER & OP	ERATOR	55	DAY	1760.00		96,800
CLAY		31850	CY	10.00		318 500
GEOMEMBRA	ANE	330000	SF	0.65		214,500
FILTER FABR	IC	330000	SF	0.10		33,000
10-2 SAND [	DRAINAGE LAYER	15925	CY	12.00		191,100
10-3 SAND E	DRAINAGE LAYER	15925	CY	17.00		270,725
ROLLER & OF	PERATOR	80	DAY	1570.00		125,600
	DRAINAGE PIPING					-
6" DIA PERF	PVC PIPE	2500	LF	6.00		15,000
12" DIA SOL 6"x12" PVC	ID WALL PVC PIPE WYE	1600 5	LF EA	15.00 500.00		24,000 2,500
	LEACHATE PUMPING CHAMBER				•	-
5' DIA PRECA	AST MANHOLE	10	VLF	250.00		2,500
FRAME, COV	ER, ETC.	1	LS	300.00		300
CONCRETE F CONTROLS	ILL PAD, SUMP, ELECTRICAL S, ALARM, FILL PIPING, BOLLARDS	- 1	LS	35000.00		35,000 -
HAUL LEACH 10 HR/DA	IATE TO BASE TREATMENT PLANT Y * 5 DAY/WK * 52 WK	2600	HR	100.00		260 <u>,</u> 000 -

# NOTE: ALL LINER SOIL MATERIAL QUANTITIES INCLUDE A 30% SWELL FACTOR

TOTAL LINER CONSTRUCTION

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\$ 2,485,735



PROJECT: LANDFILL ALTERNA	LANDFILL REMEDIATION FEASIBILITY STUDY ALTERNATIVE 9: EXCAVATE AND CONSOLIDATE	JOB #	8712-04		
LOCATION:	ALL SEVEN DISPOSAL AREAS DEVENS, MASSACHUSETTS	DATE	24-Jan-97		
ENGINEER:	ABB ENVIRONMENTAL SERVICES, INC.				
ESTIMATOR	P. R. MARTIN				

\_ \_ \_ \_ \_ \_ \_\_\_\_\_\_ = = = = : \_ \_ \_ \_ \_ \_ \_ \_ CONSOLIDATION LANDFILL CONSTRUCTION UNIT FINAL COVER CONSTRUCTION QTY DESCRIPTION UNIT COST TOTAL 159,250 SUBGRADE BUFFER 15925 CY 10.00 \$ 264,000 0.80 TEXTURED GEOMEMBRAND 330000 SF 33,000 FILTER FABRIC 330000 SF 0.10 15925 CY 17.00 270,725 **10-3 SAND DRAINAGE LAYER** 239,000 10.00 MOISTURE RETENTION LAYER 23900 CY 14.00 111,300 **VEGETATIVE LAYER** 7950 CY 1570.00 125,600 **ROLLER & OPERATOR** 80 DAY -. HYDROSEEDING SEED, FERTILIZE, MULCH 10 2000.00 20,000 AC -10,000 MONITORING WELLS 4 EA 2500.00 -

NOTE: ALL FINAL COVER SOIL MATERIAL QUANTITIES INCLUDE A 30% SWELL FACTOR

TOTAL FINAL COVER CONSTRUCTION \$ 1,232,875

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PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY ALTERNATIVE 9: EXCAVATE AND CONSOLIDATE			JOB #	8712-04
LOCATION:	ALL SEVEN DISPOSAL AREAS DEVENS, MASSACHUSETTS			DATE	24-Jan-97
ENGINEER:	ABB ENVIRONMENTAL SERVICES, INC.				
ESTIMATOR	P. R. MARTIN				
				UNIT	
	DESCRIPTION	ΩΤΥ	UNIT	COST	TOTAL
TOTAL MOB	ILIZATION				\$ 357,910
TOTAL SITE	PREPARATION				115,500
	R CONSTRUCTION				2,485,735
TOTAL FINA	L COVER CONSTRUCTION				1,232,875

UNDEVELOPED DESIGN DETAILS ~25%

#### TOTAL CONSOLIDATION LANDFILL CONSTRUCTION

1,047,980

\$ 5,240,000

PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY ALTERNATIVE 9: EXCAVATE AND CONSOLIDATE	JOB #	8712-04
LOCATION:	ALL SEVEN DISPOSAL AREAS DEVENS, MASSACHUSETTS	DATE	24-Jan-97
ENGINEER:	ABB ENVIRONMENTAL SERVICES, INC.		

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DESCRIPTION	ΩΤΥ	UNIT	UNIT COST		TOTAL
O&M COSTS OCCURING OVER THIRTY YEARS FOR CONSOLIDAT FIVE YEAR SITE REVIEW - ANNUALIZED	ION LANDFILL 0.1810	LS	10000.00	\$	1,810
ENVIRONMENTAL MONITORING					-
GROUNDWATER, 4 WELLS, SEMI-ANNUALLY					-
GENERAL PARAMETERS & METALS	8	SMPL	940.00		7,520
					-
	20		75.00		-
GENERAL REPAIR	32	MINHK	75.00		2,400
DUMP TRUCK & DRIVER	1		770.00		- 770
EBONT END LOADER & OPERATOR	1		825.00		825
ABOBER - 2 FA	16	MNHR	33 50		536
MATERIALS	1	15	500.00		500
MOWING	2	EVENT	1000.00		2,000
					-
BI-ANNUAL REPORT TO DEP - ANNUALIZED	0.4878	LS	2500.00		1,220
AYER WWTP USER FEE	600	CCF	2.00		1,200
UNDEVELOPED DESIGN DETAILS ~25%					4,220
TOTAL ANNUAL O&M COSTS FOR 30 YEAR ACTIVI	TIES			\$	23,000

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## HYDROGEOLOGICAL ASSESSMENT AT SHEPLEY'S HILL LANDFILL AREA

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W001976APP.E

## PHYSICAL CHARACTERISTICS

Fort Devens is located in the towns of Ayer and Shirley (Middlesex County) and Harvard and Lancaster (Worcester County), approximately 35 miles northwest of Boston, Massachusetts. It lies within the Ayer, Shirley, and Clinton map quadrangles (7<sup>1</sup>/<sub>2</sub>-minute series). The installation occupies approximately 9,260 acres and is divided into the North Post, the Main Post, and the South Post (Figure E-1).

More than 6,000 acres at Fort Devens are used for training and military maneuvers, and more than 3,000 acres are developed for housing, buildings, and other facilities; the installation has been reported as the largest undeveloped land holding under a single owner in north-central Massachusetts (USFWS, 1992).

The South Post is located south of Massachusetts Route 2 and is largely undeveloped. The Main Post and North Post primarily contain developed lands, including recreational areas (e.g., a golf course and Mirror Lake), training areas, and an airfield. Shepley's Hill Landfill is located on the main post.

Currently, the mission at Fort Devens is to command and train its assigned duty units; operate the South Boston Support Activity in Boston; the Sudbury Training Annex and the Hingham USAR Annex; and to support the 10th Special Forces Group (A), the U.S. Army Reserves; Massachusetts Army National Guard; and ROTC Training Programs. No major industrial operations occur at Fort Devens, although several small-scale industrial operations are performed under (1) the Directorate of Plans, Training, and Security; (2) the Directorate of Logistics; and (3) the Directorate of Engineering and Housing. The major waste-producing operations by these groups are photographic processing and maintenance of vehicles, aircraft, and small engines. Past artillery fire, mortar fire, and waste explosive disposal at Fort Devens are potential sources for explosives contamination (USAEC, 1993).

Under Public Law 101-510, the Base Closure and Realignment Act (BRAC) of 1990, Fort Devens has been identified for closure by July 1997, and 4,600 acres are to be retained to establish a Reserve Component enclave and regional training center.

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As part of the base closure requirements several environmental investigations have been conducted at Fort Devens. Studies conducted at Shepley's Hill Landfill include a Preliminary Assessment as part of the Master Environmental Plan (Biang, et al., 1992), a Remedial Investigation (Ecology and Environment, 1993), a Remedial Investigation Addendum Report (ABB, 1993), a Feasibility Study (ABB, 1994), and a Pre-Remedial Design Investigation (Stone and Webster, 1995). The information collected during these investigations is sufficient to characterize the geologic and hydrogeologic conditions of Shepley's Hill Landfill and therefore further hydrogeologic study as stated in 310 CMR 19.104 does not appear to be warranted.

## **E.2 PHYSICAL SETTING**

## E.2.1 Climate

The climate of Fort Devens is typical of the northeastern United States, with long cold winters and short hot summers. Climatological data were reported for Fort Devens by the U.S. Department of the Army (1979), based in part on a 16-year record from Moore Army Airfield (MAAF).

The mean daily minimum temperature in the coldest months (January and February) is 17 degrees Fahrenheit (°F), and the mean daily maximum temperature in the hottest month (July) is 83°F. The average annual temperature is 58°F. There are normally 12 days per year when the temperature reaches or exceeds 90°F and 134 days when it falls to or below freezing.

The average annual rainfall is 39 inches. Mean monthly precipitation varies from a low of 2.3 inches (in June) to a high of 5.5 inches (in September). The average annual snowfall is 65 inches, and snowfall has been recorded in the months of September through May (falling most heavily from December through March).

Monthly precipitation and recharge estimates were calculated as part of the groundwater modeling conducted for the Shepley's Hill Landfill Feasibility Study (ABB, 1994). Daily precipitation data were obtained from the National Climatic Data Center for the period from January 1986 to April 1993 for six cooperative weather stations that surround Fort Devens: Ashburnham, Framingham, Lowell, Natick, Pepperell, and the Worcester Airport. Fort Devens precipitation data were not used as they were not typically collected over a full 24 hour period.

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Month	Average Precipitation (in)	Potential Evapotranspiration (in)	Recharg e (in)
Jan	3.79	0.81	2.98
Feb	3.11	0.99	2.12
March	3.95	2.14	1.81
April	3.71	3.55	1.00
May	3.54	5.26	1.00
June	3.6	6.28	1.00
July	3.44	6.84	1.00
Aug	3.68	6.11	1.00
Sept	3.86	4.52	1.00
Oct	3.31	3.14	1.00
Nov	4.15	1.81	2.34
Dec	3.88	1.01	2.87
Total	44.02	42.46	19.12

Potential evapotranspiration was calculated using the Blaney-Criddle formula. In any month when average monthly precipitation minus potential evapotranspiration was less than one inch, recharge was assumed to be one inch for the month.

Wind speed averages 5 miles per hour (mph), ranging from the highest monthly average of 7 mph (March-April) to the lowest monthly average of 4 mph (September).

Average daytime relative humidities range from 71 percent (January) to 91 percent (August), and average nighttime relative humidities range from 46 percent (April) to 60 percent (January).

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## APPENDIX E

## E.2.2 Physiography

Fort Devens is in a transitional area between the coastal lowland and central upland regions of Massachusetts. All of the landforms are products of glacial erosion and deposition on a crystalline bedrock terrain. Glacial erosion was superimposed on ancient bedrock landforms that were developed by the erosional action of preglacial streams. Generally, what were bedrock hills and ridges before the onset of Pleistocene glaciation were only moderately modified by glacial action, and they remain bedrock hills and ridges today. Similarly, preglacial bedrock valleys are still bedrock valleys. In post-glacial time, streams have locally modified the surficial glacial landforms but generally have not affected bedrock.

The predominant physiographic (and hydrologic) feature in the Fort Devens area is the Nashua River. It forms the eastern installation boundary on the South Post, where its valley varies from a relatively narrow channel (at Still River Gate), to an extensive floodplain with a meandering river course and numerous cutoff meanders (at Oxbow National Wildlife Sanctuary). The Nashua River forms the western boundary of much of the Main Post, and there its valley is deep and comparatively steep-sided with extensive bedrock outcroppings on the eastern bank. The river flows through the North Post in a well-defined channel within a broad forested floodplain.

Terrain at Fort Devens falls generally into three types. The least common is bedrock terrain, where rocks that have been resistant to both glacial and fluvial erosion remain as topographic highs, sometimes thinly veneered by glacial deposits. Shepley's Hill on the Main Post is the most prominent example.

A similar but more common terrain at Fort Devens consists of materials (tills) deposited directly by glaciers as they advanced through the area or as the ice masses wasted (melted). These landforms often conform to the shape of the underlying bedrock surface. They range from areas of comparatively low topographic relief (such as near Lake George Street on the Main Post) to elongated hills (drumlins) whose orientations reflect the direction of glacier movement (such as Whittemore Hill on the South Post).

The third type of terrain was formed by sediment accumulations in glacialmeltwater streams and lakes (glaciofluvial and glaciolacustrine deposits). This is the most common terrain at Fort Devens, comprising most of the North and

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W001976APP.E

South Posts and much of the Main Post. Its form bears little or no relationship to the shape of the underlying bedrock surface. Landforms include extensive flat uplands such as the hills on which MAAF and the wastewater infiltration beds are located on the North Post. Those are large remnants of what was once a continuous surface that was later incised and divided by downcutting of the Nashua River. Another prominent glacial meltwater feature is the area around Cranberry Pond and H-Range on the South Post. This is classic kame-and-kettle topography formed by sand and gravel deposition against and over large isolated ice blocks, followed by melting of the ice and collapse of the sediments. The consistent elevations of the tops of these ice-contact deposits are an indication of the glacial-lake stage with which they are associated. Mirror Lake and Little Mirror Lake on the Main Post occupy another conspicuous kettle.

## E.2.3 Soils

Fort Devens lies within Worcester County and Middlesex County in Massachusetts (see Figure E-1). The soils of Worcester County have been mapped by the Soil Conservation Service (SCS) of the U.S. Department of Agriculture (USDA) (USDA, 1985). Mapping of the soils of Middlesex County has not been completed. However, an interim report (USDA, 1991), field sheet #19 (USDA, 1989), and an unpublished general soil map (USDA, undated) are available.

Soil mapping units ("soil series") that occur together in intricate characteristic patterns in given geographic areas are grouped into soil "associations." Soils in the Worcester County portions of Fort Devens consist generally of three associations. Three associations also have been mapped in the Middlesex County portions of Fort Devens. Although the mapped associations are not entirely the same on both sides of the county line, the differences reflect differences in definition and the interim status of Middlesex County mapping. The general distributions of the soil associations are shown in Figure E-2, and descriptions of the soil series in those associations are provided below.

#### WORCESTER COUNTY (USDA, 1985)

Winooski-Limerick-Saco Association:

<u>Winooski Series</u>. Very deep; moderately well drained; slopes 0 to 3 percent; occurs on floodplains; forms in silty alluvium.

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<u>Limerick Series</u>. Very deep; poorly drained; slopes 0 to 3 percent; occurs on floodplains; forms in silty alluvium.

<u>Saco Series</u>. Very deep; very poorly drained; slopes 0 to 3 percent; occurs on floodplains; derived mainly from schist and gneiss.

## Hinckley-Merrimac-Windsor Association:

<u>Hinckley Series</u>. Very deep; excessively drained; slopes 0 to 35 percent; occurs on stream terraces, eskers, kames, and outwash plains.

<u>Merrimac Series</u>. Very deep; excessively drained; slopes 0 to 25 percent; occurs on stream terraces, eskers, kames, and outwash plains.

<u>Windsor Series</u>. Very deep; moderately well drained; slopes 0 to 3 percent; occurs on floodplains.

## Paxton-Woodbridge-Canton Association:

<u>Paxton Series</u>. Very deep; well drained; slopes 3 to 35 percent; occurs on glacial till uplands; formed in friable till overlying firm till.

<u>Woodbridge Series</u>. Very deep; moderately well drained; slopes 0 to 15 percent; occurs on glacial till uplands; formed in firm till.

<u>Canton Series</u>. Very deep; well drained; slopes 3 to 35 percent; occurs on glaciated uplands; formed in friable till derived mainly from gneiss and schist.

## MIDDLESEX COUNTY (USDA, 1991)

<u>Hinckley-Freetown-Windsor Association</u> (This is a continuation of the Hinckley-Merrimac-Windsor Association mapped in Worcester County):

<u>Hinckley Series</u>. Deep; excessively drained; nearly level to very steep; occurs on glacial outwash terraces, kames, and eskers; formed in gravely and cobbley coarse-textured glacial outwash.

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PROJECT:	LANDFILL REMEDIATION FEASIBILITY STUDY ALTERNATIVE 9: EXCAVATE AND CONSOLIDATE	JOB #	8712-04
LOCATION:	ALL SEVEN DISPOSAL AREAS DEVENS, MASSACHUSETTS	DATE	24-Jan-97

ESTIMATOR: P. R. MARTIN

ANNUAL O&M COSTS	======		=======	 
DESCRIPTION	QTY	UNIT	COST	TOTAL
O&M COSTS OCCURING OVER FIVE YEARS FOR CSB LANDFILL SEDIMENT, 2 SAMPLES AT 2 LOCATIONS, ONE TIME ONLY A METALS - ANNUALIZED	AT YEAR 5 0.7239	SMPL	625.00	\$ 452
GROUNDWATER MONITORING, 2 WELLS, SEMI-ANNUALLY GENERAL PARAMETERS & METALS	4	SMPL	1020.00	4,080
SAMPLE COLLECTION (INCLUDES WELL PURGE, SAMPLE COLLECTION, AND SHIPMENT)	2	LS	2500	5,000
WETLANDS RESTORATION MONITORING 1 DAY @ 2 MEN/DAY, SEMI-ANNUALLY	32	MNHR	75.00	- 2,400
BIO MONITORING, BI-ANNUALLY	0.4878	LS	15000.00	7,317
FIVE YEAR EDUCATION PROGRAM ONCE PUBLIC MEETING - ANNUALIZED	0.1810	LS	2500.00	452
FIVE YEAR SITE REVIEW - ANNUALIZED	0.1810	LS	20000.00	3,619
UNDEVELOPED DESIGN DETAILS ~25%				5,679
TOTAL ADDITIONAL ANNUAL O&M COSTS FOR A	OC 40 5 YEARS			\$ 29,000

<u>Freetown Series</u>. Deep; very poorly drained; nearly level, organic; occurs in depressions and on flat areas of uplands and glacial outwash plains.

<u>Windsor Series</u>. Deep; excessively drained; nearly level to very steep; occurs on glacial outwash plains, terraces, deltas, and escarpments; formed in sandy glacial outwash.

## **Quonset-Carver Association:**

<u>Quonset Series</u>. Deep; excessively drained; nearly level to very steep; occurs on glacial outwash plains, terraces, eskers, and kames; formed in water-sorted sands derived principally from dark phyllite, shale, or slate.

<u>Carver Series</u>. Deep; excessively drained; nearly level to steep; occurs on glacial outwash plains, terraces, and deltas; formed in coarse, sandy, water-sorted material.

<u>Winooski-Limerick-Saco Association</u> (This is a continuation of the same association mapped along the Nashua River floodplain in Worcester County).

## E.2.4 Surficial Geology

Fort Devens lies in three topographic quadrangles: Ayer, Clinton, and Shirley. The surficial geology of Fort Devens has been mapped only in the Ayer quadrangle (Jahns, 1953) and Clinton quadrangle (Koteff, 1966); the Shirley quadrangle is unmapped.

Unconsolidated surficial deposits of glacial and postglacial origin comprise nearly all of the exposed geologic materials at Fort Devens. The glacial units consist of till, deltaic deposits of glacial Lake Nashua, and deposits of glacial meltwater streams.

The till ranges from unstratified gravel to silt, and it is characteristically bouldery. Jahns (1953) and Koteff (1966) recognize a deeper unit of dense, subglacial till, and an upper, looser material that is probably a slightly younger till of englacial or superglacial origin. Till is exposed in ground-moraine areas of the Main Post (such as in the area of Lake George Street) and on the South Post at and south of Whittemore Hill. It also underlies some of the water-laid deposits (Jahns,

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1953). Till averages approximately 10 feet in thickness but reaches 60 feet in drumlin areas (Koteff, 1966).

Most of the surficial glacial units in the Nashua Valley are associated with deposition in glacial Lake Nashua, which formed against the terminus of the Wisconsinan ice sheet as it retreated northward along the valley. Successively lower outlets were uncovered by the retreating glacier, and the lake level was correspondingly lowered. Koteff (1966) and Jahns (1953) recognize six lake levels (stages) in the Fort Devens area, distinguished generally by the elevations and distribution of their associated deposits. The stages are, in order of development: Clinton Stage; Pin Hill Stage; Old Mill Stage; Harvard Stage; Ayer Stage; and Groton Stage.

The glacial lake deposits consist chiefly of sand and gravely sand. Coarser materials are found in topset beds of deltas built out into the lakes and in glacial streambeds graded to the lakes. Delta foreset beds are typically composed of medium to fine sand, silt, and clay. Lake-bottom deposits, which consist of fine sand, silt, and clay, are mostly covered by delta deposits and are seldom observed in glacial Lake Nashua deposits. One of the few known exposures of glacial lake-bottom sediments in the region is on the South Post near A- and C-Ranges. There, a section of more than 14 feet of laminated clay was mined for brick-making in the early part of this century (Alden, 1925, pp. 70-71). The general physical characteristics of glacial lake deposits are the same regardless of the particular lake stage in which the deposits accumulated (Koteff, 1966; Jahns, 1953). Although glaciofluvial and glaciolacustrine sediments are typically well stratified, correlations between borings are difficult because of laterally abrupt changes characteristic of these generally high-energy depositional environments.

Postglacial deposits consist mostly of river-terrace sands and gravels; fine alluvial sands and silts beneath modern floodplains; and muck, peat, silt, and sand in swampy areas.

Jahns (1953) also observed a widespread veneer of windblown sand and ventifacts above the glacial materials (and probably derived from them in the brief interval between lake drainage and the establishment of vegetative cover).

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## E.2.5 Bedrock Geology

Fort Devens is underlain by low-grade metasedimentary rocks, gneisses, and granites. The rocks range in age from Late Ordovician to Early Devonian (approximately 450 million to 370 million years old). The installation is situated approximately 2 miles west of the Clinton-Newbury-Bloody Bluff fault zone, which developed when the ancestral European continental plate collided with and underthrust the ancestral North American plate. The continents reseparated in the Mesozoic to form the modern Atlantic Ocean. Fort Devens is located on the very eastern edge of the ancestral North American continental plate. A piece of the ancestral European continent (areas now east of the Bloody Bluff fault) broke off and remained attached to North America.

Preliminary bedrock maps (at scale 2,000 feet/inch) are available for the Clinton quadrangle (Peck, 1975 and 1976) and Shirley quadrangle (Russell and Allmendinger, 1975; Robinson, 1978). Bedrock information for the Ayer quadrangle is from the Massachusetts state bedrock map (at a regional scale of 4 miles/inch) (Zen, 1983) and in associated references (Robinson and Goldsmith, 1991; Wones and Goldsmith, 1991). Among these sources, there is some disagreement about unit names and stratigraphic sequence; however, there is general agreement about the distribution of rock types.

In contrast to the high metamorphic grade and highly sheared rocks of the Clinton-Newbury zone, the rocks in the Fort Devens area are low grade metamorphics (generally below the biotite isograd) and typically exhibit less brittle deformation. Major faults have been mapped, however, including the Wekepeke fault exposed west of Fort Devens (in an outcrop 0.25 mile west of the old Howard Johnson rest stop on Route 2).

Figure E-3 is a generalized summary of the bedrock geology of Fort Devens. It is compiled from Peck (1975), Robinson (1978), Russell and Allmendinger (1975), and Zen (1983), and it adopts the nomenclature of Zen (1983). Because of limited bedrock exposures, the locations of mapped contacts are considered approximate, and the mapped faults are inferred. Rock units strike generally northward to northeastward but vary locally. The bedrock units underlying Fort Devens are as follows:

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- DSw WORCESTER FORMATION (Lower Devonian and Silurian) Carbonaceous slate and phyllite, with minor metagraywacke to the west (Zen, 1983; Peck, 1975). Bedding is typically obscure because of a lack of compositional differences. It is relatively resistant to erosion and forms locally prominent outcrops. The abandoned Shaker slate quarry on the South Post is in rocks of the Worcester Formation. The unit corresponds to the "DSgs" and "DSs" units of Peck (1975) and the "e3" unit of Russell and Allmendinger (1975).
- So OAKDALE FORMATION (Silurian) Metasiltstone and phyllite. It is finegrained and consists of quartz and minor feldspar and ankerite, and it is commonly deformed by kink banding (Zen, 1983; Peck, 1975; Russell and Allmendinger, 1975). In outcrop it has alternating layers of brown siltstone and greenish phyllite. The Oakdale Formation crops out most visibly on Route 2 just east of the Jackson Gate exit. It corresponds to the "DSsp" unit of Peck (1975), the "e2" unit of Russell and Allmendinger (1975), and "ms" unit of Robinson (1978).
- Sb **BERWICK FORMATION** (Silurian) Thin- to thick-bedded metamorphosed calcareous metasiltstone, biotitic metasiltstone, and finegrained metasandstone, interbedded with quartz-muscovite-garnet schist and feldspathic quartzite (Zen, 1983; Robinson and Goldsmith, 1991). In areas northwest of Fort Devens, cataclastic zones have been observed (Robinson, 1978).
- Dcgr CHELMSFORD GRANITE (Lower Devonian) Light-colored and gneissic, even and medium grained, quartz-microcline-plagioclase-muscovite-biotite, pervasive ductile deformation visible in elongate quartz grains aligned parallel to mica. It intrudes the Berwick Formation and Ayer granite (Wones and Goldsmith, 1991).

## AYER GRANITE

Sacgr Clinton facies (Lower Silurian) Coarse-grained, porphyritic, foliated biotite granite with a nonporphyritic border phase; it intrudes the Oakdale and Berwick Formations and possibly the Devens-Long Pond Facies (Zen, 1983; Wones and Goldsmith, 1991).

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SOad Devens-Long Pond facies (Upper Ordovician and Lower Silurian) Gneissic, equigranular to porphyoblastic biotite granite and granodiorite. Its contact relationship with the Clinton facies is unknown (Wones and Goldsmith, 1991). Observations of mapped exposures of this unit on Fort Devens indicate that it may not be intrusive.

Bedrock is typically unweathered to only slightly weathered at Fort Devens. Glaciers stripped away virtually all of the preglacially weathered materials, and there has been insufficient time for chemical weathering of rocks in the comparatively brief geologic interval since glacial retreat.

### E.2.8 Regional Hydrogeology

Fort Devens is in the Nashua River drainage basin, and the Nashua River is the eventual discharge locus for all surface water and groundwater flow at the installation.

The water of the Nashua River has been assigned to Class B under Commonwealth of Massachusetts regulations. Class B surface water is "designated for the uses of protection and propagation of fish, other aquatic life and wildlife, and for primary and secondary contact recreation" (314 CMR 4.03).

The principal tributaries of the north-flowing Nashua River at Fort Devens are Nonacoicus Brook and Walker Brook on the North Post; Cold Spring Brook (which is a tributary of Nonacoicus Brook) on the Main Post; and Spectacle Brook and Ponakin Brook (tributaries of the North Nashua River), Slate Rock Brook, and New Cranberry Pond Brook on the South Post.

There are two ponds on Fort Devens' South Post that are called Cranberry Pond. For the purpose of this report, the isolated kettle pond located east of H-Range is referred to as Cranberry Pond, and the pond impounded in the 1970s, 0.5-mile west of the Still River gate, is referred to as New Cranberry Pond.

Glacial meltwater deposits constitute the primary aquifer at Fort Devens. In aquifer tests performed as part of the Groups 2 and 7 Site Investigation (ABB-ES, 1993b), measured hydraulic conductivities in meltwater deposits were comparatively high - typically  $10^{-3}$  to  $10^{-2}$  centimeters per second (cm/sec). In till

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### **APPENDIX E**

and in clayey lake-bottom sediments, measured hydraulic conductivities were lower and ranged generally from  $10^{-6}$  to  $10^{-4}$  cm/sec. Groundwater also occurs in the underlying bedrock; however, flow is limited because the rocks have very little primary porosity and water moves primarily in fractures and dissolution voids.

Groundwater in the surficial aquifer at Fort Devens has been assigned to Class I under Commonwealth of Massachusetts regulations. Class I consists of groundwaters that are "found in the saturated zone of unconsolidated deposits or consolidated rock and bedrock and are designated as a source of potable water supply" (314 CMR 6.03).

The transmissivity of an aquifer is the product of its hydraulic conductivity and saturated thickness, and as such it is a good measure of groundwater availability. Figure E-4 shows aquifer transmissivities at Fort Devens, based on the regional work of Brackley and Hansen (1977). Transmissivities in the meltwater deposits range from 10 square feet per day (ft<sup>2</sup>/day) to more than 4,000 ft<sup>2</sup>/day. Aquifer transmissivities between 10 and 1,350 ft<sup>2</sup>/day correspond to potential well yields generally between 10 and 100 gpm; transmissivities from 1,350 to 4,000 ft<sup>2</sup>/day typically yield from 100 to 300 gpm; and where transmissivities exceed 4,000 ft<sup>2</sup>/day, well yields greater than 300 gpm can be expected. (Most domestic wells in the area are drilled 100 to 200 feet into bedrock and yield less than 10 gpm. Higher yields are associated with deeper bedrock wells.)

In Figure E-4, the zones of highest transmissivity are found in areas of thick glacial meltwater deposits on the North and Main Posts, and these encompass the Sheboken, Patton, and McPherson production wells and the largely inactive Grove Pond wellfield. The zones of lowest transmissivity are associated with exposed till and bedrock and are located on the Main Post surrounding Shepley's Hill and between Jackson Gate and the parade ground, and on the South Post at Whittemore Hill and isolated areas to the north and west.

A regional study of water resources in the Nashua River basin was reported by Brackley and Hansen (1977). A digital model of groundwater flow at Fort Devens is available in a final report by Engineering Technologies Associates, Inc. (1994).

According to Engineering Technologies Associates, Inc. (1994), in the absence of pumping or other disturbances, groundwater recharge occurs in upland areas (e.g.,

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the high ground on the Main Post between Queenstown, Givry, and Lake George Streets, and on the South Post the area around Whittemore Hill). The groundwater flows generally from the topographic highs to topographic lows. It discharges in wetlands, ponds, streams, and directly into the Nashua River. Groundwater discharge maintains the dry-weather flow of the rivers and streams.

### E.3 SHEPLEY'S HILL LANDFILL

Shepley's Hill landfill occupies approximately 84 acres in the northeast corner of the Main Post at Fort Devens (Figure E-5). The landfill has been capped according to an approved closure plan. Wastes potentially disposed of in the landfill include incinerator ash (from burning household debris), glass, spent shell casings, and asbestos. Reportedly, flammable fluids were also disposed of in the southern portion of the landfill.

Shepley's Hill Landfill is bordered to the east by Plow Shop Pond and the Boston and Maine Railroad, to the north by Nonacoicus Brook Wetland, to the west by Shepley's Hill (a large gneiss outcrop), and to the south by the DRMO area and the Main Post.

### E.3.1 Geology

The following subsections describe the surficial and bedrock geology of the Shepley's Hill Landfill area.

**E.3.1.1 Surficial Geology**. Shepley's Hill Landfill lies within the Ayer topographic quadrangle. The surficial geology of the Ayer quadrangle was mapped in 1941 (Jahns, 1953). The soils in and around Shepley's Hill Landfill are predominantly unconsolidated, poorly graded fine to medium sands with gravel, cobbles and a silt content ranging between 1 and 15 percent. Soils in the landfill area are part of the Hinckley-Merrimack-Windsor Association and are associated with deposition in glacial Lake Nashua, which formed against the terminus of the Wisconsinan ice sheet. Depositional features include a kame terrace, a glacially deposited hill of stratified sands and gravels, with an elevation of 250 feet ASL located in the northeast corner of the landfill, and prominent cross beds in an exposed channel fill feature 100 feet west of SHL-7. The uppermost portion of the unconsolidated deposits consists of fine aeolian deposited sand. Palustrine sediments, such as

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peat, are probably located below fill material in the central and north-central sections of the landfill between Shepley's Hill and the kame plateau. Maps indicate that these areas were swamps prior to landfilling operations and may have been the result of a small kettle lake. Dense silt, 1 to 10 feet thick, was encountered at the overburden bedrock interface in borings SHL-1, SHL-4, SHL-16, SHL-25 (E&E, 1993), and SHM-93-01A. This silt may represent a till, and contained gravel to cobble size pieces of slightly weathered gneiss and phyllite. The unconsolidated overburden reaches a maximum observed thickness of 115 feet at both the northern and southern extents of the landfill. Across the central portion of the landfill the overburden thickness is estimated to range from 25 to 50 feet dependent on landforms. The overburden over the entire landfill has the general trend of thinning to the west where it abuts the Shepley's Hill outcrop.

Results of grain size analyses performed on subsurface soils are provided at the end of this appendix.

**E.3.1.2 Bedrock Geology**. The surficial soils at Shepley's Hill Landfill are underlain by low-grade phyllitic metasiltstones and biotite rich gneiss. The metasiltstone is calcareous with secondary quartz and sulfides along bedding planes and fractures. Extensive folding, banding, and foliation is also evident. The metasiltstones are only slightly weathered with small (0.1 to 0.5 inch) solution cavities. The bedrock core obtained from SHM-93-10C was moderately fractured in the uppermost 10 feet and became increasingly competent with depth. The fractures occurred chiefly along bedding planes although some fractures were nearly perpendicular to bedding. The foliation generally was observed to be dipping at 45 to 50 degrees, but was nearly vertical in areas. The following boreholes encountered metasiltstone: SHL-10, SHL-24 (E&E, 1993), SHM-93-10C, and SHM-93-22C. The bedrock core from SHM-93-22C indicates that bedrock at this location is actually a low-grade gneiss. The metasiltstones below Shepley's Hill Landfill belong to the Silurian Berwick Formation.

The gneiss, which appears from outcrops to be nonintrusive, is characterized by its high biotite content, gneissic foliation, and elongated feldspathic porphyroblasts. The following boreholes encountered varying metamorphic grades of gneiss: SHL-1, SHL-2, SHL-3, SHL-4, SHL-5, SHL-8, SHL-11, SHL-14, SHL-20, SHL-22 (E&E, 1993), and SHB-95-28X. The gneiss, which is associated with the Devens-Long Pond facies of the Ayer Granite (Upper Ordovician and Lower

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Silurian) is only slightly weathered. The gneiss directly underlies unconsolidated materials beneath most of the landfill outcropping to the west at Shepley's Hill and to the southwest near the DRMO yard and adjacent to the Petroleum Oil and Lubricants (POL) yard. The 20 feet of gneiss core obtained from SHM-93-22C contained only three natural fractures, all within the uppermost 10 feet. Secondary quartz and quartzite occur throughout the rock along healed fractures. Both open and healed fractures were observed to be dipping at approximately 50 degrees. The Berwick Formation metasiltstone occurs only in the southeast corner of the landfill.

Figure E-6 presents an interpretation of bedrock topography in the Shepley's Hill Landfill Area. Interpreted cross sections of the seismic survey data are provided in Figure E-7. Seismic survey lines are shown on Figure E-6. It appears that a bedrock ridge extends from SHL-1 eastward below Plow Shop Pond. The evidence supporting the existence of the ridge includes the bedrock elevation of 215.7 feet ASL, at monitoring well SHM-93-01A. This is 5 feet higher than the bedrock elevation at SHM-93-10C which is 250 feet to the northeast. This change in elevation would be consistent with the presence of a ridge aligned eastnortheastward from Shepley's Hill to below Plow Shop Road. The results of the seismic survey indicated a bedrock high between SHL-3 and SHL-11 with bedrock elevations rising above 200 feet ASL. The seismic survey data may be explained by a local, closed bedrock high not just the presence of a ridge. Exposed bedrock topography also supports the existence of a ridge; the gneiss that comprises Shepley's Hill juts out to the east near SHL-1 along the line of the axis of the inferred ridge. Furthermore, the prelandfill ground surface contours in Figure E-6, and the presence of a generally coincident topographic high with a superimposed shallow swampy depression suggests a shallow bedrock substrate.

Three soil borings, SHB-95-26X, SHP-95-27X (piezometer), and SHB-95-28X were installed in the area of the proposed consolidation landfill located in the southeast corner of the existing landfill (see Figure E-6). These borings were installed to better define overburden characteristics and bedrock topography. SHB-95-26X was advanced to 51 feet bgs without encountering bedrock. SHP-95-27X and SHB-95-28X encountered bedrock at 39 and 27 feet bgs respectively. Bedrock core collected from SHB-95-28X indicated that the bedrock at this location was phyllitic metasiltstone.

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The bedrock topography along the southern boundary of the landfill is characterized by a series of hills and valleys that appear to trend roughly northsouth.

Bedrock along the northern end of the landfill is characterized by a deep valley increasing in depth toward Nonacoicus Brook.

### E.3.4 Groundwater Hydrology

Groundwater present in the overburden represents the primary aquifer in the Shepley's Hill Landfill area. Groundwater also occurs in the underlying bedrock; however, there is little or no primary effective porosity. Groundwater flow can occur along bedrock fractures and solution cavities. Results of quarterly water level elevation measurements are provided in Table B-1. Hydrographs of water levels collected from SHL-3, SHL-7, SHL-18, SHM-93-18B, Plow Shop Pond, and Grove Pond are provided at the end of this section. These locations were selected and data presented due to their proximity to the proposed consolidation.

Groundwater in the area flows primarily from the west-southwest to the east and north (Figure E-8). Discharge areas for groundwater around the landfill included Plow Shop Pond, the wetland north of West Main Street in Ayer, and Grove Pond. The presence of the dam in the northwest corner of Plow Shop Pond has raised the pond surface elevation in this area above the groundwater elevation, thereby locally reversing the gradient and causing water to discharge from Plow Shop Pond. The point where the gradient reverses varies seasonally depending on pond and groundwater elevation. The transition is interpreted to occur midway between SHL-20 and SHL-21. Groundwater to the north of this point flows toward the wetland, while groundwater to the south discharges to Plow Shop Pond.

Measured groundwater levels indicate a groundwater divide exists to the southwest of the landfill below the DRMO yard. The divide occurs along a northwest-southeast trending line between monitoring well 32M-92-07X and Shepley's Hill. Groundwater to the northeast of this divide flows eastward and northeastward under the southern portion of the landfill, while groundwater to the southwest of the divide flows to the southwest away from the landfill. The overburden aquifer appears to be recharged at least in part, by groundwater discharging from the bedrock along the western border of the landfill. The

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relationship between the bedrock aquifer and the overburden aquifer in the center of the cap is unknown; however, it is possible that the bedrock aquifer may also discharge to the overburden in this area. Vertical hydraulic gradients between the bedrock aquifer and the overburden aquifer were calculated from water levels collected on June 22, 1993. Calculated gradients were upwards at 0.05 feet per foot (ft/ft) between SHM-93-10C and SHL-10, 0.003 ft/ft between SHM-93-22C and SHL-22, and 0.026 ft/ft between SHL-24 and SHM-93-24A. An upward gradient of 0.004 ft/ft exists between the deep overburden well SHM-93-18B and the water table well SHL-18. No measurable vertical gradient occurred between SHL-8S and SHL-8D in the northeast corner of the landfill.

Upward vertical gradients are observed along the southeastern and eastern perimeters of Shepley's Hill Landfill, as would be expected since groundwater discharges to Plow Shop Pond. Typically upward or lack of vertical gradients are observed in the northern and northeastern portions of the landfill. The groundwater ultimately discharges to the wetland north of West Main Street and to the Nashua River.

The landfill cap covers approximately 84 acres (Biang, 1992). The cap has reduced or eliminated infiltration from precipitation, and lowered the water table beneath it. The likely result of lowering the water table has been to impart a more northerly component of flow in the southern section of the landfill, as is observed in the bend of the 225 foot contour near the southern portion of the landfill in Figure E-7. Water levels in monitoring wells SHL-12 and SHL-17 are nearly identical even though the wells are approximately 280 feet apart. ABB-ES interprets this to mean the 225-foot contour must be roughly parallel to a line between the two wells.

Permeability testing of the Shepley's Hill Landfill monitoring wells produced hydraulic conductivity estimates ranging from  $1x10^{-2}$  cm/sec (SHL-19) to  $9x10^{-5}$  cm/sec (SHL-25) for the unconfined overburden aquifer, and  $3x10^{-2}$  cm/sec (SHL-20) to  $5x10^{-8}$  cm/sec (SHL-24) for the bedrock aquifer. The geometric mean of the hydraulic conductivities was calculated to be  $3x10^{-3}$  cm/sec with a standard deviation of  $2x10^{-2}$ . These values were determined by the method of Bouwer and Rice (1976). Hydraulic conductivity values as determined by both the Hvorslev (1951) and Bouwer and Rice methods as well as transmissivity values are provided in Table B-2.

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### **APPENDIX E**

In November 1993 Engineering Technologies Associates, Inc. performed an aquifer pumping test on the bedrock monitoring well SHM-93-10C. Analyses of the test data indicated that the bedrock aquifer responded with the characteristics of both a porous and fractured media (ETA, 1995). Reliable values of transmissivity derived from the test data ranged from 2.9 ft<sup>2</sup>/day to 4.0 ft<sup>2</sup>/day. The storage coefficient was calculated as  $1.15 \times 10^{-7}$ . The test data showed that there was significant leakage into the bedrock aquifer from the overburden sands (ETA, 1995).

Groundwater modeling utilizing MODFLOWP was conducted for the Shepley's Hill Landfill area as part of the Feasibility Study (ABB, 1994). Two layers were used to simulate groundwater flow, the overburden and bedrock. Calibration of the model resulted in a hydraulic conductivity for the overburden of 40 ft/day (0.014 cm/sec) and a specific yield of 0.05. The bedrock aquifer was assigned a transmissivity of 36 ft<sup>2</sup>/day. The model was run for 100 years with an average recharge of 19 inches/year. Two runs were performed, one with the current landfill cap configuration and one with no landfill cap, to quantify the impact of the landfill cap reduces groundwater flow to Plow Shop Pond by 71 percent with most of the flow being diverted to the north of the landfill near Nonacoicus Brook Wetland. Flow to Grove Pond, and the eastern and southern boundaries of the model are not significantly impacted by the landfill cap.

ETA completed a basewide flow model and Zone II delineation for the production wells located on Fort Devens (ETA, 1995). The results of the basewide flow model support the interpreted flow directions derived from the water level data. The Zone II delineation for the Grove Pond Well field and the Town of Ayer well is shown on Figure E-8.

### E.3.5 Surface Water Hydrology

Shepley's Hill Landfill is bordered to the northeast by Plow Shop Pond, a shallow, 30 acre pond outside the installation boundary. The water level in Plow Shop Pond is maintained by two dams, one in the northwest corner on Nonacoicus Brook and one on the north side of the pond near Moores Lumber Yard. Flow into Plow Shop Pond is through a culvert from Grove Pond to the east. The railroad causeway separating Plow Shop Pond and Grove Pond is thought to have been constructed in the late 1800s. Before construction of the causeway and dams, Plow Shop Pond and Grove Pond were most likely a continuous swampy

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area fed by a number of small streams. Nonacoicus Brook flows approximately 1 mile to the northwest from Plow Shop Pond before it discharges to the Nashua River. A wetland borders the brook and is a local groundwater discharge area north of West Main Street in Ayer. The area surrounding Nonacoicus Brook to the south of West Main Street is referred to as Nonacoicus Brook Wetland, but only has standing water during flood events suggesting that this is not a local discharge area. The area bordering Nonacoicus Brook to the north of West Main Street has surface water all year indicating that this may be a local discharge area.

Two storm sewer system outfalls are located along the southern perimeter of Shepley's Hill Landfill near SHL-12 and SHL-17 (see Figure E-8). The system, designated System #14 (ADL, 1994), drains an area occupied by barracks and an unpaved vehicle storage area located in the vicinity of the intersection of Market and Carey Streets. A surface water drainage ditch runs from the outfalls along the eastern portion of the landfill cap and discharges into Plow Shop Pond. The drainage ditch has only been observed to contain flowing water during spring flood events (March 1993).

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ELEVATION FT ASL



**CONSOLIDATION LANDFILL** 

ELEVATION FT ASL



# PLOW SHOP POND SURFACE ELEVATION



### CONSOLIDATION LANDFILL

## **GROVE POND SURFACE ELEVATION**



### FORT DEVENS, MA

			MAY 26, 1992		SEPT. 15, 1992		DECEMBER 22, 1992	
STATION/	REF.	ELEV. OF	DEPTH	ELEV. OF	DEPTH	ELEV OF	DEPTH	ELEV. OF
WELL NO.	POINT	REF. PT.	TOWATER	WATER	TO WATER	WATER	TO WATER	WATER
MNG-1	PVC	248.89	24.55	224.34	24.6	224.29	Not measured	Not measured
MNG-2	PVC	238.66	20.36	218.3	20.67	217.99	20.23	218.43
MNG-3	PVC	254.47	37.52	216.95	37.35	217.12	36.84	217.63
MNG-4	PVC	254.37	32.80	221.57	32.98	221.39	Not measured	Not measured
MNG-5	PVC	237.21	17.28	219.93	17.48	219.73	17.58	219.63
MNG-6	PVC	254.70	36.46	218.24	36.52	218.18	36.22	218.48
MNG-7	PVC	250.08	31.43	218.65	31.39	218.69	31.38	218.7
SWEL-05	CAPPED PIN	217.84		217.84	1.05	216.79	0.22	217.62
SHL-1	PVC		Dry	Dry	Dry	Dry	Not measured	Not measured
SHL-3H	PVC	248.17	Not measured	Not measured	Not measured	Not measured	Not measured	Not measured
SHL-3L	CASING	248.50	30.67	217.83	30.82	217.68	30.24	218.26
SHL-4	PVC	228.71	11.10	217.61	11.23	217.48	10.58	218.13
SHL-5	PVC	218.53	4.10	214.43	5.15	213.38	2.39	216.14
SHL-6	CASING	254.17	28.80	225.37	29.11	225.06	29.38	224.79
SHL-7	PVC	237.13	17.56	219.57	17.93	219.2	17.45	219.68
SHL-8	PVC	221.85	7.53	214.32	8.22	213.63	7.1	214.75
	PVC-2-INCH	221.66	7.70	213.96	8.4	213.26	6.92	214.74
SHIL-9	PVC	222.86	9.15	213.71	10.01	212.85	8.21	214.65
SHL-10	PVC	248.80	31.19	217.61	31.41	217.39	30.8	218
SHL-11	PVC	236.34	18.87	217.47	19.02	217.32	18.65	217.69
SHL-12	PVC	249.51	23.25	226.26	23.59	225.92	23.88	225.63
SHL-13	PVC	221.58	7.05	214.53	7.66	213.92	6.61	214.97
SHL-15	PVC	260.75	17.92	242.83	19.42	241.33	19.08	241.67
SHL-17	PVC	234.57	8.46	226.11	8.8	225.77	8.97	225.6
SHL-18	PVC	238.39	19.63	218.76	19.9	218.49	19.28	219.11
SHL-19	PVC	241.34	23.29	218.05	23.5	217.84	22.45	218.89
SHL-20	PVC	236.84	19.24	217.6	19.47	217.37	19.07	217.77
SHL-21	PVC	259.75	45.34	214.41	46.01	213.74	44.8	214.95
SHL-22	PVC	220.49	6.73	213.76	7.54	212.95	5.91	214.58
SHL-23	PVC	242.14	27.27	214.87	28.52	213.62	26.45	215.69
SHL-24	PVC	239.60	16.92	222.68	16.78	222.82	16.74	222.86
SHL-25	PVC	258.87	24.68	234.19	26.78	232.09	26.86	232.01
POL-1	PVC	259.77	19.14	240.63	19.99	239.78	19.04	240.73
POL-2	PVC	259.42	27.70	231.72	28.29	231.13	29.38	230.04
POL-3	PVC	261.94	25.42	236.52	26.8	235.14	26.74	235.2
B202-1	PVC	254.43	28.30	226.13	28.62	225.81	28.93	225.5
B202-2	PVC	258.37	32.05	226.32	32.3	226.07	32.76	225.61
B202-3	PVC	258.32	31.28	227.04	31.51	226.81	32.13	226.19
SWEL-04	TOP OF STAKE	218.00	Not measured	Not measured	1.1	216.9	Not measured	Not measured

### FORT DEVENS

			MARCH 1993		JUNE 22, 1993		SEPTEMBER 30, 1993	
STATION/	REF.	ELEV. OF	DEPTH	ELEV. OF	DEPTH	ELEV. OF	DEPTH	ELEV. OF
WELL NO.	POINT	REF. PT.	<b>TO WATER</b>	WATER	TO WATER	WATER	<b>TO WATER</b>	WATER
MNG-1	PVC	248.89	Not Measured	Not Measured	24.22	224.67	25.34	Not measured
MNG-2	PVC	238.66	19.64	219.02	20.52	218.14	20.59	218.07
MNG-3	PVC	254.47	35.94	218.53	37.26	217.21	37.16	217.31
MNG-4	PVC	254.37	Not Measured	Not Measured	Not Measured	Not Measured	Not Measured	Not Measured
MNG-5	PVC	237.21	17.14	220.07	17.27	219.94	Not Measured	Not Measured
MNG-6	PVC	254.70	35.75	218.95	36.37	218.33	36.52	218.18
MNG-7	PVC	250.08	31.06	219.02	Not Measured	Not Measured	35.89	214.19
SWEL-05	CAPPED PIN	217.84	-0.80	218.64	Stake Missing	Stake Missing	Stake Missing	Stake Missing
SWEL-GRP(P)	TOP OF PIPE	216	Not Measured	Not Measured	0.86	215.14	0.72	215.28
SHL-1	PVC	272.74	2.45	270.29	Dry	Dry	5.93	Not measured
SHL-3H	PVC	248.17	Not Measured	Not Measured	30.87	217.3	30.74	Not measured
SHL-3L	CASING	248.50	30.49	218.01	-		_	217.76
SHIL-4	PVC	228.71	10.36	218.35	11.18	217.53	11.09	217.62
SHL-5	PVC	218.53	1.81	216.72	4.88	213.65	3.22	215.31
SHIL-6	CASING	254.17	28.76	225.41	28.7	225.47	29.58	224.59
SHL-7	PVC	237.13	16.35	220.78	17.85	219.28	19.09	218.04
SHIL-8	PVC	221.85	6.78	215.07	8.05	213.8	8.03	213.82
	PVC-2-INCH	221.66	Not Measured	Not Measured	Not Measured	Not Measured	Not Measured	Not Measured
SHL-9	PVC	222.86	8.03	214.83	9.62	213.24	9.83	213.03
SHL-10	PVC	248.80	30.99	217.81	31.4	217.4	31.31	217.49
SHL-11	PVC	236.34	18.40	217.94	18.96	217.38	19.01	217.33
SHL-12	PVC	249.51	22.38	227.13	22.96	226.55	23.91	225.6
SHL-13	PVC	221.58	7.61	213.97	7.35	214.23	7.23	214.35
SHL-15	PVC	260.75	71.12	189.63	18.22	242.53	19.1	241.65
SHL-17	PVC	234.57	5.54	229.03	8.21	226.36	8.9	225.67
SHL-18	PVC	238.39	19.48	218.91	19.9	218.49	19.8	218.59
SHL-19	PVC	241.34	23.13	218.21	23.51	217.83	23.25	218.09
SHL-20	PVC	230.84	18.89	217.93	19.33	217.49	19.40	217.38
SHL-21	PVC	239.75	45.15	214.0	43.38	214.17	40.15	213.0
SHL-22	PVC	220.49	27.52	214.59	7.31	213.18	7.43	213.00
SFIL-23	PVC	242.14	15.89	214.01	16.5	214.10	17.05	213.47
SHL-24	PVC	259.00	24.47	220.71	24.95	223.1	28.6	222.33
SHL-25	PVC	238.87	24.42	221.05	24.05	220.42	23.0	219.63
SHM-93-10C	PVC	243.22	29.96	218 46	30.47	217.95	30.5	217.92
SHM-93-18B	PVC	238.12	18.93	219 19	19.6	218.52	19.51	218.61
SHM-93-22C	PVC	219.76	7.04	212.72	8.35	211.41	8.51	211.25
SHM-93-24A	PVC	239.25	15.95	223.3	17.04	222.21	17.51	221.74
POL-1	PVC	259.77	15.30	244.47	19.4	240.37	19.26	240.51
POL-2	PVC	259.42	28.02	231.4	26.81	232.61	30.73	228.69
POL-3	PVC	261.94	23.90	238.04	25.67	236.27	27.01	234.93
13MA93-04X	PVC	261.37	Not Measured	Not Measured	Not Measured	Not Measured	Not Measured	Not Measured
13MA93-05X	PVC	260.55	Not Measured	Not Measured	Not Measured	Not Measured	Not Measured	Not Measured
3MA93-06X	PVC	262.89	Not Measured	Not Measured	Not Measured	Not Measured	Not Measured	Not Measured
I3MA93-047	PVC	259.63	Not Measured	Not Measured	Not Measured	Not Measured	Not Measured	Not Measured
3MA93-08X	PVC	260.29	Not Measured	Not Measured	Not Measured	Not Measured	Not Measured	Not Measured
I3MA93-10X	PVC	260.41	Not Measured	Not Measured	Not Measured	Not Measured	Not Measured	Not Measured
3202-1	PVC	254.43	27.47	226.96	28.07	226.36	28.86	225.57
3202-2	PVC	258.37	32.20	226.17	31.8	226.57	32.92	225.45
3202-3	PVC	258.32	31.48	226.84	30.99	227.33	32.28	226.04
WEL-04	TOP OF STAKE	218.00	-0.30	218.3	4.55	213.45	Not Measured	Not Measured
WEL-PSP(P)	TOP OF STAKE	221.35	Not Measured	Not Measured	Not Measured	Not Measured	4.42	216.93



### FORT DEVENS, MA

			NOVEMBER 8, 1993		MARCE	1 30, 1994	JUNE 28, 1994	
STATION/	REF.	ELEV. OF	DEPTH	ELEV. OF	DEPTH	ELEV. OF	DEPTH	ELEV. OF
WELL NO.	POINT	REF. PT.	<b>TO WATER</b>	WATER	TO WATER	WATER	TO WATER	WATER
MNG-1	PVC	248.89	25.42	223.47	24,54	224.35	23.82	225.07
MNG-2	PVC	238.66	20.71	217.95	19,61	219.05	20.43	218.23
MNG-3	PVC	254.47	37.27	217.2	36.09	218.38	37.27	217.2
MNG-4	PVC	254.37	Not Measured	Not Measured	Not Measured	Not Measured	0	Not Measured
MNG-5	PVC	237.21	17.95	219.26	17	220.21	17.03	220.18
MNG-6	PVC	254.70	36.62	218.08	35.71	218.99	36.33	218.37
MNG-7	PVC	250.08	35.97	214.11	35.12	Not Measured	17.55	232.53
SWEL-01	BRIDGE RAIL	221.16	21.40	199.7	10.25	204.91	0	Not Measured
SWEL-02	CAPPED PIN	217.82	Not Measured	201.74	Stake Missing	Stake Missing	0	Not Measured
SWEL-05	TOP OF PIPE	217.84	1 t 1	214.9	Stake Missing	Stake Missing	0.82	215 18
SHLL-GIG(I)	PVC	272.74	Drv	Drv	2.04	Drv	0.02	Drv
SHL-3H	PVC	248.17	30.63	217.54	Stake Missing	Stake Missing	?	Not measured
SHL-3L	CASING	248.50	Not Measured	Not Measured	29.7	218.8	?	_
SHL-4	PVC	228.71	11.13	217.58	10.42	218.29	0	Not measured
SHL-5	PVC	218.53	3.14	215.39	1.68	216.85	4.67	213.86
SHL-6	CASING	254.17	29.62	224.55	27.76	226.41	28.11	226.06
SHL-7	PVC	237.13	18.84	218.29	17.27	219.86	17.55	219.58
SHL-8	PVČ	221.85	7.69	214.16	6.28	215.57	?	221.85
	PVC-2-INCH	221.66	Not Measured	Not Measured	6.14	215.52	?	Not Measured
SHL-9	PVC	222.86	9.08	213.78	7.09	215.77	9.28	213.58
SHL-10	PVC	248.80	31.17	217.63	30.24	218.56	31.3	217.5
SHP-93-10E	CASING						30.19	-30.19
SHP-93-10D	CASING	226.24	10.00	217.20	18.26	210.00	30.86	-30.86
SHL-II	PVC	236.34	19.05	217.29	18.25	218.09	18.80	217.48
SHL-12	PVC	249.31	24.20	223.51	5.67	227.01	7 22	227.17
SHL-15	PVC	221.38	18 94	214.3	15 55	215.51	17.86	214.30
SHI 17	PVC	234.57	9.31	225 26	6.99	227.58	0	Not Measured
SHL-18	PVC	238.39	19.68	218.71	18.55	219.84	19.69	218.7
SHL-19	PVC	241.34	23.27	218.07	22.54	218.8	23.24	218.1
SHL-20	PVC	236.84	19.49	217.35	18.69	218.15	19.21	217.63
SHL-21	PVC	259.75	45.47	214.28	44.6	215.15	45.28	214.47
SHL-22	PVC	220.49	6.75	213.74	5.18	215.31	6.97	213.52
SHL-23	PVC	242.14	27.49	214.65	25.9	216.24	27.31	214.83
SHL-24	PVC	239.60	16.98	222.62	15.25	224.35	16.03	223.57
SHL-25	PVC	258.87	27.06	231.81	21.21	237.66	23.92	234.95
SHM-93-01A	PVC	243.22	22.25	220.97	20.93	222.29	22.33	220.89
SHM-93-10C	PVC	248.42	30.41	218.01	29.46	218.96	30.37	218.05
SHM-93-18B	PVC	238.12	19.38	218.74	18.24	219.88	19.38	218.74
SHM-93-22C	PVC	221.35	/.8	213.75	15.62	215.55	16.00	213.49
SHM-93-24A	PVC	259.25	17.41	240 53	15.62	243.03	10.01	240.52
POL-1	PVC	259.17	29.25	230.17	26.89	232.53	25.78	233.64
POL-3	PVC	261.94	26.68	235.26	22.6	239.34	25.25	236.69
13MA93-04X	PVC	261.37	30.59	230.78	26.74	234.63	27,28	234.09
43MA93-05X	PVC	260.55	33.4	227.15	Not Measured	Not Measured	30.47	230.08
43MA93-06X	PVC	262.89	33.33	229.56	29.86	233.03	29.86	233.03
43MA93-07X	PVC	259.63	30.13	229.5	26.62	233.01	26.7	232.93
43MA93-08X	PVC	260.29	30.2	230.09	26.04	234.25	26.6	233.69
43MA93-10X	PVC	260.41	29.86	230.55	26.02	234.39	26.43	233.98
B202-1	PVC	254.43	29.19	225.24	27.05	227.38	27.43	227
B202-2	PVC	258.37	32.96	225.41	31.07	227.3	31.19	227.18
B202-3	PVC	258.32	32.31	226.01	30.53	227.79	30.28	228.04
SWEL-04	TOP OF STAKE	218.00	Not Measured	Not Measured	Not Measured	Not Measured	Not Measured	?
SWEL-PSP(P)	TOP OF STAKE	219.6	4.52	215.08	Not Measured	Not Measured	4.47	215.13
G3M-92-05X	PVC	254.30	30.56	223.74	29.65	224.65	28.85	225.45
GRM-01A	PVC	253.31	32.83	220.48	31.59	188.89	31.8	221.51
GRM-01B	PVC	252.9	34.03	218.87	32.85	186.02	33.62	219.28
GRM-01C	PVC	253.48	34.61	218.87	3.42	215.45	34.2	219.28

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### FORT DEVENS

			OCTOBER 4, 1994		JANUARY 31, 1995		MAY, 1995	
	REF.	ELEV. OF	DEPTH	LLEV. OF	DEPTH	FLEY OF	DEPTH	
STATION/	POINT	REP. PT.	TOWATER	WATER	TO WATER	WATER	TO WATER	WATER
		1	1	1	1	I		1
MNG-1	PVC	248.89	Not Measured	Not Measured	24.14	224.75	24.23	274.66
MNG-2	PVC	238.66	20.2	218.46	20.02	218.64	20.35	218.31
MNG-3	PVC	254.47	37.06	217.41	36.72	217.75	37.12	217.35
MNG-4	PVC	254.37	Not Measured	Not Measured	Not Measured	Not Measured	Not Measured	Not Measured
MNG-5	PVC	237.21	Not Measured	Not Measured	17	220.21	17.17	220.04
MNG-6	PVC	254.70	Not Measured	Not Measured	35.9	218.8	36.21	218.49
MNG-7	PVC	250.08	35.47	214.61	35.24	214.84	35.43	214.65
SWEL-05	CAPPED PIN	217.84	Not Measured	Not Measured	Not Measured	Not Measured	Not Measured	Not Measured
SWEL-GRP(P)	TOP OF PIPE	216	0.75	215.25	0.56	215.44	0.85	215.15
SHL-1	PVC	272.74	Not Measured	Not Measured	Not Measured	Not Measured	Dry	Not Measured
SHL-3H	PVC	248.17		248.17	Not Measured	Not Measured	Dry	Not Measured
SHL-3L	CASING	248.50		248.5	Not Measured	Not Measured	30.83	217.67
SHL-4	PVC	228.71	11	217.71	10.78	217.93	11.04	217.67
SHIL-5	PVC	218.53	3.35	215.18	2.88	215.65	4.29	214.24
SHL-6	CASING	254.17	28.35	225.82	28.18	225.99	28.74	225.43
SHL-7	PVC	237.13	18.35	218.78	17.81	219.32	18.81	218.32
SHL-8	PVC	221.85	7.07	214.78	R3	221.85	7.9	213.95
	PVC-2-INCH	221.66	?	221.66		221.66	7.02	214.64
SHL-9	PVC	222.86	16.7	206.16	8.1	214.76	9.38	213.48
SHL-10	PVC	248.80	31.05	217.75	30.61	218.19	31.3	217.5
SHL-11	PVC	236.34	18.89	217.45	18.00	217.68	18.91	217.43
SHL-12	PVC PVC	249.51	7.03	214.55	6 46	220.89	7.21	214.27
SHL-15	PVC	221.36	18.4	214.33	16.62	213.12	18.03	214.37
SHI -17	PVC	234.57	7 97	272.55	7.81	276.76	8.22	276 35
SHI -18	PVC	238.39	19.35	219.04	18.94	219.45	19.81	218.58
SHL-19	PVC	241.34	22.95	218.39	22.72	218.62	23.31	218.03
SHL-20	PVC	236.84	19.28	217.56	19.05	217.79	19.32	217.52
SHL-21	PVC	259.75	45.27	214.48	44.55	215.2	45.52	214.23
SHL-22	PVC	220.49	7.57	212.92	5,88	214.61	7.06	213.43
SHL-23	PVC	242.14	27.4	214.74	26	216.14	27.67	214.47
SHL-24	PVC	239.60	16.14	223.46	15.85	223.75	16.53	223.07
SHL-25	PVC	258.87	25.68	233.19	22.74	236.13	25.23	233.64
SHM-93-01A	PVC	243.22	22.06	221.16	21.46	221.76	22.69	220.53
SHM-93-10C	PVC	248.42	30.16	218.26	29.8	218.62	30.47	217.95
SHM-93-18B	PVC	238.12	19.02	219.1	17.61	220.51	19.5	218.62
SHM-93-22C	PVC	221.55	7.83	213.72	6.99	214.56	8.14	213.41
SHM-93-24A	PVC	239.25	16.6	222.65	16.25	223	16.97	222.28
SHP-93-10D	CASING	248.48	Not Installed	Not Installed	33.5	214.98	30.99	217.49
SHP-93-10E	CASING	247.91	Not Installed	Not installed	29.96	217.95	30.2	217.71
RHM-94-01X	PVC DVC	220.74	Not Installed	Not Installed	19.19	217.15	19 71	217.42
RHM-94-02X	PVC	250.13	10.33	240.44	18.02	211.34	19.21	240.56
POL-1	PVC	259.47	28.76	230.66	28.34	231.08	28.73	230.69
POL-3	PVC	261.94	25.87	236.07	23.97	237.97	25.86	236.08
32M-92-01 X	PVC	258.68	Not Measured	Not Measured	15.98	242.7	17.74	240.94
32M-92-07X	PVC	262.61	Not Measured	Not Measured	20.48	242.13	21.83	240.78
32M-92-03X	PVC	260.72	Not Measured	Not Measured	27.73	232.99	28.6	232.12
32M-92-04X	PVC	261.37	Not Measured	Not Measured	Not Measured	Not Measured	12.23	249.14
32M-92-05X	PVC	260.55	Not Measured	Not Measured	Not Measured	Not Measured	16.23	244.32
32M-92-06X	PVC	262.89	Not Measured	Not Measured	9.45	253.44	12.96	249.93
32M-92-07X	PVC	259.63	Not Measured	Not Measured	13.16	246.47	14.15	245.48
I3MA93-04X	PVC	261.37	28.72	232.65	28.15	233.22	28.66	232.71
I3MA93-05X	PVC	260.55	31.7	228.85	31.38	229.17	31.58	228.97
I3MA93-06X	PVC	262.89	31.36	231.53	31.18	231.71	31.3	231.59
3MA93-07X	PVC	259.63	28.19	231.44	0	Not Measured	28.1	231.53
3MA93-08X	PVC	260.29	28.2	232.09	27.6	232.69	28.09	232.2
3MA93-10X	PVC	260.41	Not Measured	Not Measured	27.52	232.89	27.89	232.52
3202-1	PVC	254.43	27.77	226.66	27.65	226.78	28.04	226.39
3202-2	PVC	258.37	31.5	226.87	31.41	226.96	Not Measured	258.37
3202-3	PVC	258.32	30.74	227.58	30.71	227.61	30.97	221.55
WFI -04	TOP OF STAKE	218.00	Not Measured	Not Measured	Not Measured	Not Measured	NOI Measured	NOT MEASURED

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### FORT DEVENS

			OCTOBE	R 4, 1994	JANUAR	¥ 31, 1995	MAY	1995
	REF.	ELEV. OF	DEPTH	ELEV. OF	DEPTH	ELEV. OF	DEPTH	
STATION/	POINT	REP. PT.	TO WATER	WATER	TO WATER	WATER	TO WATER	WATER
SWEL-PSP(P)	TOP OF STAKE	221.35	4.48	216.87	4.26	217.09	4.54	216.81
G3M-92-05X	PVC	254.30	29.27	225.03	29.15	225.15	29.44	224.86
GRM-01A	PVC	253.31	32.05	221.26	31.82	221.49	Not Measured	253.31
GRM-01B	PVC	252.9	33.63	219.27	33.36	219.54	Not Measured	252.9
GRM-01C	PVC	253.48	34.2	219.28	33.94	219.54	Not Measured	253.48

### FIELD HYDRAULIC CONDUCTIVITY TEST RESULTS

### CONSOLIDATION LANDFILL FEASIBILITY STUDY FORT DEVENS, MA

	TEST	TYPE OF	NDROGRAVIAV.	TRANSMISSIVITY		
WELL	TYPE	WELL	BOUWER AND RICE	HVORSLEY <sup>2</sup>		SOURCE
			CM/SEC	CM/SEC	CM2/SEC	
SHI -5	RISING	OVERBURDEN	1F-07	NOT CALC	3500	F+F
5145 5	FALLING	OVERBIEDEN	1E 02 1E492	NOT CALC	3500	E-E
SHI -7	RISING	OVERBURDEN	1E-02	NOT CALC	2E00	E+F
0112-7	FALLING	OVERBLEDEN	12-02 12-02	NOT CALC.	2000	E - E
28- IH2	RISING	OVERBURDEN	<u>ፍ</u> ፑ-ብ3	NOT CALC	8F-01	F+F
0110 00	FAILING	OVERBIRDEN	75-04	NOTCALC	1500	E-E
SHI -8D	RISING	OVERBURDEN	2E-03	NOT CALC	3E00	F+F
	FALLING	OVERBURDEN	35403	NOT CALC	4600	R4R
SHT -9	RISING	OVERBURDEN	9E-03	NOT CALC	4E00	F+F
	FALLING	OVERBURDEN	4E-03	NOT CALC	2800	E+F
SHI -10	RISING	OVERBURDEN	4E-03	NOT CALC.	<b>쥰-</b> 01	E+F
	FALLENG	OVERBURDEN	25-03	NOT CALC	316-01	P#P
SHL-11	RISING	OVERBURDEN	2E-04	NOT CALC.	5E-02	E+E
	FALLING	OVERBURDEN	4E-04	NOTCALC	16-01	E+E
SHL-12	RISING	OVERBURDEN	1E-02	NOT CALC.	2E00	E+E
	FALLING	OWERBURDEN	1E-02	NOT CALC	21680	K4F
SHL-13	RISING	OVERBURDEN	4E-03	NOT CALC.	2E00	E+E
	FALLING	OVERBURDEN	SE-04	NOT CALC.	26-01	E+E
SHL-15	RISING	OVERBURDEN	8E-03	NOT CALC.	2E00	E+E
	FALLING	OVERBURDEN	2E+02	NOT CALC.	5E00	E+£
SHL-17	RISING	OVERBURDEN	3E-03	NOT CALC.	9E-01	E+E
	FALLING	OVERBURDEN	9E-02	NOT CALC	3E01	E+E
SH-18	RISING	OVERBURDEN	1E-02	NOT CALC.	4E00	E+E
	FALLING	OVERBURDEN	4E-02	NOT CALC.	9E-01	E+E
SHL-19	RISING	OVERBURDEN	1E-01	NOT CALC.	3E01	E+E
	FALLING	OVERBURDEN	1E-03	NOT CALC.	4E-01	E+E
SHL-20	RISING	DRCK/OVRBRD	3E-02	NOT CALC.	3E01	E+E
SHIL+21	RISING	OVERBURDEN	1E-02	NOTCALC	3E00	E+E
	FALLING	OVERBURDEN	8E-03	NOT CALC.	2E00	E+E
SHIL-22	UNKOWN	OVERBURDEN	22:-04	NOT CALC	UNKNOWN	E+E
SHL-24	UNKOWN	DRCK/OVRBRD	1E-08	NOT CALC.	4E-05	E+E
SH1L-25	UNKOWN	OVERBURDEN	9E-05	NOT CALC.	3E-01	E+E
POL-1	RISING	UNKNOWN	3E-04	NOT CALC.	9E-03	E+E
	FALLENG	UNKNOWN	3E-04	NOT CALC.	1E-02	E+E
POL-3	RISING	UNKNOWN	5E-04	NOT CALC.	8E-02	E+E
	FALLING	UNKNOWN	8E-04	NOT CALC.	1E-01	E+E
B202-1	FALLING	UNKNOWN	6E-02	NOT CALC.	2E01	E+E
B202-2	RISING	UNKNOWN	2E-02	NOTCALC	4E00	E+E
	FALLING	UNKNOWN	1E-02	NOT CALC.	3E00	E+E
B202+3	RISING	UNKNOWN	SE-02	NOT CALC.	1E01	E+E
	FALLING	UNKNOWN	5E-02	NOT CALC.	1E01	E+E
SHM-93-01A	RISING	OVERBURDEN	46-03	1E-03	NULLALC	ABB-ES
	RISING	UVERBURDEN	ye-03	1E-03	NUT CALC.	ABB-ES
SHM-93-10C	RISING	BEDROCK	22,404	35.00	NOT CALL	ABD-ES
	FALLING	BEDRUCK	2E-04	3E-U3	NUT CALC.	ABB-ES
2HM-93-188	RIDING	OVERBURDEN	4E-03	72-414 5E-04	NOT CALL	ADD-CO
	KISING	DVERBURDEN	4E-03	JE-04	NOI CALU.	ADD-ES
SHEW-93+22	NUDING	OVEDDIDDEN	25.02	20.02	NOT CALC	ADDES
5HM-93-24A	MISDIC	OVERDURDEN	4E-02	20-02 36.83	NOT CALC.	AND CO
	-RIGINO	Maring	15-02	25.02	34 54	
		Minimum	10-01	55-07	45-05	
		Autore	15-00	55-02	412-000 5E00	
		Geometric Mann	35-02	35-03	1500	
		Standard Departies	25-03	95-04	8500	
			-UL-UL	2L-03	02,00	

NOTES:

1 - Bouwer and Rice (1976) 2 - Hvorslev (1951)

3 - E + E (Ecology and Environment, Inc.) Draft Final Remedial Investigation Report, 1992
4 - ABB-ES Final Remedial Investigation Addendum Report, 1993

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S E A Consultants Inc. Engineers/Architects Cambridge, MA. S. Portland, ME. Wethersfield, CT.



## MONITORING WELL CROSS-SECTION WITH BARCAD SAMPLER INSTALLATION

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S E A Censultants Inc. Engineers/Architects Cambridge, MA. S. Portland, ME. Wethersfield, CT.



S E A C Engine	Consultants rs/Archite	Inc. cta	ject : Ba La Ft.	arson's Con ndfill Clos Devens	nstruction ure		Boring Log Boring No. SEA-1 Ref. No. 392-8511
Contractor Engineer/C Boring Los Ground Su	: Soil Expl Seclegist : Cation : S	bration Corp D M. Gitten See Site Plan	Date: 28 Jan. 6 70 88	16	12.5 Deta - 7 March	C.	sing Size : 3-1/4" I.D. Hollow Sten Sempler : 1-3/8" I.D. Split Spoon NX Core Barrel Casing at : 0
	1	San	npie		T		
Depth (ft)	No.	Pen (in) /Rec.	Depth (ft)	Biows/6"	Sample Description	Remarks	Stratum Description
	<b>S-1</b>	5/5	0-0.4'	100/5*	FILL: Brown, medium to coarse		FILL: Medium to coarse SAND (
1 1.5					SAND		
2 2.5							
3 3.5							
4 4.5	<u>\$-2</u>	18/14	4-5.5	6	FILL: Brown, medium SAND, some		
5 5.5				6 7	coarse sand		
6 6.5							
7	S-3		7.			(1)	(6.5) FILL: Landfill refuse
8 8.5							
9 9.5	S-4	18/0	9-10.5	13			
10,10.5				24 17			
11							
12 <sub>12.5</sub>							
13 <sub>13.5</sub>							(13.0)
14 <sub>14.5</sub>	S-5	8/6	14-14.7	60	Brown, fine SAND, some silt and		gravel (SM)
15 <sub>15.5</sub>				80/2*	Coarse graver (giacisi uli)		
16 <sub>18.5</sub>							
17 <sub>17.5</sub>						l	
18 <sub>18.5</sub>	S-6	2/2	18-18.2	100/2*	Brown, find SAND, some silt and coarse gravel (placial till)		
19 <sub>19.5</sub>					and Alexan (Surgary and		
20							
Granula	r Soils	Cohesin	ve Soils	Remarks:	1	I	9
Biows/FL	Density	Blows/Ft.	Density	(1) Boring (2) All corir	encountered refuse, unanticipated at thi Ig time in minutes	s location	
0-4 4-10	V.Loose Loose	24	v. Son Soft				•
10-30	M. Dense	4-8 8-15	M. Stiff Stiff				Boring Log
>50 >50	V. Dense	15-30 >30	V. Stiff Hard				Boring No. SEA-1 Ref. No. +392-8511
formation o Imples. Str	n this log is a alla have bee	n interpreted b	of subsurface by commonly	conditions and accepted pro	d soil or rock classifications obtained fro codures. The stratum lines may be trans	m the field as stional and a	well as laboratory testing of pproximate. Water level

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ecology and environment

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S E A Engine	Consultant consultant	s inc.	ject : Bi La Ft	arson's Col Indfill Closs . Devens	nstruction ure		Boring Log Boring No. SEA-1 Ref. No. 392-8511		
Contracto Engineer/ Boring Lo Bround S	r : Soil Ex Geologist : cetion : urface Elev	M. Gitten See Ste Plan . : 2	late: 23 Jan. 6 70.88	i6 Water Level :	12.5' Date : 7 March	Ca 86 (	sing Size : 3-1/4" I.D. Hollow Stem Sampler : 1-3/8" I.D. Split Spoon + NX Core Barrel Casing at : 0		
Depth (fl)	No.	No. Pen (in) Depth Blow		Sample Pen (in) Depth Blows/6" Description Remain				Remarks	Stratum Description
20.5 21 21.5 22 22.5							Find SAND, some sit and coarse gravel (SM)		
23 23.5 24 24.5 25	\$-7	00	23.7	120/0" CORING TIME	Very intensely foliated, slightly weathered gneissic biotte GRANTE with closely to medium	(2) ,	(23.7) Very hard to hard, light grey, fine-grained equigranular, gneissi biotic GRANITE		
25.5 26 28.5 27 27.5	<b>C</b> -1	recovery	=83%	18	spaced, tight, planar joints; joints are flat (0° to 20°) to staeply dipping (45° to 70°)				
28.5 29 29.5 30 30.5				8	Bottom of exploration at 28.7*		(28.7)		
11 31.5 12 32.5 13									
33.5 4 34.5 5 35.5									
6 36.5 7 37.5 8									
38.5 9 39.5 0									
Granular rs/Ft	r Soils Density	Cohesivo Blows/Ft	Density	Remarka: (1) Boring er (2) All coring	ncountered refuse, unanticipated at this time in minutes	location	<u> </u>		
-4 10 -30 -50 50	V.Loose Loose M. Dense Dense V. Dense	2-4 4-8 8-15 15-30 >30	v. son Soft M. Stiff Stiff V. Stiff Hard				Boring Log Boring No. SEA-1 Ref. No. 392-8511		
les. Stra urement	this log is a Its have been Is have been	compilation of n interpreted by made in the op	subsurface o commonly a en boreholes	conditions and : accepted proce	soil or rock classifications obtained from idures. The stratum lines may be transit d location indicated, and may vary with t	the field as v ional and ap lime, geologi	well as laboratory testing of proximate. Water level c condition or construction activity.		

Page 2 of 2

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S E A Consultants Inc. Engineers/Architects Cambridge, MA. S. Portland, ME. Wethersfield, CT.



### MONITORING WELL CROSS-SECTION WITH BARCAD SAMPLER INSTALLATION



S E A Consultants Inc. Engineers/Architects Cambridge, MA. S. Portland, ME. Wethersfield, CT.

DRILLING CONTRACTOR: <u>Sc</u> FOREMAN: <u>Bob Seymour</u> METHOD: <u>Hollow Stem Auger</u>	oil Exploration	n Corp	MONITORING WELL NO. <u>BAR-2A &amp; WT-2</u> JOB NO: <u>392-8511</u> CLIENT: <u>Barson's</u> LOCATION: <u>Ft Devens Landfill</u> DATE	?
SEA GEOLOGIST/ENGINEER	a: <u>M Schultz</u>		START: 1/31/86 FINISH: 2/3/86	
-	BARCAD No. 1	WELL WT-2	SOIL SAMPLES TAKEN: No	
GROUNDWATER DEPTH DATE :	: <u>21.8'</u> <u>3/7/86</u>	22.0 <sup>•</sup> 3/7/86	EQUIPMENT CLEANING: Yes METHOD: <u>Steam &amp; Methanol Rinse</u>	
DATUM :	<u>T.C.</u>	T.C.	MATERIAL TO FACILITATE DRILLING: Ye TYPE: Water	IS



S E A ( Engine	Consultante ors/Archite	Inc. cts	ect:Ba La Ft.	rson's Col ndfill Closi Devens	nstruction ure		Boring No. SEA-2 Ref. No. 392-8511
Contractor Engineer/C Boring Lo Ground Sc	r: Soil Expl 3eologist: cation: ; urface Elev.	oration Corp. M. Gitten See Site Plan : 25	Date: 31 Jan 4.90 N	-3 Feb 86 Nater Level :	19.5° Date : 3 Feb. 8	Ca 6 (	aing Size : 3-1/4" I.D. Hollow Sten Sampler : 1-3/8" I.D. Split Spoon NX Core Barrel Casing at : 32'
	1	Sample					
Depth (ft)	t) No. Pen (in) Depth Blows/6" Sa /Rec. (ft) Blows/6"		Sample Description	Remarka	Stratum Description		
0.5	S-1	13/4	0-1.1	79 33	Brown, find SAND, little coarse sand and fine gravel, trace inorganic silt	(1)	Fine to medium SAND, sittle coal sand and gravel (SP)
1 1.5				50/1*	with roots		
2							
2.5					4		
3 ,		1					
 A					]		
. 7 4.5	<u>S-2</u>	18/16	4-5.5	7	Brown, fine SAND, little medium to		
5	<u> </u>			13	Anan an der ut draf fille fille der		
3.5 E						-	
6.5							
7				1			
7.5							
8.5							
9	5.3	18/14	9-10 5	12	Brown fine to medium SAND little		
9.5			3-10.5	17	coarse sand and fine to medium		
10				20	gravel		
11							
11.5							
12							
13							
13.5				· · · ·		1	
14	S-4	18/15	14-15.5	10	Brown, fine SAND, little medium to		
15				20	coarse sand and fine gravel		
15.5				23		1	
16			····			1	
10.0 17							
17.5							
18							(18.07)
10.5							Fine SAND, trace inorganic silt (S
19	<u>\$-5</u>	18/18	19-20.5	12	Brown, fine SAND, trace inorganic silt	× I	
20				16			
Granula	ur Soils	Cohesiv	e Sails	Remarks:			
llows/FL	Density	Blows/Ft.	Density	(1) SIOW CO (2) Gravel (	unis nign for 3-1 que to most penetration sieces include both subangular and ang.	1. Har (rock fr <b>a</b> g	ments).
0-4	V.Loose	2	V. Soft	(3) All corin	g times in minutes.	•	
4-10 10-30	Loose M. Dense	2-4 4-8	Son M. Stiff				Poring La
30-50	Dense	8-15	Stiff V SH				Boring LOG
>50	V. Dense	>30	Hard				Ref. No. 392-851

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		Pro	ject : Ba La Ft	arson's Co andfill Clos . Devens	instruction ure		Boring Log Boring No. SEA-2 Ref. No. 392-8511
igineer: itractor : ineer/Gr	: Soil Exp cologist :	icts Ioration Corp. M. Gitten	Date: 31 Jan	-3 Feb 86		c	asing Size : 3-1/4" I.D. Hollow Stem Sampler : 1-3/8" I.D. Spit Spoon &
ing Loca und Sur	etion : S risce Elev.	iee Site Plan : 21	i <b>4.9</b> 0	Water Level	: 19.5' Date : 3 Feb. 8	6	NX Core Barrel Casing at : 32'
	· · · · · · · · · · · ·	San	npie			· ·	
pth it)	No.	Pen (in) /Rec.	Depth (ft)	Blows/6"	Sample Description	Remarka	Description
20.5 1 21.5							Fine SAND, trace inorganic silt (SP)
2					-		
,				1			(22.5) Fine SAND, little inorganic silt witt
23.5							lenses of inorganic SILT (SM/ML)
24.5	S-6	18/18	24-25.5	17	Brown, fine to coarse SAND, little inorganic silt with lenses of SILT		
25.5				29		,	
26.5							
27.5							
							(28.0)
	S-7	18/12	29-30.5	18	Brown fine to merse SAND little	(2)	Fine to coarse SAND, little fine to coarse gravel, trace inorganic silt
29.5				30	fine to coarse gravel, trace		(SW)
30.5				- 28			
31.5							
32.5	S-8	0/0	32	100/0*	Freeh to elightly uperhaved biobite	(7)	(32.07)
33.5	C-1	<b>60</b> /55	32-37	10	GRANODIORITE, with closely to medium spaced, tight, planar joints;	(3)	equiangular to slightly porphyntic biotite GRANODIORITE with few
34.5L				8	joints are flat (0° to 20°) to steeply dipping (45° to 70°), few quartz		quartz stringers
75.6		Recovery	- 92%	9	stringers		
F				11			
36.5							
37.5				8		· · · ]	
38.5	C-2	24/22	37-39	12			
39.5		Recovery	= 92%	12	Bottom of Exploration at 39'		(39.0)
F							
enuler S	Soils	Cohesive	Soils	Remarks:	l	L	
FL	Density	Blows/Ft	Density	(1) Blow co (2) Gravel p	unts high for S-1 due to frost penetration seces include both subangular and angu	1. Jar (rock frag	ments).
	V.Loose	<2 2-4	V. Soft Soft	(3) ALCONN	g แกษร क <b>กรานเอร</b> .		
	M. Dense Dense V. Dense	4-8 8-15 15-30	M. Stiff Stiff V. Stiff				Boring Log Boring No. SEA-2

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S E A Consultants Inc. Engineers/Architects Cambridge, MA. S. Portland, ME. Wethersfield, CT.

DRILLING CONTRACTOR: Soil Exploration Corp. MONITORING WELL NO. BAR-3 FOREMAN: Bob Seymour JOB NO: 392-8511 CLIENT: Barson's METHOD: Hollow Stem Auger & NX Core Barrel LOCATION: Ft. Devens Landfill DATE SEA GEOLOGIST/ENGINEER: J. Jammalo START: 2/5/86 FINISH: 2/6/86 **BARCAD SAMPLER** SOIL SAMPLES TAKEN: Yes No. 1 EQUIPMENT CLEANING: Yes GROUNDWATER DEPTH : 29.5' METHOD: Steam dean and methanol rinse DATE : 2/16/86 MATERIAL TO FACILITATE DRILLING: Yes DATUM : G.S. TYPE: Water LEGEND IMPERMEABLE SEAL SAND FILTER BACKFILL MATERIAL Height of Top Casing Above Ground Surface 1.58' Protective Casing & Cover Elev. 249.15 Ground Surface Elev. 247.57 Cement Grout

\_\_\_\_\_Depth 35' \_\_\_\_\_\_Depth 37' BARCAD SAMPLER No. \_\_1 \_\_Depth Bottom 42.5' \_\_\_\_\_\_\_Depth APPROXIMATE & RELATIVE TO GROUND SURFACE 42.5'

### MONITORING WELL CROSS-SECTION WITH BARCAD SAMPLER INSTALLATION

requipted paper



S E A Censultants Inc. Engineers/Architects Cambridge, MA. S. Portland, ME. Wethersfield, CT.



**Boring Log** Project : Barson's Construction Landfill Closure Boring No. SEA-3 S E A Consultante Inc. Ft. Devens Ref. No. 392-8511 Engineers/Architects Contractor : Soil Exploration Corp. 5 Feb. & 6 Feb. 86 Casing Size : 3-1/4\* I.D. Hollow Stem Sempler : 1-3/8\* I.D. Spin Spoch & Engineer/Geologist : M. Schultz Boring Location : See Site Plan NX Core Barrel 247.57 Date : 6 Feb. 86 Casing at : 0' Ground Surface Elev. : 29.5' Water Level : Sample Stratum Depth Sample Remarks Pen (in) Depth Description Description (ft) No. Blows/6\* /Rec. (ft) Fine to measure SAND, trace to sta S-1 0.-2 Brown, fine to medium SAND, trace (1) 0.5 to little coarse sand and fine gravel coarse sand and fine graver (SP) with occasional mota 1 1.5 2 2.5 3 3.5 4 S-2 18/18 4-5.5 Brown, fine to medium SAND, trace 4.5 7 coarse sand 8 5 10 5.5 , 6 6.5 7 7.5 (7.5)\_\_\_ 8 Coarse to fine SAND, trace fine 8.5 gravel (SW) 9 S-3 18/18 9-10.5 13 Brown, coarse to find SAND, trace 9.5 fine gravel 15 10 16 10 5 **11** 11.5 12<sub>12.5</sub> (125)\_ 13 Fine to medium SAND, trace coarse 13 5 sand and fine gravel (SP) 14,14.5 5-4 18/15 14-15.5 7 Brown, fine SAND, trace to little medium to coarse sand and fine 15<sub>15.5</sub> 8 gravel a 16 16.5 17<sub>17.5</sub> 18<sub>18.5</sub> 19<sub>19.5</sub> S-5 18/16 19-20.5 7 Brown, fine to medium SAND, trace coarse sand 9 20 9 Remarks: Granular Soils Cohesive Soils (1) S-1 from auger. Blows/FL Blows/Ft. Density Density (2) Sample S-6 and above dry. V. Soft (3) Samples S-7 wet. 2 0-4 V.Loose 410 2-4 Soft Loose 4-8 M. Stiff 10-30 M. Dense Boring Log 8-15 Stiff 30-50 Donse 15-30 V. Stiff Boring No. SEA-3 >50 V. Dense Ref. No. 392-8511 Hard >30 Information on this log is a compilation of subsurface conditions and soil or rock classifications obtained from the field as well as laboratory testing of

Information on this log is a compliation of subsurface conditions and soli of rock classifications obtained from the held as well as laboratory testing of samples. Strata have been interpreted by commonly accepted procedures. The stratum lines may be transitional and approximate. Water level measurements have been made in the open boreholes at the time and location indicated, and may vary with time, geologic condition or construction activity

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<b>Se</b> <b>a</b> E A Con Engineera// Contractor : Engineer/Gool Boring Locatk Ground Surfact Depth (ft) 20.5 21 21.5 22 23 23.5 24 24.5 25 26 27 27.5 28 29 29.5	Soil Exploration Soil Exploration logist : M.: con : See Status No. Pe //	Proje a Corp. 5 Schultz B Plan 247. Sam n (In) Rec.	ect : Bi La Feb. & 6 Fe 2.57 Depth (ft)	arson's Co andfill Clos Devens b. 86 Water Level Blows/6*	sure : 29.5' Date : 6 Feb. 8 Sample Description	G Remarke	Boring Log Boring No. SEA-3 Ref. No. 392-8511 maing Size : 3-1/4* I.D. Hollow Stem Sampler : 1-3/8* I.D. Spit Spoon ( NX Core Barrel Casing at : 0* Stratum Description
S E A Con           Engineera/           Contractor :           Engineer/Gool           Boring Locatk           Ground Surfact           Depth           (ft)           20.5           21           22.5           23           23.5           24           25.5           26           27.5           28           29           29.5	Soil Exploration logist : M.S on : See Sta ce Elev. : No. Pe //	B/15	La Feb. & 6 Fe 2.57 Depth (ft)	Andfill Clos Devens b. 86 Water Level Blows/6"	: 29.5' Date: 6 Feb. 8 Sample Description	Ci Remarke	Boring No. SEA-3 Ref. No. 392-8511 ming Size : 3-1/4* 1.D. Hollow Stem Sampler : 1-3/8* 1.D. Spit Spoon / NX Core Barrel Casing et : 0* Stratum Description
Contractor : ingineer/Geoi Boring Locatk Bround Surfact Depth (ft) 20.5 21 21.5 22 23 23.5 24 24.5 25 26 27 27.5 28 29 29.5 29 29.5	Soil Exploration logist : M.: on : See Sta ce Elev. : No. Pe //	n Corp. 5 Schutz 9 Plan 247 Sam n (In) Rec.	Feb. & 6 Fe 2.57 Depth (ft)	b. 86 Water Level Biows/6*	: 29.5' Date: 6 Feb. 8 Sample Description	C; K Remarka	Sampler : 3-1/4* 1.D. Hollow Stam Sampler : 1-3/8* 1.D. Spit Spoon . NX Core Barrel Casing at : 0* Stratum Description
Control     Surfact       20.5     21       21     21.5       22     23.5       23     23.5       24     24.5       25     25.5       26     28.5       27     27.5       28     28.5       29     29.5	Ce Elsv. : No. Pe //	247. Sam n (In) Rec.	2.57 pie Depth (ft)	Biows/6"	: 29.5' Date: 6 Feb. 8 Sample Description	Remarks	Casing at : 0 Stratum Description Fine to medium SAND, trace to lit
Depth (ft)       20.5       21       21.5       22       23       23.5       24       25       25       26       28.5       29       29	No. //	Sam n (In) Rec.	pie Depth (ft)	Blows/6"	Sample Description	Remarka	Stratum Description
(ft) 20.5 21 <sub>21.5</sub> 22 23 <sub>22.5</sub> 23 <sub>23.5</sub> 24 <sub>24.5</sub> 25 <sub>25.5</sub> 26 <sub>26.5</sub> 27 <sub>27.5</sub> 28 <sub>28.5</sub> 29 <sub>29.5</sub>	No. //	n (In) Rec.	Depth (ft)	Biows/6"	Description	Remarka	Description Fine to medium SAND, trace to lit
20.5 21 21.5 22 23 23.5 24 24.5 25 25 26 26 27 27 27 28 28 29 29 29 29 29 29 29 5 20 20 21.5 21 21 21 22 22 23 23 23 23 24 25 25 25 25 25 25 25 25 25 25	S-6 1	B/15					Fine to medium SAND, trace to lit
21 21.5 22 22.5 23 23.5 24 24.5 25 25.5 26 26.5 27 27.5 28 28.5 29 29.5	S-6 1	B/15				1	annual sead (CC)
22     23.5       23     23.5       24     24.5       25     25.5       26     26.5       27     27.5       28     28.5       29     29.5	S-6 1	B/15			-		COURSE SEND (SP)
22.5 23 23.5 24 24.5 25 25.5 26 26.5 27 27.5 28 28.5 29 29.5	S-6 1	B/15			4		
23.5       24       24.5       25       25       26       26.5       27       27.5       28       28.5       29       29.5	<u>S-6</u> 1	B/15					
24       25       25       26       27       27       28       28.5       29       29.5	S-6 1	B/15					
24.3 25 25.5 26 26.5 27 27.5 28 28 28.5 29 29.5			24-25 5	15	Brown fine SAND trace to little	(2)	
25.5 26 28.5 27 27.5 28 28.5 29 29.5				20	coarse sand	, <sup>(2)</sup>	
26 28.5 27 27.5 28 28.5 29 29.5	<del></del>			22	]		
28.5 27 27.5 28 28.5 29 29.5			<u> </u>				
27.5 28 28.5 29 29.5							
28 28.5 29 29.5							
29 29.5				<u> </u>			
29.5							
	S-7 18	V15	29-30.5	8	Brown, fine to medium SAND, trace	(3)	
30 -				8	coarse sand		
30.5				9			
31.5							
32 -							
32.5							
33.5							
34 –	S.0 1		24.25.5				
34.5	3-6 1		34-33.5	12			
35.5				13			
36  — <sup>4</sup>	5-9 11		35.5-37	8			
38.5				10			
37.5							
18   <u>s</u>	÷10 0/		37.5-	50/0"	Freeh to elightly supplication to all		(37.5)
38.5				7.5	GRANODIORITE with very closely		equigranular biotite
39.5	C-1 60	<b>у</b> :	37.5 to		to closely speced, tight, planar joints; joints flat (0°-20°) to verv		SRANODIORITE
0		(00)-	42.5		steeply dipping (70° to 90°)		
				6			
Granular Soils	s (	iohesive S	ioiis I	Remarks:	21/20/		
rs/FL Der	nsity Blow	FL D	)ensity	(2) Sample 3	S-6 and above dry.		
4 V.L	L0050 <2		V. Soft	(3) Samples	S-7 weL		
10 L -30 M.C	Loose 2-4 Dense 4-6		M. Stiff				Paring Log
-50 D	Dense 8-1	5	Stiff .				Boring LOG
× v. D	>30	5	Hard		•	•	Ref. No. 392-8511

SEA Engine	Consultant ers/Archit	te Inc.	oject : B L F	larson's Cor andfill closu t. Devens	nstruction re		Boring Log Boring No. SEA-3 Ref. No. 392-8511
Contracto Engineero Boring Li Ground S	or : Soil Ex Geologist : contion : Surface Elev	pibration Corp M. Schult See Site Plan 7. :	z 247.57	Water Level :	29.5' Date : 6 Feb.	Ca .86	Being Size : 3-1/4* I.D. Hollow Ste Sempler : 1-3/8* I.D. Spirt Spoor NX Core Barrei Casing at : <sup>0</sup>
Banth		SI	Imple		0		Charles
(ft)	No.	Pen (li /Rec.	n) Depth (ft)	Blows/6"	Description	Remarks	Description
40.5 41	5 			5			Very hard to hard, dark groy, equigranular bioste GRANODIORITE
42				11			
43 43.5					Bottom of exploration at 42.5		(42.5)
44 44.5							
40 45.5 46						, ,	
45.5 47							
47.5 48							
48.5 19 49.5							
50 50.5							
51 51.5							
52 52.5			1				
53.5 54							
54.5 55		·					
55.5 56 56 5							
57 57.5							
58.5				 			
59 59.5							
Granula ws/Ft	r Soils Density	Cohesi Blows/Ft	ve Soils Density	Hemarks:			
	V.Loose Loose M. Dense Dense V. Dense	<2 2-4 4-8 8-15 15-30	V. Soft Soft M. Stiff Stiff V. Stiff				Boring Log
mation pi	n this log is a	>30 compilation (	Hard of subsurface	conditions and s	oil or rock classifications obtained from	n the field as v	Ref. No. 392-8511

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recycled caper

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#### S E A Consultants Inc. Engineers/Architects Cambridge, MA. S. Portland, ME. Wethersfield, CT.

DRILLING CONTRACTOR: Soil Exploration Corporation FOREMAN: Bob Seymour METHOD: Hollow Stem Auger & NX Cone Barrel

SEA GEOLOGIST/ENGINEER: J. Jammallo/M. Schultz

RCAD S	AMPLER	WELL
No. 1	No. 2	
10.5'	10.5'	10.9'
1/17/86	3/17/86	3/17/86
TC	TC	TC
	HCAD S No. 1 10.5' 0/17/86 TC	Incad Sampler           No. 1         No. 2           10.5'         10.5'           1/17/86         3/17/86           TC         TC

MONITORING WE JOB NO: 392-851 LOCATION: Fort	LL NO. 1 CLIE! Devens I	BAR-4	& 50N	WT-4
DATE START: 2/7/86	FINIS	H: 2/10/	86	

SOIL SAMPLES TAKEN: Yes

EQUIPMENT CLEANING: Yes METHOD: Steam Clean and Methanol Rinse

MATERIAL TO FACILITATE DRILLING: Yes TYPE: Water





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							Fage 2 or	2
6		Pr	oject : B	arson's Co	nstruction		Boring	Lo
			L	andfill Clos	ure		Boring No. Si	EA-4
t A Go Sineer	Archit	s inc. ects		t. Devens			Ref. No. 392-8	8511
ractor : neer/Ge	Soil Ex ologist :	bioration Corp. J. Jammaik Res. Ste. Dise	Date: 8 Feb.	10 Feb. 86		Cı	Sampler : 3-1/4" I.D. Ho Sampler : 1-3/8" Split S Core Barrel	xlw Ster ippon &
nd Sur	tion : · · · · · · · · · · · · · · · · · ·	.: .:	226.00	Water Lavel :	8.8 Dete : 10 Feb.	86	Casing at : 0	
		Sa	mple					
oth ;)	No.	Pen (in /Rec.	) Depth (ft)	Blows/6"	Sample Description	Remarks	Stratur Descripti	n Ion
20.5						1		
-					4		Fine SAND, little to som sand and fine gravel (Si	e coars P/SWI
21.5		+	+	+	1			,
22.5 L					1			
- F							(22.5)	
23.5				15/2-	Gray, SILT and fine SAND, trace		to coarse sand and grav	e međiu rel (SM)
. t	S-6	+	24-24.2	60/0	(giacial fill)		(24.2)	. ,
E	-			CORING		(2)	Very hard to hard, dark	grey,
25.5	C-1	60/60	24.2-29.2	11	Fresh to slightly weathered, biotite			
H	-	+	+	8	medium spaced, tight, planar joints;			
28.5		Recovery	= 100%		steeply dipping (70° to 90°), some healed			
27.5				8				
28.5								
29.5 🗆	_			9			(29.2)	
			ļ		Bottom of Exploration at 29.2'			
30.5				<u> </u>				
31.5								
						Í		
32.5				<u>  </u>				
33.5								
-								
34.5								
35.5								
						1		
85.5								
7.5								
-						[		
8.5								
s 5								
nutar Sc	xil <b>s</b>	Cohesiv	• Soils	Remarks:			······	
L D	ensity	Blows/FL	Density	(1) S-1 from a (2) All coring	times in minutes			
V	Loose	~2	V. Soft					
M	Loose Dense	2-4 4-8	Soft M. Stiff				Design	1
	Dense	8-15	Súff V Shif				Boring	LOG Sea-4
V.	Uense	>30	Hard				Ref. No. 39	2-851



#### S E A Consultants Inc. Engineers/Architects Cambridge, MA. S. Portiand, ME. Wethersfield, CT.

Yes

	DRILLING FOREMA METHOD	G CONTR N: Bob S ): 4" Sear	ACTOR: <u>So</u> eymour niess Casing	I Exploration		MONITORING WELL NO. BAR-5 JOB NO: <u>392-8511</u> CLIENT: Barson's LOCATION: Ft Devens		
:	SEA GEO	DLOGIST	ENGINEEF	: M. Schultz		DATE START: <u>2/12/86</u> FINISH: <u>2/27/86</u>		
		No. 1	BARCAD No. 2	SAMPLER No.3	R <u>No.</u> 4	SOIL SAMPLES TAKEN: Yes		
GROUNDWATER D	EPTH:	2.15	3.50'	5.41'	4.2'	EQUIPMENT CLEANING: Yes		
	DATE :	3/7/86	3/7/86	3/7/86	3/7/86	METHOD. <u>Stean dear and menandmise</u>		
עם	ATUM : _	T.C.	T.C.	T.C.	T.C.	MATERIAL TO FACILITATE DRILLING TYPE: Water		





S E A Censuitants Inc. Engineers/Architects Cambridge, MA. S. Portland, ME. Wethersfield, CT.



CROSS SECTION SCHEMATIC

Consultante rs/Archite	inc. cts	La Ft	indfill Clos . Devens	ure		Boring No. SEA-5 Ref. No. 392-851.
: Soil Exp leologist : sation :	Ioration Corp. M. Schultz See Site Plan	Date: 12 Feb	o27 Feb. 86		Ca	sing Size : 3-1/4" I.D. Holiow Ste Sampler : 1-3/8" I.D. Split Spoo NX Core Barrel
ITIBCE EIEA.	:	nnla	Water Level			
	Pen (in)	Depth		Sample	Remarks	Stratum Description
NO.	/Rec.	(ft)	BIOWS/6	Deacription .		
<u>S-1</u>		0-2	-	Peat	(1)	Peat (PT)
						(0.5) Fine SAND, some organic silt, medium sand and peat (SP/OI
		<u> </u>				
	+					
6.0		4.50	+	Dark Berner for CAND		
- 3-2	<u>כויבו</u>	4-3,3	60	organic silt, little medium sand and		
			60/3*	peat		•
	<u> </u>		+	4		
						(7.5) Fine to medium SAND, trace
						inorganic silt, coarse sand and
S-3	18/12	9-10.5	17	Brown, fine to medium SAND, trace,		
	+		21	gravel		
			1			
			1			
					(	
	ļ				[	
S-4	18/18	14-15.5	4	Brown, fine SAND, little inorganic		(14.0')
			2	silt, trace fine gravel		Fine SAND, little inorganic silt,
			4			nne Altrai (CM)
					1	
				•		(17.5)
						Fine SAND, trace inorganic silt (
5-5	18/18	19-20.5	2	Light brown, fine SAND, trace inorganic silt		
			6			
Soils	Cohesiv	e Soils	Remarks:		<b>I</b>	
Density	Blows/FL	Density	(1) Sample	S-1 auger.	ntain soit for a	riscution
V.Loose	. <2	V. Soft	(3) Drove c	esing to advance hole below 49 feet.		ur gesamdt I I Thatfill birlyf f
Loose	2-4 4-8	Soft M. Shift	(4) Evidenc	e of soil type on end of sampler.		
Dense	8-15	Stiff				Boring Lo
V. Dense	15-30 ≥30	V. Stiff Hard				Ref. No. 392-851
	S-3	S-3 18/12 Soils Cohesiv Soils Cohesiv S-4 18/18 S-5 18/18 S-5 18/18	Consultants         Inc.         FL           rs/Architects	Densitiants Inc.       Pt. Devens         solution in the second seco	Answitching Inc.     Fr. Devens       : Solid Exploration Corp.     Date: 12 Feb. 27 Feb. 86 eologist :       M Schutz     Sample       Sample     Date: 27 Feb.       Sample     Sample       Sample     Date: 27 Feb.       Sample     Date: 30 Feb.       Sample     Date: 30 Feb.       Sample     Sample       Sample     Date: 30 Feb.       Sample     Sample       Sample     Sample       Sample     Sample       Sample     Sample       Sample     Samp	Arsaitante inc.         Fr. DeVens           : Set Exportion Cop.         Date: 12 Feb. 27 Feb. 86         Cee           elegite:         X Schutz         Sample         Cee           Sample         Sample         Sample         Pear (In)         Pear (In)         Pear (In)         Pear (In)         Depth         Blows/er         Sample         Pear (In)         Pear (In)

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5		Pro	oject : B	arson Co	onstruction		Borina I	Log
A C	onsultant s/Archite	s Inc. Incts	L: Fi	andfill Clos I. Devens	ure		Boring No. SEA- Ref. No. 392-851	-5 1
ctor : er/Ge Loo	: Soil Exp sologist : stion :	Noration Corp. M. Schultz See Site Plan	Date: 12 Feb	o27 Feb. 86		Ca	sing Size : 3-1/4° I.D. Hollow Sampler : 1-3/8° I.D. Spit : NX Core Barrei	w Stern Socon
d Sur	face Elev	.: 2	16.41	Water Level	2.2 Date : 27 Fe	b. 86 (	Casing at : 0	
		Sa	mpie		Sample		Stratum	
	No.	Pen (in) /Rec.	Depth (ft)	Blows/6"	Description	Remarka	Description	<b>n</b>
0.5		+	<del> </del>		-		Fine SAND, trace inormanic	c silt
1.5 L							(SP)	
F		_			]			
2.5								
3.5 Ľ								
F	8.6	50/10	24.05.5					
1.5	3-0	10/18	24-25.5	<u>                                     </u>	inorganic silt			
5.5 Ľ		1				, ,		
_								
3.5				<u> </u>				
7.5 Ľ								
-								
1.5								
.s L	S-7	18/18	29-30.5	1	Light brown, fine SAND, trace			
-					inorganic silt			
).5								
.5								
	·····	<u> </u>						
","F								
1.5								
.⊢	S-8	18/18	34-35.5		Light brown fine SAND trace			
				7	medium sand		- With trace medium sand be	10v/ 34
.5				7				
Ē								
.5								
,E							•	
Ē								
.5	5-9	18/12	39-40.5	6	Light brown, fine SAND, trace medium sand			
				5				
ular S	ioits Durait	Cohesiv	Soils	ntemarxa: (1) Sample S	5-1 auger.			
+	Density	BIOWS/FL	Uensity	(2) No recov (3) Drove ce	ery first attempt, redrove sampler to sing to advance hole below 49 feet	obtain soil for cl	assification.	
	V.Loose	<2 2-4	V. Soft Soft	(4) Evidence	of soil type on and of sampler.			
	A. Dense	4-8 8-15	M. Stiff				Borina I	Loa
	Dense /. Dense	15-30	V. Stiff				Boring No. SE	A-5
1		>30	Hard				Ref. No. 392-8	1100

SEAC Enginee	Consultante rs/Archited	ino. Ite	La Ft.	ndfill closu Devens	10		Boring No. SEA Ref. No. 392-85
Contractor Engineer/C	: Soil Expl leologist :	M. Schultz				Ca	eing Size : 3-1/4" LD. Hollo Sempler : 1-3/8" LD. Split NX Core Barrel
Ground Su	riace Elev.	: 21	6.41 1	Water Level :	2.2' Date : 27 Feb.	86 (	Casing at : <sup>0'</sup>
	1	San	npie		1		
Depth (ft)	No.	Pen (in) /Rec.	Tepth (ft)	Blows/6"	Sample Description	Remarka	Stratum Descriptio
		1		1			Fine to medium SAND, tra
40.5							inorganic silt (SP)
41.5		ļ			•		
42		<u> </u>			4		
42.5			·		4	1	
43					4		
43.5 A A	<u> </u>	1		+	1		
44	S-10	18/0	44-45.5	11	Light brown, fine to medium SAND.	(2)	
45				22	trace inorganic silt		
45.5				15	ļ		
46		ļ		4			
46.5							
47							
47.5							
40				1			
49							
49.5	S-11	18/12	49-50.5	13	Reddish brown, fine SAND, trace	(3)	
50				18	avorganic sit		
50.5							
51				<del> </del>			
51.5 E2							
52.5							
53				<u> </u>			
53.5				<u> </u>			(53.07) Fine to coarse SAND, little
54							fine to coarse gravel, little
54.5	S-12	18/6	54.5-56	33	Brown, fine to coarse SAND, little to		inorganic silt ( SM/GM )
33				100	some fine gravel, little inorganic silt		
56				60	(gracial III)		
56.5				[			
57		· · · ·					
57.5				<del> </del>			
58							
58.5							
59 S							
60					D	. <b> </b>	
	S-13	- 6/3	59.5-60	180/6*	Brown, fine to coarse GRAVEL and fine to coarse SAND, little silt	-	
Granuta	r Soils	Cohesin	e Soils	Remarks:			
Blows/FL	Density	Blows/Ft	Density	(2) No rect (3) Drove c	overy first attempt, redrove sampler to o asing to advance hole below 49 feet.	iddain soil for	CIESSINCEDON.
0-4	V.Loose	2	V. Soft	(4) Evidenc	e of soil type on end of sampler.		
4-10	Loose	24	Soft M CH	(5) No reco	very first attempt, redrove sampler to of	btain soil for (	
10-30 30-50	M. Dense Dense	-+-6 8-15	Stiff				Boring
>50	V. Dense	15-30	V. Stiff				Boring No.
		>30	Hard	l			Fiel. NO. 35

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Page 3 of 5

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							Fage 4 01 0
	e C	Pro	ject : Bi La Ft	arson's Co andfill Clos . Devens	instruction ure		Boring Log Boring No. SEA-5 Ref. No. 292-8511
ntractor : gineer/Ge ring Loca	: Soil Exp eologist : etion : S	Ioration Corp. M. Schultz Ion Site Plan 216.41		Water Level	- 2.2' Date - 27 Feb	C.	asing Size : 3-1/4* I.D. Hollow Stem Sampler : 1-3/8* I.D. Solit Spoon + NX Core Barrel Casing at : 0*
T		Sar	nple			T	
●pth (fl)	No.	Pen (in) /Rec.	Depth (ft)	Blows/6	Sample Description	Remarka	Stratum Description
60.5 1 61.5 2 62.5							Fine to coarse SAND, little to som fine to coarse gravel, little inorganic silt ( SM / GM )
3 63,5 4 64.5 5							
65.5 5 66.5 7 67.5							
68.5 69.5	S-14	18/0	69.5-71	10	Brown, fine SAND, trace inorganic	(4)	(68.0) Fine SAND, trace inorganic silt (SP)
70.5 1 71.5 2				11 15	silt		
72.5 3 73.5							
75.5			26 6 22				
5 76.5 7 77 5		18/0	75.5-77	12 18	silt	(5)	
78.5	S-16	0/0	78	100/0"		(6)	(78.0)
79.5	C-1	60/39	78-83	15	Fresh to slightly weathered, biotite GRANODIORITE with closely spaced, tight please points: (131 /01		Very hard to hard, dark grey, equigranular biotite GRANODIOPITE
_  -				18	to 20°) [Description Continued]		
iranular S	Soils	Cohesiv	e Soils	Remarks:	use first attornal radiation another to	htein sail far	election
VFL	Density	Blows/FL	Density	(2) No reco (3) Drove c (4) Evidenc	very litst altempt, recrove sampler to c asing to advance hole below 49 feet. e of soil type on end of sampler.		GirrahiiCalgon.
	V.Loose Loose M. Dense	<2 2-4 4-8 8-15	v. Son Soft M. Stiff Stiff	(5) No recov	very first attempt, redrove sampler to o	btain soil for c	Boring Log

S E A C Enginee	E A Consultants Inc. ingineers/Architects  Project : Barson's Construction Landfill closure Ft. Devens									
Contractor Ingineer/G Coring Loo Ground Su	: Soil Explained leologist : ention : S inface Elev.	eration Corp. M. Schultz ee Site Plan : 21	6.41	Water Level :	2.2' Date : 27 Feb.	Ca 86 (	sing Size : 3-1/4" LD. Hollow Sta Sempler : 1-3-8" LD. Split Spoo NX Core Barret Casing at : 0"			
		San	nple							
Depth (ft)	No.	Pen (in) /Rec.	Depth (ft)	Blows/6"	Sample Description	Remarka	_ Stratum Description			
80.5										
81				10	Extension continued] and steeply dipping (45° to 70°) with		very hard to hard, dark grey, equioranular biotte			
81.5	(Continued)	Becover	- CEN		some very steeply (70° to 90°)	(7)	GRANODIORITE			
82	}	necovery	= 03%	3	dipping healed joints - many seams					
82.5				<u> </u>	below 81					
83		[			Bottom exploration at P3.0		(83.01)			
83.5					South exposed of Et 03.0		(00.0)			
<b>8</b> 4			[	1						
0 E				1		,				
85.5										
96										
86.5										
87										
87.5				ļ						
88										
88.5										
39										
89.5	{									
90										
90.5					1					
97										
a?"										
92.5										
93										
93.5										
94										
94.5										
95										
95.5					1					
30 05					1					
07						ł				
97.5						{				
98					1		•			
98.5										
99 H										
99.5					1					
00 ㅏ										
F										
Granuia	Soils	Cohesiv	Soils	Remarks:						
ws/FL	Density	Blows/Ft	Density	(7) Lost ara	ulation below 81 feet.					
			V S-L							
0-4   L10	V.Loose	2-4	v. Son Soft							
0-30	M. Dense	4-8	M. Stift				Poring La			
0-50	Dense	8-15	Stiff				Burning LO			
>50	V. Dense	>30	v. Sun Hard				Ref. No. 392-851			
					والمتحدين والمتحدين والمتحدين والمتحدين والمحدين والمحدين والمحدين					

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#### SEA Consultants Inc. Engineers/Architects Cambridge, MA. S. Portland, ME. Wethersfield, CT.



# CROSS SECTION SCHEMATIC

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Page 1 of 6

S E A C Engine	Consultante rs/Archite	Inc.	ject : Ba La Fo	arsons' Con Indfill Close Int Devens	nstruction ure		Boring No. SEA-6 Ref. No. 392-6611
Contractor	: Soil Exp	Ioration Corpor	ation			Ca	sing Size : See Note A
Borina Loc	ation:	See Site Plan					Sempler 1 1 30 1.0, com apoc
Ground Su	rtace Elev.	: 25	2.35'	Water Level :	28.65' Date : 8/25-8	/26/86 0	Casing at : N/A
		San	nple		0		Stratum
Depth		Pen (in)	Depth		Sample Description	Remarks	Description
(11)	NO.	/Rec.	(ft)	Blows/6"	Description		baseription
	S-1	6/6	0-0.5	1	S-1 Brown, fine SAND, little medium		Fine SAND, little medium sanc.
Q.3	S-1A	12/10	0.5-1.5	4	sand trace inorganic silt with roots.		trace inorganic silt (SP)
7 1.5				7	little medium sand, trace inorganic		
2		ļ	<u> </u>		silt		
2.5			<u> </u>				
3				+	1	1	
3.5			<u> </u>	+			(4.5)
4		1		1			Medium SAND, little coarse and
اد.م				1			fine sand, trace inorganic silt (S
5	S-2	18/12	5-6.5	7	Tan to grey, fine to medium SAND,	)	
				6	little coarse sand, trace inorganic		
6.5		Ļ		7	<b>2</b> HT		
7		<u> </u>					
7.5		ļ					
8			<u> </u>				
8.5							
9							
9.5							
10,105	S-3	18/15	10-11.5	6	Tan to grey, medium to coarse		
4 4				5	SAND, little fine sand, trace		
11.5				6	anorgenie ant		
12							
12.5							
13							
13.5							
14							
4 2							
10	S-4	18/15	15-16.5	4	Tan to grey, medium SAND, little		
16		[]		4	tine sand, trace inorganic silt		
18.5				15		Í	
17				<u> </u>			
17.5		<b> </b>		┟╾╍╼╍╍┥	1		
18				†	1		
18.5							
19, [					)	1	
22							
20	S-5	18/16	20-21.5	5	See Page 2 of 6 for Description		See Page 2 of 6 for Description
Granula	r Soils	Conesiv	e Solis	rsema7X8: (A) 2.4/4*1	D Hollow Starp Auger		
Blows/FL	Density	Blows/Ft.	Density	177 J 174 L			
0-4	V.Loose	-2	V. Soft				
4-10	Loose	2-4	Soft				
10-30	M. Dense	4-8 8-15	M. Suff Stiff				Boring Lo
>50	V. Dense	15-30	V. Suff				Boring No. SEA
		>30	Hard				Ref. No. 392-861

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ecology and environment.

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							Page 2 of 6
5		Pro	ject : Ba	arsons' Co andfill Clos	Instruction		Boring Lo
A C	onsultante s/Archite	nc. Inc.	Fo	ort Devens			Boring No. SEA-6 Ref. No. 392-8611
nector	: Soil Exp eologist :	M.P. Clark	ation			Ca	eing Size ; See Note A Sampler ; 1 3/8" I.D. Split Spo
nd Su	riace Elev.	: 2	52.35'	Water Lovel :	28.65' Date : 8/25-8/	26/86	Casing at : N/A
		Sar	npie		Sampla		Stratum
;)	No.	Pen (in) /Rec.	Depth (ft)	Blows/6"	Description	Remarks	Description
20.5		+		-5	Tan to grey, medium SAND, little		Medium to coarse SAND, little
21.5				7	fine sand, trace inorganic silt	Í 1	sand and fine gravel, trace
:							HIGLANDIC SIL (344)
22.5		+	<u> </u>		4		
23.5					1		
- F					4		
24.5							
25.5 L	S-6	18/15	25-26.5	7	Tan to grey, medium to coarse SAND, lime fee cond, tags	, ,	
				9	inorganic silt		
28.5 L							
27.5	····						
28 5							
Ę							
29.5							
30.5	<b>S</b> -7	18/12	30-31.5	9	Brown to tan, coarse SAND, little		
				10	trace inorganic sit		
31.5 L							
32.5							
33.5 L							
34.5							
35.5	S-8	18/15	35-36.5	8	Brown to tan, coarse SAND and fine		
				11	and and a set to a start and		
37.5							
18.5							
<sup>39.5</sup>							
F							
inular S	Soils	Cohesive	Soils	Remarka:		l_	
-1	Density	Blows/FL	Density	(A) 3 1/4° LC	). Hollow Stern Auger		
Γ	V.Loose	2	V. Soft				
	Loose M. Dense	4-8	M. Stiff				Boring Lo
,	Dense V. Dense	8-15 15-30 >30	Stiff V. Stiff Hard				Boring No. SEA-6 Ref. No. 392-861

No.	inc. cte oration Carp. M.P. Clark See Site Plan : 21 Sar Pen (in) /Rec. 18/15	ject : Ba La 52.85' nple Depth (ft) 40-41.5	arson's Co Indfill Clos ort Devens Water Level Blows/6	sure : 28.65' Date : 8/25-8 Sample - Description	C4 /26/86	Boring Lo Boring No. SEA-6 Ref. No. 392-8611 Using Size : See Note A Sampler : 13/8" S.D. Split Spoo Casing at : N/A Stratum
No.	inc. cts oration Corp. M.P. Clark See Site Plan : 21 Sar Pen (in) /Rec. 18/15	La Fc 52.85' nple Depth (ft) 40-41.5	Water Level	sure : 28.65' Date: 8/25-8 - Sample - Description	Ca /26/86	Boring No. SEA-6 Ref. No. 392-8611 Being Size : See Note A Sampler : 13/8" S.D. Split Spoo Caeing at : N/A Straturm
Archite Soil Expl ologist : tion : S ace Elev. No. S-9	rte oration Corp. M.P. Clark See Site Plan : 21 Sar Pen (in) /Rec. 18/15	52.85' nple Depth (ft) 40-41.5	Water Level	: 28.65' Date: 8/25-8 Sample Description	Ca /26/86	Ref. No. 392-8611 Ising Size : See Note A Sampler : 13/8" S.D. Split Spoo Casing at : N/A Stratum
Soil Expl blogist : tion : S ace Elev. No. S-9	bration Corp. M.P. Clark See Site Plan : 21 Sar Pen (in) /Rec. 18/15	52.85' nple Depth (ft) 40-41.5	Water Level Blows/6	: 28.65' Date: 8/25-8 Sample Description	Ca /26/86	eing Stze : See Note A Sampler : 13/8" S.D. Split Spoo Caeing at : N/A Stratum
No.	See Site Plan : 21 Sar Pen (in) /Rec. 18/15	52.85' npie Depth (ft) 40-41.5	Water Level Blows/6	: 28.65' Date: 8/25-8 Sample	/26/86	Casing at : N/A Stratum
No. 5-9	Sar Pen (in) /Rec. 18/15	Depth (ft) 40-41.5	Blows/6	Sample	Bemerke	Stratum
No. 5-9	Pen (in) /Rec. 18/15	Depth (ft) 40-41.5	Blows/6	- Sample - Description	Bamarka	Stratum
No. 5-9	/Rec. 18/15	(ft) 40-41.5	Blows/6	-   - Description		J
5-9	18/15	40-41.5				Description
		1	6	Brown, medium to coarse SAND,		Fine to medium SAND, httle coa
	+	+	12	itte fine gravel , trace inorganic sift		sand and fine gravel, trace
			12		1	
				-		
	<u> </u>			4		
			+	-		
				<b>_</b> ]		
S-10	18/16	45-46.5	9	Brown, medium SAND, little coarse	-	
			4	sand and tine sand, trace inorganic silt		
				-		
				4 1		
				- 1		
S-11	18/15	50-51.5	5	Brown, fine to medium SAND, little		
		·····	5	course saint, sace morganic sit		
				1		
					1	
				1		
S-12	18/14	55.55 F	10			
		33.30.3	12	coarse sand, trace inorganic silt		
			12			
					1	
S-13	18/12	60-61.5	11	See Page 4 of 6 for Description	:	See Page 4 of 6 for Description
xis	Cohesive	Soils	Remarke:		]	
ensity	Blows/FL	Density	(A) 3 1/4° L[	2. Hollow Stem Auger		
.Loose	~2	V. Soft				
Loose   Dense	48	M. Suff				
Dense	8-15	Suff V Stiff				Boring Log
Uense	>30	Hard				Boring No. 324-6 Ref. No. 392-8611
is log is a c	ompilation of	subsurface c	onditions and	soil or rock classifications obtained from	the field as v	well as laboratory testing of
	S-10 S-10 S-11 S-11 S-11 S-12 S-12 S-12 S-13 S-13 S-13 S-13 S-13 S-13 S-13 S-13	S-10 18/16 S-10 18/16 S-11 18/15 S-11 18/15 S-11 18/15 S-12 18/14 S-12 18/14 S-12 18/14 S-13 18/12 S-13 18/12 S-14 18/12 S-14 18/12 S-15 1	S-10         18/16         45-46.5           S-10         18/16         45-46.5           S-11         18/15         50-51.5           S-11         18/15         50-51.5           S-12         18/14         55-56.5           S-12         18/14         55-56.5           S-12         18/12         60-61.5           S-13         18/14         50/15           S-13         18/14         50/15           S-13         18/14         50/16	S-10         18/16         45-46.5         9           -         -         -         4           -         6         -         6           -         -         -         6           -         -         -         6           -         -         -         6           -         -         -         6           -         -         -         6           -         -         -         6           -         -         -         6           -         -         -         6           -         -         -         6           -         -         -         6           -         -         -         -           -         -         -         -           -         -         -         -           -         -         -         -         -           -         -         -         -         -           -         -         -         -         -           -         -         -         -         -           -         -	S-10     18/16     45-46.5     9       S-10     18/16     45-46.5     9       Sand and fine sand, trace inorganic sill       Sill       S11     18/15       S0-51.5       S11       18/15       S0-51.5       S11       S11       S12       S12       S12       S12       S13       S13       S13       S13       S12       S13       S12       S13       S12       S13       S13       S14       Strip       Remarke:       (A) 3 1/4* LD. Hollow Stem Auger       (A) 3 1/4* LD. Hollow Stem Auger       Strip       Strip       Strip	S-10       18/16       45-46.5       9         S-10       18/16       45-46.5       9         Sand and fine sand, trace inorganic sill       aill         S-11       18/15       50-51.5       5         S-11       18/15       50-51.5       5         S-11       18/15       50-51.5       5         S-11       18/15       50-51.5       5         S-12       18/14       55-56.5       10         S-12       18/14       55-56.5       10         S-13       18/12       60-61.5       11         See Page 4 of 6 for Description       12         S-13       18/12       60-61.5       11         Loose       24       Soft         Dense       8-15       Stiff         Dense       4-5       Nitt         Dense       4-5       Stiff         Dense       5-3       Stiff         Dense       15

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Project : Barson's Construction Boring L Landfill Closure Boring No. SEA-6 Ref. No. 392-8611 S E A Consultants Inc. Fort Devens Engineers/Architects Contractor : Soil Exploration Corp. Casing Size : See Note A Sampler : 13/8" S.D. Split Spoon Engineer/Geologist : M.P. Clark Boring Location : See Site Plan Date : 8/25-8/26/86 28.65' 252.85 Casing at : N/A Ground Surtace Elev. : Water Level : Sample Stratum Sample Depth Remarka Pen (In) Depth Description Description (ft) No. Blows/6 /Rec. (tt) 60.5 Brown, fine to medium SAND, trace Fine to medium SAND, little coarse 61 inorganic silt sand, trace inorganic silt (SW) 9 61.5 62 62.5 63 63.5 64 64.5 65 S-14 18/16 65-66.5 12 Brown, fine to medium SAND, little 65.5 coarse sand, trace inorganic silt 14 66 11 66.5 67 67.5 68 68.5 69 69.5 70 70-71.5 S-15 18/16 10 Brown, fine to medium SAND, little 70.5 coarse sand, trace inorganic silt 12 71 13 71.5 72 72 ! 73 73.5 74 74.5 75 S-16 18/8 75-76.5 10 Brown to tan, fine to medium SAND, 75 5 12 little coarse sand, trace inorganic 76 silt 16 76.5 77 77 ! (78.0) 78 Fine SAND, trace morganic silt 78.5 (SP) 79 79 5 80 Aemarks: Granular Solis Cohesive Soils (A) 3 1/4" I.D. Hollow Stem Auger Blows/FL Blows/FL Density Density V. Soft 0-4 <2 V.Loose 2.4 Soft 4-10 Loose 4-8 M. Stiff 10-30 M. Dense Boring Log Stiff 8-15 30-50 Dense Boring No. SEA. V. Soff 15-30 >50 V. Dense Ref. No. 392->30 Hard Information on this log is a compilation of subsurface conditions and soil or rock classifications obtained from the field as well as laboratory testing of samples. Strata have been interpreted by commonly accepted procedures. The stratum lines may be transitional and approximate. Water level measurements have been made in the open boreholes at the time and location indicated, and may vary with time, geologic condition or construction activity

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Page 5 of 8

S E A Engine	Consultant ers/Archite	Inc.	ject : Ba La Fo	irson's Co indfill Clos int Devens	nstruction ure		Boring No. SEA-6 Ref. No. 392-8611
Contracto Engineer/	or: Soil Exp Geologist:	M.P. Clark				Ca	sing Size : See Note A Sampler : 13/8" I.D. Split Spoor
Boring Lo Ground S	cation : iurlace Elev.	See Site Plan .: 25	2.85'	Water Level :	: 28.65' Date : 8/25-8	/25/85	Casing at : N/A
		Sar	nple		T		_
Depth (ft)	No.	Pen (in) /Rec.	Depth (ft)	Blows/6"	Sample Description	Remarks	Stratum Description
80.5	<b>S-17</b>	18/16	80-81.5	9	Brown, fine SAND, trace inorganic		Fine to very fine SAND, trace
81			<u> </u>	12			nongenne silt (GF)
82							
82.5	i <b> </b>		ļ	<u> </u>	-		
83			<u> </u>	+	1		
84							
84.5		+			4		
85	S-18	18/12	85-86.5	10	Brown, fine SAND, trace inorganic		
86				9	sit		
86.5			1	11			
87 87.5					1		
88							
88.5							
89							
90		10110	00.04.5				
90.5	5-19	18/18	90-91.5	6	brown to tan, very tine SAND, trace inorganic silt		
97 91.5				11			
92							
92.5		+					(93.0')
93.5							Fine SILTY SAND, trace ciay (Si
94		<u> </u>					
94.5							
95.5	S-20	18/12	95-96.5	4	Grey to blue, fine SILTY SAND,		
96		ŀ		7	trace clay		
96.5 0.7							
97.5							
98							
38.5 Q.Q.							
99.5		T					
00	\$-21	18/15	100-101.5	6	See Page 6 of 6 for Description		See Page 6 of 6 for Description
					- ,		
Granula	ir Soils	Cohesiv	e Soits	Remarks: (A) 3 1/4"17	). Hollow Stern Auger		
lows/FL	Density	Blows/FL	Density				
0-4	V.Loose	<2 24	V. Soft Soft				
10-30	M. Dense	4-8	M. Stiff				Boring Lo
30-50 >50	Dense V. Dense	8-15 15-30	V. Stiff				Boring No. SEA-
		>30	Hard				Ref. No. 392-861

Project : Barson's Construction Boring Loa Landfill Closure Boring No. SE Ref. No. 392-86: S E A Consultante inc. Fort Devens Engineers/Architects Contractor : Soil Exploration Corp. Casing Size : See Note A Sempler : 13/5" I.D. Spit Spoon M.P. Clark Engineer/Geologist : Boring Location : See Site Plan Date : 8/25-8/26/86 252.85 Casing at : N/A 28.65 Ground Surface Elev. : Water Level : Sample Stratum Depth Sample Remarks Pen (in) Depth Description (ft) Description Blows/6' No. /Rec. (11) 100.5 101 Fine SILTY SAND, trace clay (SM) ø Grey to blue, fine SILTY SAND, trace clay 7 (101.5) (101.5) 102 Bottom of Exploration 102.5 103 103.5 104 104.5 105 105.5 106 108.5 107 107.5 108 108.5 109 109.5 110 110.5 111 111.5 112 112.5 113 113.5 114 114.5 115 115.5 116 116.5 117 117.5 118 118.5 119 119.5 120 Remarks: Granular Soils **Cohesive Soils** (A) 3 1/4" I.D. Hollow Stern Auger Density Biows/FL Density Blows/FL ~2 V. Soft 0-4 V.Loose 2-4 Soft 4-10 Loose 10-30 4-8 M. Stiff M. Dense Boring Log 8-15 Stiff 30-50 Dense Boring No. SEA-6 Ref. No. 392-9 15-30 V. Stiff >50 V. Dense >30 Hard Information on this log is a compilation of subsurface conditions and soil or rock classifications obtained from the field as well as laboratory testing of samples. Strate have been interpreted by commonly accepted procedures. The stratum lines may be transitional and approximate. Water level measurements have been made in the open boreholes at the time and location indicated, and may vary with time, geologic condition or construction activity

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SEA Consultants Inc. Engineers/Architects Cambridge, MA. S. Portland, ME. Wethersfield, CT.



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measurements have been made in the open boreholes at the time and location indicated, and may vary with time, geologic condition or construction activit

				•		. <u></u>	Page 2 of 6
G		Pro	oject : B	arsons' Co	nstruction		Boring Log
SEA Engine	Consultant ers/Archite	s Inc. octo	Fc	ndill Clos ort Devens	ure		Boring No. SEA-7 Ref. No. 392-8611392-8
Contracto Engineer/	or: Soil Ex Geologist:	ploration Corpo M.P. Clark	ration			Ca	eing Size : See Note A Sampler : 1 3/8° I.D. Spirt Spoon
Boring Lo Ground S	Surface Elev	See Ste Plan . : 2	35.16	Water Lavel :	18.65' Date : 9/2-9/4	/86	Casing at : N/A
Depth	.	Sa	mple		Sample		Stratum
(ft)	No.	Pen (in) /Rec.	Depth (ft)	Blows/6"	Description	nemarke	Description
20.9 21	5			7	Tan, fine SAND, trace inorganic silt		Very fine to fine SAND, trace
- 21.5 22	·			10			
22.5	s			ļ			
23	,		+	+			
24	, <u> </u>	1					
24.5 0 E	·		<u> </u>				
∠⊃ 25.5	<b>S-6</b>	18/16	25-26.5	8	Tan, fine SAND, trace inorganic silt	•	
26				9			
26.5 27							
27.5		+	<del> </del>				
28 28.5							
29		<u> </u>					
29.5 20		1.					
30.5	S-7	18/15	30-31.5	6	Brown, very fine SAND, trace inorganic silt		
31.5				11	·		
32							
32.5 17			l				
33.5							
34 34.5							
35	<u> </u>	18/12	35,36.5	5	Brown the SAND tace increase	Ì	
35.5 86			Ja-30.3	4	silt		
38.5				7	1	1	
37							
38							
38.5							
39.5							
10							
Garatio	e Saile	Coherin	e Soile	l Bemarka:	•	l	
ws/FL	Density	Blows/Ft	Density	(A) 3 1/4" LD.	Hollow Stern Auger		
0-4	V.Loose	-2	V. Soft				
⊩10 0-30	Loose M. Dense	2-4 4-8	Soft M. Stiff				Boring Log
0-50 >50	Dense V. Dense	8-15 15-30 >30	Stiff V. Stiff Hard				Boring No. SEA-7 Ref. No. 392-86113
rmation or iples, Stri	n this log is a ata have been	compilation of n interpreted b	i subsurface c y commonly a	conditions and :	soil or rock classifications obtained from idures. The stratum lines may be transit	the field as v tional and ap	well as laboratory testing of proximate. Water level
Isuremen	ts have been	made in the o	oen boreholes	at the time an	d location indicated, and may vary with t	hme, geologi	c condition or construction activity

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samples. Strata have been interpreted by commonly accepted procedures. The stratum lines may be transitional and approximate. Water level measurements have been made in the open boreholes at the time and location indicated, and may vary with time, geologic condition or construction activity

			_				
51		Pro	ject : Bi	arson's Co andfill Clos	nstruction		Boring Log
A Co	onsultanta Archite	inc. cts	Fc	ort Devens	, ,		Boring No. SEA-7 Ref. No. 392-8611
actor : eer/Ge	Soil Expl ologist :	Ioration Corp. M.P. Clark		_		Ca	sing Size : See Note A Sampler : 13/8* 1.D. Solt Spoon
g Loos nd Suri	ition ;	235.16	,	Water Lavel :	18.55 Date : 9/2-9/4	4/86 0	Casing at : N/A
		Sar	npie		Comple		Steatum
th )	No.	Pen (in) /Rec.	Depth (ft)	Blows/6"	Description	Remarks	Description
60.5				12	Brown, fine SAND, trace inorganic		Fine SAND, some medium sand.
61.5 L				15	silt		trace inorganic silt (SP)
Ē							
62.5 L		<u> </u>	<b> </b>	+			
				+	1		
₩.3 <u> </u>							
54.5 🗌							
- F	S.14	19/15	CE CE E		Brun for SAND boos incomerie		
55.5 <u> </u>	3-14	1 10/13	03-00.3	10	silt		
				16			
						[ [	
57.5							
+						[ [	
58.5							
59.5 L							
			70.74.6				
70.5	5-15	18/15	70-71.5	8	redium sand, trace inorganic silt		
,, , ┝─				11	-		
rz.5							
<sup>73.5</sup>							
4.5					1		
	S-16	19/14	75 76 5		Tan In human fine SAND some		
75.5		1014	73-10.3	12	medium sand, trace inorganic silt		
76.5				16			
-							
77.5							
ns E							
Ē							
'9.5 <b> </b>							
-						1	
nular S	oils	Cohesiv	Soils	Remarks: (A) 3 1/4° 10	. Hollow Stern Auger		
<u>د</u> ۲	Density	Blows/FL	Density	199 - 19 <b>69</b>	· · · · · · · · · · · · · · · · · · ·		
1	V.Loose	~2	V. Soft				
-   A	Loose	2-4 4-8	Soft M. Stiff				
	Dense	8-15	Stiff				Boring Log
		15.30	V. Stiff				Borng No. SEA-/
v	/. Dense	>30	Hard				Ref. No. 392-8611

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S E A C	ansuitanta ra/Archite	Inc.	ject : Ba Lar Foi	rson's Cor ndfill Closi rt Devens	nstruction ure		Boring No. SEA-7 Ref. No. 392-8611
Contractor Engineer/G Boring Loc	: Soil Expi eologist : ation : S	oration Corp. M.P. Clark See Site Plan			18 65'	Cat	sing Size : See Note A Sempler : 13/8" I.D. Split Spoon
urouna su	1209 EINY.	: 23 San			10.00 Date : 9/2-9/4		wand at : 000
Depth (ft)	No.	Pen (in) /Rec.	Depth (ft)	Blows/6"	Sample Description	Remarks	Stratum Description
80.5	S-17	18/18	80-81.5	15	Brown, fine SAND, trace inorganic		Fine SAND, little to no medium
81		<u> </u>		16	sit.		sand, vace inorganic sitt (5P)
81,5	·····			20	4		
82		+		<u> </u>	1		
02					1	1 1	
83.5							
84							
84.5	<u> </u>				4		
85	S-18	18/16	85-86 5	12	Brown, fine SAND, trace increase		
85.5			03 00.5	15	silt		
86				19		·	
87							
87.5							
88							
88.5							
89							
00							
90.5	S-19	18/15	90-91.5	15	Brown, fine SAND, trace inorganic		
91				15	<b>\$</b> 11 <sup>°</sup>		
91.5							
92							
02 L							
93.5							
94							
94.5							
95	S-20	18/15	95-96.5	19	Brown, fine SAND, trace increanic		
06 <sup>10</sup>				16	silt		
96.5L				19			
97							
97.5				<u> </u>			
98							•
40.3							
99.5							
100 -	6.71	18/16	100.101 5		San Dage 5 of 5 for December		See Dece 6 of 6 for Duradation
- F	521	10/10	100-101.5		See raye o or o tor Description		ann Leffe a na na marcubadu
Granular	Soils	Cohesiv	e Soils	Remarks:			
Hows/FL	Density	Blows/Ft	Density	(A) 31/4° I.D	Hollow Stem Auger		
	Vionee	2	V. Soft				
410	Loose	24	Soft				· · · · · · · · · · · · · · · · · · ·
10-30	M. Dense	4-8 8-15	M. Stiff				Boring Lo
30-50	V. Dense	15-30	V. Stiff				Boring No. SEA
1		>30	Hard				Ref. No. 392-861

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S B E A O Engine	Consultante Consultante ara/Archita	Pro e inc.	ject : B L F	arson's Cor andfill Clos ort Devens	nstruction ure		Boring Log Boring No. SEA-7 Ref. No. 392-8611
ontractor ngineer/C oring Lo	r: Soil Exp Geologist: cation: S	Noration Corp. M.P. Clark See Site Plan		964 t t -	19.65	Cas	ning Size : See Note A Sampler : 13/8" I.D. Split Spocn
ound 34	driate Elev.	Sar	nnie	Water Level :			asing at , inc
epth (ft)	No.	Pen (in) /Rec.	Depth (ft)	Blows/6"	Sample Description	Remarks	Stratum Description
100.5 1 101.5 2 102.5	· · · · · · · · · · · · · · · · · · ·			20	Brown, fine SAND, little medium sand, trace inorganic silt (101.5) Bottom of Exploration		Fine SAND, little to no medium sand, trace inorganic silt (101.5)
3 103.5 4 104.5							
) 105.5 5 106.5 7						-	
107.5 } 108.5 } 109.5							
) 110.5   111.5							
112.5 113.5							
114.5 115.5 118.5							
117.5 118.5							
119.5							
ranular	Soils	Cohesiv	e Soils	Hemerks: (A) 31/4" LD.	Hollow Starn Auger		
/FL ) 0 0	Density V.Loose Loose M. Dense Dense V. Dense	Blows/FL 2-4 4-8 8-15 15-30	Density V. Soft Soft M. Stiff V. Stiff		- -		Boring Log Boring No. SEA-7 Bet No. 392-8611
Ltion or a. Stra	this log is a Its have been	compilation of interpreted by	subsurface commonly	conditions and accepted proce	coil or rock classifications obtained from dures. The stratum lines may be trans	n the field as w itional and app	rel as laboratory testing of rozimate. Water level

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SAMPLE NUMBER	BLOWS PER 6 INCHES	INCHES RECOVERED INCHES DRIVEN	WATER ÉLEVATION	DEPTH IN FEET	WEL PIEZC CONST	L OR DMETER RUCTION	GRAPHIC LOG	LOG OF DATE DRI PROJECT: JOB # DETECTOF	BORING NO. <u>BD&amp;85</u> LLED: <u>2/14-2/19/90</u> FORT DEVENS 8329 R: <u>TIP 2</u> DESCRIPTION	TESTS
				65'	Image: State of the state o					
GEOI	LOGIST: _	A. SIMMOI	<u>NS</u> DR	AWN BY:	J.A.D.	FILTER BENTON SCREEN	PACK: <u>66'6</u> ITE: <u>60'</u> : <u>71'</u>	TO <u>72'</u> TO <u>66'6</u> TO <u>69'6</u>	WATER LEVEL MEASUREM $\bigtriangledown$ : 8D – 7.3 DATUM: TOP OF CASIN PURGING: 80 GALLONS	G



S E A Consultants Inc. Engineers/Architects Cambridge, MA. S. Portland, ME. Wethersfield, CT.

DRILLING CONTRA FOREMAN: Jim Car METHOD: AUGET DI	CTOR: Sc npbell tve and Wa	bil Exploration	Corporation
SEA GEOLOGIST/E	NGINEE	R: M.P. Clark	
BA	No. 1	No. 2	WELL
GROUNDWATER DEPTH :	10.85 10/8/86	10.41 10/8/86	10.40 10/8/86
DATUM :	Тор	of	Casing

MONITORING WE	LL NO. Bar-9 & WT-9
JOB NO: 392-8611	CLIENT: Barson's
LOCATION: FOR L	Deven's Landfill
DATE START: 9/10/86	FINISH: 9/15/86

SOIL SAMPLES TAKEN:

EQUIPMENT CLEANING: Yes METHOD: Steam Clean

MATERIAL TO FACILITATE DRILLING: Yes TYPE: Water



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SEAC Engineer	onsultants rs/Archited	ine.	La Fo	ndfill Clos rt Devens	ure		Boring No. SE A-9 Ref. No. 392-8611
Contractor Engineer/G	: Soil Expl eologist :	M.P. Clark				Ca	sing Size : See Note A Sempler : 13/8' I.D. Spiit Spcon
Boring Loc Ground Su	ation : S risce Elev.	iee Site Plan 22	2.94'	Nator Lovel :	10.40' Date : 9/10-9	/15/86	Casing at : N/A
Desth		Sample			Sample		Stratum
(ft)	No.	Pen (in) /Rec.	Depth (ft)	Blows(6"	Description	Remarka	Description
0.5	S-1	18/16	0-1,5	1	Brown, fine SAND, little medium		Fine SAND, little medium sand, trace roots (SP)
1				4			(1.0)
2							Fine to coarse SAND, little fine cravel (SW)
2.5		ļ		4			
3 ,,	_	<u> </u>		+			
4		[				]	
4.5		}		+	1		
5 , ;	S-2	18/15	5-6.5	4	Brown to tain, fine to coarse SAND,		
6				7	little fine gravel		
6.5				6		1 N N	
7 7 75						[ ]	
8							(8.07) Fine to coarse SAND, little fine
8.5							gravel with occasional inorganic
9 9.5							layers (SW - SM)
10	6.0	10/14	10.11.6	12	Brown to too fee to seems CAND		
10.5	3	18/14	10-11.5	12	little fine gravel with occasional		
11				11	inorganic silt layers		
12							
12.5							
13				[			
14							
14.5							
15.5	S-4	18/15	15-16.5	• 5	Brown to tan, fine to coarse SAND,		
16				9	inorganic silt layers		
4 -7							
17.5					•		
18							
10					•		
19.5				<u> </u>			
20	S-5	18/12	20'-21.5'	9	See Page 2 of 6 for Description		See Page 2 of 6 for Description
Granuia	r Soils	Cohesiv	e Sails	Remarks:			
Blows/FL	Density	Blows/Ft.	Density	(A) 3 1/4" [.] (1) Wash si	D. Hollow Stem Auger Imple		
0-4	V.Loose	-2	V. Soft				
4-10 10-30	Loose M. Dense	2-4 4-8	Soft M. Stiff				Boring Lo
30-50	Dense	8-15	Stiff V Stiff				Boring No. SEA
>50	V. Dense	>30	Hard				Ref. No. 392-861

S E A Engine	Consultante ors/Archite	Inc.	lect : Βε La Fo	arsons' Co Indfill Clos Int Devens	nstruction ure		Boring Log Boring No. SE A-9 Ref. No. 392-8611
Contracto Engineer/ Boring Lo	r: Soil Exp. Geologist: Jostion: S	ioration Corp. M.P. Clark ies Sile Plan	2011		10.400 0.4 9/10.9/	Ca	sing Size : See Note A Sempler : 13/8" I.D. Split Spoon
Ground S	Urtace Elev.	: "		Water Level :	10.40 Date : 3/10-3/	15/80	Assing at ; 1970
Depth					Sampie	Remarka	Stratum
(ft) 	No.	/Rec.	(ft)	Blows/6"	Description		Description
20.5	i	+		9	Brown, fine to coarse SAND, little		Fine to coarse SAND, little fine
21 <sub>21.5</sub>				9	fine gravel, trace inorganic silt		gravel, trace inorganic sitt (SW-SM)
22							(22.0)
22.5	·						Sity the SAND (SM)
23							
24							
24.5							
25	S-6	19/12	25-26.5	6	Brown, silty fine SAND		
26				7		4	
26.5	<u> </u>			8			(27.0)
27							Fine to medium SAND, little coarse
28							Sand, trace inorganic sit (SVA-SM)
28.5							
29							
30		10.7			Development of the sector of the		
30.5	5/	18/0	30-31.5	7	SAND, little coarse sand, trace		
31				8	inorganic silt		
32							٦
32.5							
33						1	
34							i i
34.5							
చె 35.5	S-8	WASH	30-35		Brown to grey, fine to medium		
36		├			inorganic silt		1
36.5 37							
37.5							
38							
30.5							
39.5						ł	
40							
Generation	r Soite	Coherin	Soils	Remarks:		[_	1
Biows/Ft	Density	Blows Ft	Density	(A) 3 1/4" I.C	i, Hollow Stem Auger nole		1
0.4	Viere	-2	V. Soft	(1) ************************************	· <del>·</del> · · ·		1
4-10	Loose	2.4	Soft				
10-30 30-50	M, Dense Dense	4-8 8-15	M. Sun Stiff				Boring Log
>50	V. Dense	15-30 >30	V. Stiff Hard				Boring No. SE A-9 Ref. No. 392-8611
Intermation o samples. Str	in this log is a rate have been	compilation of n interpreted by	subsurface of commonly	conditions and accepted proc	soil or rock classifications obtained from edures. The stratum lines may be transi	the field as tional and ap	well as laboratory testing of proximate. Water level

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Page 2 of 6

Page 3 of 6

S E A Ca Engineer	BB ansultants a/Archited	Inc.	ect : Ba La Fo	rson's Cor ndfill Closu rt Devens	nstruction Ure		Boring No. SEA-9 Ref. No. 392-8611
Contractor :	Soil Expir	oration Corp.				Ca	sing Size : See Note A
Engineer/Ge	Hologist:	an Site Plan					autipier, iso its, opin openi
Ground Sur	tace Elev.	: 22	2.94'	Water Level :	10.40' Date : 9/10-9/	15/86 (	Casing at : N/A
		San	iple				Ctrotum
Depth		Pen (in)	Depth		Description	Remarks	Description
(11)	No.	/Rec.	(ft)	Blows/6"	Description		eessipiidii
10.5	S-9	WASH	35-40		Brown to grey, fine to coarse SAND,		Fine to coarse SAND, some to n
A1					trace inorganic silt		silt (SW-SM)
41.5		<u> </u>		<u></u>	4		
42		<u> </u>			4		
42.5	_				4		
43				+		1	
43.5				+	1		
44				1	1		
45					]	[	
45.5	S-10	18/0	45-46.5	12	No recovery		
46				15	]	í (	
46.5		ļ		19			
47				<u> </u>			
47.5				+	{		
48				+			
48.5			·····	+			
49				1			
50							
50.5	S-11	18/16	50-51.5	17	Brown to gray, fine to coarse SAND,		
51				19	some tine gravel, little inorganic sitt		
51.5				14			
52 -							
52.5							
53 -				1	·•		
53.5				1			
54 54							
55							
55.5	S-12	18/15	55-56.5	18	Brown to grey, fine to coarse SAND,		
56 -		L		16	antue are graver, attas morganic stit	ł	
56.5				13			
57				ti	1		
57.5							
20						1	
50 [							
59.5							
60 -	6.12	186	60'-61 E'		See Perce 4 of 5 for Description	· .	See Page 4 of 6 for Descention
-  -	3-13	18/0	00-01.3	┟──╹──┤	Care Lafe A of a lot Cascubson		
Granular	Soils	Cohesiv	• Soils	Remarks:	·····		
Blows/Ft	Density	Blows/Ft	Density	(A) 3 1/4" LI	D. Hollow Stem Auger		
			V 6-6	(1) Wash sa			
0-4	V.Loose	24	v. son Soft	1			
10-30	M. Dense	4-8	M. Stiff				Boring Lo
30-50	Dense	8-15	Stiff V CiiH				Barine No SEA-
>50	v. Dense	10-00	<b>.</b>	1			Bot No. 192-861

							Page 4 of 6
		Pr	oject : B	arson's Co andfill Clos	nstruction	أغذنني التقييمي التعيير	Boring Log
S E A Engine	Consultant ers/Archit	s Inc. ects	Fo	ort Devens			Boring No. SEA-9 Ref. No. 392-8511
Contract Engineer	or: Soil Ex /Geologist:	ploration Corp. M.P. Clark				Ca	aing Siza : See Note A Sampter : 13/8" I.D. Split Spoon
Boring L Ground	ocation : Surface Elev	See Site Plan .: 222.94		Water Level :	10.40' Date : 9/10-9/	15/86	Casing at : N/A
Depth (ft)	No.	Pen (in	) Depth	Blows/6"	Sample Description	Remarks	Stratum Description
60.	5	/Rec.	(ft)				
61 61	5		+	14	coarse sand and fine gravel, trace inorganic silt		sand and fine gravel, trace inorganic sit
63	5						(63.07)
64 64	5			<u> </u>			sand (SW)
65 65	S-14	WASH	61.5-65		Grey, fine to medium SAND, little	· 1	
66 66.5	· · · · · · · · · · · · · · · · · · ·				coarse sand		
67 67.5	;						
68 68.5	;						
69 69.5 70							_
70.5 71	<u>S-15</u>	WASH	65-70		Grey, fine to medium SAND, little coarse sand	.1	
71.5 72	i	<u> </u>	<u> </u>				
73.5							
74 74.5		<u> </u>					
75 75.5	S-16	WASH	70-75		Grey, fine to medium SAND, little coarse sand	1	
70 78.5 77						ł	
77.5 78	·	<u> </u>					
78.5 79							
80 <sup>/3.5</sup>							
Granuli	ar Soils	Cohesn	/e Soils	Remarka: (A) 3 1/4° LD	. Hollow Stern Auger		
liows/Ft 0-4	Density V.Loose	Blows/Ft <2	Density V. Soft	(1) Wash sar	nple		
4-10 10-30 20-50	Loose M. Dense	2-4 4-8 8-15	Soft M. Stiff Stiff				Boring Log
>50 >50	V. Dense	15-30 >30	V. Suff Hard				Boring No. SEA-9 Ref. No. 392-8611
metori o	in this log is a rate have bee	compilation of interpreted t	f subsurface o by commonly i	conditions and accepted proce	soil or rock classifications obtained from idures. The stratum lines may be transi	the field as v tional and app	vell as laboratory testing of oroximate. Water level
atsuremen	ts have been	made in the o	oen boreholes	at the time ar	d location indicated, and may vary with	time, geologii	condition of construction activity

							Page 5 of 6
C		Pro	ject : Ba	rson's Co	nstruction		Boring Lo
			La	ndfill Clos	ure		Boring No. SEA-9
ð E A Engine	consultant ers/Archite	inc.	FO	n Devens			Ref. No. 392-8611
ontracto	r: Soil Eq	ioration Corp.	•			6	seing Size : See Note A
orina La	Geologist : Instion :	MLP. Clark See Site Plan					Sampler : 13/8" I.D. Split Spoo
round S	urlace Elev	: 2	22.94'	Water Level :	10.40' Date : 9/10-9	/15/86	Ceeing at : N/A
Baath		Sa	npie		Samala		Stratum
(ft)	No.	Pen (in)	Depth	Blows/6"	Description	Remarks	Description
		/Rec.	(ft)				
80.5	5-1/	WASH	75-80	+	Grey, the to medium SAND, little coarse sand, trace inorganic silt	'	Fine to measure SAND, little co sand, trace inorganic silt (SW)
81 81.5							
82							
82.5		+		+			
83 81.5							· ·
84					]	1	
84.5 D E				+	4	1	
ຽວ 855	S-18	WASH	80-85	1	Grey, fine to medium SAND, little	1	
B6					coarse sand, trace inorganic silt		
86.5				<u> </u>			
57 875		+					
38							
88.5							
39 ***				1			
90							
90.5	<u>\$-19</u>	WASH	85-90		Grey, fine to medium SAND, little coarse sand, trace inorcanic silt	1	
91							
92							
92.5		ļ					
93		· · ·					
34							
94.5							
95 🥵	S-20	WASH	90-95		Grev. fine to medium SAND, little		
96					coarse sand, trace inorganic silt	·	
96.5							
37							
38							
98.5							
<sup>9</sup> .							
00							
-	5-21	WASH	95-100		See Page 5 of 6 for Description		See Page 6 of 6 for Description
Granula	r Soils	Cohesiv	• Soils	Remarka:		!	
ws/FL	Density	Blows/FL	Density	(A) 3 1/4" LD	. Hollow Stern Auger		
24	V.Loose	-2	V. Soft	() reading			
-10	Loose	2-4	Soft M. Stiff				-
0-50	Dense	8-15	Stiff				Boring Lo
50	V. Dense	15-30 >30	V. Stiff Hard		•		Boring No. SEA- Ref. No. 392-861
And the second se		- All and a second s					

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S E A Engine	Consultant ers/Archite	s Inc. octs	F	andfill Clos ort Devens			Boring No. SEA-9 Ref. No. 392-8611
Contracto Engineer/	or: Soil Eq Geologist:	Dioration Corp. M.P. Clark			· · · ·	Ca	sing Size : Set Note A Sampler : 13/8" I.D. Spit Spoon
Boring Lo Ground S	iurface Elev	Ses Sile Plan . : 222.94'		Water Level :	10.40' Date : 9/10-9	/15/86 (	Casing at : N/A
	T	Sa	mpie			1	
Depth (ft)	No.	Pen (in) /Rec.	Depth (ft)	Blows/6"	Sample Description	Remarke	Stratum Description
100.5 1 0 1 101.5					Grey, fine to medium SAND, little coarse sand, trace inorganic silt		Fine to medium SAND, little coa sand, trace inotganic silt (SW) (101 S)
102					Bottom of Exploration		(101.0)
103							
104							
105	ļ						
105,5			ļ	+			
106.5 07			<u> </u>				
107 <u>.5</u> 08							
108.5 109			<u> </u>				
109.5 110		<u> </u>					
110.5 <b>  1 1</b>		ļ					
111.5   <b>  1 2</b>		<u> </u>					
112.5   <b>1 3</b>		1	[				
113.5   <b>1 4</b>		<u> </u>					
114.5 15							
115.5   <b>1 6</b>		<u></u>					
116.5 17							
117.5 1 8							
118.5							
119.5							
~~							
Granula owe/Et	r Soils	Cohesin Blows/Et	e Soils Density	Remarke: (A) 3 1/4" LD.	Hollow Stem Auger		
0-4	V.Loose		V. Soft	(1) Wash san	Ţ,		
4-10 10-30	Loose M. Dense	2-4 4-6	Soft M. Stiff				Boring Lo
30-50 >50	Dense V. Dense	8-15 15-30 >30	Stiff V. Stiff Hard				Boring No. SEA-9 Ref. No. 392-8611

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CON-TEST Inc.

CON-TEST Inc.
WATER AND AIR ENGINEERING

SAMPLE NUMBER	BLOWS PER 6 INCHES	INCHES RECOVERED INCHES DRIVEN	WATER ELEVATION	DEPTH ' IN FEET	WE PIEZ CONST	LL ( OME TRU(	OR TER CTION	GRAPHIC LOG	LOG OF DATE DR PROJECT JOB # DETECTO	F BORING NO. <u>8D&amp;85</u> HLLED: <u>2/14-2/19/90</u> FORT DEVENS 8329 R: <u>TIP 2</u> DESCRIPTION	I TESTS
					BENTONITE SLURRY						1.0 N.D.
							· · · ·				0.8
				-50'							1.4
				-55 							.6 N.D. N.D.
COM  GEOL	IMENTS:	A. SIMMON		AWN BY:	J.A.D.	FIL BE SC	TER NTON REEN	PACK: <u>48'</u> ITE: :53'8"	_TO60' _TO _TO_52'5"	WATER 1 $-$ F $\nabla$ : 8S - 7.3 DATUM: TOP OF CASH PURGING: 140 GALLON	

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SHC-11 con-test P.D. BOX 591 EAST LONGMEADOW MASSACHUSETTS 01028 WATER AND AIR ENGINEERING (413)525-1198 AS-BUILT WELL DIAGRAM & GEOLOGIC DESCRIPTION WELL ND. 2 PROJECT ND. 7641 CLIENT FORT DEVENS GROUND WATER DBSERVATION PRJ. NAME SANITARY LANDFILL 19.02 FT DN 1/19/89DATE MEASURED FRDM PVC CASING ELEVATION 236.43± GROUND LOCATION FT. DEVENS, MASS. GEDLOGIST, DAVID A. MACLEAN DATE OF DRILL 11/3/88 WATER ELEVATION 217.41' BENCH MARK WT 2 DRAWN BY P.RDSSI DATE 2/10/89 START TIME 9:30 FINISH TIME 16:30 BORING SIZE : 8' CASING TYPE: SCHEDULE #40 CASING ID: \_\_\_\_\_PVC APPROVED BY \_\_\_ TYPE OF FILTER PACK NEW JERSEY SAND DATE SAMPLE ND. AND DESCRIPTION DEPTH PROTECTIVE 3'STEEL PIPE n GRADE CEMENT 1-5' CDARSE, PODRLY SORTED SAND, MINDR SILT. 2-10' MEDIUM SAND, WELL BACKFILLED SORTED, LITTLE SILT. 51 3-15' MEDIUM SAND, WELL BENTONITE SORTED, LITTLE SILT. PLUG 11.0'-6.0' 4-20' MEDIUM SAND, WELL SURTED, LITTLE SILT, SATURATED 5-25' MEDIUM SAND, WELL 101 COUPLING SORTED, LITTLE SILT. 6-30' MEDIUM SAND, WELL Ż NEW JERSEY SAND TD 11.0' SURTED. 7-35' MEDIUM TO COARSE, 2' SCHEDULE POORLY SORTED SAND. 151 40 PVC CASING 8-40' MEDIUM SAND POORLY NATURAL PACK SURTED. TD 16.8' BEDROCK CORE DESCRIPTION-CDARSE GRAINED, LIGHT GREY 20' QUARTZ, PLAGIOCLASE, BIOTITE, FOLIATED GNIESS, STEEPLY 15' SECTION DIPPING FOLIATION OF BETWEEN 10 SLOT PVC SCREEN 60<sup>0</sup>- 70<sup>0</sup> DRILLING TIMES/MIN. 5-5-7-5-25 ' 78% RECOVERY - 27' END OF BORING 45'

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SHL-13 INCHES LOG OF BORING NO. 4 DATE DRILLED: 2/19/90 WELL OR BLOWS PER 6 INCHES WATER ELEVATION PIEZOMETER GRAPHIC LOG SAMPLE NUMBER DEPTH IN FEET PROJECT: FORT DEVENS CONSTRUCTION **TESTS** INCHES JOB # \_\_\_\_\_8329 DETECTOR: TIP 2 DESCRIPTION 2.ppb . 1 . . . . . • 4" MEDIUM BROWN SILTY FINE-4,8,10 18 . . . . MEDIUM SAND ,  $\nabla$ 0.4 3' LIGHT BROWN FINE-COARSE SAND TRACE FINE GRAVEL .... . 0' . . . . 18 2,3,4 18 18' MEDIUM BROWN FINE SAND F. 0.2 Γ. • . . . . . . . . . . ..... -15'-و کې د د د ملو و کې د موه کې د وه سره کې د موه کې د موه سره کې د موه کې د د د کې سره کې 18 212 18 . . 18' MEDIUM BROWN FINE SAND N.D. TRACE SILT . . ----. . 20-18 1,2,2 18 18" MEDIUM BROWN FINE SAND .... : . . , N.D. • • • • • • TRACE SILT .\* 2. 25% 30' WATER LEVEL MEASUREMENTS COMMENTS: FILTER PACK: 3'6 TO 21'6 ⊽: 6.75' 3'6 TO 1'8 **BENTONITE:** TOP OF CASING 20' TO 5' DATUM: SCREEN: DRAWN BY: J.A.D. GEOLOGIST: PURGING: 75 GALLONS

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DR	ILL	IN(	S LO	Gof	30	RIN	GN	Ο.	SHL	- 1	44	1			Page 1 of 2
Sta	te			MASS	ACHU	SETT	S		Start	Date	;			_	7/14/91
Loca	ation			FOR	<u>t de</u>	VENS			Comple	tior	n Da	te		_	7/15/91
Dril	lling F	irm		<u>E &amp; E</u>	DR		NG		Ground	Ele	vat	ion		-	270.00
Type	e of Dr	i11		DIED	RICH	D-5	0		Total I	Dept	h o	f Bor	nin	9 _	27.7'
Dril	ller			PAL		ATH									
Geo 1	logist			LIS	A HE	LTON									
Elev	Depth .				Desci	riptio	n				Lithology	Sample No. and	Symbol)	. Blov Count	Remarks
26	1 2 3 4 55- 5 6 		)'-2.0': , moistur 1-plastic ill) from )'-7.0': irse, loo istics (f	SAND (S re. fine : thick h 1'-1.5 SAND (S Se. some 11] thr	4): med graine black -	y-brown non-pl	e. Some and bur and bur astic;	light e silt rned t rate m clear	brown. wigs Disture, and bro	חעכ				11 10 12 13 5 5 5 7	Surface conditions: Grass covered slope above landfill. Spl Spn Run 1: 0.0'-2.0' 1.5' recovery. OVA: spoon (0 ppm), hole (> 1.000 ppm), head space (2 ppm). Augered from 2.0'-5.0'. Spl Spn Run 2: 5.0'-7.0' 0.5' recovery. OVA: spoon (40 ppm), hole (> 1.000 ppm), head space (59 ppm). Augered from 7.0'-10.0'.
255	11- 11- 12- 13- 14- 5- 15-	10. moi sub	0'-12.0' sture, h angular ( 0'-18.4':	: <u>CLA</u> Y ( igh plas phyllite : <u>GRANOD</u>	CH): 1; ticity, cobble IOFITE	ight gra trace es (fil) TO GNEI	ay, mod silt; )). SS: Do	erate few la	. hard.					45 57/1*	Spl Spn Run 3: 10.0'-12.0' 0.4' recovery. OVA: spoon (5 ppm), hole (500 ppm), head space (200 ppm). Augered from 12.0'-13.0'. Auger refusal at 13.0'. Core Run 1: 13.0'-18.4' RQD: .7%.
Ecc	ology	and	US4 Envir	ATHA onment	MA, , Inc	ARI 	MY I	COF	PS	OF	E	NG	Iŀ	NEE	IRS Buffalo, New York

DRIL		NG LOG of BORING No. SHL-:	144	ł		Page 2 of 2
State		MASSACHUSETTS Location	λĐ	FO	BT_	DEVENS
Elev.	Depth	Description	Lithola	Sampl No. ar Symbo	B)ev Count	Remarks
	- 17					
	- 18 —					
	- 19 —	18.4'-24.0': <u>GRANODIOPITE TO GNEIS</u> S: same as above.	$\Sigma$			Core Run 2: 18.4'-24.0' RQD: 0%.
250-	20		222			
	21		公公			
	22					
	23-		资		-	
	24-		NX NX			
245-	25	24.0'-26.1: FOLIATED GRANITE	図			Core Run 3: 24.0'-27.7' ROD: 47%.
	25					Abandoned boring was
	27-	25.1'-27.7': <u>GRANODIORIT</u> E: hard, fractures at 24.8' and 26.2', sound.	公			tremie grouted to ground surface on 7/15/91.
						CONSTUCTION SUMMARY Cem.: 564 dry lbs., Cem./Bent.: 5%.
L		USATHAMA, ARMY CORPS OF	L L	ENGI	VEE	ERS

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State	-	MASSACHUSETTS Start Day	te				7/14/91				
Locatio	on _	FORT DEVENS Completin	on Da	ite			7/14/91				
Drillir	ng Firm _	E & E DRILLING Ground E	Ground Elevation270.00								
Type of	f Drill'_	DIEDRICH D-50 Total De	pth a	if Bor	'n	g	15.0'-				
Driller	• _	PAUL BARTH									
Geologi	ist _	LISA HELTON									
Elev.	Depth	Description	Lithology	Sample No. and	Symbol]	Blow Count	Remarks				
270 290		Ground Surface			-						
	2	'-5.0': <u>SAND</u> (SM): medium brown, low moisture. ium grained. some silt, non-plastic (fill).					<pre>Descriptions are based the examination of aug cuttings. Auger Run 1: 0.0'-5.0' OVA: hole (14 ppm), he space (70 ppm).</pre>				
265-	4 5.0 5 - 5.0 6 - 9 - 9 - 9 - 9 - 10 - 1 7	'-10.0': <u>SAND</u> (SM): same as above, except y-brown, clear plastic and a plastic ring (used to d 6-packs) observed in cuttings (fill).					Auger Run 2: 5.0'-10.0 OVA: hole (60 ppm), he space (120 ppm),				
260-	9 10 10 11 11 12	0'-15.0': <u>SAN</u> D (SM): same as above; much trash gs, plastic, metal can ~ fill}.					Auger Run 3: 10.0'-15. OVA: hole (0 ppm), hea space (20 ppm).				
	13						Abandoned boring was tremie grouted to ground surface on 7/14/91.				

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DRIL	LII	NG LOG of BORING No. SHL	-14	С				Page 1 of 1		
State		MASSACHUSETTS Start	Date					7/15/91		
Locatio	n	FORT_DEVENS Comple	Completion Date7/15/91							
Drillir	ng Fir	m <u>E &amp; E DRILLING</u> Ground	Ground Elevation270.00							
Type of	f Dri	11DIEDRICH_D-50Total	Depth	of B	ori	ng	ı	12.0'		
Driller	-	PAUL BARTH		-						
Geologi	ist	LISA HELTON								
Elev.	Depth	Description	l ithology	Sample	No. and	Symbol	Blov Count	Remarks		
270290		Ground Surface 0.0'-5.0': <u>SAND</u> (SM): medium brown, low moisture,				+	•	Descriptions are based o		
	1-	fine to medium grained, some silt, non-plastic (fi	<b>(1) .</b>					the examination of auger cuttings.		
	2-	~						Auger Aun 1: 0.0'-5.0' OVA: hole (80 ppm), head		
	3-	-						space (5 ppm).		
	4 -									
265-	5-	5.0'-10.0': <u>SAND</u> (SM): same as above; much trash						Auger Run 2: 5.0'-10.0' OVA: hole (500 ppm), hea		
	6-							space (15 ppm).		
	/-									
260-	10-					ĺ				
	11-	10.0'-15.0': <u>SAN</u> D (SM): same as above (fill).						Auger Run 3: 10.0'-12.0' Auger refusal at 12.0'.		
-					_	4		space (14 ppm).		
								Abandoned boring was tremie grouted		
								to ground surface on 7/15/91.		
	i							CONSTUCTION SUMMMARY Cem.: 188 dry 1bs., Cem./Bent.: 5%		
~		USATHAMA, ARMY CORPS	OF	EN	NG.	ī	NE	EPS		
Eco	logy	and Environment, Inc.						Buffalo, New York		

ecology and environment

State		MASSACHUSETTS	Start I	Date				7/12/91	
Locati	ion	FORT DEVENS	Complet	tion	Date			7/13/91	
Drilli	ing Fir	E & E DRILLING	Ground	Ele	vatio	n	259.03		
Туре о	of Dril	1DIEDRICH D-50	Ground	wate	r Dep	th			
Drille	Pr	PAUL BARTH	at completion					<u> </u>	
Geolog	gist	<u>    16.89</u> ¥ 25.0'							
								Lock #3217	
Elev.	Depth	Description		Litholog	Sample No. and	Symbol	B]ov Count	Remarks	We] Cons
259.03		Ground Surface 0.0'-2.0': sandy <u>SIL</u> T (SM): brown-black, dry loose, non-plastic, subangular cobbles and r throughout. 2.0'-5.0': <u>SAND</u> (SP): gray-brown, dry, media cparse grained, loose, subrounded gravels throughout.	y. roots un to				3 5 10 16 6 10 10 9	Stickup = 1.72 Sp1 Spn Run 1: 0.0'-2.0' 0.3' recovery. OVA: spoon and hole (0 ppm). head space (0.4 ppm). Collected archive sample. Augered from 2.0'-5.0'. Sp1 Spn Run 2: 5.0'-7.0' 0.8' recovery. OVA: spoon and hole (0 ppm). head space (0.3 ppm).	
	ب و							Collected archive sample. Augered from 7.0'-10.0'.	

State MASSACHUSETIS Location FORT DEVENS   Elev. Depth Description	DHT		NG LOG of WELL NO. SHL-:	15	-			Page 2	of 2
Elev. Depth Description $\left  \begin{array}{c} \frac{2}{9} \\ 2$	State	····	MASSACHUSETTS Locat	ion	·····	F(	DR.	T DEVENS	
10.0°-12.0°: SAND (SP): gray-brown, moderate moisture, medium to coarse grained, loose, organizs and subrounded pebbles throughout. 5 Spl Spn Run 3: 1.0°-12.0°: 1.3° recovery, OVA.   12- 13- 245- 14- 15- 15- 16- 16- 16- 18- 240- 19- 19- 19- 19- 19- 19- 19- 19- 19- 19	Elev.	Depth	Description	Lithology	Sample No. and	Symbol Blow	Count	Remarks	Well Const
ground surface to top of inner casing.	240-	11	10.0'-12.0': <u>SAND</u> (SP): gray-brown, moderate moisture, medium to coarse grained, loose, organics and subrounded pebbles throughout. 15.0'-17.0': <u>SAND</u> (SP): same as above, except wet. 20.0'-22.0': <u>CLAY</u> (CL): medium brown, wet, moderate plasticity, subrounded pebbles and cobbles throughout, little sand.					Sp1 Spn Run 3: 10.0'-12.0' 1.3' recovery. OVA: spoon and hole (0 ppm), head space (0.2 ppm). Collected archive sample. Augered from 12.0'-15.0'. Sp1 Spn Run 4: 15.0'-17.0' 1.4' recovery. OVA: spoon and hole (0 ppm), head space (0.8 ppm). Collected archive sample. Augered from 17.0'-20.0'. Sp1 Spn Run 5: 20.0'-22.0' 0.7' recovery OVA: spoon and hole (0 ppm), head space (0.8 ppm). Collected archive sample. Augered from 22.0'-25.0'. DVA: hole (0 ppm). CONSTRUCTION SUMMARY Well: Hole dia.: 10" screen/casing dia.: 4". slot size: 0.010". Material Qty.: Filter Pk.: 500lbs. Bent. Pel.: 15 dry gallons. Cem.: 554 dry lbs Cem./Bent.: 5%.	

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tate		<u>MASSAUNUSEIIS</u> Start D	ate				0/10/91
Locatio	n	FORT_DEVENSComplet	ion Da	te			6/15/91
Drillir	ng Fi	rm <u>E&amp;EDRILLING</u> Ground	Elevat	ion			258.00
Type of	f Dri	11DIEDRICH D-50 Total D	epth c	of Bor	ing	- 1	18.0'
Driller	•	PAUL BARTH					
Geologi	ist	AMIN AYUBCHA					
Elev.	Depth	Description	ithology	Sample No. and	Symbol	Blov Count	Remarks
58.00		Ground Surface					
255-	1- 2- 3-	0.0'-0.5': <u>FIL</u> : black, dry fill with mixture of sand, gravel, brick, debris, roots, vegetation, and charcoal. 0.5'-2.5': <u>SAND</u> (SP): tan to brown, slightly moist, medium to coarse grained, with 1/4" size boulders; ( quartz, <5% clay in matrix, low to very low	50%			6 7 8	Spi Spn Hun : 0.0-2.0 1.8' recovery. OVA: spoon and hole (0 ppm), head space (0.2 ppm). Collected archive sample. Augered from 2.0'-5.0'.
250-	4- 5- 6- 7- 8- 9-	plasticity, loose, mostly rounded elements. 2.5'-9.5': <u>SAND</u> (SP): gray, clean, trace of moisture, medium to coarse grained, 1/4-1/2" size boulders; 80-90% quartz, 5-10% micas, 10% other metamorphosed minerals, no plasticity, loose, slight angular elements.	.Jy			4 7 12 12	Spl Spn Run 2: 5.0'-7.0' 1.6' recovery. DVA: spoon and hole (0 ppm), head space (0.1 ppm). Collected archive sample. Augered from 7.0'-10.0'. Encountered a boulder at 9.5' BGS that was passed through with
245-	10- 11- 12- 13-	9.5'-14.0': <u>SAND/GRAVEL</u> (SP): gray-yellowish mixture, slightly moist. stiff, fine grained; 50% quartz, 10-15% silt in matrix, abundant quartz _boulders, metamorphosed rock, slightly plastic, dens glacial deposits; large boulders encounterted during _prilling.				17 35 75 80	high pressure. Large boulders from 9.5' downward. Spl Spn Run 3: 10.0'-12.0' 1.7' recovery. DVA: spoon, hole, and head space (0 ppm). Collected archive sample. Augered from 12.0'-15.0'
-		14.0'-17.5': <u>GLACIAL SILTY TIL</u> (GM): brownish, wet, very fine silty sand with numerous large boulders of igneous quartzitic rocks; 80% quartz, 5% clay in matrix, low plasticity, slightly dense, stiff.				53 60	Spl Spn Run 4: 15.0'-17.0"

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DRIL	_LI	NG LOG of BORING No. S	HL-	16A Page 2 of 2
State		MASSACHUSETTS	ation	FORT DEVENS -
Elev.	Depth	Description		Lithology Symbol Blow Count Count Count
	17			and hole (0 ppm). Collected archive sample. Water first encountered at 15' BGS. Augered 17.0'-17.5'. Abandoned boring was tremie grouted to surface on 6/15/91. CONSTRUCTION SUMMARY Cem.: 658 dry lbs Cem./Bent.: 5%.
Ecol	ogy a	USA HAMA, ARMY LURP nd Environment. Inc.	J UF	F ENGLINEERO Buffalo, New York

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DPI	LLI	NG	LOG	οf	BORI	NG	No.	SHL	-1	6B				Page 1 of
State			M	ASSA	CHUSE	TTS	-	Start	Dațe	2				7/10/91
Locat	ion	-		FORT	DEVE	NS		Comple	tior	Da <sup>r</sup>	te			7/10/91
Drill	ing Fi	rm _	<u> </u>	<u>&amp; E</u>	DRILL	ING		Ground	Ele	vat	ion			258.00
Туре	of Dri	11 _	D	IEDF	ICH D	-50		Total I	Dept	:h o	f Bar	9	23.7'	
Drill	11er PAUL BARTH													
Geolog	gist	_		LISA	HELT	ON	- <u></u>							
Elev.	Depth				Descrip	tion				Lithology	Sample No. and	Symbol	Blov Count	Remarks
258.00		  -	(	Groun	<u>d Surfa</u>	се								Dry hole.
255	1- 2- 3- 4- 5- 6-													Abandoned boring. Boring was tremie grouted to ground surface on 7/10/91.
<b>2</b> 50 <sup>.</sup>	- 8- 9- 10-													Auger refusal at 9.0'.
245-	112- 13- 14- 15-													MATERIAL QUANTITY: Cem.: 470 dry 1bs. Cem./Bent.: 5%
Eco	logy	and	USA Enviro	THA nment	MA, , Inc.	ARM	Y C(	)RPS	OF	= [	ENG	I	NEE	ERS Buffalo, New York

		NG LOG of BOI	RING NO	. SHL-2	165	3	<u></u>	Page 2 of 2
Elev.	apth	MASSALHU: Descr	iption	Location	ve logy	and and		Remarks
240-					[7]	82		
235-	21 22 23 							
		-						
								·
Ecolo	а урс	USATHAMA, nd Ervironment, Inc	ARMY C	ORPS OF	E	ENGI	NEE	Buffalo, New York

DRIL	_LII	NG	LOG	o f	BOR	ING	No.	SHL	- 1	60				Page 1 of 1		
State		-	MA	ASSA	CHUS	ETTS		Start	Date	2				7/12/91		
Locati	on	-	FORT DEVENS				Completion Date						7/12/91			
Drilli	ng Fir	_ תר	E	& E	DRIL	LING		_ Ground Elevation						258.00		
Type o	f Drij	11 _	D	IEDR	ICH	)-50		. Total Depth of Boring						9.0'		
Drille	r	-			BAE	TH										
Geolog:	Geologist .			ISA	HEL	TON										
Elev.	Depth				Descri	ption				L i tho logy	Sample No. and	Symbol	Blov Count	Remarks		
258.00		-	G	<u>irounc</u>	<u>1 Surf</u>	<u>ace</u>	<u> </u>	<u></u>				-		Dry hole.		
255-	1- 2- 3- 4-													Abardoned boring. Boring was tremie grouted		
250-	6- 7- 8-													to ground surface on 7/12/91.		
	9													Auger refusal at 9.0'. MATERIAL QUANTITY: Cem.: 188 dry lbs. Cem./Bent.: 5%.		
Ecol	ogy	and	USA <sup>-</sup> Enviror	THA!	MA, , Inc	ARM	Y C(	)RPS	CF	= [	ENG	Ī	NEE	ERS Buffalo, New York		

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		MASSACHUSETTS	Start	Date	-			6/14/91		
Locati	ion	FORT DEVENS	Comple	tion	Date	2		6/14/91		
Drilli	ing Firm	E & E DPILLING	Ground	Ele	vatio	n		232.77		
- Туре с	of Drill	Ground	wate	r Dep	ith					
Drille	er	a	t co	mplet	:10	n	6.20.₽			
Geolog	jist	AMIN AYUBCHA	o Total i	n 12 Dept	2/ <u>12/</u> 9 .h of	91 Bo	ring	<u> </u>		
Elev.	Depth	Description		Lithology	Sample No. and	Symbol	Blow Count	Remarks	Well Const	
2.77		Ground Surface 0.0'-0.25': <u>TOPSOIL</u> (MH): black clayey sil 00-50% clay slightly moist, moderate plast stiff, with vegetation. 0.25'-2.0': <u>SAND</u> (SP): gray, slightly mois coarse grained with abundant boulders of q (gravel locally), >70% quartz, 5% clay in matrix, loose, well rounded elements. 2.0'-6.0': <u>SAND</u> (SP): dark gray, wet, coar grained, 50-60% quartz, 20-30% micas and o more-magnesian minerals. low or no plasti	t. icity, t. uartz the se ther city,				3 12 17 23 3 4	Stickup = 1.80 Spl Spn Run 1: 0.0'-2.0' 1.5' recovery. OVA: spoon, hole, and head space (0 ppm). Collected archive sample. Augered from 2.0'-5.0'. Spl Spn run 2: 5.0'-7.0' 1.2' company. OVA:		
		pose. 5.0'-10.5': silty_ <u>SAND</u> (SM): gray, wet, 70	-75%				4	1.3 PELUVERY. OVA.		

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State	·	MASSACHUSETTS Locat	ion			FOR	DEVENS	
Elev.	Depth	Description	ithe logy	Sample No. and	Symbol	Blow Count	Remarks	Well Corst
220-		10.5'-17.0': SAND (SP): dark gray, wet, very coarse grained sand and gravellous sand, boulders of black metamorphic roks; some thin layers of clear silty sand. 60% quartz, >20% ferro-magnesians, low or no plasticity, loose, rare grains of feldspar.				1 2 3 4 5 6 7	Sp1 Spn Run 3: 10.0'-12.0' 1.7' recovery. OVA: spoon, hale, and head space (0 ppm). Collected samples: (1) 80z. jar for TOC analysis. (2) 80z. jars for Geotechnical archive Augered from 12.0'-15.0'. Sp1 Spn Run 4: 15.0'-17.0' 1.8' recovery. OVA: spoon and head space (0 ppm). hole (0.2 ppm). Collected archive sample. CONSTUCTION SUMMARY Well: Hole dia.: 10'. screen/casing dia.: 4'. slot size: 0.010'. Material Qty.: Filter Pk.: 500lbs. Bent. Pel.: 15 dry gallons. Cem.: 470 dry lbs Cem./Bent.: 5%. Stickup measured from ground surface to top of inner casing.	

DRI		NG LOG of WELL No. SH		8				Page 1	. of 3		
tate		MASSACHUSETTS	Start	Date	:			6/15/91			
Locat	ion	FORT DEVENS	Comple	tion	Date	!		6/16/91			
Drill	ing Fir	E & E DRILLING	_ Ground Elevation					236.59			
Туре	of Dri]	DIEDRICH D-50	_ Groundwater Depth								
Drill	er	PAUL BARTH	at comple			:i0	n	17.80 ₹			
Geolo	aist	AMIN AYUBCHA	- on 12/		2/ <u>12/</u> 9	91		17.12 ¥			
	5		Total I	Dept	h of	Bo	ring	<u>30.0</u>			
Elev.	Depth	Description		Lithology	Sample No. and	Symbol	Blov Count	. Remarks	Well Const.		
235-	1 1 2 3	Ground Surface 0.0'-10.0': <u>SAND</u> (SP): gray. slightly moist fine to very fine grained, 80% quartz, <5% and other metamorphosed minerals. Trace of low plasticity, slightly moist on top 1'. of rounded and angular grains.	micas roots. Nixture				2 3 4 6	Stickup = 1.80 Spl Spn Run 1: 0.0'-2.0' 1.8' recovery. OVA: spoon, hole, and head space (0 ppm). Collected archive sample			
230-	4						3 4 5	Augered from 2.0'-5.0'. Organic, blackish san was observed at 4'-5' on auger cuttings. Spl Spn Run 2: 5.0'-7.0' 1.7' recovery. OVA: spoon, hole, and head space (0 ppm). Collected archive sample. Augered from			
Ecc	USATHAMA, ARMY CORES OF ENGINEERS Buffalo, New York										


DRI	LLIN	IG L	OG d	) f	WELL	NO.	SHL-1	8				Page	3 of 3
State			MA	SSA	CHUSET	IS	Locati	2n			FORI	DEVENS	T
ev.	Depth		۲		Descripti	וסח		L 1 t ho 1 agy	Semple No. and	Symbol	Blow Count	Remarks	Well Const
												4", Slot Size: 0.010". Material Oty.: Filter Pk.: 9001bs Bent. Pel.: 17.5 d gallons. Cem.: 564 dry 1bs. Cem./Bent.: 5%. Stickup measured from ground surface to to pf inner casing.	
<u>-</u>		200 F			AMA,	ARMY	CCRPS	6 (	)F {	Ξ,	NGIN	NEERS Buffalo, N	ew Yo

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ecology and environment

	DRI		NG LOG of WELL No. SI	HL-1	9				Page 1	of ?
	tate		MASSACHUSETTS	Start	Date	?			6/16/91	I
	Locat	ion	FORT DEVENS	Comple	tion	Date	ł		6/17/91	
	Drill	ing Fir	E & E DRILLING	Ground	Ele	evatio	ī		239.45	
	Туре	of Dril	DIEDRICH D-50	Ground	wate	er Dep	ith			
	Drill	er	PAUL BARTH	a	t co	mplet	io	n	22.00 ₹	
	Geolo	gist	AMIN AYUBCHA	D Total	n 12 Dent	2/ <u>12/</u> 9	91 Bo	rina	<u>20.6/¥</u>	
		r				····		· •···J	Lock #3217	-
	Elev.	Depth	Description		.ithology	Sample No. and	Symbol	Blov Count	, Remarks	Well Const.
	235-	1	Ground Surface 0.0'-1.0': <u>SAND</u> (SP): dark gray, slightly fine grained, vegetation on top. 50-70% qua <4-5% clay in matrix, very low plasticity, subangular to well rounded grains. 1.0'-4.5': <u>SAND</u> (SP): gray, dry, clear, fin very fine grained quartz sand, 70-80% quart 5-10% ferro-magnesians of micas, no plastic slightly angular element. 4.5'-16.0': <u>SAND</u> (SP): dark gray, dry, medi- coarse grained, 60% quartz, 30-40% micas and metamorphosed rock debris, low to very low plasticity, loose, subangular grains, trace oxidized minerals, occasional thin layer (2 silty sand.	noist. ertz. loose. re to tz. city. hum to hd e of 2-3") of				1 1 2 4 3 5 5 8	Stickup = 1.89 Sp1 Spn Run 1: 0.0'-2.0' 1.7' recovery. OVA: spoon, hole, and head space (0 ppm). Collected archive sample. Augered from 2.0'-5.0'. Sp1 Spn Run 2: 5.0'-7.0' 1.8' recovery. OVA: spoon, hole, and head space (0 ppm). Collecteed archive sample.	
	230-	g							7.0'-10.0'.	
			USATHAMA, ARMY CO	)RPS	CF	ΞE	N(	GIN	EERS	
ſ	Eco	ology	and Environment, Inc.						Buffalo, New	York

State		MASSACHUSETTS Loc	ation			FOR	<u>DEVENS</u>	
Elev.	Depth	Description	L)thology	Sample No. and	Symbol	Blow Count	- Remarks	Well Corst.
225-						5 5 7 9	Sp1 Spn Run 3: 10.0'-12.0' 1.7' recovery. OVA: spoon, hole, and head Space (0 ppm). Collected archive sample. Augered from 12.0'-15.0'.	
220-	- 15 - 17 - 18 - 19 - -	16.0'-21.0': silty <u>SAND</u> (SM): white-grayish, dry, very similar to the 4.5-16' interval, loos no plasticity, rounded to subangular grains, tr of isolated boulder of metamorphosed rock.	e, ace			3 5 9	Spl Spn Run 4: 15.0'-17.0' 1.3' recovery. OVA: Spoon, hole, and head space (0 ppm). Collected archive sample. Augered from 17.0'-20.0'.	
-	20	21.0'-21.5': <u>SAND</u> (SM): same as above, slightly coarser, more sand than silt. 21.5'-22.0': <u>SAND</u> (SP): orange and black				4 12 13 14	Sp1 Spn Run 5: 20.0'-22.0' 1.4' recovery. OVA: spoon, hole, and head space [0 ppm].	
215-	23   24   25   25   26   27	(organic), very wet, coarse grained, abundant boulders of quartz, 2" of oily black and rusty sand, numerous fragments of schist and granitic rock, 50-60% quartz, 30% metamorphosed ferro-magnesians and micas, no plasticity. 22.0'-30.0': <u>SAND</u> (SP): gray, wet, medium to coarse grained, some boulders of quartz, thin layer (2-3") of fine grained sand, 60-70% quart: 5-10% metamorphosed ferro-magnesians, trace of	Z.			3 5 8 12	Collected archive sample. Augered from 22.0'-25.0'. Water at 22' BGS. Measured after stabilization. Spl Spn Run 5: 25.0'-27.0'	
210-	28	oxidized grains. no plasticity. loose.					1.5' recovery. OVA: spoon and hole (0 ppm), head space (0.4 ppm). Collected archive sample. Augered from 27.0'-31.0'.	
		HEATHAMA ABMY CODD		F			CONSTRUCTION SUMMARY Well: Hole dia.: 10", 	
<b>B</b> Eco	loov a	nd Environment. Inc.		L_!	νŲ	·	Buffalo, New	York
		recycled paper				ecolog	v and environment	

Page 3 of 3

tate		MASSACHUSETTS	Locatio	n			FOR	DEVENS	
Elev.	Depth	Description		Lithology	Sample No. and	Symbol	B]ow Count	Remarks	Well Const.
					n ž	S		4:, slot size: 0.010°. Materjal Qty.: Filter Pk.: 400lbs. Bent. Pel.: 20 dry gallons. Cem.: 554 dry lbs Cem./Bent.: 5% Stickup measured from ground surface to top of inner casing.	
Eco	logy a	USATHAMA, AHMY CO and Environment, Inc.			· E	<u>ч</u> с		ニHン Buffalo, New	York

		NG LOG of WELL No. S	HL-2	0				Page	1 af 4	4
Scate	:	MASSACHUSETTS	Start	Date	9			7/10/91		-
Locat	ion	FORT DEVENS	Comple	tior	) Date	ļ		7/13/91		-
Drill	ing Fir	E & E DRILLING	Ground	Ele	evatio	n		235.55	·	-
Туре	of Dri	ACKER 82	Ground	wate	r Dep	th				
Orill	er	DON CAMPBELL	9	t co	mplet	10	n	15.00 ₹		•
Geolo	gist	ROBERT A. MEYERS		n 12	2/ <u>12/</u> 9	)1		<u> </u>		•
	-		Total	Dept	n of	80	ring	04.0		•
Elev.	Depth	Description	<u> </u>	L1tho10gy	Somple No. and	Symbol	Blov Count	, Remarks	well Const	
235.55		Ground Surface						Stickup = 1.29		
235-	1	0.0'-0.4': <u>SILT</u> (NH): tan, dry, with fine and some rounded grave]. 0.4'-2.0': <u>SAND</u> (NH): tan to brown, fine t medium grained, with some rounded to suban	sand 0 gular _				4 6 10 14	Spl Spn Run 1: 0.0'-2.0' 1.2' recovery. OYA: spoon and nole (0		
230-	3	gravel. Sand is composed of angular fragme 90% quartz, 10% mafics. (<1%) mica for thi spoon. 5.0'-7.0': <u>SAND</u> (SP): tan to gray. moist. grained. with some limonitic staining. 90% 10% mafics. <1% mica.	nts of s split medium quartz,				4 5 5 6	ppm) Collected archive sample. Augered from 2.0'-5.0'. Spl Spn Run 2: 5.0'-7.0' 1.0' recovery. OVA: spoon and hole (0 ppm). Collected archive sample. Augered from 7.0'-10.0'.		
		USATHAMA, ARMY CO	ORPS	OF	ΞE	N,	BIN	EERS		
Eco	ology	and Environment, Inc.						Buffalo, New	/ York	
		тесустер рарен					ecolo	gy and environment		

Elev. Depth Description Elev. Depth Description 225 11 100-12.01 SAND (SP): same as above, dry, vstn 122 12 100-12.01 SAND (SP): same as above, dry, vstn 122 13 - 11 - recovery. CVA: 133 - 11 - recovery. CVA: 134 - 15 - 15.01 - 17.01 SAND (SP): vet at 15.21, fine to 155 - 15.01 - 17.01 SAND (SP): vet at 15.21, fine to 156 - recovery. CVA: 157 - 150 - 17.01 SAND (SP): vet at 15.21, fine to 156 - recovery. CVA: 157 - 150 - 17.01 SAND (SP): vet at 15.21, fine to 158 - recovery. CVA: 159 - 150 - 17.01 SAND (SP): vet at 15.21, fine to 159 - 120 -	State	· · · · · · · · · · · · · · · · · · ·	MASSACHUSETTS Locati	on	······································		FOR	T DEVENS	
225       10.0°-12.0°: SAND (SP): same as above, ary, with less staining.       4       Sol Son Run 3: 10.0°-12.0°: Sol Son Run 3: 10.0°-12.0°: Sol Son Run 3: 10.0°-12.0°: Sol Son Run 4: 10.0°-12.0°: Sol Son Run 4: 10.0°-12.0°: Sol Son Run 4: 10.0°-15.0°: 15.0°-17.0°: Sol Son Run 4: 10.0°: Sol Son Run 5: 20.0°-22.0°: Sol Son Run 5: 20.0°-27.0°: Sol Son Run 5: 20.0°: Sol Son Run 5: 20.0°: Sol Son Run 6: 20.0°-27.0°: Sol Son Run 6: 20.0°-27.0°: Sol Son Run 7: 30.0°: Sol Son Run 7: 30.0°: 30.0°-32.0°: 30.0°-32.0°: 30.0°-32.0°: 30.0°-32.0°: 30.0°-32.0°: 30.0°-32.0°: 30.0°-32.0°: 30.0°-32.0°: 30.0°-32.0°: 30.0°-32.0°: 30.0°-32.0°: 30.0°-32.0°: 30.0°-32.0°: 30.0°-32.0°: 30.0°-32.0°: 30.0°-32.0°: 30.0°-32.0°: 30.0°-32.0°: 30.0°-32.0°:	Elev.	Depth	Description	Lithology	Sample No. and	Symbol	B)ox Count	Remarks	Well Corst.
13       13         14       14         15       15.0'-17.0': SAND (SP): wet at 15.2', fine to 16       16.0'-17.0': SAND (SP): wet at 15.2', fine to 16         16       medium grained, heavily stained with nust (lisensic). SOX quartz, 10X matics, <ix mice.<="" td="">       5         17       17       17         18       0.0'-22.0': SAND (SP): seturated, fine to coarse grained, no staining, subrounded to angular, 75X quartz, 25X matics, <ix mice.<="" td="">       6         21       20.0'-22.0': SAND (SP): seturated, fine to coarse grained, no staining, subrounded to angular, 75X quartz, 25X matics, <ix mice.<="" td="">       7         22       23       25.0'-27.0': SAND (SP): gray-brown, saturated, fine to coarse grained, BSX quartz, 13X matics, 2X pink felospar, <ix angular<br="" mice,="" rounded="" to="">grains.       0         210       25.0'-27.0': SAND (SP): gray-brown, saturated, fine to coarse grained, BSX quartz, 13X matics, 2X pink felospar, <ix angular<br="" mice,="" rounded="" to="">grains.       0         210       25.0'-27.0': SAND (SP): gray-brown, saturated, fine to coarse grained, with 31th erounded grains.       1         210       25.0'-27.0': SAND (SP): gray-brown, saturated, fine to coarse grained, with 31th erounded grains.       1         211       212       31.0'-32.0': SaND (SP): gray-brown, saturated, fine to coarse grained, with 31th erounded grains.       1         211       212       31.0'-32.0': SaND (SP): gray-brown, saturated, fine to coarse grained, with 31th erounded graveli</ix></ix></ix></ix></ix>	225-	11-	10.0'-12.0': <u>SAN</u> D (SP): same as above, dry, with less staining.				4 3 4 5	Spl Spn Run 3: 10.0'-12.0' 1.1' recovery. CVA: spoon and hole (0	
14         15         15         16         17         18         19         19         20         18         19         20         215         215         215         215         215         215         216         217         218         219         220         215         216         217         218         229         219         220         2215         216         217         218         229         220         23         24         25.01         25.01         26.01         27.01         28.01         29         210         26         210         22         23         24         25.01         25.01         26         27.01<		13-						ppm). Collected archive	
15       15.0'-17.0': SAND (SP): wet at 15.2', fine to 16       5       Spi Son Run 4: 17.0'-20.0': SAND (SP): saturated, thrust (lisenstic). 90% quartz, 10% mefics, <1% mice.		14-						Augered from 12.0'-15.0'.	
16       Heading grained, meaving stained with nust         17       (isnonitic), 90% quartz, 10% merics, <i% msce.<="" td="">         17       17         18       19         19       20         20       20.0°-22.0°; SAND (SP): saturated, fine to         215       21         216       20.0°-22.0°; SAND (SP): saturated, fine to         217       22.0°-22.0°; SAND (SP): saturated, fine to         218       22.0°-22.0°; SAND (SP): saturated, fine to         219       20.0°-22.0°; SAND (SP): gray-brown, saturated,         220       22.0°-22.0°; SAND (SP): gray-brown, saturated,         221       22.0°-27.0°; SAND (SP): gray-brown, saturated,         221       23         231       1.8° recovery, OVA:         332       30.0°-32.0°; SAND (SP): gray-brown, saturated,         233       30.0°-32.0°; SAND (SP): gray-brown, saturated,      <tr< td=""><td>220-</td><td>15</td><td>15.0'-17.0': <u>SAND</u> (SP): wet at 15.2', fine to</td><td></td><td></td><td></td><td>5</td><td>Spl Spn Run 4:</td><td>F</td></tr<></i%>	220-	15	15.0'-17.0': <u>SAND</u> (SP): wet at 15.2', fine to				5	Spl Spn Run 4:	F
18       19         19       20         20       20.0'-22.0': SAND (SP): saturated, fine to carse grained. no staining, subrounded to angular. 75% quartz. 25% mafics, c1% mica.         21       22         23       24         24       23         24       24         25       25.0'-27.0': SAND (SP): gray-brown, saturated, fine to carse grained. 05% quartz. 13% mafics, 2% pink felogar. <1% mica. rounded to angular.		15	medium grained, neavily stained with rust (limphitic), 90% quartz, 10% mafics, <1% mica.				5 7 6	1,7' recovery. OVA: Spoon and hole (0	
19       20       20.0'-22.0': SAND (SP): saturated, fine to coarse grained, no staining, subrounded to angular, 75% quartz, 25% mafics, <1% mica.		18 -						ppm). Collected archive samole	
215       20.0'-22.0': SAND (SP): saturated, fine to         215       21       coarse grained, no staining, subrounded to         angular, 75% quartz, 25% mafics, <1% mica.		19						Augered from 17.0'-20.0'.	
<ul> <li>angular. 75% quartz. 25% mafics. &lt;1% mica.</li> <li>22- 23- 23- 23- 24- 25.0'-27.0': <u>SAND</u> (SP): gray-brown, saturated.</li> <li>24- 25- 25.0'-27.0': <u>SAND</u> (SP): gray-brown, saturated.</li> <li>25- 25.0'-27.0': <u>SAND</u> (SP): gray-brown, saturated.</li> <li>26- pink feldspar. &lt;1% mica. rounded to angular</li> <li>27- grains.</li> <li>205- 30- 30.0'-32.0': <u>SAND</u> (SP): gray-brown, saturated.</li> <li>28- 29- 205- 30- 30.0'-32.0': <u>SAND</u> (SP): gray-brown, saturated.</li> <li>29- 30- 30.0'-32.0': <u>SAND</u> (SP): gray-brown, saturated.</li> <li>205- 31- 51 fine to coarse grained. with little rounded gravel. 90% quertz, 10% mafics. &lt;1% mica. rounded</li> <li>205- 32- 33- USATHAMA, ARMY CORPS OF ENGINEERS</li> </ul>	215-	20	20.0'-22.0': <u>SAND</u> (SP): saturated, fine to coarse grained, no staining, subrounded to				4 7	Sp1 Spn Run 5: 20.0'-22.0'	
23- 24- 24- 25- 25- 25- 25- 25- 25- 25- 25- 25- 25		22	angular, 75% quartz, 25% mafics, <1% mica.				7 6	1.4' recovery. OVA: spoon (5 ppm) and Pol (50 ppm). (methane)	
210- 25.0'-27.0': SAND (SP): gray-brown, saturated, 26- pink feldspar, <1% mica, rounded to angular 27- 28- 20- 20- 20- 20- 20- 20- 20- 20		23						Collected archive Sample. Augered from	
210 26 - fine to coarse grained, 85% quartz, 13% mafics. 2% pink feldspar. <1% mica. rounded to angular 27 - grains. 28 - 29 - 20 - 30 -	240	25	25.0'-27.0': <u>SAND</u> (SP): gray-brown, saturated,				0	22.0'-25.0'. Spl Spn Run 5:	
205- 30- 205- 31- 30.0'-32.0': SAND (SP): gray-brown, saturated, 31- fine to coarse grained, with little rounded gravel, 90% quartz, 10% mafics. <1% mica, rounded 32- 33- USATHAMA, ARMY CORPS OF ENGINEERS Buffalo, New York	2107	26	fine to coarse grained, 85% quartz, 13% mafics, 2% pink feldspar, <1% mica, rounded to angular grains				2 3 4	25.0'-27.0' 1.8' recovery. OVA: spoon (4 ppm) and pol	
29- 30- 30- 30- 30- 30- 30- 30- 30		27						(60 ppm). (methane) Collected archive	
205- 30- 30.0'-32.0': <u>SAND</u> (SP): gray-brown, saturated. fine to coarse grained, with little rounded gravel, 90% quartz, 10% mafics. <1% mica. rounded 32- 33- USATHAMA, ARMY CORPS OF ENGINEERS Buffalo, New York		29-						Augered from 27.0'-30.0'.	
32-to angular grains. 33-USATHAMA, ARMY CORPS OF ENGINEERS Buffalo New York	205-	30	30.0'-32.0': <u>SAND</u> (SP): gray-brown, saturated, fine to coarse grained, with little rounded				1 3	Spl Spn Run 7: 30.0'-32.0'	
USATHAMA, ARMY CORPS OF ENGINEERS		32	to angular grains.				4	spoon (2 ppm) and hol (40 ppm). (methane) Collected archive	
USATHAMA, ARMY CORPS OF ENGINEERS		33-						sample.	
			USATHAMA, ARMY CORPS	05	Εŀ	٩G	INE	ERS Buffalo, New	York

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State		MASSACHUSETTS Locatio	2n			FORI	DEVENS	
Elev.	Depth	Description	Lithology	Sample No. and	Symbol	Blow Count	Remarks	Well Corst.
	34-						Augered from 32.0'-35.0'.	
200-	35 -	35.0'-37.0': <u>SAND</u> (SP): gray-brown, saturated, fine to medium grained, 90% quartz, 10% mafics,				5 5 6	Spl Spn Run B: 35.0'-37.0' 1 5' permeny 0YA:	
	37	<1% m1ca.				7	spoon (3 ppm) and nol	e
	38	· · · · · · · · · · · · · · · · · · ·					Collected archive sample.	
	39						Augered from 37.0'-40.0'.	
195-	40	40.0'-42.0': <u>SAND</u> (SP): same as above, with few				0	- Spl Spn Run 9:	
	41	rourded peobles of mafic material.		•		3	40.0°-42.0° 1.5' recovery. OVA:	
	42					10	(>100 ppm) (methane).	Ē
	43						sample.	
	44			• •			42.0'-45.0'.	
190-	45	45.0'-47.0': <u>SAND</u> (SP): gray to tan, saturated.				11 11	Spl Spn Run 10: 45.0'-47.0'	
	46	mica, rounded to angular grains.				17 25	1.8' recovery. OVA: spoon (3 ppm) and hol	
	4/						(80 ppm) (methane). Collected archive	E
	49	40'-49': Cuttings are indicative of weathered granodiorste.	$\bigotimes$				sample. Attempted to auger from 47.0'-50.0'.	E
Ì	50-	metamorphic, microcrystalline, with several high	$\bigotimes$				Casing and split spoo refusal at 48'.	
185	51-		$\bigotimes$				Top of bedrock at '48' Tri-cone roller bit	
	52		$\bigotimes$				used to drill from 48'-49'.	
	53-		$\bigotimes$				Core Run 1: 49.0'-54.0'	
	54-	54.0'-59.0': <u>DIABO-QUARTZITIC GNEI</u> SS: same as	$\bigotimes$				Core Run 2:	
180	55-	above.	$\bigotimes$				194.0	
	55		$\bigotimes$					
		USATHAMA, ARMY CORPS	0	FΕ	N	GIN	EERS	
E	ology	and Environment, Inc.				ecolo	Buffalo, New	/ York
	-	recycled Daper					<del>.</del>	

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State		MASSACHUSETTS Locati	00			FORT	DEVENS	
Elev.	Depth	Description	tho logy	Sample No. and	Symbol	Blow Count	Remarks	Well Const.
175-	58 - 59 - 60 - 61 - 62 - 63 - 63 -	59.0'-64.0': <u>DIARO-QUARIZITIC GNEISS</u> : same as above, with an approximately 2' vertical fracture which has partially healed.			6		Core Run 3: 59.0'-54.0' CONSTRUCTION SUMMARY Well: Hole dia.: 10'. screen/casing dia.: 4", stot size: 0.010'. Stickup measured from ground surface to top of inner casing. All cuttings with hea space readings above 10 ppm were containerized in 55-gallon drums.	
	logy	USATHAMA, ARMY CORPS and Environment. Inc.	. OF	- E	N(	GINE	EERS Buffalo, New	York

JRI	LLI	NG LOG of WELL No. S	HL-2	1				Page 1	of 4	
State	•	MASSACHUSETTS	_ Start [	Date	2			6/18/91		
Locat	noi	FORT DEVENS	Complet	ior	n Date	9		6/19/91	<u> </u>	
Drill	ing Fir	E E E DRILLING	Ground	Ele	evatio	ท		257.93		
Туре	of Dri	1ACKER 82	Ground	vate	er Dep	ith				
Drill	er	DON CAMPBELL	at	: co	omplet	:10	n	40.60 ¥		
Geolo	gist	ROBERT A. MEYERS		1 12	2/ <u>12/</u> 9	91		<u>42,66</u>		
	<b></b>			Jept		RD	ring	<u>J3.0</u> Lock #3217		
Elev.	Depth	Description		Lithology	Sample No. and	Symbol	Blov Count	Remarks	Well Const.	
257.93	1 2 3 4 5 5	Ground Surface 0.0'- 0.1': <u>TOPSOIL</u> (OL): organic material sand; roots extend to 0.4'. 0.1'-2.0': <u>SAND</u> (SP): medium brown, slight moist, fine to coarse, with some fine to c gravel and trace of cobbles; all materials from rounded to subangular. loose, non-com 60% guartz. 25% feldspars, 10% ferro-magnes with little silt and clay in matrix. 5.0'-7.0': <u>SAND</u> (SP): light brown, moist. to coarse grained. loose, non-plastic, with	and ly parse range esive, sians, fine h little				3 5 9 12 5 7	Stickup = 1.82 Spl Spn Run 1: 0.0'-2.0' 1.8' recovery. OVA: spoon, hole, and head space (0 ppm). Collected archive sample. Augered from 2.0'-5.0'. Spl Spn Run 2: 5.0'-7.0'		
250-	7 8 9 -	rounded (granite) gravel, angular to round clear quartz, 15% ferro-magnesians and mic feldspars.	a, 5%				9	1.2' recovery. OVA: Spoon (0.1 ppm) and hole (0 ppm). Collected archive sample. Augered from 7.0'-10.0'.		
		USATHAMA, ARMY CO	RPS	OF		10	GINE	EERS		
Eco	logy a	ned√dea∀aæenment, Inc.					ecolos	Buffalo, New	York	

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State		MASSACHUSETTS Locati	on			FOR	DEVENS	
Elev.	Depth	Description	Lithology	Sample No. and	Symbol	Blow Count	Remarks	Well Const.
-	- 11 - 12	10.0'-12.0': <u>SAND</u> (SN): light gray, dry, very fine to fine grained, loose, non-plastic, angular to subrounded, 90% quartz, 10% ferro-magnesians, mica, and feldspar.				5 8 10 12	Sp1 Spn Run 3: 10.0'-12.0' 1.2' recovery. OVA: Bpoon (0 ppm) and hol (0.2 ppm).	
245-	13					_	Collected archive sample. Augered from 12.0'-15.0'.	
240-	- 16 17 18 19	15.0'-17.0': <u>SAN</u> D (SN): same as above, fine to very fine grained.				3 3 5 9	Spl Spn Hun 4: 15.0'-17.0 1.5' recovery. OVA: Spoon (0.1 pp#) and hole (0 ppm). Collected archive sample. Augered from	
235-	20   21   22   23   23	20.0°-22.0': <u>SAN</u> D (SM): same composition as above, but slightly more finely grained, with some silt, slightly moist, no staining or inclusions.				5 9 11 12	17.0'-20.0'. Sp1 Spn Run 5: 20.0'-22.0' 1.9' recovery. OVA: spoon (0.1 ppm) and hole (0 ppm). Collected archive sample.	
230-	24	25.0'-27.0': <u>SAN</u> D (SM): same as above, light gray to white. very slightly moist, with three (1/2") seams of tan silt. non-plastic. non-cohesive.				7 9 11 15	Augered from 22.0'-25.0'. Spl Spn Run 5: 25.0'-27.0' 1.5' recovery. DVA: spoon and hole (0 ppm). Collected archive sample. Augered from 27.0'-30.0'.	
225-	30	30.0'-32.0': <u>SAN</u> D (MH): light gray to white, dry, very fine, non-plastic, non-cohesive, 90% quartz, 10% ferro-magnesians, mica, and feldspar.				3 5 8 11	Spl Spn Run 7: 30.0'-32.0' 1.5' recovery. OVA: spoon (0 ppm) and hol (0.4 ppm). Collected archive sample.	
Ecol	logy a	USATHAMA, ARMY CORPS nd Environment, Inc.	OF	ΞŇ	٩G	INE	EPS Buffalo, New	Yor



State	MASSACH	USETTS	Locati	on			FOR	DEVENS	
lev. Dep	h Desc	críption		lthe logy	Semple No. and	Symbol	B]0W Count	Remarks	Wel Cons
-								Cem.: 1.316 dry lbs., Cem./Bent.: 5%. Stickup measured from ground surface to top of inner casing.	

State	MASSACHUSETTS	_ Start	Date				7/14/91	
Location	FORT DEVENS	_ Comple	tion	Date	2		7/23/91	
Drilling Firm	E & E DRILLING	Ground	Ele	vatio	n		219.58	
Type of Drill	ACKER 82	_ Ground	wate	r Dep	oth			
Driller	DON CAMPBELL	- -	t co	mplet	:10	n	8.50 ₽	
Genlagist	BOBERT A. MEYERS	D	n 12	2/ <u>12/</u> 9	91		<u>4.85</u> <u>120</u> €'	
000103100	سور میں بالدیکر اور اور اور اور اور اور اور اور اور او	- Total	Dept	h of	Bo	ring	<u> </u>	
Elev. Depth	Description		ithe logy	Semple No. and.	Symbo 1	8]ov Count	Remarks	
	D.O'-1.2': <u>SAND</u> (SP): tan, damp, loose, me to coarse grained. with little fine sand, rounded pebbles, roots, 90% quartz, 10% me 1.2'-1.4': <u>SILT</u> (MH): medium brown, damp, arganic silt with fine sand, rounded to ar	edium trace afics. loose, ngular				2 2 2 2	Sp1 Spn Run 1: 0.0'-2.0' 1.4' recovery. OVA: spoon and hole (0 ppm). head space (2 ppm). Collected archive sample.	
215- 5-	and grains, 90% quartz, 10% mafics. ).0'-5.8': <u>SILT</u> (NH): same as above, damp,					22	Augered from 2.0'-5.0'. Spl Spn Run 2:	

State	<u>.</u>	MASSACHUSETTS Locati	on			FOR	T DEVENS	
Elev.	Depth	Description	Lithalogy	Semple No. and	Symbol	Blov Count	Remarks	Well Const
205- 200- 195-	$ \begin{array}{c} 11 \\ 12 \\ 13 \\ 13 \\ 14 \\ 15 \\ 16 \\ 17 \\ 18 \\ 19 \\ 20 \\ 21 \\ 22 \\ 23 \\ 24 \\ 25 \\ 27 \\ 28 \\ 27 \\ 28 \\ 29 \\ 30 \\ 31 \\ 31 \\ 31 \\ 31 \\ 31 \\ 31 \\ 31 \\ 31$	<pre>10.0'-12.0': <u>SAND</u> (SP): tan, loose, very fine to coarse, with some silt and trace gravel, trace limonitic staining, 90% quartz, 10% mafic, &lt;1% mica. 15.0'-17.0': <u>SAND</u> (SP): saturated, loose, medium to coarse grained, 90% quartz, 10% mafic, angular to subrounded grains, with trace gravel. 20.0'-22.0': <u>SAND</u> (SP): saturated, loose, very fine to coarse grained, with trace silt and gravel, 90% quartz, 10% mafic. 25.0'-27.0': <u>SAND</u> (SP): same as above. saturated, loose, with no gravel, &lt;1% mica. 30.0'-32.0': <u>SAND</u> (SP): same composition as above, gray, saturated, loose, fine to medium</pre>				3 4 5 9 1 2 4 5 2 4 7 13 7 7 11 11 11 7 5	<pre>water at B.5' BGS. Sp1 Spn Run 3: 10.0'-12.0' 1.9' recovery. OVA: spoon and hole (0 ppm). head space (9.8 ppm). Collected archive sample. Augered from 12.0'-15.0'. Sp1 Spn Run 4: 15.0'-17.0' 1.7' recovery. OVA: spoon and hole (0 ppm). head space (2.5 ppm). Collected archive sample. Augered from 17.0'-20.0'. Sp1 Spn Run 5: 20.0'-22.0' 1.8' recovery. OVA: spoon and hole (0 ppm). head space (4.5 ppm). Collected archive sample. Augered from 22.0'-25.0'. Sp1 Spn Run 5: 25.0'-27.0' 2.0' recovery. OVA: spoon and hole (0 ppm). head space (4.5 ppm). Collected archive sample. Augered from 22.0'-25.0'. Sp1 Spn Run 6: 25.0'-27.0' 2.0' recovery. OVA: spoon and hole (0 ppm). head space (2.8 ppm). Collected archive sample. Augered from 27.0'-30.0'. Sp1 Spn Run 7:</pre>	
	32	gravel.				θ	2.0' recovery. OVA: spoon and hole (0 ppm), head space (3.6	

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tate		MASSACHUSETTS Locati	on			FOR	DEVENS	
Elev.	Depth	Description	Lithology	Semple No. and	Symbol	Blow Count	Remarks	¥ell Const
135- 130-	81	83.0'-85.0': <u>SAND</u> (SM): gray, saturated, medium grained, angular, with trace fine sand, 90% quartz, 10% mafics. 85.0'-115.0': <u>TILL</u> (SP): consists most probably of tight till, containing both gravel and cobbles.				12 12 16 42	Spl Spn Run 15: 83.0'-85.0' 0.5' recovery. OVA: Spoon and hole (0 ppm). head space (196 ppm). (methane) Collected archive sample. Some sand flowed back into casing, approximately 1'. Unable to sample beyond 85'.	
125-	91							
<b>E</b> cc	l logv	USATHAMA, ARMY CORPS and Environment, Inc.	0	Ξ Ε	Ni	GIN	EERS Buffalo, New	York

ĎRI	LLI	NG LOG of WELL NO. SHL-2	22				Page f	6 af <sup></sup>
State		MASSACHUSETTS Locat	ipn			FOR	T DEVENS	-
Elev.	Depth	Description	Lithology	Sample No. and	Symbol	B]ov Count	Remarks	Well Const.
115-	- 105 106 107							
110-	108						Hit a large (9") cobble at 108' BGS	
105-	113	115.0'-120.0': <u>QUARTZO-FELDSPATHIC GNEISS</u> : with quartz seams, few open 45 degree angle fractures, mostly mechanical breaks and healed fractures, contains mica.					Bedrock at 115' BGS. Natural sand pack at 115' BGS due to cave in. Unable to obtain a Genterbrical pr TOC	
100-	118 119 120 121 122 122 123	120.0'-125.0': <u>QUARTZO-FELDSPATHIC GNEI</u> SS: with mica, few open 45 degree angle fractures, mostly fractures healed with quartz or are mechanical breaks.					sample from within th screened interval (105'-115') due to increased grain size in that zone. Core Run 1: 115.0'-120.0' 2.9' recovery. Core loss from top of	D1
95-	124 — 125 — 125 — 126 — 127 —	125.0'-129.6': <u>QUARTZO-FELDSPATHIC GNEI</u> SS: same as above.					core. Core Run 2: 120.0'-125.0' 4.6' recovery. Core Run 3: 125.0'-129.6' 1.7' recovery. Core loss from bottom of hole.	
	logy a	USATHAMA, ARMY CORPS and Environment, Inc.	OF	E	\	SINE	EERS Buffalo, New	York

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'DRI		NG LOG of WELL NO. SHL	-22	)				Page 7	of 7
State	· · · · · · · · · · · · · · · · · · ·	MASSACHUSETTS	catior	<u>ר</u>			FORT	DEVENS	
Elev.	Depth	Description		Lithology	Sample No. and	Symbo 1	Blow Count	Aemarks	Well Const.
90-	128 — 129 —		XXXXX					CONSTRUCTION SUMMARY Well: Hole dia.: 10°, screen/casing dia.:	
90-				~				screen/casing dia.: 4", slot size: 0.010". Stickup measured from ground surface to top of inner casing. 7	
 •		LISATHAMA ARMY COR	25	0=				FBS	
Eco	ology	an <u>d Enviro</u> nment, Inc.	·	<u> </u>	ا <u>ب</u>		ecol	Buffalo, New	York

DRI	LLIN	NG LOG of WELL No. S	HL-5	3				Page 1	of 3	
State		MASSACHUSETTS	Start	Date	!			7/16/91		
Locat	ion	FORT DEVENS	Comple	tion	Date	9		7/17/91	; 	
Drill	ing Fir	m <u> </u>	Ground	Ele	vatio	n		240.37		
Туре	of Dril	DIEDRICH D-50	Ground	Groundwater Depth						
Drill	er	PAUL BARTH	a	t co	mplet	:10	n	25.84 ₹		
Geolo	gist	LISA HELTON	DI Total I	n 12 Dent	p.of	91 Bo	nina	24.11₹		
								Lock #3217		
Elev.	Bepth	Description		L I tho Jogy	Sample No. and	Symbol	Blov Count	Remarks	well Const.	
240.37		Ground Surface						Stickup = 1.77		
240-	1     2     3     4	0.0'-2.0': <u>SILT</u> (MH): medium brown, dry, non-plastic, loose, fine grained; little so light brown, medium brown, clasts.	and.				4 6 8 18	Sp1 Spn Run 1: 0.0'-2.0' 1.0' recovery. OVA: Spoon, hole, and head space (0 ppm). Collected archive sample. Augered from 2.0'-5.0'.		
235-	5 6 7 7 8 - 9 -	5.0'-7.0': <u>SAND</u> (SP): gray-brown, low moist loose. medium grained. trace silt. organics throughout.	ture.				3 5 6 7	Spl Spn Run 2: 5.0'-7.0' 1.7' recovery. OVA: spoon, hole, and head space (0 ppm). Collected archive sample. Augered from 7.0'-10.0'.		
		USATHAMA, ARMY CO	)RPŞ	OF	EI	N	SINE	EERS		
Eco	logy	and Environment, Inc.						Buffalo, New	York	

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State		MASSACHUSETTS Locat	ion_				FOR	T DEVENS
Elev.	Depth	Description	Lithology	Sample	No. and	Symbol	B]0W Count	Remarks Const.
230-		10.0'-12.0': <u>SAND</u> (SP): same as above.					4 7 7	Sp1 Spn Run 3: 10.0'-12.0' 1 7' PERNERY DVA:
	12						14	Spoon, hole, and head Space (D ppm).
	13— - 14—							sample. Augered from
<b>2</b> 25-	15 —	15.0'-17.0': <u>SAND</u> (SP): same as above, except					4	12.0'-15.0'. Spl Spn Run 4:
	15	medium to coarse grained, loose to medium compactness.					7 11	15.0'-17.0' 1.0' recovery. OVA:
	17						15	spoon, hole, and head space (0 ppm).
	- 19							sample. Augered from 17.0'-20.0'.
220-	20	20.0'-22.0': <u>SAN</u> D (SW): same as above, except gravelly, moderate moisture.					9 12	Sp1 Spn Run 5: 20.0'-22.0'
	25						14 20	1.0' recovery. OVA: spoon, hole, and head space [0 opm].
	23-							Collected archive sample.
845	24 — - 25 —							22.0'-25.0'.
2154	25 -	25.0°-27.0°: <u>SAN</u> U (SW): gray-brown, wet, coarse grained, medium compactness, organics, gravelly.					10 17 17	Sp1 Spn Run 5: 25.0'-27.0' 1.2' recovery. OVA:
	27	27.0'-30.0': <u>SAN</u> D (SW): medium brown, wet, medium grained, some silt, non-plastic, gravelly.					20	apoon, hole, and head space (O ppm). Collected archive
	29 -							<pre>sample. Augered from 27.0'-30.0'.</pre>
210-	30 -	30.0'-35.0': <u>SAND</u> (SW): medium brown, wet,						DVA: hole and head Space (0 ppm)
	31 — ' 	NEDIWA YATNEN, SUNE SIIC, NUN-PIOSUL, YAVEIIY.						30.0'-35.0'. DVA: hole and head
	33 —							space (O ppm).
<u>A</u> _		USATHAMA, ARMY CORPS	OF	E	ΞŅ	IG	INE	ERS
FECO	logy a	nd Enviranment. Inc.						DUTEDIU, NEW YUEK

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State	`	MASSACHUSETTS	Location	FOR	<u>DEVENS</u>	
Elev.	Depth	Description	Lithology Sample	ru. aru Symbol Blow Count	Remarks	Well Const.
	34 — 				CONSTRUCTION SUMMARY Well: Hole dia.: 10", screen/casing dia.: 4", slot size: 0.010". Waterial Qty.: Filter Pk.: 600lbs. Bent. Pel.: 17.5 dry	· · · · · · · · · · · · · · · · · · ·
					gallons, Cem.: 517 dry lbs., Cem./Bent.: 5%. Stickup measured from ground surface to top of inner casing.	
Eco	logy ar	USATHAMA, ARMY C( nd Environment, Inc.	ORPS OF E	ENGINE	EERS Buffalo, New	York

										-
DRI		NG LOG of WELL No. S	HL-2	4				Page 1	. af	7
State	•	MASSACHUSETTS	Start	Date				7/19/91		_
Locat	ion	FORT DEVENS	Comple	tion	Date			7/24/91		
Drill	ing Fir	E & E DRILLING	Ground	Ele	vatio	n		237.68		
Туре	of Dri	ACKER 82	Ground	wate	n Dep	th				
Drill	er	DON CAMPBELL	at completion			n	15,30 ₽		_	
		DOREDT & MEVEDS	D	n 12	2/ <u>12/</u> 9	91		13.87 ¥		
Georg	IY ISC		Total	Dept	n of	Boi	ring	<u>    129.5'</u>		-
Elev.	Depth	Description		Lithology	Sample No. and	Symbol	Blov Count	Remarks	We : Cons	 1 51.
237.68	}	Ground Surface						Stickup = 1.92		
235-	1 — 2 — 3 — 4 — 5 —	0.0'-0.6': <u>SILT</u> (MH): dark brown, dry, with sand and trace roots. 0.6'-2.0': <u>SAND</u> (SP): tan, dry, fine to con grained, angular, 95% quartz, 5% mafics.	h fjne 				5 8 2 4	Sp1 Spn Run 1: 0.0'-2.0' 1.8' recovery. OVA: spoon, hole, and head space (0 ppm). Collected archive sample. Augered from 2.0'-5.0'.		
230-	6	5.0'-7.0': <u>SAND</u> (SP): dry, fine to coarse grained, subrounded to angular, with trace 95% quartz, 5% mafics.	si]t.				10 8 9 12	Sp1 Spn Aun 2: 5.0'-7.0' 1.8' recovery. OVA: spoon, hole, and head space (0 ppm). Collected archive sample. Augered from 7.0'-10.0'.		
	<del> </del>	USATHAMA, ARMY CO	PRPS	OF	ΞΕ	N(	GIN	EERS		
Eco	ology	and Environment. Inc.						Buffalo, New	Yor	ĸ
	<u> </u>	ret vit ett paper					ecology	and environment		

State		MASSACHUSETTS Locati	ion			FOR	T DEVENS
Elev.	Depth	Description	Lithology	Sample No. and	Symbo 1	B]0W Count	Remarks Const
225-	11	10.0'-12.0': <u>SAND</u> (SP): dry, fine to coarse grained, subrounded to angular. with trace silt. 90% quartz, 10% mafics.				5 8 8 11	Spl Spn Run 3: 10.0'-12.0' 1.8' recovery. OVA: spoon. hole. and head space (0 ppm). Collected archive sample. Augered from 12.0'-15.0'.
220-	15	15.0'-17.0': <u>SAND</u> (SP): tan, wet at 15', medium grained, some fine, trace coarse sand and gravel, limonitic staining. 20.0'-22.0': <u>SAND</u> (SP): same as above.				477	Spl Spn Run 4: 15.0'-17.0' 1.2' recovery. OVA: Spoon, hole, and head space (0, ppm). Collected archive sample. Augered from 17.0'-20.0'. Spl Spn Run 5:
215-	21	Saturated, no limpoitic Staining, <1% mica.				7 14 11	20.0'-22.0' 1.9' recovery. OVA: spoon (0.5 ppm). hole and head space (0 ppm). Collected archive sample.
210-	-25	25.0'-27.0': <u>SAND</u> (SP): tan, saturated, fine grained, trace coarse, angular to subangular, starting to flow, some silt, <b>95% quartz, 5%</b> mafics.				4 4 13	Augered from 22.0'-25.0'. Spl Spn Run 6: 25.0'-27.0' 1.6' recovery. OVA: spoon, hole, and head space (0 ppm). Collected archive sample. Augered from 27.0'-30.0'.
205-	30 - 3 31 - 6 32 - 3 33 - 1	00.0'-32.0': <u>SAN</u> D (SP): same as above, trace parse grained sand, no medium grained, flowing.				6 ! 11 : 11 : 12 : 12 :	Spl Spn Run 7: 30.0°-32.0° 1.5° recovery. OVA: Spoon, hole, and head Space (0 ppm). Collected archive
Ecol	.ogy ar	USATHAMA, ARMY CORPS nd Environment, Inc.	OF	EN	IG	INE	ERS Buffalo, New York

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Elev.         Destription         Big g g g g g g g g g g g g g g g g g g	State		MASSACHUSETTS Locati	on			FOR	DEVENS	
34- 35- 36- 36- 36- 36- 39- 200- 38- 39- 40- 40.0'-42.0': <u>SILT</u> (#4): ten. saturated, trace 39- 40- 40.0'-42.0': <u>SILT</u> (#4): same as above.       0       sol Son Run B. Sol Son '-37.0' 0       10' recovery.04: Sol Son Control Sol Son Run B. Sol Son '-37.0' 0         200- 38- 39- 40- 40.0'-42.0': <u>SILT</u> (#4): same as above.       0       sol Son Run B. Sol Son '-37.0' 0       10' recovery.04: Sol Son Run B. Sol Son Run S. Sol Son	Elev.	Depth	Description	Lithology	Sample No. and	Symbol	B10V Count	Remarks	Well Const.
10       -15.0'-37.0': SLT 0+1: ten, saturated, trace       0 <td< td=""><td></td><td>34</td><td></td><td></td><td></td><td></td><td></td><td>Augered from 32.0'-35.0'.</td><td></td></td<>		34						Augered from 32.0'-35.0'.	
37       38         38       39         40       -40.0'-42.0': SLLT (MH): same as above.         41       41         42       -40.0'-42.0': SLLT (MH): same as above.         41       -42         42       -40.0'-42.0': SLLT (MH): same as above.         41       -42         42       -43         43       -44         44       -44         44       -44         44       -44         44       -44         44       -44         44       -44         44       -44         44       -44         44       -44         44       -44         44       -44         45.0'-47.0': SauD (SP): tan, soturated, very       0         45.10'-47.0': SauD (SP): tan, soturated, very       0         46       -45.0'-47.0': SauD (SP): tan, soturated, very       0         47       -44       -44         48       -45.0'-2.0'       -46         49       -47       -46         50       -51.0'       -51.0'         51       -52       -53.0'-55.0'         52       -51.0' <td></td> <td>35 —</td> <td>35.0°-37.0°: <u>SIL</u>T (MH): tan. saturated, trace very fine sand, flowing, no inclusions.</td> <td></td> <td></td> <td></td> <td>0 0 0</td> <td>Spl Spn Run B: 35.0'-37.0' 1.8' recovery. OVA:</td> <td></td>		35 —	35.0°-37.0°: <u>SIL</u> T (MH): tan. saturated, trace very fine sand, flowing, no inclusions.				0 0 0	Spl Spn Run B: 35.0'-37.0' 1.8' recovery. OVA:	
39- 40- 40.0'-42.0': <u>SILT</u> (MH): same as above.       0       Sp1 Spn Run 9: 40.0'-42.0'.         41- 42- 43- 44- 44- 44- 44- 44- 44- 44- 44- 44	200-	37 — 					0	spoon, hole, and head space (O ppm). Collected archive	
40-40.0'-42.0': <u>SILT</u> (MH): same as above. 41- 42- 43- 43- 44- 44- 44- 44- 44- 44								sample. Augered from 37.0'-40.0'.	
42       10       Spoon. hole, and head space (0 ppm).         195-       43       44       42.0°-45.0°.         44       44       42.0°-45.0°.       53         45       45.0°-47.0°: SAND (SP): tan. seturated, very tauartz, ix mafic.       0       Spl Spn Run 10: 10         46       fine to fone grained, angular, flowing, 95% tauartz, ix mafic.       0       Spl Spn Run 10: 12.0°-47.0°         190       48       10       Spoon, hole, and head space (0 ppm).         49       50       53.0°-55.0°: No recovery due to flowing sands, samular.       53.0°-55.0°: No recovery due to flowing sands, samular.         180       53.0°-55.0°: No recovery due to flowing sands, saturated.       9       Spl Son Run 11: 13         52       53.0°-55.0°: No recovery due to flowing sands, saturated.       13       53.0°-55.0°         54       saturated.       55       53.0°-55.0°: No recovery due to flowing sands, saturated.       14         55       53.0°-55.0°: No recovery due to flowing sands, saturated.       15       53.0°-55.0°: No recovery due to flowing sands, saturated.         56       56       45.0°-47.0°       45.0°-47.0°       45.0°-47.0°         185       53.0°-55.0°: No recovery due to flowing sands, saturated.       56       50.0°-55.0°         56       45.0°-47.0°       45.0°-47.0°<		40 — 	40.0'-42.0': <u>SILT (MH</u> ): same as above.				0	Spl Spn Run 9: 40.0'-42.0'	
43- 44- 44- 45.0'-47.0': <u>SAND</u> (SP): tan. saturated, very 46. fine to fine grained, angular, flowing, 99% quartz, 1% mafic. 47- 190- 48- 49- 50- 51- 52- 53- 53.0'-55.0': No recovery due to flowing sands. 54- 55- 56- USATHAMA, ARMY CORPS OF ENGINEERS Buffalo, New York	195-	 42					8 10	Spoon, hole, and head space (0 ppm).	
45 45.0'-47.0': <u>SAND</u> (SP): tan, saturated, very 46 fine to fane grained, angular, flowing, 95% auartz, i% mafic. 47 190 48 49 50 50 51 52 53 53.0'-55.0': No recovery due to flowing sands. 54 55 55 55 55 55 55 55 55 55		43 — 44 —						sample. Augered from 42.0°-45.0°.	
190       14       1.2' recovery. 0VA:         190       48       16       spoon, hole, and head space (0 ppm).         49       49       50       Space (0 ppm).         50       50       51       Space (0 ppm).         51       52       53.0'-55.0': No recovery due to flowing sands.       9         54       53.0'-55.0': No recovery due to flowing sands.       9         55       55       55       13         56       55       53.0'-55.0': No recovery due to flowing sands.       13         55       55       53.0'-55.0': No recovery due to flowing sands.       14         56       55       53.0'-55.0': No recovery due to flowing sands.       55         56       55       53.0'-55.0': No recovery due to flowing sands.       13         55       55       55.0': No recovery due to flowing sands.       14         56       55       50.0': No recovery due to flowing sands.       15         56       USATHAMA, ARMY CORPS OF ENGINEERS       9         USATHAMA, ARMY CORPS OF ENGINEERS       8			45.0°-47.0°: <u>SAND</u> (SP): tan, saturated, very fine to fine grained, angular, flowing, 99%				0 10	Spl Spn Run 10: 45.0'-47.0'	
130       48       48       49       40       40       40       40       40       40       47       0'-53.0'.       40       47.0'-53.0'.       47.0'-53.0'.       47.0'-53.0'.       53       <	190-	47	quantz, <b>1% m</b> afic.		•		14 16	1.2' recovery. OVA: spoon, hole, and head space (O ppm).	
50       51         51       52         52       53         53       53.0'-55.0': No recovery due to flowing sands.         54       saturated.         55       55         56       USATHAMA, ARMY CORPS OF ENGINEERS	130	48 — 						sample. Augered from	
51       52         52       53         53       53.0'-55.0': No recovery due to flowing sands.         54       53.0'-55.0'         55       54         55       55         56       21         56       55.0'-53.0'         USATHAMA, ARMY CORPS OF ENGINEERS         Buffalo         New York		50 — 						47.0 - 33.0 .	
185- 53- 54- 55- 56- 56- USATHAMA, ARMY CORPS OF ENGINEERS Buffalo New York		51 — 52 —			· • • •				
55- 56- USATHAMA, ARMY CORPS OF ENGINEERS Buffalo New York	185-	53 — 	53.0'-55.0': No recovery due to flowing sands, saturated.		•		9 13	Spl Spn Run 11: 53.0'-55.0'	
USATHAMA, ARMY CORPS OF ENGINEERS Buffala New York		55 — 56 —					24 21	No recovery due to fine flowing sands. OVA: spoon, hole, and head space (0 ppm).	
USATHAMA, ARMY CORPS OF ENGINEERS								55.0'-63.0'	
			USATHAMA, ARMY CORPS	01	ΞE	N	GIN	EERS Buffald New	Yark

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State		MASSACHUSETTS Locati	on			FOR	T DEVENS	
Elev.	Depth	Description	Lithology	Sample No. and	Symbol	Blow Count	Remarks	Well Const.
<b>19</b> 0- 175- 170-		53.0'-65.0': <u>SAND</u> (SP): tan. saturated, very fine to fine grained. flowing, with some silt, 95% quartz, 4% mafic. 1% mica, limonitic staining.				13 21 19 19	Spl Spn Run 12: 63.0'-65.0' 0.9' recovery. OVA: spoon, hole, and head space (0 ppm). Collected archive sample. Augered from 65.0'-73.0'.	
165-	71 72 73 73 74 75 75 75 75 77 78 79 80	73.0'-75.0': <u>SAND</u> (SP): tan, saturated, very fine to fine grained, flowing, with trace silt, limonitic staining.				14 11 14 21	Spl Spn Run 13: 73.0'-75.0' 1.3' recovery. OVA: spoon, hole, and head space (0 ppm). Collected archive sample. Augered from 75.0'-83.0'.	
USATHAMA, ARMY CORPS OF ENGINEERS Buffalo, New York								

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Elev.         Depth         Description         is         is	TTS Location FORT DEVENS	MASSACHUSETTS Locat	State,
81-       82-         82-       83.0'-95.0': SAND (SP): gray to tan, saturated,         84-       very fine to fine grained, limonitic staining.         85-       86-         86-       86-         87-       86-         86-       87-         90-       91-         91-       92-         92-       93.0'-95.0': SILT (MH): gray to tan, saturated,         94-       vith some very fine to fine grained sand.         95-       93.0'-95.0': SILT (MH): gray to tan, saturated,         95-       95-         96-       97-         97-       97-         97-       97-         97-       97-         97-       97-         97-       97-         97-       97-         97-       97-         97-       97-         97-       97-         97-       97-         97-       97-         97-       97-         97- <t< td=""><td>ion</td><td>Description</td><td>Elev.</td></t<>	ion	Description	Elev.
85-       85-       3000. hole, and head space (0 ppm).         86-       87-       Collected archive sample.         87-       90-       91-         90-       91-       92-         91-       92-       Spl Spn run 15:         92-       93.0'-95.0': SILT (MH): gray to tan, saturated.       16         94-       with some very fine to fine grained sand.       16         95-       95-       95-         96-       97-       96-         97-       97-       No Gentechnical or TOC sample.         No Gentechnical or TOC sample.       No Gentechnical or TOC sample.	to tan, saturated, impositic staining. 13 Spl Spn Run 14: 13 83.0'-85.0' 13 0.9' recovery, OVA:	- B3.0'-85.0': <u>SAND</u> (SP): gray to tan, saturated, very fine to fine grained, limonitic staining.	155-
91- 92- 145- 93.0'-95.0': <u>SILT (MH)</u> : gray to tan, saturated. 94- with some very fine to fine grained sand. 95- 95- 96- 97- 140- 97- 140- 91- 93.0'-95.0': <u>SILT (MH)</u> : gray to tan, saturated. 93.0'-95.0' 16 93.0'-95.0' 19 0.6' recovery. OVA: spoon, hule, and head space (0 ppm). Collected archive sample. No Geotechnical or TO samples taken from	22 Spoon, hole, and head space (0 ppm). Collected archive sample. Augered from 85.0'-93.0'.		150-
95	to tan, saturated. grained sand. 16 Spl Spn run 15: 16 93.0'-95.0' 19 0.6' recovery. OVA:	93.0'-95.0': <u>SILT (MH): gray to tan, saturated.</u> with some very fine to fine grained sand.	145-
98- 99- 99- 100- 101-	24 Spoon, hole, and head space (0 ppm). Collected archive Sample. No Geotechnical or TO samples taken from 95'-114.5' (bedrock) due to split spoon refusal.		140-
USATHAMA, ARMY CORPS OF ENGINEERS	ARMY CORPS OF ENGINEERS	USATHAMA, ARMY CORPS	135-

DRI	LLIM	NG LOG of WELL NO. SHL-2	4				Page f	af T
Ŝtate	·····	MASSACHUSETTS Locati	<u>on</u>			FOR	T DEVENS	
Elev.	Depth	Description	Lithology	Semple No.and	Symbo 1	Blow Count	Remarks	Well Const.
<b>1</b> 30- 125- 	105 106 107 108 109 110 111 112 111 112 113 114 115 116 117 118	114.5'-114.65': <u>GRANITIC COBBLE</u> 114.5'-119.5': <u>PHYLLITE</u> : gray. with mechanical breaks.					<pre>Core Run 1: 114.5'-119.5' 3.6' recovery. OVA: hole (0 ppm). Monitoring well did not actually penetrat into the bedrock.</pre>	
115-	119 120 121 121 122 123 123 124 125 125 125 127 127	119.5'-124.5': <u>PHYLLIT</u> E: same as above, with a single vertical fracture from 123.8'-124.5'; slickensides along vertical fracture. 124.5'-129.5': <u>PHYLLIT</u> E: same as above, no vertical fractures.					Core Run 2: 119.5'-124.5' 4.5' recovery. Core Run 3: 124.5'-129.5' 1.3' recovery. Bottom of core left in the hole.	
Ecc	logy a	USATHAMA, ARMY CORPS and Environment. Inc.	0F	= E	Ni	GINE	EERS Buffalo, New	York

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State		MASSACHUS	ETTS	Locatio	pn		E	OR1	DEVENS
Elev.	Depth	Descrip	otion		Lìthology	Sample No. and	Symbol Blow	Count	Remarks Corst
- 110	128 — - 129 —								CONSTRUCTION SUMMARY Well: Hole dia.: 10", screen/casing dia.: 4",
									slot size: 0.010°. Stickup messured from ground surface to top of inner casing.
•									
Ecc	ology a	USATHAMA, and Environment, Inc	ARMY	CORPS	OF	- E	√G:	IN	EEPS Buffalo, New York

DRI		NG LOG of WELL NO. S	HL-2	5			<u></u> _	Page	1 of 3		
State		MASSACHUSETTS	Start I	Date				7/17/91			
Locat	ion	FORT DEVENS	Complet	tion	Date	ł		7/18/91			
Drill	ing Fir	E & E DRILLING	Ground	Ele	vatio	n		257.10			
Туре с	of Dril	DIEDRICH D-50	Ground	wate	r Dep	tħ					
Drille	er	PAUL BARTH	a	t co	mplet	io	n	24.00 ¥			
Geolog	gist	WALTER KNOTTS	on 12/ <u>12/</u> 91 Total Depth of Bo			91 Boi	ring	<u>22.79</u> ¥ 35.0'			
				2				Lock #3217	<del></del>		
Elev.	Depth	Description		Litholog	Semple No. and	Symbo]	Blov Count	Remarks *	Weli Const.		
257.10 255-	1 - 2 - 3 -	Ground Surface 0.0'-12.0': <u>SAND</u> (SP): light medium brown, medium dense, fine to coarse grained, quant trace feldspar and mica, occasional igneous metamorphic rock fragments.	damp. zose. and				6 7 8	Stickup = 1.77 Spl Spn Run 1: 0.0'-2.0' 1.6' recovery. OVA: spoon and hole (0 ppm). Collected archive sample.			
250 <del>.</del>	4     5     6   1   7   1   8   1   9   1						6 15 14 14	2.0'-5.0'. Spl Spn Run 2: 5.0'-7.0' 1.5' recovery. DVA: spoon and hole (0 ppm). Collected archive sample. Augered from 7.0'-10.0'.			
<b>-</b>		USATHAMA, ARMY CO	RPS	OF	E		GINE	EERS			
Eco	logy a	nd Environment, Inc.						Buffalo, Nev	v York		

State		MASSACHUSETTS Locati	on			FOR	DEVENS	
Elev.	Depth	Description	1thology	Semple No. and	Symbol	Blow Count	Remarks	Well Const.
245-	11	12.0'-29.0': <u>SAND</u> (SP): medium brown, moist, medium dense, very fine to fine, little silt, trace clay, quartzose, subangular to subrounded, trace mica.				5 8 9 10	Spl Spn Run 3: 10.0'-12.0' 1.7' recovery. OVA: spoon and hole (0 ppm). Collected archive sample. Augered from	
240-	14 - 15 - 16 - 17 - 18 - 19 - 20 -					6 10 9 7	12.0'-15.0'. Spl Spn Run 4: 15.0'-17.0' 1.7' recovery. OVA: spoon and hole (0 ppm). Collected archive sample. Augered from 17.0'-20.0'.	
235-	21 — 22 — 23 — 24 —					5 7 9 14	Sp1 Spn Run 5: 20.0'-22.0' 1.6' recovery. OVA: spoon and hole (0 ppm). Collected archive sample. Augered from 22.0'-25.0'.	
230-	25	29.0'-35.0': <u>SAND AND SILTY CLA</u> Y (SP): medium brown, wet. dense, trace rock fragments - possibly				4 7 14	Spl Spn Aun 5: 25.0'-27.0' 1.8' recovery. OVA: spoon and hole (0 ppm). Collected archive sample. Augered from 27.0'-34.5' OVA: hole (0 ppm). CONSTRUCTION SUMMARY	
225-		[]]]					<pre>Well: Hole dia.: 10", screen/casing dia.: 4", slot size: 0.010". Material Gty.: Filten_Pk.: 4031ps.</pre>	
Eco	logy a	USATHAMA, ARMY CORFS and Environment, Inc.	0F	Ē	١G	SINE	Buffalo, New	York

Page 3 of 3

tate		MASSACHUSETTS	Location			FOR	DEVENS	
Elev.	Depth	Description	and and a	Sample No. and	Symbo 1	B]0V Count	Remarks	Well Corst.
	34— 						Bent. Pel.: 10 dry gallons. Cem.: 329 dry lbs., Cem./Bent.: 5%. Stickup measured from ground surface to top of inner casing.	
		HRATHAMA ARMY CO		)F F		TNE	FDS	
Eco	logy a	and Environment, Inc.		·····	· • • •		Buffalo, New	York

s o	IL B	ORI	NGL	0 G				Study Area: Shepley's Hill Landfill						
Clien	it:	AEC			Projec	ct No. 7005-	04		Boring M	lo.: SHM-93-01	A			
Contr	actor:	New Ham	pshire I	Boring	Date S	Started: 01/21/	'93		Complete	ed: 01/21/93		Method:	HSA	
Jun	d Elev.	: 235.	5 ft.		Soil [	Drilled: 26 ft.			Total De	epth: 26 ft.		Casing	Size: 6.25 ID	
Logge	d by:	RRR			Checked by: DSP Groundwater Below Ground:									
Scree	n: 10	(ft)	Riser	: 18	(ft) Diam.: 4.0"' (ID) Material: Sch 40PVC Protection: Mod.								of 1	
DEPTH (FT)	SAMPLE NUMBER	SAMPLE DEPTH	PEN. REC.	PID (ppm)	SOIL-ROCK DESCRIPTION								COMMENTS	
Ļ z	S-1	0'-2'	1.5 2.0	BKG	0'-1.4' gravel 1.4'-1. medium	'SAND, poorly g subrounded, tan 5'SAND, poorly dense, tannish	· 6-'	13-13-14	Start 0940					
	s-2	51-71	1.7 2.0	BKG	SAND, p loose,	boorly graded, f light brown	ine, '	15% medium, :	subangular	r, dry, very (SP	3-	-4-5-5		
- 10	s-3	10-12	1.8 2.0	BKG	SAND, S	similar to above				(SP	) 3-	- <b>4-4-6</b>	,	
- 14 - 16 - 18	S-4	15-17	1.6  2.0	BKG	0'-1.5 1.5'-1. and gra	SAND, similar t 6' and in shoe, avel, subangular	o abov SAND, to ar	ve, banding well grade ngular, damp	d, medium , loose, l	(SP to coarse sand ight brown (SW	) 3-	5-9-12	Change	
- 20  - 22	s-5	20-22	1.6 2.0	∙BKG	0'-0.6' wet, da 0.6'-1. loose,	SAND, poorly g ark brown 6' gravely SAND subrounded, wet	raded, , poor , redk	fine to mee ly graded, lish brown	dium, roun coarse, 10	nded, very loos (SP % medium, very (SP	e, 2 ) 2	2-4-4-6 2-4-4-6	Water at 20' bgs TOC Analyti- cal collected	
- 24 - 26 28	S-6	25 - 25.5	0.6 2.0	BKG	Sandy S in silt BOE = 2	SILT, rock in sh	oe, co urs, 1	bbles of lo	w grade me	tamorphosed ro (SP-SM	ck 5-5	i0 for 4"	24' change Rock in shoe Refusal on rock	
					BOE = 2	26' bgs, 1245 ho	urs, 1	/21/93					Refusal rock	

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S O	I L B	ORI	NGL	OG						Study Ar	ea: Shepley's H	ill Landfil	ι		
Clien	t:	AEC			Proj	ect No.	70(	05-04		Boring N	lo.: SHM-93-10C				
Contr	actor:	New Ham	pshire	Boring	Date	Starte	d: 02,	/09/93		Complete	ed: 2/12/93	Method	: HSA/Case/Core		
en-sún	d Elev.	: 247.	5 ft.		Soil Drilled: 36.5 ft. To						pth: 59.5 ft.	Casing	Size: 6"		
Logge	d by:	RRR			Checked by: DSP Groundwater Below Ground:								29.5 ft.		
Scree	n: 10	(ft)	Riser	: 45	(ft)	) Diam	.: 4.0"	(ID)	Material:	Sch 40PVC	Protection: Mod	.D Page	1 of 2		
DEPTH (FT)	SAMPLE NUMBER	SAMPLE DEPTH	PEN. REC.	PID (ppm)				SOIL-	ROCK DESCR	IPTION		BLOWS\6-IN	. COMMENTS		
- 2	S-1	0-2	1.5 2.0	BKG	SAND, medium	poorly m dense,	graded, , 7.5 yr	, medium, ~6/3 lig	5% fine, ht brown,	5% coarse, aeolian,/gl	rounded, dry, acial outwash (SP)	16-10-12-12	2		
- 4 - 6 - 8	s-2	5-7	1.6 2.0	BKG	SAND,	poorly	graded,	, similar	to above i	out loose,	dry (SP)	6-5-5-6			
- 10 - 12	s-3	10-12	1.4  2.0	BKG	SAND,	similar	to abo	ove			(SP)	4-6-6-4			
- 14 - 16 - 18	S-4	15-17	1.6 2.0	BKG	SAND,	similar	to abo	ive but v	ery loose,	dry	(SP)	<b>4-4-</b> 4-5			
— 20 — 22	s-5	20-22	1.7	BKG	SAND,	similar	to abo	ve			(SP)	4-4-6-6			
24 26 28	S-6	25-27	1.9 2.0	BKG	SAND,	similar	to abo	ve, medi	um dense, 1	10 yr 6/3 pa	ale brown (SP)	7-10-14-19			
													Water at 29' bgs		

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s o	IL B	ORI	NGL	ea: Shepley's H	Iill Landfi	LL I								
Clier	nt:	AEC			Proje	ct No. 7005	-04		Boring M	Io.: SHM-93-10C	<u> </u>			
Contr	ractor:	New Ham	pshire	Boring	Date	Started: 02/09	/93		Complete	ed: 02/12/93	Metho	d: HSA/Case/Core		
Grour	nd Elev.	: 247.	5 ft.		Soil Drilled: 36.5 ft. Total Depth: 59.5 ft.							Casing Size: 6"		
Logge	ed by:	RRR			Check	ed by: DSP	1: 29.5 ft							
Scree	en: 10	(ft)	Riser	: 45	(ft)	Diam.: 4.0"'	.D Page	2 of 2						
DEPTH (FT)	SAMPLE	SAMPLE DEPTH	PEN.	PID (ppm)			BLOWS\6-IN. COMMENTS							
→ 30 → 32 → 34	s-7	30-32	1.8  2.0	BKG	Sand to dense, subangu	o silty sand, p wet, 10% silt, Mar gravel at f	oorly g 7.5 yr 1.4'	graded, fine, 5/6 strong	subround brown, co	ed, medium arse piece of (SP-SM)	16-13-13-1	12		
- 36 - 38	S-8	35 - 36.5	1.5 2.0	BKG	Similar Bedrock 36.5' w	to above, weat ill core rest o	thered	rock frags n ; see attach	ear botto	m of spoon (SP-SM) ogs.	WOR/1/50-4	n		
- 42 - 44														
- 46														
- 48														
- 50														
- 52														
- 54														
- 56 - 58														

9202159								ROC	K CC	RIN	GLÒ	G			
Ď Ì	Projec	Fort E	Devens	5								Study Area:		Project No.	
	Client:	USA	THAM	A .			Drille G	er's Nai (ta	me: v, <del></del>			Logged by: RZR	Checked by:	Ground Elev.:	
	Drilling	Contracti NHI3	or:				Prote	ection L	evel:	n T	) )	Rig Type:	Start Date:	Finish Date: 2 · / 2 · 9 J	
	Drilling	Method:	~~~·	HG		0.0			- 575	.,		₽. <del>1.D.</del> (eV):	Casing Size:	Auger Size:	
	Bit typ	e/size:	. 21	0.5.:	Bit	لغ نوع Use: م لہ		<u> </u>		Core Int	erval (ti Ce . 5	o/from)(ft):	rom)(tt): ->		
	ort.	0		Natural ( Break			Ro	ock Qua	dity				<b></b>		
	Depth (feet) Below GRD S	Sample No. & Penetration/ Recovery (fee	Graphic Log	Type/Dip	Surface Condition	Weathered Condition	Total 4" Core	RQD (%)	Rock Quality Description	Drilling Rate min/ft	Color	Roc Col	ock Description and omments on Drilling		
, @ , , . ○	-37.5_ 37.5_ 38.5_ 38.5_ 39.5_ 40.5_	Same Pene		x x	Elson (F) (F) whaterchen (w) F F K K K		4.1.	82%	6005		0	.X & MECHANICAL / = NATURAL ( LOW TO MED META - FELITIE SI QUART & FOUTE TO BE DIPPINE IS BLACK / GREY TO A DARK GRE W/ SECONDART ALONG FRACTURES	SOLUTION STRES INA GRANCES. SEC INTSTONES. SEC URLS. DEDD 5 45-55°. T UMEN OFT Y. PRIMARIC QUARTE AN S.	S ERSIGNAL) SONDARY WALCD ING APPEARS OCK DRILS T SILICICLOSTI D SULFIDES	
	41 - 41.5 - - - -			× × ×	ξ. 3 [.					7					
					- <u></u>								nmental Ser	vices, Inc.—	

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					с. 		ROC	K C	ORIN	g lo	G		
Project	t: Fort I	Devens	5				_				Study Area:		Project No.
Client:	USA	THAM	A .		· <u></u>	Drill	er's Na	me:			Logged by:	Checked by:	Ground Elev.:
Drilling	Contract	or:				Prote	ection l	.evel:			Rig Type: 8 53	Start Date:	Finish Date:
Drilling	Method:	<u></u>				•.					P.I.D. (eV):	Casing Size:	Auger Size:
Bit type പ്ര	ə/size:			Bit	Use: HQ				Core Int	erval (t	o/from)(ft): - 46-5	Run #	2
ť			Natura Bre	al Cove aaks		Ro	ck Qua	dity					
Depth (feet) Below GRD So	Sample No. & Penetration/ Recovery (feet	Graphic Log	Type/Dip	Surface Condition	Weathered Condition	Total 4" Core	RQD (%)	Rock Quality Description	Drilling Rate min/ft	Colar	Roc Cor	ck Description an mments on Drillin	lg Ig
42 - -	202 # 2	/ / / / / / / / / / / / / / / / / / /	× / \$	۴ س					5		META-PLLITIC LOW TO MEDIU SILICICLASTIC QUARTE AND	SILTSTONES. M GRADE W/ SECON SULFIDES A	DARY LONG COULTI(1
/3 _ _	5.0	I.	Sal + The J	3		5.0	100%.	Erc .	5		FRACTURES A	RING BE	70 .
'4'			X Solwrad	۶ ۶					د 		GETTING GOOD CIRCULATION EXTENSIVE	ECTURN C WATER DEN SOLUTION CAN	SPITE SPITE SITIES
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lient:	USA	ГНАМА	 \			Drille	er's Nar	ne:			Logged by:	Checked by:	Ground Elev
niling	Contracto	or:				Prote	ction L	evel:			Rig Type:	Start Date:	Finish Date
rilling	Method:	<u></u>									<del>P.I.D.</del> (eV):	Casing Size:	Auger Size
lit typ	e/size:			Bit	Use:	<u>.</u>	<u></u>	6	Core Int	erval (to	o/from)(ft):	2 # 3	
/	44		Natura	l Cove		Ro	ck Qua	l	70	4.5			
Depin (reet) Below GRD Sort	Sample No. & Penetration/ Recovery (feet)	Graphic Log	Type/Dip	Surface Condition	Weathered Condition	Total 4" Core	RaD (%)	Rock Quality Description	Drilling Rate min/ft	Color	Ro Co	ck Description ar mments on Drillir	nd ng
/7	Run #3 46.5 4 51.5		× 1 0.5	(J) (3)					6	MOTTLEC LIGHT TO DARK GREY	META PELITIC LOW TO MCD, GROWING MC SUCFIDES AN	SILTSTONE UM GRADE. DRE COMPETEN D SLEONDAR	рт с / ЦРТ ,
- 48	5.0		HEALLS FRAC SOLVTON			5.0	5.0 5.0 2,000	Exc	7		SOLUTION CAU	AT 7415 B	rearies in Sincian inT
- 44  50		× (	(F)					8					
50 - × - × 51 - 57.5-				h <b>y</b> ) (eng)					8		HEALED FRAC PLANES SEC	FURES ALD D CONDERT GUN	G BEDDIN ARTE
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Client	: USA	THAM	A			Drille -	er's Na	me:			Logged by:	Checked by:	Ground Elev.:
Drilling	g Contrac	tor:		- <u></u>		Prote	ection I	.evel:			Rig Type:	Start Date:	Finish Date:
Qnilling	g Method:		<del></del>			···					P.I.D. (eV):	Casing Size:	Auger Size:
Bit typ	e/size:			Bit	Use:				Core Int	erval (to	)/from)(ft):		L
 			Natura Bre	al Cove baks		Ro	ick Qua	l ality					
Depth (feet) Below GRD Sor	Sample No. & Penetration/ Recovery (feet)	Graphic Log	Type/Dip	Surface Condition	Weathered Condition	Total 4" Core	RQD (%)	Rock Quality Description	Drilling Rate min/ft	Color	Roc Cor	ck Description ar mments on Drillir	lg Id
 57 _	Run # 4		\$50						7		SANC AS	PREVIOUS	Corc
<sup>נז</sup>	5.0		X			5.•	100%	EKc.	5				
-4									7				
<sup>75</sup> _			×					-	7				
4 - 4.5 -	•		×						9				
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920215								ROC	k co	DRING	i LDC	G		
/ Q6	Proje	ct: Fort [	Devens									Study Area:		Project No.
	0"			, 			1					SUM.93.	10C	07005-04
	Client	USA	THAM	A	- 		Drille	er's Nar	me:		·-	Logged by: - <i> <i> <i> </i></i></i>	Checked by:	Ground Elev.:
	Drillin	g Contract	or:				Prote	ection L	.evel:			Rig Type:	Start Date:	Finish Date:
	0.111						·					53	2.9.93	2.12.93
	Unlin	g Method:					•.					- <del>P.I.D. (eV):</del>	Casing Size:	Auger Size:
	Bit tyr	0/5170	····	· · · · ·	Dit	Line:				Caro Int	an col /to	FID/OVA	6	
	Dir ty	,	_	·····	Dit	058.		ور المحمد بعد الم			91Val (10 56 - 5	· 57.5	3 Fr	-
	ort.			Natura Bre	al Cove eaks		Ro	ck Qua	lity					
	Depth (feet) Below GRD Se	Sample No. & Penetration/ Recovery (feet	Graphic Log	Type/Dip	Surface Condition	Weathered Condition	Total 4" Core	ROD (%)	Rock Quality Description	Drilling Rate min/ft	Color	Ron Con	ck Description an mments on Drillir	nd ng
		RUN #		*	F							MSTA PELIFIC	SILTSTONE	
	_	\$5	1	ļ					ł			FOLIATION BE	comine NEAR	L¥ '
ł	54 -	(RD)	V/							7		VERTICAL IN A	MIDDLE OF T	uc sample
1			1	{								Rock 15 M	OFFLED WH	TZ -GREY
		1	Í								Į	SILICICLASTIC	1 origin	
	~~	3.0	i/				٦ <sup>*</sup>	100%	Exc			Stembary	QUARTZ'	4-5
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	-	1	<i>  i</i>	FRAC.										
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so	IL B	ORI	IG L	OG				Study A	rea: Shepley	s Hill	Landfill		
Clien	t: /	AEC			Projec	t No. 7005	-04		Boring I	No.: SHM-93-1	8B		
Contr	actor: I	New Ham	oshire I	Boring	Date S	Started: 02/04,	/93		Complete	ed: 02/08/93	5	Method:	HSA
Jun	d Elev.	: 235.7	7 ft.		Soil D	orilled: 93.5	ft.		Total D	epth: 93.5 ft	•	Casing	Size: 6.25" ID
Logge	d by: I	RRR			Checke	ed by: DSP			Groundwa	ater Below Gro	ound:	14 ft.	
Scree	n: 10	(ft)	Riser	: 80	(ft)	Diam.: 4.0"	(ID)	Material:	Sch 40PVC	Protection:	Mod.D	Page 1	of 4
DEPTH (FT)	SAMPLE NUMBER	SAMPLE DEPTH	PEN. REC.	PID (ppm)			SOIL-	ROCK DESCRI	PTION		BL	OWS\6-IN.	COMMENTS
- 2	S-1	0'-2'	1.3 2.0	BKG	SAND, p loose, gray, g	poorly graded, m sample is dry b glacial outwash,	nedium out ent , aeola	to coarse, irely froze m	e, subangular, 7/2 pinkish (S	3 (P)	1-21-4-3		
4   6   − 8	S-2	51-71	1.2 2.0	BKG	SAND, p medium	poorly graded, f dense, dry, 7.5	fine to i yr 7/	o medium, 1- 2 pinkish g	-2% silt, s gray, glaci	subrounded, ial outwash (S	iP)	- 16-27-23	
- 10	S-3	10-12	1.3 2.0	BKG	SAND, s At 1.0 yellowi	similar to above SAND is banded ish red, moist,	e d with resemb	silty sand, Jes liesgar	, fine, loo ng banding	(S Sse, 2.5 yr 4/ (SP-S	(P) (6 6	-6-6-13	
- 14  - 16  - 18	S-4	15-17	1.5 2.0	BKG	0'-0.5' silt, n 0.5'-1. medium	SAND, well gra medium dense, we 5' SAND, poorly dense, wet, 10	aded, m et, 10 / grade yr 6/3	nedium to co yr 4/4 dank ed, medium, 5 pale brown	oarse, 15-2 k yellowisł 5% coarse,	20% fine, 10% brown (SW-S , 5% fine, (S	6 M) P)	-8-6-13	Change at 15.5 ft.
- 20	S-5	20-22	1.8 2.0	BKG	SAND, p wet, 10	boorly graded, m ) yr 6/3 pale bm	nedium, °own	5% coarse,	, 5% fine,	medium dense, (S	6- (P)	10-12-13	
- 26 - 28	S-6	25-27	1.7 2.0	BKG	SAND, F	poorly graded, s	similar	to above		(5	WD (P) 18	R to "/9	

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S O	ILE	ORI	NGL	OG		Study Area: Shepley's H	ill Landfil	l
Clier	nt:	AEC			Project No. 7005-04	Boring No.: SHM-93-18B		
Conti	ractor:	New Ham	pshire	Boring	Date Started: 02/04/93	Completed: 02/08/93	Method	HSA
Grour	nd Elev.	: 235.	7		Soil Drilled: 93.5 ft.	Total Depth: 93.5	Casing	Size: 6.25" ID
Logge	ed by:	RRR/LEF			Checked by: DSP	Groundwater Below Ground	: 14'	
Scree	en: 10	(ft)	Riser	: 80	(ft) Diam.: 4.0"' (ID) Material:	Sch 40PVC Protection: Mod	.D Page 2	2 of 4
DEPTH (FT)	I SAMPLE NUMBER	SAMPLE DEPTH	PEN.	PID (ppm)	SOIL-ROCK DESCRI	PTION	BLOWS\6-IN.	COMMENTS
32	S-7	30-32	2.0	BKG	SAND, poorly graded, similar to above	(SP)	WOH 1/2/5	SP
- 34 - 36	S-8	35-37	2.0	BKG	SAND, poorly graded, similar to above e brown	xcept 5 yr 6/4 reddish (SP)	3-8-12-22	SP
38 40 42	5-9	40-42	0.0	BKG	Residual sand in spoon was similar to a	bove (SP)	6-6-11-16	Sampled and drilled with 4 1/4" augers to 40'. Hole blew in to
- 44 - 46 - 48	S-10	45-47	0.7	BKG	SAND, poorly graded, similar to above	(SP)	7/12/50-4	35' bgs. Try to add head of water. Adding water was ineffec- tive. Will telescope 3" casing inside of augers and procede from
- 50 - 52	S-11	50-52	0.0	BKG	Soils are running out of spoon when we a	are retrieving it	8/12/24/30	to make ano- ther attempt with augers using twine to keep con- nections watertight.
- 54 - 56	s-12	55-57	0.7	BKG	SAND, similar to above		9/15/22/24	1' of sand heaved up inside ofd augers. Sand is flowing out of spoon when it is retrieved.
- 58 - 60	s-13	58-60	0.0	BKG	No recovery, sands are running out of sp	ioon	6/6/9/13	Sample mostly represents soils which have heaved into augers.

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s o	IL B	ORII	NG L	OG		Study Area: Shepley's H	ill Landfill	
Clien	t: .	AEC			Project No. 7005-04	Boring No.: SHM-93-18B		
Contr	actor:	New Ham	pshire	Boring	Date Started: 02/04/93	Completed: 02/08/93	Method:	HSA
	d Elev.	: 235.	7 ft.		Soil Drilled: 93.5 ft.	Total Depth: 93.5	Casing S	Size: 6.25" ID
Logge	d by:	RRR/LEF			Checked by: DSP	Groundwater Below Ground	: 14 ft.	
Scree	n: 10	(ft)	Riser	: 80	(ft) Diam.: 4.0"' (ID) Material:	Sch 40PVC Protection: Mod	.D Page 3	of 4
DEPTH (FT)	SAMPLE NUMBER	SAMPLE DEPTH	PEN. REC.	PID (ppm)	SOIL-ROCK DESCR	IPTION	BLOWS\6-IN.	COMMENTS
- 62								<u>2/4/93</u> 2/5/93
- 64 - 66					No spoon attempted			
- 68 - 70 - 72	S-14	69-71	0.9 2.0	BKG	SAND, poorly graded, fine, 15% medium, wet, 10 yr 5/3 brown, glacial outwash	4/10/19/24		
- 74  - 76	s-15	74-76		BKG	SAND, similar to above but medium dense	e to dense (SP)	6/18/31/49	<u>2/5/93</u> 2/8/93
L 78	S-16	78-80	0.8 2.0	BKG	SAND, similar to above. At 0.1' and 0 bands of SAND, medium to coarse, well silt, subrounded to rounded, medium de	10/15/29/29		
- 86	S-17	83-85	1.8 2.0	BKG	SAND, poorly graded, fine to medium, so yr 5/4, brown, glacial outwash	3/2/7/15		
- 88	S-18	88-90	1.4 2.0	BKG	SAND, similar to above, medium dense	(SP)	23/18/24/29	

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s o	IL B	ORI	NGL	. 0 G					Study Ar	ea: Shepley's	Hill Landfill	
Clien	it:	AEC		· · · · · · · · · · · · · · · · · · ·	Projec	ct No. 7005	5-04		Boring M	lo.: SHM-93-18	В	
Contr	actor:	New Ham	pshire	Boring	Date S	Started: 02/04	/93		Complete	ed: 02/08/93	Method:	HSA
Groun	d Elev.	: 235.	7 ft.		Soil I	Drilled: 93.5			Total De	epth: 93.5 ft.	Casing	Size: 6.25" II
Logge	d by:	RRR/	LEF		Checke	ed by: DSP			Groundwa	iter Below Groun	nd: 14 ft.	
Scree	n: 10	(ft)	Riser	·: 80	(ft)	Diam.: 4.0""	(ID)	Material:	Sch 40PVC	Protection: Mo	od.D Page 4	of 4
DEPTH (FT)	SAMPLE NUMBER	SAMPLE DEPTH	PEN. REC.	PID (ppm)			SOIL	ROCK DESCRI	PTION		BLOWS\6-IN.	COMMENTS
- 92											•	
- 94					Refusal tose ro	at 93.5'-Cutt ock	ings in	ndicate bedr	ock-metamo	rphosed schis-		
- <b>9</b> 6												
- 98												
- <b>10</b> 0												
102												
104												
106												
108												
110												
112												
114												
116												
120												
120	1	1										

Client:AECProject No.7005-04Boring No.:SHM-93-22CContractor:New Hampshire BoringDate Started:02/11/93Completed:02/25/93Method:DrOund Elev.:217.9Soil Drilled:115 ft.Total Depth:135 ft.Casing SizeLogged by:LETChecked by:RRRGroundwater Below Ground:5.9 ft.	rive/Wash e: 6" of 1
Contractor: New Hampshire BoringDate Started: 02/11/93Completed: 02/25/93Method: DrCond Elev.: 217.9Soil Drilled: 115 ft.Total Depth: 135 ft.Casing SizeLogged by:LETChecked by:RRRGroundwater Below Ground: 5.9 ft.	rive/Wash e: 6" of 1
Logged by:     LET     Checked by:     RRR     Groundwater Below Ground:     5.9 ft.	e: 6" of 1
Logged by: LET Checked by: RRR Groundwater Below Ground: 5.9 ft.	of 1
	of 1
Screen: 10 (ft) Riser: 127 (ft) Diam.: 4.0"' (ID) Material: Sch 40PVC Protection: Mod.D Page 1	
DEPTH     SAMPLE     SAMPLE     PEN.     PID       (FT)     NUMBER     DEPTH	COMMENTS
No split-spoons collected (see soil boring log for SHL-22 installed by Ecology and Environment)	
- 115	
Bedrock at 115' bgs, see core logs for rock descriptions	

92021:			م میں اور					ROC	K CC	RIN	g LOC			
59D /	Projec	t: Fort [	Devens	;								Study Area: ゴイム		Project No. 7005-04
	Client:	USA	THAM	Ą			Drille	er's Nar A. Two	me: mbly	/		Logged by: J. Snonden	Checked by:	Ground Elev.:
	Drilling New	Contract	or: DShiv	e Bo	ring		Prote	ection L	.evel: ´ \ D		•	Rig Type: Moble B	Start Date: 2/19/93	Finish Date: 2125193
	Drilling G.C	ງ Method: ວ້ ເລສາ	nga	nd HX	voct	r cov	·. E					P.I.D. (eV):	Casing Size:	Auger Size:
	Bit typ	e/size: 4	/火	-	Bit	Use:		-		Core Int	erval (to	/from)(ft): 115.0	o' to 120.	5' R-1
	, tr	-		Natura Bre	l Cove aks		Ro	ck Qua	dity					
	Depth (feet) Below GRD S	Sample No. & Penetration/ Recovery (feet	Graphic Log	Type/Dip	Surface Condition	Weathered Condition	Total 4" Core	ROD (%)	Rock Quality Description	Drilling Rate min/ft	Color	Ro Co	ck Description ar mments on Drillir	nd ng
	ıı́	88 5.0 5.0 5.0	UD ERC-1	x / x / x / x / 1/	N3 F3 F7 F7 2000 1000 1000 1000 1000 1000 1000 100	Co Co	Ϋ́ΥΫ́ΥΫ́ΥΫ́ΥΫ́ΥΫ́ΥΫ́ΥΫ́ΥΫ́ΥΫ́	DH 147 1.9 2.0 0.6 13150	Ϋ́ο Ϋ́ο	EĒ 7min 5min 5min 4min	S Erry e	x - mechanical 1 - natural W - weathered Meta pelt appearent qui intractions in fractures - mayority of dipping 3.	nc sittston ar Tz/quar healed au The head fracture 2 50°	he w/ tite id open ling and is are

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Projec	et: Fort I	Deven	5								Study Area:		Project No. 7005-04
Client	USA	ТНАМ	A		-	Drille	r's Na	me: ourlo	ly	<del></del>	Logged by:	Checked by:	Ground Elev.:
Drilling N	contract	ior: npshi	re B	oring	L	Prote	ection L بعر	evel:	>		Rig Type: Moble B-57	Start Date: 2/19/93	Finish Date: 22593
Drilling	g Method: 4	<i>b.0</i> ″	ID C	ising	and		nck	e cor	e		P.I.D. (eV):	Casing Size:	Auger Size:
it typ	e/size:			Bi	Use:			1	Core In	terval (t	o/from)(ft):	to 125.0'	R-2
نىت			Natura	al Cove aks		Ro	ck Qua	lity					
Below GRD Sor	Sample No. & Penetration/ Recovery (feet) Graphic Log Type/Dip Surface			Surface Condition	Weathered Condition	Total 4" Core	RaD (%)	Rock Quality Description	Drilling Rate min/tt	Color	Ro Co	ck Description an mments on Drillin	d 9
20							·		Sain	· · ·	X-mechanic	al break	· ·
21 -									4	Gravish	1-natural +	vacture	
-2-	6 D		Horted						2	wet	Similar -	to K-1	
23 -	5.0	) Y	Froc.	F		4.8				Light Grey			
24 -	-	J.	x	F					Him	2.7			
25-		$\searrow$	Ź	r W					5min				· .
-		End of R=2											
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9202159			an a					ROC	K CC	RIN	LOC			
, Q6	Projec	t: Fort I	Devens	<b>;</b> .								Study Area: ろHム		Project No. 7005-04
	Client:	USA	THAM	Ą			Drille &	er's Nar	ne: mblu	,		Logged by: J. Snowders	Checked by:	Ground Elev.:
	Drilling	Contract	or: shive	Born	~ ^a		Prote	action L	evel:			Rig Type: Moble D-57	Start Date: 2/19/93	Finish Date:
	Drilling	Method:	asing	and	-J	rock	L' COL	· · · · ·	<u> </u>			P.I.D. (eV):	Casing Size:	Auger Size:
	Bit typ	e/size:		<u> </u>	Bit	Use:				Core Int	erval (to	/from)(ft): /25-0	' to 130.0	′ R-3
	ť	_		Natural Brea	l Cove aks		Ro	ck Qua	lity					
	Depth (feet) Below GRD So	Sample No. & Penetration/ Recovery (feet)	Graphic Log	Type/Dip	Surface Condition	Weathered Condition	Total 4" Core	RaD (%)	Rock Quality Description	Drilling Rate min/tt	Color	Roc Cor	ck Description an nments on Drillin	d g
	126		X	X.	F					3min		X-mechanic	in lavent	
	126 -			Seam						4 min		Similar to	R-1	
	127 -	5.0		×	F		5.0	100%	Evel-	4 min				
	128 -	5.0		× * 12	F F				ent	Smin				
	129 -		A.	Seam										
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9202159D	Projec	at:						ROC	ck co	DRIN	g lo	G. Study Area: Project No.
7	01:	Fort	Deven	S			15.00					3HL 7005-04
	Client	USA	THAM	IA			Drill	er's Na 3. Tw	me: ows/	v		Logged by: Checked by: Ground Elev.: 2. 3Nowder
	Drillin Nei	y Contrac U Hams	tor: Shire	- Bor	-iva		Prot	ection I	Level: /	>		Rig Type: Start Date: Finish Date: Moble B-57 2/19/93 223
	Drilling	g Method:	.0" C	asivo	r an	a Hx	rock	core				P.I.D. (eV): Casing Size: Auger Size:
	Bit typ	e/size: Å	lγ		Bit	Use:	_		ľ	Core In	iterval (1	to/from)(ft): R-4 130-135
ſ	ť			Natur	al Cove eaks		Ro	ock Qua	ality			
	Depth (feet) Below GRD So	Sample No. & Penetration/ Recovery (feet)	Graphic Log	Type/Dip	Surface Condition	Weathered Condition	Total 4" Core	ROD (%)	Rock Quality Description	Drilling Rate min/ft	Color	Rock Description and Comments on Drilling
Ī	130			×	1					4	1	x-mechanical break
I	31 -			×						5		Similar to R-1
	32 -	4.1		×			49	100k	Excel	4	Great	
a,	33 -	5.		~					Circle	4	4500	Pf
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50	IL B	ORI	NGL	OG	Study Area: Shepley's H	ill Landfill
Clien	t:	AEC			Project No. 7005-04 Boring No.: SHB-93-01X	
Contr	actor:	New Ham	pshire	Boring	Date Started: 01/25/93 Completed: 01/25/93	Method: HSA
Ju	d Elev.	: 235.	5 ft.		Soil Drilled: 25 ft. Total Depth: 25 ft.	Casing Size: 4.25" I
Logge	d by:	LET			Checked by: RRR Groundwater Below Ground:	19 ft.
Scree	n: N/A	(ft)	Riser	: N/A	(ft) Diam.: N/A (ID) Material: N/A Protection: Mod.	D Page 1 of 1
DEPTH (FT)	SAMPLE NUMBER	SAMPLE DEPTH	PEN.	PID (ppm)	SOIL-ROCK DESCRIPTION	BLOWS\6-IN. COMMENTS
-	0-5	(1)			SAND, medium , dry, fill, 10 yr 5/4 yellowish brown, 15% sand	
- 10	5-10	(2)			SAND, fine-medium, dry, yellowish brown	
-	10-15	(3)		BKG	SAND, fine-medium, dry, yellowish brown	
- 20	15-20	(4)			Same	Loosened up at 19' (Water??)
-	20-25	(5)			Same	Started to
	25-26	(6)			Same Material	24' bgs
- 30 -					BOB 25' bgs	
- 40						
-						
50						
- 60						
-						
- 70						
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	Engin	eering	Techn	ologies .	Associates, Inc.		
	Engineer	s · Planne	ers • Surve	yors			
	165 S. Uni Lakewood.	on Blvd, Su , CO 80228	iite 710	Ellicon Ci	bit Center Drive, Suite 101 iy, MD 21043		Drilling Log
	Project	_Fer	t Dere	<u>5 9</u>	2307 4 Owner U	SAEC	Sketch Map
	Locatio	n <u>_Site</u>	PLZYS	HILL	W.O. Number		
•	Well Nu	imper <u>S</u>	<u>HP-43</u>	-ICD To	tal Depth 56.2	Diameter <u>1.61" - Bedicu</u>	
	Surface	Elevatio	on	Wa	iter Level: Initial	24-hrs	
	Screen	Dia		Ler	ngth	Slot Size	
	Casing:	Dia	410	Le	ngth29.5 <sup>1</sup>	Type Steel	
	Drilling	Compa	ny Ma	her	Drilling Metho	HSA/ NX Core	Notes
	Driller _	JEFF	200	nA_Lo	By Bob Kratz	Date Drilled _11/2/43	
	(198	Log	D) BCG				
	1	phic	adsp D / F	eldm nbei		Description/Soil Classi (Color, Texture, Struc	ification ctures)
	Dep	Gra	Hei PII	Nu Nu			
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		· · /			0-1.5'	SAND to	ACC OPULANICS
			4.000			SITGHTLY CLAS	FY HEDRING GRANED
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		1.				Corr Benni	Lass Num
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		•••					
	<b>├</b> ──┨				15'-5'	Saux U.s	
	<b>┝</b> ──┥	1.		11			A GRAINED SUGALL
	$\vdash$			airth		GRAVELY MODE	RATELY SORTED, BROWN
	-16-		14ppm	R A		MOISI	*****
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	$\vdash$			444		FINE GRAINER	WELL SORTED, LOUSE
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Projec	: Fee	i Der	ENS 9	23cn.4 Owner USAEC Sketch Map
Locati	on_Stti	=) = 1/5	Hill	W.O. Number
Well N	lumber	51+7 - 73	-ICD TOI	tal Depth 56.2 Diameter List BeoRsix
Surfac	e Elevatio	onn	Wa	iter Level: Initial 24-hrs
Screer	n: Dia		Ler	ngth Slot Size
Casing	;: Dia	4"	Ler	ngth 39.5' Type StEEL
Drilling		пу	τćβ	Drilling Method HSX / UX Cale Notes
Driller	Devit	- Const	WHI LO	By 2. KLATZ Date Drilled 11/8/13
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å	Ğ	₽H H_	ΰź	
ļ				35 WEATHEBED BEDROCK FRAGMENTS
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20			441419	
			$\mathbf{N}$	
			$\square$	36.1 - 56.2' Phylite
	·			FOLIATED AT ~70" NUMEROUS
· .				FRACTURES IN FIRST TWO FEET
-35-	00	Otbu		FRACTURES ARE NEARLY PERFENDIKUL
	c.0			TO FOLIATIONS, ABUNDANT IPCN STAIL
	112			ALONG FRACTURES HINGE SILICA
	1/19			BANDING ~ 1/16" WIDTH 49.0-49.5
	¥_A			SHALL FRACTURE ZONE W/ SADDY
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Lakewood.	. CO 80228	)		iy, MD 2104			,		Sketch Map
Project	1-crt	UEVEN	<u>גוי גי</u>	<u><u>۲.۱.۲</u></u>	_Owner	USITE			
Locatio	n	Elleri	HILL	<u>ح</u>	W.O. Numt	ber		ici wech-ster	
Well Nu	mber _S	HP-43-1	<u>6D</u> To	tal Depth	56 2		Diameter	EL" AFOREIK	
Surface	Elevatio	n	Wa	iter Level	Initial		_24-hrs		
Screen	Dia		Le	ngth			Slot Size		
Casing:	Dia	4"	Le	ngth	39.5		TypeST	EEL	None
Drilling	Compar	1y <u>H+</u> H	ER		_Drilling M	ethod _	_H54/I	UX Cale	
Driller_	1=FF	QUINN	Lo	g By	203 Ker	12	Date Drilled	4/8/87	
Depth (Feet)	Graphic Log	Headspace (PID / FID)	Sample Number				Descrip (Color	tion/Soil Classi , Texture, Struc	fication (tures)
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165 S. Uni Lakewood	L CO 80228	nte 710	Ellicott Ci	bit Center Drive, Suite 101 UTIII
Project	Fezz	Deven	5 923	307.4 Owner USATC Sketch Map
Locatic	on <u>Si</u>	tepley	K HIL	W.O. Number
Well Nu	umper	<u>549-93</u>	-102 TO	tal DepthDiameter
Surface	e Elevatio	on	Wa	ater Level: Initial24-hrs
Screen	Dia		Le:	ngth Slot Size
Casing	: Dia	<u>4</u> "	Le	ngth
Orilling	Compa	ny	HER	Drilling Method_HSA 1.89"NJ C:22
Driller_	dim	ASH	Lo	g By R. KRATZ, M. GARDate Drilled _11/193
Depth (Feet)	Graphic Log	Headspace (PID / FID)	Sample Number	Description/Soil Classification (Color, Texture, Structures)
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	$\cdot$	0000		
·	•••			0'-1' CLAYEY SAND DARK BE FI
	• •		1-3/1-24	GARAINED WELL SORTED LOSS
5	•	Coom	NZ	ORGANIC RICH NOIST
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-15-	[···	Oppm	$\parallel \times \mid$	
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	+	<b></b>	,	1-27 SAND VERY LIGHT BROWN
	$\left  \cdot \right $		2/3/61	FINE GRAINED, WELL SORT
-20	<b>  · ·  </b>	Oppm	$\parallel \vee \mid$	LOOSE, NOIST
	···:	ļ	$   \land  $	25.5' Cross BEDS
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roiec	- Fixi	DEVEN	<u>-si</u>	307.4 Owner USAT		Sketch Map
ecatio	on <u>Sit</u>	<del>وارة ب</del> ن	Hur			
/ell N	umper S	H5- 13 -	102 TO	tal Depth55.71	د انتر Diameter <u>انتر</u> Diameter	
urtaci	e Elevatio	on	Wa	iter Level: Initial	24-hrs	
creer	: Dia		Le	ngth	Slot Size	
ising	: Dia	4 <sup>11</sup>	Le	ngth 37.5 '	Type STEEL	
rilling	Compa	ny_ <u>H.++</u>	tER	Drilling Method	HOA NA COLO	Notes
nller;	lin As	it	Lo	BY R. KENTZ MU	Date Drilled 11/1/13	
Depth (Feet)	Graphic Log	Headspace (PID / FID)	Sample Number		Description/Soil Cl (Color, Texture, S	lassification Structures)
				201 251	il-ou Cur	-1 CAUN A RAMA
	• • •		╂}	<u> </u>	VERY SIL	IT SAND, LIGHT DROWN,
		<b></b>	A 14 14 1-		VERY FINE	GRAINED WELL SERTED
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45	5	Orom			~ 60	NUMEROUS VERTICAL
	[]				FRACTUR	ES IN TOP 1.5'
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	£4.)	1:005			Opersint	DIRECTIONS TO FOLIATIONS
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165 S. Union	Blvd. Suis	e 710	3458 Ellico	tt Center Dry	ve, Suite 101			•			Drilling
Lakewood, Cl		0=.1=4	ビー エービー エービー	210 L		155	LEC.			Sketch Map	
Project	PCZI Ohr	<u>0</u>	<u>, ۲</u>	<u>, , , , , , , , , , , , , , , , , , , </u>		<u>_</u>					
Location.	<u>Vine</u>	<u> </u>	<u></u>	×	. W.O. NU	יייייייייייייי הי	<u> </u>	ک مرتبل ۱۹۰۰ م	52.7.2.7.7		
Well Num	ber	HP-73-	CE Tot	al Depth.		1	Diame	ter	OCURAC		
Surface E	levation	ا	Wa	ter Level:	Initial		24-hrs				
Screen: (	Dia	A 11	len	igth			Slot Si	ze			
Casing: D	)ia	<u>4</u>	Ler	igth	<u>'3'/.5</u>		Type_	STEEL		Notes	
Drilling C	ompan	y <u>Nititi</u>	<u>=R</u>		_ Drilling	Method	1 <u> </u>	1.29 1	<u>A Vicke</u>		
Driller	in th	<u>.</u>		<u>, 8v _L.</u>	LRATZ	, M. GA	(1) Date C	rilled	i [53		
Depth (Feel)	Graphic Log	Headspace (PID / FID)	Sample Number				De (	scription/S Color, Tex	Soil Classi ture, Struc	fication tures)	
	-				4	4 <sup>1</sup>	LESS	FRACT	1250	FRACTURES	NOE 1-21/2
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WELL INSTALLATION DIA	AGRAM	WELL NO.: SHM-93-01A
ROJECT NAME: FORT DEVEN	NS 1A SITES	DATE INSTALLED: 1/21/93
PROJECT NO.: 7005-04	-	DRILLING METHOD: HSA WATER ELEV.: 220.6
UND ELEVATION: 241.7		CASING ID: 6.25" DATE: June 21, 1993
WELL CASING ELEVATION: 243.	.40'	RIG GEOLOGIST: Rod Rustad
		PROTECTIVE CASING STCKUP: 2.3
		BUCKING POST
NOUND SURFACE		
		OUTSIDE DIAMETER OF PROTECTIVE CASING: 6"
		BOREHOLE DIAMETER: 10"
		WELL RISER ID: 4.0"
		TYPE OF WELL RISER: SCH 40 PVC
/////	/////	TYPE OF BACKFILL: 20/1 CEMENT/BENTONITE GROUT
		DEPTH TO TOP OF BENTONITE SEAL: 6' bgs
	1111	DEPTH TO TOP OF SAND PACK: 11' bas
• • • • • • • • • • • • • • • • • • •	+•••••  •••••	DEPTH TO TOP OF WELL SCREEN: 15.5' bgs
·····		
		TYPE OF WELL SCREEN: SCH 40 PVC
·····		
		LENGTH OF WELL SCREEN: 10'
· · · · ·		TYPE OF SAND PACK: SILICA SAND
·····		
	]	DEPTH TO BOTTOM OF WELL SCREEN: 25.5' bgs
L		
<b>~</b>		

	East Dever	EC /1A	
		F3/ IA	DELLINGIALLEU: U2/12/72
-	7002-04		
URUL CIATI	CHI 24/.1*		
HELL CASING EL	EVATION: 248	8. <i>1</i> 9'	KIG GEULOGISI: Rod Rustad
ROUND SURFACE		\\\\\\ 205.7' A.S.L.	PROTECTIVE CASING STCKUP: 2.0' BUCKING POST GRAVEL PAD OUTSIDE DIAMETER OF PROTECTIVE CASING: 6" BOREHOLE DIAMETER: 6"- 36.5' bgs 55/8" - 54.5' bgs WELL RISER ID: 4.0-INCH TYPE OF WELL RISER: SCH 40 PVC TYPE OF WELL RISER: SCH 40 PVC TYPE OF BACKFILL: 20/1 Cement/Bentonite Grout TOP OF BENTONITE SEAL: 33' bgs
		···· ····	DEPTH TO TOP OF WELL SCREEN: 44' bgs
		••••	
			TYPE OF WELL SCREEN: SCH 40 PVC WELL SCREEN ID: 4.0"
			WELL SLOT SIZE: 0.010-INCH
			LENGTH OF WELL SCREEN: 10'
			TYPE OF SAND PACK: Silica Sand
		-]	DEPTH TO BOTTOM OF WELL SCREEN: 54' bgs
	L	·····	DEPTH OF BOREHOLE: 59.5' bgs
			ABB ENVIRONMENTAL SERVICES, INC.

	LLATION DIAGRAM	WELL NO.: SHM-93-18B
PROJECT NAME:	FORT DEVENS 1A SITES	DATE INSTALLED: 2/10/93
PROJECT NO.:	7005-04	DRILLING METHOD: Drive/Wash HSA WATER ELEV.: 218.79
GROUND ELEVATI	ION: 236.2'	CASING ID: 3"/6.25" DATE: June 21, 1993
WELL CASING EL	EVATION: 238.38'	RIG GEOLOGIST: Nelson Bretton
ROUND SURFACE		PROTECTIVE CASING STCKUP: 2.4' BUCKING POST GRAVEL PAD OUTSIDE DIAMETER OF PROTECTIVE CASING: 6" BOREHOLE DIAMETER: 10" WELL RISER ID: 4.0" TYPE OF WELL RISER: SCH 40 PVC
	////  ////  ////  ////  ////  ////	DEPTH TO TOP OF BENTONITE SEAL: 68.5' bgs
	·····	DEPTH TO TOP OF SAND PACK: 73.5' bgs
		DEPTH TO TOP OF WELL SCREEN: 78.5' bgs
		TYPE OF WELL SCREEN: SCH 40 PVC
		WELL SLOT SIZE: 0.010"
		LENGTH OF WELL SCREEN: 10' TYPE OF SAND PACK: SILICA SAND
	1	

	WELL NO.: SHM-93-22C
PRUJELI NAME: FOT Devens FS/IA	DATE INSTALLED: U2/24/95
	DRILLING METHOD: Wash/Drive casing WATER LEVEL: 211.41
GROUND ELEVATION: 217.9'	CASING ID: 6" DATE: June 21, 1995
WELL CASING ELEVATION: 219.76	RIG GEOLOGIST: Lori Truesdale
WELL CASING ELEVATION:       219.76'         Image: Second Surface       Image: Second Surface         Image: Second Surface       Image: Second Surface	RIG GEOLOGIST:       Lori Truesdale         PROTECTIVE CASING STCKUP:       2.45'         BUCKING POST
· · · · · · · · · · · · · · · · · · ·	
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WELL INSTAL	LATION D	IAGRAM	DATE INSTALLED - 1/20/93	WELL NO.: SHM-93-24A
	7005-04			11ATED ELEN - 220 49
	7005-04			
GROUND ELEVATIO	JN: 233.5'		LASING ID: 6.25"	DATE: June 21, 1995
WELL CASING ELE	VATION: 23	7.53'	RIG GEOLOGIST: Rod Rustad	
			- PROTECTIVE CASING STCKUP: 2	.8'
			BUCKING POST	•
ROUND SURFACE			GRAVEL PAD	
			OUTSIDE DIAMETER OF PROTECTIV	E CASING: 6"
			BOREHOLE DIAMETER: 10"	
			TYPE OF WELL RISER: SCH 4	 0 PVC
			TYPE OF BACKFILL: 20/1 CEME	NT/BENTONITE GROUT
	1111	/////		
			DEPTH TO TOP OF BENTONITE SEA	L: 4' bgs
			DEPTH TO TOP OF SAND PACK:	B.4' bgs
		 	DEPTH TO TOP OF WELL SCREEN:	13.2' bgs
	·····			
	·····		TYPE OF WELL SCREEN: SCH 4	40 PVC
	·····			
	····			
			WELL SLOT SIZE: 0.010"	
	····-		LENGTH OF WELL SCREEN: 10'	
			TYPE OF SAND PACK: SILICA SAN	4D
	····-			
	·····	J	DEPTH TO BOTTOM OF WELL SCREEN	l: 23.2' bgs
				· ·
			DEPTH OF BOREHOLE: 24' be	JS
			ABB	ENVIRONMENTAL SERVICES, INC.
			· · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·



SOIL BORING LOG				Stud Borir	y Area ng No.:	: SHL-1 SHB·	600 FR	Gons.
Client: USAEC Project No. 08712-04			Protection: MONIFIED D					
Contractor: D.L. MAHER	Date Star	ted: 6 · 26 · 95	-	Completed: 6.27.95				
Method: #SA	Casing Si	ze: 414" 1.		PIM	eter:	TE - C	orm	
Ground Elev.:	Soil Drille	d: 49' BUS (	SAMPLESTO 51	Tota	I Depth	n: <u>5</u> /		<u> </u>
Logged by: isiz	Checked	by:		$\nabla$	Below	Ground:	13.3	6.27.
Screen: - (ft.) Riser:	- (ft.)	Diam: - (ID)	Material:	Page	Z	of: 3		
EENING EENING		REF UNCI	ERENCE SAMPLE LSS OTHERWISE	NOTES	2	, Fron	n Ali Spoon	l Spoons
DEPTH (FT) SAMPLE NUW SAMPLE DEP	RECOVERY PID (ppm)	SOIL/ROCK/DISC	HARGE WATER DESCRIPTION	4	Soll CLASS	beer 2	WMER	WELL DATA
- 5.5 19		SEE PREVIO	US PACE		E			
		ADDING WATER	to addres					
24		SAND POORLY	GRANED, FINE, 4	.5%	3			
	1.0	FINES . 25% .	menun , wer ,		DE	4		1455
20	2.0	NERT LOOSE TO	COOSE, LILUT 6	ROUN				
26					E	+		
					-	╂╌┠╼╂╴		
28 -					F			
						+++	$\overline{+}$	
29	1.5	29-29.5- 5AND	SIMILAR TO S-C	-	F	4		
30 - 5.7 1	2.0 0.0	29.5-30.5-KN	ADEN EINE 5-10	v. ta	ج ارم		8	1515
- 31		MEDIUM 45	1. FINES, WET, VLC	3200		+++		
		GREY, ANGULAR	TO SUBANGULAR,		E			
32					~E	+++		
						+		
74		and the stab	3-0		- 8			
3/ - 34	1.8 0.0	SIMILAR TO 29.	5-30.5 SAMPLE BI		۳E	9		1535
- 5.8	<b>1</b>	(FINE) (EUSES.	Strates Brown -		ъF	+++	₹ T	-
36		LA Sto 35.1 BO	LASTIC			+++	1	
		35.1-35.8.54	WA . POORLY GRAN		DF			
		FINE, GREY SIN	AILAR TO ABOVE CO.					
- 35	1.3 0.0	35- 39.3. SAND	MRAVE LOOSE -V.	LOOSE S	P	4 10		153
40 5.7 41	2.0	Gicer Similare						
				-ABB E	nviror	nmental S	<b>Services</b>	, inc.——

SOIL BORING LOG		Study Area: SHL - LANDFILL CONS.			
301L, DOMING: 200.		Boring No.: SHB. 95.262			
Client: USAEC	Project No. 08712.04	Protection: MODIFIED D			
Contractor: D.L. MAHUC	Date Started: 6. 26. 95	Completed: C. 27.55			
Method: HSA	Casing Size: $4/4$ $L. D.$	PI Meter: TE OVAN			
Ground Elev.:	Soil Drilled: 49 'Bas (LAMPLED TO 51)	Iotal Depth: 5/			
Logged by: RRR	Checked by:	Below Ground: 13.3			
Screen: (ft.) Riser:	- (ft.) Diam: - (ID) Material:	Page 3 of: 3			
низеконие низеконие 42 42 44 44 44 44 46 50 52 52 52 52 52 52 52 52 52 52	SOLUPOCKUDISCHARGE WATER DESCRIPTION 13 20 35.3-33.5 - SAND, PORLY GRADING MEDIUM, 10-15 X FINE, 45%. WET, LOOSE, PETSIDIAL AS WERL TO SUBANULLAR TO SUBCOUNTER TO SUBANULLAR TO SUBCOUNTER TO SUBANULLAR TO SUBCOUNTER TO SILF (COSE, CREY, SUBSALUIAR 0.5 0.0 SAND, PORLY GRADIN, SMILAR 1.2 0.0 SAND, PORLY GRADIN, SMILAR 1.2 0.0 SAND, PORLY GRADIN, FINE, LSX FINES, WIT, LOSE TO MEDIUM DLUERS TO SUMPLES PRESSURE HEATS 1.2 0.0 SAND, PORLY GRADIN, FINE, LSX FINES, WIT, LOSE TO MEDIUM DLUER, GREYISU GREW B.O.E = 51' BCS (STOON) 45' BCS (AUGER) 1645 COMPLETED G20 0800 6.27.95 BEGIN PULLING AUGERS AND GROUTING, SL = 13.3' 1000 - GROWINE COMPLETE 13 BLOS EMENT 1 ZAC BUTONITE TOWER TELM.E FLACED				

93120055 L7

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-ABB Environmental Services, Inc.-----

SOIL BORING	LOG			Boring No.: SHP.95.27X		
Client: USAEC Project No. 08712.04			Project No. 08712.04	Protection: modificid b		
Contractor: S.L. M	ALLER	Date St	arted: 6.27.55	Completed: 6.28.55		
Method: BRIVE +0	NASH	Casing	Size: 3" 1.D. CAS.NO	PI Meter: TE-ovm		
Ground Elev.:		Soil Dri	ed: 39.5	Total Depth: 0.5</td		
Logged by: RICT	2	Checke	d by:	Below Ground: 14.2' (6.3		
Screen: (ft.)	Riser:	(ft.)	Diam: (ID) Material:	Page / of: 3		
аланананананананананананананананананана			References Every Spo	SAMPLE COLLECTED FROM		
DEPTH (FT) SAMPLE NUMB	SAMPLE DEPT JCD 15/3 " a DIDWATE BORE	RECOVERY PID (ppm)	SOIL/ROCK/DISCHARGE WATER DESCRIPTION	Z"SPOON Z"SPOON ZECU ZECU ZECU ZECU ZECU ZECU ZECU ZECU		
	27	1.3 2.0 0.	SAND POORLY GRADED, FINE, 10-20% MEDIUM, <5% SILT DRY, LOOSE, SUBROUNDED, 12100	TRU SP 2 4		
	14 17		LANN WAL BEDDING MILLOSAUUT			
4	17	0.9	SAND, POORLY GRADES, FINE,			
6 - s-2	2 7 1	2.0 0.0	5% MEDIUM, 25% FINES, MON (DUE SOLELY TO WASHING) LOOSE VERY LIGHT TAN, SUBANGULAR	57 5P 9 13		
8	7 16					
10 - 5-3 1	17	0.5	10-10.6, SAND SIMICAR TO S.			
12	2 7	Z-0	10.6-10.8- SAND, POORLY GRADEL FINE, 10-15% SICT, MOIST, LOOSE, BROWN 10.8-10.9- SAND, POORLY GRADED			
	18	-	FINE, < 5% FINES, DRY, LOOSE, L GREY TAN, SUB ROUNDED			
16 - 5.4	5 1	(.4 0.5	15-15.2- SAND, POORLY GRADEN, 1 10.15% MEDIUM & S% FINES, WET CO	$ \begin{array}{c}                                     $		
	7 7		15.2 - 15.7 - SAND, FINE, 5-10% S LOOSE, WET, SUBROUNDED, MEDIUM BAD 15.7 - 16.4 - SAND TO SILTY SAND, POOL	RLY SP		
	9 10		GRADED, FINE, 5-15% SIGT, 200 WET, GREY, SUBANGULAR, MICALEOUS			
20		<b>1</b>				



SOIL.B	ORING LOG		- · · · · · · · · · · · · · · · · · · ·		Study Area: Su	L LANDFILLELD,	
Client: USAEC Project No. 05712-04				Protection: MCS D			
Contractor:	D.L. MILLEV	Date Started: 6:27.55			Completed: 6 28.55		
Method:	+ ws su	Casing S	ize: 3" / 1	F F F F F F F F F F F F F F F F F F F	PI Meter: 75 Januar		
Ground Elev	v.:	Soil Drille	d: 795		Total Depth: 40	5- /	
Logged by:	PPR	Checked	by:		Below Ground:	14.2 (6.28.95)	
Screen:	(ft.) Riser:	(ft.)	Diam: (ID) Material:		Page 3 of: 3		
	SAMPLE NUMBER	RECOVERY	SOIL/ROCK/DISCHARGE WATER REFUSAL W/ CASING AT CLEANING OUT DOLE L AT 39.5 START TISTE PHYLLITE CUTTINGS, WHO ROLLERBIT.	DESCRIPTION 39.5 IGOS U/ ICOLLERIBIT INGING UP INGING ING INGING UP INGING UP INGING UP INGING UP INGING UP INGING UP INGING UP INGING UP INGING ING INGING UP INGING UP INGING ING INGING UP INGING UP INGING ING INGING UP INGING ING INGING UP INGING ING INGING UP INGING ING INGING UP INGING ING INGING ING ING INGING ING INGING ING INGING ING INGING ING INGING ING INGING ING INGING ING ING INGING ING INGING ING INGING ING INGING ING INGING ING ING INGING ING INGING ING ING INGING ING ING ING ING ING ING ING ING	Solir CLASS		

MONITORING WELL CONSTRUCTION DIAGRAM				
Project Fort Devens Study Area SHL - Lawor	ILL CONS Driller J. GRACLIA (D.L. MANER)			
Project No. 08712.04 Boring No. SWP. 55-2	Drilling Method 1512/VC 44454 5 7.5.			
Field Geologist 7. Rustan				
Stick-up	of Casing Above Ground Surface:			
Ground Type of	Surface Seal/ Other Protection: MORTAR COLLAR			
Type of	Surface Casing: STEEL			
ID of St	Inface Casing: <u>4"</u>			
Diamet	er of Borehole:			
- 14.2'863 Riser P	pe ID:/ ''			
(6.28.55) Type of	Riser Pipe: SCK YO PUC			
Type of	Backfill: 20:1 CEMENT BENTO NITE GROUT			
Depth o	of Top of Seal: 29			
Туре о	Seal: BENTONITE SLURRY SEAL (TREMIED)			
Depth o	of Top of Sand:			
	of Top of Screen:3o. < '			
	Screen: SCH 40 FACTORY SCOTTED PUC			
	e x Length: 0.01" x 10			
ID of S	creen:			
	Sandpack: FILTER SAND			
	of Bottom of Screen: 40.5			
GRANGE ITZ 7 Depth	of Sediment Sump with Plug: <u>40.5</u>			
Depth of	of Bottom of Borehole: <u>40.5' Bcs</u>			
	ABB Environmental Services, Inc			

SOIL BORING LOG.		Study Area: SHL-Landfill Const.
Client: USAEZ	Project No. (8717-04)	Protection: Mcd D
Contractor: DL Maher	Date Started: 6.29.95	Completed: 6 - 29 - 95
Method: $D/\omega$	Casing Size: 3" & Flush Joint (IV)	PI Meter: TE /OVM
Ground Elev.:	Soil Drilled: 27.2	Total Depth: 32.7
Logged by: CPL	Checked by:	Below Ground: = 19 1 bas offer de illing
Screen: NA (ft.) Riser: /	IA (ft.) Diam: NA (ID) Material: NA	Page of: 2
	Alote	Liferrice Spinale Diene collected From
		allinte unis . E
MBE PTH SREEL		Ho: Headspace q
LE NL LE DE	рш , ve a	CLASS
SAMP SAMP		KET CS
	[3] SAND, well grouped, coarse to Fin	l, <u>5</u> i2
= 5-1 20 N	200 15-252 gravel, 410% silt, non -pla	ustic (SW) 10 lic
2.5	(H) Sundjoubround ed to subangular, hoos	eplay
	7545 3/7 no structure possibly 1 11 or	10
50	1.5 SAND, moderitely graded, medium to	5 me 3 6 3
$-5^{-2}$ N	20 + racegravel 10% cuarse sarel, 5-10	silt, SP-1-1-7-7
75	(1) non-plastic, sand, subangular to sub ?	surdul SM
	to recensed, moisi, loose, istrativer	y mag
	Structure.	
100	14 D.D SAND, moderatelyto wellgraded, Fine	ete 21 4 2
- 5-3 R N	134 (0.0) mechium, 10-15% coarse sand, 5-10	$\mathbb{R}$
12.5	gravel 5-107csi Hinon-plastic savel	
	Subaryular (conse) Subisurdad (med -+	in SP)
	Werede struture, stylity coarse ra	
15.0-15-	1.3 1 SAND, moderately to well graded, fi	mtc 500-444-44
- S-4 17 IV	20 (00) medium 5-10% carse sand, traceq	ravel SP 444
175	US 10-13% s. H, non-plastic, saudis su	damil 4
	mothed with one 1/4" oridized sund	ayer.
30.0	0.4 O.U SA/VD, poorly graded, medium to me	sty in 55 3 CC
- 5-5 22 N	2.0 0.4) Firesand, 593 conserved, 10-1572	Midun
205	(HSI said 20 30% silt, non-plastic, si	and is
	Sub. Sundial Semi dense Saturated	Citates Mit 9
	glacio-fluvial?	16
1 <del>}</del> 5.0 <b>1</b>		


ļ ROCK CORING LOG Study Area: Project: Project No. SHL-Landfill Gors Fort Devens 8712-04 Logged by: Checked by: Client: Driller's Name: Ground Elev .: USAEC John Granlia `PL Drilling Contractor: Protection Level: Rig Type: Start Date: Finish Date: Mob. 1 B-53 MadJ 6-29-95 6-29-95 Maher P.I.D. (eV): Casing Size; Drilling Method: Auger Size: 3"0 WD TE/OVM 3ø (Nw NA (OUG) NO (Bedrock) Bit type/size: Core Interval (to/from)(ft): Bit Use N3F Minimal 27.2-32.7  $N \cap$ 197 Natural Core Rock Quality Breaks Depth (feet) Below GBØ Surf. - Natural Sample No. & Penetration/ Recovery (feet) r – Mechanica Rock Quality Description Rock Description and Drilling Rate min/tt Graphic Log Weathered Condition Surface Condition **Comments on Drilling** RQD (%) Type/Dip Total 4° Core Color CIM 26.7 Rock w Rollertone ent Ca Re 27 17.2 Gray to green it gray fine -quained meta sediment or meta 2:53 R-1 27 n.coh Noni Break E Voltanic rock. Rock is ver 28 K competent and all fractures are 3:30 28. 5 Hentel C along previous healed fractures, Fredere Ē and appear very flat. fractures 29 not al Fracter (caj can baldin 245° d.P be at angle te 4:35 appear . 29.5 120-60 327 ч.† foliation and almost app 100% D-1K or ŀ, E 30 ·n 1 to be argelaceous. Rock is fair L'ikt eath slahtly siliioues and quartz appenses 5:05 N 30 5 And Fred to fill many of the T 31 forms off 2 White 5:10 tractures and Stringers observed in the rock. Return 31 5 5 4 01 Botto. core 1.5 of core in bottom of boring (rore would not break 32 4.5' 32. 5 Penetration B.O.B@ 32.7 5.5 33 ABB Environmental Services, Inc. 9505005S L 1 35.35 10-

31.55 865

# **APPENDIX F**

# GEOTECHNICAL EVALUATION AT CONSOLIDATION LANDFILL SITE

ABB Environmental Services, Inc.

W007959APP.B

8712-04



#### **TECHNICAL MEMORANDUM**

- **PROJECT NO.:** 8712-04
- MEMO BY: Lyle Tracy, P.E.

**DATE:** 1/24/97

SUBJECT: Supplemental Preliminary Geotechnical Evaluation Landfill Remediation Feasibility Study Ft. Devens, MA

In August 1995, ABB-ES performed a preliminary geotechnical evaluation for the conceptual design of a new debris landfill at Fort Devens, MA. The conceptual landfill was planned as part of consolidation of debris from several areas of concern (AOCs) at the base. The results of that geotechnical evaluation were summarized in a technical memorandum dated August 24, 1995, and presented in Appendix F of the Draft Consolidation Landfill Feasibility Study (ABB-ES, 1995). The results of the 1995 evaluation were considered preliminary in nature, and additional evaluations were recommended during final design. This memorandum presents supplemental results of a geotechnical evaluation relevant to modifications to the landfill alternatives evaluated in 1995. The results of this evaluation should also be considered preliminary in nature; additional evaluations are recommended during final design.

#### **PROJECT DESCRIPTION**

The Consolidation Landfill has been proposed for the consolidation and disposal of construction debris from existing landfills at the base. Nine alternative plans have been evaluated as part of the Landfill Remediation Feasibility Study, and five alternatives propose to consolidate and dispose of debris from different AOCs. Variations of volumes, height, and sideslopes exist with each alternative. A detailed discussion of each alternative is presented in Section 8 of the Landfill Remediation Feasibility Study. Each alternative identifies the consolidation landfill site at a location east of Shepley's Hill Landfill (SHL), as shown in Figure 8-8. The landfill location evaluated would be a minimum of 50 feet east of the Phase II section of SHL, with minimum set backs of 100 feet from the reservation boundary to the east, and 250 feet from Plow Shop Pond to the north.

fdgeot97

Subsurface conditions at the proposed landfill site were summarized in the August 24, 1995 Preliminary Geotechnical Evaluation technical memorandum.

#### EVALUATION AND CONCLUSIONS

**General.** In 1995, the preliminary geotechnical evaluation for the landfill alternatives focused on debris fill induced settlement, global stability, and cover geosynthetic/soil interface stability. From a geotechnical perspective, the critical scenario for each of these parameters typically occurs with a combination of the greatest fill height (largest load) and/or steepest waste slope (assuming constant subsurface conditions and existing grades). This critical scenario would occur for Alternative 9, where the debris fill height would be approximately elevation 290 feet (366,000 cubic yards of waste plus cover). Alternative 9 utilizes 3H:1V (horizontal to vertical) sideslopes, and a landfill cell bottom ranging from approximately elevation 224 feet to elevation 238 feet. The results of this reevaluation are presented in the following paragraphs.

**Settlement.** Settlement of the proposed landfill would occur from a combination of foundation soil settlement and waste/debris settlement, and magnitudes would be comparable to those estimated in 1995. A preliminary estimate of foundation soil settlement induced by waste loading from Alternative 9 ranges from approximately 2 to 5 inches, and settlement of the native sand would be complete within approximately 1 month of completion of filling.

As stated in the 1995 evaluation results, settlement of the waste fill can be minimized by controlled filling. In addition, detailed estimates can be evaluated during final design, and the anticipated settlement accounted for in the grading of the cover system, so that final grades can meet required minimums slopes (typically 3 to 5 percent at the top and 3H:1V on the sideslopes).

**Slope Stability.** During the 1995 evaluation, the landfill geometry with the highest fill loading and steepest sideslopes were evaluated. Static and seismic stability was evaluated. The minimum factors of safety (FS) against failure were as follows:

Static Conditions: $FS_{min} = 3.2$ Seismic Conditions: $FS_{min} = 1.8$ 

The minimum FS for each case consisted of a rotational failure.

The waste and soil geometry for Alternative 9 is comparable to that evaluated in 1995, except that the waste is approximately 6 feet deeper (landfill base is 6 feet deeper) for Alternative 9. Preliminary reevaluation of the stability of Alternative 9 indicated that the results were comparable to those presented in 1995, as the FSs, and critical failure circles did not change. The critical circles and resulting FSs are presented in the 1995 technical memorandum.

Minimum FSs for each case are site and project dependent, and would be established during final design. However, for comparison purposes, the following approximate guideline minimum FSs are provided:

Static Conditions	FS <sub>min acceptable</sub>	=	1.5
Seismic Conditions	FS <sub>min acceptable</sub>	=	1.1

The resulting FSs were significantly higher than typical minimum standards.

## Geosynthetic/Soil Interface Stability.

The landfill cover buildup on the sideslopes is comparable to that evaluated in 1995, except that the 18-inches of clay has been eliminated. The profile consists of from the top downward:

6-inches topsoil 18-inches of moisture retention soil geotextile (filter) 12-inches of drainage sand textured geomembrane (LLDPE) 12-inches subgrade waste debris

The weakest interface would be between the geomembrane and the subgrade soil. The recommendations provided in 1995 are considered valid for this case (ie., requirement for textured geomembrane to resist sliding along the interface, and potential for the need to use veneer reinforcement depending upon the actual materials selected [soil and geosynthetic]). The potential for veneer reinforcement may be reduced by selecting a granular subgrade soil with low fines content. It is recommended that project specific laboratory shear testing be performed on proposed materials, and that literature interface results be used only for guidance.

# **APPENDIX F**

# GEOTECHNICAL EVALUATION AT CONSOLIDATION LANDFILL SITE

ABB Environmental Services, Inc.

W007959APP.B

8712-04



## **TECHNICAL MEMORANDUM**

- **PROJECT NO.:** 8712-04
- **MEMO BY:** Lyle Tracy, P.E.

**DATE:** 1/24/97

SUBJECT: Supplemental Preliminary Geotechnical Evaluation Landfill Remediation Feasibility Study Ft. Devens, MA

In August 1995, ABB-ES performed a preliminary geotechnical evaluation for the conceptual design of a new debris landfill at Fort Devens, MA. The conceptual landfill was planned as part of consolidation of debris from several areas of concern (AOCs) at the base. The results of that geotechnical evaluation were summarized in a technical memorandum dated August 24, 1995, and presented in Appendix F of the Draft Consolidation Landfill Feasibility Study (ABB-ES, 1995). The results of the 1995 evaluation were considered preliminary in nature, and additional evaluations were recommended during final design. This memorandum presents supplemental results of a geotechnical evaluation relevant to modifications to the landfill alternatives evaluated in 1995. The results of this evaluation should also be considered preliminary in nature; additional evaluation also be considered preliminary in nature; additional evaluation should also be considered preliminary in nature; additional evaluations are recommended during final design.

#### **PROJECT DESCRIPTION**

The Consolidation Landfill has been proposed for the consolidation and disposal of construction debris from existing landfills at the base. Nine alternative plans have been evaluated as part of the Landfill Remediation Feasibility Study, and five alternatives propose to consolidate and dispose of debris from different AOCs. Variations of volumes, height, and sideslopes exist with each alternative. A detailed discussion of each alternative is presented in Section 8 of the Landfill Remediation Feasibility Study. Each alternative identifies the consolidation landfill site at a location east of Shepley's Hill Landfill (SHL), as shown in Figure 8-8. The landfill location evaluated would be a minimum of 50 feet east of the Phase II section of SHL, with minimum set backs of 100 feet from the reservation boundary to the east, and 250 feet from Plow Shop Pond to the north.

fdgeot97

Subsurface conditions at the proposed landfill site were summarized in the August 24, 1995 Preliminary Geotechnical Evaluation technical memorandum.

# EVALUATION AND CONCLUSIONS

**General.** In 1995, the preliminary geotechnical evaluation for the landfill alternatives focused on debris fill induced settlement, global stability, and cover geosynthetic/soil interface stability. From a geotechnical perspective, the critical scenario for each of these parameters typically occurs with a combination of the greatest fill height (largest load) and/or steepest waste slope (assuming constant subsurface conditions and existing grades). This critical scenario would occur for Alternative 9, where the debris fill height would be approximately elevation 290 feet (366,000 cubic yards of waste plus cover). Alternative 9 utilizes 3H:1V (horizontal to vertical) sideslopes, and a landfill cell bottom ranging from approximately elevation 224 feet to elevation 238 feet. The results of this reevaluation are presented in the following paragraphs.

**Settlement.** Settlement of the proposed landfill would occur from a combination of foundation soil settlement and waste/debris settlement, and magnitudes would be comparable to those estimated in 1995. A preliminary estimate of foundation soil settlement induced by waste loading from Alternative 9 ranges from approximately 2 to 5 inches, and settlement of the native sand would be complete within approximately 1 month of completion of filling.

As stated in the 1995 evaluation results, settlement of the waste fill can be minimized by controlled filling. In addition, detailed estimates can be evaluated during final design, and the anticipated settlement accounted for in the grading of the cover system, so that final grades can meet required minimums slopes (typically 3 to 5 percent at the top and 3H:1V on the sideslopes).

**Slope Stability.** During the 1995 evaluation, the landfill geometry with the highest fill loading and steepest sideslopes were evaluated. Static and seismic stability was evaluated. The minimum factors of safety (FS) against failure were as follows:

Static Conditions: $FS_{min} = 3.2$ Seismic Conditions: $FS_{min} = 1.8$ 

The minimum FS for each case consisted of a rotational failure.

The waste and soil geometry for Alternative 9 is comparable to that evaluated in 1995, except that the waste is approximately 6 feet deeper (landfill base is 6 feet deeper) for Alternative 9. Preliminary reevaluation of the stability of Alternative 9 indicated that the results were comparable to those presented in 1995, as the FSs, and critical failure circles did not change. The critical circles and resulting FSs are presented in the 1995 technical memorandum.

Minimum FSs for each case are site and project dependent, and would be established during final design. However, for comparison purposes, the following approximate guideline minimum FSs are provided:

Static Conditions	FS <sub>min acceptable</sub>	=	1.5
Seismic Conditions	FS <sub>min acceptable</sub>	=	1.1

The resulting FSs were significantly higher than typical minimum standards.

# Geosynthetic/Soil Interface Stability.

The landfill cover buildup on the sideslopes is comparable to that evaluated in 1995, except that the 18-inches of clay has been eliminated. The profile consists of from the top downward:

6-inches topsoil 18-inches of moisture retention soil geotextile (filter) 12-inches of drainage sand textured geomembrane (LLDPE) 12-inches subgrade waste debris

The weakest interface would be between the geomembrane and the subgrade soil. The recommendations provided in 1995 are considered valid for this case (ie., requirement for textured geomembrane to resist sliding along the interface, and potential for the need to use veneer reinforcement depending upon the actual materials selected [soil and geosynthetic]). The potential for veneer reinforcement may be reduced by selecting a granular subgrade soil with low fines content. It is recommended that project specific laboratory shear testing be performed on proposed materials, and that literature interface results be used only for guidance.



## TECHNICAL MEMORANDUM

	PROJECT NO: 8	371	2-04
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- FROM: Kim LaMarre, P.E.
- DATE: August 24, 1995
- SUBJECT: Preliminary Geotechnical Evaluations Consolidation Landfill Feasibility Study Ft. Devens, MA

This memorandum presents the results of the geotechnical investigations and preliminary geotechnical evaluations relative to the construction of a new debris landfill to be located at Fort Devens, Ma. These evaluations are for conceptual design purposes only; additional evaluations may be warranted during final design.

#### **PROJECT DESCRIPTION**

A Consolidation Landfill has been proposed to dispose of soil and construction debris obtained from removal actions performed at 7 other areas of concern located at Fort Devens. The debris would primarily include wood, concrete, and other building materials. The new landfill would be located just east of the existing Shepley's Hill Landfill (Figure-1).

The Shepley's Hill Landfill site is located on the Main Post in the Town of Ayer. The site is approximately 12 acres in size and is bounded on the north by Plow Shop Pond, on the west and south by Shepley's Landfill, and on the east by the Army reservation boundary.

Two grading plans, Alternative D and Alternative E, have been developed for the conceptual design of the Shepley's Hill Site. Alternative D assumes that all excavated soil debris will be disposed in the landfill (255,000 cubic yards [cy] total capacity). Alternative E assumes that portions of the debris will be reclaimed (84,000 cy total

capacity). Alternative D proposes grades of 3 horizontal (H) to 1 vertical (V) from elevation (el) 235 to el 290 feet and would encompass approximately 6 acres. Alternative E proposes grades of 5H:1V from approximately el 235 to el 266 feet and would encompass approximately 7 acres.

## SUBSURFACE CONDITIONS

As part of the conceptual evaluation for constructing a landfill at the Shepley's Hill site, three borings were drilled within the footprint of the proposed landfill to supplement existing geologic information. The locations of the borings are shown on Figure 1 attached. Two of the borings, SHP-95-27 and SHB-95-28 were drilled using 3-inch inside diameter (ID) flush joint casing; the remaining boring, SHB-95-26 was drilled using 4 1/4 inch ID hollow stem augers. SHP-95-27 and SHB-95-28 were drilled to 50 feet or refusal, whichever was shallower; SHB-95-28 was drilled to the bedrock surface and 5 feet of rock core was obtained. Logs of the borings are appended to this memo.

Subsurface conditions at the proposed site generally consisted of loose to medium dense, fine to medium sand with varying amounts of silt (trace to silty). Only isolated layers contained the higher fraction of silt; the deposit typically has a trace amount of silt. The findings of these explorations were generally consistent with the existing geologic information obtained to the east of the proposed site. Grain size analyses were performed on 6 samples selected from the borings; the gradation curves are attached to this memo.

Bedrock was identified in SHP-95-27 and SHB-95-28 at approximately 40 and 27 feet below ground surface (bgs), respectively. The bedrock cored in SHB-95-28 was identified as a phyllite and was found to be of excellent quality. The bedrock which comprises Shepley's Hill is granodiorite. The actual contact between the phyllite and the granodiorite is believed to occur somewhere beneath the site of the Consolidation Landfill.

A 1-inch ID PVC piezometer was installed in SHP-95-27 to measure the depth to overburden groundwater. Groundwater was measured at approximately 14 feet bgs. Groundwater elevations have been measured in other wells to the east at approximately el 218 feet, roughly 16 to 18 feet below ground surface.

### PRELIMINARY GEOTECHNICAL EVALUATIONS

The preliminary geotechnical evaluations focused on three areas:

- Settlement
- Slope stability
- Geosynthetic/soil interface stability

#### SETTLEMENT

Settlement of the landfill could occur as a result of consolidation of the foundation soils or consolidation of the waste soil and debris. Excessive settlement can hinder the long-term performance of the liner and/or cover system because it causes these materials to strain under variable loading conditions.

Approximations of settlement were computed based on the steepest and highest grading plan of the three proposed landfill configurations (Alternative D). Foundation soils consisted of loose to medium dense, fine to medium sand. Settlement of the sand due to the landfill loading is expected to range from 2 to 3 inches. Settlement of sand typically occurs immediately; i.e., during filling. Therefore, no long-term settlement of foundation soils is expected once filling and capping is complete.

Consolidation of waste typically occurs in two phases; primary (immediate) settlement and secondary (biodegradation) settlement. Primary settlement usually occurs within the first 3 to 4 months of fully loading the debris and is the result of crushing or consolidating the waste. It is expected that waste will be placed in the landfill in a controlled manner; i.e., tracked with a dozer and covered with soil on a daily basis. This process should minimize primary settlement.

Secondary settlement results from exposure to air and infiltration of water. Waste will be allowed to biodegrade during filling to some extent. Once the final cover is in place, the potential for biodegradation will be significantly reduced due to the low permeability cover.

Based on the characteristics of the foundation soils, the controlled approach to waste placement, and the proposed final grades, settlement is not expected to adversely impact the performance of the landfill.

#### SLOPE STABILITY

Bearing capacity of the foundation soils was evaluated by performing a slope stability analysis. Alternative C was conservatively selected for evaluation. The stability was evaluated using the computer program SLOPE/W. Both static and pseudostatic (seismic) analyses were performed. The following soil parameters were used in the stability evaluations:

- $\gamma_{\text{waste}} = 75 \text{ pounds/cubic foot (pcf)}$
- $\gamma_{\text{sand}} = 110 \text{ pcf}$
- $\phi_{\text{weste}} = 16 \text{ degrees}$
- $\phi_{\text{send}} = 30 \text{ degrees}$
- $c_{waste} = 800 \text{ pounds/square foot}$

shp2.mmo

For the seismic evaluation, a peak horizontal acceleration of 0.34 was selected based on a 90 percent probability of not being exceeded in 250 years (USGS, Map MF-2120). One-half this peak acceleration was used to compute the seismic load in the analysis. Critical failure circles were evaluated in both the foundation soils and the waste. The minimum static factor of safety (FS) was 3.2. This failure circle was primarily confined to the waste. The minimum pseudostatic FS was 1.8. Figures 2 and 3 represent the critical failure circles for each case.

A pseudostatic analysis is a relatively conservative approach to evaluating stability during a seismic event. Additional methods of evaluation include a deformation analysis and a liquefaction analysis. A deformation analysis is often associated with soft (clay) foundation soils; liquefaction analyses are associated with loose sand foundation soils. Soils most susceptible to liquefaction are generally loose, saturated fine sands with a relatively low fines (silt and clay) content. The physical characteristics of the foundation soils at the landfill site are consistent with liquefiable soils; however groundwater across the site varies seasonally which impacts how much and how frequently the sand is saturated. Based on the above findings, it is recommended that the potential for liquefaction be evaluated in more detail during final design.

# GEOSYNTHETIC/SOIL INTERFACE STABILITY

The proposed liner and cover materials were reviewed for stability against sliding based on the grading of Alternative D. Figure 4 attached depicts the proposed landfill liner and cover build-ups. Based on the proposed slopes and interface friction values obtained from published technical literature and manufacturer's data, the weakest interface would be between the geomembrane and the clay cover materials. It is anticipated that textured geomembrane would be required to resist sliding along the 3H:1V sideslopes. Depending upon the actual soil and geosynthetic materials selected during final design, it may also be necessary to provide a reinforcing geosynthetic or to flatten the proposed slopes in order to maintain veneer stability.

# CONCLUSIONS

Based on the results of the preliminary evaluations, the foundation soils are expected to provide adequate support for the proposed loading. Both global stability and geosynthetic/soil geosynthetic/geosynthetic interface stability should be reassessed once final grades and materials are selected during the final design process.

enclosures

shp2.mmo













# **BORING LOGS**

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-ABB Environmental Services, Inc.-





SOIL BORING LOG	Study Area: SHL LANDFILLCON
Client: USASC Project No. 08212-001	Boring No.: SUP. 95.27X
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	Type of Surface Casing: STEEL
	ID of Surface Casing:
	Diameter of Borehole: 3"
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(6.28.75)	Type of Riser Pipe: SCK 40 PVC
	Type of Backfill: 20:1 CEMENT BELTO NITE GR
	Depth of Top of Seal: 29
	Type of Seal: BENTONITE SLURRY SELL (TREA
	Depth of Top of Sand:
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	Type of Screen: SCH 40 FACTORY SCOTTED PUT
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17.5 IN 20 (30 medium 5-1070 toarse Sand ; trace gravel, SP 444 17.5 IV (30 medium 5-1070 toarse Sand ; trace gravel, SP 444 10-1570 s.H, non -plastic, sand is subargular 10.5 subranded, loose to seni -donse, damp mothed with one 1/4" oridized sand layer. 30.0 5-5 22 N 20 0.0 SAND, poorly graded, medium to nestly SM 55 30.0 5-5 22 N 20 0.0 SAND, poorly graded, medium to nestly SM 55 30.0 10.0 SAND, poorly graded, medium to nestly SM 55 10.0 SAND, poorly graded, medium to nestly SM 55 10.0 SAND, poorly graded, med	
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S-5 22 N 20 0.0 SAMD, poorly graded, medium to mostly KM 55 20 0.0 Fine sand, 590 coarse sand, 10-1590 medium 20.5 V 20 0.0 Fine sand, 590 coarse sand, 10-1590 medium 10.0 Structure of the sand is subrounded, semi dense, sofurated (dilater 7.5 x - 4/2 00 Structure to no stratification M 9 3.0 (glacio-fluvial?)	щÓ
20.5 10 10 10 10 10 10 10 10 10 10 10 10 10 1	304
2).5 	7 0
7.5 x - 2/2 postructure ( diana ) 7.5 x - 2/2 postructure to no stratification M (glacio-Fluvial ?)	Б
25.0 (glacio-Fluvial?)	9
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**GRAIN SIZE ANALYSES** 

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