VOLNEY LANDFILL
REMEDIAL DESIGN REPORT

DRAFT

PRELIMINARY 35% DESIGN

DRAFT

APRIL, 1999

DRAFT

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1.0 INTRODUCTION

Barton & Loguidice, P.C. has prepared this report to provide the preliminary (35%) design in accordance with the approved Remedial Design (RD) Work Plan and the Statement of Work (SOW) for the Administrative Order on Consent (AOC) for the Source Control Operable Unit (OU-1) at the Volney Landfill. This report is the first major deliverable in the RD phase at the Volney Landfill. The RD Work Plan was approved on February 1, 1999 and provides a summary of the preceding activities which resulted in the selected remedy, and subsequent modification by the Explanation of Significant Differences (ESD). The selected remedy, presented in the 1987 Record of Decision and modified by the 1997 ESD, includes supplemental capping of the landfill side slopes, continued leachate collection from the existing leachate collection system, intermittent groundwater extraction on an as-needed basis, off-site treatment of leachate and contaminated groundwater, and long-term monitoring.

This report provides the results of the RD field investigations (described in the RD Work Plan), to the extent that these investigations could be conducted during the winter of 1998-9. Where necessary, these investigations will be completed in the early spring of 1999, with the results incorporated into the Final (100%) Design. This report presents the preliminary (35%) design for the landfill cap and appurtenances, including narrative and drawings. This report also provides plans required by the SOW, including the site security plan and draft groundwater extraction contingency plan, and specifications required by the SOW, including signage specification and photographic documentation specification. Finally, this report provides draft (35% design) construction specifications and a draft construction schedule.

2.0 RESULTS OF REMEDIAL DESIGN INVESTIGATIONS

2.1 Explosive Gas Investigation

The RD Work Plan described the rationale and methodology for the performance of the explosive gas investigation for the collection of sufficient landfill gas data to design gas collection and control elements into the landfill cap. Because of the onset of winter, which might preclude gas monitoring activities, the fieldwork for the explosive gas investigation was started in November 1998, prior to RD work plan approval. The results of the first rounds of gas measurement are provided in Appendix A. Further monitoring and gas sample collection will be conducted as field conditions permit in the late winter/early spring of 1999.

2.2 Wetlands and Floodplains Impact Evaluation

The RD Work Plan described the rationale and methodology for the performance of the wetlands and floodplains impact evaluation. Due to the onset of winter, the fieldwork for the wetlands and floodplains impact evaluation was started in October 1998, prior to RD work plan approval. The results of the preliminary wetlands delineation is presented in Appendix B. Further wetland delineations and the floodplain analysis will be conducted as field conditions permit in the early spring of 1999.

2.3 Photogrammetric Survey

The photogrammetric survey could not be scheduled prior to the onset of winter and the approval of the RD work plan. A site survey from 1993 has been used for the 35% design. This survey is representative of current site conditions, as there have been not any substantial construction/alterations of the site since that time. The photogrammetric survey is scheduled to start in late April or early May of this year. The data from this survey will be used to adjust design elevations as necessary.

3.0 PERFORMANCE STANDARDS AND DESIGN CRITERIA COMPLIANCE

The performance standards for the supplemental side slope cap are drawn from the requirements contained in 6 NYCRR Part 360, which is the Applicable or Relevant and Appropriate Requirement (ARAR) for cap construction for the Volney Landfill. Part 360, which regulates solid waste management facilities in the State of New York, contains numerous design and construction requirements for the capping and closure of municipal solid waste (MSW) landfills. Table 1 identifies the applicable requirements of Part 360, and provides a summary of the design criteria compliance with these requirements.

TABLE 1

6 NYCRR PART 360
LANDFILL CAPPING DESIGN REQUIREMENTS

Part 360 Requirement	Design Criteria Compliance	Report Section
Section 360-2.15(d)(1) The bottom layer of the final cover system must consist of at least 12 inches of soil with a permeability of 1×10^{-3} cm/sec. Gas venting risers must be spaced at one per acre.	A variance from this requirement substituting 3 gas vents per acre for the gas venting layer has been approved at other similar landfills. The remedial design calls for the installation of four gas vents per acre with one of the four consisting of a deep gas vent (3/4 the depth of the waste).	Section 4.1 and 4.2 Drawing G-3
Section 360-2.15(d)(2)(i) The gas venting layer shall be overlain by a geomembrane cover meeting the requirements of subdivision 360-2.13(r).	See description for Section 360-2.13(r), below.	N.A.
Section 360-2.13(r) A geomembrane cover must be constructed to preclude precipitation migration into the landfill.	The QA/QC requirements of the construction specifications will ensure that a competent geomembrane cover is installed, which will preclude the migration of precipitation into the landfill.	Appendix D
Settlement, erosion, and seepage forces must be considered in the design of the landfill cover system.	The landfill cap was designed to withstand settlement, erosion, and seepage factors.	Section 4.1 Appendix C

Part 360 Requirement	Design Criteria Compliance	Report Section
Section 360-2.13(r)(1) The geomembrane must be chemically and physically resistant to materials it may come into contact with and accommodate the expected forces and stresses caused by waste settlement.	The specifications call for the geomembrane to be made of polyvinyl chloride (PVC), which is a commonly used capping material.	Appendix D Drawing G-6
Section 360-2.13(r)(2)(i) The geomembrane must have a minimum thickness of 40 mils.	The geomembrane specifications call for a minimum thickness of 40 mils.	Appendix D Drawing G-4
Section 360-2.13(r)(2)(ii) The geomembrane must be placed on a 4% minimum slope to promote drainage. The geomembrane must not be placed on slopes greater than 33% to ensure stability of the capping system.	The existing landfill cap will be graded prior to cap placement to ensure slopes are between 4% and 33%.	Section 4.1 Drawing G-1
Section 360-2.13(r)(2)(iii) A barrier protection layer of soil not less than 24 inches thick must be installed on top of the geomembrane cover. The barrier protection layer must be adequate to protect the geomembrane cap from frost action and root penetration.	The proposed barrier protection layer is 24 inches thick. The cap will be vegetated with herbaceous species, the roots of which will not penetrate through the barrier protection layer.	Section 4.1 Drawing G-5 and G-6 Drawing G-5 and G-6

Part 360 Requirement	Design Criteria Compliance	Report Section
Section 360-2.13(r)(2)(iii) (Cont'd) The barrier protection layer must be adequate to resist erosion and be stable on the final design slopes of the landfill cover.	A 6-inch layer of topsoil will overlie the barrier protection layer, protecting it from erosion. Analyses have been performed to ensure that the capping system will remain stable.	Section 4.1
The lower six inches of this layer must be reasonably free of stones.	The bottom 12 inches of the barrier protection layer will consist of a granular layer and will protect the underlying geomembrane.	Section 4.1 Drawing G-5 and G-6
Section 360-2.13(r)(3) The project engineer must certify the installation of the geomembrane cover.	The construction certification report will include the approved data resulting from the geomembrane QA/QC testing.	Appendix D
Section 360-2.15(d)(4) The barrier protection layer shall be overlain by a topsoil layer, which is a minimum of 6-inches thick and suitable to maintain vegetative growth.	Specifications for the topsoil layer call for a minimum 6-inch thickness and the ability to maintain vegetative growth.	Appendix D
Section 360-2.15(d)(5) Alternative individual components of the final cover system that meet the equivalent design provisions of this 360-2.13(w) may also be used.	An alternative landfill gas control system will be installed in the landfill. See discussion under Section 360-2.15(d)(1), above.	Section 4.1 and 4.2 Drawing G-3
Section 360-2.15(d)(6) Landfill closure activities must be completed in accordance with the final landfill closure plan.	Not applicable.	Not applicable.

4.0 PRELIMINARY DESIGN

The supplemental side slope capping of the landfill and related landfill closure activities were designed in accordance with the requirements of 6 NYCRR Part 360 and applicable sections of 24 CFR 264 Subpart G.

4.1 Capping System

The proposed landfill capping system consists of a 40 mil PVC (polyvinyl chloride) geomembrane overlain by a 24-inch thick barrier protection layer, and a 6-inch thick topsoil layer. The geomembrane cap will be constructed in a manner that will preclude precipitation migration into the landfill. The geomembrane specified for use will be chemically and physically resistant to materials that it may come into contact with. The landfill side slopes will be graded to ensure that the cap is only placed on slopes greater than 4% (to promote drainage) and less than 33% (to ensure the stability of the capping system).

The barrier protection layer will be used to protect the geomembrane from frost action and root penetration. The bottom 12 inches of the barrier protection layer will consist of a granular lateral drainage layer with a permeability of $1x10^{-3}$ cm/sec. The granular nature of this layer will help to ensure the integrity of the geomembrane cap during placement of the barrier protection layer. The drainage layer was incorporated into the design to prevent slope stability problems caused by the saturation of soils above the geomembrane by adequately draining any water contained within this layer. A non-woven geotextile will be installed between the bottom 12-inch granular drainage layer and the remaining top 12-inch lift of the barrier protection layer. This geotextile will prevent fine soil particles contained within the upper layer from migrating into the lower portion of the barrier protection layer to maintain the required permeability of the lower layer.

The topsoil layer will consist of 6 inches of topsoil or alternative soil material that is capable of sustaining vegetative growth.

4.2 Landfill Gas Control

The proposed landfill gas control system has been designed to prevent the off-site migration of concentrated landfill gases. Under the current 6 NYCRR Part 360 Regulations, landfill gas must be controlled with a gas venting layer installed below the geomembrane and one gas vent per acre. However, on February 26, 1993 the New York State Department of Environmental Conservation released the Local Government Regulatory Relief Initiative, which permits the use of an alternative landfill gas venting system. The NYSDEC has found that the installation of four gas vents per acre is essentially equivalent to the gas venting layer with three gas vents per acre required by Part 360. A variance from the applicable section of Part 360 is needed for NYSDEC approval of the alternative gas venting system.

The proposed landfill gas control plan calls for the installation of four gas vents per acre. One of the four vents will be installed deep into the waste mass (to approximately ¾ of the depth of waste). The other three shallow gas vents (per acre) will be installed a minimum of five feet into the waste mass. All shallow and deep gas vents will be passively vented to the atmosphere. However, at the time of installation, the deep gas vents will also be connected to a common collection system. This will enable the future implementation of an active landfill gas collection system if one is ever warranted or desired. Such a system could be implemented in the future to beneficially use the landfill-generated gas or in the event that new regulations require the installation of such a system.

The deep gas vent collection system will not be tied into the existing gas collection system located on the top portion of the landfill. The two gas collection systems will be maintained separately. The lateral collection lines in the proposed gas collection system will be sloped towards the deep gas vents so that gas condensate drains into the vents by gravity

flow (see Drawing No. G-3). Water may need to be pumped out of some of the deep gas vents during the first year after installation, depending on the depth of the water table within the waste mass. Any water pumped out of the deep gas vents will be disposed of in the on-site leachate tank. It is anticipated that this pumping will no longer be required soon after landfill cap construction is completed, when infiltration from precipitation ceases.

4.3 Surface Water Control

The existing surface water perimeter ditches located around the top of the landfill will be filled in and replaced with a perimeter berm. The perimeter berm will be formed as a result of the elevation difference between the existing top cap of the landfill and the supplemental side slope capping system (See Typical Top of Bank with Type I Ditch Detail on Drawing No. G-5). New drainage ditches will be constructed on the top of the landfill, at the toe of the berm, to direct surface water runoff to the three existing down chutes located on the southwestern, southeastern, and eastern sides of the landfill. Surface water runoff from the top of the landfill will also be directed to intermediate side slope ditches located around the perimeter of the landfill. The three existing down chutes will be reconstructed during installation of the supplemental side slope capping.

All of the existing surface water ditches located on the landfill site, including the ditch along the western side of Silk Road, will be cleaned and regraded as part of the closure activities.

4.4 Roadways

The existing landfill access roads will be reconstructed in essentially the same location after the landfill capping activities are completed. The roadways will be constructed of a one-foot layer of compacted gravel. Geotextile fabric will be placed between the barrier protection layer and the base of the gravel roadway.

4.5 Construction Sequencing

4.5.1 Pre-Construction Activities

Exploratory field excavations will be conducted around the perimeter of the landfill top prior to the commencement of landfill side slope capping activities. These exploratory excavations will be used to locate the edge of the existing PVC liner. The approximate edge of the PVC liner is shown on completed construction drawings, which were prepared after the top of the landfill was capped in 1985. A licensed land surveyor will stake the edge of cap line shown on these drawings in the field. The exploratory excavations will be started several feet down-slope from the staked location. The excavation will then be advanced up the landfill slope until the edge of the PVC liner is encountered. The original landfill top cap was constructed with 12 inches of common fill material and 6 inches of topsoil over the PVC liner. During the exploratory excavations, if the cap is not encountered within two feet of the landfill surface, the excavations will be advanced up the slope.

The exploratory excavations will be conducted around the perimeter of the landfill top at intervals of approximately 150 feet. A total of 32 shallow excavations will be completed. Once the edge of the existing PVC is located it will be staked in the field and surveyed by a licensed land surveyor.

4.5.2 Construction Activities

All of the deep gas vents will be drilled prior to landfill cap construction. The waste that is drilled out of the 36-inch diameter borings will be disposed of on the northeastern shoulder of the landfill in a designated waste disposal area. In this area, the existing topsoil will be stripped and stockpiled in the old borrow area on the northwestern

side of the landfill. The top foot of the underlying 2-foot deep intermediate soil cover layer will also be stripped and stockpiled in the old borrow area. This soil will be used to cover the waste that is added to the designated disposal area.

The shallow gas vents will be installed just prior to the commencement of landfill capping. These vents will not be drilled, rather they will be excavated with an excavator or backhoe. The waste that is excavated from these areas will also be disposed of in the designated waste disposal area.

The landfill will be capped in sections so that the entire area to be capped will not be stripped of vegetation at one time. It is currently anticipated that the landfill side slope area will be divided into 4 to 6 separate sections, with only one to two sections being actively worked on at a time. For example, while the landfill cap is being constructed on one section of side slope, topsoil stripping operations may be simultaneously undertaken on the next section.

The first step in preparing the landfill surface for cap installation will be to remove all existing saplings and shrubs. Once this has been completed, the 6-inch topsoil layer will be stripped and the underlying intermediate cover soil will be raked and rolled. Stones and other sharp objects that are capable of damaging the PVC liner material will be removed from the subgrade prior to installation of the PVC.

The stripped topsoil from the first landfill side slope section to be capped will be hauled to the old on-site borrow area and stockpiled. Once the capping system has been installed on the first section of landfill, the topsoil will be stripped from the second section of landfill and this soil will be used to cover the first section. Topsoil stripped from a new section of landfill side slope will be used to cover the previous section of capped landfill until the last section of the cap is completed. The topsoil stockpiled in the

on-site borrow area will be used to cover the last section of cap. This sequencing will reduce the need to haul topsoil to the borrow area as capping commences on new sections of the landfill.

It is anticipated that the following sequence of capping activities will be used on each section of landfill side slope:

- Remove shrubs/saplings
- Strip 6-inch topsoil layer
- Subgrade preparation - rake, pick stones and other sharp objects, roll
- Reconstruct down chutes, if located within section to be capped
- Place and seam PVC liner panels
- Place 1-foot granular fill layer
- Place and seam geotextile fabric
- Place 1-foot of common fill
- Construct intermediate side slope ditches
- Place 6-inch topsoil layer
- Construct access roadways, if located within section to be capped
- Seed, fertilize, and mulch cap
- Clean and regrade existing ditches elsewhere on site.

4.6 Fencing

The entire landfill site, with the exception of the extreme southwestern corner of the site, is currently fenced and gated (with a lock). The existing fence is approximately eight feet in height and is made of chain link. On the eastern and southern sides of the landfill, the existing fence is located within the area of the landfill to be capped. The existing fence fabric will be removed from these areas during cap installation. However, the fence poles will be left in place. The landfill cap will be installed around the fence poles. PVC liner

boots will be installed at the base of each pole. The PVC boots will be welded to the surrounding PVC liner. Temporary construction fencing will be attached to the existing poles while landfill cap construction is taking place in these areas. A permanent fence will be installed on the existing poles once cap construction is complete. The new fence will be approximately 5 ½ feet in height and will be made of chain link. An additional foot of barbed wire fencing will be installed on the top of the fence.

5.0 REQUIRED PLANS

The SOW required the submission of specific plans and specifications. These plans are included in appendices, as follows:

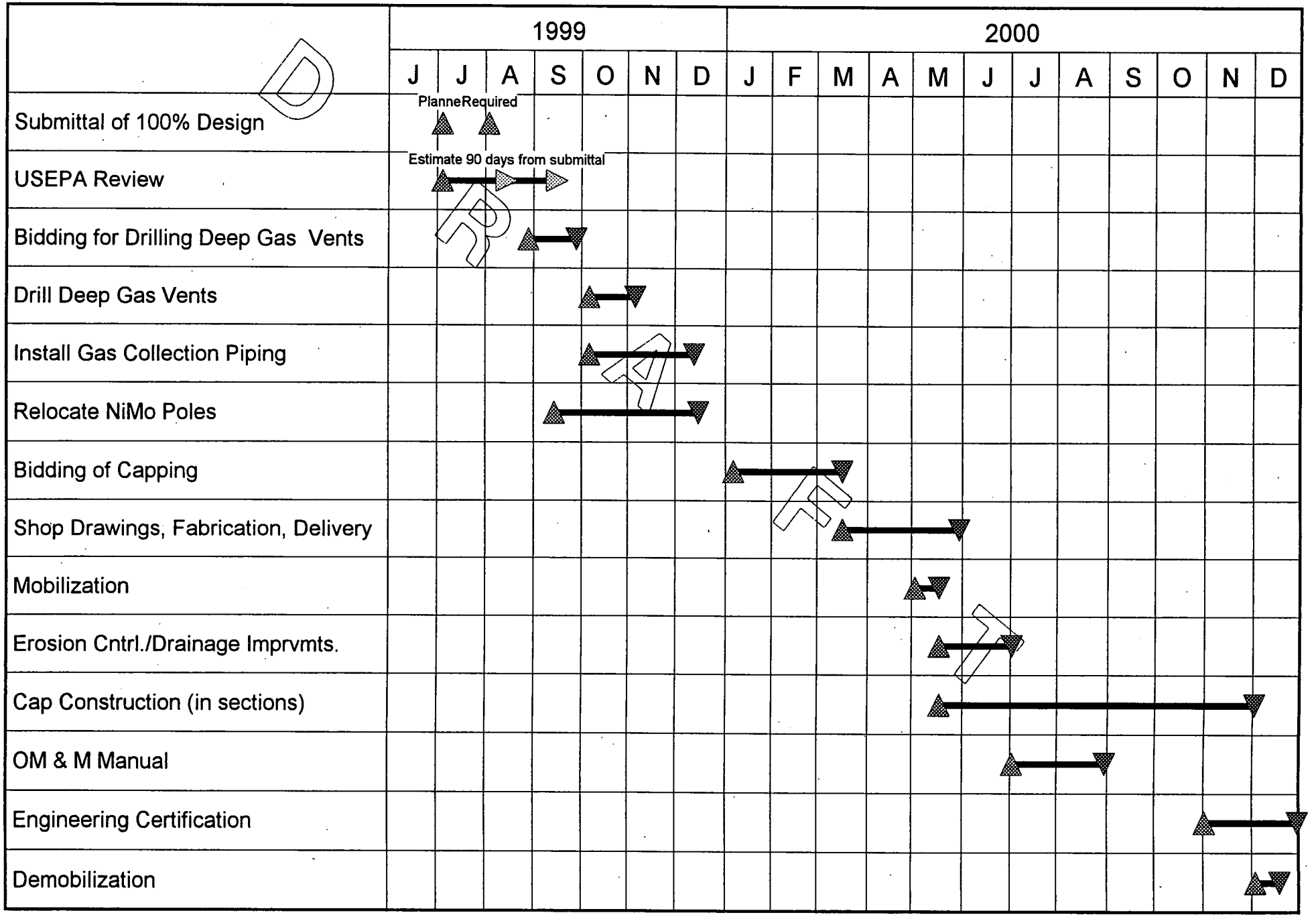
Appendix	Contents
D	35% Design Construction Specifications
E	Specifications for Photographic Documentation
F	Draft Groundwater Extraction Contingency Plan
G	Site Security Plan

6.0 PRELIMINARY CONSTRUCTION SCHEDULE

The preliminary remedial construction schedule is presented on the following pages.

Volney Landfill
Preliminary Remedial Construction Schedule

4/20/99



APPENDIX A

PRELIMINARY RESULTS OF EXPLOSIVE GAS INVESTIGATION

PRELIMINARY RESULTS OF EXPLOSIVE GAS INVESTIGATION

Volney Landfill

Two rounds of gas readings have been collected at the Volney Landfill in accordance with the scope of work identified in the Remedial Design Work Plan. Both explosive gas and total organic vapor concentrations were recorded as part of this work. These data (enclosed) were collected over the course of two separate site visits, including an initial round collected on November 6th at the time that the perimeter monitoring points were installed, and a follow-up round taken on November 30th. Two copies of Figure 4-21 from the Volney Landfill DDER are also enclosed for reference to the gas investigation locations.

As shown, the data represents readings obtained from landfill perimeter investigation locations as well as from the landfill top and sideslope gas vents. Perimeter investigation locations consist of existing shallow water table piezometers located along the northern and northeastern landfill perimeters, and small diameter probes installed around the remaining landfill perimeter.

Part of the work effort involved during the initial data collection round was to identify specific gas vents from which air samples could be collected during the follow-up round for laboratory analysis using EPA method TO-14 for volatile organic vapors. The results of the 1st data collection round identified several possible sampling locations including both top vents and sideslope vents. The selection of sampling locations was based primarily on the highest explosive gas levels, but also considered locations at which PID levels were detected, and overall sampling coverage. The second data collection round did not confirm the presence of volatile organic vapor concentrations at any of the gas vents and indicated a decrease in explosive gas

concentrations at nearly half of the vent locations. In addition, many of the gas monitoring probes were filled with or covered by water, indicating that the system may be experiencing temporary blockages and restricting normal venting. These observations suggested that conditions may be less than optimal, and therefore, samples were not collected at that time.

We will continue to monitor the landfill gas vents periodically, and will conduct sampling when conditions become appropriate. Our next site visit is scheduled for the week of December 14, 1998. The results from both sets of monitoring data suggest that the following vent locations be sampled:

Landfill Top Vents

GVA-4 (ave. 18% GAS, PID = 13.4 ppm)
GVA-6 (ave. 45% GAS, PID = 0.3 ppm)
GVB-1 (ave. 48.5% GAS, PID = 0.3 ppm)
GVC-3 (ave. 33.5% GAS, PID = 9.5 ppm)
GVF-1 (ave. 40% GAS, PID - 2.3 ppm)

Landfill Sideslope Vents

GV-4 (ave. 39.5% GAS, PID = NIR*)
GV-6 (ave. 46% GAS, PID = NIR)
GV-10 (ave. 42.5% GAS, PID = NIR)

* NIR = no instrument reading

The data also shows that there were gas concentrations detected along Howard Road at perimeter monitoring probe locations GP-4, GP-5 and GP-6. The second round of readings indicated a greater width of the affected area and significantly higher concentrations (GP-5 and GP-6 within the %GAS range). The increase in these concentrations may be associated with the observed differences between the 1st and 2nd round data recorded for the landfill gas vents. In order to delineate the extent of apparent gas migration along this section of Howard Road, several additional monitoring probes will be installed within the area to the south of GP-4, GP-5 and GP-6. These locations will be monitored at the same time that the landfill gas vents are periodically checked.

VOLNEY LANDFILL
EXPLOSIVE GAS INVESTIGATION
November 1998

Test Location	%LEL		%GAS		PID (ppm)	
	11/6/98	11/30/98	11/6/98	11/30/98	11/6/98	11/30/98
GV-1	40%	NIR	-	-	NIR	NIR
GV-2	NIR	NIR	-	-	NIR	NIR
GV-3	-	-	19%	30%	NIR	NIR
GV-4	-	-	52%	27%	NIR	NIR
GV-5	-	-	73%	14%	NIR	NIR
GV-6	-	-	42%	50%	NIR	NIR
GV-7	10%	NIR	-	-	NIR	NIR
GV-8	-	-	20%	17%	NIR	NIR
GV-9	DESTROYED					
GV-10	-	-	50%	35%	NIR	NIR
GV-11	NIR	NIR	-	-	NIR	NIR
GV-12	-	-	15%	38%	NIR	NIR
GV-13	NIR	NIR	-	-	NIR	NIR
GVA-1	NIR	NIR	-	-	NIR	NIR
GVA-2	15%	5%	-	-	0.1	NIR
GVA-3	NIR	-	-	20%	NIR	NIR
GVA-4	-	-	21%	15%	13.4	NIR
GVA-5	-	-	22%	60%	0.5	NIR
GVA-6	-	-	30%	60%	0.3	NIR
GVB-1	-	-	22%	75%	0.3	NIR
GVB-2	-	-	20%	24%	2.4	NIR
GVB-3	-	34%	33%	-	3.7	NIR
GVB-4	NIR	NIR	-	-	NIR	NIR
GVB-5	NIR	NIR	-	-	NIR	NIR
GVC-1	-	NIR	54%	-	NIR	NIR
GVC-2	-	50%	40%	-	1.7	NIR
GVC-3	-	-	43%	24%	9.5	NIR
GVD-1	-	NIR	42%	-	0.3	NIR
GVD-2	-	-	18%	24%	10.4	NIR
GVE-1	NIR	70%	-	-	NIR	NIR
GVE-2	NIR	-	-	20%	NIR	NIR
GVF-1	-	-	40%	40%	2.3	NIR
MPA-1	40%	NR	-	NR	0.7	NR
MPA-2	10%	NR	-	NR	NIR	NR
MPA-3	NR	NR	NR	NR	NR	NR
MPA-4	NR	NR	NR	NR	NR	NR
MPA-5	NR	NR	NR	NR	NR	NR
MPB-1	NIR	NR	-	NR	NIR	NR
MPB-2	NR	NR	NR	NR	NR	NR
MPB-3	40%	NR	-	NR	NIR	NR
MPB-4	NR	NR	NR	NR	NR	NR
MPC-1	NR	NR	NR	NR	NR	NR
MPC-2	NR	NR	NR	NR	NR	NR
MPD-1	15%	NR	-	NR	NIR	NR
MPD-2	-	NR	23%	NR	NIR	NR

VOLNEY LANDFILL
EXPLOSIVE GAS INVESTIGATION
November 1998

Test Location	%LEL		%GAS		PID (ppm)	
	11/6/98	11/30/98	11/6/98	11/30/98	11/6/98	11/30/98
MPE-1	-	NR	24%	NR	NIR	NR
MPE-2	-	NR	40%	NR	NIR	NR
TP-1	NIR	NIR	-	-	6.0	NIR
TP-2	NIR	NIR	-	-	7.0	4.0
TP-3	NIR	NIR	-	-	8.5	3.3
TP/SB-4	NIR	NIR	-	-	20.0	4.3
TP/SB-5	NIR	NIR	-	-	1.5	NIR
TP/SB-6	NIR	NIR	-	-	10.0	NIR
TP/SB-7	NIR	NIR	-	-	1.6	NIR
TP/SB-8	NIR	NIR	-	-	NIR	NIR
TP/SB-9	NIR	NIR	-	-	NIR	NIR
TP/SB-10	-	NIR	20%	-	7.0	NIR
TP/SB-12	-	-	45%	80%	3.3	NIR
TP/SB-27	-	NIR	9%	-	2.0	NIR
TP/SB-28	-	-	45%	50%	0.3	NIR
TP/SB-29	-	NIR	19%	-	0.3	1.7
TP/SB-30	1%	NIR	-	-	12.0	NIR
TP-31	-	NIR	25%	-	NIR	NIR
TP-32	NIR	NIR	-	-	2.0	NIR
TP-33	NIR	NIR	-	-	1.0	1.1
TP-34	NIR	NIR	-	-	2.0	0.7
GP-1	NIR	NIR	-	-	NIR	NIR
GP-2	NIR	NIR	-	-	NIR	NIR
GP-3	NIR	NIR	-	-	NIR	NIR
GP-4	68%	20%	-	-	NIR	NIR
GP-5	1%	-	-	17%	NIR	NIR
GP-6	NIR	-	-	21%	NIR	NIR
GP-7	NIR	NIR	-	-	NIR	NIR
GP-8	NIR	NIR	-	-	NIR	NIR
GP-9	NIR	NIR	-	-	NIR	NIR
GP-10	NIR	NIR	-	-	NIR	NIR
GP-11	NIR	NIR	-	-	NIR	NIR
GP-12	NIR	NIR	-	-	NIR	NIR
GP-13	1%	NIR	-	-	NIR	NIR
GP-14	NIR	NIR	-	-	NIR	NIR
GP-15	NIR	NIR	-	-	NIR	NIR
GP-16	NIR	NIR	-	-	NIR	NIR

NIR = no instrument response
NR = no reading
= significant difference in instrument readings

APPENDIX B

PRELIMINARY WETLANDS DELINEATION

PRELIMINARY WETLANDS DELINEATION

VOLNEY LANDFILL REMEDIAL DESIGN

A preliminary delineation of federally regulated wetlands on and around the Volney Landfill was performed per the methodology described in the Remedial Design (RD) work plan. The work was initiated in late October and early November 1998 after the majority of deciduous trees and shrubs had lost their leaves, making species identification difficult. Because of this difficulty and the lack of topographic relief in many of the forested wetland areas, it was not possible to determine the Federal jurisdictional wetland boundaries. Consequently, wetland boundaries were approximated based upon soils and general plant community assemblages. The approximated wetland boundaries are sufficient for the impact analysis which will be performed during the RD.

A formal wetland delineation, in accordance with U.S. Army Corps of Engineers (ACOE) Wetland Delineation Methodology, will be conducted in the Spring of 1999. At that time, the approximated wetland boundaries will be fine-tuned, based upon site-specific vegetation, hydrology, and soils data.

The attached map depicts the wetland areas, both on and off the landfill site. Note that the majority of the mapped areas on the west side of the site, and in the soil mine to the east of Silk Road, were created as a result of landfill closure and mining activities. The three larger wetland areas on the east side of Silk Road (adjacent to Bell Creek) would also be regulated by the New York State Department of Environmental Conservation (NYSDEC).

ROWLEE ROAD

HAWKS ROAD

ROWLEE ROAD

FLOODED ASPEN/ALDER

BLACK CREEK

WETLAND AREA

RW-2

APPROXIMATE WETLAND BOUNDARY

SPRING SW-7

WETLAND AREA

APPROXIMATE WETLAND BOUNDARY

SW-1A

KERFIEN MOBILE HOME PARK

RW-1B

RW-1A

APPROXIMATE WETLAND BOUNDARY

POTTER SPRING

SW-1

WETLAND AREA

LTW-

SGW-29

VBW-6

BRW-1

SP-

SHW-1

SP-11

SP-9

SP-10

VBW-14

VBW-7D

VBW-7S

LTW-13

SP-8

LTW-7

BRW-7

SP-12

SP-

OVL-1S

OVL-1D

SGW-30A

SGW-30B

SW-2

LTW-12

BRW-9

VBW-8S

VBW-8D

LTW-4

GW-16

SGW-34

SW-3

VBW-17

VBW-17A

VBW-6D

SHW-2

GW-9

SG-2

SGW-33

OVL-1

GW-10

SHW-3

VBW-15

BRW-3

LTW-5

SP-2

VBW-9S

VBW-9D

SHW-4

LTW-6

GW-15

BRW-4

SP-1

VBW-10D

VBW-10S

VBW-10R

SHW-5

BRW-5

LTW-7

SP-4

SG-3

GW-8R

RW-3B

GW-18R

RW-3A

BLACK CREEK

SW-4

HOWARD ROAD

FEDERAL WETLAND BOUNDARY DELINEATED IN 1984

SGW-28

VBW-7S

LTW-11

WETLAND AREA

SP-5

RW-11

GW-5

VBW-4S

BRW-8

VBW-4D

GW-2

VBW-13

SGW-27A

SGW-27B

PZ-1

GMPW-1

PZ-2

PZ-3

PZ-4

RW-6

VBW-3BR

VBW-3S

VBW-3

PZ-5

VBW-3D

HOWARD RD.

RW-5

NIAGARA MOHAWK GARAGE

GW-3D

GW-3C

SHW-9

SHW-8

VBW-2

LTW-10

LTW-9

SP-7

GW-6R

SHW-7

GW-7R

BRW-7

VBW-12

BRW-6

LTW-8

SGW-26

OSWEGO COUNTY AIRPORT

GW-12A

VBW-11

GW-17

GW-14A

SW-5

SILK RD.

RW-7

BALDWIN RD.

GW-11A

RW-4

SW-6

RW-10

MUCKEY RD.

LEGEND

VBW-1, VBW-3S, SHW-2, SGW-30A, GMPW-1, PZ-1, GW-2, SP-8	MONITORING WELL LOCATION INSTALLED IN SAND AND GRAVEL, LACUSTRINE SAND, AND SAND/SILT DEPOSITS OR FILL
VBW-3D LTW-1, DTP-1	MONITORING WELL LOCATION INSTALLED IN LODGEMENT TILL
VBW-3BR, BRW-1	MONITORING WELL LOCATION INSTALLED IN BEDROCK
RW-11	RESIDENTIAL WELL LOCATION
SW-5	SURFACE WATER SAMPLING LOCATION
	APPROXIMATE BOUNDARY OF U.S. ARMY CORPS OF ENGINEERS WETLANDS

In charge of

Designed by

Drawn by

Checked by

Date

Scale 0 150' 300' 600'

REVISIONS

COMPLETED CONSTRUCTION

Significant Construction Changes Are Shown

By _____ Date _____

Ck'd _____ Date _____

Barton & Loguidice, P.C.
Consulting Engineers
290 Elwood Davis Road / Box 3107, Syracuse, New York 13220

PRELIMINARY DETERMINATION OF FEDERAL WETLAND BOUNDARIES

OSWEGO COUNTY
VOLNEY LANDFILL
TOWN OF VOLNEY OSWEGO COUNTY, NY

Sheet Number 4

File Number BL1-VOL

APPENDIX C

ENGINEERING CALCULATIONS
(TO BE COMPLETED)

APPENDIX D

35% DESIGN CONSTRUCTION SPECIFICATIONS

SILK ROAD CAPPING - SEQUENCE OF CONSTRUCTION

1. Pull all saplings and shrubs (including root balls) from side slopes.

2. Install all deep Type (A) gas vents on the entire site.

3. Install 8-inch PVC gas main system, test and backfill.

4. Install all Type (A) gas vents and connect to gas main.

5. Install siltation protection in area of initial side slope capping and in topsoil stockpile area.

6. Remove permanent fencing from existing fence line (if fence line is inside area of initial capping) and install temporary construction fencing on existing posts).

7. Strip 6-inch top soil from initial area and stockpile on the excavated borrow area. York rake stripped area to remove large stones and roll area. Seed topsoil stockpile area.

8. Install Type (B) gas vents in initial work area (not entire site).

9. Install new PVC membrane, granular fill and common fill capping system.

10. Remove permanent fencing from existing fence line (if fence is in next capping area see Step 5).

11. Install siltation protection in next area of capping, strip 6-inch topsoil and use to topsoil previous capped area. Seed and mulch previous top soiled area.

12. Proceed with Steps 7, 8, 9 and 10. Do Steps 5, 7, 8, 9 and 10 for each adjacent area until entire site has complete side slope capping system.

13. Use stockpiled topsoil in the borrow area to topsoil the last section to be done.

AMENDMENT TO THE DETAIL SPECIFICATIONS

1. In the Specifications DELETE all references to "the Contractor" and SUBSTITUTE THEREFORE "The Owner" except in Section 02595 "Polyvinyl Chloride (PVC) Lining Material" and drilling for the Type (A) gas vents in accordance with Section 13052 "Landfill Gas Vents". This work will be subcontracted.

2. The Owner shall process materials from the on-site borrow area for use as Select Fills in accordance with Section 02225.

BIDDING & CONTRACT REQUIREMENTS

SECTION 00067

INDEX TO DIVISION 2 - DIVISION 16

SPECIFICATIONS

DIVISION 1 - GENERAL REQUIREMENTS

DIVISION 2 - SITE WORK

DIVISION 13 - SPECIAL CONSTRUCTION

END OF SECTION

GENERAL REQUIREMENTS

SECTION 01580

PROJECT SIGN

01580.01 GENERAL

If directed in the Additional Instructions, the Contractor shall provide and erect a project sign or signs at the project site identifying the project and the applicable funding agencies participating in the project. The project sign(s) shall also indicate the following; the title and description of the project, a statement that the project is being performed by the County of Oswego - Supervising Contractor, under the oversight of the USEPA - Jack O'Dell, Remedial Project Manager, Telephone No. (212) 637-4256. The sign(s) shall be erected within twenty-one (21) days after the construction contract is awarded, and shall be in accordance with the specifications and detailed drawing included in the Additional Instructions.

01580.02 SIGN PANEL

Each sign panel shall be constructed of 3/4" minimum thickness marine plywood rabbetted into a 2" x 4" lumber frame. All fasteners used in the construction of each sign shall be of a rustproof nature.

01580.03 PAINTING

Each sign face shall be painted with the proper paint colors for the background, lettering and emblem as specified in the Additional Instructions. All supports, trim and the back of the sign panel, shall be painted with at least two coats of the same color paint as used for each sign face. All paint used shall be exterior grade paint, suitable for use on wood signs.

01580.04 MISCELLANEOUS

Sign(s) shall be located in a prominent position and aligned as determined by the Engineer. Adequate support for the project sign(s) shall be provided by the Contractor. The bottom edge of each sign shall be a minimum of 3 feet above grade. The project sign(s) shall be maintained in good condition by the Contractor for the duration of construction. The removal of the project sign(s) from the construction site by the Contractor shall be at the completion of construction, when ordered by the Engineer.

END OF SECTION

SPECIFICATIONS

SECTION 02110

CLEARING

PART 1 - GENERAL:

1.1 DESCRIPTION:

1.1.1 Under this Section, the Contractor shall prepare and clear from the site of the work, by removal or destruction, as may be required, the following:

- Debris
- Brush
- Logs
- Trees
- Stumps
- Snow and Ice
- Refuse and Rubbish

1.1.2 The work also includes:

- Removal and replacement, as required, of fencing and supporting of all telephone and power, poles and lines within the work area.

- Any work to be performed specifically to be paid for under the Clearing Item as stated in the Information For Bidders and/or the Additional Instructions.

PART 2 - PRODUCTS

2.1 The Contractor shall furnish and install materials and equipment required.

PART 3 - EXECUTION

3.1 The Contractor shall furnish all labor, material and equipment necessary to properly construct all items under this Section in an acceptable manner.

SECTION 02110

CLEARING

3.1.1 No burning or burying of brush, logs, trees, stumps or other debris will be allowed on the site.

3.1.2 The Contractor shall chip all brush, roots, slash and toppings, and dispose with stumps at an approved location on-site.

PART 4 - MEASUREMENT & PAYMENT

4.1 MEASUREMENT - CLEARING:

4.1.1 Measurement for Clearing shall include the cost of all materials, equipment, labor, submittals and testing for the work indicated in this Section.

4.2 PAYMENT - CLEARING:

4.2.1 For Clearing, not included in other unit or lump sum price items, payment for Clearing will be made at the applicable price stated in the Bid.

END OF SECTION

SPECIFICATIONS

SECTION 02220

EXCAVATION

PART 1 - GENERAL

1.1 DESCRIPTION:

1.1.1 Under this Section, the Contractor shall furnish all labor, materials and equipment for Excavation, as shown on the Plans, specified, and/or directed.

1.1.2 Excavation, in open cut, includes the loosening, removing, transporting, storage and disposal of all materials necessary to be removed for the construction and completion of all work under the Contract. Excavations shall be made to the widths and depths shown on the Plans, specified or directed.

1.1.3 Where rock is encountered, the excavations shall be done in accordance with the applicable provisions hereof.

1.2 DEFINITIONS:

1.2.1 The term "excavation" and the term "trenching" where used, shall be deemed and understood to cover the following described work, and the price bid for any and all items including "excavation", or "trenching" shall be deemed to include and cover all of the several following detailed operations:

- The loosening, removing, transporting, storage and rehandling of all materials;
- All sheeting, sheetpiling, bracing and shoring, and the placing, driving, cutting off and removing of the same;
- All diking, ditching, fluming, cofferdamming, pumping, well-pointing, bailing, dewatering and draining or otherwise disposing of water (surface and subsurface);
- The refilling of trenches, excavations and pits, and the furnishing and placing of material over trenches, excavations and pits to the original surface of the ground or to other grades as may be shown or directed;

SECTION 02220

EXCAVATION

- The compacting of all materials used in filling or refilling by rolling, ramming, watering, puddling, etc., as may be required;

- The removing and disposing of all surplus materials from all excavations in the manner specified;

- The maintenance, accommodation and protection of travel;

- The supporting and protecting of all tracks, rails, buildings, curbs, sidewalks, pavements, overhead wires, poles, trees, vines, shrubbery, pipes, sewers, conduits or other structures or property and its appurtenances, in the vicinity of the work, whether over or underground or which appear within the excavations, and the restoration of the same in case of settlement or other injury;

- All temporary bridging and fencing and the removing of same, the temporary paving of highways, roads, driveways, and the permanent repairing or replacing and relaying of pavements, curbs, gutters and sidewalks removed, disturbed, or injured, the removing and clearing away of all construction rubbish, refuse, unused materials, plant and tools from the site;

- The dressing, topsoiling, sodding and/or seeding of all unpaved areas disturbed by the Contractor within and outside the limits of the Contract as may be necessary to leave the surface in as good condition as it was previous to the commencement of the work.

1.2.2 "Earth" includes all materials, such as sand, gravel, clay loam, pavements, ashes, cinders, muck, roots, or pieces of timber, soft or disintegrated rock, not requiring blasting, barring or wedging from their original beds, and specifically excludes all ledge or bed rock, and individual boulders or masonry larger than one-half cubic yard in volume.

1.2.3 "Backfill" includes selected materials for the backfilling or refilling of all excavations and trenches up to the original surface of the ground or to other grades as may be shown or directed.

SECTION 02220

EXCAVATION

1.2.4 "Spoil" includes surplus excavated materials not required or not suitable for backfills or embankments.

1.2.5 "Embankments" include fills constructed of selected materials above the original surface of the ground.

1.2.6 "Rock" includes ledge or bedrock requiring blasting, barring or wedging from their original beds and individual boulders or masonry larger than one-half cubic yard in volume.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS: Where used for general site fill, soil material shall be free of debris, roots, wood, scrap material, vegetable matter, refuse, soft unsound particles, frozen, deleterious, or objectionable materials.

2.2 CONTROLLED FILL: Provide where indicted and also within building lines and under concrete slabs and aprons. Fill to be granular fill as specified in Section 02222.

PART 3 - EXECUTION

3.1 ROCK EXCAVATION:

3.1.1 Rock excavation shall include the loosening, removing, transporting, storing and disposal of all materials requiring blasting, barring, or wedging for removal from their original beds. All pieces of ledge or bed rock and boulders or masonry larger than one-half (1/2) cubic yard in volume are included under rock excavation. Rock excavations shall be made to the widths and depths shown on the Plans or as directed by the Engineer. For concrete structures, rock shall be excavated only to the bottom of the structure unless otherwise shown or noted on drawings. All excavated rock which cannot be handled and compacted as earth shall not be mixed with other backfill or embankment materials except as specified herein or as directed.

SECTION 02220

EXCAVATION

3.1.2 Blasting:

3.1.2.1 Blasting shall be done with extreme care. All blasts in open cut shall be properly covered and protected with heavy timber chained together or approved blasting mats.

3.1.2.2 Charges shall be of such size that the excavation will not be unduly large and shall be so arranged and timed that adjacent rock upon or against which structures are to be built will not be shattered. Blasting shall be conducted in accordance with all applicable rules and regulations including, but not limited to, 12 NYCRR 23, 12 NYCRR 39, 12 NYCRR 53 and NYS Labor Law § 28-a. Where blasting occurs in highways under jurisdiction of NYSDOT or under jurisdiction of agencies adhering to the NYSDOT Standard Specification, the Provisions of NYSDOT Standard Specification Sections 107-05 and 203-3.05 shall also be adhered to. Where existing pipelines, conduits or structures have been exposed during excavation, such pipelines, conduits or structures shall be adequately protected from damage before proceeding with the blasting.

3.1.2.3 Any injury or damage to the work or to the existing pipelines, conduits, or structures shall be repaired or rebuilt by the Contractor at his own expense. Whenever the Engineer determines that further blasting may damage adjacent rock, pipelines or structures, blasting shall be discontinued and the rock removed by drilling, barring, wedging or other methods.

3.1.2.4 Danger signals shall be given before firing each blast. Blasting shall be done only by a person experienced in the handling and detonation of explosives, and shall be in conformity with all laws and regulations, imposed by public authorities.

3.1.2.5 Blasting shall not be carried on within three hundred (300) feet of any radio transmitter or radio frequency emission equipment such as high frequency welders, and blasting caps shall be kept in tightly-closed metal cans when in the vicinity of such equipment.

3.1.3 Explosives:

3.1.3.1 At no time shall an excessive amount of explosives be kept at the Site of the work. Such explosives shall be stored, handled and used in conformity with all applicable laws and regulations.

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3.1.3.2 Accurate daily records shall be kept showing the amounts of explosives on hand, both at the Site and at any storage magazine, the quantities received and issued, and the purpose for which issued. Copies of all records shall be furnished to the Engineer.

3.1.3.3 The Contractor shall be responsible for any damage or injury to any persons, property or structures as a result of his blasting operations.

3.2 EXCAVATION FOR STRUCTURES:

3.2.1 Excavation shall be of sufficient size, and only of sufficient size, to give suitable room for the proper construction of structures and appurtenances, including allowances for sheeting, dewatering, and other similar work necessary for completion of the Contract.

3.2.2 Excavations for structures shall be made only to the lines and grades shown on the Plans, specified or directed.

3.2.3 In no case will under cutting excavation faces for extended footings be permitted. Not less than twelve (12) inches clearance shall be provided between excavation faces and brick or block masonry exterior wall surfaces which are to be plastered.

3.2.4 Subgrade for all concrete structures shall be undisturbed original earth, thoroughly compacted where noted on drawings. Where excavation below subgrade is ordered, it shall be a thoroughly compacted and consolidated lining, special lining or special backfill as directed and as specified in Section 02224. It shall be sufficiently stable to remain firm and intact during the surfacing of subgrade, laying reinforcing steel and placing concrete thereon.

3.2.5 Where necessary, a layer of Class "D" concrete of sufficient strength and thickness to withstand subsequent construction operations shall be installed below the specified subgrade elevation and the structural concrete deposited thereon. Subject to the approval of the Engineer, lining or special lining may be used for subsoil reinforcement if satisfactory results can be obtained thereby. Such material shall be applied in thin layers, each layer being entirely embedded in the subsoil by thorough tamping. All excess soil shall be removed to compensate for the displacement of the gravel or crushed stone and the finished elevation of any subsoil reinforced in this manner shall not be above the specified subgrade.

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3.3 BACKFILLING AROUND STRUCTURES:

3.3.1 Backfilling around structures shall not be commenced until all lumber, refuse, rubbish and other similar materials are removed from the excavated area. Backfill around structures may be placed by machine, provided the work shall be done carefully to prevent damage to the structure. In no case shall backfill materials be allowed to fall directly on a structure, until at least twelve (12) inches of hand-placed material has been placed thereon and compacted.

3.3.2 Backfill around structures shall be deposited in horizontal layers not more than eight (8) inches in thickness and shall be thoroughly compacted. Compaction shall be by a vibrating tamper or other approved method and shall be to a minimum dry density of ninety-five (95) percent of the maximum dry weight density in pounds per cubic foot as determined by the AASHTO Standard Density Test or the Modified Proctor Compaction Test (ASTM D1557).

3.3.3 Backfilling shall be done immediately after work has been inspected and approved. No frozen material shall be used, nor shall backfilling be placed on or against frozen earth, debris or other deleterious matter not conducive to proper compaction. Backfill within building lines, under concrete slabs and aprons shall be granular fill as specified in Section 02222.

3.3.4 Backfilling against free standing walls shall be made against both sides at the same time. If backfill is required on one side only, the wall shall be adequately braced on the opposite side until properly cured to full strength.

3.3.5 Contractor shall take every necessary precaution during compaction of fill adjacent to foundations, walls, etc., that such items are not displaced from their proper location or damaged by compacting equipment. In the event damage or displacement occurs during or resulting from compaction of fill as specified above, the Contractor shall be responsible for correcting the same, to approval of the Engineer and at no expense to the Owner.

3.4 TRENCHING:

3.4.1 The alignment, depth and pipe subgrades of all pipe trenches shall be determined by overhead grade lines parallel to the pipe invert, or other grade control devices, installed and maintained by the Contractor.

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3.4.2 Under ordinary conditions, excavation shall be by open cut from the ground surface. Where the depth of trench and soil conditions permit, tunneling may be required beneath crosswalks, curbs, gutters, pavements, concrete driveways, railroad tracks and other surface structures. No additional compensation will be allowed for such tunneling over the price bid for open cut excavation of equivalent depths below the ground surface unless such tunnel excavation is specifically provided for in unit or lump sum price items.

3.4.3 Trenches shall not be opened for more than three hundred (300) feet in advance of the completed pipe or sewer nor left unfilled for more than one hundred (100) feet in the rear thereof without consent of the Engineer. Excavation of the trench shall be fully completed at least twenty (20) feet in advance of the pipe laying or construction of the invert unless specifically permitted otherwise.

3.4.4 Width and Depth of Trenches:

3.4.4.1 The trenches in which pipelines are to be constructed, shall be excavated in all cases in such manner and to such depths and widths as will give suitable room for the pipelines which the trenches are to contain, for sheeting, pumping, dewatering, well-pointing and draining of water, and for removing the material not suitable for pipe subgrade.

3.4.4.2 Trenches for pipes shall be not less than six (6) inches wider than the hubs of the pipe in the clear on each side, measured over the hubs of the pipe. Width of trenches, measured at a point twelve (12) inches above the top of the pipe shall not exceed twelve (12) inches on each side. Width of trenches greater than specified above will be permitted in the vicinity of joints for welded steel pipe where access for the welding of joints is required.

3.4.4.3 Where, as required by loading conditions, the width of the lower portion of the trench, measured at twelve (12) inches above top of pipe, exceeds the maximum for the size of pipe, additional concrete cradle or concrete encasement shall be installed by the Contractor at his own expense.

3.4.4.4 Ledge rock, shale, boulders and large stones shall be removed to provide minimum bottom and side clearances, for the size of pipe being laid in each case, as follows:

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Size of Pipe (Inches)	Minimum Clearance Below Pipe (Inches)	Minimum Clearance At Sides (Inches)
12 or smaller	4	6
15, 18, and 21	5	6
24 to 36	7	6
Over 36	9	7

Where concrete embedment or cradle is to be placed, it shall be placed directly on the rock, and the bottom clearance shall be adjusted as directed by the Engineer.

3.5 EARTH SUBGRADE PREPARATION FOR PIPES:

3.5.1 Unless otherwise permitted by the Engineer, the trench shall have a flat bottom conforming to the grade to which the pipe is to be laid.

3.5.2 Except where concrete cradle or encasement is required below the specified pipe subgrade, mechanical excavation of trenches for pipe shall not extend lower than one (1) inch above the finished pipe subgrade elevation at any point. The remainder of the trench excavation shall be made with hand tools.

3.5.3 Pipe subgrade preparation shall be performed immediately prior to installing the pipe in the trench. The trench bottom shall be accurately graded by means of hand tools in such a manner that a uniform and continuous bearing and support on solid and undisturbed ground is provided for each pipe for its entire length or between bell holes.

3.5.4 All trenches shall be so graded that the spigot end of the pipe will be accurately centered in the adjacent pipe bell when laid, without raising the pipe off the trench bottom. Regrading of a trench bottom which is too high will be permitted. Correction of a subgrade that is too low shall be done only by placing and compacting lining over the entire width of the trench and regrading.

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3.5.5 The trench bottom shall be accurately graded and ready for the installation of the pipe thereon prior to excavating bell holes if and where required.

3.5.6 Each bell hole shall be excavated immediately prior to laying the pipe therefor. Bell holes shall have a length, measured at the elevation of the pipe subgrade, not in excess of nine (9) inches and shall be of sufficient size so that no part of the pipe bell will be in contact with the trench bottom or granular fill thereon.

3.6 EXCAVATION FOR CONCRETE CRADLE OR ENCASEMENT:

3.6.1 Where concrete cradle or encasement is required, the trench subgrade elevation will be determined by the required concrete section in each case. Unless otherwise authorized by the Engineer, concrete cradle or encasement shall extend across the full width of the trench as excavated, and the concrete therein shall be poured directly against vertical trench banks. In the case of concrete cradle or encasement of pipe in a sheeted trench, the concrete may be poured directly against sheeting which is to be left in place in the trench, as specified.

3.7 PIPE EMBEDMENT:

3.7.1 All pipe shall be protected from lateral displacement and possible damage resulting from superimposed backfill loads, impact or unbalanced loading during backfilling operations by being adequately embedded in suitable pipe embedment material. Except where loading or subsoil conditions require the use of concrete cradle or encasement, all pipe embedment shall be placed so as to insure adequate lateral and vertical stability of the installed pipe during pipe jointing and embedment operations. A sufficient amount of the specified pipe embedment material to hold the pipe in rigid alignment shall be uniformly deposited and thoroughly compacted on each side, and back of the bell, of each pipe laid.

3.7.2 Pipe embedment materials placed at any point below an elevation six (6) inches above the top of pipe or sewer, shall be deposited and compacted in layers not to exceed four (4) inches in uncompacted depth, and such deposition and compactions shall be done simultaneously and uniformly on both sides of the pipe. Compaction shall be by vibrating tamper or other approved method and shall be to a minimum dry density of ninety-five (95) percent of the maximum dry weight density in pounds per cubic foot as determined by the Modified Proctor Compaction Test. All such materials shall be placed in the trench with hand tools in such a manner that they will be scattered alongside the pipe and not dropped into the trench in compact masses.

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3.7.3 Concrete cradle and encasement of the class specified shall be installed where and as shown on the Plans or ordered by the Engineer. Before concrete cradle or encasement is placed, the pipe shall be braced in all directions to prevent movement or flotation.

3.8 BACKFILL ABOVE PIPE EMBEDMENT:

3.8.1 The portion of pipe trenches between the top of the pipe embedment (see paragraph 3.7) and the upper limit of backfill shall be refilled with suitable materials.

3.8.2 Where trenches are within the ditch-to-ditch or curb-to-curb limits of any street, road, driveway or other recognized traveled vehicular way, or within other limits that may be specifically shown or specified for this purpose, the backfill materials shall be deposited in the trench in horizontal layers not more than eight (8) inches in thickness, and each layer shall be compacted by vibrating tamper or other approved method and shall be to a minimum dry density of ninety-five (95) percent of the maximum dry weight density in pounds per cubic foot as determined by the Modified Proctor Compaction Test (ASTM D1557).

3.8.3 Where trenches are outside the ditch-to-ditch or curb-to-curb limits of any street, road, driveway or other recognized traveled vehicular way, and outside of other limits that may be specifically shown or specified as areas in which mechanical compaction in layers is to be performed, the backfill material may be deposited in the trench by mechanical means for the full depth of the trench between the top of pipe embedment and ground surface with no special compaction. In such case the backfill materials shall be mounded over the trench to an elevation slightly above desired finished grade to allow for settlement and compaction by natural means, and the Contractor shall return to the area during his clean-up operations to remove any excess materials remaining above finished grade or add sufficient additional backfill to bring the completed work to grade. If a hazard should be created by such excess materials, or by settlement below finished grade, prior to the performance of clean-up operations, the Contractor shall remove such excess, or add additional backfill, at the time the hazard is created or when directed.

3.8.4 Any additional material added during clean-up operations, or at any other time to prevent or remove a hazard, shall be placed in horizontal layers not more than eight (8) inches in thickness, with each layer adequately compacted by mechanical means, by the Contractor at his own expense.

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3.9 REMOVAL OF WATER:

3.9.1 The Contractor shall at all times during construction provide and maintain proper and satisfactory means and devices for the removal of all water entering the excavations, and shall remove all such water as fast as it may collect, in such manner as shall not interfere with the prosecution of the work or the proper placing of pipe, masonry, concrete, structures, or other work.

3.9.2 Removal of water includes the construction and removal of cofferdams, sheeting and bracing, the furnishing of materials, equipment and labor necessary therefore, the excavation and maintenance of ditches and sluice-ways and the furnishing and operation of pumps, wellpoints, and appliances needed to maintain thorough drainage of the work in a satisfactory manner.

3.9.3 Water shall not be allowed to rise over or come in contact with any masonry, concrete or mortar, until at least twenty-four (24) hours after placement, and no stream of water shall be allowed to flow over such work until such time as the Engineer may permit.

3.9.4 Unless otherwise specified, all excavations which extend down to below the ground water elevation at the sites of structures shall be dewatered by lowering and maintaining the ground water beneath such excavations at an elevation not less than that specified herein at all times when work thereon is in progress, during subgrade preparation and the placing of the structures or pipe thereon.

3.9.5 Where an upward pressure or flow of water in combination with a fine-grained subsurface material causes a quick condition, the Contractor shall install wellpoints to stabilize the subgrade. Where wellpoints are used, the ground water table shall be continuously (day and night) maintained to an elevation of not less than twenty-four (24) inches below the excavation and when subgrade is reached the ground water shall be maintained not less than twenty-four (24) inches below the subgrade. Unless otherwise permitted by the Engineer, the ground water shall be maintained not less than twenty-four (24) inches below the subgrade until completion of the backfilling to an elevation at least twelve (12) inches above natural ground water level. Wellpoint headers, points, and other pertinent equipment shall not be placed within the limits of the excavation in such a manner or location as to interfere with the laying of pipe or trenching operations or with the excavation for and construction of other structures.

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3.9.6 In areas where ground water enters the excavation but does not cause a quick condition, the ground water may be removed by any practical method which does not damage the subgrade, cause the same to become unstable or interferes with construction operations.

3.9.7 The ground water control requirements specified for wellpointing operations apply to other dewatering methods.

3.9.8 Suitable stand-by pumping equipment shall be provided to insure the maintenance of the specified lowering of the water table.

3.9.9 Water pumped or drained from excavations, or any sewers, drains, or water courses encountered in the work, shall be disposed of in a suitable and environmental manner without injury to adjacent property, the work under construction, or to pavements, roads, and drives. No water shall be discharged to sanitary sewers. Sanitary sewage shall be pumped to sanitary sewers or shall be disposed of by an approved method.

3.9.10 Any damage caused by improper handling of water shall be repaired by the Contractor at his own expense.

3.10 SHEETING & BRACING:

3.10.1 The Contractor shall furnish, place and maintain such sheeting, bracing and shoring as may be required to support the sides and ends of excavations in such manner as to prevent any movement which could, in any way, injure the pipe, sewers, masonry, or other work; diminish the width necessary; otherwise damage or delay the work; or endanger existing structures, pipes or pavements; cause the excavation limits to exceed the right-of-way limits; or to occasion a hazard to persons engaged on the project or to the general public.

3.10.2 In no case will bracing be permitted against pipes or structures in trenches or other excavations.

3.10.3 The Contractor shall be solely responsible for the safety and adequacy of all sheeting and bracing. He shall make good any damage resulting from failure of supports with no additional cost to Owner.

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3.10.4 Removal of Sheeting & Bracing:

3.10.4.1 In general, all sheeting and bracing, whether of steel, timber or other material, used to support the sides of trenches or other open excavations, shall be withdrawn as the trenches or other open excavations are being refilled. That portion of the sheeting extending below the top of a pipe or sewer shall be withdrawn, unless directed, before more than six (6) inches of earth is placed above the top of the pipe or sewer and before any bracing is removed. The voids left by the sheeting shall be carefully refilled with selected material and rammed tight with tools especially adapted for the purpose, or otherwise as may be approved.

3.10.4.2 The Engineer may order the Contractor to delay the removal of sheeting and bracing, if in his judgement the installed work has not attained the necessary strength to permit placing of backfill.

3.10.5 Sheeting & Bracing Left In Place:

3.10.5.1 If, to serve any purpose of his own, the Contractor files a written request for permission to leave sheeting or bracing in the trench or excavation, the Engineer may grant such permission, in writing, on condition that the cost of such sheeting and bracing be assumed and paid by the Contractor.

3.10.5.2 The Contractor shall leave in place all sheeting, shoring and bracing which are shown on the Drawings or specified to be left in place or which the Engineer may order, in writing, to be left in place. All shoring, sheeting, and bracing shown or ordered to be left in place will be paid for under the appropriate item of the Contract. No payment allowance will be made for wasted ends or for portions above the proposed cut-off level which are driven down instead of cut-off.

3.10.5.3 In case sheeting is left in place, it shall be cut off or driven down as directed so that no portion of the same shall remain within twelve (12) inches of the finished street or ground surface.

3.10.5.4 All timber sheeting and bracing to be left in place and paid for under an item of the Contract shall be new, sound and straight, free from cracks, shakes and large or loose knots, and shall otherwise conform with National Design Specifications for Stress Grade Lumber for lumber of a minimum fiber stress of 1,200 pounds per square inch.

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3.10.5.5 Steel sheeting and bracing left in place and paid for under an item of the Contract shall be new and shall conform with ASTM Des: A7, with a minimum thickness of 3/8-inch.

3.10.5.6 Sheeting and bracing left in place and paid for under an item of the Contract shall be driven as the excavation progresses and in such manner as to maintain pressure against the original ground at all times. The sheeting shall be driven vertical with the edges tight together, and all bracing shall be of such design and strength as to maintain the sheeting in its proper position.

3.11 STORAGE OF MATERIAL:

3.11.1 Any sod cut during excavation shall be removed and stored during construction so as to preserve the grass growth, and shall be replaced in position upon completion of the work.

3.11.2 Topsoil suitable for final grading shall be removed and stored on the Site separately from other excavated material, and shall be replaced in position upon completion of the work.

3.11.3 All excavation materials shall be stored in locations so as not to endanger the work, and so that easy access may be had at all times to all parts of the excavation. Stored materials shall be kept neatly piled and trimmed, so as to cause as little inconvenience as possible to public travel or to adjoining property holders. All stockpiled fill material shall be stored only in those fill areas as approved by the Engineer and the New York State Department of Environmental Conservation.

3.11.4 All excavated materials shall be kept clear of all sidewalks, driveway entrances, street crossings, and any other points that may inconvenience the public. Special precautions must be taken to permit access at all times to fire hydrants, fire alarm boxes, police and fire department driveways, and other points of public convenience.

3.11.5 Where traffic is to be maintained, at least one-half (1/2) of the street width must be kept open at all times. Approved types of bridging across trenches shall be constructed and maintained where necessary. Where conditions do not permit storage of materials, the material excavated from the first one hundred (100) feet of any opening, or from such additional length as may be required, shall be removed from the street by the Contractor, at his own cost and expense, as soon as excavated. The material subsequently excavated shall be used to refill the trench where the facility has been built, provided it be of suitable character.

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3.11.6 If more material is excavated from any trench, excavation, or pit than can be refilled over the completed work or stored on the street, leaving space for traffic as herein provided, or within the limits of the right-of-way, the excess material shall be spoiled at locations selected and obtained by the Contractor. A copy of the signed agreement between the property owner and Contractor granting permission to deposit spoil shall be given to the Engineer prior to placement. When the facility is complete, the Contractor shall, at his own cost and expense, bring back adequate amounts of satisfactory excavated materials as may be required to properly refill the trenches, excavations, or pits. If directed by the Engineer, the Contractor shall refill such trenches, excavations, or pits with special backfill or other suitable materials, and excess excavated materials shall be disposed of as spoil.

3.12 DRAINAGE:

3.12.1 All material deposited in roadway ditches or other water courses crossed by the line of trench or near a structure shall be removed immediately after backfilling is completed and the section grades and contours of such ditches or water course restored to their original condition, in order that surface drainage will be obstructed no longer than necessary.

3.12.2 Backfilling of trenches for pipes installed beneath or across roadways, driveways, walks and other traffic ways adjacent to drainage ditches and water courses shall not be done prior to the completion of backfilling to the original ground surface of the trench on the upstream side of such traffic-way in order to prevent the impounding of water at any point after the pipe has been laid, and all necessary bridges and other temporary structures required to maintain traffic across such unfilled trenches shall be constructed and maintained. All backfilling shall be done in such a manner that water will not accumulate in unfilled or partially filled trenches.

3.12.3 Where trenches are constructed in or across roadway ditches or other water courses, the backfill shall be protected from surface erosion by adequate and environmentally sound means. Where trenches cross such waterways; the backfill surface exposed on the bottom and slopes thereof shall be protected by means of stone or concrete riprap, at no additional cost to the Owner.

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3.13 ADDITIONAL EXCAVATION:

3.13.1 In case the materials encountered at the locations and grades shown on the Plans or specified are not suitable, or in case it is found desirable or necessary to excavate additional materials to secure good support for the structure or pipeline, the excavation shall be carried to such additional limits as the Engineer may direct. The Contractor shall refill such additional excavated space with either lining, special lining, Class "D" or "E" concrete or other material, as the Engineer may direct. Additional excavation, lining, special backfill, concrete or other materials so ordered, will be paid for under the appropriate items of the Contract.

3.14 UNAUTHORIZED EXCAVATION:

3.14.1 Whenever excavations are carried beyond or below the lines and grades shown on the Plans, or as given or directed by the Engineer, all such excavated space shall be refilled with lining, special backfill, concrete or other materials as the Engineer may direct. Beneath structures, all such excavated space shall be refilled with Class "D" concrete. All refilling of unauthorized excavations shall be at the Contractor's own expense.

3.14.2 All material which slides, falls or caves into the established limits of excavations due to any cause whatsoever shall be removed and disposed of at the Contractor's own expense, and no extra compensation will be paid the Contractor for any materials ordered for refilling the void areas left by the slide, fall or cave-in.

3.15 DISPOSAL OF MATERIALS:

3.15.1 All spoil shall be transported and placed on the Site of the work at the locations and to the elevations and grades shown on the Plans, or if spoil areas are not shown, all spoil materials shall be disposed off the Site at appropriate locations selected and obtained by the Contractor and approved by the Engineer and the New York State Department of Environmental Conservation. No environmental sensitive areas shall be used for spoil areas. A copy of the signed agreement between the property owner and the Contractor granting permission to deposit spoil shall be given to the Engineer prior to placement.

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3.15.2 The surface of all spoil placed on the Site shall be graded and dressed, and no unsightly mounds or heaps shall be left on completion of the work.

3.16 UNFINISHED WORK:

3.16.1 When for any reason the work is left unfinished, all trenches and excavations shall be filled and all roadways and sidewalks left unobstructed with their surfaces in a safe and satisfactory condition.

3.17 HAULING MATERIAL ON STREETS:

3.17.1 When it is necessary to haul material over the streets or pavements, the Contractor shall provide suitable tight vehicles so as to prevent deposits on the streets or pavements. In all cases where any materials are dropped from the vehicles, the Contractor shall clean up the same at least daily or as often as directed and keep the crosswalks, streets and pavements clean and free from dirt, mud, stone and other hauled material.

3.18 TEST PITS:

3.18.1 For the purpose of locating underground obstructions, the Contractor shall make such excavations in advance of the work as directed. Payment for the excavations of test pits will be made under an appropriate item of the Contract.

3.19 RESTORATION OF SURFACES:

3.19.1 The various types of street surface, gutters and culverts, disturbed, damaged or destroyed during the performance of the work under the Contractor, shall be restored and maintained as specified herein and as shown and directed.

3.19.2 Restoration of Property:

3.19.2.1 The Contractor shall restore all pavement, driveways, sidewalks, gutters, culverts, trees, shrubs, lawns, landscaped areas and any other public or private property damaged as a result of work under this Contract. The quality of materials and workmanship used in the restoration shall produce a condition equal to or better than the condition before the work began. If conditions are inferior before restoration, they shall be superior after restoration.

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3.19.2.2 Payment for restoration of property shall be included in the applicable excavation items unless specifically provided for in other unit or lump sum price items.

3.19.3 Time of Replacement:

3.19.3.1 In general, permanent restoration of street surfaces will not be permitted until one month's time has elapsed after trenches have been completely backfilled as specified. A greater length of time, but not more than nine (9) months, may be allowed to elapse before permanent restoration of street surfaces is undertaken, if, in the opinion of the Engineer such additional time is required for complete shrinkage and settlement of the backfill.

3.19.3.2 If the Contractor is permitted to replace pavement at any time by the Engineer, it shall not relieve the Contractor of responsibility to make repairs to damage caused by settlement for a period of one year or as elsewhere specified.

3.19.4 Schedule of Operations:

3.19.4.1 A schedule of replacement operations shall be worked out by the Contractor, and approval of the Engineer shall be obtained. The program shall be adhered to unless otherwise approved by the Engineer.

3.19.5 Temporary Resurfacing & Repaving:

3.19.5.1 Immediately upon completion of refilling of the trench or excavation, the Contractor shall place a temporary pavement over all disturbed areas of the streets, driveways, alleys and other traveled places where the original surface has been disturbed by his operations. The temporary repavement shall be of a character satisfactory in all respects and safe for public travel.

3.19.5.2 The temporary resurfacing shall consist of a minimum of six inches (6") of well-graded broken stone with such additional depth as is necessary to withstand the traffic to which it is subjected. Where concrete pavements are removed, the broken stone shall be surfaced with "cold patch". The surface of the temporary repaving shall conform to the street grades. Mounding up of the material over the trench and covering the same with loose broken stone will not be considered as compliance with the above requirements.

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3.19.5.3 For dust prevention, the Contractor shall treat all surfaces, not covered with cold patch, as approved by the Engineer. Use of calcium chloride and/or petroleum products for dust control is prohibited.

3.19.5.4 The temporary repavement shall be placed and maintained by the Contractor in a safe and satisfactory condition until such time as the permanent repaving is completed. The Contractor shall immediately remove and restore to a satisfactory condition any and all such resurfacing and repavements as shall become unsatisfactory and not in accordance with the terms and intent of the Specifications.

3.19.6 Preparation for Permanent Replacement:

3.19.6.1 After due notice and within the time specified, the temporary broken stone or gravel pavement shall be prepared as the base to receive the permanent pavement. It shall be brought to the required grade and cross section and thoroughly compacted before placing the permanent pavement. Service boxes, manhole frames and covers, and similar structures, within the area of pavement to be replaced and not conforming to the new work, shall be set to established grade by the Contractor at his expense, unless a specific item is included in the Contract.

3.19.7 Permanent Repaving:

3.19.7.1 The permanent and final repaving of all streets, driveways and similar surfaces where pavement has been removed, disturbed, settled or damaged by or on account of the work of the Contract shall be repaired and replaced by the Contractor, by a new and similar pavement at such time as directed. The top surface shall conform with the grade of existing adjacent pavement, and the entire replacement shall meet the current specifications of the local community for the particular types of pavement.

3.19.7.2 Concrete pavement and concrete base beneath asphalt, brick and other pavement surfacings supported by a concrete base, shall be replaced with Class "B" concrete.

3.19.7.3 Undamaged brick removed from brick pavement laid with sand or a bituminous filler may be reused in the pavement replacement. All broken and otherwise damaged brick, even though such brick were broken prior to removal, and all brick from grout filled pavement, shall be replaced with new brick of equal or better quality by and at the expense of the Contractor.

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3.19.7.4 Where specified or approved by the Engineer, in writing, brick or block surfacing may be replaced by placing Class "B" concrete even with the adjacent wearing surface.

3.19.7.5 All pavement other than brick and concrete, and all gravel, crushed stone, and other types of roadway surfacings shall be replaced with new materials except where, in the opinion of the Engineer, materials salvaged from stone or gravel roadways have been removed, handled, and stored in such a manner that their original quality has been maintained, in which case such salvaged materials may be used to the extent available in the lower portion of the roadway surfacing after proper screening to remove dust and other excess fine material.

3.19.7.6 All such roadway surfacings shall be replaced to their original thickness at all points and such replacement shall in all cases conform in type, kind, and quality to the original when built. Where specifications covering the original construction are available, such specifications will apply to the replacement work. If not, the work shall be done in conformity with the State Department of Transportation Standard which conforms the closest to the type of surfacing being replaced, as determined by the Engineer.

3.19.8 Concrete Walks:

3.19.8.1 Concrete walks removed in connection with, or damaged as a result of, construction operations under the Contract shall be replaced with new construction; such walks shall be constructed of Class "B" concrete on a thoroughly compacted subgrade, shall have a vertical thickness of not less than four (4) inches (or thickness of the replaced walk where greater than four (4) inches), shall be constructed with vertical construction joints spaced not more than twenty-five (25) feet apart, shall be provided with expansion joints spaced not to exceed fifty (50) feet apart, and shall be sloped for drainage at right angles to the longitudinal center line in the amount of approximately 1/8-inch per foot of walk width.

3.19.8.2 Walks shall be float finished, edged with an edging tool, and grooved at construction joints and at intermediate intervals not in excess of the width of the walk. The length of blocks formed by grooving tool and distances between construction and expansion joints shall be uniform throughout the length of the walk in any one location. All walks shall be cured as specified for concrete slabs in the Section headed "Cast-In-Place Concrete".

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3.19.9 Curbs, Gutters & Culverts:

3.19.9.1 The Contractor shall, at his own cost and expense, permanently repair and relay all curbs, gutters, roadway and driveway culverts, where the same have been broken, injured or disturbed by the Contractor, his agents or employees, in executing any of the work covered by the Contract or by or on account of said work. He shall restore the same in a manner, to a condition and with material, either new or old as required, similar and equal to that existing before such excavations were made.

3.19.10 Maintenance & Surfaces:

3.19.10.1 The pavements, sidewalks, curbs, driveways, gutters, culverts, restored lawns, shrubs, trees, landscaped areas and any other public or private property shall be maintained in satisfactory condition during a period of one year from and after completion and acceptance of the Contract.

PART 4 - MEASUREMENT & PAYMENT

4.1 MEASUREMENT - EXCAVATION - GENERAL:

4.1.1 The quantity of Excavation - General for which payment will be made shall be the number of cubic yards actually removed, measured as the volume occupied by it (including rocks) before its removal; the maximum limits of such volumes shall not exceed those defined by the drawings, specified or ordered.

4.2 PAYMENT - EXCAVATION - GENERAL:

4.2.1 For Excavation - General, not included in other unit or lump sum price items, will be made at the applicable price stated in the Bid and shall include the cost of all the several detailed operations incidental to the excavation. No additional payment will be made for excavation of rock, boulders, masonry or concrete encountered in the work. No payment will be made for material not excavated between the actual excavation and the maximum payment limits, if shown.

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4.3 MEASUREMENT - EXCAVATION BELOW SUBGRADE:

4.3.1 The quantity of Excavation Below Subgrade, for which payment will be made, shall be the number of cubic yards (including rock) removed in accordance with the drawings, specified and/or ordered.

4.4 PAYMENT - EXCAVATION BELOW SUBGRADE:

4.4.1 For Excavation Below Subgrade, not included in other unit or lump sum price items, will be made at the applicable price stated in the Bid and shall include and cover all costs incidental to Excavation Below Subgrade when ordered. No additional payment will be made for excavation of rock, boulders, masonry, or concrete encountered in the work.

4.5 MEASUREMENT - EXCAVATION - TRENCHING:

4.5.1 The quantity for which payment will be made for Excavation - Trenching shall be the number of lineal feet, horizontal measurement, on the center line of the trench. The depth shall be measured on the center line of the trench from the invert or grade line to the original ground surface. Excavation - Trenching will be measured continuously through standard drop manholes, and no deduction will be made therefor. For other structures, deduction shall be made for length of trench occupied by the structures.

4.6 PAYMENT - EXCAVATION - TRENCHING:

4.6.1 For Excavation - Trenching, not included in other unit or lump sum price items, payment for Excavation - Trenching will be made at the price bid per lineal foot of Trenching for the various depths stated and shall include and cover all costs incidental to the trenching. No additional payment will be made for excavation of rock, boulders, masonry, or concrete encountered in the work. If so stated in the Additional Instructions, a percentage of the funds or unit amount to be retained under Excavation - Trenching will be withheld until all surface restoration is completed.

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4.7 MEASUREMENT - EXCAVATION FOR STRUCTURES:

4.7.1 The quantity of Excavation for Structures for which payment will be made shall be the number of cubic yards actually removed, measured as the volume occupied by it (including rock) before its removal unless otherwise specified; the maximum limits of such volumes shall not exceed those defined upon drawings, specified and/or ordered.

4.8 PAYMENT - EXCAVATION FOR STRUCTURES:

4.8.1 For Excavation For Structures, not included in other unit or lump sum price items, payment for Excavation For Structures will be made at the applicable unit price stated in the Bid and shall include and cover the cost of all the several detailed operations incidental to the excavation. No additional payment will be made for excavation of rock, boulders, masonry, or concrete encountered in the work. No payment shall be made for material not excavated between the actual excavation and the maximum payment limits if shown.

4.9 MEASUREMENT AND PAYMENT - EXCAVATION - TEST PITS:

4.9.1 Measurement and Payment for Excavation - Test Pits, not included in other unit or lump sum price items will be made in accordance with the following schedule:

4.9.1.1 If a specific item for Excavation - Test Pits is included in the Bid, payment shall be made at the applicable unit price stated in the Bid.

Measurement of quantity shall be the actual number of cubic yards removed and replaced, measured as the volume occupied by it before its removal in accordance with the limits ordered by the Engineer.

4.9.1.2 If no specific item for Excavation - Test Pits is included in the Bid, Excavation - Test Pits shall be measured and paid for in accordance with the Section entitled - Measurement & Payment, Excavation - General.

4.9.1.3 If neither of the above two items are included in the Bid, Excavation - Test Pits shall be measured and paid for in accordance with the Section entitled - Measurement & Payment Excavation - Trenching.

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4.10 MEASUREMENT - EXCAVATION - ROCK:

4.10.1 Unless a specific item of Excavation - Rock is included in the Bid, no additional payment will be made for Rock encountered in the work.

4.10.2 If a specific item of Excavation - Rock is included in the Bid, measurement for payment shall be the actual volume of Rock excavated, measured within the limits specified or directed by the Engineer.

4.11 PAYMENT - EXCAVATION - ROCK:

4.11.1 For Excavation - Rock, not included in other unit or lump sum price items, payment for Excavation - Rock will be made at the price stated in the Bid, and shall include and cover all costs incidental to Excavation - Rock.

END OF SECTION

SPECIFICATIONS

SECTION 02222

GRANULAR FILL

PART 1 - GENERAL

1.1 DESCRIPTION:

1.1.1 Under this Section, the Contractor shall furnish all labor, materials and equipment for Granular Fill, as shown on the Plans, as specified, and/or directed.

PART 2 - PRODUCTS

2.1 GRANULAR FILL:

2.1.1 The Granular Fill shall consist of clean, durable, gravel, or stone, well graded from coarse to fine, conforming to New York State Department of Transportation Standard Specifications Items 304.03 (Subbase Course Type 2), 304.04 (Subbase Course Type 3) and 304.05 (Subbase Course Type 4) as indicated on the Contract Drawings.

2.1.1.1 Item 304.03 Granular Fill material shall be provided for piping embedment outside of the landfill footprint area only.

2.1.2 The Contractor shall submit to the Engineer a certified sieve analysis by an independent testing laboratory showing that the materials meet the required gradation, at no cost to the Owner.

PART 3 - EXECUTION

3.1 PLACING:

3.1.1 The Items 304.04 and 304.05 Granular Fill shall be spread in horizontal layers so that the maximum thickness of any layer after compaction shall not exceed six (6) inches. Compaction shall be by travelling vibrators or other approved method and shall be to a minimum dry density of ninety-five percent (95%) of the maximum dry density as determined by the Modified Proctor Test, ASTM D1557. Each layer shall be thoroughly compacted before placement of overlying layers.

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GRANULAR FILL

3.1.2 Item 304.03 Granular Fill material shall be installed for piping embedment in accordance with Specification Section 02220, "Excavation".

3.2 COMPACTION TEST:

3.2.1 The Contractor shall employ an approved commercial testing laboratory at his own expense to conduct the compaction tests.

3.2.2 Each layer shall be tested and approved by the Engineer before succeeding layers are placed. One field density test shall be made for each fifty (50) cubic yards of material placed and/or as shown or specified in the Drawings.

3.2.3 The Contractor shall provide one optimum moisture-maximum density curve for each type of soil encountered in subgrade and fills or as directed by the Engineer.

3.2.4 The following reports in quadruplicate shall be submitted directly to the Engineer:

a. Report and Certification of Gradation.

b. Field Density Reports.

c. Optimum moisture-maximum density curves.

3.2.5 Based on the reports of the testing laboratory and inspection, if the subgrade or fills which have been placed and compacted are below the specified density, the Engineer will ask for additional compaction and testing at the expense of the Contractor.

PART 4 - MEASUREMENT & PAYMENT

4.1 MEASUREMENT - GRANULAR FILL:

4.1.1 The quantity of Granular Fill allowed for payment shall be computed by using the product of the length, depth as directed, and the actual width, but not to exceed the Maximum Payment Width as shown on the Contract Drawings, less the volume occupied by the pipe or structure, if any.

SECTION 02222

GRANULAR FILL

4.2 PAYMENT - GRANULAR FILL:

4.2.1 For Granular Fill, not included in other unit or lump sum price items, payment for Granular Fill will be made at the applicable price stated in the Bid.

END OF SECTION

SPECIFICATIONS

SECTION 02225

SELECT FILL MATERIALS

PART 1 - GENERAL

1.1 DESCRIPTION:

1.1.1 Under this Section, the Contractor shall furnish all labor, materials and equipment for Select Fill Materials as shown on the Plans, as specified, and/or directed.

1.1.2 Work under this Section shall include furnishing, transport, dumping and placement of Select Fill Materials in the areas and to the depths and grades shown on the engineering drawings and/or directed by the Engineer.

PART 2 - PRODUCTS

2.1 MATERIALS:

2.1.1 Select Fill Materials shall be of the types listed below:

Type (A) - Select Fill
Type (B) - Select Fill

2.1.1.2 Type (A) - Select Fill shall consist of clean, washed, sound, medium to coarse sand or fine gravel, less than 1 inch in the maximum dimension, free from organic material and coatings, and possessing a minimum permeability of 1.0×10^{-3} cm/sec at a relative density of 90 percent. In addition, this material must have less than three percent, by weight, pass the No. 200 sieve.

2.1.1.3 Type (B) - Select Fill shall consist of clean, screened, durable, sharp-angled fragments of crushed gravel of uniform quality, conforming to New York State Department of Transportation #3/4 Stone, with the gradation shown below:

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SELECT FILL MATERIALS

% Passing By Weight	Sieve
100	2"
90 - 100	1-1/2"
0 - 15	1"
0 - 3	#200

In addition, this material must be free of organic material and coatings.

2.1.1.3.1 A crushed particle shall be defined as one in which the total area of face fracture exceeds 25 percent of the maximum cross-sectional area of the particle. When two fractured faces are designated, the total area of each fractured face shall exceed 25 percent of the maximum cross-sectional area of the particle.

2.1.1.3.2 A naturally fractured face shall be acceptable providing that the sharp angular portion of the particle consists of sound material and is free from unsound or injurious coatings.

2.1.2 Special Considerations:

2.1.2.1 Gravels that have not been crushed may be utilized for Type (B) Select Fill.

2.1.3 Submittals:

2.1.3.1 The Contractor shall submit to the Engineer for approval a certified sieve analysis, for each type of Select Fill Material, the minimum permeability, the minimum and maximum relative densities as determined by an independent testing laboratory for the Type (A) Select Fill, at no cost to the Owner. All tests will be performed in accordance with the methods outlined in this Section.

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SELECT FILL MATERIALS

PART 3 - EXECUTION

3.1 USAGE:

3.1.1 Type (A) - Select Fill Material will be used to construct the drainage layer, or as directed by the Engineer.

3.1.2 Type (B) - Select Fill Material will be used as backfill around the gas vents, collection pipes, or as directed by the Engineer.

3.2 PLACEMENT:

3.2.1 Select fill materials shall be installed in accordance with Specification Section 02220, "Excavation", except as modified herein.

3.2.2 For Type (A) Select Fill Material, the following preparation and inspection shall be conducted prior to placement:

a. Insure all placement procedures do not damage any underlying soil or geosynthetic layers. Equipment must access on approved temporary haul roads.

b. Verify areas to be filled are properly compacted and all geosynthetics are in place.

c. Verify areas to be backfilled are free of debris, snow, ice or water and ground surfaces are not frozen.

d. Identify required lines, levels, contours and datums.

e. Proof roll existing subgrade as directed by the Engineer.

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SELECT FILL MATERIALS

f. Multiple cover spreading points will not be allowed. One initial spreading location shall be established, and the work shall proceed from this location towards a free end of the geomembrane. Select fill material must be placed using vertical placement techniques. No horizontal pushing of the initial soil lift above the geomembrane will be allowed.

g. Placement of select fill layers shall be from the low end of the cell to the high end and also from the valley to the ridge as much as possible.

h. Place select fill to contours and elevations shown on Contract Drawings. Use unfrozen materials.

i. Spread systematically, with low ground pressure equipment which exerts a ground pressure of no more than 7 pounds per square inch in a manner that will minimize movement of the underlying geotextile and geomembrane materials and potential for puncture of geotextile and geomembranes.

j. Spread select fill in loose lifts up to 12 inches thick and compact using the weight of the dozer and/or a smooth drum roller to a minimum relative density of 50 percent. Hand tamp or vibrate as required in areas not accessible to heavy compaction equipment.

k. Where heavy compaction equipment cannot access, hand tamp or vibrate select fill in 6-inch lifts, and/or as directed by the Engineer.

l. Refer to Section 02595 for placement of select fill over Polyvinyl Chloride (PVC) Lining Material.

3.2.4 For Select Fill Material Type (B), the following specific placement procedures shall be followed:

a. Place uncompacted select fill in gas vents after riser pipes are installed shown on Contract Drawings. Protect pipe from lateral displacement and possible damage during backfilling operations. Place fill uniformly around riser.

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SELECT FILL MATERIALS

3.3. FIELD TESTING AND QUALITY CONTROL:

3.3.1 In-place density will be visually approved by the Engineer for the Type (A) Select Fill Materials with field density tests performed as requested by the Engineer at the Contractor's expense.

3.3.2 In addition to field density testing, the following laboratory testing will be performed at the Contractor's expense by an independent testing laboratory on samples of the Type (A) Select Fill Materials. All samples of the select fill materials will be taken from material after placement.

a. One grain size (ASTM D422) analysis every 1,000 cubic yards of in-place material, or as directed by the Engineer.

b. One laboratory permeability test in accordance with ASTM D2434 per every 2,500 cubic yards of in-place Type (A) material, or as directed by the Engineer.

c. One minimum/maximum relative density test in accordance with ASTM D4253 and ASTM D4254 for every 5,000 cubic yards of in-place Type A Select Fill and one for each stockpile of Type B Select Fill to be pre-qualified.

3.4 CRITERIA AND TOLERANCES:

3.4.1 Criteria and tolerances of the select fill material are as listed in Paragraph 2.1.

3.5 REMEDIATION OF FAILED TEST RESULTS:

3.5.1 If laboratory test results indicate that the in-place Type (A) Select Fill Material fails to meet the required specifications, additional samples shall be taken in the field and tested in order to isolate the unacceptable area. Once the limits of unacceptable material have been defined, the Contractor shall remove the unacceptable material, replace it and retest the new material, at no additional cost to the Owner.

3.5.1.1 If unacceptable material is in the initial lift directly above a geomembrane, the unacceptable material will be removed to within 4 inches of the geomembrane and replaced. Testing of the final layer will be performed on a sample representative of the actual completed

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SELECT FILL MATERIALS

PART 4 - MEASUREMENT & PAYMENT

4.1 MEASUREMENT - SELECT FILL MATERIALS:

4.1.1 For Select Fill Materials, not included in other payment items, the quantity allowed for payment shall be computed by using the product of the length, depth as directed and the actual width, but not to exceed the Maximum Payment Width as shown on the Contract Drawings, less the volume occupied by the pipe or structure, if any.

4.2 PAYMENT - SELECT FILL MATERIALS:

4.2.1 For Select Fill Materials, not included in other unit or lump sum price items, payment for Select Fill Materials will be made at the applicable price stated in the Bid.

END OF SECTION

SPECIFICATIONS

SECTION 02233

GEOTEXTILE

PART 1 - GENERAL

1.1 DESCRIPTION:

1.1.1 Under this Section, the Contractor shall furnish all labor, materials and equipment for Geotextile as shown on the Plans, as specified, and/or directed.

1.2 SUBMITTALS:

1.2.1 Prior to the installation or delivery of a geotextile, the Contractor shall submit to the Engineer, from the geosynthetic manufacturer, a list of guaranteed "minimum average roll values" (MARV) for the geotextile (the minimum average roll value is the minimum value obtained from the average values of the sampled rolls). The Contractor shall provide the Engineer, from the manufacturer, a written certification stating that the geosynthetic material meets or exceeds the guaranteed properties submitted.

1.2.2 In addition to submitting guaranteed physical properties, the Contractor shall submit to the Engineer, from the manufacturer, documentation demonstrating the chemical compatibility of the geosynthetic material with leachate generated from mixed municipal solid waste. Such documentation shall include chemical compatibility testing results.

1.2.3 Prior to delivery of the geotextile, the Contractor shall submit a sample of the warranty to be provided as described in paragraph 3.3.1.

1.3 DELIVERY:

1.3.1 All geotextiles will be inspected on delivery, and materials that do not comply with the Specification will be rejected. The Contractor shall furnish all labor required to handle the geotextiles during inspection and shall remove the rejected material from the site of the work.

SECTION 02233

GEOTEXTILE

1.4 CONFORMANCE TESTING:

1.4.1 Within one week of delivery and at the Engineer's direction, the Contractor shall provide the necessary labor, tools and equipment to obtain samples and send these samples to an independent quality assurance laboratory for testing at the Contractor's expense. As a minimum, the following tests will be performed on all geotextiles:

- mass per unit area - ASTM D5261
- burst strength - ASTM D3786
- grab strength - ASTM D4632
- puncture strength - ASTM D4833
- trapezoidal tear strength - ASTM D4533

1.4.2 Samples will be taken by cutting along the width and 5 feet from the end of a rolled or folded geotextile material. The sampling frequency for the geotextile will be one sample per every 50,000 square feet of respective material delivered.

1.4.3 Any samples which fail the conformance testing will require the failed material to be removed from the site and replaced with new material at the Contractor's expense.

PART 2 - PRODUCTS

2.1 MATERIALS:

2.1.1 Geotextile:

2.1.1.1 The geotextile to be utilized shall be a nonwoven, needle-punched, polymeric geotextile. The fibrous structure of the geotextile must be able to withstand handling, placement and long-term loads associated with the incorporated Specifications.

2.1.1.2 The geotextile shall be protected from ultraviolet light, precipitation, mud, dirt, excessive dust, puncture, cutting and/or other damaging condition prior to and during delivery. The geotextile shall be capable of withstanding 30 days of sunlight without measurable deterioration.

SECTION 02233

GEOTEXTILE

2.1.1.3 Two types of nonwoven geotextiles will be supplied by the Contractor. Both fabrics shall be similar materials except for the weight and the associated physical properties. Type 1 will be nominal eight oz./square yard or heavier, and Type 2 will be a nominal twelve oz./square yard or heavier fabric. An equivalent substitution may be made subject to the approval of the Engineer. Geotextile Specifications are given in Paragraph 2.2.

2.1.1.4 All geotextiles shall be delivered on site in rolls contained within opaque plastic covers. These rolls will be tagged and display the following information.

- Manufacturer's name
- Product identification
- Lot number
- Roll number and dimensions

2.2 MINIMUM SPECIFIED VALUES:

2.2.1 Geotextile Minimum Average Roll Value (MARV) Specifications:

2.2.1.1 The table below lists the MARV specification values for the Type 1 and Type 2 nonwoven geotextiles. In addition, the typical average specification values, as indicated, have been listed. Final approval of the geotextile properties shall be made by the Engineer based upon Contractor's submittals.

Non-Woven Geotextiles

Property	Specification Limit Type 1	Type 2	Test Method
*Mass per Unit Area (oz/yd^2)	8.0	12.0	ASTM D5261
*Thickness (mils)	90	120	ASTM D5199
**Apparent Opening Size (micron)	70-120	100-140	CW-02215 or ASTM D4751

SECTION 02233

GEOTEXTILE

Property	Specification Limit Type 1	Type 2	Test Method
*Burst Strength (psi)	380	450	ASTM D3786
*Grab Strength (lbs)	210	290	ASTM D4632
*Grab Elongation (%)	50	50	ASTM 04632
*Puncture Strength (lbs)	100	135	ASTM D4833
*Trapezoidal Tear Strength (lbs)	80	105	ASTM D4533
**Wide-Width Strength (lbs/in)	90	130	ASTM D4595
*Permittivity (sec^{-1})	1.2	0.8	ASTM D4491
*Water Flow Rate (gpm/ft^2)	90	65	ASTM D4491

*MARV Values Taken Along Weakest Principal Direction.
**Typical Average Values

PART 3 - EXECUTION

3.1 GEOTEXTILE INSTALLATION:

3.1.1 The following procedures and requirements will be followed during the installation of geotextile.

SECTION 02233

GEOTEXTILE

3.1.2 Placement:

3.1.2.1 The placement of the geotextile shall not be conducted during adverse weather conditions. The geotextile will be kept dry during storage and up to the time of deployment. During windy conditions, all geotextiles will be secured with sandbags or an equivalent approved anchoring system. Removal of the sandbags or equal will only occur upon placement of an overlying soil layer.

3.1.2.2 Proper cutting tools shall be used to cut and size the geotextile materials. Extreme care will be taken while cutting in-place geotextiles.

3.1.2.3 During the placement of geotextiles, all dirt, dust, sand or mud shall be kept off to prevent clogging. If excessive contaminant materials are present on the geotextile, it shall be cleaned or replaced as directed by the Engineer.

3.1.2.4 No equipment used will damage the geotextiles by handling, trafficking or other means. Equipment, including ATVs, will not be allowed to travel directly on the geotextiles during the installation of overlying soils or geosynthetic layers unless otherwise determined by the Engineer.

3.1.3 Seaming or Joining:

3.1.3.1 Geotextiles:

3.1.3.1.1 Geotextiles shall be seamed using either an eighteen inch overlap, by sewing or by leister (heat) seaming. The specific conditions requiring a sewn or leistered seam or simply an overlap are as follows:

a. In all cases, seams on side slopes will be parallel to the line of slope and sewn or leistered 5 feet from the toe-of-slope upward over the length of the slope and into the anchor trench. No horizontal seams will be allowed on side slopes, except for patching.

b. Geotextiles placed on the subgrade, or between two soil layers at less than 10 percent slope may utilize an 18-inch overlap seam.

c. Where the slope is greater than 10 percent, and directly above a geomembrane, these seams shall be sewn or leistered as stated above.

3.1.3.1.2 Sewing will be done using a polymeric thread with chemical compatibility resistance equal to or exceeding the geotextile being sewn. Thread and the sewing device shall be approved by the Engineer prior to its use in the field.

3.1.3.1.3 The leistering device shall be approved by the Engineer prior to its use in the field. If required by the Engineer, sample seams will be constructed using scrap material to verify the integrity of the seam.

3.1.3.1.4 Repair of tears or holes in the geotextile will require the following procedures:

a. On slopes: A patch made from the same geotextile will be double seamed into place; with each seam 1/4-inch to 3/4-inch apart and no closer than 1-inch from any edge. Should any tear exceed 10% of the width of the roll, that roll will be removed from the slope and replaced.

b. Flat slopes: A patch made from the same geotextile will be spot-seamed in place with a minimum of 24-inch overlap in all directions.

3.2 POST-CONSTRUCTION:

3.2.1 Upon completion of the installation, the Contractor shall submit to the Engineer:

a. All quality control documentation.

b. The warranty obtained from the Manufacturer/Fabricator.

3.3 WARRANTY:

3.3.1 The Contractor shall obtain and submit to the Owner from the manufacturer a standard warranty provided for the geotextiles. The warranty shall guarantee that the geotextile shall remain free from defects for a minimum of one (1) year from the date of substantial completion of the project. The Engineer will review the warranty for completeness prior to the Owner accepting its provisions.

SECTION 02233

GEOTEXTILE

PART 4 - MEASUREMENT & PAYMENT

4.1 MEASUREMENT - GEOTEXTILE:

4.1.1 Measurement of the quantity of Geotextile, allowed for payment shall be based on the number of square feet placed as measured to the nearest one foot of Geotextile placed, excluding any overlaps and material in the anchor trench, in accordance with the Specifications, Drawings or as approved by the Engineer.

4.2 PAYMENT - GEOTEXTILE:

4.2.1 For Geotextile, not included in other unit or lump sum price items, payment for Geotextile will be made at the applicable price stated in the Bid.

4.2.2 The Owner will pay for materials delivered and properly stored on-site upon receipt of all required submittals and conformance test results. After installation of the material, the Owner shall retain 10 percent of the price of the geotextile until the Contractor provides an acceptable warranty.

END OF SECTION

SPECIFICATIONS

SECTION 02255

COMMON FILL MATERIAL

PART 1 - GENERAL

1.1 DESCRIPTION:

1.1.1 Under this Section, the Contractor shall furnish all labor, materials and equipment for Common Fill Material, as shown on the Plans, as specified, and/or directed.

1.1.2 Work under this Section shall include, but not necessarily be limited to excavating, transporting, dumping, spreading and compacting common fill material in the locations and to the depths and grades shown on the Contract Drawings or as directed by the Engineer.

PART 2 - PRODUCTS

2.1 MATERIALS:

2.1.1 Common Fill Material shall be natural soil, free from excessive moisture, frost, stumps, trees, roots, sod, muck, marl, vegetable matter or other unsuitable materials.

2.1.2 Acceptable on-site borrow shall be well graded from fine to coarse with a maximum particle size of six (6) inches and a maximum 50 percent passing by weight the No. 200 sieve. All materials shall be suitable for compaction in layers not exceeding eight (8) inches in loose thickness and shall remain stable when wet.

PART 3 - EXECUTION

3.1 PLACEMENT:

3.1.1 The entire surface to be covered with common fill shall be stripped of all grass, vegetation, top soil, rubbish, or other unsuitable materials before backfilling.

SECTION 02255

COMMON FILL MATERIAL

3.1.2 In general, common fill shall be placed in horizontal layers not exceeding eight (8) inches in loose thickness and shall be compacted according to the criteria and tolerances of Paragraph 3.3. Stones, if any, shall not exceed six (6) inches in greatest dimension and shall be well distributed throughout the mass. Subgrade for common fill shall be approved by the Engineer. Where common fill is to be constructed across ground which will not support the weight of the construction equipment, the fill shall be constructed by placing Type 2 geotextile on the subgrade or the soft soils excavated and replaced with suitable backfill as approved by the Engineer.

3.1.3 Each layer of common fill material shall be thoroughly tamped or rolled to the required degree of compaction by sheepsfoot, mechanical tampers, or vibrators. Successive layers shall not be placed until the layer under construction has been thoroughly compacted.

3.1.4 Sheepsfoot rollers shall be used wherever possible to compact common fill soil and shall have a weight on each row of feet of not less than two hundred (200) nor more than five hundred (500) pounds per square inch of foot surface.

3.1.5 Trucks or other heavy equipment shall not be operated over pipelines until a minimum of twenty-four (24) inches of backfill above the crown of the trenched pipe has been placed and properly compacted by tampers or other approved method.

3.1.6 Where required, the Contractor shall, at his own expense, moisture condition the fill to meet the compaction requirements of the specification. If, due to rain or other causes, the material is too wet for satisfactory compaction, it shall be allowed to dry or be removed as required, before compaction.

3.2 FIELD TESTING AND QUALITY CONTROL:

3.2.1 Common fill shall be compacted to a minimum dry density of ninety (90) percent of the maximum dry weight density in pounds per cubic foot as determined by the Modified Proctor Compaction Test, ASTM D1557 unless otherwise noted on the Contract Drawings or Specifications. Modified Proctor, Grain Size Analyses (ASTM D422 and 2217) and Atterberg Limits (ASTM D4318) shall be performed for each 5,000 cubic yard of fill placed by an independent testing laboratory at the Contractor's expense.

SECTION 02255

COMMON FILL MATERIAL

3.2.2 Compaction curves shall be developed for use in the construction of access roads, berms and subgrades. The development of the curves from the Modified Proctor Compaction Test shall be done by an approved testing laboratory at the Contractor's expense.

3.2.3 Field control samples shall be taken as directed by the Engineer during the construction to verify that the Proctor density limits and grain size distribution are consistent and that the common fill is uniform. Such samples shall be taken and tested by the soils quality assurance laboratory at the Contractor's expense. In-place density testing according to ASTM D2922, D2167 or D1556 procedures will be conducted at the frequencies given below:

- in-place testing will be performed at a frequency of one per 5,000 square feet per lift of common fill.

3.2.4 All in-place density tests will be located according to an approved testing grid system. Elevations will be established from known existing benchmarks by Contractor. Contractor shall establish the grid system in the field such that work areas can be easily located by the Engineer.

3.2.5 Common fill shall be constructed to such heights as to make allowance for after-construction settlement and any settlements which occur before final acceptance of the Contract shall be corrected to make the backfill conform with the established lines and grades.

3.3 CRITERIA AND TOLERANCES:

3.3.1 Criteria and tolerances of common fill are as follows:

- Compaction - a minimum of 90 percent of the maximum dry density as determined by the Modified Proctor Method unless otherwise specified or directed.

SECTION 02255

COMMON FILL MATERIAL

PART 4 - MEASUREMENT & PAYMENT

4.1 MEASUREMENT - COMMON FILL MATERIAL:

4.1.1 Measurement of the quantity of Common Fill Material, allowed for payment, shall be computed, after compaction, by using the product of the length, depth as directed, and the actual width, but not to exceed the established lines as shown on the Drawings or as directed by the Engineer, less the volume occupied by any pipe or structures, if any.

4.2 PAYMENT - COMMON FILL MATERIAL:

4.2.1 For Common Fill Material, not included in other unit or lump sum price items, payment for Common Fill Material will be made at the applicable price stated in the Bid.

END OF SECTION

SPECIFICATIONS

SECTION 02436

POLYVINYL CHLORIDE (PVC) PIPE AND FITTINGS

PART 1 - GENERAL

1.1 DESCRIPTION:

1.1.1 Under this Section, the Contractor shall furnish all referenced materials for Polyvinyl Chloride (PVC) Pipe And Fittings, as shown on the Plans, as specified, and/or directed.

1.2 SUBMITTALS:

1.2.1 The Contractor shall submit six (6) copies of the Manufacturer's material Specifications for each item to be supplied under this Section.

1.3 QUALITY ASSURANCE:

1.3.1 All pipe, fittings, and specials will be inspected on delivery, and materials that do not comply with the Specification will be rejected. The Contractor shall furnish all labor required to handle the pipe and related materials during inspection and shall remove the rejected materials from the site of work.

PART 2 - PRODUCTS

2.1 PVC PLASTIC SOLVENT WELD PIPE AND FITTINGS:

2.1.1 PVC material for the pipe and fittings shall meet the requirements of ASTM D1784 for Rigid Poly (Vinyl Chloride) Compounds and Chlorinated Poly (Vinyl Chloride) Compounds, Class 12454-B, or Class 12454-C.

2.1.2 The PVC pipe and fittings shall be extruded or molded in such a manner that all cross sections shall be dense, homogeneous, and free from porosity or other imperfections. The molded or extruded pipe and fittings shall conform to ASTM D1785 for Polyvinyl Chloride (PVC) Plastic Pipe, and ASTM D2466 and ASTM D2467 for Polyvinyl Chloride (PVC) Plastic Pipe Fittings.

SECTION 02436

POLYVINYL CHLORIDE (PVC) PIPE AND FITTINGS

2.1.3 All PVC pipe and fittings shall be Schedule 80 (unless otherwise noted).

2.1.3.1 Interior flange fittings shall be 150 pound, Schedule 80 PVC conforming to ASTM D178, unless otherwise specified or indicated.

2.1.3.2 All fasteners, bolts, nuts and washers shall be ASTM A276 (Condition B, Cold-Worked) 304 Stainless Steel with a minimum 100,000 psi yield strength.

2.1.4 Standard length of all pipe shall be 10 or 20 feet. Provide couplings as necessary. All pipe and fittings shall be of the solvent weld type unless otherwise indicated. Provide adequate solvent cement for the number of couplings and fittings provided.

2.1.4.1 The solvent cement shall be a solution of unplasticized PVC, tetrahydrofuran and cyclohexanone. The solvent cement shall meet the requirements of ASTM D2564 for Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Pipe and Fittings.

PART 3 - EXECUTION

3.1 INSTALLATION:

3.1.1 Installation of all pipe, fittings, specials, adapters and appurtenances shall conform to the manufacturer's recommendations and the following summary of installation recommendations. Where Specifications and recommendations conflict, the strictest shall apply.

3.1.2 Proper implements, tools and facilities satisfactory to the Engineer shall be provided and used by the Contractor for the safe and convenient execution of the work.

3.1.3 The interior surface of all pipe shall be clean when installed, and shall be kept clean until final acceptance. Removable end caps shall be placed on all open ends of pipe lines when pipe laying is not actively in progress. The bulkheads shall be designed to prevent the entrance of dirt, debris or small animals, and shall not be removed until pipe laying is resumed.

SECTION 02436

POLYVINYL CHLORIDE (PVC) PIPE AND FITTINGS

3.2 FIELD QUALITY CONTROL:

3.2.1 Field Tests and Inspections: The Engineer will conduct field inspections and witness field tests specified in this Section. The Contractor shall perform field tests on the gas main prior to connecting gas vents. The Contractor shall provide all labor, equipment, and incidentals required for testing. Be able to produce evidence, when required, that each item of work has been constructed in accordance with the drawings and Specifications.

3.2.1.1 Leakage Tests: Test lines for leakage by low-pressure air tests. Prior to testing for leakage, backfill trench up to at least lower half of pipe. When necessary to prevent pipeline movement during testing, place additional backfill around pipe sufficient to prevent movement, but leaving joints uncovered to permit inspection. When leakage or pressure drop exceeds the allowable amount specified, make satisfactory correction and retest pipeline section in the same manner. Correct visible leaks regardless of leakage test results.

a. Low-pressure Air Tests: Perform tests as follows:

(1) PVC Plastic Pipelines: Test in accordance with UNI B-6. Allowable pressure drop shall be as given in UNI B-6. Make calculations in accordance with the Appendix to UNI B-67.

PART 4 - MEASUREMENT & PAYMENT

4.1 MEASUREMENT - POLYVINYL CHLORIDE (PVC) PIPE AND FITTINGS:

4.1.1 Measurement of the quantity of Polyvinyl Chloride (PVC) Pipe and Fittings, allowed for payment shall be the actual linear feet of pipe installed and the number of each type of fitting installed.

4.2 PAYMENT - POLYVINYL CHLORIDE (PVC) PIPE AND FITTINGS:

4.2.1 For Polyvinyl Chloride (PVC) Pipe And Fittings, not included in other unit or lump sum price items, payment for Polyvinyl Chloride (PVC) Pipe And Fittings will be made at the applicable price stated in the Bid.

END OF SECTION

SPECIFICATIONS

SECTION 02444

FENCE, CHAIN LINK

PART 1 - GENERAL

1.1 DESCRIPTION:

1.1.1 Under this Section, the Contractor shall furnish all labor, materials and equipment for Fence, Chain Link, including accessory items of work herein described, as shown on the Plans, as specified and/or directed.

1.2 REFERENCES: The publications listed below and their latest revisions form a part of this Specification to the extent referenced. The publications are referred to in the text by the basic designation only.

1.2.1 American Society for Testing and Materials (ASTM) Publications:

A121	Standard Specification for Zinc-Coated (Galvanized) Steel Barbed Wire
A123	Standard Specification for Zinc (Hot-Galvanized) Coatings on Products Fabricated From Rolled, Pressed, and Forged Steel Shapes, Plates, Bars, and Strip
A153	Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
A392	Standard Specification for Zinc-Coated Chain-Link Fence Fabric
F567	Standard Practice for Installation of Chain-Link Fence
F1083-9	Standard Specification for Pipe, Steel, Hot-Dipped Zinc-Coated (Galvanized) Welded, for Fence Structures

SECTION 02444

FENCE, CHAIN LINK

1.3 SUBMITTALS:

1.3.1 Shop Drawings and Catalog Cuts: Show all fencing components, details of fencing and accessories. Drawing shall also show fence height ~~and concrete footing details.~~

1.3.2 Manufacturer's Certificate of Conformance: Certify that materials and coatings furnished have been tested and conform to the referenced ASTM Specification.

a. Braces
b. Framing
c. Rails
d. Tension Wire
e. Fabric

1.4 DELIVERY, STORAGE, AND PROTECTION: Deliver materials to the site in an undamaged condition. Store materials off the ground to provide protection against oxidation caused by ground contact.

PART 2 - PRODUCTS

2.1 POSTS, RAILS, BRACES AND GATE FRAMES: All posts, rails, gate frames, and post braces shall be hot-dip galvanized Schedule 40 standard steel pipe.

2.1.1 Minimum pipe diameters shall be as follows:

Top rail	1-5/8" OD, 2.27 lb per foot
Horizontal post braces	1-5/8" OD, 2.27 lb per foot

2.1.2 All posts shall be equipped with pressed steel combination tops with barbed wire supporting arms. Tops shall be provided with a hole to permit through passage of the top rail.

SECTION 02444

FENCE, CHAIN LINK

2.2 FENCE FABRIC:

2.2.1 Wire for chain link fence fabric shall be No. 9 coated wire gauge carbon steel produced in accordance with ASTM A392, Class 2 with a 2-inch mesh; twisted selvage at top, knuckled selvage at bottom. The fabric shall be stretched taut and anchored so that a pull of 150 pounds at the middle of a panel will not lift the bottom of the fabric more than 6 inches.

2.2.2 Coated fence fabric shall be produced from helically wound and interwoven steel wire forming a continuous 2-inch mesh.

2.2.3 Ties or clips of adequate strength shall be provided in sufficient number for attachment of the fabric to line posts at intervals not exceeding 16 inches and to the top rail and bottom tension wire at a maximum 24-inch spacing.

2.3 TENSION BARS: Tension bars shall be minimum 3/16-inch by 3/4-inch flat steel plates and no more than 2 inches shorter than the fabric height. Bars shall be hot-dip galvanized.

2.4 TERMINAL POST BANDS: Bands or clips of adequate strength shall be provided in sufficient number for attachment of the fabric and stretcher bars to all terminal posts at intervals not exceeding 15 inches. Tension bands shall be formed from No. 12 gauge flat or beveled steel and attached with 3/8-inch diameter carriage bolts hot-dip galvanized.

2.5 FENCING ACCESSORIES: All accessories shall have zinc coatings.

2.6 TENSION WIRE: Bottom tension wire shall be 7 gauge galvanized coil spring wire.

2.7 BARBED WIRE: Barbed wire shall consist of two (2) strands of twisted 12-1/2 gauge steel wire with 4 point 14 gauge barbs on 4-inch spacing; wire shall be zinc coated.

SECTION 02444

FENCE, CHAIN LINK

PART 3 - EXECUTION

3.1 INSTALLATION: Install fence in accordance with the fence manufacturer's written installation instructions except as modified herein. Fencing shall consist of galvanized steel framework and steel fabric with a height of 5 feet [6 inches]. The fence shall have a top rail, bottom tension wire, and three strands of barbed wire mounted on 45 degrees extension areas. The upper strand shall be approximately 12 inches out from the fence and 12 inches above the top of the fabric.

3.1.1 Grading: Establish a graded fence line prior to fencing installation. Clear the fence line of all obstacles that will interfere with the fencing.

3.1.2 Bracing: Brace gate, end and corner posts to the nearest adjoining line post at mid height with a horizontal standard steel pipe used as a compression member and a diagonal truss rod and truss tightener used as a tension member. Diagonal tension bracing provided from end, corner, or gate posts to line posts shall consist of 3/8-inch minimum diameter steel truss rods with turnbuckles or equivalent provision for adjustment.

3.1.3 One tension bar shall be provided for each end and gate post, and two (2) for each corner and pull post.

3.1.4 Bottom Tension Wires: Install bottom tension wires before installing chain-link fabric, and pull wires taut. Bottom tension wires shall be within 8 inches and the respective fabric edge. Fabric shall be attached to wires at 24 inches on center.

3.2 CLEANUP: Remove waste fencing materials and other debris from the fencing site.

PART 4 - MEASUREMENT & PAYMENT

4.1 MEASUREMENT - FENCE, CHAIN LINK:

4.1.1 Measurement for Fence, Chain Link shall include the cost of all materials, equipment, labor, submittals and testing for the work indicated in this Section.

SECTION 02444

FENCE, CHAIN LINK

4.2 PAYMENT - FENCE, CHAIN LINK:

4.2.1 For Fence, Chain Link, not included under other unit or lump sum price items, payment for Fence, Chain Link will be made at the applicable price stated in the Bid.

END OF SECTION

SPECIFICATIONS

SECTION 02484

TOPSOIL

PART 1 - GENERAL

1.1 DESCRIPTION:

1.1.1 Under this Section, the Contractor shall furnish all labor, materials and equipment for Topsoil as shown on the Plans, as specified, and/or directed.

PART 2 - PRODUCTS

2.1 MATERIAL:

2.1.1 Topsoil for such depth as directed shall be removed from areas of the Site where excavations are to be made or embankments placed. The soil so removed shall be transported and stored in piles at convenient locations designated or approved and shall be kept separate from all other classes of excavated material. Should the Contractor fail to keep separate from other material any soil removed, he shall procure and furnish at his own expense an equivalent quantity of satisfactory topsoil.

2.1.2 In the event the topsoil removed from areas of the Site is unsatisfactory, or the quantity available is inadequate, the Contractor shall furnish topsoil from an approved source or sources off the Site. The off-site material shall contain no admixture of refuse or any material toxic to plant growth and shall be free from subsoil, stumps, roots, brush, stones, clay lumps or similar objects larger than two inches in greatest dimension. Topsoil shall not be delivered or placed in a frozen or muddy condition.

PART 3 - EXECUTION

3.1 PLACING:

3.1.1 Topsoil shall include fine grading the surface of the ground upon which topsoil is to be placed and the furnishing and placing of topsoil in the areas to be seeded or planted.

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TOPSOIL

3.1.2 Depth of topsoil shall be minimum 6 inches unless otherwise shown or directed.

3.1.3 After approval by the Engineer of the fine grading of the subgrade, the topsoil shall be spread and compacted with a light roller to the lines, grades and elevations shown on the drawings, or directed by the Engineer, without unsightly variations, ridges or other depressions which will hold water. Any stone, litter or objectionable material shall be removed from the topsoil and the surface raked to true lines. Any uneven spots shall be leveled. The work shall not be performed during unsuitable weather.

PART 4 - MEASUREMENT & PAYMENT

4.1 MEASUREMENT - TOPSOIL:

4.1.1 The quantity allowed for payment for Topsoil shall be the actual number of cubic yards of compacted material in place computed as the area covered times the thickness.

4.2 PAYMENT - TOPSOIL:

4.2.1 For Topsoil, not included in other unit or lump sum price items, payment for Topsoil will be made at the applicable price stated in the Bid and shall cover all costs and expense incidental to excavating from storage, transporting, rehandling and placing in the completed work as shown, specified and directed. No payment will be made for any portion of this item until the Topsoil has been placed in final location.

END OF SECTION

SPECIFICATIONS

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SEEDING

PART 1 - GENERAL

1.1 DESCRIPTION:

1.1.1 Under this Section, the Contractor shall furnish all labor, materials and equipment for Seeding as shown on the Plans, as specified, and/or directed.

1.1.2 The Contractor shall seed new areas and disturbed areas where shown on the Drawings, specified or directed by the Engineer. Contractor shall prepare the seed bed by scarifying or otherwise loosening soil to a depth of 2 inches, applying fertilizer, lime, seed and mulch at the rates specified.

PART 2 - PRODUCTS

2.1 MATERIALS:

2.1.1 Fertilizer:

2.1.1.1 Commercial fertilizer (19-19-19) shall contain not less than nineteen percent nitrogen, nineteen percent available phosphoric acid and nineteen percent water soluble potash. The fertilizer shall be inorganic or a combination of inorganic and organic substances.

2.1.1.2 If, as an alternative, the Contractor wishes to substitute another fertilizer, such as 10-20-10 to 6-12-6, he may do so with the approval of the Engineer, and the rate of fertilizer to be used shall be whatever amount is required to furnish the same amount of nitrogen as would be supplied by the 19-19-19.

2.1.1.3 Commercial fertilizer shall be delivered in original bags of the manufacturer, showing weight, analysis and the name of the manufacturer.

2.1.1.4 If the commercial fertilizer is not used immediately after delivery, the Contractor shall store it in such a manner that its effectiveness will not be impaired.

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SEEDING

2.1.2 Seed:

2.1.2.1 Grass seed shall be a mixture of the species and/or varieties specified, mixed in the proportions specified.

2.1.2.2 The seed shall be fresh, recleaned and of the latest crop year. It shall conform to Federal and State Standards. Each type of grass in the mixture shall meet or exceed the minimum percentage purity and germination listed for that type of grass.

2.1.2.3 The following seed mixture shall be used for ditches, slopes and all areas disturbed by construction.

Percentage by Weight	Species or Variety	Percent Germination
30	Kentucky 31 Tall Fescue	85%
30	Perennial Ryegrass	85%
20	New Zealand White Clover	85%
20	Creeping Red Fescue	85%

2.1.2.4 For excessively wet areas, Reed Canary Grass shall be utilized.

2.1.2.5 The balance of material in an acceptable seed mixture, other than specified pure live seed shall, for the most part consist of non-viable seed, chaff, hulls, live seeds of crop plants and harmless inert matter. The percentage of weed shall not exceed one percent by weight for the mixture.

2.1.2.6 All seed mixtures furnished under this Item shall be mixed by the vendor and shall be delivered in standard sized bags of the vendor, showing the weight, analysis and vendor's name.

2.1.2.7 All seed shall be properly stored by the Contractor at the site of the work and any seed damaged during storage shall be replaced.

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SEEDING

2.1.3 Mulch:

2.1.3.1 Straw mulch shall consist of oats, wheat, rye or other approved crops which are free of noxious weeds. Weight shall be calculated on the basis of the straw having not more than 15% of moisture content.

PART 3 - EXECUTION

3.1 INSTALLATION:

3.1.1 Time For Seeding:

3.1.1.1 Grass seed shall be sown from March 15th to May 15th or from August 15th to October 1st, unless in a favorable season, and upon written permission of the Engineer, the seeding period is extended. All seeding shall be done in a dry or moderately dry soil and at times when the wind does not exceed a velocity of five miles per hour.

3.1.2 Preparation of Seed Bed:

3.1.2.1 After the finished grading is completed and just before seeding, the areas to be seeded shall be loosened to a depth of two inches and free from depressions which will hold water. All sticks, stones, clods, roots or other objectionable material which might interfere with the formation of a fine seed bed shall be removed from the soil.

3.1.2.2 Commercial fertilizer shall be evenly applied at the rate of 600 pounds per acre.

3.1.3 Seeding:

3.1.3.1 Grass seed mixture shall be sown at the rate of 200 pounds per acre.

3.1.3.2 The seed shall be sown by hand or by an approved machine, in such a manner that a uniform stand will result.

3.1.3.3 After sowing, seeded areas shall be rolled with a light lawn roller weighing not more than one hundred pounds per foot of width.

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3.1.4 Mulching:

3.1.4.1 Within three days after the seed is sown, the seeded areas shall be covered with a uniform blanket of straw mulch at the rate of 1,000 pounds per acre of seeded area or as required to provide 90% coverage (i.e., lightly cover 90% of the surface).

3.1.5 Hydroseeding:

3.1.5.1 The Contractor may substitute a hydroseeding process for hand seeding and mulching as specified above.

3.1.5.2 Where hydroseeding is used, the Contractor shall mix water, seed fertilizer, mulch and mulch anchorage at the following rates and apply to the prepared seed bed by means of a hand-held hose. No truck mounted spraying equipment shall be driven over the areas to be seeded. Discharge shall be in an uphill direction only.

a.	Fertilizer	- 1000 lbs. per acre
b.	Seed	- 250 lbs. per acre
c.	Mulch	- Sufficient to equal 90% straw mulch coverage
d.	Mulch Anchorage	- Per Manufacturer's instructions
	Chemical	750 lbs. wood fiber/acre
	Wood Cellulose	

3.1.5.3 Where the mulch anchorage is provided ready mixed with the mulch, no additional mulch anchorage will be required.

3.1.5.4 Mulch shall be a commercial cellulose hydromulch such as "Conwed 2000", "Turf Fiber", or equal. Soil seal or mulch anchorage used shall be approved by the Engineer. An asphalt emulsion shall not be used as mulch anchorage.

3.2 MAINTENANCE AND PROTECTION:

3.2.1 The Contractor shall maintain and protect all seeded areas until final acceptance of the Seeding portion of the Contract.

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SEEDING

3.2.2 Final acceptance will not be made until an acceptable uniform stand of grass is obtained in all newly seeded areas except that the Engineer at his discretion may accept a portion or portions of the work at various times.

3.2.3 Upon final acceptance of a seeded area by the Engineer, the Owner will assume responsibility for maintenance and protection of that area.

3.2.4 Any portions of seeded areas which are unacceptable, and which fail to show a uniform stand of grass from any cause, shall be reseeded as before except the fertilizer shall be applied at one-half the original rate. The seeding shall be repeated until the seeded areas are satisfactorily covered with grass.

PART 4 - MEASUREMENT & PAYMENT

4.1 MEASUREMENT - SEEDING:

4.1.1 The quantity for which payment will be made shall be the actual number of acres covered.

4.2 PAYMENT - SEEDING:

4.2.1 For Seeding, not included in other unit or lump sum price items, payment for Seeding will be made at the applicable price stated in the Bid.

END OF SECTION

SPECIFICATIONS

SECTION 02595

POLYVINYL CHLORIDE (PVC) LINING MATERIAL

PART 1 - GENERAL

1.1 DESCRIPTION:

1.1.1 Under this Section, the Contractor shall furnish all labor, materials and equipment for Polyvinyl Chloride (PVC) Lining Material as shown on the Plans, as specified, and/or directed.

1.1.2 The Contractor shall furnish and install 40 mil Polyvinyl Chloride (PVC) Lining Material as landfill cap geomembrane or as otherwise shown on the Contract Drawings.

1.2 SHEET QUALITY:

1.2.1 The Contractor shall submit to the Engineer the following information regarding sheet quality and properties.

1.2.1.1 A material properties sheet including, at a minimum, all specified properties, measured using test methods indicated in the Specifications, or equivalent.

1.2.1.2 A list and description of materials other than the base polymer which comprise the geomembrane.

1.2.1.3 A written certification that property values given in the properties sheet are guaranteed by the Geomembrane Manufacturer.

1.2.1.4 Certification that the sheeting shall contain no deep gas checks, surface divots, blisters, pinholes, windows and shall not exhibit cold flow. In addition, it shall be uniform in color, size and thickness.

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1.3 ROLL QUALITY:

1.3.1 Quality Control Certification:

1.3.1.1 Prior to shipment, the Contractor will provide the Engineer with a quality control certificate for each roll of geomembrane provided. The quality control certificate will be signed by a responsible party employed by the Geomembrane Manufacturer, such as the Production Manager. The Quality Control Certificate will include:

a. Roll numbers and identification.

b. Documentation certifying the geomembrane was continuously inspected for uniformity, damage, imperfections, holes, cracks, thin spots and foreign materials.

c. Sampling results of quality control tests; as a minimum, results will be given for thickness, tensile strength, tear resistance and seam strength evaluated in accordance with the methods indicated in the specifications or equivalent methods approved by the Engineer.

d. Documentation certifying non-destructive seam testing was performed on all fabricated seams over their full length using a test method acceptable to the Engineer.

1.4 DELIVERY, HANDLING AND STORAGE:

1.4.1 The Contractor will be liable for all damages to the materials incurred prior to and during transportation to the site.

1.4.2 Handling, storage and care of the geomembrane materials prior to and following installation at the site, is the responsibility of the Contractor.

1.5 CONFORMANCE TESTING:

1.5.1 Upon delivery of the geomembrane, the Contractor shall provide the necessary labor, tools and equipment to obtain samples to be sent to the quality assurance laboratory for testing at the Contractor's expense to ensure conformance to both the design specifications and the list of guaranteed properties.

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1.5.2 As a minimum, tests to determine the following characteristics will be performed on geomembranes:

a. specific gravity, ASTM D792A

b. thickness, ASTM D5199

c. tensile properties, ASTM D882

d. volatility loss, ASTM D1203A

1.5.3 Unless otherwise specified, samples will be 1.5 feet long by 20 feet of the panel width. The Engineer will mark the machine direction on the samples with an arrow.

1.5.4 Unless otherwise specified, geomembrane samples will be taken at a maximum rate of one per 25,000 square feet.

1.6 PRE-QUALIFICATIONS:

1.6.1 Geomembrane Manufacturer:

1.6.1.1 The Contractor shall submit to the Owner and the Engineer for approval the following qualification information regarding the Geomembrane Manufacturer:

a. Corporate background and information.

b. Manufacturing capabilities including:

- daily production quantity available for this Contract
- quality control procedures for manufacturing
- list of material properties including certified test results, to which geomembrane samples are attached.

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c. A list of at least ten completed facilities, totaling a minimum of 10,000,000 square feet, for which the Manufacturer has manufactured a geomembrane of the type specified. For each facility, the following information will be provided:

- name and purpose of facility, its location and date of installation
- name of Owner, Project Manager, Designer, Fabricator (if any), and Installer
- thickness of geomembrane, surface area of geomembrane manufactured
- available information on the performance of the lining system and the facility.

d. Origin (resin supplier's name, resin production plan) and identification (brand name, number) of the resin.

1.6.2 Geomembrane Fabricator (if required):

1.6.2.1 The Contractor shall submit to the Engineer for approval the following written information in regards to the Geomembrane Fabricator (if required).

a. Copy of Geomembrane Manufacturer's letter of approval of license.

b. Corporate background and information.

c. Fabrication Capabilities:

- daily fabrication quantity available for this Contract
- quality control procedure
- samples of fabricated seams and a certified list of minimum values of seam properties and employed test methods.

d. A list of at least ten completed facilities for which the Fabricator has fabricated liner factory panels of the type of geomembrane to be used in this project, totaling a minimum of 10,000,000 square feet, the following information will be provided for each fabrication:

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- name and purpose of facility, its location, and date of installation
- name of Owner, Project Manager, Designer, Manufacturer, Installer, and the name of the contact at the site who can discuss the project
- thickness of liner and surface area of liner fabricated
- type of seaming and type of seaming apparatus used
- available information on the performance of the lining system and the facility.

1.6.3 Installer:

1.6.3.1 The Installer must be trained and qualified to install geomembrane and must be approved and/or licensed by the Geomembrane Manufacturer and/or Fabricator.

1.6.3.2 The Contractor shall submit to the Engineer for approval the following written information, relative to the Installer.

a. Copy of Installer's letter of approval or license by the Manufacturer and/or Fabricator.

b. Corporate background and information.

c. Description of installation capabilities, including:

- information on equipment and personnel
- average daily production anticipated
- quality control procedures.

d. A list of at least ten completed facilities, totaling a minimum of 3,000,000 square feet for which the Installer has installed geomembrane of the type for this project. For each installation, the following information will be provided:

- name and purpose of facility, its location and date of installation
- name of Owner, Designer, Manufacturer, Fabricator (if any), and name of contact at the facility who can discuss the project
- name and qualifications of the supervisor(s) of the Installer's crew(s)
- thickness of geomembrane and surface area of the installed liner

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- type of seaming and type of seaming apparatus used
- duration of installation
- available information on the performance of the lining system and the facility.

e. Resume of the "master seamer" to be assigned to this project, including dates and duration of employment.

f. Resume of the field engineer or installation supervisor to be assigned to this project, including dates and duration of employment.

1.6.3.3 All personnel performing seaming operations will be qualified by experience or by successfully passing seaming tests. The field crew foreman must have experience seaming a minimum of 3,000,000 square feet of geomembrane of the type for this project, using the same type of seaming apparatus in use at the site.

1.7 SHOP DRAWING SUBMITTALS: The Contractor shall submit detailed shop drawings of all prefabricated PVC fabrications for review prior to installation. Shop drawings shall contain all necessary panel layouts, details, dimensions, etc., sufficient to assure that fabrication shall meet the intended use and will conform to the geometry of its intended application.

1.8 WARRANTY:

1.8.1 The Contractor shall obtain and submit to the Engineer from the Manufacturer and Installer separate written warranties guaranteeing for a 20 year and 2 year period (respectively) from the date of issuance of the Certificate of Substantial Completion that the liner materials and workmanship specifically provided or performed under this Contract shall be free from defects. Said warranty shall apply to normal use and service by the Owner as described in Contract Specifications and as shown on the Contract Drawings. It shall specifically exclude mechanical abuse or puneture by machinery, equipment, or people, exposure of the liner to harmful chemicals or catastrophe due to earthquake, flood or tornado. Such written warranty shall provide for the repair or replacement of the defect or defective area of lining materials upon written notification and demonstration by the Owner of the specific nonconformance of the lining material or installation with the project Specifications. Such defects or nonconformance shall be repaired or replaced within a reasonable period of time of such notification. The Owner agrees to pay an amount equal to the then current sales and installation price of the defective portion of the lining material multiplied by a fraction, the numerator of which shall be the

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number of years elapsed since the commencement of the warranty period and the denominator of which shall be the warranty period, provided that portion of the area in question has been made available to the Manufacturer/Installer and that such areas have been cleared of all liquids, sludges, earth, sand or gravel.

PART 2 - PRODUCTS

2.1 RAW MATERIALS:

2.1.1 Prior to installation of any geomembrane material, the Contractor shall submit to the Engineer the following information regarding resin quality.

2.1.1.1 A copy of the Quality Control Certificates issued by the Resin supplier.

2.1.1.2 Reports on the tests conducted by the Manufacturer to verify the quality of the resin used to manufacture the geomembrane rolls assigned to the considered facility.

2.1.1.3 A statement of origin and identification of raw materials used.

2.1.1.4 Documentation demonstrating the chemical compatibility of the materials.

2.2 PVC GEOMEMBRANE MINIMUM SPECIFICATIONS:

2.2.1 PVC liner material shall have a matted finish on at least one side. Matted side of PVC panel to be installed on top.

2.2.2 PVC liner material shall meet the minimum specification values listed below.

Property	Specification Limit	Test Method
Raw Material	(All domestic and Virgin Polyvinyl Chloride)	
Thickness (mils)	40 (± 5%)	ASTM D5199
Specific Gravity	1.23-1.30	ASTM D792

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Property	Specification Limit	Test Method
Cold Crack	Pass	ASTM D1790
Tensile Properties		
- Tensile Strength at Break (lb/in)	90 min.	ASTM D882
- Modulus at 100% Elongation (lb/in)	36 min.	ASTM D882
- Elongation (%) at Break	300%	ASTM D882
Tear Resistance (lbs/in)	10 min.	ASTM D1004
Water Extraction (%)	0.35 (max.)	ASTM D3080
Volatility (% Loss)	0.60 (max.)	ASTM D1203
Resistance to Soil Burial % change, max.:		ASTM D3083
Tensile Strength	±5	
Elongation at Break	±20	
Modulus at 100% Elongation	±20	
Hydrostatic Resistance (psi)	82(min.)	ASTM D751
Factory Seam Requirements*		
Bonded Seam Strength (factory seam, breaking factor lbs/inch width)	74	ASTM D3083

*Factory bonded seam strength is the responsibility of the fabricator.

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2.3 LABELING GEOMEMBRANE ROLLS OR PANELS:

2.3.1 Labels on each roll or factory panel will identify:

a. The thickness of the material

b. The length and width of the roll or factory panel

c. The Manufacturer

d. Directions to unroll the material

e. Product identification

f. Lot number

g. Roll or field panel number

PART 3 - EXECUTION

3.1 GEOMEMBRANE INSTALLATION:

3.1.1 Related Earthwork:

3.1.1.1 Geomembrane liners will be installed on a firm, smooth, soil surface. The final soil surface will be relatively free from stones greater than 1", clumps, sticks or any other material that may puncture the membrane. Special care should be taken to maintain the prepared soil surface. No geomembrane will be placed onto an area which has become softened by precipitation. The Contractor shall certify in writing that the final soil surface on which the membranes are to be installed is acceptable.

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POLYVINYL CHLORIDE (PVC) LINING MATERIAL

3.2 GEOMEMBRANE DEPLOYMENT:

3.2.1 Placement of the geomembrane panels will be according to the approved location and position plan provided by the Installer. Placement will follow all instructions on the boxes or wrapping containing the geomembrane materials which describe the proper methods of unrolling, and/or unfolding rolls and panels. The field panel installation schedule is left to the preference of the Contractor, but the method chosen must minimize erosion of the underlying soil liner and the potential for wind damage.

3.2.2 The method of placement must ensure that:

3.2.2.1 No equipment used will damage the geomembrane by handling, trafficking, leakage of hydrocarbons, or other means.

3.2.2.2 No personnel working on the geomembrane will smoke, wear damaging shoes, or engage in other activities which could damage the geomembrane.

3.2.2.3 The prepared surface underlying the geomembrane must not be allowed to deteriorate after acceptance and must remain acceptable up to the time of geomembrane placement.

3.2.2.4 Adequate temporary loading and/or anchoring (e.g., sand bags, tires), not likely to damage the geomembrane, will be placed to prevent uplift by wind (in case of high winds, continuous loading is recommended along edges of panels to minimize risk of wind flow under the panels).

3.2.2.5 Direct contact with the geomembrane will be minimized; i.e., the geomembrane in excessively high traffic areas will be protected by geotextiles, extra geomembrane, or other suitable materials.

3.2.3 Any damage to the geomembrane panels or portions of the panels as a result of placement must be replaced or repaired at no cost to the Owner. The decision to replace or repair any panel or portions of panels will be made by the Engineer.

3.2.4 The Engineer will assign an "identification number" to each geomembrane panel placed. This number will be consistent with the number used by the Installer. The number system used will be simple, logical and identify the relative location in the field.

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3.3 SEAMING DURING INSTALLATION:

3.3.1 At liner penetrations and corners the number of seams will be minimized.

3.3.2 The area of the geomembrane to be seamed shall be cleaned and prepared according to the procedures specified by the material manufacturer. Care will be taken to eliminate or minimize the number of wrinkles and "fishmouths" resulting from seam orientation.

3.3.3 Seaming will not proceed in extreme heat (above 105°F) or extreme cold (below 32°F) conditions. The specified temperature range is for ambient air. In addition, seaming will not be conducted when geomembrane material is wet from precipitation, dew, fog, etc., or during periods when winds are in excess of 20 mph.

3.3.4 Seams will have an overlap beyond the weld large enough to perform destructive peel tests, but not exceed 5 inches. Any material used to temporarily bond adjacent geomembrane panels must not damage or leave the geomembrane altered in any manner.

3.3.5 Trial seams will be made of excess geomembrane material. A 1-foot by 3-foot seamed liner sample will be fabricated with the seam running down the 3-foot length in the center of the sample. Such trial seaming will be conducted prior to the start of each seaming succession (i.e. at the start of each morning and afternoon session). From each trial seam, two sample field test specimens will be taken. The test specimens will be 1-inch by 12-inch strips cut perpendicular to the trial seam. Pass and fail criteria will be based on an approved curing chart submitted by the Contractor to the Engineer. Upon initial failure, a second trial seam will be made; if both test specimens do not pass, then the seaming method will be reviewed and seamer will not perform any seaming operations until the deficiencies are corrected and two successive passing trial seam test specimens are produced. Completed trial seam samples cannot be used as portions of a second sample and must be discarded.

3.3.6 The Contractor shall use a prefabricated PVC boot for all liner penetrations by pipes.

3.3.7 Acceptable seaming method for PVC is lap jointing with an approved cold applied solvent or hot wedge welding (single or double wedge). Lap joints shall be formed by lapping 6 inch minimum of the PVC material. Actual welded surface will be a minimum of 4 inches.

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3.4 SEAM TESTING:

3.4.1 Nondestructive Testing:

3.4.1.1 The Contractor shall perform nondestructive seam testing on 100 percent of all field seams (including patches and boots) under the direct supervision of the Engineer. The Contractor shall test seams as directed in Paragraph 3.4.1.2 or 3.4.1.3.

3.4.1.2 Air Channel Test: The air channel test shall be used on all seams constructed using a double hot wedge welder (except for double wedge seams welded transversely across factory fabricated panels). The following procedures will be followed:

a. Determine the area to be tested, and seal off two ends of the continuous air channel.

b. Insert an air pressure needle into the air channel by penetrating the upper geomembrane.

c. Connect a pressure gage to the needle.

d. Connect an air pump to the pressure gage. The air pump should be capable of generating and sustaining an air pressure of 50 psi.

e. Inflate the air channel to a pressure of between 20 and 30 psi, and disconnect the air pump.

f. Sustain the inflated pressure for 2 minutes, and observe any pressure drop. If more than a 4 psi pressure loss occurs, the tested seam will be subject to repair.

g. testing is to be conducted under the direct observation of the Engineer

3.4.1.3 Air Lance Testing: Air lance testing will be used on all seams not air-channel tested (including patches and boots). The procedure for this method is outlined below:

a. a testing device capable of producing a jet of air at approximately 50 psi through a 3/16-inch diameter orifice will be used as the lance

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b. place the lance beneath the overlap

c. move the lance slowly along the solvent bond seam

d. observe the seam for localized fluttering or inflation

e. mark the seam for repair where fluttering or inflation occurs

f. testing is to be conducted under the direct observation of the Engineer

3.4.2 Destructive Testing:

3.4.2.1 In addition to non-destructive seam testing, destructive testing will also be conducted. Test samples will be taken every 500 feet of seam length or more frequently at the discretion of the Engineer. Sample location and size will also be selected by the Engineer. The sample size (12x44 inches) will be large enough to produce three sets of test specimens for the following tests:

a. seam shear strength (ASTM D4437)

b. peel adhesion (ASTM D4437)

3.4.2.2 Ten specimens will compose a set. Half of these will be tested for peel and the other half for shear strength. Each specimen will be 1 inch wide and 12 inches long with the field seam at the center of the specimen. The 44-inch sample length will first be cut at the ends to produce two field peel test specimens. The remaining 42 inches will be divided into thirds and submitted to the Installer for laboratory testing, an independent testing laboratory and the Owner for storage and future reference. The independent laboratory testing shall be performed at the Contractor's expense.

3.4.2.3 Test specimens will be considered passing if the minimum values below are met or exceeded for four of the five test specimens tested by the independent laboratory. All acceptable seams will lie between two locations where samples have passed.

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Field Seam Properties	Specification Limit PVC	Test Method
Thickness (mils)	40	ASTM D5199
Shear Strength at Yield (lb/in width)	74 (80% of Roll Strength)	ASTM D4437
Peel Adhesion	10 lbs/in width or FTB*	ASTM D4437

*FTB = Film tearing bond.

3.4.2.4 If a sample fails destructive testing, the Installer must ensure that: the seam is reconstructed between the location of the sample which failed and the location of the next acceptable sample; or the bonding path is retraced to an intermediate location at least ten feet from the location of the sample which failed the test, and a second sample is cut from the liner for additional testing. If this second test sample passes, the seam must be then reconstructed between the location of the second test and the original sampled location. If the second sample fails, the process must be repeated.

3.4.2.5 All holes created by the Installer cutting out destructive samples will be patched immediately with an oval patch of the same material bonded to the membrane using solvent-cement (PVC). All solvent-cement seams will cure for a minimum of 24 hours prior to destructive testing. The patch seams will be tested using an air lance and the procedures described above. Work will not proceed with materials covering the geomembrane until passing results of destructive testing have been achieved.

3.5 LINER REPAIR:

3.5.1 All imperfections, flaws, construction damage, destructive and nondestructive seam failures will be repaired by the Contractor at no additional expense to the Owner. The appropriate methods of repair are listed below:

a. patching, used to repair holes, tears, undispersed raw materials and contamination by foreign matter

b. capping, used to repair pinholes or other minor flaws

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c. topping, used to repair areas of large length of failed seams or of inadequate seams, which have an exposed edge

d. removing bad seam and replacing with a strip of new material solvent welded into place.

3.5.2 The actual method used will be agreed upon by the Engineer, Installer and Contractor. All defects that are patched will have the patch overlap the edge of the defect by a minimum of 6 inches. The patch will be cut with rounded edges (no corners). In the case of a large patch, the underlying geomembrane will be cut appropriately to avoid trapping gases and moisture between the two sheets.

3.5.3 During repair, the Engineer must be present and observe the procedures as well as all nondestructive testing of the repair seams. If the repair is very large, destructive testing may be required at the discretion of the Engineer. Any failure of repaired seams will require that the patch be removed, replaced and retested until passing results are achieved.

3.6 CONSTRUCTION MATERIAL PLACEMENT:

3.6.1 All granular materials placed above geomembrane shall be spread with a minimum initial lift thickness of 12 inches using tracked equipment with ground pressures not exceeding 7 pounds per square inch. No construction equipment will be driven directly on the geomembrane. All rubber-tired vehicles will access construction above geomembranes from temporary access roads built a minimum of 3 feet above the liner. Extra geotextile or geomembrane layers shall be placed on or beneath all access roads or high trafficked areas. Any placement operation which results in damage to the underlying geomembrane, or in the opinion of the Engineer, has the potential of damaging the underlying geomembrane, shall immediately cease and be modified to prevent such damage.

3.6.2 Placement of overlying cover soil shall be performed in a systematic manner in accordance with this Section and Section 02226. Cover soil must be placed using vertical placement techniques. No horizontal pushing of the initial soil lift above the geomembrane will be allowed.

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3.7 POST-CONSTRUCTION:

3.7.1 The Installer of the geomembrane materials will prepare and the Contractor shall submit, to the Engineer, record drawings illustrating the following information:

a. dimensions of all geomembrane field panels

b. panel locations referenced to the Contract Drawing plans

c. identify all field seams and panels with the appropriate number or code

d. location of all patches, repairs and destructive testing samples

e. warranties

PART 4 - MEASUREMENT & PAYMENT

4.1 MEASUREMENT - POLYVINYL CHLORIDE (PVC) LINING MATERIAL:

4.1.1 Measurement of the quantity of Polyvinyl Chloride (PVC) Lining Material allowed for payment shall be based on the number of square feet placed to the nearest one foot of lining material placed in accordance with the Specifications, Drawings or as approved by the Engineer.

4.2 PAYMENT - POLYVINYL CHLORIDE (PVC) LINING MATERIAL:

4.2.1 For Polyvinyl Chloride (PVC) Lining Material, not included in other unit or lump sum price items, payment for Polyvinyl Chloride (PVC) Lining Material will be made at the applicable price stated in the Bid.

4.2.2 No payment will be made for Polyvinyl Chloride (PVC) Lining Material until all factory conformance test results, all field conformance tests results, and all field seaming quality assurance test results have been reviewed and approved by the Engineer.

END OF SECTION

SPECIFICATIONS

SECTION 13052

LANDFILL GAS VENTS

PART 1 - GENERAL

1.1 DESCRIPTION:

1.1.1 Under this Section, the Contractor shall furnish all labor, materials and equipment for Landfill Gas Vents, as shown on the Plans, as specified, and/or directed.

1.1.2 The work shall include but not necessarily be limited to:

- Excavation
- Schedule 80 PVC Gas Vent Pipe with top fitting and bird screens
- Perforated PVC Pipe as shown on Contract Drawings
- Type A Select Fill, Section 02226, or approved material
- Installation as shown on Contract Drawings

1.1.3 The Contractor shall maintain the installed gas vents free of any obstruction (cave-in, backfill) and damage during placement of the soil layers and until final acceptance of the work required by this Contract.

PART 2 - PRODUCTS

2.1 MATERIALS:

2.1.1 PVC pipe, fittings and miscellaneous related materials as specified in Section 02435.

2.1.2 Type A Select Fill as specified in Section 02226 or approved alternate material.

SECTION 13052

LANDFILL GAS VENTS

PART 3 - EXECUTION

3.1 LANDFILL GAS VENTS INSTALLATION:

3.1.1 Installation of the gas vent shall be completed as the layers for the final cap are placed.

3.1.2 After grading the in-place intermediate cover layer, excavation to install the gas vent shall be performed. A backhoe or power auger shall be used to excavate a minimum of 5 feet into the refuse. Excavation shall be in accordance with Section 02220.

3.1.3 The PVC pipe for the gas vent shall be centered in the excavation and backfilled with Type D Select Fill to the top of subgrade. A coupling shall be installed on the PVC pipe about even with the subgrade.

3.1.4 The remainder of the solid PVC pipe for the vent shall be attached to the coupling.

3.1.5 The geomembrane shall be placed on the Select Fill Type A layer in the configuration as shown on the Contract Drawings and as specified in Section 02595 "Polyvinyl Chloride (PVC) Lining Material."

PART 4 - MEASUREMENT & PAYMENT

4.1 MEASUREMENT - LANDFILL GAS VENTS:

4.1.1 Measurement for payment shall be based on the actual number of gas vents installed as shown on the Contract Drawings or as directed by the Engineer.

4.2 PAYMENT - LANDFILL GAS VENTS:

4.2.1 For Landfill Gas Vents, not included in other unit or lump sum price items, payment for Landfill Gas Vents will be made at the applicable price stated in the Bid.

END OF SECTION

APPENDIX E

SPECIFICATIONS FOR PHOTOGRAPHIC DOCUMENTATION

SPECIFICATION FOR PHOTOGRAPHIC DOCUMENTATION OF REMEDIAL CONSTRUCTION

VOLNEY LANDFILL REMEDIAL PROGRAM
VOLNEY, NEW YORK

Introduction

Barton & Loguidice, P.C. has prepared this specification as part of the preliminary (35%) design, in accordance with the approved Remedial Design (RD) Work Plan and the Statement of Work (SOW) for the Administrative Order on Consent (AOC) for the Source Control Operable Unit (OU-1) at the Volney Landfill. The 35% design is the first major deliverable in the RD phase at the Volney Landfill. The RD Work Plan was approved on February 1, 1999 and provides a summary of the preceding activities which resulted in the selected remedy, and subsequent modification by the Explanation of Significant Differences (ESD). The selected remedy, presented in the 1987 Record of Decision and modified by the 1997 ESD, includes supplemental capping of the landfill side slopes, continued leachate collection from the existing leachate collection system, intermittent groundwater extraction on an as-needed basis, off-site treatment of leachate and contaminated groundwater, and long-term monitoring.

This specification provides the procedures which will be used to prepare and maintain photographic documentation during the remedial construction.

Equipment

A conventional 35 mm camera will be kept at the site for documentation of construction activities. The camera will have adequate zoom features to allow for photographing panoramic views as well as detailed views of construction features. Several rolls of fresh film will be kept

on hand in the event unusual conditions are encountered and require documentation. Unless otherwise needed, photographs will be developed into standard photograph size pictures (approximately 6 inches by 5 inches). Exposed film rolls will be dropped off for development on a weekly basis.

Photograph Frequency

The intent of the photographic record is to be able document that construction activities were performed in accordance with the approved design and to document approved field changes, where necessary. The following table provides the anticipated frequency of photographic documentation:

Construction Activity	Photo Type	Frequency
Pre-construction	Panorama	Once
Site clearing/stripping	Panorama	Weekly
Site grading	Panorama	Weekly
Uncovering of existing top cap	Closeup (~10')	Daily
Placement of bedding layer(s)	Closeup	Daily
	Panorama	Weekly
Placement of sideslope cap	Closeup	Daily
	Panorama	Weekly
Welding of seams	Closeup	Daily
	Panorama	Weekly
Placement of cap cover layer(s)	Closeup	Daily
	Panorama	Weekly
Installation of drainage facilities	Closeup	Daily
	Panorama	Weekly
Seeding/vegetation placement	Closeup	Daily
	Panorama	Weekly
Site restoration	Panorama	Weekly
Waste exhumation (if performed)	Closeup	Daily
	Panorama	Weekly

Maintenance of Photographs

A log will be maintained by the on-site engineer which will be used to record the date and subject of each exposure. Upon receipt of developed photographs, the on-site engineer will compare the photographs to the log description, and transcribe the log information onto the back of the photograph, and add pertinent details, if necessary. Photographs will be stored in labeled photograph albums in chronological order.

APPENDIX F

DRAFT GROUNDWATER EXTRACTION CONTINGENCY PLAN

DRAFT GROUNDWATER EXTRACTION CONTINGENCY PLAN

VOLNEY LANDFILL REMEDIAL ACTION
VOLNEY LANDFILL - VOLNEY NY

Introduction

In August 1997, USEPA issued an Explanation of Significant Differences (ESD) for the Volney Landfill, which concluded "... that it would be more appropriate to collect the contaminated groundwater (in combination with the existing leachate collection system), on an as-needed-basis...to match the intermittent elevated contaminant concentrations...". This plan provides the mechanism for implementation of groundwater extraction as an element of the Remedial Action at the Volney Landfill.

Purpose and Goal of Groundwater Extraction

The remedy for the site was presented in the 1987 ROD and modified by the 1997 ESD. The remedy was selected and subsequently modified according to the National Contingency Plan (NCP). Consistent with the NCP, one of the goals of the Remedial Action at the Volney Landfill is to restore groundwater quality to its beneficial use in a reasonable timeframe. Groundwater extraction is not capable of achieving state/federal drinking water standards and/or to provide aquifer restoration as a stand-alone measure, as discussed below. Restoration of groundwater quality at the Volney Landfill will be the result of: 1) the design and installation of the landfill cap (which effectively eliminates leachate production); 2) the capacity for natural attenuation to reduce existing groundwater impacts (which will be evaluated as a task of the Contamination Pathways Remedial Investigation [CPRI]); and 3) contaminant mass removal from groundwater by pumpage on an as-needed basis.

The application of groundwater extraction has proven problematic for achieving groundwater restoration (i.e.- achieving state/federal drinking water standards), particularly for organic compounds with limited solubility (such as volatile organic compounds [VOCs]). There are a variety of natural chemical and physical processes which limit the effectiveness of groundwater extraction in achieving groundwater restoration, principally sorption and dispersion. Under groundwater pumpage conditions, contaminant concentrations may decline somewhat rapidly at first, in response to contaminant mass removal, but tend to level off (asymptotic) as the low ug/L (ppb) concentration range is reached and the sorption and dispersion processes become more dominant. At this point, groundwater extraction tends to be a highly inefficient means of achieving contaminant removal. The scientific literature contains many articles which describe water as a very inefficient "carrier" for VOCs in porous media. One of the more complete discussions of the difficulty in achieving groundwater restoration by groundwater pumpage is discussed in the 1993 USEPA memo entitled *Guidance for Evaluating the Technical Impracticability of Ground-Water Restoration.*

While groundwater extraction has generally proven ineffective in the low ug/L range (i.e. - achieving state/federal drinking water standards), it has proven effective in higher concentration ranges (typically in the high ug/L range into the lower mg/L [ppm] range) by containing/stabilizing contaminant plumes and providing limited contaminant mass removal. Contaminant plumes are not evident at the Volney Landfill, and are not anticipated based on historic data. However, in the event that monitoring data indicate intermittent groundwater contamination in the higher ug/L range, groundwater extraction, implemented as a relatively short-term measure, can assist in achieving the remedial goal by providing limited contaminant mass removal through focused pumpage.

The long-term groundwater monitoring plan (described in the Remedial Design Work Plan) has been developed to provide a means for effectively monitoring groundwater quality around the site, and to provide a mechanism which would trigger implementation of hydraulic containment in a timely manner, if warranted by groundwater quality data.

Summary of Leachate Generation Analyses

Leachate generation forecasts were provided in Table 5-15 of the DDER, which indicated that ten years after placement of the proposed PVC cap on the sideslopes, the amount of annual percolation from the waste (leachate) will have dropped from an initial 6.77 million gallons to roughly 880,000 gallons. In reviewing these forecasts, it is important to note that less than 1% of incident water infiltrates into the waste. Once the site is fully capped, leachate generation is largely the result of water in the waste and soil layers prior to capping. The majority of this water entered the waste when the site was operating. In summary, the initial moisture content of the waste dominates the leachate generation estimates.

Because of the difficulties in obtaining actual waste moisture content values, a default value was used in the forecasts, and as discussed above, the likelihood is that actual leachate generation will be less than that predicted by the HELP Model. While the predicted annual leachate volumes are important results to evaluate, it is also important to evaluate the rate of reduction of leachate. Carrying the leachate generation forecasts out an additional 10 years (20 years after capping), annual leachate generation would be 430,000 gallons; carrying out the forecast another 10 years (30 years after capping), leachate generation would be 280,000 gallons. These forecasts demonstrate a gradual unloading of water stored in the waste (drying out of the waste mass) over time.

Groundwater Monitoring/Trigger Concentrations

The groundwater monitoring program is described in the Remedial Design Work Plan. The initiation of hydraulic containment pumping will be based on groundwater quality data which indicates that groundwater exhibits the "...intermittent elevated contaminant concentrations ..." referred to in the ROD. A trigger mechanism has been developed (described in the next section) to help distinguish between routine variations in groundwater quality and elevated contaminant concentrations which are precursors to groundwater contaminant plume formation. The trigger

mechanism is meant to apply to the marginal cases (where contaminant concentrations vary in the same range as their respective drinking water standard), and the trigger mechanism can be circumvented when groundwater quality data clearly indicates elevated concentrations in one or more wells. The trigger values are not intended to act as, or imply, a groundwater cleanup criteria, but to help distinguish between cases where groundwater extraction can provide contaminant mass removal and cases where groundwater extraction will be ineffective.

Initially, TVOC will be used as the trigger parameter; other parameters (such as individual SVOCs or heavy metals) may be added to the trigger list based on future groundwater monitoring. The TVOC parameter will be used because a unique VOC has not been consistently identified in groundwater around the Volney Landfill, *i.e.* - different VOCs have been detected in groundwater at the site, but not in a consistent pattern or distribution. Data will be subject to QA/QC review prior to calculation of TVOC for each sampling event. The QA/QC review may result in the exclusion of persistent laboratory artifact compounds such as methylene chloride and acetone for a specific TVOC calculation.

Trigger Mechanism

As discussed above, the purpose of the trigger mechanism is to help distinguish between routine variations in groundwater quality and elevated contaminant concentrations which are precursors to groundwater contaminant plume formation. To allow for timely implementation of hydraulic control, the trigger mechanism will be bypassed in the event that groundwater quality data clearly indicate that formation of a groundwater plume is occurring. Examples of such a situation are provided below:

Contaminant concentrations are detected at two or more times their respective drinking water standard (if such a detection takes place, the well(s) will be re-sampled as soon as possible, with sample analysis on a quick turnaround basis).

A distinct contaminant concentration gradient becomes evident between adjacent monitoring wells.

By its nature, the trigger mechanism has a temporal component, which is the rationale for bypassing the trigger mechanism in non-marginal cases just described. Initiation of hydraulic containment pumping via the trigger mechanism at a particular monitoring well will require that two criteria be met, as follows:

- Trigger concentrations are exceeded on a sustained basis in the monitoring well
- Monitoring data demonstrates an upward trend in trigger constituent concentration in the well

These criteria are described in more detail below:

The trigger concentration(s) represent concentrations in groundwater samples which, if exceeded, initiate a series of activities possibly leading to the commencement of hydraulic containment pumping. If a trigger concentration is exceeded for two consecutive monitoring periods in a monitoring well, trend analysis (described later) will be conducted to determine whether the exceedences are indicative of an overall upward trend of the trigger constituent concentration in that well. If an upward trend is not evident, no further action will be taken unless subsequent data indicates that such a trend is evident. If an upward trend is evident, the monitoring well will be re-sampled as soon as feasible following data reporting, and the sample will be analyzed for the exceeded parameter, with sample analysis on a quick turnaround basis. If the re-analyzed concentration is below the trigger concentration, monitoring will resume according to the previous schedule. If the re-analyzed concentration still exceeds the trigger concentration, the monitoring well will be sampled on at least a monthly basis. Trend analysis will be conducted on the groundwater quality data from the monitoring well. This monitoring process will continue

until trend analysis indicates that a statistically upward trend is evident. At the time when the trend is evident and concentrations continue to exceed the primary trigger concentration, hydraulic containment pumping will be initiated.

Trend Analysis

Trend analysis will be conducted on data sets sorted by well and parameter. The Mann-Kendall test will be used for the trend analysis. The Mann-Kendall test is a non-parametric statistical test and is thus not dependant upon the data set following a normal distribution, nor is the Mann-Kendall test affected by missing values. Several examples of the use of the Mann-Kendall test are provided in Appendix F. These examples demonstrate the outcome of the test (initiate hydraulic control or continue to monitor water quality) as applied to hypothetical sets of quarterly data with TVOC concentrations in the range of 100 ug/L. Different statistical tests may be proposed in the future, based on a review of the monitoring results.

Trigger Concentrations

The TVOC trigger concentrations will be 100 ug/L. This value is the New York State Drinking Water Guidance Value (6NYCRR Part 702.16) for TVOC in groundwater effluent. The trigger concentration was in part developed based on an analysis of existing groundwater, surface water and leachate data from the landfill, which includes data generated by Oswego County, USEPA/NYSDEC contractors, and from the DDER. This pooled data provides a reliable range of concentrations of the three parameters detected at and around the landfill. The frequency of detection of these parameters in different concentration ranges is provided below:

Concentration (ug/L)	TVOC (ug/L)
Not Detected	1337
50	157
50-100	29
100-200	26
200	42

Initial Pumping

The ESD refers to "... ground-water extraction and treatment, on an as-needed basis (after initial pumping)...". The initial pumping phrase was included in the ESD based on the fact that two wells have contained TVOC concentrations in excess of the trigger concentration (VBW-8S and SP-13), and the presumption that one or more of these wells would contain TVOC in excess of the TVOC trigger concentration. Following the first round of groundwater monitoring, exceedences of the TVOC trigger concentration will be compared to historic data for the individual well. If appropriate, trend analysis will be conducted to determine whether initial pumping needs to be undertaken.

Implementation, Operation, Monitoring and Maintenance of Hydraulic Containment System

This section describes the procedures which will be used to implement, operate, monitor and maintain the hydraulic containment system, should the need be triggered.

Description of Hydraulic Containment System

The DDER provided an evaluation of alternatives for capping and for complete hydraulic containment of leachate and groundwater at the landfill, including the use of groundwater extraction wells. The results of the evaluation of extraction wells to provide full hydraulic containment are summarized below:

Perimeter Area	Number of Extraction Wells	Pumping Rate Per Well (gallons per minute)
Southwest	2	5
North/Northeast	8	0.5
South/Southeast	14	2

If pumpage becomes necessary by the mechanisms described in this plan, a somewhat different approach would be taken than proposed in the DDER, as the intent would be to provide focused, and likely temporary, means of controlling leachate and impacted groundwater. On the northern half of the landfill, additional containment may not be necessary due to the presence of the northern leachate collection system; the DDER indicated appreciable bypass of this system such that upgrading the system may be necessary. In the event that hydraulic containment is necessary prior to the installation of the cap and leachate bypass cannot be controlled by ugrading the leachate collection system, extraction wells would be employed. For the southern portion of the landfill, extraction well placement will be in the areas of greatest saturated thickness (southeast and southwest of the landfill) rather than trying to encapsulate or surround the site with extraction wells. Pumpage, at a rate greater than proposed in the DDER (owing to greater saturated thickness), would be focused in these areas to provide the broadest hydraulic influence. This approach is already developed for the southwest area, as shown above. For the southeast area, it may be possible to install two to three extraction wells at the base of the gravel pit, east

of Silk Road; utilizing high pumpage rates to achieve the desired hydraulic control. The DDER evaluation (summarized above) assumed an average saturated thickness of the upper overburden unit of 20 feet along the south/southeast side; however, at the proposed location, the saturated thickness is 30-40 feet, and consequently, higher pumpage rates may be achieved.

Pumping and Conveyance System for Pumped Water

The pumping system will consist of permanent submersible pumps, either electrically or pneumatically powered. Depending on whether the pumped water is directly loaded into tankers or transferred to new storage tanks, the leachate conveyance system will differ. A discussion of the alternatives for managing pumped water is provided in a following section. For direct tanker loading, there will be a prepared area near the extraction wells for staging the tanker. The tanker will be connected to the wellhead by flexible hose equipped with quick disconnect fittings. Once connections are made, the pump(s) will be activated; pumping will continue under the supervision of an operator until the tanker is full. At that point, an isolation valve will be activated, and the pump will be deactivated. Water remaining in the hose will be drained back into the well. The staging area will be lined with geomembrane with an overlying protective fabric, and topped with rounded gravel. Accidental releases will be contained within the staging area and pumped into the tanker.

If a system of transfer to new storage tanks is implemented, the pumping systems will be connected to double-walled piping installed on top of the existing cap, leading to the new storage tank. The pipelines will be insulated for winter operation. Pumps will likely be manually controlled, unless operating conditions dictate that automatic controls are appropriate.

Flow Control

Each extraction well will be fitted with a rotary type flow meter to record and control pumpage. Pumpage will be controlled through the use of an overflow system to avoid filling the new storage tanks within one foot of the top.

Containment Options for Pumped Water

Depending on the pumping rates which are ultimately selected, there are two basic options for containing the pumped water: direct tanker loading or the use of new storage construction. The volume of storage required will be dependent on the magnitude of the impacted area, as well as the rate of groundwater extraction.

If direct tanker loading is employed, water will be pumped directly from the extraction wells into tankers, then directly transported for disposal. As described earlier, there will be a prepared staging area for tankers while they are being filled; this area will be capable of containing accidental releases. A spill prevention plan will be developed to minimize the possibility of overfills. The design for the tanker staging area will be prepared during the RD.

The existing leachate tank will continue to store leachate which is conveyed through the in-place collection system and from groundwater pumpage. If new storage tanks are constructed, pumped water will be conveyed to the tank(s) from the extraction wells by double-walled piping installed on top of the existing cap.

Disposal Options for Pumped Water

Removal and disposal of leachate/groundwater will be performed in accordance with the applicable sections of 40 CFR Parts 262, 263 and 268, as well as 6 NYCRR Parts 360, and 370-373.

Oswego County has been disposing of leachate collected from the northern portion of the site as non-hazardous waste at in-state municipal sewage treatment facilities on a batch basis, with USEPA approval. It is anticipated that this practice will continue, regardless of which containment option is employed. If the direct tanker loading method is employed, loads will be sampled and analyzed (with an expedited laboratory turnaround) prior to shipment.

In the event that leachate quality changes in the future such that non-hazardous disposal is not allowed, the pumped water will be shipped to a permitted treatment facility; facilities in western New York and New Jersey have previously been used for this purpose. Another option is to pre-treat the pumped water on-site and then ship the treated water off-site for disposal as a non-hazardous waste. Pre-treatment would likely be by precipitation.

Operation and Maintenance

To ensure that the system is operated and maintained properly, an operation and maintenance (O&M) manual will be developed. The manual will describe the O&M procedures and provide for an operator training program. Operators will receive an initial briefing on system operation and then have periodic refresher training. Additionally, spill prevention and contingency plans will be prepared, and operators will be thoroughly familiar with emergency response procedures.

If system operation is triggered, a trained operator will be on-site daily to operate, maintain and monitor the system. In the event that long-term operation of the system becomes necessary, automatic controls will be designed and installed.

The decision to use pneumatic or electrical pumps will be dictated by how many wells would need to be pumped and at which locations, and possibly due to landfill gas considerations (whether explosion-proof equipment is necessary). At least one spare pump will be kept on-site. Pumps will be utilized quarterly as part of the groundwater monitoring program; at this time valves will also be operated to verify functionality.

Effectiveness Monitoring

An effectiveness monitoring program will be employed to determine the efficiency of the pumpage in mitigating the observed impact to groundwater quality and to provide a basis for termination of pumpage based on improvements in groundwater quality. The effectiveness monitoring program will initially employ the same analytical parameters as the groundwater monitoring program; the analytical parameters may be modified depending upon the project needs at that time, with USEPA concurrence.

It is anticipated that pumped groundwater will be sampled and analyzed on roughly a weekly basis right after the implementation of pumpage. Water levels in monitoring wells proximate to the impacted area will be measured to demonstrate hydraulic control in the area. Groundwater samples will be collected from selected wells in the impacted area and analyzed on a monthly basis for the first three months; thereafter, the selected wells will be included in the quarterly monitoring program.

Pumpage Termination

Pumpage will be terminated when it can be demonstrated that contaminant concentrations are below their primary respective trigger levels or that contaminant concentrations have declined but reached an asymptotic relationship with time. The achievement of an asymptotic condition indicates that the pumpage has been successful in providing contaminant mass removal, but further contaminant removal is limited by hydrogeologic/ geochemical factors such as sorption/desorption and diffusion. In this general type of case, the achievement of groundwater standards is likely infeasible (USEPA, 1993). Modifications to the pumpage program will be evaluated prior to discontinuing pumpage if standards are not achieved.

If an asymptotic demonstration becomes necessary, an appropriate statistical method will be proposed and mutually agreed upon at that time. Depending upon the trends in groundwater quality data, monitoring frequency may be increased from quarterly to monthly for the purpose of facilitating the termination of pumpage.

APPENDIX G

SITE SECURITY PLAN

SITE SECURITY PLAN

VOLNEY LANDFILL

SILK ROAD

VOLNEY, NEW YORK

FEBRUARY, 1999

PREPARED FOR:

COUNTY OF OSWEGO

(SUPERVISING CONTRACTOR)

PREPARED BY:

BARTON & LOGUIDICE, P.C.

CONSULTING ENGINEERS

290 ELWOOD DAVIS ROAD

BOX 3107

SYRACUSE, NEW YORK 13220

1.0 INTRODUCTION

The Security Plan has been prepared to describe the security measures which will be implemented during remedial action construction activities at the Volney Landfill site. The County of Oswego is serving as the Supervising Contractor for the Remedial Action (RA), and Barton & Loguidice, P.C. (B&L) will be providing engineering design and oversight services for the RA.

The landfill property and many of the surrounding properties are owned by the County of Oswego. The County, through its Highway and Health Departments, currently coordinate site security. These roles will continue through the performance of the RA.

- Maintain and submit records and reports required to keep management and Tyree informed of the status and effectiveness of the guard force.
- Coordinate security and emergency services with local agencies.
- Ensure that access to the site is restricted to authorized personnel only.

2.0 SITE SECURITY

2.1 Fencing

Primary security for the landfill site is provided by the perimeter chain-link fence which encloses the landfill site; there are a limited number of access gates (which are chained and locked), with the primary access gate on the east (Silk Road) side of the site. Prior to the commencement of the Remedial Action, the length of the fence will be inspected; breaches in the fence will be noted and repaired.

2.2 Site Access

The primary access gate will be the one located along Silk Road. It is anticipated that one or more project trailers will be located just inside this gate, and the area just inside the gate will serve as a material staging point. This gate will be kept unlocked during working hours and will be locked at other times. Personnel entering the site will be required to sign in with the Site Project Manager (not yet designated) or his designee. In the event that delivery of materials requires access through another gate, the Site Project Manager will coordinate the delivery.

2.3 Authorized Personnel List

The Site Project Manager will maintain a list of persons authorized for site entry. Initially, this list will include personnel from Oswego County, B&L, USEPA and its contractors, and NYSDEC and its contractors. This list will be expanded as necessary, with the Site Project Manager and the USEPA Project Manager being responsible for authorizing list additions.

2.4 Site Entry

Entry to the working areas of the site will be restricted by the requirements of the Health and Safety Plan. Visitors will be escorted by the Site Project Manager or his designee. Visitors will not be permitted to enter the active hazardous work areas on-site without the expressed permission of the Site Project Manager.

2.5 Vehicle Control

Vehicles entering through the primary gate will be identified upon entry. Only authorized personnel and vehicles will be allowed to enter the site. Use of personal vehicles will be restricted to the Support Zone.

2.6 Visitor Log

Visitors will be required to log into the Visitors/Vendors Sign In/Out Log.

2.7 Incidents Log and Daily Reports

The following is a list of the anticipated security documentation:

a. Employee Sign In/Out Log Sheet (County, B&L personnel);
b. Employee Sign In/Our Log Sheet (USEPA, NYSDEC personnel);
c. Visitors/Vendors Sign In/Out Log Sheet; and
d. Unusual Incident/Occurrence Report (unauthorized entry, signs of vandalism, any event involving local fire department, law enforcement, or city officials).

2.8 Emergencies

Emergency situations will be managed per the Health and Safety Plan.

3.0 SECURITY INCIDENT PROCEDURES

3.1 Unauthorized Person(s) Being Found on the Site

In the event that an unauthorized person is found on the site, an attempt will be made to stop and interrogate the suspected intruder, without using force. If no resistance or belligerence is encountered, the intruder will be informed that the site is a hazardous area, unauthorized entry is prohibited, cautioned not to return and escorted off the site. The Site Project Manager or his designee will attempt to obtain name, address, and Social Security number of the intruder for documentation in the Security Log and Incident Report. If the intruder attempts to flee or becomes belligerent, local law enforcement agency will be notified for assistance.

3.2 Unauthorized Person(s) Attempting to Gain Access to the Site

In the event that an unauthorized person attempts to enter the site, an attempt will be made to stop and interrogate the person(s) attempting to gain unauthorized entry. If the person(s) flee(s) and do(es) not enter the site, the incident will be reported to the local police and the incident will be recorded.

If the potential intruder(s) does not flee, the intruder(s) will be informed of the nature of the site and that entry is not authorized. The Site Project Manager or his designee will attempt to obtain name, address, and Social Security number of the intruder for documentation in the Security Log and Incident Report. If the intruder continues to make an unauthorized entry, the local police will be notified and assistance requested. The incident will then be handled as an unauthorized person being found on the site.

3.3 Vandalism

Vandalism will be reported to the local police. If possible, any person caught in the act of vandalism will be detained until the local police arrive. If the person flees, the local police will be notified and given as many details as possible to assist them in identifying and apprehending the person observed vandalizing the site. All acts of vandalism will be properly recorded in the Security Log, investigated as thoroughly as possible, and reported to the Site Project Manager and evidence of vandalism will be reported to the local police.

File on eDOCs ✓ Yes _____ No

Site Name Volney

Site No. 738083

County Oswego

Town Volney

Foilable ✓ Yes _____ No

File Name 1999-04-23 Preliminary 35 Percent Design

Scanned & eDOC _____