November 25, 2002

DRAFT FINAL FEASIBILITY STUDY REPORT

Glens Falls Municipal Landfill At Luzerne Road Site
NYSDEC Site No. 5-57-003
Town of Queensbury
Warren County, New York

Prepared for:

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TOWN OF QUEENSBURY, NEW YORK

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GLOSSARY OF ACRONYMS AND ABBREVIATIONS

ARAR	Applicable or Relevant and Appropriate Requirements
ASP	Analytical Services Protocol
ASTM	American Society for Testing and Materials
BPL	Barrier Protection Layer
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CHA	Clough, Harbour & Associates
Chemtech	Chemtech Consulting Group, Inc.
C.T. Male	C.T. Male Associates, P.C.
CLP	Contract Laboratory Protocol
CP	Citizen Participation
CPP	Citizen Participation Plan
CRDL	Contract Required Detection Limit
DQO	Data Quality Objectives
DUSR	Data Usability Summary Report
EPA	Environmental Protection Agency
EQBA	Environmental Quality Bond Act
ERA	Ecological Risk Assessment
FS	Feasibility Study
FSP	Field Sampling Plan
FWIA	Fish and Wildlife Impact Analysis
GVL	Gas Venting Layer
HASP	Health and Safety Plan
HRS	Hazard Ranking System
IDL	Instrument Detection Limit
LLDPE	Linear Low Density Polyethylene
MW	Monitoring Well
MSW	Municipal Solid Waste
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NYCRR	New York Codes, Rules and Regulations
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
NYSDOT	New York State Department of Transportation
PCB	Polychlorinated Biphenyl
PID	Photoionization Detector
PIM	Precision Industrial Maintenance, Inc.
ppb	Parts Per Billion
PPE	Personal Protective Equipment
ppm	Parts Per Million
PQL	Practical Quantitation Limit
QAPP	Quality Assurance Project Plan

GLOSSARY OF ACRONYMS AND ABBREVIATIONS
(Continued)

QA/QC	Quality Assurance Quality Control
RCRA	Resource Conservation and Recovery Act
Recra	Recra Environmental, Inc.
RI	Remedial Investigation
RTK	Right to Know
SCG	Standards, Criteria and Guidelines
SDG	Sample Delivery Group
STEL	Short Term Exposure Limit
SVOC	Semi-Volatile Organic Compounds
SU	Standard Units
TAGM	Technical Administration Guidance Memorandum
TAL	Target Analyte List
TCL	Target Compound List
TICs	Tentatively Identified Compounds
TOGS	Technical and Operational Guidance Series
USGS	United State Geological Society
VOC	Volatile Organic Compound

1.0 INTRODUCTION

1.1 General

This document is the Feasibility Study (FS) conducted by C.T. Male Associates, P.C. (C.T. Male) on behalf of the City of Glens Falls for the Glens Falls Municipal Landfill At Luzerne Road Site located in the Town of Queensbury, Warren County, New York. The subject site is identified in the Registry of Inactive Hazardous Waste Disposal Sites in New York as Site Number 5-57-003.

The FS was implemented and prepared as directed by and in general accordance with the Order on Consent Index No. A7-0383-9903 dated March 30, 2000 and is based on the findings of the Remedial Investigation Report dated October 7, 2002. The FS identifies potential remedial alternatives and evaluates the feasibility of the potential alternatives. The RI/FS provides a basis for selecting an appropriate remedial action at the Glens Falls Municipal Landfill At Luzerne Road site and presents a recommended alternative. The FS is intended to plan actions required under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), as amended by the Superfund Amendment and Reauthorization Act (SARA). The general structure of the FS is based on the interim final EPA document entitled "Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA", the NYSDEC Technical and Administrative Guidance Memorandum (TAGM) HWR-90-4030 entitled "Revised TAGM - Selection of Remedial Actions at Inactive Hazardous Waste Sites", the EPA document entitled “Presumptive Remedy for CERCLA Municipal Landfill Sites” and the EPA document entitled “Conducting Remedial Investigations/Feasibility Studies for CERCLA Municipal Landfill Sites”, as further identified in Section 8.0, References.

The FS Report consists of a glossary of acronyms and abbreviations and eight main sections organized as follows:

Section 1.0 introduces the report and summarizes the findings of the Remedial Investigation (RI). The RI consisted of historical background research, completion of field investigation work tasks, and conducting a qualitative exposure assessment and Step I Fish and Wildlife Impact Assessment.

Section 2.0 presents a review of regulations which could pertain to potential site-related contamination and potential remedial activities, termed Applicable or Relevant and Appropriate Requirements (ARARs) or State Standards, Criteria and Guidelines (SCGs).

Section 3.0 establishes remedial action objectives and identifies general response actions.

Section 4.0 identifies remedial technologies for preliminary screening.

Section 5.0 describes preliminary screening of suitable remedial technologies and develops alternatives comprised of selected technologies for subsequent detailed evaluation.

Section 6.0 presents the criteria for detailed analysis of alternatives, describes the remedial alternatives considered for detailed analysis, and presents the results of the individual and comparative analysis.

Section 7.0 describes the proposed remedial alternative for the subject site.

Section 8.0 is a listing of references.

The detailed cost analysis worksheets are presented in Appendix A.

1.2 Feasibility Study (FS) Objective

The FS objectives have been developed in accordance with State and Federal regulations and technical guidance documents. The FS for the Glens Falls Municipal Landfill At Luzerne Road site has the following program objectives:

- Establish objectives or goals for potential remedial actions that are protective of human health and the environment.

- Develop, screen and evaluate, in detail, potential remedial alternatives that will satisfy these goals.

- Select a proposed remedy for the site that is cost effective and capable of achieving these goals.

The purpose of this report is to present the results of the FS and to describe conceptually the proposed remedy for the Glens Falls Municipal Landfill At Luzerne Road site.

1.3 Remedial Investigation Summary

1.3.1 Site Description/History

The Glens Falls Municipal Landfill, a Class 2 Inactive Hazardous Waste Disposal Site, is located on an approximately 15 acre parcel north of Luzerne Road and east of Interstate 87 (Adirondack Northway) in the Town of Queensbury, Warren County, New York. A Site Location Map is presented as Figure 1. The site's longitude and latitude are reported to be 73° 40′ 36″ and 43° 18′ 12″. A Class 2 designation indicates that the site has been determined by NYSDEC to categorically pose a significant threat to public health and/or the environment requiring action. This classification has been made on the basis of historical placement of hazardous materials (i.e., ink sludge) within the contents of the landfill.

An active transfer station operated by the Town of Queensbury for residents of Warren and Washington Counties is located between the landfill mass and Luzerne Road. The transfer station opened on January 2, 1977 and accepts municipal waste and recyclables. It consists of a small attendant's building, a covered compactor and associated building and 50 cubic yard container, a small Quonset hut building that is used for storage, and containers for the recyclable materials. Although the landfill can be accessed from many points, the transfer station is considered to be the primary access to the site. Additionally, the access to the site from points other than the transfer station (which is gated) is uncontrolled. Currently, the landfill is covered with trees and overgrown grass/weed vegetation. Several dirt trails traverse the landfill in various directions and appear to be regularly utilized by off-road vehicles. There are sporadic locations where the landfill mass has limited soil cover causing its contents (i.e., refuse, tires, corroded drums, etc.) to become exposed. A Site Plan and Sampling Locations Map of the site taken from the RI Report is presented as Figure 2. A Boundary Survey of Glens Falls Municipal Landfill At Luzerne Road is presented within the RI Report as Drawing No. 01-601.

The City of Glens Falls operated the Glens Falls Municipal Landfill as a municipal solid waste (MSW) landfill for approximately 16 years from 1961 to 1977. It has been reported by NYSDEC that the landfill was used primarily for disposal of municipal refuse and some quantity of PCB capacitors may have been deposited at this landfill. However, there is no known documentation of the quantity or characteristics of either solid or hazardous waste at the landfill nor data pertaining to the receipt of any waste other than general refuse (MWS). In the late 1970's, closure efforts were made through grading and seeding, but they were not considered sufficient to properly close the landfill, resulting in the City being in non-compliance with NYSDEC Part 360 landfill closure requirements. In 1979, an alternative closure scheme was implemented at the initiation of the Rotary Club of Glens Falls with NYSDEC support and assistance. A NYSDEC memorandum reports that the landfill was listed as a Class 2 Inactive Hazardous Waste Disposal Site in 1988 and retains this classification to date. A detailed description of the site, the site history and additional investigations completed by others are presented in Sections 1.4, 1.5 and 1.6, respectively of the RI Report.

1.3.2 Site Geology and Hydrogeology

1.3.2.1 Site Geology

Based on review of existing reports on subsurface investigations conducted previously by others, the site exhibits light brown to gray, fine to medium sands, with isolated occurrences of seams of silty fine sand or gravel. Additionally, previous geotechnical results show that the largest percentage, up to 98.8 percent, of material composition consists of sand with the remaining composition consisting of silt and clay.

The test pits and soil borings advanced as part of the RI activities disclosed similar soils as those previously encountered on-site by others. The primary soil unit at the site is sand (very fine to medium and occasionally coarse) with periodic appearances of little to trace silt. According the Unified Soil Classification System, this soil type falls into the description of poorly graded sands with little to no fines (SP) and silty sand (SM). The sand was encountered from grade and extended to the termination depths of the soil borings, which were 52.5 feet (MW-101-6I), 44.5 feet (MW-101-7I), 53 feet (MW-101-8I), 28 feet (MW-101-9S) and 18 feet (MW-101-10S). The only exception is that fill materials (i.e., ash material or refuse) were encountered at several test pit locations, and fill materials of a different type were encountered at soil boring B-101-7I (MW-101-7I). The fill at B-101-7I was 0.3 feet of silt, some clay followed by clay and some cinders to a depth of two feet. The soil borings and monitoring well locations are shown on Figure 2, Site Plan and Sampling Locations Map.

1.3.2.2 Site Hydrogeology

Five monitoring wells (MW-101-1 through MW-101-5) were installed in 1985 as part of Phase II site investigations performed by others. These wells were installed to monitor groundwater quality and flow direction in the first water bearing zone. The wells are located around the perimeter of the landfill thereby providing upgradient, downgradient and cross-gradient monitoring points. Four piezometers were installed as part of the 1996 Supplemental Sampling Project including two on or in close proximity to the landfill (HR-4 and HR-8) and two on the Luzerne Road Site (53-LR-1 and 53-LR-2). Additional wells were installed in 1999 on the Luzerne Road Site as part of the RI for that site, which also have been used for monitoring groundwater quality and flow direction. The Luzerne Road Site monitoring wells closest to the landfill include MW-1S, MW-2S and MW-3S. The groundwater flow direction based on water table contouring by others suggests that the groundwater consistently flows towards the southeast.

Five shallow monitoring wells and three intermediate monitoring wells were installed as part of the RI activities. Water level depths were collected from the existing monitoring wells, the newly installed wells (RI), the wells installed by others (east of the site) and piezometers HR-4 and HR-8. Groundwater was generally observed from 8 to 24 feet below the ground surface or 357 to 363 feet above mean sea level. The water level depths were converted to elevations (in feet above mean sea level) based on the site benchmark and utilized to contour the water table. Water level data was collected on November 19, 2001, December 4, 2001 and February 27, 2002. Mapping of this water level data indicates that the inferred groundwater flow direction is to the southeast. Water Level Contour Maps for November 19, 2001 and February 27, 2002 are presented within the RI Report.

Utilizing the water level data, the hydraulic gradients between select upgradient and downgradient wells were calculated. The hydraulic gradient ranged between 0.003 and 0.006 feet/feet. By applying Darcy's Law of Flow, an average hydraulic gradient of 0.005 feet/feet, and a coefficient of permeability of 10^{-2} centimeters/second (as calculated by others), the velocity of flow was calculated to be on the order of 0.001 feet per minute or 518 feet per year.

1.3.3 Summary of Types and Extent of Contamination

The findings of the test pit investigation and property line information from the boundary survey performed during the RI identified the presence of waste mass on adjoining properties. In general, the waste encountered during the test pits consisted of municipal solid waste (MSW). However, in an area on the east side of the landfill and in an area on the west side (northern half) of the landfill other types of waste material were encountered. Construction and demolition (C & D) debris waste, compressed paper and bulky waste (car parts, appliances) were encountered on the north end of the 55 Luzerne Road property (area of test pits TP-18A, TP-19 and TP-19A, Figure 2) adjacent to the east side of the landfill property.

An ash, slag, glass and cinders material (ash material) mixed with sand was encountered on the State of New York property adjacent to and west of the western side of the landfill property line (the northern half, Figure 2). City representatives interviewed regarding the findings have indicated that refuse was burned at the landfill in the early days. A New York State Department of Transportation (NYSDOT) representative interviewed regarding the findings provided a map that showed that the general area where the ash material was encountered was used for disposal of waste material from the construction of Interstate 87, which occurred in the early 1960's. Photographs taken in 1977 to 1978 and supplied by the City of Glens Falls showed that the area of the ash material had a vegetative cover with a substantial growth of pine trees and other trees indicating that the area had not been disturbed for some time. The landfill proper including the area of the transfer station encompasses approximately 14.25 acres and of just the waste mass encompasses approximately 12.93 acres. The area of waste mass (not ash material) on adjoining properties is approximately 2.92 acres. The total area within the limit of waste mass both on-site and off-site is approximately 15.85 acres. The area of ash material on adjoining properties encompasses approximately 2.74 acres. The limits of the waste mass and ash material in relation to the property line are shown on Figure 3, Landfill Waste Delineation Map, taken from the RI Report.

The potential site related contaminants identified during the RI include a few VOCs, SVOCs, PCBs, metals and a few leachate indicator parameters in various media at the site. A few SVOCs were detected in a minority of surface soil samples above NYSDEC TAGM 4046 soil cleanup objective values, but have the tendency to adsorb to that media and not migrate with storm water runoff. SVOCs have historically not been detected in groundwater samples collected from the existing monitoring wells at the site. PCBs were detected slightly above NYSDEC TAGM 4046 soil cleanup objective values in one surface soil sample and above NYSDEC sediment criteria in one sediment sample. PCBs also have a strong tendency to adsorb to organic matter of soils and suspended solids reducing their mobility. A few metals (mercury and zinc) were detected in a minority of surface soil samples above regulatory levels, but within the normal background range found in Eastern United States and therefore are potentially at background levels. These metals were also not detected in groundwater samples collected at the site above groundwater standards. The sediment sampling results suggest that transport of contaminants with storm water runoff and deposition/retention of the contaminants in downstream sediment is not occurring at significant levels as there were no significant detections of contaminants in the sediment samples. Based on the sampling results, surface soil and sediment at and/or near the landfill site have not been significantly impacted by the landfill operations and remedial action is not warranted.

A few SVOCs were detected in the ash material samples slightly above NYSDEC TAGM 4046 soil cleanup objective values, but have the tendency to adsorb to that media and not migrate with storm water runoff. SVOCs have historically not been detected in groundwater samples collected from the existing monitoring wells at the site. No PCBs were detected in the ash material samples above their NYSDEC TAGM 4046 soil cleanup objective value. A few metals (copper, mercury and zinc) were detected in the ash material samples above regulatory levels, but within the normal background range found in Eastern United States and therefore are potentially at background levels. These metals were also not detected in groundwater samples collected at the site above groundwater standards, except copper at one monitoring well. Copper was detected at 209 ug/l versus the groundwater standard of 200 ug/l at one monitoring well, MW-101-7S, during the November 2001 RI sampling event only, and therefore is not considered significant. Analysis of the ash material samples for hazardous waste characteristics showed that the ash material is not corrosive, ignitable, reactive or TCLP hazardous. Based on the sampling results, it appears the ash material does not contain contaminants that would warrant remedial action.

Three PCBs (Aroclor 1248, Aroclor 1254 and Aroclor 1260) were detected within one to four of the eleven subsurface soil samples collected and analyzed from the test pit excavations and soil borings, however, the concentrations were below the NYSDEC TAGM 4046 recommended soil cleanup objective value of 10 mg/kg for subsurface soil. The detections were not at levels which suggest a significant threat to human health or the environment. Based on the limited subsurface soil sampling results, the landfill is a potential source of PCB contamination, however, it does not appear to be a significant source of PCB contamination.

Several abandoned drums were observed across the landfill waste mass (Figure 2). In general the drums did not have any visible markings, were rusted, and appeared to be empty or contained a hard white material, possibly a hardened enamel/epoxy material. Based on the sampling and testing results, the contents of the abandoned drums encountered at the landfill that contain a hard white material are not corrosive, ignitable, reactive or TCLP hazardous. Since the drums are rusted and pitted and do not contain hazardous waste, it is anticipated that the drums will be able to be crushed and incorporated within the landfill during closure and capping activities.

Currently, storm water/precipitation is able to infiltrate the landfill waste mass based on the primarily sandy soil/vegetative cover over the landfill surface and potentially leach contaminants from the waste mass into groundwater and migrate with groundwater in the direction of the groundwater flow. A few VOCs were detected in groundwater (five in one well, one in another well), but generally at concentrations only slightly above groundwater standards and within the same order of magnitude as the groundwater standards. One VOC, MTBE was detected over an order of magnitude above its NYDEC groundwater guidance value in one existing monitoring well (MW-101-1). MTBE is typically used as an additive in gasoline. No evidence of stressed vegetation or stained soil were observed in the area of the monitoring well. The source of the MTBE is not known. PCBs were detected above groundwater standards in one to three of the existing monitoring wells, but historical analytical data indicates the concentrations are decreasing. With the exception of aluminum, iron, magnesium, manganese and sodium, a few metals were detected above groundwater standards in a minority of the monitoring well locations, but generally only slightly above or within the same order of magnitude as the groundwater standards. The exceedances of aluminum, iron, magnesium, manganese and sodium occurred in both upgradient and downgradient monitoring well locations suggesting these metal concentrations could be at background levels. A few leachate indicator parameters were detected above groundwater standards, but the exceedances generally occurred in both upgradient and downgradient monitoring well locations.

Based on the comparison of VOCs, metals and leachate indicator parameter results to limited historical data for the existing wells, the VOCs, metal and leachate indicator parameters in groundwater in general have not increased since 1985 (select parameters analyzed) and 1990. In view of the above, it appears that the landfill has had some impact on the downgradient groundwater quality as some contravention of groundwater standards has occurred. The groundwater quality, however, does not appear to be worsening compared to limited historical data. Therefore, the groundwater sampling results and comparisons show that groundwater treatment is not warranted considering that the local groundwater is not used as a source of drinking water.

There were isolated areas of elevated explosive gases detected below grade, primarily at higher elevations on top of the landfill waste mass and at a few perimeter locations on the southeast and south sides of the landfill. The elevated perimeter readings did not extend beyond the property boundary. No explosive gases were detected in the buildings on-site at the transfer station. No elevated readings of explosive gases were detected at above grade sampling locations suggesting that significant levels of explosive gases are not entering the atmosphere on-site or off-site, or are dispersing or being degraded before accumulation occurs. However, due to the presence of elevated levels of explosive gases below grade on top of the landfill, venting of explosive gases is anticipated to be warranted if a low permeability cap is placed over the landfill.

During the RI, there were no leachate outbreaks observed during completion of field activities or specifically during the surface leachate investigation. In addition, there are no leachate outbreaks historically reported for the subject site. Laboratory analysis of groundwater samples for 6 NYCRR Part 360 leachate indicator parameters did not identify groundwater contamination that suggests on-going leachate outbreaks or the significant presence of leachate. As such, leachate collection and treatment is not warranted.

1.3.4 Summary of Qualitative Exposure Assessment

Some areas of exposed refuse were observed on the landfill, primarily on dirt trails used by bicycles and off-road vehicles that trespass on the property and at select locations around the perimeter of the landfill.

The concentrations of contaminants detected in surface and subsurface soil, sediment and groundwater samples are not at levels that indicate the landfill is a significant threat to human health and the environment that would warrant remedial action of these media. However, the potential for contact with exposed refuse and the potential leaching of contaminants from the waste mass as a result of storm water runoff and infiltration need to be addressed. Based on air monitoring and explosive gas investigation results, the potential for inhalation of contaminated dust and/or vapor emissions or exposure to explosive gases under current conditions by the area residents, site visitors, trespassers and workers at the transfer station is anticipated to be minimal or non-existent.

Containment of the landfill under the EPA presumptive remedy will eliminate the potential exposure routes and pathways of dermal contact with exposed refuse, dermal contact and/or ingestion of contaminated soil and potential leaching of contaminants with storm water runoff, and minimize storm water/precipitation infiltration and potential leaching of contaminants from the waste mass that could be carried downward to and migrate with groundwater. The area of the site is serviced by public water and therefore ingestion of contaminated groundwater is unlikely.

The concentrations of contaminants detected in the ash material samples are not at levels that indicate the ash material is a significant threat to human health or at levels that would warrant remedial action of the ash material. The area of the ash material is covered with a vegetative cover and trees, and access to the area is restricted. The potential for exposure to the ash material is anticipated to be minimal.

The Step I FWIA did not identify significant wildlife resources at the site. The sediment sampling of low lying areas west and northeast of the site did not identify contaminants present at levels that would have a significant impact on benthic aquatic life or organisms or on wildlife.

2.0 APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs) AND STATE STANDARDS, CRITERIA AND GUIDELINES (SCGs)

2.1 Overview

This section identifies and evaluates Federal applicable or relevant and appropriate requirements (ARARs) and New York State standards, criteria and guidelines (SCGs) regarding potential site-related contamination and potential remedial activities. Local requirements pertaining to remedial activities are also identified. Together with the results of the qualitative exposure assessment, ARARs and SCGs are used to evaluate the need and extent of remediation required, and define the cleanup standards which are used to select remedial actions appropriate to the site. ARARs and SCGs can also regulate the implementation and operation of the remedial action.

Section 121(d) of the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), establishes standards that govern the degree of cleanup required at a listed inactive hazardous waste site. Except under certain circumstances, in order to be consistent with the National Contingency Plan, remedial actions shall meet Federal and State standards, requirements, criteria or limitations that are determined to be legally applicable or relevant and appropriate requirements (ARARs). SARA mandates that remedies meet promulgated Federal and/or State ARARs, whichever are more stringent. Based on that requirement and since New York is an authorized State, State standards, criteria and guidelines (SCGs) that are more stringent have been assumed to take precedence over Federal ARARs.

According to CERCLA, as amended by SARA, State ARARs must be promulgated and have the force and effect of law. To be consistent with this requirement, to-be-considered (TBC) criteria such as State guidance documents and other unpromulgated criteria are not ARARs. However, during the course of developing this report and selecting a proposed remedy the potential relevance of such criteria have been considered.

Under the following circumstances, a remedial action is not required to satisfy a specific ARAR.

- The action taken is an interim measure and is only a part of the total remedial actions that will attain the ARAR when completed.
- Compliance with the ARAR presents a greater risk than alternative options.
- Meeting the ARAR is technically impractical from an engineering perspective.
- The remedial actions achieve a standard of performance equal to or better than that achieved by the ARAR.
- The State has not consistently applied the ARAR in similar circumstances involving other remedial actions within the State.
- The action is not cost effective, in that a large increase in cost is needed to achieve a relative small increase in level of remediation.

ARARs may be characterized as either location-specific, action-specific or chemical-specific. Location-specific ARARs pertain to restrictions or requirements utilizing specific locations such as wetlands, flood plains, historic sites or disposal areas. Action-specific ARARs pertain to remedial technologies. Chemical-specific ARARs set health based concentration limits for contaminants of concern, define acceptable exposure levels and govern the level or extent of remediation required.

State SCGs are included in State ARARs. The selected remedial activity should substantially comply with Federal and State ARARs unless it meets one of the circumstances discussed previously that waives the requirement to satisfy a specific ARAR.

2.2 Federal ARARs

Federal requirements which are or could potentially be applicable or relevant and appropriate, and which could be triggered by potential remedial activities at the site are listed below:

- 29 CFR Part 1910 – Occupational Safety and Health Standards
- 29 CFR Part 1910.120 – Hazardous Waste Operations and Emergency Response

These are Occupational Safety and Health Administration regulations that pertain to worker safety and specify requirements for work involving hazardous waste operations. The regulations are action-specific.

- 33 CFR Part 330 - Nationwide Permit Program
- Federal Register, Thursday March 9, 2000 – Final Notice of Issuance and Modification of Nationwide Permits, Notice

These regulations regulate the discharge of pollutants into wetlands and other waters of the U.S. as well as disturbance, dredging and/or filling of wetlands or other waters of the U.S. These regulations would apply in the event that wetlands would need to be disturbed and/or filled during implementation of the remedial activity. The regulations are location-specific.

- 40 CFR Part 50 – National Primary and Secondary Ambient Air Quality Standards

These regulations identify ambient air quality standards for certain contaminants to protect the public health and welfare; and could apply to air emissions such as fugitive dust from remedial activities at the subject site. The regulations are chemical-specific.

- 40 CFR Part 122 – National Pollution Discharge Elimination System

These regulations apply to and regulate discharges of pollutants to surface water.

- 40 CFR Part 141 (Subparts B, F and G) – National Primary Drinking Water Regulations

These regulations identify maximum contaminant levels and maximum contaminant level goals for public drinking water supplies. These regulations apply if groundwater is used as a source of drinking water. The regulations are chemical-specific.

- 40 CFR Part 261 – Identification and Listing of Hazardous Waste
- 40 CFR Part 262 – Standards Applicable to Generators of Hazardous Waste
- 40 CFR Part 263 – Standards Applicable to Transporters of Hazardous Waste
- 40 CFR Part 264 – Standards for Owners and Operators of Hazardous Waste Treatment, Storage and Disposal Facilities
- 40 CFR Part 266 – Standards for the Management of Specific Hazardous Wastes and Specific Types of Hazardous Waste Management Facilities
- 40 CFR Part 268 – Land Disposal Restrictions

These regulations serve to define whether contaminated media or other substances on-site are considered hazardous wastes, and contain requirements and restrictions for transporting, handling, storing and disposing of hazardous wastes. The regulations are chemical-specific in defining a hazardous waste and action-specific in limiting and regulating activities conducted with hazardous wastes. Hazardous wastes were not identified at the site during the RI field activities. Therefore, it is unlikely that the regulations pertaining to transporting, handling, storing and disposing of hazardous wastes would apply.

- 40 CFR Part 761 – PCBs Manufacturing, Processing, Distribution In Commerce, and Use Prohibitions

These regulations deal with the manufacture, processing, distribution, markings, remediation of, and storage and disposal of PCBs, PCB contaminated media and PCB items. The regulations are chemical-specific in defining regulated PCBs and action-specific in limiting and regulating activities conducted with PCB wastes.

- 49 CFR Subchapter C – Hazardous Materials Regulations

- 49 CFR Part 171 – General Information, Regulations and Definitions

- 49 CFR Part 172 – Hazardous Materials Table, Special Provisions, Hazardous Materials Communications, Emergency Response Information, and Training Requirements

- 49 CFR Part 173: Shippers – General Requirements for Shipments and Packaging

- 49 CFR Part 177 – Carriage by Public Highway

- 49 CFR Part 178 – Specifications for Packaging

These are Department of Transportation regulations that outline requirements for the packaging, labeling, manifesting and transportation of hazardous materials. The regulations are action-specific.

- Conducting Remedial Investigations/Feasibility Studies for CERCLA Municipal Landfill Sites, EPA 540-P-91-001, February 1991

- EPA Presumptive Remedy for CERCLA Municipal Landfill Sites, EPA 540-F-93-035, September 1993

These guidance documents establish containment as the response action for CERCLA municipal landfill sites and present the framework for streamlining the RI/FS at these types of sites. These guidance documents apply to the Glens Falls Municipal Landfill site since it is an inactive hazardous waste site and a municipal landfill.

2.3 State SCGs

New York State requirements which are or could potentially be applicable or relevant and appropriate, and which could be triggered by potential remedial activities at the site are listed below:

- 6 NYCRR Part 200 (200.6) - Air Pollution Control Regulations, General Provisions

- 6 NYCRR Part 201 - Air Pollution Control Regulations, Permits and Certificates

- 6 NYCRR Part 211 (211.1) - Air Pollution Control Regulations, General Prohibitions

- 6 NYCRR Part 212 - Air Pollution Control Regulations, General Process Emission Sources

- 6 NYCRR Part 257 - Air Pollution Control Regulations, Air Quality Standards

- New York State Air Guide-1: Guidelines for the Control of Toxic Ambient Air Contaminants

These regulations regulate emission of pollutants to the ambient air; and would apply to remedial activities which involve emission of a waste air stream to the environment.

The NYS Air Guide-1 identifies guideline concentrations for emissions of toxic air contaminants and provides guidelines for assessing air emissions. The regulations are chemical-specific and action-specific.

- 6 NYCRR Part 360 - Solid Waste Management Facilities

These regulations apply to disposal of the investigation derived wastes generated during the RI and would apply in the event that remedial activities include removing other wastes which fall under the definition of solid waste from the site and disposing of it at a permitted facility. These regulations also apply to implementation of the containment remedial action and specify the procedures and requirements to be followed during closure/capping of the landfill. These regulations also specify monitoring, operations and maintenance requirements during the landfill post-closure monitoring period; and requirements for including provisions in the property deed regarding the use of the property as a landfill. The regulations are chemical-specific in defining a solid waste, action-specific in limiting activities conducted with solid waste, in specifying landfill closure/cap requirements and landfill monitoring activities, and location-specific with respect to where the waste would be disposed of (i.e., solid waste landfill).

- 6 NYCRR Part 364 - Waste Transporter Permits

These regulations apply to the transportation of regulated waste from the site of generation to the site of ultimate treatment, storage or disposal. The regulations apply to the investigation derived wastes that are disposed of off-site and would also apply if other wastes are removed from the site for off-site treatment, storage or disposal. The regulations are action-specific.

- 6 NYCRR Part 370 - Hazardous Waste Management System: General

- 6 NYCRR Part 371 - Identification and Listing of Hazardous Wastes

- 6 NYCRR Part 372 - Hazardous Waste Manifest System and Related Standards for Generators, Transporters and Facilities
- 6 NYCRR Part 373 - Hazardous Waste Treatment, Storage and Disposal Facility Regulations
- 6 NYCRR Part 374 - Standards for the Management of Specific Hazardous Wastes and Specific Types of Hazardous Waste Management Facilities

These regulations serve to define whether contaminated media or other substances on-site are considered hazardous wastes, and contain requirements and restrictions for transporting, handling, storing and disposing of hazardous wastes. The regulations are chemical-specific in defining a hazardous waste and action-specific in limiting and regulating activities conducted with hazardous wastes. Hazardous wastes were not identified at the site during the RI field activities. Therefore, it is unlikely that the regulations pertaining to transporting, handling, storing and disposing of hazardous wastes would apply.

- 6 NYCRR Part 375 - Inactive Hazardous Waste Disposal Site Remedial Program

These regulations classify sites according to the threat to human health and the environment, and apply to investigation, remediation and change in use of inactive hazardous waste disposal sites. The regulations are action-specific.

- 6 NYCRR Parts 700-705 - Water Quality Regulations for Surface Waters and Groundwaters
- NYSDEC Technical and Operational Guidance Series (TOGS) 1.1.1, Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations, June 1998 and April 2000 Addendum

These regulations and guidance document (TOGS 1.1.1) establish classes of water quality and the associated use, and set concentration limits of compounds for the different classes and usage. These regulations apply in determining impacts to surface water and groundwater quality and in establishing target clean-up levels for surface water and groundwater. The regulations are chemical-specific.

- 10 NYCRR Part 5-1: Drinking Water Supplies

These regulations outline standards that are not to be exceeded in public water supplies, and apply if groundwater is being used as a source of drinking water. The regulations are chemical-specific.

- 10 NYCRR Part 170 - Sources of Water Supply

These regulations apply to sources of drinking water and sets water quality standards that sources of water supply need to meet. The regulations are chemical-specific.

- NYSDEC Technical and Administrative Guidance Memorandum (TAGM) 4046, Determination of Soil Cleanup Objectives and Cleanup Levels, January 24, 1994 and December 20, 2000 Addendum

This guidance document provides a basis and procedure to determine soil cleanup levels at inactive hazardous waste sites when cleanup of a site to pre-disposal conditions is not possible or feasible. It also presents recommended soil cleanup objectives.

- NYSDEC Technical Guidance For Screening Contaminated Sediments, January 25, 1999

This guidance document presents sediment criteria and the basis for establishing the criteria to be protective of human health, benthic aquatic life and wildlife.

- NYSDEC Local Government Regulatory Relief Initiative, Guidance on Landfill Closure Regulatory Relief, February 26, 1993

This guidance document presents specific variances that can be applied for by municipalities to provide relief during the landfill closure process and post-closure monitoring period to lessen the cost of landfill closure and monitoring, but still provide protection to human health and the environment. Specific variances are available for the cap materials and post-closure monitoring.

2.4 Local ARARs

Local regulations or requirements which may apply for potential remedial activities at the site include the following:

NYSDOT: A NYSDOT Highway Work Permit would need to be obtained prior to implementation of the remedial activity due to the landfill's proximity to Interstate 87.

3.0 REMEDIAL ACTION OBJECTIVES AND GENERAL RESPONSE ACTIONS

3.1 General

Since EPA's Superfund Program was established (1980), the remedial and removal programs have found that certain categories of sites have similar characteristics, such as contaminants present, types of disposal practices, or how environmental media are affected. Based on the information EPA acquired from evaluating and cleaning up these types of contaminated sites, the Superfund Program undertook an initiative to develop "presumptive remedies" (circa 1990) to accelerate future clean-ups at these types of sites. Presumptive remedies are preferred technologies for common categories of sites, based on historical patterns of remedy selection and EPA's scientific and engineering evaluation of performance data on technology implementation. The objective of the presumptive remedies initiative is to use the EPA's past experience to streamline site investigations and speed up selection of clean-up actions. Over time, presumptive remedies are expected to ensure consistency in remedy selection and reduce costs and time required to clean-up similar types of sites. Presumptive remedies are expected to be used at all appropriate sites except under unusual site specific circumstances (Reference 4).

The findings of the RI demonstrate that the Glens Falls Municipal Landfill primarily consists of large volumes of municipal waste (based on test pit excavations) reportedly mixed with some level of industrial/hazardous waste. Because treatment of the waste is impractical and the waste poses low long-term threat, the EPA presumptive remedy of containment is the appropriate response action for the source area of the landfill mass. Use of this presumptive remedy thereby eliminates the need for the initial identification and screening of other remedial technologies.

3.2 Remedial Action Objectives

The remedial action should be designed to reduce, treat and/or control contaminated media of concern so that the contaminants of concern do not migrate further (on or off-site) or come into contact with humans or sensitive environments. The ARARs, State SCGs, and the type and level of contact that can occur dictate the level of concern. The following paragraphs summarize the type of media at the subject site and reasoning why the media does or does not warrant remedial action based on the findings of the RI.

Surface Soil:

The surface soil at the site is readily accessible to direct contact by humans that trespass on the site. Three SVOCs and one PCB (Aroclor 1254) were detected slightly above NYSDEC TAGM 4046 soil cleanup objective values in a minority of the eleven surface soil samples collected and analyzed as part of the RI. A few metals were also detected in a minority of the surface soil samples above TAGM 4046 soil cleanup objective values, but within the normal background range found in Eastern United States and therefore are potentially at background levels. Although the detections do not appear to be a significant threat to human health or the environment, there is the potential for some exposure due to the trespassing that occurs on-site. The surface soil sample locations where detections slightly exceeded TAGM values and/or background levels are on or at the edge of the landfill waste mass. Separate surface soil remediation is not warranted, therefore, as the potential exposure will be addressed during containment (capping) of the landfill waste mass under the EPA presumptive remedy. Separate treatment of the site's surface soil was not considered as part of the remedial action objectives as it will be addressed during containment of the landfill waste mass.

Sediment:

Sediment samples were collected and analyzed from a low lying wetland area located northeast of the landfill site and a low lying area located west of the landfill site. In general there were no contaminants of concern identified above NYSDEC sediment criteria or TAGM 4046 soil cleanup objective values within the sediment samples, except one PCB (Aroclor 1254) was detected in one sediment sample at a concentration slightly above the NYSDEC wildlife bioaccumulation sediment criteria. Based on the RI sediment sampling results, sediment near the landfill site has not been significantly impacted by the landfill operations and remediation is not warranted. Therefore, remediation of the nearby sediment was not considered as part of the remedial action objectives.

Subsurface Soil:

The subsurface soil at the site is not accessible unless some form of excavation activity is undertaken. Two PCBs (Aroclor 1248 and Aroclor 1254) were detected within some of the six subsurface soil samples collected and analyzed from test pits advanced along the perimeter of the landfill waste mass as part of the RI, none of which were above NYSDEC TAGM 4046 soil cleanup objective values. No visual evidence of soil staining, residual oil or "hot spots" of contamination were encountered during the test pits advanced around the perimeter of the landfill waste mass. Considering the subsurface soil is not accessible and the PCBs detected are at low levels, the subsurface soil at the site is not considered a media of concern and treatment of subsurface soil was not considered as part of the remedial action objectives. Containment of the landfill waste mass will minimize potential storm water/precipitation infiltration and potential leaching of contaminants from the subsurface soil.

Groundwater:

The groundwater at the site is not readily accessible to humans or the environment, unless drilled wells are used to extract groundwater. Currently the residences around the landfill are supplied by public water and private wells are not known to exist. No public water supply wells are reported to exist in close proximity to or downgradient of the site. The groundwater quality at the site shows some contravention of NYSDEC groundwater standards or guidance values, but the concentrations of contaminants detected are generally decreasing in concentration, remain similar to historical data, or are consistent with typical groundwater quality in the areas of landfills. The main contaminant of concern in groundwater is PCBs, which is also present in groundwater at the Luzerne Road Site. PCBs were detected above NYSDEC groundwater standards in one to three of the existing monitoring wells only, but historical data indicates the concentrations are decreasing. Based on the RI groundwater sampling results, comparisons and findings, the potential impact of the landfill to off-site groundwater quality does not appear to be significant. Therefore, groundwater collection and treatment are not warranted considering that local groundwater is not used as a source of drinking water and were not considered as part of the remedial action objectives.

Explosive Gas:

There were isolated areas of explosive gases detected below grade, primarily at higher elevations on top of the landfill waste mass and at a few perimeter locations on the southeast and south sides of the landfill. The elevated perimeter readings did not extend beyond the property boundaries. The above grade readings for the explosive gas sampling did not suggest that explosive gases are entering into the atmosphere at elevated levels on or off the site. As such, treatment of the off-gas was not considered as part of the remedial action objectives. However, due to the presence of elevated levels of explosive gases below grade within the landfill waste mass, venting of explosive gases is warranted if a low permeability cap is placed over the landfill.

Appropriate explosive gas collection and venting measures were considered in the remedial action objectives.

Leachate Outbreaks:

There were no leachate outbreaks observed during completion of RI fieldwork or specifically during the RI surface leachate investigation. In addition, there are no leachate outbreaks historically reported for the subject site. Analysis of groundwater for 6 NYCRR Part 360 leachate indicator parameters did not identify groundwater contamination that suggests on-going leachate outbreaks. As such, leachate collection and treatment are not warranted and were not considered as part of the remedial action objectives.

Ash Material:

Based on the findings of the RI, the area of the ash material as it is currently graded appears to have been in existence since construction of Interstate 87 in the early 1960's. The area is covered with a vegetative cover and trees, and access to the area is restricted by an existing NYSDOT fence. The potential for exposure to the ash material is therefore anticipated to be minimal. A few SVOCs were detected in the ash material samples slightly above NYSDEC TAGM 4046 soil cleanup objective values, but have the tendency to adsorb to that media and not migrate with storm water runoff. SVOCs have historically not been detected in groundwater samples collected from the existing monitoring wells at the site. Therefore, SVOCs are not identified as contaminants of concern in the ash material. No PCBs were detected in the ash material samples above its NYSDEC TAGM 4046 soil cleanup objective value. A few metals were detected in the ash material samples above regulatory levels, but within the normal background range found in Eastern United States and therefore are potentially at background levels. Analysis of the ash material samples for hazardous waste characteristics showed that the ash material is not corrosive, ignitable, reactive or TCLP hazardous. Based on the ash material sampling results, the ash material is not a significant threat to human health or the environment and remedial action of the ash material is not warranted. Therefore, remediation of the ash material was not considered as part of the remedial action objectives.

While the current risk of exposure to the site contaminants (as explained above and in more detail in the RI Report) appears to be low, there is potential for some level of exposure to the landfill waste mass and residual contaminants. The exposure could be the result of subsurface excavation at the site, unauthorized recreational activities at the site, and/or utilizing groundwater in the area of the site as a potable water supply source. The extent of exposure would be dependent on construction management techniques, institutional controls and site and area future uses. In view of the above, the remedial action objectives for the Glens Falls Municipal Landfill site considering the EPA presumptive remedy approach are:

- Prevent direct contact with the landfill contents;
- Minimize storm water/precipitation infiltration into the landfill waste mass and thereby reduce potential contaminant leaching to groundwater;
- Control surface water runoff and surface erosion; and
- Control landfill gas migration.

3.3 General Response Actions

The general response action for this site is to undertake feasible, implementable and cost effective measures to control or prevent direct contact with the landfill contents and potentially contaminated media by humans or sensitive environments, to minimize infiltration into the landfill waste mass and resulting potential leaching of contaminants to groundwater, to control surface water runoff and erosion and to control migration of landfill gases. In accordance with EPA's Presumptive Remedy For CERCLA Municipal Landfill Sites (Reference 4), the general response action to address the landfill waste mass, potential leaching of contaminants to groundwater or surface water, and landfill gas generation is “containment”. Because treatment of the waste is impractical and the waste poses low long-term threat, the EPA presumptive remedy of containment is the appropriate response action for the source area of the landfill mass. The general response actions therefore are no action and containment. These general response actions and associated technologies are discussed in more detail in Section 4.0.

4.0 IDENTIFICATION AND SCREENING OF TECHNOLOGIES

4.1 Identification of Technologies

This section identifies potential containment technologies to address the source area of the landfill waste mass taking into account the remedial action objectives presented in Section 3.2. The technology types identified include no action, 6 NYCRR Part 360 (Part 360) cap, Modified Part 360 cap, soil and vegetative cover cap, and evapo-transpiration vegetative cover cap. Table 4.1-1 lists the technologies and gives a brief description of each.

Table 4.1-1
Identification of Remedial Technologies
Glens Falls Municipal Landfill at Luzerne Road
Feasibility Study

No Action	Continue to leave the inactive site as is with implementation of institutional controls and landfill monitoring.
Containment	Place a cap/cover over the surface of the landfill waste mass.
• Part 360 Cap	The cap would consist of a gas venting layer with gas venting structures, a low permeability barrier layer, a barrier protection layer, and a topsoil and vegetative cover layer.
• Modified Part 360 Cap	The cap would consist of a gas venting layer with gas venting structures, a low permeability barrier layer, a drainage layer, a barrier protection layer, and a topsoil and vegetative cover layer.
• Soil and Vegetative Cover Cap	The cap would consist of a gas venting layer with gas venting structures, a silty sand layer, and a topsoil and vegetative cover layer.

Table 4.1-1
Identification of Remedial Technologies
Glens Falls Municipal Landfill at Luzerne Road
Feasibility Study

• Evapo-Transpiration Vegetative Cover Cap	The cap would consist of a native sand and topsoil layer and evapo-transpiration plants and trees planted over the cover.
• No Waste Consolidation With the Identified Containment Technologies	The areas of waste mass that exist on adjoining properties would be left in-place, obtained though eminent domain, and capped in-place by one of the identified containment technologies.
• Select Waste Consolidation With the Identified Containment Technologies	Select areas where minimal waste exists on adjoining properties would be excavated and placed back on the landfill surface within the site's property boundaries and the other areas of waste mass that exist on adjoining properties would be left in-place, obtained though eminent domain, and capped in-place by one of the identified containment technologies.

4.2 Screening of Technologies

The technologies identified in Table 4.1-1 were screened based on technical implementability and effectiveness in order to obtain a reasonable number of potential applicable technologies to be evaluated as potential alternatives to achieve the remedial action objectives.

4.2.1 No Action

This alternative includes placing no additional cover on the landfill waste mass and areas of waste would remain on adjoining properties. It would include implementing and maintaining institutional controls, installing fencing around the entire limit of waste to restrict access to the waste mass and landfill monitoring. It would also require acquisition of portions of adjoining properties through eminent domain where landfill waste exists on adjoining property in order to be able to install the fence around the entire perimeter of the waste mass (i.e., both on and off-site).

4.2.2 Containment

Containment consists of restricting the spread of contamination within the environment or into contact with the public by capping/covering the waste mass and residual contaminants in the soil from mechanisms of transmission such as direct contact, precipitation infiltration and leaching of contaminants to groundwater, surface water runoff or wind erosion. Capping the waste mass source area would prevent direct contact with the waste mass and residual soil contaminants, reduce or prevent dispersion of source area contaminants by reducing infiltration of storm water/precipitation through the waste mass and potential leaching of contaminants, and prevent volatilization and dispersion of contaminants through wind erosion of waste mass by making the waste mass inaccessible.

All four containment technologies would require removal of trees and vegetation and regrading the landfill waste mass for erosion and drainage control. If no waste consolidation were implemented there would be minimal disturbance/exposure of the refuse during construction which has had over 25 years to settle and decompose. However, large volumes of clean fill would need to be brought in to achieve maximum side slopes of 33 percent, required by 6 NYCRR Part 360, as some of the existing side slopes exceed 40 percent. If waste consolidation of select areas was implemented, less clean fill would be required and the overall footprint of the landfill would be less, however there would be considerable disturbance of the existing refuse. The materials and experienced contractors needed to regrade the landfill waste mass and construct the cap are readily available. In this regard, the four containment technologies identified are implementable.

All four containment technologies would eliminate direct contact with the landfill waste mass and residual contaminants in the soil and thereby be effective in protecting human health and the environment. The Part 360 cap and Modified Part 360 cap technologies would include a low permeability barrier layer that would minimize the amount of storm water/precipitation infiltration that could occur and thereby minimize the potential leaching of contaminants from the waste mass that could be carried downward to and migrate with groundwater. The mobility of the contaminants in the landfill waste mass would be minimized. The soil and vegetative cover cap technology does not include a low permeability barrier layer so potential leaching of contaminants to groundwater could still occur. The evapo-transpiration cover is a soil cover with an engineered vegetative cover. This cover utilizes plants, shrubs and trees to cycle water from the soil profile to the atmosphere during the growing season thus minimizing the amount of storm water/precipitation infiltration and potential leaching of contaminants to the groundwater. Generally, native/local soil with an overlying topsoil layer is used in the cover. The type of vegetation used is dependent upon the local soil and climatological conditions. Several studies are currently being conducted by EPA and at least one study is being conducted under NYSDEC oversight in Monroe County, New York to determine the effectiveness of this alternative landfill capping method. The EPA studies are occurring in the Western and Central United States and Hawaii where the climate is generally arid to semi-arid, which is thought to be the ideal climate for this cover. The effectiveness of this technology in the Northeastern United States where significant precipitation and large differences in temperature can occur has not been determined.

Long term maintenance of the cap would be required for the Part 360 and Modified Part 360 caps to address potential damage to the low permeability barrier layer material from tree root penetration and animal burrows. This would not be the case for the soil and vegetative cover cap or the evapo-transpiration vegetative cover cap. For the latter two technologies, the landfill waste mass source area could be replanted with trees to make it more aesthetically pleasing and conducive to being used for low impact recreational hiking.

The feasibility of obtaining approval to implement the soil and vegetative cover cap and the evapo-transpiration vegetative cover cap however is low since these two technologies would not minimize or have not been proven effective in minimizing storm water/precipitation infiltration into the landfill waste mass and therefore the potential leaching of contaminants to groundwater. These two containment technologies, therefore, will not be considered further.

The technologies therefore that will be considered further in this study are:

- No Action,
- Part 360 Cap With and Without Select Consolidation of Waste, and
- Modified Part 360 Cap With and Without Select Consolidation of Waste.

5.0 DEVELOPMENT AND SCREENING OF ALTERNATIVES

This section presents the development and screening of remedial alternatives. The alternatives were developed from the potentially feasible technologies discussed in Section 4.0. The various technologies were combined into a selection of alternatives that cover a range of approaches to properly close the Glens Falls Municipal Landfill.

During screening the alternatives were evaluated against two criteria; short-term and long-term effectiveness and implementability. The screening process thereby reduces the field of alternatives by eliminating those that do not effectively protect human health and the environment, or pose complicated technical or administrative challenges to implement.

5.1 Development of Remedial Alternatives

Several options exist for the type of materials that can be used in constructing the Part 360 cap and Modified Part 360 cap. For the gas venting and drainage layers either soil (typically sand) or a geocomposite material can be utilized. Geocomposites typically consist of two bonded, overlapping high density polyethylene (HDPE) strands (i.e., geonet) with non-woven filter fabric heat-bonded to both sides of the geonet. For the low permeability barrier layer either clay having a permeability of 1×10^{-7} cm/sec or a geomembrane can be utilized. In case a clay source is not readily available in the area of the Glens Falls Municipal Landfill and to minimize the thickness of the cap, we have conducted the screening of alternatives based on a geomembrane being used for the low permeability barrier layer as requested by NYSDEC.

The 6 NYCRR Part 360 regulations require that the low permeability barrier layer be placed on a surface with a minimum 4 percent slope and maximum 33 percent slope. Some of the existing slopes exceed 40 percent. For the FS we have utilized a maximum slope of 30 percent in developing the intermediate and final landfill closure grading plans where soil is used for the gas venting and/or drainage layers to add some factor of safety. We have also planned for using a textured geomembrane to increase the friction angle and resulting slope stability between the geomembrane and soil cover materials next to it. During the design of the selected remedy, actual slope stability calculations would be performed to determine if a 33 percent slope with the selected soil and geomembrane cap materials would be stable and protect the cover from a 24-hour, 25-year frequency storm required by Part 360. If so, then the final design of the selected remedy could incorporate a 33 percent maximum slope.

As noted above, soil or a geocomposite can be utilized for the gas venting and drainage layers. The friction angle is lower between the geocomposite and geomembrane surfaces versus the soil and geomembrane surfaces, so slippage or failure is more apt to occur unless the slope is reduced. It is anticipated that around a 25 percent slope should provide an acceptable factor of safety when the geocomposite and geomembrane materials are used next to each other. For purposes of the FS, we have assumed 25 percent as the slope required if a geocomposite instead of soil is used for the gas venting and/or drainage layers.

In view of the above, eight alternatives were developed from the identified containment technologies to cap the Glens Falls Municipal Landfill site. The alternatives with a brief description are presented below:

<u>Alternative 1:</u> No action.

This alternative includes placing no additional cover on the landfill waste mass and areas of waste would remain on adjoining properties. It would include implementing and maintaining institutional controls, installing fencing around the entire limit of waste to restrict access to the waste mass and landfill monitoring.

Alternative 2A: Part 360 Cap With Soil For Gas Venting Layer and No Waste Consolidation (30% Side Slopes).

This alternative consists of grading the landfill waste mass for erosion and drainage control and to meet minimum and maximum Part 360 slope requirements, and installing a Part 360 cap over the entire landfill waste mass (ash material not included as waste mass). The areas of waste mass that exist on adjoining properties would be left in-place, obtained through eminent domain, and capped. The limit of the waste mass in relation to the existing property line is shown on Figure 3. The minimum and maximum Part 360 slope requirements would be achieved by importing, placing and grading clean fill over the landfill surface instead of excavating and regrading the existing waste. A portion of the area with ash material would likely be covered by the cap materials as a result of grading to achieve the required slopes. There would be some excavation of waste on the south side of the landfill so that the cap would not extend over into the transfer station. The Part 360 cap would consist of a soil gas venting layer (12-inch depth), a geomembrane low permeability barrier layer (40 mil textured LLDPE), a barrier protection layer (24-inch depth), and a topsoil (6-inch depth) and vegetative cover layer. This alternative also would include implementing and maintaining institutional controls and post-closure landfill monitoring.

Alternative 2B: Part 360 Cap With Soil For Gas Venting Layer and Consolidation of Select Off-Site Waste Mass (30% Side Slopes, Balanced Cut and Fill).

This alternative consists of consolidating select areas where waste extends onto adjoining properties and transferring the material back onto the surface of the landfill within the site's property boundaries, backfill and grading of the excavated areas, regrading the landfill waste mass for erosion and drainage control, to meet minimum and maximum Part 360 slope requirements and to obtain a more balanced cut and fill, and installing a Part 360 cap over the new smaller footprint of the landfill waste mass (ash material not included as waste mass). A portion of the area with ash material would likely be covered by the cap materials as a result of grading to achieve the required slopes.

This alternative would include consolidation of waste from the property on the north side of the landfill back onto the landfill property, cutting of the north slope back to a 30 percent slope to be able to accept the cap without extending over the property line, excavation of some waste on the south side of the landfill so that the cap would not extend over into the transfer station, excavation of some waste on the northeast side so that the cap would not extend into the wetlands on the northeast side of the landfill, and consolidation of some waste from the property on the east side of the landfill (55 Luzerne Road property) back onto the landfill property to achieve a smooth curvature for installation of the cap materials. Refer to Figure 3 for the relation of the limit of waste to the existing property line. There is also general cutting of side slopes (refuse) to achieve a more balanced cut and fill. In the other areas where waste extends onto adjoining properties on the west and east sides of the landfill, due to the area, volume and/or existing slopes, excavating the waste would be too extensive a process and therefore was not considered for evaluation. These other areas of waste mass on adjoining properties would be left in-place, obtained through eminent domain, and capped.

The Part 360 cap would consist of a soil gas venting layer (12-inch depth), a geomembrane low permeability barrier layer (40 mil textured LLDPE), barrier protection layer (24-inch depth), and topsoil (6-inch depth) and vegetative cover layer. This alternative also would include implementing and maintaining institutional controls and post-closure landfill monitoring.

Alternative 2C: Part 360 Cap With Soil For Gas Venting Layer and Consolidation of Select Off-Site Waste Mass (30% Side Slopes, Unbalanced Cut and Fill).

This alternative is the same as Alternative 2B, with the exception that there is less waste consolidation as there would be no excavation of waste from the property to the east (55 Luzerne Road property) and there is less general cutting of side slopes (refuse) to minimize disturbance of the existing waste so there is not a balanced cut and fill. More clean fill is used in Alternative 2C instead of waste excavation to achieve the required slopes.

Alternative 3A: Modified Part 360 Cap With Soil For Gas Venting and Drainage Layers and No Waste Consolidation (30% Side Slopes).

This alternative is the same as Alternative 2A, with the exception that a Modified Part 360 cap would be installed instead of a Part 360 cap. The Modified Part 360 cap would consist of a soil gas venting layer (12-inch depth), a geomembrane low permeability barrier layer (40 mil textured LLDPE), a soil drainage layer (12-inch depth), a barrier protection layer (12-inch depth), and a topsoil (6-inch depth) and vegetative cover layer.

Alternative 3B: Modified Part 360 Cap With Soil For Gas Venting and Drainage Layers, and Consolidation of Select Off-Site Waste Mass (30% Side Slopes, Balanced Cut and Fill).

This alternative is the same as Alternative 2B, with the exception that a Modified Part 360 cap would be installed instead of a Part 360 cap. The Modified Part 360 cap would consist of a soil gas venting layer (12-inch depth), a geomembrane low permeability barrier layer (40 mil textured LLDPE), a soil drainage layer (12-inch depth), a barrier protection layer (12-inch depth), and a topsoil (6-inch depth) and vegetative cover layer.

Alternative 3C: Modified Part 360 Cap With Soil For Gas Venting and Drainage Layers, and Consolidation of Select Off-Site Waste Mass (30% Side Slopes, Unbalanced Cut and Fill).

This alternative is the same as Alternative 3B, with the exception that there is less waste consolidation as there would be no excavation of waste from the property to the east (55 Luzerne Road property) and there is less general cutting of side slopes (refuse) to minimize disturbance of the existing waste so there is not a balanced cut and fill. More clean fill is used in Alternative 3C instead of waste excavation to achieve the required slopes.

Alternative 4: Modified Part 360 Cap With Geocomposites For Gas Venting and Drainage Layers, and Consolidation of Select Off-Site Waste Mass (25% Side Slopes, Balanced Cut and Fill).

This alternative consists of consolidating select areas where wastes extends onto the adjoining properties and transferring the material back onto the surface of the landfill within the site's property boundaries, backfill and grading the excavated areas, regrading the landfill waste mass for erosion and drainage control, to meet minimum and maximum Part 360 slope requirements and to obtain a balanced cut and fill, and installing a Modified Part 360 cap over the new smaller footprint of the landfill waste mass (ash material not included as waste mass). There would be consolidation of waste from the property on the north side of the landfill back onto the landfill property, cutting the north slope back to be able to accept the cap without extending over the property line, excavating some waste on the south side of the landfill so that the cap would not extend over into the transfer station, and excavating some waste on the northeast side so that the cap would not extend into the wetlands on the northeast side of the landfill. There is also general cutting of side slopes (refuse) to achieve a balanced cut and fill. The other areas of waste mass that exists on adjoining properties would be left in-place, obtained through eminent domain, and capped. The Modified Part 360 cap would consist of a geocomposite gas venting layer, a geomembrane low permeability barrier layer (40 mil textured LLDPE), a geocomposite drainage layer, a barrier protection layer (18-inch depth), and a topsoil (6-inch depth) and vegetative cover layer. As noted above, it is anticipated that the landfill would have to be regraded to a slope of approximately 25% in order to achieve an appropriate factor of safety between the geocomposite and geomembrane interfaces. This alternative also would include implementing and maintaining institutional controls and post-closure landfill monitoring.

A cross-section of the landfill cap alternatives discussed above is presented as Figure 4. Intermediate grading plans of the landfill were prepared for the alternatives noted above to assist in determining if consolidation of select areas would be necessary or feasible and if it would be feasible to regrade the landfill to 25% side slopes. The Intermediate Grading Plan for Alternatives 2A and 3A is presented as Figure 5, for Alternatives 2B and 3B is presented as Figure 6, for Alternatives 2C and 3C is presented as Figure 7 and for Alternative 4 is presented as Figure 8. The cut and fill analysis for each intermediate grading plan is summarized below in Table 5.1-1 and discussed in Section 5.2, Screening of Alternatives. A cut and fill volume is given for the whole landfill area and for just within the limits of waste/refuse so that an estimate of how much refuse would actually have to be moved could be determined.

Table 5.1-1
Intermediate Grading Cut and Fill Volumes
Feasibility Study Capping Alternatives
Glens Falls Municipal Landfill At Luzerne Road

Alternative (Intermediate Grading)	Inside Limit of Refuse Only			Total Site		
	Cut CYs	Fill CYs	Net CYs	Cut CYs	Fill CYs	Net CYs
No. 2A & 3A - No Waste Consolidation - 30% Side Slopes	5,998	52,878	46,880 (Fill)	6,359	63,893	57,534 (Fill)

Table 5.1-1
Intermediate Grading Cut and Fill Volumes
Feasibility Study Capping Alternatives
Glens Falls Municipal Landfill At Luzerne Road

Alternative (Intermediate Grading)	Inside Limit of Refuse Only			Total Site		
	Cut CYs	Fill CYs	Net CYs	Cut CYs	Fill CYs	Net CYs
No. 2B & 3B - Select Waste Consolidation - 30% Side Slopes (Balanced)	37,207	42,357	5,150 (Fill)	37,770	45,952	8,182 (Fill)
No. 2C & 3C - Select Waste Consolidation - 30% Side Slopes (Unbalanced)	29,649	41,805	12,156 (Fill)	30,154	48,186	18,032 (Fill)
No. 4 - Select Waste Consolidation - 25% Side Slopes	67,424	68,224	800 (Fill)	67,993	75,169	7,176 (Fill)

5.2 Screening of Alternatives

The alternatives identified above were screened to reduce the total number of alternatives that are subjected to the detailed analysis. To conduct the screening of remedial alternatives, the criteria and procedures presented in NYSDEC's "Revised TAGM 4030 – Selection of Remedial Actions at Inactive Hazardous Waste Sites" were utilized. In accordance with TAGM 4030 the alternatives were evaluated for short-term and long-term effectiveness and implementability. The preliminary screening criteria of short-term and long-term effectiveness and implementability are discussed in Sections 5.2.1 and 5.2.2. This screening process eliminates those alternatives that do not address unacceptable health risks or are too difficult to technically or administratively implement.

5.2.1 Short-Term and Long-Term Effectiveness

Each alternative was evaluated with respect to its effectiveness in protecting human health and the environment by the extent the alternative will eliminate significant threats to public health and the environment through reductions in toxicity, mobility and volume of the wastes at the site. Both short-term and long-term effectiveness were evaluated. Short-term effectiveness applies to the duration of construction and implementation of the remedial action. Long-term effectiveness covers the period of time after the remedial action is in place and operational.

5.2.2 Implementability

Each alternative was evaluated for implementability which is a measure of technical and administrative feasibility of constructing, operating and maintaining a remedial action. The technical feasibility aspect evaluates the ability to construct, operate and maintain regulatory requirements for the duration of the remedial action. The availability of equipment and technical personnel, which may be necessary for long-term operation, maintenance and monitoring purposes were other factors considered. The administrative feasibility aspect evaluates the compliance to applicable regulations and the ability to obtain necessary permits and/or approvals from government agencies.

5.2.3 Evaluation of Alternatives

Except for the no action alternative, the other alternatives would be equally effective in protecting human health and the environment in the long term. There would be no reduction in volume of the waste, but the cap would eliminate the potential exposure routes and pathways of dermal contact with exposed refuse, dermal contact and/or ingestion of residual contaminated soil and potential leaching of contaminants with storm water runoff, and minimize storm water/precipitation infiltration and potential leaching of contaminants from the waste mass that could be carried downward to and migrate with groundwater. Alternative 1 would provide some protection from dermal contact as long as the fence restricting access to the site was maintained and trespassers were able to be kept off the landfill waste mass surface.

In the short term, Alternatives 2A and 3A would be most effective in protecting human health and the environment during construction as these alternatives do not involve waste consolidation and there would be minimal excavation/disturbance of waste. As shown in Table 5.1-1, approximately 6,000 cubic yards of waste/daily cover soil within the limits of the waste would need to be excavated/disturbed during construction for Alternatives 2A and 3A, compared with approximately 67,000 cubic yards for Alternative 4. For Alternatives 2B and 3B approximately 37,000 cubic yards of waste/daily cover soil would need to be excavated/disturbed to achieve select waste consolidation and a more balanced cut and fill. To achieve some waste consolidation without a balanced cut and fill (Alternatives 2C and 3C) approximately 30,000 cubic yards of waste/daily cover soil would need to be excavated/disturbed, but approximately 10,000 cubic yards of additional clean fill would need to be brought in and placed to achieve the required slopes. For Alternative 4 there would be a significant increase in the potential exposure to the landfill waste mass during construction due to the large volume of waste that would need to be excavated/disturbed.

With respect to the technical feasibility of implementing the containment alternatives, earthwork and geomembrane contractors, equipment and materials are readily and locally available to install the cap specified for any of the identified containment alternatives. Equipment and personnel are also readily available for installing the fence in Alternative 1 and for monitoring, operation and maintenance of the identified alternatives. Alternative 4 is anticipated to be the most difficult to implement with respect to controlling the waste that would need to be excavated, placed and recompacted due to the sheer volume involved. Administratively, all of the alternatives would involve obtaining some of the adjoining properties where waste exists through eminent domain, which could slow the process while sale agreements and agreed to market value of the properties are worked out between the City and the affected property owners. Since Alternatives 2B, 2C, 3B and 3C involve some consolidation of waste on the north side of the landfill, there would be fewer adjoining property owners involved with the eminent domain process and therefore may be more easily implemented administratively.

In view of the above, Alternatives 2C, 3C and 4 were eliminated from further evaluation. Alternatives 2C and 3C were eliminated as considerably more clean fill would be needed for Alternatives 2C and 3C compared with Alternatives 2B and 3B, with no significant added benefit. Alternative 4 was eliminated due to the increased risk to construction workers and the community and the difficulty of implementing it as a result of the large volume of waste that would need to be excavated. If clay were used for the low permeability barrier layer, it is anticipated that using a geocomposite for the gas venting and/or drainage layers as proposed in Alternative 4 would be feasible. It is anticipated that the existing slope would not need to be reduced to 25 percent if clay were utilized, therefore there would not be the significant amount of waste excavation required as is the case when geocomposites are used with a geomembrane. If a clay source is available in the area of the Glens Falls Municipal Landfill, this combination of materials for the cap could be evaluated during final design.

5.3 Selection of Alternatives for Detailed Analysis

Based on the results of the preliminary screening, the retained alternatives to be evaluated in detail are as follows:

- Alternative 1 – No Action. This alternative is being retained for baseline comparison to the other alternatives.

- Alternative 2A – Part 360 Cap With Soil For Gas Venting Layer and No Waste Consolidation (30% Side Slopes).

- Alternative 2B – Part 360 Cap With Soil For Gas Venting Layer and Consolidation of Select Off-Site Waste Mass (30% Side Slopes, Balanced Cut and Fill).

- Alternative 3A – Modified Part 360 Cap With Soil For Gas Venting and Drainage Layers and No Waste Consolidation (30% Side Slopes).
- Alternative 3B – Modified Part 360 Cap With Soil For Gas Venting and Drainage Layers and Consolidation of Select Off-Site Waste Mass (30% Side Slopes, Balanced Cut and Fill).

6.0 DETAILED ANALYSIS OF ALTERNATIVES

6.1 General

This section presents the detailed analysis of remedial alternatives for the Glens Falls Municipal Landfill at Luzerne Road site. This analysis provides comprehensive information necessary to select the most effective and feasible remedy for the site. The detailed analysis for each alternative includes the following:

- Detailed description of the alternatives; and
- Detailed analysis of each alternative against the seven evaluation criteria specified in the National Contingency Plan (NCP) and the NYSDEC TAGM 4030.

As part of the detailed analysis, a description of the methodologies and technologies used for each alternative is included in the discussion. The descriptions include conceptual layouts (intermediate and final grading plans) and discusses the limitations and assumptions made for each alternative. The preliminary data was developed in order to have a basis for preparing cost estimates, a part of the overall evaluation of each alternative.

Following is a brief description of the alternatives that were retained during the development of alternatives in Section 5.0 and that will be discussed in this section:

- Alternative 1 - No Action

  This alternative includes placing no additional cover on the landfill waste mass and areas of waste would remain on adjoining properties. The limit of the waste mass in relation to the existing property line is shown on Figure 3. It would include implementing and maintaining institutional controls, installing fencing around the entire limit of waste to restrict access to the waste mass and landfill monitoring.

- Alternative 2A – Part 360 Cap with Soil for Gas Venting Layer and No Waste Consolidation (30% Side Slopes)

  This alternative consists of grading the landfill waste mass for erosion and drainage control and to meet minimum and maximum Part 360 slope requirements, and installing a Part 360 cap over the entire landfill waste mass (ash material not included as waste mass). The areas of waste mass that exist on adjoining properties would be left in-place, obtained through eminent domain, and capped. The limit of the waste mass in relation to the existing property line is shown on Figure 3. The minimum and maximum Part 360 slope requirements would be achieved by importing, placing and grading clean fill over the landfill surface instead of excavating and regrading the existing waste. A portion of the area with ash material would likely be covered by the cap materials as a result of grading to achieve the required slopes. There would be some excavation of waste on the south side of the landfill so that the cap would not extend over into the transfer station. The Part 360 cap would consist of a soil gas venting layer (12-inch depth), a geomembrane low permeability barrier layer (40 mil textured LLDPE), barrier protection layer (24-inch depth), and topsoil (6-inch depth) and vegetative cover layer. This alternative also would include implementing and maintaining institutional controls and post-closure landfill monitoring.

- Alternative 2B – Part 360 Cap With Soil For Gas Venting Layer and Consolidation of Select Off-Site Waste Mass (30% Side Slopes, Balanced Cut and Fill)

  This alternative consists of consolidating select areas where waste extends onto the adjoining properties and transferring the material back onto the surface of the landfill within the site's property boundaries, backfill and grading the excavated areas, regrading the landfill waste mass for erosion and drainage control, to meet minimum and maximum Part 360 slope requirements and to obtain a balanced cut and fill, and installing a Part 360 cap over the new smaller footprint of the landfill waste mass (ash material not included as waste mass). A portion of the area with ash material would likely be covered by the cap materials as a result of grading to achieve the required slopes. There would be consolidation of waste from the property on the north side of the landfill back onto the landfill property, cutting of the north slope back to a 30 percent slope to be able to accept the cap without extending over the property line, excavating some waste on the south side of the landfill so that the cap would not extend over into the transfer station, excavating some waste on the northeast side so that the cap would not extend into the wetlands on the northeast side of the landfill, and consolidation of some waste from the property on the east side of the landfill (55 Luzerne Road property) back onto the landfill property to achieve a smooth curvature for installation of the cap materials. The limit of the waste mass in relation to the existing property line is shown on Figure 3. There is also general cutting of side slopes (refuse) to achieve a more balanced cut and fill. The other areas of waste mass that exist on adjoining properties would be left in-place, obtained through eminent domain, and capped. The Part 360 cap would consist of a soil gas venting layer (12-inch depth), a geomembrane low permeability barrier layer (40 mil textured LLDPE), barrier protection layer (24-inch depth), and topsoil (6-inch depth) and vegetative cover layer. This alternative also would include implementing and maintaining institutional controls and post-closure landfill monitoring.

- Alternative 3A – Modified Part 360 Cap With Soil For Gas Venting and Drainage Layers and No Waste Consolidation (30% Side Slopes)

  This alternative is the same as Alternative 2A, with the exception that a Modified Part 360 cap would be installed instead of a Part 360 cap. The Modified Part 360 cap would consist of a soil gas venting layer (12-inch depth), a geomembrane low permeability barrier layer (40 mil textured LLDPE), a soil drainage layer (12-inch depth), a barrier protection layer (12-inch depth), and a topsoil (6-inch depth) and vegetative cover layer.

- Alternative 3B – Modified Part 360 Cap With Soil For Gas Venting and Drainage Layers, and Consolidation of Select Off-Site Waste Mass (30% Side Slopes, Balanced Cut and Fill)

  This alternative is the same as Alternative 2B, with the exception that a Modified Part 360 cap would be installed instead of a Part 360 cap. The Modified Part 360 cap would consist of a soil gas venting layer (12-inch depth), a geomembrane low permeability barrier layer (40 mil textured LLDPE), a soil drainage layer (12-inch depth), a barrier protection layer (12-inch depth), and a topsoil (6-inch depth) and vegetative cover layer.

Each of the alternatives described above were evaluated against the following evaluation criteria, which are described in Table 6.1-1:

1. Compliance with New York State Standards, Criteria and Guidelines (SCG) and Federal ARARs,
2. Protection of Human Health and the Environment,
3. Short-Term Effectiveness,
4. Long-Term Effectiveness and Permanence,
5. Reduction of Toxicity, Mobility and Volume,
6. Implementability, and
7. Cost.

Table 6.1-1
Evaluation Criteria For Detailed Analysis of Alternatives
Glens Malls Municipal Landfill At Luzerne Road
Feasibility Study

Compliance with New York Standards, Criteria and Guidelines (SCGs)	Used to determine how each alternative complies with applicable or relevant and appropriate New York State SCGs or Federal standards which are more stringent than State standards. Three general categories: chemical-, location-, and action-specific are considered.
Protection of Human Health and the Environment	Assesses how each alternative protects and maintains the overall protection of human health and the environment.
Short-Term Effectiveness	Assesses the impact of each alternative on the community, workers, and environment during the construction and implementation of the remedial action until remedial action objectives are met.
Long-Term Effectiveness and Permanence	Assesses the effectiveness of the alternative after it is operational in meeting the remedial action objectives in terms of permanence, magnitude of remaining risk, and adequacy and reliability of controls.
Reduction of Toxicity, Mobility and Volume	Evaluates the remedial alternative's use of treatment technologies that permanently and significantly reduce the toxicity, mobility or volume of hazardous materials. Focuses specifically on amount destroyed or treated, degree of reduction and irreversibility and type and quantity of residuals remaining following treatment.
Implementability	Assesses the technical and administrative ability to install and operate the remedial alternative. The technical feasibility considers construction and operation, reliability of technology, ease of undertaking additional remedial action and ability to monitor the effectiveness. Administrative feasibility considers ability to obtain approvals from other agencies, and availability of services, materials and equipment to implement and maintain the remedial action.
Cost	Evaluates the capital cost and monitoring, operation and maintenance (O&M) costs for each alternative and includes a present worth cost for comparison of alternatives.

6.2 Analysis of Individual Alternatives

6.2.1 Alternative 1 – No Action

This alternative includes placing no additional cover on the landfill waste mass and areas of waste would remain on adjoining properties. This alternative would also include implementing and maintaining institutional controls, installing fencing around the entire limit of waste to restrict access to the waste mass and landfill monitoring. The areas where waste exists on adjoining properties would be obtained through eminent domain in order to be able to install the fence around the entire perimeter of the waste mass (i.e., both on and off-site).

6.2.1.1 Description of Components

Currently a 4-foot chain link fence exists on the south side of the landfill site in the area of the transfer station along Luzerne Road. A 6-foot chain link fence owned by NYSDOT exists along the northern half of the west side of the landfill, but not along the southern half of the west side. A 6-foot chain link fence exists along a portion of the north side of the landfill (west half of north side) and owned by the adjoining property owner (i.e., Northway Self Storage), however, the limit of waste extends beyond this existing fence line. Therefore, a new 6-foot chain link fence would be installed around the landfill outside the limit of waste, except along Luzerne Road where there is an existing fence in good condition. Some clearing of trees and brush around the perimeter of the landfill limit of waste would need to be performed in order to be able to install the fence.

A portion of four adjoining parcels of property where waste extends over the landfill property line (Figure 3) would need to be obtained through eminent domain. Where waste extends onto State of New York property (i.e., under NYSDOT control) on the west side of the landfill (Figure 3), an easement, use and occupancy permit or other agreement will need to be obtained to allow access to the site.

Institutional controls would include deed restrictions incorporated into the property deed to limit the current and future use of the property. The deed restriction would prevent the property from being developed and used in a manner that could result in contact with the landfill waste mass or explosive landfill gases. Institutional controls could also include groundwater use restrictions, if necessary, for a designated area surrounding the site. It is noted that the area of the site is serviced by public water.

Landfill monitoring would consist of groundwater and surface water sampling and analysis, explosive gas monitoring and landfill inspections. Groundwater sampling would consist of purging and sampling of up to thirteen existing monitoring wells associated with the landfill and laboratory analysis of groundwater samples for Part 360 baseline parameters on an annual basis and for Part 360 routine parameters on a quarterly basis. Surface water sampling would consist of the collection and analysis of surface water when present from the wetlands area located northeast of the landfill and from the wet area located west of the landfill. Considering that surface water is not present year round at these locations, the surface water sampling would be conducted semi-annually, once each for the Part 360 baseline parameters and Part 360 routine parameters.

Explosive gas monitoring would include installation of permanent gas monitoring points every 400 feet around the perimeter of the waste mass to sample the explosive gases potentially being emitted from the decomposing waste at the landfill. The landfill inspections would focus on the condition of the ground cover, monitoring wells, explosive gas monitoring points and fence, and checking for leachate outbreaks.

It is anticipated that initially the groundwater monitoring, explosive gas monitoring and landfill inspections would be conducted on a quarterly basis, and the surface water sampling conducted on a semi-annual basis. These frequencies would be evaluated at a minimum after five years of monitoring and reduced as appropriate and approved by

NYSDEC. For cost estimating purposes we have assumed that at a minimum the groundwater sampling would be able to be reduced to semi-annually after five years. The Part 360 regulations require that monitoring, operation and maintenance be performed for 30 years, unless specific approval is obtained from NYSDEC to reduce this requirement.

6.2.1.2 Compliance with NYS SCGs

Under this alternative the landfill would not meet action-specific NYS SCGs (Part 360) for proper closure of a municipal landfill, but would meet NYS SCGs for landfill monitoring. Chemical-specific SCGs currently being exceeded 1) may not be achieved as storm water/precipitation would be able to continue infiltrating the landfill and potentially leach landfill contaminants into groundwater, or 2) could take longer to be achieved as natural attenuation would be the primary mechanism for reducing the concentration of existing chemical constituents in groundwater over time. The area is currently serviced by public water. The construction workers and landfill monitoring personnel would need to comply with the OSHA action-specific ARARs including health and safety training.

6.2.1.3 Protection of Human Health and the Environment

This alternative provides some protection of human health and the environment since a fence would be installed around the landfill to significantly reduce the risk of exposure to the landfill waste mass and residual contamination in surface soil, specifically by direct contact or incidental ingestion. This alternative would also include institutional controls to control the current and future uses of the site so that the waste mass is not disturbed or built upon and control groundwater use, if necessary.

6.2.1.4 Short-Term Effectiveness and Long-Term Effectiveness and Permanence

The alternative of no action would include no construction activities other than installation of explosive gas monitoring points and a fence around the landfill waste mass. Therefore, there would be no impact to the community, workers or environment except during the limited time required to install the monitoring points and the fence. The impacts to the community, workers and the environment would be negligible, as this activity will only involve clearing of trees and brush where the monitoring points and fence would be installed and minimal disturbance of soil during clearing. The explosive gas monitoring points and fence posts would be located outside the limit of waste so there should be no disturbance of the waste mass during their installation.

Once the fence is in-place the magnitude of remaining risk would be low and controlled by restricting access. This alternative would be effective in the long-term as long as the fence is maintained to ensure trespassers are kept off the site and as long as the institutional controls are implemented and maintained. The institutional controls could breakdown and lose effectiveness over the long-term due to diminished enforcement and maintenance of the deed restrictions and turnover of individuals knowledgeable of the deed restrictions. Alternative 1 is not permanent as the fence could be removed and the institutional controls could be removed.

6.2.1.5 Reduction of Toxicity, Mobility and Volume

There would be some reduction in toxicity as the waste decomposes and natural attenuation breaks down the chemical contaminants. There would potentially be some reduction in mobility as the fence would restrict trespassers. Currently bicycles and off-road vehicles trespass on the site which can damage the existing cover and expose the waste potentially making it more mobile. This condition would be minimized with installation of the fence. There would be no reduction in the volume of the waste mass.

6.2.1.6 Implementability

The construction materials, equipment and contractors required to install the explosive gas monitoring points and fencing around the site are readily available. The fence would need to be maintained. The personnel, equipment and/or materials needed for monitoring, operation and maintenance of Alternative 1 are also readily available. Implementing the institutional controls at this site would be feasible as long as Local, County and State laws permit deed restrictions. Coordination with Local, County and State agencies would be required to implement the institutional controls.

Where waste extends onto adjoining properties, the land would have to be obtained through eminent domain. Implementing this action may be difficult if adjoining property owners are not willing to negotiate the sale of part of their property or don't agree with the sale price. Where waste extends onto State of New York property (i.e., under NYSDOT control), an easement, use and occupancy permit or other agreement will need to be obtained to allow access to the site for installation and maintenance of the fence. A Highway Work Permit For Non-Utility Work will also need to be obtained from NYSDOT for installation of the fence on the west side of the landfill as this area is adjacent to Interstate 87.

6.2.1.7 Cost

The direct and indirect capital cost estimate for Alternative 1 is $67,011.00. The direct capital costs associated with this alternative would be for the installation of the explosive gas monitoring points and fence around the site. The preliminary construction cost estimates were generated based on data obtained from RS Means Heavy Construction Cost Data, 2001 and previous C.T. Male experience. The indirect costs include engineering and design costs (25% utilized), contingencies (15% utilized), legal fees (5% utilized), licensing/permit fees, and the cost to purchase land where waste exists on the adjoining properties through eminent domain. In determining the cost to purchase portions of the properties, the assessed land values from Town of Queensbury assessment records were obtained and pro-rated based on each area of land that would need to be purchased and then a 15 percent contingency added. A breakdown of the direct and indirect capital costs are presented in Worksheet 1 and Worksheet 2, respectively, in Appendix A.1.

The annual monitoring, operation and maintenance cost estimate for years 1 through 5 is $49,630.00 and for years 6 through 30 is $32,703.00. These costs are detailed in Worksheet 3A and 3B, respectively, in Appendix A.1. The total present worth cost of Alternative 1 is estimated at $648,000.00, and is detailed in Worksheet 4 in Appendix A.1. This cost is based on landfill monitoring for a period of 30 years and assumes groundwater monitoring would be performed on a quarterly basis for the first 5 years and semi-annual for the remaining years; surface water sampling would be performed on a semi-annual basis; and explosive gas monitoring and landfill inspections would be performed on a quarterly basis. The frequency of landfill monitoring would at a minimum be evaluated after five years and adjusted as appropriate and approved by NYSDEC.

6.2.2 Alternative 2A – Part 360 Cap with Soil for Gas Venting Layer and No Waste Consolidation (30% Side Slopes)

This alternative consists of grading the landfill waste mass for erosion and drainage control and to meet minimum and maximum Part 360 slope requirements, and installing a Part 360 cap over the entire landfill waste mass (ash material not included as waste mass). The areas of waste mass that exist on adjoining properties would be left in-place, obtained through eminent domain, and capped (Figure 3). The minimum and maximum Part 360 slope requirements would be achieved by importing, placing and grading clean fill over the landfill surface instead of excavating and regrading the existing waste. A portion of the area with ash material would likely be covered by the cap materials as a result of grading to achieve the required slopes. There would be some excavation of waste on the south side of the landfill so that the cap would not extend over into the transfer station. This alternative also would include implementing and maintaining institutional controls and post-closure landfill monitoring.

6.2.2.1 Description of Components

The landfill area within the limits of waste and grading for the cap materials would be cleared of trees, brush and vegetation. Existing fencing owned by the adjoining property owner along a portion of the north and west (northern half) sides of the landfill and existing fencing along a portion of the southeast side of the landfill would need to be removed to allow access for grading and placement of the cap materials. Clean fill consisting of run of bank sand and/or gravel would be delivered, placed and compacted on the landfill surface to achieve a minimum 4 percent slope and maximum 33 percent slope required by Part 360 without disturbing the existing waste. Approximately 58,000 cubic yards of clean fill would be needed under this alternative. The exception is that approximately 6,000 cubic yards of waste/daily cover would have to be excavated on the south side of the landfill to enable the cap materials to be placed without extending into the existing transfer station. The Part 360 cap material would be placed and compacted above the clean fill. The landfill cap for Alternative 2A would encompass approximately 19.6 acres. The approximate proposed final cap limit is shown on Figure 9. Erosion and sedimentation controls (silt fence and haybale sediment barriers) would be implemented during construction.

The Part 360 cap would consist of a gas venting layer (GVL), a geomembrane low permeability barrier layer, a barrier protection layer (BPL) and a topsoil and vegetative cover layer. The GVL would be 12 inches thick and consists of a sand (Unified Soil Classification of SP or SW) with a minimum permeability of 1×10^{-3} cm/sec and a maximum of 10 percent passing the No. 200 sieve. In accordance with Part 360 a filter layer would be placed below the gas venting layer to maintain the integrity of the GVL. A filter layer above the GVL is not required per Part 360 when a geomembrane is used as the low permeability barrier layer. The filter layer can either be a granular soil material with a maximum of 5 percent passing the No. 200 sieve or a geosynthetic filter. For developing the grading plans and for cost estimating purposes we have assumed the filter layer would be an 8 ounce per square yard non-woven filter fabric. The GVL material in contact with the geomembrane would have a maximum grain size of 3/8-inch so as not to damage the geomembrane.

The gas venting layer would also include gas venting structures to provide an outlet for the landfill gases to be emitted to the air for dispersion instead of potentially traveling horizontally outside the limits of the landfill. In accordance with Part 360 the gas venting structure would consist of a minimum 6-inch diameter perforated vertical pipe extending at least 5 feet into the refuse and connected to a solid riser pipe at the top of the GVL to at least 3 feet above the final cover grade elevation and be fitted with a gooseneck cap and insect screen. The perforated portion of the gas venting structure within the refuse would be backfilled with a porous stone such as crushed stone or washed gravel. At least one gas venting structure would be installed per acre of landfill or approximately sixteen gas venting structures.

The low permeability barrier layer would be constructed of textured linear low density polyethylene (LLDPE) geomembrane and be a minimum 40 mil thick per Part 360 requirements. A textured geomembrane is proposed in lieu of a smooth geomembrane to increase the friction angle and resulting slope stability between the geomembrane and cover materials next to it. The BPL would be 24 inches thick and consist of a silty sand. The BPL material in contact with the geomembrane would have a maximum grain size of 3/8-inch so as not to damage the geomembrane. The topsoil layer would be 6 inches thick and be able to sustain a vegetative cover. A cross-section of the Alternative 2A cap is shown on Figure 4. Intermediate and final grading plans that show the estimated limits of grading for Alternative 2A based on no consolidation of off-site waste are presented as Figures 5 and 9, respectively. A typical gas venting structure detail is presented as Figure 11.

For the FS we have utilized a maximum slope of 30 percent in developing the intermediate and final landfill closure grading plans based on soil being used for the GVL to add some factor of safety. During the design of the selected remedy, actual slope stability calculations would be performed to determine if a 33 percent slope with the selected cap materials would be stable and protect the cover from a 24-hour, 25-year frequency storm required by Part 360. If so, then the final design of the selected remedy could incorporate a 33 percent maximum slope.

Alternative 2A would also include construction of a drainage swale around the perimeter of the landfill or a perimeter toe drain where space is limited to promote drainage of the BPL and topsoil layer and minimize ponding, to provide an outlet for the landfill surface water runoff, and to minimize the landfill surface water runoff and other storm water run-on from infiltrating the area around the perimeter of the landfill. It is anticipated that storm water runoff from the northwest, north and east sides of the landfill would be directed towards the wetlands on the northeast side of the landfill, and that storm water runoff from the west, southwest and south sides of the landfill would be directed towards a retention basin or similar structure to be located on the southwest side of the landfill. No storm catch basins or storm sewers are known to exist along Luzerne Road on the south side of the landfill that storm water runoff could be directed to. A drainage swale may also need to be installed over a portion of the top of the landfill depending on what the slope stability calculations show. The drainage swale or toe drain construction, layout, size, etc. would be determined during the final design of the selected remedy. For cost estimating purposes we have assumed an 8-foot wide and average 2-foot deep drainage swale around the perimeter of the landfill and lined with stabilization fabric and a mixture of light and medium rip rap.

A perimeter access road where sufficient space exists and an access road over the top of the landfill would also be installed as part of this alternative. The location, construction, size, etc. would be determined during the final design of the selected remedy. This alternative also includes installation of a 6-foot chain link fence around the perimeter of the landfill outside the drainage swale and access road. The purpose of the fence is to keep out trespassers, specifically off-road vehicles that could damage the integrity of the cap. Currently the landfill is covered with trees and not readily visible. As noted above, the trees will need to be cleared for installation of the landfill cap. Due to the rural nature of the area and the proximity of the landfill to Interstate 87, trees would be replanted along portions of the landfill perimeter to screen the landfill from view.

A portion of seven adjoining parcels of property where waste extends or the cap would extend over the landfill property line (Figures 3 and 9) would need to be obtained through eminent domain. Where waste extends onto State of New York property (i.e., under NYSDOT control) on the west side of the landfill (Figure 3), an easement, use and occupancy permit or other agreement will need to be obtained to allow access to the site.

The institutional controls would include deed restrictions incorporated into the property deed to limit the current and future use of the property. The deed restriction would prevent the property from being developed and used in a manner that could damage the integrity of the cap. Institutional controls could also include groundwater use restrictions, if necessary, for a designated area surrounding the site. It is noted that the area of the site is serviced by public water.

Landfill monitoring would consist of groundwater and surface water sampling and analysis, explosive gas monitoring and landfill inspections. Groundwater sampling would consist of purging and sampling of up to thirteen existing monitoring wells associated with the landfill and laboratory analysis of groundwater samples for Part 360 baseline parameters on an annual basis and for Part 360 routine parameters on a quarterly basis. Surface water sampling would consist of the collection and analysis of surface water when present from the wetlands area located northeast of the landfill and from the wet area located west of the landfill. Considering that surface water is not present year round at these locations, the surface water sampling would be conducted semi-annually, once each for the Part 360 baseline parameters and Part 360 routine parameters.

Explosive gas monitoring would include installation of permanent gas monitoring points every 400 feet around the perimeter of the waste mass to sample the explosive gases potentially being emitted from the decomposing waste at the landfill. Approximately ten permanent explosive gas points are anticipated. The landfill inspections would focus on the condition of the cap, drainage swales, vegetative cover, gas venting structures, monitoring wells, explosive gas monitoring points and fence, and checking for erosion, ponding and leachate outbreaks.

It is anticipated that initially the groundwater monitoring, explosive gas monitoring and landfill inspections would be conducted on a quarterly basis, and the surface water sampling conducted on a semi-annual basis. These frequencies would be evaluated at a minimum after five years of monitoring and reduced as appropriate and approved by NYSDEC. For those landfills that closed prior to October 9, 1993 which applies to the Glens Falls Municipal Landfill, the Post-Closure Monitoring II Specific Variance in the Local Government Regulatory Relief Initiative document dated February 26, 1993 allows the frequency of monitoring to be reduced after two baseline parameters sampling events from annually for baseline parameters and quarterly for routine parameters to twice per year for routine parameters and once every three years for baseline parameters as long as certain conditions are met. Therefore, the groundwater and surface water monitoring is anticipated to be able to be evaluated after two baseline sampling events and reduced as approved by NYSDEC.

For cost estimating purposes we have assumed that at a minimum the groundwater sampling would be able to be reduced to semi-annually after five years. The Part 360 regulations require that monitoring, operation and maintenance be performed for 30 years, unless specific approval is obtained from NYSDEC to reduce this requirement. The actual environmental monitoring plan that would be implemented including the number of existing and/or new monitoring wells to be monitored would be developed and submitted for review and comment as part of the design phase.

6.2.2.2 Compliance with NYS SCGs

Constructing a Part 360 cap over the landfill waste mass would satisfy action-specific NYS SCGs and Federal ARARs for municipal landfill closure. Post-closure landfill monitoring would also satisfy NYS SCGs. Chemical-specific SCGs currently being exceeded are anticipated to be reduced and potentially achieved over time as storm water/precipitation infiltration and potential leaching of contaminants into the groundwater would be minimized with installation of the cap and natural attenuation would reduce the concentration of existing chemical constituents in groundwater over time. The area is currently serviced by public water.

It appears that without waste consolidation, the cap would potentially extend into the wetlands on the northeast side of the landfill in order to cover the waste mass and achieve required slopes in the area of test pit TP-12 and TP-14 (Figure 9). There also is a wetland between Interstate 87 and the west side of the landfill that would potentially be impacted in order to achieve required slopes and/or during placement of the cap materials. The limits of the wetlands have not been delineated and therefore the impacts have not been fully determined. The design and construction of the cap would need to comply with the United States Army Corps of Engineers Nationwide Permit Program. The construction workers and landfill monitoring personnel would need to comply with the OSHA action-specific ARARs including health and safety training.

6.2.2.3 Protection of Human Health and the Environment

This alternative is protective of human health and the environment as the cap would eliminate the potential exposure routes and pathways of dermal contact with exposed refuse, dermal contact and/or ingestion of residual contaminated soil and potential leaching of contaminants with storm water runoff, and would minimize storm water/precipitation infiltration and potential leaching of contaminants from the waste mass that could be carried downward to and migrate with groundwater.

6.2.2.4 Short-Term Effectiveness and Long-Term Effectiveness and Permanence

This alternative does not involve waste consolidation and there would be minimal excavation/disturbance of waste. Approximately 6,000 cubic yards (Table 5.1-1) of waste/daily cover soil within the limits of the waste would need to be excavated/disturbed during construction for Alternative 2A. However, with no waste consolidation, there would be additional truck traffic to bring in the fill (approximately 58,000 cubic yards) needed to achieve the required Part 360 slopes. During construction, there would potentially be an increased risk to the community and the environment as a result of increased truck traffic to deliver the clean fill and cap materials to the site, potential residual dust during truck traffic and grading, potential exposure of landfill contents to construction personnel and noise. Increased dust and particulate matter in the air from grading and truck traffic at the landfill would be monitored and controlled by applying water over the construction surfaces. Exposure impacts to workers during construction activities would be controlled by following established safety procedures and using monitoring and personnel protective equipment.

There would be significant long-term effectiveness and permanence of this alternative as the landfill waste mass would be capped thereby reducing the risk of dermal contact with the landfill waste mass, and also reducing the potential for leaching of contaminants provided the integrity of the cap is maintained. There would be less potential for settlement as there would be less excavation/disturbance of waste that would need to be recompacted. The existing landfill waste mass has had over 25 years to settle, where as recompacted waste would potentially not be at the same compaction.

6.2.2.5 Reduction of Toxicity, Mobility and Volume

There would be some reduction in toxicity as the waste decomposes and natural attenuation breaks down the chemical contaminants. There would be reduction in mobility as the cap would cover the exposed refuse and prevent contact, prevent leaching of contaminants with storm water runoff, and minimize infiltration of storm water/precipitation and potential leaching of contaminants to groundwater. There would be no reduction in the volume of the waste mass.

6.2.2.6 Implementability

This alternative could not be implemented quickly, as design of the Part 360 cap would need to be performed prior to construction. The design phase, obtaining approvals from NYSDEC and the bidding phase could take a period of 6 to 12 months to complete. Earthwork and geomembrane contractors experienced in grading existing soil covers and installing a Part 360 cap as well as equipment and materials to perform this work are readily and locally available. Equipment and personnel for landfill monitoring, and operation and maintenance of the landfill cap and associated structures are also readily and locally available.

Implementing the institutional controls at this site would be feasible as long as Local, County and State laws permit deed restrictions. Coordination with Local, County and State agencies would be required to implement the institutional controls.

Where waste extends onto adjoining properties, the land would have to be obtained through eminent domain. Implementing this action may be difficult if adjoining property owners are not willing to negotiate the sale of part of their property or don’t agree with the sale price. Where waste extends onto State of New York property (i.e., under NYSDOT control), an easement, use and occupancy permit or other agreement will need to be obtained to allow access to the site for installation and maintenance of the cap materials on the west side of the landfill. A Highway Work Permit For Non-Utility Work will also need to be obtained from NYSDOT for the construction work as the western side of the landfill is adjacent to Interstate 87.

In the case of the adjoining property north of the landfill (western half), currently occupied by Northway Self Storage, there is approximately 63 feet from the property line to the asphalt paved road used to access the self storage units and approximately 93 feet from the property line to the nearest storage unit building. As shown on Figure 9, under Alternative 2A the landfill cap (not including a drainage swale or perimeter access road) would extend approximately 65 feet onto this northern adjoining property at its furthest point (i.e., along southeast property line). Implementing this alternative may be difficult since it would interfere with the existing use of the Northway Self Storage property.

6.2.2.7 Cost

The direct and indirect capital cost estimate for Alternative 2A is $5,179,769.00. The major components of the direct capital costs associated with this alternative would be for construction/site work and material testing relative to installation of the Part 360 cap. The preliminary construction cost estimates were generated based on data obtained from RS Means Heavy Construction Cost Data, 2001; RS Means Environmental Remediation Cost Data – Assemblies, 2002; quotes received from material suppliers including for the geomembrane, non-woven filter fabric, soil cap materials, slope stabilization fabric and riprap; communication with landfill closure contractor; and previous C.T.Male experience. The costs are presented in 2002 dollars, based on conceptual designs only and based on the work being performed by a contractor. The preliminary material testing cost estimates were generated based on quotes obtained from a soil and material testing laboratory. The indirect costs include engineering and design costs (10% utilized), contingencies (15% utilized), legal fees (5% utilized), licensing/permit fees, and the cost to purchase land where waste exists on the adjoining properties through eminent domain. In determining the cost to purchase portions of the properties, the assessed land values from Town of Queensbury assessment records were obtained and pro-rated based on each area of land that would need to be purchased and then a 15 percent contingency added. A breakdown of the direct and indirect capital costs are presented in Worksheet 1 and Worksheet 2, respectively, in Appendix A.2.

The annual monitoring, operation and maintenance cost estimate for years 1 through 5 is $56,438.00 and for years 6 through 30 is $39,511.00. These costs are detailed in Worksheet 3A and 3B, respectively, in Appendix A.2. The total present worth cost of Alternative 2A is estimated at $5,861,000.00, and is detailed in Worksheet 4 in Appendix A.2. This cost is based on landfill monitoring for a period of 30 years and assumes groundwater monitoring would be performed on a quarterly basis for the first 5 years and semi-annual for the remaining years; surface water sampling would be performed on a semi-annual basis; and explosive gas monitoring and landfill inspections would be performed on a quarterly basis. The frequency of landfill monitoring would at a minimum be evaluated after five years, but is anticipated to be able to be evaluated after two baseline sampling events, and adjusted as appropriate and approved by NYSDEC.

6.2.3 Alternative 2B - Part 360 Cap With Soil For Gas Venting Layer and Consolidation of Select Off-Site Waste Mass (30% Side Slopes, Balanced Cut and Fill)

This alternative consists of excavating the small amount of waste on the adjoining property to the north in the area of test pits TP-8 and TP-9B (Figure 2) and transferring the material back onto the surface of the landfill within the site’s property boundaries, excavating some waste from the property on the east side of the landfill (55 Luzerne Road property), backfill and grading the excavated areas, regrading the landfill waste mass for erosion and drainage control and to meet minimum and maximum Part 360 slope requirements, and installing a Part 360 cap over the new smaller footprint of the landfill waste mass. The other areas of waste mass that exist on adjoining properties would be left in-place, obtained through eminent domain, and capped. This alternative also would include implementing and maintaining institutional controls and post-closure landfill monitoring.

6.2.3.1 Description of Components

The components of Alternative 2B would be the same as described for Alternative 2A in Section 6.2.2.1, with the exception that Alternative 2B includes some waste consolidation. Therefore a portion of three adjoining parcels of property where waste extends over the landfill property line (Figures 3 and 10) instead of seven would need to be obtained through eminent domain. As noted above, the small amount of waste that extends onto the adjoining property on the north side of the landfill would be excavated and placed back on the landfill. There would be cutting of the north slope back to a 30 percent slope to be able to accept the cap without extending over the property line, excavating some waste on the south side of the landfill so that the cap would not extend over into the transfer station, excavating some waste on the northeast side in the area of test pits TP-12 and TP-14 (Figure 2) so that the cap would not extend into the wetlands on the northeast side of the landfill, and excavating some waste from the property on the east side of the landfill (55 Luzerne Road property, Figures 3 and 10) and placing it back onto the landfill property to facilitate installation of the geomembrane low permeability barrier layer. There also would be general cutting of side slopes (refuse) to achieve a balanced cut and fill. This general cutting is currently shown on the northern half of the west side of the landfill (Figure 6), but would be modified during final design so that the cutting to achieve a more balanced cut and fill involves the least area possible to minimize the amount of waste that would potentially have to be disturbed.

Approximately 37,000 cubic yards of waste/daily cover would need to be excavated or cut from existing slopes where noted above and then recompacted. This material would be used as fill in other areas on the landfill surface to achieve the desired minimum 4 percent and maximum 33 percent slopes. Approximately 8,200 cubic yards of clean fill would need to be delivered, placed and compacted, primarily in those areas were waste was excavated outside the property line and on the west side of the landfill, to achieve the desired slope outside of the limit of waste. Refuse cannot be placed outside of the existing landfill footprint in accordance with the Part 360 regulations. The landfill cap for Alternative 2B would encompass approximately 17.9 acres. The approximate proposed final cap limit is shown on Figure 10.

A cross-section of the Alternative 2B cap is shown on Figure 4. Intermediate and final grading plans that show the estimated limits of grading for Alternative 2B based on select areas of waste consolidation are presented as Figures 6 and 10, respectively.

6.2.3.2 Compliance with NYS SCGs

Compliance with NYS SCGs would be the same for Alternative 2B as Alternative 2A described in Section 6.2.2.2, except that the waste mass in the area of test pit TP-12 and TP-14 on the northeast side of the landfill would be excavated so that the cap would not extend into the wetlands on the northeast side of the landfill. Therefore, the requirements of the United States Army Corps of Engineers Nationwide Permit Program should be able to be avoided in that area of the site.

6.2.3.3 Protection of Human Health and the Environment

This alternative is protective of human health and the environment as the cap would eliminate the potential exposure routes and pathways of dermal contact with exposed refuse, dermal contact and/or ingestion of residual contaminated soil and potential leaching of contaminants with storm water runoff, and would minimize storm water/precipitation infiltration and potential leaching of contaminants from the waste mass that could be carried downward to and migrate with groundwater.

6.2.3.4 Short-Term Effectiveness and Long-Term Effectiveness and Permanence

This alternative involves some waste consolidation and excavation/cutting of waste to achieve required slopes and more balanced cuts and fills. Approximately 37,000 cubic yards (Table 5.1-1) of waste/daily cover soil would need to be excavated/disturbed during construction for Alternative 2B. During construction, there would potentially be an increased risk to the community and the environment as a result of 1) the magnitude of waste that would need to be excavated and the potential difficulties controlling it (i.e., from wind erosion, etc.); 2) increased truck traffic to deliver the cap materials to the site; 3) potential residual dust during truck traffic and grading; 4) potential exposure of landfill contents to construction personnel; and 5) noise. There would be less truck trips as approximately 8,200 cubic yards of clean fill instead of 58,000 cubic yards (Alternative 2A) would need to be brought in to achieve the required slopes. Increased dust and particulate matter in the air from grading and truck traffic at the landfill would be monitored and controlled by applying water over the construction surfaces. Exposure impacts to workers during construction activities would be controlled by following established safety procedures and using monitoring and personnel protective equipment.

There would be significant long-term effectiveness and permanence of this alternative as the landfill waste mass would be capped thereby reducing the risk of dermal contact with the landfill waste mass, and also reducing the potential for leaching of contaminants provided the integrity of the cap is maintained. There would be increased potential for settlement as there would be approximately 37,000 cubic yards of waste/daily cover soil being excavated/disturbed that would need to be recompacted. The existing landfill waste mass has had over 25 years to settle, where as recompacted waste would potentially not be at the same compaction.

6.2.3.5 Reduction of Toxicity, Mobility and Volume

The reduction in toxicity, mobility and volume of the waste for Alternative 2B would be the same as Alternative 2A described in Section 6.2.2.5.

6.2.3.6 Implementability

The implementation of Alternative 2B would essentially be the same as Alternative 2A described in Section 6.2.2.6, except that there would be less land that would need to be obtained through eminent domain. Under this alternative, the waste that extends onto the adjoining property on the north side of the landfill (Northway Self Storage) would be excavated and consolidated on the landfill property and the north landfill slope would be cut back so that the cap would not extend over the landfill's north property line. This results in three fewer property owners involved in the eminent domain process and therefore this alternative may be more easily implemented administratively.

6.2.3.7 Cost

The direct and indirect capital cost estimate for Alternative 2B is $4,541,571.00. The major components of the direct capital costs associated with this alternative would be for construction/site work and material testing relative to consolidation of select waste and installation of the Part 360 cap. The indirect costs include engineering and design costs (10% utilized), contingencies (15% utilized), legal fees (5% utilized), licensing/permit fees, and the cost to purchase land where waste exists on the adjoining properties through eminent domain (i.e., areas where waste is not being consolidated back onto the landfill property). The basis for the preliminary direct and indirect costs for this alternative are the same as for Alternative 2A presented in Section 6.2.2.7. A breakdown of the direct and indirect capital costs are presented in Worksheet 1 and Worksheet 2, respectively, in Appendix A.3.

The annual monitoring, operation and maintenance cost estimate for years 1 through 5 is $56,438.00 and for years 6 through 30 is $39,511.00. These costs are detailed in Worksheet 3A and 3B, respectively, in Appendix A.3. The total present worth cost of Alternative 2B is estimated at $5,223,000.00, and is detailed in Worksheet 4 in Appendix A.3. This cost is based on landfill monitoring for a period of 30 years and assumes groundwater monitoring would be performed on a quarterly basis for the first 5 years and semi-annual for the remaining years; surface water sampling would be performed on a semi-annual basis; and explosive gas monitoring and landfill inspections would be performed on a quarterly basis. The frequency of landfill monitoring would at a minimum be evaluated after five years, but is anticipated to be able to be evaluated after two baseline sampling events, and adjusted as appropriate and approved by NYSDEC.

6.2.4 Alternative 3A – Modified Part 360 Cap With Soil For Gas Venting and Drainage Layers and No Waste Consolidation (30% Side Slopes)

This alternative consists of grading the landfill waste mass for erosion and drainage control and to meet minimum and maximum Part 360 slope requirements, and installing a Modified Part 360 cap over the entire landfill waste mass (ash material not included as waste mass). The areas of waste mass that exist on adjoining properties would be left in-place, obtained through eminent domain, and capped (Figure 3). The minimum and maximum Part 360 slope requirements would be achieved by importing, placing and grading clean fill over the landfill surface instead of excavating and regrading the existing waste. A portion of the area with ash material would likely be covered by the cap materials as a result of grading to achieve the required slopes. There would be some excavation of waste on the south side of the landfill so that the cap would not extend over into the transfer station. This alternative also would include implementing and maintaining institutional controls and post-closure landfill monitoring.

6.2.4.1 Description of Components

The components of Alternative 3A would be the same as described for Alternative 2A in Section 6.2.2.1, except that a Modified Part 360 cap would be installed instead of a Part 360 cap. The only difference between the Modified Part 360 cap and Part 360 cap is that a drainage layer would be installed above the geomembrane low permeability layer and the BPL would be reduced from 24 inches to 12 inches. The soil drainage layer would be 12 inches thick and consist of a sand with a minimum permeability of 1×10^{-2} cm/sec and a maximum of 5 percent passing the No. 200 sieve. As the drainage layer material is in contact with the geomembrane, the sand would have a maximum grain size of 3/8-inch so as not to damage the geomembrane. The benefit of the soil drainage layer is to allow storm water/precipitation that infiltrates through the topsoil layer and BPL to be drained quickly from the surface of the geomembrane to minimize the potential for erosion or worst case slope failure.

A cross-section of the Alternative 3A cap is shown on Figure 4. Intermediate and final grading plans that show the estimated limits of grading for Alternative 3A based on no consolidation of off-site waste are presented as Figures 5 and 9, respectively. The landfill cap for Alternative 3A would encompass approximately 19.6 acres. The approximate proposed final cap limit is shown on Figure 9.

6.2.4.2 Compliance with NYS SCGs

Compliance with NYS SCGs would be the same for Alternative 3A as Alternative 2A described in Section 6.2.2.2.

6.2.4.3 Protection of Human Health and the Environment

This alternative is protective of human health and the environment as the cap would eliminate the potential exposure routes and pathways of dermal contact with exposed refuse, dermal contact and/or ingestion of residual contaminated soil and potential leaching of contaminants with storm water runoff, and would minimize storm water/precipitation infiltration and potential leaching of contaminants from the waste mass that could be carried downward to and migrate with groundwater.

6.2.4.4 Short-Term Effectiveness and Long-Term Effectiveness and Permanence

The short-term and long-term effectiveness and permanence of Alternative 3A would be the same as Alternative 2A described in Section 6.2.2.4, except there would be some added effectiveness due the presence of the drainage layer. The drainage layer present in this alternative above the low permeability barrier layer instead of just barrier protection layer material would reduce the potential for erosion and provide additional slope stability during significant or prolonged storm events.

6.2.4.5 Reduction of Toxicity, Mobility and Volume

The reduction in toxicity, mobility and volume of the waste for this alternative would be the same as Alternative 2A described in Section 6.2.2.5.

6.2.4.6 Implementability

The implementation of Alternative 3A would be the same as Alternative 2A described in Section 6.2.2.6.

6.2.4.7 Cost

The direct and indirect capital cost estimate for Alternative 3A is $5,407,322.00. The major components of the direct capital costs associated with this alternative would be for construction/site work and material testing relative to installation of the Modified Part 360 cap. The indirect costs include engineering and design costs (10% utilized), contingencies (15% utilized), legal fees (5% utilized), licensing/permit fees, and the cost to purchase land where waste exists on the adjoining properties through eminent domain. The basis for the preliminary direct and indirect costs for this alternative are the same as for Alternative 2A presented in Section 6.2.2.7. A breakdown of the direct and indirect capital costs are presented in Worksheet 1 and Worksheet 2, respectively, in Appendix A.4.

The annual monitoring, operation and maintenance cost estimate for years 1 through 5 is $56,438.00 and for years 6 through 30 is $39,511.00. These costs are detailed in Worksheet 3A and 3B, respectively, in Appendix A.4. The total present worth cost of Alternative 3A is estimated at $6,088,000.00, and is detailed in Worksheet 4 in Appendix A.4. This cost is based on landfill monitoring for a period of 30 years and assumes groundwater monitoring would be performed on a quarterly basis for the first 5 years and semi-annual for the remaining years; surface water sampling would be performed on a semi-annual basis; and explosive gas monitoring and landfill inspections would be performed on a quarterly basis. The frequency of landfill monitoring would at a minimum be evaluated after five years, but is anticipated to be able to be evaluated after two baseline sampling events, and adjusted as appropriate and approved by NYSDEC.

6.2.5 Alternative 3B – Modified Part 360 Cap With Soil For Gas Venting and Drainage Layers, and Consolidation of Select Off-Site Waste Mass (30% Side Slopes, Balanced Cut and Fill)

This alternative consists of excavating the small amount of waste on the adjoining property to the north in the area of TP-8 and TP-9B (Figure 2) and transferring the material back onto the surface of the landfill within the site's property boundaries, excavating some waste from the property on the east side of the landfill (55 Luzerne Road property), backfill and grading the excavated areas, regrading the landfill waste mass for erosion and drainage control and to meet minimum and maximum Part 360 slope requirements, and installing a Modified Part 360 cap over the new smaller footprint of the landfill waste mass. The other areas of waste mass that exist on adjoining properties would be left in-place, obtained through eminent domain, and capped. The limit of the waste mass in relation to the existing property line is shown on Figure 3.

There would be cutting of the north slope back to a 30 percent slope to be able to accept the cap without extending over the property line, excavating some waste on the south side of the landfill so that the cap would not extend over into the transfer station, excavating some waste on the northeast side in the area of TP-12 and TP-14 (Figure 2) so that the cap would not extend into the wetlands on the northeast side of the landfill, and excavating some waste from the property on the east side of the landfill (55 Luzerne Road property, Figures 3 and 10) and placing it back onto the landfill property to facilitate installation of the geomembrane low permeability barrier layer. There also would be general cutting of side slopes (refuse) to achieve a more balanced cut and fill. This general cutting is currently shown on the northern half of the west side of the landfill (Figure 6), but would be modified during final design so that the cutting to achieve a balanced cut and fill involves the least area possible to minimize the amount of waste that would potentially have to be disturbed. This alternative also would include implementing and maintaining institutional controls and post-closure landfill monitoring.

6.2.5.1 Description of Components

The components of Alternative 3B would be the same as described for Alternative 2B in Section 6.2.3.1, except that a Modified Part 360 cap would be installed instead of a Part 360 cap. The only difference between the Modified Part 360 cap and Part 360 cap is that a drainage layer would be installed above the geomembrane low permeability layer and the BPL would be reduced from 24 inches to 12 inches. The soil drainage layer would be 12 inches thick and consist of a sand with a minimum permeability of 1×10^{-2} cm/sec and a maximum of 5 percent passing the No. 200 sieve. As the drainage layer material is in contact with the geomembrane, the sand would have a maximum grain size of 3/8-inch so as not to damage the geomembrane. The benefit of the soil drainage layer is to allow storm water/precipitation that infiltrates through the topsoil layer and BPL to be drained quickly from the surface of the geomembrane to minimize the potential for erosion or worst case slope failure.

A cross-section of the Alternative 3B cap is shown on Figure 4. Intermediate and final grading plans that show the estimated limits of grading for Alternative 3B based on select areas of waste consolidation are presented as Figures 6 and 10, respectively. The landfill cap for Alternative 3B would encompass approximately 17.9 acres. The approximate proposed final cap limit is shown on Figure 10.

6.2.5.2 Compliance with NYS SCGs

Compliance with NYS SCGs would be the same for Alternative 3B as Alternative 2A described in Section 6.2.2.2, except that the waste mass in the area of test pit TP-12 and TP-14 on the northeast side of the landfill would be excavated so that the cap would not extend into the wetlands on the northeast side of the landfill. Therefore, the requirements of the United States Army Corps of Engineers Nationwide Permit Program should be able to be avoided in that area of the site.

6.2.5.3 Protection of Human Health and the Environment

This alternative is protective of human health and the environment as the cap would eliminate the potential exposure routes and pathways of dermal contact with exposed refuse, dermal contact and/or ingestion of residual contaminated soil and potential leaching of contaminants with storm water runoff, and would minimize storm water/precipitation infiltration and potential leaching of contaminants from the waste mass that could be carried downward to and migrate with groundwater.

6.2.5.4 Short-Term Effectiveness and Long-Term Effectiveness and Permanence

The short-term and long-term effectiveness and permanence of Alternative 3B would be the same as Alternative 2B described in Section 6.2.3.4, except there would be some added effectiveness due the presence of the drainage layer. The drainage layer present in this alternative above the low permeability barrier layer instead of just barrier protection layer material would reduce the potential for erosion and provide additional slope stability during significant or prolonged storm events.

6.2.5.5 Reduction of Toxicity, Mobility and Volume

The reduction in toxicity, mobility and volume of the waste for this alternative would be the same as Alternative 2A described in Section 6.2.2.5.

6.2.5.6 Implementability

The implementation of Alternative 3B would be the same as Alternative 2B described in Section 6.2.3.6.

6.2.5.7 Cost

The direct and indirect capital cost estimate for Alternative 3B is $4,749,755.00. The major components of the direct capital costs associated with this alternative would be for construction/site work and material testing relative to consolidation of select waste and installation of the Modified Part 360 cap. The indirect costs include engineering and design costs (10% utilized), contingencies (15% utilized), legal fees (5% utilized), licensing/permit fees, and the cost to purchase land where waste exists on the adjoining properties through eminent domain (i.e., areas where waste is not being consolidated back onto the landfill property). The basis for the preliminary direct and indirect costs for this alternative are the same as for Alternative 2A presented in Section 6.2.2.7. A breakdown of the direct and indirect capital costs are presented in Worksheet 1 and Worksheet 2, respectively, in Appendix A.5.

The annual monitoring, operation and maintenance cost estimate for years 1 through 5 is $56,438.00 and for years 6 through 30 is $39,511.00. These costs are detailed in Worksheet 3A and 3B, respectively, in Appendix A.5. The total present worth cost of

Alternative 3B is estimated at $5,431,000.00, and is detailed in Worksheet 4 in Appendix A.5. This cost is based on landfill monitoring for a period of 30 years and assumes groundwater monitoring would be performed on a quarterly basis for the first 5 years and semi-annual for the remaining years; surface water sampling would be performed on a semi-annual basis; and explosive gas monitoring and landfill inspections would be performed on a quarterly basis. The frequency of landfill monitoring would at a minimum be evaluated after five years, but is anticipated to be able to be evaluated after two baseline sampling events, and adjusted as appropriate and approved by NYSDEC.

6.3 Comparative Analysis of Alternatives

6.3.1 Compliance with NYS SCGs

All of the alternatives would meet NYS SCGs (Part 360) for closure of a municipal landfill, except Alternative 1. Chemical-specific NYS SCGs (NYSDEC groundwater standards and guidance values) currently being exceeded are anticipated to be reduced and potentially achieved over time with all the alternatives, except potentially Alternative 1. Under Alternative 1 storm water/precipitation infiltration would continue so there would be the potential for leaching of contaminants to groundwater. Under Alternatives 2A and 3A there would potentially be impacts to wetlands located on the northeast and west sides of the landfill. Under Alternatives 2B and 3B, which include waste consolidation, there would potentially be impacts to the wetlands located on the west side of the landfill. The landfill closure design would need to meet requirements of the United States Army Corps of Engineers Nationwide Permit Program.

6.3.2 Protection of Human Health and the Environment

Alternative 1 would provide some protection of human health and the environment from dermal contact with the waste mass and residual contamination in the surface soil.

Alternatives 2A, 2B, 3A and 3B would be protective of human health and the environment as the waste would be contained. They would all be equally protective.

6.3.3 Short-Term and Long-Term Effectiveness and Permanence

There would be negligible impacts to the community and construction workers during implementation of Alternative 1 as there would be minimal disturbance/contact with landfill waste mass. There would potentially be increased risk to the community and construction workers during construction of Alternatives 2B and 3B due to the amount of waste that would need to be excavated/disturbed. There would be considerably less waste excavated/disturbed under Alternatives 2A and 3A, but there would be additional truck trips to deliver the clean fill needed to achieve the required Part 360 slopes. All the alternatives, but Alternative 1 would have short-term impacts to the community with respect to truck traffic to deliver the cap materials to the site and some increase in noise levels from construction equipment.

Long-term, there is the potential for additional settlement under Alternatives 2B and 3B due to the amount of waste being excavated/disturbed and recompacted. The existing waste mass has had over 25 years to settle. There would be some added effectiveness for Alternatives 3A and 3B compared to Alternatives 2A and 2B due to the presence of the drainage layer above the low permeability barrier layer. The drainage layer would reduce the potential for erosion and provide additional slope stability during significant or prolonged storm events.

6.3.4 Reduction of Toxicity, Mobility and Volume

There would be some reduction in toxicity for all the alternatives as the waste decomposes and natural attenuation breaks down the chemical constituents. There would be the least reduction in mobility for Alternative 1 since this alternative does not include containment of the waste mass. Alternatives 2A, 2B, 3A and 3B would provide the same degree of reduction in mobility, as the cap would cover the exposed refuse and prevent contact, prevent leaching of contaminants with storm water runoff, and minimize infiltration of storm water/precipitation and potential leaching of contaminants to groundwater. There would be no reduction in volume of the waste mass for any of the alternatives.

6.3.5 Implementability

Alternative 1 would be the easiest alternative to implement as it involves the least amount of construction work. All the alternatives utilize common construction practices that are readily and locally available. The Part 360 cap utilized in Alternatives 2A and 3A and Modified Part 360 cap utilized in Alternatives 3A and 3B are proven containment technologies. Alternatives 2A and 3A may be more difficult to implement as the cap materials would extend onto a portion of the Northway Self Storage property that is currently being used as a paved access road to the self storage units. For all of the alternatives, portions of adjoining properties would need to obtained through the eminent domain process where the waste extends beyond the landfill property line. Alternatives 2B and 3B involve some consolidation of waste, therefore these alternatives may be more easily implemented administratively as less land and fewer property owners would need to be involved in the eminent domain process.

6.3.6 Cost

The preliminary cost estimates in present worth dollars for Alternatives 1 through 3B ranged from $648,000.00 for Alternative 1 to $6,088,000.00 for Alternative 3A. The cost estimates are summarized in Table 6.3.6-1.

Table 6.3.6-1
Summary of Costs Per Alternative
Glens Malls Municipal Landfill At Luzerne Road
Feasibility Study

Alternative	Direct and Indirect Capital Cost	Monitoring, Operation & Maintenance Costs		Total in Present Worth (1)
		Annual Cost Years 1-5	Annual Cost Years 6-30	
1	$67,011	$49,630	$32,703	$648,000
2A	$5,179,769	$56,438	$39,511	$5,861,000
2B	$4,541,571	$56,438	$39,511	$5,223,000
3A	$5,407,322	$56,438	$39,511	$6,088,000
3B	$4,749,755	$56,438	$39,511	$5,431,000

(1) The present worth cost is based on a discount rate of 5%.

Note: The costs are preliminary and based on conceptual design only. The costs could vary from ± 15% to ± 25%.

7.0 PROPOSED ALTERNATIVE

This section presents the proposed alternative to meet the remedial action objectives for the Glens Falls Municipal Landfill site. The rational for selecting the proposed alternative and for not selecting the other alternatives is also presented.

Based on the detailed analysis of alternatives presented in Section 6.2 and the comparative analysis of alternatives presented in Section 6.3, the proposed alternative is Alternative 3B: Modified Part 360 Cap With Soil For Gas Venting and Drainage Layers, and Consolidation of Select Off-Site Waste Mass (30% Side Slopes, Balanced Cut and Fill). Alternative 3B consists of excavating the small amount of waste on the adjoining property to the north in the area of TP-8 and TP-9B (Figure 2) and transferring the material back onto the surface of the landfill within the site's property boundaries, excavating some waste from the property on the east side of the landfill, backfill and grading the excavated areas, obtaining the other adjoining properties where waste exists though eminent domain, regrading the landfill waste mass for erosion and drainage control and to meet minimum and maximum Part 360 slope requirements, and installing a Modified Part 360 cap over the new smaller footprint of the landfill waste mass.

The other areas of waste mass that exists on adjoining properties would be left in-place, obtained through eminent domain, and capped. There would be cutting of the north slope back to a 30 percent slope to be able to accept the cap without extending over the property line, excavating some waste on the south side of the landfill so that the cap would not extend over into the transfer station, excavating some waste on the northeast side in the area of TP-12 and TP-14 (Figure 2) so that the cap would not extend into the wetlands on the northeast side of the landfill, and excavating some waste from the property on the east side of the landfill (55 Luzerne Road, Figures 3 and 10) and placing it back onto the landfill property to facilitate installation of the geomembrane low permeability barrier layer. There also would be general cutting of side slopes (refuse) to achieve a more balanced cut and fill. This general cutting is currently shown on the northern half of the west side of the landfill (Figure 6), but would be evaluated and modified during final design so that the cutting to achieve a more balanced cut and fill involves the least area possible to minimize the amount of waste that would potentially have to be disturbed. The Modified Part 360 cap would be the same as a Part 360 cap except that it would include a drainage layer (not included in the Part 360 cap) above the geomembrane low permeability barrier layer and the barrier protection layer would be reduced from 24 inches to 12 inches. A description of the components of Alternative 3B is presented in Section 6.2.5.1. The landfill cap for Alternative 3B would encompass approximately 17.9 acres.

Alternative 3B would include a drainage swale around the perimeter of the landfill or a perimeter toe drain where space is limited to promote drainage of the BPL and topsoil layer and minimize ponding, to provide an outlet for the landfill surface water runoff, and to minimize the landfill surface water runoff and other storm water run-on from infiltrating the area around the perimeter of the landfill. A perimeter access road where sufficient space exists and an access road over the top of the landfill would also be installed as part of this alternative. This alternative also includes installation of a 6-foot chain link fence around the perimeter of the landfill outside the drainage swale and access road. The purpose of the fence is to keep out trespassers, specifically off-road vehicles that could damage the integrity of the cap. Currently the landfill is covered with trees and not readily visible. The trees will need to be cleared for installation of the landfill cap. Due to the rural nature of the area and the proximity of the landfill to Interstate 87, trees would be replanted along portions of the landfill perimeter to screen the landfill from view. The drainage swale or toe drain and access road construction, layout, size, etc., and the location, construction, etc. of the chain link fence and tree buffer would be determined during the final design of the selected remedy. Therefore, these components are currently not shown on Figure 10, but would be located outside of the limit of the cap. The final limits of the adjacent properties that would need to be acquired through eminent domain would be determined after the final design of the selected remedy is complete.

As noted in Sections 5.1 and 6.2, we have utilized a maximum slope of 30 percent in developing the intermediate and final landfill closure grading plans based on soil being used for the GVL to add some factor of safety. During the design of the selected remedy, actual slope stability calculations would be performed to determine if a 33 percent slope with the selected cap materials would be stable and protect the cover from a 24-hour, 25-year frequency storm required by Part 360. If so, then the final design of the selected remedy could incorporate a 33 percent maximum slope.

Therefore, the proposed final grading contours and the proposed final cap limit shown on Figure 10 may change during the final design based on where the general cutting of side slopes occurs to achieve a balanced cut and fill while disturbing the least amount of waste and based on the findings of the slope stability calculations.

Alternative 3B would meet action-specific NYS SCGs with respect to landfill closure and post-closure monitoring, operation and maintenance; and chemical-specific NYS SCGs with respect to groundwater quality to the extent feasible. This alternative would also be protective of human health and the environment. There would potentially be an increased risk to the community and construction workers during construction due to the amount of waste that would need to be excavated/disturbed, due to the truck traffic to deliver the cap materials to the site and due to potential increase in noise levels from construction equipment. These impacts would be controlled by construction practices and procedures. This alternative would provide increased effectiveness in the long term as the drainage layer would reduce the potential for erosion and provide additional slope stability during significant and prolonged storm events. The cap would provide a reduction in mobility of the waste mass and potential contaminants present in the waste mass. Less land and fewer properties would need to be involved in the eminent domain process under this alternative so administratively it may be more easily implemented.

The primary reasons for not proposing the other alternatives is summarized below:

Alternative 1 was eliminated since it would be the least protective of human health and the environment. Alternatives 2A and 3A were eliminated since the cap materials would extend onto a portion of the Northway Self Storage property that is currently being used as a paved access road to the self storage units. Alternative 2B was eliminated since it would potentially not be as effective in the long term as Alternative 3B since it does not include a drainage layer above the geomembrane low permeability barrier layer.

If you have any questions regarding this report, please contact this office at (518)786-7400.

Respectfully submitted,
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FIGURES

FIGURE 1

Site Location Map

FIGURE 2

Site Plan and Sampling Locations Map

FIGURE 3

Boundary Survey of Glens Falls Municipal Landfill at Luzerne Road

FIGURE 4
Cross-Section of Cap Alternatives

FIGURE 5

FS Alt. 2A and 3A Intermediate Grading Plan, No Waste Consolidation – 30% Side Slopes

FIGURE 6

FS Alt. 2B and 3B Intermediate Grading Plan, Select Waste Consolidation – 30% Side Slopes (Balanced Cuts and Fills)

FIGURE 7

FS Alt. 2C and 3C Intermediate Grading Plan, Select Waste Consolidation – 30% Side Slopes (Unbalanced Cuts and Fills)

FIGURE 8

FS Alt. 4 Intermediate Grading Plan, Select Waste Consolidation – 25% Side Slopes

FIGURE 9

FS Alt. 2A and 3A Final Grading Plan, No Waste Consolidation – 30% Side Slopes

FIGURE 10

FS Alt. 2B and 3B Final Grading Plan, Select Waste Consolidation – 30% Side Slopes (Balanced Cuts and Fills)

FIGURE 11

Gas Venting Structure Detail

APPENDIX A

Detailed Cost Analysis

A.1	**Alternative 1**
A.2	**Alternative 2A**
A.3	**Alternative 2B**
A.4	**Alternative 3A**
A.5	**Alternative 3B**

A.1: Alternative 1

- **Worksheet 1:** **Capital Cost**
- **Worksheet 2:** **Basis of Capital Cost Estimate**
- **Worksheet 3A:** **Annual Post-Closure Monitoring, Operation and Maintenance Costs, Years 1-5**
- **Worksheet 3B:** **Annual Post-Closure Monitoring, Operation and Maintenance Costs, Years 6-30**
- **Worksheet 4:** **Present Worth Cost Analysis Worksheet**

A.2: Alternative 2A

- **Worksheet 1: Capital Cost**
- **Worksheet 2: Basis of Capital Cost Estimate**
- **Worksheet 3A: Annual Post-Closure Monitoring, Operation and Maintenance Costs, Years 1-5**
- **Worksheet 3B: Annual Post-Closure Monitoring, Operation and Maintenance Costs, Years 6-30**
- **Worksheet 4: Present Worth Cost Analysis Worksheet**

A.3: Alternative 2B

- **Worksheet 1:** **Capital Cost**
- **Worksheet 2:** **Basis of Capital Cost Estimate**
- **Worksheet 3A:** **Annual Post-Closure Monitoring, Operation and Maintenance Costs, Years 1-5**
- **Worksheet 3B:** **Annual Post-Closure Monitoring, Operation and Maintenance Costs, Years 6-30**
- **Worksheet 4:** **Present Worth Cost Analysis Worksheet**

A.4: Alternative 3A

- **Worksheet 1:** **Capital Cost**
- **Worksheet 2:** **Basis of Capital Cost Estimate**
- **Worksheet 3A:** **Annual Post-Closure Monitoring, Operation and Maintenance Costs, Years 1-5**
- **Worksheet 3B:** **Annual Post-Closure Monitoring, Operation and Maintenance Costs, Years 6-30**
- **Worksheet 4:** **Present Worth Cost Analysis Worksheet**

A.5: Alternative 3B

- **Worksheet 1:** **Capital Cost**
- **Worksheet 2:** **Basis of Capital Cost Estimate**
- **Worksheet 3A:** **Annual Post-Closure Monitoring, Operation and Maintenance Costs, Years 1-5**
- **Worksheet 3B:** **Annual Post-Closure Monitoring, Operation and Maintenance Costs, Years 6-30**
- **Worksheet 4:** **Present Worth Cost Analysis Worksheet**

Worksheet 1: Capital Cost

Worksheet 2: Basis of Capital Cost Estimate

Worksheet 3A: Annual Post-Closure Monitoring, Operation and Maintenance Costs, Years 1-5

Worksheet 3B: Annual Post-Closure Monitoring, Operation and Maintenance Costs, Years 6-30

Worksheet 4: Present Worth Cost Analysis Worksheet

Report Drawings

The drawings for this report are in separate AutoCAD files located in eDocs in an associated folder.