Cover Certification Report

Positive Start Realty, Inc.
Tax Map 9-1-6
204 Merrimac Street
Woburn, Massachusetts 01801

June 24, 2008

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1.0 INTRODUCTION

The Industri-Plex Site Remedial Trust (Remedial Trust) is required by the Consent Decree entered on April 24, 1989 by the United States District Court for the District of Massachusetts in the matter styled *United States v. Stauffer Chemical Company et al.*, Civil Action No. 89-0195-MC, and *Commonwealth of Massachusetts v. Stauffer Chemical Company et al.*, Civil Action No. 89-0196-MC, and recorded at the Middlesex South Registry of Deeds in Book 19837, Page 476 (Consent Decree) to fund and administer the obligations of the Consent Decree. At the request of the Remedial Trust, Roux Associates, Inc. (Roux Associates) has prepared this property-specific Final Cover Certification Report (Cover Certification Report) in compliance with the Consent Decree requirements. This Cover Certification Report documents completion of a portion of the Remedial Action for soil, sediments, and air at the Industri-Plex Superfund Site (Industri-Plex Site), Woburn, Massachusetts. Site wide completion of the Remedial Action for soil, sediments, and air is documented in the Master Cover Certification Report for the Industri-Plex Site. The specific property addressed in this report is owned by Positive Start Realty, Inc. (Tax Map 9-1-6) and located at 204 Merrimac Street in Woburn, Massachusetts. Construction of the Remedial Action for soil, sediment, and air was completed on June 28, 1996. Changes to the cover at this property may have been made since that date. Approved changes to the cover are documented in the Administrative Record for the Industri-Plex Site.

In accordance with the Consent Decree and the Contract Documents for the Remedial Action, a certification report must be prepared by a registered professional engineer certifying that all remedial activities have been completed in full satisfaction of the requirements of the Consent Decree. As defined by the United States Environmental Protection Agency (EPA), (Federal Register, July 26, 1982) certification does not constitute a guarantee or warranty, but a "rendering of a professional opinion concerning compliance with a requirement of the regulations by a qualified professional in the field."

1.1 Site Description and History

The Industri-Plex Site is a 245 (+/-) acre area, located about 10 miles northwest of Boston, Massachusetts in the north part of Woburn, within the Aberjona River Valley. The Site is bounded on the east side by Interstate 93, and Interstate 95/State Route 128 is located about one half mile south of the Site. The Boston Edison Power Company right-of-way No. 9 is the southwest boundary of the Site. The Massachusetts Bay Transportation Authority (MBTA)

railway transects roughly the western third of the Site in a northwest-southeast direction. The Industri-Plex Site was surveyed by SAIC Engineering, Inc. and Liu Aerial Surveys in 1990 and 1991.

Since the mid-1800s, the Industri-Plex Site has been used primarily by companies producing chemicals for textile, leather, and paper. Chemical manufacturing operations occurred at the Site from 1853 to 1931, producing sulfuric acid and related chemicals, arsenic insecticides, acetic acid, dry colors, phenol, benzene, picric acid, toluene and trinitrotoluene (TNT). By 1929, the Merrimac Chemical Company, which occupied the Industri-Plex Site, had become one of the leading producers of insecticides and other chemicals in the United States. The Merrimac Chemical Company plant included 90 buildings on 417 acres, many of which were within the current Industri-Plex Site. Early operations included disposal of wastes in pits or low-lying wetlands. Liquid wastes were discharged into streams and later sewers. As a result, heavy metal wastes from the chemical operations contaminated Site soils and wetland sediments.

From 1934 to 1969, the property was used by several companies to manufacture glues and gelatins from animal hides. Raw, salted or limed hides, hide fleshings, or chrome tanned leather scraps from cattle, hogs, sheep or other animals were used to manufacture glue by extracting a protein called collagen from animal tissues or bones. Animal hide waste products from the rendering process were disposed of in mounds or hide piles on-Site. A developer purchased the plant property in the early 1970s intending to build a complex of industrial buildings (hence Industri-Plex) and began grading operations. During hide pile excavation, noxious gases and odors, attributable to the decomposing hide wastes, were released. The distinctive odor became known as the "Woburn odor." Complaints from local residents and encroachment on wetland areas stopped further development of the Site.

In 1981, the EPA proposed the Industri-Plex Site for the National Priorities List (NPL), also known as Superfund. The Industri-Plex Site was finalized on the NPL in 1983. In May 1982, EPA and the Massachusetts Department of Environmental Quality Engineering [DEQE – currently known as the Massachusetts Department of Environmental Protection (MassDEP)] entered into a Consent Order with Stauffer Chemical Company to undertake a Remedial Investigation/Feasibility Study (RI/FS). In April 1985, Phase II of the RI/FS was completed. The Remedial Investigation identified arsenic, lead, and chromium in Site soils and wetland

sediments as well as impacts to the ground water and odors due to hydrogen sulfide and methyl mercaptans emitted from the hide piles. Abandoned buildings and waste lagoons were also present on the Site. Based on the RI/FS, EPA, along with MassDEP, established a Record of Decision (ROD) in 1986 for the first phase of the cleanup at the Industri-Plex Site (known as Operable Unit 1, OU-1), which included a protective cover over more than 100 acres of soil contaminated with heavy metals and animal wastes, a gas collection and treatment system, institutional controls, an interim groundwater remedy, as well as further investigations of Site related contamination at and downstream of the Site to support a future second phase (known as Operable Unit 2, OU-2). The location of the protective cover is illustrated in **Attachment 1** and includes an impermeable cover for the gas collection and treatment system situated at what is known as the East Hide Pile.

Further details of the Industri-Plex Site history can be found in the 1986 Record of Decision.

In a 1989 Consent Decree between EPA, MassDEP and the current and former property owners, two Trusts were established which set in motion the remediation and reuse of the Industri-Plex Site. The Remedial Trust was formed to prepare and implement the remedy according to the ROD. The Industri-Plex Site Custodial Trust (Custodial Trust) was formed to hold, manage, and sell a portion of the Site.

Golder Associates, Inc. (Golder) was selected in 1989 by the Remedial Trust to design the remediation for the Industri-Plex Site. The remedial design included pre-design investigations of the soils, wetlands, air, and groundwater.

The pre-design investigations included sampling analysis and studies to determine the extent of contamination and, in accordance with the Consent Decree, to evaluate cover types. Designs were needed to prepare the ground surface for cover. The remedial design included:

1. Plans for the demolition or decommissioning of abandoned buildings, railroad tracks, underground utilities, a personnel tunnel, and over 120 existing observation wells and piezometers used during the preliminary investigation.

2. Plans for controlling odors, fugitive dusts, and surface water runoff during construction to prevent off-Site impacts.

3. Evaluation of, and considerations for the future stability of, the hide pile slopes.

4. Plans for collecting and treating waste gases in a Thermal Oxidation Unit.
5. Plans for dredging, remediating, and revitalizing streams and wetlands.

The remedial design for contaminated soils and air included both permeable (soil and geotextile) and impermeable (soil and geomembrane) covers. A permeable cover system was designed for 60 acres of upland soils and three hide piles (known as the West, East-Central and South Hide Piles) contaminated with high concentrations of heavy metals and decomposing organic wastes. The permeable cover included a geotextile base to maintain separation between contaminated soils and clean cover material, a clean grading fill, and topsoil with vegetation. An impermeable cover was designed for a fourth hide pile (known as the East Hide Pile) which was approximately four acres in size and an active odor source. The impermeable cover included a high permeability gas collection layer, geomembrane, cover grading fill, topsoil, and vegetation. An active gas collection system was designed to collect gases trapped by the impermeable cover and convey the gases to a Thermal Oxidation Unit for treatment. The permeable cover system for the Site was further divided into two categories: "Engineered Cover"; and "Equivalent Cover". The Engineered Cover was designed and constructed by the Industri-Plex Site Remedial Trust as part of the response activities at the Site to prevent exposure to contaminated soil, and may be comprised of one or more of the following materials: geotextile, geomembrane, soil, gravel, bituminous concrete and/or asphalt. The Equivalent Cover represents existing structures serving as an adequate permeable cover. Equivalent Cover, although not designed as part of the Engineered Cover, functions to prevent exposure to contaminated soil, and may be comprised of one or more of the following ground covering structures or features, or portions of such structures or features: buildings; foundations; slabs; paved driveways, walkways, parking lots and/or roads; or other such ground covering structures or features. The location of Engineered and Equivalent Covers are illustrated in the Record Drawings.

Site remediation also required capping approximately five acres of contaminated streams and wetland sediment. Approximately seven acres of wetland enhancement, restoration, and creation were designed to compensate for wetland losses. Normandeau Associates, Inc. of Bedford, New Hampshire, was a key designer of the wetland mitigation plans.

A revised final (100%) Design Report was issued on May 8, 1992. Approval for the 100% Design Report was issued by EPA in consultation with the MassDEP on May 18, 1992. A Remedial Action Work Plan for Soil, Sediment and Air Remedy was issued on June 22, 1994, and approved by EPA, in consultation with MassDEP, on July 11, 1994.

1.2 Scope of the Remedial Action

The Remedial Action (RA) implemented the Remedial Design prepared by Golder and distributed for bidding in April 1992. The RA included covering metal-contaminated soils encountered over an approximately 100-acre portion of the 245-acre Site, a portion of which this property represents, is shown on Sheet A-64 of **Attachment 1**. This certification addresses the remedial action performed on the Positive Start Realty, Inc. Property (Tax Map 9-1-6). The remedial action on this property included a permeable cover of clean soil overlying a geotextile layer that was placed directly on prepared existing ground and fill soil. The remedial action also included a designed permeable asphalt cover overlying a geotextile that was placed directly on prepared existing ground or fill soil.

Work conducted between 1992 and December 1997 is addressed in this report.

This report includes the following information as it pertains to the remedial action performed on the Positive Start Realty, Inc. Property (Tax Map 9-1-6):

- Relevant portions of the Final 100% Design Report (**Appendix A**);
- The submittal log (**Appendix B**);
- Modification of specifications and plans (**Appendix C**);
- Results of Site air and surface water monitoring (**Appendix D**);
- Results of soil conformance and in-place material testing during the Remedial Action (**Appendix F, G**);
- Results of geosynthetics conformance material testing (**Appendix H**);
- Observations of subgrade preparation and geosynthetic installation (**Appendix I**); and
- Review of lines and grade control.

1.3 Report Format

This property-specific Cover Certification Report was derived from the Master Cover Certification Report documenting the completion of the soil, sediment and air remedies at the Site [excluding MassPort Authority property documented in the April 1998 Regional Transportation Center (RTC) Cover Certification Report]. Other property-specific Cover Certification Reports will be produced for the remaining properties at the Site. This property-specific Cover Certification Report presents a generic description of all work performed to complete the soil, sediment and air remedies, some of which are applicable to this property. For those portions/sections which are not relevant to this property-specific Cover Certification Report, those sections have be identified as "[Not Applicable to This Property]". The Master Cover Certification Report contains property-specific details and record drawings for 31 Tax Map lots at the Site including additional general and Woburn Roads/Right of Way information. Please reference the Master Cover Certification Report for this additional Site-wide information.

2.0 PROJECT PARTICIPANTS

In July of 1989 Golder was retained by the Remedial Trust to prepare the Remedial Design for the Site. The Consent Decree included the Remedial Design/Remedial Action Plan (RDAP). The RDAP required the preparation of Pre-Design Investigations and a Remedial Design. The design was executed in accordance with the requirements of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) as amended and re-authorized. From 1990 to 1992 Golder prepared Preliminary, Intermediate, Pre-Final and Final Design Reports in conformance with the RDAP.

The Remedial Trust entered into an agreement with Chemical Waste Management, Inc. Remediation Services Group of Princeton, New Jersey, (CWM, also Contractor) to perform the Remedial Action in accordance with the RDAP and the Remedial Design plans and specifications. The name of the Contractor changed January 1, 1993 when CWM was acquired by Rust Remedial Services Inc. (Rust), then again in May of 1995 when OHM acquired Rust. The name Chemical Waste Management was retained as the legal name of the Contractor throughout the period covered by this report.

Several subcontractors assisted the Contractor with specific tasks during the remedial work. A list of the subcontractors and the services they provided is presented below:

- Rust Environment and Infrastructure, formerly SEC Donohue Inc., of Burlington, Massachusetts provided engineering support;
- Earth Tech Inc. (Earth Tech), formerly HMM Associates Inc., of Concord, Massachusetts provided surveying services from 1992 to 1993 and Meridian Land Services Inc. (Meridian) of Milford, New Hampshire provided surveying services from 1993 to 2001. Both surveying companies collected field documentation that would be used to establish the as-built drawings for this report;
- Eastmont Environmental Inc. of Walpole, Massachusetts conducted perimeter air monitoring;
- Beattie Enterprises of Lancaster, New Hampshire assisted with clearing and grubbing the Site;
- Midway Paving of Chelmsford, MA or its subcontractors performed paving work for the Site during 1992-1995;
- HMM Associates, Inc. (HMM) of Concord, MA performed surface water monitoring services;

- Toxikon Laboratories, of Woburn, Massachusetts, and 21st Century Environmental Inc. of Bridgeport, New Jersey, assisted the Contractor with water and soil analytical testing; and,

- Reliable Fence Company of Woburn, Massachusetts installed chain link fence on the Site.

In accordance with the Consent Decree, EPA contracted with Halliburton NUS (HNUS) of Wilmington, Massachusetts to provide technical oversight. Representatives of EPA and the MassDEP met with the Remedial Trust monthly (approximately) throughout the Remedial Action to oversee the performance of the work. Minutes of the meetings were recorded but are not included in this report.

Golder provided engineering quality assurance (QA) for the Remedial Action from September 1992 through December 1995. QA included examining and testing materials and procedures to verify and assure the Remedial Trust that the construction conformed to the specifications and drawings. The Remedial Trust directed Golder to perform a geophysical investigation during May 1993. Golder Construction Services Inc. (Golder Construction) provided on-Site construction management services for the Remedial Trust from March 1995 through December 1995.

The Remedial Trust contracted with Professional Service Industries, Inc. (PSI) of Canton, Massachusetts to perform soil moisture/density testing of compacted soils, soil laboratory testing, and asphalt testing. PSI also performed on-Site QA testing from August 1993 through December 1995.

During 1995, the Remedial Trust contracted with *de maximis, inc.* to be the Site manager for the Remedial Trust and to coordinate the work conducted by Golder, CWM, and other contractors. In 1998, the Site manager role was assumed by Maverick Construction Management Services, Inc. (Maverick). Following remedial construction activities, the Remedial Trust contracted directly with Maverick to coordinate the documentation of as-built cover conditions, to manage construction activities necessary to bring the cover into compliance with the 100% Design and to prepare a Draft Cover Certification Report. In 2007, the Remedial Trust contracted with Roux Associates to complete the certification of the cover, including the completion of the draft and final Cover Certification Report.

3.0 CONSTRUCTION DOCUMENTS

RD/RA work performed for the Remedial Trust was completed according to the documents, plans, and specifications described in Sections 3.1 through 3.4.

3.1 Consent Decree

The Consent Decree (EPA, 1989) entered into between the Plaintiffs [*i.e.*, EPA and the MassDEP (Agencies)] and the Settlers defined the work that was to be undertaken at the Site. This definition is within the Consent Decree as well as the RDAP. The Consent Decree was based on the Record of Decision (ROD) for the Site (EPA, 1986). While the Consent Decree, the RDAP, and the ROD were consulted for the specific definition of the remedies to be implemented at the Site, the RDAP generalized the remedy and formed the basis for Golder's preparation of the Remedial Design Work Plan and ultimately the Final 100% Design Report. This certification applies to the Consent Decree but the primary component is the RDAP.

3.2 100% Design Report and Addenda

Golder developed the design and specifications and produced the "Final 100% Design Report, Part I" for the Industri-Plex Site (**Appendix A**), which was submitted to EPA and MassDEP in December 1991. This report applied to the remedy for soil, sediments, and air for the Site. Other Consent Decree requirements were deferred in accordance with the Agencies' instructions. The Agencies provided comments on the 100% Design Report, and responses to those comments were submitted April 3, 1992. A revised final 100% Design Report was issued April 3, 1992. The 100% Design was issued for bid April 25, 1992. The 100% Design Report was approved on May 18, 1992.

Subsequent addenda were issued for the 100% Design Report including the following:

- Addendum 1 issued May 1992 (EPA/MassDEP Approval March 11, 1993)
- Addendum 2 issued June 1992 (EPA/MassDEP Approval March 11, 1993)
- Addendum 3 issued May 14, 1993 (EPA/MassDEP Approval May 27, 1993)
- Addendum 3 revision 1 August 27, 1993 (EPA/MassDEP Approval September 10, 1993)
- Addendum 3 revision 2 October 18, 1993 (EPA/MassDEP Approval November 2, 1993)

On October 1, 1996, EPA approved an alternative permeable cover design for the RTC entitled

RTC Alternate Cover Design (Golder, 1996). Details of the construction and certification of the RTC Alternative Cover Design are presented in the RTC Cover Certification Report (Golder, 1998), which was approved by EPA in April 28, 1998.

3.3 Remedial Action Work Plan

According to the Consent Decree, the Remedial Action Work Plan (RAWP) was to be submitted to the Agencies within sixty (60) days after EPA and the Commonwealth received notification of the selected Remedial Action Contractor. The RAWP was prepared by the Remedial Action Contractor for the Remedial Trust to implement the Site remedy consistent with the approved design for each Site area. The Consent Decree required that the RAWP contain:

(1) A description of all the activities necessary to implement the Remedial Actions; and

(2) A timetable for the completion of all these activities, which shall also identify major and minor milestone events in the Remedial Action process. The schedule of significant events shall be consistent with Attachment D, [Project Schedule and Remedial Design/Action Milestones].

On August 18, 1992, prior to EPA's receipt, review, and acceptance of the RAWP, the Remedial Trust requested EPA and MassDEP approval of a preparatory, non-intrusive work plan for work that would begin in September. Submittal of this work plan allowed the Contractor to maximize the construction work season while awaiting final approval of the RAWP. An addendum to the August request was submitted to EPA and MassDEP on October 9, 1992 expanding the earlier request to include debris removal and non-intrusive work and above ground structure demolition. Both the August 18 and October 9 requests were tacitly approved by EPA in consultation with MassDEP. As required, the Remedial Trust submitted a RAWP to EPA on October 5, 1992 (Consent Decree Attachment, Section B, Subsection 3B).

An interim RAWP was submitted to EPA on October 22, 1992 with a request to begin work west of the MBTA railroad tracks. EPA in consultation with MassDEP provided comments on the interim RAWP on November 25, 1992 and a revised interim work plan was submitted to EPA in December 1992. With EPA and MassDEP concurrence, the Remedial Trust authorized the Contractor to begin remediation of the Site on December 2, 1992.

EPA's review of the original RAWP, in consultation with MassDEP, continued through the first half of 1993. EPA, in consultation with MassDEP, provided a conditional approval of the RAWP on March 11, 1993. The Agencies had two main concerns, 1) "the effect of the proposed

groundwater treatment changes on the 'Created Wetlands' (CW); and 2) the maintenance of air and stream water quality (ARARs) during the construction of the Remedy." EPA, after consultation with MassDEP, requested the following: 1) a revised CW design with a buffer and separation from the groundwater; and 2) implementation of a program for surface water sampling for contaminants.

Following the Remedial Trust's responses, EPA after consultation with MassDEP, presented an approval of the RAWP on May 19, 1993, contingent upon: 1) sampling of surface water to measure water quality; 2) resolution of water treatment design questions; 3) provision of a copy of the Contractor drilling and blasting plan; and 4) blasting plan and a requirement to cover all frequently used roads with a minimum of 4 inches of crushed stone. On July 2, 1993, EPA, after consultation with MassDEP and the Remedial Trust, reached an agreement on procedures for testing surface water and revisions to the CW.

Erosion and sediment control issues prompted further revisions to the RAWP. On March 1, 1994, a major revision to the RAWP was submitted to EPA. EPA, after consultation with MassDEP, approved the revision on July 11, 1994. Subsequent revisions were submitted and the latest version of the RAWP at the preparation of this report is August 21, 1995.

3.4 Health and Safety Plan

A Health and Safety Plan (HASP), prepared by CWM and dated August 1992, for the remediation of the Site was transmitted to EPA, after consultation with MassDEP, on September 2, 1992. The submission was made in fulfillment of the requirements to the Consent Decree Appendix I, Section F. The Remedial Trust was informed at the March 22, 1993 meeting that EPA, after consultation with MassDEP, would not approve the HASP but would provide comments. The HASP was revised on March 16, 1994; December 20, 1994; May 5, 1995; and June 29, 1995 largely to address changes to the Emergency Response Plan. In accordance with the Agencies' policy, the HASP was reviewed but not approved. The latest version of the HASP as of this report is June 29, 1995.

4.0 REMEDIAL DESIGN/ACTIONS

4.1 Soil Remedy

The soil remedy for the Site involved covering on-Site soils containing lead, arsenic, or chromium at or above the action levels established by the Consent Decree with permeable soil cover. An impermeable cover was designed for a four-acre hide pile (East Hide Pile) on Site, which was an active odor source. The Positive Start Realty, Inc. Property (Tax Map 9-1-6), however, does not include the East Hide Pile and therefore required only permeable soil and asphalt cover.

4.1.1 Soil Remedy - Consent Decree Requirements

The RDAP is included as Appendix I of the Consent Decree. Throughout the RDAP, the remedy for the Site is referred to as the "cap". However, the 100% Design refers to the Site remedy as the "cover". The term "cover" has been retained for the text of this report, excluding the RDAP.

Page 1 of the RDAP states the following:

"The remedial action for soils, sediments, and sludges contaminated with Hazardous Substances, other than those emitting odors (the East Hide Pile), shall include site grading, capping with a permeable soil cover, excavation, dredging, and/or consolidation for all areas containing Hazardous Substances at concentrations above established action levels (arsenic = 300 ppm, lead = 600 ppm, chromium = 1,000 ppm)...."

Furthermore the RDAP states, "Settlers shall design and implement remedial action for soils contaminated with Hazardous Substances above the action level for metals that shall consist of site grading and capping together with Institutional Controls. Areas already covered adequately by buildings, roadways, parking lots, or other ground covering features, would not receive cover material, instead allowing the structures themselves to act as the protective cap.

For small areas on-Site, such as the landscaped areas between buildings and parking lots, Settlers may propose location-specific alternatives to capping consisting of excavation of contaminated soil and consolidation on-site with similarly contaminated soils, or placement of a protective layer such as asphalt to cap the contaminated soils.

Settlers shall design and implement the remedial actions for contaminated soils in accordance with the following requirements:

(1) cap design and construction activities shall be in accordance with regulations and/or guidance on cap design for permeable covers as summarized in [RDAP] Attachment A provided that an alternative permeable cap design including a permeable synthetic fabric and a soil layer less than 30 inches in depth, may be used in all areas of the Site where Settlers demonstrate to EPA and the Commonwealth that the alternative cap design will perform as well as or better than the permeable cap design summarized in Attachment A."

Attachment A to the RDAP states that:

"Permeable covers shall be designed and constructed to include at a minimum the following:

A. A vegetated top layer which shall be:

    1. of a minimum thickness of six (6) inches;

    2. capable of supporting vegetation that minimizes erosion and minimizes continued maintenance;

    3. planted with a persistent species with roots that will not penetrate into the contaminated soils;

    4. designed and constructed with a top slope of between 3 percent and 5 percent after settling and subsidence or, if designed and constructed with less than 3 percent, a drainage plan to ensure that the ponding of surface water does not occur or, if designed and constructed with a slope of greater than 5 percent, an expected soil loss of less than 2 tons/acre/year using the USDA universal soil loss equation; and

    5. designed and constructed with a surface drainage system capable of conducting effective run-off across the cap.

B. A base layer that shall be:

    1. of a minimum thickness of twenty-four (24) inches of appropriate fill material; and

    2. designed and constructed to prevent clogging."

Two alternative permeable covers were designed as part of the remedy under the Consent Decree. The first alternative permeable cover design concept utilizing a 16-inch thick borrow cover overlaying a geotextile was developed in the Alternative Cover Design Report (Golder, 1989). This design was subsequently approved by the EPA and MassDEP in a letter dated September 11, 1989. The second alternative permeable cover design was the design to accommodate the RTC Alternative Cover (VHB/Golder, 1996). The EPA, in consultation with the MassDEP, approved the RTC Alternate Cover design in a letter dated October 1, 1996. The RTC Alternative Cover was properly constructed and documented in the RTC Cover Certification Report (Golder, 1998), approved by EPA on April 28, 1998.

4.2 Sediment Remedy [Not Applicable To This Property]

4.3 Air Remedy [Not Applicable To This Property]

5.0 SITE CONTROLS AND DOCUMENTATION

5.1 Survey Control

The Contractor utilized Meridian and Earth Tech to provide record survey documentation of the extent of cover, configuration of grading and general as-built conditions of the cover and any buried or concealed construction. The results of these record surveys are provided in **Attachment 1** (Sheets A-64 through A-68). The record drawings are based on the survey control provided in the 100% Design Report plans.

5.2 Construction Control

During the RA work, the Contractor was required by the project specifications to provide controls to maintain a safe work environment and protect the public health and safety. Such controls included air monitoring and surface water monitoring (**Appendix D**).

Air Monitoring

The objective of the ambient air monitoring program was to monitor total reduced sulfur (TRS) compounds and total suspended particulate (TSP) and inhalable particulate (PM10) as well as heavy metals (arsenic, lead and chromium) in TSP at fence line locations during remediation efforts.

Specification section 01562 - Dust Control of the 100% Design Report required the contractor to employ construction methods and means that would keep airborne particulates below the following action levels:

- PM10 particulates were to be limited to an annual average of less than 150 micrograms per cubic meter ($\mu g/m^3$) at Site monitoring points; and
- Respirable dust concentrations were limited to 90 $\mu g/m^3$ at Site monitoring points and 5,000 $\mu g/m^3$ in the worker's breathing zone.

Data gathered by dust monitoring devices was used to monitor metals in the particulates to ensure that they were below the following threshold limit values (TLVs) outlined in the American Council of Governmental and Industrial Hygienists:

Arsenic	Chromium	Lead
0.02 $\mu g/m^3$ (of air)	1.36 $\mu g/m^3$ (of air)	1.36 $\mu g/m^3$ (of air)

Appendix B to Volume 6 of the 100% Design Report provides a detailed Odor Control Plan which specifies that TRS compounds in air at the perimeter of the Site may not exceed 47 parts per billion (ppb).

Eastmount Environmental Inc. conducted ambient air quality testing, beginning in September 1992. The particulates and heavy metals were sampled at four perimeter monitoring locations. TRS sampling was conducted at seven perimeter monitoring locations. See **Appendix D.1** for a map indicating sampling points.

TSP and PM10 Sampling

TSP and PM10 samples were collected using Hi-Volume samplers. Each Hi-Volume sampler was programmed to sample at each of the four sample locations from midnight to midnight on six day intervals. In addition to the four sample locations, a duplicate TSP sampler was stationed at Location 4 and a duplicate PM10 sampler was stationed at Location 2. The duplicate TSP sample was also analyzed for metals (arsenic, chromium, and lead).

Eastmount Environmental prepared Hi-Volume Sampling Summary reports. The Summary of Hi-Volume Results tables from those reports issued for periods during performance of work on the RA are included in **Appendix D.1**. Analytical results showed levels of TSP, PM10, and metals below the action levels.

TRS Sampling

The ambient TRS sampling was conducted using a Photovac 10S Plus portable gas chromatograph capable of measuring odorous sulfur compounds in the low part per billion range. Ambient TRS sampling was conducted twice a week from the beginning of the sampling program up until December 1992. After that, the sampling frequency was reduced to once every six days.

Eastmount Environmental prepared Ambient Air Sampling Summary reports. The Summary of Ambient TRS Results tables from those reports issued for periods during performance of work on the RA are included in **Appendix D.1**. The majority of TRS results were non-detects. Hydrogen sulfide was detected on a few occasions; however, there were no exceedances of the 47 ppb action level.

Surface Water Monitoring

CWM was also required to monitor surface water during remedial activities. According to the Site Surface Water Monitoring Plan (RAWP, Section 5.2), the following Ambient Water Quality Control (AWQC) concentrations were used as the response action levels for the Industri-Plex Site:

- AWQC chronic concentration for arsenic = 0.190 milligrams per liter (mg/L)
- AWQC chronic concentration for chromium = 0.210 mg/L
- AWQC acute concentration for lead = 0.082 mg/L

The above-tabulated AWQC limits correspond to a hardness of 100 parts per million (ppm). Water hardness values on-Site indicated moderately hard to very hard conditions (EPA, 1986). Historical background surface water data collected from surface water drainways periodically contained lead concentrations of 0.025 mg/L. Since these background levels routinely exceeded the threshold value of the AWQC chronic concentration for lead, the AWQC acute concentration was approved on June 8, 1994 as the response action level by MassDEP and EPA.

Surface water sampling was conducted to meet the project specifications and the RAWP requirements. The surface water controls established by EPA and included in the Contractor's RAWP required the following procedures:

- Each work day, field measurements were conducted at various stations (whenever there was flow) for turbidity, dissolved oxygen, temperature, specific conductivity, and pH. The sample from each station with the highest turbidity during the week was submitted for laboratory analyses of total and dissolved arsenic, lead, and chromium, total suspended solids (TSS), and hardness. Any sample with a turbidity greater than or equal to 85 nephelometric turbidity units (NTU) was also submitted for the same laboratory analyses.

- Additional sampling was conducted if a storm and/or a construction event caused the turbidity to rise above 85 NTU at the monitoring stations. The samples were analyzed for total and dissolved metals (arsenic, chromium, and lead), TSS, and hardness. Field measurements for turbidity, dissolved oxygen, temperature, specific conductivity, and pH were conducted at the time of sampling.

HMM conducted surface water quality sampling as a subcontractor to CWM. Test results indicate that the surface water quality remained below the response action thresholds with the exception of exceedances as listed in **Appendix D.2**. Specific reasons and mitigating actions for each exceedance are described in the Quarterly Reports of 1993-1995. Generally, the Agencies were notified and the mitigating actions were performed to the satisfaction of the Agencies.

5.3 Decontamination

CWM was required to decontaminate all equipment that came in contact with contaminated soils, sediments, and sludges during the work. Water used during the pressure washing was collected and treated at the on-Site storage areas. The decontamination was performed in accordance with the specifications and the project work plans. Water generated from decontamination activities was stored in a Modu-tank on the east side (across the MBTA rail lines) of the Site. The water was treated and properly disposed of on-Site as approved by the Agencies.

Personnel entering work areas (exclusion zones) during the RA, wore protective equipment as specified by CWM's Health and Safety Plan (HASP). The HASP also specified personal decontamination procedures. All personnel leaving work areas were required to properly clean or dispose of all protective equipment, small tools and instruments.

5.4 Facility Documentation for Off-Site Disposal

Prior to disposing of any materials off-Site during the RA, EPA was to determine if the proposed facilities were of "acceptable status" and could receive materials from the Site. Only non-hazardous vegetation (cleared/cut above ground surface) was disposed off-Site during the RA. During the work, as previously discussed, wastewater from decontamination activities was stored on the east side of the Site and treated prior to disposal.

All grubbed vegetation (containing soil), and contaminated soil, sediments, and sludges excavated from the Site were consolidated in other areas of the Site in accordance with the RDAP. All contaminated materials excavated from the Site were placed on the hide piles that were covered as part of the approved RA. However, prior to placement on the hide piles, saturated sediments and sludges were dried over large areas east of the MBTA rail lines on the Site within the remedial cover area.

6.0 SOURCE AND CONFORMANCE TESTING

Testing performed for the Remedial Trust, such as testing of soil and soil products and geosynthetics, is described in Sections 6.1 and 6.2, respectively. The testing methods according to the specifications are summarized in **Table 2** [*i.e.*, Golder's Quality Assurance Procedure Plan (QAPP) Table 1-1]. Abbreviations used in the supporting documentation found in the appendices are summarized in **Table 3**.

6.1 Soil and Soil Products

6.1.1 Compacted Fill

The majority of compacted fill materials were derived from on-Site grubbing and dredging operations. Compacted fills were used as stabilizing fill to flatten hide pile slopes and re-grade low relief areas to promote drainage. A portion of rock and concrete demolition debris generated by crushing and screening operations was also used to a limited degree as compacted fill material. The remaining compacted fill was imported from off-Site borrow areas. Most of the off-Site fill was composed of silty sand from a quarry in Hubbardston, Massachusetts and glacial till from a borrow pit on Deer Island, Boston Harbor, Massachusetts. Compacted fill tests included grain size distribution and primarily Standard Proctor tests with some Modified Proctor tests as needed.

6.1.2 Cover Soil

All cover soil used on-Site was from off-Site sources. Cover soil placed on slopes flatter than 8 horizontal to 1 vertical (8H:1V) was typically a granular silt from a glacial till deposit on Deer Island. Cover soil placed on slopes steeper than 8H:1V and some slopes flatter than 8H:1V was a silty sand from a quarry in Hubbardston. Cover soil tests included grain size distribution, Standard and Modified proctor densities, interface friction, and Atterburg Limits. Results of the testing are provided in **Appendix F**. Analytical testing was performed on Deer Island cover soil materials to verify the levels of potential contaminants. All soil materials tested and placed on-Site met the clean soil thresholds set up by EPA, after consultation with MassDEP, or were otherwise approved by a variance in accordance with EPA in consultation with MassDEP criteria. EPA in consultation with MassDEP clean soil threshold criteria for cover soil used at the Site are summarized in **Table 1**. Analytical test results are provided in **Appendix F.1**.

6.1.3 Topsoil

According to the Consent Decree, topsoil must be capable of supporting vegetation that minimizes both erosion and continued maintenance. Topsoil used for the cover in upland areas and as a wetland vegetative cover soil came from several off-Site sources. Such source locations were from the following Massachusetts towns: Andover, Reading, Salem, and Tewksbury. Other topsoils were sourced from the following New Hampshire towns: Nashua, New Boston, and Manchester. Each source was tested for grain size distributions, organic content, and soil fertility or Baker Soil test. Results of testing are provided in **Appendix F.2.3**. Where the topsoil did not meet some criteria, but would be capable of meeting the Consent Decree requirement for being capable of supporting vegetation, a variance was requested and received from EPA, after consultation with MassDEP.

6.1.4 Subangular Stone

There were several varieties of subangular stone required by the 100% Design Report. Each of the subangular stone materials was a product of off-Site crusher/screener operations from PJ Keating Company of Lunenburg, Massachusetts or Bardon Trimount Inc. of Burlington, Massachusetts. The products required for the Remedial Action included American Association of State Highway and Transportation Officials (AASHTO) No. 8, the stone used in the gas collection layer material; AASHTO No. 57, a variety of stone used for bedding and armoring purposes; and both AASHTO 2 and 67, stone materials used in sediment filter construction. Testing of these stone materials consisted of the following: grain size, permeability, and carbonate content. Testing was performed on a per source basis unless the Remedial Trust requested additional testing. Test results are provided in **Appendix F.2.2.**

6.1.5 Stone Riprap [Not Applicable To This Property]

6.1.6 Subbase

Road Structural Fill as specified in Section 02223 was used as subbase in the Remedial Action. Tests for the subbase material included gradation and compaction. All subbase materials were supplied by an off-Site quarry. Test results are provided in **Appendix F.2.1**.

6.2 Geosynthetics

6.2.1 Geotextile

6.2.1.1 Materials

Geotextile materials were supplied by the following three manufacturers: Nicolon/Mirafi, Polyfelt Americas Inc., and Synthetic Industries. Nicolon/Mirafi provided 6-ounce (oz), 10-oz and 16-oz geotextile, Polyfelt Americas Inc. provided 6-oz and 16-oz geotextile and Synthetic Industries provided 16-oz geotextile. All fabrics are permeable, non-woven, needle-punched monofilament and allow percolation. The geotextile was used in the cover to primarily separate the contaminated soil from the clean cover soil (Golder, 1989). The geotextile also precludes upward migration of contaminated material by frost heave effects; provides a drainage capillary break layer at the base of the cover on slopes to prevent sloughing during thaws; and provides further means of reducing the chance of incidental contact through land use.

6.2.1.2 Quality Control Testing

The manufacturers of the geotextile material provided Quality Control certificates for the installed 6-, 10-, and 16-oz materials. Copies of the Quality Control Certificates are presented in **Appendix H.1.2**. As material was delivered to the Site, Golder reviewed the Quality Control Certificates for conformance with the 100% Design through the submittal process.

6.2.1.3 Quality Assurance Testing

Rolls of 6-, 10- and 16-oz geotextile were tested for conformance to the 100% Design Report specifications. Conformance testing was performed by Golder Construction Service's Geosynthetic Laboratory (Golder Construction's Geosynthetic Laboratory) located in Atlanta, Georgia. Test results are provided in **Appendix H.1.3**. Before individual rolls of geotextile were deployed on-Site, Golder reviewed the test results for conformance with the project specifications.

6.2.2 Geomembrane [Not Applicable To This Property]

6.2.3 Geocomposite [Not Applicable To This Property]

6.2.4 Geogrid [Not Applicable To This Property]

6.2.5 Interface Friction [Not Applicable To This Property]

6.3 Asphalt Cover Materials

6.3.1 Bituminous Materials

Bituminous materials were used to construct asphalt covers within the subject property. Four inches of asphalt binding course and two inches of asphalt wearing surface were placed and compacted above the six-inch granular subbase layer of the asphalt cover.

Material Requirements

Two types of bituminous concrete, a binder course and a surface or wearing course, were specified by the design specifications. The specifications required that the mix for binder and surface course conform to the requirements of the Massachusetts Department of Public Works Specifications (MDPW). The following table summarizes the State mix requirements according to the Massachusetts Highway Department (MHD) Standard Specifications for Highways and Bridges:

Sieve Size	State Binder (% by weight passing)	State Top (% by weight passing)
1-inch	100	*
3/4-inch	80-100	*
5/8-inch	*	100
1/2-inch	55-75	95-100
3/8-inch	*	80-100
#4	28-50	50-76
#8	20-38	37-54
#16	*	26-40
*No limit/value established for the specific parameter.		

Sources

Midway Paving of Chelmsford, MA performed the paving work on the subject property. Bardon Trimount supplied the asphalt materials, and Middlesex Materials supplied the aggregate materials. The asphalt was mixed at Massachusetts Bituminous in Chelmsford, MA.

Testing Requirements

The specifications required testing of the pavement materials. Standard Marshall testing, which including testing for stability, flow, and density, was conducted at the bituminous plant prior to Site delivery.

The asphalt binder and top course materials were required to meet the MDPW Standard Specifications. Field compaction testing and asphalt covering was performed to determine if the materials were placed in accordance with the MDPW Standard Specifications.

Conclusions

Bituminous plant inspection reports (including material test results) and field compaction and coring results for the subject property are included in **Appendix G**. Bituminous plant inspection reports provided in **Appendix G** show the material delivered met the MDPW Standard Specifications requirements. Field quality assurance testing was performed during installation of the asphalt. PSI performed nuclear density testing, checked lift thickness, and asphalt temperatures. Asphalt cores cut at later dates demonstrated lift thicknesses and in-place density results to be in compliance with the design specifications.

6.3.2 Aggregate

In asphalt cover systems, clean, road-grade structural fill (granular subbase) was placed and compacted above the base geotextile separation layer.

Material Requirements

Per Specification Section 02223 – Backfill and Fill, the granular subbase was clean material from an off-Site source approved by the Remedial Trust Representative. The granular subbase also met the following gradation specifications:

Sieve Designation	3 in	3/4 in.	No. 10	No. 50	No. 200
Percent Passing	90-100	50-90	40-80	20-60	5-15

Sources

All granular subbase used on the subject property was supplied by two quarries, Bardon Trimount of Swampscott, MA and PJ Keating of Lunenburg, MA.

Testing Requirements

Geotechnical testing requirements for the granular subbase are specified in Section 02223 – Backfill and Fill and include grain size (ASTM D422) and standard proctor (ASTM D698) methods. Both the Bardon Trimount and PJ Keating sources were virgin or native quarry operations. Therefore, analytical testing was not required to verify that the material was clean.

Conclusions

The geotechnical test results for the granular subbase are included in **Appendix F**. While the gradation test results show that the material was not always completely in accordance with gradation requirements on the #10 and #50 sieves, Golder determined the material met the intent of the design and the material was accepted by the on-Site Resident Engineer.

7.0 REMEDY CONSTRUCTION

7.1 Construction Sequence

7.1.1 Decommissioning [Not Applicable To This Property]

7.1.2 Soil Remedy

7.1.2.1 Subgrade and Drainage

Existing vegetation was cleared and root matter grubbed to a minimum depth of one foot prior to placement of the permeable cover. No herbicides were employed to control re-establishment of vegetative growth. Tree roots were grubbed to a depth of 2 feet. Woody material from above ground, roots and other vegetation were chipped and stockpiled for later placement as fill under the permeable cover. Rocks and concrete debris grubbed from the surface were crushed on-Site in order to comply with the fill material specifications. Reinforcing steel was removed from the concrete during the crushing operations and stockpiled for off-Site disposal.

The cover area in the vicinity of bedrock outcrops or exposed concrete structures was grubbed of vegetation and cleaned in accordance with recommendations of the Site Health and Safety Officer and documented by the Contractor. The surrounding soil cover was extended up to the outcrop or structure.

Existing subgrade soils were proof rolled prior to placing the cover and fill materials were compacted and tested. The final prepared grade was rolled with a 10-ton smooth wheel compactor or in small areas compacted with a hand operated plate vibratory compactor. Where positive drainage was called for in the 100% Design Report plans, such drainage was achieved in the finish grade of the cover. Throughout construction, erosion and sedimentation measures were generally utilized and maintained in accordance with the 100% Design Report specifications to control soil loss. Any deficiencies in the erosion and sedimentation measures were corrected in accordance with EPA in consultation with MassDEP guidelines.

7.1.2.2 Geosynthetics

After proof rolling, the prepared subgrade was inspected and any protruding debris or roots greater than ½-inch in diameter were manually removed prior to placing geosynthetics. After geosynthetics were placed, filling was performed to reach final elevations.

A 6-oz per square yard non-woven geotextile was used in the permeable cover on the subject property. The geotextile materials were sewn together using white nylon thread for dark fabric and black thread for white fabric.

The geotextile seam was initially placed with a minimum slack along the seam to protect it and allow for movement in the geotextile during placement of cover soil. This procedure was primarily practiced in the developed areas of the Site with little topographic relief. Subsequent reviews of the procedure and the 100% Design Report concluded the extra slack was unnecessary and the procedure was discontinued for the remainder of the Remedial Action (**Appendix C, DSCR-030-R2**).

7.1.2.3 Cover Soil

Cover soils placed over the geotextile on slopes greater than 8H:1V were granular materials from off-Site sources that had an inherently low potential to clog the geotextile. For slopes flatter than 8H:1V, the cover soil from off-Site sources could contain more than 12 percent by weight passing the #200 sieve. In all areas where the remediated slope was steeper than 33 percent, a geogrid reinforcement layer was included at the base of the cover soil immediately above the geosynthetic layer. The cover soil was placed in a manner that minimized imposed stresses on the underlying geosynthetics by using low ground pressure earth moving equipment and maintaining a minimum thickness of 12 inches of soil between the rubber tire equipment and the geosynthetic. Cover soil placed in unpaved areas with permeable cover was nominally compacted by the action of the placing equipment only.

Other cover sections used in limited areas or for access roads were comprised of various combinations of cover soil and dense graded aggregate subbase or riprap. Each modified section of cover is designed to be a minimum of 16 inches in accordance with the specifications of the 100% Design Report. The types and locations of these modified sections are included in the record drawing documentation, **Attachment 1**.

Minimum thicknesses of cover soil are detailed in Section 02242 of the 100% Design Report. Generally, the permeable cover consists of 12 inches of select soil fill and 4 inches of topsoil. The tolerance, in thickness is -0.0 feet and +0.3 feet. Based upon survey data collected both at the time of construction, as well as post construction data collected, the vast majority of the Site met the design thickness within the tolerances.

Any isolated areas identified by multiple post construction survey data points to be below the acceptable tolerances, were corrected by the placement of additional cover fill to meet the required thickness. This repair of cover fill was performed during the summer of 1999 by Maverick.

Based on analysis of the of the relevant survey data points located on the Positive Start Realty, Inc. Property (Tax Map 9-1-6), the minimum thickness of cover soil specified in Section 02242 of the 100% Design Report was met at all locations surveyed throughout the subject parcel.

7.1.2.4 Topsoil and Vegetation

Topsoil was placed over the cover soil in 4-, 6- or 8-inch thicknesses as specified by the 100% Design Report. After placing the top soil, lime and fertilizer were applied to the topsoil by a York rake in larger areas and by a walk-behind drop-spreader for small areas. Seed was broadcast by the hydroseed method in all other areas using fertilizer mulch and seed according to the 100% Design Report, or approved variances.

7.1.2.5 Revegetation

The vegetation on the upland soil covers of the Site has been restored to an herbaceous meadow to protect the underlying geotextile from penetration of large, woody roots of trees and shrubs. Drainways adjacent to upland covers have been revegetated with shallow-rooted overhanging vegetation which will eventually provide cooling shade and organic input in the form of leaves.

Criteria for selecting the revegetation plants and seeds in the 100% Design Report included:

- Endemic to Central Massachusetts;
- Tolerant of full sun and water levels;
- Easily established, with fibrous root systems rather than tap roots; and
- Perennials, or prolific annuals.

7.1.3 Sediment Remedy [Not Applicable To This Property]

7.1.4 Air Remedy [Not Applicable To This Property]

8.0 DESIGN CHANGES

Section 8.0 describes design changes associated with the Alternative Cover Design Report (Golder, 1989), approved by EPA on September 11, 1989, and the RTC Cover Certification Report (VHB/Golder, 1996), approved by EPA on October 1, 1996.

8.1 Change Management

During the Remedial Action from 1992 to 1994 for the Site, changes were managed through the Remedial Trust. At the start of 1995, the Remedial Trust and Contractor agreed to a new scope and cost contract for the remaining remedial work. The Construction Management contractor, Golder Construction, performed change management during 1995 as an agent for the Remedial Trust.

Managing changes for the Remedial Action primarily included changing the agreed upon scope of work or technical details of the 100% Design Report. Requirements identified in the Consent Decree were not changed unless approved by EPA, after consultation with MassDEP. Changes could be initiated from any of the following: EPA or MassDEP, the Contractor, the Remedial Trust or Golder as the designer, and later, Golder Construction in the role of Construction Managers.

Changes were divided into two categories, design specification changes and administrative, cost and schedule changes. Design specification changes were usually technical in nature and involved specific changes to the details of the specifications and plans presented in the 100% Design Report. Generally these changes were minor and EPA, after consultation with MassDEP, initially wanted only to review significant changes. Design changes were originally documented as design/specification change requests (DSCR). Impacts to cost and schedule were handled by another system administered by the Remedial Trust.

Early in 1994, the Contractor made several management revisions including a new method for managing changes. The Contractor introduced a change management system that included Variance Requests (VRs), Change Request Authorizations (CRAs), Corrective Action Requests (CARs), and Requests for Information (RFIs), procedures that subsequently were accepted by the Remedial Trust. The DSCR system was phased out by mid 1994 with the introduction of this change management system. Copies of all the associated forms pertaining to this Cover Certification Report are included in **Appendix C**.

8.2 Site Wide Design Changes

A series of DSCRs and CARs were adopted for Site wide application.

The Site wide design changes listed below were approved by the resident design engineer, project manager, EPA and/or MassDEP. The design changes generally related to grubbing, geotextile selection, geotextile installation, fill materials selection, and fill materials sampling. Several design changes applied to design details that required revision to match the 100% Design Report. The approved design changes included:

- DSCR-001
- DSCR-002
- DSCR-003
- DSCR-023
- DSCR-027
- DSCR-030
- DSCR-056
- DSCR-069

Additional Site wide design changes were identified as requiring further review in order to verify compliance with the 100% Design Specifications. These design changes included:

- CAR-053 involved a request for resampling of Deer Island Stockpile materials due to incorrect initial sampling procedures. The stockpile was resampled on March 30, 1994 and approved by the Agencies on April 28, 1994. The CAR was not signed completely by the design engineer, which appears to be an administrative discrepancy that does not affect the integrity of the cover.

- CAR-071 involved a request for resampling of soil Stockpiles 5 and 6. Hold times for volatiles in the soils were exceeded. The Remedial Trust decided to accept data for Stockpile 5, but requested Stockpile 6 be resampled. Stockpile 6 was resampled on March 30, 1994, and test results were approved by the Agencies on April 28, 1994. The CAR was not signed completely by the design engineer, which appears to be an administrative discrepancy that does not affect the integrity of the cover.

Additional details and documentation of Site wide design changes are located in **Appendix C**.

8.3 Property-Specific Design Changes

A series of DSCRs and CARs were adopted for application on the subject property.

The property-specific design changes listed below were approved by the resident design engineer, project manager, EPA and/or MassDEP. The design changes generally related to cover types, materials testing, and materials placement. The approved design changes included:

- DSCR-011
- DSCR-042
- DSCR-061

Additional property-specific design changes were identified as requiring further review in order to verify compliance with the 100% Design Specifications. These design changes included:

- CAR-31 involved a request for approval of geotextile panel placement that differed from the original submitted panel layout. The Contractor made a constructability decision to lay the geotextile panels in a different orientation than the original layout. The CAR form indicated that the request was accepted as is and that no corrective action was needed. However, the form was not signed completely by the design engineer, which appears to be an administrative discrepancy that does not affect the integrity of the cover.

- CAR-055 involved a generic request pertaining to all properties west of the MBTA requiring topsoil cover. The Contractor added soil amendments to the original topsoil submittal, because the optimum seeding time for soil had passed. The topsoil amendments were added on June 9, 1994, and sod was placed over the prepared topsoil. However, the CAR form was not signed completely by the design engineer, which appears to be an administrative discrepancy that does not affect the integrity of the cover.

Additional details and documentation of property-specific design changes are located in **Appendix C**.

9.0 QUALITY ASSURANCE OBSERVATION AND TESTING

Construction documentation includes daily field reports and weekly reports to the Remedial Trust. Inspection field diaries were also prepared, and photographs were taken on a regular basis throughout construction. The Golder reports and diaries are not included in this document, but are available for review at Golder's Manchester, New Hampshire office.

9.1 Decommissioning [Not Applicable To This Property]

9.2 Compacted Fill

Field moisture-density tests were generally performed at least once per 5,000 square feet per lift using a Troxler Model 3440 Nuclear Density gauge. Golder periodically monitored the soil testing operations performed by PSI. Failing tests were retested. During 1993 to 1994 the Contractor performed soil moisture density tests as quality control testing. The QC testing was performed by Express Geotesting, Concord, Massachusetts. A summary of field moisture density tests is located in **Appendix F.3**.

9.3 Subgrade Preparation

Subgrade preparation was inspected by Golder or PSI and the Contractor prior to geotextile deployment. A subgrade inspection form was prepared by Golder, PSI, or the Contractor for areas in which deployment would take place. Subgrade inspection forms are provided in **Appendix I.1**.

9.4 Permeable Cover

Geotextile was deployed over the prepared subgrade and seamed. The seams were inspected by Golder or PSI and the Contractor to verify the connection. A geotextile seam inspection form was prepared by Golder, PSI, or the Contractor. Geotextile seam inspection forms are provided in **Appendix I.2**.

Cover soil was placed as permeable cover over the geotextile in accordance with the 100% Design Report, and was nominally compacted by the placing equipment. No inspection or testing was required according to the 100% Design Report. Surveyors verified the cover thickness prior to placing topsoil or gravel. Topsoil, soil amendments, and seeds were then added, and the seed germinated with rainfall or water applied from water trucks. The quality of vegetative cover was evaluated. Erosion control matting was utilized in areas where seed did not germinate well.

9.5 Impermeable Liner Installation [Not Applicable To This Property]

9.6 Geocomposite Drainage [Not Applicable To This Property]

9.7 Geogrid Reinforcing [Not Applicable To This Property]

9.8 Manholes and Culverts [Not Applicable To This Property]

9.9 Seeding and Wetland Vegetation

Calculations for soil loss, based on the United States Department of Agriculture (USDA) Soil Loss Equation, verify assumptions of the topsoil type, anticipated rainfall, vegetative cover type, and slope steepness are still valid with a calculated loss of less than 2 tons per acre per year. Erosion control matting was installed as a temporary measure to supplement the vegetated cover when the remaining growing season was too short to establish protective vegetative growth.

10.0 RECORD DRAWINGS

Based on the Survey Control (Section 5.1) established for the Industri-Plex Site, Record Drawings of the as-built conditions were established for the soil, sediment and air remedies constructed at the Site, and certified by a Massachusetts Land Surveyor (Meridian Land Services, Inc.). The Record Drawings for this property at the Site are included in **Attachment 1**.

The Record Drawings include an elaborate survey network and extensive details on the horizontal and vertical locations of the various protective covers installed for the soil, sediment and air remedies. These details may aid in the future monitoring and management of the remedy and Institutional Controls/Grant of Environmental Restrictions for the Site. The Record Drawings also illustrate the Institutional Controls/Grant of Environmental Restrictions boundaries denoted as Class A, B, C and D Lands.

Where located in Class C lands, existing concrete structures such as concrete pads, stairways, ramps, and loading docks remained in-place as an equivalent cover. These structures are similar to cover types 4, paved equivalent cover, and 5, building equivalent cover. However, because they were not specifically identified in the 100% Design Report, they have not been identified as a specific equivalent cover type herein.

The Record Drawing have plan views and points charts. The plan view shows grid points and intermediate point locations. The points chart shows elevation data collected at each point shown on the plan view. The plan views include contour lines for subgrade and finish grade. A summary of the separate sections of the Record Drawings is as follows:

- Sheet A-64: Specific Property Location;
- Sheet A-65: Boundary Lines, Land Classifications, Easements and As-Built Drainage;
- Sheet A-66: Record Points, Topography & Limits of Engineer Cover;
- Sheet A-67: Cover Types and Transitions; and
- Sheet A-68: Details and Transitions.

11.0 CERTIFICATION

On behalf of the Remedial Trust, Roux Associates certifies that the Positive Start Realty, Inc. (Tax Map 9-1-6) remedial action was completed in compliance with the approved remedial design and work plans, approved design variances, and the Consent Decree. Any exceptions to this design are noted within this Cover Certification Report. Changes to the cover made following construction completion on June 28, 1996 are not addressed in this report. Approved changes to the cover made since that date are documented in the Administrative Record. The Professional Engineer's certification (below) comprises a declaration of his professional judgment. It does not constitute a warranty or guarantee, expressed or implied, nor does it release any other party of their responsibility to abide by contract documents or applicable codes, standards, regulations, and ordinances. The Professional Engineer's certification is based upon a review of the remedial action documentation. Roux Associates' certification relies upon the accuracy of the as-built survey and record drawings prepared by Meridian and upon the representations made and information provided by the Remedial Trust and its representatives, contractors and consultants involved with the remedial action effort. These contractors and consultants include CWM, Golder, PSI, and Maverick.

Respectfully Submitted,

ROUX ASSOCIATES, INC.

Glen Gordon, P.E.
Certifying Engineer for Roux Associates, Inc.
MA License No. 41819

COMMONWEALTH OF MASSACHUSETTS
GLEN P. GORDON
ENVIRONMENTAL
No. 41819
REGISTERED
PROFESSIONAL ENGINEER

Lawrence McTiernan
Project Principal

Table 1
ISRT Clean Soil Thresholds
in milligrams per kilogram (mg/kg)

Adapted from Table 02223-1

The following table is presented as the clean soil guideline for the Industri-Plex (I-Plex) Site. Metals which are naturally rock-forming compounds may vary from the guideline values on a case by case basis.

Tests	Proposed Threshold Levels for Clean Soil Used at I-Plex				
Volatile Organic (TCL)	Non-detectable (3)			EPA Method	8240
Acid/Base Neutrals (TCL)	Non-detectable (3)			EPA Method	3550/8270/8270
Pesticides/PCBs (TCL)	Non-detectable			EPA Method	3550/8080
Metals - Target Analyte List (TAL) (4)					
Aluminum	<	100,000	mg/kg	EPA Method	3050/6010
Antimony	<	10	mg/kg	EPA Method	3050/6010
Arsenic	<	25	mg/kg	EPA Method	3050/7060
Barium	<	500	mg/kg	EPA Method	3050/6010
Beryllium	<	1	mg/kg	EPA Method	3050/6010
Cadmium	<	10	mg/kg	EPA Method	3050/6010
Calcium	<	50,000	mg/kg	EPA Method	3050/6010
Chromium	<	23	mg/kg	EPA Method	3050/6010
Cobalt	<	20	mg/kg	EPA Method	3050/6010
Copper	<	50	mg/kg	EPA Method	3050/6010
Iron	<	70,000	mg/kg	EPA Method	3050/7420
Lead	<	87	mg/kg	EPA Method	3050/6010
Magnesium	<	10,000	mg/kg	EPA Method	3050/6010
Manganese	<	1,000	mg/kg	EPA Method	3050/6010
Mercury	<	1	mg/kg	EPA Method	3050/7470
Nickel	<	100	mg/kg	EPA Method	3050/6010
Potassium	<	10,000	mg/kg	EPA Method	3050/6010
Selenium	<	20	mg/kg	EPA Method	3050/7740
Silver	<	20	mg/kg	EPA Method	3050/6010
Sodium	<	4,000	mg/kg	EPA Method	3050/6010
Thallium	<	5	mg/kg	EPA Method	3050/7840
Vanadium	<	150	mg/kg	EPA Method	3050/6010
Zinc	<	200	mg/kg	EPA Method	3050/6010
Cyanide	<	10	mg/kg	EPA Method	9010
TPH (Total Petroleum Hydrocarbon)	<	200	mg/kg	EPA Method	418.1

Notes:

1) At any time the Trust may revise this list to include testing for additional constituents which may pose a health threat.
2) TCL = Target Compound List
3) Excludes common laboratory contaminants given in the EPA Region 1 Contract Laboratory Program Data Validation Functional Guidelines.
4) TAL Metals by Inductively Coupled Plasma (ICP) and Atomic Absorption (AA) Methods, Test 6010, except run the following constituents by the following methods: (As) 7060, (Pb) 7420, (SE) 7740, (Th) 7840, (Hg) 7470. The 7000's are "furnace and cold vapor AA" methods.

Table 2
Testing Methods for Soil and Geosynthetics
adapted from Golder's QAPP Table 1-1

7.2 TESTING METHODS	STANDARD	PRECONSTRUCTION FREQUENCY	CONSTRUCTION FREQUENCY
BACKFILL & FILL (Specification Section 02223)			
Backfill and fill tests will be performed by Professional Service Industries, Inc.			
Compacted Fill			
Gradation Test	ASTM D422	1/Source	1/5,000 CY
Plasticity Index	ASTM D4318	1/Source	1/5,000 CY
Standard Compaction	ASTM D698	1/Source	1/5,000 CY
Modified Compaction	ASTM D1557	1/Source	1/5,000 CY
Field Moisture/Density	ASTM D2922	Not Required	9/Lift or 1/100 LF
In-Place Methods	ASTM D1556 or D2167	Not Required	1/Day
Sand Bedding			
Gradation Test	ASTM D422	1/Source	1/5,000 CY
Carbonate Content	ASTM D3042	1/Source	Not Required
SUBANGULAR STONE (Specification Section 02233)			
Subangular stone tests will be performed by Professional Service Industries, Inc.			
AASHTO No. 2, 57, 67			
Gradation Test	ASTM D422	1/Source	1/1,000 CY
Carbonate Content	ASTM D3042	1/Source	Not Required
AASHTO No. 8			
Gradation Test	ASTM D422	1/Source	1/1,000 CY
Carbonate Content	ASTM D3042	1/Source	Not Required
Permeability Test	USCO EM1110-2-1906	1/Source	Not Required
IMPERMEABLE & PERMEABLE COVER FILL (Specification Section 02242)			
Impermeable and permeable cover fill test will be performed by Professional Service Industries, Inc. unless designated with **			
Cover Soil (Select Cover Fill)			
Gradation Test	ASTM D422	1/Source	1/2,000 CY
Plasticity Index	ASTM D4318	1/Source	1/5,000 CY
Direct Shear Test**	Section 02242	1/Source	1/2,000 CY
** Test to be performed by Golder Associates Ltd.			
Top Soil			
Gradation Test	ASTM D422	1/Source	1/2,000 CY
pH Test	ASTM D4972	1/Source	Not Required
Baker Soil Fertility Test**	Section 02242	1/Source	1/2,000 CY
** Test to be performed by Land Management Decisions, Inc.			
WETLANDS SEDIMENT REMEDIATION COVER SOILS (Specification Section 02243)			
Wetland sediment cover soil tests will be performed by Professional Service Industries, Inc. unless designated with **			
Wetland Gravel (Road Structural Fill: Section 02223)			
Gradation Test	ASTM D422	1/Source	1/5,000 CY
Wetland Topsoil (Topsoil: Section 02937)			
Gradation Test	ASTM D422	1/Source	1/5,000 CY
pH Test	ASTM D4972	1/Source	1/5,000 CY
Organic Matter Content	Section 02937, Tbl 2	1/Source	1/5,000 CY
Soil Fertility Test**	Section 02937, Tbl 2	1/Source	1/5,000 CY
** Test to be performed by Land Management Decisions, Inc.			
STREAM SEDIMENT REMEDIATION COVER (Specification Section 02244)			
Stream sediment cover tests will be performed by Professional Service Industries, Inc.			
Gravel/Cobble (Section 02271)			
Abrasion Test	ASTM C535	Not Required	Not Required
Freeze Thaw Test	AASHTO T103	Not Required	Not Required
Specific Gravity	ASTM C127	Not Required	Not Required
Gradation Test-Aggregate	ASTM C136	1/Source	Not Required

Table 2
Testing Methods for Soil and Geosynthetics
adapted from Golder's QAPP Table 1-1

7.2 TESTING METHODS	STANDARD	PRECONSTRUCTION FREQUENCY	CONSTRUCTION FREQUENCY
STONE RIPRAP (Specification Section 02271)			
Stone riprap tests will be performed by Professional Service Industries, Inc.			
Gravel/Cobble (d_{50}=3 inches) (Section 02271)			
Abrasion Test	ASTM C535	Not Required	Not Required
Freeze Thaw Test	AASHTO T103	Not Required	Not Required
Specific Gravity	ASTM C127	Not Required	Not Required
Gradation Test-Aggregate	ASTM C136	1/Source	Not Required
Streambed Sediment Filter and Gabion Rock (d_{50}=6 inches)			
Abrasion Test	ASTM C535	Not Required	Not Required
Freeze Thaw Test	AASHTO T103	Not Required	Not Required
Specific Gravity	ASTM C127	Not Required	Not Required
Gradation Test-Aggregate	ASTM C136	1/Source	Not Required
SUBBASE AND PAVEMENT (Specification Section 02575)			
Subbase and Pavement tests will be performed by Professional Service Industries, Inc.			
Graded Aggregate Base Course			
Gradation Test	AASHTO T11 & T27	1/Source	1/5,000 SY or 1 Day
Compacted Density	AASHTO T180 Method D	1/Source	1/5,000 SY or 1 Day
Abrasion Test*	AASHTO T96	1/Source	1/5,000 SY or 1 Day
Freeze Thaw Test*	AASHTO T103	1/Source	1/5,000 SY or 1 Day
(* as required by MDPW specifications)			
Binding and Wearing Asphalt Courses			
Extraction Test (Plant)	AASHTO T168	Not Required	1/500 Tons
Gradation Test (Plant)	AASHTO T11 or T27	Not Required	1/500 Tons
Density/Stability (Plant)	AASHTO T209, T245, T246, T247	Not Required	1/500 Tons
Max. Theoretical Density	ASTM D2041	Not Required	1/500 Tons
Max. Density - Marshall	AASHTO T209 or T245	Not Required	2/500 Tons
In place Density	ASTM D2950	Not Required	1/100 LF
In place Density (Core)	AASHTO T166	Not Required	1Core/500 SY
In place Thickness (Core)	AASHTO T166	Not Required	1 Core/500 SY
In place Smoothness Test	Section 02575	Not Required	1/100 LF
GEOTEXTILE (Specification Section 02595)			
Geotextile tests will be performed by Golder Construction Services, Inc.			
Non-woven, 6, 10, and 16 ounces/square yard			
Mass Per Unit Area	ASTM D5261	1/100,000 SF	Not Required
Grab Strength	ASTM D4632	1/100,000 SF	Not Required
Trapezoidal Tear Strength	ASTM D4533	1/100,000 SF	Not Required
Burst Strength	ASTM D3786	1/100,000 SF	Not Required
Puncture Strength	ASTM D4833	1/100,000 SF	Not Required
Thickness	ASTM D5199	1/100,000 SF	Not Required
Apparent Opening Size	ASTM D4751	1/100,000 SF	Not Required
GEOMEMBRANE (Specification Section 02597)			
Geomembrane tests will be performed by Golder Construction Services, Inc.			
Textured HDPE			
Thickness	ASTM D5199	1/100,000 SF	Not Required
Density	ASTM D1505	1/100,000 SF	Not Required
Minimum Tensile Properties:	ASTM D638	1/100,000 SF	Not Required
Tensile Strength, Yield			
Tensile Strength, Break			
Elongation at Yield			
Elongation at Break			
Tear Resistance	ASTM D1004 Die C	Not Required	Not Required
Low Temperature Brittleness	ASTM D746 Proc. B	Not Required	Not Required
Dimensional Stability	ASTM D1204	1/100,000 SF	Not Required
Environmental Stress Crack	ASTM D1693	Not Required	Not Required
Puncture Resistance	FTMS 101C Method 2065	Not Required	Not Required
Carbon Black Content	ASTM D1603	1/100,000 SF	Not Required
Carbon Black Dispersion	ASTM D3015	1/100,000 SF	Not Required
Shear Test	ASTM D4437 NSF Mod.	Not Required	1/500 LF
Peel Adhesion (Hot Wedge Fusion Weld)	ASTM D4437 NSF Mod.	Not Required	1/500 LF
Peel Adhesion (Fillet Extrusion Weld)	ASTM D4437 NSF Mod.	Not Required	1/500 LF

Table 2
Testing Methods for Soil and Geosynthetics
adapted from Golder's QAPP Table 1-1

7.2 TESTING METHODS	STANDARD	PRECONSTRUCTION FREQUENCY	CONSTRUCTION FREQUENCY
GEOCOMPOSITE (Specification Section 02598)			
Geocomposite tests will be performed by Golder Construction Services, Inc.			
Geocomposite (TEX-NET TN3002CN)			
Geocomposite Transmissivity @ 500 psf; Gradient = 1	ASTM D4716	1/100,000 SF	Not Required
Geocomposite Transmissivity @ 20,000 psf; Gradient = 1	ASTM D4716	1/100,000 SF	Not Required
Tensile Strength - Net only (prior to lamination)	ASTM D5035	Not Required	Not Required
Tensile Strength - Geotextile only (prior to lamination)	ASTM D4632	Not Required	Not Required
Geocomposite Peel Strength	ASTM D413	1/100,000 SF	Not Required
Density - Net only (prior to lamination)	ASTM D1505	Not Required	Not Required
Carbon Black Content - Net only (prior to lamination)	ASTM D1603	Not Required	Not Required
Thickness - Net only (prior to lamination)	ASTM D5199	Not Required	Not Required
Thickness - Geotextile only (prior to lamination)	ASTM D5199	Not Required	Not Required
Geotextile Mass/Unit Area	ASTM D5261	1/100,000 SF	Not Required
Apparent Opening Size - Geotextile only (prior to lamination)	ASTM D4751	Not Required	Not Required
GEOGRID (Specification Section 02599)			
Geocomposite tests will be performed by Golder Construction Services, Inc.			
Geocomposite (TEX-NET TN3002CN)			
Open Area	COE CW 02215-89	1/100,000 SF	Not Required
Thickness:	ASTM D5199	1/100,000 SF	Not Required
Ribs			
Junctions			
Long Term Design Load (MD)	ASTM D5262	Not Required	Not Required
Flexural Rigidity	ASTM D1388	1/100,000 SF	Not Required
Geogrid Rib Tensile Strength	GRI GG1	1/100,000 SF	Not Required
Junction Node Strength	GRI GG2	1/100,000 SF	Not Required
Strength			
Efficiency			
Density	ASTM D1248	1/100,000 SF	Not Required
Carbon Black Content	ASTM D1603	1/100,000 SF	Not Required
WETLAND MITIGATION (Specification Section 02937)			
Wetland sediment cover soil tests will be performed by Professional Service Industries, Inc. unless designated with **			
Wetland Cover Soil			
Gradation Test	ASTM D422	1/Source	1/Acre/Lift
Plasticity Index	ASTM D4318	1/Source	1/Acre/Lift
Standard Compaction	ASTM D698	1/Source	1/Source
Flexible Wall Perm Test **	ASTM D5084	1/Source	1/Acre/Lift
Field Moisture/Density	ASTM D2922	Not Required	1/10,000 SF
** Test will be performed by Golder Associates, Inc.			
CAST IN PLACE CONCRETE (Specification Section 03300)			
Cast in place concrete tests will be performed by Professional Service Industries, Inc.			
Compression Test Cylinders	ASTM C39	Not Required	4/Class/100 CY to
Making of Test Cylinders	ASTM C31	Not Required	4/Class/5,000 SF of
Testing of Aggregate	ASTM C33	Not Required	Conrete Place As

Notes:
QAPP = Quality Assurance Project Plan
ASTM = American Society for Testing and Materials
CY = cubic yard
LF = linear feet
AASHTO = American Association of State Highway and Transportation Officials
Tbl = Table
MDPW = Massachusetts Department of Public Works
SF = square foot
PSF = pounds per square foot

Table 3
Summary of Abbreviations
Property-Specific Cover Certification Reports
Industri-Plex Site

Mapping Location:

@	=	at
AAD	=	Atlantic Avenue Drainway
AL	=	Above Geotextile
AP	=	Above Pipe
BECO	=	Boston Edison Company right of way
BLDG	=	Building
BRD	=	Bradford
BSG	=	Below Subgrade
BTOB	=	Below Top of berm
CO	=	Company
COMM	=	Commerce (Way Extension)
DET	=	Detention Basin
E	=	East
EEOS	=	East End of Seam
ECHP	=	East Central Hide Pile
EXT	=	Extension
HUB	=	Hubbardston
MID	=	Middle
N	=	North
PLYM	=	Plymouth
PRES	=	Presidential (Way Extensi
REV	=	Revere
S	=	South
SEOS	=	South End of Seam
SG	=	Subgrade
STK	=	Stock (yard)
UGT	=	Under Ground Tank
UTIL	=	Utility
W	=	West
w/	=	with
WEOS	=	West End of Seam
WIL	=	Wilmington
WOB	=	Woburn

Risk Assessment Summary for Surface Soil Exposures Only for the HHEM property portion of the Site subject to this RAO-P

Receptor
Revised Table Numbers
Cumulative Hazard Index

Cover Materials:

GB	=	Gravel Borrow (Subbase)
LL	=	Liquid Limit
MOIST	=	Optimum Moisture Content
NP	=	Non-Plastic
PCF	=	Pounds per Cubic Foot
PL	=	Plastic Limit
PSI	=	Pounds per Square Inch
PROC	=	Processed
SCRND	=	Screened
SD	=	Sand
SS	=	Site Soil
TRI	=	(Bardon) Trimount

INDUSTRI-PLEX SITE
OU-1 COVER CERTIFICATION REPORT
LOCUS OF TAX MAP LOT 9-1-6 (AKA LOT IC-11)
N/F POSITIVE START REALTY, INC.

RECORD DRAWINGS

WOBURN, MASSACHUSETTS
AUGUST 8, 2000

REFERENCE PLANS:

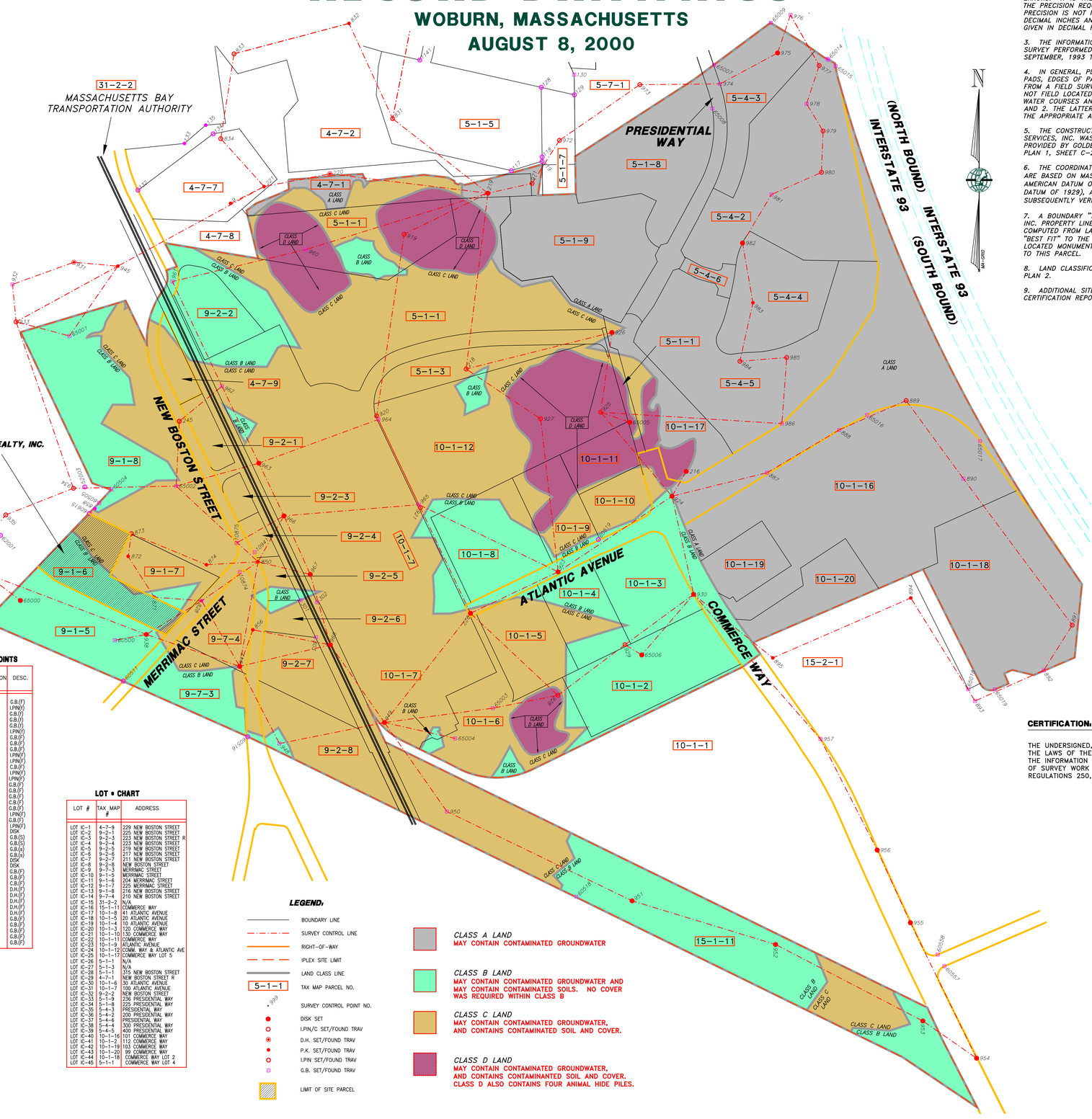
1. "REGIONAL TRANSPORTATION CENTER– WOBURN, MASSACHUSETTS" ALTERNATE COVER DESIGN– ISSUED FOR EPA/DEP APPROVAL, DATE ISSUED: MAY 16, 1995 LATEST ISSUE: JULY 26, 1996, BY VANASSE HANGEN BRUSTLIN, INC., WATERTOWN, MA

2. "INDUSTRIAL–PLEX SITE – WOBURN, MASSACHUSETTS – 100% DESIGN REPORT, PART I – REMEDIAL WORK FOR SOIL, SEDIMENTS AND AIR– VOLUME 7 OF 8", PREPARED BY GOLDER ASSOCIATES, MT. LAUREL, N.J., APRIL 25, 1992.

3. "SUBDIVISION PLAN OF LAND IN WOBURN – PERFORMED BY DANA F. PERKINS, AUGUST 28,1969", SCALE 1"=100', CERT. OF TITLE NO. 131682 BOOK 788 PAGE 132, RECORDED AS PLAN NO. 7312F ON SEPTEMBER 24, 1969 AT SOUTH REGISTRY DISTRICT OF MIDDLESEX COUNTY.

4. "INDEX PLAN OF – LAND COURT SUBDIVISION – IN – WOBURN, MA" PREPARED FOR THE NORTHEAST REGIONAL TRANSPORTATION CENTER BY MASSACHUSETTS PORT AUTHORITY, DATED OCTOBER 21, 1996, SHEETS 1–6. LCC 7312.

5. "PLAN OF RELOCATION OF A PORTION OF NEW BOSTON STREET, WOBURN, AS ORDERED BY THE COUNTY COMMISSIONERS, 1978, SCALE 1"=40'", SHEETS 4 & 5 OF 5. DOCUMENT NO. 579260.



NOTES:

1. THE OWNER OF RECORD FOR LOT 9–1–6 IS (NOW OR FORMERLY) POSITIVE START REALTY, INC., 8 CLINTON STREET, WOBURN, MA 01801. DEED REFERENCE TO PARCEL IS CERTIFICATE #167277 BOOK 966 PAGE 127, DATED MARCH 11, 1983 AND FILED IN THE LAND REGISTRATION OFFICE OF THE SOUTH REGISTRY DISTRICT OF MIDDLESEX COUNTY.

2. ELEVATION RECORDS TABULATED ON THESE DRAWINGS WERE COMPILED FROM FIELD OBSERVATIONS COLLECTED BY ELECTRONIC TOTAL STATION AND DATA COLLECTION TECHNIQUES. ELEVATIONS ARE SHOWN TO ONE HUNDREDTH OF A FOOT FOR SIMPLICITY OF TABULATION AND TO REDUCE COMPOUNDING ROUNDING ERRORS. IT IS THE INTENTION OF THE SURVEY TO REFLECT ELEVATIONS ONLY TO THE PRECISION REQUIRED BY THE PROJECT SPECIFICATIONS. ADDITIONAL PRECISION IS NOT IMPLIED BY THE TABULATION. COVER DEPTHS ARE GIVEN IN DECIMAL INCHES AND CALCULATED BY MULTIPLYING THE ELEVATION DIFFERENCES GIVEN IN DECIMAL FEET BY 12.

3. THE INFORMATION CONTAINED HEREIN IS THE RESULT OF AN ON–SITE FIELD SURVEY PERFORMED BY MERIDIAN LAND SERVICES, INC. DURING THE PERIOD OF SEPTEMBER, 1993 THROUGH JANUARY, 2000.

4. IN GENERAL, PLAN GRAPHICS SUCH AS BUILDINGS, WALKWAYS, CONCRETE PADS, EDGES OF PAVEMENT, CURBING, DRAINAGE FEATURES, ETC. WERE LOCATED FROM A FIELD SURVEY BY THIS OFFICE. ADDITIONAL GRAPHIC REPRESENTATIONS, NOT FIELD LOCATED, SUCH AS NON–GERMANE EDGES OF PAVEMENT, FENCE LINES, WATER COURSES AND ABUTTING DETAIL WERE TAKEN FROM REFERENCE PLANS 1 AND 2. THE LATTER MENTIONED DETAIL WILL BE REFERENCED ON THE PLAN WITHIN THE APPROPRIATE AREAS.

5. THE CONSTRUCTION SURVEY CONTROL NETWORK USED BY MERIDIAN LAND SERVICES, INC. WAS DERIVED ENTIRELY FROM THE EXISTING SITE CONTROL POINTS PROVIDED BY GOLDER ASSOCIATES AND VHB, INC., AS SHOWN ON REFERENCE PLAN 1, SHEET C–2 AND REFERENCE PLAN 2, SHEETS 11–1A THRU 11–1D.

6. THE COORDINATES AND ELEVATIONS OF THE EXISTING SITE CONTROL POINTS ARE BASED ON MASSACHUSETTS GRID COORDINATE SYSTEM/NAD–27 (NORTH AMERICAN DATUM OF 1927) AND NGVD–29 (THE NATIONAL GEODETIC VERTICAL DATUM OF 1929). AS STATED IN THE REFERENCE PLAN 2 NOTE 3 & SUBSEQUENTLY VERIFIED BY THIS OFFICE VIA GPS (GLOBAL POSITIONING) IN 2001.

7. A BOUNDARY "TIE IN" SURVEY WAS PERFORMED BY MERIDIAN LAND SERVICES, INC. PROPERTY LINES SHOWN HEREON WERE COMPILED AND MATHEMATICALLY COMPUTED FROM LAND COURT CASE NUMBER 7312. THESE COMPUTED PLANS WERE "BEST FIT" TO THE PROJECT COORDINATE SYSTEM USING NUMEROUS FIELD LOCATED MONUMENTS. SEE REFERENCE PLAN #3 FOR BOUNDARY LINES PERTAINING TO THIS PARCEL.

8. LAND CLASSIFICATION LINES SHOWN HEREON WERE TAKEN FROM REFERENCE PLAN 2.

9. ADDITIONAL SITE–WIDE INFORMATION CAN BE FOUND IN THE MASTER COVER CERTIFICATION REPORT, INCLUDING, MASTER RECORD DRAWINGS.

SURVEY CONTROL NETWORK POINTS

POINT #	NORTHING (FEET)	EASTING (FEET)	ELEVATION (FEET)	DESC.
8	555829.94	696197.41	88.93	PIN/C(s)
9	554787.93	695334.79	93.29	MAGNL(s)
117	554935.71	696605.05	119.44	LPIN(f)
118	554997.69	696744.31	124.49	LPIN(f)
119	554977.42	696743.93	125.72	LPIN(f)
120	556005.46	696613.05	95.27	C.B.(f)
128	555312.88	696740.29	115.51	LPIN(f)
129	555279.16	696890.59	117.47	LPIN(f)
130	555370.20	696889.50	118.61	C.B.(f)
132	554847.71	694915.95	78.43	LPIN(f)
133	555058.90	695126.18	96.01	P.K.(f)
134	555102.46	695256.34	96.55	LPIN(f)
135	555142.01	695222.63	90.28	P.K.(f)
157	555602.41	696284.78	90.59	C.B.(f)
216	553575.07	697396.19	72.34	DISK
218	554038.23	696400.64	91.30	LPIN(s)
219	554833.75	696498.97	113.51	DISK
220	554921.67	695784.06	73.06	D.H.(f)
221	554863.96	695486.38	96.35	P.K.(f)
245	553801.79	695102.81	70.74	PIN/C(s)
301	552991.99	695650.71	67.70	G.B.(f)
302	552983.08	695726.35	68.00	G.B.(f)
303	552824.40	695720.82	66.92	G.B.(f)
751	550314.48	698866.23	58.42	G.B.(f)
752	550363.63	698811.51	57.52	G.B.(f)
754	550089.43	697819.49	53.51	G.B.(f)
755	550155.77	697925.27	54.70	G.B.(f)
756	550192.19	698080.56	56.08	PIN/C(f)
828	552989.66	695204.98	72.68	RRSPK(S)
831	555171.27	696067.95	92.16	PIN/C(s)
832	555602.29	695870.66	86.06	P.K.(a)
833	555464.48	695350.57	78.24	PIN/C(s)
834	555080.77	695290.39	96.82	PIN/C(s)
850	553166.01	695458.74	66.79	P.K.(f)
857	554268.42	694914.00	73.19	PIN/C(S)
858	553407.27	694721.18	73.66	P.K.(S)
871	553005.63	694989.59	75.27	P.K.(s)
872	553190.49	694871.47	74.38	P.K.(s)
873	553293.14	694886.21	73.74	PIN/C(s)
874	553152.45	695225.83	72.96	P.K.(s)
887	553569.05	697762.19	74.67	G.B.(s)
888	553762.69	698088.18	75.46	G.B.(f)
889	553895.58	698391.10	74.41	PIN/C(s)
890	553542.21	698649.64	72.97	G.B.(S)
891	552879.28	699142.48	69.34	PIN/C(s)
892	552674.56	699013.57	68.58	G.B.(S)
893	552536.04	698702.70	69.67	G.B.(S)
894	553002.10	698412.19	69.40	MAGNL(s)
895	552730.89	697787.70	67.50	MAGNL(s)
919	554648.09	696120.30	106.02	PIN/C(s)
920	553826.01	695995.76	79.40	PIN/C(s)
921	553411.21	696193.36	78.92	PIN/C(s)
922	552932.88	696420.08	71.72	DISK
923	553120.20	696816.46	72.78	DISK
924	553462.61	697331.77	68.39	DISK
925	553842.55	697009.22	94.89	PIN/C(s)
926	554203.87	697060.28	79.00	DISK
927	553812.75	696737.39	107.69	PIN/C(s)
928	552561.74	696815.28	88.15	PIN/C(s)
929	552790.55	697119.09	71.75	PIN/C(s)
930	553018.55	697429.53	68.02	DISK
931	554521.49	694626.27	87.39	D.H.(f)
932	554421.26	694348.31	101.39	G.B.(f)
933	554251.87	694364.55	90.95	PIN/C(s)
934	553498.56	694623.81	69.94	PIN/C(s)
935	553378.01	694317.96	72.10	PIN/C(s)
936	553290.51	694245.09	81.03	PIN/C(s)
937	553114.85	694221.58	97.94	PIN/C(s)
938	552836.93	694953.72	80.60	DISK
944	550614.66	697637.80	N/A	G.B.(F)
945	554503.77	694825.96	74.68	P.K.(f)
947	552692.72	695376.15	65.92	DISK
948	552434.09	695555.77	63.57	G.B.(s)
949	552438.47	696030.92	71.73	DISK
950	552035.73	696313.53	68.40	G.B.(s)
951	551631.65	697151.14	65.87	DISK
952	551433.89	697800.32	73.68	DISK
953	551087.81	698466.50	63.64	DISK
954	550919.29	698709.73	60.45	DISK
955	551532.44	698410.23	63.71	DISK
956	551861.31	698260.16	65.21	DISK
957	552364.26	698003.18	67.73	G.B.(F)
960	554579.37	695677.56	96.32	G.B.(s)
961	554434.15	695071.84	85.91	G.B.(s)
962	553960.20	695295.87	79.76	G.B.(s)
963	553612.09	695462.70	78.81	DISK
964	553810.04	696003.71	79.67	G.B.(s)
965	553424.46	696186.34	79.67	G.B.(s)
966	553373.67	695576.30	77.68	DISK
967	553108.66	695695.24	76.92	DISK
968	552790.10	695786.11	73.69	DISK
971	554878.15	696698.61	129.11	PIN/C(s)
972	555073.02	696822.69	125.79	PIN/C(s)
973	555324.98	697186.40	117.15	PIN/C(s)
974	555328.29	697548.91	96.63	G.B.(f)
975	555468.38	697809.50	92.45	DISK
976	555640.49	697867.72	72.09	G.B.(s)
977	555411.42	697997.77	85.47	PIN/C(s)
978	555238.37	697940.64	70.49	G.B.(S)
979	555115.28	698015.18	87.78	PIN/C(s)
980	554928.03	698008.18	80.93	PIN/C(s)
981	554828.02	697781.52	67.51	G.B.(S)
982	554608.27	697651.96	76.95	DISK
983	554337.91	697697.91	77.28	MAGNL(s)
984	554073.15	697638.96	76.58	PIN/C(s)
985	554090.37	697850.88	75.15	PIN/C(s)

SURVEY CONTROL NETWORK POINTS

POINT #	NORTHING (FEET)	EASTING (FEET)	ELEVATION (FEET)	DESC.
986	553791.19	697828.87	72.71	G.B.(F)
1141	555436.21	696190.95	93.57	LPIN(F)
10874	553119.80	695375.82	69.28	G.B.(f)
10875	553250.96	695361.95	69.88	G.B.(f)
10941	553209.59	695443.61	67.53	G.B.(f)
52003	553504.76	694675.40	69.61	LPIN(f)
60500	552811.04	694811.44	81.43	G.B.(F)
60504	553493.08	694795.99	68.28	G.B.(F)
60505	553431.74	694740.48	72.60	G.B.(F)
60511	552626.22	694850.12	75.34	LPIN(F)
60516	552373.95	695412.38	64.04	LPIN(F)
60518	551650.24	696899.13	59.14	C.B.(F)
60519	553266.67	696998.63	71.39	LPIN(F)
60545	550635.42	698962.56	N/A	LPIN(F)
60549	550646.41	699172.79	N/A	G.B.(F)
60551	550588.82	697583.34	N/A	G.B.(F)
60552	550611.64	697561.55	N/A	G.B.(F)
60557	551335.71	698564.07	N/A	C.B.(F)
60558	551388.23	698534.25	N/A	G.B.(F)
60615	553385.09	694695.50	75.40	LPIN(F)
60950	550705.00	699289.45	N/A	G.B.(F)
62001	553285.48	694294.18	77.01	LPIN(F)
65000	552990.73	694384.08	81.27	DISK
65001	554187.89	694605.57	73.26	G.B.(S)
65002	553508.43	695088.74	70.95	G.B.(S)
65003	552503.26	694521.21	65.89	G.B.(s)
65004	552366.69	696350.85	66.78	G.B.(s)
65005	553796.88	697140.89	74.08	DISK
65006	552744.10	697194.90	65.26	DISK
65007	555414.66	697522.06	102.24	G.B.(F)
65008	555217.20	697514.54	90.27	G.B.(F)
65009	555605.36	697779.98	90.97	C.B.(F)
65010	555803.93	697977.42	72.86	D.H.(F)
65011	555708.76	697858.52	73.01	D.H.(F)
65012	555702.94	697888.20	70.08	D.H.(F)
65013	555745.19	697945.39	70.36	D.H.(F)
65014	555440.08	698036.86	89.23	D.H.(F)
65015	555409.32	698071.85	82.18	G.B.(F)
65016	553829.73	698214.01	76.93	G.B.(F)
65017	553712.31	698725.05	66.57	G.B.(F)
65018	552588.82	698672.03	69.10	G.B.(F)
65019	552588.11	698792.15	69.58	G.B.(F)

LOT # CHART

LOT #	TAX MAP #	ADDRESS
LOT IC–1	4–7–9	229 NEW BOSTON STREET
LOT IC–2	9–2–1	225 NEW BOSTON STREET
LOT IC–3	9–2–3	223 NEW BOSTON STREET R
LOT IC–4	9–2–4	223 NEW BOSTON STREET
LOT IC–5	9–2–5	219 NEW BOSTON STREET
LOT IC–6	9–2–6	217 NEW BOSTON STREET
LOT IC–7	9–2–7	211 NEW BOSTON STREET
LOT IC–8	9–2–8	NEW BOSTON STREET
LOT IC–9	9–3–3	MERRIMAC STREET
LOT IC–10	9–1–5	MERRIMAC STREET
LOT IC–11	9–1–6	204 MERRIMAC STREET
LOT IC–12	9–1–7	225 MERRIMAC STREET
LOT IC–13	9–1–8	216 NEW BOSTON STREET
LOT IC–14	9–7–4	210 NEW BOSTON STREET
LOT IC–15	31–2–2	N/A
LOT IC–16	15–1–11	COMMERCE WAY
LOT IC–17	10–1–8	41 ATLANTIC AVENUE
LOT IC–18	10–1–5	20 ATLANTIC AVENUE
LOT IC–19	10–1–4	10 ATLANTIC AVENUE
LOT IC–20	10–1–3	120 COMMERCE WAY
LOT IC–21	10–1–10	130 COMMERCE WAY
LOT IC–22	10–1–11	COMMERCE WAY
LOT IC–23	10–1–9	ATLANTIC AVENUE
LOT IC–24	10–1–12	COMM. WAY & ATLANTIC AVE.
LOT IC–25	10–1–17	COMMERCE WAY LOT 5
LOT IC–26	5–1–1	N/A
LOT IC–27	5–1–3	N/A
LOT IC–28	5–1–1	315 NEW BOSTON STREET
LOT IC–29	4–7–1	NEW BOSTON STREET R
LOT IC–30	10–1–6	30 ATLANTIC AVENUE
LOT IC–31	10–1–7	100 ATLANTIC AVENUE
LOT IC–32	9–2–2	NEW BOSTON STREET
LOT IC–33	5–1–9	236 PRESIDENTIAL WAY
LOT IC–34	5–1–8	225 PRESIDENTIAL WAY
LOT IC–35	5–1–3	PRESIDENTIAL WAY
LOT IC–36	5–4–2	200 PRESIDENTIAL WAY
LOT IC–37	5–4–6	PRESIDENTIAL WAY
LOT IC–38	5–4–4	300 PRESIDENTIAL WAY
LOT IC–39	5–4–5	400 PRESIDENTIAL WAY
LOT IC–40	10–1–16	101 COMMERCE WAY
LOT IC–41	10–1–7	112 COMMERCE WAY
LOT IC–42	10–1–19	103 COMMERCE WAY
LOT IC–43	10–1–20	99 COMMERCE WAY
LOT IC–44	10–1–18	COMMERCE WAY LOT 2
LOT IC–45	5–1–1	COMMERCE WAY LOT 4

RESTRICTED AREAS BY CLASSES OF LAND

CLASS OF LAND	DESCRIPTION
A	MAY CONTAIN CONTAMINATED GROUNDWATER
B	MAY CONTAIN CONTAMINATED GROUNDWATER, AND MAY CONTAIN CONTAMINATED SOILS. NO COVER WAS REQUIRED WITHIN CLASS B.
C	MAY CONTAIN CONTAMINATED GROUNDWATER, AND CONTAINS CONTAMINATED SOIL AND COVER.
D	MAY CONTAIN CONTAMINATED GROUNDWATER, AND CONTAINS CONTAMINATED SOIL AND COVER. CLASS D ALSO CONTAINS FOUR ANIMAL HIDE PILES.

LEGEND:

- BOUNDARY LINE
- SURVEY CONTROL LINE
- RIGHT–OF–WAY
- IPLEX SITE LIMIT
- LAND CLASS LINE
- 5–1–1 TAX MAP PARCEL NO.
- 999 SURVEY CONTROL POINT NO.
- DISK SET
- I.PIN/C SET/FOUND TRAV
- D.H. SET/FOUND TRAV
- P.K. SET/FOUND TRAV
- I.PIN SET/FOUND TRAV
- G.B. SET/FOUND TRAV
- LIMIT OF SITE PARCEL

CLASS A LAND
MAY CONTAIN CONTAMINATED GROUNDWATER

CLASS B LAND
MAY CONTAIN CONTAMINATED GROUNDWATER AND MAY CONTAIN CONTAMINATED SOILS. NO COVER WAS REQUIRED WITHIN CLASS B

CLASS C LAND
MAY CONTAIN CONTAMINATED GROUNDWATER, AND CONTAINS CONTAMINATED SOIL AND COVER.

CLASS D LAND
MAY CONTAIN CONTAMINATED GROUNDWATER, AND CONTAINS CONTAMINANTED SOIL AND COVER. CLASS D ALSO CONTAINS FOUR ANIMAL HIDE PILES.

CERTIFICATION:

THE UNDERSIGNED, A DULY REGISTERED PROFESSIONAL LAND SURVEYOR UNDER THE LAWS OF THE COMMONWEALTH OF MASSACHUSETTS, HEREBY CERTIFIES THAT THE INFORMATION ON THESE RECORD PLANS CONTAINED HEREIN IS THE RESULT OF SURVEY WORK PERFORMED IN CONFORMANCE WITH THE CODE OF MASSACHUSETTS REGULATIONS 250, SECTION 6.03.

FINAL

PROFESSIONAL LAND SURVEYOR DATE

GRAPHIC SCALE
200' 100' 0 200' 400' 600'

REV.	DATE	DESCRIPTION	DR	CK
I	6/25/08	FINAL SUBMISSION	TC	DBM
H	2/28/08	EPA, DEP COMMENTS	TC	DBM
G	9/20/07	EPA & DEP COMMENTS OF 8/29/07	JF	CAC
F	5/1/07	EPA & DEP COMMENTS OF 8/3/06	JF	CAC
E	9/21/05	EPA & DEP COMMENTS OF 7/12/04	KL	MDP
D	6/11/04	EPA & DEP COMMENTS OF 10/30/03	JF	MDP
C	8/16/03	DEP REVISIONS	JF	MDP
B	8/11/03	EPA REVISIONS	JF	MDP
A	8/8/00	ISSUE FOR REVIEW		MDP

FINAL

PROFESSIONAL LAND SURVEYOR

PROFESSIONAL ENGINEER

PREPARED FOR: ROUX ASSOCIATES, INC. Environmental Consulting & Management

PREPARED BY: MERIDIAN Land Services, Inc. ENGINEERS • LAND SURVEYORS • SCIENTISTS • LAND PLANNERS

DESIGNED BY:

Golder Associates Manchester, New Hampshire 400 Commercial Street Manchester, N.H. USA 03101 603–668–0880 • FAX 603–668–1199

PROJECT RECORD (TAX MAP LOT 9-1-6)

N/F POSITIVE START REALTY, INC.

INDUSTRI-PLEX SITE REMEDIAL TRUST
WOBURN, MASSACHUSETTS

AUGUST 8, 2000

SCALE: 1" = 200'

DESIGNED BY: MDP
DRAFTED BY: MDP
CHECKED BY: JGK
FILE: 2900191111.dwg
DO NOT SCALE DRAWING

A-64
SHEET NO.
PROJECT: 2900.00
SHEET 1 OF 5

Jun 25, 2008 – 3:11pm MDP Land Desktop 2004 – LDT4
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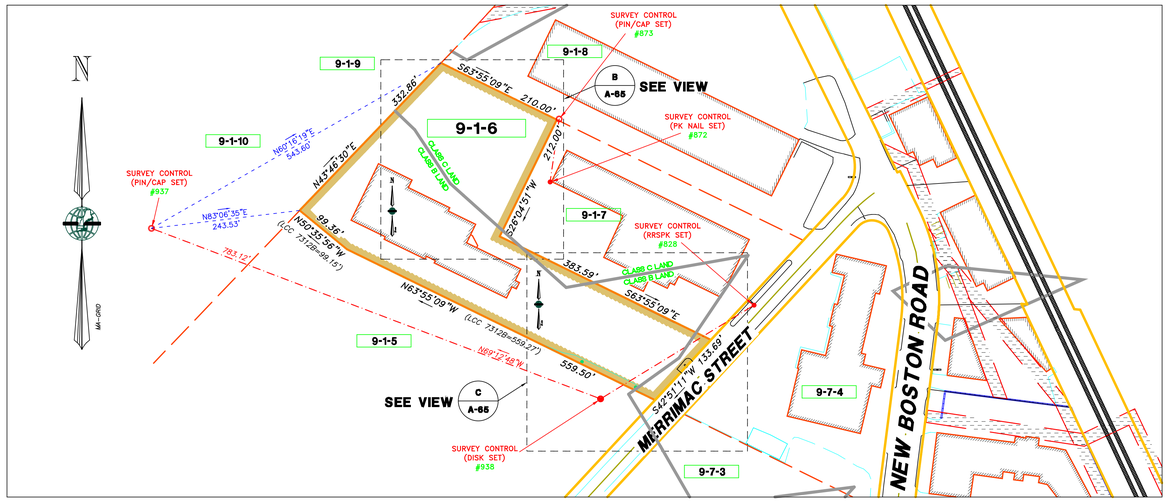


BOUNDARY LINES FOR ENTIRE PARCEL (A / A-65)
SCALE: 1"=100'

LEGEND

ASBUILT COVER TYPE	BOUNDARY LINE	LIMITS OF EXISTING EASEMENTS
TEST PIT	RIGHT-OF-WAY	EDGE OF EXISTING BUILDINGS
MONITOR WELL	ABUTTING PROPERTY LINES	AREA OF LEDGE
HYDRANT	ASPHALT, CONCRETE, GRANITE CURB	HIDE PILES BASED ON CONSENT DECREE
GATE VALVE	TRANSITION ZONE	LIMITS OF RIPRAP = 6" STONE
CATCH BASIN (SQUARE)	LAND CLASS LINE	AREA OF ENGINEERED COVER (COMPLIES WITH 100R DESIGN PLANS UNLESS OTHERWISE STATED)
CATCH BASIN (ROUND)	N 551,000 GRID LINE	
DRAIN MANHOLE	EDGE OF EXISTING PAVEMENT	
SEWER MANHOLE	LIMIT OF GEOTEXTILE	
UTILITY POLE	A.T.&T. FIBER OPTIC CABLE	
GUY WIRE	TOE OF SLOPE	
+14000 ASBUILT POINT NO. & LOCATION	TOP OF SLOPE	
GAS METER	LIMIT CHAIN LINK FENCE	
GAS SHUT OFF	EDGE OF ASBUILT GRAVEL ROAD	ASBUILT FINISH GRADE CONTOUR 5' INTERVAL
WATER SHUT OFF	BACK EDGE OF PLANTER	ASBUILT FINISH GRADE CONTOUR 1' INTERVAL
WATER CONTROL BOX	EDGE OF PROPOSED PAVEMENT	OHW OVERHEAD WIRES
SIGN	EXISTING EASEMENT	UGG UNDERGROUND GAS LINE
BOLLARD	ASBUILT CULVERT	99999 POINT MARKER (SEE POINTS CHART)
TELEPHONE MANHOLE	LIMIT OF TREELINE	TIE COURSE
BORING LOCATION	EXISTING CONCRETE STRUCTURE	SURVEY CONTROL LINE
MICRO WELL LOCATION	SURVEY CONTROL MONUMENT (GRANITE BOUND SET)	
PIEZOMETER LOCATION	SURVEY CONTROL MONUMENT (DISK SET)	
SOIL SAMPLE LOCATION	SURVEY CONTROL MONUMENT (PIN/CAP SET)	
STAFF GUAGE LOCATION	UID LOCATION	
TENSIOMETER LOCATION	MONITORING WELL LOCATION	

X — DETAIL/CROSS SECTION DESIGNATION
A-XX — SHEET No. WHERE DETAIL/CROSS SECTION IS PRESENTED

LAND CLASS RESTRICTED AREAS POINTS CHART

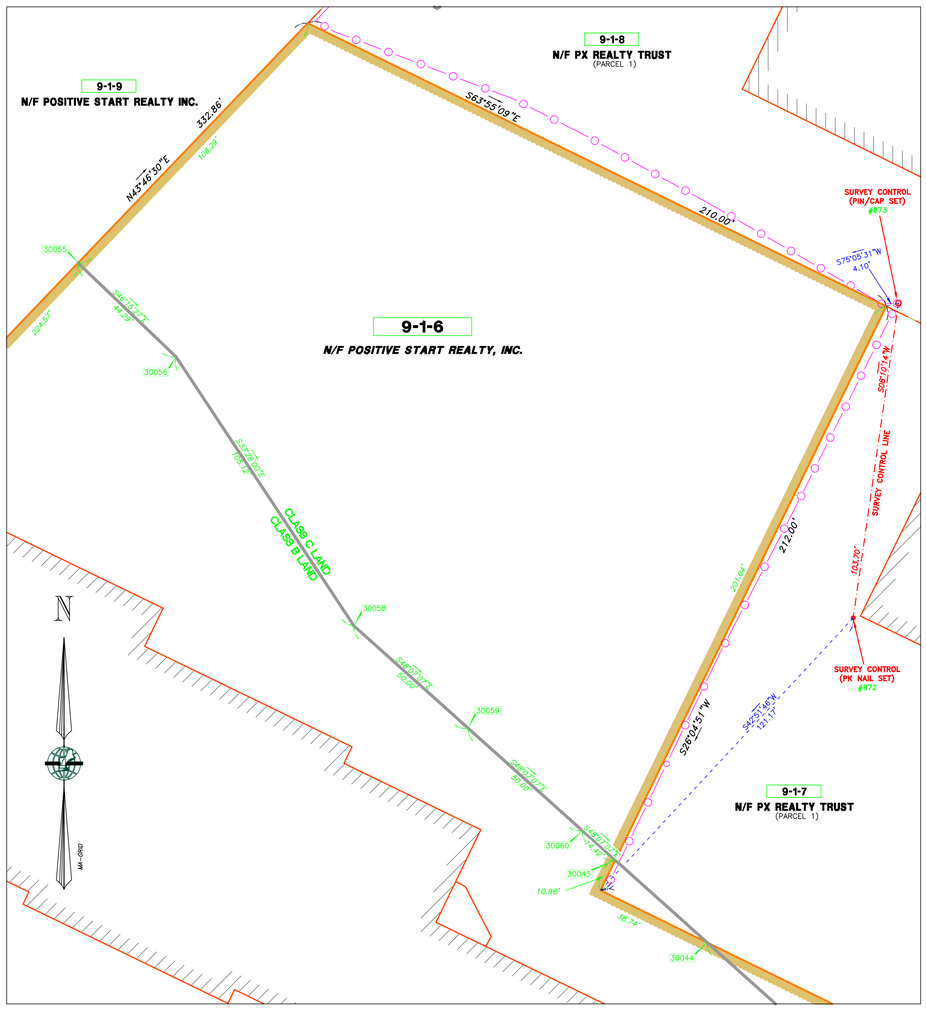
NUMBER	NORTHING	EASTING
30055	553306.2	694618.7
30056	553275.6	694650.7
30058	553187.9	694708.7
30043	553111.5	694793.9
30044	553084.4	694823.8
30062	553018.5	694897.6
30045	553026.4	694942.8
30053	552944.9	695169.4
30063	552903.5	695081.5
30065	552851.4	695009.1

SURVEY CONTROL NETWORK POINTS

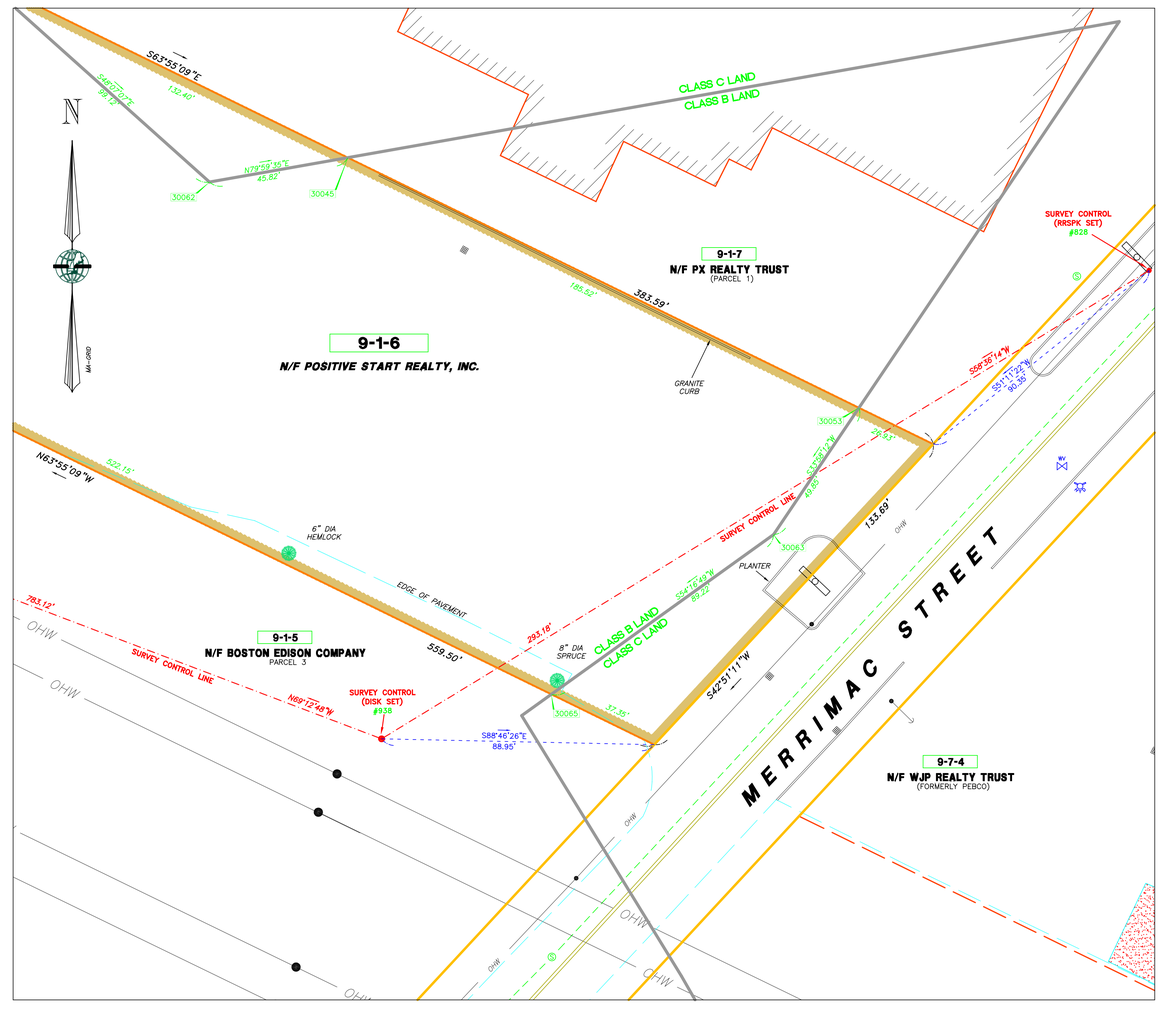
POINT #	NORTHING (FEET)	EASTING (FEET)	ELEVATION (FEET)	DESC.
828	552989.66	695204.98	72.68	RRSPK(S)
872	553190.49	694871.47	74.38	P.K.(s)
873	553293.14	694886.21	73.74	PIN/C(s)
937	553114.85	694221.58	97.94	PIN/C(s)
938	552836.93	694953.72	80.60	DISK

RESTRICTED AREAS BY CLASSES OF LAND

CLASS OF LAND	DESCRIPTION
A	MAY CONTAIN CONTAMINATED GROUNDWATER
B	MAY CONTAIN CONTAMINATED GROUNDWATER, AND MAY CONTAIN CONTAMINATED SOILS. NO COVER WAS REQUIRED WITHIN CLASS B.
C	MAY CONTAIN CONTAMINATED GROUNDWATER, AND CONTAINS CONTAMINATED SOIL AND COVER.
D	MAY CONTAIN CONTAMINATED GROUNDWATER, AND CONTAINS CONTAMINATED SOIL AND COVER. CLASS D ALSO CONTAINS FOUR ANIMAL HIDE PILES.



REMEDIATED AREA (B / A-65)
SCALE: 1"=20'



REMEDIATED AREA (C / A-65)
SCALE: 1"=20'

GRAPHIC SCALE
20' 10' 0 20' 40' 60'

REV.	DATE	DESCRIPTION	DR	CK
I	6/25/08	FINAL SUBMISSION	TC	DBM MDP
H	2/29/08	EPA, DEP COMMENTS	TC	DBM MDP
G	8/29/07	EPA & DEP COMMENTS OF 8/29/07	JF	CAC MDP
F	5/1/07	EPA & DEP COMMENTS OF 8/3/06	JF	CAC MDP
E	9/21/05	EPA & DEP COMMENTS OF 7/12/04	KL	MDP JCK
D	6/11/04	EPA & DEP COMMENTS OF 10/30/03	JF	MDP JCK
C	10/16/03	DEP REVISIONS	JF	MDP JCK
B	8/12/01	EPA REVISIONS	JF	MDP JCK
A	8/8/00	ISSUE FOR REVIEW		MDP JCK

FINAL

PROFESSIONAL LAND SURVEYOR

PROFESSIONAL ENGINEER

PREPARED FOR: ROUX — ROUX ASSOCIATES, INC. Environmental Consulting & Management

PREPARED BY: MERIDIAN Land Services, Inc. — ENGINEERS • LAND SURVEYORS • SCIENTISTS • LAND PLANNERS

DESIGNED BY: Golder Associates — 400 Commercial Street, Manchester, New Hampshire, Manchester, N.H. USA 03101, 603-668-0880 • FAX 603-668-1199

PROJECT RECORD (TAX MAP LOT 9-1-6)

BOUNDARY LINES, LAND CLASSIFICATIONS, EASEMENTS AND ASBUILT DRAINAGE

INDUSTRI-PLEX SITE REMEDIAL TRUST
WOBURN, MASSACHUSETTS

AUGUST 8, 2000

SCALE: 1" = 20'

DESIGNED BY: MDP	A-65
DRAFTED BY: MDP	SHEET NO.
CHECKED BY: JCK	
FILE: 29001912.dwg	PROJECT: 2900.00
DO NOT SCALE DRAWING	SHEET 2 OF 5

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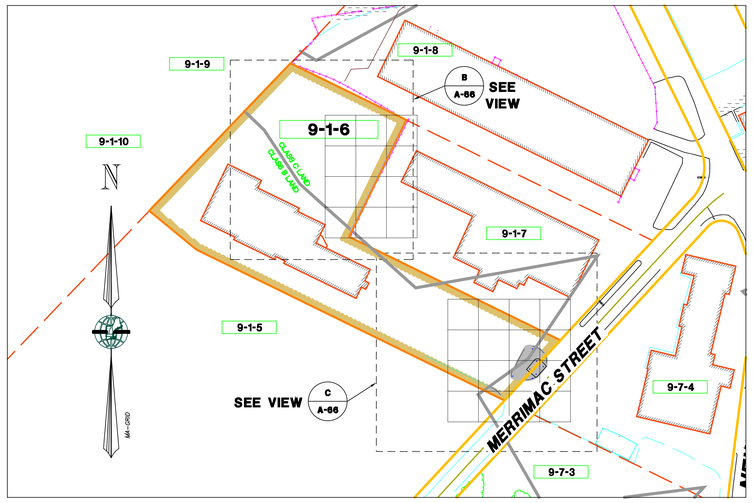


ENTIRE PARCEL (A / A-66)
SCALE: 1"=100'

POINT DESCRIPTORS			
A	AERO	HYD	HYDRANT
BEOP	BACK EDGE OF PLANTER	K	KOSTER
BLDG	BUILDING	LIM	LIMIT
BNDY	BOUNDARY	MW	MONITOR WELL
BR	BREAK IN SLOPE	P	PEBCO (NOW WJP REALTY TRUST)
C##	CONTOUR INTERVAL	PLNTR	PLANTER
CG	COVER GRADE	PC	POINT OF CURVATURE
CHNL	CHANNEL	POC	POINT ON CURVE
CL	CENTERLINE	PT	POINT OF TANGENCY
CLF	CHAIN LINK FENCE	PX	PX REALTY
CONT	CONTOURS	R	RANDOM
COR	CORNER	RD	ROAD
CUL	CULVERT	REM	REMEDIATION
CURBa	ASPHALT CURB	RPRP	RIPRAP
CURBg	GRANITE CURB	SG	SUBGRADE
D	DAGATA	SL	SLOPE
DTCH	DITCH	SWL	SWALE
E.	EDGE OF	TOB	TOP OF BANK
E.C.	EDGE OF CONCRETE	TOE	TOE OF SLOPE
E.P.	EDGE OF PAVEMENT	TOP	TOP OF SLOPE
EX	EXCAVATION	TRAN	TRANSITION ZONE
EZ	EXCLUSION ZONE	UC	UTILITY CORRIDOR
FAB	FABRIC	UCN	NORTH UTILITY CORRIDOR
FG	FINISH GRADE	UP	UTILITY POLE
G	GENERAL POINT	WG	WATERGATE
GUY	GUY WIRE	RRBD	RAILROAD BED

MERIDIAN LAND SERVICES POINTS TABLE

Point Number	Northing	Easting	(Subgrade) Geotextile Elev. Feet	Cover Grade Elev. Feet	Cover Grade Depth Inches	Finish Grade Elev. Feet	Finish Grade Depth Inches	Total Depth Inches	Desc.	Date Of Coring
8041	552903.0	695107.0	71.66	73.15	17.88	73.71	6.72	24.60	CORING-G41	7/29/99
8042	552919.0	695087.9	72.72	73.64	11.04	74.29	7.80	18.84	CORING-G42	7/29/99
8043	552874.7	695056.0	72.53	73.82	15.48	74.55	8.76	24.24	CORING-G43	7/29/99
8044	552870.9	695087.9	71.93	72.86	11.16	73.51	7.80	18.96	CORING-G44	7/29/99
20433	552890.6	695106.0	71.91	74.26	28.20	74.60	4±	32.28	R	
20434	552899.0	695094.9	72.07	74.57	30.00	74.91	4±	34.88	R	
20435	552886.0	695083.8	72.44	74.64	26.40	74.98	4±	30.48	R	
20436	552877.5	695094.2	71.96	74.19	26.76	74.53	4±	30.84	R	

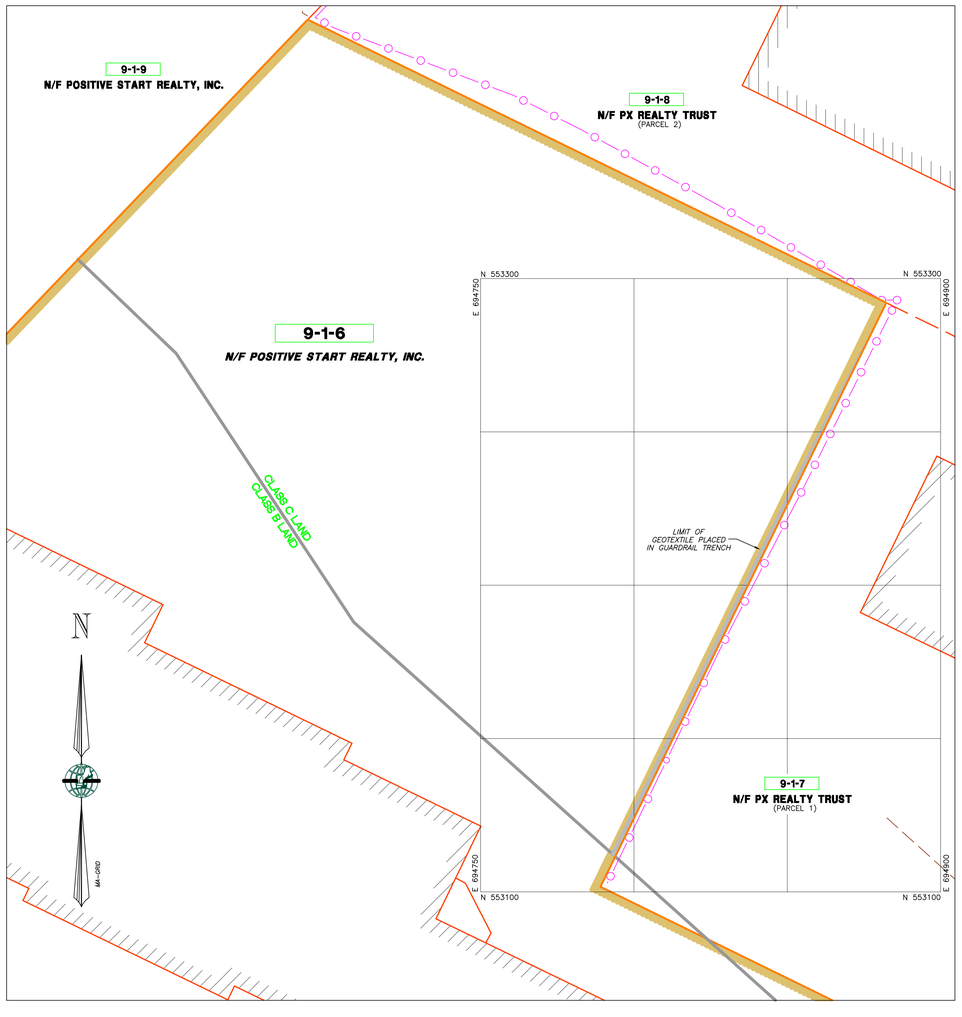
RESTRICTED AREAS BY CLASSES OF LAND

CLASS OF LAND	DESCRIPTION
A	MAY CONTAIN CONTAMINATED GROUNDWATER
B	MAY CONTAIN CONTAMINATED GROUNDWATER, AND MAY CONTAIN CONTAMINATED SOILS. NO COVER WAS REQUIRED WITHIN CLASS B.
C	MAY CONTAIN CONTAMINATED GROUNDWATER, AND CONTAINS CONTAMINATED SOIL AND COVER.
D	MAY CONTAIN CONTAMINATED GROUNDWATER, AND CONTAINS CONTAMINATED SOIL AND COVER. CLASS D ALSO CONTAINS FOUR ANIMAL HIDE PILES.

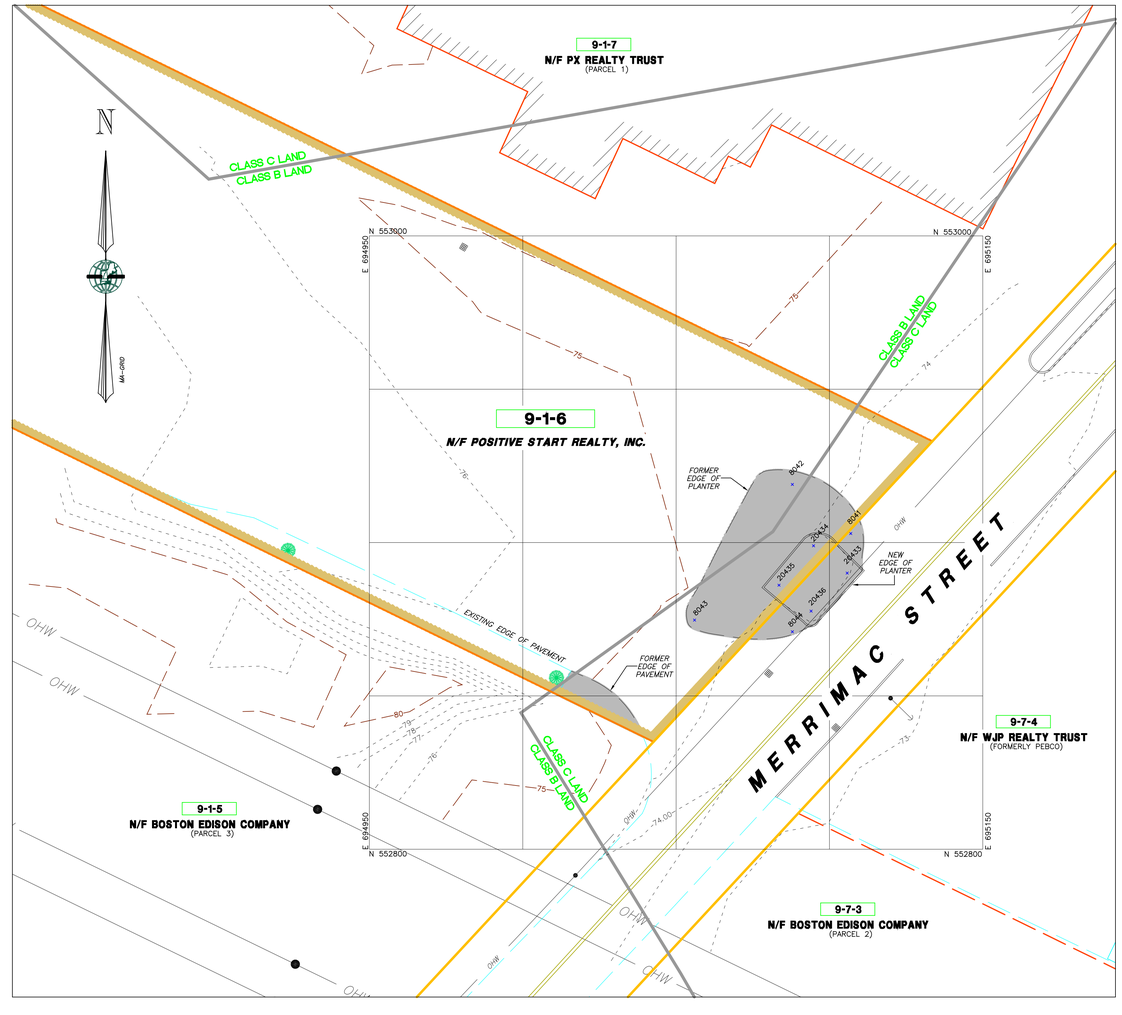
LEGEND

- BOUNDARY LINE
- RIGHT-OF-WAY
- ABUTTING PROPERTY LINES
- ASPHALT, CONCRETE, GRANITE CURB
- TRANSITION ZONE
- LAND CLASS LINE
- N 551,000 — GRID LINE
- EDGE OF EXISTING PAVEMENT
- LIMIT OF GEOTEXTILE
- A.T.&T. FIBER OPTIC CABLE
- TOE OF SLOPE
- TOP OF SLOPE
- LIMIT CHAIN LINK FENCE
- EDGE OF ASBUILT GRAVEL ROAD
- BACK EDGE OF PLANTER
- EDGE OF PROPOSED PAVEMENT
- EXISTING EASEMENT
- ASBUILT CULVERT
- LIMIT OF TREELINE
- EXISTING CONCRETE STRUCTURE
- ASBUILT FINISH GRADE CONTOUR 5' INTERVAL
- ASBUILT FINISH GRADE CONTOUR 1' INTERVAL
- OHW — OVERHEAD WIRES
- UGG — UNDERGROUND GAS LINE
- 3.3 — ASBUILT COVER TYPE
- TEST PIT
- MW — MONITOR WELL
- HYDRANT
- GATE VALVE
- CATCH BASIN (SQUARE)
- CATCH BASIN (ROUND)
- DRAIN MANHOLE
- SEWER MANHOLE
- UTILITY POLE
- GUY WIRE
- +14000 — ASBUILT POINT NO. & LOCATION
- GAS METER
- GAS SHUT OFF
- WATER SHUT OFF
- WATER CONTROL BOX
- SIGN
- BOLLARD
- TELEPHONE MANHOLE
- LIMITS OF EXISTING EASEMENTS
- EDGE OF EXISTING BUILDINGS
- AREA OF LEDGE
- HIDE PILES BASED ON CONSENT DECREE
- LIMITS OF RIPRAP = 6" STONE
- AREA OF ENGINEERED COVER (COMPLIES WITH 100% DESIGN PLANS UNLESS OTHERWISE STATED)

X / A-XX — DETAIL/CROSS SECTION DESIGNATION / SHEET No. WHERE DETAIL/CROSS SECTION IS PRESENTED



REMEDIATED AREA (B / A-66)
SCALE: 1"=20'



REMEDIATED AREA (C / A-66)
SCALE: 1"=20'

GRAPHIC SCALE
20' 10' 0 20' 40' 60'

REV.	DATE	DESCRIPTION	DR	CK
I	6/25/08	FINAL SUBMISSION	TC	DBM
H	4/29/08	EPA & DEP COMMENTS OF 8/29/07	TC	DBM
G	9/26/07	EPA & DEP COMMENTS OF 8/3/06	JF	CAC
F	5/1/07	EPA & DEP COMMENTS OF 7/12/04	KL	MDP
E	9/21/05	EPA & DEP COMMENTS OF 10/30/03	JF	MDP
D	6/11/04	DEP REVISIONS	JF	MDP
C	10/16/03	EPA REVISIONS	JF	MDP
B	8/11/01	ISSUE FOR REVIEW	MDP	JCK
A	8/8/00	ISSUE FOR REVIEW	MDP	JCK

FINAL

PROFESSIONAL LAND SURVEYOR

PROFESSIONAL ENGINEER

PREPARED FOR: ROUX ASSOCIATES, INC. *Environmental Consulting & Management*

PREPARED BY: MERIDIAN Land Services, Inc. — ENGINEERS • LAND SURVEYORS • SCIENTISTS • LAND PLANNERS

DESIGNED BY: Golder Associates, Manchester, New Hampshire, 400 Commercial Street, Manchester, N.H. USA 03101, 603-668-0880 • FAX 603-668-1199

PROJECT RECORD (TAX MAP LOT 9-1-6)

RECORD POINTS, TOPOGRAPHY & LIMITS OF ENGINEERED COVER

INDUSTRI-PLEX SITE REMEDIAL TRUST WOBURN, MASSACHUSETTS

SCALE: 1" = 20'
AUGUST 8, 2000

DESIGNED BY: MDP	A-66
DRAFTED BY: MDP	SHEET NO.
CHECKED BY: JCK	
FILE: 290019113.dwg	PROJECT: 2900.00
DO NOT SCALE DRAWING	SHEET 3 OF 5

Jun 25, 2008 - 3:42pm MDP Land Desktop 2004 - LDT4
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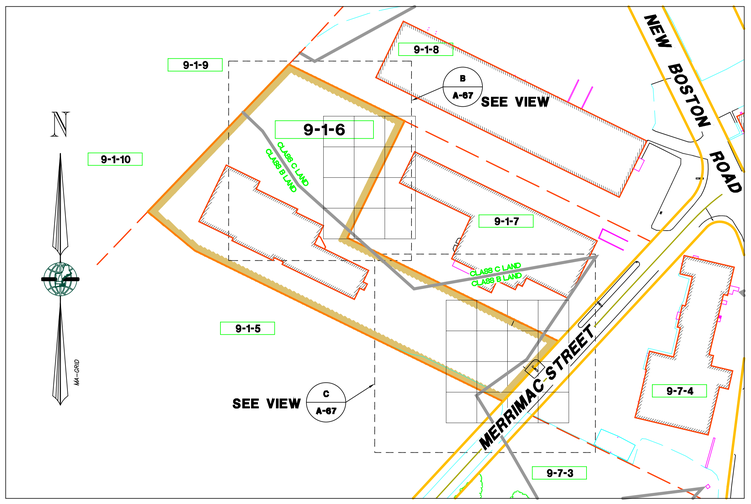


ENTIRE PARCEL (A / A-67)
SCALE: 1"=100'

RESTRICTED AREAS BY CLASSES OF LAND

CLASS	DESCRIPTION
A	MAY CONTAIN CONTAMINATED GROUNDWATER
B	MAY CONTAIN CONTAMINATED GROUNDWATER, AND MAY CONTAIN CONTAMINATED SOILS. NO COVER WAS REQUIRED WITHIN CLASS B.
C	MAY CONTAIN CONTAMINATED GROUNDWATER, AND CONTAINS CONTAMINATED SOIL AND COVER.
D	MAY CONTAIN CONTAMINATED GROUNDWATER, AND CONTAINS CONTAMINATED SOIL AND COVER. CLASS D ALSO CONTAINS FOUR ANIMAL HIDE PILES.

COVER TYPES (EQUIVALENT)

AREA	ORIGINAL CONDITION	EQUIVALENT COVER TYPE
4	PAVED	EQUIVALENT COVER
5	BUILDING	EQUIVALENT COVER
8	BEDROCK DRAINAGE SWALE	BLAST/EXCAVATE CHANNEL EQUIVALENT COVER
21	BEDROCK OUTCROP	GRUB & CLEAN EQUIVALENT COVER
30	STACK	EQUIVALENT COVER

(4) PAVED EQUIVALENT COVER

COVER TYPES (ENGINEERED)

AREA	ORIGINAL CONDITION	COVER TYPE	AREA	ORIGINAL CONDITION	COVER TYPE
1	VARIES	ABOVE GRADE ENGINEERED PERMEABLE COVER	20	CONCRETE FOUNDATION	CLEAR, CLEAN & PATCH
2	VARIES	AT GRADE ENGINEERED PERMEABLE COVER	22	PAVED	REGRADE, ABOVE GRADE ENGINEERED ASPHALT
3	PLANTER WITH GRASS SHRUBS, SMALL TREES	AT GRADE ENGINEERED PERMEABLE COVER	23	VARIES	PLACE CULVERT
6	DRAINAGE SWALE	ENGINEERED COVER GRAVEL/COBBLE LINED	24	CULVERT	EXTEND CULVERT
7	DRAINAGE SWALE	CONCRETE CULVERT (BENEATH EAST-CENTRAL HIDE PILE REMEDIATED SLOPE)	25	VARIES	SEE NOTE 4 (SHEET 11-3D) (IN REFERENCE PLAN 2)
9	WETLANDS	ABOVE GRADE ENGINEERED PERMEABLE COVER (WETLANDS REMEDIATION)	26	VARIES	ABOVE GRADE ENGINEERED ASPHALT COVER
10	WETLANDS	DREDGE SEDIMENT, PLACE PERMEABLE COVER (WETLANDS REMEDIATION)	27	VARIES	EXCAVATE, STORMWATER STORAGE, PLACE 16" FILL ENGINEERED COVER
11	EAST HIDE PILE	IMPERMEABLE COVER ENGINEERED (EAST HIDE PILE REMEDIATION)	28	DRAINAGE CHANNEL	DREDGE 16" SEDIMENT, PLACE GRAVEL/COBBLE LINING ENGINEERED COVER
12	VARIES	ABOVE GRADE ENGINEERED PERMEABLE COVER (EXTENT OF SOUTH HIDE PILE REMEDIATION)	29	EXISTING MDC SEWER SERVICE	RAISE MANHOLES
13	SOUTH HIDE PILE	ABOVE GRADE ENGINEERED PERMEABLE COVER	31	DRAINAGE SWALE	DREDGE 16", PLACE GRAVEL/COBBLE (GROUNDWATER RECHARGE BASIN)
14	EAST CENTRAL HIDE PILE	ABOVE GRADE ENGINEERED PERMEABLE COVER	32	VARIES	AT GRADE ENGINEERED COVER (GRAVEL SURFACE)
15	DEPRESSION VEGETATION VARIES	AT GRADE ENGINEERED PERMEABLE COVER	33	VARIES	ABOVE GRADE ENGINEERED COVER (GRAVEL SURFACE)
16	RAILROAD LINES	ENGINEERED RAILROAD COVER	34	VARIES	GROUNDWATER TREATMENT PLANT
17	VARIES	PLACE TRENCH DRAIN	35	VEGETATION VARIES	AT GRADE ENGINEERED ASPHALT COVER
18	VARIES	GRAVEL ACCESS ROAD	36	WEST HIDE PILE	ABOVE GRADE ENGINEERED PERMEABLE COVER
19	CHROMIUM LAGOONS	FILL, ABOVE GRADE ENGINEERED PERMEABLE COVER	37	VARIES	GRAVEL/COBBLE LINED CREATED WETLAND STREAM

(2) & (3) AT GRADE ENGINEERED PERMEABLE COVER

(35) AT GRADE ENGINEERED ASPHALT COVER

COVER TYPE POINT CHART

NUMBER	NORTHING*	EASTING*
40971	553084.6	694823.8
40972	553026.4	694942.8
40973	553018.5	694897.6
40974	552944.9	695109.4
40975	552933.0	695133.6
40976	552907.3	695109.7
40977	552915.1	695104.5
40978	552921.7	695093.8
40979	552886.5	695057.8
40980	552876.8	695053.4
40981	552871.9	695055.8
40982	552870.2	695062.0
40983	552868.6	695073.8
40984	552835.0	695042.6
40985	552836.7	695039.2
40986	552847.5	695032.9
40987	552855.1	695022.9
40988	552857.4	695017.4
40989	552851.4	695009.1
40990	552854.9	695013.9
40991	552852.2	695012.3
40992	552837.8	695037.1
40993	552900.1	695111.1
40994	552892.6	695109.6
40995	552899.5	695102.7
40996	552903.2	695097.6
40997	552901.6	695091.7
40998	552885.3	695078.0
40999	552873.8	695091.7
41000	552872.6	695093.3
41001	552868.7	695082.0
41002	552874.6	695096.2
41003	552890.8	695110.7
41004	552889.2	695102.3
41005	552902.8	695097.0
41006	552901.3	695092.1
41007	552885.4	695078.7
41008	552874.1	695092.0
41009	552873.1	695094.6
41010	552884.4	694493.6
41011	553338.2	694787.9
41012	553292.1	694882.2
41013	553284.4	694878.5
41014	553258.1	694864.6
41015	553231.3	694851.2
41016	553171.9	694822.0
41017	553112.5	694792.8
41018	553169.0	694729.8
41019	553187.9	694708.7
41020	553275.6	694650.7
41021	553306.2	694618.7
41022	553345.3	694656.2
41023	553197.9	694836.2

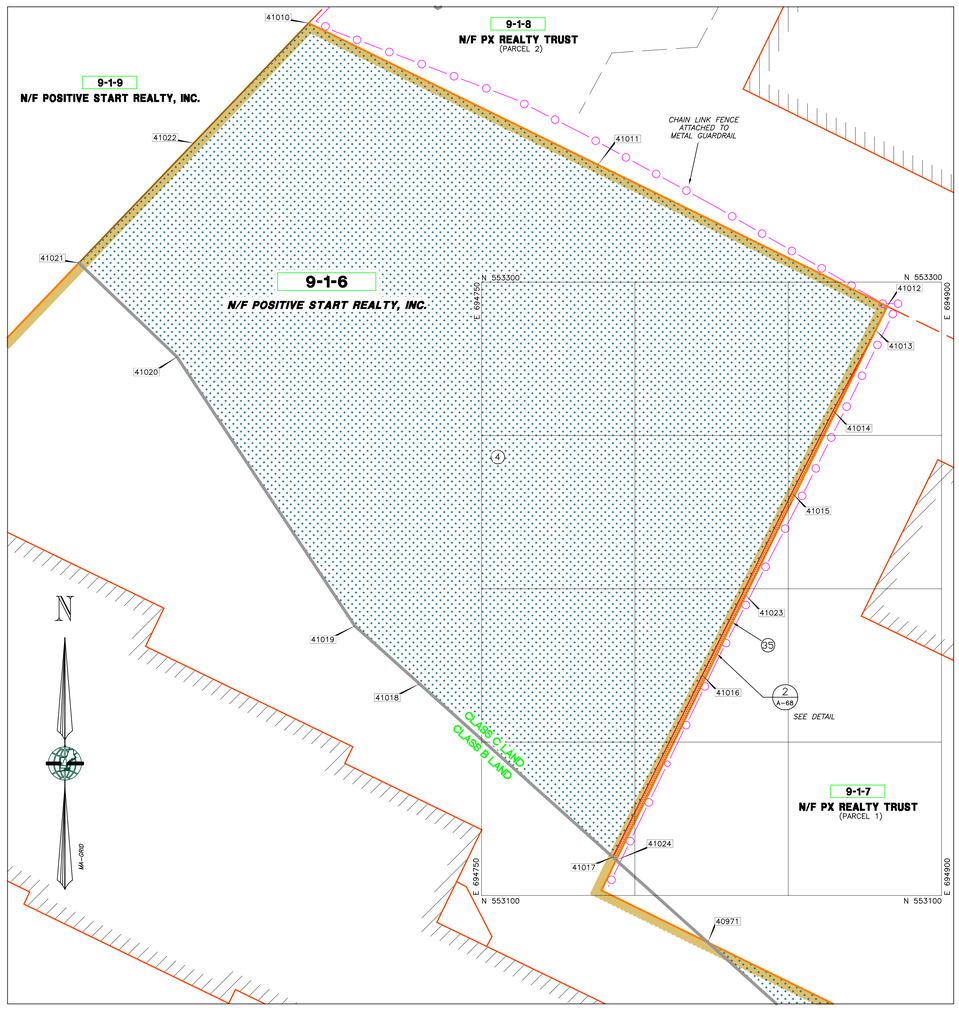
* HORIZONTAL POSITION REPRESENTED BY DATA LISTED ABOVE WAS DEVELOPED FROM VARIOUS SOURCES. (SEE NOTES 3 & 4 ON SHEET 1)

LEGEND

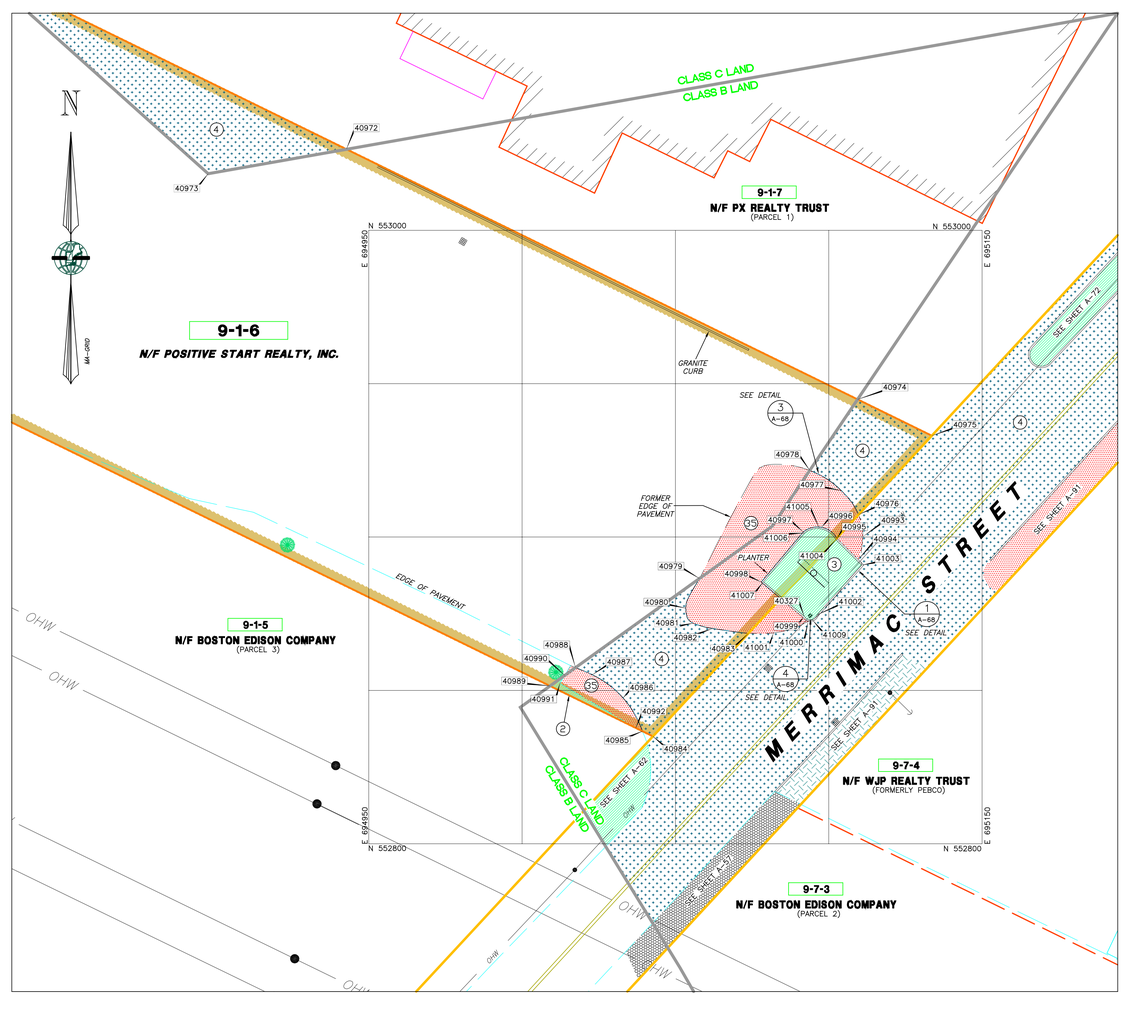
BOUNDARY LINE
RIGHT-OF-WAY
ABUTTING PROPERTY LINES
ASPHALT, CONCRETE, GRANITE CURB
TRANSITION ZONE
LAND CLASS LINE
N 551,000 GRID LINE
EDGE OF EXISTING PAVEMENT
LIMIT OF GEOTEXTILE
A.T.&T. FIBER OPTIC CABLE
TOE OF SLOPE
TOP OF SLOPE
LIMIT CHAIN LINK FENCE
EDGE OF ASBUILT GRAVEL ROAD
BACK EDGE OF PLANTER
EDGE OF PROPOSED PAVEMENT
EXISTING EASEMENT
ASBUILT CULVERT
LIMIT OF TREE LINE
EXISTING CONCRETE STRUCTURE
ASBUILT FINISH GRADE CONTOUR 5' INTERVAL
ASBUILT FINISH GRADE CONTOUR 1' INTERVAL
OHW OVERHEAD WIRES
UGG UNDERGROUND GAS LINE
LIMITS OF EXISTING EASEMENTS
EDGE OF EXISTING BUILDINGS
AREA OF LEDGE

(33) ASBUILT COVER TYPE
TEST PIT
MW MONITOR WELL
HYDRANT
GATE VALVE
CATCH BASIN (SQUARE)
CATCH BASIN (ROUND)
DRAIN MANHOLE
SEWER MANHOLE
UTILITY POLE
GUY WIRE
+14000 ASBUILT POINT NO. & LOCATION
GAS METER
GAS SHUT OFF
WATER SHUT OFF
WATER CONTROL BOX
SIGN
BOLLARD
TELEPHONE MANHOLE
99999 POINT MARKER (SEE POINTS CHART)
BORING LOCATION
MICRO WELL LOCATION
PIEZOMETER LOCATION
(SS) SOIL SAMPLE LOCATION
STAFF GUAGE LOCATION
TENSIOMETER LOCATION
UID LOCATION
MONITORING WELL LOCATION

X / A-XX — DETAIL/CROSS SECTION DESIGNATION; SHEET No. WHERE DETAIL/CROSS SECTION IS PRESENTED



COVER TYPES VIEW (B / A-67)
SCALE: 1"=20'



COVER TYPES VIEW (C / A-67)
SCALE: 1"=20'

GRAPHIC SCALE
20' 10' 0 20' 40' 60'

REV.	DATE	DESCRIPTION	DR	CK
I	6/25/08	FINAL SUBMISSION	TC DBM	MDP MDP
H	4/29/08	EPA & DEP COMMENTS OF 4/4/08	TC CAC	MDP MDP
G	8/31/07	EPA & DEP COMMENTS OF 8/29/07	JF CAC	MDP MDP
F	5/1/07	EPA & DEP COMMENTS OF 8/3/06	JF CAC	MDP MDP
E	9/21/05	EPA & DEP COMMENTS OF 7/12/04	KL MDP	JCK JCK
D	6/11/04	EPA & DEP COMMENTS OF 10/30/03	JF MDP	JCK JCK
C	10/16/03	DEP REVISIONS	JF MDP	JCK JCK
B	8/11/01	DEP REVISIONS	JF	JCK JCK
A	8/8/00	ISSUE FOR REVIEW		MDP JCK

FINAL

PROFESSIONAL LAND SURVEYOR

PROFESSIONAL ENGINEER

PREPARED FOR: ROUX ASSOCIATES, INC. Environmental Consulting & Management

PREPARED BY: MERIDIAN Land Services, Inc. — ENGINEERS • LAND SURVEYORS • SCIENTISTS • LAND PLANNERS

DESIGNED BY:

Golder Associates — 400 Commercial Street, Manchester, N.H. USA 03101, 603-668-0880 • FAX 603-668-1199

PROJECT RECORD (TAX MAP LOT 9-1-6)

COVER TYPES AND TRANSITIONS

INDUSTRI-PLEX SITE REMEDIAL TRUST
WOBURN, MASSACHUSETTS

SCALE: 1" = 20'
AUGUST 8, 2000

DESIGNED BY: MDP	A-67
DRAFTED BY: MDP	SHEET NO.
CHECKED BY: JCK	
FILE: 29001914.dwg	PROJECT: 2900.00
DO NOT SCALE DRAWING	SHEET 4 OF 5

Jun 25, 2008 - 4:13pm MDP Land Desktop 2004 - LD74
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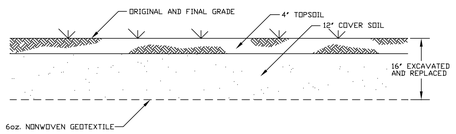
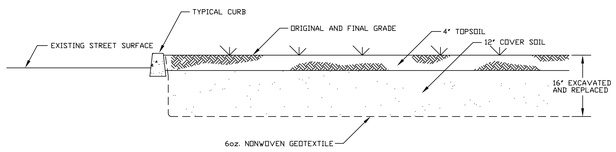
COVER TYPE

2 AT GRADE ENGINEERED PERMEABLE COVER

NOT TO SCALE



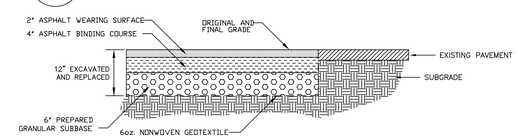


1 / A-68 TYPICAL AT GRADE ENGINEERED COVER AT CURB TIE IN

NOT TO SCALE

3 / A-68 TYPICAL AT GRADE ENGINEERED COVER AT EXISTING ASPHALT TIE-IN

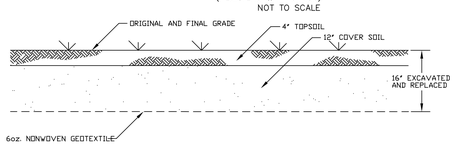
NOT TO SCALE

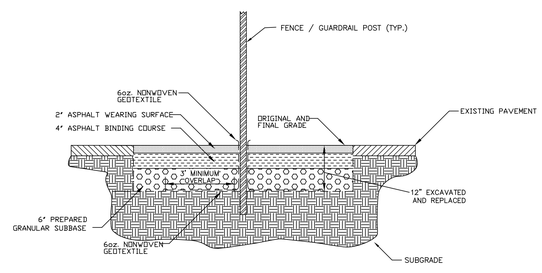


COVER TYPE

3 AT GRADE ENGINEERED PERMEABLE COVER

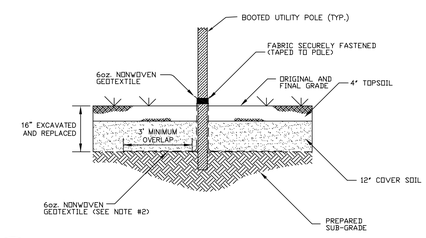
(PLANTERS WITH GRASS)
NOT TO SCALE





2 / A-68 TYPICAL AT GRADE ENGINEERED ASPHALT COVER WITHIN FENCE / GUARDRAIL TRENCH

NOT TO SCALE



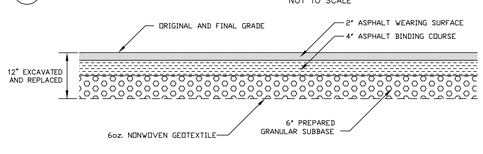
4 / A-68 TYPICAL UTILITY POLE BOOT DETAIL

NOT TO SCALE

COVER TYPE

35 AT GRADE ENGINEERED ASPHALT COVER

NOT TO SCALE



LEGEND

X / A-68 — DETAIL/CROSS SECTION DESIGNATION
SHEET No. WHERE DETAIL/CROSS SECTION IS PRESENTED

NOTES

1.) FOR SLOPES FLATTER THAN 25% A 16oz. NONWOVEN GEOTEXTILE WAS INSTALLED ON HIDE PILES AND A 6oz. NONWOVEN GEOTEXTILE WAS INSTALLED ELSEWHERE.

2.) FOR SLOPES 25% OR STEEPER, A GEOSYNTHETIC DRAIN WAS INSTALLED AS FOLLOWS:

a. ON HIDE PILES, A GEOCOMPOSITE DRAIN WAS EXTENDED FROM THE TOE OF SLOPE A DISTANCE EQUAL TO A 10 FOOT CHANGE IN ELEVATION. A 16oz. NONWOVEN GEOTEXTILE WAS USED ELSEWHERE AND FIELD SEWN TO THE GEOCOMPOSITE.
b. IN AREAS OTHER THAN HIDE PILES, A 16oz. NONWOVEN GEOTEXTILE WAS USED THROUGHOUT.

3.) SEE SPECIFICATIONS FOR DETAILS AND MATERIALS USED.

REV.	DATE	DESCRIPTION	DR	CK
I	6/25/08	FINAL SUBMISSION	TC	DBH MDP
H	2/8/08	EPA COMMENTS OF 1/22/08	TC	DBH MDP
G	9/20/07	EPA & DEP COMMENTS OF 8/29/07	JF	CAC MDP
F	5/1/07	EPA & DEP COMMENTS OF 8/3/06	JF	CAC MDP
E	9/21/05	EPA & DEP COMMENTS OF 7/12/04	KL	MDP JCK
D	6/11/04	EPA & DEP COMMENTS OF 10/30/03	JF	MDP JCK
C	10/16/03	DEP REVISIONS	JF	MDP JCK
B	8/11/00	EPA REVISIONS	JF	MDP JCK
A	8/8/00	ISSUE FOR REVIEW		MDP JCK

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DESIGNED BY:

Golder Associates
Manchester, New Hampshire
400 Commercial Street
Manchester, N.H. USA 03101
603-668-0880 • FAX 603-668-1199

PROJECT RECORD (TAX MAP LOT 9-1-6)

DETAILS & TRANSITIONS

INDUSTRI-PLEX SITE REMEDIAL TRUST
WOBURN, MASSACHUSETTS

AUGUST 8, 2000

SCALE: 1" = NONE

DESIGNED BY: MDP	A-68
DRAFTED BY: MDP	SHEET NO.
CHECKED BY: JGK	
FILE: 29001915.dwg	PROJECT: 2900.00
DO NOT SCALE DRAWING	SHEET 5 OF 5

Jun 25, 2008 - 4:24pm MDP Land Desktop 2004 - LD74
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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION I
ONE CONGRESS STREET SUITE 1100
BOSTON, MASSACHUSETTS 02114-2023

June 26, 2008

Positive Start Realty
(property owner of 204 Merrimac Street, Woburn, MA)
Attention: Robert W. DeRosa, President
8 Clinton Street
Woburn, MA 01801

Re: Industri-plex Superfund Site, Operable Unit 1: Final Property-Specific Cover Certification Report for 204 Merrimac Street, Woburn, MA, (Tax Map 9-1-6).

Please find attached the property-specific final Cover Certification Report (CCR) for your property located at 204 Merrimac Street, Woburn, MA, (Tax Map 9-1-6). This CCR documents the completion of a portion of the Remedial Action for soil, sediments, and air at the Industri-Plex Superfund Site, Operable Unit 1, Woburn, MA, in accordance with approved 100% Design Report, dated April 1992. The Remedial Action implemented on your property was required by the Consent Decree entered on April 24, 1989 by the United States District Court for the District of Massachusetts in the matter styled United States v. Stauffer Chemical Company et al., Civil Action No. 89-0195-MC, and Commonwealth of Massachusetts v. Stauffer Chemical Company et al., Civil Action No. 89-0196-MC.

The CCR contains detailed full-size Record Drawings illustrating the Remedial Action implemented on your property, such as the location of Engineered and/or Equivalent Covers which serve as barriers preventing contact to the underlying Contaminated Soils. The Record Drawings also illustrate the location of various land classifications designated on your property (i.e. Land Class A, B, C and/or D), which represent various conditions and restrictions. The details contained in the CCR, particularly the Record Drawings, will be useful towards ensuring the long protectiveness of the remedy and compliance with institutional controls (i.e. Grant of Environmental Restriction).

In addition to the CCR, your are also being provided:

1) a set of half-size Record Drawings; and

2) a compact disc containing electronic versions of the CCR, as well as electronic CAD files of the Record Drawings.

The half-size drawings will be useful towards your periodic inspection of the remedial action implemented on your property, as well as any consideration you may have towards implementing

future intrusive work on the property that may affect the remedial action. If you elect to alter the remedial action on your property (e.g. Engineered or Equivalent Covers), then you will be required to prepare As Built Records. The As Built Records are engineering drawings and other records depicting the location and details of remedial action alterations, and Clean Corridors, as constructed on the property. EPA expects the As Built Records to include engineering drawings which are similar in detail and quality as the Record Drawings. The electronic CAD files provided in the attached compact disc can be utilized by the owner and/or their designated surveyor to effectively and efficiently alter the Record Drawings and prepare adequate As Built Records.

The next steps in the superfund process for this property will be the inauguration and recording of the Grant of Environmental Restrictions (Grant). A package will be sent to you regarding the inauguration requirements for your property.

If you should have any questions regarding this letter, please contact me at (617) 918-1323.

Sincerely,

Joseph F. LeMay, P.E.
Remedial Project Manager
Office Site Remediation and Restoration

cc: Bob Cianciarulo, EPA (letter)
David Peterson, EPA (letter)
Jennifer McWeeney, MassDEP
Andy Cohen, MassDEP (letter)
Tim Cosgrave, ISRT Coordinator (letter)
Carol Dickerson, SMC (letter)
Randy Cooper, Monsanto (letter)

APPENDIX A

100% Final Design Report Specifications

INDUSTRI-PLEX SITE
REMEDIAL WORK FOR SOIL, SEDIMENTS, AND AIR
WORK TO COMPLETE

GENERAL TABLE OF CONTENTS

DIVISION 0 - BIDDING DOCUMENTS

SECTION

00200 - Required Information
00300 - Bid Form
00800 - List of Drawings

DIVISION 1 - GENERAL SPECIFICATIONS

SECTION

01010 - Summary of Remedial Work
01016 - Occupancy
01017 - Temporary Facilities and Utilities Provided
01026 - Schedule of Values
01041 - Project Coordination
01200 - Project Meetings
01300 - Submittals
01400 - Quality Control
01540 - Job Site Security
01550 - Site Access and Traffic Plan
01562 - Dust Control
01563 - Odor Control
01564 - Health and Safety Specifications for Construction
01565 - Ambient Air Monitoring Testing
01700 - Project Closeout
01720 - Project Record Documents
01740 - Warranties

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B - Odor Control Plan

SECTION 00200

REQUIRED INFORMATION

Organization of Proposal

The information in Contractor's proposal shall be presented in the same order and sequence as is set forth in this request, and in a clear, concise manner.

All contractors must verify that they have accepted the requirements, schedules, and penalties of the attached Consent Decree, and attachments to the Consent Decree, as part of their responsibilities and costs, and as an integral part of this bid request.

All contractors must verify they have visited and inspected the Site and are familiar with current Site conditions. All contractors must verify that they were given the opportunity to examine samples of Industri-Plex Site waste materials available at the Industri-Plex Site, Woburn, Massachusetts.

The Contractor shall guarantee that his work, equipment, personnel, etc. meet requirements of the Record of Decision, Consent Decree, Scope of Work, and Schedules and Work Plans developed in accordance with these documents. Contractor shall reimburse the Industri-Plex Site Remedial Trust for fines or stipulated penalties, if any, that are imposed as a result of the Contractor's work or performance.

General

- Provide a preliminary Health and Safety Plan specific to the work and the Site.

- Provide an outline of Remedial Action Work Plan which shall outline those elements required by the Consent Decree and the Contractor's Erosion and Sedimentation Control Plan.

Waste Excavation and Staging

- Provide preliminary plan drawing to scale showing equipment and facilities layout.

- Describe plans for preparing and securing the Site for occupancy.

- Describe plans for decontamination (if necessary) of Site debris and rubble (foundations, trash, etc.) and on-Site or off-Site transport/disposal of same.

- Describe plans for excavating and transporting surface contamination.

- Describe proposed methods for control of odor.

- Describe plans for moving material across the Site in a manner that will not cause traffic tie-ups and will comply with all government safety requirements.

- Describe plans for removal and staging of off-Site contamination, if any.

- Describe plans for work performance during inclement weather including excavation activities.

- Describe plans to prevent spread of contaminants during high winds, heavy rainfall, floods, and other occurrences. Also discuss strategy for protection of Site facilities from storm damage.

- Describe plans for preventing silt and sediment from entering any watercourse if soil erosion cannot be prevented.

- Prepare outline or conceptual plan for overall soil erosion control measures.

Waste Water Collection, Treatment & Disposal

- Describe plans and facilities for collecting, storing and treating rain and contaminated water during both construction and normal operations.

- Describe plans for collecting, storing and treating of contaminated groundwater.

- Describe plans for collecting, storing, and treating of contaminated wash water used in steam cleaning debris, rebar, and other waste material to be removed off-Site.

Wetlands Remediation

- Describe the methods, equipment, logistics of waste handling and control methods during periods of inclement weather.

Site Closure

- Describe plans for installing the permeable and impermeable covers.

Industrial Hygiene and Laboratory

- Describe plans for handling industrial hygiene requirements, i.e., level of protection, decontamination of worker clothing and equipment, on-Site facilities provided, etc.

- Identify the major laboratory equipment contained in the on-Site laboratory and its capabilities. Provide copies of laboratory certifications, as appropriate.

- Describe any off-Site analyses to be performed and identify the laboratory and its capabilities. Provide copies of laboratory certifications, as appropriate.

- Discuss relationship of analytical program to Site operation and management strategy, i.e. critical analytical controls, sample turn around time, etc.

- Provide written certification that the proposed laboratory can achieve detection limits required for the specific compounds and ions identified in the Site Monitoring Plan.

Staffing

- Describe Site staffing requirements (civil, operations, maintenance, laboratory, security, supervision). Describe operating staff level per shift.

- Describe Site operating strategy for receiving warehouse, record keeping, health and safety monitoring, fire protection and other infrastructure elements at a well managed site.

- Provide a Project Organization Plan describing the management and coordination aspects of the project, including a description of chain of command, lines of responsibility and authority, point of contact for the Trust field and administrative representatives, and person(s) who have authority to submit and certify shop drawings for the Contractor.

Cost Information

- Provide cost data/bases in the format described in the attached BID FORMAT section.

Schedule

- In accordance with schedule requirements of Consent Decree, provide a tentative milestone schedule for procurement, construction, start-up operation, and site closure.

Other Information

- Submit a graphic and tabular projection of cash flow (i.e. your invoices to the Industri-Plex Site Remedial Trust) vs. time, and milestone.

Bidder Data

- Provide the following:

  Corporate name and address.

  Mailing address and name of one person, respective position and telephone number to contact as

representative of the Bidder. Include telex and facsimile transfer numbers, if available.

Bidder shall describe what form of entity it is (i.e. corporation, partnership, joint venture, sole owner, other) and shall list all partners, joint venturers.

State and date of incorporation.

Corporate organization chart.

- Provide current 10-K report and 10-Q report for last fiscal quarters as filed with the Securities and Exchange Commission.

- Identify all subcontractors, describe their relationship to the bidder and describe which portions of the work would be subcontracted. Include qualification data for the subcontractors if such has not been provided earlier.

- Provide organization chart for the Contractor/ subcontractor relationship.

- Provide certification that contractor is licensed to perform work in the State of Massachusetts.

- Provide a disclosure of any and all environmental or safety violations and/or convictions within the past five years up to the presentations of the Bid Documents.

END OF SECTION

INDUSTRI-PLEX REMEDIAL TRUST
WOBURN, MASSACHUSETTS
BID FORM

BID ITEM	DESCRIPTION	TOTAL LABOR COST	TOTAL EQUIP COST	SUBCONTRACT COST	MATERIAL COST	TOTAL COST
A-1	Remobilization 1995					
A-2	Field Surveying					
A-4	Project Management					
A-5	Insurances and Allowances					
B-1	Decom & Demo structures on sheet 11-5					
B-4	Const. cover on Atlantic Ave. Assoc prop.					
B-5	Const. cover on Gianiani property					
B-6	Const. cover on Nidrael Realty Trust prop					
B-7	Const. cover on Atlantic Ave. Trust prop.					
B-8	Const. cover on Winter Hill Store House property					
B-9	Const. cover on The Boyd Corporation property					
B-17	Const. cover on MBTA RR Right of Way					
B-20	Remove areas of damaged or broken pavement and replace IAW Section 02575					
C-1	Drilling Contractor					
C-10	Set up at well location					
C-15	Grouting 2-inch D wells					
C-16	Overdrilling and grouting 2-inch D wells					
E-1	Site Preparation for Wetlands 3A					
E-2	Excavate existing fill within watermain easement (Wetland 3A)					
E-3	Lower exsiting 12-inch DIP watermain at Wetland 3A crossing.					
E-5	Construct Cap in Wetland 1C and 1D Enhancement Area					
E-6	Topsoil layer 8-inch thickness in place in Wetland 3A excavation					
F-2	Furnish and Install Channel between 1C and Created Wetland					
F-3	Culverts Wetland 2A and Commerce Extension					
F-4	Excavate Utility Corridor					
F-6	Geotextile in Utility Corridor					
F-7	Supply Place and Place Offsite Borrow in Utility Corridor					
F-8	Fill in Wetland Embankment Area and Sides of EDHP					
G-1	Site Preparation					
G-2	Construct rip-rap lined drainage channels, including excavation, geosynthetics					
G-3	Supply & place rip-rap slope protection and toe of slope protection					
G-4	Construct gabion retaining walls.					
G-5	Revegetate hide piles.					
G-6	Construct paved access roads on West Hide Pile.					
G-7	Furnish & install security fence & gravel road at Consolidation Area. (Sheet 11-22)					
G-8	Haul, place and compact fill to flatten slopes					
G-9	F & permeable cover including subgrade preperation					
H-2	Furnish and Install RCP Culverts					
H-3	Construct Rip-Rap Lined Drainage Channel					
H-4	Rip-Rap Protection at Toe of Slope					
H-6	Gas Collection System					
H-8	Gas Treatment Plant					
H-9	Construct Gravel Access Road					
H-11	Supply and install 6-feet high galv. steel chain link fence.					
H-12	Revegetate all disturbed areas					
H-14	East Hide Pile Impermeable Cover					
I-3	Construct cap in channels					

INDUSTRI-PLEX REMEDIAL TRUST
WOBURN, MASSACHUSETTS
BID FORM

BID ITEM	DESCRIPTION	TOTAL LABOR COST	TOTAL EQUIP COST	SUBCONTRACT COST	MATERIAL COST	TOTAL COST
I-4	Construct Created Wetland outlet. Includes supply & installation 36-inch RCP.					
I-5	Supply, place & compact clean off-site fill & 4-inch layer of off-site topsoil for Created Wetlands Berm.					
I-7	Construct Revitalization Areas along remediated stream and channel banks per Sheet 14-7.					
I-8	Excavate Created Wetland to cover subgrade elevations.					
I-10	Excavate drainage channels in Atlantic Ave. Drainway, and West Branch of Aberjona River.					
I-12	Construct cap in Created Wetlands					
K-1	Site Preparation Undeveloped Areas					
K-4	Revegetate Cover Area					
K-5	Haul, place and compact fill below cover subgrade.					
K-6	Construct permeable cover					
	TOTALS					

SECTION 00800

LIST OF DRAWINGS

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*5-2	Existing Development
5-3A	Existing Utilities
5-3B	Existing Utilities
5-3C	Existing Utilities
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5-5	Abandoned Facilities Below Grade
5-6	Wetlands
*5-7	Geotechnical Investigation PDI Tasks S-2 and S-4
*5-8	Geotechnical Cross Sections (Existing) East and West Hide Piles
9-1	Recharge Basin
11-1 (A-D)	Existing Topography
11-2 (A-D)	Extent of Arsenic, Lead, And Chromium At Or Above Action Levels
11-3 (A-D)	Cover Types
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*11-6	Monitoring Well Decommissioning Plan
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11-10	Permeable Cover East-Central Hide Pile Cross-Sections
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11-14	Profile N-N'
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*11-20	Utility Corridor Profile
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11-24	Permeable Cover Details
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11-25	Permeable Cover Details
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12-1	East Hide Pile Impermeable Cover Plan
12-2	Impermeable Cover East Hide Pile Cross Sections
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12-5	Impermeable Cover East Hide Pile Drainage Channel Profile
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12-7	Impermeable Cover East Hide Pile Details
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Sheet No.	Title
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13-1	Stream and Wetland Sediments Remediation
13-2	Stream Sediment Remediation Details
13-3	Stream Sediment Remediation Details
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13-5	Stormwater Management Details
*13-6	Stormwater Management Details
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*13-8	Site Plan for PX Realty
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14-2	Wetland 1C Revitalization - Cross-Sections
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*15-1	East Hide Pile Gas Collection System Piping Plan
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*16-1	East Hide Pile Gas Treatment System Process and Instrumentation Diagram Legend I
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* Signifies drawings are not part of this work to complete.

*****END OF SECTION*****

SECTION 01010

SUMMARY OF REMEDIAL WORK

PART 1 - GENERAL

1.01 SCOPE OF WORK

a. Remediation of the Industri-Plex Site shall be performed in accordance with the requirements of the Consent Decree and all applicable federal, state and local laws and regulations. Previous studies at the Site are listed in Part 1.04 of this Section. These and additional pertinent Site documents are available for review at the Trust's Site office as discussed herein (see paragraph 1.04 of this Section).

b. Drawings are listed in Technical Specification Section 00800. This project represents the continuation of remediation activities undertaken by the Trust. The drawings are coded to represent areas where remediation is complete.

1.02 CONSTRUCTION SCHEDULE AND CONTRACT TIME

The required construction schedule is January 1, 1995 to December 31, 1995. The actual length of the Contract time shall be defined in the Contract based on the Bidder's proposed construction schedule as approved by the Trustee Representative. That Contract schedule must indicate completion within the required Contract Time.

1.03 WORK PERFORMED UNDER SEPARATE CONTRACTS

The Trust may issue concurrent and independent contracts to others to perform Quality Assurance testing, to perform perimeter monitoring for odors and air pollutants, to check as-built lines and grades, to provide and install vegetation of wetland areas, and for other work as may be deemed necessary by the Trust. The Contractor shall coordinate their efforts with the other contractors, allow for mutual access to the work areas, and protect-in-place any work in progress. The Contractor shall consider these concurrent activities when preparing their Bid and no claims for additional compensation will be honored as a result of an inability to coordinate or communicate with the other contractors, or delays caused to the Contractor by other contractors.

1.04 PREVIOUS REPORTS AND STUDIES

The following reports and studies will be made available for inspection by the prospective Bidders at the Trust offices in Woburn, MA:

Ecology and Environment Inc., 1980: Monitoring of Metal Content in Airborne Particulate, Field Investigations of Uncontrolled Hazardous Waste Sites, FIT Project, Task Report to the Environmental Protection Agency, Contract No. 68-01-6056, May 13,1980.

Ecology and Environment Inc., 1981: Amendment to the North Woburn, Massachusetts Monitoring of Metal Content in Airborne Particulate, Field Investigations of Uncontrolled Hazardous Waste Sites, FIT Project, Task Report to the Environmental Protection Agency, Contract No. 68-01-6056, May 13,1981.

Golder Associates Inc., 1992, 100% Design Report, Part I, Industri-Plex Site, Woburn, Massachusetts, April 1992, including Addenda 1,2, and 3.

Golder Associates Inc. 1990a. Preliminary Design Work Plan, Industri-Plex Site, Woburn, MA, July.

Golder Associates Inc. 1990b. Preliminary Design Report (30% Design), Industri-Plex Site, Woburn, MA, January.

Golder Associates Inc. 1991a. Preliminary Design Supplement Report, (30% Design) Response to Comments (2 Volumes), Industri-Plex Site, Woburn, MA , February.

Golder Associates Inc., 1991b Preliminary Design Supplement Report, (2 Volumes), Industri-Plex Site, Woburn, MA February.

Golder Associates Inc., 1991c. 60% Design Report, (9 volumes), Industri-Plex Site, Woburn, MA, April.

Golder Associates Inc., 1991d. 60% Design Report Responses to Comments, Industri-Plex Site, Woburn, MA , July.

Golder Associates Inc., 1991e. 95% Design Report, (6 Volumes), Industri-Plex Site, Woburn, MA, August.

Golder Associates Inc., 1991f. 95% Design Report Response to Comments, Industri-Plex Site, Woburn, MA, November.

Golder Associates Inc., 1991g. 100% Design Report, Part I, (8 Volumes), Industri-Plex Site, Woburn, MA, December.

Golder Associates, 1991, Aquifer Pumping Test, Industri-Plex Site, Woburn, Massachusetts, January 1991.

Golder Associates Inc., 1991, ISRT-PDI-35, Pre-Design Investigation, Task A-1, Baseline Air Survey, Interim Final Report, Industri-Plex Site, Woburn, MA, May, 1991.

Golder Associates Inc., 1991, ISRT-PDI-33, Pre-Design Investigation, Site Monitoring Plan, Interim Final Report, Industri-Plex Site, Woburn, MA, April, 1991.

Golder Associates Inc., 1991, ISRT-PDI-32, Pre-Design Investigation, Task GW-3, Groundwater Treatability, Interim Final Report, Industri-Plex Site, Woburn, MA, April, 1991.

Golder Associates Inc., 1991, ISRT-PDI-31, Pre-Design Investigation, Task SW-2, Surface Water Treatability, Interim Final Report, Industri-Plex Site, Woburn, MA, April, 1991.

Golder Associates Inc., 1991, ISRT-PDI-30, Pre-Design Investigation, Analytical Laboratory Reports, Industri-Plex Site, Woburn, MA, April, 1991.

Golder Associates Inc., 1991, ISRT-DESIGN-6, 60% Design Report, Industri-Plex Site, Woburn, MA, (9 Volumes), April, 1991.

Golder Associates Inc., 1991, ISRT-PDI-29, Pre-Design Investigation, Task SW-2, Surface Water Treatability, Interim Report, Industri-Plex Site, Woburn, MA, February, 1991.

Golder Associates Inc., 1991, ISRT-PDI-36, Supplemental Pre-Design Investigation of the Arsenic Pit and Chromium Lagoons, Industri-Plex Site, Woburn, MA, July 1991.

Golder Associates Inc., 1991, ISRT-PDI-26, Pre-Design Investigation, Task GW-3, Groundwater Treatability, Interim Report No.2, Industri-Plex Site, Woburn, MA, January, 1991.

Golder Associates Inc., 1991, ISRT-PDI-25, Pre-Design Investigation, Task S-1, Extent of Hazardous Substances in Soils, Supplemental Report, Industri-Plex Site, Woburn, MA, January, 1991.

Golder Associates Inc., 1991, ISRT-PDI-24, Pre-Design Investigation, Task GW-1, Plume Delineation, Interim Final Report, Industri-Plex Site, Woburn, MA, (2 Volumes), January, 1991.

Golder Associates Inc., 1990, ISRT-PDI-20A, Pre-Design Investigation, Task GW-3, Groundwater Treatability, Supplementary Work Plan, Industri-Plex Site, Woburn, MA, November, 1990.

Golder Associates Inc., 1990, ISRT-PDI-19, Pre-Design Investigation, Task A-2, Gas Treatability, Interim Final Report, Industri-Plex Site, Woburn, MA, October, 1990.

Golder Associates Inc., 1990, ISRT-PDI-18, Pre-Design Investigation, Task GW-3, Groundwater Treatability, Interim Report No.2, Industri-Plex Site, Woburn, Ma, October, 1990.

Golder Associates Inc., 1990, ISRT-DESIGN-3, Preliminary Design Report (30% Design), Industri-Plex Site, Woburn, MA, October, 1990.

Golder Associates Inc., 1990, ISRT-PDI-17, Pre-Design Investigation, Task S-4, Foundation Data, Interim Final Report, Industri-Plex Site, Woburn, MA, September, 1990.

Golder Associates Inc., 1990, ISRT-PDI-16, Pre-Design Investigation, Task SW-1, Extent of Hazardous Substances in Wetlands and Surface Water Sediments, Interim Final Report, Industri-Plex Site, Woburn, MA, (2 Volumes) September, 1990.

Golder Associates Inc., 1990, ISRT-PDI-15, Pre-Design Investigation, Task S-2, Stability of Hide Piles, Interim Final Report, Industri-Plex Site, Woburn, MA, September, 1990.

Golder Associates Inc., 1990, ISRT-PDI-14, Pre-Design Investigation, Task S-1, Extent of Hazardous Substances in Soils, Interim Final Report, Industri-Plex Site, Woburn, MA, (2 Volumes) September, 1990.

Golder Associates Inc., 1990, ISRT-PDI-13, Pre-Design Investigation, Task S-3, Identify Sources of Cap Materials, Interim Final Report, Industri-Plex Site, Woburn, MA, September, 1990.

Golder Associates Inc., 1990, ISRT-PDI-11, Pre-Design Investigation, Task SW-1, Extent of Hazardous Substances in Wetlands and Surface Water Sediments, Interim Report, Industri-Plex Site, Woburn, MA, September 1990.

Golder Associates Inc., 1990, ISRT-PDI-10, Pre-Design Investigation, Task GW-1, Plume Delineation, Phase I, Interim Report, Industri-Plex Site, Woburn, MA, September 1990.

Golder Associates Inc., 1990, ISRT-PDI-5, Pre-Design Investigation, Task S-1, Hazardous Substances in Soils,

Interim Report, Industri-Plex Site, Woburn, MA, June 1990.

Golder Associates Inc., 1990, ISRT-PDI-3, Pre-Design Investigation, Task GW-3, Groundwater Treatability, Interim Report No.1, Industri-Plex Site, Woburn, MA, June 1990.

Golder Associates Inc., 1990, ISRT-PDI-2, Pre-Design Investigation, Task S-3, Identify Sources of Cap Materials, Interim Report, Industri-Plex Site, Woburn, MA, March 1990.

Industri-Plex Site Remedial Trust, 1992. Letter from D.M. Light to Joseph N. DeCola (USEPA) and Jay Naparstek (MDEP) dated April 3, 1992.

Roux Associates, Inc., and others, 1991, ISRT-GSIP-2, Phase I Remedial Investigation, Ground-Water/Surface-Water Investigation Plan, Final Report (5 Volumes), prepared for the Industri-Plex Site Remedial Trust, May, 1991.

Stauffer Chemical Company, 1985, Woburn Environmental Studies, Phase II Report, Volume 2, Feasibility Study, April, 1985.

Stauffer Chemical Company, 1984, Woburn Environmental Studies, Phase II Report, Volume 1, Remedial Investigation, August, 1984.

Stauffer Chemical Company, 1983, Woburn Environmental Studies, Phase I Report, Environmental Assessment, April 1983.

U.S. Environmental Protection Agency, (USEPA), 1989a, Industri-Plex Site Consent Decree, (Remedial Design/Action Plan as Appendix I) Civil Action Nos. 89-0195-MC and 89-0196-MC, April, 1989.

U.S. Environmental Protection Agency, (USEPA), 1986a, Record of Decision, Industri-Plex Site, Woburn, MA, (includes Summary of Remedial Alternatives Selection) September, 1986.

U.S. Environmental Protection Agency, 1986. Record of Decision, Industri-Plex Site, Woburn, MA, September.

U.S. Environmental Protection Agency, 1989. Industri-Plex Site Consent Decree, Civil Action No. 89-0196-MC, April.

U.S. Environmental Protection Agency, 1991a. Letter from Paula Fitzsimmons to Warren Smull (ISRT) dated June 27, 1991.

U.S. Environmental Protection Agency, 1991b. Letter from Paula Fitzsimmons to Warren Smull (ISRT) dated June 9, 1991.

1.05 BID FORM

This section describes the Scope of Work for each item shown in the Bid Form. All Work shall be performed in strict accordance with the Contractor's Health and Safety Plan.

Estimated quantities are provided for use by the Trustee in comparing bids. Bidder shall evaluate the estimated quantities and identify any bid items in which the estimated quantities do not accurately reflect the remaining work and shall identify additional quantities and/or pay items and their associated costs as necessary to complete the work. Bidder's schedule shall be based upon bidder's quantity estimate. The Trustee reserves the right to alter the quantities of Work to be performed or to extend or shorten the improvements at any time when and as found necessary, and the Contractor shall perform the Work as altered, increased or decreased. Payment for such increased or decreased quantity will be made in accordance with the Contract. No allowance will be made for any change in anticipated profits nor shall such changes be considered as waiving or invalidating any conditions or provisions of the Contract.

Bidder shall estimate costs based on labor staffing and equipment as required to meet Contract schedule (work completed by December 31, 1995).

a. Contract Items - Bid Form A

(1) Item No. A-1 - Mobilization and Demobilization

The cost for this item shall include the direct cost for labor, transportation of equipment, project start-up, project shut-down, for the duration of the construction effort.

Payment at the Contract price shall constitute full compensation for, but shall not be limited to mobilizing all labor, materials, and equipment necessary to perform the required work.

(2) Item No. A-2 - Field Surveying

The cost for this item shall include the direct cost for labor, equipment, and incurred expenses as appropriate, to perform the field engineering and surveying required to ensure the design is being constructed in accordance with the Drawings and Technical Specifications.

The cost shall include, at a minimum, the following work activities.

a. Initial horizontal and vertical control construction stakeout survey.

b. Ongoing verification of original stakeout and resetting grade marks and control points as needed.

c. Surveying existing grades and post-construction grades in all construction areas where construction is contour-specific.

d. Preparation of final record drawings by a licensed Massachusetts surveyor as described in the Specifications.

e. Surveying pre-cover and post-cover grades in the permeable and impermeable cover areas, as necessary.

(3) Item No. A-4 - Project Management

The cost for this item shall include labor, equipment , and incurred expenses as appropriate, to perform the project management, health and safety monitoring, construction quality inspection and support, as needed to ensure the project is constructed in accordance with the Drawings and Technical Specifications and to meet the project deadline of December 31, 1995.

Costs shall include:

a. Project Manager;
b. Superintendent;
c. Support Staff;
d. Health and Safety Officer and Technicians; and,
e. Construction Quality Control Inspectors.
f. All scheduling and tracking of equipment, labor and costs.
g. Certification by a Massachusetts Registered professional engineer that the

completed construction complies with the 100% Design Report.

h. Minor field fit engineering.

(4) Item A-5 Insurances and Allowances

This item is not measured for payment. This item is included in the 4.7% markup of the cost of the work. Payment of the 4.7% mark-up shall be full compensation for work included in this item.

a. Contractor's General Liability Insurance; and

b. Vehicle Insurances..

b. Contract Items - Bid Form B

*(1) Bid Item No. B-1 - Decommission/Demolition of Structures

The cost for this item shall include the direct cost for labor, equipment, , and off-site transportation and disposal, as appropriate, to decommission and demolish the items which have not already been decommissioned/demolished identified on Sheet 11-5 of the Drawings, in accordance with the Drawings and Technical Specifications..

This item includes existing debris piles scattered through the undeveloped portions of the site. Consequently, this item includes sorting these debris piles, crushing concrete, and removing, transporting, and disposing of the debris, in accordance with applicable regulations. The Contractor shall provide all supporting documentation for material disposed off-site.

(2) Bid Item No. B-2

NOT USED

*(3) Bid Item No. B-3

NOT USED

(4) Bid Item No. B-4 - Construct Cover on Atlantic Avenue Associates Property

The cost for this item shall include the direct cost for labor, equipment, and materials to construct the remedy on the Atlantic Avenue Associates property.

The effort for the Atlantic Avenue Associates property remedy includes, but is not limited to clearing, excavating and hauling existing materials to the ECHP, proofrolling, placing and compacting the above grade permeable cover, in accordance with the Drawings and Technical Specifications. For this property, the above grade permeable cover shall consist of 6 oz. nonwoven geotextile, overlain by a 12-inch thick layer of cover soil and a 4-inch layer of topsoil and its associated transitions, and seeding.

(5) Bid Item No. B-5 - Construct Cover on Ganglani Property

The cost for this item shall include the direct cost for labor, equipment, and materials to construct the remedy on the Ganglani property.

The Ganglani property remedy includes, but is not limited to clearing, excavating and hauling existing materials to the ECHP, proofrolling, placing and compacting the at-grade permeable cover in accordance with the Drawings and Technical Specifications. For this property, the at-grade permeable cover shall consist of 6 oz. nonwoven geotextile, overlain by a 12-inch thick layer of cover soil and a 4-inch layer of topsoil and its associated transitions, and seeding.

(6) Bid Item No. B-6 - Construct Cover on Nordraer Realty Trust Property

The cost for this item shall include the direct cost for labor, equipment, and materials to construct the remedy on the Nordraer Realty Trust property.

The effort for the Nordraer Realty Trust property remedy includes, but is not limited to clearing, excavating and hauling existing materials to the ECHP proofrolling, placing and compacting the at-grade permeable cover in accordance with the Drawings and Technical Specifications. For this property, the at-grade permeable cover shall consist of 6 oz. nonwoven geotextile, overlain by a 12-inch thick layer of cover soil and a 4-inch layer of topsoil and its associated transitions, and seeding.

(7) Bid Item No. B-7 - Construct Cover on Atlantic Avenue Trust Property

The cost for this item shall include the direct cost for labor, equipment, and materials to complete the construction of the remedy on the Atlantic Avenue Trust property.

The effort for the Atlantic Avenue Trust property remedy includes, but is not limited to clearing, excavating and hauling existing materials to the ECHP, proofrolling, placing and compacting the at-grade permeable cover in accordance with the Drawings and Technical Specifications. For this property, the at-grade permeable cover shall consist of 6 oz. nonwoven geotextile, overlain by a 12-inch thick layer of cover soil and a 4-inch layer of topsoil and its associated transitions, and seeding or a 12-inch thick layer of cover soil overlain by a 4-inch thick gravel layer according to the plans and specifications.

(8) Bid Item No. B-8 - Construct Cover on Winter Hill Property

The cost for this item shall include the direct cost for labor, equipment, and materials to construct the remedy on the Winter Hill property.

The effort for the Winter Hill property remedy includes, but is not limited to clearing, excavating and hauling existing materials to the ECHP, proofrolling, placing and compacting the at-grade permeable cover consisting of 6 oz. nonwoven geotextile, overlain by either a 12-inch thick layer of cover soil and a 4-inch layer of topsoil and its associated transitions, and seeding, in accordance with the Drawings and Technical Specifications or a 6-inch thick layer of subbase overlain by a 6-inch thick asphalt layer of binder and wearing courses according to the plans and specifications. The work shall be limited to planter areas to the east, south and west of the existing building as shown on the drawings and technical Specifications.

(9) Bid Item No. B-9 - Construct Cover on Boyd Corporation Property

The cost for this item shall include the direct cost for labor, equipment, and

(3) Bid Item No. C-3

NOT USED

(4) Bid Item No. C-4

NOT USED

(5) Bid item No. C-5

NOT USED

(6) Bid Item No. C-6

NOT USED

(7) Bid Item No. C-7

NOT USED

(8) Bid Item No. C-8

NOT USED

(9) Bid Item No. C-9

NOT USED

(10) Bid Item No. C-10 - Setup at a Well Location

The cost per well location for this item shall include the direct cost for labor, equipment, and materials to setup at well locations to decommission wells in accordance with the Drawings and Technical Specifications (particularly Section 02070).

(11) Bid Item No. C-11

NOT USED

(12) Bid Item No. C-12

NOT USED

(13) Bid Item No. C-13

NOT USED

(14) Bid Item No. C-14

NOT USED

(15) Bid Item No. C-15 Grouting 2-inch Diameter Wells

The cost per linear feet for this item shall include the direct cost for labor, equipment, and materials to grout 2-inch diameter groundwater monitoring well, piezometer, or gas vent to decommission wells in accordance with the Drawings and Technical Specifications (particularly Section 02070).

(16) Bid Item No. C-16 - Overdrilling and Grouting 2-inch Diameter Wells

The cost per linear foot for this item shall include the direct cost for labor, equipment, and materials to overdrill and grout 2-inch diameter groundwater monitoring well, piezometer, or gas vent to decommission wells in accordance with the Drawings and Technical Specifications (particularly Section 02070).

(17) Bid Item No. C-17

NOT USED

d. Contract Items - Bid Form D

NOT USED

e. Contract Items - Bid Form E

*(1) Bid Item No. E-1 - Site Preparation for Wetland 3A

The cost for this item shall include the direct cost for labor and equipment, and material to complete preparation of Wetland 3A by clearing and grubbing, hauling, chipping, on-site grinding, and cleared materials. Also included in this item is the removal of trash in Wetland 3A. Other items defined as site preparation in these areas include construction effort, materials, and maintenance effort for access roads to each location, and construction effort, operations effort, and materials to construct, operate, and maintain the dredge spoil dewatering areas for each location.

(2) Bid Item No. E-2 - Excavate Existing Fill in Water Main Easement (Wetland 3A)

The cost for this item shall include the direct cost for labor, equipment, and

materials to excavate, haul, place and compact the existing fill material within the water main easement along Wetland 3A to the ECHP, in accordance with the Drawings and Technical Specifications.

(3) Bid Item No. E-3 - Lower Existing Water Main at Wetland 3A

The cost for this item shall include the direct cost for labor, equipment, and materials to lower the existing 12-inch diameter ductile iron pipe (DIP) water main as it crosses Wetland 3A a sufficient depth to pass under Wetland 3A and prevent freezing of the pipe.

The effort for lowering the existing DIP water main includes, but is not limited to, excavating, hauling to dewatering area, hauling to ECHP, placing and compacting excavated material; lowering the DIP water main and testing the relocated water main for leaks; and, placing and compacting clean material in the water main trench, in accordance with the Drawings and Technical Specifications.

(4) Bid Item No. E-4

NOT USED

(5) Bid Item No E-5 - Construct Cap in Wetland IC and IC Enhancement Area

The cost for this items shall include the direct cost for labor, equipment, and materials to complete remaining work to install the specified cover in the Wetland 1C and 1C Enhancement Area. The work in Wetland 1C for this item shall be limited to providing and placing topsoil and completing the cover in transition areas. The Enhanced Wetland work for this item remains to be completed. The work includes installation of 16 oz. geotextile, gravel, topsoil, and riprap, in accordance with the Drawings and Technical Specifications.

(6) Bid Item No. E-6 - Place Topsoil in Wetland 3A

The cost for this item shall include the direct cost for labor, equipment, and materials to place an 8-inch thick layer of topsoil in Wetland 3A Restoration Area, in

accordance with the Drawings and Technical Specifications.

f. Contract Items - Bid Form F

*(1) Bid Item No. F-1

NOT USED

(2) Bid Item No. F-2 - Install Gravel Lined Channel Between Wetland 1C and Created Wetland.

The cost for this item shall include the direct cost for labor, equipment and materials to construct the riprap lined drainage channel between Wetland 1C and Created Wetland. The construction effort for this item includes excavation of the channel trench, placement of geotextile, clay loam and gravel/cobble lining, in accordance with the Drawings and Technical Specifications.

(3) Bid Item No. F-3 - Install Culvert Extensions and Elliptical Culvert on Commerce Way Extension.

The cost for this item shall include the direct cost for labor, equipment and materials to construct the extensions of the existing culverts and elliptical culvert on Commerce Way Extension. The construction effort for this item includes trenching, geotextile, bedding material, RCP, headwall section, trench backfill, riprap and gabion, outlet protection in accordance with the Drawings and Technical Specifications.

(4) Bid Item No. F-4 Excavate Utility Corridor

The cost for this item shall include the direct cost for labor, equipment, and materials to excavate the approximately 120 feet of the southern extension of the utility corridor and place the excavated material as compacted fill beneath the cover subgrade in accordance with the Drawings and Technical Specifications.

(5) Bid Item No. F-5

NOT USED

(6) Bid Item No. F-6 - Geotextile in Utility Corridor

The cost for this item shall include the direct cost for labor, equipment, and materials to install 6 oz. geotextile on the bottom and sides of the approximately 120 feet of the southern extension of the utility corridor in accordance with the Drawings and Technical Specifications.

(7) Bid Item No. F-7 - Off-Site Borrow Fill in Utility Corridor

The cost for this item shall include the direct cost for labor, equipment, and material to place and compact off-site borrow fill-in the utility corridors. The construction effort for this item includes the supply, placement and compaction of off-site borrow fill in the utility corridors in accordance with the Drawings and Technical Specifications.

(8) Bid Item No. F-8 - Fill in area between Wetland 1C and Created Wetland and Along the North and East Sides of the East Central Hide Pile.

The cost for this item shall include the direct cost for labor, equipment, and material to complete the construction of the fill in area of an embankment between Wetland 1C and the Created Wetland and along the north and east sides of the East Central Hide Pile. The construction effort for this item includes supplying, placing and compact dry fill in the areas described in accordance with the Drawings and Technical Specifications.

g. Contract Items - Bid Form G

*(1) Bid Item No. G-1 - Site Preparation for Hide Pile Cover Construction

The cost for this item shall include the direct cost for labor, and equipment to complete preparation of the South and East-Central Hide Piles for permeable cover construction by clearing and grubbing, hauling, chipping, and on-site grinding of cleared materials in accordance with the Drawings and Technical Specifications.

(2) Bid Item No. G-2 - Riprap Channels in Permeable Cover Areas

The cost for this item shall include the direct cost for labor, equipment and materials to construct the riprap lined draining channel in Permeable Cover Areas. The construction effort for this item includes excavation of the channel trench, placement of geosynthetics, and placement riprap lining in accordance with the Drawings and Technical Specifications.

(3) Bid Item No. G-3 - Riprap Slope Protection in Permeable Cover Areas

The cost for this item shall include the direct cost for labor, equipment and material to complete the construction of the riprap slope protection in Permeable Cover Areas. The construction effort for this item includes excavation of the slope protection trench, placement of geosynthetics, and placement of riprap in accordance with the Drawings and Technical Specifications.

(4) Bid Item No. G-4 - Gabion Retaining Walls in Permeable Cover Areas

The cost for this item shall include the direct cost for labor, equipment and materials to construct the gabion retaining walls in Permeable Cover Areas. The construction effort for this item includes providing the gabion cage and gabion rock, assembling gabion cages, placing gabion cages and gabion rock, anchoring cages, and placing and compacting backfill, in accordance with the Drawings and Technical Specifications.

(5) Bid Item No. G-5 - Revegetate Hide Piles

The cost for this item shall include the direct cost for labor, equipment and materials to complete the revegetation of the South, West and East-Central Hide Piles. The materials for this item include seeding, fertilizer, and mulch, in accordance with the Drawings and Technical Specifications.

(6) Bid Item No. G-6 - Paved Access Road on West Hide Pile

The cost for this item shall include the direct cost for labor, equipment, and

materials to complete the construction of the paved access road on the West Hide Pile to the Boston Edison Power Poles. The construction effort for this item includes completing the stone subbase and placing an above grade asphalt cover section from the western side to the Boston Edison power poles on the West Hide Pile, in accordance with the Drawings and Technical Specifications.

(7) Bid Item No. G-7 - Security Fence around ECHP Consolidation Area

The cost for this item shall include the direct cost for labor, equipment, and materials to construct a security fence around the ECHP Consolidation Area. The construction effort for this item includes installing a Contractor-provided fence which will prevent access to the ECHP Consolidation Area by the general public, in accordance with the Drawings and Technical Specifications.

(8) Bid Item No. G-8 - Fill Material

The cost for this item shall include the direct cost for labor, equipment, and materials to complete the hauling, placing and compacting fill material from on-site excavations or off-site sources, in accordance with the Drawings and Technical Specifications.

(9) Bid Item No. G-9 - Permeable Cover

The cost for this item shall include the direct cost for labor, equipment, and materials to complete the construction of the permeable cover on the South and East-Central Hide Piles, in accordance with the Drawings and Technical Specifications. The materials required for this effort includes 16 oz nonwoven geotextile, 6 oz nonwoven geotextile, geogrid, geocomposite drain, 12-inch thick in-place cover soil layer, and 4-inch thick in-place topsoil layer. The construction effort required for this item include, hauling, placing, seaming, sewing, testing, tying, and compacting, as appropriate, the materials listed in the previous sentence.

h. Contract Items - Bid Form H

(1) Bid Item No. H-1

NOT USED

(2) Bid Item No. H-2 - Install 18" RCP

The cost for this item shall include the direct cost for labor, equipment, and materials to install an 18" diameter reinforced concrete pipe (RCP) culvert. This item includes trenching, bedding material, RCP, flared end section and backfill in accordance with the Drawings and Technical Specifications.

(3) Bid Item No. H-3 - Riprap Lined Drainage Channel

The cost for this item shall include direct labor, equipment, and materials to excavate, install geosynthetics and place riprap in accordance with the Drawings and Technical Specifications.

(4) Bid Item No. H-4 - Riprap Protection at Toe of Slope

The cost for this item shall include the direct cost for labor, equipment, and materials to install 16-oz. geotextile and 6-inch riprap at the toe of slope, in accordance with the Drawings and Technical Specifications.

(5) Bid Item No. H-5

NOT USED

(6) Bid Item No. H-6 Gas Collection System

The cost for this item shall include the direct labor, equipment, and materials to furnish and install the complete gas collection system from the present state of completion in accordance with direction from the Trustee Representative..

(7) Bid Item No. H-7

NOT USED

(8) Bid Item No. H-8 - Gas Treatment Plan

The cost for this shall include the direct labor, equipment, and materials to furnish and install the complete gas treatment plan from the present state of completion in accordance

with direction from the Trustee Representative.

(9) Bid Item No. H-9 - Construct Gravel Access Road

The cost for this item shall include the direct cost for labor, equipment, and materials to place off-site borrow fill and construct a Gravel Access Road to the Gas Treatment Plant as described in the Drawings and Technical Specifications.

*(10) Bid Item No. H-10

NOT USED

(11) Bid Item No. H-11 - Chain Link Fence on East Hide Pile

The cost for this item shall include the direct cost for labor, equipment, and materials to construct a 6 feet high galvanized steel chain link fence along the eastern and northern boundaries of the East Hide Pile. The construction effort for this item includes installing a Contractor provided fence which will prevent access to the East Hide Pile by the general public, in accordance with the Drawings and Technical Specifications.

(12) Bid Item No. H-12 - Revegetate East Hide Pile

The cost for this item shall include the direct cost for labor, equipment, and materials to revegetate all areas in or around the East Hide Pile. The construction effort for this item includes seeding, fertilizing, and mulching, as required in accordance with the Drawings and Technical Specifications.

(13) Bid Item No. H-13

NOT USED

(14) Bid Item No. H-14 - Impermeable Cover East Hide Pile

The cost for this item shall include the direct cost for labor, equipment, and materials to repair erosion damage to the soil cover. Work shall also include supplying, hauling, placing and compacting fill to flatten the slope in the east end of the north

slope of the East Hide Pile in accordance with the Drawings and Technical Specifications.

*(15) Bid Item No. H-15

NOT USED

i. Contract Items - Bid Form I

*(1) Bid Item No. I-1

NOT USED

(2) Bid Item No. I-2

NOT USED

(3) Bid Item No. I-3 - Channels Cover Construction

The cost for this item shall include the direct cost for labor, equipment, and materials for constructing the specified covers in the west branch of the Aberjona River, Atlantic Avenue Drainway, and the Atlantic Avenue Drainway extension between the Created Wetland and Atlantic Avenue, in accordance with the Drawings and Technical Specifications. The materials required for this effort includes previously excavated material as backfill, 16 oz nonwoven geotextile, and 16-inch thick in-place gravel/cobble lining. The construction effort required for this item include, hauling, placing, sewing, testing, and compacting, as appropriate, the materials listed in the previous sentence.

(4) Bid Item No. I-4 - Construct Created Wetland Outflow Structure

The cost for this item shall include the direct cost for labor, equipment, and materials to complete the construction of the Created Wetland outflow structure, including the precast reinforced concrete drop box, flashboard and supports, and 36-inch diameter reinforced concrete pipe (RCP), in accordance with the Drawings and Technical Specifications.

(5) Bid Item No. I-5 - Construct Created Wetland Berm

The cost for this item shall include the direct cost for labor, equipment, and

materials to construct the berm along the western and southern boundaries of the Created Wetland, including clean fill from off-Site sources and the 4-inch thick layer of topsoil from off-Site sources, in accordance with the Drawings and Technical Specifications.

(6) Bid Item No. I-6

BY OTHERS

(7) Bid Item No. I-7 Construct Drainway Revitalization Areas

The cost for this item shall include the direct cost for labor, equipment and material to construct drainway revitalization areas along remediated stream and channel banks as specified on sheets 13-1 and 14-7. The remaining work for this item includes the Atlantic Avenue Drainway and Wetland 2A. The construction effort for this includes excavation and placing of additional soil and topsoil.

(8) Bid Item No I-8 - Excavate Created Wetland

The cost for this item shall include the direct cost for labor, and equipment, and material to complete to excavate place soil and topsoil in the Atlantic Avenue drainway and the West Branch of the Aberjona River in accordance with the Drawings and Technical Specifications.

*(9) Bid Item No I-9

NOT USED

(10) Bid Item No. I-10 - Excavate Drainage Channels

The cost for this item shall include the direct cost for labor, equipment, and materials for completing excavation of the existing soil and sediment in the and the West Branch of the Aberjona River, Atlantic Avenue Drainway, including the extension in accordance with the Drawings and Technical Specifications.

*(11) Bid Item No. I-11

NOT USED

(12) Bid Item No. I-12 - Created Wetland Cover

The cost for this item shall include the direct cost for labor, equipment, and materials to construct the permeable cover in accordance with the Drawings and Technical Specifications. The materials required for this effort includes 16 oz. nonwoven geotextile, 8-inch thick in-place layer of silty clay loam, 4-inch thick in-place layer of gravel, and 12 to 20-inch thick in-place layer of topsoil. The construction effort required for this item include, hauling, placing, sewing, testing, and compacting, as appropriate, the materials listed in the previous sentence.

j. Contract Items - Bid Form J

NOT USED

k. Contract Items - Bid Form K

*(1) Bid Item No. K-1 - Site Preparation for Permeable Cover Construction in Undeveloped Areas

The cost for this item shall include the direct cost for labor and equipment for completing preparation of the undeveloped areas to receive permeable cover by clearing and grubbing, hauling, chipping, on-site grinding, materials in accordance with the Drawings and Technical Specifications.

(2) Bid Item No. K-2

NOT USED

(3) Bid Item No. K-3

NOT USED

(4) Bid Item No. K-4 - Vegetate Permeable Cover in Undeveloped Areas

The cost for this item shall include the direct cost for labor, equipment, and materials to revegetate all areas in or around the East and East Central Hide Pile. The construction effort for this item includes seeding, fertilizing, and mulching, as required, in accordance with the Drawings and Technical Specifications.

(5) Bid Item No. K-5 - Fill Under Permeable Cover in Undeveloped Areas

The cost for this item shall include the direct cost for labor, equipment, and materials to complete hauling, placing, and compacting on-Site fill materials under the Permeable Cover in undeveloped areas, in accordance with the Drawings and Technical Specifications.

(6) Bid Item No. K-6 - Permeable Cover in Undeveloped Areas

The cost for this item shall include the direct cost for labor, equipment, and materials to complete the construction of the permeable cover in undeveloped areas, in accordance with the Drawings and Technical Specifications. The materials required for this effort includes 6 oz nonwoven 12-inch thick in-place cover soil layer, and 4-inch thick in-place topsoil layer. The construction effort required for this item include, hauling, placing, sewing, testing, and compacting, as appropriate, the materials listed in the previous sentence.

1. Contract Items - Bid Form L

NOT PART OF THIS CONTRACT

*The following is a list of deleted items removed from the Contract:

1. All composting (Bid Items E-1, F-1, G-1, I-1)
2. Rock crushing (Bid Item B-21)
3. Woodchip disposition on Janpet Property (Bid Item B-3)
4. Debris piles on Janpet Property (Bid Item B-1)
5. Cover on Janpet Property (Bid Item B-3)
6. Electrical Power (Bid Item H-10)
7. Gas line (Bid Item H-15)
8. Rock Excavation (Bid Items B-21, I-9, and I-11)

2.02 WORK NOT INCLUDED

This contract does not include vegetating and revegetating wetland areas.

2.03 NOISE LIMITS AND WORK PERIOD

Noise must be curtailed between 10:00 PM and 6:00 AM. Activities between those hours may be undertaken only with the prior approval of the Trustee Representative.

PART 3 - EXECUTION

Not Used.

END OF SECTION

SECTION 01016

OCCUPANCY

PART 1 - GENERAL

1.01 Partial Occupancy By Trustee

Whenever, in the opinion of the Trustee Representative, any section or portion of the Work or any structure is in suitable condition, it may be put into use upon the written order of the Trustee Representative and such usage will not be held in any way as an acceptance of said Work or structure, or any part thereof, or as a waiver of any of the provisions of these Specifications and the Contract. Pending final completion and acceptance of the Work, all necessary repairs and replacements due to defective materials or workmanship or operations of the Contractor for any section of the Work so put into use shall be performed by the Contractor at Contractor's own expense.

END OF SECTION

SECTION 01017

TEMPORARY FACILITIES AND UTILITIES PROVIDED

PART 1 - GENERAL

1.01 DESCRIPTION

This section is intended to describe the facilities, buildings, equipment, and utilities that are presently under ISRT control or ownership. This section will also identify what will be provided to the Contractor by the ISRT at no cost to the Contractor. It will be the Contractors responsibility to inspect all items that ISRT proposes to provide and ascertain their suitability and adequacy to support the remedial construction activities to be performed by the Contractor. If additional temporary facilities, buildings, equipment, or utilities are deemed necessary by the Contractor, they are to be described and the cost included in the bid form. It will be the Contractors responsibility to procure, maintain, operate, and remove all additional facilities, buildings, equipment, and utilities.

1.02 BUILDINGS

The ISRT has leased a 30,000 square foot building located at 41 Atlantic Avenue, which was the former location of the Woodcraft Supply Co. who is also a PRP at the Site. This building was vacant and deemed ideally located and suited to support the remedial construction. It is centrally located on the Site next to the existing decontamination facility. It is a combination of office and warehouse space that should be adequate to support most or all of the remedial construction activities. The building will be under lease to the ISRT for two years with a third year option. ISRT will pay all cost for the building including utilities (except Contractor telephone). The building consists of three separate areas:

Office Area: A total of 6,250 square feet will be assigned to various parties as deemed necessary by the ISRT. Occupants will be the ISRT, EPA MDEP, and the Contractors. A minimum of 3,000 square feet will be reserved for use by the Remedial Contractor. In addition, a conference

room, a reception area, and bathrooms will be shared by all parties. Office furniture and modular partitions needed by the Contractor will be leased and paid for by the Contractor. The Remedial Contractor will provide all janitorial and maintenance services for the building.

Employee Area: Between the office area and the warehouse area is a separate but connected 3,750 square feet of air conditioned/heated space. It has access doors to the parking lot, office area, and warehouse area where restrooms are located. The Contractor will provide all lockers, benches, tables, chairs, timeclock, storage shelves, showers, or other equipment as deemed necessary. this area appears to be suited for use as a field employee area for dressing, breaks, and lunchroom. However, it will be up to the Contractor to decide how this space will be utilized. Within this area is a room 12'X15' with separate air conditioners and could be used for instrument calibration, first aid, field supervisors office, or other purposes as deemed necessary by the Contractor.

Warehouse Area: The back of the Building is 20,000 square feet of warehouse space that is insulated and heated. Ventilation fans are in place to allow flow-through of air during warm weather and to provide fume exhaust during fork truck operations. A loading dock with two 8'X8' roll-up metal doors are provided. The warehouse is protected by a wet sprinkler fire protection system and a electronic security system that is common to the rest of the building. The ISRT may have need for some storage space for early arrival equipment for the groundwater treatment system. However, this need would be limited to the first year and should not exceed 5,000 square feet of space. The Contractor should provide a fork lift as one of the equipment items needed for off-loading of materials and equipment. Any utilization of the fork lift and operator for off-loading ISRT equipment or material will be documented by the Contractor and approved by the ISRT Site Manager. This documentation will be the basis for a change order from the Contractor with costs based upon the equipment and labor rates reflected in the bid.

1.03 BUILDING UTILITIES

The building at 41 Atlantic Avenue has three phase 120/208 volt, 800 amp power, potable water, and MWRA sewer connection all paid by ISRT. The contractor will be responsible for their telephone service and bills.

1.04 BUILDING USE TERMS AND CONDITIONS

The ISRT will divide the office area into two sections with common use facilities such as conference room, reception area, and bathrooms in the middle. This will provide a level of privacy and separation for both the Contractor and their Subcontractors and the ISRT and their other occupants such as EPA, MDEP, NUS, and Golder. The ISRT Site Manager will act as Building Manager and will be responsible for control of the building. All disputes, complaints, and requests regarding the use and operations of the building will be made to the ISRT Site Manager. The Contractor will be required to maintain safe, orderly, and clean working environment within the building. All contractor and their Subcontractor employees will not be allowed in the ISRT office area without prior approval from the party they wish to visit. The Contractor will provide an employee to act as receptionist/secretary during normal business hours. This person will answer calls, control access of visitors entering the front door, schedule appointments, and be in control of all common use facilities and equipment (i.e., conference room scheduling, fax and copy machine). In addition, this person will perform secretarial work for ISRT on an as needed basis and will provide secretarial service to the Contractor.

1.05 EQUIPMENT PROVIDED BY ISRT

In the common use area between the conference room and the bathroom, the ISRT will provide a Xerox 5028 Copier and a NEC AF-2000 Fax Machine. This equipment will be available for use by all building occupants for the project related work. The receptionist/secretary provided by the Contractor will be responsible for oversite of this equipment and will perform any major copy operations. ISRT will provide all supplies and service needs for the equipment. The conference room will be furnished with conference table, chairs, wall mounted writing board with projection screen, and overhead projector by ISRT.

1.06 RADIO EQUIPMENT AND LICENCE

The ISRT has obtained a FCC licence for FM portable radios for use on the Site. We are permitted for ten radios at 4 watt output on frequency 151.62500 Mhz. We presently have one base station and seven portable Motorola HT-600 radios. The base station will be located in the reception area and monitored by the receptionist or security guard. The ISRT Site Manager will have one portable unit and will monitor Site operations and emergencies over it. The remaining six portables will be available for Contractor use. A radio sign-out log will be kept by the receptionist or security guard and all parties will sign for and be responsible for the radio. In the event that a radio be lost or damaged by a Contractor employee, it will be the Contractor's responsibility to repair or replace the radio. During construction of the remedy, the Contractor will have one radio for each field operations supervisor and additional radios if required. The radios will be used for Site communications and coordination. The Contractor will include a written radio communications protocol for Site emergencies and releases in the Contractor Health and Safety Plan.

1.07 EXISTING DECONTAMINATION FACILITIES

To the East of the building at 41 Atlantic Avenue, there exists a concrete decontamination pad with containment curbs. It drains into a sump with a submersible pump that pumps into any of three 15,000 gallon steel storage tanks. The facility will be turned over to the Contractor for use, operation, maintenance, and disposal. The water that is collected in the storage tanks will be sampled when full by the Contractor. The Contractor will send the sample to a approved laboratory for full TCL/TAL analysis. The water will be allowed to be sprayed back on to the East Central Hide Pile if the levels of contaminates are low and ISRT received EPA approval as per past practice. This will be allowed prior to installation of the remedy on the East Central Hide Pile only. Another decontamination pad exist at the site compound at the end of Commerce Way but is limited to Site personnel only and is not to be used for vehicle or large equipment decon. Both decon facilities have a heat-traced water supply, electric power and lights, and a storage building supplied by ISRT.

1.08 TRAILER HOOK-UPS AT SITE COMPOUND

There are existing utilities and connection points for power, water, sewer, and telephones for trailers or portable buildings at the existing compound at the end of Commerce Way. These are available for the Contractor to use, however due consideration must be given to the remedy installation in this area as well as potential road construction through this area.

END OF SECTION

SECTION 01026

SCHEDULE OF VALUES

PART 1 - GENERAL

1.01 Scope

The work under this Section includes preparation and submittal of a schedule of values.

1.02 General

(a) Timing of Submittal: Submit to the Trustee Representative, a schedule of values allocated to the various portions of the Work, within 10 days after Award of Contract. The first progress payment will not be made until the next pay cycle following the Trustee Representative's approval of the Contractor's values.

(b) Supporting Data: Upon request of the Trustee Representative, support the values with data which will substantiate their correctness.

(c) Use of Schedule: The schedule of values, unless objected to by the Trustee Representative, shall be used only as a basis of the Contractor's Application for Payment. Progress payments will be based on work completed.

1.03 Form and Content of Schedule of Values

(a) Form and Identification

1. Contractor's standard forms and automated printout may be used

2. Identify schedule with:

(a) Title of project and location
(b) Trustee Representative
(c) Name and address of Contractor
(d) Contract designation
(e) Date of submission

(b) Schedule shall list the installed value of the component parts of the Work in sufficient detail to serve as a basis for computing values for progress payments during construction. Breakdown

shall be by structure, then by CSI Format, for ease of field verification of quantities completed in each structure.

(c) Format

1. Follow the Bid Forms of Section 00300 of the Contract Documents and Specifications as the format for listing the component items.

2. Identify each item with the number and title of the respective major section of the specifications.

(d) For each major line item list sub-values of major products or operations under the item.

(e) For the Various Portions of the Work, each item shall include a directly proportional amount of the Contractor's burden, overhead, and profit.

(f) The sum of all values listed in the schedule shall equal the total Contract sum.

END OF SECTION

SECTION 01041

PROJECT COORDINATION

PART 1 - GENERAL

1.01 Scope

(a) Management of the Project shall be through the use of a logical method of construction planning, inspection, scheduling and cost value documentation.

(b) The work under this Section includes all surface and subsurface condition inspections and coordination by the Contractor necessary for the proper and complete performance of the Work.

(c) This Section applies to the work of every Division and every Section of these Specifications.

1.02 Site Conditions

(a) Inspection

1. Prior to performing any work under a Section, the Contractor shall carefully inspect the installed work of other trades and verify that all such work is complete to the point where the work under that Section may properly commence.

2. The Contractor shall verify that all materials, equipment and products to be installed under a Section may be installed in strict accordance with the original design and pertinent reviewed shop drawings.

(b) Discrepancies

1. In the event of discrepancy, immediately notify the Trustee Representative.

2. Do not proceed with installation in areas of discrepancy until all such discrepancies have been fully resolved.

1.03 Existing Facilities

(a) Existing Landowner - and Tenant-occupied facilities must of necessity remain in operation while the new construction is in progress.

(b) The Contractor shall coordinate the work with the Landowners, Tenants, and Trustee Representative so that the construction will not restrain or hinder the access to and operation of the existing active facilities. If, at any time, any portion of the Site facilities needs to be out of service, the Contractor must obtain approval from the Trustee Representative, Landowner, and Tenant as to the date, time and length of time that portion will be out of service.

(c) Connections to the existing facilities or alteration of existing facilities will be made at times when the piping or facility involved is not in use or at times, established by the Trustee Representative, when the use of the piping or facility can be conveniently interrupted for the period of time needed to make the connection or alteration.

(d) After having coordinated the work with the Trustee, the Contractor shall notify the Trustee Representative of the time, time limits and methods of each connection or alteration and have the approval of the Trustee Representative before any work is undertaken on the connections or alterations.

(e) Before any roadway or facilities are blocked off, the Trustee Representative's approval shall be obtained.

1.04 Coordination

(a) Carefully coordinate work with all other trades and subcontractors to insure proper and adequate interface of the work of other trades and subcontractors with the work of every Section of these Specifications.

(b) The Contractor shall coordinate operations with all utility companies in or adjacent to the area of Contractor's work. The Contractor shall require said utilities to identify in the field their property and provide drawings as necessary to locate them.

END OF SECTION

SECTION 01200

PROJECT MEETINGS

PART 1 - GENERAL

1.01 Scope

(a) Work under this Section includes all scheduling and administering of pre-construction and progress meetings as herein specified and necessary for the proper and complete performance of this Work.

(b) Scheduling and Administration by Turstee Representative

1. Prepare agenda

2. Make physical arrangements for the meetings

3. Preside at meetings

4. Record minutes and include significant proceedings and decisions

5. Distribute copies of the minutes to participants

1.02 Preconstruction Conference

a.) The Trustee representative shall schedule the preconstruction conference prior to the issuance of the Notice to Proceed.

b.) Representatives of the following parties are to be in attendance at the meeting:

1. Trustee Representative

2. Contractor and superintendent

3. Major subcontractors

4. Representatives of governmental or regulatory agencies when appropriate

5. Representatives of utility companies with installations that are affected by this contract

c.) The agenda for the preconstruction conference shall consist of the following as a minimum:

1. Distribute and discuss a list of major subcontractors and a tentative construction schedule

2. Critical work sequencing

3. Designation of responsible personnel and emergency telephone numbers

4. Processing of field decisions and change orders

5. Adequacy of distribution of Contract Documents

6. Schedule and submittal of shop drawings, product data and samples

7. Pay request format, submittal cutoff date, paydate and retainage

8. Procedures for maintaining record documents

9. Use of premises, including office and storage areas and Trustee's requirements

10. Major equipment deliveries and priorities

11. Safety and first aid procedures

12. Security procedures

13. Housekeeping procedures

14. Workhours

1.03 Project Coordination Meetings

a.) Schedule regular monthly meetings as directed by the Trustee Representative.

b.) Hold called meetings as the progress of the Work dictates.

c.) The meetings shall be held at the location indicated in the notice.

d.) Representatives of the following parties are to be in attendance at the meetings:

1. Trustee Representative

2. Contractor and superintendent

3. Major subcontractors as pertinent to the agenda

4. Other Trustee Representatives as appropriate

5. Representatives of governmental or other regulatory agencies as appropriate

e.) The minimum agenda for progress meetings shall consist of the following:

1. Review and approve minutes of previous meetings

2. Review work progress since last meeting

3. Note field observations, problems and decisions

4. Identify problems which impede planned progress

5. Review off-Site fabrication problems

6. Review Contractor's corrective measures and procedures to regain planned schedule

7. Review Contractor's revision to the construction schedule as outlined in the Supplementary Conditions

8. Review submittal schedule; expedite as required to maintain schedule

9. Maintenance of quality and work standards

10. Review changes proposed by Trustee for their effect on the construction schedule and completion date

11. Complete other current business

END OF SECTION

SECTION 01300

SUBMITTALS

PART 1 - GENERAL

1.01 General

(a) Wherever submittals are required hereunder, all such submittals by the Contractor shall be submitted to the Trustee Representative.

(b) Prior to mobilization onto the Site;

1. Contractor shall submit to the Trustee Representative a detailed Health and Safety Plan (H&SP) developed in accordance with OSHA 1910.120 regulations.

2. Contractor shall submit a detailed resume of proposed Site Safety Engineer and meet for interviews with the Trustee Representative and Safety Engineer.

3. Contractor shall submit cost estimates including Schedule of Values (Section 01026).

4. Contractor shall submit the Remedial Action Work Plan, which shall include those elements required by the Consent Decree and the Contractor's Erosion and Sedimentation Plan.

(c) Within 14 days after the date of commencement as stated in the Notice to Proceed, the Contractor shall submit the following items to the Trustee Representative for review:

1. A preliminary construction schedule indicating the starting and completion dates of the various stages of the Work. The schedule shall follow the same format as the Schedule of Values, Section 01026.

2. A preliminary schedule of Shop Drawing, sample, and proposed substitutes or "or equal" submittals.

1.02 Shop Drawing Submittal

(a) Whenever called for in the Contract Documents, or where required by the Trustee Representative, the Contractor shall furnish to the Design Engineer for review, 4 copies of each shop drawing submittal. The term "Shop Drawings" as used herein shall be understood to include detailed design calculations, shop drawings, fabrication and installation drawings, erection drawings, lists, graphs, operating instructions, catalog sheets, data sheets, and similar items.

(b) All Shop Drawing submittals shall be accompanied by the Design Engineer standard submittal transmittal form. This form may be obtained in quantity from the Design Engineer at reproduction cost. Any submittal not accompanied by such a form, or where all applicable items on the form are not completed, will be returned for resubmittal.

(c) Normally, a separate transmittal form shall be used for each specific item or class of material or equipment for which a submittal is required. Transmittal of a submittal of various items using a single transmittal form will be permitted only when the items taken together constitute a manufacturer's "package" or are so functionally related that expediency indicates review of the group or package as a whole. A multiple-page submittal shall be collated into sets, and each set shall be stapled or bound, as appropriate, prior to transmittal to the Design Engineer.

(d) Except as may otherwise be provided herein, the Design Engineer will return prints of each submittal to the Contractor with its comments noted thereon, within 15 calendar days following their receipt by the Design Engineer. It is considered reasonable that the Contractor shall make a complete and acceptable submittal to the Design Engineer by the second submission of a submittal item. The Trustee reserves the right to withhold monies due the Contractor to cover additional costs of the review beyond the second submittal. Any consequences or delays due to unacceptable submittals will not be cause for extensions in schedule.

(e) If 2 copies of a submittal are returned to the Contractor marked "NO EXCEPTIONS TAKEN" formal revision and resubmission of said submittal will not be required.

(f) If 2 copies of a submittal are returned to the Contractor marked "MAKE CORRECTIONS NOTED" formal revision and resubmission of said submittal will not be required. Final record drawings or Operation and Maintenance manual submittal must reflect requested changes.

(g) If one copy of the submittal is returned to the Contractor marked "AMEND-RESUBMIT" the Contractor shall revise said submittal and shall resubmit the required number of copies of said revised submittal to the Design Engineer.

(h) If one copy of the submittal is returned to the Contractor marked "REJECTED-RESUBMIT" the Contractor shall revise said submittal and shall resubmit the required number of copies of said revised submittal to the Design Engineer.

(i) Fabrication of an item may be commenced only after the Design Engineer has reviewed the pertinent submittals and returned copies to the Contractor marked either "NO EXCEPTIONS TAKEN" or "MAKE CORRECTIONS NOTED". Corrections indicated on submittals shall be considered as changes necessary to meet the requirements of the Contract Documents and shall not be taken as the basis of claims for extra work. Items fabricated without approval will not qualify for payment.

(j) All Contractor shop drawing submittals shall be carefully reviewed by an authorized representative of the Contractor, prior to submission to the Design Engineer. Each submittal shall be dated, signed, and certified by the Contractor, as being correct and in strict conformance with the Contract Documents. In the case of shop drawings, each sheet shall be so dated, signed, and certified. No consideration for review by the Design Engineer of any Contractor submittals will be made for any items which have not been so certified by the Contractor. All noncertified submittals will be returned to the Contractor without action taken by the Design Engineer, and any delays caused thereby shall be the total responsibility of the Contractor.

(k) The Design Engineer review of Contractor Shop Drawing submittals shall not relieve the Contractor of the entire responsibility for the correctness of details and dimensions. The Contractor shall assume all responsibility and risk for any misfits due to any errors in Contractor submittals. The Contractor shall be responsible for the dimensions and the design of adequate connections and details.

(l) The Contractor shall present Shop Drawings at least one month before work is due to start.

1.3 Contractor's Schedule Submittal

(a) Contractor's construction schedule shall be prepared and submitted to the Design Engineer.

1.4 Proposed Substitutes of "Or Equal" Items:

(a) Whenever materials or equipment are specified or described in the Contract Documents by using the name of a proprietary item or the name of a particular supplier, the naming of the item is intended to establish the type, function, and quality required. If the name is followed by the words "or equal" indicating that a substitution is permitted (i.e., if "or equal" is not indicated substitutes are not allowed), materials or equipment of Others suppliers may be accepted by the Design Engineer if sufficient information is submitted by the Contractor to allow the Design Engineer to determine that the material or equipment proposed is equivalent or equal to that named, subject to the following requirements:

1. The burden of proof as to the type, function, and quality of any such substitute material or equipment shall be upon the Contractor.

2. The Design Engineer will be the sole judge as to the type, function, and quality of any such substitute material or equipment and the Design Engineer decision shall be final.

3. The Design Engineer may require the Contractor to furnish at the Contractor's expense additional data about the proposed substitute.

4. The Trustee may require the Contractor to furnish at the Contractor's expense a special performance guarantee or other surety with respect to any substitute.

5. Acceptance by the Design Engineer of a substitute item proposed by the Contractor shall not relieve the Contractor of the responsibility for full compliance with the Contract Documents and for adequacy of the substitute item.

6. The Contractor shall be responsible for resultant changes and all additional costs which the accepted substitution requires in the Contractor's work, the work of its subcontractors and of Others, and shall effect such changes without cost to the Trustee.

7. All proposed substitutes shall be listed at the time of bidding on the "Proposed Substitute Equipment/Material Supplier List" located in the Bid Forms.

(b) The procedure for review by the Design Engineer will include the following:

1. If the Contractor wishes to furnish or use a substitute item of material or equipment, the Contractor shall make written application to the Design Engineer on the "Substitution Request Form" for acceptance thereof.

2. Unless otherwise provided by law or authorized in writing by the Design Engineer the "Substitution Request Form(s)" shall be submitted within the 35 day period after award of the Contract.

3. Wherever a proposed substitute material or equipment has not been submitted within said 35-day period, or wherever the submission of a proposed substitute material or equipment has been judged to be unacceptable by the Design Engineer the Contractor shall provide the material or equipment named in the Contract Documents.

4. The Contractor shall certify that the proposed substitute will perform adequately the functions and achieve the results called for by the general design, be similar and of equal substance to that specified, and be suited to the same use as that specified.

5. The Design Engineer will be allowed a reasonable time within which to evaluate each proposed substitute.

6. As applicable, no shop drawing submittals will be made for a substitute item nor will any substitute item be ordered, installed, or utilized without the Design Engineer prior written acceptance of the Contractor's "Substitution Request Form."

7. The Design Engineer will record the time required by the Design Engineer to evaluate substitutions proposed by the Contractor and to make changes in the Contract Documents occasioned thereby. Whether or not the Design Engineer accepts a proposed substitute, the Contractor shall reimburse the Trustee for the charges of the Design Engineer for evaluating each proposed substitute.

(c) The Contractor's application using the "Substitution Request Forms" shall contain the following statements and/or information which shall be considered by the Design Engineer in evaluating the proposed substitution:

1. The evaluation and acceptance of the proposed substitute will not prejudice the Contractor's achievement of substantial completion on time.

2. Whether or not acceptance of the substitute for use in the Work will require a change in any of the Contract Documents to adopt the design to the proposed substitute.

3. Whether or not incorporation or use of the substitute in connection with the Work is subject to payment of any license fee or royalty.

4. All variations of the proposed substitute for that specified shall be identified.

5. Available maintenance, repair, and replacement service shall be indicated.

6. Itemized estimate of all costs that will result directly or indirectly from acceptance of such substitute, including cost of redesign and claims of other contractors affected by the resulting change.

1.5 Samples Submittal

(a) Whenever in the Specifications samples are required, the Contractor shall submit at his expense, not less than 3 samples of each such item or material to the Trustee Representative for acceptance at no additional cost to the Trustee.

(b) Samples, as required herein, shall be submitted for acceptance a minimum of 21 days prior to ordering such material for delivery to the job site, and shall be submitted in an orderly sequence so that dependent materials or equipment can be assembled and reviewed without causing delays in the Work.

(c) All samples shall be individually, legibly, and indelibly labeled or tagged, indicating thereon all specified physical characteristics and Supplier's names for identification and submittal to the Trustee Representative for acceptance. Upon receiving acceptance of the Trustee Representative, one set of the samples will be stamped and dated by the Trustee Representative and returned to the Contractor, one set will be retained by the Trustee Representative, and one set of samples shall remain at the job site until completion of the Work.

(d) Unless otherwise specified, all colors and textures of specified items will be selected by the Trustee Representative from the manufacturer's standard colors and standard materials, products, or equipment lines.

(e) Any tests performed by the Trust to verify acceptability of substitutes shall be at the Contractor's expense.

1.6 Technical Manual Submittal

(a) The Contractor shall furnish to the Trustee Representative 12 identical sets of technical manuals for all equipment installed to be operated and maintained by the Trust. Each set shall consist of one or more volumes, each of which shall be bound in a standard size, 3-ring, loose leaf, vinyl plastic hard cover binder suitable for bookshelf storage. Binder ring size shall not exceed 2.5 inches. A table of contents shall be provided which indicates all equipment in the technical manuals.

(b) Using the outline provided in the Equipment Maintenance Summary Sheet (copy of which may be obtained from the Trustee Representative), the Contractor shall include in the technical manuals for each item of mechanical, electrical, and instrumentation equipment the following:

1. Complete operating instructions, including location of controls, special tools or other equipment required, related instrumentation, and other equipment needed for operation.

2. Lubrication schedules, including the lubricant SAE grade and type, temperature range of lubricants, and including frequency of required lubrication.

3. Preventive maintenance procedures and schedules.

4. Parts lists, by generic title and identification number, complete, with exploded views of each assembly.

5. Disassembly and reassembly instructions.

6. Name and location of nearest supplier and spare parts warehouse.

7. Recommended troubleshooting and start-up procedures.

8. Reproducible prints of the record drawings, including diagrams and schematics, as required under the electrical and instrumentation portions of these specifications.

9. Tabulation of proper settings for all pressure relief valves, (low/high) pressure switches and other related equipment protection devices.

10. Detailed test procedures to determine performance efficiency of equipment.

11. List of all electrical relay settings including alarm and contact settings.

(c) All technical manuals shall be submitted in final form to the Trustee Representative not later than the 75 percent of construction completion date. All discrepancies found by the Trustee Representative in the technical manuals shall be corrected by the Contractor within 30 days from the date of written notification by the Trustee Representative.

1.7 Spare Parts Lists Submittal

(a) The Contractor shall furnish to the Trustee Representative 5 identical sets of spare parts information for all mechanical, electrical, and instrumentation equipment. The spare parts list shall include the current list price of each spare part. The spare parts list shall be limited to those spare parts which each manufacturer recommends be maintained by the Trustee in inventory at the plant site. Each manufacturer or supplier shall indicate the name, address, and telephone number of its nearest outlet of spare parts to facilitate the Trustee in ordering. The Contractor shall cross-reference all spare parts lists to the equipment numbers designated in the Contract Documents. The spare parts lists shall be bound in standard size, 3-ring, loose leaf, vinyl plastic hard cover binders suitable for bookshelf storage. Binder ring size shall not exceed 2.5 inches.

1.8 Record Drawings Submittal

(a) The Contractor shall keep and maintain, at the job site, one record set of Drawings. On these, it shall mark all project conditions, locations, configurations, and any other changes or deviations which may vary from the details represented on the original Contract Drawings, including buried or concealed construction and utility features which are revealed during the course of construction. Special attention shall

be given to recording the horizontal and vertical location of all buried utilities that differ from the locations indicated, or which were not indicated on the Contract Drawings. Said record drawings shall be supplemented by any detailed sketches as necessary or directed to indicate, fully, the Work as actually constructed. These master record drawings of the Contractor's representation of as-built conditions, including all revisions made necessary by addenda, change orders, and the like shall be maintained up-to-date during the progress of the Work. As-built plans shall be accurate and certified by a registered Professional Land Surveyor and a Professional Engineer licensed to practice in Massachusetts. All as-built survey documentation shall be in accordance with Third Order, Class II Standards.

(b) In the case of those drawings which depict the detailed requirements for equipment to be assembled and wired in the factory, such as motor control centers and the like, the record drawings shall be updated by indicating those portions which are superseded by change order drawings or final shop drawings, and by including appropriate reference information describing the change orders by number and the shop drawings by manufacturer, drawing and revision numbers.

(c) Record drawings shall be accessible to the Trustee Representative at all times during the construction period and shall be delivered to the Trustee Representative upon completion of the Work.

(d) Upon substantial completion of the Work and prior to final acceptance, the Contractor shall complete and deliver 12 complete sets of record drawings to the Trustee Representative, conforming to the construction records of the Contractor. This set of drawings shall consist of corrected drawings showing the reported location of the Work. The information submitted by the Contractor and incorporated by the Trustee Representative into the Record Drawings will be assumed to be reliable, and the Trustee Representative will not be responsible for the accuracy of such information, nor for any errors or omissions which may appear on the Record Drawings as a result.

1.9 Sheeting, Shoring, Bracing, or Sloping of Trenches Plan Submittal

(a) Prior to commencement of any excavation which has a planned depth greater than the threshold limits of the OSHA regulations, the Contractor shall submit to the Trustee Representative a detailed plan showing the design of sheeting, shoring, bracing, sloping, or equivalent method and shall be in receipt of the Trustee Representative's acceptance of same. This design shall be sealed by a registered Professional Engineer licensed in the Commonwealth of Massachusetts.

2.0 Demolition

Prior to performing demolition of any above or below ground structures or utilities, Contractor shall submit to the Trustee Representative a detailed schedule of proposed demolitions identifying the structures to be demolished and the means and methods to be used in the demolition.

2.1 Soil Erosion and Sedimentation Control Plan

Prior to performing any soil removal or material placement, the Contractor shall submit a plan for temporary and permanent erosion control in accordance with Section 02125.

2.2 Daily, Weekly, and Monthly Reports

The Contractor shall prepare daily reports summarizing on-Site activities. Daily reports shall include as a minimum the following:

- Weather conditions;
- Active work area;
- Crew description;
- Subcontractor activity;
- Equipment operating;
- Hours worked;
- Work performed;
- Problems; and
- Health and safety issues.

The Contractor shall also submit weekly and monthly reports describing the activity of the period. Daily reports shall be submitted the day following the report day. Weekly reports shall be submitted within 3 days of the report period. Monthly reports shall be submitted within 14 days of the report period.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

Not used

END OF SECTION

SECTION 01400

QUALITY CONTROL

PART 1 - GENERAL

1.01 Description of Work:

(a) Quality assurance and the control of installation.

(b) References.

(c) Inspection and testing laboratory services.

1.02 Related Section

Section 01300 - Submittals

1.03 Quality Assurance/Control of Installation

(a) Monitor quality control over products, services, Site conditions, and workmanship, for conformance with the Contract Documents.

(b) Comply fully with manufacturers' instructions, including each step in sequence.

(c) Should manufacturers' instructions conflict with Contract Documents, request clarification from Trustee Representative before proceeding.

(d) Comply with specified standards as a minimum quality for the Work except when more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.

(e) Perform Work by persons qualified to produce workmanship of specified quality.

1.04 References

(a) Conform to the reference standard which is in effect as of the date for receiving bids.

(b) Obtain copies of standards when required by Contract Documents.

(c) Should specified reference standards conflict with Contract Documents, request clarification from Trustee Representative before proceeding.

(d) The contractual relationship of the parties to the Contract shall not be altered from the Contract Documents by either mention or inference in any reference document.

1.05 Inspection and testing laboratory services

(a) Trustee will appoint, employ, and pay for services of an independent QA Inspector to perform Quality Assurance inspection and testing.

(b) The QA Inspector will perform inspections, tests, and services specified in individual specification Sections and as required by the Trustee Representative.

(c) Reports will be submitted by the QA Inspector to the Trustee Representative, indicating observations and results of tests and indicating compliance or non-compliance with Contract Documents.

(d) The contractor, when required, shall cooperate with QA Inspector to furnish samples of materials, design mix, equipment, tools, storage and assistance as requested.

1. Notify QA Inspector 24 hours prior to expected time for operations requiring services.

2. Make arrangements with QA Inspector and pay for additional samples and tests required for Contractor's use.

(e) Retesting or reinspection required because of non-conformance to specified requirements shall be performed by the QA Inspector on instructions by the Trustee Representative. Payment for retesting or reinspection will be charged to the Contractor by deducting inspection or testing charges from the Contract Price.

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

Not Used.

END OF SECTION

SECTION 01540

JOB SITE SECURITY

PART 1 - GENERAL

1.01 Barricades, Lights and Signals

(a) The Contractor shall furnish and erect such barricades, fences, lights and danger signals and shall provide such other precautionary measures for the protection of persons or property and of the Work as necessary and to comply with Federal, State, and local regulations. Barricades shall be painted in a color that will be visible at night. From sunset to sunrise, the Contractor shall furnish and maintain at least one light at each barricade and sufficient numbers of barricades shall be erected to keep vehicles from being driven on or into any Work under construction.

(b) The Contractor will be held responsible for all damage to the Work due to failure of barricades, signs and lights and whenever evidence is found of such damage, the Contractor shall immediately remove the damaged portion and replace it at Contractor's cost and expense. The Contractor's responsibility for the maintenance of barricades, signs and lights shall not cease until the Work has been accepted by the Trustee.

(c) The Trust will provide 24 hour uniformed security personnel to patrol the fence line and the Site offices at 41 Atlantic Avenue for the purpose of discouraging trespassing. These patrols will be conducted on the outside of the fence to determine the integrity of the fence. These personnel will not enter the fenced portion of the Site to apprehend a trespasser or to determine their location but will immediately report the violations. The Contractor will continue to have security responsibility for the Work, both inside and outside the fenced area. KEM Associates, whom the Trust uses for Site security, is willing to give their personnel the appropriate OSHA training in order to meet additional requirements if they are retained for additional job site security.

1.02 Restricted Areas

Designated portions of the Site are currently restricted from public access. Immediately

following the awarding of the Contract, the Contractor shall assume the responsibility and cost of Site Security. This includes, but is not limited to, security guards, fence inspection and repair, and other necessary measures to restrict public access to these designated areas until the remedy is installed. Contractor shall coordinate with the Trustee Representative to establish guidelines for personnel access to the Site. Contractor shall be fully responsible for maintaining site security from the time of awarding the contract to completion of the work including periods of no construction activity such as between construction seasons.

END OF SECTION

SECTION 01550

SITE ACCESS AND TRAFFIC PLAN

PART 1 - GENERAL

1.01 PURPOSE

This plan has been developed with input from the Woburn Police Department. The intention is to provide a method to minimize traffic congestion in the area around the Site, to improve public safety, and to reduce the potential for complaints from the public. The Contractor shall comply with all federal, state, and local laws and regulations that apply to the work to be performed, including, but not limited to, all traffic laws and vehicular weight limitations.

1.02 RESTRICTED AREAS

Truck traffic shall not pass through residential areas. Route 38 and Merrimack Street shall not be used for access to the Site.

1.03 SITE ACCESS

All truck traffic shall access the Site from Route 128 to the Washington Street exit and Mishawum Road. Truck access to the main site which covers the eastern half, shall be from Commerce Way. Truck access to the western portion of the Site, shall be from Mishawum Road and New Boston Street.

PART 2 - TRAFFIC PLAN

2.01 LIMITS ON VOLUME

To minimize traffic congestion in the area around the Site the Contractor limit the number of trucks entering the Washington Street, Mishawum Road, and Commerce Way areas. During the hours from 7:00 AM to 3:30 PM, the maximum number of trucks will be 50 (i.e., 50 trucks shall be allowed into the Site and 50 trucks shall be allowed to exit the Site). These trips should be spread evenly over the time period. Truck traffic is prohibited during the peak period of 3:30 PM to 5:30 PM.

2.02 OFF-LOADING

The Contractor, in conjunction with the Trustee Representative, shall select the areas to be used for off-loading and temporary storage of materials. These areas shall be located on clean portions of the Site to eliminate the need to decontaminate the trucks. These areas shall be located so that trucks can exit the public street into the area with no delay so that there is no impact to local traffic flow. To reduce tracking of soils back on to the streets, dumping of soils should be done in a manner that minimizes wheel contact with the soils.

Tracking pads, 20 feet wide and 50 feet long, consisting of a 12 inch thick layer of 2 1/2 inch clean, crushed stone placed over geotextile fabric shall be constructed and maintained over the duration of the construction at the entrances to the staging and storage areas.

2.03 COVERING OF MATERIALS

All trucks used for transport of fill materials, soils, gravel, crushed rock, asphalts, and similar materials shall be covered with a well secured tarp before transportation on public roads. The Contractor shall take such steps as necessary to prevent spillage, wind blown deposits on the streets and highways, and damage to other vehicles. After dumping the load at the Site, the Contractor shall inspect the truck bed for residual materials and shall remove or cover residual material before the truck is allowed to leave the Site on public roads.

2.04 STREET CLEANING

The Contractor is responsible for removing all soils, dirt, rock, asphalt and other deposits that accumulate on the public streets that are a result of the Contractor's hauling operation. This includes windblown deposits, spillage, and trackage of materials onto the streets. Inspection of the streets is to be performed at least daily during hauling operations. When the inspection determines that cleaning is required, it shall be performed immediately. The Trustee Representative will verify compliance with this requirement.

2.05 FLAGMEN

Hauling, dumping, and other operations shall be performed in such a manner that public streets and traffic flow on the streets are not impacted. If the Contractor finds in planning and scheduling of the work that there will be a requirement to restrict traffic flow or temporarily stop traffic, a flagman will be required. This flagman must be an Off-Duty Woburn Police Officer. The Contractor shall be responsible to contact the Woburn Police Department in advance and shall make payment for this service. In emergency situations where a flagman is required to halt or divert traffic, the Contractor will provide a flagman until the Woburn Police Dept. can be notified and respond to the Site. Under no circumstance shall a Woburn Police Dept. Flagman be used where there is a potential for exposure to hazardous materials.

2.06 ON-SITE TRANSPORTATION

Movements of trucks and equipment within the Site boundary are not limited in volume. However, the work is to be performed in a manner such that public streets and the business operations on-Site are not adversely impacted. The Contractor shall coordinate via the Trustee Representative with business operators on-Site to stage the work such that on-Site business activities are not adversely impacted. This may require performing portions of the work during off-hours. The Trustee Representative will assist in and monitor the planning, scheduling, coordination, and implementation of the work to achieve the above goal. The control of traffic on Site, with the exception of public streets, is the Contractors sole responsibility and shall be performed in a safe and orderly manner. A speed limit of 15 MPH shall be enforced by the Contractor on all vehicles and equipment performing work on the Site.

2.07 TRANSPORTATION OF CONTAMINATED MATERIALS

Certain activities on Site require that contaminated materials from one area be removed and transported to another area of the Site for use as fill material. These materials must not be transported outside of the Site boundary. All trucks moving contaminated material on public streets and through clean areas on the Site must be free of external contamination. All trucks and equipment that have been exposed to contamination must be decontaminated by the methods outlined in the Contractors decontamination plan and approved by the Trustee Representative before moving from contaminated areas to clean areas. Steam cleaning on a

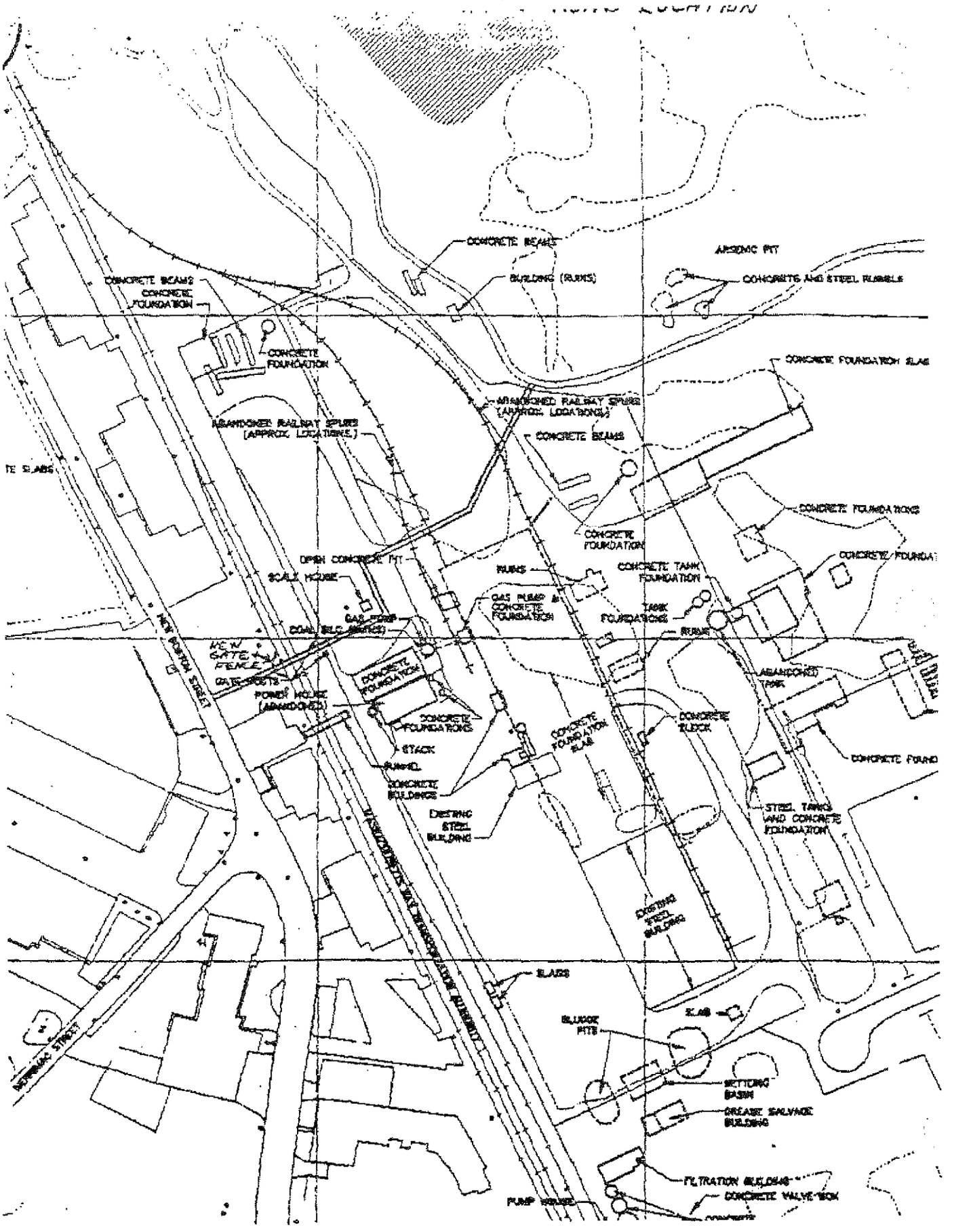
decontamination pad that will collect the run-off shall be used where possible. All contaminated materials being transported are to be securely covered to eliminate the potential for the contaminant to escape into the environment. The Contractor shall use a suitable dust inhibitor approved by the Trustee Representative in conjunction with a securely anchored tarp as a minimum. Trucks that have hauled contaminated material shall not haul clean material or leave the Site until after undergoing thorough decontamination. This will include steam cleaning of the bed, wheels, tires, fenderwells, and all external surfaces as a minimum. The Contractor shall comply with all applicable laws and regulations in performance of these specifications.

2.08 ON-SITE HAUL ROAD

Several areas on the western side of the Site, in the vicinity of New Boston Street and Merrimac Street, require removal and transport of contaminated materials to the eastern side of the Site. In order to do this without hauling outside of the Site, the Contractor shall utilize an existing temporary haul road that will cross the railroad lines that divide the Site (see Figure No. 01550-1). The Trust will provide, through MBTA, the track crossing itself but it will be the responsibility of the Contractor to provide the road connecting to either side of the tracks. The road shall be constructed of crushed stone. The Trust will obtain written authorization from the parties involved for permission to access and construct the road. One key element of this activity will be compliance with the MBTA track crossing procedures and safety requirements. The Contractor will provide MBTA flagmen to be on Site at the crossing during construction of, and all use of the road over the railroad tracks. At no time will any activity be allowed within the railroad right-of-way without the presence of a MBTA flagman, who will be in charge of all crossing activities. Any Contractor employee or subcontractor that fails to comply with directions given by the MBTA flagman shall be immediately dismissed and removed from the Site. The Trust will make all arrangements with the MBTA and will provide the Contractor with information pertaining to these arrangements and other requirements. Any additional cost for involving the MBTA such as insurance or inspectors (if required) will be paid directly by the Trust. This does not include costs for damages caused by the Contractor due to negligence or nonconformance to MBTA safety requirements.

The Contractor shall provide with his bid, an estimate of the amount of time which a flagman will be required at the MBTA crossing.

END OF SECTION


CONCRETE BEAMS
BUILDING (RUINS)
ARSENIC PIT
CONCRETE AND STEEL RUBBLE
CONCRETE BEAMS
CONCRETE FOUNDATION
CONCRETE FOUNDATION
CONCRETE FOUNDATION SLAB
ABANDONED RAILWAY SPURS (APPROX. LOCATIONS)
ABANDONED RAILWAY SPURS (APPROX. LOCATIONS)
CONCRETE BEAMS
CONCRETE FOUNDATIONS
CONCRETE FOUNDATION
OPEN CONCRETE PIT
SCALE HOUSE
RUINS
CONCRETE TANK FOUNDATION
GAS PUMP & CONCRETE FOUNDATION
TANK FOUNDATIONS
RUINS
COAL BELT
NEW GATE FENCE
GATE POSTS
CONCRETE FOUNDATION
POWER HOUSE (ABANDONED)
CONCRETE FOUNDATIONS
STACK
RUINS
CONCRETE BUILDINGS
CONCRETE FOUNDATION SLAB
CONCRETE SLUDGE
ABANDONED TANK
CONCRETE FOUND
DESTRING STEEL BUILDING
STEEL TANKS AND CONCRETE FOUNDATION
NEW BURTON STREET
WASHINGTON BALTIMORE & ANNAPOLIS RAILROAD
DESTRING STEEL BUILDING
SLABS
SLAB
SLUDGE PITS
SETTLING BASIN
GREASE SALVAGE BUILDING
FILTRATION BUILDING
CONCRETE VALVE BOX
PUMP HOUSE
DEPOSIT STREET

SECTION 01562

DUST CONTROL

PART 1 - GENERAL

1.01 Description of Work

The Contractor shall employ construction methods and means that keep airborne particulates to the minimum and shall provide for the application of water or employ other appropriate preventative means or methods to maintain dust control, subject to the approval of the Trustee Representative.

1.02 Related Sections

(a) Odor Control, Section 01563
(b) Site Preparation, Section 02100
(c) Cleaning and Grubbing, Section 02110
(d) Excavation, Section 02220
(e) Backfill and Fill, Section 02223
(f) Drilling and Blasting, Section 02221
(g) Ambient Air Monitoring, Section 01565

1.03 Protection of Adjacent Property

The Contractor shall visit the Site and note the buildings, landscaping, roads, parking areas and other facilities at and near the Work Site that may be affected by their operations. The Contractor shall make adequate provision to fully protect the surrounding area and will be held fully responsible for all damages resulting from Contractor's operations.

1.04 Health and Safety

PM10 particulates shall be limited to an annual average of less than 150 ug per cubic meter and a 24-hour maximum of 450 ug per cubic meter of air at the Site monitoring points described in Section 01565. In addition, data gathered by dust monitoring devices will be used to monitor metals in particulates to ensure that they are below TLV's outlined by the American Council of Governmental and Industrial Hygienists.

PART 2 - PRODUCTS

The use of calcium chloride for dust control is not permitted on the Site. Site workers shall not be exposed to particulates in excess of applicable Federal and/or State standards. In certain areas of the Site, the metal concentrations in soil are such that total airborne particulates shall be kept at concentrations lower than the OSHA particulate standard of 10 mg/m^3, or respiratory protection should be used.

PART 3 - EXECUTION

Watering equipment shall be used to minimize airborne concentrations and shall consist of pipelines, tank trucks, or other devices approved by the Trustee Representative, which are capable of applying a uniform spread of water over the ground surface. A suitable device for a positive shut-off and for regulating the flow rate of water shall be located so as to permit positive operator control.

END OF SECTION

SECTION 01563

ODOR CONTROL

PART 1 - GENERAL

1.01 Description of Work

(a) The Contractor shall provide all labor, equipment, machinery, and materials to apply odor control media to exposed soils containing hide residues or soils releasing odors at the Site during prosecution of the Work.

(b) Control of odors is critical to site construction. The Contractor shall be fully responsible for the proper and timely implementation of odor control measures in such a way that compliance with the odor standard is ensured.

(c) Odor control shall include application and maintenance of temporary/permanent soil cover, or temporary foam odor control agents.

(d) The use of odor controls shall be mandatory during all grading work on hide piles and during construction in Wetland 2A, the New Boston Street Drainway adjacent to Wetland 8, and excavation of the utility corridor adjacent to the East-Central Hide Pile.

(e) The Contractor shall perform all Work in accordance with the Odor Control Plan, Subsections 3, 4, and 5. The Odor control Plan is included in draft form as Attachment B to these Specifications. The Contractor shall assist the trustee representative with updated schedule information for Public Information program, described in Attachment B. The contractor shall not release any project related information to the media, all such communication shall be coordinated by the Trustee Representative.

1.02 Related Sections

(a) Dust Control, Section 01562
(b) Site Preparation, Section 02100
(c) Clearing and Grubbing, Section 02110
(d) Excavation, Section 02220
(e) Backfill and Fill, Section 02223

(f) Ambient Air Monitoring and Stack Gas Testing, Section 01565

PART 2 - PRODUCTS

(a) As noted in part 1.01, temporary odor control media to be applied by the Contractor shall include soil cover or an applied foam agent. For the purpose of temporary odor control, clean fill soil may be placed at a nominal 6-inch thickness over exposed subgrades containing hide residues or other soils releasing odors. Odor control foam shall consist of Rusmar AC-900, or an approved equal, applied in accordance with the manufacturer's recommendations for odor control.

PART 3 - EXECUTION

(a) Soils containing hide residues and other soils emitting odors shall, if disturbed during the course of construction activities and found to give off odors, be covered with a minimum of 6 inches of cover soil or odor control foam until such time as final grading and cap placement can be accomplished. The Contractor shall maintain the integrity of the temporary odor control measure until the final cap materials have been placed and approved by the Trustee Representative.

(b) Odor control media shall be placed over disturbed areas by the contractor immediately upon the discovery of odors, especially hydrogen sulfide (rotten egg) odors. Media shall be applied over areas of regrading or excavation of materials known to contain hide residue.

(c) Areas that have received odor control foam shall not be left exposed for more than 10 calendar days without receiving a subsequent application of foam or final cover materials.

(d) Clean fill used for temporary odor control may not be re-used, following application for odor control, for permeable cover. It may, however, be reused as odor control or used as subgrade to receive permeable cover materials, if it meets all other criteria for compacted subgrade fill.

(e) Odor control foam shall be applied in accordance with manufacturer's recommendations. Following application, the Contractor shall limit traffic over the area of application to limit disruption of the foam membrane and the subsequent potential

release of odors. If necessary, the Contractor shall reapply foam to areas that have been disturbed by construction activities, or where the foam is greater than 10 calendar days old, at no cost to the Trustee.

(f) The Trustee Representative shall be the final judge in determining if odor control is adequate. If the Contractor is unable to control odor, Work may be stopped at the discretion of the Trustee Representative. Contractor shall not be granted extensions of time or reimbursement for any delays so caused.

(g) At no time shall the concentration of total reduced sulfur compounds in air exceed 47 parts per billion at the site monitoring stations described in Section 01565. Portable instruments and detector tubes shall be used in and near excavations within areas known to contain hide residue. The monitoring personnel shall provide feedback to the excavation crew as rapidly as possible.

END OF SECTION

SECTION 01564

HEALTH AND SAFETY SPECIFICATIONS FOR CONSTRUCTION

PART 1 - INTRODUCTION

1.01 Purpose

The purpose of these Health and Safety Specifications is to establish minimum health and safety requirements for the Contractor.

1.02 Applicability

These requirements should be used by the Contractor's Health and Safety Officer to assist in preparation of the Contractor's Health and Safety Plans. These requirements shall not relieve any party from compliance with any applicable State, Federal, or other health and/or safety requirements and safe construction practices which are not identified in these requirements.

PART 2 - SITE BACKGROUND/REMEDIES

The Industri-Plex Site, which covers approximately 245 acres in the northern part of Woburn, Massachusetts, is a CERCLA site. Certain chemicals known to be present at the Site may cause adverse health effects under certain circumstances. Various chemical hazards are identified below, based upon Site data presented in the Record of Decision (ROD), Remedial Investigation (RI), and Pre-Design Investigation (PDI) reports. These reports, which are identified in Attachment 1, and other public information should be consulted for more detail. Reports are contained in the Administrative Record for the Industri-Plex Site, and can be reviewed at the City of Reading Public Library and USEPA Region 1 in Boston, MA.

Potentially impacted media include air, groundwater, soil and sediments. Potential exposure pathways include, but are not necessarily limited to, ingestion, inhalation of vapors and particulates, and dermal contact. Materials of greatest concern include:

1. Animal hide residues buried in soil and stream/pond sediments which give off a noxious odor (hydrogen sulfide and methyl mercaptan) and methane; and,

2. Soils and sediments containing metals and certain organic compounds.

Many of these materials are known or suspected human carcinogens and might cause adverse health effects under certain circumstances. In accordance with the ROD, remedies are to be instituted at various parts of the Site in order to protect public health and the environment from the above chemical hazards. The remedies comprise:

1. Remedy for Contaminated Soils;

2. Air Remedy for the East Hide Pile; and

3. Remedy for Contaminated Groundwater.

The soil and sediment remedy is intended to prevent physical contact with soil and sediment containing arsenic, lead, and/or chromium above ROD Action Levels of 300 ppm, 600 ppm, and 1000 ppm, respectively. Physical contact is prevented using either pre-existing structures (such as buildings and paved roadways), or a permeable soil cover or cover equivalent.

A gas collection and treatment system constitutes the Air Remedy for the East Hide Pile.

The groundwater remedy will consist of groundwater extraction, treatment and recharge systems.

Institutional Controls are an integral part of the remedies and are intended to protect the integrity of the remedies in perpetuity.

The Contractor shall prepare and implement Project Health and Safety Plans. The Health and Safety Plans shall conform with the requirements of 29 CFR 1910.120 and shall be prepared by the Contractor's Health and Safety Officer. The Contractor's Health and Safety Officer shall be a Certified Industrial Hygienist and shall have experience with establishing and implementing health and safety plans and programs for hazardous waste site operations. The Contractor's Health and Safety Plans shall incorporate the requirements contained herein and shall describe all actions to be taken to protect worker health and safety. These plans shall identify all tasks to be undertaken by the Contractor and shall establish Health and Safety procedures for each task. The Contractor's Health and Safety Plans shall be approved by the Contractor's Health and Safety Officer prior to the initiation of any fieldwork, and submit copies for comment from the USEPA, and MDEP. Any

modifications to the Plans shall be submitted to the USEPA and MDEP for comment.

PART 3 - RECORD KEEPING

All parties engaged in on-Site activities must read the Contractor's Health and Safety Plans for the relevant tasks. Documentation demonstrating compliance with this requirement shall be maintained on-Site by the Contractor. Written evidence of compliance with 29 CFR 1910.120 shall also be maintained on-Site in the Contractor's files. Copies of such documentation shall be provided to the Trustee Representative.

ATTACHMENT 1
REFERENCES

Ecology and Environment Inc., 1980: Monitoring of Metal Content in Airborne Particulate, Field Investigations of Uncontrolled Hazardous Waste Sites, FIT Project, Task Report to the Environmental Protection Agency, Contract No. 68-01-6056, May 13,1980.

Ecology and Environment Inc., 1981: Amendment to the North Woburn, Massachusetts Monitoring of Metal Content in Airborne Particulate, Field Investigations of Uncontrolled Hazardous Waste Sites, FIT Project, Task Report to the Environmental Protection Agency, Contract No. 68-01-6056, May 13,1981.

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Golder Associates Inc., 1991, ISRT-PDI-32, Pre-Design Investigation, Task GW-3, Groundwater Treatability, Interim Final Report, Industri-Plex Site, Woburn, MA, April, 1991.

Golder Associates Inc., 1991, ISRT-PDI-31, Pre-Design Investigation, Task SW-2, Surface Water Treatability, Interim Final Report, Industri-Plex Site, Woburn, MA, April, 1991.

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Golder Associates Inc., 1991, ISRT-DESIGN-6, 60% Design Report, Industri-Plex Site, Woburn, MA, (9 Volumes), April, 1991.

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Golder Associates Inc., 1991, ISRT-PDI-36, Supplemental Pre-Design Investigation of the Arsenic Pit and Chromium Lagoons, Industri-Plex Site, Woburn, MA, July 1991.

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Golder Associates Inc., 1991, ISRT-PDI-24, Pre-Design Investigation, Task GW-1, Plume Delineation, Interim Final Report, Industri-Plex Site, Woburn, MA, (2 Volumes), January, 1991.

Golder Associates Inc., 1990, ISRT-PDI-20A, Pre-Design Investigation, Task GW-3, Groundwater Treatability, Supplementary Work Plan, Industri-Plex Site, Woburn, MA, November, 1990.

Golder Associates Inc., 1990, ISRT-PDI-19, Pre-Design Investigation, Task A-2, Gas Treatability, Interim Final Report, Industri-Plex Site, Woburn, MA, October, 1990.

Golder Associates Inc., 1990, ISRT-PDI-18, Pre-Design Investigation, Task GW-3, Groundwater Treatability, Interim Report No.2, Industri-Plex Site, Woburn, Ma, October, 1990.

Golder Associates Inc., 1990, ISRT-DESIGN-3, Preliminary Design Report (30% Design), Industri-Plex Site, Woburn, MA, October, 1990.

Golder Associates Inc., 1990, ISRT-PDI-17, Pre-Design Investigation, Task S-4, Foundation Data, Interim Final Report, Industri-Plex Site, Woburn, MA, September, 1990.

Golder Associates Inc., 1990, ISRT-PDI-16, Pre-Design Investigation, Task SW-1, Extent of Hazardous Substances in Wetlands and Surface Water Sediments, Interim Final Report, Industri-Plex Site, Woburn, MA, (2 Volumes) September, 1990.

Golder Associates Inc., 1990, ISRT-PDI-15, Pre-Design Investigation, Task S-2, Stability of Hide Piles, Interim Final Report, Industri-Plex Site, Woburn, MA, September, 1990.

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Golder Associates Inc., 1990, ISRT-PDI-5, Pre-Design Investigation, Task S-1, Hazardous Substances in Soils, Interim Report, Industri-Plex Site, Woburn, MA, June 1990.

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U.S. Environmental Protection Agency, (USEPA), 1989a, Industri-Plex Site Consent Decree, (Remedial Design/Action Plan as Appendix I) Civil Action Nos. 89-0195-MC and 89-0196-MC, April, 1989.

U.S. Environmental Protection Agency, (USEPA), 1986a, Record of Decision, Industri-Plex Site, Woburn, MA, (includes Summary of Remedial Alternatives Selection) September, 1986.

SECTION 01565

AMBIENT AIR MONITORING

PART 1 - GENERAL

1.01 Description of Work

The Contractor shall operate a site monitoring system to ensure that air quality standards for odor and PM10 particulates (47 ppb hydrogen sulfide odor units and 90 ug per cubic meter, respectively) are not exceeded during remedial action. The Contractor shall take appropriate action, as discussed in Sections 01563 and 01562 if these standards are exceeded. The Contractor shall also perform ambient air monitoring to protect site workers as appropriate (Sections 01563 and 01564).

1.02 Related Sections

(a) Dust Control, Section 01562
(b) Site Preparation, Section 02100
(c) Clearing and Grubbing, Section 02110
(d) Excavation, Section 02220
(e) Backfill and Fill, Section 02223
(f) Odor Control, Section 01563
(g) Health and Safety Specifications for Construction, Section 01564

PART 2 - PRODUCTS

The Contractor shall utilize products which meet the specifications and performance requirements defined in the attached Site Monitoring Plan (Attachment 01565-1).

PART 3 - EXECUTION

The particulate and odor monitoring programs shall be in effect at all times during remedial action as described in the attached Site Monitoring Plan. The monitoring team shall provide feedback to excavation crews as soon as possible.

END OF SECTION

Attachment

ATTACHMENT

Volume 2 of the Site Monitoring Plan (ISRT-PDI-33), which was submitted to the Agencies as part of the Pre-Design Investigation, will be included in the Contractor bid Documents.

1.04 Closeout Submittals:

(a) Certification of completion from a Professional Engineer registered in the Commonwealth of Massachusetts that work has been completed in compliance with the terms of the remedial design.

(b) Project Record Documents: In accordance with requirements of Section 01720.

(c) Deliver evidence of compliance with requirements of governing authorities:

1. Certificates of Acceptance.
2. Certificate of Occupancy, if required.

(d) Deliver Certificate of Insurance for Products and Completed Operations.

(e) Maintenance Manual.

(f) Applicable requirements of federal, state, and local agencies having jurisdiction.

1.05 Evidence Of Payments, And Release Of Liens:

(a) Contractor's Affidavit of Payment of Debts and Claims:

(b) Contractor's Affidavit of Release of Liens; with:

1. Consent of Surety to Final Payment.

2. Contractor's release or waiver of liens. (To be reviewed by Trustee prior to final Payment Certification.)

3. Separate releases or waivers of liens for subcontractors, suppliers, and others with lien rights against property of Trustee, together with list of those parties.

(c) All submittals shall be duly executed before delivery to Trustee Representative.

1.06 Final Adjustment Of Accounts:

(a) Submit final statement of accounting to Trustee Representative.

(b) Statement shall reflect all adjustments, including:

1. Original Contract Amount.

2. Additions and deductions resulting from:
   a. Previous Change Orders.
   b. Unit Prices.
   c. Other Adjustments.
   d. Deductions for uncorrected work.
   e. Deductions to Re-review/Re-inspection Payments.

3. Total Contract price, as adjusted.

4. Previous payments.

5. Amount remaining due.

1.07 Final Application For Payment:

(a) Contractor shall submit final application in accordance with requirements of the Contract Agreement.

1.08 Post-construction Review:

(a) Prior to expiration of one year from Date of Substantial Completion, Trustee Representative will make visual review of Project in company with Contractor to determine whether correction of work is required, in accordance with provisions of Section 01740.

(b) For guarantees beyond one year, Trustee Representative will provide reviews at request of Trustee, after notification to Contractor.

(c) Trustee Representative will promptly notify Contractor, in writing, of any observed deficiencies.

PART 2 - PRODUCTS

Not used

PART 3 - EXECUTION

Not used

END OF SECTION

SECTION 01720

PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.01 Description of Work

(a) The work under this Section includes, but is not necessarily limited to, the maintenance, recording and submittal of project record documents as herein specified.

(b) The Contractor shall maintain in designated locations at the Site for the Owner one record copy of:

1. Drawings

2. Specifications

3. Change orders and other modifications to the Contract

4. Engineer field orders or written instructions

5. Reviewed shop drawings, product data and samples

6. Field test records

7. Health and Safety records as required under OSHA 1910.120.

1.02 Maintenance Of Documents and Samples

(a) Storage

1. Store documents and samples in Contractor's field office apart from documents used for construction.

2. Provide files and racks for storage of documents.

3. Provide locked cabinet or secure storage space for storage of samples.

(b) File documents and samples in accordance with format of these Specifications.

(c) Maintenance

1. Maintain documents in a clean, dry, legible condition and in good order.

2. Do not use record documents for construction purposes.

(d) Make documents and samples available at all times for inspection by Trustee Representative.

1.03 Recording

(a) Label each document "PROJECT RECORD" in neat, large printed letters.

(b) Recording

1. Record information concurrently with construction progress.

2. Do not conceal any work until required information is recorded.

(c) Drawings: Record drawings shall be reproducible, shall have a title block indicating that the drawings are record drawings, the name of the company preparing the record drawings and the date the record drawings were prepared. The Contractor will be provided paper sepias of the Contract Drawings, at the cost of reproduction, or he may elect to provide reproducible drawings via another method. Legibly mark drawings to record actual construction:

1. Depths of various elements of foundation in relation to finish first floor datum.

2. Horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.

3. Location of internal utilities and appurtenances concealed in the construction, referenced to visible and accessible features of the structure.

4. Field changes of dimension and detail.

5. Changes made by Requests for Information (RFI), field order or by change order.

6. Details not on original Contract Drawings.

(d) Specifications: Legibly mark each section to record:

1. Manufacturer, trade name, catalog number, and supplier of each product and item of equipment actually installed.

2. Changes made by Requests for Information (RFI), field order or by change order.

1.04 Submittal

(a) At Contract closeout, deliver record documents in the form of a Final Remedial Construction Report to Trustee Representative for the Trustee.

(b) Accompany submittal with transmittal letter, in duplicate, containing:

1. Date

2. Project title and number

3. Contractor's name and address

4. Title and number of each record document

5. Signature of Contractor or Contractor's authorized representative.

END OF SECTION

SECTION 01740

WARRANTIES

PART 1 - GENERAL

1.01 Project Maintenance And Warranty

(a) Maintain and keep in good repair the Work covered by these Drawings and Specifications until acceptance by the Trustee.

(b) The Contractor shall warrant for a period of one year from the date of Trustee's written acceptance of certain segments of the Work and/or Trustee's written final acceptance of the Project, as defined in the Contract Documents, that the completed Work is free from all defects due to faulty products or workmanship and the Contractor shall promptly make such corrections as may be necessary by reason of such defects. The Trustee will give notice of observed defects with reasonable promptness. In the event that the Contractor should fail to make such repairs, adjustments or other work that may be made necessary by such defects, the Trustee may do so and charge the Contractor the cost thereby incurred.

(c) The Contractor shall not be obligated to make replacements which become necessary because of ordinary wear and tear, or as a result of improper operation or maintenance, or as a result of improper work or damage by another Contractor or the Trustee, or to perform any work which is normally performed by a maintenance crew during operation.

(d) In the event of multiple failures of major consequences prior to the expiration of the one year warranty described above, the affected unit shall be disassembled, inspected and modified or replaced as necessary to prevent further occurrences.

All related components which may have been damaged or rendered non-serviceable as a consequence of the failure shall be replaced. A new 12 month warranty against defective or deficient design, workmanship, and materials shall commence on the

day that the item is reassembled and placed back into operation. As used herein, multiple failure shall be interpreted to mean two or more successive failures of the same kind in the same item or failures of the same kind in two or more items. Major failures may include, but are not limited to, cracked or broken housings, piping, or vessels, excessive deflections, bent or broken shafts, broken or chipped gear teeth, premature bearing failure, excessive wear or excessive leakage around seals. Failures which are directly and clearly traceable to operator abuse, such as operations in conflict with published operating procedures or improper maintenance, such as substitution of unauthorized replacement parts, use of incorrect lubricants or chemicals, flagrant over- or under-lubrication and using maintenance procedures not conforming with published maintenance instructions, shall be exempted from the scope of the one year warranty. Should multiple failures occur in a given item, all products of the same size and type shall be disassembled, inspected, modified or replaced as necessary and rewarranted for one year.

(e) The Contractor shall, at Contractor's own expense, furnish all labor, materials, tools and equipment required and shall make such repairs and removals and shall perform such work or reconstruction as may be made necessary by any structural or functional defect or failure resulting from neglect, faulty workmanship or faulty materials, in any part of the Work performed by the Contractor. Such repair shall also include refilling of trenches, excavations or embankments which show settlement or erosion after backfilling or placement.

(f) Except as noted on the Drawings or as specified, all structures such as embankments and fences shall be returned to their original condition prior to the completion of the Contract. Any and all damage to any facility not designated for removal, resulting from the Contractor's operations, shall be promptly repaired by the Contractor at no cost to the Trustee.

(g) The Contractor shall be responsible for all road and entrance reconstruction and repairs and maintenance of same for a period of one year from the date of final acceptance. In the event the repairs and maintenance are not made immediately and it becomes necessary for the owner of the road

to make such repairs, the Contractor shall reimburse the owner of the road for the cost of such repairs.

(h) The Trustee Representative shall have access to the Work at all times and Contractor shall provide such access for inspection or observation of the Work by the Representative or persons designated by the Representative. Examination or re-examination of covered Work may be ordered by the Representative; and, if so ordered, such Work must be uncovered by the contractor. If such Work is found to be in accordance with the Contract Documents, Trustee shall pay Contractor the cost of uncovering and replacement, such cost shall be determined by the change provisions of the Contract. If such Work is found to be effective or faulty, Contractor shall pay all costs to correct that Work and all costs for the uncovering and replacement.

(i) In the event the Contractor fails to proceed to remedy the defects upon notification within 15 days of the date of such notice, the Trustee reserves the right to cause the required materials to be procured and the work to be done, as described in the Drawings and Specifications, and to hold the Contractor liable for the cost and expense thereof.

(j) Notice to Contractor for repairs and reconstruction will be made in the form of a registered letter per the notice provisions of the contracts.

(k) Neither the foregoing paragraphs nor any provision in the Contract Documents, nor any special guarantee time limit implies any limitation of the Contractor's liability within the law of the place of construction.

END OF SECTION

SECTION 02010

SUBSURFACE CONDITIONS

PART 1 - GENERAL

1.01 Description

(a) Soil boring logs are shown in reports prepared as part of past investigations of the Site and the PreDesign Investigation. This information may be reviewed at the offices of The Industriplex Site Remedial Trust, 41 Atlantic Avenue, Woburn, MA.

(b) This soil investigation information is offered as an aid in Bidding only and is not a part of the Contract Documents. The boring logs are available for Contractor's information but are not a warranty of subsurface conditions. The Trustee, Engineer, and the Trustee Representative assume no responsibility for any variation between materials encountered during construction and those indicated on the boring logs nor for any variation between the location of the water table encountered during construction and that indicated on the boring logs at the date borings were taken.

(c) Additional Investigation: The Contractor shall visit the Site and become acquainted with Site conditions. Once the Trustee Representative has given his approval in writing, prospective Contractors may perform their own subsurface investigations, in which case their request for borings or digging of testholes will have to be accompanied by a Work Plan and associated Health and Safety Plan. The Contractor shall obtain the right to access private property located on the Site from Trustee Representative and shall assume all responsibility for any damage to property caused as a result of the Contractor's investigation. The Contractor shall be responsible for the proper sealing of test borings in accordance with applicable state and local regulations and for the proper handling and disposal of soil cuttings and/or samples.

(d) Location of Borings: Contractors shall be responsible for making their own determination of the location of the soil borings on this Project.

END OF SECTION

SECTION 02060

DECOMMISSIONING OF UTILITIES AND STRUCTURES

PART 1 - GENERAL

1.01 Description of Work

The Contractor shall furnish all labor, materials, tools, and appurtenances required to complete the work as described below. The Contractor shall provide a "Competent Person" to implement, supervise, and inspect all decommissioning work. Work described in this Section includes work in confined spaces. All work shall be performed in accordance with the Contractor's Health and Safety Plan. The Contractor shall be fully responsible for protecting utilities and structures which are to remain in service. Contractor shall notify and coordinate with utility owners as required to complete the work.

1.02 Related Sections

(a) Clearing and Grubbing - Section 02110
(b) Excavation - Section 02220
(c) Backfill and Fill - Section 02223
(d) Impermeable and Permeable Cover Fill - Section 02242
(e) Health and Safety Specifications for Construction - Section 01564
(f) Dust Control - Section 01562
(g) Odor Control - Section 01563
(h) Concrete - Section 03330

1.03 Submittals

(a) The Contractor shall submit to the Trustee Representative a decommissioning plan describing the abandonment sequence and methods prior to the work.

(b) The Contractor shall submit proposed grout mix and procedure for grouting under Subsection 3.03 (c).

1.04 Record Documents

The Contractor shall accurately survey and record actual locations of decommissioned structures, tanks and utilities, and submit as-built decommissioning plans to the Trustee Representative.

PART 2 - PRODUCTS

2.01 Fill Material

Backfill material shall be used as specified in Sections 02223 and 02242.

PART 3 - EXECUTION

3.01 Underground Concrete Tanks

The decommissioning shall include, but not be limited to:

(a) The testing, removal and disposal of any contents in accordance with all current regulations.

(b) The demolition and removal of the roof slab and, if necessary, the demolition and removal of the side walls to 2 feet below the cover subgrade.

(c) Steam cleaning the inside of the tank, and

(d) Filling empty, cleaned tanks as specified, with lean concrete or with backfill placed in compacted lifts in accordance with these specifications (Section 02223).

3.02 Underground Steel Tanks

The work shall include, but not be limited to:

(a) Same as 3.01(a)
(b) Steam Cleaning
(c) Fill with lean concrete

3.03 Abandoned Pipelines

The work shall include, but not be limited to:

(a) Demolish and remove manholes and inlets to -2 feet below cover subgrade and backfill with lean concrete.

(b) Plug abandoned pipelines with masonry or concrete bulkheads, minimum thickness 12 inches at both ends if possible.

(c) Pressure grout the 36 inch pipeline on the Woburn Industrial Associates property.

3.04 U/G Vaults and Pits

The work shall include, but not be limited to:

(a) Cut and remove all pipes at the inside of the structure.

(b) Fill structure with lean concrete.

(c) Wood bulkheads may be used to block off U/G Vaults and Pits provided they are fully encased by concrete.

3.05 Concrete Slabs

Unless otherwise specified, structural slabs shall be demolished and removed. Structurally sound concrete slabs may be left in place, if so directed by the Trustee Representative, as a cover equivalent. In such case all soil, vegetation and debris shall be removed and the slab shall be steam cleaned.

3.06 Above Ground Steel Tanks

The work shall include, but not be limited to:

(a) Same as 3.01(a)
(b) Steam clean steel inside and outside
(c) Demolish tank
(d) Remove tank in accordance with all current regulations.
(e) Steam clean concrete slab

3.07 Gas Pumps

The work shall include, but not be limited to:

(a) Same as 3.01(a)
(b) Steam clean
(c) Remove in accordance with all current regulations.

3.08 Above Ground Structures

The work shall include, but not be limited to:

(a) Steam clean all surfaces
(b) Demolish roof and walls
(c) Demolish slabs if directed by the Trustee Representative.
(d) Remove debris in accordance with all current regulations.

3.09 Disposal of Demolition Debris

Demolition debris shall be disposed in accordance with the requirements of Section 02110, Clearing and Grubbing.

3.10 Abandoned Rail Spurs

Existing abandoned railroad spurs within an area to receive above grade cover shall be abandoned in place. The rails and ties shall be covered with compacted soil fill to provide a smooth surface for the cover. Requirements for proof rolling are waived within the limits defined by the ends of the railroad ties. No grubbing is necessary to remove ties and rail. Clear all other debris from the railroad tracks including trees, stumps, brush, and trash prior to backfilling.

Existing abandoned rail spurs within an area to receive at grade cover shall have the ties and rails completely removed. Rails and ties will be treated as metal and wood debris and disposed of as described in subsection 3.03 of Section 02110.

END OF SECTION

SECTION 02070

MONITORING WELL, GAS VENT, AND PIEZOMETER DECOMMISSIONING

PART 1 - GENERAL

1.01 Description of Work

This section describes the general requirements for abandoning the existing groundwater monitoring wells, hide pile gas vents, and piezometers.

1.02 Reference Specifications

All groundwater monitoring well, gas vent, and piezometer abandonment shall be done in accordance with the current Commonwealth of Massachusetts Department of Environmental Protection (MDEP), Standard References for Monitoring Wells, Section 4.6, Decommission of Monitoring Wells.

1.03 Submittals

A detailed plan for abandonment of each well shall be submitted to the Trustee Representative in accordance with Section 1300. At the completion of the well abandonment, record drawings showing the as-built conditions of the abandoned well shall be prepared. The documentation shall include at least the following;

1. Method and equipment used to seal the well(s),
2. Well depth to the nearest 0.1 feet,
3. Depth drilled,
4. Diameter of overdrill,
5. Volume of grout used,
6. Grout mix, and
7. Copies of Massachusetts well drillers registrations of drillers performing the work.

1.04 Quality Assurance

(a) Observation and testing: All well, gas vent, and piezometer abandonment operations shall be conducted under the observation of the Trustee Representative. The Trustee Representative will be familiar with Commonwealth of Massachusetts Department of Environmental Protection, Standard References for Monitoring Wells, Section 4.6, Decommissioning of Monitoring Wells guidelines and will ensure that all field activities follow these guidelines.

1.05 Qualifications

(a) Well Decommissioning Personnel: Driller must be licensed in the Commonwealth of Massachusetts. The driller must have knowledge of well construction and geologic conditions of the area and must have familiarity with procedures presented in this Section.

1.06 Sequencing

(a) Sequence activities to decommission the wells in the following order.

1. Review existing As-Built Notes and Records on each well where available.

2. Remove obstructions, overburden casings, drop pipes, check valves and pumps. Clear any obstacles or debris that may have entered the well.

3. Destroy or remove the casing in accordance with Section 3.02, if appropriate.

4. Grout the well to be sealed including the annular space, if necessary.

5. Finish the plugged well or borehole with a concrete surface seal a minimum of 24 hours after grouting.

1.07 Scheduling

(a) Schedule Work to precede cover construction in the area.

1.08 Related Sections

(a) Health and Safety Specifications for Construction - Section 01564.

PART 2 - PRODUCTS

2.01 Materials

(a) Grout: Mixture of not more than six gallons of water per cubic foot (one per 94 pound bag) Portland Cement with the addition of 5 percent by weight, free flowing bentonite power. Water used shall be fresh, clean, and potable.

2.02 Equipment

(a) Drilling Equipment: Drill rig consisting of rotary drilling equipment for re-drilling the boring at well locations.

(b) Provide the following as indicated:

1. Grout pump capable of pumping grout mixture as specified to the required depths.

2. Tremie pipe of sufficient length to reach within 1-foot of the bottom of well.

3. Mud tub or barrel of sufficient volume to adequately mix grout prior to placement in the borehole.

PART 3 - EXECUTION

3.1 General

The currently identified groundwater monitoring wells, piezometers, well points, and gas vents are listed below. All are to be abandoned unless required for the GSIP study or otherwise instructed by the Trustee Representative.

Well Number	Casing Type	Borehole Diameter	Overdrill Depth	Screen Bottom
OW-1*	6" Steel	13"	108 ft.	25 ft.
OW-1A*	4" PVC	8"	25 ft.	6 ft.
OW-2*	6" Steel	8 3/4"	100 ft.	17 ft.
OW-3*	6" Steel	13"	83 ft.	13.5 ft.
OW-4*	6" Steel	13"	44 ft.	26 ft.
OW-5*	4" PVC	8"	49.5 ft.	10 ft.
OW-6*	4" PVC	8"	56 ft.	7 ft.
OW-7*	4" PVC	8"	46.5 ft.	7 ft.
OW-8*	6" Steel	8"	100 ft.	10 ft.
OW-9*	6" Steel	13"	123 ft.	29 ft.
OW-10*	4" PVC	8"	34.5 ft.	3.5 ft.
OW-11*	4" PVC	8"	42 ft.	3 ft.
OW-12*	4" PVC	8"	52 ft.	10 ft.
OW-13*	4" PVC	8"	34.5 ft.	9 ft.
OW-14*	4" PVC	8"	52 ft.	8 ft.
OW-15*	6" Steel	12"	28 ft.	8.5 ft.
OW-16*	4" PVC	8 1/4"	38 ft	16.75 ft.
OW-17*	4" PVC	12"	30.5 ft.	11 ft.
OW-18*	6" PVC	12"	61 ft.	16.5 ft.
OW-18A*	4" PVC	8 1/4"	20 ft.	15.5 ft.
OW-19*	6" PVC	12 1/4"	70 ft.	71.5 ft.

Well Number	Casing Type	Borehole Diameter	Overdrill Depth	Screen Bottom
OW-19A*	4" PVC	8"	40 ft.	41 ft.
OW-20*	4" PVC	8"	99.5 ft.	101 ft.
OW-20A*	4" PVC	8"	40.5 ft.	40.7 ft.
OW-21	4" PVC	12"	NA	15 ft.
OW-22	2" PVC	12"	NA	13.3 ft.
OW-23	4" PVC	10"	NA	27 ft.
OW-24A	4" PVC	10"	NA	24.97 ft.
OW-24B	4" PVC	10"	NA	59.65 ft.
OW-25A	4" PVC	8"	NA	23 ft.
OW-25B	4" PVC	8"	NA	40.2 ft.
OW-26A	4" PVC	10"	NA	23.2 ft.
OW-26B	4" PVC	8"	NA	41.46 ft.
OW-27A	4" PVC	10"	NA	40.32 ft.
OW-27B	4" PVC	8"	NA	94.57 ft.
OW-28	4" PVC	8 3/4"	NA	8.8 ft.
OW-29	4" PVC	10"	NA	25.70 ft.
OW-30A	4" PVC	10"	NA	18.72 ft.
OW-30B	4" PVC	10"	NA	57.83 ft.
OW-31	4" PVC	10"	NA	13.4 ft.
OW-32	4" PVC	10"	NA	7.7 ft.
OW-33A	4" PVC	10"	NA	44.4 ft.
OW-33B	4" PVC	unknown	NA	84.01 ft.
OW-36	4" PVC	unknown	NA	12.90 ft.
OW-37	4" PVC	unknown	NA	15.72 ft.
OW-38	4" PVC	unknown	NA	15.50 ft.

Well Number	Casing Type	Borehole Diameter	Overdrill Depth	Screen Bottom
OW-39	4" PVC	unknown	NA	15.10 ft.
OW-40	4" PVC	unknown	NA	17.00 ft.
OW-41	4" PVC	unknown	NA	16.00 ft.
OW-42	4" PVC	unknown	NA	34.0 ft.
OW-43	4" PVC	12"	17 ft.	14 ft.
OW-44	4" PVC	10"	17 ft.	16.5 ft.
OW-45	4" PVC	10"	20.5 ft.	19.5 ft.
OW-46	4" PVC	12"	14.5 ft.	13.5 ft.
OW-47	4" PVC	12"	18 ft.	16.5 ft.
OW-48	4" PVC	12"	NA	44.5 ft.
OW-48A	4" PVC	12"	NA	24.5 ft.
OW-49	4" PVC	12"	66.5 ft.	56 ft.
OW-49A	4" PVC	10"	NA	26 ft.
OW-50	4" PVC	12"	76.5 ft.	50 ft.
OW-50A	4" PVC	12"	NA	28.5 ft.
OW-37A	2" PVC	unknown	NA	30.0 ft.
OW-51B	6" Steel	unknown	88.3 ft.	88.3 ft.
OW-52A	2" PVC	unknown	NA	12.4 ft.
OW-52B	2" PVC	unknown	NA	18.0 ft.
OW-53B	6" Steel	unknown	81.9 ft.	81.9 ft.
OW-54A	2" PVC	unknown	NA	13.5 ft.
OW-54B	2" PVC	unknown	NA	25.2 ft.
OW-54C	2" PVC	unknown	NA	47.8 ft.
OW-55	6" Steel	unknown	70.1 ft.	70.1 ft.
OW-56A	2" PVC	unknown	NA	14.3 ft.

Well Number	Casing Type	Borehole Diameter	Overdrill Depth	Screen Bottom
OW-56B	2" PVC	unknown	NA	26.0 ft.
OW-56C	2" PVC	unknown	NA	32.0 ft.
OW-57	6" Steel	unknown	65.2 ft.	65.2 ft.
WP-1	2" Steel	unknown	NA	12.0 ft.
WP-2	2" Steel	unknown	NA	12.0 ft.
WP-3	2" Steel	unknown	NA	12.0 ft.
WP-4	2" Steel	unknown	NA	12.0 ft.
WP-5	2" Steel	unknown	NA	12.0 ft.
PZ-1	2" PVC	8 1/4"	NA	14 ft.
PZ-2	2" PVC	8 1/4"	NA	14 ft.
P-1	2" PVC	8 1/4"	NA	50.7 ft.
P-2S	2" PVC	8 1/4"	NA	22 ft.
P-2I	2" PVC	8 1/4"	NA	35 ft.
P-2D	2" PVC	8 1/4"	NA	64 ft.
P-3S	2" PVC	8 1/4"	NA	44.3 ft.
P-3D*	2" PVC	4"	74.3"	69.5 ft.
P-4S	2" PVC	8 1/4"	NA	25 ft.
P-4I	2" PVC	8 1/4"	NA	59.5 ft.
P-4D*	2" PVC	12"	8.85"	84 ft.
P-6	2" PVC	8 1/4"	NA	67 ft.
P-7	2" PVC	8 1/4"	NA	46 ft.
P-8	2" PVC	8 1/4"	NA	50.5 ft.

Well Number	Casing Type	Borehole Diameter	Overdrill Depth	Screen Bottom
AS-5	4" PVC	6"	22 ft.	unknown
BH-9	4" PVC	6"	46 ft.	8 ft.
BH-10	4" PVC	6"	40 ft.	8 ft.
BH-11	4" PVC	6"	40 ft.	8 ft.
BH-12	4" PVC	6"	17 ft.	8 ft.
BH-13	4" PVC	6"	15 ft.	8 ft.
BH-14	4" PVC	6"	17 ft.	8 ft.
BH-15	4" PVC	6"	15 ft.	8 ft.
BH-16	4" PVC	6"	15 ft.	8 ft.
BH-17	4" PVC	6"	10 ft.	8 ft.
BH-17A	4" PVC	6"	10 ft.	8 ft.
BH-18	4" PVC	6"	12 ft.	8 ft.
BH-19	4" PVC	6"	22 ft.	8 ft.
BH-20	4" PVC	6"	20 ft.	8 ft.
BH-21	4" PVC	6"	16 ft.	8 ft.
BH-22	4" PVC	6"	10 ft.	8 ft.
BH-23	4" PVC	6"	15 ft.	8 ft.
BH-24 (44/52)	4" PVC	6"	27 ft.	8 ft.
BH-25 (43/57)	4" PVC	6"	27 ft.	8 ft.
BH-26	4" PVC	6"	17 ft.	8 ft.

Additionally, approximately sixty additional piezometers might exist which may also require abandonment using the procedures outlined herein. Abandonment shall be at the direction of and under the supervision of the Trustee Representative.

* Overdrilling required for these wells.

3.02 Procedure

(a) Depth to water and total depth shall be measured for each well before abandoning. Measurement shall be made to the nearest 0.1 foot. The measuring point shall be either a notch cut in the well casing or, if absent, the high point of the well casing.

(b) Surface protective casings (and steel overburden casings, if necessary) shall be removed.

1. Should the removal of any steel overburden casings prove to be impossible with the drilling equipment, then an on-site backhoe shall be used to excavate to a minimum depth of two feet below ground surface, and the casing removed using a cutting torch or equivalent method.

2. If the steel overburden casing is not removed, any PVC casing and well construction materials shall be removed by drilling with a bit seated as close as possible to the inside diameter of the steel overburden casing as described in item (c) below.

(c) For monitoring wells constructed of PVC where no boring log exists, or where the boring log indicates that the open interval extends through the overburden sand, gravel, glacial till and bedrock without a proper seal, except for air monitoring boreholes (BH), see 3.02(h) the well shall be over-drilled using a truck-mounted air-rotary drill rig with a roller bit diameter greater than that of the original borehole and to a depth at least three feet greater than the total well depth provided in as-built drawings, or measured as described in 3.02(a) above. For wells extending into bedrock, overdrilling (reaming) to the bottom of the hole is sufficient. The hole shall be maintained open during re-drilling and grouting operations.

(d) Monitoring wells with casings constructed of PVC, where a monitoring well log clearly presents details of well construction and shows the existence of an adequate annular seal, do not require overdrilling unless directed to do so by the Trustee Representative.

(e) For monitoring wells constructed of steel or stainless steel, the Contractor shall make

reasonable attempts to remove the casing. If the attempt is unsuccessful, the Contractor, if approved by the Trustee Representative, may then leave the casing in the ground. The casing shall be cut off 2 feet below ground surface as in item (b) above.

(f) Well casings and boreholes resulting from overdrilling shall then be grouted with cement-bentonite grout to a depth four feet below ground surface using a tremie method to ensure placement from bottom to top of the well. The grout shall be allowed to set for a minimum of twenty four hours. After this time the Contractor shall top off the grout with additional material if shrinkage has occurred.

(g) The upper four feet of wells and piezometers shall be filled with concrete to a diameter at least two feet greater than the borehole wall with a 6" thick slab of concrete above grade. The upper four feet of hide pile gas vents shall be filled with clean sand.

(h) In order to minimize the potential for odor release, the following method will be used to decommission the air monitoring boreholes. The air monitoring boreholes are identified in 3.1 with either the BH or AS prefix. The screen, with the bottom set at 8 feet in each borehole will either be pulled or perforated. Once the screen has been removed or destroyed, the existing borehole will be grouted with a tremie pipe from the bottom of the existing hole. The borehole will not be overdrilled in order to minimize odor releases. Air monitoring wells located on the east Hide Pile, BH-9, BH-10, BH-11, BH-12 and BH-13, will have the length of borehole above the water level filled with the same material as the gas collection layer (3/8-inch) gravel. All other wells will be grouted to within 3 feet of the surface and completed according to the specification Section 02070.

END OF SECTION

COMMONWEALTH OF MASSACHUSETTS

DEPARTMENT OF ENVIRONMENTAL PROTECTION

STANDARD REFERENCES FOR MONITORING WELLS

SECTION 4.6 DECOMMISSIONING OF MONITORING WELLS

SECTION 4.6
DECOMMISSIONING OF MONITORING WELLS

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4.6 DECOMMISSIONING OF MONITORING WELLS

4.6-1 PURPOSE

Any abandoned monitoring well that is no longer in use or that is unfit for its intended purposes should be decommissioned. Plugging the well and surface restoration are the central features of the decommissioning process. Plugging consists of constructing a low permeability cylinder or plug within that portion of the subsurface occupied by the well and its annulus, including the uncased portion of bedrock wells as well as the cased portion. Surface restoration consists of the removal of the upper three to four feet of the well and backfilling the area with an effective seal. An abandoned monitoring well has been defined for the purpose of these Standard References (SRs) as "a well whose use has been permanently discontinued; as used in these References it includes a monitoring well, piezometer, or observation well that is no longer suitable for use either for water-level measurements or water quality sampling."

Proper plugging of such wells will:

- Eliminate physical hazards
- Prevent ground water contamination
- Conserve the yield and hydrostatic head of confined aquifers
- Prevent the intermingling of potable and non-potable ground water, and
- Prevent the migration of contamination through a confining layer separating aquifers.

It should be noted that the objective in Massachusetts differs markedly from the goals established by the American Water Works Association and the statutes, regulations, or guidelines of most other states. Many documents contain the following language: "The basic concept of proper sealing of abandoned wells is restoration, as far as feasible, of the controlling hydrogeological conditions that existed before the well was drilled and constructed. If this restoration can be accomplished, all the objectives of plugging wells will be adequately fulfilled." To accomplish this goal some states have suggested the placement of sand and gravel opposite the more permeable subsurface zones and clay opposite less permeable zones. While that goal is an admirable one, it is also one which, in DEP's opinion, is unattainable in practice. In order to meet the objectives of proper plugging as stated above, DEP has tried to develop a simple, workable approach that will solve the existing and potential problems from unsafe abandoned wells.

Some examples of the types of unsafe wells that may cause problems include:

- Buried uncapped wells: contaminants may enter the well through the buried top of the casing, travel down the well casing, and enter the aquifer through the well screen and wall of the annulus;
- Wells with cracked or corroded casing: surface water may enter the well;
- Improperly constructed wells: an unsealed or improperly sealed annular space around the outside of a well casing or between an inner and outer casing may serve as a channel for surface water to migrate into an aquifer and/or ground water may be transferred from one aquifer to another;
- Open hole wells in bedrock: may serve to interconnect aquifers in different formations;
- Unplugged abandoned flowing artesian wells: this can result in a loss of water, reduction of regional artesian head and localized surface flooding; and
- Uncovered and unplugged abandoned wells with large inside diameter: these may represent a physical hazard to human beings and animals, as well as a disposal receptacle for contaminants, waste, and debris.

4.6-2 PRELIMINARY WORK TO BE PERFORMED BEFORE UNDERTAKING WELL PLUGGING

4.6-2.1 Who Can Perform Proper Well Decommissioning?

One should be a registered well driller in Massachusetts or a person knowledgeable with the installation of wells in order to decommission them. There is no nationally recognized or state-approved examination or certification process for well decommissioning and plugging. However, it is obvious that a well contractor or person who is familiar with well construction and the geologic conditions of the region is preferable to a person who does not routinely perform such work. If the existing well must be "over drilled" then a registered Massachusetts well driller must perform the work. It is expected that an experienced well contractor will be familiar with the correct procedures to follow. That experience should provide substantial savings to the property owner in the long run.

The property owner should ask the well contractor about his qualifications. Some drillers or contractors specialize in rock wells; others in overburden wells. Some have worked extensively with multi-level wells at sites with contaminated ground water; others have only worked with single-level, cased water wells.

4.6-2.2 Location and Inspection

Locating the abandoned well is the first step in decommissioning. While some wells are easily located, others may be buried or otherwise concealed. It may be possible to find the location of abandoned wells through contact with past land owners, occupants, retired workers, neighbors, or well contractors. Regulatory officials and hydrogeologic reports may have useful information. The well records maintained by the United States Geological Survey (USGS), Water Supply Division, Massachusetts Section, with headquarters in Marlborough, Massachusetts, all have been assigned coordinates of latitude and longitude. For well locations, historic documents may be used, such as aerial photo and assessing maps, insurance company maps or photographs. Metal detectors may be of value in locating buried metal casings.

Obtaining accurate information on the well's original construction and present condition is the next step in decommissioning. This information is best obtained from monitoring well drilling records. Recent well records may be obtained from local Boards of Health, the Water Resources Division of the Department of Environmental Management (DEM), USGS Water Resources Division, or DEP.

Next a site inspection is necessary to ascertain the condition of the well and to note if the well is accessible, located in a pit or buried, if a dedicated pump is in place, or if the well is currently operating. The inspection should also note if the well has been damaged or obstructed. A downhole TV camera survey can sometimes provide valuable information as it can verify the current well depth, condition, construction, and the presence or absence of well casing in rock wells.

4.6-2.3 Clearing the Well

Decommissioning a well starts with removal of any obstructions, such as drop pipes, check valves and pumps, and clearing any obstacles or debris that may have entered the well.

When the well is obstructed by pumps or other equipment have been dropped down the well, the debris must be removed or "fished" out before the well can be sealed. A variety of fishing tools are used to remove obstructions. Threaded taps on the end of a drill rod may be run into the hole in an attempt to screw into the top of a pump or drop pipe. An other type of equipment used is an "over shot" (a casing with inner teeth that is run over the obstacle to be removed). Corkscrews and spears also have been used to hook the obstacle for removal.

In some instances the driller may chop or grind up the obstacles in an attempt to clear the well. Debris or other materials such as rock, sand, clay, stones, and wood is usually drilled out or washed out of the hole. This technique appears to be suitable for destroying multi-level wells installed within a single borehole.

4.6-2.4 Casing Removal or Destruction

Assuming the original well did not have an adequate seal in the annular space outside the well casing, in most cases the original well casing should be destroyed in place or pulled out of the ground.

However, if the As-Built Notes and Records indicate that the annular space contains an adequate seal, this information should enable the well contractor to design a simpler and less costly decommissioning procedure. The procedure should not require destruction or removal of the entire well casing, but would require adequate perforation of any well screen to allow the grout to penetrate the filter pack. Insert neat cement grout (or its equivalent) into the uncased portion of a bedrock well or into the filter pack around the well screen and fill the riser pipe with the same grout material. Figures 4.6-1 through 4.6-3 show the zones to be plugged through the well riser for three types of well installation where the annular space contains an adequate seal. Terminate the well casing at a minimum of 3 to 4 feet below the land surface or at the water table, which ever is encountered first. Finally, finish off the well at the land surface in a manner as described in Section 4.6-4. Figures 4.6-1 through 4.6-3 also show the zones to be prepared for a new surface finish. This procedure is appropriate for monitoring wells installed under all types of hydrogeologic conditions.

In instances where a well has penetrated a confining layer separating aquifers and there is no evidence that the annular space around the casing was adequately sealed during installation, the most conservative approach is to destroy or remove the casing by over drilling. Simply pulling the casing in this situation may result in the collapse of the formation before an adequate seal can be placed across the confining layer. The easiest way to over drill and keep the cutting bit in line with the hole (rather than straying off the hole) would be to spin casing over and around the existing observation well. The observation well will help hold the casing in line with the borehole as opposed to roller-bitting operations where an in-place casing will tend to deflect the cutting bit. Augers would probably also work in lieu of spinning casing, but spinning casing would probably be better as it is less likely to damage the observation well and, therefore, continue down the hole rather than veering off.

If, however, vertical contaminant migration across aquifers is not a concern, such as a shallow (15-30 feet) water table well in glacial sands and gravels, a choice may be made to either over drill the well, pull the well casing out of the ground or to plug the well in place. In this case, the presence or absence of annular seal is not a factor. If attempts are made to pull the casing out of the ground and the hole collapses, care must be taken to compact the materials in the hole to avoid future subsidence at the surface. Regardless of which method is chosen, the most important consideration is to seal the well from possible surface infiltration. This is accomplished by plugging the well/boring (Section 4.6-3) and terminating the well 3 to 4 feet below grade then backfilling with concrete or other appropriate seal (Section 4.6-4).

4.6-4 FINAL SURFACE FINISH

The contractor should return to the well no sooner than 24 hours after sealing to allow time for settlement. A proper surface seal is the final step in decommissioning a well. Where a concrete surface seal is appropriate, the remaining 3 to 4 feet at the top of the well should be filled with concrete. Form the top to create a concrete slab at least six inches thick above grade, and with a diameter at least two feet greater than the borehole wall. This procedure is more fully described in Section 4.3 Installation of Wells.

Where a concrete surface seal is not compatible with the existing land-uses (i.e., agriculture, shopping malls, residential areas, etc.) the borehole or well riser should be terminated with a minimum 1 foot thick concrete plug. The remaining 3 to 4 foot portion of the borehole should be filled to grade with materials compatible with the abutting land surface and properly compacted to minimize subsidence.

4.6-5 RECORD OF DECOMMISSIONING

Complete, accurate records of the entire decommissioning procedure should be maintained by the property owner and well contractor. The following items are especially noteworthy:

- Depth sealed The depth of all plugging materials should be recorded.
- Quantity of sealing material used The quantity of sealing material used should be recorded. Measurements of static levels and depths should be recorded.
- Changes recorded Any changes in the well made during the plugging, such as perforating casing, should be recorded in detail.

Examples of Abandoned Well Reports required by the states of Minnesota and Iowa are included as Figures 4.6-4 and 4.6-5.

4.6-6 PROHIBITIONS

The use of explosives in well-plugging operations is strictly prohibited.

LIST OF FIGURES

Figure	Title	Page No.
4.6-1	Diagram of an Abandoned Overburden Well.	9
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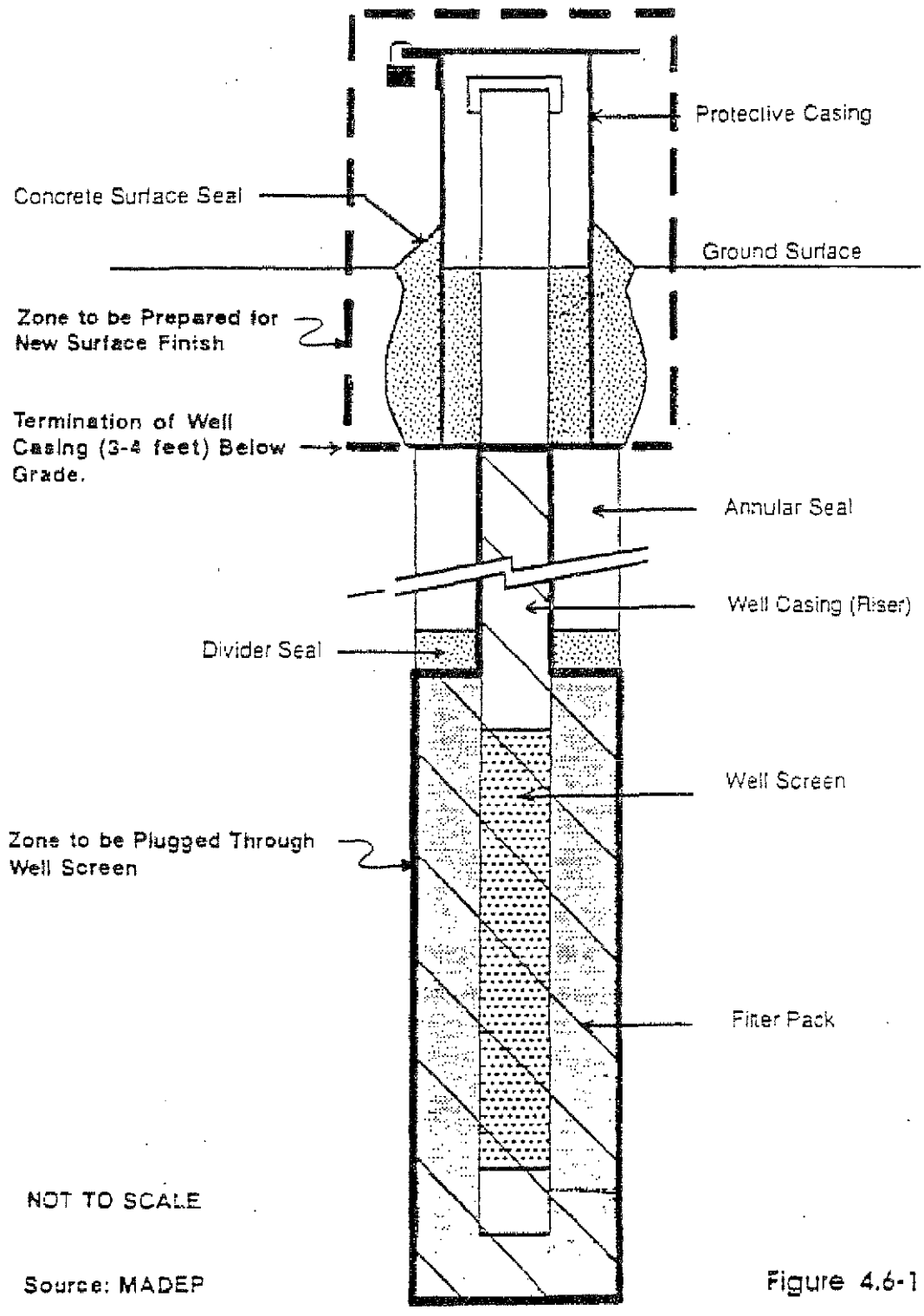
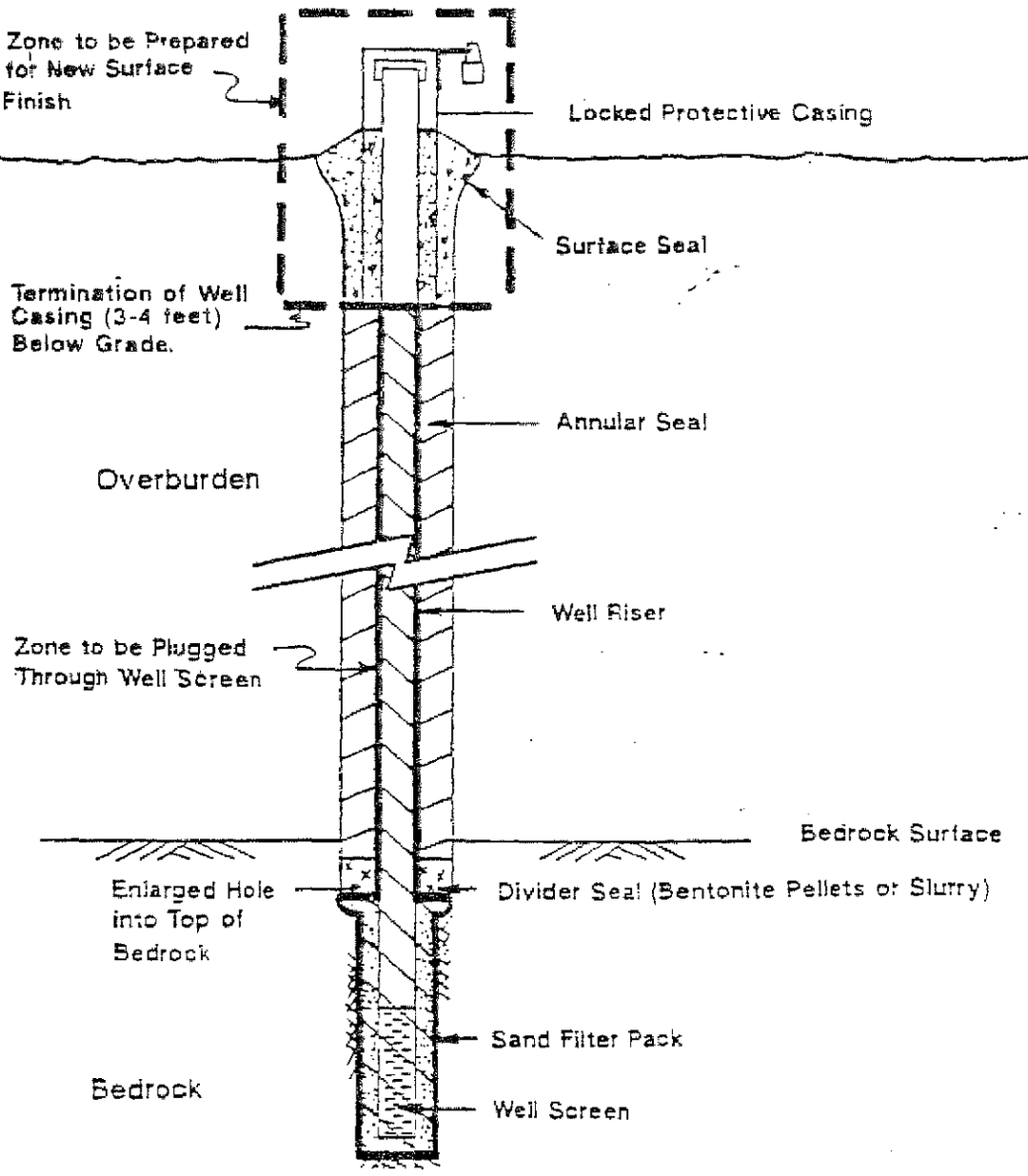
4.6.3	Diagram of an Abandoned Well (Open Hole Well in Bedrock)	11
4.6-4	Example of Minnesota Abandoned Well Report.	12
4.6-5	Example of Iowa Abandoned Water Well Plugging Record.	13



Source: MADEP

Figure 4.6-1

Diagram of an Abandoned Overburden Well.

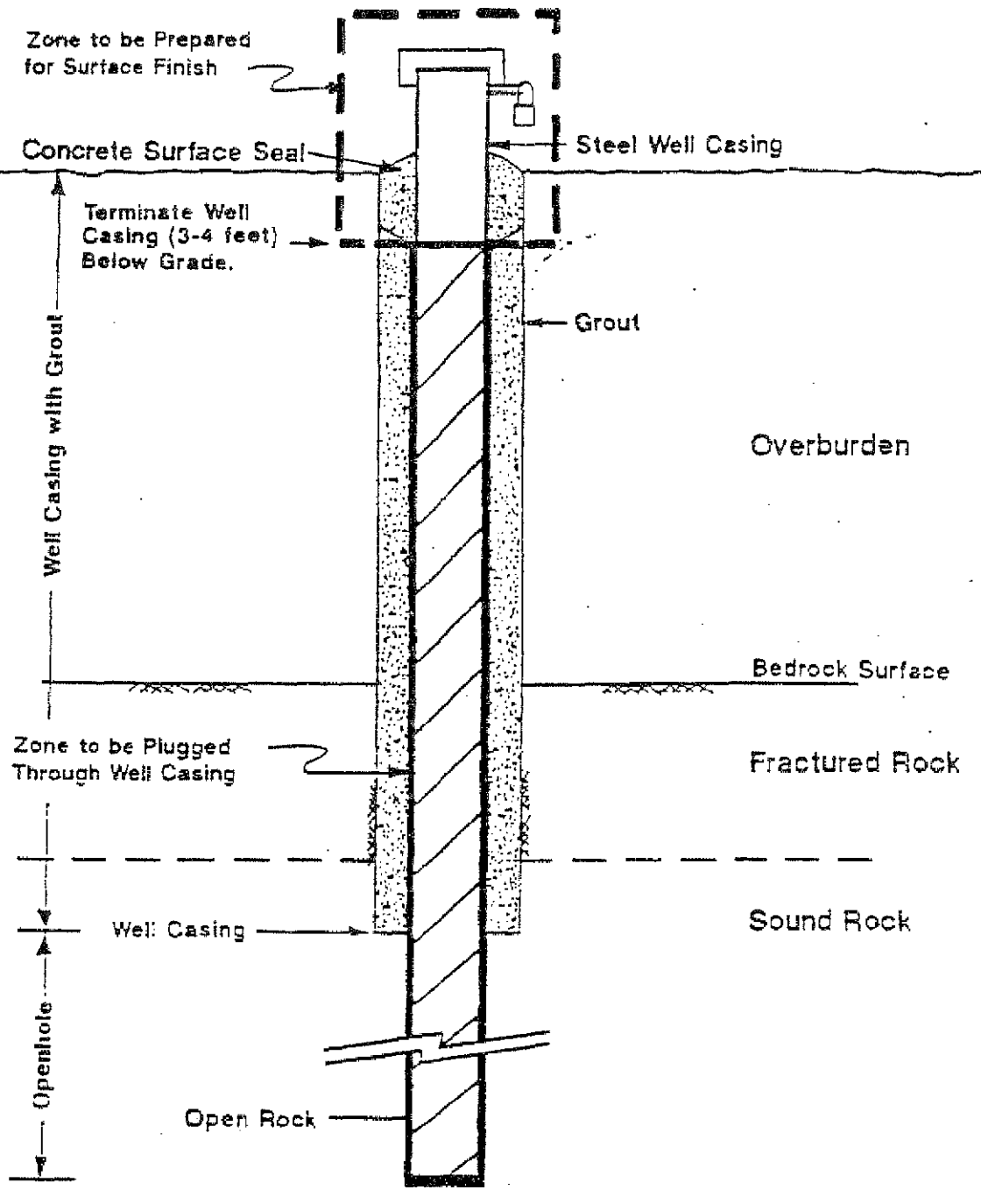


Source: MADEP

NOT TO SCALE

Figure 4.6-2

Diagram of an Abandoned Bedrock Well with Screen.



NOT TO SCALE

Source: MADEP

Figure 4.6-3

Diagram of an Abandoned Bedrock Well-Open Hol

WATER WELL RECORD

ABANDONED

County: Anoka

Oaktree | 120 | 22 | 16 | NW SE SE

100' East of Co. Rd 9, 200' South of Co Rd 2

Red Oaks | 2 | 1

Co Rd 2 · well · Co Rd 9

Well depth: 126' | drilled 1948

Boring method: Cable tool

Use: Abandoned

Casing: Steel, 4"

Screen: Brass mesh, 4 inch, 5, 4 feet, 122 to 126

Static water level: 52 | 1/7/87

Well grouted: Cement, 2, 126 to 1.75

Pump: Removed 1/7/87, Decks Pump Company, 8-12, 110, 72

Property owner's name: John Jones
RR1 Box 23, Gillman, Mn 55297

Formation log	Color	Hardness of formation	From	To
*Sand	brown	soft	0	10
Clay	green	med	10	50
Clay and Sand	grey	med	50	98
Clay	blue	med	98	115
Sand	brown	med	115	126

* formation log estimated from well nearby (#101057)

Remarks: pump removed from well. 1 1/4 yds neat cement installed thru tremie pipe. Casing cut off 2 feet below grade. Top 2' filled with native soil.

Water well contractor's certification: Gopher State Well Co 74000, Box 282 Rt 1 Gillman Mn
Henry Ramsey 1/7/87
Ralph Sirsey 1/7/87

WORK COPY

F-10

Figure 4.6-4

Minnesota Abandoned Well Report.

INSTRUCTIONS Page 1 (

Submit one completed copy of this form for each abandoned well that is plugged to t Department of Natural Resources, Wallace Building, 900 E. Grand Ave., Des Moines, Iowa 50319-0034 within thirty (30) days of completion of plugging operations.

Provide all of the information requested for Items 1 through 6 so far as it is known or can be obtained. If the date of construction or date of abandonment in Item 6 cannot be determined, provide the best estimate possible, such as "more than 20 years ago" or "prior to 1950."

Certification of plugging by the owner of the abandoned well in Item 7 is required for the plugging of all abandoned water wells.

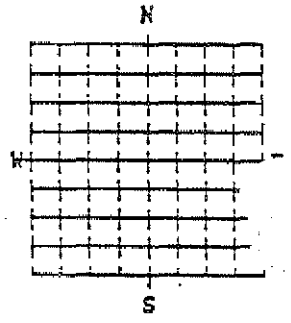
Certification of plugging by a registered well driller in Item 8 is required for all wells except large diameter (18" diameter or more) wells 100' or less in depth which are plugged by the well owner. If a registered well driller plugs this type of well, certification by the well driller is required.

1. Property Owner Name _____

2. Property Owner Address _____
Number and Street or RR

_____
City

_____
State Zip Code



LOCATE ABANDONED WELL ON THIS SECTION PLAT-640 ACRES

3. Address of property on which abandoned well is located (if different from above)

_____
Number and Street or RR

_____
City Zip Code

4. Legal description of property on which abandoned well is located:

Location ____1/4 ____1/4 ____1/4, Sec.____ T.____N., ____R. _____E.W.; _____County

5. Type of Well (*check one*)

[] Large diameter (18" or more) well 100 feet or less in depth
[] Well less than 18" diameter or greater than 100 feet in depth
[] Sandpoint well
[] Bedrock well in a single confined aquifer
[] Bedrock well in a single unconfined aquifer
[] Bedrock well in multiple aquifers
[] Well of unknown type

Figure 4.6-5

Examples of Iowa Abandoned Water Well Plugging Record.

6. Detailed Information:

Diameter at Top of Casing _____ inches Date Constructed _____

Depth to Static Water Level _____ feet Date Abandoned _____

Total Depth _____ feet Date Plugged _____

Distance from nearest active well supplying potable water (*check one*):
[] More than 200 feet [] Less than 200 feet

Distance from nearest point source of potential contamination (*check one*):
[] More than 660 feet [] Less than 660 feet

If distance is less than 660 feet, indicate type of nearest point source of potential contamination (*check one*):
[] industrial waste site
[] uncontrolled hazardous waste site
[] petroleum storage area
[] hazardous waste treatment, storage or disposal area
[] agricultural chemical storage area
[] animal feedlot
[] wastewater treatment facility
[] other potential contamination source (describe) _____

7. Certification by owner. I hereby certify that the abandoned well described has been plugged in accordance with the requirements of Chapter 39 of the rules implementing 1987 Iowa Code Supplement section 455B.190.

Signature of Owner Date

8. Certification by a registered well driller. This is required for all wells except large diameter (18" diameter or more) wells 100 feet or less in depth in Quaternary sediments.

Company Name

Address

City State Zip Code

I hereby certify that the abandoned well described was plugged under my supervision in accordance with the requirements of Chapter 39 of the rules implementing 1987 Iowa Code Supplement section 455B.190.

Name of Registered Well Driller Registration No.

Signature Date

Figure 4.6-5
(continued)
Examples of Iowa Abandoned Water Well Plugging Record.

SECTION 02100

SITE PREPARATION

PART 1 - GENERAL

1.01 Scope

(a) This Section describes materials and equipment to be utilized and requirements for their use in preparing the work site for construction. The Contractor shall furnish all materials, equipment, a competent supervisor and labor necessary to complete the work.

(b) Disposal of cleared and grubbed materials shall be at designated area in the vicinity of the East Central Hide Pile in accordance with Section 02110 and as directed by the Trustee Representative.

(c) In areas where hide residues and other odorous compounds are exposed by site preparation, odor control measures as outlined in Section 01563 shall be implemented.

(d) Protect and maintain bench marks, monuments and other reference points. Re-establish, at no cost to the Trustee, any such reference points if disturbed or destroyed. The Contractor's surveyor shall conduct a survey of all monuments and property markers within proposed cover areas prior to any disturbance such as they can be re-established after completion of the cover by the Contractor as part of this Contract.

(e) Protect and maintain existing monitoring wells, piezometers, staff gages, extraction wells, and fences.

(f) Protect existing facilities, utilities, and structures from damage due to construction activity.

(g) Remove and dispose of trash and debris in Wetland 3A. This work must be completed with no disturbance to the wetland habitat. Any use of mechanical equipment in the wetland must be pre-approved by the Trustee Representative.

1.02 Related Sections

(a) Dust Control - Section 01562
(b) Odor Control - Section 01563
(c) Health and Safety Specifications for Construction - Section 01564
(d) Decommissioning of Utilities and Structures - Section 02064
(e) Clearing and Grubbing - Section 02110

END OF SECTION

SECTION 02110

CLEARING AND GRUBBING

PART 1 - GENERAL

1.01 Scope

(a) Clearing and grubbing includes, but is not limited to, removing from the construction area hauling to designated areas within the Site and disposing of trees, stumps, roots, brush, structures, abandoned utilities, trash, debris and all other materials found on or near the surface of the ground in the construction area and understood by generally accepted engineering practice not to be suitable for construction of the type contemplated. Precautionary measures that prevent damage to existing features to remain is part of the work.

Landowners or tenants of private property on the Site will be given the opportunity to remove or dispose of materials, debris, or obstructions prior to the Work. It is anticipated that these materials, debris, and obstructions will be removed by the landowner or tenant. The Contractor shall coordinate with the Trustee Representative to ensure appropriate scheduling of this work.

If items remain where cover is to be installed, the Contractor will move them (at no liability to Contractor or Trustee) to a suitable location on the private property. If no suitable location is available the items will be placed back on the finished cover. The cost of moving and/or replacing materials, debris, or obstructions on occupied properties shall be considered additional to the base cost.

The removal and disposal of material, debris, or obstructions on vacant properties will be the responsibility of the Contractor.

(b) No clearing and grubbing will be allowed without adequate erosion and sedimentation control measures in place and to the satisfaction of the Trustee Representative.

(c) In areas where hide residues are exposed by clearing and grubbing, odor control measures, as outlined in Section 01563, shall be implemented.

(d) Subgrade is defined for this Section 02110 as the grade or elevation where geotextile is placed or the bottom of the cover section.

1.02 Related Sections

(a) Dust Control - Section 01562
(b) Odor Control - Section 01563
(c) Health & Safety Specifications for Construction - Section 01564
(d) Decommissioning of Utilities and Structures - Section 02060

1.03 Job Conditions

(a) Location of the Work: The area to be cleared and grubbed is shown schematically on the Drawings or specified below. It includes all areas designated for cover construction and required construction access areas, limited to a maximum width of thirty feet.

PART 2 - PRODUCTS

2.01 Equipment

(a) The Contractor shall furnish equipment of the type normally used in clearing and grubbing operations including, but not limited to, dozers, shears, skidders, loaders, root rakes, chipping equipment and stump grinders.

PART 3 - EXECUTION

3.01 Scheduling Of Clearing

(a) The Contractor shall clear at each construction site only that work area which would be the equivalent of one month's work. This area shall be determined from the Contractor's Progress Schedule.

(b) The Trustee Representative may permit clearing of additional areas provided that temporary erosion and sedimentation controls are in place and a satisfactory stand of temporary grass can be established. Should a satisfactory stand of grass not be possible, no additional clearing shall be permitted beyond that specified above.

(c) A satisfactory stand of grass shall have no bare spots larger than 1 square yard. Bare spots shall be scattered and the bare area shall not comprise more than one percent of any given area.

3.02 Clearing And Grubbing

(a) Materials to be cleared, grubbed and removed from the construction areas include, but are not limited to, the following: all trees, stumps, roots, brush, trash, organic matter, paving, miscellaneous structures, debris and abandoned utilities.

(b) Grubbing shall consist of removing roots, stumps, trash and other debris from all graded areas according to the following:

Remove all stumps and root masses to a depth of two feet below existing grade.

Remove all roots 1/2-inch or greater to a depth of 1 foot below subgrade.

All protruding roots shall be removed from the prepared ground surface on which the geotextile will be placed.

(c) All stumps, roots, foundations (except Janpet property) and planking embedded in the ground shall be removed and disposed of. Piling and butts of utility poles shall be removed to a minimum depth of two feet below the limits of excavation for structures and trenches or two feet below finish grade, whichever is lower.

(d) Landscaping features shall include, but are not necessarily limited to, fences, cultivated trees, cultivated shrubbery, property corners, man-made improvements, business and other signs within the sites.

(e) Surface rocks and boulders 6 inches or less to a depth of 1 foot below the subgrade shall be grubbed from the soil. Surface rocks and boulders may be placed back on the completed cover with the approval of the Trustee Representative. Surface rocks and boulders which will be replaced on the cover must be decontaminated by steam cleaning prior to replacement.

(f) All construction areas other than the hide piles shall be grubbed unless approved by the Trustee

Representative. There shall be no grubbing on the hide pile slopes unless approved by the Trustee Representative. On the hide piles trees shall be cut off at ground level and the root mats allowed to remain intact and undisturbed.

(g) Where tree limbs interfere with utility wires, or where the trees to be felled are in close proximity to utility wires, the tree shall be taken down in sections to eliminate the possibility of damage to the utility.

(h) Any work pertaining to utility poles and guy wires shall comply with the requirements of the appropriate utility.

(i) Contractor shall be responsible for removing and replacing any fence which may interfere with the proper completion of the Work. Replacement fence shall match the style, material, and quality of original fence.

(j) Except on the hide piles, stumps and roots shall be grubbed and removed to a depth not less than two feet below grade. All holes or cavities which extend below the subgrade elevation of the proposed work shall be filled with crushed rock or other suitable material, compacted to the same density as the surrounding material.

(k) The Contractor shall exercise special precautions for the protection and preservation of trees, cultivated shrubs, sod, fences, etc. situated adjacent to the limits of the construction area. The Contractor shall be held liable for any damage the Contractor's operations have inflicted on such property.

(l) The Contractor shall be responsible for all damages to existing improvements resulting from Contractor's operations.

(m) The Contractor shall protect existing monitoring wells, piezometers, staff gages, and extraction wells from damage due to construction activities. Damaged wells, piezometers, and gages shall be repaired or replaced at no cost to the Trustee.

(n) Rock outcrops which are to remain exposed shall be cleaned of soil, vegetation, and debris by a method approved by the Trustee Representative.

(o) In no case shall the final depth of grubbed soil be less than 1 (one) foot. So if removal of roots and rock diminish the 24-inch depth of grubbed soil there is no need to continue grubbing deeper, unless the final grubbed depth is less than 1 (one) foot.

(p) Removal of soil during the grubbing process does not relieve the Contractor from meeting the required lines and grades of the final cover in accordance with Section 02242; 3.01; (b). In addition several measures should be taken to ensure a stable foundation for the geotextile. These steps include clearing and grubbing, proof rolling, excavation of or placement of additional fill over areas that may puncture the geotextile or cause substantial settlements as described in Section 02595, 3.01 Site Preparation.

3.03 Disposal Of Debris

(a) All trees and shrubs from the clearing operation shall be chipped on Site and stockpiled at a designated area as determined by the Trustee Representative. Material shall be stored in windrows 6 to 8 feet high and 15 to 20 feet wide for composting.

(b) Construction debris such as demolition lumber, wood pallets, railroad ties, and other compostable waste materials shall be processed by an industrial type tub grinder and mixed and stockpiled separately from compost until mixed into fill as specified in Section 02223.

(c) Concrete debris shall be freed from protruding rebars and stored separately for crushing on Site or - after steam cleaning - hauling to a crushing plant.

(d) Scrap metal, rebars, and other metal debris shall be separated from debris and - after steam cleaning - removed off Site.

(e) Waste materials other than described above shall be separated, steam cleaned and removed to a registered landfill.

(f) Open burning will not be allowed.

*3.04 Composting

(a) Wood chips and grindings shall be filled in windrows with a height of 6 to 8 feet and a width of 15 to 20 feet at the base. The composting area shall be located on a gently sloped area (1 percent to 3 percent slope) and the windrows directed up and down the slope to avoid ponding of runoff. The windrows shall be turned and reshaped with a front end loader once a week to accelerate the aerobic composting process and to avoid the pile becoming anaerobic between turnings. Frequent turnings help avoid odor problems. The composting operation shall be performed for a minimum of 6 months.

Alternatively the composting can be mixed into fill when biological activity (as measured by self-heat potential) is reduced. To use this method the compost material shall be maintained at a moisture content of 45% to 55% and mixed with a nitrogen source. Compost shall be turned once per week and monitoring for temperature and moisture content 3 times per week. The compost shall be useable after composting for a minimum of eight weeks and when self-heat is so low that the compost temperature is no warmer than 10-degree Celsius above ambient temperature. The compost shall then be mixed into the fill as specified in Section 02223, 3.02 (f).

3.05 Monitoring

Monitoring by QC or QA personnel may include excavation of "pot holes" in the grubbed soil to verify that grubbing is complete. The Contractor will conduct the excavation in locations selected by the inspection personnel. The number of pot holes may be as frequent as 1 per 5,000 square feet.

*This item is not included with this Contract.

END OF SECTION

SECTION 02125

TEMPORARY AND PERMANENT EROSION AND SEDIMENTATION CONTROL

PART 1 - GENERAL

1.01 Description of Work

(a) The Contractor shall provide all materials and promptly take all actions necessary to achieve effective erosion and sedimentation control in accordance with all applicable federal, state, and local enforcing agency guidelines and these Specifications.

(b) The work shown on the construction plans and working drawings shall be considered a minimum requirement. What is shown shall not relieve the Contractor of the responsibility to actively take all steps necessary to control soil erosion and sedimentation.

(c) No contaminated sediments or runoff shall be allowed to leave the Site. Controls shall ensure that the turbidity of runoff or discharges to surface water shall not exceed 85 TU, unless otherwise approved by Trustee Representative.

(d) Contractor shall repair any material damaged by erosion or covered with sedimentation at the Contractor's expense.

1.02 Related Sections

Clearing and Grubbing - 02116
Dredging - 02222
Impermeable and Permeable Cover Fill - 02242
Wetland Sediment Remediation Cover - 02243
Stone rip-rap - 02271
Geotextile - 02595
Seeding - 02936
Wetland Mitigation - 02937
Subangular Stone - 02233

1.03 Related Documents

None

1.04 Quality Assurance

(a) The temporary erosion control features installed by the Contractor shall be maintained by the Contractor until no longer needed or permanent erosion control methods are installed.

1.05 Submittals

(a) At the preconstruction conference, the Contractor shall submit for Trustee Representative's approval, a schedule and construction drawing for accomplishment of temporary and permanent erosion control work, as are applicable for clearing and grubbing, grading, structures at watercourses, construction activities in streams and wetlands, general construction and paving. No work shall be started until the erosion control schedules and methods of operations for each phase of construction have been accepted by the Trustee Representative.

PART 2 - PRODUCTS

2.01 Silt Fence

Silt fence shall be equal to Mirafi 100X, Amoco 1380 or Exxon GTF-100 Series.

2.02 Bales

Straw bales shall be clean, seedfree oat or wheat type.

2.03 Coarse Aggregate

Coarse aggregate shall meet the requirements of Section 02233 "Subangular Stone".

2.04 Seed

Seed type shall meet the requirements of Section 02936 "Seeding"

PART 3 - EXECUTION

3.01 General

(a) Conduct earthwork and excavation activities in such a manner to fit the topography, soil type and condition.

(b) Minimize the area being disturbed and the duration of exposure to erosion elements.

(c) Stabilize disturbed areas immediately.

(d) Retain on-Site, sediment that was generated on-Site.

(e) Minimize encroachment upon watercourses.

(f) Prevent silt and sediment from migrating downstream in the event it cannot be prevented from entering the watercourse.

(g) Where provisions of pertinent rules and regulations conflict with these Specifications, the more stringent provisions shall govern.

(h) The Trustee Representative has the authority to limit the surface area of erodible earth material exposed by clearing and grubbing, and to direct the Contractor to provide immediate temporary or permanent control measures to prevent sediment impact on adjacent watercourses, ponds, or other water impoundments.

(i) Where erosion is likely to be a problem, clearing and grubbing operations should be so scheduled and performed that grading operations and permanent erosion control features can follow immediately thereafter if the Project conditions permit; otherwise erosion control measures may be required between successive construction stages. Under no conditions shall the surface area of erodible earth material (such as exposed soil or erodible material without vegetation or erosion protection) exposed at one time by clearing and grubbing, exceed 750,000 square feet without approval by the Trustee Representative.

(j) The Trustee Representative will limit the area of excavation, and embankment operations in progress commensurate with the Contractor's capability and progress in keeping the finish grading, mulching, seeding and other such permanent control measures current in accordance with the accepted schedule. Should seasonal limitations make such coordination unrealistic, temporary erosion control measure shall be taken immediately to the extent feasible and justified.

(k) In the event that temporary erosion and sedimentation control measures are required due to the Contractor's negligence, carelessness or failure to install permanent controls as a part of the work schedule, and are ordered by the Trustee Representative, such work shall be performed by the Contractor at the Contractor's expense, and no time extension shall be given.

3.02 Temporary Erosion and Sedimentation Control

(a) Temporary erosion control measures shall be used to correct conditions that develop during construction that lead to soil erosion or deposition of waterborne sediments; that are needed prior to installation of permanent erosion control features; or that are needed temporarily to control erosion that develops during normal construction practices, but are not associated with permanent control features on the Project.

(b) Temporary erosion and sedimentation control devices shall be installed and maintained from prior to the initial land disturbance activity until the satisfactory completion and establishment of permanent erosion control measures. At that time, temporary devices shall be removed.

(c) The Contractor shall coordinate the installation of temporary erosion and sedimentation control provisions contained herein with the permanent erosion control features, to ensure economical, effective and continuous erosion control throughout the construction and post-construction period.

(d) Temporary erosion and sedimentation control procedures should be initially directed toward preventing silt and sediment from entering the watercourses. The preferred method is to provide an undisturbed natural buffer, extending a minimal 5 feet from the top of the bank, to filter the run-off. Should this buffer prove infeasible due to construction activities being too close to the stream, or if the amount of sediment overwhelms the buffer, the Contractor shall place silt fences to filter the run-off and, if necessary, place rip-rap to stabilize stream banks. When excavation activities disturb the previously stated preventative measures, or if they are not maintained, or whenever the construction activities cross the streams, streambed sediment

filters shall be installed immediately downstream and within 200 feet downstream.

(e) Silt fences, barriers, and other temporary measures and devices shall be installed as indicated on the approved Contractor's Erosion Control Plan and shall be maintained until no longer needed, as determined by the Trustee Representative. At that time, the items shall be removed by the Contractor. All temporary items and devices must be removed with the Trustee Representative's approval prior to final demobilization from the Site.

(f) Where permanent vegetation is not appropriate, and where the Contractor's temporary erosion and sedimentation control practices are inadequate, the Trustee Representative may direct the Contractor to provide temporary vegetative cover. Such temporary vegetative cover shall be provided by the Contractor in compliance with Section-02936 "Seeding" of these specifications.

(g) All erosion and sedimentation control devices shall be inspected by the Contractor at least weekly and after each rainfall occurrence, and cleaned out and repaired by the Contractor as necessary.

3.03 Temporary Erosion and Sediment Control Techniques

(a) Temporary Diversion Berms

1. A temporary diversion berm is constructed of compacted soil, with or without a shallow ditch, at the top of fill slopes.

2. These diversion berms are used temporarily at the top of newly constructed slopes to prevent excessive erosion until permanent controls are installed or slopes stabilized.

3. A temporary diversion berm shall be constructed of compacted soil, with a minimum width of 24-inches at the top and a minimum height of 12-inches with or without a shallow ditch. Side slopes shall be 3:1 or flatter.

(b) Temporary Slope Drains

1. A temporary slope drain is a facility consisting of stone down chutes, fiber mats, plastic sheets, half-round pipe, metal pipe, plastic pipe, sod or other material acceptable to the Trustee Representative that may be used to carry water down slopes to reduce erosion prior to installation of permanent facilities or growth of adequate ground cover on slopes.

2. Fiber matting and plastic sheeting shall not be used on slopes steeper than 4:1 except for short distances of 20 feet or less.

3. All temporary slope drains shall be adequately anchored to the slope to prevent disruption by the force of the water flowing in the drains. The base of temporary slope drains shall be compacted and concavely formed to channel water or hold the slope drain in place. The inlet end shall be properly constructed to channel water into the temporary slope drain.

4. Energy dissipators, sediment basins or other approved devices shall be constructed at the outlet end of the slope drains to reduce erosion downstream.

(c) Sediment Structures

1. Sediment basins, ponds and traps, are prepared storage areas constructed to trap and store sediment from erodible areas in order to protect properties and stream channels below the construction areas from excessive siltation.

2. Sediment structures shall be utilized to control sediment at the foot of the embankments where slope drains outlet. All sediment structures shall be at least twice as long as they are wide.

3. When use of temporary sediment structures is to be discontinued, all sediment accumulation shall be removed and all excavation backfilled and properly compacted. The existing ground shall be restored to its natural or intended condition.

(d) Streambed Sediment Filter

1. Streambed Sediment Filters are stone barriers placed across a natural or constructed drainway to retard flow and catch small stream sediment loads.

2. At a minimum, streambed sediment filters shall be constructed to the dimensions shown on the construction plans.

(e) Rip-Rap

1. Unless shown otherwise on the Drawings, rip-rap shall be placed where ordered by the Trustee Representative and at all points where banks of streams or drainage ditches are disturbed by excavation. Carefully compact fill or backfill and place rip-rap to prevent subsequent settlement and erosion. This requirement applies equally to construction along side a stream or drainage ditch as well as crossing a stream or drainage ditch.

(f) Straw Bales

1. Straw bales are temporary measures to control erosion and retain the suspended silt particles in the runoff water leaving disturbed areas. Bales shall contain five cubic feet or more of material.

2. Straw bales shall be embedded in the ground 4 to 6-inches to prevent water flowing under them. The bales shall also be anchored securely to the ground by wooden stakes driven through the bales into the ground. Bales shall be removed after they have served their purpose, as determined by the Trustee Representative.

3. The Contractor shall keep the bales in good condition by replacing broken or damaged bales immediately after damage occurs. Normal debris clean-out will be considered routine maintenance.

4. Straw bales shall be used at the toe of fill slopes, in ditches, or other areas where siltation, erosion or water run-off is a problem.

(g) Silt Fences

1. Silt fences are temporary measures utilizing woven wire or other approved materials attached to posts with filter cloth attached to the upstream side of the fence and embedded with compacted soil or equivalent a minimum of 0.5 feet deep to retain the suspended silt particles in the runoff water.

2. Temporary silt fences shall be placed on the natural ground, at the toe of fill slopes, in ditches or other areas where siltation is a problem. Caution should be used in placing silt fence on slopes sleeper than 1H:1V, and where water flows exceed 1 ft^3/sec.

3. The Contractor shall be required to maintain the silt fence in a satisfactory condition for the duration of the Project or until its removal is requested by the Trustee Representative. The silt accumulation at the fence must be removed and placed on Site as directed by the Trustee Representative.

(h) Temporary Vegetation

1. Temporary vegetation are measures consisting of seeding, mulching, fertilizing and matting utilized to reduce erosion. All cut and fill slopes shall be seeded when and where necessary to eliminate erosion. Disturbed or bare soil areas shall not be left without stabilization for more than 30 days.

2. Seeding, mulching and fertilizing shall be performed in accordance with Section 02936 "Seeding" of these Specifications.

3. If late fall completion prevents germination, disturbed areas shall be protected by mulching without application of seed as a minimum.

3.04 Permanent Erosion and Sediment Control

(a) The Contractor shall incorporate all permanent erosion control features into the Project at the earliest practicable time as outlined in the Contractor's accepted schedule or as land disturbance for each segment of the Project has been completed.

(b) Restore the work site to its original contours, unless shown otherwise on the Drawings or directed by the Trustee Representative.

(c) All references to permanent vegetation, unless noted otherwise, shall relate to establishing permanent vegetative cover and be in accordance with Section 02936 "Seeding" of these specifications.

(d) When final grade has been established, all bare soil, unless otherwise required by the Contract Documents, shall be seeded, fertilized and mulched in an effort to restore to a protected condition. Areas that are not stabilized with seed and mulch shall be sodded as approved or directed by the Trustee Representative.

(e) Specified permanent vegetation shall be established at the first appropriate season following establishment of final grading in each section of the Site.

(f) Where sod is removed or damaged, replant such areas using sod of the same species of grass at the first appropriate season.

(g) Permanent vegetative cover activities shall comply with local soil and water conservation guidelines.

(h) Where permanent vegetative cover cannot be immediately established (due to season or other circumstances) the Contractor shall provide temporary vegetative cover.

3.05 Permanent Erosion and Sediment Control Techniques

(a) Permanent Vegetation

1. All references to permanent vegetation, unless noted otherwise, shall relate to establishing permanent vegetative cover and be in accordance with Section 02936 "Seeding" of these specifications.

(b) Rip-Rap

1. Rip-Rap used for permanent stabilization of stream banks, slopes and culvert outlets shall be installed in accordance with the construction drawings and Section 02271 "Stone Rip-Rap" of these specifications.

2. Placing of rip-rap at locations other than those specified on the construction drawings shall be done only with approval or by the direction of the Trustee Representative.

3. The ground surface upon which the rip-rap is to be placed shall be brought in reasonably close conformity to the correct lines and grades before placement is commenced.

4 Unless otherwise shown or specified, rip-rap shall begin in a toe ditch constructed in original ground around the toe of the fill or the cut slope. The toe ditch shall be two feet deep in original ground, and the side next to the fill or cut shall have that same slope. After the rip-rap is placed, the toe ditch shall be backfilled and the excess dirt spread neatly within the construction area.

(c) Gravel/Cobble

1. Gravel/cobble shall meet all requirements for rip-rap as identified in this section of the construction specifications.

END OF SECTION

SECTION 02150

SHORING AND BRACING

PART 1 - GENERAL

1.01 Description of Work

(a) The Contractor shall furnish all labor, materials, equipment, tools and appurtenances required to complete the work of shoring, bracing, and sheeting or sheet piling, necessary to complete the construction, protect structures, and prevent the loss of ground or caving of embankments, as shown, specified or required, and shall meet all applicable building and safety codes. The Contractor shall provide a "Competent Person" as defined by OSHA regulations to implement, supervise, and inspect all shoring and bracing.

(b) Pressures on sheeting and the stability of the sheeting and bottom of the excavation are dependent not only on soil conditions but upon many procedures and options available to the Contractor, such as dewatering, staging of excavation and installation of bracing, flexibility of sheeting, construction equipment used, and time of completing the work. All such factors shall be considered investigated in the design of the sheeting and bracing.

1.02 Related Documents

(a) Recommended Technical Provisions for Shoring and Sloping of Trenches and Excavations, U.S. Department of Commerce.

(b) Construction Safety and Health Regulations, U.S. Department of Labor, Occupational Safety and Health Administration.

(c) Occupational Safety and Health Regulations-Excavations, U.S. Department of Labor, Occupational Safety and Health Administration, 29 CFR Part 1926.

1.03 Submittals

(a) In cases where the excavation exceeds a depth of 6 feet or where excavation may jeopardize the stability of nearby structures or facilities, the Contractor shall submit drawings, computations and substantiating data, prepared, signed, and sealed by a Professional Engineer licensed in the Commonwealth of Massachusetts, showing his proposed sheeting, sheet piling, and bracing design and method of construction for the information of the Trustee Representative prior to the start of such construction. Any review or comments by the Trustee Representative shall not relieve the Contractor of his responsibility for sheeting and bracing.

(b) In trenches, the sheeting shall be designed so that the lowest brace is no closer than 12 inches above the base of the structure to be installed.

1.04 Related Sections

(1) Excavation - Section 02220
(2) Backfill and Fill - Section 02223
(3) Health and Safety Specification for Construction - Section 01564

1.05 Quality Control

(a) During the installation of the sheeting and bracing and as long as the excavation is open, the Contractor's "Competent Person" shall monitor the work to insure that it is carried out in accordance with his design and procedures. For this purpose, leveling observations for heave and settlement shall be made in addition to piezometric readings where excavations extend below the water table, adjacent to hide pile and through unconsolidated soils.

PART 2 - PRODUCTS

(a) All materials shall meet, or exceed, the minimum requirements of the applicable codes and those assumed in the design submitted by the Contractor.

PART 3 - EXECUTION

3.01 Verifying Existing Conditions

(a) Before commencing work, the Contractor shall check and verify all governing dimensions and elevations, including field measurements of

existing and adjoining work on which his work is dependent, to assure proper fit and clearance of each part of the work to the new and existing structures.

(b) The Contractor's attention is drawn to General Terms and Conditions for general information for evaluating existing conditions which may affect his work.

3.02 Coordination With Other Operations

(a) The schedule and progress of the shoring, bracing, and sheeting work shall be coordinated with the excavation and backfilling work. If, during the progress of the excavation, lateral movement of the surrounding soils is discovered, corrective measures shall be taken immediately to prevent further movement.

3.03 Removal of Shoring and Bracing Materials

(a) Where the Contractor elects not to remove shoring and bracing material, all such material shall be removed to the extent that the top of the material shall be a minimum of 5 feet below the proposed finished grade. No shoring or bracing may remain in place within the limits of the treatment plant or the proposed permeable cap placement.

(b) Removal of shoring and bracing shall be carried out in a manner such that no structure shall be disturbed or damaged during or after removal. Protection of structures during the removal of shoring and bracing shall be the sole responsibility of the Contractor, and any disturbance or damage shall be rectified at no expense to the Trustee.

3.04 Safety

(a) Installation and removal methods of shoring and bracing shall meet, or exceed, the minimum requirements of the applicable codes and safety precautions as outlined in such codes, and shall be enforced by the Contractor.

END OF SECTION

SECTION 02220

EXCAVATION

PART 1 - GENERAL

1.01 Description of Work

(a) The Contractor shall furnish all labor, materials, equipment, tools and appurtenances required to complete the work of excavation, including excavation, disposal of excess and unsuitable materials, relocation of excavated soils to designated areas, and other related and incidental work within the designated area and as required for the construction of other work, as shown, specified or required.

(b) The Contractor shall locate all existing active and abandoned utilities and structures in work areas prior to commencing any excavation activities and shall protect from damage those utilities and structures which are to remain in place due to completion of the work.

1.02 Related Work Specified Elsewhere

(a) Shoring and Bracing - Section 02150
(b) Drilling and Blasting - Section 02221
(c) Backfill and Fill - Section -02223
(d) Clearing and Grubbing - Section 02110
(e) Odor Control - Section 01563
(f) Dust Control - Section 01562
(g) Health and Safety Specifications for Construction - Section 01564
(h) Decommissioning of Utilities and Structures - Section 02060

1.03 Definitions

(a) Excavation shall mean the removal from place of all materials and shall include soil, facilities, utilities above and below ground, rock, pavements, topsoil, demolition waste material, boggy waste, rubbish, hide residues, tree stumps, boulders, logs, ashes, cinders or organic material such as peat, humus or organic silt.

(b) Mucking or mucking-out shall mean excavation, as defined hereinbefore, without prior dewatering.

1.04 Protection of People and Property

(a) The Contractor shall plan and conduct his operations so as to prevent damage to existing structures, safeguard people and property, minimize traffic inconvenience, protect the structures to be installed and provide safe working conditions. The work shall be staged and monitored to minimize the exposure of the public and of the workers to hazardous substances.

(b) Excavations, except as specified hereinafter, shall be adequately sheeted and braced. Where the installation of sheeting is impractical or might cause damage, as a result of, but not limited to, vibration, settlement or lateral movement, the Contractor shall utilize other methods.

(c) Excavation may be made without sheeting and bracing within the limitations and requirements of the governmental agencies having jurisdiction, provided that:

(1) Hazards, such as described hereinbefore, do not exist in the proximity of the excavation.

(2) Work is not in streets or other paved, landscaped or improved areas.

(3) Work can be restricted to the land provided for the Contractor's use.

(4) Sheeting and bracing are not specifically required by the Contract Documents.

(d) In cases where excavation without sheeting and bracing is not permissible solely because of protection of workers, trench boxes may be used.

(e) The Contractor shall not stockpile any excavated material without the Trustee Representative's approval.

(f) In cases where excavation or surficial disturbance of soils containing hide residues is necessary, odor control measures shall be used as specified in Section 01563 and required as by the Trustee Representative.

(g) Prior to exposing subgrades for placement of permeable cover fills and backfills, the area of the work shall be surrounded by a soil berm to contain surface runoff accumulating within the berm and exclude surface runon from areas surrounding the work. For small areas for which there is little runoff potential such as topographic depressions, the Trust may not require a berm. Prior to commencing any work that would expose subgrade soils in these areas, the Contractor shall obtain written authorization from the Trustee Representative to perform the work without constructing a berm.

Water ponding within the area of the work shall be considered to be contaminated. The Contractor shall employ excavation methods which minimize the need to remove accumulated water from excavations. However if unavoidable, accumulated water may be disposed by pumping through a sedimentation filter and treating and discharging in accordance with a method approved by the Trustee Representative.

PART 2 - PRODUCTS

Not used

PART 3 - EXECUTION

3.01 Excavation

(a) Excavation Classifications: The following classifications of excavation will be made when rock excavation is encountered in work.

(1) Earth Excavation includes excavation of pavements and other obstructions visible on ground surface; underground facilities, utilities and other items indicated to be demolished and removed; together with earth and other materials encountered that are not classified as rock or unauthorized excavation.

(2) Rock excavation in trenches and pits includes removal and disposal of materials and obstructions encountered which cannot be excavated with a 1.0 cubic yard (heaped) capacity, (3/4 cu. yd. backhoe for smaller work), 42" wide bucket on track-mounted power excavator equivalent to Caterpiller Model

215, rated at not less than 90 HP flywheel power and 30,000 lb. drawbar pull. Trenches in excess of 10'-0" in width and pits in excess of 30'-0" in either length or width are classified as open excavation.

(3) Rock excavation in open excavations includes removal and disposal of materials and obstructions encountered which cannot be dislodged and excavated with modern track-mounted heavy-duty excavating equipment without drilling, blasting or ripping. Rock excavation equipment is defined a Caterpillar Model No. 973 or No. 977K, or equivalent track-mounted loader, rated at not less than 170HP flywheel power and developing 40,000 lb. break-out force (measured in accordance with SAE J732C).

(4) Typical of materials classified as rock are boulders 1/2 cu. yd. or more in volume, solid rock, rock in ledges, and rock-hard cementitious aggregate deposits.

(5) Intermittent drilling, blasting or ripping performed to increase production and not necessary to permit excavation of material encountered will be classified as earth excavation.

(6) Rock excavation shall not be performed until material to be excavated has been classified by Trustee Representative.

(b) Rock payment lines are limited to the following:

(1) Two feet outside of concrete work for which forms are required, except footings.

(2) One foot outside perimeter of footings.

(3) In utility, corridors and drainage trenches 1 foot beyond dimensions shown; in pipe trenches, 6" below invert elevation of pipe and 2 ft. wider than inside diameter of pipe, but not less than 3 ft. minimum trench width.

(4) Neat outside dimensions of concrete work where no forms are required.

(5) Under slabs on grade, verify subgrade depth requirement.

(c) Unauthorized excavation consists of removal of materials beyond indicated subgrade elevations or dimensions without specific direction of Trustee Representative. Unauthorized excavation, as well as remedial work directed by Trustee Representative, shall be at Contractor's expense.

(d) Under footings, foundation bases, or retaining walls, fill unauthorized excavation by extending indicated bottom elevation of footing or base to excavation bottom, without altering required top elevation. Lean concrete fill may be used to bring elevations to proper position, when acceptable to Trustee Representative.

(e) Elsewhere, backfill and compact unauthorized excavations as specified for authorized excavations of same classification, unless otherwise directed by Trustee Representative.

(f) Additional Excavation: When excavation has reached required subgrade elevations, notify Trustee Representative who will make a review of conditions.

(1) If unsuitable bearing materials are encountered at required subgrade elevations, carry excavations to develop suitable bearing and replace excavated material as directed by Trustee Representative.

(2) Removal of unsuitable material and its replacement as directed will be paid on basis of contract conditions relative to changes in work.

(g) Stability of Excavations: Slope sides of excavations to comply with local codes and ordinances having jurisdiction. Shore and brace in accordance with Section 02150 where sloping is not possible because of space restrictions or stability of material excavated. Comply with all OSHA and other applicable safety requirements.

(1) Maintain sides and slopes of excavations in safe condition until completion of backfilling.

(h) Material Storage: Stockpile satisfactory excavated materials where directed, until required for backfill or fill. Place, grade and shape stockpiles for proper drainage.

(1) Locate and retain soil materials away from edge of excavations. Do not store within drip line of trees indicated to remain.

(2) Dispose of excess soil material and waste materials as herein specified.

(i) Excavation for Structures: Conform to elevations and dimensions shown within a tolerance of plus or minus 0.10', and extending a sufficient distance from footings and foundations for permit placing and removal of concrete formwork, installation of services, other construction, and for inspection.

(1) In excavating for footings and foundations, take care not to disturb bottom of excavation. Excavate by hand to final grade just before concrete reinforcement is placed. Trim bottoms to required lines and grades to leave solid base to receive other work.

(j) Excavation for Pavements: Cut surface under pavements to comply with cross-sections, elevations and grades as shown.

(k) Excavation for Trenches: Dig trenches to the uniform width required for particular item to be installed, sufficiently wide to provide ample working room, or as shown on drawings for Utility Corridors. Provide 6" to 9" clearance on both sides of installed pipe or conduit.

(1) Excavated trench with depth greater than 3'-0" shall be considered a confined space and shall be excavated and utilities installed in conformance with the requirements of the Site Health and Safety Plan.

(2) All excavated material shall be removed from the area at time of excavation, and stockpiles on-site or disposed of as directed by the Trustee Representative.

(3) Barricades and signs warning of open ditch shall be erected to protect personnel working in the area.

(4) Excavate trenches to depth indicated or required. Carry depth of trenches for piping to establish indicated flow lines and invert elevations. Beyond building perimeter, keep

bottoms of trenches sufficiently below finish grade to avoid freeze-ups.

(5) Where rock is encountered, carry excavation 6" below required elevation and backfill with a 6" layer of crushed stone or gravel prior to installation of pipe.

(6) Grade bottoms of trenches as indicated, notching under pipe bells to provide solid bearing for entire body of pipe.

(7) Do not backfill trenches until tests and inspections have been made and backfilling authorized by Trustee Representative. Use care in backfilling to avoid damage or displacement of pipe systems.

(l) Cold Weather Protection: Protect excavation bottoms against freezing when atmospheric temperature is less than 35 deg F.

END OF SECTION

SECTION 02221

DRILLING AND BLASTING

PART 1 - GENERAL

1.01 Description of Work

(a) Any rock excavation using drill and blast techniques, including blasting for rock slopes, drainage channels, wetlands creation, utility corridors and trench blasting shall be performed in accordance with the requirements of this section. The Contractor shall employ controlled blasting procedures in order to maintain ground vibrations and airblast overpressures below the maximum levels specified in this section, and to minimize stressing and fracturing of the rock beyond the limits of excavation shown on the Drawings.

(b) The area which is to involve blasting operations encompasses public roads, railroads, utilities, private residences, and businesses. Maintenance and protection of these installations must be taken into account in the Contractors' plan of blasting operations.

(c) The Contractor shall perform a "before and after" condition survey of all structures and improvements of adjoining properties subject to effects from the blasting operations. This survey shall include:

(1) Informal discussions to familiarize the adjacent property owners with blasting effects and planned precautions to be taken on this project.

(2) Detailed examination and photographic records of adjacent structures.

(3) Establishment of horizontal and vertical control points.

The results shall be summarized in a before blasting condition report which shall include photographs and shall be submitted to the Trustee Representative within twenty-one days of the before blasting conditions survey and prior to

the start of blasting. Following blasting operations, the survey shall be undertaken again to identify any changes found in the conditions of the adjacent properties. When requested by the Trustee Representative, surveys shall be done in the presence of the Trustee Representative, or their blast monitoring subcontractor and the property owner. Should any damage or change occur to the properties during construction, additional surveys of the affected property shall be taken as directed by the Trustee Representative

(d) In addition, a blast monitoring program shall be established with seismographs installed at selected monitoring stations inside adjacent structures. During construction, detailed records should be kept of:

(1) Charge weight;
(2) Location of blast point and distance from existing structures;
(3) Delays;
(4) Response indicated by air blast monitors and seismographs including peak particle velocity, vibration frequency, and air blast, for safety.

Small charges should be used initially to establish Site specific relationship between charge weight, distance and response.

(e) In the event that a Contractor's blasting round results in ground vibrations or airblast overpressures which exceed the blasting limit criteria specified herein, the Contractor shall, prior to detonating any subsequent rounds, revise his round design appropriately to reduce the vibrations and submit the revised round design to the Trustee Representative for approval.

(f) Whenever explosives are used, they shall be of such character and in such amount as permitted by the Commonwealth of Massachusetts, local laws and ordinances, and all respective agencies having jurisdiction over them. The Contractor shall survey the entire blast area for a minimum of five minutes following a blast to guard against rockfalls before commencing work in a cut. The Trustee Representative shall, at all times, have the authority to prohibit or halt the Contractor's blasting operations if it is apparent that through the method being employed,

the required excavation slopes are not being obtained in a stable condition, or the safety and convenience of the public is jeopardized.

(g) Review by the Trustee Representative or their blast monitoring subcontractor of the blast design and techniques shall not relieve the Contractor of responsibility for the accuracy, adequacy, and safety of the blasting, exercising proper supervision and field judgment, and producing the results within the blasting limits required by these Specifications.

(h) The specific requirements of this section are not intended and should not interfere with the ability of the Contractor to alter spacing of holes and explosive loading so that adequate rock breakage may be obtained.

1.02 Referenced Standards

(a) National Fire Protection Association (NFPA):
495 Code for the Manufacture, Transportation, Storage and Use of Explosive Materials.

1.03 Related Sections

(a) Excavation - Section 02220

(b) Backfill and Fill - Section 02223

1.04 Advance Submittals

(a) At least two weeks prior to commencing drilling and blasting operations, the Contractor shall submit to the Trustee Representative for approval complete details of his proposed blasting operations, including the following for each separate blasting area (i.e., building, rock cut, trench, etc.)

1. Sequence and schedule of blasting rounds, including the general method of developing the excavation, lift heights, etc.

2. Specifics of a typical production round (away from the perimeter of excavation) and specifics of all controlled blasting at the perimeter of the excavation, including:

a. Diameter, spacing, burden, depth, and orientation of each drill hole.

b. Type and nomenclature of detonators, and delay pattern.

c. Type, nomenclature, and weight per cartridge of explosive to be used, and weight and distribution of charge to be used within each hole, as well as total weight of explosive charge on each delay, and the total weight for the blast round.

d. Type and distribution of stemming to be used in each hole.

e. Estimates of vibration levels at nearest adjacent structures.

3. Methods of matting or covering of blast area, if required to prevent flyrock and excessive airblast pressure.

4. Written evidence of the licensing, experience, and qualifications of blasters who will be directly responsible for the loading and firing of each shot.

5. Name and qualifications of the person responsible for designing and directing the blasting.

6. If required, a listing of instrumentation which the Contractor proposes to use to monitor vibrations and airblast overpressure levels, together with performance specifications and user's manual supplied by the manufacturers, and a recent calibration (within the previous six months) to a standard traceable to the National Bureau of Standards.

7. A copy of the blasting permit obtained to conduct blasting on the Site.

8. Before blasting condition survey report.

1.05 Progress Submittals

(a) Within 24 hours following each blast, the Contractor shall submit to the Trustee Representative a Blast Monitoring Report, which shall include the following items:

1. Details of the round as shot, including drill hole diameter, spacing, burden, depths, delay pattern used, with charge weights for each delay, and loading configuration of typical holes.

2. Blast monitoring data:

   a. A plan drawing, to scale, showing the location of each blast monitoring instrument, as well as the location of each round.

   b. Results of blast monitoring at each instrument location, including peak particle velocity in inches per second (in./sec.), vibration frequency (Hz) and peak airblast overpressure in pounds per square inch (psi), as well as a copy of the strip chart recording for each monitoring location, marked with the date, time, and location of the equipment.

1.06 Blast Scheduling

(a) The Contractor shall coordinate the general blasting schedule with the Trustee Representative and shall notify the Trustee Representative of individual blasts when requested. The Contractor shall notify the Trustee Representative a minimum of twenty-four hours in advance of the start of blasting in any new area.

1.07 Blasting Hours

Blasting hours are restricted to 8:00 a.m. to 5:00 p.m., Monday through Friday. No blasting will be permitted on weekends or legal holidays unless specifically approved by the Trustee Representative.

1.08 Safety Precautions

(a) During the progress and approach of a thunderstorm, the handling or use of explosives shall be discontinued and all personnel shall be moved to a place of safety until the danger has passed. All parts of an electrical blasting circuit shall be effectively insulated or protected from grounds or short circuits and adequately separated from power lines so as to prevent any possibility of electrical contact or entrance of stray current into the blast circuit.

Mobile transmitters shall not be energized near electric caps or delays being handled or used. If electric blasting caps are used, every effort shall be made to ensure that they are properly wired into the circuit and that ample current is supplied to fire the blast. It is equally important, when using a straight parallel hookup, to follow the manufacturer's instructions implicitly as to cutting off the current supply with the first cap or caps to fire, in order to prevent possible arcing, which could result in a "hang-fire" (delayed explosion).

(b) No blasting shall be permitted until all personnel in the danger zone have been moved to a place of safety. A suitable warning system shall be devised and implemented by the Contractor. He shall familiarize all personnel on the project, Trustee Representative, the general public with the implemented system. The danger zone shall be patrolled before each blast to make certain that it has been completely cleared, and guards shall be stationed to prevent entry until the area has been inspected following the blast.

(c) Explosives shall be stored, handled and employed in accordance with federal, state, and local regulations and in accordance with NFPA 495, except that where stricter requirements are contained elsewhere herein, such requirements shall govern.

(d) No explosives, caps, detonators, and fuses shall be stored on the Site during non-working hours.

(e) The Contractor shall be responsible for determining any other safety requirements unique to his blasting operation on this particular Site so as not to endanger life, property, utility services, any existing or new construction, or any property adjacent to the Site.

(f) No requirement of, or omission to require, any precautions under this Contract shall be deemed to limit or impair any responsibility or obligation assumed by the Contractor under or in connection with this Contract; and the Contractor shall at all times maintain adequate protection to safeguard the public and all persons engaged in the Work and shall take such precautions as will accomplish such end, without undue interference with the public. The contractor shall be responsible for and pay for any damage

to adjacent structures resulting from work executed under this Contract.

1.09 Indemnity

(a) Notwithstanding full compliance with these specifications, approval of blasting plan, and successful limitation to maximum peak particle velocity and airblast overpressure as specified herein, the Contractor shall be solely responsible for any damage, direct or indirect, arising from blasting and shall hold the Trustee, Trustee Representative, and their blast monitoring subcontractor harmless from any costs, liens, charges, claims, or suits, including the costs of defense arising from such damage, real or alleged. The Trustee, Trustee Representative, and their blast monitoring subcontractor shall be additionally-named insureds on any insurance policy covering blasting carried by the Contractor, and this requirement shall also be enforced on any subcontractor.

1.10 Protection of Completed Work

(a) The Contractor shall conduct the blasting operations in such a manner that completed work of any type is not damaged. Any replacement or repair of damaged work as directed by the Trustee Representative shall be made at no additional cost to the Trustee. No blasting shall be done within 200 feet of concrete, shotcrete, or grout which has been in place less than seven (7) days, nor within 50 feet of any concrete, shotcrete, or grout that is older than seven (7) days, unless authorized by the Trustee Representative.

PART 2 - MATERIALS

2.01 Explosives

The Contractor shall use type(s) of explosives and blasting accessories necessary to accomplish the specified results. All explosives and accessories shall be used and assembled in accordance with the manufacturer's recommendations. The bottom charge of a pre-split hole may be larger than the line charges but shall not be large enough to cause overbreak. The top charge shall be placed far enough below the collar of the hole, and reduced sufficiently, to avoid overbreaking and heaving. Because shallow groundwater is known to exist at the Site, blasting agents not sensitive to wet conditions shall be used.

PART 3 - EXECUTION

3.01 Blasting Procedures

(a) Blasting shall be done by skilled operators and all necessary precautions shall be taken to avoid damage to persons or property. The Contractor shall be solely responsible for and shall repair any and all damage caused by blasting.

(b) Overblasting of rock shall be kept to a minimum.

(1) Where overblasting occurs at footings for structures, the overblasted rock shall be removed, rock surface swept clean, and the overexcavated area filled with 2500 psi concrete to bring the excavation to the required footing elevation.

(2) Where overblasting occurs at roadway and parking areas, the overblasted rock shall be removed and the areas filled with compacted structural fill.

(c) Flyrock - Flyrock shall be controlled so that it does not present a hazard to people working on the Site or other personnel outside the Site. Flyrock shall not be cast beyond the Site limits or more than one half the distance to the nearest dwelling, or other occupied structure or paved roadway. If flyrock presents a potential hazard, blasting mats shall be utilized as necessary.

(d) Vibration Limits - The Contractor shall conduct all blasting operations in such a manner that peak airblast overpressures and peak particle velocity of ground vibrations do not exceed the following limits at the location of any existing dwelling or other building in the vicinity of the project.

Distance (D) from Blast Round to Building (ft.)	Maximum Allowable Peak Particle Velocity (PPV) of Ground Vibration (in./sec.)(1)	Maximum Allowable Airblast Overpressure (psi)
Less than 300	1.00	0.014
Greater than 300 or at Site limits	0.75	0.014

Notes:

1. Maximum PPV shall be the maximum of three components measured in three mutually perpendicular directions (transverse, vertical and longitudinal).

2. The Contractor shall monitor vibrations at the nearest structure for all blasts and other sensitive structures as designated by the Trustee Representative.

3.02 Special Perimeter Control Blasting Producers

(a) When blasting at designated areas in the vicinity of live utilities and at building locations, care shall be taken at the excavation limits to minimize overbreak and fracturing of remaining rock. Presplitting and cushion blasting shall be utilized at the above locations and as directed by the Trustee Representative.

(b) The presence of perimeter drill hole casts will be used to judge the Contractor's perimeter control blasting procedures.

(c) If, in the judgement of the Trustee Representative, the Contractor's perimeter control blasting procedures are causing or resulting in the absence of drill hole casts, the geometry (diameter, spacing,) stemming and loading of perimeter holes and adjacent production holes shall be adjusted until results acceptable to the Trustee Representative are obtained or the perimeter control blasting technique shall be changed.

END OF SECTION

SECTION 02222

DREDGING

PART 1 - GENERAL

1.01 Description of Work

(a) The Contractor shall furnish all labor, materials, equipment, tools and appurtenances required to complete the work of dredging, including dredging, relocation of dredge spoils to designated areas, dewatering, and other related and incidental work, as shown, specified or required.

(b) The Contractor shall determine the method of dredging and dewatering based on site conditions, the ability to safely contain the dredge spoils and regulations regarding the discharge of water. The selected method shall be approved by the Trustee Representative before work commences.

(c) The Contractor shall be responsible for dewatering the dredge spoils before they are placed beneath the permeable cover.

(d) The Contractor shall locate all existing utilities in work areas prior to commencing dredging activities.

1.03 Definitions

(a) Dredging shall mean the removal of material from below surface water.

(b) Spoils shall mean the material that has been dredged and the associated water that is carried with the dredged material.

(c) Dewatering shall mean the removal and treatment of excess water found in the dredged material and the associated water that is carried with the dredged material.

1.04 Protection of People and Property

(a) The Contractor shall plan and conduct his operations so as to prevent damage to existing structures, safeguard people and property, minimize traffic inconvenience, protect the structures to be installed and provide safe working conditions.

(b) Spoil holding areas shall provide a means to prevent the migration of sediments and water away from the designated spoil area.

(c) Dewatering operations shall dispose of water in accordance with the requirements of Section 02220. The Contractor is advised that it may be necessary to test and treat water, by methods including but not limited to addition of flocculation agents, prior to discharge to obtain a suitable effluent quality. It is the responsibility of the Contractor to propose and implement appropriate test and treatment methods to the approval of the Trustee Representative.

1.05 Related Sections

(a) Excavation - Section 02220
(b) Backfill and Fill - Section 02223
(c) Wetland Mitigation - Section 02937
(d) Reinforced Concrete Culvert Pipe and Cleaning Existing Culverts - Section 02600

1.06 Related Information

(a) As part of the Pre-Design Investigation, Task SW-2 assessed treatability of water which may be derived from dredging operations. The report on this study is available to the Contractor.

1.07 Submittals

(a) The Contractor shall submit proposed equipment and methods for dredging, management of spoil holding areas and disposal of water and spoil for approval by the Trustee Representative.

END OF SECTION

SECTION 02223

BACKFILL AND FILL

PART 1 - GENERAL

1.01 Description of Work

(a) The Contractor shall furnish all labor, materials, equipment, tools and appurtenances required to complete the work of backfill and fill, including backfill, at - and above-grade permeable covers, impermeable cover, grading fills, road subbase and other related and incidental work within the designated area and as required for the construction of other work, as shown specified or required.

1.02 Related Work Specified Elsewhere

(a) Shoring and Bracing - Section 02150
(b) Excavation - Section 02220
(c) Geotextile - Section 02595
(d) Odor Control - Section 01563
(e) Subangular Stone - Section 02233
(f) Impermeable and Permeable Cover Fill - Section 02242

1.03 Definitions

(a) Compacted Fill shall consist of material from on-Site excavations or material furnished from off-Site sources, if necessary, and meeting the requirements of subsection 2.03.

(b) Backfill shall consist of furnishing clean borrow material.

(c) Impermeable and permeable cover fill shall consist of off-Site clean material as defined in Section 02242, if necessary.

(d) Road subbase shall consist of material from a clean off-Site source and conforming to the requirements of subsection 2.04.

(e) Compacted clay berms shall consist of off-Site material meeting the requirements of subsection 2.06.

1.04 Protection of People and Property

(a) Protection of people and property shall conform to the requirements of Section 02220 - Excavation.

(b) Odor control shall conform to the requirements of Section 02220 - Excavation and Section 01563 - Odor Control.

1.05 Tolerances

(a) Grading tolerance for fill, backfill, and prepared subgrade shall be - 0.5 to + 0.3 feet.

PART 2 - PRODUCTS

2.01 Materials - General

(a) All backfill and fill materials, unless otherwise specified, shall consist of suitable selected and approved (by the Trustee Representative) soil from on-Site excavation or from off-Site borrow areas.

(b) Maximum particle size unless otherwise specified or approved by Trustee Representative, shall be no larger than one-half the recommended lift thickness.

(c) No frozen earth shall be used for backfill and fill. All backfill and fill materials shall be free from all perishable and objectionable (as described below) materials. All fill shall be protected from frost if the Trustee Representative judges frost will prevent the material from performing as required.

(d) Backfill materials for buried pipe and piped utilities shall be natural soil, not containing deleterious material, refuse, rubble, metal, wood, etc. No particle greater than 3 inches in size can be used.

(e) All required fill materials shall be free from wood, trash, and other objectionable materials which may be compressible or which cannot be properly compacted. It shall not contain rock fragments, broken concrete, masonry rubble, or other similar materials. It shall have physical properties such that it can be readily spread and compacted to the specified density. Snow, ice, and frozen soil shall not be permitted.

(f) On-Site soils excavated from wetland areas may be used as grading fill in the hide pile areas as specified under Article 2.03 and provided they meet the requirements for fill and can be dewatered sufficiently to allow required compaction. Prior to placement, Contractor shall establish requirements for moisture content and compaction methods by means of a test fill section. The methods used in the test fill shall be approved by the Trustee Representative prior to starting the test fill. The placement and compaction control method proposed by the Contractor must be approved by the Trustee Representative prior to utilizing wetlands soil as fill.

(g) On-Site soils excavated from work areas shall be hauled and placed as grading fill below cover.

(h) Composted organic material shall be used as fill in areas designated on the drawings.

2.02 Off-Site Borrow

(a) Material suitable for at grade and above grade permeable covers, impermeable cover, utilities corridor backfill, and road embankment fill is not available from the on-Site excavations. The Contractor, therefore, shall procure elsewhere, a sufficient quantity of suitable material approved by the Trustee Representative, as specified in the following subsections and in Section 02242 - Impermeable and Permeable Cover Fill, and shall furnish and place such materials.

2.03 Compacted Fill

Compacted fill shall be provided from on- or off-Site sources and shall be free of deleterious materials. It shall not contain rock or lumps over 6 inches in greatest dimension. No more than 15 percent shall be larger than 2-1/2 inches.

Compacted fill placed for grading on slopes steeper than 8 horizontal to 1 vertical shall be sand conforming to the following requirements:

- Free of organic matter
- Nonplastic
- Maximum percentage passing #200 sieve by weight 12%

Compacted fill material which contains organic or plastic materials, or contains more than 12% by weight passing the #200 sieve, may only be used for grading in areas with slopes flatter than 8 horizontal to 1 vertical.

Compacted fill material for the created wetland berm shall be clean soil or soil-rock fill provided from an off-Site source. This material shall conform to the following gradation:

US Standard Sieve	Percent Passing by Weight
3"	90-100
3/4"	60-90
#10	40-70
#50	30-60
#200	20-50

2.04 Road Structural Fill (Subbase)

(a) Road structural fill material shall be clean soil from an off-Site borrow source approved by the Trustee Representative.

(b) Subbase material shall meet the following requirements:

U.S. Standard Sieve	Percent Passing by Weight
3"	90-100
3/4"	50-90
#10	40-80
#50	20-60
#200	5-15

(c) Subbase material shall be hard, uniform, and free of debris, plant material, and other deleterious material.

2.05 Sand Bedding

(a) Sand bedding shall consist of material composed of predominantly angular particles of quartz or other hard durable minerals.

(b) Sand bedding shall conform to the following gradation requirements:

Sieve Size Designation	3/8"	No. 4	No. 8
Percentage Passing by Weight	100	95-100	80-100

2.06 Compacted Clay Berm

(a) The Contractor shall provide compacted clay berms as part of the construction of the recharge basin.

(b) Clay used in the compacted clay berms shall meet the requirements of a SC type soil as identified using the Unified Soil Classification System.

2.07 Testing

(a) The Contractor shall submit to the Trustee Representative certification that the soils proposed for backfill, fill, and permeable cover, comply with the specifications for the various components of construction. This certification shall include testing as shown below.

PRECONSTRUCTION TESTING				
TEST & NO.	COMPACTED FILL	SAND BEDDING	ROAD SUBBASE	BORROW CLAY
Gradation ASTM D422	1 per source	1 per source	1 per source	1 per source
Atterberg Limits ASTM D43	1 per source	-	-	1 per source
Compaction ASTM D1557	1 per source	-	-	-
Compaction ASTM D698	1 per source	-	1 per source	1 per source
Carbonate Content ASTM D3042 or D4373 modified	-	1 per source	-	-
Permeability USCOE EM1110-2-1906	-	-	-	-
pH ASTM D4972	-	-	-	-
Baker Soil Fertility Test	-	-	-	-
Direct Shear Test	1 per source	-	-	-

(b) Additional confirmatory testing may be required by the Trustee Representative to confirm compliance with the specifications.

(c) The Contractor shall submit certification of compliance along with a minimum of 100 pounds of each proposed material from each source which is proposed for use.

(d) The Contractor shall not proceed with backfill or fill operations until the Trustee Representative has approved the proposed materials.

(e) If in the opinion of the Trustee Representative the Contractor's proposed soil is unsuitable for the proposed application, the Contractor shall submit the above certification for material of another type or from another source for consideration by the Trustee Representative.

(f) The origin of off-Site soil shall be approved by the Trustee Representative. The Contractor shall be responsible for ensuring that off-Site materials are free from chemical and organic contamination. The Trustee Representative may at any time require that the Contractor provide evidence of chemical tests to demonstrate that the materials are clean. Any contaminated soil which is placed must be removed at the Contractor's expense.

PART 3 - EXECUTION

3.01 Precautions

(a) Backfilling shall not be performed with frozen materials, over ice, or over uncompacted subgrades unless accepted by the Trustee Representative.

(b) Due care shall be exercised to avoid damage to previously placed fill; cover materials, such as geosynthetics; utilities; adjacent trees; and shrubbery that are not to be removed.

3.02 Backfilling

(a) Backfill shall not be placed until the structure, pipeline, subgrade or other construction component has been inspected in place and approved. The extent of pipe trenches left open shall be kept to a minimum.

(b) Unless otherwise directed, excavations shall be backfilled as soon as possible after structures are constructed, subgrades are exposed, pipes are laid and the work is inspected, tested as required and accepted, and permission to backfill has been given by the Trustee Representative. Immediately prior to backfilling, all rubbish, debris, forms and similar materials shall be removed from the excavations.

(c) Subgrade shall be proofrolled prior to placement of fill or backfill. Proofrolling shall be performed with a roller weighing at least 10 tons.

(d) Backfill shall be brought up evenly on each side of structures when applicable, and for their full length. The thickness of each compacted layer shall not exceed that specified under Article 2.01 unless specified otherwise or as directed by the Trustee Representative. Care shall be taken to ensure that no damage is done to structures or protective coatings thereon.

(e) Where sheeting is withdrawn, all cavities left thereby shall be filled with sand, hosed or tamped in place so as to fill all voids thoroughly.

(f) Composted organic material shall be used in thin lifts in areas of the Site where slopes do not exceed 8H:1V. Composted material shall be blended with fill soil in the following manner. Fill soil and composted material shall be spread in alternate lifts not exceeding six inches in loose thickness. Composted material shall be tilled into the underlying soil lift prior to compaction. A maximum thickness of three feet of this blended material will be allowed in any location.

(g) Grading fill for the hide piles shall be placed in essentially horizontal lifts constructed by working from toe of slope toward the crest of slope. Maximum lift thickness shall be 12 inches. Sliver fill shall not be allowed. For shallow fills near the crests of slopes the fill may be placed in lifts sub-parallel to the slope.

3.03 Trench Backfill Procedures

(a) Before placing any material over the subgrade, the Trustee Representative must visually inspect the exposed surface to evaluate the suitability of the subgrade and ensure that the surface is properly compacted, smooth, and uniform and elevations are consistent with the construction plans. The subgrade must be proof-rolled using acceptable equipment and procedures. Soft or unsuitable subgrade material shall be removed as directed by the Trustee Representative and replaced with compacted fill.

(b) Pipes shall be bedded and backfilled as shown on the Construction Plans or as directed by the

Trustee Representative. Care shall be taken to place and compact material under pipe haunches.

(c) All trenches shall be backfilled with the subangular stone as soon as possible after the geotextile or geomcomposite and pipes have been installed to assure protection against damage.

(d) The stone bedding and backfill shall be compacted with the compaction effort acceptable to the Trustee Representative. The compaction effort shall be applied to both the bedding and the backfill around the pipes. The method of compaction shall not damage the pipe, the flexible membrane liner or geotextile.

(e) Trenches shall be backfilled by hand to a depth of not less than 12 inches above the top of the pipe, for the full width of the trench. Such backfill shall be uniformly placed in 6-inch maximum thickness layers. Care shall be taken not to dislodge or damage the pipe. Each layer shall be compacted before the next layer is placed.

(f) The Trustee Representative will at any time inspect the stone in the trenches or in stockpile on-Site for contamination and, if necessary, reject all or portions of the stone.

3.04 Compaction of Backfill

(a) The density of all backfill shall be at least equal to that specified in Article 3.06. The moisture content of the backfill material shall be such that proper compaction may be obtained. Puddling for compacting will not be permitted.

(b) Hand-operated plate type vibratory or other suitable equipment may be used in areas not accessible to larger rollers or compactors, and to avoid damaging pipes or structures.

3.05 Filling

(a) Areas on which embankments for runoff and runon containment berms, or other fill will be constructed shall be cleared and prepared as for backfilling. Immediately prior to filling, the subgrade shall be proofrolled unless otherwise specified. All unsuitable material as determined by the Trustee Representative shall be removed prior to filling except as approved by the Trustee Representative.

(b) Fill shall be brought up in essentially horizontal uniform lifts throughout the area. The lift thickness shall not exceed 12 inches before compaction.

3.06 Compaction of Fill

(a) Unless otherwise shown or specified, the minimum density of fill shall be 95 percent of maximum dry density, as determined by the Standard Proctor Test (ASTM D698).

3.07 Fill Under Gas Treatment System Floor Slab

(a) Prior to placing select fill for support of the gas treatment system slab, the subgrade shall be scarified to a depth of 6 inches and recompacted to minimum density of 95 percent of maximum dry density, as determined by the Modified Proctor Test (ASTM D1557).

(b) Select fill shall be placed in lifts not exceeding 8 inches in uncompacted thickness and compacted to a minimum degree of compaction of 95 percent as determined by the Modified Proctor Test (ASTM D1557).

3.08 Road Subbase

(a) No subbase material shall be placed without the approval of the compacted subgrade by the Trustee Representative.

(b) Subbase material shall be placed in uniform lifts not exceeding 10 inches in loose thickness. It shall be compacted to at least 95 percent of the Standard Proctor Density value for the material.

(c) No material shall be placed unless approved by the Trustee Representative.

(d) The Contractor shall submit to the Trustee Representative for approval, evidence that the material proposed for use as Road Subbase is suitable for the proposed application. The evidence shall include evaluation of subgrade soils and bearing of subbase.

(e) If in the opinion of the Trustee Representative the Soil is unsuitable for the proposed application then the Contractor shall submit to the Trustee Representative the required evidence

as specified above for soil from a difference source.

3.09 Temporary Berm Construction

Temporary runoff containment soil berms shall be constructed in accordance with the Guidelines for Erosion & Sediment Control by the project specifications and the Massachusetts Soil Conservation Service and as required by the sequencing of the construction activities.

3.10 Compacted Clay Berm

(a) Compacted clay berms located within the recharge basin shall be constructed using lifts no greater than 6 inches.

(b) Clay shall be compacted to achieve a minimum dry density of 95 percent of maximum.

(c) Clay shall be compacted at a moisture content between 2 percentage points below and 4 percentage point above the optimum moisture content.

3.11 Field Quality Control

(a) Testing of fill shall be performed for each lift. Any areas that do not meet the above requirements shall be reworked by providing additional compaction effort until acceptable test results are obtained. The Contractor shall not proceed with a new lift of material until the Trustee Representative has confirmed that the previous lift has attained the required density.

(b) Tests for the backfill and fill materials will be made by a testing laboratory employed by the Trustee as follows:

Test Required (ASTM Designations)	Frequency of Tests
During Construction	
(a) Mechanical Analysis - D422	One test per 5,000 cubic yards in place
(b) Liquid Limit - D4318	One test per 5,000 cubic yards in place
(c) Plastic Limit - D4318	One test per 5,000 cubic yards in place

(d)	Field Density - D2992	A minimum of nine test per lift per acre and one per 100 L.F of pipe trench.
(e)	Field Moisture - D3017	A minimum of nine tests per lift per acre and one per 100 L.F. of pipe trench.
(f)	Maximum Density - D1557	A minimum of one test per 5,000 cubic yards of material in place.
(g)	Maximum Density - D698	A minimum of one test per 5,000 cubic yards of material in-place.

(c) In areas where the degree of compaction is doubtful, or the uniformity of materials is not maintained, additional tests will be made as directed by the Trustee Representative.

END OF SECTION

SECTION 02233

SUBANGULAR STONE

PART 1 - GENERAL

1.01 Description of Work

(a) The Contractor shall furnish all labor, materials, equipment, tools and appurtenances required to complete the work of furnishing, placing and compacting the subangular stone as shown, specified or required.

1.02 Related Work Specified Elsewhere

(a) Backfill and Fill - Section 02223
(b) Geotextile - Section 02595
(c) Geocomposite - Section 02597
*(d) Below Grade Gas Collection System - Section 15300

PART 2 PRODUCTS

2.01 Material

(a) The material shall be clean, sound, tough, and durable, non-carbonate, subangular, subrounded or round stone, not lumpy, and free from slag, cinders, ashes, rubbish, or other deleterious material.

(b) The Contractor shall maintain a uniform gradation of subangular stone.

(c) Stone shall be stored in designated areas approved by the Trustee Representative and Trustee. The Contractor is responsible for maintaining the stone free of contamination, and any stone determined by the Trustee Representative to be contaminated, shall not be incorporated into the work.

(d) Gradation

*(1) Gas Collection Layer

The material shall meet the following grading requirements (AASHTO No. 8) and have a minimum permeability of 1 cm/sec.

Openings or Sieve Size	Percent Passing by Weight
1/2 inch	100
3/8 inch	85-100
No. 4	10-30
No. 8	0-10
No. 16	0-5

(2) Subangular Stone for East Hide Pile drainage collection trench, gravel road surface, transition area surface, gravel surface cover, pipe bedding and underwater fill for utility corridor, if required, shall meet the following grading requirements. (AASHTO No. 57)

Opening or Sieve Size	Percent Passing by Weight
1 1/2 inch	100
1 inch	95-100
1/2 inch	25-60
No. 4	0-10
No. 8	0-5

(3) Streambed Sediment Filter

Stream bed sediment filter material shall be either AASHTO No. 2 or AASHTO No. 67 as shown on the drawings. AASHTO No. 2 material shall meet the following grading requirements.

Openings or Sieve Size	Percent Passing by Weight
3 inch	100
2 1/2 inch	90-100
2 inch	35-70
1-1/2 inch	0-15
3/4 inch	0-5

(4) Streambed Sediment Filter
AASHTO No. 67 material shall meet the following grading requirements.

Opening or Sieve Size	Percent Passing by Weight
1 inch	100
3/4 inch	90-100
3/8 inch	20-55
No. 4	0-10
No. 8	0-5

(5) Dagata Property Stormwater Detention Basin Backfill
AASHTO No. 3 material shall meet the following grading requirements.

Opening or Sieve Size	Percent Passing by Weight
2-1/2 inch	100
2 inch	90-100
1-1/2 inch	35-70
1 inch	0-15
1/2 inch	0-5

(e) The material shall have a carbonate content of 5 percent or less as measured by ASTM D3042 or D4373 modified.

2.02 Testing

(a) The Contractor shall submit to the Trustee Representative certification that the materials proposed for use as subangular stone comply with specification for the proposed application. The certification shall include, but not necessarily be limited to providing a minimum of one per source of each of the following tests:

(1)	Grain Size	ASTM D422
(2)	Permeability	USCOE EM1110-2-1906
(3)	Carbonate Content	ASTM D3042 or D4373 modified

(b) Additional confirmatory testing may be required by the Trustee Representative to confirm compliance with the specifications.

(c) The Contractor shall submit to the Trustee Representative certification of compliance above along with a minimum 100-pound sample of each proposed material for each proposed source of subangular stone.

(d) No material shall be placed unless approved by the Trustee Representative.

(e) If in the opinion of the Trustee Representative the material is unsuitable for the proposed application, then the Contractor shall submit to the Trustee Representative the required certification as specified in (a) above for material from a different source.

PART 3 - EXECUTION

3.01 Placement

(a) A uniform layer of subangular stone shall be placed to the lines, depths and grades as shown on the Drawings.

(b) Backfilling of subangular stone shall be performed by the Contractor in a manner such that the material is kept clean and free of foreign materials.

(c) The Trustee Representative will at any time inspect the stone in the trenches or in stockpile on-Site for contamination and, if necessary, reject all or portions of the stone.

*This item is not included with this Contract.

END OF SECTION

SECTION 02242

IMPERMEABLE AND PERMEABLE COVER FILL

PART 1 - GENERAL

1.01 Description of Work

The Contractor shall furnish all labor, materials, equipment, tools and appurtenances required to complete the work of furnishing, placing, and compacting select soil fill as shown, specified or required.

1.02 Related Work Specified Elsewhere

(a) Excavation - Section 02220
(b) Geotextile - Section 02595
(d) Flexible Membrane Cover - Section 02597
(e) Subangular Stone - Section 02233
(f) Below Grade Gas Collection System - Section 15300
(g) Backfill and Fill - Section 02223

1.03 Tolerances

(a) Minimum thicknesses of cover soil shall be as follows except as approved by the Trustee Representative:

Permeable Cover

12 inches of select soil fill
4 inches of topsoil

Impermeable Cover

14 inches of select soil fill
4 inches of topsoil

(b) The tolerance, in thickness for cover sections constructed of soil fill is - 0.0 foot and + 0.3 foot.

PART 2 - PRODUCTS

2.01 Materials

(a) Cover soil fill.

(1) Cover soil fill shall conform to the requirements for compacted fill as specified

in Section 02223, Backfill and Fill, except that it shall be clean material from an off-Site source not containing rocks, stones, or lumps larger than 2 inches in any dimension. It shall have physical properties such that it can be readily spread. Snow, ice, and frozen soil shall not be permitted.

(2) Cover soil fill shall be composed of clean subangular material free of any sharp objects which could tear, puncture, or otherwise damage the geotextile, geocomposite, geogrid or HDPE geomembrane.

(b) Topsoil

(1) Topsoil shall be sandy loam, suitable to support vegetative growth.

(2) Topsoil shall not contain stones, lumps, roots, or similar objects larger than 2 inches in any dimension.

(3) Topsoil shall have a pH between 5.8 and 7.6.

(4) Topsoil shall have a minimum organic content of 2.75 percent by weight.

(5) The gradation of the topsoil shall be within the following ranges:

(1) If more than one-half the sand is smaller than 0.5 mm:

Sand (2.000 mm to 0.050 mm) - 40% to 80%
Silt (0.050 mm to 0.005 mm) - 0% to 30%
Clay (0.005 mm and smaller) - 0% to 30%

(2) If more than one-half the sand is larger than 0.5 mm:

Sand (2.000 mm to 0.050 mm) - 40% to 75%
Silt (0.050 mm to 0.005 mm) - 0% to 30%
Clay (0.005 mm and smaller) - 0% to 30%

(C) Verification of the above specifications shall be supplied to the Trustee Representative prior to delivery of the cover soil material. The Trustee Representative may request the Contractor to supply samples of material being placed, for testing by the Trustee Representative if he feels the properties of the material have changed or do not conform to the specifications.

2.02 Testing

(a) The Contractor shall submit to the Trustee Representative for approval, certification that the materials proposed for use as cover soil fill and topsoil comply with the specifications for the proposed application. The necessary certification shall consist of information provided by the material supplier including, the following:

(1) Select Cover Fill

- Grain Size	ASTM D422

(2) Topsoil

- Grain Size	ASTM D422
- pH	ASTM D4972
- Baker Soil Fertility	

A minimum of one test per source for each required test shall be provided.

The material to be used for select cover fill shall also have a minimum demonstrated interface friction angle with the 16 ounce geotextile or geocomposite of 26 degrees. The interface friction angle shall be determined by the Contractor using a direct shear testing method approved by the Trustee Representative. Inclined table tests will not be allowed. The tests shall be performed under saturated conditions with confining pressures over the range of 50 to 300 pounds per square foot. The direct shear testing shall be completed with the soil material in a loose, uncompacted state to represent anticipated field conditions.

A minimum of 3 specimens at varying confining pressures over the specified range are required to establish the friction angle between each geosynthetic and soil.

(b) The Contractor shall submit to the Trustee Representative evidence as specified in (a) above along with a minimum 100-pound sample of the proposed soil for each different source of the soil.

(c) No material shall be placed unless approved by the Trustee Representative.

(d) If in the opinion of the Trustee Representative the soil is unsuitable for the proposed application, then the Contractor shall submit to the Trustee Representative the required suitable evidence as specified in (a) above for soil from a different source.

PART 3 - EXECUTION

3.01 Installation

(a) This item shall consist of the placement of select fills and topsoil at locations shown on the drawings. The Contractor shall provide all the required materials, labor, and equipment to perform the work in accordance with these Specifications.

(b) Select cover soil fill and topsoil shall be installed to the lines and grades as illustrated on the Construction Plans.

(c) No material shall be placed until the Trustee Representative has approved the installation of the underlying baseliner materials.

(d) Permeable cover soil fill shall be placed directly above the geosynthetic.

(e) The Contractor shall use extreme care in the placing of the materials over geosynthetics to avoid damage. The material shall be placed in a manner that will maintain a minimum thickness of 1 foot of material between the geosynthetic and the spreading equipment. All equipment to be used in this spreading operation shall be approved by the Trustee Representative.

(f) The Contractor shall take care to insure that:

(1) The underlying components remain intact during the installation of select soil fill. The location of the gas collection pipelines shall be marked throughout the placing of all cover components.

(2) No vehicles shall drive on either the uncovered geotextile, geocomposite, geogrid, or the textured HDPE membrane.

(g) The Contractor shall insure that the select cover soil fills are free of any foreign objects to the complete satisfaction of the Trustee Representative prior to placement.

(h) Geotextile in transition areas along the limit of above grade cover shall be covered with a minimum of 6 inches of cover material.

3.02 Quality Control

(a) Test for the select or vegetative cover soil fill will be made by a testing laboratory employed by the Trustee as follows:

Test Required (ASTM Designations)	Frequency of Tests
(1) Mechanical Analysis-D422 (Both)	A minimum of one test per 2,000 c.y. of in place material
(2) Baker Soil Fertility Test (Topsoil Only)	One per 2,000 c.y. per source
(3) Direct Shear Testing (Fill/Geosynthetic)	One per 2,000 c.y. per source for soils used as cover on hide piles

(b) In areas where the uniformity of materials is not maintained, additional tests will be made as directed by the Trustee Representative.

(c) The thickness of the select soil fill shall be determined by comparison of as-built survey of the top of the preceding layer to the top of the completed, select soil fill at the locations of a previously established 50-foot control grid.

END OF SECTION

SECTION 02243

WETLAND SEDIMENT REMEDIATION COVER

PART 1 - GENERAL

1.01 Description of Work

(a) The Contractor shall furnish all labor, materials, equipment, tools, and appurtenances required to complete the work of furnishing, and placing the wetland sediment remediation cover as shown, specified or required.

(b) The Contractor shall be responsible for selecting a method acceptable to the Trustee Representative for placing the wetland sediment remediation cover.

(c) The Contractor is responsible for providing a preconstruction and an as-built bathymetric survey of the completed wetlands sediment remediation cover.

(d) The Contractor shall provide all necessary techniques to stop sediment created from construction activities from leaving the Site boundaries.

1.02 Related Sections

(1) Backfill and Fill - Section 02223
(2) Wetland Mitigation - Section 02937
(3) Geotextile - Section 02595
(4) Dredging - 02222
(5) Impermeable and Permeable Cover Fill - 02242
(6) Temporary and Permanent Erosion and Sedimentation Control - 02125

1.03 Related Document

None

1.04 Quality Assurance

(a) The thickness of each cover soil layer shall be verified by means of a bathymetric survey before placing of the next cover soil layer.

(b) Final cap thickness shall be verified by an as-built bathymetric survey, with a 20 foot control grid and also indicate the limits of remediation.

(c) Survey shall be based on N.G.V.D datum and be prepared by professional surveyor licensed to survey in the Commonwealth of Massachusetts.

1.05 Submittals

(a) Prior to construction, the Contractor shall submit for approval of the Trustee Representative the proposed capping construction technique. An as-built bathymetric survey shall be submitted upon completion of capping.

(b) The Contractor shall submit Shop Drawings showing proposed construction methods; geosynthetic panel arrangements; and tie-in details between geosynthetics, drainage structures, fill and materials, the like.

1.06 Job Conditions

None

PART 2 - PRODUCTS

2.01 Materials

(a) Gravel used in the sediment remediation cap shall meet the requirements of Section 02223 for Road Structural Fill.

(b) Topsoil used in the sediment remediation cap shall meet the requirement of Section 02937 for Topsoil.

PART 3 - EXECUTION

3.01 General

(a) All appropriate erosion and sediment control devices shall be installed prior to construction of the wetland sediment remediation cover.

(b) No soil material shall be placed until the Trustee Representative has approved the installation of the underlying geotextile.

(c) In placing the remedial cover, the Contractor shall take every precaution so as to minimize sediments into the water of the wetlands.

(d) The Contractor shall not proceed with the wetland sediment remediation cover until given authorization by the Trustee Representative.

(e) The tolerance in each soil layer placed shall be -0 to +0.3 feet.

END OF SECTION

SECTION 02244

STREAM SEDIMENT REMEDIATION COVER

Part 1 - General

1.01 Description of Work

(a) The Contractor shall furnish all labor, materials, equipment, tools, and appurtenances required to complete the work of furnishing and placing the stream sediment remediation cover

(b) The Contractor shall be responsible for selecting an excavation method acceptable to the Trustee Representative

(c) The Contractor shall provide all necessary techniques to stop sediment created from construction activities from leaving the Site boundaries.

(d) The Contractor shall be responsible for providing any dewatering operations that may be required to implement the stream sediment remediation.

1.02 Related Sections

(1) Geotextile - Section 02595
(2) Excavation - Section 02220
(3) Temporary and Permanent Erosion Control - Section 02125
(4) Backfill and Fill - Section 02223
(5) Stone Rip-rap - Section 02271
(6) Dredging - Section 02222

1.04 Submittals

(a) The Contractor shall submit all construction methods to the Trustee Representative for his review and approval.

(b) The Contractor shall submit Shop Drawings showing proposed construction methods; geosynthetic panel arrangements; and tie-in details between geosynthetics, drainage structures, fill materials, and the like.

Part 2 - Products

2.01 Materials

(a) Gravel/cobble used in the stream sediment remediation cover shall meet the requirements of Section 02271.

(b) Geotextile used in the stream remediation cover shall meet the requirements of Section 02595.

Part 3 - Execution

3.01 General

(a) The Contractor shall not proceed with any activities within the streams without prior authorization from the Trustee Representative.

(b) All appropriate erosion and sediment control devices shall be installed prior to construction of the stream sediment remediation cover.

(c) Sediments that are removed from below the stream water surface shall be delivered to a prepared dewatering area before being used for fill material.

(d) Excavation limits shall correspond to the limits as shown on the construction drawings.

(e) Where the stream sediment remedy requires the placement of gravel/cobble, extreme care shall be used in placing materials over the geotextile to avoid damage. Any damage to the geotextile will be repaired as stated in Section 02595. The Trustee Representative may require an extra geotextile cushion layer when the method of placement of the cover material causes holes from free falling material.

(f) The tolerance in placing material shall be -0 to +0.3 feet.

END OF SECTION

SECTION 02271

STONE RIP-RAP

PART 1 - GENERAL

1.01 Description of Work

(a) The Contractor shall provide all labor, materials, equipment, tools and appurtenances required to complete the work of furnishing and placing stone rip-rap, gravel/cobble lining, as shown, specified or required.

1.02 Related Section

(a) Temporary and Permanent Erosion and Sedimentation Control - Section 02125
(b) Geotextile - Section 02595.

1.03 Submittals

(a) The Contractor shall submit test reports for abrasion tests, freeze/thawing tests, and specific gravity to the Trustee Representative at least 3 weeks prior to delivery of material to the site.

(b) The Contractor shall submit Shop Drawings showing proposed construction methods; geosynthetic panel arrangements; and tie-in details between geosynthetics, drainage structures, fill materials, and the like.

PART 2 - PRODUCTS

2.01 Gravel/Cobble

(a) Gravel/cobble lining as indicated on the construction plans shall meet all requirements of this section.

2.02 Rip-Rap

(a) The stone rip-rap shall sustain a loss of not more than 40 percent after 500 revolutions in the ASTM abrasion test (Los Angles machine - ASTM C535), and shall sustain a loss of not more than 10 percent after 12 cycles of freezing and thawing (AASHTO Test 103 for Ledge Rock Procedure A).

Stone rip-rap shall have a minimum specific gravity of 2.50, as defined by ASTM C127).

(b) The rip-rap shall be composed of a clean, well-graded mixture such that 50 percent of the mixture by weight shall be larger than the d_{50} size as determined from the design. The diameter of the largest stone size in such a mixture shall be 1.5 times the d_{50} size. (ASTM C136 or ASTM D422)

(c) The breadth or thickness of a single stone shall not be less than 1/3 its length.

2.03 Testing

(a) A minimum of three stone rip-rap samples or less if requested by the Trustee Representative shall be tested from each source of supply. The tests will be performed by an approved testing laboratory. Test results shall be submitted to the Trustee Representative in accordance with Subsection 1.03.

PART 3 - EXECUTION

3.01 Installation

(a) Stone rip-rap shall be placed to thicknesses as indicated on Construction Plans. The minimum thickness for rip-rap transition areas shall be the d_{50} dimension for the given application or 6 inches which ever is larger.

(b) Stone rip-rap shall be placed in a manner that will not damage geotextile, synthetics, utilities or other facilities. The Trustee Representative may require a trial run of any placement method to evaluate impact or damage to the geotextile, synthetics, utilities or other facilities.

(c) The tolerance in rip-rap thickness in place shall be -0 to +0.3 feet.

END OF SECTION

SECTION 02275

GABIONS

PART 1 - GENERAL

1.01 Description of Work

(a) The Contractor shall furnish all labor, materials, equipment, tools and appurtenances required to complete the work of furnishing, placing the gabion baskets, and backfilling with gabion stone as shown, specified or required.

1.02 Related Work Specified Elsewhere

(a) Excavation - Section 02220
(b) Backfill and Fill - Section 02223
(c) Geotextile - Section 02595
(d) Geocomposite - Section 02597
(e) Stone Rip-Rap - Section 02271

PART 2 - PRODUCTS

2.01 Material

(a) Gabion Baskets

(1) The gabions shall be the size and type called for on the plans with a maximum length of 6 feet and shall be PVC coated.

(2) All wire used in the construction of galvanized gabion baskets including the tie wire shall be equal to or shall exceed Federal Specification QQ -W-461h, wire, steel, carbon including the following specific requirement: Finish 5, Class 3 weight of zinc coating.

(3) PVC coated wire used in the construction of galvanized gabions, with a gabion thickness of 12-inches or greater, shall meet the following diameters:

Mesh PVC Coated Wire: Nominal 0.106 +/- 0.004-inches or approximately U.S. 11 gauge.

Selvedge PVC Coated Wire: Nominal 0.134 +/- 0.004-inches or approximately U.S. 9 gauge.

The wall thickness of one side for the PVC coating shall not be less than 0.014 inches.

PVC Coated Tie Wire: Nominal 0.093 +/- 0.004-inches or approximately U.S. 13 gauge.

Locking Wire Fastener shall be of stainless steel with a minimum thickness of 0.125 +/- 0.004 inches or approximately U.S. 11 gauge.

All testing of wire diameters shall be prior to fabrication.

(4) Tie wire or locking wire fasteners shall be supplied for securely fastening all edges of the gabion baskets and diaphragms. Tie wire shall be included in sufficient quantity for tying all gabion baskets in accordance with the specifications. No other wire except for the type supplied with the gabions shall be used.

(5) Mesh opening of the gabions shall be approximately 3-1/4 x 4-1/2-inch and shall be fabricated in a uniform hexagonal shaped, double twisted, non-ravelling pattern.

(6) All cut edges of the mesh shall be securely attached to the selvedge wire by a minimum or two complete turns of the mesh wires around the selvedge wire or locking wire fasteners applied every 4-1/2 inch mesh opening along the joints of the gabion.

(7) Gabion baskets furnished by the manufacturer shall be of uniform size and subject to dimension tolerance limit +/- 5%. All wire used, including tie wire, and locking fasteners shall be certified by mill test reports showing compliance with specification requirements.

(b) Gabion Rock

(1) The rock (gabion rock) shall be clean, sound, tough, and durable, non-carbonate, subangular, subrounded or round stone, not lumpy, and free from slag, cinders, ashes, rubbish, or other deleterious material and conform to the requirements of Section 02271 with a d50 of 6 inches.

(2) The Contractor shall maintain a uniform gradation of subangular stone that is reasonably well graded with a minimum size of 4 inches to a maximum size of 10 inches. The larger rock should be deposited in the center of the cell.

(3) Stone shall be stored in designated areas approved by the Trustee Representative. The Contractor is responsible for maintaining the stone free of contamination, and any stone determined by the Trustee Representative to be contaminated, shall not be incorporated into the work.

(4) Rock shall be hand or equipment placed so as to produce a reasonably homogeneous stable fill that contains no segregated pockets of large or small fragments or unfilled spaces because of bridging.

(c) Geotextile

(1) Geotextiles used as a filter media shall be 16 ounce and shall be placed along the gabion structure shown in the Drawings. The geotextile type shall be as specified on the plan and as described in Geotextile - Section 02595.

(2) The geotextile shall be placed with a minimum overlap of 18 inches.

PART 3 - EXECUTION

3.01 Placement

(a) The gabions shall be placed to the lines, depths and grades as shown on the Drawings and shall be in strict accordance with these specifications. The trench for the gabion shall be excavated in accordance with Section 02220, Excavation, and the bottom of the excavation shall be proofrolled in accordance with Section 02223 for trenches.

(b) All tying of the gabions in each step of construction shall be done in the following manner:

(1) Cut a length of tie wire approximately 5 feet long, secure the wire at one end by looping and twisting together, then proceed tying with a double loop (made at the same point)

every 4 to 5-inches apart, pulling the basket pieces tightly together. Secure the end of the wire by again looping and twisting.

(2) Gabion baskets are assembled by unfolding the baskets on a hard flat surface and stamping out all kinks. Fold up the front, back and end panels and fasten together with the projecting heavy gauge wire by twisting it around the selvedge wire two (2) complete turns. As an alternative, the gabion baskets may be fastened along the sides, front, and back using locking wire fasteners. The fasteners shall be applied at every 4-1/2 inch mesh opening. Fold the diaphragms up and secure in the same manner. All end panels and diaphragms then tied to the sides.

(3) Gabion baskets shall be placed in position empty and shall be tied together each to its neighbor along all contacting edges in order to form a continuous connecting structural unit. Gabions 3-feet high, that are to be placed in a straight row are to be stretched in the following manner before being tied to the adjacent gabions. Tie together approximately 100 feet of gabion baskets and fill one gabion cell on the end to hold the row in place or tie the end gabion to an existing gabion already filled and then stretch the row of baskets with a come-a-long or other suitable means until the row of baskets is stretched sufficiently to remove the kinks. Do not overstretch. While maintaining tension, tie the row of baskets to its neighbor.

(4) When the assembled empty baskets have been installed, the gabion stone shall then be placed in the following manner. The gabion baskets shall be filled a minimum of 2 layers, however, the rock must be manipulated by hand to accomplish a maximum density and a minimum amount of voids. Individual cells may not be filled more than 12-inches above any adjacent cell unless looped inner tie wires run in both directions. Care shall be taken when placing the stone into the baskets to insure that the baskets are not damaged or bent. Edges of baskets and diaphragms may be protected by tying steel reinforcement to the baskets or other suitable means. Retaining walls shall have the rock in vertical outside

surfaces placed by hand with large select stone in order to achieve the best appearance. Care shall be taken that the individual cells do not bulge outward and that the rows are straight, level and have square corners.

(5) When each basket has been filled to its maximum, which is slightly higher than the sides, and the surface leveled with a minimum amount of voids, the lids shall be pried down and over with a bar or lid closing tool until the edge of the lid and the edge of the basket are together. It should require a light stretching in order to bring the two basket pieces together. The heavy projecting wire on the lid shall then be twisted around the heavy wire on the sides two complete turns and the lid shall then be tied to the sides and tops of the diaphragms in the same manner as the baskets are assembled. The lids of the gabion baskets shall also be tied together, each to its neighbor along all contacting edges to insure the formation of a continuous connecting structural unit. Special attention shall be given that all projecting sharp ends are turned in.

(6) Gabion baskets may be cut to form curves or bevels. Re-tying shall be in a manner to produce a closed cell and re-tying of the basket shall be in a manner as the assembly. Excess mesh wire shall be cut off or be tightly and neatly laced down.

(7) Gabion basket walls shall have the baskets arranged so that end baskets are protected from erosion. Where excavation is permitted or the fill is sufficient, the gabion wall shall be turned in toward the slope, and the end covered.

(8) Gabion baskets should be staggered so that vertical joints in successive layers do not form a continuous joint up the wall.

3.02 Quality Control

(a) Proper tying of all joints and the baskets being filled to their maximum density with a minimum amount of voids is very critical to the performance of the gabions. Therefore, compliance with the technical specification shall be closely and thoroughly inspected and any work not meeting the implied quality shall be rejected.

END OF SECTION

SECTION 02575

REMOVING AND PLACING PAVEMENT

PART 1 - GENERAL

1.01 SCOPE

The work to be performed under this Section shall consist of repair of damaged pavement and removing and replacing existing pavement, sidewalks and curbs in paved areas where such have been removed for construction. Damaged pavement shall be repaired by removing and replacing pavement. Cold patch is not allowed.

1.02 SUBMITTALS

(a) Certificates: Provide certificates stating that materials supplied comply with Specifications. Certificates shall be signed by the asphalt producer and the Contractor.

(b) Mix Design: Submit mix design for each course to the Trustee Representative for acceptance.

1.03 REFERENCE SECTIONS

(a)	Excavation	Section 02220
(b)	Backfill and fill	Section 02223
(c)	Concrete	Section 03300

1.04 QUALITY ASSURANCE

(a) Unless otherwise indicated on the Drawings or herein specified, all work under this Section shall be performed in accordance with the current Massachusetts Department of Public Works Standard Specifications.

(b) Testing shall be conducted in accordance with the section entitled "Testing Laboratory Services" of these Specifications.

(c) Furnish weight slips for all material incorporated in the Project to verify that the required tonnage has been applied.

1.05 PRODUCT HANDLING

(a) Protection: Use all means necessary to protect the materials of this Section before, during and after installation and to protect the installed work and materials of all other trades.

(b) Replacement: In the event of damage, immediately make all repairs and replacements necessary to gain the approval of the Trustee Representative at no additional cost to the Trustee.

PART 2 - PRODUCTS

2.01 MATERIALS AND CONSTRUCTION

(a) General: All materials and products for the work under this Section shall conform to the current Massachusetts Department of Public Works Standard Specifications except as otherwise specified herein. The pavement section shall be as shown on the drawings.

(b) Graded Aggregate Base Course: The required base course thickness shall be as shown on the Drawings and a width equal to the width of the finished paving. Furnish stone meeting the requirements of the Massachusetts Department of Public Works Standard Specifications.

(c) Binder Course: The binder for all paved roadways and parking areas shall conform to the requirements of the Massachusetts Department of Public Works Specifications for the Binder Course. The base shall be applied for an average total thickness after compaction of not less than the thickness shown on the plans and shall not vary in thickness at any point by more than 1/4-inch. Apply and compact the binder course in accordance with the City of Woburn Design Standards. After compaction, the binder course shall be smooth and true to established profiles and sections.

(d) Surface Course: The surface course for all pavement, including tack coat shall conform to the requirements of the Massachusetts Department of Public Works Specifications for Asphaltic Concrete. Apply and compact the surface course in accordance with the City of Woburn Design Standards. After compaction the surface course shall be of average thickness of not less than the thickness shown on the Drawings. Immediately correct any high, low or defective areas.

(e) Special Surfaces: Where driveways or roadways are disturbed or damaged which are constructed of specialty type surfaces, e.g. brick or stone, these driveways and roadways shall be restored utilizing similar, if not original, materials. Where the nature of these surfaces dictate, a specialty contractor shall be used to restore the surfaces to their previous or better condition. Special surfaces shall be removed and replaced to the limits to which they were disturbed.

2.02 TYPES OF PAVEMENTS

(a) General: All existing pavement removed, destroyed or damaged by construction shall be replaced with the same type and thickness of pavement as that existing prior to construction, unless otherwise directed by the Trustee Representative. Materials, equipment and construction methods used for paving work shall conform to the Massachusetts Department of Public Works specifications applicable to the particular type required for replacement, repair or new pavements.

(b) Concrete Pavement: Concrete pavement or base courses shall be replaced with concrete. The surface finish of the replaced concrete pavement shall conform to that of the existing pavement. The surface of the replaced concrete base course shall be left rough. The slab depth shall be equivalent to the existing concrete pavement or base course, but in no case less than 6-inches thick. Transverse and longitudinal joints removed from concrete pavement shall be replaced at the same locations and to the same types and dimensions as those removed. Concrete shall be of the strength classifications shown on the Drawings. Concrete pavements or concrete base courses shall be reinforced and shall conform to Massachusetts Department of Public Works Standard Specifications, Section 430.

(c) Asphalt Concrete Binder and Top Course: Asphalt concrete binder and top course construction shall conform to Massachusetts Department of Public Works Standard Specifications, Section 460. The pavement mixture shall not be spread until the designated surface has been previously cleaned and prepared, is intact, firm, properly cured, dry and the tack coat has been applied. Apply and compact the base in maximum layer thickness by asphalt spreader equipment of design and operation approved by the Trust Reprsentative. After

compaction, the gravel base shall be smooth and true to established profiles and sections. Apply and compact binder and the top course in a manner approved by the Trustee Representative. Immediately correct any high, low or defective areas by cutting out the course, replacing with fresh hot mix, and immediately compacting to conform and thoroughly bond to the surrounding area.

PART 3 - EXECUTION

3.01 EXCAVATION AND BACKFILL

(a) Perform excavating and filling in accordance with sections 02220 and 02223

3.02 NEW PAVEMENT INSTALLATION

(a) Placing the Mix

1. Do not begin paving work until unsatisfactory subgrade and base course conditions have been corrected as directed by the Trustee Representative.

2. Place the asphalt concrete mixtures on the prepared base surface, spread and strike-off using an acceptable bituminous paver.

3. Spread mixture at minimum temperature of 225 degrees F.

4. Inaccessible and small areas may be placed by hand.

5. Place each course in the required quantities so that when compacted, they will conform to the indicated grade, cross section and minimum thickness as specified or as indicated on the Drawings.

(b) Bond Coat

1. Clean contact surfaces of sand, dirt or other objectionable materials before applying bond coat.

2. Apply a bond coat to each layer of bituminous material immediately prior to applying the succeeding layer.

3. Use whatever means necessary to prevent bond coat from coming into contact with structures near the areas to be paved.

3.03 REMOVING PAVEMENT

(a) Remove existing pavement as necessary for installing the pipe line and appurtenances.

1. Marking: Before removing any pavement, mark the pavement neatly paralleling pipe lines and existing street lines. Space the marks the width of the trench. The extent of pavement removal shall be approved by the Trustee Representative.

2. Breaking: Break asphalt pavement along the marks using pavement shearing equipment, jack hammers or other suitable tools. Break concrete pavement along the marks by scoring with a rotary saw and breaking below the score by the use of jack hammers or other suitable tools.

3. Machine Pulling: Do not pull pavement with machines until the pavement is completely broken and separated from pavement to remain.

4. Damage to Adjacent Pavement: Do not disturb or damage the adjacent pavement. If the adjacent pavement is disturbed or damaged, remove and replace the damaged pavement.

5. Sidewalk: Remove and replace any sidewalks disturbed by construction for their full width and to the nearest undisturbed joint.

6. Curbs: Tunnel under or remove and replace any curb disturbed by construction to the nearest undisturbed joint.

3.04 REPLACING PAVEMENT

(a) Preparation of Subgrade: Upon completion of backfilling and compaction of the backfill, arrange to have the compaction tested by the independent testing agency approved by the Trustee Representative. After compaction testing has been satisfactorily completed, replace all pavements, sidewalks and curbs removed.

1. The existing street pavement or surface shall be removed along the lines of the work for the allowable width specified for the trench or structure. After the installation of the sewerage or water works facilities and after the backfill has been compacted suitably, the additional width of pavement to be removed shall be done immediately prior to replacing the pavement.

2. Trench backfill shall be compacted for the full depth of the trench as specified in Section 02223 of these Specifications.

3. Temporary trench backfill along streets and driveways shall include 6-inches of crushed stone or cherty clay as a temporary surfacing of the trenches. This temporary surface shall be maintained carefully at grade and dust-free by the Contractor until the backfill of the trench has been thoroughly compacted in the opinion of the Trustee Representative and permission is granted to replace the street pavement.

4. When temporary crushed stone or chert surface is considered by the Trustee Representative to be sufficient surface for gravel pavement, the surface shall be graded smooth and to an elevation that will make the final permanent surfacing level with the adjacent surfacing that was undisturbed.

(b) Pavement Replacement

1. Prior to replacing pavement, make a final cut in concrete pavement 12-inches back from the edge of the damaged pavement with a concrete saw. Remove asphalt pavement 12-inches back from the edge of the damaged pavement using pavement shearing equipment, jack hammers or other suitable tools.

2. Replace all street and roadway pavement as shown on the Drawings. Replace driveways, sidewalks and curbs with the same material, to nearest existing construction joint and to the same dimensions as those existing.

3. If the temporary crushed stone or chert surface is to be replaced, the top 6-inches shall be removed and the crushed stone surfacing for unpaved streets or the base for the bituminous surface shall be placed.

4. Following this preparation, the chert or crushed stone base shall be primed with a suitable bituminous material and surfaced with the proper type of bituminous surface treatment.

5. Where the paved surface is to be replaced with asphaltic concrete pavement, concrete pavement or with a concrete base and a surface course, the temporary chert or crushed stone surface and any necessary backfill material, additional existing paving and new excavation shall be removed. All edges of the existing pavement shall be cut to a straight, vertical edge. Care shall be used to get a smooth joint between the old and new pavement and to produce an even surface on the completed street. Concrete base slabs and crushed stone bases, if required, shall be placed and allowed to cure for three days before bituminous concrete surface courses are applied. Expansion joints, where applicable, shall be replaced in a manner equal to the original joint.

6. Where driveways or roadways, constructed of specialty type surfaces, e.g. brick or stone are disturbed or damaged, these driveways and roadways shall be restored utilizing similar materials. Where the nature of these surfaces dictate, a specialty contractor shall be used to restore the surfaces to their previous or better condition. Special surfaces shall be removed and replaced to the limits to which they were disturbed.

(c) Pavement Resurfacing

1. Resurfacing limits shall be perpendicular to the road centerline. The limits of resurfacing shall be 10 feet beyond the edge of the pavement replacement on the main road being resurfaced, and to the point of tangency of the pavement on the side streets.

(d) Pavement Striping: Pavement striping removed or paved over shall be replaced with the same type, dimension and material as original unless directed otherwise by the Trustee Representative.

3.05 SIDEWALK AND CURB REPLACEMENT

(a) Construction

1. All concrete sidewalks and curbs shall be replaced with concrete.

2. Preformed joints shall be 1/2-inch thick, conforming to the latest edition of AASHTO M59 for sidewalks and AASHTO M 123 for curbs.

3. Forms for concrete sidewalks shall be of wood or metal, shall be straight and free from warp, and shall be of sufficient strength, when in place, to hold the concrete true to line and grade without springing or distorting.

4. Forms for concrete curbs shall be metal and of an approved section. They shall be straight and free from distortions, showing no vertical variation greater than 1/8-inch in 10 feet and no lateral variation greater than 1/4-inch in 10 feet from the true plain surface on the vertical face of the form. Forms shall be of the full depth of the structure and constructed such to permit the inside forms to be securely fastened to the outside forms.

5. Securely hold forms in place true to the required lines and grades.

6. Wood forms may be used on sharp turns and for special sections, as approved by the Trustee Representative. Where wooden forms are used, they shall be free from warp and shall be the nominal depth of the structure.

7. All mortar and dirt shall be removed from forms and all forms shall be thoroughly oiled or wetted before any concrete is deposited.

8. Granite edging shall be replaced in accordance with Commonwealth of Massachusetts Department of Public Works Construction Standards. Damaged or broken pieces of

granite edging shall be replaced with stones of same dimension.

(b) When a section concrete is removed, the existing sidewalk or curb shall be cut to a neat line, perpendicular to both the centerline and the surface of the concrete slab. Existing concrete shall be cut along the nearest existing construction joints; if such joints do not exist, the cut shall be made at minimum distances shown on the Drawings.

(c) Existing concrete sidewalks and curbs that have been cut and removed for construction purposes shall be replaced with the same width and surface as the portion removed. Sidewalks shall have a minimum uniform thickness of 4-inches. The new work shall be neatly jointed to the existing concrete so that the surface of the new work shall form an even, unbroken plane with the existing surfaces.

(d) The subgrade shall be formed by excavating to a depth equal to the thickness of the concrete, plus 2-inches. Subgrade shall be of such width as to permit the proper installation and bracing of the forms. Subgrades shall be compacted by hand tamping or rolling. Soft, yielding or unstable material shall be removed and backfilled with satisfactory material. Two inches of porous crushed stone shall be placed under all sidewalks and curbs and shall be compacted thoroughly, then finished to a smooth, unyielding surface at proper line, grade and cross section.

(e) Joint for Curbs

1. Joints shall be constructed as specified. Construct joints true to line with their faces perpendicular to the surface of the structure and within 1/4-inch of their designated position.

2. Thoroughly spade and compact the concrete at the faces of all joints filling all voids.

3. Install expansion joint materials at the point of curve at all street returns. Install expansion joint material behind the curb at abutment to sidewalks and adjacent structures.

4. Place contraction joints every 10 feet along the length of the curbs and gutters. Form contraction joints using steel templates or division plates which conform to the cross section of the structure. Leave the templates in place until the concrete has set sufficiently to hold its shape, but remove them while the forms are still in place. Contraction joint templates or plates shall not extend below the top of the steel reinforcement or they shall be notched to permit the reinforcement to be continuous through the joint. Contraction joints shall be a minimum of 1-1/2-inches deep.

(f) Expansion joints shall be required to replace any removed expansion joints or in new construction. Expansion joints shall be true and even, shall present a satisfactory appearance, and shall extend to within 1/2-inch of the top of finished concrete surface.

(g) Finishing

1. Strike off the surface with a template and finish the surface with a wood float using heavy pressure, after which, contraction joints shall be made and the surface finished with a wood float or steel trowel.

2. Finish the face of the curbs at the top and bottom with an approved finishing tool.

3. Finish edges with an approved finishing tool having a 1/4-inch radius.

4. Provide a final broom finish by lightly combing with a stiff broom after troweling is complete.

5. The finished surface shall not vary more than 1/8-inch in 10 feet from the established grade.

(h) Driveway and Sidewalk Ramp Openings

1. Provide driveway openings of the widths and at locations as directed by the Trustee Representative.

2. Provide sidewalk ramp openings in conformance with the applicable regulations and as directed by the Trustee Representative.

(i) Concrete shall be suitably protected from freezing and excessive heat. It shall be kept covered with burlap or other suitable material and kept wet until cured. Provide necessary barricades to protect the work. All damage caused by people, vehicles, animals, rain, the Contractor's operations and the like shall be repaired by the Contractor, at no additional expense to the Trustee.

3.06 MAINTENANCE

The Contractor shall maintain the surfaces of roadways built and pavements replaced until the acceptance of the Project. Maintenance shall include replacement, scraping, reshaping, wetting and rerolling as necessary to prevent raveling of the road material, the preservation of reasonably smooth surfaces and the repair of damaged or unsatisfactory surfaces, to the satisfaction of the Trustee Representative. Maintenance shall include sprinkling as may be necessary to abate dust from the gravel surfaces.

3.07 SUPERVISION AND APPROVAL

(a) Pavement restoration shall meet the requirements of the regulatory agency responsible for the pavement. Obtain agency approval of pavement restorations before requesting final payment.

(b) Obtain the Trustee Representative's approval of restoration of pavement, such as private roads and drives, that are not the responsibility of a regulatory agency.

(c) Complete pavement restoration as soon as possible after backfilling.

(d) Failure of Pavement: Should any pavement restoration or repairs fail or settle during the life of the Contract, including the bonded period, promptly restore or repair defects.

3.08 CLEANING

The Contractor shall remove all surplus excavation materials and debris from the street surfaces and rights-of-way and shall restore street, roadway or sidewalk surfacing to its original condition.

3.09 INSPECTION AND TESTING

(a) Pavement and base testing will be performed by an independent testing agency selected by the Trustee Representative.

(b) The testing agency shall test in-place courses for compliance with specified density, thickness and surface smoothness requirements.

(c) The testing agency shall take two 4-inch diameter cores per 1,000 square yards of paved surface at locations selected by the Trustee Representative for density and thickness tests. Repair holes resulting from coring to match existing paving.

(d) Compaction

1. Aggregate Base: The maximum dry density will be determined from representative samples of the material being compacted by AASHTO:T180, Method D.

2. Asphaltic Concrete: Compare density of in-place material against laboratory specimen of same mixture, subjected to 50 blows of a Standard Marshall hammer on each side of specimen. Minimum acceptable density of in-place material shall be 97 percent of recorded laboratory specimen density. It is intended that acceptance density testing will be accomplished while the bituminuous mixture is hot enough to permit further densification if such is shown to be necessary. If the density does not conform to the requirements stated herein above, the Contractor shall continue compactive effort until the required density is obtained.

(e) Concrete Strength: One set of acceptance and field cylinders (a total of four) from the same batch of concrete will be made for each 50 cubic yards or fraction thereof, not less than once for each 5,000 square feet of pavement in each day's placing for each class and mix design.

1. Acceptance cylinders are compression test cylinders molded in the field, stored and cured in the field for the first 24 hours after moulding and thereafter in the laboratory of the testing agency until time of testing. Average breaking strength at 28

days of a set of two acceptance cylinders will comprise a test.

2. Field cylinders are compression test cylinders moulded in the field, stored and cured on the work site in the same location and subject to the same exposure as job concrete of which it is a representative. Each set of two acceptance cylinders will have two matching field cylinders.

3. One field cylinder will be broken at seven days and the remaining will be held in reserve.

(f) Allowable Variation in Thickness

1. Base Course: ±1/2-inch

2. Binder Course: ± 1/4-inch

3. Surface Course: ± 1/8-inch

(g) Surface Smoothness: Test finished surface of each asphalt course for smoothness using a 16 foot straightedge. Intervals of tests shall be as directed by the Engineer. Surfaces will not be acceptable if exceeding the following:

1. Base Course: 1/4-inch in 16 feet

2. Binder Course: 1/4-inch in 10 feet

3. Surface Course: 1/8-inch in 10 feet

END OF SECTION

SECTION 02595

GEOTEXTILE

PART 1 - GENERAL

1.01 Work Included

(a) The Contractor shall furnish all labor, materials, equipment, tools and appurtenances required to complete the work of furnishing, and placing geotextile, complete with appurtenances, as shown, specified or required.

1.02 Related Sections

(1) Backfill and Fill - Section 02223
(2) Stone Rip-Rap - Section 02271
(3) Impermeable and Permeable Cover Fill - Section 02242
(4) Subangular Stone - Section 02223

1.03 Submittals

(a) The Contractor shall furnish a mill certificate from the company manufacturing the geotextile attesting that the geotextile meets the chemical, physical, and manufacturing requirements specified. Geotextile will be rejected if it is found to have defects, rips, holes, flaws, deterioration or other damage.

(b) The Contractor shall submit shop drawings showing proposed construction methods; geosynthetics panel arrangements; and tie-in details between geosynthetics, drainage structures, fill materials, and the like.

1.04 Product Handling

(a) The Contractor shall protect the work described in this Section before, during, and after installation, and shall protect the installed work covered by other Sections.

(b) The Contractor shall, during all periods of shipment and storage, protect the geotextile from direct sunlight, ultraviolet ray, temperatures greater than 120 degrees F, mud, dirt, dust, debris and other deleterious sources. Geotextile shall be maintained, wrapped in a heavy-duty protective opaque covering until it is installed.

(c) If the Trustee Representative determines material is damaged or has excessive sunlight exposure, the Contractor shall immediately make all repairs and replacements, at no additional cost to the Trustee.

1.05 Definitions

(a) On the Drawings and in the Specifications, the word geotextile is used and refer to a specific geotextile type as described in Section 2.0.1.

PART 2 - MATERIALS

2.01 Geotextile

Geotextiles used in the impermeable and permeable cover systems shall be manufactured by Mirafi, polyfelt Exxon, Hoechst or other approved manufacturers.

(a) Six (6) ounce Geotextile

(1) Six ounce geotextile shall be a needle punched non-woven polypropylene or polyester fabric.

(2) Six ounce geotextile shall demonstrate the following minimum average roll values:

Property	Requirements	Test Method
Mass per Unit Area	6 oz/sy	ASTM D5261
Grab Strength	150 lbs	ASTM D4632
Trapezoidal Tear Strength	65 lbs	ASTM D4533
Burst Strength	325 psi	ASTM D3786
Puncture Strength	85 lbs	ASTM D4833
Thickness	75 mils	ASTM D5199
Apparent Opening Size	US Sieve No. 70	ASTM D4751

(b) Ten (10) ounce Geotextile

(1) Ten ounce geotextile shall be needle-punched non-woven polypropylene or polyester fabric.

(2) Ten ounce geotextile demonstrate the following minimum average roll values:

Property	Requirements	Test Method
Mass per Unit Area	10 oz/sy	ASTM D5261
Grab Strength	225 lbs	ASTM D4632
Trapezoidal Tear Strength	90 lbs	ASTM D4533
Burst Strength	500 psi	ASTM D3786
Puncture Strength	140 lbs	ASTM D4833
Thickness	120 mils	ASTM D5199
Apparent Opening Size	US Sieve No. 100	ASTM D4751

(c) Sixteen (16) ounce Geotextile

(1) Sixteen ounce geotextile shall be needle-punched, non-woven polypropylene or polyester fabric.

(2) Sixteen ounce geotextile demonstrate the following minimum average roll values:

Property	Requirements	Test Method
Mass per Unit Area	16 oz/sy	ASTM D5261
Grab Strength	350 lbs	ASTM D4632
Trapezoidal Tear Strength	110 lbs	ASTM D4533
Burst Strength	700 psi	ASTM D3786
Puncture Strength	200 lbs	ASTM D4833
Thickness	180 mils	ASTM D5199
Apparent Opening Size	US Sieve No. 100	ASTM D4751

2.02 Width of Fabric

(a) To keep the number of seams to a minimum, the geotextile shall be provided in sections not less than 12 feet wide for cover geotextiles.

PART 3 - EXECUTION

3.01 Site Preparation

(a) Site subgrade preparation shall conform to the requirements of this Section, and Section 02223 - Backfill and Fill.

(b) The surface to receive geotextile shall be cleared of sharp objects, boulders, stumps, or any materials that may contribute to fabric punctures, shearing, rupturing or tearing.

(c) The base surface or surface of embankments shall be graded as smooth as possible and compacted with a smooth - wheeled roller having a minimum operating weight of 10 tons capable of vibratory and static compaction mode. The subgrade shall be inspected for unstable areas or soft spots, before the geotextile is placed and additional fill shall be placed and compacted to eliminate those unstable areas.

3.02 Installation

(a) Cover

(1) The geotextile shall be placed in the manner and at the locations shown. Geotextile shall be laid smooth and free of tension, stress, folds, wrinkles, or creases.

(2) All geotextiles seams shall be continuously sewn, spot sewing or thermal bonding are not allowed. Geotextile will be overlapped a minimum of 6 inches prior to seaming. Sewing shall be done using polymeric thread with chemical and ultraviolet light resistance properties and strength properties equal to or exceeding those of the geotextile. Sewing shall be done using machinery and stitch types approved by the Trustee Representative. The geotextile seam will be located a minimum of one inch from the geotextile edge.

(3) During backdumping and spreading of soil over the geotextile, a minimum depth of 12 inches of soil shall be maintained over the geotextile at all times between the geotextile and wheel, or truckloads and bucket. Dozer blades shall not be in direct contact with the geotextile.

(4) All soil materials located on top of geotextiles shall be deployed in such a manner as to ensure:

- o The geotextile and any underlying lining materials are not damaged.
- o Minimal slippage of the geotextile on underlying layers occurs.
- o No excess tensile stresses occur in the geotextile.

(5) If geotextile is damaged during any step of installation, a piece of geotextile material shall be cut and placed over the damaged area and overlap the undamaged material a minimum of 3 feet in each direction and as approved by the Trustee Representative.

(6) Geotextile in transition areas along the limit of above grade cover shall be covered with a minimum of 6 inches of cover material.

Where geotextile has been covered by soil and will need to connect to a new cover system the geotextile may be joined by overlapping the covered geotextile a minimun of three feet. If the Trustee Representative determines the previously covered geotextile is damaged, then the overlap will be increased to extend as stated in (5) beyond the damaged areas.

3.03 Protection

(a) Any geotextile damaged during its installation or during placement of cover material shall be replaced by the Contractor at no additional cost to the Trustee.

(b) The work shall be scheduled so that the covering of the geotextile with a layer of the cover material is accomplished within 15 days after placement of the geotextile. Failure to comply with this requirement shall require replacement of the geotextile at no additional cost to the Trustee.

PART 4 - QUALITY CONTROL

4.01 Conformance Testing

Upon delivery of geotextile to the Site, additional samples shall be obtained from select rolls by the Trustee Representative or an independent testing agency appointed by the Trustee Representative. Samples shall be approximately 3 feet long over the entire width of the roll and shall not include the first 3 feet of the roll. The samples shall be taken at a minimum average frequency of one per 100,000 ft^2 of geotextile. This testing may include all properties specified in Article 2.01 of this Section and need not be limited to the testing required by the manufacturer. The HDPE Cover Contractor shall, however, at no additional cost, provide whatever reasonable assistance the Trustee Representative may require in obtaining the samples.

END OF SECTION

SECTION 02598

GEOCOMPOSITE

PART 1 - GENERAL

1.01 Work Included

(a) Installation of geocomposite must be completed by an experienced installer or contractor fully qualified to complete the work in this Section.

(b) Geocomposite shall be installed as part of the impermeable and permeable cover construction. The following technical specifications shall govern the manufacturing, transport, and installation of the geocomposite components of the impermeable and permeable covers.

1.02 Related Work Specified Elsewhere

(a) Geotextile - Section 02595
(b) Flexible Membrane Cover - Section 02597
(c) Geogrid - Section 02599

1.03 Submissions

(a) The geocomposite Contractor shall submit to the Trustee Representative all items described in subsequent sections as outlined by the following schedule:

Prior to Delivery to the Site

(1) Shop drawings including all geocomposite panel layouts and details of all work including details of all overlapping, tying, sewing and attachments.

(2) Geocomposite specifications.

(3) Certification stating geocomposite roll numbers and base resin type and lot from which the internal geonet was produced.

(4) Manufacturers roll inspection diagram for all material panels.

Prior to Installation

(1) Submit to the Trustee Representative for approval a schedule of operations including means and methods of installation.

During Installation Submitted Daily

(1) Daily construction progress reports clearly showing geocomposite panels placed by date.

(2) Summary and log of all laboratory quality control completed by geocomposite Contractor.

(3) Certification that geocomposite installation is complete and in accordance with these specifications.

(4) Statement of warranty.

After Installation

(1) As-built record drawings

PART 2 - PRODUCTS

2.01 Resin

(a) The geonet component of the geocomposite shall be manufactured from pure virgin high density polyethylene resin, having a minimum density of 0.935 g/cm^3, high density polyethylene or an approved equivalent. The pure virgin resin shall be mixed with two to three percent carbon black. The carbon black is to be pre-blended according to specifications of the manufacturer. While more than one resin may be suitable and will be considered, the Contractor is cautioned that the Trustee Representative considers resin selection crucial to the successful completion of the project and proposed resins will be most thoroughly and carefully reviewed.

(b) Prior to the delivery of the geocomposite material to the Site, the Contractor will be required to provide the Trustee Representative with a written certification that the product to be delivered has been extruded from an approved resin. No material will be permitted to be stored on Site until this certification has been delivered to the Trustee Representative.

2.02 Manufacturing

(a) The manufacturer of the geocomposite must be approved by the Trustee Representative and have satisfactory experience in extruding geonet and bonding geotextiles with the geonet, with a reputation for producing a high quality product. The Contractor shall submit the manufacturing company, address, and employee contact to the Trustee Representative. The geocomposite shall be formulated from the appropriate polymers and

compounding ingredients to form a geocomposite that meets all requirements for the specified end use of the product.

(b) Geocomposite rolls shall be a minimum of 6 feet in width. Each roll shall be identified by a number and date of manufacture.

(c) Geocomposite shall be TEX-NET TN3002CN as manufactured by Fluid Systems, Inc., or an approved equal. The geocomposite shall possess the following typical properties:

Property	Test Method	Value	Units
1. Flow Capacity (Gradient of 1)			
a. Transmissivity at 500 psf (1)	ASTM D4716	>or=2.5×10^{-4}	m^2/s
b. Transmissivity at 2,000 psf (1)	ASTM D4716	>or=1.0×10^{-4}	m^2/s
2. Mechanical Properties			
a. Tensile Strength (2)	ASTM D5035	23	lbs
b. Tensile Strength (3)	ASTM D4632	160	lbs
c. Peel Strength (1)	ASTM D413	2	lbs/in MARV
3. Material			
a. Polyethylene - Density (2)	ASTM D1505	0.94	gm/cm^3
b. Carbon Black Content (2)	ASTM D1603	2-3	%
c. Apparent Opening	ASTM D4751	70	US Sieve Size

4. Dimensions

a. Thickness (2)	ASTM D5199	200	mils
b. Thickness (3)	ASTM D5199	75	mil/layer
c. Mass/Unit Area (1)	ASTM D5261	23	oz/sy

(1) Geocomposite
(2) Geonet only - prior to lamination
(3) Geotextile - prior to lamination

2.03 Material Transport

(a) The Contractor shall be responsible for the protection of the geocomposite rolls against damage during transportation to the Site, during storage at the Site, and prior to placement of subsequent constructions materials. Only non-damaged geocomposite shall be included within the construction. Any damaged material, as determined by the Trustee Representative, shall be replaced by the Contractor at no cost to the Trustee.

PART 3 - EXECUTION

3.01 Geocomposite Installation

(a) A geocomposite drainage layer, as described in Article 2.02 of this Section, will be installed over the flexible membrane of the impermeable cover and in some slopes of the permeable cover on the hide piles. Contractor shall install the geocomposite drainage layer to the lines and grades shown on the Drawings in accordance with the manufacturer's recommendations.

(b) The Contractor shall be responsible for the protection of the membrane cover during the installation of the geocomposite layer. No equipment shall be permitted to operate on the membrane at any time. In no way shall any tracked equipment or any other equipment which may pose a risk of puncturing, tearing, or otherwise damaging the membrane be permitted for use during this phase of construction.

(c) The geocomposite shall be placed on side slopes as shown on the contract drawings. Over the textured HDPE, the geocomposite shall be rolled down the slope in such a manner as to continually keep the geocomposite in tension. If necessary, the geocomposite shall be positioned by hand after being unrolled to minimize wrinkles. The geocomposite can

not be placed in the horizontal direction (i.e., across the slope).

In the presence of wind, all in place geocomposite rolls shall be weighted with sandbags or the equivalent, such sandbags shall be installed during placement and shall remain until replaced with cover material.

(d) Adjacent rolls shall be overlapped a minimum of 4 inches and the geonet secured by plastic ties a minimum of every five (5) feet along the roll length and every 6-inches end to end. Plastic ties shall be white or other bright color for ease of inspection and shall be connected according to the Manufacturer's recommendations. Metallic ties are not allowed. The upper geotextile sheets shall then be sewn along their entire length. The bottom geotextile sheets shall be overlapped without sewing. For end to end seams the ties shall be made using an overlap of the geocomposite 4-6 inches. A geotextile cap will cover the tied seam.

(e) Where the geocomposite abuts geotextile, geocomposite sheet shall be overlain and/or underlain by a geotextile sheet with an overlap along its entire length to keep sediments for intruding into the geocomposite. The seam shall be sewn or thermally bonded and secured with metal screws. Screws shall be placed 3-feet on center minimum, and 4-inches from the edge of both geocomposite and geotextile. Screws shall not be used in cases where the connection may puncture other materials such as geomembrane.

(f) The geocomposite shall not be welded to the geomembrane.

(g) All connections shall be inspected and approved by the Trustee Representative. The Trustee Representative shall reject any connections he deems insufficient and require those joints to be redone at no additional cost to the Trustee.

(h) Repairs shall be made in accordance with the manufacture's procedures and recommendation at no additional cost the Trustee. The Contractor shall submit proposed report producers for the approval of the Trustee Representative.

PART 4 - QUALITY CONTROL

4.01 General

(a) The geocomposite Contractor, before installation begins, shall appoint an experienced individual who

will be on-Site at all times during the installation, to represent him in all matters relevant to this work. This appointment shall be subject to approval by the Trustee Representative.

(b) Before installation begins, and at least weekly thereafter, more often if determined necessary by the Trustee Representative, project coordination meetings shall be held with the designated representative of the geocomposite Contractor, Trustee Representative, to review the following information. This information shall be submitted to the Trustee Representative by the geocomposite Contractor in writing, during or before this meeting.

(1) Progress of the work.

(2) Adherence to the Specifications.

(3) Adherence to the Quality Control Program, including the timely submission of the pertinent forms.

(4) Planned work and methods for the ensuing week, including estimate of time remaining to completion of the work.

(c) All of the Forms specified and required must be submitted in a timely fashion.

(d) Any changes in the proposed method of work, subcontractors to be utilized, geocomposite resin or manufacturing must be approved in advance by the Trustee and Trustee Representative. The geocomposite Contractor assumes all responsibility relevant to providing an acceptable product.

4.02

(a) Random sampling of the geocomposite shall be performed by the manufacturer at the cost of the geocomposite contractor to assure proper quality control. The minimum frequency of such sampling shall be as follows:

(1) One (1) sample taken from each day's production, and additional conformance as directed by the Trustee Representative.

(2) Samples selected randomly by the Trustee Representative subsequent to material delivery, or

(3) Other, as proposed by the geocomposite Contractor and approved by the Trustee Representative.

The samples shall be tested for the following properties:

(1) Uniformity - visual inspection to assure the material is free of holes, blisters, un-dispersed raw material, or foreign matter is mandatory.

(2) Mass per Unit Area - Measurements to assure the materials are within the specified tolerances. (ASTM D5261)

(3) Peel Strength - Measurements to assure the proper bond between the geotextile and the HDPE drainage net shall meet the minimum tolerances. (ASTM D413)

(4) Transmissivity - Constant head hydraulic transmissivity within the manufactured plane of geocomposite under the specified normal compressive stresses (ASTM D4716)

(b) The geocomposite Contractor shall provide the Trustee Representative with certified copies of the manufacturer's test results. The material delivered to the site will be certified by the manufacturer to meet all of Article 2.02 properties. No material shall be installed prior to furnishing the required test results.

(c) The Trustee Representative, at his discretion, may obtain additional random samples of the geocomposite for further confirmatory testing. This testing will be at the expense of the Trustee. This testing may also include all properties specified in Article 2.02 of this Section and need not be limited to the testing required by the manufacturer. The geocomposite Contractor shall, however, at no additional cost, provide whatever reasonable assistance the Trustee Representative may require in obtaining the samples.

(d) The geocomposite Contractor shall be solely responsible for the quality of the material provided. Should any of the tests performed on the material yield unsatisfactory results, the geocomposite Contractor will be responsible for replacing the material with satisfactory materials without delay to the project or cost to the Trustee.

(e) Upon delivery of geocomposite to the Site, additional samples shall be obtained from select rolls by the Trustee Representative or an independent testing agency appointed by the Trustee Representative. Samples shall be approximately 3 feet long over the entire width of the roll and shall not include the first 3 feet of the roll. The samples shall be taken at a minimum frequency of one per 100,000 ft^2 of geocomposite. This testing may also include all properties specified in

Article 2.02 of this Section and need not be limited to the testing required by the manufacturer. The HDPE Cover Contractor shall, however, at no additional cost, provide whatever reasonable assistance the Trustee Representative may require in obtaining the samples.

4.03 Quality Control During Installation

(a) The Trustee Representative and geocomposite Contractor shall visually inspect all material to be included in the work for transport damage and uniformity and compare roll identification numbers with those on the certification provided by the manufacturer to assure delivery of the appropriate material.

(b) The Trustee Representative and geocomposite Contractor shall also visually inspect the material for any damage incurred as a result of handling or on-Site storage.

(c) The Trustee Representative shall also visually inspect all seams for continuity and quality. All inadequate seams shall be repaired at no cost to the Trustee.

4.04 Warranty

(a) The geocomposite Contractor shall warranty all work, including materials and installation of geocomposite for a minimum period of one year.

END OF SECTION

SECTION 02599

GEOGRID

PART 1 - GENERAL

1.01 Work Included

(a) Installation of geogrid must be completed by an experienced installer or contractor fully qualified to complete the work in this Section.

(b) Geogrid shall be installed as part of the permeable cover construction. The following technical specifications shall govern the manufacturing, transport, and installation of the geogrid components of the permeable covers.

1.02 Related Work Specified Elsewhere

(a) Impermeable and Permeable Cover Soil - Section 02242
(b) Geotextile - Section 02595
(c) Geocomposite - Section 02598

1.03 Submissions

(a) The geogrid Contractor shall submit to the Trustee Representative all items described in subsequent sections as outlined by the following schedule:

Prior to Delivery to the Site

(1) Shop drawings including all geogrid panel layouts and details of all work including details of all overlapping, joining and attachments.

(2) Geogrid specifications.

(3) Certification stating geogrid roll numbers and base resin type and lot from which the geogrid was produced.

Prior to Installation

(1) Submit to the Trustee Representative for approval a schedule of operations including means and methods of installation.

During Installation Submitted Daily

(1) Daily construction progress reports clearly showing geogrid rolls placed by date.

(2) Certification that geogrid installation is complete and in accordance with these specifications.

(3) Statement of warranty.

PART 2 - PRODUCTS

2.01 Definitions

(a) Uniaxial Geogrid: A high density polyethylene (HDPE) grid structure specifically manufactured for use as a soil reinforcement. A geogrid which has been manufactured with high junction strength and high tensile strength and modulus in one direction only.

(b) Direction of Geogrid: Refers to the orientation that the uniaxial geogrid is used for a particular project, which is along the machine direction (roll direction).

(c) MD: Machine direction.

(d) CMD: Cross machine direction.

2.02 Manufacturing

(a) The manufacturer of the geogrid must be approved by the Trustee Representative and have satisfactory experience in producing geogrid, with a reputation for producing a high quality product. The Contractor shall submit the manufacturing company, address, and employee contact to the Trustee Representative. The geogrid shall be formulated from the appropriate polymers and compounding ingredients to form a material that meets all requirements for the specified end use of the product.

(b) Geogrid rolls shall be a minimum of 4 feet in width. Each roll shall be identified by a number and date of manufacture.

(c) Geogrid used in the permeable cover system shall be the uniaxial geogrid TENSAR UX 1400 (SR1) as manufactured by the Tensar Corporation, or an approved equal. The geogrid shall posses the following typical properties:

	Property	Test Method	Units	Value
1.	Interlock			
a.	Apertures	I.D. Calipered		
	- MD		in.	5.70 (nom)
	- CMD		in.	0.66 (nom)
b.	Open Area	COE Method	%	60 (nom)
c.	Thickness	ASTM D1777-64		
	- ribs		in.	0.030 (nom)
	- junctions		in.	0.110 (nom)
2.	Reinforcement			
a.	Long Term Design Load - MD	GRI GG3-87	lb/ft	1,200 (min)
b.	Flexural Rigidity	ASTM D1388-64	mg-cm	670,00 (min)
c.	Tensile Modulus - MD	GRI GG1-87	lb/ft	50,000 (min)
d.	Junction	GRI GG2-87		
	- Strength		lb/ft	3,330 (min)
	- Efficiently		%	90 (min)
3.	Material			
a.	High Density Polyethylene	ASTM D1248 Type III/Class A/ Grade 5	%	97 (min)
b.	Carbon Black	ASTM D1603	%	2.0 (min)
4.	Dimensions			
a.	roll length		ft	98
b.	roll width		ft	4
c.	roll weight		lb	44

2.03 Material Transport

(a) The Contractor shall be responsible for the protection of the geogrid rolls against damage during transportation to the Site, during storage at the Site, and prior to placement of subsequent constructions materials. Only non-damaged geogrid shall be included within the construction. Any damaged material, as

determined by the Trustee Representative, shall be replaced by the Contractor at no cost to the Trustee.

PART 3 - EXECUTION

3.01 Geogrid Installation

(a) Geogrids shall be laid at the proper elevation and orientation as shown on the Construction Drawings or as directed by the Trustee Representative.

(b) Correct orientation (roll direction) of the geogrids shall be verified by the Trustee Representative.

(c) Geogrids shall be secured at the top of the slope and unrolled in their machine direction down the slope across the area to be covered.

(d) Overlaps and Connections:

1. Overlaps

Uniaxial geogrids do not need to be overlapped in the cross-machine direction. Adjacent geogrid strips shall be butted and tied at a minimum 6 foot (1.8m) intervals using plastic ties in accordance with Manufacturer's recommendations.

2. Connections

Uniaxial geogrids shall be mechanically connected in the machine direction by a 1.5 inch x 0.25 inch (38mm x 6.3mm) HDPE flat bar (or equivalent), or as directed by the Trustee Representative. Grids shall be overlapped a minimum of 12 inches. Joints shall be staggered to provide at least 20 feet of separation between joints in adjacent rolls.

(e) All slack shall be removed from the placed geogrids before the soil cover is placed on top of it.

(f) Tracked construction equipment shall not be operated directly on the geogrids. A minimum soil cover thickness of 12 inches (300 mm) is required prior to operation of tracked vehicles over the geogrids. Turning of tracked vehicles should be kept to a minimum to prevent tracks from displacing the soil and making contact with the geogrids.

(g) Rubber tired equipment may pass over geogrids at slow speeds, less than 10 MPH (16KPH). Sudden braking and sharp turning shall be avoided.

3.02 Soil Cover Placement

(a) The soil cover shall be prepared to the lines and grades shown on the construction drawings or as directed by the Trustee Representative.

(b) The soil cover shall be placed as directed under Section 02242 - Impermeable and Permeable Cover Soil.

(c) The soil cover shall be placed, and spread in a manner that minimizes movement of the geogrids and development of wrinkles in other components of the cover system.

PART 4 - QUALITY CONTROL

4.01 General

(a) The geogrid Contractor, before installation begins, shall appoint an experienced individual who will be on-Site at all times during the installation, to represent him in all matters relevant to this work. This appointment shall be subject to approval by the Trustee Representative.

(b) Before installation begins, and at least weekly thereafter, more often if determined necessary be the Trustee Representative, project coordination meetings shall be held with the designated representative of the geogrid Contractor, and Trustee Representative, to review the following information. This information shall be submitted to the Trustee Representative by the geogrid Contractor in writing, during or before this meeting.

(1) Progress of the work.

(2) Adherence to the Specifications.

(3) Adherence to the Quality Control Program, including the timely submission of the pertinent forms.

(4) Planned work and methods for the ensuing week, including estimate of time remaining to completion of the work.

(c) All of the Forms specified and required must be submitted in a timely fashion.

(d) Any changes in the proposed method of work, subcontractors to be utilized, geogrid resin or manufacturing must be approved in advance by the Trustee Representative. The geogrid Contractor assumes

all responsibility relevant to providing an acceptable product.

4.02 Quality Control During Manufacturing

(a) Random sampling of the geogrid shall be performed by the manufacturer at the cost of the geogrid Contractor to assure proper quality control. The minimum frequency of such sampling shall be as follows:

(1) One (1) sample taken from each day's production, and

(2) Samples selected randomly by the Trustee Representative subsequent to material delivery, or

(3) Other as proposed by the geogrid Contractor and approved by the Trustee Representative.

The samples shall be tested for the following properties:

(1) Uniformity - Visual inspection to assure the material is free of holes, blisters, undispersed raw material, or foreign matter is mandatory.

(2) Thickness - Measurement along the sample to assure that the materials are within the specified tolerances.

(3) Carbon Black - The proper amount, grade, and degree of dispersion are imperative to assure proper U.V. radiation protection (ASTM D1603).

(4) Tensile Properties - One (1) dimensional tensile testing of the geogrid component which measures tensile modulus (GRI GG1-87).

(b) The geogrid Contractor shall provide the Trustee and Trustee Representative with certified copies of the manufacturer's test results. No material shall be installed prior to furnishing the required test results.

(c) The Trustee Representative, at his discretion, may obtain additional random samples of the geogrid for further confirmatory testing. This testing will be at the expense of the Trustee. This testing may also include all properties specified in Article 2.02 of this Section and need not be limited to the testing required by the manufacturer. The geogrid Contractor shall, however, at no additional cost, provide whatever reasonable assistance the Trustee Representative may require in obtaining the samples.

(d) The geogrid Contractor shall be solely responsible for the quality of the material provided. Should any of the tests performed on the material yield unsatisfactory results, the geogrid Contractor will be responsible for replacing the material with satisfactory materials without delay to the project or cost to the Trustee.

4.03 Quality Control During Installation

(a) The Trustee Representative and geogrid Contractor shall visually inspect all material to be included in the work for transport damage and uniformity and compare roll identification numbers with those on the certification provided by the manufacturer to assure delivery of the appropriate material.

(b) The Trustee Representative and geogrid Contractor shall also visually inspect the material for any damage incurred as a result of handling or on-Site storage.

4.04 Warranty

(a) The geogrid Contractor shall warranty all work including materials and installation of geogrid for a minimum period of one year.

END OF SECTION

SECTION 02600

REINFORCED CONCRETE CULVERT PIPE AND CLEANING EXISTING CULVERTS

PART 1 - GENERAL

1.01 Description of Work

(a) The Contractor shall furnish all labor, materials, equipment, tools, and appurtenances required to complete the work of furnishing and installing reinforced concrete culvert pipe and cleaning existing culverts.

1.02 Related Work Specified Elsewhere

(1) Temporary and Permanent Erosion and Sedimentation Control Section 02125
(2) Shoring and Bracing - Section 02150
(3) Excavation - Section 02220
(4) Dredging - Section 02222
(5) Backfill and Fill - Section 02223
(6) Manholes - Section 02607

1.03 Submittals

(a) Contractor shall submit a procedure for cleaning culverts and preventing the release of sediment for approval of the Trustee Representative.

PART 2 - PRODUCTS

2.01 Reinforced Concrete Pipe

(a) Reinforced concrete pipe shall conform to the requirements of AASHTO-M170 for Standard Strength Reinforced Concrete Culvert Pipe for Class III Pipe unless otherwise designated on the plans, except that the steel area for 24 inch pipe shall be 0.10 square inch per foot and circular reinforcement only shall be used in circular pipes. All pipe 24 inch in diameter or smaller shall be of the bell-and-spigot type. Pipes larger than 24 inch in diameter shall be tongue and groove or bell and spigot.

2.02 Reinforced Concrete Pipe Flared Ends

(a) Flared End Sections shall be fabricated to comply with the current construction standard for this item. The method of fabrication and materials used shall conform to the requirements of AASHTO-M170, Class III, except that the three edge bearing tests shall not be required. The flare shall be of the same thickness and materials as the barrel and have steel reinforcement equaling or exceeding the amount shown on the table for AASHTO-M170, Class III, except that a double row of steel will not be required.

2.03 Rubber Ring Gaskets

(a) Rubber ring gaskets shall be tough, flexible, chemical - resistant material, and of such size and shape as to ensure satisfactory pipe joints when incorporated in the work and shall conform to ASTM - C443.

PART 3 - EXECUTION

3.01 Laying of Pipe

(a) The laying of pipe shall begin at the downstream end of the pipe line. The lower segment of the pipe shall be in firm contact with the bedding throughout its full length. Bell or groove ends of pipe shall be placed facing upstream.

Where the ends of pipes are to enter existing concrete or masonry walls, the pipe shall be neatly cut to fit the inside face of the wall and the pipe shall be grouted in place.

The tolerance in laying reinforced concrete pipe shall be -0 to +0.15 feet at the culvert inverts and no more than a 10% decrease in slope.

3.02 Joining Pipe to Manholes

(a) Joints between pipe and manholes shall be mortared. The pipe ends shall be cleaned and wetted with water before the joint is made. Stiff mortar shall be placed on the upper half of the spigot or tongue of the section at the manhole. Any voids occurring in the outside of the joint shall be filled. Lifting holes shall be filled with stiff mortar.

For pipes 36 inches and larger, the inside of the pipe to manhole joint shall be finished smooth. For pipes smaller than 36 inches, the joint shall be cleared of protruding mortar. The completed mortar joints shall be protected against rapid drying if not immediately backfilled with earth. In cold weather, mortar for pipe joints shall be prepared and protected in accordance with Section 02607.

Any pipe which is not in true alignment or which shows any settlement after laying shall be taken up and relaid without extra compensation.

3.03 Joining Pipe Sections

(a) Reinforced concrete pipe shall be joined using flexible water tight rubber gaskets conforming to ASTM - C443.

3.04 Cleaning of Culverts

(a) Culverts designated on the Drawings shall be cleaned of sediment by excavation, flushing with high pressure water or other suitable method. Cleaning shall be completed in such a way that the removed sediment is collected and not released to adjacent areas or water courses. Removed sediment shall be considered to be contaminated and shall be dewatered and disposed in accordance with Section 02222.

END OF SECTION

SECTION 02607

MANHOLES

PART 1 - GENERAL

1.01 Description of Work

The work covered by this Section includes furnishing all labor, equipment and materials required to precast concrete manholes and concrete junction chambers as described herein and/or shown on the Drawings.

1.02 Design Requirements

Manholes shall be constructed of specified materials to the sizes, shapes and dimensions and at the locations shown on the Drawings or as otherwise directed by the Trustee Representative. The height or depth of the manhole will vary with the location, but unless shown otherwise on the Drawings, shall be such that the top of the manhole frame will be at the finished grade of the pavement or ground surface and the invert will be at the designed elevation.

1.03 Submittals

Complete shop drawings and engineering data on frames, covers, steps and precast manhole sections shall be submitted in accordance with the requirements of the section entitled "Shop Drawings, Product Data and Samples" of these Specifications.

1.04 Quality Assurance

(a) Prior to delivery, all basic materials specified herein shall be tested and inspected by an approved independent commercial testing laboratory or, if approved by the Trustee Representative, certified copies of test reports prepared by the manufacturer's testing laboratory will be acceptable. All materials which fail to conform to these Specifications shall be rejected.

(b) After delivery to the Site, any materials which have been damaged in transit or are otherwise unsuitable for use in the Work shall be rejected and removed from the Site.

PART 2 - PRODUCTS

2.01 Acceptable Manufacturers

(a) Standard manhole frame and cover shall be Vulcan Foundry No. VM-3MOD, Neenah Foundry No. R-1708 U.S. Foundry No. 365 or approved equal.

(b) Watertight manhole frames and covers shall be Vulcan Foundry No. VM-80WT, U.S. Foundry No. 385 Neenah Foundry No. R-1915-H2 or approved equal.

(c) Manhole adjusting rings shall be R1979-H as manufactured by Neenah Foundry Company of Neenah, Wisconsin or approved equal.

2.02 Materials and Construction

(a) Concrete and Reinforcement

1. Concrete used in manhole and junction chamber construction shall be Class "A" concrete conforming to the requirements of the section entitled "Cast-In-Place Concrete" of these Specifications.

2. Steel reinforcement shall conform to the requirements of the section entitled "Concrete Reinforcement" of these Specifications.

(b) Concrete block for inlets and manholes shall be solid, precast segmental concrete masonry units. Cement Portland shall conform to ASTM C-150. The blocks shall be either rectangular in shape, or curved blocks with the inside and outside surfaces curved to the required radii, whichever is appropriate for the shape of the structure. The length shall be not less than 12 inches and not more than 18 inches. The height shall be not less than 5 inches and not more than 8 inches. The width shall be not less than 6 inches.

For the reduction of cross sectional area of the cones or tops of manholes, blocks may be of special shapes and heights. Blocks of special shapes and heights may be used in the top courses of all structures so that the head castings shall be set at the required elevation on a mortar bed not more than 1/2 inch thick without cutting the blocks.

All blocks shall have an interlocking-type joint at the ends so as to form a strong, rigid structure and shall be free from cracks or other defects.

(c) Mortar: Mortar for manhole construction shall be sand-cement mortar composed of one part Portland cement to two parts clean sand conforming to ASTM C 144.

(d) Precast Concrete Manholes

1. Precast concrete manholes shall consist of precast reinforced concrete sections, a conical or flat slab top section, and a base section conforming with the typical manhole details as shown on the Drawings.

2. Precast manhole section shall be manufactured, tested and marked in accordance with the latest provisions of ASTM C 478.

3. The minimum compressive strength of the concrete for all sections shall be 4,000 psi.

4. The maximum allowable absorption of the concrete shall not exceed eight percent of the dry weight.

5. The circumferential reinforcement in the riser sections, conical top sections and base wall sections shall consists of one line of steel and shall be not less than 0.17 square inch per lineal foot.

6. The ends of each reinforced concrete manhole riser section and the bottom end of the manhole top section shall be so formed that when the manhole risers and the top are assembled, they will make a continuous and uniform manhole.

7. Joints of the manhole sections shall be of the tongue and groove type. Sections shall be joined using O-ring rubber gaskets conforming to the applicable provisions of ASTM C443, latest revision, or filled with an approved preformed plastic gasket meeting the requirements of Federal Specifications SS-S-00210, "Sealing Compound, Preformed Plastic for Pipe Joints", Type 1, Rope Form.

8. Each section of the precast manhole shall have not more than two holes for the purpose of handling and laying. These holes shall be tapered and shall be plugged with rubber stoppers or mortar after installation.

9. Cast iron manhole steps shall be installed in each section of the manhole in accordance with the details on the Drawings.

(e) Frames, Covers and Steps

1. Toe pockets, frames and covers shall be cast iron conforming to the minimum requirements of Federal Specifications WW0I-652 or to ASTM A 48 for Class 30 Gray Iron Castings. All castings shall be made accurately to the required dimensions, fully interchangeable, sound, smooth, clean, and free from blisters and/or other defects. Defective castings which have been plugged or otherwise treated shall not be used. All castings shall be thoroughly cleaned. Each casting shall have its actual weight in pounds stenciled or painted on it in white paint.

2. Standard manhole frames and covers shall have a minimum of 21-inches clear inside diameter and shall be a minimum of 6-inches high, with guide ring and shall weigh not less than 310 pounds total.

3. The contact surfaces of all manhole covers and the corresponding supporting rings in the frames shall be machined to provide full perimeter contact.

4. Manhole steps shall conform to the applicable provisions of ASTM Standard Specification Serial Designation C478.

PART 3 - EXECUTION

3.01 Construction of Precast Concrete Manholes

(a) After placing manhole base, inverts shall be constructed using Class "B" concrete in accordance with details on the Drawings and inverts shall have the same cross section as the invert of the culverts which they connect. The manhole invert shall be carefully formed to the required size and grade by gradual and even changes in sections.

(b) After the base section has been set, and inverts formed, the precast manhole sections shall be placed thereon, care being exercised to form the incoming and outgoing pipes into the wall of the manhole at the required elevations.

(c) The cast iron frame for the manhole cover shall be set at the required elevation and properly anchored to the masonry. Where manholes are constructed in paved areas, the top surface of the frame and cover shall be tilted to conform to the exact slope, crown and grade of the existing adjacent pavement.

3.02 Modification of Existing Manholes to Drain Inets

If no concrete base exists, (typical sumps are three feet maximum) then the existing soils at the base shall be removed to a depth of 4 to 6 inches as needed. In no case shall the existing concrete barrel blocks be undermined to cause a collapse of the existing manhole structure nor shall the flow of the existing 12-inch and 36-inch pipes be blocked by the installation of the new base. The base shall be backfilled with 4 inch minimum thickness of class "A" or class "D" cement concrete with sufficient reinforcing for shrinkage and temperature stresses in accordance with Massachusetts Department of Public Works Construction Standards 201.3 or 6-inches of AASHTO #57 stone. The existing pipes shall not be disturbed. For construction of the frame and grate see the Massachusetts Department of Public Works Construction Standards.

END OF SECTION

SECTION 02720

WATER MAINS

PART 1 - GENERAL

1.01 Description of Work

The Contractor shall furnish all materials and perform all the work and services necessary for the replacement of the existing 12 inch D.I.P. water main at Wetland 3A which includes all pipes, valves, fittings, valve boxes, thrust blocks, etc., and all relating excavation, backfilling, compaction, flushing, chlorination, and testing.

1.02 Related Sections

(a) Excavation, Section 02220
(b) Backfill and Fill, Section 02223
(c) Shoring and Bracing, Section 02150
(d) Temporary and Permanent Erosion and Sediment Control, Section 02125

1.03 Submittals

The Contractor shall submit to the Trustee Representative a plan for installing a water main to City of Woburn Public Works Department Standards, and other conditions by permitting agencies as required.

PART 2 - PRODUCTS

All materials for pipe, fittings, valves, valve boxes, tapping sleeves, etc. shall be as specified herein or as otherwise required by the City of Woburn Department of Public Works Standards for installation of water mains.

Pipe shall be cement lined Class 52 ductile iron with push-on joints. The pipe shall meet the requirements of ANSI A21.51 American National Standard for Ductile Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lines Molds, for Water or Other Liquids (AWWA C-151-76). The cement lining shall meet the requirements of ANSI A21.4 American National Standard for Cement-Mortar Lining for Cast Iron and Ductile Iron Pipe and Fittings for Water (AWWA C-104-74).

Joints for ductile iron pipe shall be push-on rubber gasket, meeting the requirements of ANSI A21.111 American National Standard for Rubber-Gasket Joints for Cast Iron and Ductile Iron Pressure Pipe and Fittings (AWWA C-111).

All piping, fittings, and valves shall be protected from corrosion by encasement in polyethylene tubing or sheet, meeting requirements of ANSI/AWWA C105-77.

Fittings shall be cement lined gray iron or ductile iron furnished with mechanical joint ends conforming to ANSI/AWWA C-110-77 American National Standard for Gray Iron and Ductile Iron Fittings, 3 inch through 48 inch, for Water and Other Liquids. The cement lining shall meet the requirements of ANSI A21.4 American National Standard for Cement-Mortar Lining for Cast Iron and Ductile Iron Pipe and Fittings for Water (AWWA C-104-74).

Valves shall be cast iron furnished with mechanical joint ends conforming to AWWA C-500-71 Standard for Gate Valves, 3 inch through 48 inch, for Water and Other Liquids.

Valve boxes shall be made of good quality cast iron and shall be of the sectional type. The lower section shall be a minimum of 5 inches in diameter, enlarged to fit around the bonnet of the valve. The upper section shall be arranged to screw down over the adjoining lower section and shall be full diameter throughout. Valve boxes shall be provided with cast iron lids or covers. The overall length of valve boxes shall be sufficient to permit the top to be set flush with the established ground surface grade.

Thrust blocks shall be made of concrete with a 28 day compressive strength of 3,000 psi. Thrust and reaction blocking shall be installed at all bends, tees, reducers, plugs, caps, and hydrants.

A sufficient number of bolts, nuts, tie rods, glands, gaskets, brass wedges, and all other required accessories shall be provided. All accessories shall be of proper dimensions for the size of pipe intended. All gaskets shall be made of rubber with duck back and lead tips.

Tapping sleeves shall be suitable to provide a branch main connection to the existing water main. Tapping sleeves shall have mechanical joint ends and meet the requirements of ANSW/AWWA C-110-77 American National Standard for Gray Iron and Ductile Iron Fittings, 3 inch through 48 inch, for Water and Other Liquids. Tapping valves shall be mechanical joint type capable of 200 psi working pressure. The valve shall be sufficient to allow attachment of drilling machine and equipment.

Blow-offs shall consist of 2 inch galvanized pipe, fittings, gate valve, tapped plug and pipe cap; sectional cast iron valve box, and concrete support.

PART 3 - EXECUTION

Connections to existing water mains shall be made in the presences of representatives of the City of Woburn Public Works Department.

Excavation shall generally follow the provisions of Section 02220 of these Specifications.

Trench depths shall be figured to allow a minimum five (5) foot cover over the top of pipe. Excavated materials shall be protected from erosion by means selected by the Contractor.

The Contractor shall keep the trench width at the top of the pipe not wider than the outside diameter of the pipe plus 1.5 feet unless the angle of repose of the soil is unsuitable. The trench above the top of the pipe shall have sufficient slope so that banks will not slide.

Care must be taken not to injure in any way water mains, water service pipes, drain pipes, sanitary or storm water sewers, gas mains, electric conduits or other structures encountered on the lines of the work.

Sheeting of trenches will be at the Contractor's discretion and as may be required by OSHA, local or state regulations and the cost of any sheeting will be included in the cost for laying pipe. Sheeting will not be paid as an extra unless ordered left in place by the Trustee Representative and a change order issued therefore.

The Contractor shall remove, by pumping or other means, any water accumulated in the excavation and keep the trench dry during the pipe laying period and until compacted fills where required are placed. The

Contractor shall provide adequate pumps or other dewatering methods and perform the work at no additional cost to the Trust.

The bottom of the trench shall be shaped to conform as nearly as possible to the outside of the pipe, particular care being taken to recess the trench bottom to relieve the bell or coupling of excessive load. Where the bottom of the trench has been taken out to greater depth than above specified, it shall be refilled with suitable granular material, properly compacted and shaped.

The Contractor shall undercut unsuitable material and replace it with suitable bedding material at no cost to the Trust.

Before lowering into the trench, and while suspended, each pipe and fitting shall be inspected for defects. Defective, damaged or unsound pipe shall immediately be removed from the site. The interior of each pipe shall be inspected for cleanness and cleared of all dirt and foreign matter before being lowered into the trench.

Unless otherwise directed, pipe shall be laid with bell ends facing in the direction of laying. After a length of pipe is placed in the trench, the spigot shall be centered in the bell of the preceding pipe, the pipe shoved into position and brought to true alignment and there secured with sand tamped under and on each site of the pipe, except at bell holes. No earth or other foreign matter shall be allowed to enter the joint space.

Where necessary to cut pipe, cutting shall be done with approved tools and cut ends of pipe shall be squared and regular. Cutting shall be done in a manner to avoid damage to lining and coatings.

Proper tools, including pipe pullers, special cutters, machining tools, ring feeler gauges, spacing yokes, test caps, etc., shall be provided at the site of the work for the installation of the pipe.

Bells and spigots shall be thoroughly cleaned and all foreign matter shall be removed. The bells, spigots and rubber gaskets shall then be thoroughly washed in soapy water so that no particles of sand or grit can damage the gasket.

Pipes shall be assembled in accordance with the manufacturer's recommendations.

The Contractor shall be responsible to supply and install concrete thrust blocks or straps at the bends, tees and hydrants as called for by the City of Woburn Public Works Department. Thrust blocks shall be installed prior to backfilling.

Gravel or other select backfill shall be carefully placed and thoroughly compacted around the pipe with hand tools, in 6 inch layers until four inches (4") exists over the pipe.

HYDROSTATIC TESTING. The Contractor shall provide all necessary equipment and shall perform all work required in connection with the tests.

Preliminary testing of mains shall be done by the Contractor to ascertain if there are any major breaks. Final pressure tests shall be made in the presence of representatives of the City of Woburn Public Works Department and the Trustee Representative who shall receive twenty-four (24) hours notice prior to testing. If it is necessary to supervise more than one test, the Contractor will be liable for the additional cost involved.

All pipe shall be tested following the procedures of the City of Woburn Public Works Department.

Water for making tests will be furnished by the Contractor at his expense.

FINAL ACCEPTANCE. Prior to final acceptance of the water system, the Contractor shall make necessary corrections and adjustments, finish all cleanup operations, and settle all complaints and claims which have been filed as a result of his operation. Final acceptance shall not be given until after acceptance by the City of Woburn Public Works Department.

STERILIZATION OF COMPLETED WATER MAIN. All pipe and fittings connected to and forming a part of the water supply system shall be sterilized and bacteria tested in a manner acceptable to the City of Woburn Public Works Department.

Each valved section of the completed main shall be flushed prior to sterilization as thoroughly as possible with water pressure and outlets available. Flushing shall be done after the pressure test has been made. This flushing removes only the lighter solids and care should be used in laying the pipe to keep foreign material out of the pipe.

Before being placed in service, all new mains and existing piping disturbed in any manner by the work shall be desinfected. Draining the water from existing piping or even lowering the water pressure more than one-half will constitute disturbance of the piping.

END OF SECTION

SECTION 02831

CHAIN LINK FENCES AND GATES

PART 1 - GENERAL

1.01 Scope

(a) The Contractor shall furnish all labor, materials, equipment and miscellaneous items as necessary for the installation of a complete chain link fence system. Fencing shall be installed in the location as shown on the Drawings in complete conformity with the manufacturer's written recommendations and as specified herein.

(b) Security fencing for the Contractor is at Contractor's option and is not included as part of the work specified.

1.02 Submittals

(a) Product data shall be submitted in complete conformance with the requirements of the section entitled "Shop Drawings, Product Data and Samples" of these Specifications.

1.03 Delivery And Handling

(a) Deliver materials with the manufacturer's tags and labels intact.

(b) Handle and store materials in such a manner that will avoid damage.

1.04 Storage And Protection

(a) Provide storage and protection in accordance with the requirements of the section entitled "General Equipment Stipulations" of these Specifications.

1.05 Quality Assurance

(a) Standards of manufacturer shall comply with the standards of the Chain Link Manufacturers Institute and these Specifications.

(b) Provide fencing as a complete unit produced by a single manufacturer including the required erection accessories, fittings and fasteners.

PART 2 - PRODUCTS

2.01 General

(a) Overall height for new fencing shall be seven feet including three strands of barbed wire on malleable iron post tops. Posts shall be set at no more than 10 foot centers, a full three feet deep in concrete footings, poured the full size of the holes as excavated. Corner posts shall have the necessary strut and tie bracing. Gates shall be provided of the size and at the locations indicated on the Drawings.

(b) Where fencing crosses ditches, steep grades, and other unusual conditions, make special provisions to insure that the security, appearance, maintainability and permanence of the standard fencing are equalled or exceeded.

2.02 Materials And Construction

(a) Materials shall conform to the following:

1. Fence Mesh: 9 gauge wire, woven to 2-inch squares, galvanized after weaving, 6 foot wide roll. Continuous tension wire shall be provided at the lower edge of the mesh.

2. Line Post: 2-1/2-inch O.D. Galvanized Pipe (3.65 #/ft.)

3. Corner Post: 3-inch O.D. Galvanized Pipe (5.79 #/ft.)

4. Gate Post: 4-inch O.D. Galvanized Pipe (9.11 #/ft.)

5. Top Rail: 1-5/8-inch O.D. Galvanized Pipe (2.27 #/ft.) with extra long pressed steel sleeves

6. Gates shall be supplied with heavy-duty latches, keepers and heavy duty hardened bronze padlocks with duplicate keys.

7. Gate Frames: 2-inch O.D. Galvanized Pipe Frame (2.72 #/ft.)

8. Barbed wire shall consist of three strands of 12 gauge wire, with 4-point pattern barbs, galvanized after weaving.

PART 3 - EXECUTION

3.01 Installation

(a) Fence installation shall not be started before the final grading is completed, with finish grade elevations established, unless otherwise permitted.

(b) Excavation

Drill holes for post footings in firm, undisturbed or compacted soil.

1. If not shown on the Drawings, excavate holes to the minimum diameters as recommended by fence manufacturer.

2. Unless otherwise indicated, excavated hole depths shall be approximately 3-inches lower than the post bottom, with bottom of posts set not less than 36-inches below the surface when in firm, undisturbed soil.

3. If solid rock is encountered near the surface, drill into rock at least 12-inches for line posts and at least 18-inches for end, pull corner, and gate posts. Drill hole at least 1-inch greater diameter than the largest dimension for the post to be placed. If solid rock is below soil overburden, drill to full depth required. Penetration into rock need not exceed the minimum depths specified above.

4. All post hole cuttings shall be cleaned up and disposal of as directed by the Trustee Representative.

5. All Health and Safety precautions and odor control measured should be followed during post hole excavation, fence post placement and post hole backfilling.

(c) Setting Posts: Remove loose and foreign materials from sides and bottoms of holes and moisten soil prior to placing concrete.

1. Center and align posts in holes 3-inches above bottom of excavation.

2. Place concrete around posts in a continuous pour and vibrate or tamp for consolidation. Check each post for vertical and top alignment and hold in position during placement and finishing operations.

3. Trowel finish tops of footings and slope of dome to direct water away from posts. Extend footings for gate posts to the underside of bottom hinge. Set keeps, stops, sleeves and other accessories into concrete as required.

4. Keep exposed concrete surfaces moist for at least seven days after placement or cure with membrane curing materials or other acceptable curing methods.

5. Grout-in posts set into sleeved holes, concrete constructions or rock excavations with non-shrink Portland cement grout or other acceptable grouting material.

(d) Concrete Strength: Concrete shall have a minimum 28 day compressive strength of 3000 psi. Allow concrete to attain at least 75 percent of its minimum 28 day compressive strength, but in no case sooner than seven days after placement, before rails, tension wires, barbed wire or fabric is installed. Do not stretch and tension fabric and wires and do not hang gates until the concrete has attained its full design strength.

(e) Top Rails: Run rail continuously through post caps or extension arms, bending to radius for curved runs. Provide expansion couplings as recommended by fencing manufacturer.

(f) Brace Assemblies: Install braces so posts are plumb when diagonal rod is under proper tension.

(g) Tension Wire: Install tension wires by weaving through the fabric and tying to each post with not less than 6 gauge galvanized wire or by securing the wire to the fabric.

(h) Fabric: Pull fabric taut and tie to posts, rails and tension wires. Install fabric on security side of fence and anchor to framework so that fabric remains in tension after pulling force is released.

(i) Repair damaged coatings in the shop or during field erection by recoating with manufacturer's recommended repair compound, applied per manufacturer's directions.

(j) Stretcher Bars: Thread through or clamp to fabric 4-inches on center and secure to posts with metal bands spaced 15-inches on center.

(k) Barbed Wire: Install three parallel wires on each extension arm; on security side of fence, unless otherwise indicated. Pull wire taut and fasten securely to each extension arm.

(l) Tie Wires: Use U-shaped wire appropriate for the diameter of pipe. Attach pipe and fabric firmly with tie wire ends twisted at least two full turns. Bend ends of wire to minimize hazard to persons or clothing.

(m) Fasteners: Install nuts for tension band and hardware bolts on side of fence opposite fabric side. Peen ends of bolts or score threads to prevent removal of nuts.

3.02 Cleaning

(a) Perform cleaning during installation of the work and upon completion of the work. Remove from site all debris and equipment. Repair all damage resulting from chain link fence system installation.

END OF SECTION

SECTION 02936

SEEDING

PART 1 - GENERAL

1.01 Description of Work

The Contractor shall furnish all labor, materials, equipment, tools, and appurtenances required to complete the seeding of all areas disturbed, regraded or receiving permeable or impermeable covers during the course of construction.

1.02 Related Sections

Backfill and Fill - Section 02223
Temporary and Permanent Erosion and Sediment Control - Section 02125
Impermeable and Permeable Cover Fill - Section 02242
Wetlands Sediment Remediation Cover - Section 02243

1.04 Quality Assurance

A satisfactory stand of grass, as determined by the Trustee Representative, shall be required. To be acceptable, a stand of grass shall consist of a uniform stand of at least 60 percent established permanent grass species.

1.05 Submittals

(a) A manufacturer's Certificate of Compliance to the seed mixture shall be submitted by the manufacturer with each shipment of each type of seed. These certificates shall include the guaranteed percentages of purity, weed content and germination of the seed, and also the net weight and date of shipment. No seed may be sown until the Contractor has submitted the certificates.

(b) Provide analysis of soil suitability to sustain vegetation. Analyze to ascertain percentage of nitrogen, phosphorus, potash, soluble salt content, organic matter content, and pH value.

(c) Recommendations of local USDA Soil Conservation Service office.

PART 2 - PRODUCTS

2.01 Seedings for Temporary Cover

Species	Seeding Rates in lbs Per Acre	Recommended Seeding Dates
Annual Ryegrass	40	March 1 to June 15 Aug. 15 to Sept. 15
Sundangrass	40	May 15 to July 15
Millet	30	June 1 to Aug. 1
Winter Rye	120	Aug. 15 to Oct. 15
Winter Wheat	120	Aug. 15 to Oct. 15
Oats	96	May 1 to Sept. 15
Buckwheat	75	May 1 to June 15

2.02 Seed Mixture for Permanent Cover

Species	Seeding Rates in lbs Per Acre	Recommended Seeding Dates
Tall Fescue	40	In the spring by May 15 or between Aug. 1 and Oct. 1
Perennial Ryegrass	15	
TOTAL	55 lbs/ac	
	or	
Annual Rye	15	For the Fall (cool and warm season) grasses
Oats	2 bushels	
Red top	8	
Big bluestem-Niagra	4	
Indian grass	2	
Partridge pea	2	

2.03 Fertilizer

FS O-F-24, Type I, Grade A; recommended for grass, with 50 percent of the elements derived from organic sources; of proportion necessary to eliminate any deficiencies of topsoil (as indicated in analysis) to the following proportions: nitrogen, 10 percent; phosphoric acid, 10 percent; soluble potash, 10 percent.

2.04 Limestone

Limestone shall consist of pulverized limestone obtained by grinding either calcareous or dolomitic limestone so that 95 percent of the material will pass a No. 20 sieve and at least 50 percent will pass a No. 100 sieve.

2.05 Mulch

(a) Straw mulch shall be oat or wheat straw, free from weeds, foreign matter detrimental to plant life, and dry. Hay or chopped cornstalks are not acceptable.

(b) Wood fibre mulch shall consist of wood fibre produced from clean, whole uncooked wood, formed into resilient bundles having a high degree of internal friction and shall be dry when delivered on the project.

(c) Liquid mulch binders shall be emulsified asphalt (SS-1, CSS-1, CMS-2, MS-2, RS-1, RS-2, CRS-1 and CRS-2), cutback asphalt rapid curing (RC-70, RC-750, and RC-800) or medium curing (MC-250 or MC-800a), or synthetic or organic binders of type and quality satisfactory to the Trustee Representative.

2.06 Water

Clean, fresh, and free of substances or matter which could inhibit vigorous growth of grass.

PART 3 - EXECUTION

3.01 Inspection

Verify that prepared soil base is ready to receive the work of this Section.

3.02 Delivery, Storage, and Handling

(a) Deliver grass seed mixture in sealed containers showing weight, seed mix, year of production, date of packaging, and location of packaging. Seed in damaged packaging is not acceptable.

(b) Deliver fertilizer in waterproof bags showing weight, chemical analysis, and name of manufacturer. Fertilizer in damaged packaging is not acceptable.

3.03 Liming

When required, ground limestone which has been protected from moisture and is dry and free flowing, shall be evenly spread over the area to be seeded at a rate that will produce a pH value of the soil of 6.5.

3.04 Fertilizing

(a) Apply fertilizer in accordance with manufacturer's instructions.

(b) Apply after smoothing of soil and prior to roller compaction.

(c) Do not apply fertilizer at same time or with same machine as will be used to apply seed unless hydroseeding.

(d) Mix thoroughly into upper 3 to 6 inches of soil.

(e) Lightly water to aid the dissipation of fertilizer.

3.05 Seeding

(a) Apply seed at rate shown in Part 2 of this section or as recommended by local USDA soil conservation service. Seed evenly in two intersecting directions. Rake in lightly. Do not seed area in excess of what which can be mulched on same day.

(b) Planting season shall be as indicated in Part 2 of this section or as recommended by local USDA soil conservation service.

(c) Do not sow immediately following rain, when ground is too dry, frozen, or during windy periods.

3.06 Mulching

(a) Straw mulch shall be applied at a rate of 2 tons per acre.

(b) Wood fiber mulch shall be applied to seeded area at a rate of 1,400 pounds per acre. Immediately before spraying, the mulching material shall be mixed with water in the sprayer and kept uniformly suspended in the water by agitation during the spraying operation.

(c) Liquid mulch binders used to anchor straw mulch shall be applied at 8 gallons per 1,000 S.F.

3.07 Hydroseeding

This method is best for steep, inaccessible areas. When applying seeds, lime, fertilizer, or mulch materials with the hydroseeder, do not use more than 100 to 150 pounds of solids per 100 gallons of water. If inoculate is in a seed, fertilizer, and lime slurry, it should be used within three to four hours, or a fresh supply of inoculate should be added. It is preferable to hydroseed when the soil is moist.

END OF SECTION

SECTION 02937

WETLAND MITIGATION EARTHWORK

PART 1 - GENERAL

1.01 Description of Work

(a) The Contractor shall furnish all labor, materials, equipment, tools, and appurtenances required to install shallow groundwater piezometers, staff gauges and wetland mitigation soils in all the remediated wetlands including the wetland 1C revitalization areas, wetland enhancement area, the wetland restoration areas, and the created wetland area and designated upland buffers (created wetland and wetland 3A).

1.02 Related Sections

(a) Excavation - Section 02220
(b) Backfill and Fill - Section 02223
(c) Impermeable and Permeable Cover Fill - Section 02242
(d) Wetland Sediment Remediation Cover - Section 02243

1.03 Tests

(a) Top soils used in the wetland mitigation areas shall be tested for parameters and shall meet the specifications in Table 02937-1.

(b) Cover soil for wetland 1C and the enhancement area will conform to the specifications in Section 02243.

(c) Provide geotechnical test analyses for low permeability material that will be used in the base of created wetland, for both borrow source and field quality control as described in 2.02 (b) and 3.04.

1.04 Submittals

(a) Records of monthly water level readings from the shallow groundwater piezometers shall be transmitted to the Trustee Representative within 5 days of the date of the readings.

(b) The Contractor will prepare as-built plans showing surveyed final grades of mitigation wetlands.

PART 2 - PRODUCTS

2.01 Shallow Groundwater Piezometers

(a) Shallow groundwater piezometers shall be installed at a minimum frequency of one piezometer for each 0.5 acre of shrub, wet meadow or forested mitigation wetland. Piezometers shall be 2 inch interior diameter, schedule 40 PVC with 0.01 inch horizontal slots on at least 12 inches of the lower portion of the well. The bottom of the piezometer riser shall be capped with a 2" PVC cap.

(b) Staff gauges shall be installed at a minimum frequency of one staff gauge for each 0.5 acres of marsh mitigation wetlands. Staff gauges shall be marked in 0.01 foot increments.

2.02 Wetland Topsoil and Cover Soil

(a) Wetland topsoil will conform to the specifications listed in Table 02937-1 and will be graded in accordance with the performance standards in Table 02937-2.

(b) Wetland cover soil within revitalization and enhancement areas must conform to the specifications in Section 02243. Within the created wetland only, a subsoil of low permeability material will be installed to minimize seepage losses to groundwater. This soil shall have an as-built permeability rating of less than 1×10^{-6} centimeters per second typical of silty clay or silty clay loam soils. Grain size distribution should range between 28 to 50 percent clay, 40 to 70 percent silt and 20 to 40 percent sand. Clay content in natural soils may be augmented by a bentonite mix. Permeability may also be reduced through compaction during installation. For this soil, the Contractor shall provide the following tests for each borrow source:

Atterberg limits (ASTM D 4318)	1/source
Standard Proctor (ASTM D 698)	1/source
Flexible wall permeability test (ASTM D 5084) (performed on a sample compacted to 95% of Standard Proctor maximum density)	1/source

PART 3 - EXECUTION

3.01 Inspection

(a) Verify that prepared soil base meets all soil and grading performance standards and specifications in Tables 02937-1 and 02937-2 and is ready to be planted.

(b) Erect barricades and caution signs at the edge of wetland mitigation areas (as determined by the Trustee Representative) to protect against traffic and trespass.

(c) Erect erosion control haybales, fencing, and matting.

(d) Considerable handwork may be required in all phases of execution to prevent rutting or compaction of wet soils by heavy machinery. Vehicles shall not be permitted to drive on graded wetland soils.

3.02 Installation of Shallow Groundwater Piezometers and Water Measurements

(a) Shallow groundwater piezometers shall be installed to a depth of 16 inches using a hand soil auger. Soils recovered during augering shall be used as backfill around the well. Once firmly in place, the height of each piezometer above ground surface shall be recorded. Water levels in the piezometers shall be recorded monthly during the first growing season starting immediately after final grading is completed. Piezometer heights and water level records shall be transmitted to the Trustee Representative in accordance with subsection 1.05.

3.03 Maintenance

(a) All erosion control material shall be periodically inspected and maintained until final completion and acceptance of the work determined by the Trustee Representative. Maintenance shall include repair or replacement of all undermined or ineffective erosion control material.

(b) Contractor will provide and maintain a suitable area for stockpiling nursery plants make a water source available to the vegetation Contractor for watering plants.

3.04 Field Quality Control

Testing of low permeability soil in the created wetland base during construction shall be performed as follows:

(a)	Moisture/Density-ASTM D 2922	one per 10,000 sq.ft. on a 100 ft. grid per lift
(b)	Permeability-ASTM D 5084	one per acre per lift
(c)	Sieve Analysis-ASTM D 422	one per acre per lift
(d)	Atterberg Limits-ASTM D 4318	one per acre per lift
(e)	Standard Proctor-ASTM D 698	one per source

Field compaction of this material shall be performed on a maximum 8-inch lift to 95% Standard Proctor density with a water content of 2% dry to 4% wet of optimum moisture content. Any material that does not meet the requirements shall be reworked by providing additional compaction effort or replaced with acceptable material until acceptable test results are obtained.

END OF SECTION

TABLE 02937-1

PROPOSED TOPSOIL COMPOSITION FOR CAPPING WITHIN WETLAND AREAS AT THE INDUSTRI-PLEX SITE.

PARAMETER	DESCRIPTION
Organic matter[1]	5-8%
pH	6 - 7
Soil texture	sandy loam[2]
Soluble salts	not to exceed 500 ppm
Nitrogen	based on plant requirements[3]
Total Phosphorus	≤50 ppm
Potassium	3-5% saturation[4]
Magnesium	10-25% saturation
Calcium	50-80% saturation

[1]Organic matter content of the soil can be increased to reach 5 to 8 percent through the addition of soil amendments such as leaf compost or aged sawdust. these soils amendments should contain low levels of nitrogen and phosphorus to minimize the impact to water quality. These are minimum values for organic matter content. The maximum values should not exceed 20 percent.

[2]Sandy loam: 20 percent or less clay and 52 percent or more sand and the percentage of silt plus twice the percentage of clay exceeds 30; or less than 7 percent clay, less than 50 percent silt, and between 43 and 52 percent sand. (USDA - SCS, 1981. Chapter 4, Examination and descriptions of soils in the field. Soil Survey Manual. 430-V, Issue 1. USDA - SCS, Washington, DC).

[3]Nitrogen and phosphorus fertilizer should be lightly broadcast in areas to receive seed. A slow release tablet form fertilizer should be used in the planting holes of nursery stock.

[4]Magnesium, potassium and calcium ranges are provided in terms of base saturation. Percent saturation is calculated by dividing the milli-equivalents of each ion by the cation exchange capacity and multiplying by 100. The standard soil test from the Maine Soil Testing Service, University of Maine, Orono, Maine, provides results in terms of plant nutrient needs based on specific crop recommendations.

TABLE 02937-2

DESIGN PERFORMANCE STANDARDS AND SUCCESS CRITERIA FOR MITIGATION SITES.

STANDARD	SUCCESS CRITERIA
SOIL AND GRADING	
Topsoil treatment	Min. depth of 12-24 in. within created wetland and adjacent buffer, 8 in. within other wetland mitigation areas, 6 in. within Wetland 3A buffer
Organic matter content	At least 5-8% but less than 20%
Slope	≥20:1 within seasonally and semi-permanently flooded zones
Finish grades	±6 in. of proposed elevation with 6-16 in. hummocks for shrubs and trees in created wetland
Zone configuration	Predominantly sinuous (irregular) edges where feasible
Floodwater storage volume	Consistent with proposed grading plans and outlet structure in created wetland
HYDROLOGY	
Revitalized and Compensatory wetland hydrology	Meets general hydroperiod design; meets Federal Interagency Committee for Wetland Delineation minimum hydrologic criteria

SECTION 03100

CONCRETE FORMWORK

PART 1 - GENERAL

1.01 Description of Work

Furnish and install the concrete formwork as required by the concrete outlines shown and indicated on the Drawings and specified in this Section, complete.

1.02 Referenced Publications

(a) The latest edition of the publications listed below are included as a part of these Specifications.

1. ACI 318 Building Code Requirements for Reinforced Concrete

2. ACI 347 Recommended Practice for Concrete Formwork

3. U.S. Department of Commerce Product Standard (PS)

PS 1 Construction and Industrial Plywood

1.03 Form Design

The design of the forms and their performance as required by this Section is the Contractor's responsibility. Formwork shall comply with ANSI A10.9 and OSHA Construction Standards, Part 1926, Subpart Q, Concrete, Concrete Forms, and Shoring.

PART 2 - PRODUCTS

2.01 Form Material

(a) Formwork for all concrete, unless otherwise specified, shall not be less than 5/8-inch, 5-ply Douglas fir plywood of exterior structural grade especially processed to resist moisture and conforming to PS I, B-B Concrete Form Panels. Patented forms may be used, subject to approval by the Trustee Representative, provided they are in new, or like new condition so as to produce a smooth, even surface; this approval is for the finish these forms will leave on the contact surfaces and will not relieve the Contractor of

the responsibility for the design and structural soundness of the forms.

2.02 Accessories

(a) Form tie assemblies shall be form clamps with smooth tie rods, with a waterstop at the center, permitting tightening of the forms and be of such type as to leave no metal or other material within 1-1/2-inch of the surface after use. The assembly should provide cone-shaped depressions at the forms, at the surface at least 1-inch in diameter and 1-1/2-inch deep to allow filling and patching.

(b). Form releasing agent shall be a non-staining form coating compound such as "Cast-Off" by Sonneborn Products Division (Contech, Inc.), or an equal product as approved by the Trustee Representative.

PART 3 - EXECUTION

3.01 Form Construction

A. Formwork shall be in accordance with ACI 347 and as follows:

1. Forms shall conform to shape, lines and dimensions of members indicated and shall be sufficiently rigid and tight to prevent leakage of mortar. Forms shall be properly braced or tied together so as to maintain position and shape. Construct forms so that they can be removed readily without hammering or prying against the concrete. Forms for exposed concrete shall be carefully made and accurately placed to obtain correct shape and lines. If required by the Design Engineer, cambers in beams and slabs will be noted on the Drawings.

2. Wood forms shall be made of plywood. Joints shall be butted tight on solid bearings. Arrangements of panels shall be orderly and symmetrical, and use of small pieces shall be avoided. Forms shall be chamfered for external corners of concrete, including top of walls, which will be exposed in the finished work.

3. The Contractor shall be fully responsible for adequacy of formwork in its entirety. Forms shall support loads they will be required to sustain and shall maintain their dimensional and surface correctness to produce members required by Drawings.

4. Box out for slots, chases, recesses or other openings as shown on Drawings or as needed for the work of any other trades.

5. Install all the inserts to be supported by the formwork as required by the work of this and other trades as indicated and/or shown on the Drawings.

6. Provide cleanout doors at the base of wall and column forms.

3.02 Tolerance for Formed Surfaces

(a) Variation from Plumb

1. In the lines and surfaces of columns, piers, walls and in arises:

   a. In any 10 feet of length: ± 1/4-inch
   b. Maximum for the entire length: ± 1-inch

2. For exposed corner columns, control-joint grooves and other conspicuous lines:

   a. In any 20 foot length: ± 1/4-inch
   b. Maximum for the entire length: ± 1/2-inch

(b) Variation from the Level or from the Grades Specified in the Contract Documents

1. In slab soffits, ceilings, beam soffits and in arises, measured before removal of supporting shores:

   a. In any 10 foot length: ± 1/4-inch
   b. In any bay or in any 20 foot length: ±3/8-inch
   c. Maximum for the entire length: ±3/4-inch

2. In exposed lintels, sills, parapets, horizontal grooves and other conspicuous lines:

   a. In any bay or in any 20 foot length: ± 1/4-inch
   b. Maximum for the entire length: ± 1/2-inch

(c) Variation of the Linear Building Lines from Established Position in Plan and Related Position of Columns, Walls and Partitions

1. In any bay: ± 1/2-inch

2. In any 20 foot length: ± 1/2-inch

3. Maximum for the entire length: ± 1-inch

(d) Variation in the Sizes and Location of Sleeves, Floor Openings and Wall Openings: ± 1/4-inch

(e) Variation in Cross-Sectional Dimensions of Columns and Beams and in the Thickness of Slabs and Walls: ± 1/4-inch, ± 1/2-inch

(f) Footings*

1. Variations in Dimensions in Plan: ± 2-inch, provided minimum cover requirements are met.

2. Misplacement or Eccentricity: Two percent of the footing width in the direction of misplacement but not more than: 2-inches

3. Thickness: Decrease in specified thickness ±5 percent; Increase in specified thickness ±25 percent unless otherwise approved by the Design Engineer

*Tolerances apply to concrete dimensions only, not to positioning of vertical reinforcing steel, dowels or embedded items.

(g) Variation in Steps

1. In a flight of stairs:

   a. Rise: ± 1/8-inch
   b. Tread: ± 1/4-inch

2. In consecutive steps:

a. Rise: ± 1/16-inch
b. Tread: ± 1/8-inch

3.03 Inspection

Give the Trustee Representative at least 48 hours notice before any concrete is to be cast. Concrete shall not be cast until the Trustee Representative has observed and given approval of the work to be cast including, but not limited to, the placement of all the reinforcing, accessories, forms and the surfaces to be cast against. Such observations are in the nature of assisting the Contractor to minimize errors and in no case will they serve to relieve the Contractor of the responsibility to provide the materials and workmanship required by the Contract Documents.

3.04 Application of Form Coating

Immediately before the placing of reinforcing, faces of all forms in contact with the concrete shall receive a thorough coating of the liquid form-releasing agent specified, applied in compliance with the manufacturer's instructions.

3.05 Removal of Forms

(a) The Contractor shall assume full responsibility for removal of formwork and forms shall be removed in such a manner as to insure complete integrity and safety of the structure. The forms and reshoring shall remain in place for the following minimum periods of time after casting the concrete.

	Form Removal	Reshoring
Beams (sides)	2 days	0 days
Beams and slabs (soffits)	7 days	14 days
Walls and Columns	2 days	0 days

(b) Wood forms shall be completely removed from all the work to avoid termite infestation.

END OF SECTION

SECTION 03200

CONCRETE REINFORCEMENT

PART 1 - GENERAL

1.01 Description of Work

Furnish and install the concrete reinforcement as shown and indicated on the Drawings and specified in this Section, complete in place.

1.02 Referenced Publications

(a) The latest edition of the publications listed below are included as a part of these Specifications.

1.	ACI 318	Building Code Requirements for Reinforced Concrete
2.	ACI 315	Manual of Standard Practice for Detailing Reinforced Concrete Structures
3.	ASTM A 82	Specification for Cold Drawn Steel Wire for Concrete Reinforcement
4.	ASTM A 185	Specification for Welded Steel Wire Fabric for Concrete Reinforcement
5.	ASTM A 496	Deformed Steel Wire for Concrete Reinforcement
6.	ASTM A 497	Welded Deformed Steel Wire Fabric for Concrete Reinforcement
7.	ASTM A 615	Specification for Billet-Steel Bars for Concrete Reinforcement

1.03 Submittals

(a) Shop Drawings: Reproductions of the Drawings are not permitted. Shop drawings shall show placing plans, bending details and bar lists. All details and notes appearing on the Drawings and giving information for the placing of reinforcing steel, shall be shown on the shop drawings. Shop

drawings will not be reviewed without such information. Wall reinforcing shall be shown in elevation. Location and arrangement of accessories shall be clearly indicated. Placing drawings, detail drawings and bar list shall be checked by the fabricator and Contractor before being submitted to the Trustee Representative for review.

(b) Mill tests of reinforcing steel shall be submitted prior to use for each 15 tons or less shipped to the Site. Tests shall be conducted in conformance with ASTM A 615, and methods prescribed therein.

1. Cost of tests shall be borne by Contractor.

2. Three copies of each test report stating whether the material meets the requirements of the ASTM specifications shall be submitted to the Trustee Representative.

3. Certified copies of the mill tests may be considered evidence of compliance provided such tests are regularly conducted by the reinforcement supplier by experienced, competent personnel using adequate testing equipment. In case of doubt as to the adequacy or accuracy of the mill tests, the Trustee Representative may require the Contractor to furnish, at no additional cost to the Trustee, test results from an independent testing laboratory acceptable to the Trustee Representative on mill samples or delivered steel reinforcement.

PART 2 - PRODUCTS

2.01 Reinforcing Bars

Bar reinforcement shall be deformed-type bars conforming to ASTM A 615. Reinforcement shall be manufactured from new billet steel of American manufacture, Grade 60, yield strength 60,000 psi minimum.

2.02 Welded Wire Fabric

Welded wire fabric shall be in flat sheets conforming to ASTM A 185 (A 497), with wire conforming to ASTM A 82 (A 496).

2.03 Accessories

(a) All chairs and bolsters shall have plastic-covered or galvanized steel legs.

(b) For slabs on grade, all reinforcing shall be supported on chairs and/or bolsters as required to properly position the bars. The chairs and/or bolsters shall be supported on precast concrete pads bearing on the subgrade. The concrete pads shall be at least 6-inch x 6-inch and no more than 1-inch thick. Pads shall be cast from Class "A" concrete or from mortar made up of one part cement and two parts sand, with tie wires embedded.

PART 3 - EXECUTION

3.01 Storage of Materials

Reinforcing steel delivered to the Site, not immediately placed in forms, shall be protected from mud and excessive rust-producing conditions by storing in a well-drained area and supported off the ground.

3.02 Inspection of Steel Placement

(a) Give the Trustee Representative at least 48 hours notice before any concrete is to be cast. Concrete shall not be cast until the Trustee Representative has observed and given approval of the work to be cast including, but not limited to, the placement of all the reinforcing, accessories, forms and the surfaces to be cast against. Such observations are in the nature of assisting the Contractor to minimize errors and in no case will they serve to relieve the Contractor of the responsibility to provide the materials and workmanship required by the Contract Documents.

3.03 Tolerances

(a) Allowable tolerances for fabricating steel reinforcement shall be as follows:

Item	Maximum Tolerance	
Sheared length of bars	+ 1-inch	- 1-inch
Depth of truss bars	+ 0.0-inch	- 1/2-inch
Outside dimensions of stirrups, ties and spirals	+ 1/2-inch	- 1/2-inch
Location of bends	+ 1-inch	- 1-inch

(b) Allowable tolerances for placing steel reinforcement shall be as follows:

Item	Maximum Tolerance
Concrete cover from outside of bar to finished surface	+ 1/4-inch - 0.0-inch
Lateral spacing of bars in plane of reinforcement in beams and joists	+ 1/4-inch - 0.0-inch
Lateral spacing of bars in plane of reinforcement in slabs and walls	+ 1-inch - 1-inch
Spacing of stirrups, ties and spirals along longitudinal axis of member	+ 1/2-inch - 1/4-inch
Height of bottom bars in slabs, beams and joist	+ 1/4-inch - 1/4-inch
Height of top bars in slabs, beams and joists	
Depth 8-inches and less	+ 1/4-inch - 1/4-inch
Depth 9 - 24-inches	+ 1/2-inch - 1/2-inch
Depth 25-inches and greater	+ 1-inch - 1-inch

3.04 Shop Fabrication

(a) Reinforcing steel shall be fabricated to shapes and dimensions indicated on the Drawings and in compliance with applicable provisions of ACI 315 and ACI 318.

(b) Bars shall be bent cold. Bars shall be pre-fabricated to detail and delivered on the job plainly tagged and ready to set.

3.05 Field Fabrication

Field fabrication of reinforcing steel will not be permitted without the approval of the Trustee Representative.

3.06 Placement and Anchorage

(a) Space metal chairs, bolsters, spacers and hangers in accordance with ACI 315.

(b) Reinforcement, at the time concrete is placed, shall be free from rust scale or other coatings that will destroy or reduce bond. Bars with kinks or bends not shown on the plans shall not be used. A thin coating of firmly attached rust shall not be cause for rejection.

(c) Reinforcement shall be accurately placed in accordance with the Drawings and shall be adequately secured in position with not less than 16-gauge annealed wire or suitable clips at intersections. Reinforcement shall be held securely at the required distance from the forms. Nails shall not be driven into outside forms to support reinforcement.

(d) Install welded wire fabric reinforcement for concrete slabs on ground and as otherwise indicated. Lap all joints 6-inches and wire securely. Extend mesh to within 2-inches of sides and ends of slabs. Sheets that do not lay flat when in their intended position will be rejected. Tags designating the wire size and spacing shall be left on each sheet until ready for use. Tuck ends of welded mesh well down into edge of beams or walls. Do not leave unreinforced border strips. Welded wire fabric shall not contain loose rust.

(e) Conduits: Where conduits are permitted in slabs, low conduit shall be wired to the upper side of bottom reinforcing and top conduit shall be wired to lower side of top steel. Where parallel conduits occur, they shall be separated by at least 2-inches clear.

3.07 Concrete Cover

Metal reinforcement shall be protected by concrete cover as shown and noted on the Drawings.

3.08 Splicing

(a) Splicing of reinforcement shall be as shown and indicated in the Contract Documents. Splices not shown on the Drawings shall be Class "B" splice minimum. Any changes to the location and type of splices desired by the Contractor must be specifically requested and must meet the approval of the Design Engineer before they can be used.

(b) Splices shall not be made at point of maximum stress and shall provide sufficient lap to transfer stress between bars by bond.

(c) Mechanical splices may be used instead of lap splices provided that their location and type meets with the approval of the Trustee Representative.

END OF SECTION

Section 03300

CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.01 Description of Work

Furnish and install the cast-in-place concrete as shown and indicated on the Drawings and as specified in this Section, complete.

1.02 Referenced Publications

(a) The latest edition of the publications listed below form a part of these Specifications:

1. American Concrete Institute (ACI) Publications

211.1	Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete
301	Specifications for Structural Concrete for Buildings
302.1R	Guide for Concrete Floor and Slab Construction
304	Recommended Practice for Measuring, Mixing, Transporting, and Placing Concrete
305R	Hot Weather Concreting
306R	Cold Weather Concreting
318	Building Code Requirements for Reinforced Concrete

2. U.S. Army Corps of Engineers (COE) Waterways Experiment Station Publications

CRD-C-621	Handbook for Concrete and Cement, Specifications for Non-shrink Grout, Volume II

3. American Association of State Highway and Transportation Officials (AASHTO) Publication

M 182	Burlap Cloth Made From Jute or Kenaf

4. American Society for Testing and Materials (ASTM) Publications

C 31	Making and Curing Concrete Test Specimens in the Field
C 33	Concrete Aggregates
C 39	Compressive Strength of Cylindrical Concrete Specimens
C 42	Obtaining and Testing Drilled Cores and Sawed Beams of Concrete
C 94	Ready-Mixed Concrete
C 143	Slump of Portland Cement Concrete
C 150	Portland Cement
C 171	Sheet Materials for Curing Concrete
C 172	Sampling Freshly Mixed Concrete
C 173	Air Content of Freshly Mixed Concrete by the Volumetric Method
C 231	Air Content of Freshly Mixed Concrete by the Pressure Method
C 260	Air-Entraining Admixtures for Concrete
C 309	Liquid Membrane-Forming Compounds for Curing Concrete
C 494	Chemical Admixtures for Concrete
C 595	Blended Hydraulic Cements

C 618	Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete
C 881	Epoxy-Resin-Base Bonding Systems for Concrete
D 1751	Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types)

PART 2 - PRODUCTS

2.01 Cement

Cement shall be standard Portland cement of American manufacture, conforming to ASTM C-150, Type I. Only one brand of commercial Portland cement shall be used in the exposed concrete of the structure. Cement reclaimed by cleaning bags or from leaking containers shall not be used. Each bag shall weight approximately 94 pounds and contain one cubic foot.

2.02 Concrete Aggregates

(a) Fine aggregate shall be sand having clean, hard, durable, uncoated grains and free from deleterious substances and shall conform to ASTM C-33.

(b) Coarse aggregate shall be crushed stone having clean, hard, durable, uncoated particles conforming to ASTM C-33. Aggregate for lightweight concrete shall conform to ASTM C 330.

2.03 Water

Water used in mixing concrete shall be clean, potable and free from deleterious amounts of acids, alkalies or organic materials.

2.04 Expansion Joint Filler Material

Expansion joint material shall be asphalt-impregnated fiber strips, 1/2-inch thick, unless otherwise shown or noted on the Drawings, conforming to ASTM 1751.

2.05 Waterstops

Where shown on the Drawings in expansion joints and construction joints, waterstops shall be polyvinyl chloride (PVC) and shall incorporate a galvanized steel wire along both edges which shall be used to secure the waterstop in position, by tying to reinforcement, during concrete placement. The waterstop shall be of the size noted on the Drawings. The waterstop shall be equal to Wirestop CR-9380 or Burke. The waterstop shall extend the entire length of the joint and all splices shall be heat welded and tested in accordance with the manufacturer's instructions.

2.06 Vapor Barrier

Vapor barrier shall be polyethylene sheeting, minimum 6 mil thickness, conforming to ASTM C 171.

2.07 Non-Shrink Grout

Non-shrink grout shall be a ready-to-use non-metallic aggregate product requiring only the addition of water at the jobsite, and shall conform to COE CRD-C-621.

2.08 Admixtures

(a) Water reducing admixture shall conform to ASTM C-494, Type A.

(b) Water reducing, retarding admixture shall conform to ASTM C-494, Type D.

(c) Non-Corrosive, Non-Chloride Accelerator: The admixture shall conform to ASTM C-494, Type C.

(d) Air entraining admixture shall conform to ASTM C-260.

(e) High range water reducer (HRWR) shall conform to ASTM C494, Type F or G.

(f) Calcium Chloride: Calcium chloride or admixtures containing more than 0.1 percent chloride ions are not permitted.

2.09 Curing and Sealing Compounds

(a) Curing compound shall be acrylic based, conforming to ASTM C-309.

(b) Sealing-hardener compound shall conform to ASTM C-309.

2.10 Bonding Compounds

Bonding Compound shall conform to ASTM 881.

PART 3 - EXECUTION

3.01 Concrete Quality

(a) All mix designs shall be proportioned in accordance with ACI 211.1. The proportioning shall be based on the requirements of a well-graded high density plastic and workable mix within the slump range and strengths required. The following class of concrete is required:

Class of Concrete	Compressive Strength @ 28 Days	Slump Range
A	4000	3 to 5-inch

1. Air Content: All concrete shall have an air content of 5 to 7 percent.

2. Water-Cement Ratio: All concrete shall have a maximum water-cement ratio of 0.45.

3. Admixture Usage: All concrete shall contain a water reducing admixture or water reducing-retarding admixture, and an air entraining agent. All concrete placed at air temperatures below 50 degrees F shall contain the specified non-corrosive non-chloride accelerator.

3.02 Mix Designs

(a) The testing laboratory shall be paid for by the Trustee.

(b) The Contractor shall submit samples, in adequate quantities for each mix design and verification, of all concrete materials to be used on the project to the designated testing laboratory. The Contractor shall not use any concrete in this work without acceptance and verification of design mix by the testing laboratory and the approval of the Design Engineer.

(c) If trial batches are used, the testing laboratory shall make strength tests from trial batches in the laboratory using materials and mix designs proposed for use by the Contractor. The testing laboratory shall prepare trial batches in accordance with ACI 211.1.

(d) If field experience method is selected, the proposed mix design must be accompanied by complete standard deviation analysis and at least 30 consecutive strength test that represent the proposed mix.

(e) The proposed mix design and supporting data must be submitted, in triplicate, to the testing laboratory for their review and comments at least 21 days prior to the expected start of concreting operations. The testing laboratory will forward two copies of the submittal to the Trustee Representative with their comments. The Trustee Representative will review the submittal and return one copy to the Contractor with the Trustee Representative's comments.

(f) Compression test specimens made to verify the mixes shall be made in accordance with ASTM C-192. Aggregates shall be tested in accordance with ASTM C-33. All compression test specimens shall be tested in accordance with ASTM C-39.

3.03 Plant Mixing

(a) Proportioning Concrete

1. Proportions shall be in compliance with approved design mix for each class of concrete.

2. The mixing plant shall be provided with adequate equipment and facilities for accurate measurement and control of the quantities of material and water used in the concrete.

3. Concrete materials shall be measured by weight except that admixtures shall be measured by volume.

(b) Batching

1. The Contractor shall provide all necessary equipment to accurately determine and control actual amount of materials entering into the concrete mix. Individual ingredients shall be weighted separately for each batch. Accumulative weighing will be allowed if equipment is in acceptable working order as determined by the testing laboratory and approved by the Trustee Representative. Accuracy of all weighing devices shall be such that successive quantities can be measured to within one percent of the desired amount.

2. Completely discharge contents of the mixer before each new batch is loaded. Use of retempered concrete is not permitted.

3. Ready-mixed concrete shall be mixed and delivered in accordance with requirements of ASTM C-94 and to the following:

   a. A separate water metering device (not truck tank) shall be used for measuring water added to the original batch.

   b. Use of wash water as a portion of the mixing water is not permitted. Wash water added to empty drums after discharging shall be dumped before a new batch is received.

   c. Centrally mixed concrete shall be mixed for the length of time specified herein, not "shrink-mixed".

   d. Mixing drums shall be watertight.

   e. Concrete shall be discharged within one hour from the time concrete was mixed, if centrally mixed, or from time the original water was added, if transit-mixed.

   f. Furnish delivery ticket with each load of concrete delivered under these Specifications. Delivery ticket shall show clearly the class and strength of concrete, size of coarse aggregate, water per cubic yard, the slump ordered, quantities of all admixtures, and the

date and time of departure from the batching plant.

3.04 Conveying Equipment

(a) If concrete is to be transported in carts or buggies, the carts or buggies shall be equipped with pneumatic tires.

(b) Equipment for chuting or other methods of conveying concrete shall be of such size and design as to insure a practically continuous flow of concrete at delivery without segregation of materials.

3.05 Conveying

(a) Concrete shall be conveyed from mixer to place of final deposit by methods which will prevent separation or loss of the material.

(b) Runway supports shall not bear upon reinforcing steel or fresh concrete.

(c) All conveying equipment shall be thoroughly cleaned before each run of concrete is begun.

3.06 Delivery and Protection of Materials

Deliver ready-mixed concrete in compliance with requirements set forth in ASTM C-94.

3.07 Severe-Weather Provisions

(a) Hot-Weather Concreting

1. Provide adequate methods of lowering temperature of concrete ingredients so that the temperature of concrete when placed does not exceed 90 degrees F.

2. When the weather is such as to raise concrete temperature, as placed, consistently above 90 degrees F, Pozzolith retarder shall be used.

3. Subgrade and forms shall be wetted with water before placing of concrete. All excess water shall be removed before concrete is placed.

4. Curing shall start as soon as practicable to prevent evaporation of water. Flat work shall be protected from dry winds, direct sun and high temperatures.

(b) Cold-Weather Concreting

1. Provide adequate equipment for heating concrete materials and protecting concrete during freezing or near-freezing weather. No frozen materials, or materials containing ice, shall be used.

2. All concrete materials and all reinforcement, forms, fillers and ground with which concrete is to come into contact shall be free from frost.

3. Whenever the temperature of the surrounding air is below 40 degrees F and falling, all concrete placed in the forms shall have a temperature of between 70 and 80 degrees F, and adequate means shall be provided for maintaining a temperature of not less than 70 degrees F for three days, or 50 degrees F for five days, or for as much more time as is necessary to insure proper curing of the concrete. If high early strength concrete is used, the requirement for maintenance of 50 degrees F can be reduced to three days.

4. Use only the specified non-chloride accelerator. Calcium chloride or admixtures containing more than 0.1 percent chloride ions are <u>not</u> permitted.

5. Housing, covering or other protection used in connection with curing shall remain in place and intact at least 24 hours after the artificial heat is discontinued.

3.08 <u>Construction Joints and Expansion Joints</u>

(a) Construction Joints: Early in the construction program, the Contractor shall review with the Design Engineer any construction joints proposed for use which are not indicated on the Drawings. The Contractor shall not use any construction joints which are not approved by the Design Engineer. In all cases, construction joints shall occur at sections of minimum shear. Where construction joint is to be made, surface of the concrete shall be roughened (construction joints detailed with key ways in slabs and walls, are not required to be roughened) and thoroughly cleaned of foreign matter and laitance. In addition to the foregoing, joints shall be dampened with water

and the specified bonding compound applied, or a slush coat of neat cement grout shall be applied. Additional construction joints that are requested by the Contractor and approved by the Trustee Representative shall be of the type shown and/or noted on the Drawings for the specific element(s) being considered (i.e., wall slabs, etc.).

(b) Expansion joints shall be installed as indicated.

3.09 Waterstops

Waterstops shall be installed as indicated and noted on Drawings and shall be made continuous by fusion welds.

3.10 Inspection of Work Before Placing

(a) The Contractor shall inspect the forms to receive concrete for any deficiencies which would prevent proper placing of concrete. Do not proceed with placing concrete until such deficiencies are corrected.

(b) Give the Trustee Representative at least 48 hours notice before any concrete is to be cast. Concrete shall not be cast until the Trustee Representative has observed and given approval of the work to be cast including, but not limited to, the placement of all the reinforcing, accessories, forms and the surfaces to be cast against. Such observations are in the nature of assisting the Contractor to minimize errors and in no case will they serve to relieve the Contractor of the responsibility to provide the materials and workmanship required by the Contract Documents.

(c) Do not place concrete on earth until the fill or excavation has been prepared as set forth under applicable Sections of the Specifications for that work.

(d) The Contractor shall not place in the concrete any item that is not authorized to be placed by the Drawings and Specifications. The Contractor shall insert all the items as required by the other trades and properly position and secure them in their intended location. Openings other than those which are facilitated by sleeves shall be properly formed and positioned as required by the other trades.

(e) Do not place concrete in forms until all foreign matter has been removed from forms and the reinforcing steel is in proper condition for placement of concrete.

(f) Remove hardened, or partially hardened, concrete on forms or reinforcement before placing concrete.

3.11 Placing

(a) Deposit concrete as nearly as practicable in its final position to avoid segregation due to rehandling or flowing. Do not deposit concrete on work that has partially hardened or been contaminated by foreign material, and do not use retempered concrete. In no case shall Group II concrete be cast when the elapsed time after addition of water and cement to batch exceeds one hour. For Group I concretes, this elapsed time may be extended if sufficient data from this construction indicates a time extension is permissable and if approved by the Design Engineer.

(b) Concrete shall be placed to avoid the displacement of reinforcing, and coating or spattering the reinforcing steel. The placing of concrete within form work shall be regulated so that the pressure within form work does not exceed the design pressure. In placing concrete each layer shall be placed following the preceding layer to prevent lines of separation or "cold joints" in the work. After the concrete reaches its initial set, jarring the formwork or placing strain or vibration on the ends of projecting reinforcing bars shall be carefully avoided.

(c) Concrete shall not be dropped more than four feet. For greater distances of drop, concrete shall be handled with metal chutes or tremie pipes. Greater drops shall be permitted only if approved by the Design Engineer.

(d) Once concreting is started, it shall be carried on as a continuous operation until placing of the concrete between construction joints is completed. The top surface will be finished to the required alignment.

(e) Concrete shall be placed in layers not over 12-inches deep and each layer shall be compacted with the aid of mechanical internal-vibrating equipment supplemented by hand spading. Vibrators shall in no case be used to transport concrete. Use of form vibrators will not be permitted. Internal vibrators shall maintain a speed of not less than 5,000 impulses per minute when submerged in the concrete. At least one spare vibrator shall be maintained as a relief. Duration of vibrator use shall be limited to that necessary to produce satisfactory consolidation without causing objectionable segregation. Vibrator shall not be lowered into courses that have begun to set. Apply vibrator at uniformly spaced points not further apart than the visible effectiveness of the machine.

(f) Install vapor barrier over prepared sub-base for all concrete floor slabs on grade. Use largest sheets practicable to reduce number of joints. Lap joints a minimum of 24-inches. Remove torn and punctured sheets and replace with new sheets prior to placing concrete. Placing of concrete shall be done in a manner that will not damage the vapor barrier material. The sub-base material shall be as shown and/or noted on the Drawings.

(g) Type and use of vibrators shall be in accordance with ACI 301.

3.12 Protection

Protect freshly placed concrete from damage or injury due to water, falling objects, persons or anything that may mar or injure finish surface on concrete. Only light use of the floor shall be permitted for the first seven days after placing of concrete.

3.13 Curing

(a) All Slabs. After placement and finishing, concrete shall be maintained in a moist condition for at least seven successive days during which the temperature of the concrete is 50 degrees F or above. For temperatures of 50 degrees F and below, curing period shall be 14 successive days.

1. Concrete shall be kept moist by any one, or combination, of the following methods:

a. Ponding or Immersion: Continually immerse the concrete in water throughout

the curing period. Water shall not be more than 20 degrees F less than the temperature of the concrete.

b. Fog Spraying or Sprinkling: Provide uniform and continuous application of water throughout the curing period.

c. Pervious Sheeting: Completely cover surface and edges of the concrete with two thicknesses of wet sheeting. Overlap sheeting 6-inches over adjacent sheeting. Sheeting shall be at least as long as the width of the surface to be cured. During application, do not drag the sheeting over the finished concrete nor over sheeting already placed. Wet sheeting thoroughly and keep continuously wet throughout the curing period.

d. Impervious Sheeting: Wet the entire exposed surface of the concrete thoroughly with a fine spray of water and cover with impervious sheeting throughout the curing period. Lay sheeting directly on the concrete surface and overlap edges 12-inches minimum. Provide sheeting not less than 18-inches wider than the concrete surface to be cured. Secure edges and transverse laps to form closed joints. Repair torn or damaged sheeting or provide new sheeting. Inspect surface of concrete daily for wetness. The surface shall be kept continuously wet during the curing period.

(b) All Other Concrete: After placement, concrete shall be maintained in a moist condition for the same periods as specified above.

1. Concrete in Formed Surfaces - Slabs, Beams, Columns and Building Walls: Keep forms and exposed surfaces wet with water during the curing period. If forms are removed before the end of the curing period, apply a curing compound within one hour after form removal.

3.14 Patching

(a) Any concrete which is not formed as shown on the Drawings, or for any reason is out of alignment or level or shows a defective surface, or shows defects which reduce the structural adequacy of a member or members, as determined by the Trustee Representative, shall be considered as not conforming with these Specifications and shall be removed from the Project by the Contractor at Contractor's own expense, unless the Design Engineer grants permission to patch the defective area, which shall be done in accordance with the following procedure:

1. Permission to patch any such area shall not be considered a waiver of the Design Engineer right to require complete removal of the defective work if the patching does not, in the Trustee Representative's opinion, satisfactorily restore the quality and appearance of the surface or the structural adequacy of the member or members.

(b) After removing the forms, all concrete surfaces shall be inspected and any joints, voids, stone pockets or defective areas permitted by the Trustee Representative to be patched and all tie holes, shall be patched. Defective areas shall be chipped away to a depth not less than 1-inch with the edges perpendicular to the surface. Remove defective areas to sound concrete with clean, square cuts. Dampen concrete surfaces to be in contact with patching concrete and apply the specified bonding compound. Place patching concrete over the bonding compound as specified by the manufacturer. Place, compact and finish to blend with adjacent finished concrete. Cure in the same manner as adjacent concrete. Before patching mix is applied, the prepared surface shall first be approved by the Design Engineer.

(c) Patching concrete mix (or mortar) shall be subject to the approval of the Design Engineer. The patching concrete shall be compacted into place and screeded off so as to leave the patch higher than the surrounding surface. It shall then be left undisturbed for a period of one to two hours to permit initial shrinkage before being finished. The patch shall be finished to match the adjoining surface. All patches shall be cured as specified for the original concrete.

(d) Tie holes left by withdrawal of rods or the holes left by removal of ends of wall ties shall be filled solid with mortar after first being wetted. For holes passing through the wall, a plunger-type grout gun shall be used to force the mortar through the wall starting at the back face. A piece of burlap or canvas shall be held over the hole on the outside and when the hole is filled, the excess mortar shall be struck off with the cloth flush with the surface. Holes not passing through the walls shall be filled with a small tool that will permit packing the hole solid with mortar. Any excess mortar at the surface of the wall shall be struck off flush with a cloth.

3.15 Finishes on Formed Surfaces

(a) Upon completion of patching, surfaces of concrete shall be finished as follows:

1. Rubbed stone finish, where noted on the Drawings

a. Stone rubbed finish shall be produced by casting concrete against plywood forms and by rubbing the surfaces with carborundum stone and water, after patching of tie holes and depressions, to a true, even and smooth finish of uniform color and texture. No slush coat of cement grout or cement wash will be permitted at any state of the finishing.

b. Areas to be rubbed shall be finished as soon as forms can be stripped. Strip only those forms on areas which can be finished in the same day as the forms are stripped.

2. Common finish shall be produced by filling all tie holes, honeycomb and depressions, and knocking off and evening up burrs and form marks.

a. All concrete surfaces not receiving a stone rubbed or rough finish shall receive a common finish.

3. Rough finish shall be produced by filling all tie holes and honeycomb and in other respects leaving the surface as formed.

a. All concrete surfaces which will be covered by earth and which will not be visible in the completed structure, shall receive a rough finish.

3.16 Steel Troweled Finish - Floor Slabs

(a) Steel troweled finish shall be applied to the surface of all concrete floor slabs and interior equipment pads and slabs shown on the Drawings or specified to receive a steel troweled finish.

(b) Concrete shall be placed, consolidated, struck-off and leveled to the proper elevation. After the surface has stiffened sufficiently to permit the operation and the water sheen has disappeared, the surface shall be wood floated, by hand or power floated, at least twice, to a uniform sandy texture. Floors shall be leveled such that depressions between high spots do not exceed 1/4-inch under a 10 foot straightedge except where drains occur, in which case the floors shall be pitched to the drains as indicated on the Drawings.

(c) After the concrete has received a float finish, it shall be troweled at least twice to a smooth dense finish. The drying of the surface moisture before floating or troweling shall not be hastened by the dusting on of dry sand or cement. Both power and hand troweling shall be required. The first troweling shall be done by a power trowel and shall produce a smooth surface relatively free of defects. Additional troweling shall be done by hand after the surface has hardened sufficiently. The final troweling shall be done when a ringing sound is produced as the trowel is moved over the surface. The surface shall be thoroughly consolidated by the hand troweling operations. The finished surface shall be free of any trowel marks or other imperfections; shall be uniform in texture and appearance, and shall be in true plane within the tolerance specified. Any deviation from this condition which remains after the troweling is completed shall be corrected by grinding.

3.17 Broom Finish

(a) Broom finish shall be applied to all exterior side walks, walkways, platforms and all steps and landings both interior or exterior.

(b) The surface shall be given a floated finish as specified above, then finished with a flexible bristle broom or burlap belt drawn across the surface. Surface must be hardened sufficiently to retain the scoring or ridges. Scores or ridges shall be transverse to traffic or at right angles to the slope of the slab.

3.18 Testing Laboratory

(a) The testing laboratory shall be paid by the Trustee. The laboratory shall have access to all places where concrete materials and concretes are manufactured, stored, proportioned, mixed, placed and tested. Duties shall include, but not necessarily be limited to the following:

1. Make, store, transport, cure and test compression specimens made during placing of concrete. Compression test specimens shall be tested in accordance with ASTM C-39. Test reports shall show all pertinent data, such as class of concrete, exact location of pour, air temperature, date of pour, time of pour, truck number for ready-mixed concrete, date on which specimen was broken, age of specimen, compressive strength of specimen, slump test results, and air content of pour from which the specimen was made. One copy each of all tests shall be sent to the Contractor and two copies each to the Trustee Representative.

2. For each class of concrete, take four standard test cylinders from each 100 cubic yards or fraction thereof of concrete placed, not less than four cylinders for each 5,000 square feet of surface area placed in any single day. Two of these cylinders shall be designated for the 28 day test and shall comprise a test under the definition of these Specifications. One cylinder will be broken at seven days and will be used as an aid in determining the early strength of the concrete and the 28 day strength, and one cylinder retained in reserve for later testing if required.

3. Periodically inspect the batching plant and file a report with the Trustee Representative stating whether the supplier's equipment and methods meet the requirements of these Specifications.

(b) Temperature and Placing Record: Temperature record shall be made each day during the concreting operations. Records shall also include location, quantity and starting and finishing time of placement for all concrete work. Copy distribution shall be as specified above for test reports.

3.19 Evaluation of Compression Tests

(a) Evaluation of compression test results shall be as follows:

1. For each class of concrete, compression-strength tests for laboratory-cured cylinders shall be considered satisfactory if the averages of the results of all sets of three consecutive compression-strength tests equal or exceed the 28 day design compression-strength specified; and, no individual cylinder strength test falls below the required compression strength by more than 500 psi. Strength tests of specimens cured under field conditions may be required by the Trustee Representative to check the adequacy of curing and protecting of the concrete placed. Specimens shall be molded by the field quality-control laboratory at the same time and from the same samples as the laboratory-cured specimens.

(b) Faulty Concrete: Failure to meet any of the specified conditions constitutes faulty concrete. Unless otherwise directed by the Design Engineer, faulty concrete shall be removed and replaced with concrete as specified, at no expense to the Trustee.

(c) Additional Testing: If permitted by the Trustee Representative, additional testing shall be subject to the approval of the Trustee Representative and the Design Engineer and at no expense to the Trustee. Load test, if permitted by the Trustee Representative and the Design Engineer shall be conducted in accordance with the loading criteria as required by the design of the

structure, as determined by the Trustee Representative.

(d) Neither the results of laboratory verification tests nor any provision in the Contract Documents shall relieve the Contractor of the obligation to furnish concrete of the class and strength specified.

3.20 Non-Shrink Grout

All column base plates, equipment bases and other locations noted on the structural Drawings shall be grouted with the specified non- shrink, non-metallic grout.

END OF SECTION

ATTACHMENT A

Volume 2 of the Site Monitoring Plan (ISRT-PDI-33), which was submitted to the Agencies as part of the Pre-Design Investigation, is included in the Bid Document packages provided to the short-listed Contractors.

ATTACHMENT B

ODOR CONTROL PLAN

ODOR CONTROL PLAN

1.0 INTRODUCTION

The release of odors at the Industri-Plex Site has historically been a source of disturbance and concern to the local community. During the 1970's, Site development produced odors which were released into the surrounding neighborhoods and resulted in numerous complaints. The "rotten egg" odor, characteristic of hydrogen sulfide, is produced by the anaerobic decomposition of organic wastes, in this case animal hide residues produced from former glue manufacturing activities on the Site. Hide residues are known to be located in four discrete areas on-Site known as the East, West, South and East-Central Hide Piles. Hide residues have also been encountered in subsurface investigations in other areas of the Site as identified on Sheets 11-2(A-D) of the design plans.

One of the primary objectives of the remedial design and remediation activities at the Site is to minimize the release of obnoxious odors. The final design achieves this objective by construction of an impermeable cover, gas collection and treatment system for the East Hide Pile. The remedial design avoids, to the extent practical, excavation in areas of known hide residue. However, completely avoiding the disturbance and uncovering of soils containing hide residues during remedial activities is not possible. This plan outlines the procedures that will be taken to minimize the potential for release of obnoxious odors, the measures to be taken to mitigate any odor release, and a public information program that will be implemented prior to and during Site remedial activities.

2.0 POTENTIAL ODOR SOURCES

During the period from about 1934 to 1969, the Site was used by several companies to manufacture glue. The glue manufacturing process extracted proteins from animal hides and raw materials and waste resulting from the process was buried mostly in the southern portion of the Site. Subsequently, the hide residue deposits were partially moved during Site development activities in the 1970's. Today, the hide residue deposits are largely found in four discrete locations known as the East, West, South and East-Central Hide Piles. Additional subsurface investigations have revealed hide residues in other areas of the Site as identified on Sheets 11-2(A-D).

Remedial activities which involve disturbances (i.e., excavations) in known areas of hide residues have the greatest potential for the release of odors. When such activities are required as part of the remedial design, they are to be conducted during the spring and fall when outdoor activities in the surrounding neighborhoods are low. Specifically, remedial work is not permitted to occur during the months of June, July and August at the following locations:

1. New Boston Street Drainway adjacent to Wetland 8;
2. Wetland 2A between the East and East-Central Hide Piles; and
3. Excavation of the utility corridor adjacent to the East-Central Hide Pile.

Odor control measures are also mandatory during grading on the hide piles as described below.

3.0 MANDATORY ODOR CONTROL

Mandatory odor control measures shall be utilized in potentially odorous situations. Odor control measures shall follow the requirements of Section 01563 of the Specifications which include the use of a soil cover or a foam agent. The soil cover should be placed at a nominal 6-inch thickness over exposed areas containing hide residues or other soils releasing odors. Odor control foam shall consist of Rusmar AC-900, or an approved equal, applied in accordance with the manufacturer's recommendations for odor control. The odor control media shall be placed over the disturbed area and shall be maintained until the final cover has been placed.

In the areas listed above (i.e., those with a high potential to produce odors), odor control shall be implemented during all construction irrespective of whether odors are detected. In addition, construction techniques should be utilized that minimize odor emissions. The Trustee Representative must be notified by the Contractor at least one month before work is scheduled to start in such an area. Construction activities in areas where the presence of hide residues is known must be planned well in advance to expedite execution of the work. A sufficient number of trucks, equipment and labor must be available to complete the work in the shortest practical time consistent with attaining the necessary quality of work. Odor control equipment must be at the working face during the entire time work is being performed and the odor control media applied as frequently as possible.

All truck loads of odorous soils must be covered with odor control media and a tarp during hauling. Where odorous soils are being used as fill, construction techniques and odor control measures should follow the same guidelines as

those described above. Any relocation of odorous materials must be accomplished between 9 a.m. and 4 p.m. At the end of each workday the entire surface of any excavation or fill involving odorous materials must be covered with an odor control medium.

4.0 ODOR MONITORING

A Site Monitoring Plan shall be instituted as part of the remedy and is included in Section 01565 of the Specifications. The monitoring plan is designed, in part, to monitor ambient air quality during remedial activities. The air monitoring plan requires sampling for total reduced sulfer (TRS) compounds, suspended particulate matter as total suspended particulate (TSP) and inhalable particulate (PM_{10}) as well as heavy metals (arsenic, lead and chromium) in TSP at fence-line locations identified in the Site Monitoring Plan (Attachment A).

Odor monitoring will be conducted at seven fixed locations around the Site. The monitoring will be performed using a portable reduced sulfur analyzer. At no time may the concentration of total reduced sulfur compounds in air at the perimeter of the site exceed 47 parts per billion. An initial sampling frequency of once per day for nine days will be used to generate a statistical data base at the beginning of the remedy. Sampling will then be reduced to once every six days for the remainder of the remedy. Detailed sampling procedures and analyses are included in the Site Monitoring Plan.

In addition to monitoring for odors along the perimeters of the Site, monitoring shall also be conducted at active working areas in accordance with Section 01563 of the Specifications. At work areas on the Site the air monitoring standard will be set by the Contractor's Health and Safety Officer based on health concerns. Monitoring personnel at the working areas shall provide input to the excavation crews as quickly as possible.

The requirements for monitoring ambient air at the Site boundary or at active working areas is in addition to

monitoring requirements for construction personnel which will be specified in the Contractor's Site Health & Safety Plan. Preparation of the Site Health & Safety Plan is required by the Contractor and must be approved by the Agencies in accordance with Section 01564 of the Specifications.

5.0 ODOR CONTROL CONTINGENCIES

Odor control contingency steps may be required if the air monitoring program indicates that odor levels are being exceeded during Site activities and odors have not been mitigated as part of the Mandatory Odor Control procedure.

Contingency procedures may include such steps as the use of additional odor control agents and reducing the size of the working face. Thicker and more frequent application of the odor control agent or utilizing a different media may be attempted. The size of the working area may be reduced to decrease the exposure time of a particular area and make odor control procedures more efficient. If odors persist, the area should be covered and work temporarily ceased. Further attempts to continue work in the area should be postponed until better weather conditions or alternate odor control agents are available.

If hide residues and odor emissions are encountered during excavation in an area not expected to contain animal hide wastes, and no provisions for odor control had been made, the operation must be stopped and the odors abated immediately, or the excavated material must be backfilled immediately and the area temporarily covered with clean soil. The Trustee Representative must be immediately informed of the incident. The work may only be resumed after all odor control measures are implemented.

6.0 PUBLIC INFORMATION PROGRAM

6.1 Pre-Construction Information

Prior to commencement of remedial activities, a public information program shall be initiated. The program will first consist of consulting with local government officials and leaders of citizen groups. The consultation process will focus on describing the Site conditions, future remedial activities, potential problems and odor control measures described above. Input and suggestions will be solicitated during the consultation for methods to disseminate information to the general public.

Press releases will be utilized to inform the public of site activities. Such releases will explain when remedial activities will start and the types of activities that will be ongoing. Press releases will also inform the public as to where additional detailed information can be obtained. Sources may include:

1. A public meeting in each of the surrounding municipalities,
2. Informational brochure,
3. Informational telephone number.

6.2 Information During Construction

During construction lines of communication will be maintained between ISRT and the local community. An open dialogue may continue through the combined use of press releases, an informational telephone number, and a "hot line" number.

The press releases will notify the public regarding the construction progress and upcoming remedial activities. The informational telephone number with a recorded message will

be updated weekly and will outline the location and type of remedial activities to be performed during the upcoming week. A "hot line" number will be implemented for any special inquiries to ISRT and will be manned on a full-time basis during construction in areas that have a high potential to produce odors.