Approved

FEASIBILITY STUDY REPORT

Amenia Town Landfill
Amenia, New York

Prepared for:

Amenia Landfill Group
Technical Committee
c/o Ashland Inc.
5200 Blazer Parkway
Dublin, Ohio 43017

Prepared by:

URS
201 Willowbrook Boulevard
Wayne, New Jersey 07470

April 2005

URS

April 15, 2005

Ms. Karen Maiurano
NYS Department of Environmental Conservation
Division of Environmental Remediation
Remedial Bureau C, 11th Floor
625 Broadway
Albany, NY 12233-7014

Re: Amenia Town Landfill Feasibility Study Report
April 2005
Site Code #3-14-006

Dear Ms. Maiurano:

In accordance with the Administrative Order on Consent for Amenia Town Landfill, Site Code # 3-14-006, dated October 4, 2001, enclosed please find two copies of the Feasibility Study Report for the Amenia Town Landfill Site.

If you have any questions regarding this submittal, please do not hesitate to call.

Sincerely,

URS Corporation

Marion Craig
Project Manager

Enclosure

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I, the undersigned, certify that this Feasibility Study was prepared in accordance with NYSDEC Order on Consent # W3-0859-99-10

George A. Zahy

Prepared by:

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201 Willowbrook Boulevard
Wayne, New Jersey 07470

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This Feasibility Study Report presents evaluations of remedial alternatives to eliminate, abate, monitor or control all significant threats to human health and the environment at the Amenia Town Landfill, Dutchess County, Amenia, New York (Figure 1-1). This document is prepared on behalf of the Amenia Landfill Group (ALG), in accordance with the requirements of the New York State Department of Environmental Conservation's (NYSDEC) Order on Consent (Order) for Amenia Town Landfill, Site # 3-14-006, effective October 4, 2001.

1.1 FEASIBILITY STUDY OVERVIEW

In accordance with the Order, the ALG conducted a Remedial Investigation (RI) and Feasibility Study (FS) for the landfill. The RI was completed by mid-2003 and the Final Remedial Investigation Report (URS, 2003) was submitted to NYSDEC and public repositories in November 2003. The alternatives presented in this FS report are based on the results of the RI and, as stated in the Order, prepared to evaluate "on-site and off-site remedial action to eliminate, to the maximum extent practical, all significant health and environmental hazards and potential hazards at the site."

The purpose of this FS is to develop, screen, and evaluate remedial alternatives that address significant threats to human health and the environment associated with site-related contamination identified and characterized during investigation of the Amenia Town Landfill (site).

This Feasibility Study Report was prepared in accordance with the Final Remedial Investigation and Feasibility Study Work Plan (URS, 2001) and following NYSDEC and US Environmental Protection Agency (EPA) guidelines and recommendations found in the following documents:

- Accelerated Remedial Actions at Class 2, Non-RCRA Regulated Landfills (NYSDEC TAGM 4044, March 9, 1992)
- Selection of Remedial Actions at Inactive Hazardous Waste Sites (NYSDEC TAGM 4030, May 15, 1990)
- Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA (EPA, 1988)
- Conducting Remedial Investigations/Feasibility Studies for CERCLA Municipal Landfill Sites (EPA, 1991)
- EPA Presumptive Remedy Directives (e.g., EPA, January 1997)
- National Oil and Hazardous Substances Pollution Contingency Plan (NCP) (40 CFR Part 300, July 16, 1982)

NYSDEC and EPA recognize that remedial actions for landfills can be accelerated and streamlined through use of proven presumptive remedies (NYSDEC, March 9, 1992; EPA, January 1997). The rationale is that treatment or removal of enormous volumes of landfill waste is usually unrealistic and, based on previous remedial actions at dozens of municipal landfills, containment is the most appropriate remedy for a typical landfill (EPA, 1991). Based on this approach, the universe of remedial alternatives that otherwise would require evaluation can be narrowed to one – containment through the installation of a landfill cap. The following elements comprise the typical source containment presumptive remedy:

- landfill cap;
- groundwater control, as required;
- leachate collection and treatment, as required;
- landfill gas collection and treatment, as required; and
- institutional controls to supplement engineering controls

Accordingly, and in accordance with National Contingency Plan (NCP) policy, the use of the presumptive remedy eliminates the need for the initial identification and screening of any other alternatives for the landfill itself other than various cap configuration options.

1.2 REPORT ORGANIZATION

This report is divided into the following sections:

- Section 1.0 introduces the Amenia Town Landfill RI/FS program and describes the objectives of the program
- Section 2.0 provides a summary of the site background
- Section 3.0 identifies and screens various remedial technologies and process options for each of the technologies.
- Section 4.0 evaluates combined technologies and process options with respect to various criteria.
- Section 5.0 provides a summary of the analysis of the remedial alternatives developed for the site and recommends a remedy.
- Section 6.0 is a listing of references cited in this document

The results of the remedial investigation and risk evaluations (both human health and ecological) are summarized in Section 2.0 to present a conceptual site model for the landfill.

Based on this model, remedial approaches are identified and screened for affected media in Section 3.0. Remedial technologies to implement the approaches are then screened and analyzed using the criteria presented in the guidance documents listed above. Finally, certain technologies are combined to develop remedial alternatives specific to the site. These alternatives are analyzed in detail using the nine evaluation criteria listed in Section 300.430 of the NCP, including compliance with State and Federal applicable or relevant and appropriate requirements (ARARs). The remedial alternatives evaluation concludes with a comparative analysis of various alternatives and recommendation of the selected alternative.

This section provides a summary of the background information and site setting of the Amenia Town Landfill. More detailed information is provided in the Final Remedial Investigation Report (URS, November 2003).

2.1 SITE LOCATION AND DESCRIPTION

The Amenia Town Landfill is on the outskirts of the Town of Amenia, Dutchess County, New York, about 1.5 miles south of the intersection of Route 22 and Route 44 (Figure 1-1). The site is in a rural area, bordered to the east by Route 22 and by a wetland and small stream to the north and west. There are no residences within ¼ mile of the site (NYSDEC, April 2003). A steep wooded hill is present immediately to the south. The site is a former sanitary landfill that began accepting waste in the late 1940s and ceased operations in 1976. The NYSDEC classifies the landfill as a Class 2 Inactive Hazardous Waste Disposal Site.

The site boundaries as shown in Figure 2-1, are approximations of the property lines depicted in the Town of Amenia Tax Maps (1999), which show the site having an estimated size of 29 acres. Of the total acreage, approximately 10 acres were used as a landfill, and 2 acres were used for a fuel and propane gas storage area. The area is open, well graded, and vegetated with grasses, shrubs and trees. The limits of waste and the property boundary of the site, estimated from aerial photographs and recent site investigations (see Appendix A), are shown on Figure 2-1.

Wetlands, a stream, and intermittent ponds border the site to the north and west. The Harlem Valley Landfill, a closed 18-acre landfill, is about 1,500 ft south of the site. The Harlem Valley Landfill was closed under New York Codes, Rules, and Regulations (NYCRR) Part 360 regulations between 1998 and 1999 and currently monitored on a quarterly basis (Budnik & Associates, September 2003). An active public golf course (the Island Green County Club) is located west of the site, just across the pond.

At the north end of the site, a fenced enclosure, about two acres in size, contains above ground storage tanks of propane and heating oil previously owned by Sharon Oil Company, Sharon, Connecticut. The fuel storage area contains four 20,000-gallon No. 2 fuel oil tanks (which were emptied and closed in place in January 2001) and a 30,000-gallon propane tank.

Route 22 forms the eastern boundary of the site. East of Route 22 and paralleling the roadway is an abandoned Conrail railroad spur (Figure 1-1). The site is unfenced, with the exception of the former Sharon Oil property.

2.2 PHYSICAL SETTING

This section provides a summary of the physical setting of the site. A more detailed discussion of the physical site setting is provided in the Remedial Investigation Report (URS, November 2003)

2.2.1 Surface Water and Wetlands

Wetlands are present immediately west and north of the site. The wetlands are mapped as part of a Palustrine System, which consists of fresh water wetlands dominated by shrubs, trees, and persistent emergent plants. NYSDEC classifies regulated freshwater wetlands according to their respective functions, values and benefits. Wetlands may be Class I, II, III or IV. Class I wetlands are the most valuable and are subject to the most stringent standards. NYSDEC assigned the wetlands adjoining the landfill a regulatory size of 34 acres and designated the area as Class II wetlands.

Ponds and surface water comprise part of the wetlands system described above. A 5-acre pond, herein called West Pond, is located immediately west of the landfill (Figure 2-1). The pond is near the headwaters of a small tributary (herein called West Pond Tributary) to the Amenia Stream. West Pond is fed by a small stream that originates from two other small ponds at the golf course. West Pond is also fed by surface water runoff from the surrounding hills and landfill.

West Pond was formed by two beaver dams (Figure 2-1). The dams were built before 1987, based on a 1987 map which shows the pond (EPA, 1990), but there appears to be no current beaver activity. One dam is at the northern-most end of the landfill and the other is located about 100 feet south of the first dam. Stream water from the golf course ponds behind the beaver dams then flows in a northerly direction.

The West Pond basin is shallow, open, and receives direct sunlight. The water level in the pond fluctuates seasonally and drops during extended dry periods. Sediment in the pond is primarily a black organic silty muck that is several feet deep. The sediment is typically fine grained, but some areas contain coarser sediment from soils eroded from the landfill.

West Pond Tributary flows east from the beaver dam at the north end of the West Pond, along the base of the landfill through a wetland. About 600 feet east of the dam, West Pond Tributary crosses beneath Route 22 through a concrete culvert. West Pond Tributary is narrow (approximately three feet wide), having a defined bed and bank that courses through a broad and level wetland. Flow is more diffuse near the culvert, where beavers may have once built a dam. Previous investigators reported the existence of ponds north of the landfill, in the area where West Pond Tributary currently flows. The dam and, therefore, the ponds, no longer exist, and there is evidence that the north wetland is drying out as a result. West Pond Tributary may not be persistent throughout the year and only significant storm events may cause it to rise above the shallow banks. Substrates in the streambed are gravel and rubble, with riffles present throughout. The north wetland substrates are stable and mudflats are not present.

East of Route 22, West Pond Tributary flows south and meanders through a wetland next to the steep abandoned railroad spur that is about 30 feet above the wetland (Figure 2-1). West Pond Tributary meets Amenia Stream about 750 ft downstream of the Route 22 culvert. The confluence of West Pond Tributary with Amenia Stream is opposite the landfill at a small

bridge leading to a quarry. Amenia Stream is wider than the West Pond Tributary, although it is shallow with fewer riffles. Sediments in Amenia Stream vary but are primarily a gray/black sandy silt to the north with more organic material just upstream of the quarry bridge. Just south of the confluence, sediments in Amenia Stream are primarily a light brown silty sand.

Amenia Stream and its tributaries are classified by the NYSDEC as Class C waters, with fishing as the best usage. Floodplains (100-yr and 500-yr), as mapped by the Federal Emergency Management Agency (FEMA, 1996), are only found immediately along the banks of Amenia Stream, east of Route 22 (Figure 2-2).

2.2.2 Geology

This section describes the geology of the site.

Surface Soil

Surface soils at the site generally consist of brown, poorly sorted sand or gravelly sand. Native soils collected for background samples are similar to landfill cover soil.

Overburden

The overburden at the Site was investigated by advancing stratigraphic test borings and soil borings for the installation of monitoring wells (Figure 2-3). The overburden soils consist of one or more of the following four units: a fill unit, a sand and gravel unit, a silt unit, and a glacial till unit. Each unit is briefly described below.

Fill Unit – The Fill Unit is a mixture of sands and gravels intermixed with landfill waste material. The sands and gravels likely represent periodic cover lifts over the landfill waste. In general, this unit was loose, poorly sorted, and ranged in thickness from 0 to about 50 feet. The quantities and types of landfill waste material intermixed with the soils varied between borings and consisted of materials such as glass, paper, metal, rubber, plastic, and brick pieces.

Sand and Gravel Unit – The Sand and Gravel Unit is a continuous layer consisting of a brown, poorly sorted mixture of sands and gravels or interlayered lenses of sands and gravels. The thickness of this unit ranges between 10 and 20 feet.

Silt Unit – The Silt Unit is a continuous, brown, soft silt layer with some interlayered clay. The thickness of this unit ranges between 10 and 20 feet.

Till Unit – The Till Unit is a discontinuous layer consisting of a red-brown to gray, well compacted, heterogeneous mixture of boulders and clay with lenses of sand and gravel. The Till Unit ranges in thickness from 5 to 10 feet.

Bedrock

The depth to bedrock beneath the main part of the landfill varies between 20 and 70 feet. Bedrock is exposed at the surface in areas of the hill south of the landfill. The rock is a gray to dark gray, fine to medium grained, massive to fissile dolomitic marble with local thin calcite seams and occasional to abundant pyrite. Micaceaous or phyllitic seams are locally present. The rock is highly fractured in places with secondary mineralization along fracture faces. The rock composition at the landfill is consistent with regional descriptions of the Stockbridge Marble provided by Fisher and others (1970).

2.2.3 Hydrogeology

The hydrogeologic regime at the landfill is complex because of the interaction between surface water, groundwater in overburden, groundwater in unconfined bedrock, and groundwater in deep confined bedrock.

Shallow Unconfined Aquifer

Because of steep topographic relief at the Site, the water table in the overburden (unconfined conditions) is between 20 and 50 feet below the ground surface (Figure 2-4). Also, because of a relatively steep hydraulic gradient across the Site, the elevation of the water table ranges between about 479 and 485 ft (North American Vertical Datum 1988). At the south end of the site, where overburden thickness is less than 20 feet, the water table occurs in bedrock (MW-5 and MW-9).

There is a steep hydraulic gradient between the surface water in the West Pond and Amenia Stream east of the landfill. Surface water elevations drop about 5 to 8 ft from West Pond eastward to West Pond Tributary, a distance of about 1,000 feet. Groundwater elevations measured in the landfill monitoring wells are lower than the elevation of water in West Pond and consistently follow this gradient. Groundwater beneath the landfill appears hydrologically connected and dependent on the elevation of surface water in the West Pond. After rain, for example, the water level rises in the West Pond and groundwater under the landfill responds relatively quickly and rises also. During dry conditions, when the water level drops in the pond, the groundwater level also drops correspondingly beneath the landfill. Shallow groundwater from the site flows northward and eastward to West Pond Tributary with a hydraulic gradient of about 0.008 (i.e., the water elevation drops vertically by 0.008 feet for every horizontal foot of travel)

Deep Confined Aquifer

Confined groundwater in bedrock flows to the east with a hydraulic gradient of about 0.009 (i.e., the water elevation drops vertically by 0.009 feet for every horizontal foot of travel). There is a positive upward hydraulic gradient between the unconfined and confined aquifers. Elevations of water in the confined, bedrock wells are consistently about 1 to 1.5 feet higher than the water table.

Results of the Hydraulic Conductivity Tests

Hydraulic conductivity values of the monitoring wells screened in the unconfined unit ranged from 0.0044 ft/min to 0.19 ft/min (2,300 to 10,000 ft/year). This value is within the expected range for the hydraulic conductivity in glacial deposits and fine to coarse sand (Driscoll, 1986).

Hydraulic conductivity values of the monitoring wells screened in confined bedrock ranged from 0.000034 ft/min to 0.0076 ft/min (20 to 4,000 ft/year). Low hydraulic conductivities such as these are typical of unjointed limestones or metamorphic rocks (Driscoll, 1986).

2.3 NATURE AND EXTENT OF CONTAMINATION

The nature and extent of contamination at the site is described in detail in the Remedial Investigation Report (URS, November 2003), which includes chemical data for each sample. Additional information was obtained from the Test Pit Investigation (see Appendix A). A summary of the RI and Test Pit Investigation results is provided below.

Landfill Surface and Subsurface Soil

Samples of surface soil from the top and from the base of the slope of the landfill contained concentrations of polychlorinated biphenyls (PCBs - up to 63 mg/kg) and the semivolatile organic compound (SVOC) phenol (one sample at 4.09 mg/kg) above NYSDEC soil cleanup objectives. Most surface soil samples contained concentrations of inorganic constituents higher than background levels or NYSDEC soil cleanup objectives, including calcium, magnesium, antimony, mercury, and chromium.

Samples of subsurface soil (10-12 ft depth interval) from a former drum disposal area contained the SVOC phenol (one sample at 0.084 mg/kg) and inorganic constituents at concentrations that exceeded background levels or NYSDEC soil cleanup objectives, including calcium, magnesium, potassium, and nickel.

Soil in an area beneath the former Sharon Oil facility contains non-aqueous phase liquid (NAPL) approximately 3.5 ft below grade (see log for testpit TP-9, Appendix A).

Shallow Groundwater

Two comprehensive rounds of groundwater sampling were conducted during the RI. Round 1 samples were collected in January 2002 and Round 2 samples were collected in April 2002. An off-site groundwater investigation was conducted at the request of NYSDEC in June 2004.

Volatile organic compounds (VOCs) - mainly benzene and chlorinated compounds - were the chief constituents detected in shallow groundwater at concentrations above NYSDEC groundwater quality standards. Total VOC concentrations were highest at the southwest

corner of the landfill and decreased eastward in the downgradient groundwater flow direction.

SVOCs (bis(2-ethylhexyl)phthalate and phenol) and one pesticide compound (beta-BHC) were detected at concentrations above NYSDEC groundwater quality standards. Each shallow groundwater sample contained concentrations of one or more inorganic constituents above standards.

Deep Groundwater

Deep groundwater is not affected by organic compounds. Each deep groundwater sample, however, contained concentrations of one or more inorganic constituents above NYSDEC groundwater quality standards. These constituents, however, are believed to be naturally occurring.

Sediment

Upstream sediment samples from Amenia Stream (east side of Route 22) are not impacted with organic compounds. The samples contained concentrations of arsenic, copper, iron, manganese and nickel above NYSDEC sediment screening criteria.

Upstream sediment samples from the golf course stream that discharges to West Pond are not impacted with organic compounds. The samples contained concentrations of arsenic, iron, manganese, nickel and zinc above NYSDEC sediment screening criteria.

Sediment samples from the West Pond and from West Pond Tributary up to its confluence with Amenia Stream contained PCBs above NYSDEC sediment screening criteria. Samples also contained concentrations of inorganic constituents, including arsenic, iron, manganese, nickel and zinc, above NYSDEC sediment screening criteria.

Surface Water

Pesticide compounds were detected above NYSDEC surface water quality standards in the surface water of West Pond Tributary north of the landfill, but were not detected in samples collected east of Route 22. Aluminum and iron were the only inorganic constituents to exceed surface water quality standards. The similarity of upstream and downstream inorganic concentrations indicates that surface water from the area of the landfill is not contributing to the inorganics load of Amenia Stream.

2.4 CONCEPTUAL SITE MODEL

Contaminants may be migrating from the site through three pathways - air, soil, or water. These pathways are shown in Figure 2-5 and discussed below.

Air Pathway

Volatile emissions from the soil or wind transport of dust present potential contaminant migration pathways from the site. However, this is not expected to be a significant pathway based on the minimal detections of VOCs in soil and based on the relatively well-established vegetative cover over much of the landfill area. The direction of the air pathway will vary, depending on climatic conditions and on the prevailing winds for the area. Future workers, however, if they ever need to excavate and work in deep trenches at the site, may be exposed to this pathway.

Soil Pathway

The soil pathway consists of direct contact with soil particles from the site or with sediment from the adjacent creek. Surface soil particles may also be transported by wind or surface water runoff into the pond, creek, or onto surrounding properties.

Water Pathways

Surface water and groundwater present potential contaminant migration pathways. Surface water may transport soluble contaminants and suspended soil particles into the adjacent creek, pond, or onto surrounding properties through runoff. Surface water may also transport soluble contaminants into the groundwater system by infiltrating the unpaved areas of the site. Groundwater may then transport contaminants into surrounding areas.

2.5 BASELINE RISK EVALUATION

Streamlined human health and ecological risk evaluations were performed for the Amenia Town Landfill. Potential exposures and likely current and reasonably anticipated future receptor populations were evaluated to guide implementation of the remedy, which under EPA presumptive remedy guidance, at a minimum, includes the following components:

- Landfill cap
- Institutional controls to supplement engineering controls

A summary of the conclusions of the risk evaluations are presented below.

2.5.1 Human Health Risk Evaluation

Several potential current and reasonably anticipated future receptors were considered in the human health risk evaluation. These receptors consisted of the following categories:

- Site Visitor/Trespasser/Hunter
- Off-site Recreational User
- Off-site Resident

No complete exposure pathways were identified for current or reasonably anticipated future off-site Residents who are not recreational users.

The results of the assessment indicate that implementation of the presumptive remedy (i.e., the landfill cap and institutional controls) would eliminate potential threats to receptors who may occasionally visit the site (Site Visitor/ Trespasser/Hunter) by isolating impacted soil from human contact.

The only potentially significant exposure pathway for off-site Recreational Users is direct contact with sediments. The landfill cap will minimize the potential for any transport of constituents to sediment. The presumptive remedy, however does not address existing PCBs and inorganics identified in sediments in concentrations exceeding NYSDEC sediment guidance values.

2.5.2 Screening Level Ecological Risk Assessment

A screening level ecological risk assessment (SLERA) was conducted for the Site. Conclusions regarding exposure media, potentially complete pathways, and risk characterization for terrestrial and aquatic habitats identified at the site are as follows:

Exposure Media:

- Three media types with potential exposure routes to viable ecological habitat in the vicinity of the Site were identified:

  1) surface waters in West Pond and West Pond Tributary

  2) sediments in West Pond and West Pond Tributary

  3) surface soils

Exposure Pathways:

- The evaluation of the surface water data indicates that this pathway poses low potential exposure to aquatic wildlife in West Pond and West Pond Tributary
- The evaluation of the sediment from West Pond Tributary indicate that this pathway poses low potential exposure to aquatic wildlife
- Exposure pathways are complete for aquatic wildlife in contact with sediments in West Pond
- Concentrations of constituents in surface soils serve as a potential migration pathway to aquatic/wetland habitats in West Pond.
- Exposure pathways are complete for terrestrial wildlife in contact with surface soils

Risk Characterization:

- Potential exposure threats in West Pond and West Pond Tributary from contact with surface water was determined to be negligible.
- Potential exposure threats with surface soil are primarily associated with several metals (iron, lead, barium, chromium, copper, mercury, and zinc) and PCBs
- Potential exposure threats in West Pond sediment are primarily associated with several metals (copper, lead, mercury, and zinc) and PCBs along the east side of the pond.
- Potential exposure threats in West Pond Tributary are low overall, given the relatively low detections of PCBs ($\leq$ 1.2 mg/kg total PCBs at all stations) and limited physical aquatic habitat, resulting in limited prey resources and likely low use rates by wildlife.

The results of these assessments indicate that implementation of the presumptive remedy (i.e., the landfill cap and institutional controls) would eliminate significant threats to receptors by isolating surface soil from contact. Significant threats posed by existing sediment in West Pond, will be addressed by additional measures.

This section describes the process by which remedial alternatives for the Amenia Town Landfill were initially identified and screened for technical implementability, effectiveness, and relative costs. Technologies and process options that were retained after the initial screening are used to develop a detailed analysis of alternatives, which is presented in Section 4.0.

3.1 INTRODUCTION

Identification and screening of remedial technologies and process options is facilitated in a six-step process developed by the EPA (1988):

Step 1 – Establish remedial action objectives for each medium of concern and preliminary remediation goals. This step is presented in Section 3.2 and 3.3.

Step 2 – Develop general response actions for each medium of concern that may satisfy the remedial action objectives. This step is presented in Section 3.4.1.

Step 3 – Identify volumes or areas to be remediated. This step is presented in Section 3.4.2.

Step 4 - Identify and Screen Technologies. In this step, technology types and process options are reduced through an initial screening of the options based on technical implementability. This step is presented in Section 3.5.

Step 5 – Evaluate Process Options. In this step, process options are evaluated based on implementability, effectiveness, and relative cost. This step is presented in Section 3.6.

Step 6 – Configure and Screen Alternative. The sixth step evaluates combined process options with respect to various evaluation criteria. This step is presented in Section 4.0.

3.2 REMEDIAL ACTION OBJECTIVES

The following discussion presents remedial action objectives (RAOs) for the Amenia Town Landfill. These objectives provide the basis for recommending appropriate technologies and for developing remedial alternatives for the site.

Remedial action objectives are media-specific and are established to protect human health and the environment. Contaminated media considered in this section are soil, sediments, and shallow groundwater. The development of the remedial action objectives is based on the results of the human health risk evaluation (HHRE), screening level ecological risk assessment (SLERA), and comparison of contaminant concentrations detected in media with NYSDEC chemical-specific standards, criteria, and guidance (SCGs), since these are the basis for measuring the potential impact of the landfill on human health and the environment. Media-specific RAOs for the site are presented below.

The following items are the RAOs for soil:

- to minimize the potential for human and ecological receptors to ingest, come into direct contact with, or inhale PCBs in the soil and landfill waste that will present a significant threat; and
- to minimize the migration of contaminants that will present a significant threat from soil to surface water, sediment, or groundwater.

The following items are the RAOs for shallow groundwater:

- to minimize human and ecological direct contact with contaminants at concentrations that will present a significant threat in shallow groundwater, either by ingestion, inhalation, or dermal contact, and
- to minimize the potential for contaminants at concentrations that will present a significant threat in shallow groundwater to migrate to off-site receptors.

The following items are the RAOs for sediment in West Pond and West Pond Tributary:

- to minimize the potential for humans and ecological receptors to ingest, come into dermal contact with, or inhale contaminants in sediment at concentrations that will present a significant threat, and
- to minimize the potential for contamination at concentrations that will present a significant threat in sediment to reach off-site receptors.

As discussed in the RI report (URS, November 2003) and summarized in Section 2.1 of this report (Nature and Extent of Contamination), no further action is required at this time for surface water and deep groundwater in the bedrock aquifer.

3.3 ARARs

This section discusses the applicable or relevant and appropriate requirements (ARARs) that govern the remediation of the Amenia Town Landfill. The attainment of ARARs ensures that the remedial or corrective actions employed comply with federal and state public health and environmental standards. Review of ARARs highlights site-specific regulatory conditions that might either limit the choice of alternatives or place limits on contaminant concentrations.

New York State does not have ARARs in its statute. NYSDEC TAGM #4030, Selection of Remedial Actions at Inactive Hazardous Waste Sites, states that an analysis of remedial alternatives must evaluate compliance with New York State Standards, Criteria and Guidelines (SCGs) and federal standards which are more stringent than the SCGs. NYSDEC Technical and Administrative Guidance Memoranda (TAGMs) are considered SCGs.

The NCP mandates that cleanup standards for remedial actions must attain a general standard of cleanup that ensures protection of human health and the environment, is cost-effective, and uses permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. In addition, regulatory guidance (EPA, 1988) requires that hazardous substances or pollutants remaining on-site meet the level or standard of control established by ARARs and the requirements or limitations established under any applicable or relevant and appropriate federal environmental law. The requirement that the remedy be protective of human health and the environment cannot be waived.

A requirement may be either applicable or relevant and appropriate to remedial activities at a site, but not both. Applicable requirements are those cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under federal or state law that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstances at a site. A remedial action must satisfy all the jurisdictional prerequisites of a requirement for the requirement to be applicable.

If a regulation is not applicable, it may still be relevant and appropriate. The basic considerations are whether the requirement (1) regulates or addresses problems or situations sufficiently similar to those encountered at the subject site (i.e., relevance), and (2) is appropriate to the circumstances of the release or threatened release, such that its use is well suited to the particular site. Determining whether a requirement is relevant and appropriate is site-specific and based on best professional judgment. This judgment is based on a number of factors, including the characteristics of the remedial action, the hazardous substances present at the site, and the physical circumstances of the site and of the release, as compared to the statutory or regulatory requirement. The selected alternative must comply with all regulations found to be applicable or relevant and appropriate.

To-be-considered materials (TBCs) are nonpromulgated advisories, proposed rules, or guidance documents issued by federal or state governments that are not legally binding and do not have the status of potential ARARs. However, these advisories and guidance are to be considered in the site risk assessment and in determining protective cleanup levels. Where no ARAR exists, or where ARARs are not sufficiently protective of human health and the environment, chemical-specific TBC values may be used to establish cleanup targets.

The ARARs are divided into three major categories: chemical-specific requirements, location-specific requirements, and action-specific requirements.

- Chemical-specific requirements are based on health- or risk-based concentration limits or discharge limitations in environmental media such as air or water, for specific hazardous chemicals. These requirements may be used to set cleanup levels for the chemicals of concern in the designated media, or to set a safe level of emission or discharge (e.g., air emission or wastewater discharge, taking into account air and water quality standards, respectively) where an emission and/or discharge occurs as part of the remedial activity.

- Location-specific ARARs are restrictions placed on the types of activities that may occur in particular locations. The location of a site may be an important characteristic in determining its impact on human health and the environment, and thus individual states, like New York, may have established location-specific ARARs. These ARARs may restrict or preclude certain remedial actions or may apply only to certain portions of a site.

- Action-specific requirements generally set performance, design, or other similar operational controls or restrictions on particular kinds of activities related to management of hazardous substances or pollutants. These requirements address the particular activities that are selected to accomplish a remedy. There are several alternative remedial actions considered for this site, and there are several action-specific requirements for each alternative. These action-specific requirements do not in themselves determine the remedial alternative, rather, they indicate how a selected alternative must be designed, operated, or managed.

3.3.1 Chemical-specific ARARs

The chemical-specific ARARs and TBCs are presented in Appendix B. Potential target cleanup levels are specified for the following media: shallow groundwater, soil and sediment. The chemical-specific ARARs are based on selected SCGs from NYSDEC and New York State Department of Health (NYSDOH). A study of the regional hydrogeology indicates that there is currently no withdrawal of groundwater for public supply within a one-quarter mile radius of the site (NYSDOH, May 1999). However, New York State classifies all groundwater of the State as a source of drinking water; therefore, NYSDEC's water quality standards (6 NYCRR Part 703) are applicable.

NYSDEC guidance for soil cleanup levels (TAGM 4046) and screening contaminated sediment are also considered relevant for determining whether remediation is necessary.

3.3.2 Location-specific ARARs

Location-specific ARARs set restrictions on the type of activities conducted at a remediation site. To determine which environmental laws are location-specific ARARs for the Amenia Town Landfill, a review of Federal and New York State laws and regulations was conducted.

New York State's Freshwater Wetlands Act presented in 6 NYCRR 662 and 663 are applicable location-specific requirements. Designated wetland areas have been identified adjacent to Amenia Town Landfill.

New York State regulations regarding the Use and Protection of Water (6 NYCRR Part 608) are potentially applicable if West Pond is determined to be navigable water.

3.3.3 Action-specific ARARs

Action-specific ARARs regulate the activities performed to accomplish a remedial objective. Potential action-specific ARARs and their applicability or relevance and appropriateness to the remedial activities under consideration are summarized in Appendix B. Further discussion of the regulations applicable or relevant and appropriate for the site are given in the following subsections.

Inactive Hazardous Waste Site

New York State has established in 6 NYCRR 375 regulations that govern inactive hazardous waste site remedial programs. This regulation is applicable as the Site is classified as an Inactive Hazardous Waste Site.

New York Solid Waste Landfill Requirements

The New York Solid Waste Landfill Requirements in 6 NYCRR 360 are not applicable because the Amenia Landfill closed prior to the effective date of those regulations. However, portions of the regulations given in 6 NYCRR 360-2 are relevant and appropriate because they address landfills similar to the site. The relevant sections of this regulation for remedial activities that include in-place capping and closure under consideration for the Site are:

- 360-2.13 Landfill Construction Requirements. The standards for the gas venting layer, low permeability barrier soil covers, geomembrane covers, and top soil as given in 360-2.13 (p-s).

- 360-2.15 Landfill Closure and Post-Closure Criteria. The final cover, gas control system, post-closure operation and maintenance requirements.

New York State Department of Environmental Conservation Technical and Administrative Guidance Memoranda

- Accelerated Remedial Actions at Class 2, Non-RCRA Regulated Landfills (TAGM 4044). On February 20, 1992 the NYSDEC Division of Hazardous Waste Remediation issued a Technical and Administrative Guidance Memorandum (TAGM), which allowed for the consideration of a final cover designed to 6 NYCRR Part 360 (solid waste) requirements for capping a typical Class 2, non-Resource Conservation and Recovery Act (RCRA) regulated landfill. This guidance was used in the development of remedial alternatives for the site.

- Selection of Remedial Actions at Inactive Hazardous Waste Sites (TAGM 4030) provides guidance to model the FS remedy selection process after CERCLA and was considered in the remedy selection process for this site.

- Fugitive Dust Suppression and Particulate Monitoring Program at Inactive Hazardous Waste Sites (TAGM 4031) provides guidance for particulate air monitoring during remedial activities. This guidance will be used to develop a community air monitoring program during construction activities.

OSHA

Occupational Safety and Health Administration regulations (29 CFR Chapter XVII) are applicable to all site work activities.

3.3.4 Additional To-Be-Considered Material

To-be-considered (TBCs) materials include non-promulgated advisories or guidance issued by Federal or State agencies. They are not legally binding, and do not have the status of potential ARARs or SCGs, but were considered in the evaluation and selection of remedial activities for the Site. The following is a list of the more germane TBCs used in the development of remedial activities for the Site:

- Conducting Remedial Investigations/Feasibility Studies for CERCLA Municipal Landfill Sites (EPA/540/P-91/001). This TBC establishes recommended RI/FS practices for municipal landfill sites under CERCLA in order to streamline the process. This document establishes containment in-place as the most likely response action at municipal landfill sites with the expectation of treatment for identifiable areas of highly toxic and/or mobile constituent "hot spots".

- Guidance for Conducting RI/FSs Under CERCLA (EPA/540/G-89/004). This TBC provides guidance for conducting investigations and evaluating remedial options for Superfund sites.

- Design, Operation, and Closure of Municipal Solid Waste Landfills (EPA/600/6-85/006). This TBC includes a collection of presentations regarding the provisions of Subtitle D of RCRA, as implemented by 40 CFR 258 - Municipal Solid Waste Landfill Criteria. The presentations included landfill design criteria, landfill operations, landfill gas, groundwater monitoring, and closure and post-closure care.

- Design and Construction of Covers for Solid Waste Landfills (EPA-600/2-79-165). This TBC provides guidance on the selection and design of final covers for solid waste landfills. Design considerations covered in this guidance included soil properties, soil placement/treatment, cover materials, operation plan, infiltration/percolation control, gas control, erosion control, side slope stability, traffic concerns, dewatering, cold climate operations, fire hazards, vegetation, animal control, and future land use.

3.4 GENERAL RESPONSE ACTIONS

General response actions are broad response categories capable of satisfying the remedial action objectives. Like remedial action objectives, general response actions are media specific and may consist of categories of treatment, containment, disposal, or combinations of these categories.

3.4.1 Response Categories

For contaminated soil, sediments, and groundwater at the Amenia Town Landfill, remedial technologies are grouped and evaluated by the following general response categories:

- No Action – A no-action response provides a baseline for comparison with other alternatives. The NCP requires that the no-action alternative be evaluated as part of the FS process.

- Institutional Actions – Institutional actions refer to measures, taken by government or private parties, whose purpose is not to clean up or contain site contaminants by active remedial measures, but rather to reduce human exposure and health risk by limiting public access to those contaminants.

- Containment – Containment measures are those remedial actions whose purpose is to contain and/or isolate contaminants on site. These measures prevent migration from, or direct human or ecological exposure to, contaminated media without treating, disturbing or removing the contamination from the site.

- Treatment/Disposal – Treatment measures include technologies whose purpose is to reduce the toxicity, mobility or volume of on-site contaminants by directly altering, isolating or destroying those contaminants. Disposal measures include excavation, removal, discharge, etc.

General response actions and technology types are listed in Table 3-3 for each medium of concern.

3.4.2 Extent of Remediation

This section provides estimates of the area or volumes to which a general response action might be applied for each medium of interest.

Soil

General response actions for soil apply to the entire landfill area (approximately 10 acres). The horizontal extent of the landfill (Figure 2-1) was defined using boring data, test pit

excavations, and historical aerial photographs. The landfill reaches a maximum thickness of about 50 ft.

Sediment

The SLERA identified several metals in sediments that potentially pose ecological exposure risk: copper, lead, mercury and zinc. The EPA has stated that "because of the potential for dredging to harm indigenous wetland biota, it should be considered only as a last resort after a careful environmental risk assessment of the site demonstrates that a significant risk actually exists" (EPA, February 1991). Other potential remedies, such as in-situ treatment or containment approaches for sediment also can be extremely disruptive to ecological habitat. As such, to minimize potential impacts, the concentrations of copper, lead, mercury and zinc in sediment were compared to the Severe Effect Level (SEL) as opposed to Lowest Effect Level criteria (LEL), thereby focusing on areas of relatively significant potential risk. Based on this analysis, sediment in the area of samples SD-11, SD-12, SD-13, SD-14, SD-13-2 and SD-1-3 will be remediated (Figure 3-1).

The HHRE screened sediment concentrations against NYSDEC recommended cleanup objectives. Based on this screening, several metals were identified as potential constituents of concern with regard to human health. To define remediation areas for the FS, metal concentrations were compared to health-based criteria that have been developed by the EPA and to background concentrations. This comparison is presented in Table 3-1. The results show that although above NYSDEC screening values, all but one of the metals (arsenic) were found in concentrations below health-based criteria. As shown in Table 3-2, however, arsenic concentrations are typically less than 10 mg/kg, which is within the range of background concentrations for New York State. In addition, background concentrations for the site were similar to concentrations found at on-site sampling locations. Based on these findings, arsenic in site sediment does not pose any greater risk to human health than arsenic found in sediment in background areas around the site. Therefore, no remediation specific for arsenic in site sediment is warranted.

Polychlorinated biphenyls (PCBs) are the only organic constituents of potential concern identified in sediment for ecological receptors. The SEL for PCBs is 1.4 mg/kg (1,400 ug/kg). The human health direct contact criterion for PCBs is 1 mg/kg (1,000 ug/kg). Therefore, sediment in those areas where PCB concentrations exceed 1 mg/kg will be remediated. These areas, and the area defined based on potential ecological risk from metals, are shown on Figure 3-1.

Shallow (0-6 inches) and deep (18-24 inches) sediment samples were collected during the RI. Both shallow and deep samples were found to be contaminated with PCBs. Therefore, the vertical extent of contamination is assumed to extend to two feet. The areal extent of contaminated sediment is approximately 2 acres. The estimated volume of sediments requiring remediation is approximately 3,000 cubic yards.

Groundwater

The shallow, unconfined (water table) groundwater at the site contains organic and inorganic constituents in concentrations above NYSDEC groundwater standards. The areal extent of affected groundwater is approximately 11 acres. The maximum thickness of the affected groundwater is about 30 ft in the central part of the site. Given the low levels of constituents of potential concern in groundwater and the current absence of complete pathways to receptors, active remediation is not considered warranted.

3.5 IDENTIFICATION AND INITIAL SCREENING OF REMEDIAL TECHNOLOGIES

Remedial action objectives, general response actions and technology types for each medium of concern are presented in Table 3-3. In this section, the number of technology types and process options are reduced by screening the options with respect to the technology's technical implementability. This evaluation is based on information in the RI site characterization, which identified contaminant types and concentrations, and physical characteristics (e.g., hydrogeology, geology, etc.) of the site. The results of the initial screening are summarized in Table 3-4.

3.5.1 Identification and Initial Screening of Remedial Technologies for Soil

No Action/Limited Action. The No Action/Limited Action alternative is considered in this FS as a management option required by the NCP. Under a No Action alternative, no remedial actions, including removal, treatment, containment or engineering controls, are implemented. Limited actions such as institutional controls (e.g., deed restrictions) may be appropriate in conjunction with a No Action/Limited Action alternative. Land use restrictions could be placed on the property to limit the future use of the Site. The No Action/Limited Action alternative is easily implemented and is retained for further consideration (Table 3-4).

Containment. Containment (capping) is the presumptive remedy for CERCLA municipal landfills, and is retained as the preferred technology for soil (Table 3-4). Capping technologies are designed to minimize percolation of precipition through landfill contents, prevent direct contact with landfill contents, and eliminate off-site migration of landfill soil via wind erosion or stormwater runoff. In addition, capping will address localized hotpots, such as the non-aqueous phase liquid identified in test pit TP-9 by minimizing infiltration and the potential for constituents to impact groundwater.

RCRA capping requirements (double barrier-type cap) were evaluated but deemed not appropriate for the landfill. A RCRA cap was not considered because of the high cost compared to other cap options (i.e., NYSDEC Part 360 cap) that are equally effective and protective of human health and the environment.

Treatment/Disposal. These options involve the treatment or excavation and disposal of landfill materials. Based on the EPA's analysis of potentially available technologies for municipal landfills, these types of technolgies are routinely screened out on the basis of effectiveness, feasibility, or cost and were, therefore, not included in the presumptive remedy. As per the presumptive remedy, treatment/disposal are not retained for further consideration.

3.5.2 Identification and Initial Screening of Remedial Technologies for Sediment

No Action/Limited Action. Similar to the general response actions described above for Soil, the No Action/Limited Action alternative is considered in this FS as a management option required by the NCP. The No Action/Limited Action alternative for sediment is easily implemented and is retained for further consideration (Table 3-4).

Containment. Sediment containment technologies are designed to prevent direct contact with sediments and eliminate off-site migration of sediment via surface water. Containment is technically implementable and is therefore retained for consideration (Table 3-4).

Treatment/Disposal. In-situ treatment or excavation and disposal of impacted sediments are technically implementable. These technologies are therefore retained for further consideration (Table 3-4).

3.5.3 Identification and Initial Screening of Remedial Technologies for Groundwater

No Action/Limited Action. The No Action/Limited Action alternative is considered for groundwater in this FS as a management option required by the NCP. The No Action/Limited Action process option for groundwater is retained for further consideration as per the NCP (Table 3-4).

Monitoring and Institutional Controls. Given the low levels of constituents in groundwater and the current absence of complete pathways to receptors, no active remediation is considered warranted. A combination of monitoring and institutional controls would ensure that impacted groundwater is not used as a potable water source, and monitoring will provide the ability to assess the effectiveness of the remedial action program. Furthermore, the proposed installation of a landfill cap will minimize the infiltration of water thereby minimizing future impacts to groundwater. For these reasons, this option is retained for further consideration (Table 3-4).

3.6 IDENTIFICATION AND INITIAL SCREENING OF PROCESS OPTIONS

3.6.1 Introduction

The process options for technologies retained for further consideration in Section 3.5 were screened against the evaluation criteria presented below. This section presents a description of the process options for each type of technology, an evaluation of the process options against the screening criteria, and a recommendation as to whether the process option should be retained for combination into site-wide alternatives. The results of the initial screening of process options are summarized in Table 3-4.

3.6.2 Process Option Evaluation Criteria

The technology process options are screened against three criteria in order to select a reasonable number of alternatives for detailed analysis in Section 4.0. The criteria used to evaluate the process options include:

- implementability
- effectiveness; and,
- relative cost.

Implementability includes the technical feasibility and commercial availability of the technologies, as well as the administrative feasibility of implementation at a given site. This criterion includes emphasis on the institutional aspects of implementability (e.g., permits procurement; treatment, storage, and disposal services availability). Process options that are technically or administratively not implementable are eliminated from further consideration.

Effectiveness considers the extent to which a process option reduces the toxicity, mobility, or volume of contamination through treatment, or otherwise. It also considers the residual risk remaining at the site and the long-term protection that the process option provides. Effectiveness includes the process option's ability to meet ARARs, minimize short-term impacts, and provide protection quickly. Process options that are not effective are eliminated from further consideration.

Relative cost considers the capital, O&M, and long-term monitoring costs. Costs of similar technologies are compared on a low, medium, or high basis. Technologies whose costs are grossly excessive compared to their overall effectiveness, or whose costs are greater than other technologies for a similar level of effectiveness, are eliminated from further consideration.

3.6.3 Process Option LF-NA/LA: No Action/Limited Action for Soil

Description

The No Action process option is evaluated as per the requirements of the NCP. Under this option, the current status of the Amenia Town Landfill would be maintained and no remedial actions would be implemented. Limited Action alternatives could include securing the site with a fence and imposing deed restrictions (Table 3-5).

Evaluation

Implementability: No Action/Limited Action is implementable.

Effectiveness: No Action will not reduce the potential for the transport of contaminants. Limited Action (fencing, deed restrictions) could reduce the potential for human exposure to constituents of potential concern (COPCs), but does not reduce the potential for ecological exposure. The No Action option does not meet the remedial action objectives for the site.

Relative Cost: There are minimal costs associated with this option.

The No Action option is retained for further consideration as required by the NCP. Limited Action in the form of institutional and engineering controls is also maintained for further consideration.

3.6.4 Process Option LF-1a: NYSDEC Solid Waste Management Facility Cap

Description

Process Option LF-1a consists of the minimum layering requirements as stipulated in 6 NYCRR, Section 360, Subpart 2.15 (Table 3-5). This layering includes a gas-venting layer with a minimum permeability of $1x10^{-3}$ cm/sec, bounded on the top and bottom by filter layers. A low-permeability barrier layer with a maximum permeability of $1x10^{-7}$ cm/sec overlies the upper filter and is, in turn, overlain by a surface/protective layer.

For Process Option LF-1a, the 12-inch gas-venting layer will be constructed of sand, providing the required permeability value. Gas vent pipes or extraction wells will also be integrated into this layer. The low-permeability barrier layer will be an 18-inch layer of compacted clay. The surface/protective layer will be constructed of a 30-inch soil layer of which the top 6 inches will be topsoil capable of supporting vegetation. The bottom 24 inches can be constructed of any locally available loamy soil capable of resisting erosion and protecting the compacted clay layer from desiccation cracking, frost action, and root penetration. The filter layers bounding the gas-venting layer will be constructed of geotextiles. Refer to Figure 3-2 for an illustration of this process option.

As per 6 NYCRR, Section 360, Subpart 2.13(w), alternative individual components of the final cover system that meet the equivalent design provisions may also be considered.

Evaluation

Implementability: Process Option LF-1a would be moderately difficult to implement at the Site. Care must also be taken when constructing the low-permeability barrier layer to reduce the potential for tearing the geotextile filter layer on top of the gas-venting layer. This process option is commercially available.

Effectiveness: The required permeability of the compacted clay barrier layer would provide an effective barrier to percolation. The surface/protective layer provides adequate protection against freeze/thaw cycles. The geotextile layer provides a deterrent to burrowing animals.

Process Option LF-1a is effective at providing a medium for collection and venting of landfill gases. This option does not provide, however, a drainage mechanism in the cap to minimize the increase in water pressure above the barrier layer that could result in increasing infiltration through the low permeability layer. The absence of a drainage mechanism also negatively impacts side slope stability.

This process option does attain ARARs for cap design and provides long-term protection from contact with the landfill contents and soils. This option reduces the threat of exposure to landfill contents and soils.

Relative Cost: The relative cost of Process Option LF-1a is moderate to high compared to other capping process options due to costs associated with the low permeability clay.

Process Option LF-1 is not retained for further consideration because of the relatively high costs compared to other available options that are equally effective and implementable.

3.6.5 Process Option LF-1b: NYSDEC Solid Waste Management Facility Cap

Description

Process Option LF-1b is identical to Process Option LF-1a except that the compacted clay barrier layer is replaced with a geomembrane (Table 3-5). This geomembrane must have a minimum thickness of 40 mils and have a water vapor transmission rate of not more than 0.03 grams per meter squared per day according to NYSDEC regulations. Refer to Figure 3-3 for an illustration of this process option.

As per 6 NYCRR, Section 360, Subpart 2.13(w), alternative individual components of the final cover system that meet the equivalent design provisions may also be considered.

Evaluation

Implementability: Process Option LF-1b would be moderately difficult to implement at the Site. A significant amount of care must be exercised when installing the geomembrane to minimize damage that could result in unanticipated increases in the permeability of the cap.

Special care is required to seam the panels of the geomembrane to provide adequate strength and low permeability. This process option is commercially available.

Effectiveness: The required permeability of the geomembrane would provide an effective barrier to percolation. The surface/protective layer provides adequate protection against freeze/thaw cycles. The geotextile layer provides a deterrent to burrowing animals.

Process Option LF-1b is effective at providing a medium for collection of landfill gases. This option does not provide, however, a drainage mechanism in the cap to minimize the increase in water pressure above the barrier layer that could result in increasing infiltration through the low permeability layer. The absence of a drainage mechanism also negatively impacts side slope stability.

This process option does attain ARARs for cap design and provides long-term protection from contact with landfill contents and soils. This option reduces the threat of exposure to landfill contents and soils.

Relative Cost: The relative cost of Process Option LF-1b is moderate compared to other capping process options.

Process Option LF-1b is not retained for further consideration because it is not as effective as other options on side slopes.

3.6.6 Process Option LF-2a: NYSDEC Solid Waste Management Facility Cap (modified)

Description

Process Option LF-2a consists of a 30-inch surface/protective layer comprised of a 6-inch topsoil layer and a 24-inch layer of any locally available loamy soil (Table 3-5). A drainage layer constructed of a geonet, bounded on the top and bottom by geotextile filter layers, and capable of providing the required permeability, is placed beneath the surface protective layer. The low-permeability barrier layer is constructed of an 18-inch layer of compacted clay with a maximum permeability of $1x10^{-7}$ cm/sec. A 12-inch gas-venting layer will be constructed of sand below the compacted clay layer. Refer to Figure 3-4 for an illustration of this process option.

As per 6 NYCRR, Section 360, Subpart 2.13(w), alternative individual components of the final cover system that meet the equivalent design provisions may also be considered.

Evaluation

Implementability: Process Option LF-2a is moderately difficult to difficult to implement at the Site. A significant amount of care must be taken when installing the geosynthetic materials present in the cap to minimize damage to these materials. This process option is commercially available.

Effectiveness: Process Option LF-2a is considered an effective solution for reducing infiltration through the cap. The surface/protective layer provides adequate protection against the effects of freeze/thaw cycles. The geotextile layer provides a deterrent to burrowing animals. This cap is also considered effective for collection and management of both infiltrating surface water and landfill gas trapped beneath the cap.

This process option is effective in providing long-term protection from contact with the landfill contents and soils, reduces the exposure threats, and attains ARARs for cap design.

Relative Cost: The relative cost of the capping system in Process Option LF-2a is moderate to high as compared to other capping process options due to costs associated with the low permeability clay.

Process Option LF-2a is not retained for further consideration because of the relatively high costs compared to other available options that are equally effective and implementable.

3.6.7 Process Option LF-2b: NYSDEC Solid Waste Management Facility Cap (modified)

Description

Process Option LF-2b is identical to Process Option LF-2a except that the compacted clay barrier layer is replaced with a geomembrane (Table 3-5). This geomembrane must have a minimum thickness of 40 mils and a water vapor transmission rate of not more than 0.03 grams per meter squared per day according to NYSDEC regulations. Refer to Figure 3-5 for an illustration of this process option.

As per 6 NYCRR, Section 360, Subpart 2.13(w), alternative individual components of the final cover system that meet the equivalent design provisions may also be considered.

Evaluation

Implementability: Process Option LF-2b is moderately difficult to difficult to implement at the Site. A significant amount of care must be taken when installing the geosynthetic materials to minimize damage. This process option is commercially available.

Effectiveness: Process Option LF-2b is considered effective for reducing infiltration through the cap. The surface/protective layer provides adequate protection against the effects of freeze/thaw cycles. The geotextile layer provides a deterrent to burrowing animals. The cap is also considered effective for collection of both infiltrating surface water and landfill gas trapped beneath the cap.

This process option is effective in providing long-term protection from contact with the landfill contents and soils, reduces exposure threats, and attains ARARs for cap design.

Relative Cost: The relative cost of Process Option LF-2b is moderate as compared to other capping process options.

Process Option LF-2b is retained for further consideration.

3.6.8 Process Option LF-3: NYSDEC Solid Waste Management Facility Cap (modified)

Description

Process Option LF-3 is a combination of Process Option LF-1b and LF-2b. Portions of the landfill that are level would be capped effectively using process option LF-1b which does not include a drainage layer. Sloped portions of the landfill, where stability is a concern, would be capped using process option LF-2b which includes a drainage layer.

As per 6 NYCRR, Section 360, Subpart 2.13(w), alternative individual components of the final cover system that meet the equivalent design provisions may also be considered.

Evaluation

Implementability: Process Option LF-3 is moderately difficult to difficult to implement at the Site. A significant amount of care must be taken when installing the geosynthetic materials to minimize damage to the materials. This process option is commercially available.

Effectiveness: Process Option LF-3 is considered effective for reducing infiltration through the cap. The surface/protective layer provides adequate protection against the effects of freeze/thaw cycles. The geotextile layer provides a deterrent to burrowing animals. The cap is also considered effective for collection of both infiltrating surface water and landfill gas trapped beneath the cap.

This process option is effective in providing long-term protection from contact with the landfill contents and soils, reduces exposure threats, and attains ARARs for cap design.

Relative Cost: The relative cost of Process Option LF-3 is moderate as compared to other capping process options.

Process Option LF-3 is retained for further consideration.

3.6.9 Process Option S-NA/LA: No Action/Limited Action for Sediment

Description

The No Action process option is evaluated as per the requirements of the NCP. Under this option, the current status of the impacted sediments would not be modified (Table 3-6).

Evaluation

Implementability: No Action/Limited Action is implementable.

Effectiveness: No action will not reduce the potential for the transport of contaminants. Limited actions (fencing, deed restrictions) could reduce the potential for human exposure to constituents of concern, but does not reduce the potential for ecological exposure. No action option does not meet the remedial action objectives for the site.

Relative Cost: There are minimal costs associated with this option.

Process Option S-NA/LA is retained as required by the NCP, but it does not meet the remedial action objectives for the site. Limited action (access restrictions) may be required for certain process options.

3.6.10 Process Option S-1: In-situ Capping of Sediment

Description

Sediment capping consists of covering submerged sediments with stable layers of sediment, gravel, rock and/or synthetic materials (Table 3-6).

Evaluation

Implementability: Process option S-1 is moderately difficult to implement. Steep slopes along the east shore of West Pond will have to be graded to allow equipment access.

Effectiveness: Capping would be effective in minimizing the potential for human and ecological exposure to contaminated sediments. Placing the first layer of capping material can suspend sediment in the water column thereby resulting in off-site movement of contamination. Therefore, measures would be needed to minimize off-site impacts during construction. Strong currents during storm events can displace capping materials and reduce effectiveness. Long-term monitoring and maintenance is required to ensure the integrity of the cap.

Relative Cost: Construction costs for this option are relatively low. However, maintenance costs raise the overall costs to moderate to high.

Process Option S-1 is retained for further consideration.

3.6.11 Process Option S-2a: Dredging of Sediment and On-site Disposal

Description

This option involves the excavation (dredging) and dewatering of contaminated sediment and placement of the sediment under the landfill cap (Table 3-6).

Evaluation

Implementability: Process option S-2a is moderately difficult to implement. Steep slopes along the east shore of West Pond will have to be graded to allow equipment access.

Effectiveness: This option will effectively eliminate the potential for human and ecological exposure to contaminated sediment. Dredging operations can suspend sediment in the water column thereby resulting in off-site movement of contamination. Therefore, measures would be needed to minimize off-site impacts during dredging.

Relative Cost: Costs for this option are moderate. Maintenance cost would be included with maintenance of the landfill cap.

Process Option S-2a is retained for further consideration.

3.6.12 Process Option S-2b: Dredging of Sediment and Off-site Disposal

Description

This option involves the excavation (dredging) and dewatering of contaminated sediment and disposal at a regulated off-site disposal facility (Table 3-6).

Evaluation

Implementability: Process option S-2b is moderately difficult to implement. Steep slopes along the east shore of West Pond will have to be graded to allow equipment access.

Effectiveness: This option will effectively eliminate the potential for human and ecological exposure to contaminated sediment. Dredging operations can suspend sediment in the water column thereby resulting in off-site movement of contamination. Therefore, measures would be needed to minimize off-site impacts during dredging.

Relative Cost: Costs for this option are relatively high because of disposal fees. There are no maintenance costs associated with this option.

Process Option S-2b is not retained for further consideration because the costs are relatively high compared to other equally effective available options (on-site disposal).

3.6.13 Process Option S-3: In-situ Treatment of Sediment

Description

This option involves solidification or stabilization of sediments using chemicals or cements. Biological treatment methods are generally not effective against inorganics.

Evaluation

Implementability: Process option S-3 is moderately difficult to implement. Steep slopes along the east shore of West Pond will have to be graded to allow equipment access.

Effectiveness: There is generally poor control of the treatment process, which may result in non-uniform application of the chemicals. Mixing of the treatment chemicals with the water column may affect surface water quality. The use of stabilizing cements would affect the pH of sediment and surface water.

Relative Cost: Costs for this option are moderate.

Process Option S-3 is not retained for further consideration because of its uncertain effectiveness and potential impacts to ecological habitat.

3.6.14 Process Option GW-NA/LA: No Action/Limited Action for Groundwater

Description

The No Action process is evaluated as per the requirements of the NCP. Under this option, no remedial groundwater actions would be implemented. Limited Action includes institutional controls to prevent use of groundwater as a potable water source (Table 3-7).

Evaluation

Implementability: Institutional controls are readily available and there are no technical constraints to restrict implementation of this alternative. Institutional controls can be imposed quickly.

Effectiveness: Institutional controls ensure that impaired groundwater is not used as a potable water source. Institutional controls are not effective in reducing the level or mobility of contamination in the shallow groundwater at the site. However, concentrations are expected to decrease over time as a result of physical, chemical, and biological natural processes and due to reduced infiltration afforded by the landfill cap.

Relative Cost: The relative cost of this option is low.

Process Option GW-NA/LA is retained as required by the NCP.

3.6.15 Process Option GW-T1: Monitoring and Institutional Controls for Groundwater

Description

This process option includes long-term groundwater monitoring and institutional controls to prevent use of the groundwater as a potable water source (Table 3-7).

Evaluation

Implementability: Monitoring is readily available and there are no technical constraints to restrict implementation of this alternative. Monitoring can be provided quickly.

Effectiveness: Monitoring in itself is not effective in reducing the level of contamination in the shallow groundwater at the site, although concentrations are expected to decrease over time as a result of physical, chemical, and biological natural processes, and due to reduced infiltration afforded by the landfill cap.. The monitoring data generated will be used to document the effectiveness of the cap and remedial program, to track the quality of the shallow groundwater, to identify potential impacts to off-site receptors, and to determine if additional remedial action is necessary in the future to eliminate any significant threat.

Relative Cost: The relative cost for this option is moderate.

Long term groundwater monitoring and institutional controls are the preferred alternative for groundwater.

4.1 ASSEMBLING OF ALTERNATIVES

This section of the FS report combines the technology process options retained after screening in Section 3 to produce comprehensive site-wide remedial action alternatives that meet the remedial action objectives for the Site. The output of this chapter is a listing of several alternatives potentially applicable for site remediation. These alternatives undergo detailed analysis in Section 4.2.

The development of alternatives is summarized in Table 4-1 and discussed below.

Alternative 1 is the No Action alternative. This alternative does not meet the remedial objectives for the site, but is an alternative that is required by the NCP. This alternative serves as basis for a comparison with other alternatives in the detailed anlaysis.

Alternaitve 2 is a modified NYSDEC Solid Waste Management Facility (SWMF) single barrier cap (LF-2b), a sediment cap (S-1), and groundwater institutional controls and monitoring.

Alternative 3 is a modified NYSDEC SWMF single barrier cap (LF-2b), on-site sediment disposal (S-2a), and groundwater institutional controls and monitoring.

Alternative 4 is a modified NYSDEC SWMF single barrier cap (LF-3), a sediment cap (S-1), and groundwater institutional controls and monitoring.

Alternative 5 is a modified NYSDEC SWMF single barrier cap (LF-3), on-site sediment disposal (S-2a), and groundwater institutional controls and monitoring.

4.2 ANALYSIS OF ALTERNATIVES

In this section, each of the alternatives described above is evaluated against seven primary evaluation criteria as follows:

- Compliance with ARARs
- Protection of human health and the environment
- Short-term effectiveness
- Long-term effectiveness and permanence
- Reduction of toxicity, mobility or volume
- Implementability
- Cost

4.2.1 Alternative 1 No Action/Limited Action

4.2.1.1 Description of Alternative 1

Remedial Alternative 1 constitutes the no action/limited action alternative. This option involves institutional controls for the Site including:

- Long-term analytical monitoring of the media of concern including groundwater, sediment and soil;
- Deed restrictions limiting future site usage
- Institutional controls restricting groundwater usage
- Fencing and postings to limit access to the site.

4.2.1.2 Alternative 1 Compliance with ARARs

This alternative does not meet NYS ARARs for landfill closure (6 NYCRR 360). Under these regulations, landfill closure must include in-place capping and closure. This alternative also does not meet ARARs for sediment. If the no action/limited action option is implemented exceedances of chemical-specific ARARs for groundwater would continue.

4.2.1.3 Alternative 1 Protection of Human Health and the Environment

The site poses unacceptable risks to human health (for on-site exposures only) and the environment under current conditions. If this alternative is implemented, contaminated surface soil could be carried by storm-water runoff to surrounding surface water bodies and contaminated sediment could potentially migrate off site. Also, if the institutional controls are not enforced, unrestricted use of the site could occur. The residual risks posed by the site after implementation of this alternative would only be slightly reduced.

4.2.1.4 Alternative 1 Short-term Effectiveness

Implementation of this alternative will have little to no overall short-term impacts. Minimal short-term impacts may be associated with installing fencing on the site. Personal protective equipment as specified by the site-specific health and safety plan (HASP) would control exposure of workers. The time to complete this alternative is about one month following the receipt of all required approvals.

4.2.1.5 Alternative 1 Long-term Effectiveness and Permanence

The long-term effectiveness and permanence of this alternative is poor. Transport of contaminants via runoff and surface water transport would continue to occur. Risks to trespassers from direct contact and other pathways will remain.

4.2.1.6 Alternative 1 Reduction of Toxicity, Mobility or Volume

This alternative does not reduce the toxicity, mobility, or volume of contamination at the site. No mass or volume of contaminated material will be contained, treated or destroyed. Residual contamination will remain on site.

4.2.1.7 Alternative 1 Implementability

This remedial alternative is readily implementable, assuming deed restrictions are easily obtainable. The estimated time of implementation is short (about one month after the necessary approvals are obtained).

4.2.1.8 Alternative 1 Cost

The cost for this alternative is estimated at $503,260 in 2005 dollars based on a present worth analysis. The cost breakdown for the activities which comprise this alternative is presented in Table 4-2.

4.2.2 Alternative 2

4.2.2.1 Description of Alternative 2

Remedial Alternative 2 includes the following elements:

- Surface protective layer
- Drainage layer
- Geomembrane barrier
- Sand gas vent layer
- Sediment cap (in place)
- Groundwater monitoring
- Institutional controls for landfill, sediment remediation areas and groundwater

See Figure 3-5 for a diagram of this landfill cap configuration.

4.2.2.2 Alternative 2 Compliance with ARARs

This landfill cap fulfills the requirements under 6 NYCRR Part 360 regulations. Therefore, this capping option meets the ARARs for landfill closure.

Groundwater ARARs will not immediately be met since treatment is not included in this alternative. However, with the addition of the barrier in the Part 360 cap, infiltration of precipitation through the waste mass will be reduced such that it is expected that future impact to groundwater, if any, will be greatly reduced. Further, it is expected that groundwater quality will be restored over time.

4.2.2.3 Alternative 2 Protection of Human Health and the Environment

Placement of a landfill cap will be protective of human health and the environment by preventing direct contact with the soil/waste. The cap will also eliminate erosion of the soil/waste and subsequent transport to adjacent surface water.

The geomembrane will restrict penetration by burrowing animals and reduce the amount of infiltration of water through the waste which will reduce potential impacts to groundwater.

Placement of a sediment cap will be protective of human health and the environment by preventing direct contact with impacted sediment. The sediment cap will also eliminate erosion of the sediment and subsequent downstream transport.

Groundwater monitoring and institutional controls will protect human health and the environment by restricting use of the impaired groundwater, protecting people from exposure to the site, and assessing the effectiveness of the remedial action program.

4.2.2.4 Alternative 2 Short-term Effectiveness

Short-term impacts associated with placement of the landfill cap are expected to be minimal. Exposure of workers and on-site personnel is expected to occur only at the outset of construction activities, prior to placement of the final grading layer. Health and safety practices outlined in a Site-specific Health and Safety Plan for the site would be strictly followed to control this exposure. Exposure to dust will be controlled by appropriate use of personnel protective equipment and dust control systems.

Short-term impacts associated with placement of the sediment cap could be significant. Proper construction techniques will be imperative to minimize potential off-site impacts from suspended sediment during construction. Similarly, proper construction techniques will be needed to minimize potential impacts to surrounding areas due to drainage alteration.

There are no short-term impacts associated with groundwater monitoring and institutional controls.

4.2.2.5 Alternative 2 Long-term Effectiveness and Permanence

The landfill cap is expected to maintain its effectiveness in the long-term. The addition of a drainage layer makes this cap stable for both sloped and non-sloped areas.

A complete program for maintenance of the recommended cap will be required for the post-closure period. This maintenance program will involve monthly inspection and repair as necessary. Settlement of the landfill is expected to be minimal given the nature and age of the waste materials, but will also need to be monitored by periodic surveys.

The sediment cap is susceptible to erosion which would reduce its effectiveness. A maintenance program will be required for post-closure. However, maintenance cannot prevent catastrophic storm events from potentially impacting the integrity of the sediment cap.

Groundwater monitoring and institutional controls are expected to be effective in the long-term.

4.2.2.6 Alternative 2 Reduction of Toxicity, Mobility or Volume

Installation of the landfill and sediment caps will not reduce the toxicity or volume of impacted media. Both will, however, reduce the mobility of constituents by eliminating erosion.

The geomembrane will reduce the mobility of landfill constituents by reducing infiltration and groundwater impacts.

Groundwater monitoring and institutional controls will not in and of themselves reduce the toxicity, mobility or volume of impacted groundwater.

4.2.2.7 Alternative 2 Implementability

Construction of the landfill cap is expected to be moderately difficult to implement given the steep side slopes along the western boundary, and the potential need to regrade the current surface of the landfill. Technologies associated with this cap option are readily available and fully demonstrated. Standard construction practices will be followed with implementation of appropriate health and safety protection measures. Quality control during construction will be very important since the effectiveness of the cap to reduce infiltration will depend on the quality of the finished cap.

Construction of the sediment cap is expected to be moderately difficult to implement given the need to minimize potential downstream impacts from suspended sediment.

Groundwater monitoring and institutional controls are expected to be easy to implement. Limitations may include gaining permission for off-site access.

4.2.2.8 Alternative 2 Cost

The cost for this alternative is estimated $6,409,700 in 2005 dollars based on present worth analysis. The cost breakdown for the activities that comprise this alternative is presented in Table 4-3.

4.2.3 Alternative 3

4.2.3.1 Description of Alternative 3

Remedial Alternative 3 includes the following elements:

- Surface protective layer
- Drainage layer
- Geomembrane barrier
- Sand gas vent layer
- Sediment excavation and on-site disposal
- Groundwater monitoring
- Institutional controls for landfill and groundwater

See Figure 3-5 for a diagram of this landfill cap configuration.

4.2.3.2 Alternative 3 Compliance with ARARs

This landfill cap fulfills the requirements under 6 NYCRR Part 360 regulations. Therefore, this capping option meets the ARARs for landfill closure.

Groundwater ARARs will not immediately be met since treatment is not included in this alternative. However, with the addition of the barrier in the Part 360 cap, infiltration of precipitation through the waste mass will be reduced such that it is expected that future impact to groundwater, if any, will be greatly reduced. Further, it is expected that groundwater quality will be restored over time.

4.2.3.3 Alternative 3 Protection of Human Health and the Environment

Placement of a landfill cap will be protective of human health and the environment by preventing direct contact with the soil/waste. The cap will also eliminate erosion of the soil/waste and subsequent transport to adjacent surface water.

The geomembrane will restrict penetration by burrowing animals and reduce the amount of infiltration of water through the waste which will reduce potential impacts to groundwater.

Removal of impacted sediment will be protective of human health and the environment by eliminating exposure by direct contact with impacted sediment and potential downstream transport.

Groundwater monitoring and institutional controls will protect human health and the environment by restricting use of the impaired groundwater, protecting people from exposure to the site, and assessing the effectiveness of the remedial action program.

4.2.3.4 Alternative 3 Short-term Effectiveness

Short-term impacts associated with placement of the landfill cap are expected to be minimal. Exposure of workers and on-site personnel is expected to occur only at the outset of construction activities, prior to placement of the final grading layer. Health and safety practices outlined in a Site-specific Health and Safety Plan for the site would be strictly followed to control this exposure. Exposure to dust will be controlled by appropriate use of personnel protective equipment and dust control systems.

Short-term impacts associated with the excavation of sediment could be significant. Proper construction techniques will be imperative to minimize potential off-site impacts from suspended sediment during construction.

There are no short-term impacts associated with groundwater monitoring and institutional controls.

4.2.3.5 Alternative 3 Long-term Effectiveness and Permanence

The landfill cap is expected to maintain its effectiveness in the long-term. The addition of a drainage layer makes this cap stable for both sloped and non-sloped (level) areas.

A complete program for maintenance of the recommended cap will be required for the post-closure period. This maintenance program will involve monthly inspection and repair as necessary. Settlement of the landfill is expected to be minimal given the nature and age of the waste materials, but will also need to be monitored by periodic surveys.

The on-site disposal of impacted sediment beneath the landfill cap is effective in the long term as it will be protected under the maintenance program for the landfill cap.

Groundwater monitoring and institutional controls are expected to be effective in the long-term.

4.2.3.6 Alternative 3 Reduction of Toxicity, Mobility or Volume

Installation of the landfill cap and placement of impacted sediment beneath the cap will not reduce the toxicity or volume of impacted media. Both will, however, reduce the mobility of constituents by eliminating erosion.

The geomembrane will reduce the mobility of landfill constituents by reducing infiltration and groundwater impacts.

Groundwater monitoring and institutional controls will not in and of themselves reduce the toxicity, mobility or volume of impacted groundwater.

4.2.3.7 Alternative 3 Implementability

Construction of the landfill cap is expected to be moderately difficult to implement given the steep side slopes along the western boundary, and the potential need to regrade the current surface of the landfill. Technologies associated with this cap option are readily available and fully demonstrated. Standard construction practices will be followed with implementation of appropriate health and safety protection measures. Quality control during construction will be very important since the effectiveness of the cap to reduce infiltration will depend on the quality of the finished cap.

Excavation of impacted sediment is expected to be moderately difficult to implement given the need to minimize potential downstream impacts from suspended sediment.

Groundwater monitoring and institutional controls are expected to be easy to implement. Limitations may include gaining permission for off-site access.

4.2.3.8 Alternative 3 Cost

The cost for this alternative is estimated $6,150,171 in 2005 dollars based on present worth analysis. The cost breakdown for the activities that comprise this alternative is presented in Table 4-4.

4.2.4 Alternative 4

4.2.4.1 Description of Alternative 4

Alternative 4 uses a combination of landfill cap option 1b with no drainage layer on level areas of the landfill, and landfill cap option 2b with a drainage layer on slopes.

- Surface protective layer
- Drainage layer (slopes only)
- Geomembrane barrier
- Sand gas vent layer
- Sediment cap (in place)
- Groundwater monitoring
- Institutional controls for landfill, sediment remediation areas and groundwater

4.2.4.2 Alternative 4 Compliance with ARARs

This landfill cap fulfills the requirements under 6 NYCRR Part 360 regulations. Therefore, this capping option meets the ARARs for landfill closure.

Groundwater ARARs will not immediately be met since treatment is not included in this alternative. However, with the addition of the barrier in the Part 360 cap, infiltration of precipitation through the waste mass will be reduced such that it is expected that future impact to groundwater, if any, will be greatly reduced. Further, it is expected that groundwater quality will be restored over time.

4.2.4.3 Alternative 4 Protection of Human Health and the Environment

Placement of a landfill cap will be protective of human health and the environment by preventing direct contact with the soil/waste. The cap will also eliminate erosion of the soil/waste and subsequent transport to adjacent surface water.

The geomembrane will restrict penetration by burrowing animals and reduce the amount of infiltration of water through the waste which will reduce potential impacts to groundwater.

Placement of a sediment cap will be protective of human health and the environment by preventing direct contact with impacted sediment. The sediment cap will also eliminate erosion of the sediment and subsequent downstream transport.

Groundwater monitoring and institutional controls will protect human health and the environment by restricting use of the impaired groundwater, protecting people from exposure to the site, and assessing the effectiveness of the remedial action program.

4.2.4.4 Alternative 4 Short-term Effectiveness

Short-term impacts associated with placement of the landfill cap are expected to be minimal. Exposure of workers and on-site personnel is expected to occur only at the outset of construction activities, prior to placement of the final grading layer. Health and safety practices outlined in a Site-specific Health and Safety Plan for the site would be strictly followed to control this exposure. Exposure to dust will be controlled by appropriate use of personnel protective equipment and dust control systems.

Short-term impacts associated with placement of the sediment cap could be significant. Proper construction techniques will be imperative to minimize potential off-site impacts from suspended sediment during construction. Similarly, proper construction techniques will be needed to minimize potential impacts to surrounding areas due to drainage alteration.

There are no short-term impacts associated with groundwater monitoring and institutional controls.

4.2.4.5 Alternative 4 Long-term Effectiveness and Permanence

The landfill cap is expected to maintain its effectiveness in the long-term. Cap option 1b with no drainage layer will be stable on level portions of the landfill. Cap option 2b, with a drainage layer, will provide stability on landfill slopes.

A complete program for maintenance of the recommended cap will be required for the post-closure period. This maintenance program will involve monthly inspection and repair as necessary. Settlement of the landfill is expected to be minimal given the nature and age of the waste materials, but will also need to be monitored by periodic surveys.

The sediment cap is susceptible to erosion which would reduce its effectiveness. A maintenance program will be required for post-closure. However, maintenance cannot prevent catastrophic storm events from potentially impacting the integrity of the sediment cap.

Groundwater monitoring and institutional controls are expected to be effective in the long-term.

4.2.4.6 Alternative 4 Reduction of Toxicity, Mobility or Volume

Installation of the landfill and sediment caps will not reduce the toxicity or volume of impacted media. Both will, however, reduce the mobility of constituents by eliminating erosion.

The geomembrane will reduce the mobility of landfill constituents by reducing infiltration and groundwater impacts.

Groundwater monitoring and institutional controls will not in and of themselves reduce the toxicity, mobility or volume of impacted groundwater.

4.2.4.7 Alternative 4 Implementability

Construction of the landfill cap is expected to be moderately difficult to implement given the steep side slopes along the western boundary, and the potential need to regrade the current surface of the landfill. Technologies associated with this cap option are readily available and fully demonstrated. Standard construction practices will be followed with implementation of appropriate health and safety protection measures. Quality control during construction will be very important since the effectiveness of the cap to reduce infiltration will depend on the quality of the finished cap.

Construction of the sediment cap is expected to be moderately difficult to implement given the need to minimize potential downstream impacts from suspended sediment.

Groundwater monitoring and institutional controls are expected to be easy to implement. Limitations may include gaining permission for off-site access.

4.2.4.8 Alternative 4 Cost

The cost for this alternative is estimated $5,719,292 in 2005 dollars based on present worth analysis. The cost breakdown for the activities that comprise this alternative is presented in Table 4-5.

4.2.5 Alternative 5

4.2.5.1 Description of Alternative 5

Alternative 5 uses a combination of landfill cap option 1b with no drainage layer on level areas of the landfill, and landfill cap option 2b with a drainage layer on slopes.

- Surface protective layer
- Drainage layer (slopes only)
- Geomembrane barrier
- Sand gas vent layer
- Sediment excavation and on-site disposal
- Groundwater monitoring

- Institutional controls for landfill and groundwater

4.2.5.2 Alternative 5 Compliance with ARARs

This landfill cap fulfills the requirements under 6 NYCRR Part 360 regulations. Therefore, this capping option meets the ARARs for landfill closure.

Groundwater ARARs will not immediately be met since treatment is not included in this alternative. However, with the addition of the barrier in the Part 360 cap, infiltration of precipitation through the waste mass will be reduced such that it is expected that future impact to groundwater, if any, will be greatly reduced. Further, it is expected that groundwater quality will be restored over time.

4.2.5.3 Alternative 5 Protection of Human Health and the Environment

Placement of a landfill cap will be protective of human health and the environment by preventing direct contact with the soil/waste. The cap will also eliminate erosion of the soil/waste and subsequent transport to adjacent surface water.

The geomembrane will restrict penetration by burrowing animals and reduce the amount of infiltration of water through the waste which will reduce potential impacts to groundwater.

Removal of impacted sediment will be protective of human health and the environment by eliminating exposure by direct contact with impacted sediment and potential downstream transport.

Groundwater monitoring and institutional controls will protect human health and the environment by restricting use of the impaired groundwater, protecting people from exposure to the site, and assessing the effectiveness of the remedial action program.

4.2.5.4 Alternative 5 Short-term Effectiveness

Short-term impacts associated with placement of the landfill cap are expected to be minimal. Exposure of workers and on-site personnel is expected to occur only at the outset of construction activities, prior to placement of the final grading layer. Health and safety practices outlined in a Site-specific Health and Safety Plan for the site would be strictly followed to control this exposure. Exposure to dust will be controlled by appropriate use of personnel protective equipment and dust control systems.

Short-term impacts associated with the excavation of sediment could be significant. Proper construction techniques will be imperative to minimize potential off-site impacts from suspended sediment during construction.

There are no short-term impacts associated with groundwater monitoring and institutional controls.

4.2.5.5 Alternative 5 Long-term Effectiveness and Permanence

The landfill cap is expected to maintain its effectiveness in the long-term. Cap option 1b with no drainage layer will be stable on level portions of the landfill. Cap option 2b, with a drainage layer, will provide stability on landfill slopes.

A complete program for maintenance of the recommended cap will be required for the post-closure period. This maintenance program will involve monthly inspection and repair as necessary. Settlement of the landfill is expected to be minimal given the nature and age of the waste materials, but will also need to be monitored by periodic surveys.

The on-site disposal of impacted sediment beneath the landfill cap is effective in the long term as it will be protected under the maintenance program for the landfill cap.

Groundwater monitoring and institutional controls are expected to be effective in the long-term.

4.2.5.6 Alternative 5 Reduction of Toxicity, Mobility or Volume

Installation of the landfill cap and placement of impacted sediment beneath the cap will not reduce the toxicity or volume of impacted media. Both will, however, reduce the mobility of constituents by eliminating erosion.

The geomembrane will reduce the mobility of landfill constituents by reducing infiltration and groundwater impacts.

Groundwater monitoring and institutional controls will not in and of themselves reduce the toxicity, mobility or volume of impacted groundwater.

4.2.5.7 Alternative 5 Implementability

Construction of the landfill cap is expected to be moderately difficult to implement given the steep side slopes along the western boundary, and the potential need to regrade the current surface of the landfill. Technologies associated with this cap option are readily available and fully demonstrated. Standard construction practices will be followed with implementation of appropriate health and safety protection measures. Quality control during construction will be very important since the effectiveness of the cap to reduce infiltration will depend on the quality of the finished cap.

Excavation of impacted sediment is expected to be moderately difficult to implement given the need to minimize potential downstream impacts from suspended sediment.

Groundwater monitoring and institutional controls are expected to be easy to implement. Limitations may include gaining permission for off-site access.

4.2.5.8 Alternative 5 Cost

The cost for this alternative is estimated $5,459,762 in 2005 dollars based on present worth analysis. The cost breakdown for the activities that comprise this alternative is presented in Table 4-6.

5.1 INTRODUCTION

Section 4 of the FS Report evaluated five remedial alternatives for the Site. The remedial alternatives were developed consistent with the contemplated and intended end use of the Site – i.e. non-residential end use. The alternatives consisted of combinations of three landfill caps and two sediment remediation options. All of the alternatives include groundwater monitoring and institutional controls. The barrier in the landfill cap will reduce infiltration through the waste mass. This reduction in infiltration, when coupled with the physical, chemical and biological natural processes at the site, are expected to improve the quality of the groundwater and, over time, achieve the groundwater ARARs.

Two capping options were considered. Capping option 2b consists of a surface protective layer, geomembrane barrier, a gas vent layer, and a drainage layer. The second capping option (LF-3) considers a combination of the 2b cap and the 1b cap which has no drainage layer. The type of cap for a given area would be selected based on the slope of the area.

Two options were considered for sediment – in-place capping and excavation and placement under the landfill cap.

5.2 SUMMARY OF ALTERNATIVES ANALYSIS

Compliance with ARARs

Alternatives 2 through 5 are equally effective with regard to ARARs compliance. Alternative 1 does not meet ARARs

Protection of Human Health and the Environment

Alternatives 2 through 5 are equally effective with regard to protection of human health and the environment. Alternative 1 is not protective of human health or the environment.

Short-term Effectiveness

Alternative 1 has the least short-term impact. Alternatives 2 through 5 have comparable short-term impacts.

Long-term effectiveness and Permanence

Alternative 1 has poor effectiveness. For the remaining alternatives, those with excavation and on-site sediment disposal and a landfill cap with drainage on sloped areas have the greatest permanence and long-term effectiveness (Alternatives 3 and 5)

Reduction of Toxicity Mobility or Volume

Alternative 1 offers no reduction of toxicity, mobility or volume. Alternatives 2 through 5 are comparable with regard to reduction of toxicity, mobility and volume.

Implementability

Alternative 1 is easily implementable. Alternatives 2 through 5 are moderately difficult to implement.

Costs

The lowest costs are associated with Alternative 1, the No Action Alternative (Table 5-1). Variations in costs associated with Alternative 2 through 5 are primarily due to increased costs associated with construction of a drainage layer. Alternatives 4 and 5, with a drainage layer on sloped areas only have the lowest capping cost. Alternatives 2 and 3, with a drainage layer throughout the cap, have the highest capping cost.

5.3 RECOMMENDED ALTERNATIVE

Based on the alternatives analysis results, Alternative 1, the No Action/Limited Action alternative does not meet most of the evaluation criteria and is, therefore rejected. The remaining alternatives are similar when compared to the evaluation criteria. Alternatives 3 and 5 are preferable in terms of long-term effectiveness and permanence because of the on-site placement of impacted sediment, and the incorporation of a drainage layer into the landfill cap. Because Alternative 5 uses judicious placement of the cap drainage layer on slopes, it is less costly than Alternative 3, while being equally effective. Therefore, Alternative 5 is the recommended alternative for the Site. Alternative 5 consists of the following components:

- Landfill cap –
  Surface protective layer
  Drainage layer (slopes only)
  Geomembrane barrier
  Sand gas vent layer
- Sediment excavation and on-site placement under the landfill cap
- Groundwater monitoring
- Monitoring and maintenance of the landfill cap
- Institutional controls for landfill (deed restrictions and fencing)
- Institutional controls for groundwater (use restrictions)

5.4 CONCEPTUAL DESIGN AND FUTURE LAND USE

A preliminary conceptual design for the configuration of the preferred remedy is presented in Figure 5-1. This figure shows the anticipated areas to be capped and the area where excavated sediment will be placed.

It is anticipated that the existing helicopter pad and propane storage facility will be demolished prior to construction of the cap. The helicopter pad is no longer in use. If the propane.storage facility is to continue operations, the cap will be constructed so as to seal the barrier layer around the tank cradle. Thus, the presence of the tank will not impair the integrity of the cap.

Future land use is currently being considered. Options being evaluated include slab-on-grade commercial, municipal or light industrial use buildings and associated parking areas. Where the slab foundation and asphalt are placed, they will be used as a substitute for the surface/protective layer of the landfill cap. As such, the low permeability layer and gas vent layer will exist under the buildings and pavement, and the integrity of the cap will be maintained.

5.5 SITE MANAGEMENT PLAN

In order to ensure that the engineering controls remain in place and effective, a Site Management Plan (SMP) will be developed and implemented. The SMP will include the following elements:

1. A plan for long-term groundwater monitoring.
2. A plan for maintenance of the landfill cap.
3. A plan to manage any development of buildings on the surface that would result in excavation into the cap and/or waste.
4. Prohibition of future residential use through deed restrictions or other institutional controls.
5. Prohibition against the use of groundwater as a source of potable or process water without necessary water treatment through institutional controls.

The SMP will require that an Institutional Controls/Engineering Controls (IC/EC) certification be submitted annually, or as specified by NYSDEC. The IC/ED would document that the institutional and engineering controls are unchanged and continue to protect public health and the environment.

5.6 ENVIRONMENTAL EASEMENT

It will be necessary for an Environmental Easement to be recorded on the property by the property owner. An Environmental Easement is an enforceable means of ensuring the performance of operation, maintenance, and monitoring requirements and restricting future land use. It is a legal agreement between the property owner and the people of the State of New York which designates the property as a Controlled Property. The Environmental Easement will ensure compliance with the Site Management Plan including the IC/EC certification. The areas of the site proposed for designation as the Controlled Property in the Environmental Easement are depicted in Figure 5-2.

Tables

Table 3-1
Amenia Town Landfill FS
Comparison of Inorganics in Sediment to Health-Based Criteria and Background Concentrations

Parameter	Surface Sediments Maximum Concentration	Upstream Sediment Max. Concentration	Eastern US Background*	NYSDEC Recommended Cleanup Level*	Region III Non-residential Soil	Region VI Non-residential Soil	Region IX Non-residential Soil
Inorganics	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
Aluminum	13,900	10,400	33,000	background	1,000,000	100,000	100,000
Antimony	7.6	< 2.2	NA	background	410	450	NA
Arsenic	23	8.4	3-12 (NY Bkgd)	7.5	1.9	1.8	1.6
Barium	224	44.4	15-600	300	72,000	79,000	67,000
Beryllium	3.5	2.1	0-1.75	0.16	2,000	2,200	1,900
Cadmium	3.2	0.15	0.1-1	10	NA	560	450
Calcium	157,000	10,800	130-35,000 (NY Bkgd)	background	NA	NA	NA
Chromium	20	12.8	1.5-40 (NY Bkgd)	50	3,100	71	64
Cobalt	124	29.1	2.5-60 (NY Bkgd)	30	20,000	2,100	1,900
Copper	166	28.7	1-50	25	41,000	42,000	41,000
Iron	112,000	76,700	2,000-550,000	2000	310,000	100,000	100,000
Lead	205	23	4-500	background	NA	800	750
Magnesium	10,200	9,010	100-5,000	background	NA	NA	NA
Manganese	5,070	1,630	50-5,000	background	20,000	35,000	19,000
Mercury	1.9	0.058	0.001-0.2	0.1	NA	340	310
Nickel	142	78.5	0.5-25	13	20,000	23,000	20,000
Potassium	1,700	1,130	8,500-43,000 (NY Bkgd)	background	NA	NA	NA
Selenium	9.5	1.4	0.1-3.9	2	5,100	5,700	5,100
Silver	5.4	0.18	NA	background	5,100	5,700	5,100
Sodium	307	100	6,000-8,000	background	NA	NA	NA
Thallium	12.2	7.1	NA	background	72	NA	67
Vanadium	26	11.8	1-300	150	310	1,100	7,200
Zinc	977	225	9-50	20	310,000	100,000	100,000
Cyanide	1.97	< 1.01	NA	background	20,000	14,000	12,000

*NYSDEC TAGM 4046, January 24, 1994

NA = Not available

Table 3-2
Amenia Town Landfill FS
Arsenic Concentrations in Shallow Sediment Samples

WEST POND SHALLOW SEDIMENT SAMPLES

Sample	SD-1	SD-2	SD-3	SD-4	SD-4C	SD-5	SD-6	SD-7	SD-8	SD-9	SD-10
Arsenic (mg/kg)	3.1	7.5	7.3	5.1	4.7	6.4	6.9	5.5	14.4	8.4	11.3

SD-11	SD-12	SD-13	SD-14	SD-15	SD-1-2	SD-2-2	SD-3-2	SD-4-2	SD-5-2	SD-6-2	SD-7-2
11.5	4.8	7.3	5.0	5.2	10.6	12.4	9.2	10.5	8.2	8.5	8.1

SD-8-2	SD-9-2	SD-10-2	SD-11-2	SD-12-2	SD-13-2	SD-14-2	SD-15-2	SD-9-3	SD-10-3	SD-11-3	SD-12-3
6.3	9.3	5.7	12.1	2.9	3.5	3.1	4.5	9.1	5.4	5.6	6.1

SD-13-3	SD-14-3	SD-15-3	West Pond Min.	West Pond Max.	West Pond Avg.
6.8	6.1	2.7	**2.7**	**14.4**	**7.1**

WEST POND TRIBUTARY SHALLOW SEDIMENT SAMPLES

Sample	SD-N1	SD-N2	SD-N3	SD-N4	SD-N5	SD-N6	SD-N7	SD-N8	West Pond Trib. Min.	West Pond Trib. Max.	West Pond Trib. Avg.
Arsenic (mg/kg)	4.4	4.3	6.3	7.2	9.1	6.1	6.1	6.0	**4.3**	**9.1**	**6.2**

OFF-SITE STREAM SHALLOW SEDIMENT SAMPLES

Sample	SD-OF1	SD-OF2	SD-OF3	SD-OF4	SD-OF4B*	SD-OF5	SD-OF6	Off-site Stream Min.	Off-site Stream Max.	Off-site Stream Avg.
Arsenic (mg/kg)	7.6	10.3	8.0	16.7	17.4	23.0	7.1	**7.1**	**23.0**	**12.9**

UPSTREAM SHALLOW SEDIMENT SAMPLES

Sample	SD-UP1	SD-UP2	SD-UP3	SD-UP4	Upstream Minimum	Upstream Maximum	Upstream Average
Arsenic (mg/kg)	8.4	6.7	7.2	5.9	**5.9**	**8.4**	**7.1**

Table 3-3

Remedial Action Objectives, General Response Actions, and Technology Types

Environmental Media	Remedial Action Objectives	General Response Actions	Technology Types
Soil/Waste	Minimize potential for human and ecological receptors to contact or ingest contaminated soil/waste and minimize off-site migration of soil/waste	No Action/ Limited Action	None/access restrictions
			Monitoring
		Containment	Capping
		[redacted]	[redacted]
Sediment	Minimize potential for human and ecological receptors to contact or ingest contaminated sediment and minimize potential for contaminated sediment to reach off-site receptors	No Action/ Limited Action	None/access restrictions
			Monitoring
		Containment	In-situ Capping
		Treatment/Disposal	Dredging and on-site disposal
			Dredging and off-site disposal
			In-situ treatment
Groundwater	Minimize potential for human and ecological receptors to contact contaminated groundwater	No Action/ Limited Action	None/Access restrictions
		Monitoring and Institutional Controls	Monitoring/Access restrictions

Shaded response actions or technologies are screened out for reasons stated.

Table 3-4
Process Options and Technical Implementability

Environmental Media	General Response Actions	Technology Types	Process Options	Screening Comments
Soil/Waste	No Action/ Limited Action	None/access restrictions	Posting, fencing, deed restrictions.	Easily implementable.
		Monitoring	Routine environmental sampling.	Easily implementable.
	Containment	Capping		
			Single barrier cap.	Moderately difficult to difficult to implement.
Sediment	No Action/ Limited Action	None/access restrictions	Posting, fencing, deed restrictions.	Easily implementable.
		Monitoring	Routine environmental sampling.	Easily implementable.
	Containment	In-situ Capping	Double barrier cap, single barrier cap, soil cap.	Moderately difficult to implement.
	Treatment/ Disposal	Dredging and on-site disposal	Mechanical, hydraulic, or pneumatic dredging and disposal under landfill cap.	Moderately difficult to implement.
		Dredging and off-site disposal	Mechanical, hydraulic, or pneumatic dredging and disposal off-site.	Moderately difficult to implement.
		In-situ treatment	Solidification/stabilization.	Moderately difficult to difficult to implement.
Groundwater	No Action/ Limited Action	None/Access restrictions	Deed restrictions.	Easily implementable
	Monitoring and Institutional Controls	Monitoring/Access restrictions	Routine environmental sampling and deed restrictions.	Easily implementable.

Table 3-5
Screening and Evaluation of Remedial Technologies and Process Options for Landfill Soil

General Response Actions	Remedial Technology	Process Options	Description	Implementability/Effectiveness/Cost
No Action/ Limited Action	Access restrictions	Posting, fencing, deed restrictions	Restrict use and limit access to landfill.	Easily implementable Partially effective -Limited actions could reduce the potential for human exposure to COPCs, but does not reduce the potential for ecological exposure. Effective in conjunction with other processes. Cost – low.
	Monitoring	Routine environmental sampling	Monitor conditions and migration of COPCs in landfill	Easily implementable Not effective – does not reduce exposure Cost – low
Containment	Capping, as per presumptive remedy	Single barrier cap	LF-1a NYSDEC SWMF Cap: surface protective layer, vent layer bounded by filter layers, and low permeability layer (Figure 3-2).	Moderately difficult to implement. Partially Effective- creates barrier to human and ecological exposure; side slope stability poor due to absence of drainage layer. Cost – moderate.
			LF-1b NYSDEC SWMF Cap: surface protective layer, vent layer bounded by filter layers, and geomembrane (Figure 3-3).	Moderately difficult to implement. Partially Effective- creates barrier to human and ecological exposure; side slope stability poor due to absence of drainage layer. Cost – moderate.
			LF-2a NYSDEC SWMF Cap (modified): surface protective layer, geonet drainage layer bounded by geotextille filter layer, low permeability clay layer, and geonet gas vent layer (Figure 3-4).	Moderately difficult to difficult to implement. Effective – creates barrier to human and ecological exposure. Cost – moderate to high.
			LF-2b NYSDEC SWMF Cap (modified): surface protective layer, geonet drainage layer bounded by geotextille filter layer, geomembrane, and geonet gas vent layer (Figure 3-5).	Moderately difficult to difficult to implement. Effective – creates barrier to human and ecological exposure. Cost – moderate.
			LF-3 NYSDEC SWMF Cap (modified): surface protective layer, geonet drainage layer bounded by geotextille filter layer (on slopes only), geomembrane, and geonet gas vent layer (Figure 3-6).	Moderately difficult to difficult to implement. Effective – creates barrier to human and ecological exposure. Cost – moderate.

Shaded Process Options are screened out based on relative implementability, effectiveness and/or cost.

Table 3-6
Screening and Evaluation of Remedial Technologies and Process Options for Sediment

General Response Actions	Remedial Technology	Process Options	Description	Implementability/Effectiveness/Cost
No Action/Limited Action	None/access restrictions	Posting, fencing, deed restrictions	S-NA/LA -No remediation (Required for consideration by NCP.) Restrict use and limit access to sediment area.	Implementable. Not effective – does not address potential for ecological exposure to sediment. Cost – low.
	Monitoring	Routine environmental sampling	S-NA/LA – Monitor concentrations and migration of COPCs in sediment.	Implementable. Not effective – would not eliminate potential for ecological exposure to sediment. Cost – moderate.
Containment	In-situ Capping	Soil (non-barrier) cap	S-1 – Cap submerged sediments with gravel, rock and/or synthetic material.	Implementable, but may cause permanent destruction of habitat. Effective – eliminates potential for ecological and human exposure to sediments. Cost – moderate to high because of long-term monitoring.
Treatment/ Disposal	Dredging and on-site disposal		S-2a - Dewater, grade and place under landfill cap.	Implementable, but may cause permanent destruction of habitat. Effective – eliminates potential for ecological and human exposure to sediments. Cost – moderate.
	Dredging and off-site disposal		S-2b – Dewater and dispose at off-site facility.	Implementable, but may cause permanent destruction of habitat. Effective – eliminates potential for ecological and human exposure to sediments. Cost – high.
	In-situ treatment	Solidification/ stabilization	S-2c – Treat sediment in place with chemicals or agents to encapsulate or immobilize PCBs and metals.	Implementable, but may cause permanent destruction of habitat. Effective – eliminates potential for ecological and human exposure to sediments. Cost – moderate.

Shaded Process Options are screened out based on relative implementability, effectiveness and/or cost.

Table 3-7
Screening and Evaluation of Remedial Technologies and Process Options for Groundwater

General Response Actions	Remedial Technology	Process Options	Description	Implementability/Effectiveness/Cost
No Action/ Limited Action	None/Access restrictions	Deed restrictions.	Restrict use of groundwater.	Implementable. Partially effective - eliminates potential for future human exposure to site groundwater. Cost – low.
Monitoring and Institutional Controls	Monitoring/ Access restrictions	Routine environmental sampling and deed restrictions.	Restrict use and conduct long-term groundwater monitoring program.	Implementable. Effective – eliminates potential for future human exposure to site groundwater and provides mechanism to assess the effectiveness of the remedial action program. Cost – moderate.

TABLE 4-1
SUMMARY OF REMEDIAL ALTERNATIVES

ALTERNATIVE NUMBER	MEDIA	PROCESS OPTION DESCRIPTION
Alternative 1	All	No action/limited action would include deed notice and physical access restrictions. No action alternative is required by NCP and serves as basis for comparison.
Alternative 2	Soil/Waste	LF-2b NYSDEC SWMF: surface protective layer, geotextile filter layers, geonet drainage layer, geomembrane, and sand gas venting layer (Figure 3-5).
	Sediment	S-1 – Cap submerged sediments with gravel, rock and/or synthetic material.
	Groundwater	Restrict use. Monitor to show no further degredation and no off-site migration.
Alternative 3	Soil/Waste	LF-2b NYSDEC SWMF: surface protective layer, geotextile filter layers, geonet drainage layer, geomembrane, and sand gas venting layer (Figure 3-5).
	Sediment	S-2a - Dewater, grade and place under landfill cap.
	Groundwater	Restrict use. Monitor to show no further degredation and no off-site migration.
Alternative 4	Soil/Waste	LF-3 NYSDEC SWMF: LF-2b on slopes and LF-1b on level areas.
	Sediment	S-1 – Cap submerged sediments with gravel, rock and/or synthetic material.
	Groundwater	Restrict use. Monitor to show no further degredation and no off-site migration.
Alternative 5	Soil/Waste	LF-3 NYSDEC SWMF: LF-2b on slopes and LF-1b on level areas.
	Sediment	S-2a - Dewater, grade and place under landfill cap.
	Groundwater	Restrict use. Monitor to show no further degredation and no off-site migration.

Table 4-2
Detailed Cost Estimate
Alternative 1

	Descriptions	Unit	Unit Cost	Quantity	Total
	Install Fencing and signage	LF	$30.00	3000	$ 90,000.00
	Contingency (20%)	LS	$ 18,000.00	1	$ 18,000.00
				Subtotal	**$ 108,000.00**
	Mobilization/Demobilization (10% direct)	LS	$ 10,800.00	1	$ 10,800.00
	Health and Safety (5% direct)	LS	$ 5,400.00	1	$ 5,400.00
	Construction, Admin. And Design Engineering (15% direct)	LS	$ 16,200.00	1	$ 16,200.00
	Deed Notice	LS	$ 50,000.00	1	$ 50,000.00
				Subtotal	**$ 82,400.00**
	Fence inspection and maintenance		$ 4,032.00	1	$ 4,032.00
	Groundwater sampling		$ 16,320.00	1	$ 16,320.00
	Total Annual O&M				$ 20,352.00
	Present Value O&M (30 yrs; 5% net)			**Subtotal**	**$ 312,860.12**

Table 4-3
Detailed Cost Estimate
Alternative 2

	Description	Unit	Unit Cost	Quantity	Total
DIRECT COSTS					
	Install Fencing and signage	LS	$ 108,000.00	1	$ 108,000.00
	Non-Hazardous Waste Excavation, Transportation and Compaction	CY	$ 30.00	20399	$ 611,970.00
	Provide & Install Embankment Fill	CY	$ 18.52	3056	$ 56,597.12
	Provide & Install Clean Fill	CY	$ 18.52	8067	$ 149,400.84
	Vegetated Topsoil	CY	$ 20.00	8067	$ 161,340.00
	Loamy Soil (Barrier Protection Material)	CY	$ 18.52	32267	$ 597,584.84
	Drainage Layer (DNL) Geonet	SF	$ 1.27	435600	$ 553,212.00
	40 mil Geomembrane	SF	$ 1.27	435600	$ 553,212.00
	Sand (GVL w/ k>=10^{-3} cm/sec)	CY	$ 22.00	16134	$ 354,948.00
	Geotextile (Filter Fabric)	SY	$ 4.05	96800	$ 392,040.00
	12" Riprap Cap for Submerged Sediments[1]	TON	$ 35.00	3762	$ 131,670.00
	Seeding	ACRE	$ 2,000.00	10	$ 20,000.00
	Contingency (20%)	LS	$ 737,994.96	1	$ 737,994.96
				Subtotal	**$4,427,969.76**
INDIRECT COSTS					
	Mobilization/Demobilization (10% direct)	LS	$ 442,796.98	1	$ 442,796.98
	Health and Safety (5%)	LS	$ 221,398.49	1	$ 221,398.49
	Construction, Admin. And Design Engineering (15% direct)	LS	$ 664,195.46	1	$ 664,195.46
	Wetland Mitigation	ACRE	$ 75,000.00	1.7	$ 123,750.00
	Deed Notice	LS	$ 50,000.00	1	$ 50,000.00
				Subtotal	$ 1,502,140.93
O&M					
	Fence inspection and maintenance		$ 4,032.00	1	$ 4,032.00
	Cap inspection and maintenance		$ 10,846.08	1	$ 10,846.08
	Groundwater sampling		$ 16,320.00	1	$ 16,320.00
	Total Annual O&M				$ 31,198.08
	Present Value O&M (30 yrs; 5% net)			**Subtotal**	$479,589.73
TOTAL ESTIMATED COST					

Notes: [1] - Riprap cap used over adjacent submerged sediments to act as an extension to the landfill cap.

Table 4-4
Detailed Cost Estimate
Alternative 3

	Description	Unit	Unit Cost	Quantity	Total
	Install Fencing and signage	LS	$ 108,000.00	1	$ 108,000.00
	Non-Hazardous Waste Excavation, Transportation and Compaction	CY	$ 30.00	20399	$ 611,970.00
	Dredging Adjacent Waterways for Fill	CY	$ 25.04	2786	$ 69,761.44
	Structural Supportive Admixtures in Dredged Fill	CY	$ 9.50	2786	$ 26,467.00
	Provide & Install Embankment Fill[1]	CY	$ 18.52	270	$ 5,000.40
	Provide & Install Clean Fill	CY	$ 18.52	8067	$ 149,400.84
	Vegetated Topsoil	CY	$ 20.00	8067	$ 161,340.00
	Loamy Soil (Barrier Protection Material)	CY	$ 18.52	32267	$ 597,584.84
	Drainage Layer (DNL) Geonet	SF	$ 1.27	435600	$ 553,212.00
	40 mil Geomembrane	SF	$ 1.27	435600	$ 553,212.00
	Sand (GVL w/ k>=10^{-3} cm/sec)	CY	$ 22.00	16134	$ 354,948.00
	Geotextile (Filter Fabric)	SY	$ 4.05	96800	$ 392,040.00
	Seeding	ACRE	$ 2,000.00	10	$ 20,000.00
	Contingency (20%)	LS	$ 720,587.30	1.0	$ 720,587.30
				Subtotal	$4,323,523.82
	Mobilization/Demobilization (10% direct)	LS	$ 432,352.38	1.0	$ 432,352.38
	Health and Safety (5%)	LS	$ 216,176.19	1.0	$ 216,176.19
	Construction, Admin. And Design Engineering (15% direct)	LS	$ 648,528.57	1.0	$ 648,528.57
	Deed Notice	LS	$ 50,000.00	1.0	$ 50,000.00
				Subtotal	$ 1,347,057.15
	Fence inspection and maintenance		$ 4,032.00	1	$ 4,032.00
	Cap inspection and maintenance		$ 10,846.08	1.0	$ 10,846.08
	Groundwater sampling		$ 16,320.00	1.0	$ 16,320.00
	Total Annual O&M				$ 31,198.08
	Present Value O&M (30 yrs; 5% net)			**Subtotal**	$479,589.73

Notes: [1] - Remaining fill needed after dredging adjacent submerged sediments.

Table 4-5
Detailed Cost Estimate
Alternative 4

	Description	Unit	Unit Cost	Quantity	Total
	Install Fencing and signage	LS	$ 108,000.00	1	$ 108,000.00
	Non-Hazardous Waste Excavation, Transportation and Compaction	CY	$ 30.00	20399	$ 611,970.00
	Provide & Install Embankment Fill	CY	$ 18.52	3056	$ 56,597.12
	Provide & Install Clean Fill	CY	$ 18.52	8067	$ 149,400.84
	Vegetated Topsoil	CY	$ 20.00	8067	$ 161,340.00
	Loamy Soil (Barrier Protection Material)	CY	$ 18.52	32267	$ 597,584.84
	Drainage Layer (DNL) Geonet	SF	$ 1.27	87120	$ 110,642.40
	40 mil Geomembrane	SF	$ 1.27	435600	$ 553,212.00
	Sand (GVL w/ k>=10^{-3} cm/sec)	CY	$ 22.00	16134	$ 354,948.00
	Geotextile (Filter Fabric)	SY	$ 4.05	96800	$ 392,040.00
	12" Riprap Cap for Submerged Sediments[1]	TON	$ 35.00	3762	$ 131,670.00
	Seeding	ACRE	$ 2,000.00	10	$ 20,000.00
	Contingency (20%)	LS	$ 649,481.04	1	$ 649,481.04
				Subtotal	$3,896,886.24
	Mobilization/Demobilization (10% direct)	LS	$ 389,688.62	1	$ 389,688.62
	Health and Safety (5%)	LS	$ 194,844.31	1	$ 194,844.31
	Construction, Admin. And Design Engineering (15% direct)	LS	$ 584,532.94	1	$ 584,532.94
	Wetland Mitigation	ACRE	$ 75,000.00	1.7	$ 123,750.00
	Deed Notice	LS	$ 50,000.00	1	$ 50,000.00
				Subtotal	$ 1,342,815.87
	Fence inspection and maintenance		$ 4,032.00	1	$ 4,032.00
	Cap inspection and maintenance		$ 10,846.08	1	$ 10,846.08
	Groundwater sampling		$ 16,320.00	1	$ 16,320.00
	Total Annual O&M				$ 31,198.08
	Present Value O&M (30 yrs; 5% net)			Subtotal	$479,589.73

Notes: [1] - Riprap cap used over adjacent submerged sediments to act as an extension to the landfill cap.

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Table 4-6
Detailed Cost Estimate
Alternative 5

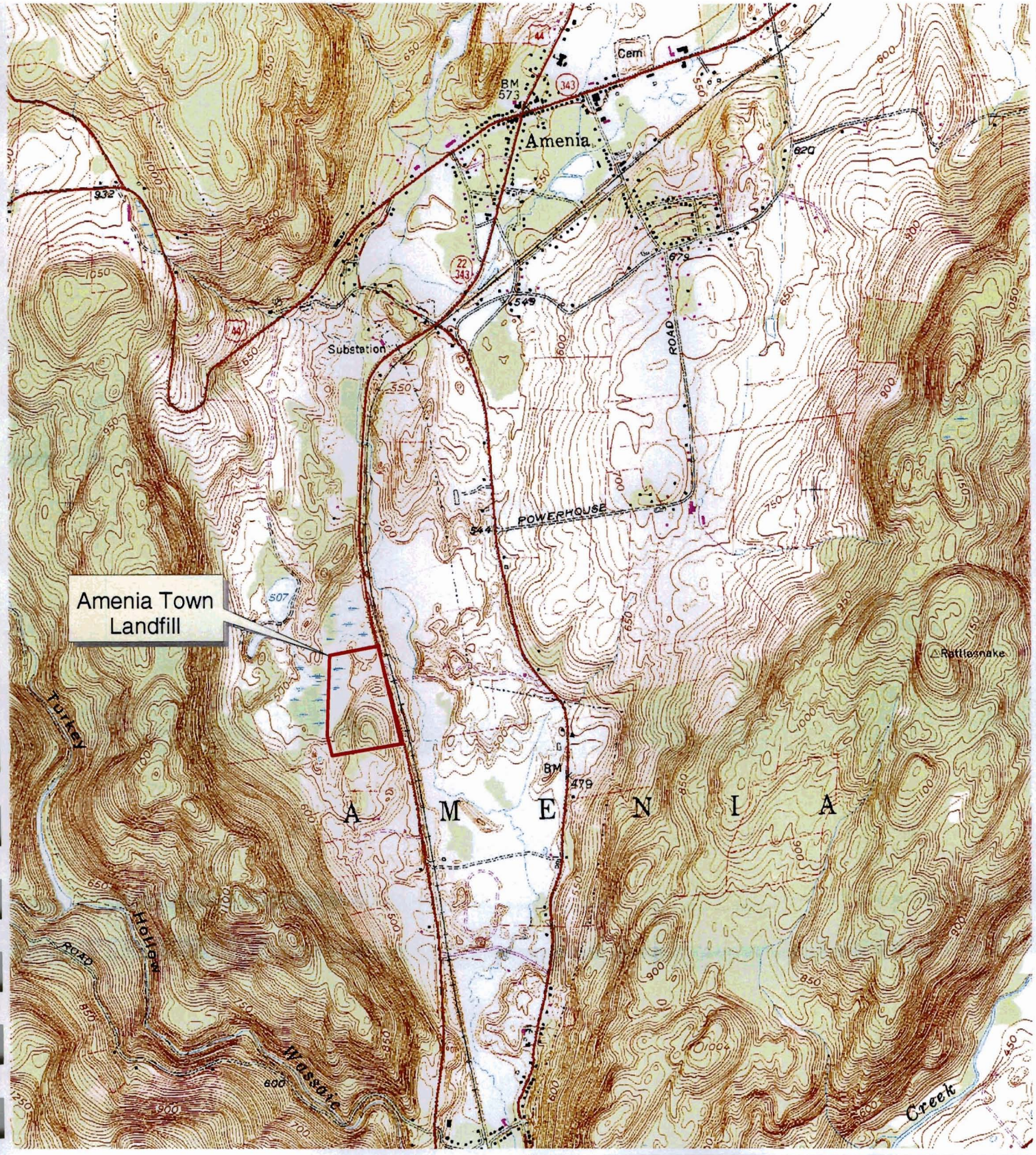
	Description	Unit	Unit Cost	Quantity	Total
	Install Fencing and signage	LS	$ 108,000.00	1	$ 108,000.00
	Non-Hazardous Waste Excavation, Transportation and Compaction	CY	$ 30.00	20399	$ 611,970.00
	Dredging Adjacent Waterways for Fill	CY	$ 25.04	2786	$ 69,761.44
	Structural Supportive Admixtures in Dredged Fill	CY	$ 9.50	2786	$ 26,467.00
	Provide & Install Embankment Fill[1]	CY	$ 18.52	270	$ 5,000.40
	Provide & Install Clean Fill	CY	$ 18.52	8067	$ 149,400.84
	Vegetated Topsoil	CY	$ 20.00	8067	$ 161,340.00
	Loamy Soil (Barrier Protection Material)	CY	$ 18.52	32267	$ 597,584.84
	Drainage Layer (DNL) Geonet	SF	$ 1.27	87120	$ 110,642.40
	40 mil Geomembrane	SF	$ 1.27	435600	$ 553,212.00
	Sand (GVL w/ k>=10^{-3} cm/sec)	CY	$ 22.00	16134	$ 354,948.00
	Geotextile (Filter Fabric)	SY	$ 4.05	96800	$ 392,040.00
	Seeding	ACRE	$ 2,000.00	10	$ 20,000.00
	Contingency (20%)	LS	$ 632,073.38	1.0	$ 632,073.38
				Subtotal	$3,792,440.30
	Mobilization/Demobilization (10% direct)	LS	$ 379,244.03	1.0	$ 379,244.03
	Health and Safety (5%)	LS	$ 189,622.02	1.0	$ 189,622.02
	Construction, Admin. And Design Engineering (15% direct)	LS	$ 568,866.05	1.0	$ 568,866.05
	Deed Notice	LS	$ 50,000.00	1.0	$ 50,000.00
				Subtotal	$ 1,187,732.09
	Fence inspection and maintenance		$ 4,032.00	1	$ 4,032.00
	Cap inspection and maintenance		$ 10,846.08	1.0	$ 10,846.08
	Groundwater sampling		$ 16,320.00	1.0	$ 16,320.00
	Total Annual O&M				$ 31,198.08
	Present Value O&M (30 yrs; 5% net)			**Subtotal**	$479,589.73

Notes: [1] - Remaining fill needed after dredging adjacent submerged sediments.

TABLE 5-1
SUMMARY OF THE EVALUATION OF ALTERNATIVES

Criteria	Alternative 1 No Action/Limited Action (fencing, deed notice, groundwater use restrictions)	Alternative 2 Landfill cap with gas vent layer geomembrane and drainage layer, sediment cap, groundwater monitoring and institutional controls	Alternative 3 Landfill cap with gas vent layer and geomembrane and drainage layer, sediment on-site disposal, groundwater monitoring and institutional controls	Alternative 4 Landfill cap with gas vent layer and geomembrane and drainage layer on slopes, sediment cap, groundwater monitoring and institutional controls	Alternative 5 Landfill cap with gas vent layer and geomembrane and drainage layer on slopes, sediment on-site disposal, groundwater monitoring and institutional controls
Compliance with ARARs	Does not meet ARARs	Meets ARARs for landfill; facilitates compliance with groundwater ARARs	Meets ARARs for landfill; facilitates compliance with groundwater ARARs	Meets ARARs for landfill; facilitates compliance with groundwater ARARs	Meets ARARs for landfill; facilitates compliance with groundwater ARARs
Protection of Human Health and the Environment	Not protective of human health or the environment	Protective of human health and the environment in conjunction with maintenance and monitoring	Protective of human health and the environment in conjunction with maintenance and monitoring	Protective of human health and the environment in conjunction with maintenance and monitoring	Protective of human health and the environment in conjunction with maintenance and monitoring
Short-term Effectiveness	Minimal short-term impacts; requires HASP	Effective with HASP, dust control and silt control	Effective with HASP, dust control and silt control	Effective with HASP, dust control and silt control	Effective with HASP, dust control and silt control
Long-term Effectiveness and Permanence	Poor effectiveness; may result in off-site impacts. May result in trespasser exposure.	Effective long-term in conjunction with maintenance and monitoring. Sediment cap not as permanent as removal.	Effective long-term in conjunction with maintenance and monitoring.	Effective long-term in conjunction with maintenance and monitoring. Sediment cap not as permanent as removal.	Effective long-term in conjunction with maintenance and monitoring.
Reduction of Toxicity, Mobility, or Volume	No reduction of toxicity, mobility or volume	Reduction in mobility of soil and sediment; no reduction in toxicity or volume. Reduction of toxicity mobility and volume for groundwater with time.	Reduction in mobility of soil and sediment; no reduction in toxicity or volume. Reduction of toxicity mobility and volume for groundwater with time.	Reduction in mobility of soil and sediment; no reduction in toxicity or volume. Reduction of toxicity mobility and volume for groundwater with time.	Reduction in mobility of soil and sediment; no reduction in toxicity or volume. Reduction of toxicity mobility and volume for groundwater with time.
Implementability	Easy to implement	Moderately difficult to implement	Moderately difficult to implement	Moderately difficult to implement	Moderately difficult to implement
Cost	$503,260	$6,409,700	$6,150,171	$5,719,292	$5,459,762

Figures



Map Source: USGS 7.5 Minute Series Quadrangle
Amenia, NY-CT, 1958
Photorevised 1984

Site Location Map
Amenia Town Landfill
Amenia, New York

URS
Wayne, New Jersey

Scale 1:24000	Proj. No. 19683595	
Date: March 2004		Figure 1-1

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LEGEND:

SITE BOUNDARY

APPROXIMATE LIMITS OF WASTE

NOTES:

1. WATER BODY BOUNDARIES ARE APPROXIMATE AND BASED ON 1990 AERIAL PHOTOGRAPH
2. PROPERTY BOUNDARY IS APPROXIMATE AND BASED ON AMENIA TOWN ASSESSOR'S 7066-00 TAX MAP, 1999.

0 100 200 400

SCALE (FEET)

SITE LAYOUT
AMENIA, TOWN LANDFILL
AMENIA, NEW YORK

URS
WAYNE, NEW JERSEY

DR. BY	KM	SCALE	AS SHOWN	DWG. NO. 83595015	PROJ. NO. 19683595
CK'D. BY	PN	DATE	MAY 4, 2004	FIG. NO.	2-1

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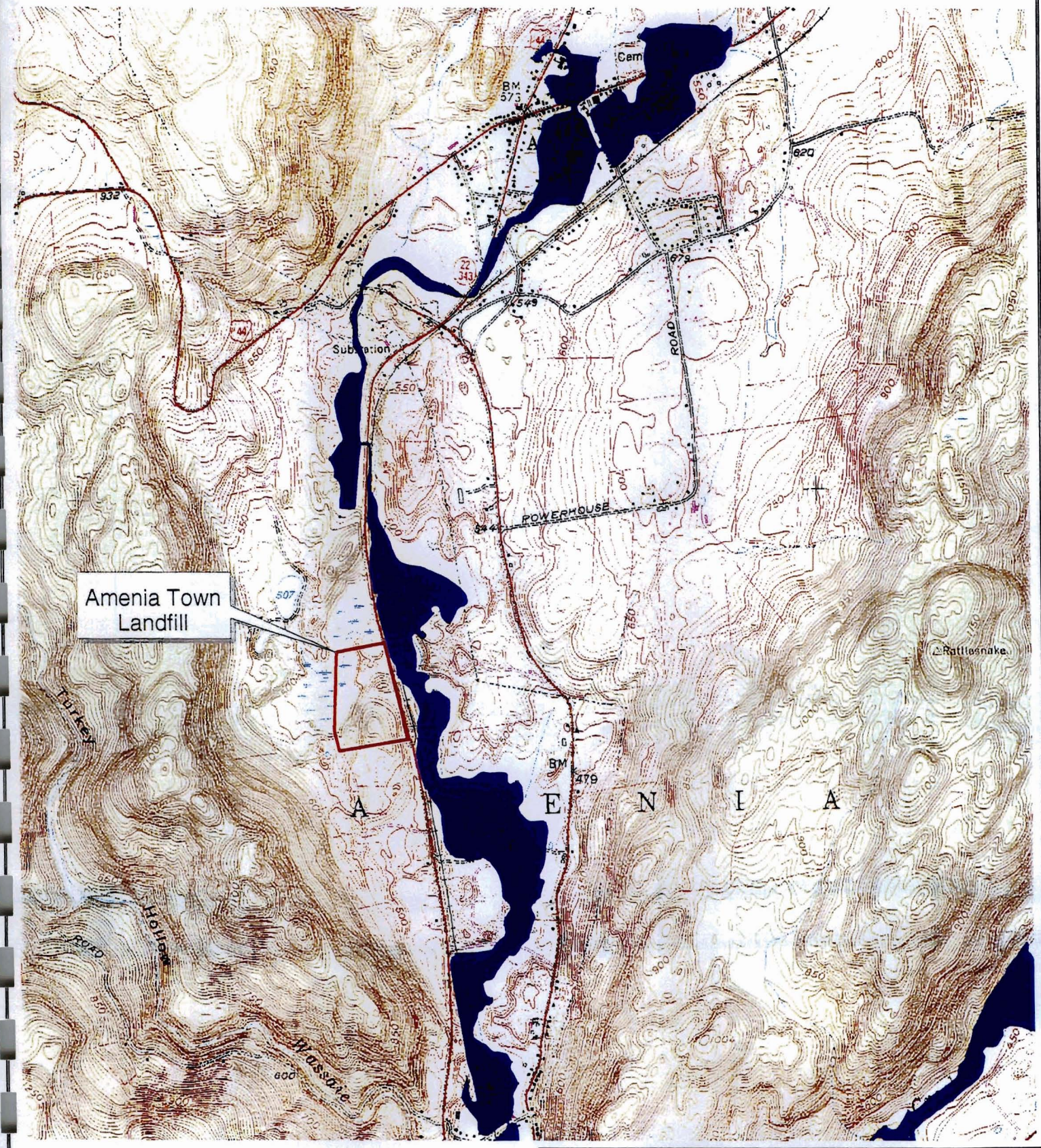

100 Year Flood Zones
Amenia Town Landfill
Amenia, New York

URS
Wayne, New Jersey

Scale 1:24000	Proj. No. 19683595
Date: March 2004	Figure 2-2

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POND

MW 7

MW 8B

MW 8

MW

MW 6

SB 3

SB-2

PZ 1

PZ 1B

MW 2B

MW 2

SB

MW 3

MW 4B

MW 4

MW 5

PZ 2

LEGEND:

- SITE BOUNDARY
- APPROXIMATE LIMITS OF WASTE
- MONITORING WELL LOCATION
- SOIL BORING LOCATION
- PIEZOMETERS LOCATION

NOTES:

1. WATER BODY BOUNDARIES ARE APPROXIMATE AND BASED ON 1990 AERIAL PHOTOGRAPH
2. PROPERTY BOUNDARY IS APPROXIMATE AND BASED ON AMENIA TOWN ASSESSOR'S 7066-00 TAX MAP, 1999.

0 50 100 200

SCALE (FEET)

RI BORING LOCATION MAP
AMENIA, TOWN LANDFILL
AMENIA, NEW YORK

URS
WAYNE, NEW JERSEY

DR. BY	ET	SCALE	AS SHOWN	DWG. NO. 14141008	PROJ. NO. 1E04141
CK'D. BY	AG	DATE	MAR 23, 2000	FIG. NO.	2-3

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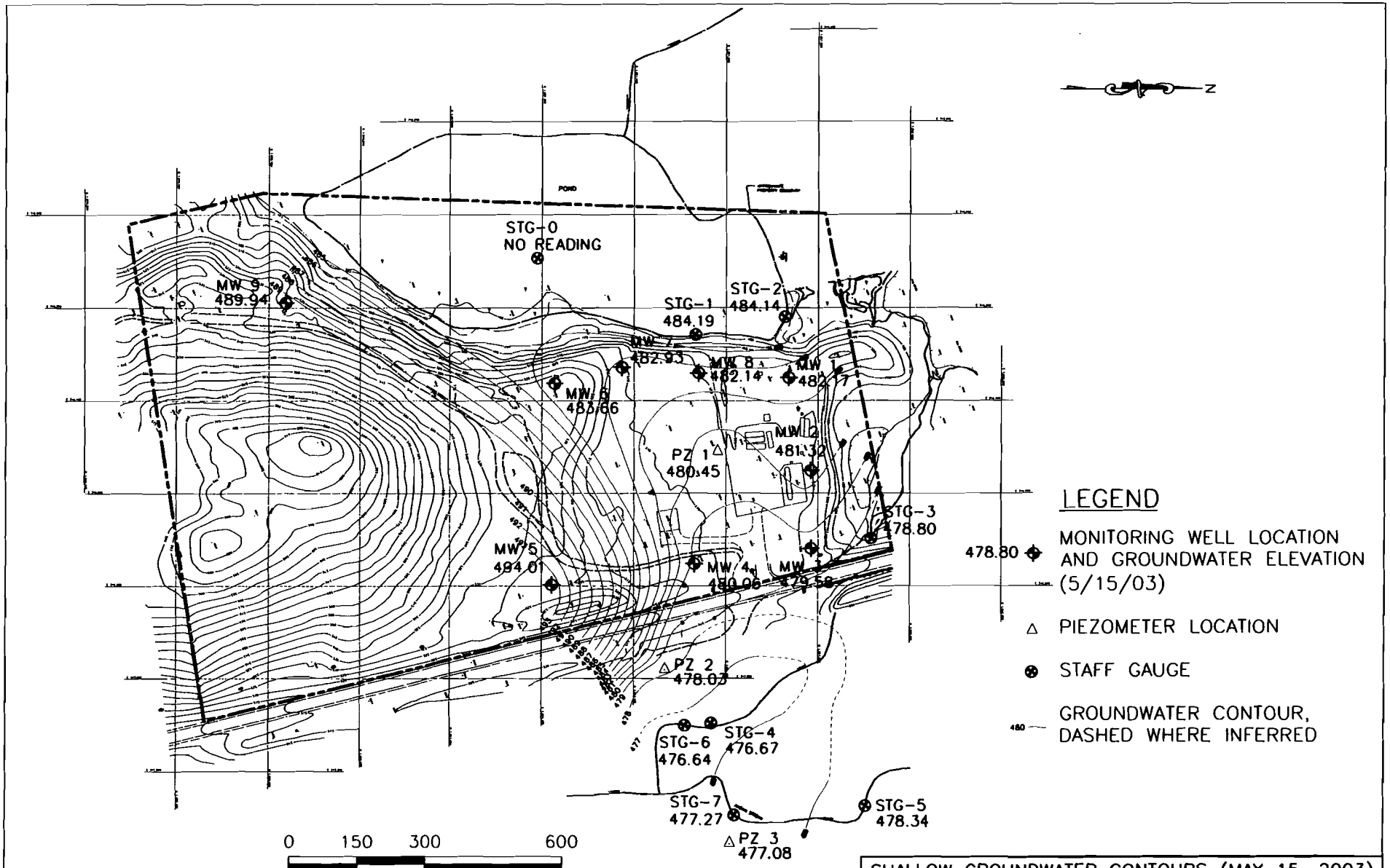

SHALLOW GROUNDWATER CONTOURS (MAY 15, 2003)
AMENIA TOWN LANDFILL
AMENIA, NEW YORK

URS
WAYNE, NEW JERSEY

DR. BY	KM	SCALE	AS SHOWN	DWG. NO. 83595014	PROJ. NO. 1E04141
CK'D. BY	PN	DATE	MAY 4, 2004	FIG. NO.	2-4

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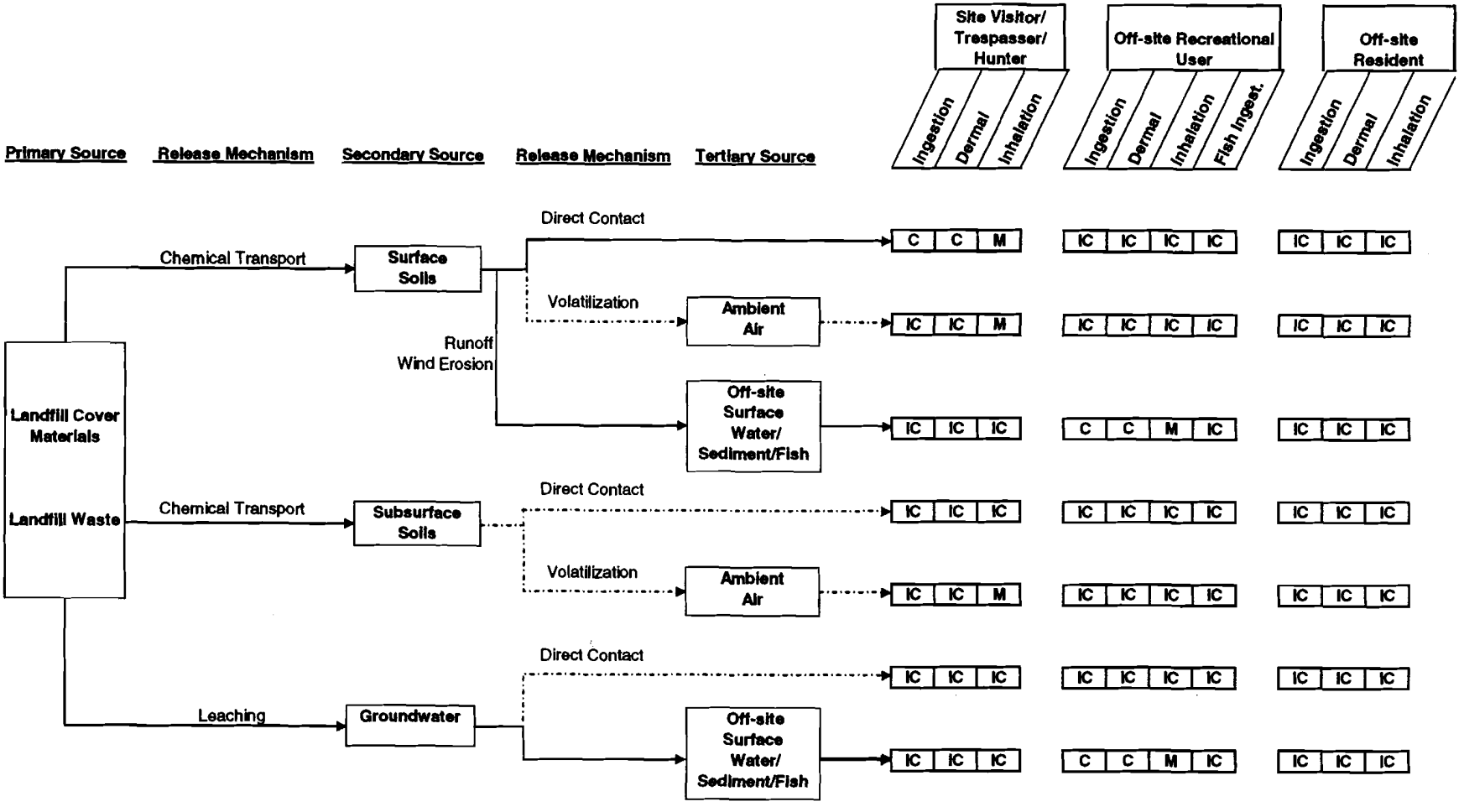
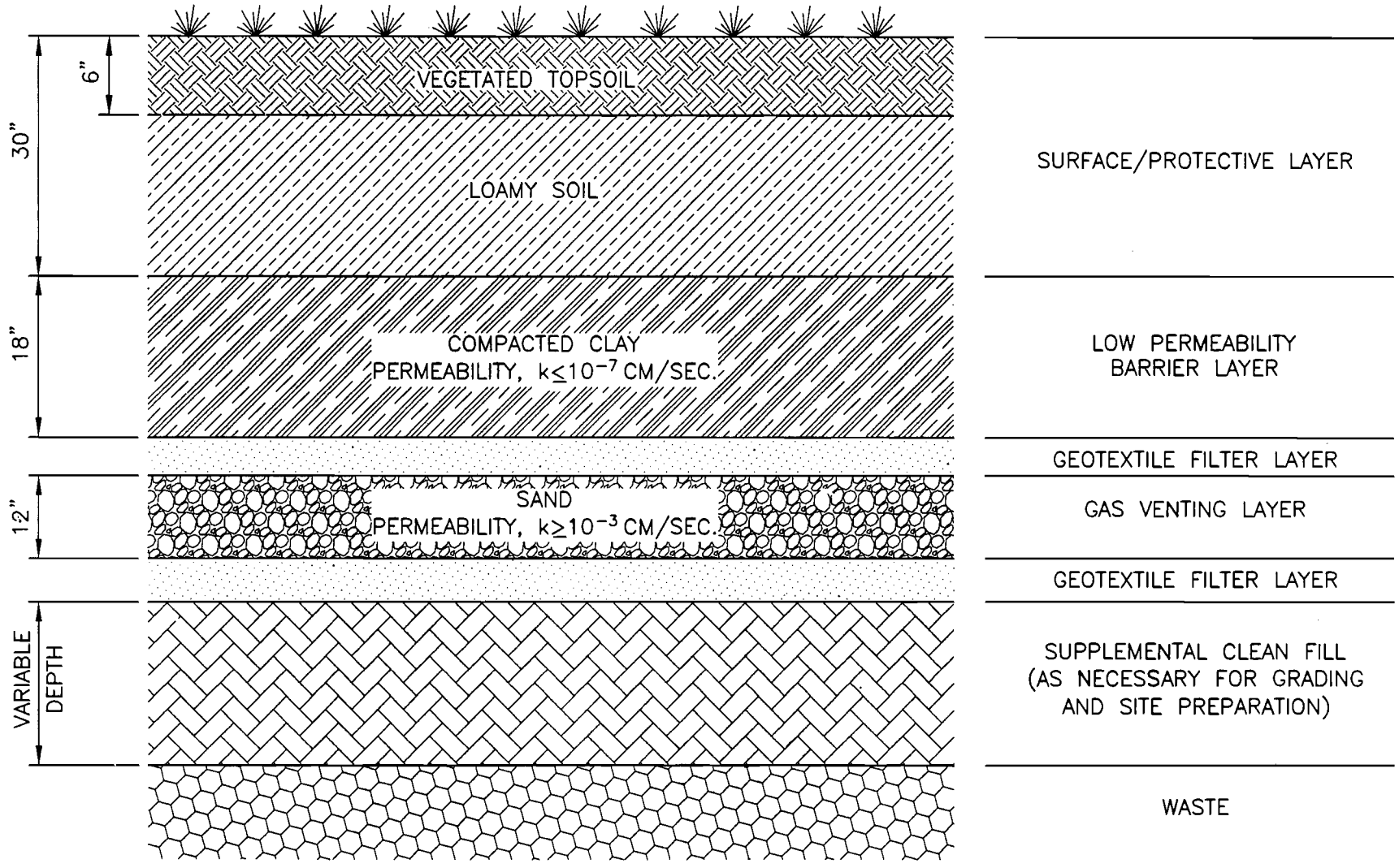
Figure 2-5
Site Conceptual Exposure Model
Current and Reasonably Anticipated Future Conditions
Amenia Town Landfill
Amenia, New York



C = Potentially Complete Exposure Pathway Under Current and Reasonably anticipated Future Conditions
M = Minor Exposure Pathway (Pathway may be complete; however, low exposure is anticipated.)
IC = Incomplete Exposure Pathway. (No significant exposure anticipated.)

H:\Amenia Landfill\FS_SCEM.xls



LANDFILL CAP PROCESS OPTION LF-1a
AMENIA TOWN LANDFILL-AMENIA, N.Y.

URS
WAYNE, NEW JERSEY

DR. BY	KM	SCALE	NONE	DWG. NO. 83595006	PROJ. NO. 1E04141
CK'D. BY	PN	DATE	APRIL 29, 2004	FIG. NO.	3-2

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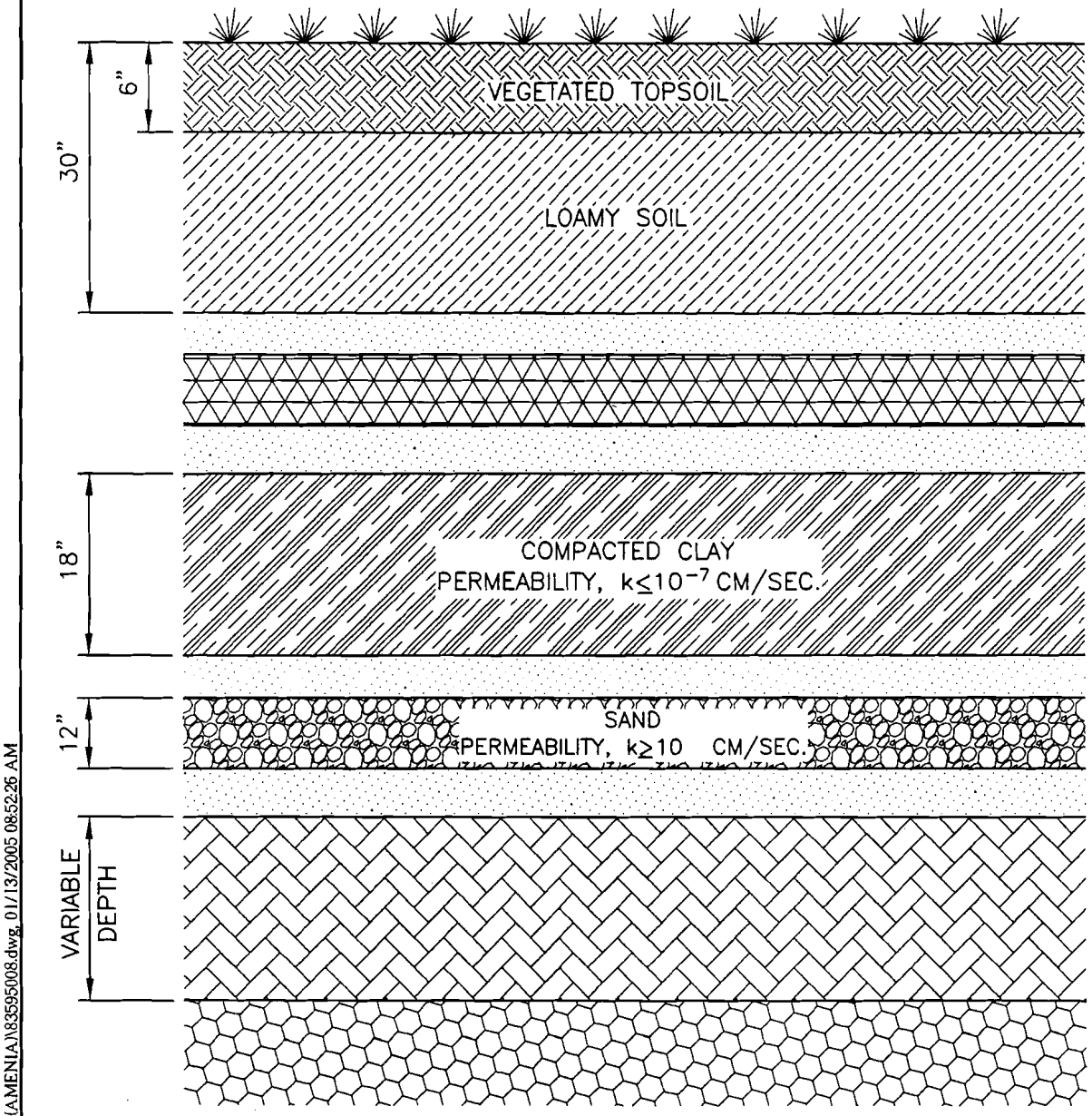

LANDFILL CAP PROCESS OPTION LF-2a
AMENIA TOWN LANDFILL-AMENIA, N.Y.

URS
WAYNE, NEW JERSEY

DR. BY	KM	SCALE	NONE	DWG. NO. 83595008	PROJ. NO. 1E04141
CK'D. BY	PN	DATE	APRIL 29, 2004	FIG. NO.	3-4

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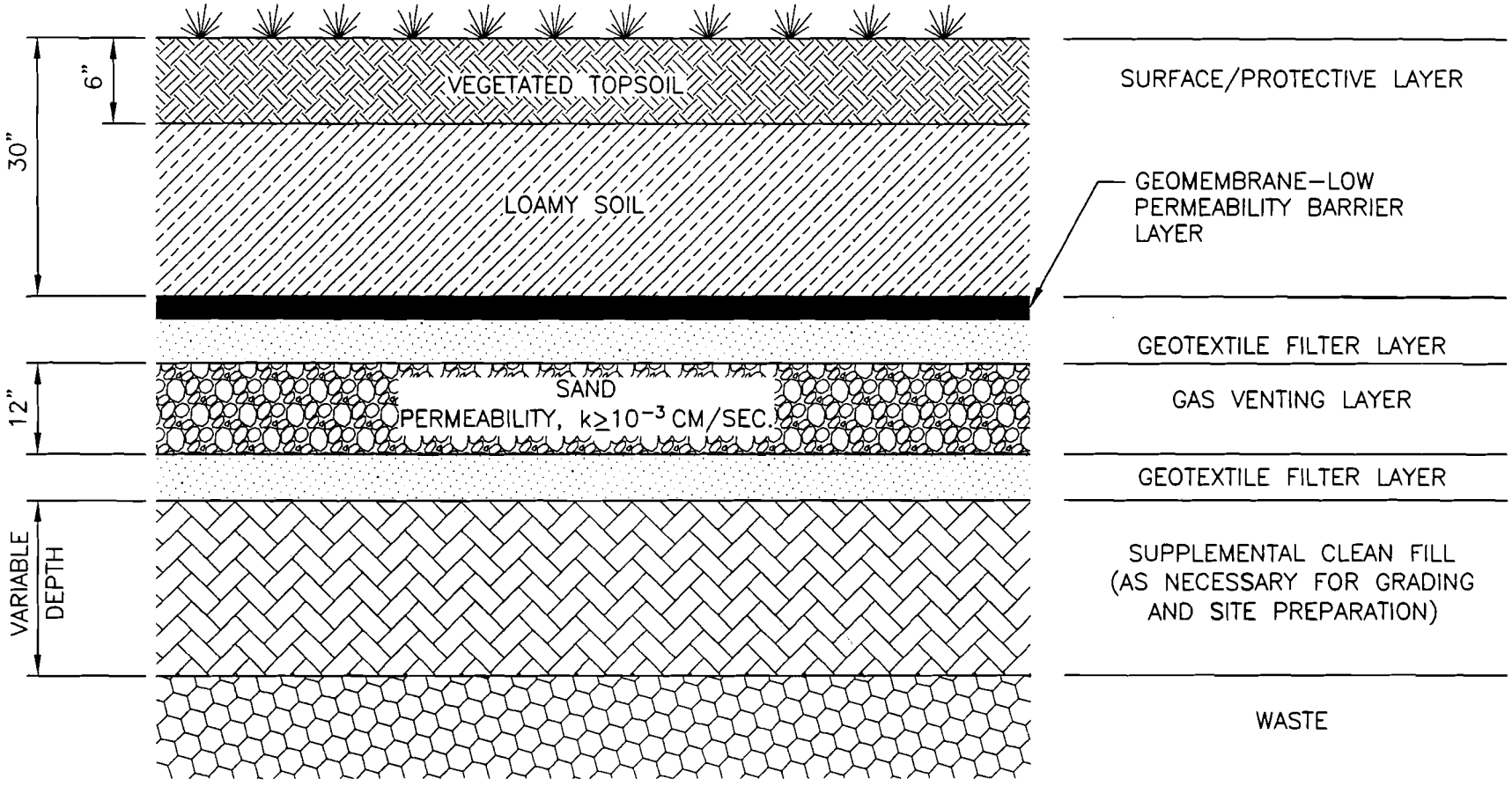

LANDFILL CAP PROCESS OPTION LF–1b
AMENIA TOWN LANDFILL–AMENIA, N.Y.

URS
WAYNE, NEW JERSEY

DR. BY	KM	SCALE	NONE	DWG. NO. 83595007	PROJ. NO. 1E04141
CK'D. BY	PN	DATE	APRIL 29, 2004	FIG. NO.	3-3

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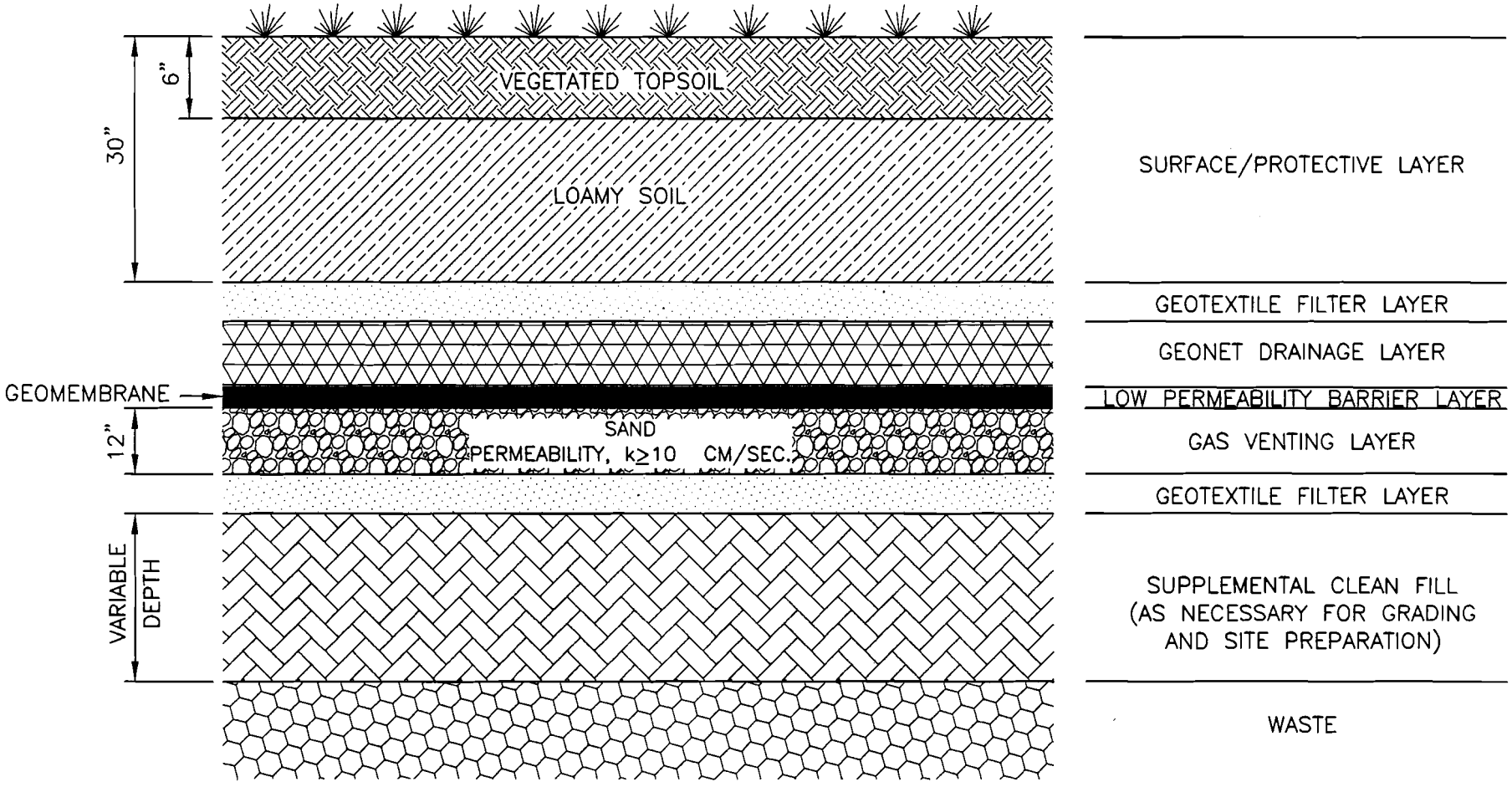

LANDFILL CAP PROCESS OPTION LF-2b
AMENIA TOWN LANDFILL-AMENIA, N.Y.

URS
WAYNE, NEW JERSEY

DR. BY	KM	SCALE	NONE	DWG. NO. 83595009	PROJ. NO. 1E04141
CK'D. BY	PN	DATE	APRIL 29, 2004	FIG. NO.	3-5

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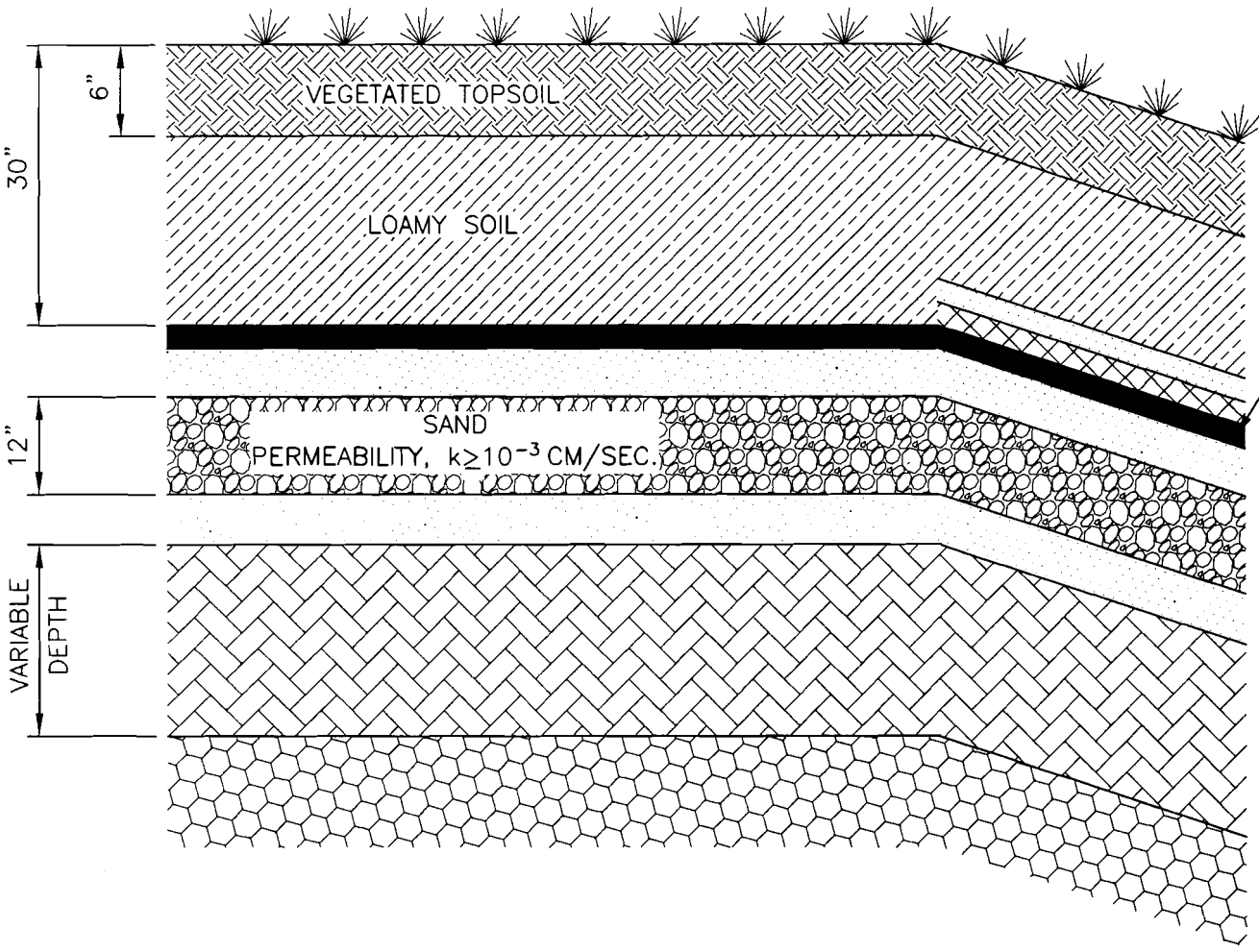

LANDFILL CAP PROCESS OPTION LF–3
AMENIA TOWN LANDFILL–AMENIA, N.Y.

URS
WAYNE, NEW JERSEY

DR. BY	KM	SCALE	NONE	DWG. NO. 83595020	PROJ. NO. 1E04141
CK'D. BY	MC	DATE	APRIL 12, 2005	FIG. NO.	3–6

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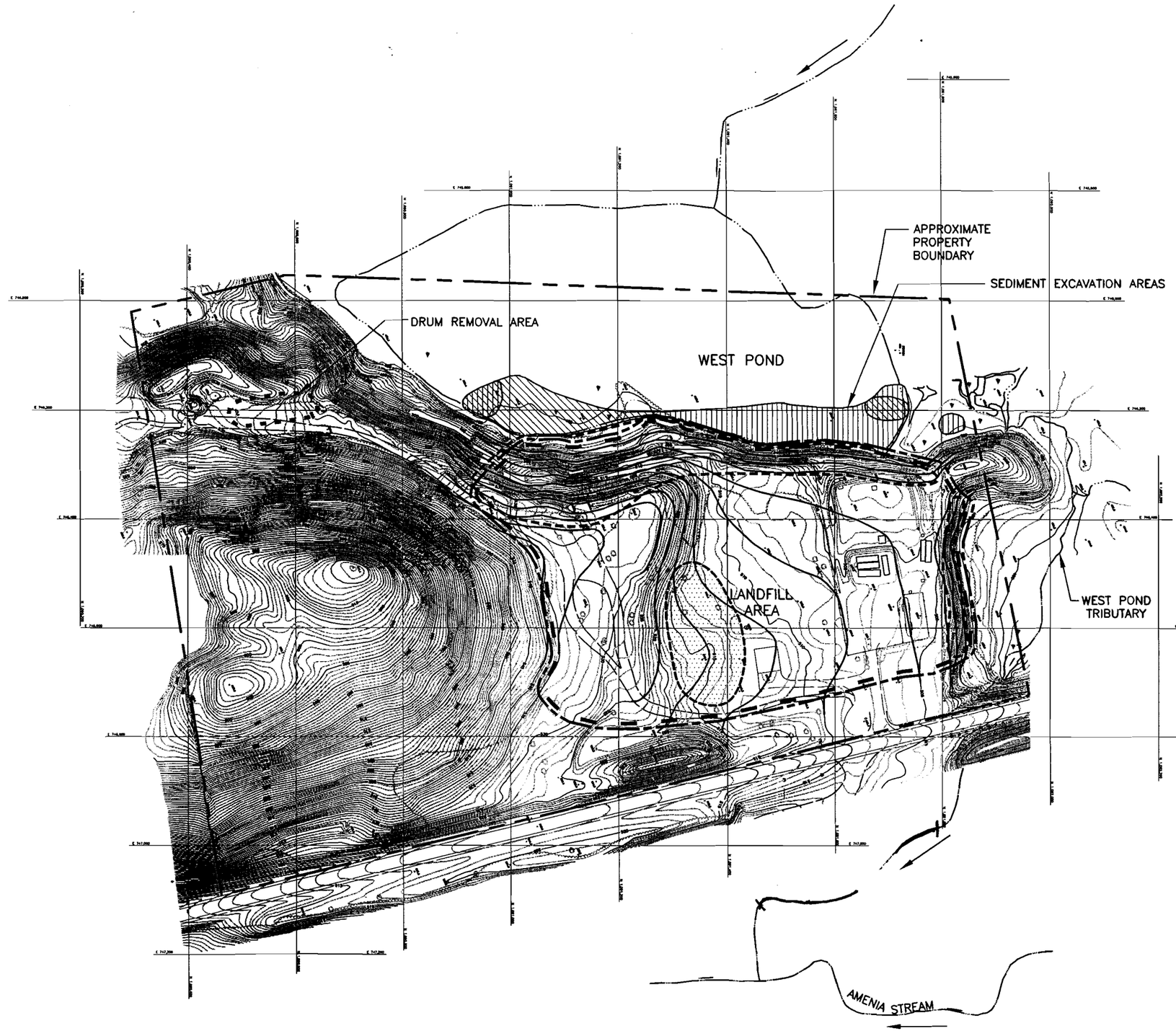

LEGEND:

- SITE BOUNDARY
- APPROXIMATE LIMITS OF WASTE
- 5FT. FINAL GRADES OF FINAL COVER
- LIMIT OF GEOCOMPOSITE DRAINAGE LAYER
- APPROXIMATE LIMITS OF LANDFILL CAP AREA
- SEDIMENT PLACEMENT AREA

NOTES:

1. WATER BODY BOUNDARIES ARE APPROXIMATE AND BASED ON 1990 AERIAL PHOTOGRAPH
2. PROPERTY BOUNDARY IS APPROXIMATE AND BASED ON AMENIA TOWN ASSESSOR'S 7066-00 TAX MAP, 1999.

0 100 200 400

SCALE (FEET)

PROPOSED AREAL EXTENT OF LANDFILL CAP
AMENIA, TOWN LANDFILL
AMENIA, NEW YORK

URS
WAYNE, NEW JERSEY

DR. BY	KM	SCALE	AS SHOWN	DWG. NO. 83595022	PROJ. NO. 1E04141
CK'D. BY	MC	DATE	APRIL 12, 2005		

FIGURE 6

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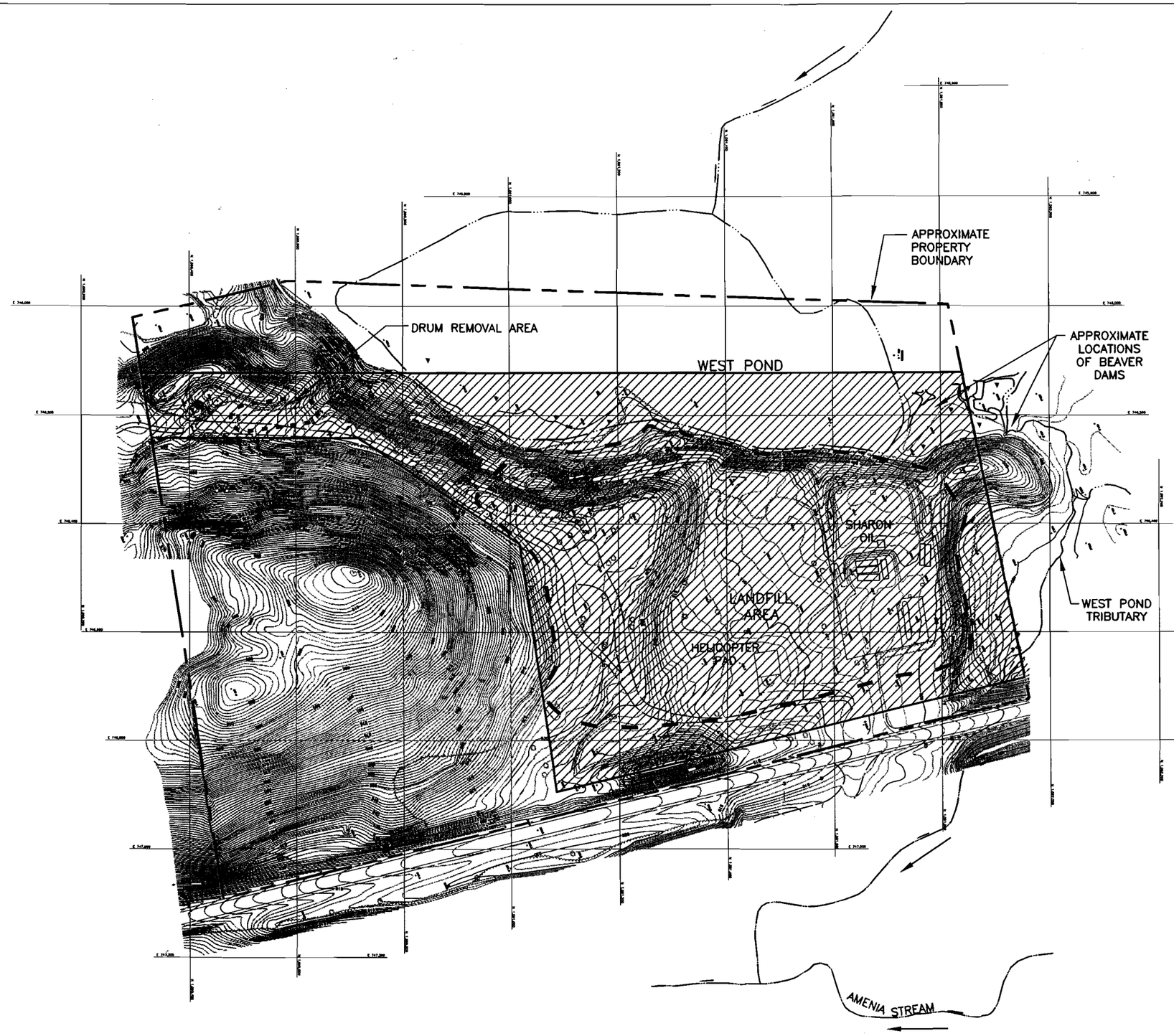

N

LEGEND:

- PROPOSED AREA OF CONTROLLED PROPERTY FOR ENVIRONMENTAL EASEMENT
- SITE BOUNDARY
- APPROXIMATE LIMITS OF WASTE

NOTES:

1. WATER BODY BOUNDARIES ARE APPROXIMATE AND BASED ON 1990 AERIAL PHOTOGRAPH
2. PROPERTY BOUNDARY IS APPROXIMATE AND BASED ON AMENIA TOWN ASSESSOR'S 7066-00 TAX MAP, 1999.

0 100 200 400

SCALE (FEET)

PROPOSED AREA OF CONTROLLED PROPERTY
AMENIA, TOWN LANDFILL
AMENIA, NEW YORK

URS
WAYNE, NEW JERSEY

DR. BY	KM	SCALE	AS SHOWN	DWG. NO.	83595021	PROJ. NO.	1E04141
CK'D. BY	MC		DATE APRIL 12, 2005			FIG. NO.	5-2

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Appendix A

TEST PIT INVESTIGATION REPORT

Amenia Town Landfill
Amenia, New York

Prepared for:

Amenia Landfill Group
Technical Committee
c/o Ashland Inc.
5200 Blazer Parkway
Dublin, Ohio 43017

Prepared by:

URS
201 Willowbrook Boulevard
Wayne, New Jersey 07470

June 2004

TEST PIT INVESTIGATION REPORT – OCTOBER 28, 2003
Amenia Town Landfill
Amenia, New York

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ATTACHMENTS

1.0 INTRODUCTION

A Remedial Investigation (RI) was conducted in at the Amenia Town Landfill, Amenia, New York and a RI report was submitted to the New York State Department of Environmental Conservation (NYSDEC) describing the results of the work (URS, November 2003). The RI report recommended that the limits of landfill material be defined to better evaluate potential site remedies. Accordingly, the Amenia Landfill Group (ALG) developed a Test Pit Investigation Work Plan (URS, October, 22, 2003). The Work Plan was approved by NYSDEC (October 23, 2003) and executed on October 28, 2003 under the supervision of NYSDEC. This report presents a technical summary of the activities and results of the test pit investigation.

1.1 SITE DESCRIPTION

The former landfill is in the Town of Amenia, Dutchess County, New York, about 1.5 miles south of the intersection of Route 22 and Route 44 (Figure 1-1). The site is in a rural area, bordered to the east by Route 22 and by a wetland and small stream to the north and west. At the north end of the site, a fenced enclosure, about two acres in size, contains above ground storage tanks of propane and heating oil previously owned by Sharon Oil Company, Sharon, Connecticut. The landfill portion of the site encompasses about 10 acres.

1.2 PROJECT OBJECTIVE

Test pits were excavated to assess the horizontal distribution of landfill materials in areas of the site not previously investigated. The objectives of the test pit investigation were to define the limits of landfill material and to provide conceptual design parameters for a landfill cap.

1.3 REPORT ORGANIZATION

This report is divided into four Sections. Section 1.0 introduces the test pit investigation, provides a brief description of the site, and describes the objectives of the project. Section 2.0 presents a technical overview of the activities and methods used to conduct the investigation. Section 3.0 presents a discussion of the results of the site investigation. Section 4.0 lists the references cited in this document.

2.0
FIELD ACTIVITIES AND METHODS

This section provides a technical overview of the field activities and the methods and procedures used to conduct the test pit investigation at the Amenia Town Landfill. The investigation was conducted in accordance with a workscope (URS, October 22, 2003) approved by the New York State Department of Environmental Conservation on October 23, 2003, and following a site-specific health and safety plan prepared by URS (October 27, 2003). The test pit investigation took place on October 28, 2003. Site activities were observed by representatives of the ALG, NYSDEC, and URS. A URS Field Activity Report is presented in Appendix A.

The test pit investigation consisted of the following main activities:

- Conducting a Community Air Monitoring Program
- Excavation of test pits
- Logging test pits and backfilling excavations

A description of these activities is summarized in the sections below.

2.1 COMMUNITY AIR MONITORING PROGRAM

A community air monitoring program (CAMP) for organic vapors and particulate matter (e.g., dust) was developed and implemented for the test pit investigation following guidance provided by NYSDEC (May 2002). The purpose of the CAMP was to provide a measure of protection for downgradient receptors against any dust and organic vapors generated during excavation work.

A URS field inspector set continuous air monitoring equipment along the perimeter of the work zone established for each excavation and 15-minute running average concentrations were calculated and documented. A DataRAM Model DR-4000 monitor was used to record real time concentrations of particulates in ambient air and a MiniRAE 2000 photoionization detector was used to monitor organic vapors. The instruments were calibrated in the field before use. The CAMP air monitoring log is presented in Appendix A.

2.2 EXCAVATION OF TEST PITS

The test pits were excavated by Environmental Industrial Services Corporation (EISCO), Port Reading, New Jersey, using a Caterpillar 426 backhoe. An EISCO operator and helper, both trained in accordance with Occupational Safety and Health Administration (OSHA) requirements, conducted the work under subcontract to URS.

2.3 LOGGING TEST PITS AND BACKFILLING EXCAVATIONS

Eleven test pits (TP-1 through TP-10 and TP-8A) were excavated at the areas shown in Figure 2-1 and work activities were documented by a URS field inspector. The logs of test pits are presented in Appendix B. The test pits were backfilled with the same material removed from each excavation immediately after the work was finished.

3.0 TEST PIT INVESTIGATION RESULTS

This section presents the results of the test pit investigation at the Amenia Town Landfill.

3.1 RESULTS OF COMMUNITY AIR MONITORING PROGRAM

The results of the CAMP (see Table 1 in Appendix A) indicate that there were no airborne risks posed by dust and organic vapors to downgradient receptors during the investigation. Organic vapor readings exceeded the 5 part per million action level during excavation of test pit TP-9 and, in accordance with the work plan, work stopped immediately and the pit was promptly backfilled.

3.2 RESULTS OF TEST PIT EXCAVATIONS

The results of the test pit excavations provide good definition of the limits of landfill waste material at the site. Landfill material was not observed in test pits TP-4, TP-7, TP-8A, and TP-8 (Table 3-1). The limits of landfill waste were observed in the remaining test pits. Based on these test pit data, as well as other subsurface information collected during previous investigations (Table 3-2), and historical photographs, the approximate limits of waste are determined and shown in Figure 3-1.

4.0
REFERENCES

New York State Department of Environmental Conservation, Division of Environmental Remediation, December 2002 (12/25/02), DRAFT DER-10, Technical Guidance for Site Investigation and Remediation.

New York State Department of Environmental Conservation, October 23, 2003, NYSDEC letter to Ashland Inc., Re: Approval of the October 22, 2003, Test Pit Investigation Work Plan for the Amenia Landfill, Site No. 3-14-006.

URS Corporation, October 22, 2003, Letter to NYSDEC , Re: Test Pit Investigation Work Plan, Amenia Town Landfill, Amenia, New York.

URS Corporation, October 27, 2003, Health and Safety Plan, Test Pit Program, Amenia Town Landfill, Amenia, New York.

URS Corporation, November 2003, Remedial Investigation Report, Amenia Town Landfill, Amenia, New York.

Table 3-1
Amenia Town Landfill
Summary of October 2003 Test Pit Information

Designation	Length (ft)	Width (ft)	Maximum Depth (ft)	Long-Axis Orientation (degrees)	Test Pit Centroid Easting	Test Pit Centroid Northing	Landfill Material Present ?
TP-1	131	2	7.0	025	746375.85	1090983.03	Yes
TP-2	12	2	5.5	008	746512.28	1091066.00	Yes
TP-3	13	2	6.5	005	746710.13	1091062.58	Yes
TP-4	6	2	6.0	337	746838.55	1091043.21	No
TP-5	46	2	6.0	075	746786.53	1091239.04	Yes
TP-6	46	2	6.0	090	746759.88	1091397.24	Yes
TP-7	36	2	6.0	080	746759.37	1091497.28	No
TP-8A	8	2	6.0	360	746694.14	1091691.30	No
TP-8	15	2	3.0	090	746689.21	1091791.60	No
TP-9	8	2	4.0	360	746508.27	1091787.70	Yes
TP-10	35	2	5.5	310	746329.96	1091745.30	Yes

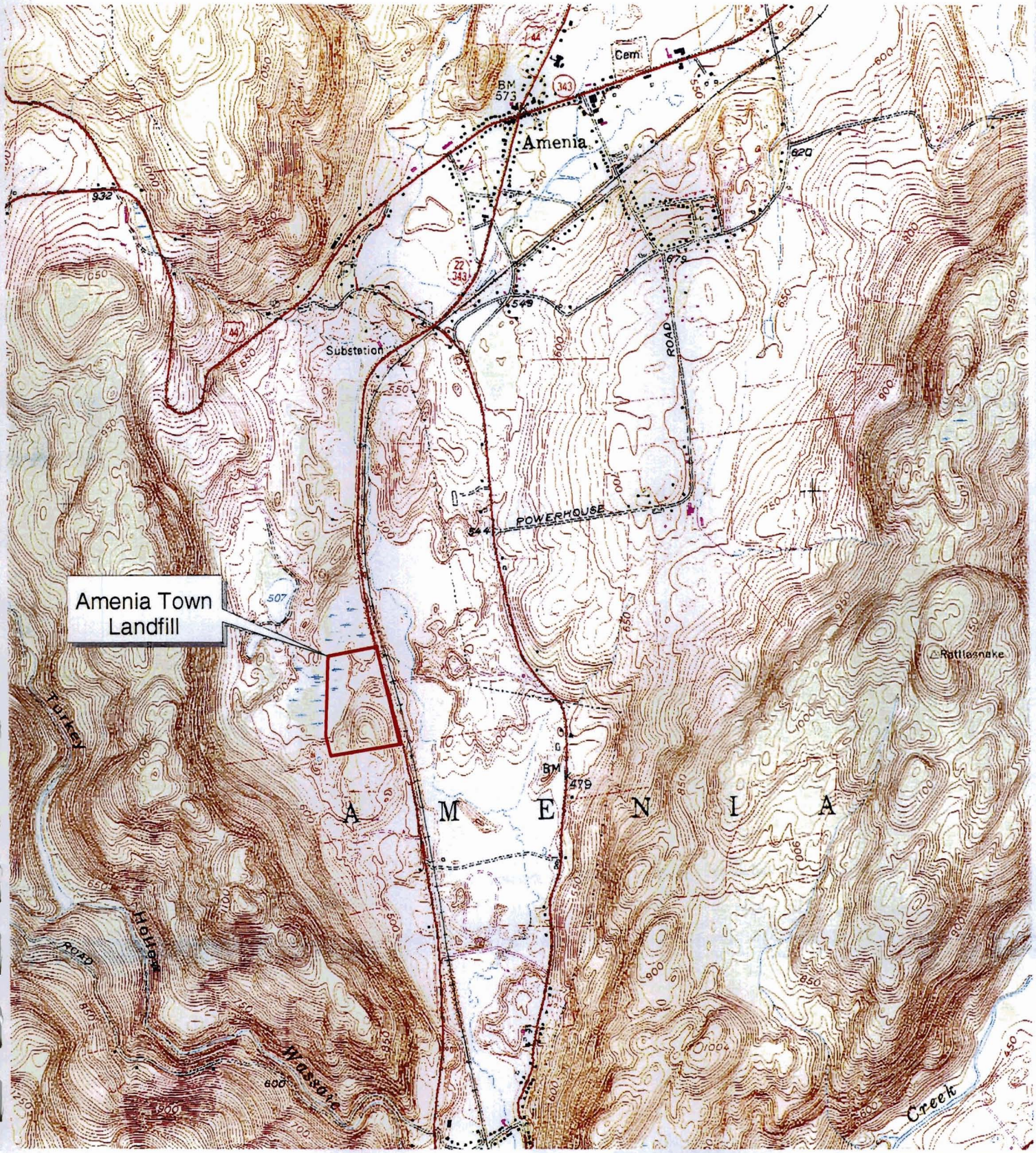
Test pits were excavated and backfilled October 28, 2003

Northings and Eastings in 1983 NY State Plane Coordinate System

Table 3-2
Amenia Town Landfill
Summary of Limits of Waste Data From RI/FS Borings

Name	Landfill Material Present	Nominal Depth to Bottom of Waste	Nominal Elev. to Bottom of Waste	Nominal Boring Depth	Easting	Northing
MW-1	Yes	14.3	487.12	27	746351.134	1091736.015
MW-2	Yes	22.5	483.12	31	746550.595	1091783.925
MW-3	No	---	---	32	746719.023	1091784.694
MW-4	No	---	---	38	746751.939	1091531.318
MW-5	No	---	---	33	746797.163	1091221.941
MW-6	Yes	50	482.97	55	746363.369	1091227.546
MW-7	Yes	8	501.83	29	746328.786	1091373.812
MW-8	Yes	18	487.5	33	746341.030	1091540.463
PZ-1	Yes	24	483.42	37	746511.027	1091581.612
SB-1	Yes	24	480.98	54	746635.930	1091770.051
SB-3	Yes	10	522.96	30	746522.898	1091140.007

Northings and Eastings in 1983 NY State Plane Coordinate System



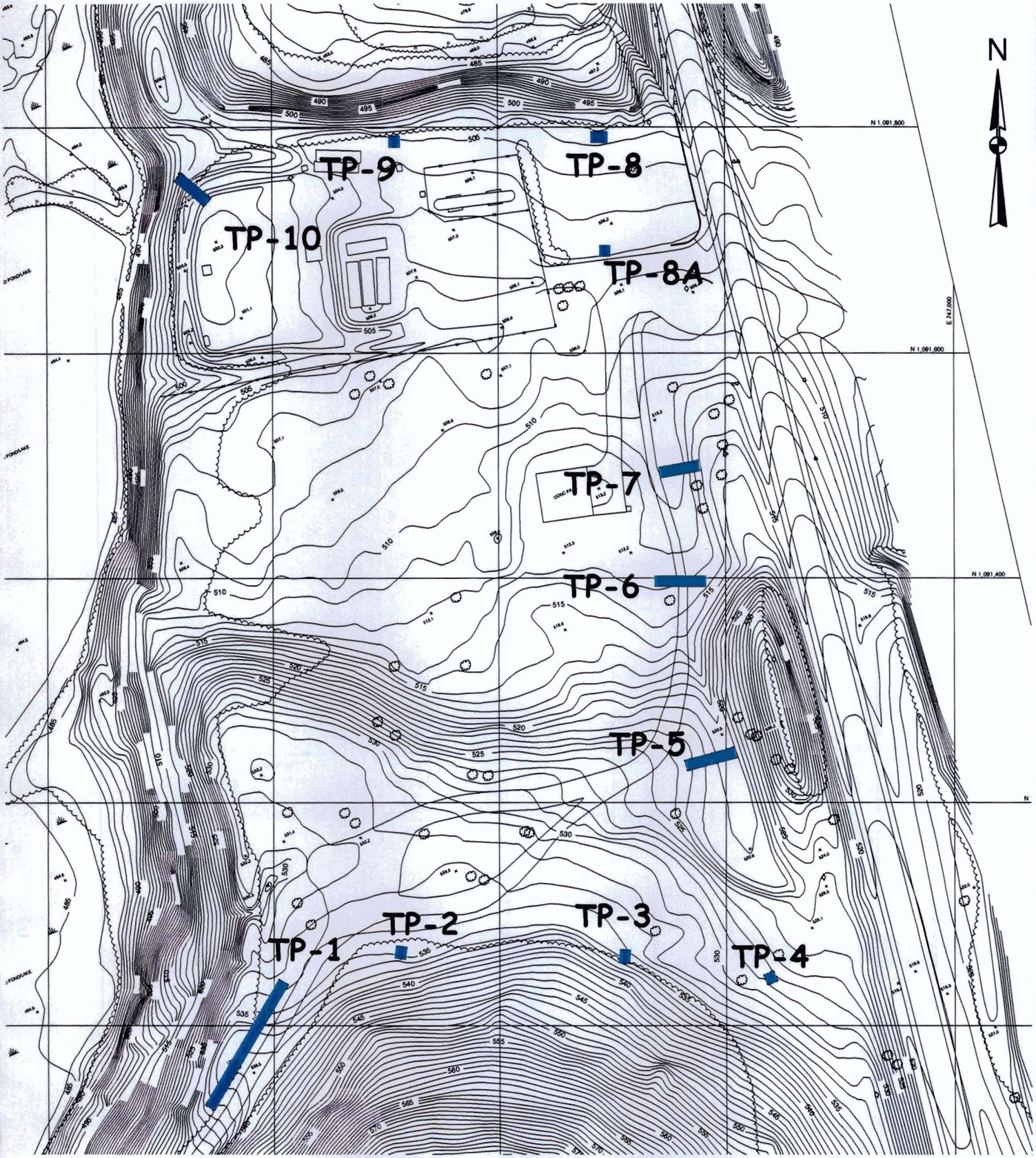
Map Source: USGS 7.5 Minute Series Quadrangle
Amenia, NY-CT, 1958
Photorevised 1984

Site Location Map
Amenia Town Landfill
Amenia, New York

URS
Wayne, New Jersey

Scale 1:24000	Proj. No. 19683595	
Date: March 2004		Figure 1-1

I:\projects\1E04141(AmeniaRIFS)\GIS\amenia_FS.apr



Datum: New York State Plane Coordinate System
1983 State Plane - Eastern NY

Vertical Datum = North American Datum of 1988

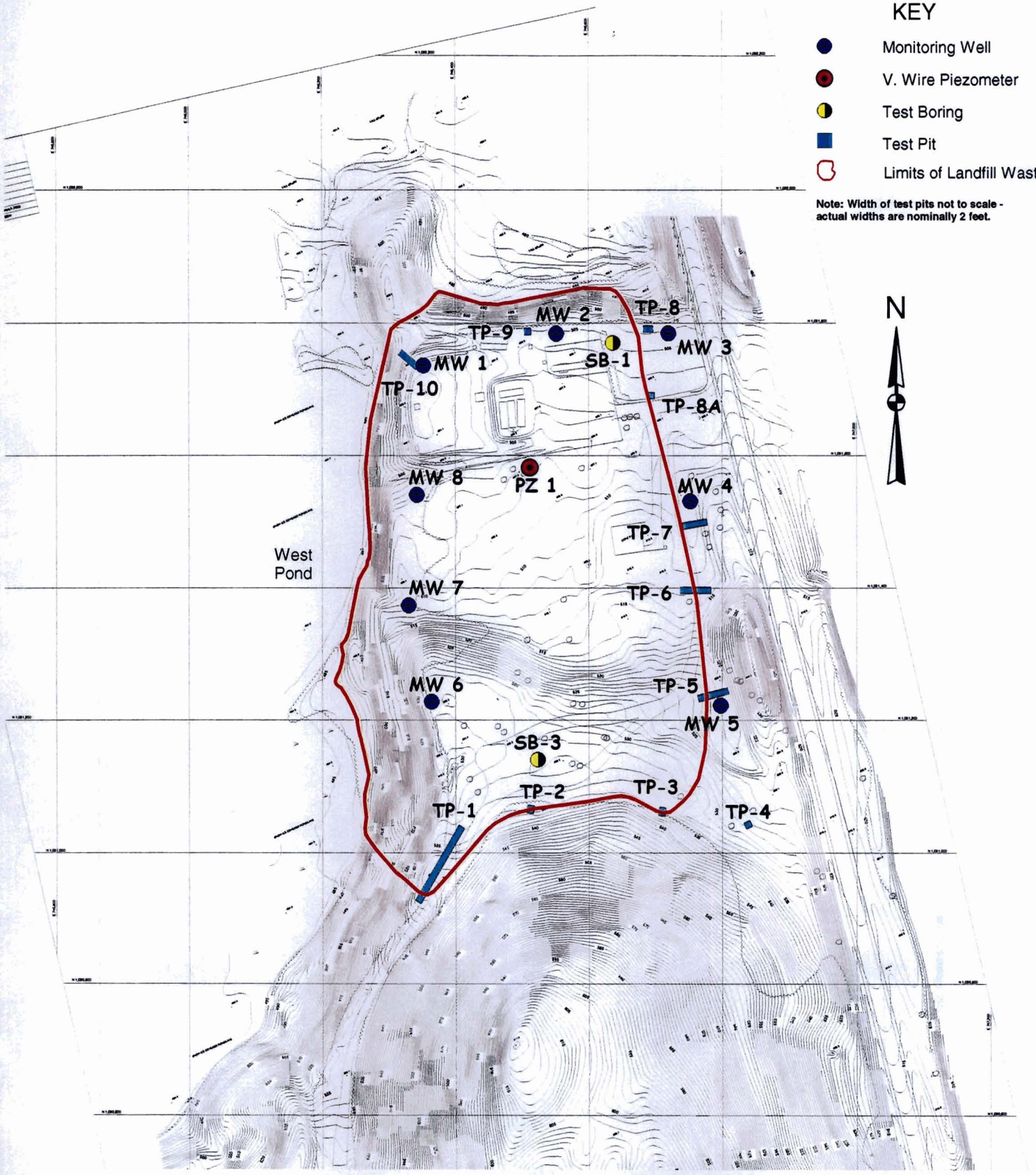
Note: Width of test pits not to scale - actual widths are nominally 2 feet.

Test_pit.apr

October 2003 Test Pit Locations
Amenia Town Landfill RI/FS
Amenia, New York

URS
Wayne, New Jersey

Scale: As Shown	Proj. No. 19683595.003B1	
Date 11/2003		Figure 2-1



0 100 200 300 400 500 Feet

Datum: New York State Plane Coordinate System
1983 State Plane - Eastern NY

Vertical Datum = NAD 1988

Test_pit.apr

Approximate Limits of Landfill Waste
Amenia Town Landfill RI/FS
Amenia, New York

URS
Wayne, New Jersey

Scale 1:2400	Proj. No. 19683595.003B1	
Date 11/2003		Figure 3-1

ATTACHMENTS

ATTACHMENT A

October 28, 2003 Field Activity Report
and
Community Air Monitoring Data

URS	FIELD ACTIVITY REPORT
DATE	October 28, 2003
PROJECT & NUMBER	Amenia Town Landfill- URS 19683595
CONTRACTOR	EISCO-NJ
CONTRACTOR PERSONNEL	Walter Dowd, Keith Petric
EQUIPMENT USED	Backhoe
WEATHER	Sunny, Clear, Breezy, cool ~52-62°F

DESCRIPTION OF WORK PERFORMED AND INSPECTED

	AGENDA: Test Pit excavations for landfill limits with Health and Safety (H&S) and CAMP Air Monitoring.
0900	George Nemeth (GN) and Dan Stettner (DS) of URS onsite. Walter Dowd, Keith Petric (EISCO), Karen Maiurano (DEC), and Fay Navratil (DOH) already onsite. Discussion of field activities to be performed.
	DS reviews site plan and starts flagging test pit locations. GN reviews H&S plan with EISCO and receives signatures for H&S Compliance form.
	URS Project Manager- Marion Craig on-site, as well as other individuals from NYSDEC and Amenia Landfill Group
	Instruments onsite include: 2-Data Ram 4000's, 2-MiniRae 2000's, 1-Vrae CGI, and associated cal kits. GN calibrates all instruments to Fresh Air and known reference gases: PID #1 Fresh Air: ~0.4 ppm / 100ppm Isobutylene: ~105 ppm / Background: fluctuating+/- ~0.2-0.4 ppm PID #2 Fresh Air: ~0.2 ppm / 100ppm Isobutylene: ~101 ppm / Background: fluctuating+/- ~0.3 ppm VRAE Fresh Air: (CO, H_2S,LEL=0 ppm), O_2= 21% Span Calibration Reference Gas: CO=50 ppm, H_2S=25 ppm, LEL=50, O_2=21% Span Calibration: CO=50 ppm, H_2S =26 ppm, LEL=49, O_2=21% Background: CO=0 ppm, H_2S =0 ppm, LEL=0, O_2=20.9-21% DataRam #1 Zeroed Instrument: OK Background: fluctuating +/- 8-12 ug/m^3 Note: Instruments fluctuating in background, drifting.
~1055	Start performing test pit excavations at location Test Pit (TP-1). URS/EISCO uses yellow caution tape around and/or near test pit excavations to signal caution. A perimeter monitoring station containing a PID, DataRam, and flagging tape (to observe wind direction), was setup downwind from the excavation activities. Perimeter PID measurements were recorded approximately ever 1 to 2 min. with an instrument 15-min. average recorded approximately every 15-min. in the field book. The DataRam was programmed to display a continuous 15-min average which was recorded approximately every 1 to 2 min. in the field book. Breathing zone air monitoring was performed approximately every 1 to 2 mins and at least every 30 mins. Air Quality Measurements can be found on Table 1 attached. Once Test Pit excavations were completed, the excavation was flagged around the perimeter using caution tape and left open for visual inspection by the DEC and other visitors later in the day.
	Continue working on Test Pits: TP-1, TP-2, and TP-3.
1322-1351	Lunch Break/discussion of project activities.
1351	Continue with Test Pit excavations TP-3, TP-4, TP-5, TP-6, TP-7, TP-8/8A, TP-9

~1547	While excavating TP-9, breathing zone vapors increased upon excavating activities. Breathing zone concentration was 24 ppm, the Action Limit (AL) is 5 ppm. GN and DS tell everyone to move away from the area around excavation due to high VOC concentrations exceeding the AL. GN and DS direct backhoe operator to backfill excavation immediately. GN monitors breathing zone around backhoe operator were PID readings are below 5 ppm.
	Due to high VOC readings encountered at TP-9, GN decides to perform continuous air monitoring at the breathing zone and to stop note taking at the perimeter monitoring station. Considering that the AL for perimeter VOC monitoring is 5 ppm (continuous 15-minute average), and the AL for the breathing zone is 5 ppm (1-minute average), and the fact that the test pits are conducted very quickly; if the AL is to exceed 5 ppm it would first be encountered in the immediate work area before reaching the perimeter. In both types of monitoring if the AL is exceeded, the test Pit is immediately backfilled. GN feels this would provide better protection to onsite personnel due the new location of the landfill being excavated and the proximity to TP-9.
1549	GN explains to onsite visitors the air monitoring being performed and the caution that should be exercised with and around the excavated soil and materials especially due to contamination observed in TP-9. Continue working on TP-10.
	PIDs start to read high concentrations, even in background areas. GN and DS suspect this can be attributed to humidity and moisture. The sun went down, cooler temperature and damp air pushing into area. Also, the area of the landfill where work is being conducted is very wet with puddles of standing water.
	Finish conducting all Test Pit excavations. GN and DS start-logging test pit locations on map and clean up site, EISCO starts to backfill all Test Pits.
	All Test Pits backfilled.
1730	GN, DS, Marion Craig, Rick (Ashland Chemical) and EISCO offsite.

Table 1
Air Monitoring Log For Test Pit Excavations
Amenia Town Landfill
October 28, 2003

Test Pit Number	Time	Perimeter Monitoring		Breathing Zone Monitoring
		PID (ppm) [1]	DataRam (ug/m³) [2]	PID (ppm)
TP-1	1057	0.3	9.4	See note [3]
	1058	0.2	--	
	1103	0.2	13.8	
	1105	0.3	28.6	
	1106	0.3	9.4	
	1108	1.5	8.0	
	1110	0.0	17.7	
	1112	0.3	8.4	
	1113	0.5*	8.4	
	1117	0.4	8.0	
	1122	0.2	9.2	
	1123	0.7	8.2	
	1126	0.2	7.4	
	1128	0.4*	6.7	
	1133	0.4	6.9	
	1138	0.2	10.0	
	1143	0.2*	5.8	
	1146	0.2	6.4	
	~1146	Stopped Excavating, continued ~1212		
	1212	0.4	10.4	
	1213	0.2	6.5	
	1213	Stopped Excavating, continued ~1221		
	1221	0.3*	6.7	0.2
	1225	1.1	5.3	--
	1233	0.0	6.1	0.2
	1237	1.1*	5.1	--
TP-2	1249	0.4	8.0	0.2
	1251	1.0	13.1	--
	1252	0.2	5.9	--
	1254	0.0	8.4	--
	1256	1.7	15.6	0.3
	1258	0.3	6.3	--
TP-3	1313	0.2	67.5	--
	1314	0.4	14.2	--
	1316	1.2	9.2	0.4
	1318	0.7	12.9	--
	1320	1.0	58.0	--
	1322	0.4	16.2	0.3
	1322	Break, start ~1351		
	1351	0.2	8.3	0.2
	1352	0.8	23.9	0.2
	1354	0.4*	55.7	0.2
TP-4	1400	0.4	18.9	0.2
	1403	0.1	14.0	0.3
	1406	1.4	7.6	--

Table 1
Air Monitoring Log For Test Pit Excavations
Amenia Town Landfill
October 28, 2003

Test Pit Number	Time	Perimeter Monitoring		Breathing Zone Monitoring
		PID (ppm) [1]	DataRam (ug/m³) [2]	PID (ppm)
TP-5	1412	1.1	15.4	--
	1414	1.0	14.8	0.2
	1416	0.6	9.8	0.7
	1418	0.5*	35.5	0.6
	1419	0.3	41.3	0.5
	1424	0.4	23.1	~0.4
TP-6	1427	0.7	11.2	0.3
	1428	0.5*	27.5	0.4
	1429	1.1	28.4	0.3
	1433	0.6	8.1	0.3
	1434	0.6	7.1	--
	1436	--	--	0.3
TP-7	1442	0.8	8.6	0.7
	1443	0.5*	7.8	0.2
	1446	0.6	17.9	0.2
	1448	0.8	16.2	0.4
	1450	0.5	17.2	--
	1453	0.2	18.7	0.2
	1456	0.6/0.5*	7.6	0.2
TP-8/8A	1512	1.0	7.8	0.2
	1513	0.5*	--	--
	1515	0.2	7.2	0.2
	1517	0.6	9.0	--
	1521	0.7	17.3	0.2
TP-9	1542	1.8	9.4	1.8
	1547	--	8.9	24.2
TP-10	1549	1.3	19.9	2.1

Notes:

See Field Activity Report and Field Book for additional information.

(1) parts per million (ppm)

(2) micrograms per cubic meter (ug/m^3)

(3) Breathing zone measurements were conducted, but not recorded in log book.

* Concentration recorded is equal to instrument displayed 15 minute running average.

-- Measurement was not recorded.

1. The DataRam was programmed to display a continuous-running 15-minute average value displayed on the instrument readout.
2. The PID could not calculate a continuous-running 15-minute average, but only a 15-minute average for each running 15-minute time period. This measurement display was manually selected on the instrument at approximately each 15-minute time period.

ATTACHMENT B

Logs of Test Pits

URS Corporation

Amenia Town Landfill

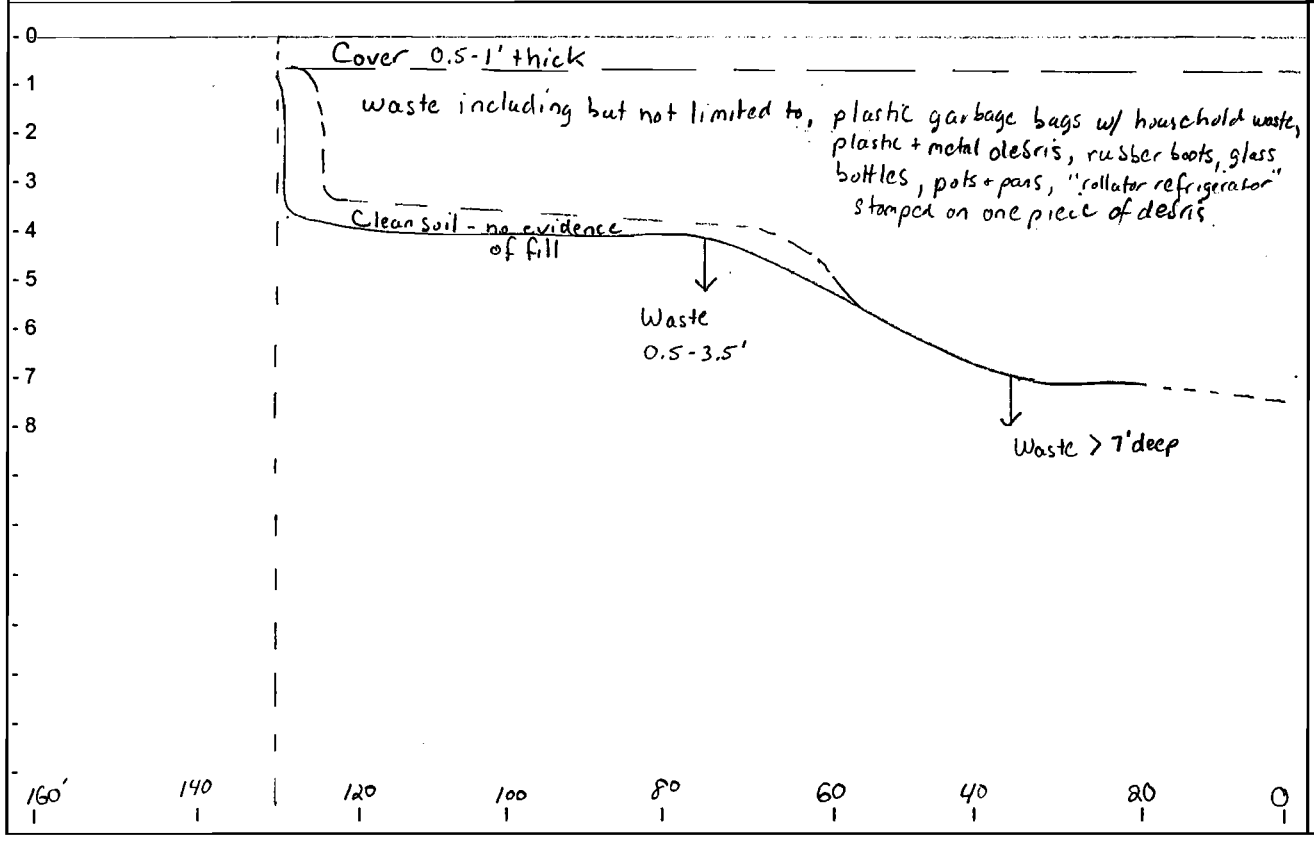
LOG OF TEST PIT TP-1

SHEET 1 OF 1

SITE NAME: Amenia Town Land Fill, LOCATION: Amenia, New York		DATE STARTED: October 28, 2003	DATE COMPLETED: October 28, 2003	PROJECT NUMBER: 19683595.00008
EXCAVATION CONTRACTOR: Eisco of NJ	FOREMAN: W. Dowd	GROUND ELEVATION (FT): ~ 535'	COMPLETION DEPTH (FT): 3-7' bgs	PLAN (SKETCH WITH SHAPE, L x W (FT) DIMENSIONS, AND PROFILE ORIENTATION)
EXCAVATION EQUIPMENT: CAT 426C 4X4 Turbo ExtendaHoe		WATER LEVEL (FT): N/A	INSPECTOR: D. Stettner	← 131' → NORTH; 2' ↕
EXCAVATION LOCATION: Southwest boundary of fill near scrap metal pile		WEATHER: Mostly Clear, 50 F°		

HORIZONTAL SCALE: 1 inch = 20 ft
VIEW LOOKING: West

PROFILE DESCRIPTION



Sample Interval	Water Table	Depth (ft)	PID/ FID (ppm)	Sample Number
		0	Back ground	No samples collected
		1		
		2		
		3		
		4		
		5		
		6		
		7		
		8		
		9		
		10		
		11		
		12		
		13		
		14		
		15		

URS Corporation

Amenia Town Landfill

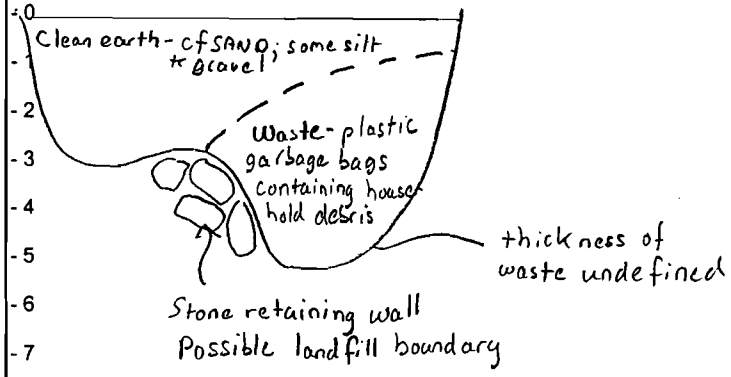
LOG OF TEST PIT TP-2

SHEET 1 OF 1

SITE NAME Amenia Town Land Fill, LOCATION Amenia, New York		DATE STARTED October 28, 2003	DATE COMPLETED October 28, 2003	PROJECT NUMBER 19683595.00008
EXCAVATION CONTRACTOR Eisco of NJ	FOREMAN W. Dowd	GROUND ELEVATION (FT) ~ 535'	COMPLETION DEPTH (FT) 5.5'	PLAN (SKETCH WITH SHAPE, L x W (FT) DIMENSIONS, AND PROFILE ORIENTATION)
EXCAVATION EQUIPMENT CAT 426C 4X4 Turbo ExtendaHoe		WATER LEVEL (FT)	INSPECTOR D. Stettner	← 12' → ↑ 2' ↓ NORTH
EXCAVATION LOCATION Southwest boundary of fill near contractor storage yard.		WEATHER Mostly Clear, 60 F°		

HORIZONTAL SCALE: 1 inch = 5 ft
VIEW LOOKING: West

PROFILE DESCRIPTION



Depth (ft)	Sample Interval	Water Table	PID/ FID (ppm)	Sample Number
0			Back-ground	No samples collected
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				

0 5' 10' 15'

URS Corporation
Amenia Town Landfill

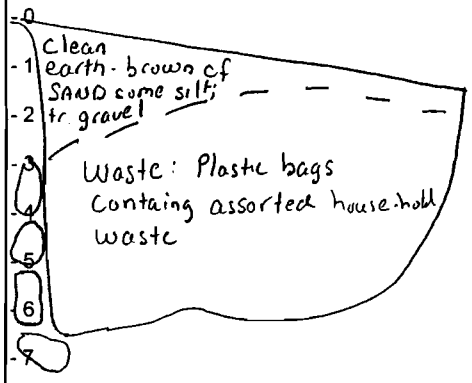
LOG OF TEST PIT TP-3

SHEET 1 OF 1

SITE NAME: Amenia Town Land Fill, LOCATION: Amenia, New York		DATE STARTED: October 28, 2003	DATE COMPLETED: October 28, 2003	PROJECT NUMBER: 19683595.00008
EXCAVATION CONTRACTOR: Eisco of NJ	FOREMAN: W. Dowd	GROUND ELEVATION (FT): ~ 535'	COMPLETION DEPTH (FT): 6.5'	PLAN (SKETCH WITH SHAPE, L x W (FT) DIMENSIONS, AND PROFILE ORIENTATION)
EXCAVATION EQUIPMENT: CAT 426C 4X4 Turbo ExtendaHoe		WATER LEVEL (FT): NA	INSPECTOR: D. Stettner	← 13' → ↑ 2' ↓ NORTH
EXCAVATION LOCATION: South boundary of fill		WEATHER: Mostly Clear, 60 F°		

HORIZONTAL SCALE: 1 inch = 5 ft
VIEW LOOKING: West

PROFILE DESCRIPTION



Depth (ft)	Sample Interval	Water Table	PID/FID (ppm)	Sample Number
0			Back-ground	No samples collected
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				

URS Corporation

Amenia Town Landfill

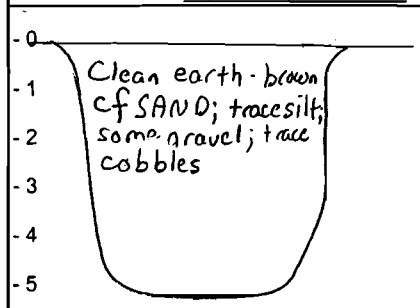
LOG OF TEST PIT TP-4

SHEET 1 OF 1

SITE NAME Amenia Town Land Fill, LOCATION Amenia, New York		DATE STARTED October 28, 2003	DATE COMPLETED October 28, 2003	PROJECT NUMBER 19683595.00008
EXCAVATION CONTRACTOR Eisco of NJ	FOREMAN W. Dowd	GROUND ELEVATION (FT) 528'	COMPLETION DEPTH (FT) 6.0'	PLAN (SKETCH WITH SHAPE, L x W (FT) DIMENSIONS, AND PROFILE ORIENTATION)
EXCAVATION EQUIPMENT CAT 426C 4X4 Turbo ExtendaHoe		WATER LEVEL (FT) NA	INSPECTOR D. Stettner	← 6' → NORTH ↑ 2' ↓
EXCAVATION LOCATION Southeast corner of fill		WEATHER Mostly Clear, 60 F°		

HORIZONTAL SCALE: 1 inch = 5 ft
VIEW LOOKING: West

PROFILE DESCRIPTION



Depth (ft)	Sample Interval	Water Table	PID/ FID (ppm)	Sample Number
0			Back-ground	No samples collected
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				

0 5 10 15

URS Corporation

Amenia Town Landfill

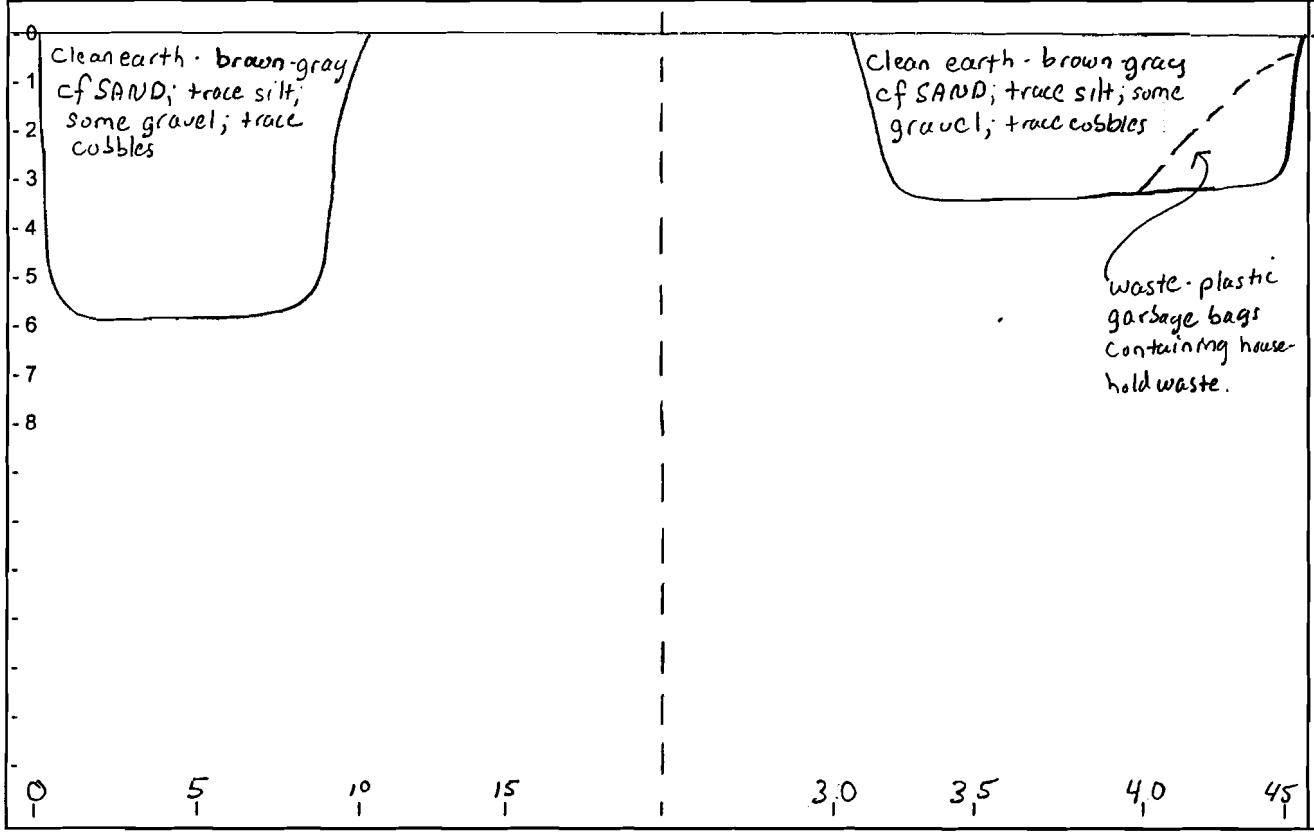
LOG OF TEST PIT TP-5

SHEET 1 OF 1

SITE NAME Amenia Town Land Fill, LOCATION Amenia, New York		DATE STARTED October 28, 2003	DATE COMPLETED October 28, 2003	PROJECT NUMBER 19683595.00008
EXCAVATION CONTRACTOR Eisco of NJ	FOREMAN W. Dowd	GROUND ELEVATION (FT) 520'	COMPLETION DEPTH (FT) 6.0	PLAN (SKETCH WITH SHAPE, L x W (FT) DIMENSIONS, AND PROFILE ORIENTATION)
EXCAVATION EQUIPMENT CAT 426C 4X4 Turbo ExtendaHoe		WATER LEVEL (FT) N/A	INSPECTOR D. Stettner	46' NORTH 2'
EXCAVATION LOCATION East boundary of fill		WEATHER Mostly Clear, 60 F°		

HORIZONTAL SCALE: 1 inch = 5 ft
VIEW LOOKING: South

PROFILE DESCRIPTION



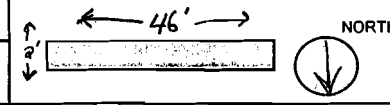
Depth (ft)	PID/FID (ppm)	Sample Number
0	Back-ground	No samples collected
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		

Sample Interval | Water Table

URS Corporation
Amenia Town Landfill

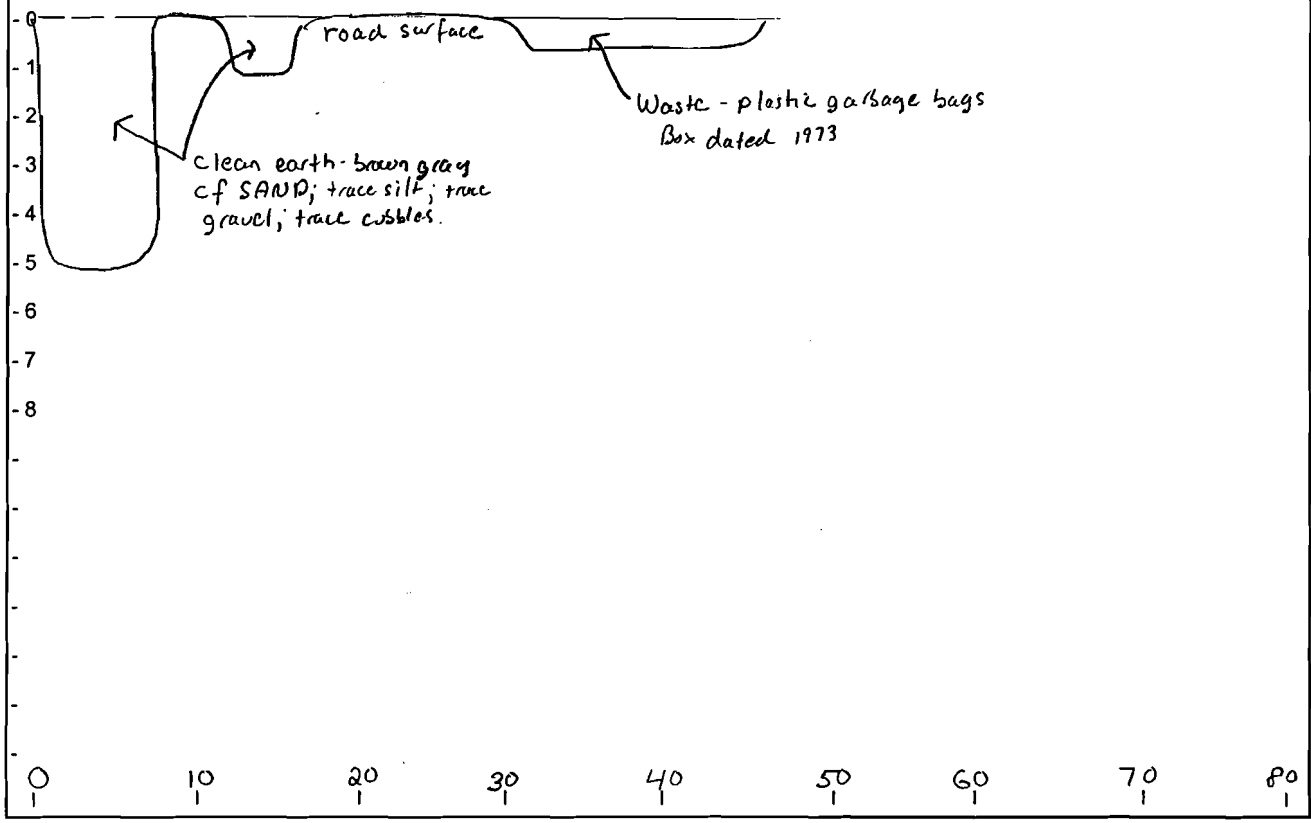
LOG OF TEST PIT TP-6

SITE NAME Amenia Town Land Fill, LOCATION Amenia, New York		DATE STARTED October 28, 2003	DATE COMPLETED October 28, 2003	PROJECT NUMBER 19683595.00008
EXCAVATION CONTRACTOR Eisco of NJ	FOREMAN W. Dowd	GROUND ELEVATION (FT) ~ 513'	COMPLETION DEPTH (FT) 6.0'	PLAN (SKETCH WITH SHAPE, L x W (FT) DIMENSIONS, AND PROFILE ORIENTATION)
EXCAVATION EQUIPMENT CAT 426C 4X4 Turbo ExtendaHoe		WATER LEVEL (FT)	INSPECTOR D. Stettner	
EXCAVATION LOCATION East boundary of fill		WEATHER Mostly Clear, 60 F°		



HORIZONTAL SCALE: 1 inch = 10 ft
VIEW LOOKING: South

PROFILE DESCRIPTION



Depth (ft)	PID/FID (ppm)	Sample Number
0	Back-ground	No samples collected
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		

Sample Interval | Water Table

URS Corporation

Amenia Town Landfill

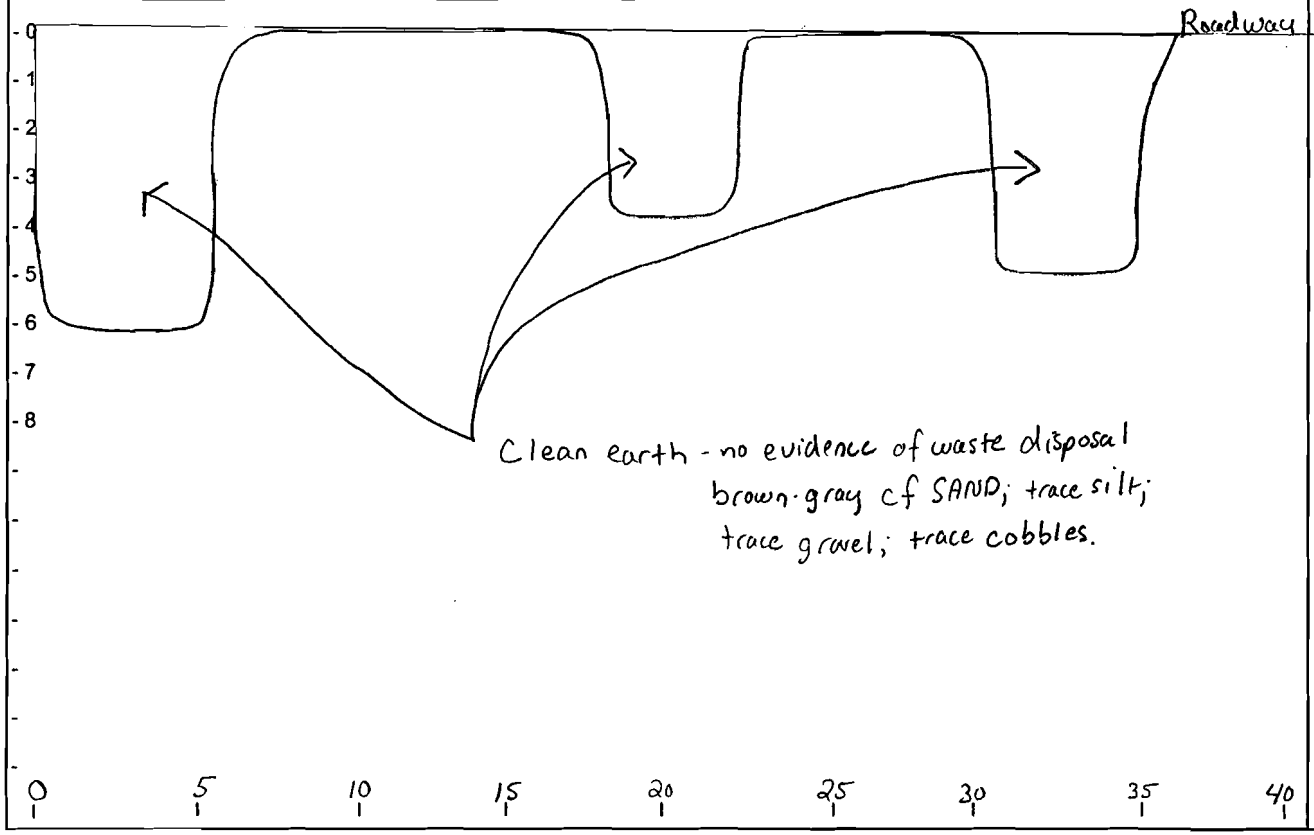
LOG OF TEST PIT TP-7

SHEET 1 OF 1

SITE NAME Amenia Town Land Fill, LOCATION Amenia, New York		DATE STARTED October 28, 2003	DATE COMPLETED October 28, 2003	PROJECT NUMBER 19683595.00008
EXCAVATION CONTRACTOR Eisco of NJ	FOREMAN W. Dowd	GROUND ELEVATION (FT) ~ 511'	COMPLETION DEPTH (FT) 6.0'	PLAN (SKETCH WITH SHAPE, L x W (FT) DIMENSIONS, AND PROFILE ORIENTATION)
EXCAVATION EQUIPMENT CAT 426C 4X4 Turbo ExtendaHoe		WATER LEVEL (FT)	INSPECTOR D. Stettner	← 36' → NORTH
EXCAVATION LOCATION Northeast boundary of fill adjacent former helipad		WEATHER Mostly Clear, 65 F°		0' ↓

HORIZONTAL SCALE: 1 inch = 5 ft
VIEW LOOKING: South

PROFILE DESCRIPTION



Depth (ft)	PID/FID (ppm)	Sample Interval	Water Table	Sample Number
0	Back-ground			No samples collected
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				

URS Corporation

Amenia Town Landfill

LOG OF TEST PIT TP-8

SHEET 1 OF 1

SITE NAME: Amenia Town Land Fill, LOCATION: Amenia, New York		DATE STARTED: October 28, 2003	DATE COMPLETED: October 28, 2003	PROJECT NUMBER: 19683595.00008
EXCAVATION CONTRACTOR: Eisco of NJ	FOREMAN: W. Dowd	GROUND ELEVATION (FT): ~ 504'	COMPLETION DEPTH (FT): 3.0'	PLAN (SKETCH WITH SHAPE, L x W (FT) DIMENSIONS, AND PROFILE ORIENTATION)
EXCAVATION EQUIPMENT: CAT 426C 4X4 Turbo ExtendaHoe		WATER LEVEL (FT): NA	INSPECTOR: D. Stettner	← 15' → ↓ 2' NORTH
EXCAVATION LOCATION: Northeast corner of site		WEATHER: Mostly Clear, 65 F°		

HORIZONTAL SCALE: 1 inch = 5 ft
VIEW LOOKING: North

PROFILE DESCRIPTION

Depth (ft)	Sample Interval	Water Table	PID/ FID (ppm)	Sample Number
0			Back-ground	No samples collected
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				

Brown-black cf SAND; trace silt; trace gravel; trace cobbles; no evidence of waste.

0 5 10 15 20 25 30 35 40

URS Corporation

Amenia Town Landfill

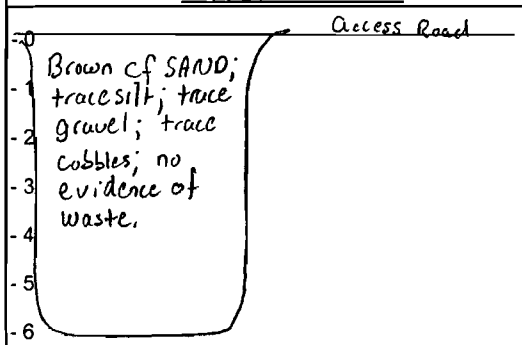
LOG OF TEST PIT TP-8A

SHEET 1 OF 1

SITE NAME Amenia Town Land Fill, LOCATION Amenia, New York		DATE STARTED October 28, 2003	DATE COMPLETED October 28, 2003	PROJECT NUMBER 19683595.00008
EXCAVATION CONTRACTOR Eisco of NJ	FOREMAN W. Dowd	GROUND ELEVATION (FT) ~ 507'	COMPLETION DEPTH (FT) 6.0'	PLAN (SKETCH WITH SHAPE, L x W (FT) DIMENSIONS, AND PROFILE ORIENTATION)
EXCAVATION EQUIPMENT CAT 426C 4X4 Turbo ExtendaHoe		WATER LEVEL (FT) NA	INSPECTOR D. Stettner	← 8' → NORTH 2'
EXCAVATION LOCATION Immediately adjacent the site access road.		WEATHER Mostly Clear, 65F°		

HORIZONTAL SCALE: 1 inch = 5 ft
VIEW LOOKING: East

PROFILE DESCRIPTION



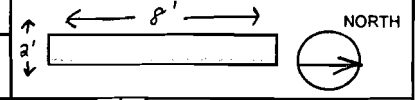
Sample Interval	Water Table	Depth (ft)	PID/ FID (ppm)	Sample Number
		0	Back-ground	No samples collected
		1		
		2		
		3		
		4		
		5		
		6		
		7		
		8		
		9		
		10		
		11		
		12		
		13		
		14		
		15		

URS Corporation

Amenia Town Landfill

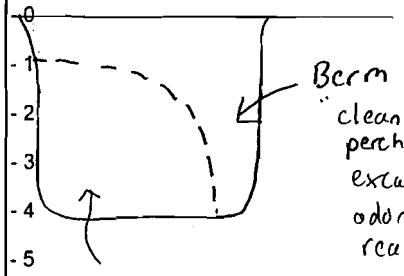
LOG OF TEST PIT TP-9

SITE NAME Amenia Town Land Fill, LOCATION Amenia, New York		DATE STARTED October 28, 2003	DATE COMPLETED October 28, 2003	PROJECT NUMBER 19683595.00008
EXCAVATION CONTRACTOR Eisco of NJ	FOREMAN W. Dowd	GROUND ELEVATION (FT) ~506	COMPLETION DEPTH (FT) 4.0	PLAN (SKETCH WITH SHAPE, L x W (FT) DIMENSIONS, AND PROFILE ORIENTATION)
EXCAVATION EQUIPMENT CAT 426C 4X4 Turbo ExtendaHoe		WATER LEVEL (FT) ~3,5'	INSPECTOR D. Stettner	
EXCAVATION LOCATION Northwest of LPG tank		WEATHER Mostly Clear, 60F°		



HORIZONTAL SCALE: 1 inch = 5 ft
VIEW LOOKING: West

PROFILE DESCRIPTION



Berm appeared to be constructed of "clean soils" - higher silt/clay content perched water with product in bottom of excavation. Product exhibits sweet phenol-like odor. Immediately backfill due to elevated PID readings.

Waste including metal soda + beer cans assorted scrap metal possible 5 gallon pail appeared to be mop bucket with castors.

Sample Interval	Water Table	Depth (ft)	PID FID (ppm)	Sample Number
		0	24.7	No samples collected
		1		
		2		
		3		
		4		
		5		
		6		
		7		
		8		
		9		
		10		
		11		
		12		
		13		
		14		
		15		

0 5 10 15 20 25 30 35 40

URS Corporation

Amenia Town Landfill

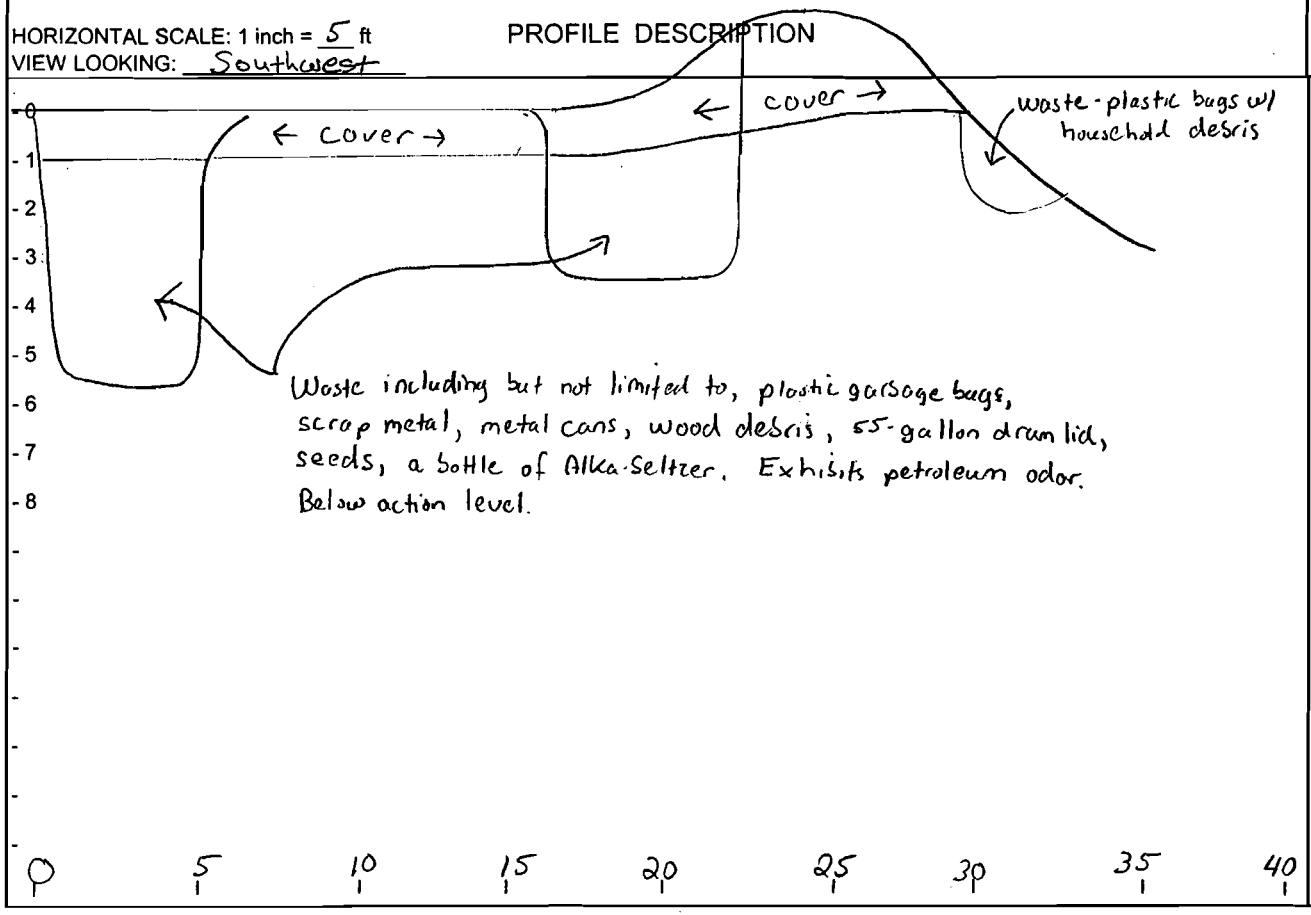
LOG OF TEST PIT TP-10

SHEET 1 OF 1

SITE NAME Amenia Town Land Fill, LOCATION Amenia, New York		DATE STARTED October 28, 2003	DATE COMPLETED October 28, 2003	PROJECT NUMBER 19683595.00008
EXCAVATION CONTRACTOR Eisco of NJ	FOREMAN W. Dowd	GROUND ELEVATION (FT) ~ 503'	COMPLETION DEPTH (FT) 5.5'	PLAN (SKETCH WITH SHAPE, L x W (FT) DIMENSIONS, AND PROFILE ORIENTATION)
EXCAVATION EQUIPMENT CAT 426C 4X4 Turbo ExtendaHoe		WATER LEVEL (FT) N/A	INSPECTOR D. Stettner	← 35' → ↕ 2' NORTH
EXCAVATION LOCATION Northwest corner of LPG enclosure.		WEATHER Mostly Clear, 50 F°		

HORIZONTAL SCALE: 1 inch = 5 ft
VIEW LOOKING: Southwest

PROFILE DESCRIPTION



Depth (ft)	PID/FID (ppm)	Sample Number
0	2.1	No samples collected
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		

Sample Interval | Water Table

Appendix B

TABLE B-1
AMENIA TOWN LANDFILL FEASIBILITY STUDY
APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

Statute or Regulation	Citation	Description	Applicability	Comment
STATE: Chemical-Specific				
New York Water Quality Standards	6 NYCRR Part 703	NYSDEC provides standards of quality and purity for surface water and groundwater and effluent guidelines.	Applicable	A study of regional water use indicates that there is currently no withdrawal of groundwater for public supply within one-quarter mile radius of the site (NYSDOH, May 1999). However, New York State classifies all groundwater of the State as a source of drinking water; therefore, NYSDEC's water quality standards are applicable.
NYSDEC Technical and Administrative Guidance Memorandum: Determination of Soil Remediation Objectives and Cleanup Levels	HWR-94-4046 TAGM 4046, January 1994	NYSDEC provides the recommended soil remediation objectives for hazardous waste sites.	Relevant and Appropriate	This guidance was considered in the development of remedial alternatives for the site.
NYSDEC Technical Guidance for Screening Contaminated Sediments	July 1994, revised January 1999	NYSDEC provides screening criteria for sediment evaluations	Relevant and Appropriate	This guidance was considered in defining the extent of impacted sediment at the site.
New York State Regulations for the Identification and Management of Hazardous Waste	6 NYCRR Part 370 -374, 376	Establishes regulatory requirements for the identification and handling of hazardous remediation wastes that are actively managed.	Potentially Applicable	These regulations would only be applicable if hazardous remediation wastes are identified and actively managed during remediation activities at this site.
FEDERAL: Chemical-Specific				
None Identified				

TABLE B-1
AMENIA TOWN LANDFILL FEASIBILITY STUDY
APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

Statute or Regulation	Citation	Description	Applicability	Comment
STATE: Location-Specific				
NYS Freshwater Wetlands Act	NYS ECL Article 24, 6 NYCRR Part 662 and 663	Establishes a state permit procedure for activities impacting wetlands greater than 12.4 acres.	Applicable	Amenia wetlands are larger than 12.4 acres. Remediation will involve this statute because remedial work in wetlands is required.
Use and Protection of Waters	6 NYCRR Part 608	Defines activities disturbing navigable waters of the state which require a permit.	Potentially Applicable	Applicable to the extent that West pond is considered navigable waters of the state.
FEDERAL: Location-Specific				
None Identified				

TABLE B-1
AMENIA TOWN LANDFILL FEASIBILITY STUDY
APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

Statute or Regulation	Citation	Description	Applicability	Comment
State - Action-Specific				
Inactive Hazardous Waste Disposal Sites	6 NYCRR Part 375	Establishes regulations for NYS Inactive Hazardous Waste Disposal Sites program.	Applicable	Applicable for the Amenia Town Landfill, including permitting requirements, public participation, and remedy selection.
Solid Waste Management Facilities	6 NYCRR Part 360	Establishes that certain solid waste landfills will be capped, monitored, closed and maintained accordance with the requirements set forth therein.	Relevant and Appropriate	These regulations are not applicable because the landfill at the site was closed before the effective date of the closure requirements set forth in the regulations. However, they are relevant and appropriate because they address landfills similar to that involved here, such that their use to address closure, groundwater monitoring and post-closure requirements for the landfill may be well-suited to this site.
NYSDEC Technical and Administrative Guidance Memorandum: Selection of Remedial Actions at Inactive Hazardous Waste Sites	HWR-90-4030, TAGM 4030, May 1, 1990	NYSDEC provides guidance to model the FS remedy selection process after CERCLA	Relevant and Appropriate	This guidance is considered during the FS remedy selection process.
NYSDEC Technical and Administrative Guidance Memorandum: Fugitive Dust Suppression and Particulate Monitoring Program at Inactive Hazardous Waste Sites	TAGM 4031, October 1989	Provides guidance for particulate air monitoring during remedial activities	Relevant and Appropriate	This guidance will be used to develop a community air monitoring program during construction.
NYSDEC Technical and Administrative Guidance Memorandum: Accelerated Remedial Actions at Class 2, Non-RCRA Regulated Landfills	HWR-92-4044, TAGM 4044, March 1992	NYSDEC describes source control measures for accelerated development of remedial options for Class 2 landfills	Relevant and Appropriate	This guidance is considered in the development of remedial alternative for the site.

TABLE B-1
AMENIA TOWN LANDFILL FEASIBILITY STUDY
APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

Statute or Regulation	Citation	Description	Applicability	Comment
Federal - Action-Specific				
Occupational Safety and Health Administration regulations	29 CFR Chapter XVII	Regulates worker health and safety including medical surveillance and training requirements, job hazard analyses, personal protective equipment, record keeping and reporting.	Applicable	OSHA requirements apply to all site work activities.
Toxic Substance Control Act (TSCA)	15 USC §§ 2601-2692	Regulates manufacturing, storage, transportation and disposal of toxic chemicals, such as PCBs, asbestos and lead.	Potentially Applicable	These regulations would only be applicable if remediation wastes regulated under TSCA are actively managed during remediation.
Hazardous Materials Transportation Uniform Safety Act	49 CFR Parts 101, 106, 107, and 171-180	This Act provides for the safe transport of hazardous materials. The Secretary of Transportation also has the authority to designate materials as hazardous when they pose unreasonable risks to health, safety, or property.	Potentially Applicable	These regulations would only be applicable if hazardous materials are transported off the site.

TABLE B-1
AMENIA TOWN LANDFILL FEASIBILITY STUDY
APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

Statute or Regulation	Citation	Description	Applicability	Comment
State – Guidance to Be Considered				
NYSDEC Division of Air Resources: Guidelines for the Control of Toxic Ambient Air Contaminants	Air Guide-1, 1991 Edition; Revised as DAR-1, AGC/SGC Tables, December 22, 2003	NYSDEC evaluates the impact of air emissions resulting from the selected remedy and assists in evaluating the need for air-emissions control equipment.	To be considered	This guidance is considered because the site may be a source of potential air emissions (landfill gas)
NYSDEC Technical and Operations Guidance Series: Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations	TOGS 1.1.1, revised June 1998	NYSDEC Division of Water provides a compilation of both promulgated water standards from 6 NYCRR 703 and guidance values	To be considered	NYSDEC guidance values were considered for certain constituents without NYSDEC standards (e.g., magnesium in groundwater) to evaluate groundwater and surface water quality at the site.
Freshwater Wetlands Regulations - Guidelines on Compensatory Mitigation	October 1993	NYSDEC Bureau of Habitat provides guidance for the mitigation of impacted wetlands	To be considered	This guidance will be considered if wetlands mitigation is required.
New York State Petroleum-Contaminated Soil Guidance Policy	STARS Memo #1 August 1992	NYSDEC provides direction for the management of petroleum-contaminated soil	To be considered	This guidance is to be considered if soils contaminated with petroleum products are excavated and disposed off site.

TABLE B-1
AMENIA TOWN LANDFILL FEASIBILITY STUDY
APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

Statute or Regulation	Citation	Description	Applicability	Comment
Federal – Guidance to Be Considered				
US EPA Presumptive Remedy for CERCLA Municipal Landfill Site	OSWER No.: 93555.0-49, EPA No.: 540-F-93-035	Provides guidance for capping landfills	To be considered	This guidance is considered because capping is a feasible remedial alternative.
Sediment Quality Criteria	NOAA, 1990	The potential for biological effects of sediment - sorbed contaminants tested in the national status and trends program. NOAA technical memorandum NOSOMA 52.	To be considered	This Federal sediment quality guidance is incorporated in NYSDEC sediment guidance and was used to evaluate sediment data.
Use of Monitored Natural Attenuation at Superfund, RCRA Corrective Action, and Underground Storage tank Sites	OSWER Directive No.: 9200.4-17P, April 21, 1999	Provides guidance for implementing a Monitored Natural Attenuation remedy.	To be considered	This guidance is considered for the long term monitoring of groundwater.
Conducting RI/FSs for CERCLA Municipal Landfill Sites	EPA/540/P-91/001	Recommends RI/FS practices to streamline process for CERCLA municipal landfills	To be considered	This guidance is considered for the development of remedial alternatives.
Conducting RI/FSs Under CERCLA	EPA/540/G-89/004	Recommends RI/FS practices for Superfund sites	To be considered	This guidance is considered for the development of remedial alternatives
Design Operation and Closure of Municipal Solid Waste Landfills	EPA/600/6-85/006	Provides guidance for Subtitle D municipal solid waste landfill design and closure	To be considered	This guidance is considered for the development of the landfill cap design.
Design and Construction of Covers for Solid Waste Landfills	EPA/600/2-79/165	Provides guidance for solid waste landfill final cover design	To be considered	This guidance is considered for the development of the landfill cap design.