# Remedial Design Report

## *Peter Cooper Markhams NPL Site*
## *Dayton, New York*

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# REMEDIAL DESIGN REPORT

for

# PETER COOPER MARKHAMS NPL SITE

# DAYTON, NEW YORK

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# 1.0 INTRODUCTION

## 1.1 Site Description

The Peter Cooper Markhams NPL Site, hereinafter referred to as the "Peter Cooper Markhams Site," the "Markhams Site," or the "Site," is located off Bentley Road approximately 6 miles south of the Village of Gowanda in the Town of Dayton, Cattaraugus County, New York (see Figure 1). As illustrated on Figure 2, the Site encompasses approximately 103 acres and is bordered to the northwest by Bentley Road, to the northeast by a wooded property and farm field, to the southeast by a railroad right-of-way, and to the southwest by hardwood forest. Site access is restricted by a locked cable gate at the Bentley Road entrance. Surrounding property is entirely rural, consisting of small farm fields, open meadow, and forests.

In general, the majority of the Site, including the northeastern, northwestern and southwestern areas of the property, is characterized by mature hardwood tree cover, as well as open fields. An approximately 15- to 20-acre area within the central and southeast portions of the Site contains several covered/vegetated fill piles arranged in an elliptical pattern. For the purpose of this report, the terms "waste fill, mounded fill, and fill piles" refer to the elevated piles of material disposed at the Site. Several of the fill piles appear to consist primarily of re-worked native soil. Other fill piles consist of primarily vacuum filter sludge and cookhouse sludge. The fill piles vary in size and elevation, with base dimensions ranging from approximately 1,100 - 160,000 square feet and elevations of 5 to 15 feet above surrounding grade. The total area covered by fill piles (base area) is approximately 7 acres.

Site topography, with the exception of the fill piles, is relatively flat with some natural relief and a moderate grade to the west-southwest. An approximately 5-foot high berm, which provides an elevated bed for the Buffalo and Jamestown Railroad Company (also known as Erie-Lackawanna Railroad) rail track, runs along the entire southeast border of the Site. A dirt access road extends to the fill area from Bentley Road and continues around a portion of the fill area perimeter. The road also provides access to a natural gas wellhead located on the eastern side of the drive, northwest of the fill areas.

## 1.2 Background

### 1.2.1 Historic Operations

The Peter Cooper Markhams Site was used for the disposal of certain wastes from a former animal glue and adhesives manufacturing company located in Gowanda, New York. Materials disposed at the Markhams Site were reported to consist of residue pile material, vacuum filter sludge, and cookhouse sludge (Reference 1). Residue pile material is described as air-dried cookhouse sludge, which was stabilized to a dry, granular form. Vacuum filter sludge reportedly was produced during primary (settling) treatment of liquid wastes, including liquids generated during gravity dewatering of cookhouse sludge. Cookhouse sludge reportedly was derived from the animal glue manufacturing process, and is comprised of settled sludge resulting from the processing of animal hides, some of which were allegedly chrome-tanned.

Peter Cooper Corporations (PCC) reportedly purchased the Site in 1955. PCC sold the Site in 1976 to a buyer that was subsequently renamed Peter Cooper Corporation (PCCII). PCCII continues to own the Site and is listed as the current landowner on tax assessor maps. From approximately 1955 until September 1971, it was reported that approximately 9,600 tons of residuals were placed at the Peter Cooper Markhams Site. Pursuant to a New York State Supreme Court Order dated June 1971, approximately 38,600 tons of previously accumulated residual materials from the Gowanda Plant reportedly were also transferred to the Markhams Site. No further disposal reportedly occurred at the Markhams Site, and the fill area has since re-vegetated.

### 1.2.2 Previous Investigations and Remedial Measures

In accordance with the June 1971 State Supreme Court Order, PCC initiated transfer of residue pile material to the Markhams Site in August 1971. Shortly thereafter, PCC submitted to the New York State Department of Environmental Conservation (NYSDEC) a Solid Waste Management Report (Reference 1) documenting the means for transfer of these materials to the Markhams Site. Follow-up discussion between PCC and the NYSDEC in August 1972 provided for grading the waste piles to a height of approximately 10 feet and covering them with 6 inches of soil or stabilized residue, followed by seeding to promote fast growing cover vegetation. PCC apparently completed the closure of the Site pursuant to these work plans and to the satisfaction of NYSDEC.

Subsequent to closure, several different parties investigated the Site. The NYSDEC completed Phase I and Phase II Environmental Site Investigations at the Peter Cooper Markhams Site in 1983 and 1985 (References 2 and 3). In 1986, PCCII, under NYSDEC Consent Order, commissioned O'Brien & Gere Engineers, Inc. (OBG) to perform a Remedial Investigation and Feasibility Study (RI/FS) at the Site, which included a quantitative human health risk assessment (Reference 4), herein referred to as the 1989 OBG RI. In conjunction with the 1989 OBG RI, interim remedial measures were performed in 1989 to remove a number of buried containers that had been disposed within an isolated area of the Site (Reference 5). The containers reportedly held off-specification animal glue, PV Emulsion, Dextrin, and oil. The containers and impacted soils were excavated and transported off-site to the BFI Niagara Landfill in Tonawanda, New York for disposal as non-hazardous waste. One drum of animal glue was sent to Chemical Waste Management, Inc. in Model City, New York for disposal as hazardous waste, as the cost of analysis required to demonstrate that the material was not a hazardous waste was not justified.

The 1989 OBG RI indicated the presence of total chromium, hexavalent chromium and arsenic above background levels in waste materials and some adjacent soils. Low levels of these parameters were also detected in groundwater wells installed immediately adjacent to the fill piles. None of the samples tested exhibited hazardous waste (i.e., EP toxicity) characteristics. The 1989 OBG RI concluded that the Site did not pose a risk to human health or the environment. OBG completed a Feasibility Study for the Site in March 1991 (Reference 5). The FS recommended a remedial alternative involving consolidation, compaction, and covering of the waste materials.

NYSDEC apparently did not pursue any remedial action because the Site did not meet the statutory definition of an inactive hazardous waste disposal site. Consequently, the NYSDEC removed the site from its Registry of Inactive Hazardous Waste Sites.

In 1993, the United States Environmental Protection Agency (USEPA) conducted a Site Sampling Inspection, which included the collection and analysis of soil and surface water samples from the Peter Cooper Markhams Site (Reference 6), herein referred to as the 1993 SSI. Chromium and arsenic were detected in soils above background concentrations on and within the waste piles.

In March 1999, USEPA Region II prepared a Hazard Ranking System Model score for the Site and then listed the Peter Cooper Markhams Site on the National Priority List (NPL) in February 2000. On September 29, 2000, USEPA issued a Unilateral Administrative

Order (UAO) to several potentially responsible parties (PRPs) directing completion of an updated RI/FS for the Site.

The RI/FS Work Plan (Reference 7) was prepared for the USEPA by Geomatrix Consultants and Benchmark Environmental Engineering & Science, PLLC (Benchmark) on behalf the responding PRPs (the "Respondents") for the Peter Cooper Markhams Site, in accordance with the requirements of Paragraph 23 and Appendix 1 of Administrative Order CERCLA-02-2000-2003 and Respondents Notices of Intent to Comply (February 2001). The revised final Work Plan was submitted to the USEPA in September 2001.

Geomatrix and Benchmark performed RI scoping visits and field activities on several occasions at the Peter Cooper Markhams Site during the period of November 2000 to December 2003. The RI Report (Reference 8), referred to as the 2005 RI, was submitted to the USEPA in February 2005.

Based on the RI findings, a Feasibility Study was completed by the cooperating PRPs and was submitted to the USEPA in August 2006 (Ref. 9). The FS Report identified and evaluated effective and implementable remedial alternatives for the Site, consistent with the guidelines presented in "*Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA*" (USEPA Office of Emergency and Remedial Response, October 1988, OSWER Directive No. 9355.3-01). The remedial alternatives were developed to satisfy USEPA-approved Remedial Action Objectives for the Site, which include:

- Mitigate excess risk due to groundwater ingestion at the Site.
- Prevent direct exposure to waste fill materials.
- Mitigate erosion and migration of waste materials from exposed surfaces.

### 1.2.3 Proposed Plan and Record of Decision

In July 2005 USEPA issued a Proposed Plan for the Site that identified the following proposed remedial measures:

- Consolidating the waste/fill piles into 7 -acres or less then capping with a low permeability soil cover, consistent with the requirements of 6 NYCRR Part 360, including seeding with a mixture to foster natural habitat. Waste piles moved during consolidation will be removed to native soil, as removal to this depth will insure that any remaining contaminants will be within background concentrations.

- Imposing institutional controls in the form of an environmental easement and/or restrictive covenants that would require: (a) restricting the use of groundwater as a source of potable or process water unless groundwater quality standards are met; (b) restricting activities on the site that could compromise the integrity of the cap; and (c) the owner/operator to complete and submit periodic certifications that the institutional and engineering controls are in place.

- Developing a site management plan that provides for the proper management of all Site remedy and post-construction components, such as institutional controls, and that shall also include: (a) monitoring of groundwater to ensure that, following the capping, the contamination is attenuating and groundwater quality continues to improve; (b)identification of any use restrictions on the Site; and (c) provision for any operation and maintenance required of the components of the remedy; and (d) evaluating Site conditions at least once every five years to ensure that the remedy continues to protect public health and the environment.

Following review of public comments, USEPA issued a Record of Decision (ROD) for the Peter Cooper Landfill NPL Site on September 30, 2005. The ROD remained effectively unchanged from the Proposed Plan, with the exception that the Site Management Plan requirements were expanded to include necessary provisions for ensuring the easement/covenant remains in place and is effective; and the requirement for periodic certifications concerning the status of the institutional and engineering controls for the Site was made part of the Site Management Plan in lieu of the institutional controls.

## 1.3 Purpose and Scope

The cooperating PRPs have executed a Consent Decree outlining the terms and conditions under which the PRPs will perform remedial measures at the Peter Cooper Markhams NPL Site. This Remedial Design (RD) Report has been prepared to present a description of the remedial work that will be performed to satisfy the requirements of the Consent Decree Scope of Work. Because of the need for fast-track implementation of the remedy, the approved RD Report and design plans and specifications will be implemented by Benchmark Environmental Engineering & Science under a design-build contract for Site remediation. Accordingly, this RD Report identifies: materials to be employed for major remedial components; construction requirements; and requirements to protect workers, the surrounding community and the environment during the remedial work.

The report is composed of 8 sections:

- Section 1.0 presents a summary of the Site background including Site history and the purpose and scope of the RD Report.
- Section 2.0 identifies the project management team.
- Section 3.0 describes the remedial work including site preparation activities, waste fill consolidation and cover system construction.
- Section 4.0 presents the construction quality assurance tasks to be monitored and measured during this construction.
- Section 5.0 presents the mitigation and monitoring of remedial construction impacts through implementation of a Health and Safety Plan, a Community Air Monitoring Plan, and erosion and dust controls.
- Section 6.0 describes permits and approvals that will be required before construction of remedial measures.
- Section 7.0 identifies post-remediation requirements for the Site.
- Section 8.0 presents the project schedule for remedial design activities.
- Section 9.0 lists documents referenced herein.

# 2.0 PROJECT MANAGEMENT TEAM

## 2.1 Supervising Contractor

Benchmark Environmental Engineering & Science, PLLC will serve as Supervising Contractor for the Peter Cooper Markhams Site remedial design and construction. Benchmark is a licensed professional engineering firm with extensive experience in the design, construction and operation of remedial measures at solid and hazardous waste facilities.

All plans and specifications developed in support of the Markhams Site remediation will be prepared by or under the supervision of Benchmark, and shall be signed and certified by a licensed New York State professional engineer.

## 2.2 Project Coordinator

The Consent Decree Scope of Work requires identification of a Project Coordinator who shall be responsible for the day to day management of all Work performed pursuant to the Consent Decree, and shall be knowledgeable at all times about matters relating to the remedial design and remedial action. The designated Project Coordinator for the Peter Cooper Markhams Site is Thomas H. Forbes, P.E. Mr. Forbes has approximately 20 years experience in the design, implementation, maintenance and monitoring of remedial measures, and has served as Project Manager for remedial investigation and feasibility study-related work at the Peter Cooper Markhams Site since 2000.

Mr. Forbes shall be the primary contact for EPA on all matters relating to Work at the Site and will be available for EPA to contact during all working days. Contact information, including office, mobile and home phone numbers for Mr. Forbes will be provided to USEPA under separate cover.

# 3.0 SUMMARY OF PLANNED REMEDIAL CONSTRUCTION MEASURES

A general description of the planned remedial construction measures for the Site, consistent with the ROD, is presented in this section. Details of the planned construction are contained in the design-build plans and specifications submitted under separate cover.

## 3.1 Mobilization

Upon USEPA's approval, Benchmark and its designated construction subcontractor will mobilize to the Site. A field trailer with temporary power and lighting will be provided per the project specifications. In addition, a project sign will be erected, in accordance with the specifications, which will identify the USEPA, contact information and other pertinent information per the Consent Decree. The project sign will be located at the Site access drive entrance along Bentley Road.

## 3.2 Site Preparation

Site preparation will involve clearing, grubbing and access improvements required for the consolidation and covering work. The Storm Water Management and Erosion Control Plan (Appendix A) will be employed during all clearing and earthwork activities.

To facilitate heavy equipment access to the site, the access drive extending from Bentley Road to the northwestern limit of the waste fill will be re-established and shored, if necessary, with crushed concrete, aggregate or other suitable material. In addition to the access drive, clearing will be performed in and around the area of waste consolidation to allow equipment access. Trees, shrubs and brush within the clearing limits will be removed to facilitate construction and post-closure maintenance work. Large trees will be cut and buried within the consolidation area subgrade in a manner to prevent settlement, or removed from the Site. Stumps within the clearing limits will be removed. Small branches and brush will be mulched and reused onsite or disposed in a layer no more than 2 inches thick beneath the barrier layer. Vegetation will be stripped off the surface of waste fill where cover soils will be placed. The vegetative layer as well as any excess soil generated from the clearing work will be disposed beneath the cover soils.

## 3.3 Waste/Fill Consolidation and Grading

Waste/fill consolidation will involve relocating the various waste/fill piles presently located at various location across the center of the Site into a single waste/fill area. The configuration of the planned consolidation area is shown on the contract drawings. In general, waste/fill that presently lies within the planned consolidation footprint will be graded and recompacted to conform to the proposed subgrade contouring. Waste/fill outside of the planned consolidated footprint will be excavated, hauled and placed/compacted within the consolidation area. Relocated waste/fill will be excavated to native soil. Native soils are characterized as primarily comprised of sand, silt and gravel, and to a lesser extent clay, absent waste fill indicators (i.e., sludge; highly organic, peat-like material; animal hair; ash; cinders; and construction debris). Construction inspection personnel will verify that native soils have been reached.

Regraded and consolidated waste/fill will be placed in maximum 12-inch lifts and compacted with a sheepsfoot roller to 90% modified proctor density. Representative samples of waste/fill will be collected during construction and subjected to sieve and proctor density measurement to allow determination of maximum compaction density. Test frequency and procedure will be in accordance with Construction Quality Assurance Project Plan (CQAPP) included as Appendix B.

The sub-grade configuration will depend, in part, on the volume and recompacted density of the consolidated waste/fill. Based on present estimates, it is anticipated that uncompacted waste/fill and associated soil from outside of the proposed consolidation area footprint will be consolidated with waste/fill footprint to yield a total anticipated recompacted capacity of 47,000 cubic yards. The resultant waste/fill consolidation area will have a footprint of approximately 4.5 acres, with an average peak elevation (including cover soils) of 22 feet above surrounding grade. The target maximum sideslope will be approximately 5:1 (i.e., 20%), and will not exceed 4:1 (i.e., 25%). Figure 3 presents a plan view of the anticipated consolidation area.

All equipment in contact with waste/fill materials will be decontaminated prior to leaving the Site or being used for work on cover soils. As such, all grading equipment, excavators, compaction equipment and off-road trucks employed in subgrade activities will require decontamination. Decontamination requirements are presented in the contract specifications.

## 3.4 Cover System

The final cover system will be designed to provide long-term minimization of leachate formation by limiting the infiltration of surface water during the post-closure period. The final cover system will be constructed so that it functions with minimum maintenance, promotes drainage, and minimizes erosion. The design of the cover system calls for providing a minimum 18-inch thick recompacted low permeability ($1x10^{-6}$ cm/sec) soil barrier layer and 6 inches of topsoil.

### 3.4.1 Barrier Layer Materials, Placement and Compaction

Barrier layer soil will be comprised of natural soil material originating from borrow source locations having no evidence of disposal or releases of hazardous, toxic, or radioactive substances, or petroleum products. Certification and chemical testing requirements for barrier soil borrow materials are presented in the contract specifications. Barrier soil will contain no sod or vegetative matter, and will be tested prior to acceptance to assure that it can achieve a maximum recompacted permeability of $1x10^{-6}$ cm/sec.

Barrier soil will be placed and compacted to provide a minimum thickness of 18 inches across the final waste surface. Barrier layer soil will be placed in 6-inch thick lifts, compacted wet of optimum moisture content to achieve a minimum of 90% of the modified proctor maximum density as determined by the Modified Proctor Compaction Test (ASTM D-1557-78), and will achieve a recompacted permeability of no greater than $1x10^{-6}$ cm/sec. Amendment of barrier soils with bentonite will be considered acceptable for purposes of achieving permeability requirements. Barrier soil will be compacted with a tamping foot or sheepsfoot rollers. Smooth drum rollers will be used only for temporary sealing of lifts or stockpiled soils. Alternate compaction methods, may be employed for smaller areas where large equipment is impractical. In addition, the following requirements will apply:

- Intermediate lifts will be smooth rolled to seal them when subsequent lifts will not be placed within 48 hours of completion.
- Sealed intermediate lifts will be scarified or rolled with a sheepsfoot roller and if necessary, moistened prior to placement of subsequent barrier later soil lifts.
- Damage to compacted lifts (i.e., rutting by equipment) will be repaired prior to placing any overlying materials.

- The barrier layer soil moisture content will be maintained greater than optimum during placement and compaction, and when necessary, the moisture content will be adjusted accordingly using practical field equipment and methods.
- Compaction of barrier layer soil containing excessive moisture will not be attempted until the soil moisture content is dried to an acceptable level.

The CQAPP, described in Section 4.0, and the contract specifications provide additional detail concerning barrier soil placement requirements.

### 3.4.2 Topsoil and Seeding

The topsoil layer is the uppermost component of the cover system. Its functions are to protect the underlying layer from mechanical damage, and (in conjunction with a vegetative cover) to protect against erosion. Topsoil used for final soil cover will be a natural loam surface soil with sufficient organic material and nutrient to establish and sustain vigorous vegetative growth, and will be free of clods of hard earth, plants or roots, sticks or other extraneous material.

Topsoil will be comprised of natural soil material originating from borrow source locations having no evidence of disposal or releases of hazardous, toxic, or radioactive substances, or petroleum products. Certification and chemical testing requirements for topsoil borrow materials are presented in the contract specifications.

Following the final grading and compaction of the barrier layer, topsoil will be placed to a minimum depth of six inches (after placement and rolling). Topsoil will not be placed when it is partially frozen, muddy, or when it is covered with ice, snow, or standing water. Topsoil will be placed and graded to a smooth, even surface and will be rolled and raked to remove ridges and fill in depressions, ruts and low spots that result after settlement. Grade stakes will be used to verify the thickness of the topsoil layer.

Topsoil placement, preparation for seeding, and spreading the seed will take place in a more or less continuous operation. Seed will be selected to provide a good stand of grass that will yield a desirable natural habitat cover. A suitable starter fertilizer will be applied with the seed to stimulate growth.

The CQAPP (Section 4.0) and the contract specifications provide additional details concerning topsoil placement

### 3.4.3 Passive Gas Venting

Passive gas venting will involve the installation of passive gas venting wells through the waste/fill to relieve gas buildup beneath the cover system. Passive gas venting wells will be installed at a density of approximately one per acre to yield 5 wells. Details for vent construction are provided on the project design plans. In general, however, all gas venting wells will be constructed of 4-inch diameter Schedule 40 PVC with 180 degree (gooseneck) risers and wire bird screens.

Gas venting wells will be installed a minimum of 5 feet into the waste or to the top of native soils, whichever is encountered sooner, and will be screened in an approximate 3-foot diameter annular space filled with washed backfill material having a minimum permeability of $1x10^{-3}$ cm/s. Waste material excavated during gas vent installation will be disposed of on-site within the consolidation area subgrade.

### 3.4.4 Monitoring Wells

Monitoring wells to be retained is support of the post-remedial groundwater monitoring program for the Site (see Section 7.2) will be protected during construction. Wells that will not be retained for future monitoring or water level information will be abandoned in accordance with the FOP presented in Appendix C.

Due to suspect well integrity issues identified in the RI/FS, existing monitoring well MW-2S will be abandoned and replaced with a new 2-inch PVC well (MW-2SR) fitted with a 5-foot screen. The replacement well will be constructed to a depth of 11 feet below grade per the existing well. Well construction and installation will follow the procedures specified in the USEPA-approved RI Quality Assurance Project Plan (Reference 9).

Following construction, MW-2SR will be developed and sampled using low-flow procedures following the methodology identified in Reference 9. Samples from MW-2SR will be analyzed for Target Analyte List (TAL) metals. A sample for soluble TAL metals will be collected and analyzed if field-measured turbidity exceeds 50 NTU. Additional sample volume will be collected for matrix spike/duplicate analysis by the laboratory. TestAmerica (formerly Severn Trent Labs) of Amherst, NY will perform the analyses in accordance with USEPA SW-846 Methodology. A complete validatable package satisfying requirements of the USEPA CLP Statement of Work will be provided to allow validation of the results by a third party data validation expert. A copy of the report will be provided to the USEPA for review.

# 4.0 CONSTRUCTION QUALITY ASSURANCE

Construction quality assurance during waste consolidation and cover system placement activities will be monitored and measured through adherence to the site-specific Construction Quality Assurance Project Plan (CQAPP) included as Appendix B. The CQAPP will verify that: constructed components of the waste/fill consolidation area and cover system meet the performance and fundamental requirements of the contract specifications (e.g., compacted density, hydraulic conductivity, moisture content, etc.); proper construction techniques and procedures are used, and the materials used uniformly meet the requirements contained in the technical specifications. The CQAPP program will attempt to identify and define potential problems that are reasonably anticipated to occur during construction and address possible corrective measures.

# 5.0 MITIGATION AND MONITORING

## 5.1 Health and Safety Requirements

A Site-Specific Health and Safety Contingency Plan (HSCP) will be enforced at the Site in accordance with the requirements of 29 CFR 1910.120. The HSCP will cover all on-site remediation activities. Benchmark's HSCP is provided for informational purposes in Appendix D. The design-build remediation subcontractor will be required to develop and enforce a HSCP as or more stringent than Benchmark's HSCP.

## 5.2 Community Air Monitoring Requirements

Real-time community air monitoring will be performed during remedial activities at the Site. A Community Air Monitoring Plan (CAMP) is included with Benchmark's HSCP in Appendix D. Particulate monitoring will be performed continuously at the downwind location during all intrusive activities involving potentially-impacted media (i.e., waste/fill excavation, grading, and compaction) in accordance with the CAMP. Particulate monitoring will be discontinued following placement of the first barrier soil lift.

The CAMP is consistent with the requirements for community air monitoring at remediation sites as established by the New York State Department of Health (NYSDOH) and NYSDEC. Accordingly, it follows procedures and practices outlined under NYSDOH's Generic Community Air Monitoring Plan (dated June 20, 2000) and NYSDEC Technical Assistance and Guidance Memorandum (TAGM) 4031: Fugitive Dust Suppression and Particulate Monitoring Program at Inactive Hazardous Waste Sites.

## 5.3 Erosion and Dust Controls

Mitigation and control of surface erosion from stormwater runoff and wind borne dust will be performed in conjunction with the remedial activities at the Site.

A Storm Water and Master Erosion Control Plan (SMECP) has been prepared and incorporated as Appendix A to this Work Plan. The SMECP includes provisions for: silt fencing, hay baling, mulching, and other measures, as warranted.

Dust suppression techniques will be employed as necessary to mitigate fugitive dust from unvegetated or disturbed soil/fill to the extent practicable during construction. Dust suppression techniques will be initiated if the downwind PM-10 particulate level is 100

$\mu g/m^3$ above background (upwind perimeter). Such techniques shall be employed even if the community air monitoring results indicate particulate levels are below action levels. Techniques to be used may include one or more of the following:

- Applying water on haul roads.
- Wetting equipment and excavation faces.
- Spraying water on buckets during excavation and dumping.
- Hauling materials in properly tarped containers or vehicles.
- Restricting vehicle speeds on-site.
- Covering excavated areas and materials after excavation activity ceases.
- Reducing the excavation size and/or number of excavations.

All reasonable attempts will be made to keep visible and/or fugitive dust to a minimum.

# 6.0 PERMITS AND APPROVALS

Permits and approvals that may be required for construction include local permits for temporary utility connections, NYSDEC permits for mining of off-site fill sources, a permit for access drive improvements at Bentley Road, and general construction permits. These will be the responsibility of the Design-Build Remedial Subcontractor.

# 7.0 POST-CONSTRUCTION REQUIREMENTS

## 7.1 Institutional Controls

Institutional controls will be established prior to final completion of the remedial measures. The institutional controls will involve filing of an Environmental Easement which will preclude the use of groundwater as a source of potable or process water source (unless groundwater quality standards are met) and restrict activities on the Site that could compromise the integrity of the consolidation area cover.

The record owner of the Site, Peter Cooper Corporation, is an inactive Delaware Corporation. Following a diligent search of potential corporate successors, none has been located as of this time. The PRPs that have voluntarily agreed to conduct the remedy at the Site will, consistent with their obligation to use reasonable best efforts to implement the institutional controls: commence an action in Supreme Court, Cattaraugus County, against the Peter Cooper Corporations and proceed *in rem* against the Site to secure an Order from a court of competent jurisdiction to provide the cooperating PRPs with access to the Site and the ability to implement the institutional controls by filing the Easement in the Office of the Clerk of Cattaraugus County.

## 7.2 Operation, Maintenance and Monitoring

A post-remedial Operation, Maintenance and Monitoring (OM&M) Plan is presented in Appendix E. The OM&M Plan describes personnel requirements, responsibilities and duties, and lines of authority, and specifies post-construction sampling, analysis, and monitoring to be conducted to monitor the effectiveness of the remedy. The primary components to be monitored and/or maintained include the Waste/Fill consolidation area cover system, gas vents, and groundwater and surface water quality. The OM&M Plan will be updated, if necessary, prior to completion of the remedy as discussed in Section 7.3.2.

Monitoring and maintenance requirements for the Waste/Fill Consolidation area cover system entails routine inspections for:

- Integrity of cover, including:
    - Erosion or settling of cap materials
    - Cracking/breaches in cover
    - Loss of slope

  - Pooling or ponding of surface water
  - Loss of vegetative cover
  - Presence of undesirable plant or animal species

- Visible debris, litter and waste from illegal dumping activities

- Integrity of remaining monitoring wells, including but not limited to sediment intrusion, working locks, adequate surface seals and protective casings.

Gas vent monitoring is required concurrent with cover system inspections, and involves semi-annual inspection of gas vents for physical integrity, as well as field monitoring for explosive gases and hydrogen sulfide at the point of vent discharge.

A post-remedial groundwater monitoring plan was included as Appendix C of the approved FS report (Reference 10). The requirements of the post-remedial groundwater monitoring plan have been incorporated in the OM&M Plan. Groundwater and surface water (wetland) monitoring and reporting will be performed on a routine basis following completion of remedial construction activities.

## 7.3 Site Management Plan

A Site Management Plan (SMP) will be prepared and submitted concurrent with completion of the remedial construction activities. The purpose of the Site Management Plan is to assure that proper procedures are in place to provide for long-term protection of human health and the environment after remedial construction is complete. Toward that end, the SMP is comprised of three main components:

- An Institutional and Engineering Control Plan incorporating a description of all institutional and/or engineering controls employed at the site, including the mechanisms that will be used to continually implement, maintain, monitor, and enforce the controls. Proof of filing for environmental easements restricting site use will be provided as well. An Institutional and Engineering Control certification, to be completed periodically following remedy construction, is provided as part of the Institutional and Engineering Control Plan.

- A Soil/Fill Management Plan identifying proper management of any residual impacted subsurface soil/fill that might be encountered during redevelopment or post-remedial construction activities at the Site, if undertaken.

- The updated post-remedial Operation, Maintenance, and Monitoring Plan.

### 7.3.1 Institutional and Engineering Control Plan

Engineering controls will be required as part of the final remedy in the form of the planned cover system for the Waste/Fill consolidation area. As discussed in Section 7.1, institutional controls involving an easement that precludes the use of groundwater as a source of potable or process water source (unless groundwater quality standards are met) and restricts activities on the Site that could compromise the integrity of the cap will also be filed.

Benchmark will prepare an Institutional and Engineering Control Plan that will identify the means by which these controls will be monitored, including documentation to support periodic post-closure certification of the integrity of the controls.

### 7.3.2 Updated OM&M Plan

The OM&M Plan described in Section 7.2 will be updated to reflect any changes necessitated by modification of the final remedy from the remedial design. For example, if a monitoring well slated for post-remedial sampling is damaged during construction and a replacement well is installed, the OM&M Plan will be updated to reflect the revised well construction information. The updated OM&M Plan will be included with the SMP.

### 7.3.3 Soil/Fill Management Plan

The Soil/Fill Management Plan (SFMP) will provide guidance for proper management of any residual impacted subsurface soil/fill that could be encountered during redevelopment or post-remedial construction activities within the original limits of the waste/fill, if undertaken. These may include activities such as infrastructure construction (i.e., roads, waterline, sewers, electric cable, etc.) or foundation excavation and Site grading. The SFMP will also include measures for handling Site groundwater, if necessary for construction. Specific elements to be addressed by the SFMP include:

- Field monitoring of Site soils, and sampling and handling of impacted soil/fill, if encountered after construction.
- Collection, handling and disposal of groundwater, if encountered.
- Acceptability of soil/fill from off-site sources for backfill or subgrade fill.

- Erosion and dust control measures.
- Fencing and other access controls.
- Health and safety procedures for subsurface construction work and the protection of the surrounding community.
- Notification and reporting requirements.

## 7.4 Remedial Action Report

A Remedial Action (RA) Report will be prepared and submitted to the USEPA after the Site is remediated. The RA Report will be stamped and certified by a NYS-licensed Professional Engineer, and will be submitted within 30 days of final completion of the remediation. The RA Report will include:

- An introduction and background summarizing the Site history and remedial action requirements per the ROD.
- A summary of the remedial activities undertaken at the Site
- A chronology of the remedial construction events, including dates for all major milestones.
- A performance summary as indicated by comparison of recorded construction to performance standards and quality control requirements per the CQAPP. This will include description of any deviations from the RD Report and associated corrective measures taken; and other pertinent information necessary to document that the Site activities were carried out in accordance with the RD Report and the approved design plans and specifications.
- Observations and lessons learned, including a description of any remedial component that significantly altered project costs from those anticipated by the ROD.

# 8.0 PROJECT SCHEDULE

Figure 4 presents an overall project schedule for the performance of remedial design and cleanup activities. As indicated, the schedule anticipates substantial completion of consolidation and cover work within the 2008 construction season. This is predicated on timely review and approval of remedial design documents and receipt of necessary approvals within the timeframes shown to allow construction to begin by the end of March 2008. The schedule also assumes no significant weather delays that would hinder cover soil placement.

# 9.0 REFERENCES

1. Obrien & Gere Engineers, Inc., November 1971. Peter Cooper Corporations, Gowanda, NY - Solid Waste Management.

2. RECRA Research, 1983. *Phase I Investigation Report, Peter Cooper Gowanda and Markhams Site.*

3. RECRA Research, August 1985. *Phase II Investigation Report, Peter Cooper Gowanda and Markhams Site.*

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6. Malcolm Pirnie, Inc., 1993. *Sampling Inspection Report, Peter Cooper Markhams Site.*

7. Geomatrix Consultants, Inc. & Benchmark Environmental Engineering and Science, PLLC, February 2001 and revised September 2001. *Remedial Investigation/Feasibility Study Work Plan, Peter Cooper Markhams Site, Dayton, New York.*

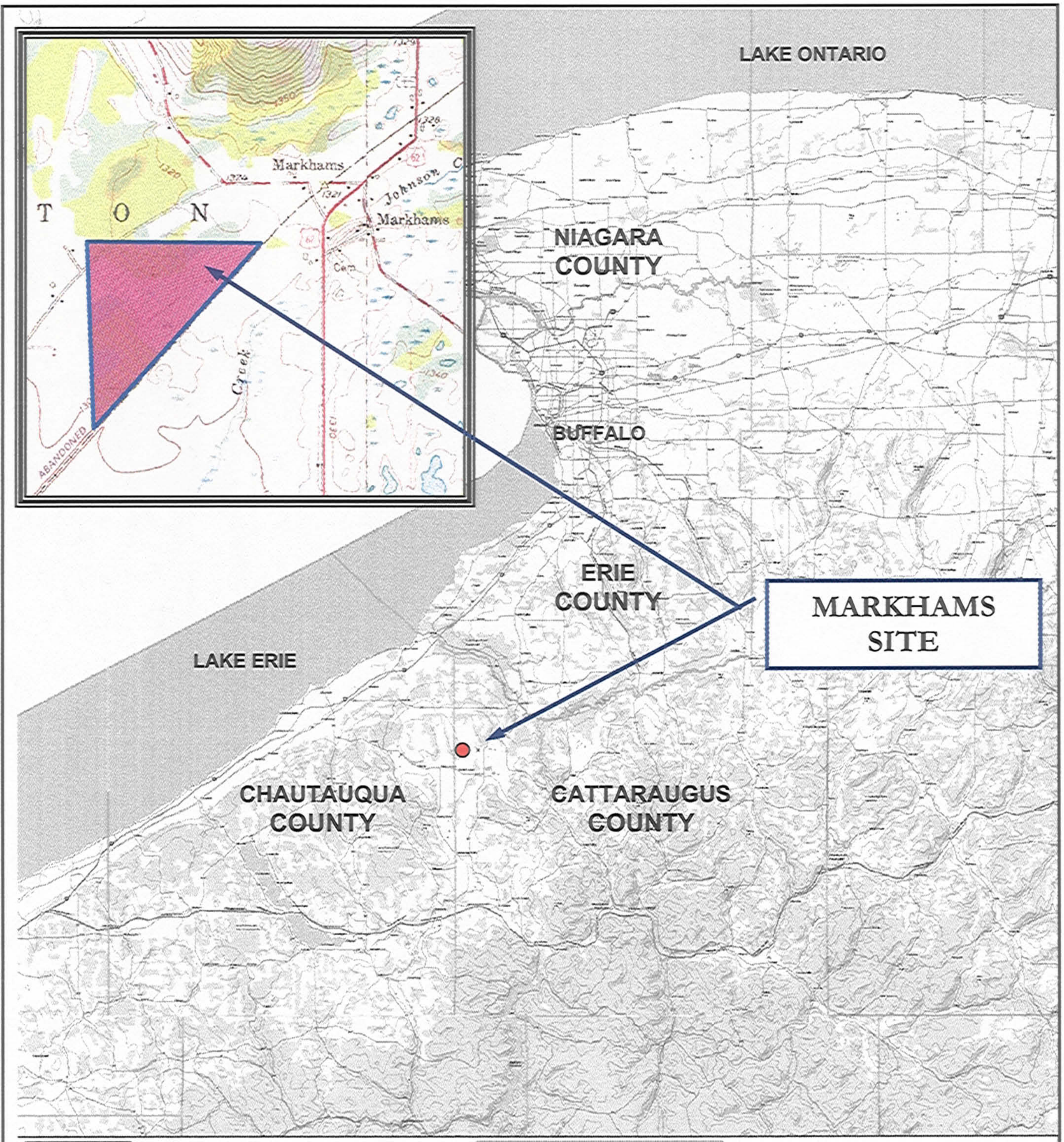
8. Geomatrix Consultants, Inc. & Benchmark Environmental Engineering and Science, PLLC, February 2005. *Remedial Investigation Report, Peter Cooper Markhams Site, Dayton, New York, Volumes I and II.*

9. Geomatrix Consultants, Inc. & Benchmark Environmental Engineering and Science, PLLC, February 2001 and revised September 2001. *Quality Assurance Project Plan for Peter Cooper Markhams Site, Dayton, New York.*

10. Benchmark Environmental Engineering and Science, PLLC, August 2006. *Feasibility Study Report – Peter Cooper Markhams Site, Dayton, New York.*

# FIGURES

FIGURE 1



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**BENCHMARK**
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PROJECT NO.: 0021-003-400

DATE: JANUARY 2008

DRAFTED BY: AJZ

# SITE LOCATION AND VICINITY MAP

REMEDIAL DESIGN REPORT

PETER COOPER MARKHAMS SITE
DAYTON, NEW YORK

PREPARED FOR
RESPONDENTS FOR PETER COOPER MARKHAMS SITE

FILEPATH:\CAD\Benchmark\Collier Shannon\Markhams Site\Remedial Design Report\figure 1;site location and vicinity map.dwg

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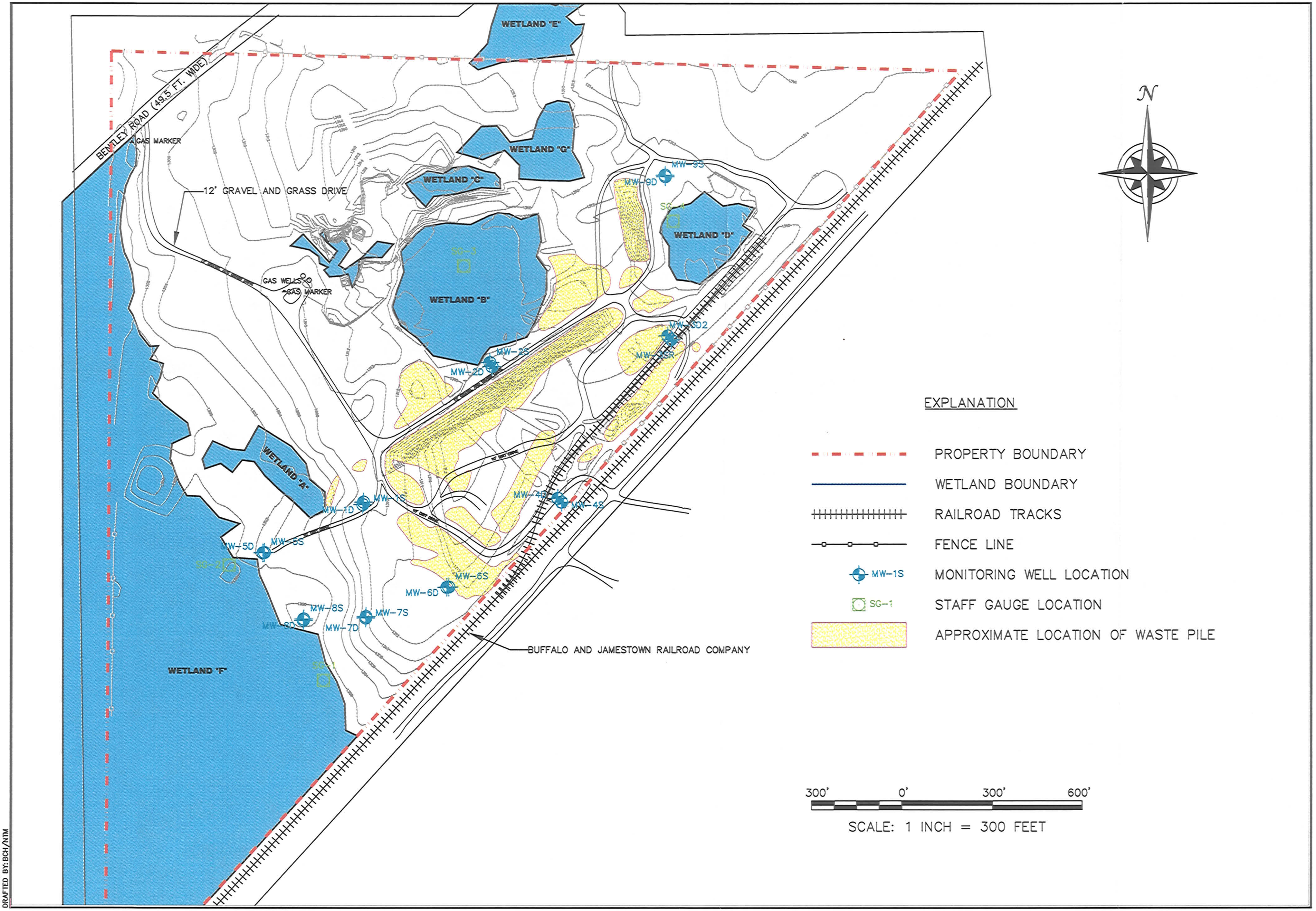

DATE: JANUARY 2008
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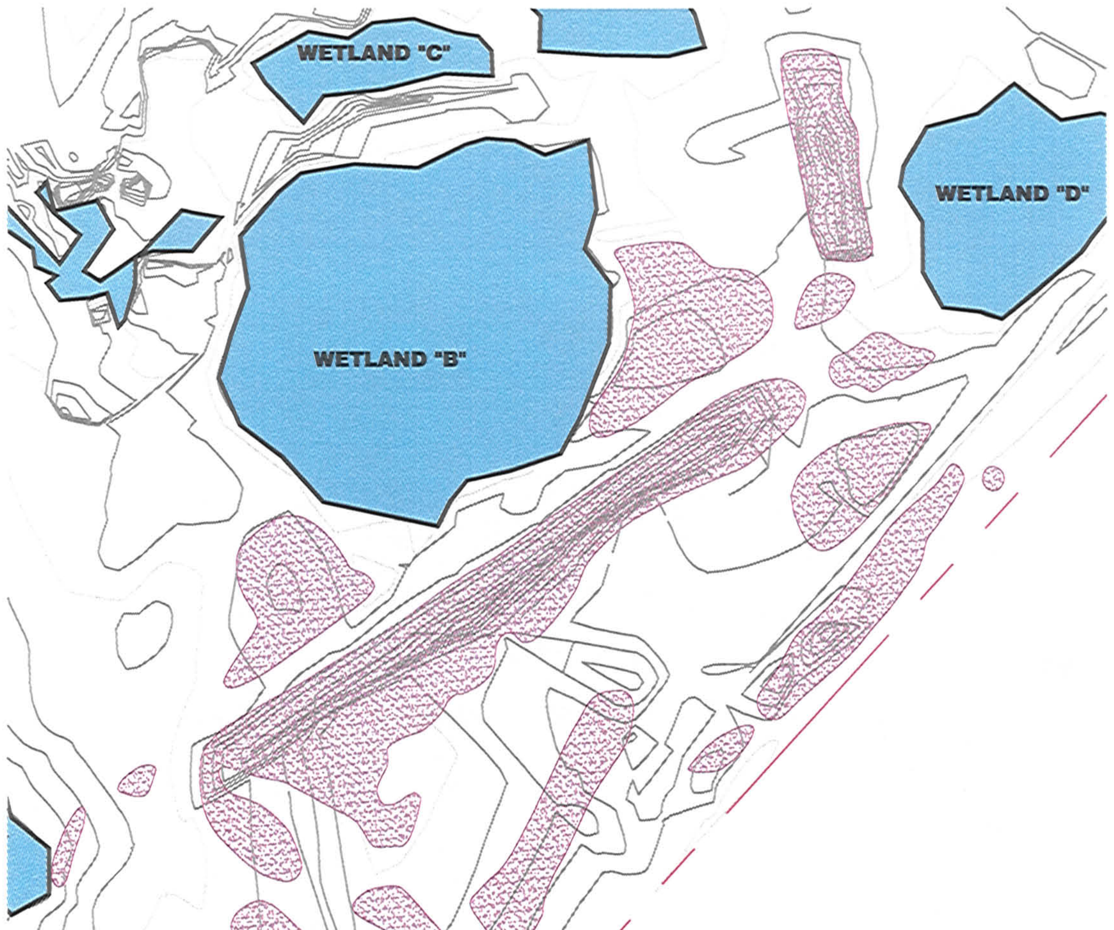
**EXISTING SITE PLAN**

REMEDIAL DESIGN REPORT
PETER COOPER MARKHAMS SITE

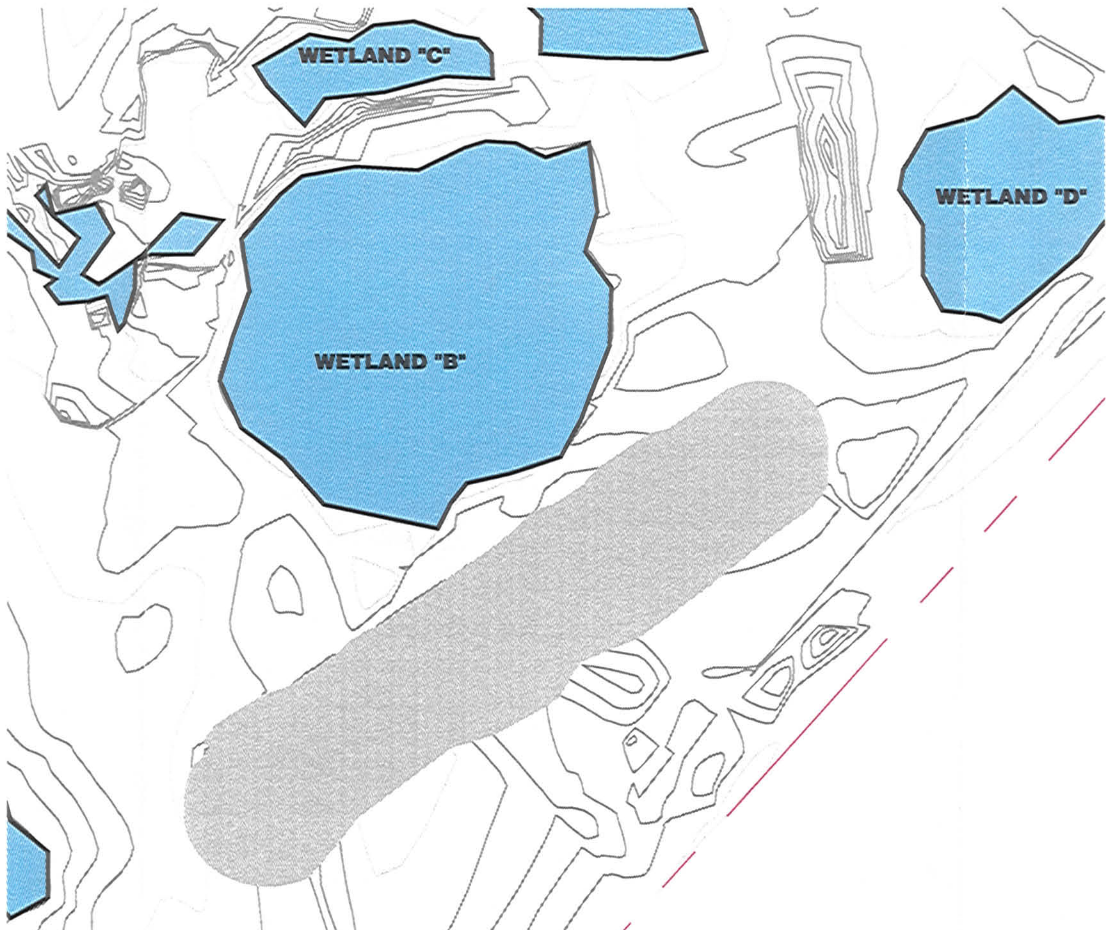
DAYTON, NEW YORK
PREPARED FOR
RESPONDENTS FOR PETER COOPER MARKHAMS

**FIGURE 2**



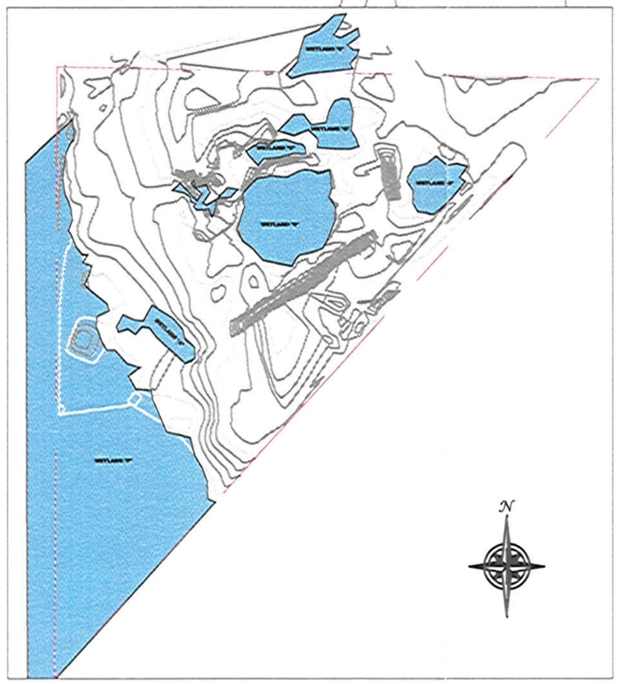
PRE-CONSOLIDATION WASTE/FILL

SCALE = 1"-250' APPROX.



POST-CONSOLIDATION WASTE/FILL

SCALLE = 1"-250' APPROX.



SITE LAYOUT

SCALE = 1"-1000' APPROX.

- PROPERTY LINE
- 🟦 DELINEATED WETLAND
- EXISTING MAJOR CONTOUR
- EXISTING MINOR CONTOUR
- ▨ EXISTING DELINEATED WASTE PILES

CONSOLIDATION CONCEPT PURPOSE & SCOPE:

1. OUTLYING WASTE FILL PILES TO BE CONSOLIDATED INTO A SINGLE WASTE FILL, NOT TO EXCEED 5 ACRES IN SIZE.
2. CONSOLIDATED WASTE WILL BE GRADED TO PROMOTE PROPER POSTIVE WATER RUNOFF.
3. CONSOLIDATED WASTE WILL BE COVERED WITH 18-INCHES OF LOW-PERMEABILITY SOIL (1X10 E-6 CM/SEC OR LESS) AND 6-INCHES OF TOPSOIL.
4. COVER SOILS WILL BE SEEDED WITH APPROPRIATE SEED MIX TO PROVIDE A GOOD STAND OF GRASS AND MITIGATE EROSION.
5. PASSIVE GAS VENTS ARE TO BE INSTALLED AT 1 PER ACRE.
6. AREAS FORMERLY COVERED BY WASTE WILL BE GRADED AND SEEDED TO PROMOTE REVEGETATION.

DATE: JANUARY 2008
DRAFTED BY: WJM

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# SCHEMATIC VIEW OF WASTE/FILL CONSOLIDATION AREA

REMEDIAL DESIGN

PETER COOPER MARKHAMS NPL SITE
BENTLEY ROAD, DAYTON, NEW YORK

PREPARED FOR
PRINCIPAL RESPONSIBLE PARTIES

FIGURE 3

# FIGURE 4
# RD/RA PROJECT SCHEDULE
# PETER COOPER MARKHAMS NPL SITE

BENCHMARK
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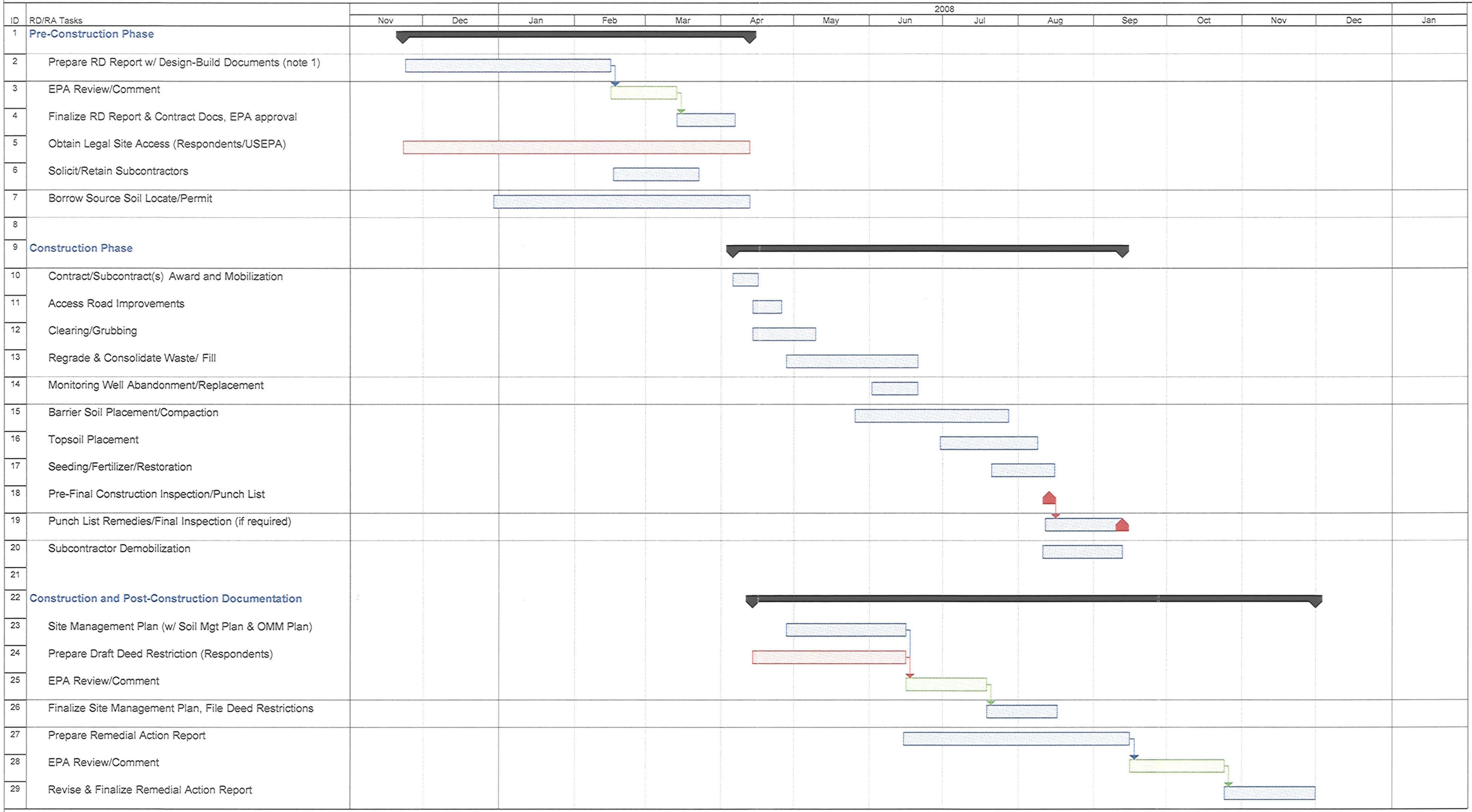


Notes:

1. Includes Construction Quality Assurance Project Plan (CQAPP) and Health & Safety Contingency Plan (HSCP).

# APPENDIX A

## STORM WATER MANAGEMENT AND EROSION CONTROL PLAN

# STORM WATER MANAGEMENT AND EROSION CONTROL PLAN
for
# PETER COOPER MARKHAMS NPL SITE
## DAYTON, NEW YORK

January 2008 0021-003-400

# STORM WATER MANAGEMENT AND EROSION CONTROL PLAN

## PETER COOPER MARKHAMS NPL SITE

## Table of Contents

## LIST OF FIGURES

## ATTACHMENTS

# 1.0 BACKGROUND

This Storm Water Management and Erosion Control Plan (SWMECP) was prepared as a supplement to the Remedial Design Report for the Peter Cooper Markhams NPL Site (hereafter referred to as the "Markhams Site" or "Site," see Figures 1 and 2). The SWMECP describes protocols for the proper handling of storm water runoff and site soil and waste materials during all clearing and earthwork activities as necessary to mitigate storm water impacts. Benchmark Environmental Engineering & Science, PLLC (Benchmark), as the Supervising Contractor, will be responsible for all monitoring and reporting requirements of this Plan. This Plan is intended to meet the functional equivalent of NYSDEC Storm water Pollution Prevention Plan. Implementation of the SWMECP will be the responsibility of the remediation subcontractor.

Storm water and erosion control will be a critical component of preventing the potential migration of contaminants onto adjacent property or into wetland areas during remediation of the site. This SWMECP was prepared to provide guidance to remediation subcontractors and NYSDEC during construction activities on the property. This document is general in nature and provides minimum storm water runoff and erosion control practices to be employed during construction. More stringent or modified procedures may be required as the work proceeds depending on actual site conditions at the time of construction.

# 2.0 SUMMARY OF PLANNED REMEDIAL CONSTRUCTION MEASURES

## 2.1 Site Preparation

Site preparation will involve clearing, grubbing and access improvements required for the consolidation and covering work. The SWMECP will be employed during all clearing and earthwork activities. To facilitate heavy equipment access to the site, the access drive extending from Bentley Road to the northwestern limit of the waste fill will be re-established and shored, if necessary, with crushed concrete, aggregate or other suitable material.

In addition to the access drive, clearing will be performed in and around the area of waste consolidation to allow equipment access. Trees, shrubs and brush within the work limits will be removed to facilitate construction and post-closure maintenance work. Large trees will be cut and buried within the consolidation area subgrade in a manner to present settlement, or removed from the Site. Stumps within the work limits will be removed. Small branches and brush will be mulched and reused onsite or disposed off-site in a layer no more than 2 inches thick beneath the barrier layer. Vegetation will be stripped off the surface of waste fill where cover soils will be placed. The vegetative layer as well as excess soil/fill generated from the clearing work will be disposed beneath the cover soils.

## 2.2 Waste Fill Consolidation and Grading

Consolidation would first involve clearing and grubbing the area covered by the waste fill piles. The smaller, outlying waste fill piles, which are presently staged across 20 acres of the site, will be consolidated to the larger piles to create a single waste fill area of approximately 5 acres in size. In general, waste/fill that presently lies within the planned consolidation footprint will be graded and recompacted to conform to the proposed subgrade contouring. Waste/fill outside of the planned consolidated footprint will be excavated, hauled and placed/compacted within the consolidation area. Relocated waste/fill will be excavated to native soil.

## 2.3 Pre-Construction Site Conditions (Existing)

Site topography, with the exception of the fill piles, is relatively flat with some natural relief and a moderate grade to the west-southwest. An approximately 5-foot high berm, which provides an elevated bed for the Buffalo and Jamestown Railroad Company (also known as Erie-Lackawanna Railroad) rail track, runs along the entire southeast border of the Site. A dirt access road extends to the fill area from Bentley Road and continues around a portion of the fill area perimeter. The road also provides access to a natural gas wellhead located on the eastern side of the drive, northwest of the fill areas.

## 2.4 Post-Construction Site Conditions

Following clearing, grubbing, and waste fill consolidation, the sub-grade will be uniformly graded to lines and grades depicted on construction grading plans. Following placement and compaction of the barrier layer materials, topsoil will be placed and graded to a smooth, even surface. The topsoil will be rolled and raked to remove ridges and to fill in depressions, ruts, and low spots that result after settlement. Seed will be selected to provide a good stand of grass that will yield a desirable natural habitat cover. Outlying areas formerly covered by waste fill will also be seeded to promote revegetation.

# 3.0 CONSTRUCTION SEQUENCE SCHEDULE

The proposed construction sequence for the activities scheduled for the Site is presented in this section. The following construction schedule is tentative and subject to change.

- Flag the work limits.
- Re-establish access road.
- Install downgradient silt/sediment fencing prior to commencing any clearing and regrading activities.
- Construct upgradient diversion swale to divert clean stormwater flow away from consolidation area.
- Clear in and around the area of waste consolidation to allow equipment access. Remove trees, shrubs, and brush within the work limits to facilitate construction and post-closure maintenance work.
- Construct sediment traps or barriers as needed during grading.
- Regrade and consolidate waste fill.
- Construct cover system and place seed for vegetative cover.
- All erosion and sediment control practices will be inspected weekly and after rainfall events. Corrective actions will be recorded and implemented immediately by adequately trained personnel.
- Following site stabilization, remove all temporary control measures.

# 4.0 EROSION AND SEDIMENT CONTROL

Erosion and sediment control will be a critical component of preventing the potential migration of contaminants onto adjacent property or into wetland areas during remediation of the site. As such, soil conservation techniques and associated Best Management Practices (BMPs) need to be incorporated into the remediation plans to mitigate soil erosion damage, off-site sediment migration, and water pollution from erosion. BMPs that combine vegetative and structural measures, some of which will be permanent in nature and become part of the completed project, are incorporated herein. Other measures will be temporary and serve only during the construction stage. Selected erosion and sediment control measures will meet the following criteria:

- Minimize erosion through project design (minimize slopes, phased construction, etc.).
- Incorporate temporary and permanent erosion control measures.
- Remove sediment from sediment-laden storm water before it leaves the site.

## 4.1 Site Design

The final cover system will be constructed so that it functions with minimum maintenance, promotes drainage, and minimizes erosion. While consolidation activities will alter existing surface runoff drainage patterns, the overall quantity of surface water runoff from the site when comparing pre-remediation to post-remediation conditions will not change significantly. In addition, construction of an engineered cover system over the consolidated waste/fill is anticipated to improve overall storm water quality, as existing waste/fill piles exhibit surface soil erosion in some instances.

## 4.2 Temporary Erosion Control Measures

Temporary erosion and sedimentation control measures and facilities will be used during construction. They will be installed by the remediation subcontractor and maintained until they are either no longer needed or until such time as permanent measures are installed and become effective. At a minimum, the following temporary measures will be used:

- Stabilized construction entrance (if necessary to prevent rutting)
- Storm water diversion

- Silt fencing
- Straw/hay bales
- Temporary vegetation/mulching
- Cautious placement, compaction, and grading of stockpiles

### 4.2.1 Stabilized Construction Entrance

To facilitate heavy equipment access to the site, the access drive extending from Bentley Road to the northwestern limit of the waste fill will be re-established and shored, if necessary, with crushed concrete, aggregate or other suitable material. Shoring will be performed if rutting by trucks and construction vehicles causes ponding, or if mud tracking necessitates excessive cleaning on Bentley Road.

### 4.2.2 Storm Water Diversion

Storm water will be diverted from areas upgradient of the consolidation area to minimize erosion and sedimentation. Diversion will involve construction of a temporary swale or perimeter dike/swale directed toward silt fencing. Typical perimeter dike/swale and temporary swale details are provided in Attachment A.

### 4.2.3 Silt Fencing

Clearing and consolidation activities may temporarily increase overland water flow to drainage ditches and wetland areas. Overland flow is not anticipated to encroach on adjacent properties. Silt fencing will be the primary sediment control measure used in these areas. Prior to excavation activities, silt fences will be installed along the downgradient perimeter of all construction areas. Stockpiles, if constructed, will also be surrounded with silt fencing. The orientation of the fencing will be adjusted as necessary as the work proceeds to accommodate changing site conditions.

As sediment collects, the silt fences will be cleaned as necessary to maintain their integrity. Removed sediment will be used as general fill beneath the consolidation area cover. All perimeter silt fences will remain in place until construction activities in an area are completed and vegetative cover has been established. Silt fences will be installed in accordance with the details presented in Attachment A.

### 4.2.4 Straw and/or Hay Bales

Straw and/or hay bales may be used as a substitute to or in conjunction with silt fences. As with silt fencing, sediment will be removed as necessary from behind the bales and disposed on-site beneath the soil cover. Bales that have become laden with sediment or have lost their structural integrity or effectiveness due to the weather will be replaced. Bales should be installed in accordance with the details presented in Attachment A.

### 4.2.5 Cautious Placement of Stockpiles

The remedial activities will involve relocation and consolidation of smaller waste fill piles into the larger consolidation area. Silt fencing will be installed on the downgradient side of the consolidation area as described above. Intermediate stockpiling of waste/fill materials outside of the silt-fenced consolidation area will not be allowed. Should the need arise to stockpile imported cover soil, careful placement and construction of stockpiles will be required to control erosion. Stockpiles will be placed no closer than one hundred feet from the wetlands and property boundaries. Additionally, stockpiles will be graded and compacted as necessary for positive surface water runoff and dust control. Silt fencing and/or hay bails will be placed between any stockpiles of soil and storm water receptors as described in Sections 4.2.3 and 4.2.4.

## 4.3 Permanent Erosion Control Measures

Permanent erosion and sedimentation control measures and structures will be installed as soon as practical during construction. Examples of permanent erosion control measures that will be used include:

- Planting and maintaining vegetation.
- Limiting runoff flow velocities to the extent practical through site grading practices.

## 4.4 Construction Best Management Practices (BMPs)

The following general construction practices will be followed to further mitigate erosion and sedimentation problems during site development activities:

- Clearing and grading only as much area as is necessary to accommodate the construction needs to minimize disturbance of areas subject to erosion (i.e., phasing the work).
- Grading and seeding exposed or disturbed areas of the site as quickly as practical.
- Installing all erosion and sediment control measures before disturbing the site subgrade.
- Using routine entry/exit routes to minimize both on-site and off-site tracking of soil by vehicles.

Good housekeeping and spill control practices will be followed during construction to minimize storm water contamination from waste fill and fertilizers. Good housekeeping practices are listed below.

- Fertilizers will be applied only in the minimum amounts recommenced by the manufacturer.
- Fertilizers will be worked into the soil to limit exposure to storm water.
- Fertilizers will not be stored on-site and partially used bags will be transferred to sealable containers to avoid spills.
- All vehicles on-site will be monitored for leaks and receive regular preventive maintenance to reduce the chance of leakage.
- All spills will be cleaned up immediately upon discovery. Spills large enough to reach the storm system will be reported to the NYSDEC Spill Hotline at 1-800-457-7362.
- A stabilized construction entrance will be maintained to reduce vehicle tracking of sediments.
- Bentley Road will be swept as necessary to remove excess mud, dirt, or rock tracked from the site.
- All ruts caused by equipment used for cutting and removing of trees will be graded.

## 4.5 Coordination of BMPs with Construction Activities

Structural BMPs will be coordinated with construction activities so the BMP is in place before construction begins. The following BMPs will be coordinated with construction activities:

- The temporary perimeter controls (silt fences and straw bails) will be installed before any clearing and grading begins.
- Clearing and grading will not occur in an area until it is necessary for construction to proceed.
- The construction site entrance and will be re-established before clearing and grading begins.

- Once construction activity ceases permanently in an area, that area will be stabilized with permanent seed and mulch.
- The temporary perimeter controls (silt fencing and straw bails) will not be removed until all construction activities at the site are complete and soils have been stabilized.

## 5.0 MAINTENANCE/INSPECTION PROCEDURES

All erosion and sedimentation controls described in this Plan will be inspected by Benchmark within 24 hours of a heavy rainfall event (greater than 0.5 inches) and repaired or modified as necessary to effectively control erosion or turbidity problems. Inspections will include areas under construction, stockpile areas, erosion control devices (i.e., silt fences, hay bales, etc.) and locations where vehicles enter and leave the site. Routine inspections of the entire site will also be made on a monthly basis during remediation work.

If inspections indicate problems, corrective measures will be implemented within 48 hours of report. A report summarizing the scope of the inspection, name of the inspector, date, observations made, and a description of the corrective actions taken will be completed.

The inspection will be conducted by Benchmark personnel or its designated storm water team members. The inspection will verify that the procedures used to prevent storm water contamination from construction activities are effective. The following inspection and maintenance practices will be used to maintain erosion and sediment controls:

- Built up sediment will be removed from silt fencing when it has reached one-third the height of the fence.

- Silt fences will be inspected for depth of sediment, for tears, to see if the fabric is securely attached to the fence posts and to see that the fence posts are firmly in the ground.

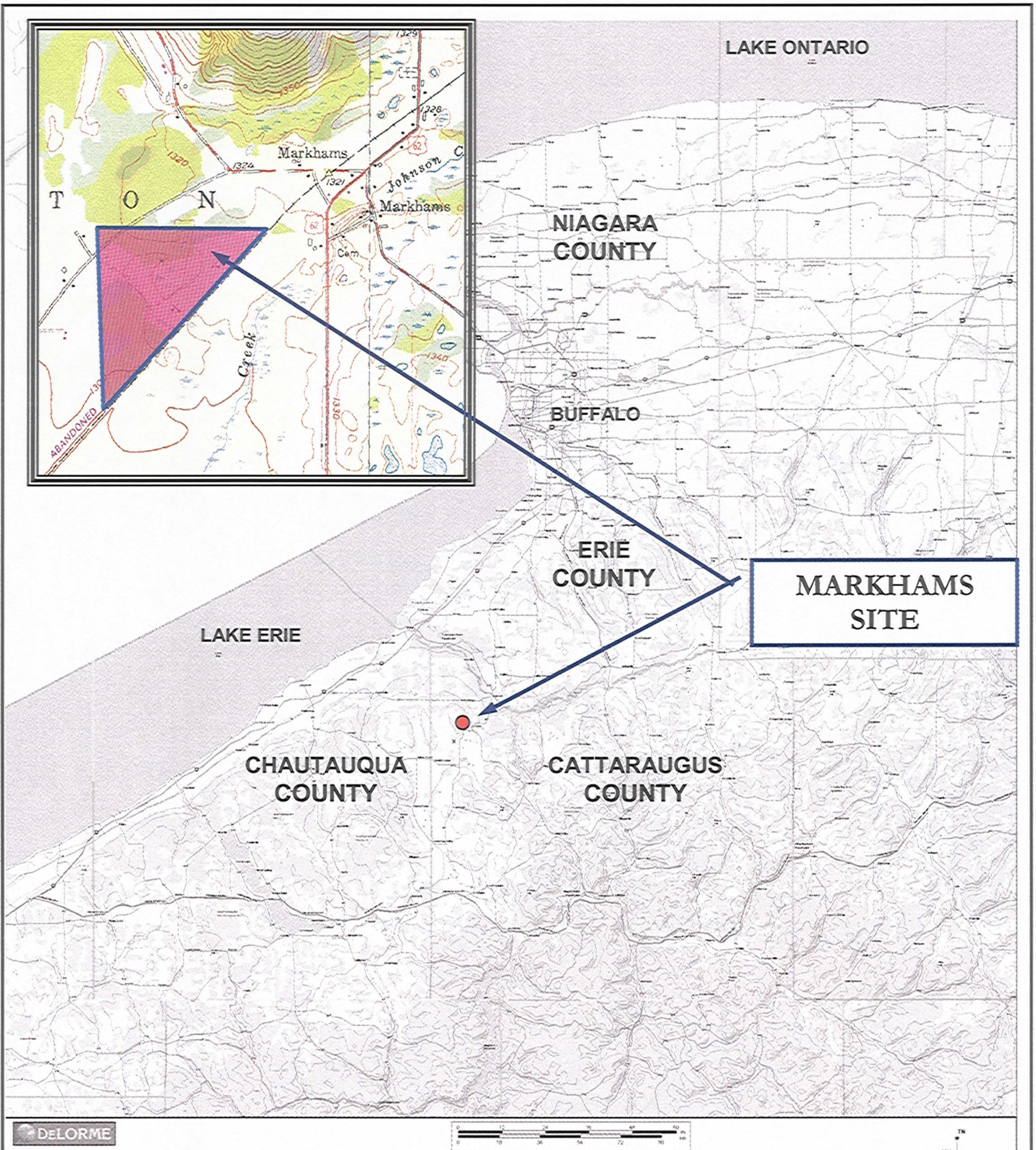
- Temporary and permanent seeding will be inspected for bare spots, washouts and healthy growth.

- The construction entrance will be inspected for sediment tracked on the road, for clean gravel, and to make sure that the culvert beneath the entrance is working and that all traffic use the stabilized entrance when leaving the site.

A maintenance inspections report summarizing the scope of the inspection, name of the inspector, date, and observations made, and a description of the corrective actions taken should be completed after each inspection. Attachment B includes a Monitoring, Inspection, and Maintenance Plan. Completed forms will be maintained on-site during the entire construction project. Following construction, the completed forms will be retained at the Supervising Contractor's office for a minimum of 3 years. If construction activities or design modifications are made to the site plan, which could impact storm water, this SWMECP will be amended appropriately. The amended SWMECP will have a description of the new activities that contribute to the increased pollutant loading and the planned source control activities.

# FIGURES

**FIGURE 1**



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PROJECT NO.: 0021-003-400

DATE: DECEMBER 2007

DRAFTED BY: AJZ

## SITE LOCATION AND VICINITY MAP

STORM WATER MANAGEMENT AND EROSION CONTROL PLAN

PETER COOPER MARKHAMS SITE
DAYTON, NEW YORK

PREPARED FOR
RESPONDENTS FOR PETER COOPER MARKHAMS SITE

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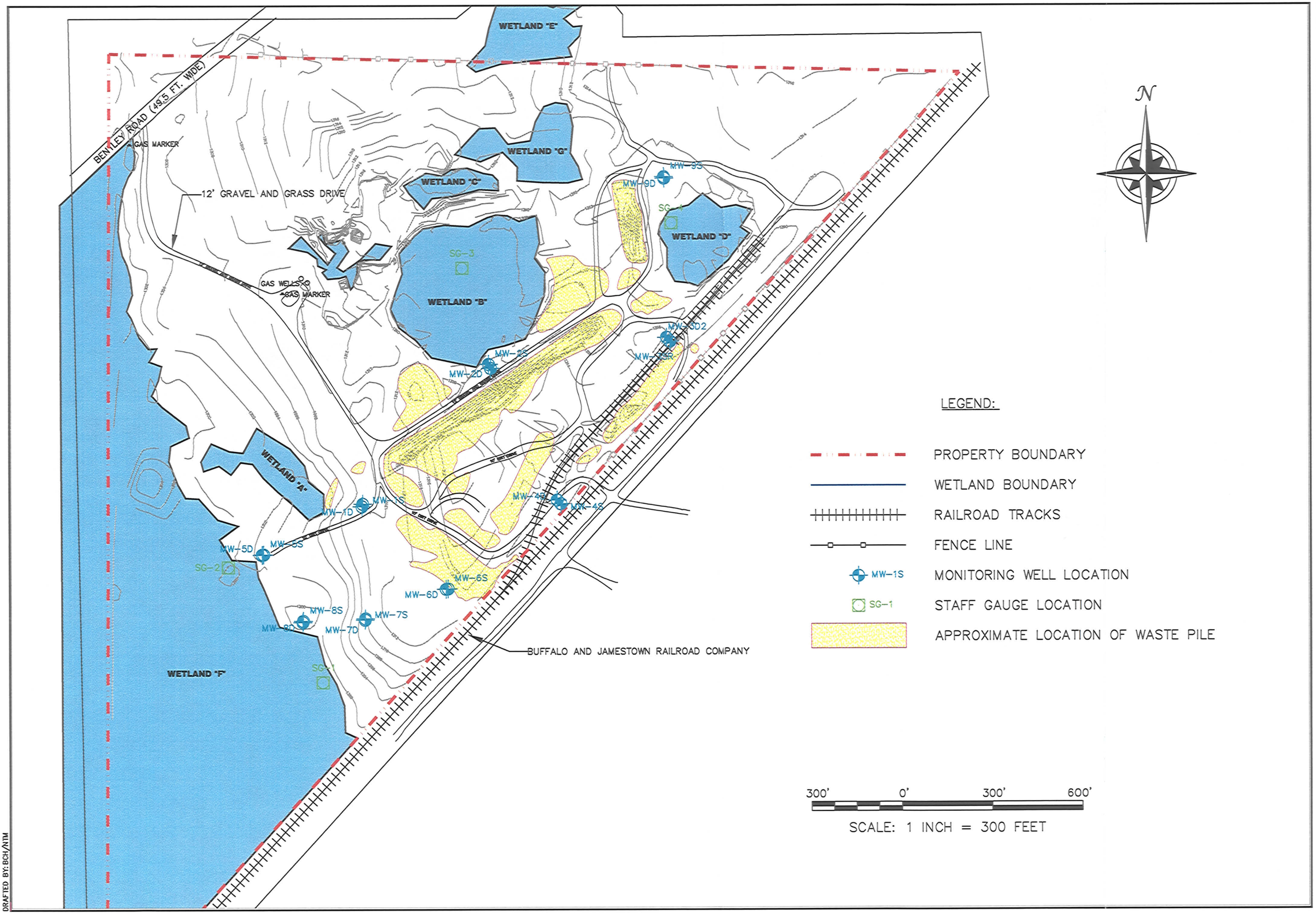

## SITE PLAN MAP

STORM WATER MANAGEMENT AND EROSION CONTROL PLAN

PETER COOPER MARKHAMS SITE

DAYTON, NEW YORK
PREPARED FOR
RESPONDENTS FOR PETER COOPER MARKHAMS

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FIGURE 2

# ATTACHMENT A

## EROSION CONTROL DETAILS

# STANDARD AND SPECIFICATIONS
# FOR
# TEMPORARY SWALE

## Definition

A temporary excavated drainage way.

## Purpose

The purpose of a temporary swale is to prevent runoff from entering disturbed areas by intercepting and diverting it to a stabilized outlet or to intercept sediment laden water and divert it to a sediment trapping device.

## Conditions Where Practice Applies

Temporary swales are constructed:

1. to divert flows from entering a disturbed area.
2. intermittently across disturbed areas to shorten overland flow distances.
3. to direct sediment laden water along the base of slopes to a trapping device.
4. to transport offsite flows across disturbed areas such as rights-of-way.

Swales collecting runoff from disturbed areas shall remain in place until the disturbed areas are permanently stabilized.

## Design Criteria

See Figure 5A.2 on page 5A.5 for details.

| | Swale A | Swale B |
|---|---|---|
| Drainage Area | <5 Ac | 5-10 Ac |
| Bottom Width of Flow Channel | 4 ft | 6 ft |
| Depth of Flow Channel | 1 ft | 1 ft |
| Side Slopes | 2:1 or flatter | 2:1 or flatter |
| Grade | 0.5% Min.<br>20% Max. | 0.5% Min.<br>20% Max. |

For drainage areas larger than 10 acres, refer to the Standard and Specification for Waterways on page 5B.11.

**Stabilization**

Stabilization of the swale shall be completed within 7 days of installation in accordance with the appropriate standard and specifications for vegetative stabilization or stabilization with mulch as determined by the time of year. The flow channel shall be stabilized as per the following criteria:

| Type of Treatment | Channel Grade[1] | Flow Channel A (<5 Ac.) | Flow Channel B (5-10 Ac) |
|---|---|---|---|
| 1 | 0.5-3.0% | Seed & Straw Mulch | Seed & Straw Mulch |
| 2 | 3.1-5.0% | Seed & Straw Mulch | Seed and cover with RECP, Sod, or lined with plastic or 2 in. stone |
| 3 | 5.1-8.0% | Seed and cover with RECP, Sod, or line with plastic or 2 in. stone | Line with 4-8 in. or stone or Recycled Concrete Equivalent[2] or geotextile |
| 4 | 8.1-20% | Line with 4-8 in. stone or Recycled Concrete Equivalent[2] or geotextile | Site Specific Engineering Design |

[1] In highly erodible soils, as defined by the local approving agency, refer to the next higher slope grade for type of stabilization.

[2] Recycled Concrete Equivalent shall be concrete broken into the required size, and shall contain no steel reinforcement.

**Outlet**

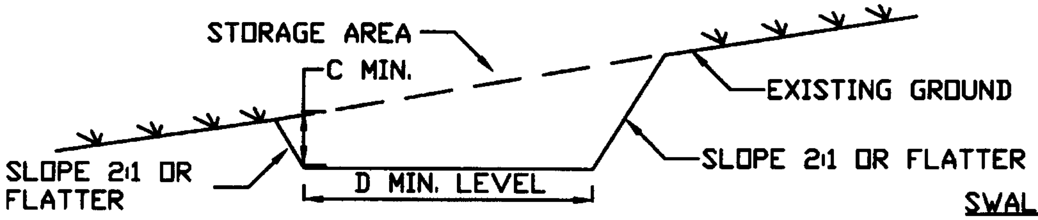
Swale shall have an outlet that functions with a minimum of erosion, and dissipates runoff velocity prior to discharge off the site.

Runoff shall be conveyed to a sediment trapping device such as a sediment trap or sediment basin until the drainage area above the swale is adequately stabilized.

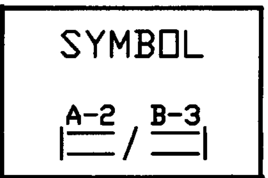
The on-site location may need to be adjusted to meet field conditions in order to utilize the most suitable outlet condition.

If a swale is used to divert clean water flows from entering a disturbed area, a sediment trapping device may not be needed.

# Figure 5A.2
# Temporary Swale

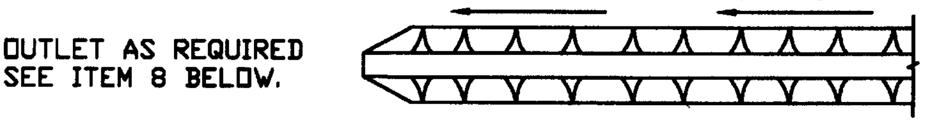


CROSS SECTION



| | SWALE A | SWALE B |
|---|---|---|
| C | 1′ | 1′ |
| D | 4′ | 6′ |

POSITIVE DRAINAGE: 0.5% OR STEEPER DEPENDENT ON TOPOGRAPHY



PLAN VIEW

## CONSTRUCTION SPECIFICATIONS

1. ALL TEMPORARY SWALES SHALL HAVE UNINTERUPTED POSITIVE GRADE TO AN OUTLET.
2. DIVERTED RUNOFF FROM A DISTURBED AREA SHALL BE CONVEYED TO A SEDIMENT TRAPPING DEVICE.
3. DIVERTED RUNOFF FROM AN UNDISTURBED AREA SHALL OUTLET DIRECTLY INTO AN UNDISTURBED STABILIZED AREA AT NON-EROSIVE VELOCITY.
4. ALL TREES, BRUSH, STUMPS, OBSTRUCTIONS, AND OTHER OBJECTIONABLE MATERIAL SHALL BE REMOVED AND DISPOSED OF SO AS NOT TO INTERFERE WITH THE PROPER FUNCTIONING OF THE SWALE.
5. THE SWALE SHALL BE EXCAVATED OR SHAPED TO LINE, GRADE, AND CROSS SECTION AS REQUIRED TO MEET THE CRITERIA SPECIFIED HEREIN AND BE FREE OF BANK PROJECTIONS OR OTHER IRREGULARITIES WHICH WILL IMPEDE NORMAL FLOW.
6. FILLS SHALL BE COMPACTED BY EARTH MOVING EQUIPMENT.
7. ALL EARTH REMOVED AND NOT NEEDED FOR CONSTRUCTION SHALL BE PLACED SO THAT IT WILL NOT INTERFERE WITH THE FUNCTIONING OF THE SWALE.
8. STABILIZATION SHALL BE AS PER THE FLOW CHANNEL STABILIZATION CHART BELOW:

| TYPE OF TREATMENT | CHANNEL GRADE | A(5 AC. OR LESS) | B(5 AC -10AC) |
|---|---|---|---|
| 1 | 0.5-3.0% | SEED AND STRAW MULCH | SEED AND STRAW MULCH |
| 2 | 3.1-5.0% | SEED AND STRAW MULCH | SEED AND COVER USING RECP |
| 3 | 5.1-8.0% | SEED AND COVER WITH RECP | LINED WITH 4-8" RIP-RAP OR GEOTEXTILE |
| 4 | 8.1-20.% | LINED WITH 4-8" RIP-RAP OR GEOTEXTILE | ENGINEERED DESIGN |

9. PERIODIC INSPECTION AND REQUIRED MAINTENANCE MUST BE PROVIDED AFTER EACH RAIN EVENT.

ADAPTED FROM DETAILS PROVIDED BY: USDA - NRCS,
NEW YORK STATE DEPARTMENT OF TRANSPORTATION,
NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION,
NEW YORK STATE SOIL & WATER CONSERVATION COMMITTEE

TEMPORARY
SWALE

# STANDARD AND SPECIFICATIONS
# FOR
# PERIMETER DIKE/SWALE

## Definition

A temporary ridge of soil excavated from an adjoining swale located along the perimeter of the site or disturbed area.

## Purpose

The purpose of a perimeter dike/swale is to prevent off site storm runoff from entering a disturbed area and to prevent sediment laden storm runoff from leaving the construction site or disturbed area.

## Conditions Where Practice Applies

Perimeter dike/swale is constructed to divert flows from entering a disturbed area, or along tops of slopes to prevent flows from eroding the slope, or along base of slopes to direct sediment laden flows to a trapping device.

The perimeter dike/swale shall remain in place until the disturbed areas are permanently stabilized.

## Design Criteria

See Figure 5A.3 on page 5A.8 for details.

The perimeter dike/swale shall not be constructed outside the property lines without obtaining legal easements from affected adjacent property owners. A design is not required for perimeter dike/swale. The following criteria shall be used:

<u>Drainage area</u> – Less than 2 acres (for drainage areas larger than 2 acres but less than 10 acres, see earth dike or temporary swale; for drainage areas larger than 10 acres, see standard and specifications for diversion).

<u>Height</u> – 18 inches minimum from bottom of swale to top of dike evenly divided between dike height and swale depth.

<u>Bottom width of dike</u> – 2 feet minimum.

<u>Width of swale</u> – 2 feet minimum.

<u>Grade</u> – Dependent upon topography, but shall have positive drainage (sufficient grade to drain) to an adequate outlet. Maximum allowable grade not to exceed 8 percent.

<u>Stabilization</u> – The disturbed area of the dike and swale shall be stabilized within 7 days of installation, in accordance with the standard and specifications for temporary swales.

### Outlet

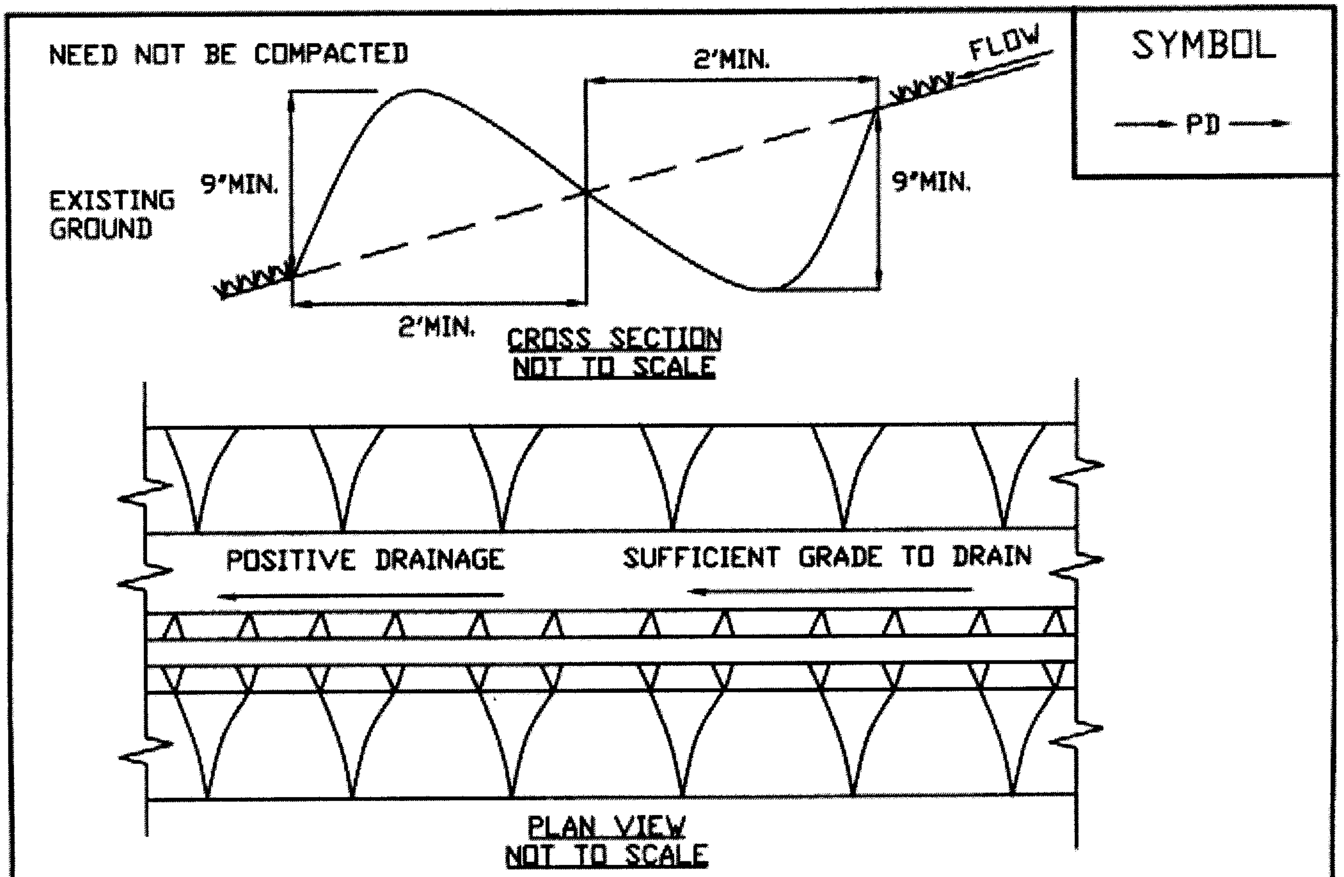
1. Perimeter dike/swale shall have a stabilized outlet.

2. Diverted runoff from a protected or stabilized upland area shall outlet directly onto an undisturbed stabilized area.

3. Diverted runoff from a disturbed or exposed upland area shall be conveyed to a sediment trapping device such as a sediment trap, sediment basin, or to an area protected by any of these practices.

4. The on-site location may need to be adjusted to meet field conditions in order to utilize the most suitable outlet.

# Figure 5A.3
# Perimeter DikeSwale



## CONSTRUCTION SPECIFICATIONS

1. ALL PERIMETER DIKE/SWALE SHALL HAVE UNINTERRUPTED POSITIVE GRADE TO AN OUTLET.
2. DIVERTED RUNOFF FROM A DISTURBED AREA SHALL BE CONVEYED TO A SEDIMENT TRAPPING DEVICE.
3. DIVERTED RUNOFF FROM AN UNDISTURBED AREA SHALL OUTLET INTO AN UNDISTURBED STABILIZED AREA AT NON-EROSION VELOCITY.
4. THE SWALE SHALL BE EXCAVATED OR SHAPED TO LINE GRADE, AND CROSS SECTION AS REQUIRED TO MEET THE CRITERIA SPECIFIED IN THE STANDARD.
5. STABILIZATION OF THE AREA DISTURBED BY THE DIKE AND SWALE SHALL BE DONE IN ACCORDANCE WITH THE STANDARD AND SPECIFICATIONS FOR TEMPORARY SEEDING AND MULCHING, AND SHALL BE DONE WITHIN 10 DAYS.
6. PERIODIC INSPECTION AND REQUIRED MAINTENANCE MUST BE PROVIDED AFTER EACH RAIN EVENT.

MAX. DRAINAGE AREA LIMIT: 2 ACRES

ADAPTED FROM DETAILS PROVIDED BY: USDA - NRCS,
NEW YORK STATE DEPARTMENT OF TRANSPORTATION,
NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION,
NEW YORK STATE SOIL & WATER CONSERVATION COMMITTEE

PERIMETER DIKE OR SWALE

# STANDARD AND SPECIFICATIONS
# FOR
# STRAW BALE DIKE

## Definition

A temporary barrier of straw, or similar material, used to intercept sediment laden runoff from small drainage areas of disturbed soil.

## Purpose

The purpose of a bale dike is to reduce runoff velocity and effect deposition of the transported sediment load. Straw bale dikes have an estimated design life of three (3) months.

## Conditions Where Practice Applies

The straw bale dike is used where:

1. No other practice is feasible.
2. There is no concentration of water in a channel or other drainage way above the barrier.
3. Erosion would occur in the form of sheet erosion.
4. Length of slope above the straw bale dike does not exceed these limits.

| Constructed Slope | Percent Slope | Slope Length (ft.) |
|---|---|---|
| 2:1 | 50 | 25 |
| 3:1 | 33 | 50 |
| 4:1 | 25 | 75 |

Where slope gradient changes through the drainage area, steepness refers to the steepest slope section contributing to the straw bale dike.

The practice may also be used for a single family lot if the slope is less than 15 percent. The contributing drainage areas in this instance shall be less than one quarter of an acre per 100 feet of fence and the length of slope above the dike shall be less than 200 feet.

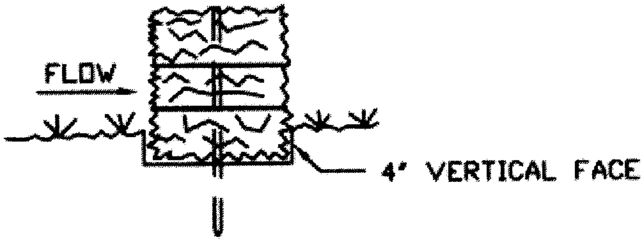
## Design Criteria

The above table is adequate, in general, for a one-inch rainfall event. Larger storms could cause failure of this practice. Use of this practice in sensitive areas for longer than one month should be specifically designed to store expected runoff. All bales shall be placed on the contour with cut edge of bale adhering to the ground. See Figure 5A.7 on page 5A.18 or details.

# Figure 5A.7
# Straw Bale Dike

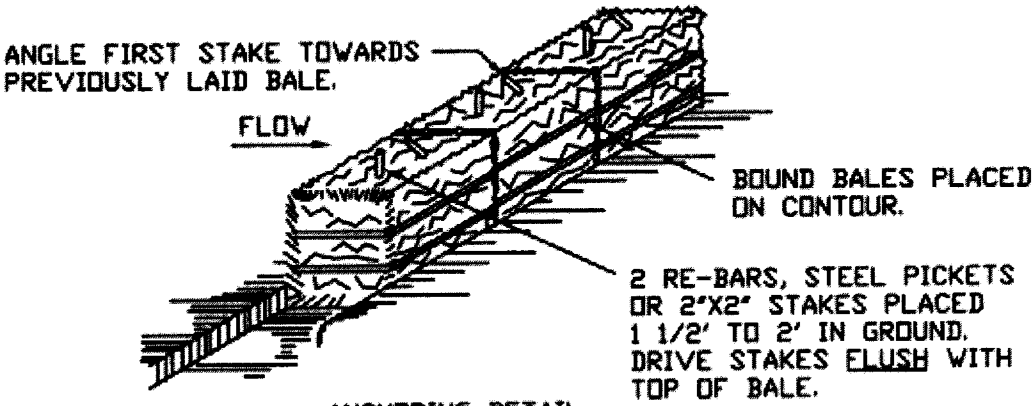
SYMBOL

●—●—●



BEDDING DETAIL
NOT TO SCALE

DRAINAGE AREA NO MORE THAN 1/4 ACRE PER 100 FEET OF STRAW BALE DIKE FOR SLOPES LESS THAN 25%.



ANCHORING DETAIL
NOT TO SCALE

## CONSTRUCTION SPECIFICATIONS

1. BALES SHALL BE PLACED AT THE TOE OF A SLOPE OR ON THE CONTOUR AND IN A ROW WITH ENDS TIGHTLY ABUTTING THE ADJACENT BALES.
2. EACH BALE SHALL BE EMBEDDED IN THE SOIL A MINIMUM OF (4) INCHES, AND PLACED SO THE BINDINGS ARE HORIZONTAL.
3. BALES SHALL BE SECURELY ANCHORED IN PLACE BY EITHER TWO STAKES OR RE-BARS DRIVEN THROUGH THE BALE. THE FIRST STAKE IN EACH BALE SHALL BE DRIVEN TOWARD THE PREVIOUSLY LAID BALE AT AN ANGLE TO FORCE THE BALES TOGETHER. STAKES SHALL BE DRIVEN FLUSH WITH THE BALE.
4. INSPECTION SHALL BE FREQUENT AND REPAIR REPLACEMENT SHALL BE MADE PROMTLY AS NEEDED.
5. BALES SHALL BE REMOVED WHEN THEY HAVE SERVED THEIR USEFULLNESS SO AS NOT TO BLOCK OR IMPEDE STORM FLOW OR DRAINAGE.

ADAPTED FROM DETAILS PROVIDED BY: USDA - NRCS,
NEW YORK STATE DEPARTMENT OF TRANSPORTATION,
NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION,
NEW YORK STATE SOIL & WATER CONSERVATION COMMITTEE

STRAW BALE
DIKE

# STANDARD AND SPECIFICATIONS
# FOR
# SILT FENCE

## Definition

A temporary barrier of geotextile fabric installed on the contours across a slope used to intercept sediment laden runoff from small drainage areas of disturbed soil.

## Purpose

The purpose of a silt fence is to reduce runoff velocity and effect deposition of transported sediment load. Limits imposed by ultraviolet stability of the fabric will dictate the maximum period the silt fence may be used (approximately one year).

## Conditions Where Practice Applies

A silt fence may be used subject to the following conditions:

1. Maximum allowable slope lengths contributing runoff to a silt fence placed on a slope are:

| Slope Steepness | Maximum Length (ft.) |
|---|---|
| 2:1 | 25 |
| 3:1 | 50 |
| 4:1 | 75 |
| 5:1 or flatter | 100 |

2. Maximum drainage area for overland flow to a silt fence shall not exceed ¼ acre per 100 feet of fence, with maximum ponding depth of 1.5 feet behind the fence; and

3. Erosion would occur in the form of sheet erosion; and

4. There is no concentration of water flowing to the barrier.

## Design Criteria

Design computations are not required for installations of 1 month or less. Longer installation periods should be designed for expected runoff. All silt fences shall be placed as close to the areas as possible, but at least 10 feet from the toe of a slope to allow for maintenance and roll down. The area beyond the fence must be undisturbed or stabilized.

Sensitive areas to be protected by silt fence may need to be reinforced by using heavy wire fencing for added support to prevent collapse.

Where ends of filter cloth come together, they shall be overlapped, folded and stapled to prevent sediment bypass. A detail of the silt fence shall be shown on the plan. See Figure 5A.8 on page 5A.21 for details.

## Criteria for Silt Fence Materials

1. Silt Fence Fabric: The fabric shall meet the following specifications unless otherwise approved by the appropriate erosion and sediment control plan approval authority. Such approval shall not constitute statewide acceptance.

| Fabric Properties | Minimum Acceptable Value | Test Method |
|---|---|---|
| Grab Tensile Strength (lbs) | 90 | ASTM D1682 |
| Elongation at Failure (%) | 50 | ASTM D1682 |

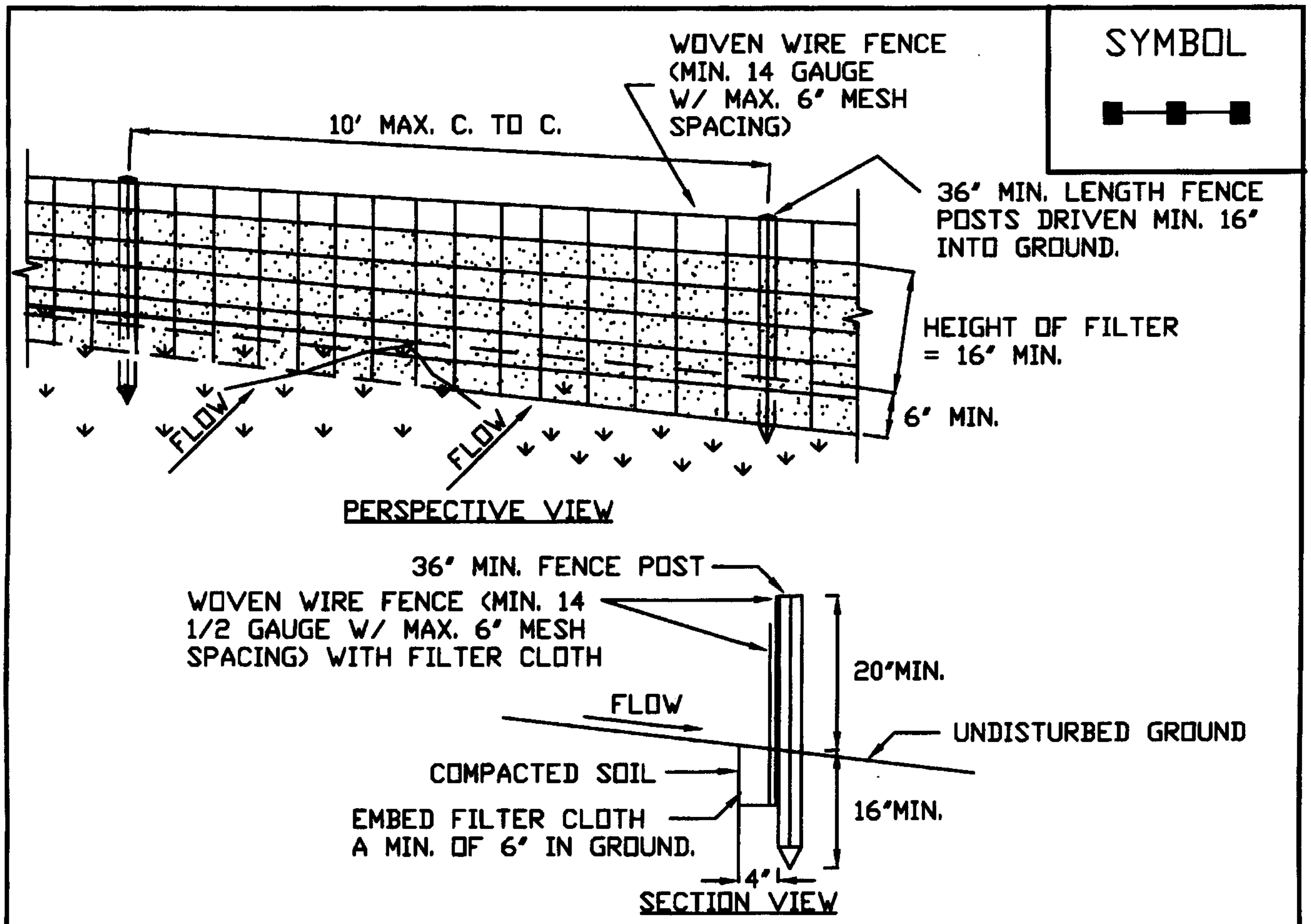
| | | |
|---|---|---|
| Mullen Burst Strength (PSI) | 190 | ASTM D3786 |
| Puncture Strength (lbs) | 40 | ASTM D751 (modified) |
| Slurry Flow Rate (gal/min/sf) | 0.3 | |
| Equivalent Opening Size | 40-80 | US Std Sieve CW-02215 |
| Ultraviolet Radiation Stability (%) | 90 | ASTM G-26 |

2. Fence Posts (for fabricated units): The length shall be a minimum of 36 inches long. Wood posts will be of sound quality hardwood with a minimum cross sectional area of 3.0 square inches. Steel posts will be standard T and U section weighing not less than 1.00 pound per linear foot.

3. Wire Fence (for fabricated units): Wire fencing shall be a minimum 14 gage with a maximum 6 in. mesh opening, or as approved.

4. Prefabricated Units: Envirofence, Geofab, or approved equal, may be used in lieu of the above method providing the unit is installed per details shown in Figure 5A.8.

# Figure 5A.8
# Silt Fence



## CONSTRUCTION SPECIFICATIONS

1. WOVEN WIRE FENCE TO BE FASTENED SECURELY TO FENCE POSTS WITH WIRE TIES OR STAPLES. POSTS SHALL BE STEEL EITHER 'T' OR 'U' TYPE OR HARDWOOD.
2. FILTER CLOTH TO BE TO BE FASTENED SECURELY TO WOVEN WIRE FENCE WITH TIES SPACED EVERY 24' AT TOP AND MID SECTION. FENCE SHALL BE WOVEN WIRE, 6' MAXIMUM MESH OPENING.
3. WHEN TWO SECTIONS OF FILTER CLOTH ADJOIN EACH OTHER THEY SHALL BE OVER-LAPPED BY SIX INCHES AND FOLDED. FILTER CLOTH SHALL BE EITHER FILTER X, MIRAFI 100X, STABILINKA T140N, OR APPROVED EQUIVALENT.
4. PREFABRICATED UNITS SHALL BE GEOFAB, ENVIROFENCE, OR APPROVED EQUIVALENT.
5. MAINTENANCE SHALL BE PERFORMED AS NEEDED AND MATERIAL REMOVED WHEN 'BULGES' DEVELOP IN THE SILT FENCE.

ADAPTED FROM DETAILS PROVIDED BY: USDA - NRCS,
NEW YORK STATE DEPARTMENT OF TRANSPORTATION,
NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION,
NEW YORK STATE SOIL & WATER CONSERVATION COMMITTEE

SILT FENCE

# ATTACHMENT B

## MONITORING, INSPECTION AND MAINTENANCE PLAN

# MONITORING, INSPECTION & MAINTENANCE PLAN
## for
# PETER COOPER MARKHAMS NPL SITE
## DAYTON, NEW YORK

January 2008 0021-003-400

# MONITORING, INSPECTION, AND MAINTENANCE PLAN

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## IMPLEMENTATION

A. The Contractor at this site shall at all times, properly construct, operate and maintain all erosion controls and features, as part of the construction activities, in accordance with regulatory requirements, and with good construction practices. Erosion control measures and activities will be in accordance with Storm Water Management and Erosion Control Plan (SWMECP).

B. The key elements of the erosion control monitoring, inspection, and maintenance plan are described herein and include the following:

- Site Inspections and Maintenance
- BMPs Monitoring
- Record Keeping
- Review and Modifications
- Certification of Compliance

## SITE INSPECTIONS AND MAINTENANCE PRACTICES

A. The temporary erosion control features installed by the Contractor will be maintained by the Contractor until no longer needed or permanent erosion control methods are installed.

Site inspections are required every 7 days or within 24 hours of a rainfall of 0.5 inches or greater. All disturbed areas, areas for material storage, locations where vehicles enter or exit the site, and all of the erosion and sediment controls that are identified as part of this site's construction storm water and erosion control plan must be inspected. Controls must be in good operating condition until the affected area they protect has been completely stabilized and the construction activity is complete. If a repair is necessary, it must be completed within 7 days of receipt of a report or notice, if practical. Inspection for specific erosion and sediment controls will include the following:

- Silt fence will be inspected to determine the following:

    1) Depth
    2) Condition of fabric
    3) That the fabric is attached to the posts
    4) That the fence posts are firmly in the ground

- The silt fences will be inspected weekly and within 24 hours of a 0.5-inch or greater storm event.

- Diversion berms, if used, will be inspected and any breaches promptly repaired.

- Temporary and permanent seeding and planting will be inspected for bare spots, washouts, and other potential erosion control problems.

B. The individual inspecting the site must record any damages or deficiencies on an inspection form (Attachment 1). These forms can be used to request maintenance and repair and to document inspection and maintenance activities. Damages or deficiencies must be corrected as soon as possible after the inspection. Any changes that may be required to correct deficiencies in the SWMECP should also be made as soon as possible, but in no case later than 7 days after the inspection.

C. An Inspection and Maintenance Report Form is attached to record the inspection and assessment (see Attachment 1).

D. A Stabilization Measures Report Form is attached (see Attachment 2) to record the effects of any corrective measures implemented as reported in the Inspection and Maintenance Report Form.

## RECORDKEEPING

A. Records Retention

- A copy of the SWMECP and inspection, maintenance, and amendment records must be kept at the construction site from the time construction begins until the site is stabilized.

- Inspection records shall be retained for a minimum of 3 years.

# REVIEW AND MODIFICATIONS

A. During the course of construction, unanticipated changes may occur that affect this plan such as schedule changes, phasing changes, staging area modifications, off-site drainage impacts, and repeated failures of designed controls. Any changes to the activities and controls identified in this Plan must be documented and the Plan revised accordingly. An Amendment Report must be completed and attached to the plan (see Attachment 3).

B. Certification of revisions to this Plan shall be included at the end of the document.

# ATTACHMENT 1

## INSPECTION & MAINTENANCE REPORT FORM
## (SAMPLE)

BENCHMARK
ENVIRONMENTAL
ENGINEERING &
SCIENCE, PLLC

# SWMECP: INSPECTION & MAINTENANCE REPORT FORM

**TO BE COMPLETED EVERY 7 DAYS AND WITHIN 24 HOURS OF A RAINFALL EVENT OF 0.5-INCHES OR MORE**

Project:
Client:
Job No.:
Rainfall (approx. inches):

Date:
Report No.:
Personnel:
Rainfall Event Personnel:

| Contractor Activities | OK | NO | N/A | Notes |
|---|---|---|---|---|
| Are construction onsite traffic routes, parking and storage of equipment and supplies restricted to areas specifically designated for those uses? | | | | |
| Are locations of temporary soil stockpiles of construction materials in approved areas? | | | | |
| Is there any evidence of spills and resulting cleanup procedures? | | | | |
| **GENERAL EROSION & SEDIMENT CONTROLS** | | | | |
| Are sediment and erosion BMPs installed in the proper location and according to the specifications set out in the SWMECP? | | | | |
| Are all operational storm drain inlets protected from sediment inflow? | | | | |
| Do any seeded or landscaped areas require maintenance, irrigation, fertilization, seeding or mulching? | | | | |
| Is there any evidence that sediment is leaving the site? | | | | |
| Is there any evidence of erosion or cut fill slopes? | | | | |
| **PERIMETER ROAD USE** | | | | |
| Does much sediment get tracked on to the perimeter road? | | | | |
| Is the gravel clean or is it filled with sediment? | | | | |
| Does all traffic use the perimter road to leave the site? | | | | |
| Is maintenance or repair required for the perimeter road? | | | | |
| REFER TO STABILIZATION MEASURES REPORT | | | | |

**PREPARED BY:**

**DATE:**

SWPPP = Storm Water Pollution Protection Plan
Inspection and Maintenance Report Form.xls

# ATTACHMENT 2

## STABILIZATION MEASURES REPORT FORM (SAMPLE)

BENCHMARK
ENVIRONMENTAL
ENGINEERING &
SCIENCE, PLLC

# SWMECP: STABILIZATION MEASURES REPORT FORM

**TO BE COMPLETED EVERY 7 DAYS AND WITHIN 24 HOURS OF A RAINFALL EVENT OF 0.5-INCHES OR MORE**

Project:
Client:
Job No.:
Rainfall (approx. inches):

Date:
Report No.:
Personnel:
Rainfall Event Personnel:

**STABILIZATION MEASURES**

| Area | Date Since Last Disturbed | Date of Next Disturbance | Stabilized? Yes/No | Stabilized With | Condition |
|---|---|---|---|---|---|
| | | | | | |
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**STABILIZATION REQUIRED:**

**TO BE PERFORMED BY:**

**ON OR BEFORE:**

**PREPARED BY:**

**DATE:**

SWPPP = Storm Water Pollution Protection Plan
Stabilization Measures Report Form.xls

# ATTACHMENT 3

## AMENDMENT REPORT
## (SAMPLE)

BENCHMARK
ENVIRONMENTAL
ENGINEERING &
SCIENCE, PLLC

# SWMECP: AMMENDMENT REPORT

Project:
Client:
Job No.:
Rainfall (approx. inches):

Date:
Report No.:
Personnel:
Rainfall Event Personnel:

**CHANGES REQUIRED TO THE SWMECP:**

**REASONS FOR CHANGES:**

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are signification penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

**PREPARED BY:**

**DATE:**

SWPPP = Storm Water Pollution Protection Plan
Ammendment Report.xls

# APPENDIX B

## CONSTRUCTION QUALITY ASSURANCE PROJECT PLAN (CQAPP)

# CONSTRUCTION QUALITY ASSURANCE PROJECT PLAN (CQAPP)

for

# PETER COOPER MARKHAMS NPL SITE
# DAYTON, NEW YORK

February 2008
Revised June 2008

0021-003-400

# CONSTRUCTION QUALITY ASSURANCE PROJECT PLAN

# PETER COOPER MARKHAMS NPL SITE

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# CONSTRUCTION QUALITY ASSURANCE PROJECT PLAN

# PETER COOPER MARKHAMS NPL SITE

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## Table Of Contents

## LIST OF TABLES

## LIST OF FIGURES

## APPENDICES

# 1.0 INTRODUCTION

This Construction Quality Assurance Project Plan (CQAPP) describes quality assurance procedures for the implementation of remedial measures at the Peter Cooper Markhams National Priority List (NPL) Site, located in the Town of Dayton, New York (see Figure 1 for location). All work will be performed in accordance with the approved Remedial Design Report and Design-Build Technical Specifications. This CQAPP stresses careful inspection and documentation during the entire waste consolidation and cover system construction phase.

All parties involved in this final cover system construction project have had input into and will receive a copy of this CQAPP including the Respondents, the supervising contractor (Benchmark Environmental Engineering & Science, PLLC), the Subcontractor (Zoladz Construction, Inc.), and the USEPA.

The overall goals of this CQAPP are to verify that: constructed components of the consolidated waste fill area and cover system meet the performance and fundamental requirements of the technical specifications (e.g., compacted density, hydraulic conductivity, moisture content, etc.); proper construction techniques and procedures are used, and that the materials used uniformly meet the requirements contained in the technical specifications (e.g., gradation). The Construction Quality Assurance (CQA) program will attempt to identify and define potential problems that are reasonably anticipated to occur during construction and address possible corrective measures. After completion of the work, a Remedial Action Report will be prepared by Benchmark documenting the work and certifying: that the project was constructed in general conformance with the design standards; identifying where and why the constructed elements deviated from the construction documents (if any); and documenting sampling test results and corrective measures.

This CQAPP was prepared in accordance with the following documents:

- Statement of Work for Peter Cooper Markhams Site, Town of Dayton, Cattaraugus County, New York, October 2007 prepared by USEPA.

- Remedial Design Report for Peter Cooper Markhams Site, February 2008, prepared by Benchmark Environmental Engineering & Science, PLLC.

- Design-Build Technical Plans and Specifications prepared by Benchmark Environmental Engineering & Science, PLLC (February 2008).

# 2.0 SCOPE

The work addressed under this CQAPP will facilitate proper construction of the remedial measures for the Peter Cooper Markhams Site. All work will be constructed to the general lines, grades, and dimensions indicated on the plans and details, and in accordance with this CQAPP or as may otherwise be required by Benchmark.

# 3.0 RESPONSIBILITY AND AUTHORITY

## 3.1 Quality Assurance/Quality Control (QA/QC) Management Organization

The principal organizations involved in permitting, designing and constructing the remedial measures for the Peter Cooper Markhams Site include: the United States Environmental Protection Agency (USEPA); the Respondents, as defined under the Consent Decree for remedial measures (also referred to as the Owner under the General Conditions); Benchmark Environmental Engineering and Science, PLLC (Benchmark) (the supervising contractor); the Subcontractor (Zoladz Construction, Inc.); and CQA personnel (as designated in Section 4.2). The roles and responsibilities of these parties are identified in the following subsections.

### 3.1.1 United States Environmental Protection Agency (USEPA)

It is the responsibility of the USEPA to review this CQAPP for consistency with the Consent Decree Statement of Work. The USEPA also has the responsibility and authority to review, approve, comment on or reject the Remedial Action Report and CQA documentation collected during construction to confirm that the approved CQAPP was followed and that the work was constructed as specified in the design documents.

### 3.1.2 Respondents

The Respondents are responsible for construction and monitoring of the remedial measures for the Peter Cooper Markhams Site. This responsibility includes complying with construction quality control requirements of the USEPA. The Respondents have the authority to monitor and control the quality of construction and related activities to make sure that they are in full conformance with the design approach and the approved CQAPP. The Respondents also have the authority to select professional organizations to assist them in fulfilling these responsibilities.

### 3.1.3 Benchmark Environmental Engineering and Science, PLLC (Benchmark)

Benchmark will be responsible for engineering design changes, construction coordination/monitoring and quality assurance in accordance with this CQAPP. CQA personnel will monitor construction activities and be assigned specific responsibilities and tasks. All laboratory testing will be performed by a qualified facility under subcontract to Benchmark at a frequency and manner specified in this CQAPP. Field testing will be performed by a qualified Benchmark representative. As discussed in Section 4.2, CQA personnel will include a Project Officer, Project Manager/CQA Engineer, and the necessary supporting engineering and inspection personnel.

Specific CQA responsibilities of the Project Officer will include:

- Overall technical quality assurance.
- Certifications, on behalf of Benchmark, that the construction was completed in general conformance with the approved Remedial Design Report, design plans and this CQAPP.
- Supporting the Project Manager/CQA Engineer in meetings with the USEPA and/or the Subcontractor, as necessary.

Specific responsibilities of the Project Manager/CQA Engineer will include:

- Consulting with inspection personnel on field problems and corrective measures.
- Scheduling and coordinating CQA inspection activities.
- Serving as the primary interface with USEPA and Respondents and supporting the inspection personnel in meetings with the USEPA and/or Subcontractor, as necessary.
- Directing, supervising and supporting the CQA inspection personnel in performing observations and tests by:
    - Confirming that regular calibration of testing equipment is properly conducted and recorded.
    - Confirming that the testing equipment, personnel, and procedures are consistent with the CQAPP or verifying that changes or deviations do not adversely impact the quality of construction.
    - Confirming that representative test data is collected at the proper frequency and accurately recorded and maintained.

  - Verifying that the raw data are properly recorded, validated, reduced, summarized, and interpreted.

- Informing Project Officer of problems or deficiencies, if any.

- Scheduling site visits to review the adequacy of completed work.

- Prompt inspection of suspected non-standard work when notified by CQA inspection personnel.

- Providing reports to the Respondents and USEPA on the construction progress in accordance with the Consent Decree, including:

  - Review and interpretation of all data sheets and reports.

  - Identification of work that he/she believes should be accepted, rejected, or uncovered for observation, or that may require special testing or approval.

  - Rejection of defective work and verification that corrective measures are implemented.

Responsibilities of supporting CQA inspection personnel will include:

- Performing on-site inspection of the work in progress as required assuring conformance with the facility design criteria and construction documents.

- Verifying that the equipment used in testing meets the test requirements and that the tests are conducted according to this CQAPP.

- Reporting to the Project Manager/CQA Engineer results of all work that is not of acceptable quality or that fail to meet the specified design.

- Verifying that labels, tags, manifests or other identifying documents of all construction materials conform to construction requirements and specifications.

## 3.2 Project Meetings

Conducting periodic project meetings is the responsibility of Benchmark and the Respondents.

### 3.2.1 Preconstruction Meeting

A preconstruction meeting will be held prior to the start of any field activities. Representatives of Benchmark and the Subcontractor will be present (the Respondents and USEPA will also be invited to attend). The agenda for this meeting will include but not be limited to the following:

- Provide each organization with all relevant CQA documents and supporting information.
- Familiarize each organization with the CQAPP and its role relative to the design criteria, work plans, specifications and construction documentation.
- Determine if any changes to the CQAPP are needed to assure that the work will be constructed to meet or exceed the specified design.
- Review lines of authority and communication for each organization.
- Discuss the established procedures or protocol for observations and tests including sampling strategies.
- Discuss the established procedures or protocol for handling construction deficiencies, repairs, and retesting.
- Review methods for documenting and reporting inspection data.
- Review methods for distributing and storing documents and reports.
- Review work area security and health and safety protocol.
- Discuss procedures for the location and protection of construction materials and for the prevention of damage of the materials from inclement weather or other adverse events.

### 3.2.2 Progress Meetings

Progress meetings will be held on a bi-weekly basis or more frequently as needed throughout the course of the work to:

- Discuss the project schedule and work performed to date.

- Address and resolve (i.e., establish corrective actions for) any existing or anticipated construction problems.

- Discuss and resolve (i.e., establish corrective actions for) any coordination or CQA problems encountered to date.

Progress meetings will be attended by CQA personnel and the Subcontractor. The USEPA and Respondents will also be invited to attend. The meetings will be documented by CQA personnel.

### 3.2.3 Problem or Work Deficiency Meetings

A special meeting will be held when and if a major CQA problem or deficiency is present or likely to occur. At a minimum, the meeting shall be attended by the Subcontractor, CQA inspection personnel, and the CQA Engineer and/or Project Officer. The purpose of these meetings will be to define and resolve the problem(s) encountered or recurring CQA deficiencies in the following manner:

- Define and discuss the problem or deficiency.
- Review alternative solutions.
- Implement a plan to resolve the problem or deficiency.

Benchmark personnel will document the meeting.

## 3.3 Project Schedule

A project schedule is included as Figure 2. Benchmark will prepare, with assistance from the Subcontractor, an updated construction schedule prior to initiating waste fill consolidation activities. In the event construction activities are delayed due to unforeseen circumstances such as problem situations, inclement weather, mechanical equipment breakdown, etc., the schedule shall be revised accordingly and the USEPA will be notified.

# 4.0 BENCHMARK QUALIFICATIONS

## 4.1 General

Benchmark was established in 1998 by a highly experienced group of environmental professionals that presently have over 150 years of combined consulting engineering and construction management experience. Its staff have investigated, designed and overseen and/or implemented the construction and/or the remediation of numerous waste disposal sites including 10 on the National Priority List, 8 RCRA sites, and over 100 NY State Superfund and Brownfield Cleanup Program sites. Benchmark's office is located in Buffalo, New York. The company provides complete environmental consulting services, from permitting and investigations through design, construction administration and operations assistance for solid and hazardous waste sites and other environmental projects. Benchmark also routinely performs design-build services for petroleum, hazardous and solid waste facilities. Relevant examples include closure of the Urbana Landfill inactive hazardous waste site in Urbana, NY; closure of the Steelfields Area II Containment Cell in Buffalo, New York, and cleanup/restoration of the Brewer Street Site in Rochester NY. Our engineers have designed over 50 new solid waste management facilities and upgrades, expansions, or closure of existing facilities, including landfills, incinerators, transfer stations, leachate and gas collection conveyance and treatment, sludge dewatering and land application, and compost plants.

## 4.2 Designated CQA Personnel

Implementation of the CQAPP including certification that construction activities were completed in general conformance with the design criteria and construction documents are the responsibility of Benchmark. Specific CQA personnel designated for involvement in this project are as follows:

| | | |
|---|---|---|
| Project Officer | - | Paul H. Werthman, P.E. |
| Project Manager/ CQA Engineer | - | Thomas H. Forbes, P.E. |
| Backup CQA Engineer | - | Walter J. Meisner, P.E. |

| | |
|---|---|
| CQA Inspection Personnel - | Richard L. Dubisz<br>Allen Zgaljardic (backup) |

All designated personnel are subject to change as required to facilitate completion of the construction activities. The USEPA will be notified when any of the above-designated personnel are changed.

## 4.3 CQA Inspection Personnel

The person(s) filling this position will be trained in proper CQA procedures. They will have a working knowledge of documents pertaining to construction of the remedial measures for the Site, including the Work Plan, the Contract Plans and Specifications, and this CQAPP.

In addition, field personnel will be instructed to contact the CQA Engineer in the event project requirements are not being met, CQA procedures are not being implemented, or construction problems have been encountered.

## 4.4 Construction Subcontractor Qualifications

Qualifications for Benchmark's designated Subcontractor, Zoladz Construction, Inc., will be forwarded to the USEPA under separate cover.

# 5.0 QUALITY ASSURANCE ACTIVITIES

## 5.1 General

The waste/fill subgrade configuration and final cover system for the Peter Cooper Markhams Site is designed to provide a physical barrier to contact with waste fill materials and minimization of potential releases to groundwater by limiting the water infiltration into the fill. The final cover system will be constructed so that it functions with minimum maintenance, promotes drainage and minimizes erosion of the cover. The design of the cover system calls for providing a minimum 18 inches of recompacted soil barrier layer and 6 inches of topsoil.

The following are elements of the waste fill consolidation and cover system constructions that are provided as background for CQA personnel. The Subcontractor shall refer to the Design-Build Plans and Specifications for detailed construction requirements:

- Trees, shrubs and brush within the work limits shall be removed to facilitate construction and any post-closure maintenance work. Large trees will be either cut and disposed off-site or cut into 24-inch lengths and buried within the landfill subgrade in a manner that prevents settlement from occurring. Stumps within the clearing limits will be removed. Small branches and brush shall be mulched and disposed of off-site or on-site in a layer no more than 2 inches thick over the top of waste.

- Vegetation will be stripped off of the waste surface in areas where excavation or re-grading will not occur, and will be disposed beneath the final cover in a manner that prevents settlement from occurring.

- Waste fill materials designated for relocation/consolidation will be excavated to the native soil interface. Native soils are characterized as primarily comprised of sand, silt and gravel, and to a lesser extent clay, absent waste fill indicators. Waste fill indicators include: sludge; highly organic, peat-like material; animal hair; ash, cinders, and construction debris. CQA inspection personnel shall verify that native soils have been reached.

- Consolidated waste/fill will be placed in maximum 12-inch thick loose lifts prior to compaction.

- The waste fill will be uniformly graded to lines and grades depicted on construction grading plans.

- Barrier layer soil will be placed and compacted in maximum 6-inch thick compacted lifts to provide a minimum thickness of 18 inches after required compaction.

- Barrier soil will be compacted with tamping foot or sheepsfoot rollers. The use of dozers or smooth drum rollers as primary compaction equipment is unacceptable. Smooth drum rollers may be used only for temporary sealing of lifts or stockpiled soils. The Subcontractor may select alternate compaction methods, subject to Benchmark's approval, for smaller areas where large equipment is impractical, if necessary.

- The CQA Engineer will approve, prior to construction, the type of compaction equipment used.

- Intermediate lifts will be seal rolled when subsequent lifts will not be placed within 48 hours of completion.

- Sealed intermediate lifts will be scarified or rolled with a sheepsfoot roller and if necessary, moistened prior to placement of subsequent barrier soil lifts.

- Damage to compacted lifts (i.e., rutting by equipment) will be repaired prior to placing any overlying materials.

- The barrier layer soil moisture content will be maintained greater than optimum during placement and compaction, and when necessary, the moisture content will be adjusted accordingly using practical field equipment and methods.

- Compaction of barrier layer soil containing excessive moisture will not be attempted until the soil moisture content is dried to an acceptable level.

## 5.2 Consolidated Waste Fill

Specific quality control testing for the consolidated waste fill layer shall consist of material evaluations and construction quality evaluations. Each is discussed in more detail below.

### 5.2.1 Material Evaluations

Material evaluations shall be performed on the consolidated waste fill. Approximately 46,000 cubic yards of consolidated waste fill material will be consolidated into one uniformly shaped pile as shown on the design drawings.

An approved soil-testing laboratory will perform all evaluation tests. The testing frequency and sampling protocols are discussed in section 6.0. The following consolidated waste fill material test will be performed to facilitate material evaluations:

| TEST | ASTM STANDARD NO. |
|---|---|
| Moisture Density Relations of Soil and Soil Aggregate Mixtures Using 10-lb. Hammer and 18-in. Drop (Modified Proctor) | D1557-78 |

### 5.2.2 Construction Quality Evaluation

Construction quality evaluations will be performed on the consolidated waste fill. Construction evaluation testing will consist of visual observations of the work, in-place soil density/moisture tests, and a survey of as-built conditions.

#### a. Moisture Control

The CQA inspector will check the moisture content of the waste fill layer using the nuclear densitometer programmed for the soil being placed (Form C, Appendix A). The waste fill layer material moisture content shall be greater than optimum prior to compaction. Waste fill material shall not be placed unless the moisture content of the previous lift is also greater than optimum. When necessary, moisture will be added using approved sprinkling equipment. The Subcontractor shall temporarily stop work during a precipitation (i.e., rainfall) event or if the material is excessively wet as determined by the inspector and the material will be allowed to dry. The placement or compaction of material will not be permitted during or immediately following heavy rainfall. The Subcontractor personnel will not be permitted to proceed with in-place waste fill material compaction until the moisture content of the material is approved by the CQA personnel.

#### b. In-Place Soil Density Control

Each waste fill lift will be compacted wet of optimum moisture content to a minimum of 90 percent of the modified proctor maximum density, in pounds per cubic foot, as determined by the Modified Proctor Compaction Test (ASTM D-1557-78). Evaluations of the construction work will include the following:

- Observations of the water content and other physical properties of the waste fill material during processing, placement and compaction.
- Observation of the thickness of lifts as loosely placed and compacted (maximum of 12-inch loose lifts prior to compaction).
- Observations of the use of proper equipment for the construction and effective use of the equipment to properly prepare materials.
- Observations of the action of the compaction and heavy hauling equipment on the construction surface (sheepsfoot penetration, pumping, cracking, etc.).
- Observations of the average number of passes used to compact each lift.

Determination of in-place soil moisture and density will be performed in accordance with the following method:

| Test | ASTM Standard No. |
|---|---|
| Moisture and density of soil and Soil aggregate, in-place, by Nuclear Methods | D2922-81 |

The CQA inspector will perform field tests to measure the dry density and moisture content of the compacted waste fill material using Troxler nuclear moisture/density gauges. These measurements will be performed with the gauge in the direct transmission mode with the depth probe extended to the bottom of the lift (typically 12 inches for waste fill). The gauges will be standardized daily. The CQA inspector will verify that the nuclear densitometer has been programmed with the maximum dry density of the waste fill actually being placed (i.e., based on laboratory material evaluations).

## 5.3 Barrier Layer

Specific quality control testing for the recompacted soil barrier layer shall consist of material evaluations and construction quality evaluations. Each is discussed in more detail below. This CQAPP assumes that all barrier layer soil will be obtained from one source. If more than one borrow source is used, each will be tested independently. All borrow sources must be approved by the CQA Engineer and USEPA prior to acceptance and use at the Site.

### 5.3.1 Material Evaluations

Material evaluations shall be performed on borrow area soil proposed for use to ascertain its acceptability as construction material and compliance with the Remedial Design Report and this CQAPP. Approximately 10,800 cubic yards of barrier layer material and 3,500 cubic yards of topsoil will be mined for use in the final cover system for the site.

An approved soil-testing laboratory will perform all evaluation tests. The testing frequency and sampling protocols are discussed as sections 6.0 and 5.4, respectively. The following barrier layer material and/or topsoil tests will be performed to facilitate material evaluations:

| TEST | ASTM STANDARD NO. |
|---|---|
| Water (Moisture) Content of Soil and Soil Aggregate | D2216-80 |
| Gradation Analysis of Soils (Sieve and Hydrometer) | D422-63 |
| Moisture Density Relations of Soil and Soil Aggregate Mixtures Using 10-lb. Hammer and 18-in. Drop (Modified Proctor) | D1557-78 |
| Recompacted Laboratory Hydraulic Conductivity Testing at 90 Percent of the Modified Proctor Density on Wet Side of Optimum | D5084 |

#### a. Water Content

This test will be used to determine whether the soil proposed for use is wet or dry of the optimum water content as received and/or placed on-site.

### b. Gradation

The material used to construct the soil barrier layer shall conform to the following approximate gradation requirements:

| Sieve Size Designation[1] | Percent Minimum Passing By Weight | Maximum Falling Head Permeability[2] |
|---|---|---|
| 3 inch | 100 | $1.0 \times 10^{-6}$cm/s |
| No. 4 | 85 | |
| No. 200 | 50 | |
| 0.002 mm | 25 | |

### c. Moisture-Density Relationships

The moisture-density relationships determined during the materials evaluation testing (see Form B, Appendix A) will be used as a basis for predetermining optimal moisture content and maximum compacted density. The CQA inspector will program the nuclear densitometer with the modified Proctor optimum moisture content and maximum dry density that is representative for the soil being placed.

### d. Recompacted Hydraulic Conductivity (Permeability)

The recompacted permeability of the soil being tested for the barrier layer shall have a maximum value of $1.0 \times 10^{-6}$ cm/s. Soils which do not meet this requirement will be rejected (see Form A, Appendix A) or amended to achieve the required permeability.

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[1] Gradation (other than required 100% passing 3-inch sieve) will be used as guidance only. Recompacted permeability as determined by the Soils Testing Laboratory will be used as criteria for acceptance or rejection. (see Form A, Appendix A).

[2] Bentonite addition will be allowable for purposes of achieving permeability criteria.

### 5.3.2 Construction Quality Evaluation

Construction quality evaluations will be performed on each completed lift of each area of the barrier layer construction. Construction evaluation testing will consist of visual observations of the work, in-place soil density/moisture tests, undisturbed hydraulic conductivity (permeability) testing, and a visual assessment of the adequacy of layer bonding.

#### a. Moisture Control

The CQA inspector will check the moisture content of the barrier layer material for each lift using the nuclear densitometer programmed for the soil being placed (Form C, Appendix A). The barrier layer material moisture content shall be greater than optimum prior to compaction. Barrier layer material shall not be placed unless the moisture content of the previous lift is also greater than optimum. When necessary, moisture will be added using approved sprinkling equipment. The Subcontractor shall temporarily stop work during a precipitation (i.e., rainfall) event or if the material is excessively wet as determined by the inspector and the material will be allowed to dry. The placement or compaction of material will not be permitted during or immediately following heavy rainfall. The Subcontractor will not be permitted to proceed with in-place soil compaction until the moisture content of the soil is approved by the CQA personnel. Compacted material that is damaged by erosion shall be replaced by the Subcontractor personnel in a manner deemed acceptable to the CQA inspector.

#### b. In-Place Soil Density Control

Each soil lift of the barrier will be compacted wet of optimum moisture content to a minimum of 90 percent of the modified proctor maximum density, in pounds per cubic foot, as determined by the Modified Proctor Compaction Test (ASTM D-1557-78) and in accordance with the procedures for determining the acceptable level of compaction as described in Appendix B. Lift thickness, water content of the material, compactor weight and the number of passes of the compacting equipment will be adjusted as required to obtain the minimum specified density. Evaluations of the construction work will include the following:

- Observations of the water content and other physical properties of the soil during processing, placement and compaction.
- Observation of the thickness of lifts as loosely placed and compacted (maximum 6-inch compacted lift).
- Observations of the use of proper equipment for the construction and effective use of the equipment to properly prepare materials.
- Observations of the action of the compaction and heavy hauling equipment on the construction surface (sheepsfoot penetration, pumping, cracking, etc.).
- Observations of the average number of passes used to compact each lift.

Determination of in-place soil moisture and density will be performed in accordance with the following method:

| Test | ASTM Standard No. |
|---|---|
| Moisture and density of soil and Soil aggregate, in-place, by Nuclear Methods | D2922-81 |

The CQA inspector will perform field tests to measure the dry density and moisture content of the compacted barrier soils using Troxler nuclear moisture/density gauges. These measurements will be performed with the gauge in the direct transmission mode with the depth probe extended to the bottom of the lift (typically 6-inches). The gauges will be standardized daily. The CQA inspector will verify that the nuclear densitometer has been programmed with the maximum dry density of the soil actually being placed (i.e., based on laboratory material evaluations of the soil). Hydraulic conductivity samples (Shelby tubes) shall not be collected until the in-place soil density is approved by the CQA inspector (see Form C, Appendix A).

### c. Undisturbed Hydraulic Conductivity (Permeability) Measurements

Undisturbed laboratory permeability measurements will be performed on Shelby tube samples collected from the completed barrier layer in all areas requiring supplemental barrier layer material. The procedure for collecting barrier layer Shelby Tube samples is contained in Appendix C. A maximum hydraulic conductivity of 1.0 x $10^{-6}$ cm/s will be used for determination of acceptability. The test method used will be an undisturbed saturated backpressure triaxial test as described in ASTM D5084. The Shelby tube sample will be obtained from the same location as one of the moisture-density tests. A backup tube will also be collected at each location in the event that the other sample is compromised during transit or for duplicate analysis, if necessary. The Subcontractor will assist Benchmark in collecting Shelby Tube samples.

#### d. Thickness Verification

The Subcontractor will obtain the approval of the subgrade quality from CQA personnel before beginning placement of additional barrier layer material.

Benchmark's designated surveyor will perform a topographic survey using a 100' x 100' grid interval over the consolidated waste fill area to be capped. The topographic survey will be repeated following barrier soil placement and compaction. Grade stakes will be marked to note the final, compacted grade. The surveys will be referenced to a horizontal grid system and vertical control on site. The surveys will be the determining factor on checking that the waste fill and barrier layer were graded/placed to the approved elevations and slopes.

### 5.3.3 Barrier Layer Perforations

All barrier layer perforations (i.e., nuclear density test probe locations, grade stake locations, and Shelby tube sampling locations) will be backfilled with acceptable barrier soil by CQA personnel. The soil will be compacted in place with a tamping rod or hand tamper, depending on the size of the perforation. Alternatively, the perforations can be filled with bentonite pellets.

## 5.4 Topsoil Layer

The topsoil layer is the uppermost component of the cover system. Its functions are to protect the underlying layer from mechanical damage, and (in conjunction with a vegetative cover) to protect against erosion.

Preconstruction inspection activities will include verifying topsoil properties against technical specifications. The foundation for the topsoil layer will be the barrier layer. The barrier layer should be checked to ensure that it has been constructed to meet or exceed the specified design and that erosion and/or desiccation cracking have not impacted the integrity.

Following the final grading, compaction and survey of the barrier layer, topsoil will be placed over it to a minimum depth of 6 inches (after placement and rolling). Topsoil will not be placed when it is partially frozen, muddy, or when it is covered with ice, snow, or standing water. During construction of the topsoil layer, inspection personnel will monitor the uniformity of the application process, observe the placement procedure to ensure that the soil is not overly compacted, and measure the thickness of the topsoil layer. Topsoil will be placed and graded to a smooth, even surface and shall be rolled and raked to remove ridges and fill in depressions, ruts and low spots that result after settlement. CQA inspection personnel should also ensure that care is taken in the vicinity of gas vents to prevent damage by construction equipment. Grade stakes will be used to verify the thickness of the topsoil layer.

Topsoil placement, preparation for seeding, and spreading the seed will take place in a more or less continuous operation. The application rate of seed, fertilizer and additives will be monitored to confirm that it is as specified in Section 5.6, below. CQA inspection personnel will verify that all vents and standpipes or any other penetrations through the cover are not damaged.

CQA inspection personnel will ensure that the application equipment is appropriate for the job. The rate of seed and mulch application, amount and uniformity of coverage, and watering instructions, will be as specified. All areas will be examined to ensure that bare spots are not left inadvertently.

### 5.4.1 Topsoil Quality Assurance

Benchmark will collect one sample for every 5,000 cubic yards of topsoil material proposed for use for analysis by approved soils testing laboratory. All topsoil approved for use shall meet the following criteria:

a. Gradation:

| Sieve Size: | Percent Passing By Weight: |
|---|---|

| | |
|---|---|
| 3-inch | 100 |
| 1-inch | 85-100 |
| 1/4-inch | 65-90 |
| No. 200 | 20-80 |

b. Clay content of material passing #200 sieve not greater than 30 percent, as determined by hydrometer tests.

c. pH 5.5 to pH 7.6. If approved by Benchmark, natural topsoil not having the specified pH value may be amended to meet this criterion.

d. Organic content at least 2.5 percent, as determined by ignition loss. If approved by Benchmark, topsoil may be amended per the specifications to meet this requirement.

e. Free of pests and pest larvae.

f. Soluble salt content not greater than 500 ppm.

## 5.5 Gas Vent Installation Quality Assurance

Gas venting wells will be installed at the locations and in accordance with the details shown on the project plans. The CQA inspector shall be present during the installation. Inspection personnel will determine the depth of the screened interval for each vent at the time of installation and will also verify that boreholes for the gas vents extend to the bottom of waste. Waste material excavated during gas vent installation shall be disposed of on-site within the subgrade. The thickness of bentonite and grout layers, the minimum permeability of the granular backfill material (1 x $10^{-3}$ cm/s), and all other construction details will be verified and documented by Benchmark.

### 5.5.1 Gas Vent Granular Backfill

Gas vent granular backfill shall be washed, No. 2 stone having a placed minimum permeability of 1 x $10^{-3}$ cm/s.

## 5.6 Seeding

The application rate of seed, fertilizer and additives will be monitored during the restoration period. Benchmark field personnel will ensure that the application equipment is appropriate for the job. The rate of seed application, amount and uniformity of coverage, and initial watering instructions will be followed per the manufacturer's recommendations. After germination, all areas will be examined and bare spots or sparse growth will be re-seeded by hand and covered with mulch.

Timing of seeding is important, particularly for grasses. Seeding will not take place before the spring growing season (April 1). In addition, it will not be placed when weather conditions will impede good coverage or growth (i.e., it will not take place during high wind or rain, or when the soil is frozen.)

Seed mix quality will be as follows:

| Name of Grass | Application Rate Per Acre | Percent of Mix (by Weight) | Variety |
|---|---|---|---|
| Tall Fescue | 70.6 pounds | 36% | KY-31 |
| Orchard Grass | 29.4 pounds | 15% | PENNLATE |
| Creeping Red Fescue | 39.2 pounds | 20% | ENSYLVA |
| Perennial Ryegrass | 49 pounds | 25% | POLLY |
| Birds-Foot Trefoil | 7.8 pounds | 4% | VIKING |

The seed will be sewn on the surface of the soil, raked into the upper 1/8 inch and rolled. The seed will be placed with an appropriate starter fertilizer having not less than 4% phosphoric acid and not less than 2% potassium, with the percentage of nitrogen required to yield no less than 1.5 lbs. of actual nitrogen per 1000 square feet of seeded area. Fertilizer will be applied in 2 operations; 75% of the total amount will be thoroughly and evenly incorporated within the upper 3 inches of topsoil, and 25% will be applied as surface dressing following seeding and rolling of topsoil.

Anti-erosion mulch will be applied over the seeded soils. Acceptable anti-erosion materials will be clean, seed-free salt hay or straw of wheat, rye, oats or barley. Alternatively, hydroseed may be applied (depending on weather conditions) if pre-approved by Benchmark.

## 5.7 Construction Quality Assurance Testing Frequency

Testing frequencies for each of the CQA testing categories identified above have been summarized in Table 1. All CQA testing is related to the construction sequence. To facilitate the CQA program, the following definitions are presented:

- A layer is defined as a compacted stratum composed of several lifts constructed without construction joints.
- A lift is defined as a constructed segment of a layer composed of waste fill materials placed in a maximum 12-inch loose thickness or barrier soil materials placed in a maximum 6-inch compacted thickness.

Documentation and reporting of test results will be in accordance with the requirements identified in Section 8.0.

The exact location of the construction quality tests will be determined in the field by the CQA personnel. Benchmark will measure and mark by reference the location of all construction quality tests to the horizontal grid system (State Planar Coordinates) that will be established by the surveyor. Sampling of soil will be in accordance with sampling and testing strategies discussed in Section 6.0.

Additional testing will be used at the discretion of Benchmark when visual observations of construction performance indicate a potential problem.

# 6.0 SOIL SAMPLING AND TESTING METHODS

## 6.1 General

Generally, one of two methods will be used to collect soil samples for analysis. One method is to collect the samples by digging a series of representative test pits at the borrow area and obtaining samples from them. The other method involves collecting samples from representative stockpiles (normally after the material has been mechanically screened). These procedures are discussed below.

## 6.2 Barrier Soil Borrow Area Test Pit Sampling Method

Prior to obtaining soil samples, test holes will be dug at the barrier soil borrow area to measure the actual depth and lateral extent of barrier layer material. As shown in Figure 3, five samples will be collected for each 5,000 cubic yards of soil designated for use as barrier layer material in the borrow areas (at approximately mid-depth). Each sample will be collected using a shovel.

### 6.2.1 Sampling Procedure

Step 1: Using the shovel, collect a sample at approximately mid-depth at each of the sampling locations representing 1,000 cubic yards of the proposed excavation area.

Step 2: Transfer each sample into a labeled separate container.

Step 3: Attach label to container and record location referencing the established grid system in the borrow area.

Step 4: Deliver the samples to the laboratory for analysis as soon as possible.

### 6.2.2 Sample Containers

Two plastic 5-gallon buckets (filled completely) will be used to transport soil samples to the laboratory for analysis.

### 6.2.3 Sample Identification

The samples will be identified with labels, which will include the following information:

- Project name.
- Sample number.
- Initials of CQA inspector or sample collection personnel.
- Date of collection.
- Location of collection (i.e. location of borrow area grid system location)

The label may be made with permanent marker on the side (not top) of the container or using adhesive-back paper labels affixed to the side of the container.

### 6.2.4 Field Data

All information pertinent to each sampling event will be recorded by sampling personnel in the field at the time of sample collection. Each report will correspond to a test pit and will contain the following information:

- Project name
- Sample number or numbers collected
- Field observations.
- Climatologic conditions.
- Date and time of collection.
- Approximate location of test pit.
- Name of person who collected sample.

## 6.3 Barrier Soil Stockpiled Soil Sampling Method

If barrier soil is obtained from a stockpiled source, 12 samples of approximate equal volume will be collected from the top, middle, and bottom of each 1,000 cubic yard stockpile by CQA personnel, as shown in Figure 4,. The samples will be composited in the field to give one representative aliquot per 1,000 cubic yard. Each sample will be collected using a shovel.

### 6.3.1 Sampling Procedure

| | |
|---|---|
| Step 1: | Using a shovel or backhoe, penetrate the pile to a depth of about two to three feet. |
| Step 2: | Collect a sample using the shovel. |
| Step 3: | Transfer the sample to a specially prepared mixing area. |
| Step 4: | Repeat Steps 1 through 3 at each of the sampling points (see Figure 4). |
| Step 5: | Mix subsamples using shovel into one homogenous mass and place in a properly labeled container. |
| Step 6: | Attach label to container and record necessary data in field logbook. |
| Step 7: | Return remaining contents of composite sample to stockpile. |
| Step 8: | Deliver the composited sample aliquots to the laboratory for analysis as soon as possible. |

### 6.3.2 Sample Containers

Two plastic 5-gallon buckets (filled completely) will be used to transport soil samples to the laboratory for analysis.

### 6.3.3 Sample Identification

All samples will be identified with labels, which will include the following information:

- Project Name
- Sample number.
- Initials of CQA inspector or sample collection personnel.
- Date of collection.
- Location of collection (i.e., stockpile number and/or location).

### 6.3.4 Field Data

All information pertinent to each sampling event will be recorded. Each report will contain all of the information in Section 6.2.4.

## 6.4 Composite Soil Sampling Method for Materials Evaluation

Where QA Testing requires samples to be analyzed at a frequency of one per 5,000 cubic yards, the sample to be used for the laboratory test will be a composite of five sample aliquots (collected by field personnel in accordance with Section 6.2 or 6.3). Each aliquot shall represent 1,000 cubic yards of material. The composite samples of soil will then be thoroughly mixed and quartered with one quarter being used as the representative sample for testing.

## 6.5 Waste Fill Sampling for Modified Proctor Density Evaluation

One representative sample of waste fill will be collected for laboratory testing to determine modified proctor density. The sample will be a composite of five to ten sample aliquots (collected by field personnel in accordance with Section 6.3). Each aliquot shall represent a representative sample of the waste fill material and shall exclude any cover soils. The waste fill aliquots will be thoroughly mixed and quartered with one quarter being used as the representative sample for testing.

## 6.6 In-Place Moisture-Density Tests

Table 1 presents the frequency of moisture-density testing. The test locations will be determined in the field. The CQA inspector may determine that more than the minimum required moisture-density tests are necessary to accurately evaluate the quality of the compacted soil lift being evaluated. All tests performed will be located at the CQA inspector's discretion and tied into the grid system.

Testing of consecutive lifts will be offset laterally and axially by at least 5 feet from the prior lift's tests. This will help to eliminate "stacking" of moisture-dry tests.

## 6.7 Undisturbed Hydraulic Conductivity Tests

Table 1 presents the frequency of undisturbed hydraulic conductivity testing (Shelby tubes). Locations will be determined in the field by the CQA personnel. Testing of consecutive lifts will be offset both laterally and radially. Benchmark personnel will collect the sample (using the procedure presented in Appendix C) with assistance from the Subcontractor.

## 6.8 Treatment of Laboratory Test Result Outlier

Occasionally, one laboratory test value deviates markedly from the remainder of the test values. Such a value is called an outlier. When an outlier is determined to exist, the following procedures will be followed by laboratory personnel:

- Recalculate the test value checking for math errors.
- Check any values used for comparison, making sure they were the correct values to be used.
- If outlier value(s) still exists, perform test again on the same soil sample or backup (i.e., duplicate) sample
- If outlier value(s) still exists, discuss value(s) and course of action with CQA personnel.

# 7.0 CORRECTIVE MEASURES

When material or work is rejected because field observations or tests indicate that it does not meet the requirements identified herein, corrective measures must be implemented. For questionable material or workmanship additional testing may be necessary. The following are procedures and corrective measures to be followed for CQA testing problems, which are likely to occur:

## 7.1 Excessive Drying or Wetting of Stockpile Soil

If excessive drying or wetting of stockpiled soil becomes a problem, consideration will be given to cover the piles with tarps or smooth-rolling the surface to minimize loss or gain until the material is used in the construction activities. Water can also be sprayed on the stockpile to prevent drying or supplement moisture. If the stockpiles are too wet, the material can be spread out to dry.

## 7.2 In-Place Moisture-Density Test Failures

Corrective actions for in-place moisture-density test failures are presented below.

- **Moisture** – When the moisture content is determined to be too far below optimum, the compacted soil will be disked and moisture added to achieve a moisture content greater than optimum prior to recompaction. When the moisture content is so high that the soil cannot be compacted to required density limits, the soil will be disked or scarified and left to dry in the sun and wind prior to recompaction. If this action does not result in sufficient drying, the soil will be admixed with other, dry soil or removed and stockpiled until it dries to acceptable moisture content. Under either failure condition, the extent of work will include the area delineated by a circle with the center at the location of the failed test and a radius corresponding to the distance from the location of the failed test to the nearest passing test or to a closer passing test as determined by additional testing. Retesting will be performed within 10 feet of the original location of the failed test after corrective measures have been taken.

- **Density –** If the compaction is less than 90 percent of the modified proctor maximum density, or is not considered acceptable using the field density measurement procedures described in Appendix B, the lift of soil in the work area shall be deemed unacceptable. The soil will be reworked, if feasible, and retested. If field density measurements continue to indicate compaction less than 90 percent of the modified proctor maximum density, the soil will be removed and set aside for alternative uses. The extent of the work area will include the area delineated by a circle with a center at the failed test and a radius of 50 feet.

### c. Erosion and/or Desiccation Cracking of Compacted Soil Layers, Lift or Subgrades

Dry weather and/or high wind conditions may lead to erosion and/or desiccation cracking of completed and compacted soil layers, lifts or subgrades. When erosion and/or desiccation cracking occur, the affected area will be scarified, wetted, and recompacted prior to replacement of new soil. The new soil will be placed, compacted and tested in accordance with Section 5.0. Consideration will be given to the use of temporary plastic sheets to limit erosion and desiccation cracking if the problem occurs on a routine basis. Completed areas of the soil barrier layer should also be covered with topsoil and seeded as soon as possible to prevent desiccation cracking.

### d. Ponding of Water on Completed Compacted Soil Layers, Lifts or Subgrades

If ponding of water on completed, compacted soil layers, lifts or subgrades become a routine problem, the completed surfaces which are to receive additional lifts of compacted soil will be rolled with a smooth drum roller at the end of each day. This will limit ponding as well as help to minimize drying and desiccation cracking. The affected area will be scarified prior to placement of the next lift of soil.

### e. Hydraulic Conductivity Test Failure

The minimum acceptable values and testing standards are discussed in Section 5.0. If a test during preliminary materials evaluation fails (i.e., greater than 1.0 x$10^{-6}$ cm/s), the test will be repeated either in the same sample or a duplicate or backup sample. If the test fails a second time, the material will be rejected for use as barrier layer material.

If the study tube hydraulic conductivity test fails, four supplemental Shelby tube measurements will be taken approximately 100 feet from the failed test location (see Figure 5) assuming a square sided acre-lift. The results of the supplemental test will be used in conjunction with the original test to establish the extent of the work area where the lift of soil will be removed and stockpile for alternative uses prior to placement, compaction and testing of the next lift of soil. The extent of the work area will include those areas delineated by circles with midpoints at the failed test locations and a radius of 70 feet. Once corrective measures have been applied, retesting will be performed within ten feet of the location of the original failed test.

In lieu of supplemental permeability testing, the entire acre-lift soil may either be reworked or removed and stockpiled (for alternative uses) followed by placement, compaction and testing of a new lift of soil. The acre-lift of soil will be defined as a circle with a center at the failed test and a radius of 125 feet.

Observations and test results that indicate adverse conditions not corrected by the Subcontractor will be well documented and discussed with the Project Manager before specifying corrective measures.

# 8.0 DOCUMENTATION

## 8.1 General

Benchmark will document activities associated with the construction of the remedial measures. Such documentation will include, at a minimum, daily reports of construction activities, photographs and sketches, as necessary.

## 8.2 Construction Monitoring

Standard daily reporting procedures will include preparation of a summary report with supporting data sheets and, when appropriate, problem identification and corrective measures reports (see Appendix A for Daily Report).

Information that will be included on the forms by the CQA personnel includes:

- Unit processes, and locations, of construction under way during the time frame of the daily monitoring report.
- Equipment and personnel working in the area including second tier subcontractors.
- Description of off-site materials received, including any quality verification (vendor certification) documentation.
- Summary of field tests performed and laboratory samples collected, including a sketch of sample locations.

### 8.2.1 Data Sheets

All field density tests will be recorded on data sheets per Appendix A. Laboratory test results will be presented on standard forms. Example laboratory report forms are included in Appendix A (forms A and B).

All completed field forms/reports will be available on-site and will be submitted to the USEPA as part of the final Remedial Action Report. Laboratory reports will be delivered to the Project Manager/CQA Engineer and submitted to USEPA with monthly progress reports and in the final Remedial Action Report.

### 8.2.2 Problem Identification and Corrective Measures Reports

A problem identification report and a corrective measure report (see Appendix A) will be completed by Benchmark whenever major field problems are encountered and corrective measures may be necessary. These reports will be attached to the associated daily reports.

The USEPA will be notified (by telephone or e-mail) of problems requiring modifications to design plans and details prior to proceeding or completion of the construction item. Changes or additions will be noted in construction record drawings.

### 8.2.3 Acceptance of Completed Components

All daily reports, data sheets, problem identification and corrective reports will be reviewed by the CQA Engineer. The documentation will be evaluated and analyzed for internal consistency and for consistency with similar work. Timely review of these documents will permit errors, inconsistencies, and other problems to be detected and corrected as they occur.

The above information will be assembled and summarized as part of the final Remedial Action Report. The report will indicate that the materials and construction process comply with the Work Plan and this CQAPP.

## 8.3 Remedial Action Report

Upon completion of the remedial construction, Benchmark will prepare a final Remedial Action Report addressing each item identified above. The report will include an analysis of compliance with this CQAPP, and a summary of CQA sampling and testing. The report will also include:

- Scale drawings depicting a topographic survey of the site before and after construction of the cap.
- A summary of the location of the construction and CQA testing results.
- Statements pertaining to the extent of construction, i.e., depths, plan dimensions, elevations, and thickness.

- A discussion of any necessary remedial actions. This will include a description of the overall circumstances, actions taken and results of retesting.
- Other information as required per the Consent Decree.

## 8.4 Certification of Remediation/Closure

Upon completion of closure construction activities, Respondents and Benchmark shall submit to the USEPA in conjunction with the Final Remedial Action Report, a certification that the Site has been remediated in accordance with the CQAPP, the Remedial Design Report, and USEPA approved modifications (if any).

## 8.5 Storage of Records

During the construction of the remedial measures a copy of the design criteria, work plans, and specifications, the CQAPP, and the originals of all data sheets and reports will be maintained in the field office. Originals will be maintained in Benchmark's Buffalo, New York office. A final Remedial Action Report will be sent to and maintained in a publicly acknowledged repository. All documentation will be maintained through the post-closure monitoring periods of the site.

# TABLES

# TABLE 1

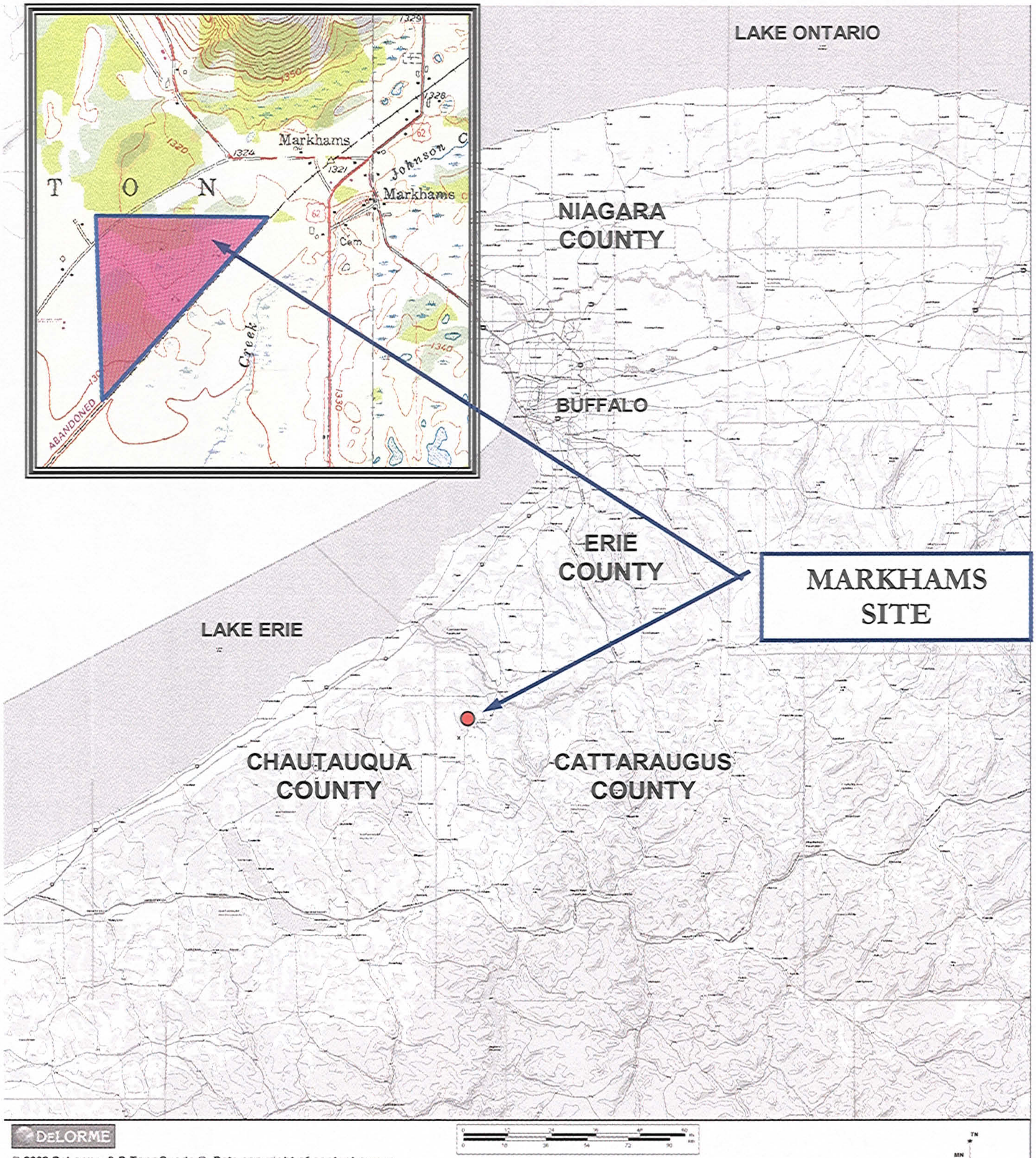
# QUALITY ASSURANCE TESTING FREQUENCIES

## Construction Quality Assurance Project Plan
## Peter Cooper Markhams NPL Site
## Dayton, New York

| Test | Frequency |
|---|---|
| **Materials Evaluation:** | |
| Re-compacted Waste/Fill: | |
| Modified Proctor Test (ASTM D1557) | 1 sample |
| Re-compacted Soil Barrier Layer: | |
| Moisture Content (ASTM D2216) | 1 per 1000 cubic yards |
| Sieve Analysis (ASTM D422, D421) | 1 per 1000 cubic yards |
| Hydrometer Analysis (ASTM D422, D421) | 1 per 1000 cubic yards |
| Modified Proctor Test (ASTM D1557) | 1 per 5000 cubic yards |
| Recompacted Permeability (ASTM 5084) | 1 per 5000 cubic yards |
| Topsoil: | |
| Sieve Analysis (ASTM D422, D421) | 1 per 5000 cubic yards |
| Hydrometer Analysis (ASTM D422, D421) | 1 per 5000 cubic yards |
| Organic Content (ignition loss) | 1 per 5000 cubic yards |
| Soluble Salt Content (current literature) | 1 per 5000 cubic yards |
| pH (ASTM D4972) | 1 per 5000 cubic yards |
| **Construction Quality Evaluation:** | |
| Re-compacted Waste/Fill: | |
| In-Place Moisture-Density Test (ASTM D2922-81, D3017-78) | Minimum of 9 per 1-acre, 12-inch thick test pad; 1 per acre per lift following satisfactory test results as determined by the CQA Engineer |
| Re-compacted Soil Barrier Layer: | |
| In-Place Moisture-Density Test (ASTM D2922-81, D3017-78) | Minimum of 9 per lift per acre of barrier layer placed or as determined by the CQA Engineer |
| Undisturbed Shelby-Tube Hydraulic Conductivity (ASTM D5084) | One per lift per acre of barrier layer placed. |

# FIGURES

**FIGURE 1**



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www.delorme.com

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726 EXCHANGE STREET
SUITE 624
BUFFALO, NEW YORK 14210
(716) 856-0599

PROJECT NO.: 0021-003-400

DATE: DECEMBER 2007

DRAFTED BY: AJZ

## SITE LOCATION AND VICINITY MAP

CONSTRUCTION QUALITY ASSURANCE PROJECT PLAN

PETER COOPER MARKHAMS SITE
DAYTON, NEW YORK

PREPARED FOR
RESPONDENTS FOR PETER COOPER MARKHAMS SITE

FILEPATH:F:\CAD\Benchmark\Collier Shannon\Markhams Site\Remedial Design Report\CQAP\figure 1;site location and vicinity map.dwg

# FIGURE 2
## RD/RA PROJECT SCHEDULE
## PETER COOPER MARKHAMS NPL SITE

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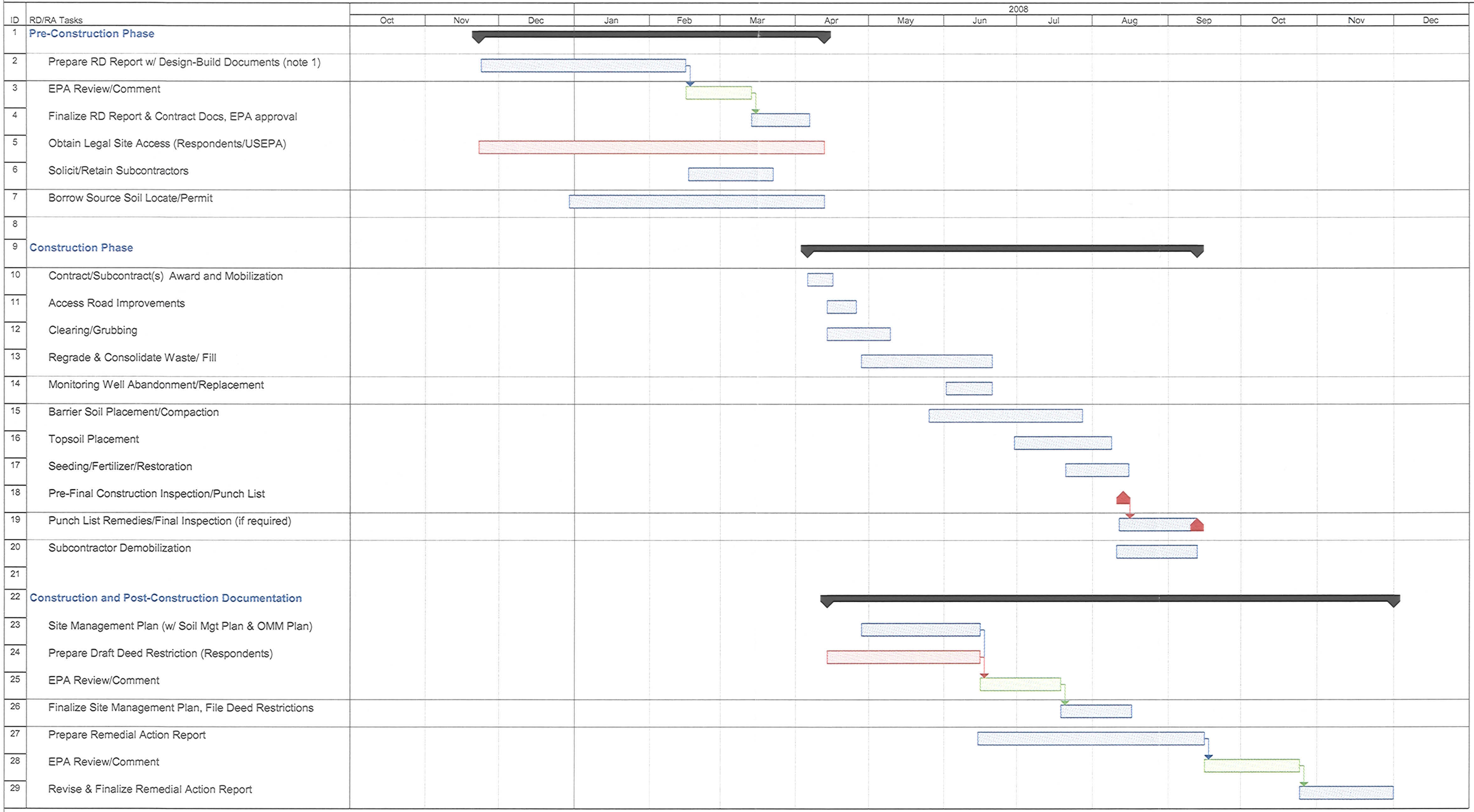
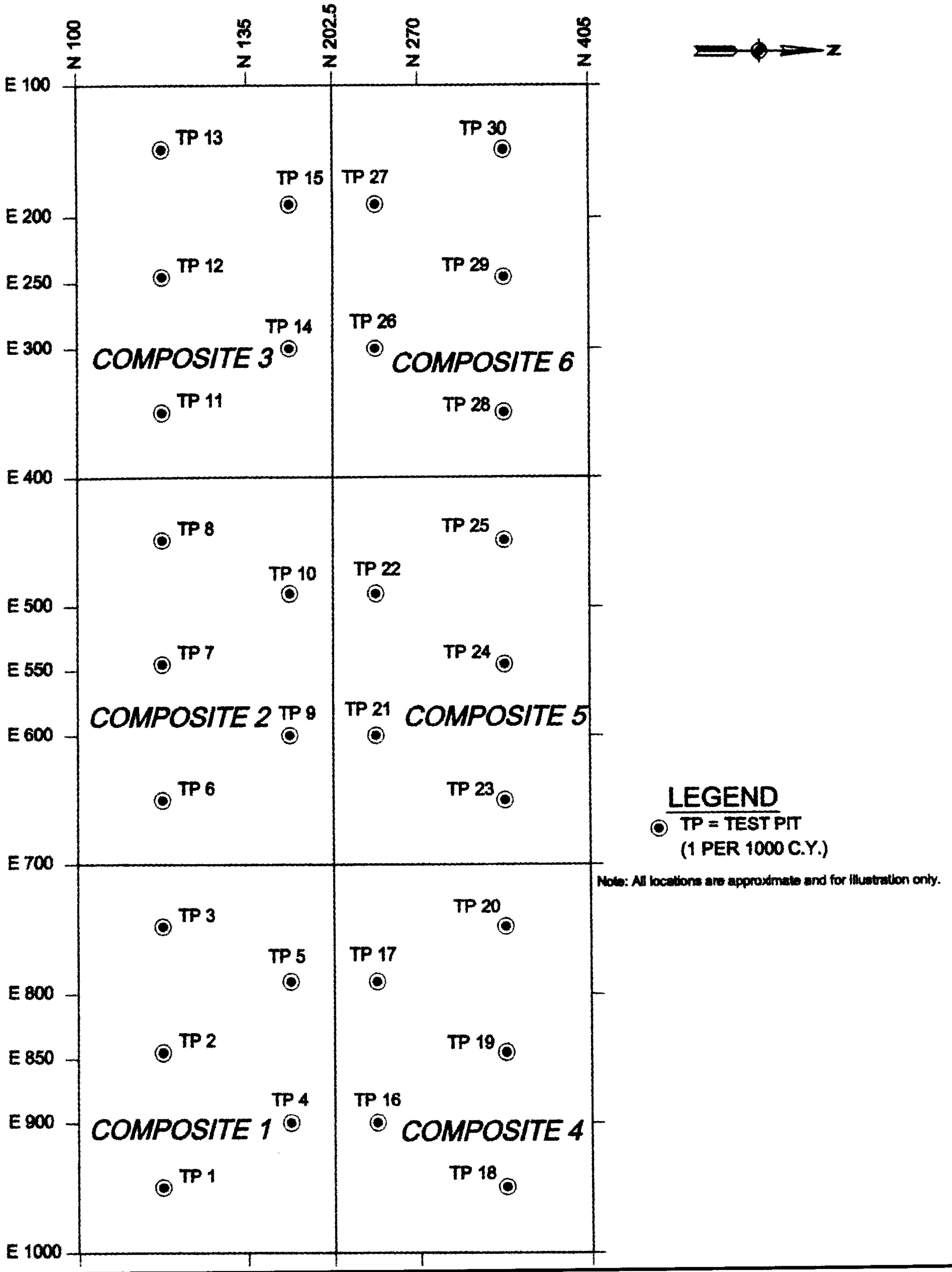


Notes:

1. Includes Construction Quality Assurance Project Plan (CQAPP) and Health & Safety Contingency Plan (HSCP).

# FIGURE 3



Note: All locations are approximate and for illustration only.

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PROJECT NO.: 0021-003-400

DATE: JANUARY 2008

DRAFTED BY: AJZ

## IN-PLACE BORROW SOIL SAMPLING METHODOLOGY

CONSTRUCTION QUALITY ASSURANCE PROJECT PLAN

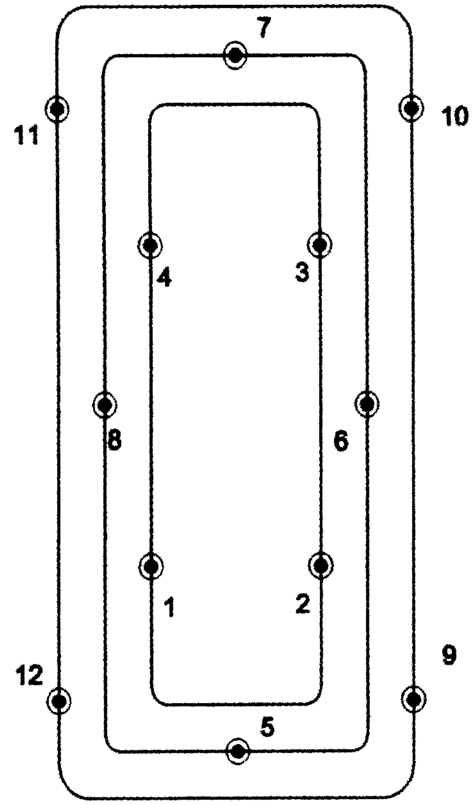
PETER COOPER MARKHAMS NPL SITE
DAYTON, NEW YORK

PREPARED FOR

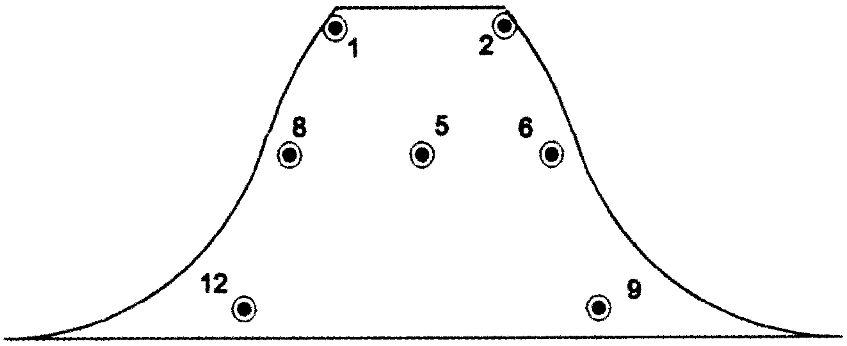
RESPONDENTS FOR PETER COOPER MARKHAMS SITE

FILEPATH: F:\CAD\Benchmark\Collier Shannon\Markhams Site\Remedial Design Report\CQAP\Figure 3; In-place borrow soil sampling methodology.dwg

**FIGURE 4**



**PLAN**



**SECTION**

Note: All locations are approximate and for illustration only.

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PROJECT NO.: 0021-003-400

DATE: JANUARY 2008

DRAFTED BY: AJZ

## STOCKPILE SAMPLING METHODOLOGY

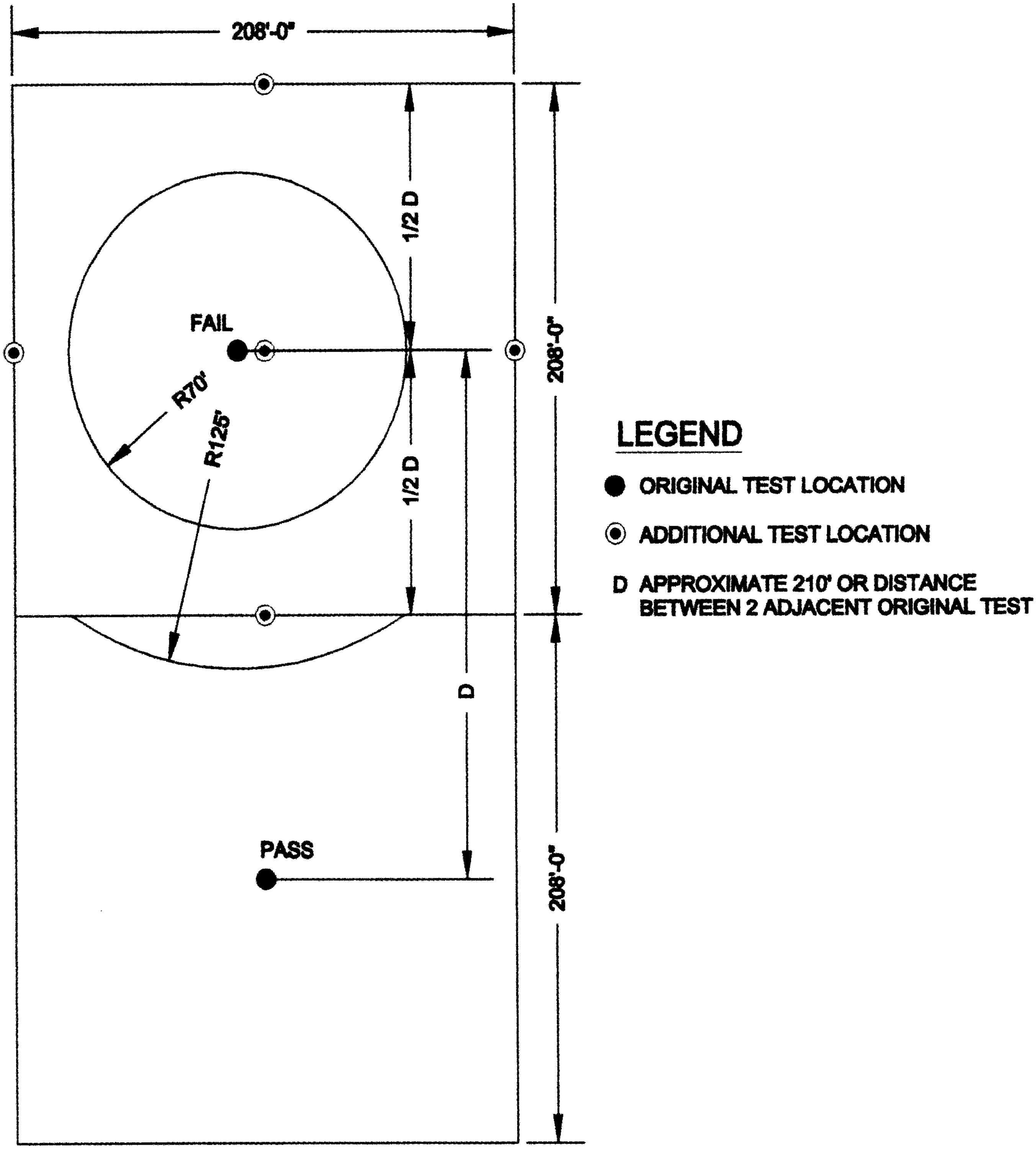
CONSTRUCTION QUALITY ASSURANCE PROJECT PLAN

PETER COOPER MARKHAMS NPL SITE
DAYTON, NEW YORK

PREPARED FOR
RESPONDENTS FOR PETER COOPER MARKHAMS SITE

FILEPATH:F:\CAD\Benchmark\Collier Shannon\Markhams Site\Remedial Design Report\CQAP\figure 4; stockpile sampling methodology.dwg

**FIGURE 5**



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DATE: JANUARY 2008

DRAFTED BY: AJZ

# IN-PLACE (SHELBY TUBE) SAMPLING METHODOLOGY

CONSTRUCTION QUALITY ASSURANCE PROJECT PLAN

PETER COOPER MARKHAMS NPL SITE
DAYTON, NEW YORK

PREPARED FOR

RESPONDENTS FOR PETER COOPER MARKHAMS SITE

FILEPATH:F:\CAD\Benchmark\Collier Shannon\Markhams Site\Remedial Design Report\CQAP\figure 5; in-place (shelby tube) sampling methodology.dwg

# APPENDIX A

## STANDARD DOCUMENTATION SHEETS

Form A

# 3rd Rock, LLC
## Permeability Report Sheet

**Project:** **Date of Test: July 26, 2000**

**East Swale Clay Placement**

**Project No: 00-001** **Date Sample Received: July 27, 2000**

**Sample No: L-2A, 00-042**

**Shelby Tube Sample**

### Before Test

Wet Density (pcf): 129.8
Moisture Content (%): 19.4
Dry Density (pcf): 108.7

### After Test

Wet Density (pcf): 130.2
Moisture Content (%): 22.3
Dry Density (pcf): 106.5

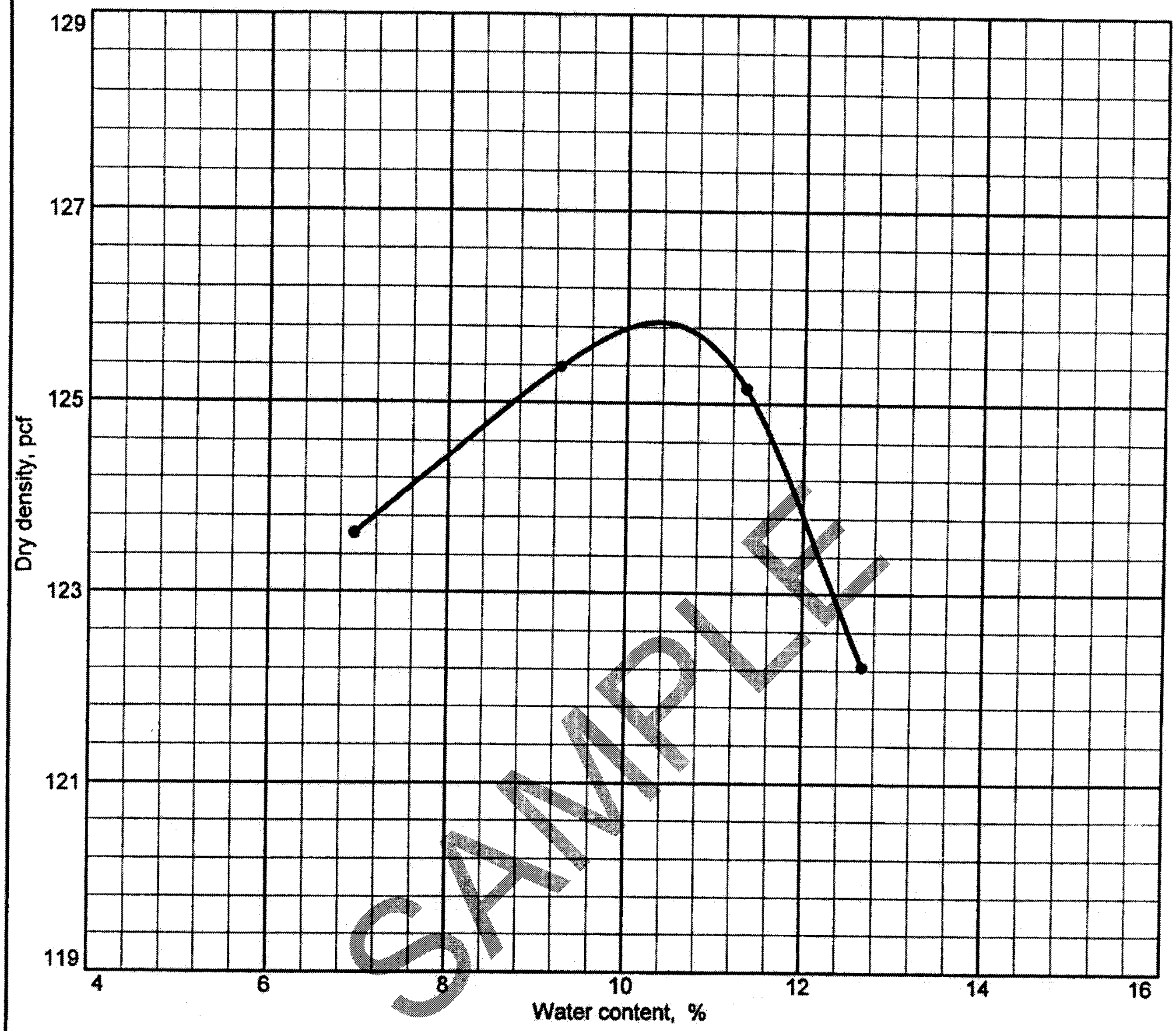
### Hydraulic Conductivity Result

Average of Last 4 Readings (cm/s): **$2.2 \times 10^{-8}$**

580 Olean Road
East Aurora, New York 14052
(716) 655-4933

Form B

# COMPACTION TEST REPORT



Test specification: ASTM D 1557-91 Procedure A Modified

| Elev/ Depth | Classification | | Nat. Moist. | Sp.G. | LL | PI | % > No.4 | % < No.200 |
|---|---|---|---|---|---|---|---|---|
| | USCS | AASHTO | | | | | | |
| | | | | | | | | |

**TEST RESULTS**

Maximum dry density = 125.9 pcf

Optimum moisture = 10.4 %

**MATERIAL DESCRIPTION**

ID#00-189

**Project No.** 00-005 **Client:** Benchmark Environmental

**Project:**

● **Source:** Cap Evaluation **Sample No.:** Comp 2

COMPACTION TEST REPORT

## 3rd Rock, LLC

**Remarks:**

**Plate**

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# NUCLEAR DENSITOMETER FIELD LOG

Project:

Date:

Client:

Report No.:

Job No.:

Inspector:

Contractor:

Page of

**PROCTOR DATA:**

| | |
|---|---|
| *Type of Material* | |
| *Source Area* | |
| *Maximum Density* | pcf |
| *Optimum Moisture Content* | % |

**PASSING REQUIREMENT:**

*90% of the Modified Proctor*

**NUCLEAR DENSITOMETER RESULTS:**

**STANDARD COUNTS**

*Density:*

*Moisture:*

**GAUGE INFORMATION:**

*Troxler Model No.:* 3440

*Troxler Serial No.:*

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TEST NUMBER | | | | | | | | | | | | |
| DEPTH OR ELEVATION | | | | | | | | | | | | |
| PERCENT COMPACTION (%) | | | | | | | | | | | | |
| DRY DENSITY (pcf) | | | | | | | | | | | | |
| WET DENSITY (pcf) | | | | | | | | | | | | |
| MOISTURE (pcf) | | | | | | | | | | | | |
| PERCENT MOISTURE (%) | | | | | | | | | | | | |
| DENSITY COUNT | | | | | | | | | | | | |
| MOISTURE COUNT | | | | | | | | | | | | |
| PASS [P] or FAIL [F] | | | | | | | | | | | | |

**LOCATION:**

| TEST NO. (from above) | X | Y | Z |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

| TEST NO. (from above) | X | Y | Z |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

**REMARKS:**

**SIGNED:**

**DATE:**

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# INSPECTOR'S DAILY REPORT

| | | | |
|---|---|---|---|
| CONTRACTOR | | | |
| CLIENT | | DATE: | |

| | | | | | | |
|---|---|---|---|---|---|---|
| LOCATION | | | DAY | | JOB NO. | |
| WEATHER | TEMP | ° F | START | | END | |

## MEETINGS HELD & RESULTS:

## CONTRACTOR'S WORK FORCE AND EQUIPMENT

| *DESCRIPTION* | *H* | *#* | *DESCRIPTION* | *H* | *#* | *DESCRIPTION* | *H* | *#* | *DESCRIPTION* | *H* | *#* |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Field Engineer | | | | | | Equipment | | | Front Loader Ton | | |
| Superintendent | | | Ironworker | | | Generators | | | Bulldozer | | |
| | | | | | | Welding Equip. | | | DJ Dump truck | | |
| Laborer-Foreman | | | Carpenter | | | | | | Water Truck | | |
| Laborer | | | | | | | | | Backhoe | | |
| Operating Engineer | | | Concrete Finisher | | | | | | Excavator | | |
| | | | | | | Roller | | | Pad foot roller | | |
| Carpenter | | | | | | Paving Equipment | | | | | |
| | | | | | | Air Compressor | | | | | |

## REMARKS:

## REFERENCES TO OTHER FORMS:

| | | | | | |
|---|---|---|---|---|---|
| **SAMPLES COLLECTED:** | | | | | |
| SAMPLE NUMBER | | | | | |
| APPROX. LOCATION OF STOCKPILE | | | | | |
| NO. OF STOCKPILE | | | | | |
| DATE OF COLLECTION | | | | | |
| CLIMATOLOGIC CONDITIONS | | | | | |
| FIELD OBSERVATION | | SHEET | | OF | |

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# INSPECTOR'S DAILY REPORT

CONTRACTOR

CLIENT

DATE:

LOCATION

DAY

JOB NO.

WEATHER

TEMP °F

START

END

**WORK PERFORMED:**

**CONTRACTOR ACTIVITIES:**

*[PUT CONTRACTOR ACTIVITIES HERE, BE SPECIFIC. TYPE OF EQUIPMENT, ACTIVITIES PERFORMED, BY WHOM, LOCATION OF LANDFILL ETC.]*

**BENCHMARK ACTIVITIES:**

*[PUT ENGINEER ACTIVITIES HERE, BE SPECIFIC. TYPE OF EQUIPMENT, ACTIVITIES AND TESTING PERFORMED, SAMPLES COLLECTED, BY WHOM, LOCATION OF LANDFILL ETC.]*

TEST PERFORMED

PICTURES TAKEN none

VISITORS none

*QA PERSONNEL* SIGNATURE

REPORT NO.

SHEET 1 OF

BENCHMARK
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| DAILY LOG | | | | |
|---|---|---|---|---|
| | DATE | | | |
| | REPORT NO. | | | |
| | PAGE | OF | | |

# PROBLEM IDENTIFICATION REPORT

Date:

Project:

Job No:

Location:

CQA Monitor(s):

Client:

Contractor:

Contractor's Supervisor:

**WEATHER CONDITIONS:**

Ambient Air Temp. - A.M.:

Ambient Air Temp. - P.M.:

Wind Direction:

Wind Speed:

Precipitation:

Problem Description:

Problem Location (reference test location, sketch on back of form as appropriate):

Problem Causes:

Suggested Corrective Measures or Variances:

*Linked to Corrective Measures Report No.* *or Variance Log No.*

Approvals (initial):

CQA Engineer:

Project Manager:

Signed:

CQA Representative

Form F - Problem Identification Report.xls

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| DAILY LOG | | | | |
|---|---|---|---|---|
| | DATE | | | |
| | REPORT NO. | | | |
| | PAGE | OF | | |

# CORRECTIVE MEASURES REPORT

Date:

Project:

Job No:

Location:

CQA Monitor(s):

Client:

Contractor:

Contractor's Supervisor:

**WEATHER CONDITIONS:**

Ambient Air Temp. - A.M.:

Ambient Air Temp. - P.M.:

Wind Direction:

Wind Speed:

Precipitation:

Corrective Measures Undertaken (reference Problem Identification Report No.)

Retesing Location:

Suggested Method of Minimizing Re-Occurrence:

Approvals (initial):

CQA Engineer:

Project Manager:

Signed:

CQA Representative

# APPENDIX B

## METHOD FOR DETERMINING ACCEPTABILITY OF COMPACTION VIA IN-SITU NUCLEAR DENSITOMETER TESTING

# METHOD FOR DETERMINING ACCEPTABILITY OF COMPACTION VIA IN-SITU NUCLEAR DENSITOMETER TESTING

Barrier layer soil compaction will be monitored in support of QA measures for achieving the target maximum barrier soil permeability. The compaction process will be monitored through routine determination of the soil moisture content and nuclear densitometer measurement of the density of the lift being constructed. Maintaining the soil moisture content and density within acceptable limits will be instrumental toward achieving the desired barrier layer soil permeabilities.

During barrier layer construction, the measured in-situ dry density immediately following barrier layer soil compaction shall be at or greater than 90% of the maximum modified proctor dry density determined for the barrier layer soil. In-situ moisture content shall be wet of optimum following compaction.

A representative modified proctor curve will be used. A typical moisture-density graph (proctor curve) is included in Appendix A as Form B.

# APPENDIX C

## PROCEDURE FOR THIN-WALLED SHELBY TUBE SAMPLING OF BARRIER LAYER SOILS

# APPENDIX C:

## Procedure for Thin-walled Shelby Tube Sampling of Barrier Layer Soils

### 1.0 INTRODUCTION

Collection of undisturbed soil samples for hydraulic conductivity testing will be performed in accordance with the procedure outlined below (modified ASTM Standard D 1587-94).

### 2.0 COLLECTION PROCEDURE

A. Collect one shelby tube sample for undisturbed hydraulic conductivity testing for each acre-lift of compacted soil barrier layer (i.e., 1 per acre per 6-inch lift). The Contractor and CQA engineer shall establish, prior to the start of cover system application, a horizontal grid system that will segregate the area to be covered into 1-acre parcels. Remaining parcels less than 1-acre in size shall be regarded as an acre and sampled accordingly.

B. Soil sample locations will be determined by the QA Engineer. Sample location shall be as level and uniform as possible and free of large stones/debris. The Contractor's surveyor will provide the CQA Engineer with coordinates and elevation of the sample locations.

C. A nuclear densitometer reading will be taken at the sample site prior to collecting the shelby tube sample to determine in-situ density and moisture content. The barrier layer shall be compacted to at least 90% of the Modified Proctor maximum density and should be wet of optimum. The contractor will perform any work required to provide the specified density and moisture content. The shelby tube sample will not be collected until the in-situ density and moisture content are approved by the CQA Engineer.

D. Collect two (2) shelby tube samples; 1 from the soil located between the nuclear densitometer source rod and detectors, and a duplicate sample the same distance from the source rod to the first sample, but in the opposite direction (180 degrees away). Label the second sample "Duplicate". Instruct the testing laboratory to hold the duplicate sample for potential analysis if the first sample does not meet permeability limits.

E. Advance the Shelby Tube as follows:

- Mark a line on the tube indicating the desired depth of penetration. Penetration depth shall be two inches greater than the lift thickness unless otherwise directed.
- Place protective blocking on the top end of the Shelby tube. and place a bottle jack on top of the blocking. Locate a dozer blade or backhoe bucket on the jack so that the jack is firmly seated between the blocking and the blade/bucket.
- Using the bottle jack, smoothly advance the tube through the barrier layer to the appropriate depth. The tube must remain perpendicular to the barrier layer surface at all times, and should not be allowed to move radially.
- Upon advancing to the desired depth, remove the jack and heavy equipment. Insert a steel bar through the Shelby Tube pin openings, rotate once and carefully remove the tube from the soil barrier layer. If poor recovery is encountered, repeat the collection procedure at another nearby location.

F. Sample Preparation:

- Remove any disturbed material in the upper end of the tube and measure the length of the soil sample.
- Seal the upper end of the tube with melted wax, place wadded newspaper or similar packing in remaining empty space (if any), cover with a plastic cap and secure with duct tape.
- Remove approximately 1-inch of material from the lower end of the tube. Calculate the overall sample length, and seal the lower end with melted wax and a plastic cap. Secure with duct tape.
- Label, with permanent marker, the following information on the tube (not on duct tape or end cap): site name, project number, sampler (initials), sample number, date, and sample length. Also label the top of the tube and draw a line indicating the approximate top of the sample.

- Transport the sample to the testing lab. Maintain in an upright position at all times.

- Backfill Shelby tube perforations with a dry soil-bentonite (1-1) mixture. Compact in-place with a tamping rod.

# APPENDIX C

## MONITORING WELL ABANDONMENT FOP

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FIELD OPERATING PROCEDURES

# Abandonment of Monitoring Wells Procedure

# FOP 002.0

# ABANDONMENT OF MONITORING WELLS PROCEDURE

## PURPOSE

This guideline presents a method for the abandonment and decommissioning of wells that are no longer reliable as competent monitors of formation groundwater. Well abandonment and decommissioning is required in order to remove a potential pathway for the vertical migration of impacted groundwater and/or surface water.

## PROCEDURE

1. Examine the existing well to be abandoned/decommissioned and review well construction detail information (if applicable) to determine well depth,, screened interval, diameter, material of composition and other construction details. Establish appropriate equipment requirements for removal of the well.

2. Determine the most suitable seal materials as discussed in the next section.

3. Attempt to remove the well using a drilling rig, by using the following procedures:
    - Attaching the winch line to the well to see if it can be removed by pulling;
    - Using the rig's hydraulics to advance casing incrementally;
    - If a cable tool rig is available, bump back the casing using the cathead and drive block.

3. Upon removal of the well, ream the borehole by advancing the augers approximately one foot beyond the total depth of the well. Rotate the augers at a speed sufficient to remove the construction materials (i.e., filter pack, bentonite seal, etc.) from the borehole annulus (if possible). Backfill the resulting borehole with cement/bentonite grout, by tremie method, to approximately one foot below ground surface. Fill the remaining borehole to match the existing grade elevation and material of construction (i.e., clean native soil, concrete or asphalt, as necessary). Go to Step 10.

4. If the well cannot be removed from the borehole over-drill the borehole and well to approximately two (2) feet below the well depth. Upon reaching the desired depth, remove the well from within the augers and go back to Step 3.

5. If the borehole cannot be reamed out using conventional drilling techniques (i.e., over-drilled), remove or puncture the base plate of the well screen using the drill rig and associated equipment by pounding with the drill rods. Upon filling the well with grout by tremie method, slowly pull the well from the ground surface to allow the grout to evacuate through the bottom of the well to fill the void space created by removal of the well casing. Continue adding grout mix to the well casing, as necessary, to fill the void space to approximately one foot below ground surface. Fill the remaining borehole to match the existing grade elevation and material of construction (i.e., clean native soil, concrete or asphalt, as necessary). Go to Step 10.

   If the driller is unsuccessful at removing or puncturing the base plate of the well due, in part, to well construction materials (i.e., stainless steel or black iron), go to Step 6.

6. Insert a tremie pipe down the well to the bottom and pump a cement/bentonite grout mixture to a depth one to two feet above the top of the screen.

7. Perform a hydraulic pressure test on the portion of the well casing above the grouted screen section. Allow the grout to set up for a period not less than 72 hours before pressure testing of the grouted interval. Place a pneumatic packer a maximum of 4.5 feet above the top of the slotted screen section of the well. The infiltration pressure applied to the packer shall not exceed the pressure rating of the well casing material. If the interval between the top of the grout and the bottom of the packer is not saturated, potable water will be used to fill the interval. A gauge pressure of 5 psig at the well head shall be applied to the interval for a period of 5 minutes to allow for temperature stabilization. After 5 minutes, the pressure will be maintained at 5 psig for 30 minutes. The grout seal shall be considered acceptable if the total loss of water to the seal does not exceed 0.5 gallons over a 30-minute period.

8. If the grout seal is determined to be unacceptable, tremie grout an additional 5 feet of well riser above the failing interval and retest as specified above (see Step 7).

9. If the grout seal is determined to be acceptable, tremie grout the remainder of the well until grout displaces all formation water and a grout return is visible in the well at the surface. Cut off well casing at a depth of five feet or greater below ground surface and backfill the remaining borehole to match the existing grade elevation and material of construction (i.e., clean native soil, concrete or asphalt, as necessary).

10. Record all well construction details and abandonment procedures on the **Well Abandonment/Decommissioning Log** (sample attached).

## CEMENT/BENTONITE GROUT MIXTURE

The cement/bentonite grout mixture identified below is generally considered the most suitable seal material for monitoring well advancement and abandonment. Grout specifications generally have mixture ratios as follows:

Grout Slurry Composition (% Weight)

1.5 to 3.0% - Bentonite (Quick Gel)
40 to 60% - Cement (Portland Type I)
40 to 60% - Potable Water

## MISCELLANEOUS

All removed well materials (PVC, stainless steel, steel pipe) should be decontaminated (if necessary) as per the project specific **Drilling and Excavation Equipment Decontamination FOP** and removed from the site. The project manager will determine the destination of final disposal for all well materials. All drill cuttings (depending on site protocol) should be placed in DOT-approved 55-gallon drums, labeled and sampled in accordance with Benchmark's field operating procedure **Management of Investigation-Derived Waste** in order to determine proper removal and disposal procedures. The drilling subcontractor will provide any potable water utilized during this field activity from a known and reliable source (see Notes section).

## ATTACHMENTS

Well Abandonment/Decommissioning Log (sample)

## REFERENCES

New York State Department of Environmental Conservation, July 1988, *Drilling and Monitoring Well Installation Guidance Manual.*

Driscoll, F.G., 1987, *Groundwater and Wells*, Johnson Division, St. Paul, Minnesota, p. 1089.

Benchmark FOPs:
*018 Drilling/Excavation Equipment Decontamination Protocols*
*032 Management of Investigation-Derived Waste*

## NOTES

Tap water may be used from any municipal water treatment system. The use of an untreated potable water supply is not an acceptable substitute.

BENCHMARK
ENVIRONMENTAL
ENGINEERING &
SCIENCE, PLLC

## WELL ABANDONMENT/ DECOMMISSIONING LOG

| PROJECT INFORMATION | WELL INFORMATION |
|---|---|
| Project Name: | WELL I.D.: |
| Client: | Stick-up (fags): |
| Project Job Number: | Total Depth (fbgs): |
| Date: | Screen Interval (fbgs): |
| Weather: | Well Material: |
| | Diameter (inches): |
| BM/TK Personnel: | |
| Drilling Company: | Drilling Company Personnel: |
| Drill Rig Type: | |

### DECOMMISSIONING PROCEDURES

| Time | Description of Field Activities |
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# APPENDIX D

## HEALTH AND SAFETY CONTINGENCY PLAN (HSCP)

# HEALTH AND SAFETY CONTINGENCY PLAN (HSCP)

for

# PETER COOPER MARKHAMS NPL SITE
# DAYTON, NEW YORK

February 2008 0021-003-400

# HEALTH AND SAFETY CONTINGENCY PLAN

# PETER COOPER MARKHAMS NPL SITE

## ACKNOWLEDGEMENT

**Plan Reviewed by (initial):**

Corporate Health and Safety Director: Thomas H. Forbes, P.E.

Project Manager: Thomas H. Forbes, P.E.

Designated Site Safety and Health Officer: Richard L. Dubisz

**Acknowledgement:**
I acknowledge that I have reviewed the information contained in this site-specific Health and Safety Plan, and understand the hazards associated with performance of the field activities described herein. I agree to comply with the requirements of this plan.

| NAME (PRINT) | SIGNATURE | DATE |
|---|---|---|
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# HEALTH AND SAFETY CONTINGENCY PLAN

# PETER COOPER MARKHAMS NPL SITE

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# HEALTH AND SAFETY CONTINGENCY PLAN

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# 1.0 INTRODUCTION

## 1.1 General

In accordance with OSHA requirements contained in 29 CFR 1910.120, this Health and Safety Contingency Plan (HSCP) describes the specific health and safety practices and procedures to be employed by Benchmark Environmental Engineering & Science, PLLC (Benchmark) employees during Remedial Action (RA) activities on the Peter Cooper Markhams NPL Site. The Peter Cooper Markhams NPL Site, hereinafter referred to as the "Peter Cooper Markhams Site," the "Markhams Site," or the "Site," is located off Bentley Road approximately 6 miles south of the Village of Gowanda in the Town of Dayton, Cattaraugus County, New York (see Figure 1). This HSCP presents procedures for Benchmark employees who will be involved with field activities; it does not cover the activities of the Subcontractor or other individuals on the site. These firms will be required to develop and enforce their own HSCP as discussed in Section 2.0. Benchmark accepts no responsibility for the health and safety of the Subcontractor or other personnel.

This HSCP presents information on known site health and safety hazards using available historical information, and identifies the equipment, materials, and procedures that will be used to eliminate or control these hazards. Environmental monitoring will be performed during the course of field activities to provide real-time data for on-going assessment of potential hazards.

## 1.2 Background

The Site encompasses approximately 103 acres and is bordered to the northwest by Bentley Road, to the northeast by a wooded property and farm field, to the southeast by a railroad right-of-way, and to the southwest by hardwood forest. Site access is restricted by a locked cable gate at the Bentley Road entrance. Surrounding property is entirely rural, consisting of small farm fields, open meadow, and forests.

In general, the majority of the Site, including the northeastern, northwestern and southwestern areas of the property, is characterized by mature hardwood tree cover, as well as open fields. An approximately 15- to 20-acre area within the central and southeast portions of the Site contains several covered/vegetated fill piles arranged in an elliptical pattern. For the purpose of this report, the terms "waste fill, mounded fill, and fill piles" refer to the elevated piles of material disposed at the Site. Several of the fill piles appear to consist primarily of re-worked native soil. Other fill piles consist of primarily vacuum filter sludge and cookhouse sludge. The fill piles vary in size and elevation, with base dimensions ranging from approximately 1,100 - 160,000 square feet and elevations of 5 to 15 feet above surrounding grade. The total area covered by fill piles (base area) is approximately 7 acres.

Site topography, with the exception of the fill piles, is relatively flat with some natural relief and a moderate grade to the west-southwest. An approximately 5-foot high berm, which provides an elevated bed for the Buffalo and Jamestown Railroad Company (also known as Erie-Lackawanna Railroad) rail track, runs along the entire southeast border of the Site. A dirt access road extends to the fill area from Bentley Road and continues around a portion of the fill area perimeter. The road also appears to provide access to a natural gas wellhead located on the eastern side of the drive, northwest of the fill areas.

## 1.3 Known and Suspected Environmental Conditions

In accordance with the June 1971 State Supreme Court Order, Peter Cooper Corporation (PCC) initiated transfer of residue pile material to the Markhams Site in August 1971. Shortly thereafter, PCC submitted to the New York State Department of Environmental Conservation (NYSDEC) a Solid Waste Management Report (Reference 1) documenting the means for transfer of these materials to the Markhams Site. Follow-up discussion between PCC and the NYSDEC in August 1972 provided for grading the waste piles to a height of approximately 10 feet and covering them with 6 inches of soil or stabilized residue, followed by seeding to promote fast growing cover vegetation. PCC apparently completed the closure of the Site pursuant to these work plans and to the satisfaction of NYSDEC.

Subsequent to closure, several different parties investigated the Site. The NYSDEC completed Phase I and Phase II Environmental Site Investigations at the Peter Cooper Markhams Site in 1983 and 1985 (References 2 and 3). In 1986, PCCII, under NYSDEC Consent Order, commissioned O'Brien & Gere Engineers, Inc. (OBG) to perform a Remedial Investigation and Feasibility Study (RI/FS) at the Site, which included a quantitative human health risk assessment (Reference 4), herein referred to as the 1989 OBG RI. In conjunction with the 1989 OBG RI, interim remedial measures were performed in 1989 to remove a number of buried containers that had been disposed within an isolated area of the Site. The containers held off-specification animal glue, PV Emulsion, Dextrin, and oil. The containers and impacted soils were excavated and transported off-site to the

BFI Niagara Landfill in Tonawanda, New York for disposal as non-hazardous waste. One drum of animal glue was sent to Chemical Waste Management, Inc. in Model City, New York for disposal as hazardous waste, as the cost of analysis required to demonstrate that the material was not a hazardous waste was not justified.

The 1989 OBG RI indicated the presence of total chromium, hexavalent chromium and arsenic above background levels in waste materials and some adjacent soils. Low levels of these parameters were also detected in groundwater wells installed immediately adjacent to the fill piles. None of the samples tested exhibited hazardous waste (i.e., EP toxicity) characteristics. The 1989 OBG RI concluded that the Site did not pose a risk to human health or the environment. OBG completed a Feasibility Study for the Site in March 1991 (Reference 5). The FS recommended a remedial alternative involving consolidation, compaction, and covering of the waste materials.

NYSDEC apparently did not pursue any remedial action because the Site did not meet the statutory definition of an inactive hazardous waste disposal site. Consequently, the NYSDEC removed the site from its Registry of Inactive Hazardous Waste Sites.

In 1993, the United States Environmental Protection Agency (USEPA) conducted a Site Sampling Inspection, which included the collection and analysis of soil and surface water samples from the Peter Cooper Markhams Site (Reference 6), herein referred to as the 1993 SSI. Chromium and arsenic were detected in soils above background concentrations on and within the waste piles.

In March 1999, USEPA Region II prepared a Hazard Ranking System Model score for the Site and then listed the Peter Cooper Markhams Site on the National Priority List (NPL) in February 2000. On September 29, 2000, USEPA issued a Unilateral Administrative Order (UAO) to several potentially responsible parties (PRPs) directing completion of an updated RI/FS for the Site.

The RI/FS Work Plan (Reference 7) was prepared for the USEPA by Geomatrix Consultants and Benchmark Environmental Engineering & Science, PLLC (Benchmark) on behalf the responding PRPs (the "Respondents") for the Peter Cooper Markhams Site, in accordance with the requirements of Paragraph 23 and Appendix 1 of Administrative Order CERCLA-02-2000-2003 and Respondents Notices of Intent to Comply (February 2001). The revised final Work Plan was submitted to the USEPA in September 2001.

Geomatrix and Benchmark performed Remedial Investigation field activities on several occasions at the Peter Cooper Markhams Site during the period of November 2000 to December 2003. The RI Report (Reference 8), herein referred to as the 2005 RI, was submitted to the USEPA in February 2005.

## 1.4 Parameters of Interest

A baseline Human Health Risk Assessment (Reference 9) was preformed in support of the RI/FS. For site soil/fill, which is the primary media that will be encountered during remedial activities, the constituents of potential concern (COPC) at the Site are: arsenic, benzo(a)pyrene, chromium, hexavalent chromium, and manganese. For site groundwater, the Human Health Risk Assessment identified COPCs associated with ingestion and/or dermal contact. Groundwater ingestion is prohibited by this HSCP (see Section 6.0). Groundwater COPCs associated with dermal contact are cadmium and thallium.

## 1.5 Overview of RA Activities

Benchmark personnel will be on-site to observe RA activities. Planned RA activities are more fully described in the Remedial Action (RA) Work Plan for the Site.

- **Monitoring/Observation Well Installation and Decommission:** Benchmark will observe the installation of groundwater monitoring wells on the Site, for purposes of determining the nature and extent of potential COPC impacts to groundwater.

- **Oversight of Construction/Cover System Installation,** including:
  - Clearing, grubbing and regrading of existing cover soils.
  - Installation of gas venting wells.
  - Placement of final cover soils, topsoil and seeding.

# 2.0 ORGANIZATIONAL STRUCTURE

This chapter of the HSCP describes the lines of authority, responsibility, and communication as they pertain to health and safety functions at the Site. The purpose of this chapter is to identify the personnel who impact the development and implementation of the HSCP and to describe their roles and responsibilities. This chapter also identifies other contractors/subcontractors involved in work operations and establishes the lines of communications among them for health and safety matters. The organizational structure described in this chapter is consistent with the requirements of 29 CFR 1910.120(b)(2). This section will be reviewed by the Project Manager and updated as necessary to reflect the current organizational structure at this site.

## 2.1 Roles and Responsibilities

All Benchmark personnel on the Site must comply with the minimum requirements of this HSCP. The specific responsibilities and authority of management, safety and health, and other personnel on this site are detailed in the following paragraphs.

### 2.1.1 Corporate Health and Safety Director

The Benchmark Corporate Health and Safety Director is ***Mr. Thomas H. Forbes, P.E.*** The Corporate Health and Safety Director is responsible for developing and implementing the Health and Safety program and policies for Benchmark Environmental Engineering & Science, PLLC and consulting with corporate management to ensure adequate resources are available to properly implement these programs and policies. The Corporate Health and Safety Director coordinates Benchmark's Health and Safety training and medical monitoring programs and assists project management and field staff in developing site-specific health and safety plans.

### 2.1.2 Project Manager

The Project Manager for this Site is ***Mr. Thomas H. Forbes, P.E.*** The Project Manager has the responsibility and authority to direct all Benchmark work operations at the site. The Project Manager coordinates safety and health functions with the Site Safety and Health Officer, and bears ultimate responsibility for proper implementation of this HSCP. He may delegate authority to expedite and facilitate any application of the program, including modifications to the overall project approach as necessary to circumvent unsafe work conditions. Specific duties of the Project Manager include:

- Preparing and coordinating the site work plan.
- Providing Benchmark workers with work assignments and overseeing their performance.
- Coordinating health and safety efforts with the Site Safety and Health Officer (SSHO).
- Reviewing the emergency response coordination plan to assure its effectiveness.
- Serving as the primary liaison with site Subcontractor and the property owner.

### 2.1.3 Site Safety and Health Officer

The Site Safety and Health Officer (SSHO) for this Site is ***Mr. Richard L. Dubisz.*** The qualified alternate SSHO is ***Mr. Allen J. Zgaljardic.*** The SSHO reports to the Project Manager. The SSHO is on-site or readily accessible to the site during all work operations and has the authority to halt site work if unsafe conditions are detected. The specific responsibilities of the SSHO are:

- Managing the safety and health functions for Benchmark personnel on the site.
- Serving as the point of contact for safety and health matters.
- Ensuring that Benchmark field personnel working on the site have received proper training (per 29 CFR Part 1910.120(e)), that they have obtained medical clearance to wear respiratory protection (per 29 CFR Part 1910.134), and that they are properly trained in the selection, use and maintenance of personal protective equipment, including qualitative respirator fit testing.
- Performing or overseeing site monitoring as required by the HSCP.
- Assisting in the preparation and review of the HSCP
- Maintaining site-specific safety and health records as described in this HSCP

- Coordinating with the Project Manager, Site Workers, and Subcontractor's SSHO as necessary for safety and health efforts.

### 2.1.4 Site Workers

Site workers are responsible for: complying with this HSCP or a more stringent HSCP, if appropriate (i.e., Subcontractor's HSCP); using proper PPE; reporting unsafe acts and conditions to the SSHO; and following the safety and health instructions of the Project Manager and SSHO.

### 2.1.5 Other Site Personnel

Other site personnel with health and safety responsibilities include the Subcontractor, who will be responsible for developing, implementing and enforcing a Health and Safety Contingency Plan equally stringent or more stringent than Benchmark's HSCP. Benchmark assumes no responsibility for the health and safety of anyone outside its direct employ. The Subcontractor's HSCP shall cover all non-Benchmark site personnel. The Subcontractor shall assign a SSHO who will coordinate with Benchmark's SSHO as necessary to ensure effective lines of communication and consistency between contingency plans.

In addition to Benchmark and the Subcontractor personnel, other individuals who may have responsibilities in the work zone include subcontractors and governmental agencies performing site inspection work (e.g., the United States Environmental Protection Agency). The Subcontractor shall be responsible for ensuring that these individuals have received OSHA-required training (29 CFR 1910.120(e)), including initial, refresher and site-specific training, and shall be responsible for the safety and health of these individuals while they are on-site.

# 3.0 HAZARD EVALUATION

Due to the presence of certain contaminants at the Site, the possibility exists that workers will be exposed to hazardous substances during field activities. The principal points of exposure would be through direct contact with and incidental ingestion of soil/fill, and through the inhalation of contaminated particles or vapors. Other points of exposure may include direct contact with groundwater. In addition, the use of medium to large-sized construction equipment (e.g., excavators, drill rigs) will also present conditions for potential physical injury to workers. Further, since work will be performed outdoors, the potential exists for heat/cold stress to impact workers, especially those wearing protective equipment and clothing. Adherence to the medical evaluations; worker training relative to chemical hazards; safe work practices; proper personal protection; environmental monitoring; work zones and site control; appropriate decontamination procedures; and contingency planning outlined herein will reduce the potential for chemical exposures and physical injuries.

## 3.1 Chemical Hazards

Table 1 identifies concentration ranges for COPCs detected during previous investigations at the Site. Table 2 lists exposure limits for airborne concentrations of these substances. Brief descriptions of the toxicology and related health and safety guidance and criteria for site COPCs are provided below.

- **Chromium (CAS # 7440-47-3) and Hexavalent Chromium (CAS # 18540-29-9)** are natural inorganic elements and are usually combined with one or more elements, such as oxygen, chloride or sulfur. The common forms of chromium are hexavalent ($CR^{+6}$) and trivalent ($CR^{+3}$). The hexavalent form is associated with significantly greater potential health impacts than the trivalent form. Hexavalent chromium is an irritant and corrosive to the skin and mucus membranes. Chromium is a potential occupational carcinogen. Acute exposures to dust may cause coughing, wheezing, headaches, pain and fever.

- **Arsenic (CAS # 7440-38-2)** is a naturally occurring, inorganic element and is usually found combined with one or more elements, such as oxygen or sulfur. Inhalation is a more important exposure route than ingestion. First phase exposure symptoms include nausea, vomiting, diarrhea and pain in the stomach. Prolonged contact is corrosive to the skin and mucus membranes. Arsenic is considered a Group A human carcinogen by the USEPA. Exposure via inhalation is associated with an increased risk of lung cancer. Exposure via the oral route is associated with an increased risk of skin cancer.

- **Benzo(a)pyrene (CAS #50-32-8)** Benzo(a)pyrene is one of the polycyclic aromatic hydrocarbons (PAHs) formed when gasoline, garbage or animal or plant materials burn incompletely. Many PAHs including benzo(a)pyrene have been identified as carcinogenic. Benzo(a)pyrene occurs ubiquitously in products of incomplete combustion of fossil fuels and has been identified in ambient air, surface water, drinking water, waste water, and char-broiled foods. Benzo(a)pyrene is primarily released to the air and removed from the atmosphere by photochemical oxidation and dry deposition to land or water. PAH aerosols formed during the combustion process disperse throughout the atmosphere, resulting in the deposition of PAH condensate in soil, water and on vegetation. In addition, several products formed from petroleum processing operations (e.g., roofing materials and asphalt) also contain elevated levels of PAHs. Hence, these compounds are widely dispersed in the environment. PAHs are characterized by a molecular structure containing three or more fused, unsaturated carbon rings. The primary route of exposure to benzo(a)pyrene is through incidental ingestion and inhalation of contaminated particulates. PAHs are characterized by an organic odor, and exist as oily liquids in pure form. Acute exposure symptoms may include acne-type blemishes in areas of the skin exposed to sunlight.

- **Manganese (CAS #7439-96-5)** in large doses can cause asthma, insomnia, mental confusion, and metal fume fever. Acute exposure to lower concentrations may cause dry throat, cough and tightness of the chest.

- **Cadmium (CAS #7440-43-9)** is a natural element and is usually combined with one or more elements, such as oxygen, chloride or sulfur. Breathing high levels of cadmium severely damages the lungs and can cause death. Ingestion of high levels of cadmium severely irritates the stomach, leading to vomiting and diarrhea. Long term exposure to lower levels of cadmium leads to a buildup of this substance in the kidneys and possible kidney disease. Other potential long term effects are lung damage and fragile bones. Cadmium is suspected to be a human carcinogen.

- **Thallium (CAS #7440-28-0)** is a natural occurring element and its physical appearance is a bluish-white very soft metal. Turns gray on exposure to air. Can be absorbed into the body by inhalation of its aerosols, through the skin and by ingestion. May cause effects on liver, kidneys, central nervous system, skin, and cardiovascular system.

With respect to the anticipated RA activities discussed in Section 1.5, possible routes of exposure to the above-mentioned contaminant are presented in Table 3. The use of proper respiratory equipment, as outlined in Section 7.0 of this HSCP, will minimize the potential for exposure to airborne contaminants. Exposure to contaminants will also be minimized through the use of protective clothing (Section 7.0), safe work practices (Section 6.0), and proper decontamination procedures (Section 12.0).

## 3.2 Physical Hazards

Field activities at the Site may present the following physical hazards:

- The potential for physical injury during heavy construction equipment use, such as backhoes, excavators, and drill rigs.
- The potential for heat/cold stress to employees during the summer/winter months (see Section 10.0).
- The potential for slip and fall injuries due to rough, uneven terrain and/or open excavations.

These hazards represent only some of the possible means of injury that may occur at the Site during RA activities. Since it is impossible to list all potential injuries, it is the responsibility of each individual to exercise proper care and caution during all phases of the work.

# 4.0 TRAINING

## 4.1 Site Workers

All personnel performing RA activities at the Site (such as, but not limited to, equipment operators and general laborers) who may be exposed to hazardous substances, health hazards, or safety hazards, including their supervisors/managers responsible for the site, shall receive training in accordance with 29 CFR 1910.120(e) before they are permitted to engage in operations in the exclusion zone or contaminant reduction zone. This training includes an initial 40-hour Hazardous Waste Site Worker Protection Course, an 8-hour Annual Refresher Course subsequent to the initial 40-hour training, and 3 days of actual field experience under the direct supervision of a trained, experienced supervisor. Additional site-specific training shall also be provided by the SSHO prior to the start of field activities. A description of topics to be covered by this training is provided below.

### 4.1.1 Initial and Refresher Training

Initial and refresher training is conducted by a qualified instructor as specified under OSHA 29 CFR 1910.120(e)(5), and is specifically designed to meet the requirements of OSHA 29 CFR 1910.120(e)(3) and 1910.120(e)(8). The training covers, as a minimum, the following topics:

- OSHA HAZWOPER regulations.
- Site safety and hazard recognition, including chemical and physical hazards.
- Medical monitoring requirements.
- Air monitoring, permissible exposure limits, and respiratory protection level classifications.
- Appropriate use of personal protective equipment (PPE), including chemical compatibility and respiratory equipment selection and use.
- Work practices to minimize risk.
- Work zones and site control.

- Safe use of engineering controls and equipment.
- Decontamination procedures.
- Emergency response and escape.
- Confined space entry procedures.
- Heat and cold stress monitoring.
- Elements of a Health and Safety Plan.
- Spill containment.

Initial training also incorporates workshops for PPE and respiratory equipment use (Levels A, B and C), and respirator fit testing. Records and certifications received from the course instructor documenting each employee's successful completion of the training identified above are maintained on file at Benchmark's Buffalo, NY office. The Subcontractor is required to provide similar documentation of training for all their personnel who will be involved in on-site work activities.

Any employee who has not been certified as having received health and safety training in conformance with 29 CFR 1910.120(e) is prohibited from working in the exclusion and contamination reduction zones or engaging in any on-site work activities that may involve exposure to hazardous substances or wastes.

### 4.1.2 Site Training

Site workers are given a copy of the HSCP and a site-specific briefing prior to the commencement of work to ensure that employees are familiar with the HSCP and the information and requirements it contains. The site briefing shall be provided by the SSHO prior to initiating field activities and shall include:

- Names of personnel and alternates responsible for site safety and health.
- Safety, health and other hazards present on the site.
- The site lay-out including work zones and places of refuge.

- The emergency communications system and emergency evacuation procedures.
- Use of PPE.
- Work practices by which the employee can minimize risks from hazards.
- Safe use of engineering controls and equipment on the Site.
- Medical surveillance, including recognition of symptoms and signs of over-exposure as described in Section 5.0 of this HSCP.
- The spill containment program as detailed in Section 9.0 of this HSCP.
- Site control as detailed in Section 11.0 of this HSCP.
- Decontamination procedures as detailed in Section 12.0 of this HSCP.
- Confined space entry procedures, if required, as detailed in Section 13.0 of this HSCP.
- The emergency response plan as detailed in Section 15.0 of this HSCP.

Supplemental health and safety briefings will also be conducted by the SSHO on an as-needed basis during the course of the work. Supplemental briefings are provided as necessary to notify employees of any changes to this HSCP. Conditions for which the SSHO may schedule additional briefings include, but are not limited to: a change in site conditions (e.g., based on monitoring results); changes in the work schedule/plan; newly discovered hazards; and safety incidents occurring during site work.

## 4.2 Supervisor Training

On-site safety and health personnel or SSHO who are directly responsible for or supervise the safety and health of workers engaged in hazardous waste operations shall receive, in addition to the appropriate level of worker training described in Section 4.1, an additional 8 hours of specialized supervisory training, in compliance with 29 CFR 1910.120(e)(4).

## 4.3 Emergency Response Training

Emergency response training is addressed in the Emergency Response Plan appended to this HSCP as Appendix A.

## 4.4 Site Visitors

The Subcontractor's SSHO will provide a site-specific briefing to all site visitors and other non-Benchmark personnel who enter the site beyond the site entry point. The site-specific briefing will provide information about site hazards; the site layout including work zones and places of refuge; the emergency communications system and emergency evacuation procedures; and other pertinent safety and health requirements as appropriate.

Site visitors will not be permitted to enter the exclusion zone or contaminant reduction zones unless they have received the level of training required for site workers as described in Section 4.1.

## 5.0 MEDICAL MONITORING

Medical monitoring examinations are provided to Benchmark employees as stipulated under 29 CFR Part 1910.120(f). These exams include initial employment, annual, and employment termination physicals for employees involved in hazardous waste site field operations. Post-exposure examinations are also provided for employees who may have been injured, received a health impairment, developed signs or symptoms of over-exposure to hazardous substances, or were accidentally exposed to substances at concentrations above the permissible exposure limits without the necessary PPE. Such exams are performed as soon as possible following development of symptoms or the known exposure event.

Medical evaluations are performed by Health Works WNY, Seneca Square Plaza, 1900 Ridge Road, West Seneca, New York 14224. The facility can be reached at (716) 712-0670 to schedule routine appointments or post-exposure examinations.

Medical evaluations are conducted according to the Benchmark Medical Monitoring Program and include an evaluation of the workers' ability to use respiratory protective equipment. The examinations include:

- Occupational/medical history review.
- Physical exam, including vital sign measurement.
- Spirometry testing.
- Eyesight testing.
- Audio testing (minimum baseline and exit, annual for employees routinely exposed to greater than 85db).
- EKG (for employees >40 yrs age or as medical conditions dictate).
- Chest X-ray (baseline and exit, and every 5 years).
- Blood biochemistry (including blood count, white cell differential count, serum multiplastic screening).
- Medical certification of physical requirements (i.e., sight, musculoskeletal, cardiovascular) for safe job performance and to wear respiratory protection equipment.

The purpose of the medical evaluation is to determine an employee's fitness for duty on hazardous waste sites and to establish baseline medical data.

In conformance with OSHA regulations, Benchmark will maintain and preserve medical records for a period of 30 years following termination of employment. Employees are provided a copy of the physician's post-exam report and have access to their medical records and analyses.

# 6.0 SAFE WORK PRACTICES

All Benchmark employees shall conform to the following safe work practices during all on-site work activities conducted within the exclusion and contamination reduction zones, and at other locations as indicated below:

- Eating, drinking, chewing gum or tobacco, smoking, or any practice that increases the probability of hand-to-mouth contact is strictly prohibited. No ingestion of site of groundwater or fruits/vegetables grown on the site shall be allowed from any location within the site boundaries.

- The hands and face must be thoroughly washed upon leaving the work area and before engaging in any activity indicated above.

- Respiratory protective equipment and clothing must be worn by all personnel entering the site as required by the HSCP or as modified by the SSHO. Excessive facial hair (i.e., beards, long mustaches or sideburns) that interferes with the satisfactory respirator-to-face seal is prohibited.

- Contact with surfaces/materials either suspected or known to be contaminated will be avoided to minimize the potential for transfer to personnel, cross contamination and need for decontamination.

- Medicine and alcohol can synergize the effects of exposure to toxic chemicals. Due to possible contraindications, use of prescribed drugs should be reviewed with the Benchmark occupational physician. Alcoholic beverage and illegal drug intake are strictly forbidden by all site personnel at all locations during the workday.

- All personnel shall be familiar with standard operating safety procedures and additional instructions contained in this Health and Safety Plan.

- On-site personnel shall use the "buddy" system. No one may work alone (i.e., out of earshot or visual contact with other workers) in the exclusion zone.

- Personnel and equipment in the contaminated area shall be minimized, consistent with effective site operations.

- All employees have the obligation to immediately report and if possible, correct unsafe work conditions.

- Use of contact lenses on-site will not be permitted. Spectacle kits for insertion into full-face respirators will be provided for Benchmark employees, as requested and required.

The recommended specific safety practices for working around the Subcontractor's equipment (e.g., backhoes, bulldozers, excavators, drill rigs, etc.) are as follows:

- Although the Subcontractor is responsible for their equipment and safe operation of the site, Benchmark personnel are also responsible for their own safety.
- Subsurface work will not be initiated without first clearing underground utility services.
- Heavy equipment should not be operated within 20 feet of overhead wires. This distance may be increased if windy conditions are anticipated or if lines carry high voltage. The site should also be sufficiently clear to ensure the project staff can move around the heavy machinery safely.
- Care should be taken to avoid overhead wires when moving heavy equipment from location to location.
- Hard hats, safety boots and safety glasses should be worn at all times in the vicinity of heavy equipment. Hearing protection is also recommended.
- The work site should be kept neat. This will prevent personnel from tripping and will allow for fast emergency exit from the site.
- Proper lighting must be provided when working at night.
- Construction activities should be discontinued during an electrical storm or severe weather conditions.
- The presence of combustible gases should be checked before igniting any open flame.
- Personnel shall stand upwind of any construction operation when not immediately involved in sampling/logging/observing activities.
- Personnel will not approach the edge of an unsecured trench/excavation closer than 2 feet.

# 7.0 PERSONAL PROTECTIVE EQUIPMENT

## 7.1 Equipment Selection

Personal protective equipment (PPE) will be donned when work activities may result in exposure to physical or chemical hazards beyond acceptable limits, and when such exposure can be mitigated through appropriate PPE (see Attachment 1). The selection of PPE will be based on an evaluation of the performance characteristics of the PPE relative to the requirements and limitations of the site, the task-specific conditions and duration, and the hazards and potential hazards identified at the site.

Equipment designed to protect the body against contact with known or suspect chemical hazards are grouped into four categories according to the degree of protection afforded. These categories designated A through D, consistent with United States Environmental Protection Agency (USEPA) Level of Protection designation, are:

- **Level A:** Should be selected when the highest level of respiratory, skin and eye protection is needed.

- **Level B:** Should be selected when the highest level of respiratory protection is needed, but a lesser level of skin protection is required. Level B protection is the minimum level recommended on initial site entries until the hazards have been further defined by on-site studies. Level B (or Level A) is also necessary for oxygen-deficient atmospheres.

- **Level C:** Should be selected when the types of airborne substances are known, the concentrations have been measured and the criteria for using air-purifying respirators are met. In atmospheres where no airborne contaminants are present, Level C provides dermal protection only.

- **Level D:** Should not be worn on any site with elevated respiratory or skin hazards. This is generally a work uniform providing minimal protection.

OSHA requires the use of certain PPE under conditions where an immediate danger to life and health (IDLH) may be present. Specifically, OSHA 29 CFR 1910.120(g)(3)(iii) requires use of a positive pressure self-contained breathing apparatus, or positive pressure air-line respirator equipped with an escape air supply when chemical exposure levels present a substantial possibility of immediate serious injury, illness or death, or impair the ability to escape. Similarly, OSHA 29 CFR 1910.120(g)(3)(iv) requires donning totally encapsulating chemical protective suits (with a protection level equivalent to Level A protection) in conditions where skin absorption of a hazardous substance may result in a substantial possibility of immediate serious illness, injury or death, or impair the ability to escape.

In situations where the types of chemicals, concentrations, and possibilities of contact are unknown, the appropriate level of protection must be selected based on professional experience and judgment until the hazards can be further characterized. The individual components of clothing and equipment must be assembled into a full protective ensemble to protect the worker from site-specific hazards, while at the same time minimizing hazards and drawbacks of the personal protective gear itself. Ensemble components are detailed below for levels A/B, C, and D protection.

## 7.2 Protection Ensembles

### 7.2.1 Level A/B Protection Ensemble

Level A/B ensembles include similar respiratory protection; however, Level A provides a higher degree of dermal protection than Level B. Use of Level A over Level B is determined by: comparing the concentrations of identified substances in the air with skin toxicity data, and assessing the effect of the substance (by its measured air concentrations or splash potential) on the small area of the head and neck unprotected by Level B clothing.

The recommended PPE for level A/B is:

- Pressure-demand, full-face piece self-contained breathing apparatus (MSHA/-NIOSH approved) or pressure-demand supplied-air respirator with escape self-contained breathing apparatus (SCBA).

- Chemical-resistant clothing. For Level A, clothing consists of totally-encapsulating chemical resistant suit. Level B incorporates hooded one-or two-piece chemical splash suit.

- Inner and outer chemical resistant gloves.

- Chemical-resistant safety boots/shoes.

- Hardhat.

### 7.2.2 Level C Protection Ensemble

Level C protection is distinguished from Level B by the equipment used to protect the respiratory system, assuming the same type of chemical-resistant clothing is used. The main selection criterion for Level C is that conditions permit wearing an air-purifying device. The device (when required) must be an air-purifying respirator (MSHA/NIOSH approved) equipped with filter cartridges. Cartridges must be able to remove the substances encountered. Respiratory protection will be used only with proper fitting, training and the approval of a qualified individual. In addition, an air-purifying respirator can be used only if: oxygen content of the atmosphere is at least 19.5% in volume; substances are identified and concentrations measured; substances have adequate warning properties; the individual passes a qualitative fit-test for the mask; and an appropriate cartridge/canister is used, and its service limit concentration is not exceeded.

Recommended PPE for Level C conditions includes:

- Full-face piece, air-purifying respirator equipped with MSHA and NIOSH approved organic vapor/acid gas/dust/mist combination cartridges or as designated by the SSHO.

- Chemical-resistant clothing (hooded, one or two-piece chemical splash suit or disposable chemical-resistant one-piece suit).

- Inner and outer chemical-resistant gloves.

- Chemical-resistant safety boots/shoes.

- Hardhat.

An air-monitoring program is part of all response operations when atmospheric contamination is known or suspected. It is particularly important that the air be monitored thoroughly when personnel are wearing air-purifying respirators. Continual surveillance using direct-reading instruments is needed to detect any changes in air quality necessitating a higher level of respiratory protection.

### 7.2.3 Level D Protection Ensemble

As indicated above, Level D protection is primarily a work uniform. It can be worn in areas where only boots can be contaminated, where there are no inhalable toxic substances, and where the atmospheric contains at least 19.5% oxygen.

Recommended PPE for Level D includes:

- Coveralls.
- Safety boots/shoes.
- Safety glasses or chemical splash goggles.
- Hardhat.
- Optional gloves, escape mask, face shield.

### 7.2.4 Recommended Level of Protection for Site Tasks

Based on current information regarding both the contaminants suspected to be present at the site and the various tasks that are included in the remedial activities, the minimum required Levels of Protection for these tasks shall be as identified in Table 4.

# 8.0 EXPOSURE MONITORING

## 8.1 General

Based on the results of historic sample analysis and the nature of the proposed work activities at the site, the possibility exists that organic vapors and/or particulates may be released to the air during intrusive construction activities. Ambient breathing zone concentrations may at times, exceed the permissible exposure limits (PELs) established by OSHA for the individual compounds (see Table 2), in which case respiratory protection will be required. Respiratory and dermal protection may be modified (upgraded or downgraded) by the SSHO based upon real-time field monitoring data.

### 8.1.1 On-Site Work Zone Monitoring

Benchmark personnel will conduct routine, real-time air monitoring during all intrusive construction phases such as excavation, backfilling, drilling, etc. The work area will be monitored at regular intervals using a photo-ionization detector (PID), combustible gas meter and a particulate meter. Observed values will be recorded and maintained as part of the permanent field record.

Additional air monitoring measurements may be made by Benchmark personnel to verify field conditions during Subcontractor oversight activities. Monitoring instruments will be protected from surface contamination during use. Additional monitoring instruments may be added if the situations or conditions change. Monitoring instruments will be calibrated in accordance with manufacturer's instructions before use.

### 8.1.2 Off-Site Community Air Monitoring

In addition to on-site monitoring within the work zone(s), monitoring at the downwind portion of the site perimeter will be conducted. This will provide a real-time method for determination of substantial vapor and/or particulate releases to the surrounding community as a result of ground intrusive work.

Ground intrusive activities are defined by NYSDOH Appendix 1A Generic Community Air Monitoring Plan (Reference 10, attached as Appendix B of this HSCP). Ground intrusive activities include soil/waste excavation and handling; test pitting or trenching; and the installation of soil borings or monitoring wells. Non-intrusive activities include the collection of soil, sediment, and groundwater samples and placement of clean cover soils. In general, continuous monitoring is required for ground intrusive activities and periodic monitoring is required for non-intrusive activities. Periodic monitoring consists of taking a reading upon arrival at a sample location, monitoring while opening a well cap or overturning soil; monitoring while bailing a well; and taking a reading prior to leaving a sampling location. Periodic monitoring may be upgraded to continuous if the sampling location is in close proximity to individuals not involved in the site activity (i.e., on a curb of a busy street). Based on the remote location of the waste fill relative to surrounding properties and the absence of volatile COPCs at the site, continuous organic vapor monitoring may be reduced to periodic organic vapor monitoring during ground intrusive activities for both on-site and off-site community air monitoring. Such a reduction would be contingent on preliminary monitoring during initial intrusive work and would be subject to USEPA approval.

## 8.2 Monitoring Action Levels

### 8.2.1 On-Site Work Zone Action Levels

A MiniRae 2000 PID equipped with a 10.6 eV lamp, or other appropriate instrument(s), will be used by Benchmark personnel to monitor organic vapor concentrations as specified in this HSCP. Combustible gas will be monitored with the "combustible gas" option on the combustible gas meter or other appropriate instrument(s). In addition, fugitive dust/particulate concentrations will be monitored during major soil intrusion (e.g., soil excavation) using a real-time particulate monitor as specified in this plan. In the absence of such monitoring, appropriate respiratory protection for particulates shall be donned. Sustained readings obtained in the breathing zone may be interpreted (with regard to other site conditions) as follows for Benchmark personnel:

- Total atmospheric concentrations of unidentified vapors or gases ranging from 0 to 1 ppm above background on the PID) - Continue operations under Level D (see Attachment 1 of this HSCP).
- Total atmospheric concentrations of unidentified vapors or gases yielding sustained readings from >1 ppm to 5 ppm above background on the PID (vapors not suspected of containing high levels of chemicals toxic to the skin) - Continue

operations under Level C (see Attachment 1 of this HSCP).

- Total atmospheric concentrations of unidentified vapors or gases yielding sustained readings of >5 ppm to 50 ppm above background on the PID - Continue operations under Level B (see Attachment 1 of this HSCP), re-evaluate and alter (if possible) construction methods to achieve lower vapor concentrations.

- Total atmospheric concentrations of unidentified vapors or gases above 50 ppm on the PID - Discontinue operations and exit the work zone immediately.

The explosimeter will be used to monitor levels of both combustible gases and oxygen during site activities. Action levels based on the instrument readings shall be as follows:

- Less than 10% LEL - Continue engineering operations with caution.

- 10-25% LEL - Continuous monitoring with extreme caution, determine source/cause of elevated reading.

- Greater than 25% LEL - Explosion hazard, evaluate source and leave the Work Zone.

- Less than 19.5% oxygen - Leave work zone immediately.

- 19.5-23.5% oxygen - Continue engineering operations.

- Greater than 23.5% oxygen - Fire hazard potential, leave Work Zone immediately.

The particulate monitor will be used to monitor respirable dust concentrations during all intrusive activities and during handling of site soil/fill. Action levels based on the instrument readings shall be as follows:

- Less than 50 $\mu g/m^3$ - Continue field operations.

- 50-150 $\mu g/m^3$ - Don dust/particulate mask or equivalent

- Greater than 150 $\mu g/m^3$ - Don dust/particulate mask or equivalent. Initiate engineering controls to reduce respirable dust concentration (e.g., wetting of excavated soils or tools at discretion of SSHO).

Readings with the organic vapor analyzer, combustible gas meter, and particulate monitor will be recorded and documented on the appropriate Project Field Forms. All instruments will be calibrated before use on a daily basis and the procedure will be documented on the appropriate Project Field Forms.

### 8.2.2 Community Air Monitoring Action Levels

In addition to the action levels prescribed in Section 8.2.1 for Benchmark personnel on-site, the following criteria shall also be adhered to for the protection of downwind receptors consistent with the NYSDOH Generic CAMP requirements (Appendix B of this HSCP):

- ORGANIC VAPOR PERIMETER MONITORING:
    - If the sustained ambient air concentration of organic vapors at the downwind perimeter of the exclusion zone exceeds 5 ppm above background, work activities will be halted and monitoring continued. If the sustained organic vapor decreases below 5 ppm over background, work activities can resume but more frequent intervals of monitoring, as directed by the SSHO, must be conducted.
    - If the sustained ambient air concentration of organic vapors at the downwind perimeter of the exclusion zone are greater than 5 ppm over background but less than 25 ppm, activities can resume provided that: the organic vapor level 200 feet downwind of the working site or half the distance to the nearest off-site residential or commercial structure, whichever is less, is below 5 ppm over background; and more frequent intervals of monitoring, as directed by the SSHO, are conducted.
    - If the sustained organic vapor level is above 25 ppm at the perimeter of the exclusion zone, the SSHO must be notified and work activities shut down. The SSHO will determine when re-entry of the exclusion zone is possible and will implement downwind air monitoring to ensure vapor emissions do not impact the nearest off-site residential or commercial structure at levels exceeding those specified in the ***Organic Vapor Contingency Monitoring Plan*** below. All readings will be recorded and will be available for NYSDEC and NYSDOH personnel to review.

- ORGANIC VAPOR CONTINGENCY MONITORING PLAN:
  - If the sustained organic vapor level is greater than 5 ppm over background 200 feet downwind from the work area or half the distance to the nearest off-site residential or commercial property, whichever is less, all work activities must be halted.
  - If, following the cessation of the work activities or as the result of an emergency, sustained organic levels persist above 5 ppm above background 200 feet downwind or half the distance to the nearest off-site residential or commercial property from the work area, then the air quality must be monitored within 20 feet of the perimeter of the nearest off-site residential or commercial structure (20-foot zone).
  - If efforts to abate the emission source are unsuccessful and if sustained organic vapor levels approach or exceed 5 ppm above background within the 20-foot zone for more than 30 minutes, or are sustained at levels greater than 10 ppm above background for longer than one minute, then the ***Major Vapor Emission Response Plan*** (see below) will automatically be placed into effect.
- MAJOR VAPOR EMISSION RESPONSE PLAN:

  Upon activation, the following activities will be undertaken:

  1. All Emergency Response Contacts as listed in this HSCP and the Emergency Response Plan (Appendix A of this HSCP) will be advised.
  2. The local police authorities will immediately be contacted by the SSHO and advised of the situation.
  3. Frequent air monitoring will be conducted at 30-minute intervals within the 20-foot zone. If two sustained successive readings below action levels are measured, air monitoring may be halted or modified by the SSHO.

  The following personnel are to be notified in the listed sequence in the event that a Major Vapor Emission Plan is activated:

| Responsible Person | Contact | Phone Number |
|---|---|---|
| SSHO | Police | 911 |
| SSHO | State Emergency Response Hotline | (800) 457-7362 |

Additional emergency numbers are listed in the Emergency Response Plan included as Appendix A of this HSCP.

- <u>**EXPLOSIVE VAPORS**</u>:
  - <u>Sustained</u> atmospheric concentrations of greater than 10% LEL in the work area – Initiate combustible gas monitoring at the downwind portion of the site perimeter.
  - <u>Sustained</u> atmospheric concentrations of greater than 10% LEL at the downwind site perimeter – Halt work and contact local Fire Department.
- <u>**Airborne Particulate Community Air Monitoring**</u>

Respirable (PM-10) particulate monitoring will be performed on a continuous basis at the downwind perimeter of the exclusion zone. The monitoring will be performed using real-time monitoring equipment capable of measuring PM-10 and integrating over a 15-minute period for comparison to the airborne particulate action levels. The equipment will be equipped with an audible alarm to indicate exceedance of the action level. In addition, fugitive dust migration will be visually assessed during all work activities. All readings will be recorded and will be available for NYSDEC and NYSDOH review. Readings will be interpreted as follows:

- If the downwind PM-10 particulate level is 100 micrograms per cubic meter ($\mu g/m^3$) greater than the background (upwind perimeter) reading for the 15-minute period or if airborne dust is observed leaving the work area, then dust suppression techniques must be employed. Work may continue with dust suppression provided that the downwind PM-10 particulate levels do not exceed 150 $\mu g/m^3$ above the upwind level and that visible dust is not migrating from the work area.
- If, after implementation of dust suppression techniques downwind PM-10 levels are greater than 150 $\mu g/m^3$ above the upwind level, work activities must

> be stopped and dust suppression controls re-evaluated. Work can resume provided that supplemental dust suppression measures and/or other controls are successful in reducing the downwind PM-10 particulate concentration to within 150 $\mu g/m^3$ of the upwind level and in preventing visible dust migration.

Pertinent emergency response information including the telephone number of the Fire Department is included in the Emergency Response Plan (Appendix A of this HSCP).

# 9.0 SPILL RELEASE/RESPONSE

This chapter of the HSCP describes the potential for and procedures related to spills or releases of known or suspected petroleum and/or hazardous substances on the site. The purpose of this Section of the HSCP is to plan appropriate response, control, countermeasures and reporting, consistent with OSHA requirements in 29 CFR 1910.120(b)(4)(ii)(J) and (j)(1)(viii). The spill containment program addresses the following elements:

- Potential hazardous material spills and available controls.
- Initial notification and evaluation.
- Spill response.
- Post-spill evaluation.

## 9.1 Potential Spills and Available Controls

An evaluation was conducted to determine the potential for hazardous material and oil/petroleum spills at this Site. For the purpose of this evaluation, hazardous materials posing a significant spill potential are considered to be:

- CERCLA Hazardous Substances as identified in 40 CFR Part 302, where such materials pose the potential for release in excess of their corresponding Reportable Quantity (RQ).
- Extremely Hazardous Substances as identified in 40 CFR Part 355, Appendix A, where such materials pose the potential for release in excess of their corresponding RQ.
- Hazardous Chemicals as defined under Section 311(e) of the Emergency Planning and Community Right-To-Know Act of 1986, where such chemicals are present or will be stored in excess of 10,000 lbs.
- Toxic Chemicals as defined in 40 CFR Part 372, where such chemicals are present or will be stored in excess of 10,000 lbs.
- Chemicals regulated under 6NYCRR Part 597, where such materials pose the potential for release in excess of their corresponding RQ.

Oil/petroleum products are considered to pose a significant spill potential whenever the following situations occur:

- The potential for a "harmful quantity" of oil (including petroleum and non-petroleum-based fuels and lubricants) to reach navigable waters of the U.S. exists (40 CFR Part 112.4). Harmful quantities are considered by USEPA to be volumes that could form a visible sheen on the water or violate applicable water quality standards.

- The potential for any amount of petroleum to reach any waters of NY State, including groundwater, exists. Petroleum, as defined by NY State in 6NYCRR Part 612, is a petroleum-based heat source, energy source, or engine lubricant/maintenance fluid.

- The potential for any release, to soil or water, of petroleum from a bulk storage facility regulated under 6NYCRR Part 612. A regulated petroleum storage facility is defined by NY State as a site having stationary tank(s) and intra-facility piping, fixtures and related equipment with an aggregate storage volume of 1,100 gallons or greater.

The evaluation indicates that, based on site history and decommissioning records, a hazardous material spill and/or a petroleum product spill is not likely to occur during site activities.

## 9.2 Initial Spill Notification and Evaluation

Any worker who discovers a hazardous substance or oil/petroleum spill will immediately notify the Project Manager and SSHO. The worker shall, to the best of his/her ability, report the material involved, the location of the spill, the estimated quantity of material spilled, the direction/flow of the spill material, related fire/explosion incidents, if any, and any associated injuries. The Emergency Response Plan (Appendix A) will immediately be implemented if an emergency release occurs.

Following initial report of a spill, the Project Manager will make an evaluation as to whether the release exceeds RQ levels. If an RQ level is exceeded, the Project Manager will notify the site owner and NYSDEC at 1-800-457-7362 within 2 hours of spill discovery. The Project Manager will also determine what additional agencies (e.g., USEPA) are to be contacted regarding the release, and will follow-up with written reports as required by the applicable regulations.

## 9.3 Spill Response

For all spill situations, the following general response guidelines will apply:

- Only those personnel involved in overseeing or performing containment operations will be allowed within the spill area. If necessary, the area will be roped, ribboned or otherwise blocked off to prevent unauthorized access.
- Appropriate PPE, as specified by the SSHO, will be donned before entering the spill area.
- Ignition points will be extinguished/removed if fire or explosion hazards exist.
- Surrounding reactive materials will be removed.
- Drains or drainage in the spill area will be blocked to prevent inflow of spilled materials or applied materials.

For minor spills, the Subcontractor will maintain a Spill Control and Containment Kit in the Field Office or other readily accessible storage location. The kit will consist of, at a minimum, a 50-lb bag of "speedy dry" granular absorbent material, absorbent pads, shovels, empty 5-gallon pails, and an empty open-top 55-gallon drum. Spilled materials will be absorbed, and shoveled into a 55-gallon drum for proper disposal (NYSDEC approval will be secured for on-site treatment of the impacted soils/absorbent materials, if applicable). Impacted soils will be hand-excavated to the point that no visible signs of contamination remains, and will be drummed with the absorbent.

In the event of a major release or a release that threatens surface water, a spill response contractor will be called to the site. The response contractor may use heavy equipment (e.g., excavator, backhoe, etc.) to berm the soils surrounding the spill site or create diversion trenching to mitigate overland migration or release to navigable waters. Where feasible, pumps will be used to transfer free liquid to storage containers. Spill control/cleanup contractors in the Western New York area that may be contacted for assistance include:

- The Environmental Service Group of NY, Inc.: (716) 695-6720

- Environmental Products & Services of Vermont, Inc. (Buffalo Office): (716) 597-0001
- Op-Tech: (607) 565-8891 (Waverly, NY) or (800) 225-6750

## 9.4 Post-Spill Evaluation

If a reportable quantity of hazardous material or oil/petroleum is spilled as determined by the Project Manager, a written report will be prepared as indicated in Section 9.2. The report will identify the root cause of the spill, type and amount of material released, date/time of release, response actions, agencies notified and/or involved in cleanup, and procedures to be implemented to avoid repeat incidents. In addition, all re-useable spill cleanup and containment materials will be decontaminated, and spill kit supplies/disposable items will be replenished.

# 10.0 HEAT/COLD STRESS MONITORING

It is anticipated that work activities at the site will be completed during the spring and summer months. The SSHO and/or his or her designee will be responsible for monitoring Benchmark field personnel for symptoms of heat/cold stress.

## 10.1 Heat Stress Monitoring

PPE may place an employee at risk of developing heat stress, a common and potentially serious illnesses often encountered at construction, landfill, waste disposal, industrial or other unsheltered sites. The potential for heat stress is dependent on a number of factors, including environmental conditions, clothing, workload, physical conditioning and age. PPE may severely reduce the body's normal ability to maintain temperature equilibrium (via evaporation and convection), and require increased energy expenditure due to its bulk and weight.

Proper training and preventive measures will mitigate the potential for serious illness. Heat stress prevention is particularly important because once a person suffers from heat stroke or heat exhaustion, that person may be predisposed to additional heat related illness. To avoid heat stress, the following steps should be taken:

- Adjust work schedules.
- Modify work/rest schedules according to monitoring requirements.
- Mandate work slowdowns as needed.
- Perform work during cooler hours of the day if possible or at night if adequate lighting can be provided.
- Provide shelter (air-conditioned, if possible) or shaded areas to protect personnel during rest periods.
- Maintain worker's body fluids at normal levels. This is necessary to ensure that the cardiovascular system functions adequately. Daily fluid intake must approximately equal the amount of water lost in sweat (i.e., eight fluid ounces must be ingested for approximately every 1 lb of weight lost). The normal thirst mechanism is not sensitive enough to ensure that enough water will be consumed to replace lost perspiration. When heavy sweating occurs, workers should be encouraged to drink more.

- Train workers to recognize the symptoms of heat related illness.

### Heat-Related Illness - Symptoms:

- Heat rash may result from continuous exposure to heat or humid air.
- Heat cramps are caused by heavy sweating with inadequate electrolyte replacement. Signs and symptoms include: muscle spasms; pain in the hands, feet and abdomen.
- Heat exhaustion occurs from increased stress on various body organs including inadequate blood circulation due to cardiovascular insufficiency or dehydration. Signs and symptoms include: pale, cool, moist skin; heavy sweating; dizziness; nausea; fainting.
- Heat stroke is the most serious form of heat stress. Temperature regulation fails and the body temperature rises to critical levels. Immediate action must be taken to cool the body before serious injury and death occur. Competent medical help must be obtained. Signs and symptoms are: red, hot, usually dry skin; lack of or reduced perspiration; nausea; dizziness and confusion; strong, rapid pulse; coma.

The monitoring of personnel wearing protective clothing should commence when the ambient temperature is 70 degrees Fahrenheit or above. For monitoring the body's recuperative ability to excess heat, one or more of the following techniques should be used as a screening mechanism.

- Heart rate may be measured by the radial pulse for 30 seconds as early as possible in the resting period. The rate at the beginning of the rest period should not exceed 100 beats per minute. If the rate is higher, the next work period should be shortened by 10 minutes (or 33%), while the length of the rest periods stay the same. If the pulse rate is 100 beats per minute at the beginning of the nest rest period, the following work cycle should be further shortened by 33%.
- Body temperature may be measured orally with a clinical thermometer as early as possible in the resting period. Oral temperature at the beginning of the rest period should not exceed 99.6 degrees Fahrenheit. If it does, the next work period should be shortened by 10 minutes (or 33%), while the length of the rest period remains the same. However, if the oral temperature exceeds 99.6 degrees

Fahrenheit at the beginning of the next period, the work cycle may be further shortened by 33%. Oral temperature should be measured at the end of the rest period to make sure that it has dropped below 99.6 degrees Fahrenheit. No Benchmark employee will be permitted to continue wearing semi-permeable or impermeable garments when his/her oral temperature exceeds 100.6 degrees Fahrenheit.

## 10.2 Cold Stress Monitoring

Exposure to cold conditions may result in frostbite or hypothermia, each of which progresses in stages as shown below.

- **Frostbite** occurs when body tissue (usually on the extremities) begins to freeze. The three states of frostbite are:

  1) **Frost Nip** - This is the first stage of the freezing process. It is characterized by a whitened area of skin, along with a slight burning or painful sensation. Treatment consists of removing the victim from the cold conditions, removal of boots and gloves, soaking the injured part in warm water (102 to 108 degrees Fahrenheit) and drinking a warm beverage. Do not rub skin to generate friction/ heat.

  2) **Superficial Frostbite** - This is the second stage of the freezing process. It is characterized by a whitish gray area of tissue, which will be firm to the touch but will yield little pain. The treatment is identical for Frost nip.

  3) **Deep Frostbite** - In this final stage of the freezing process the affected tissue will be cold, numb and hard and will yield little to no pain. Treatment is identical to that for Frost nip.

- **Hypothermia** is a serious cold stress condition occurring when the body loses heat at a rate faster than it is produced. If untreated, hypothermia may be fatal. The stages of hypothermia may not be clearly defined or visible at first, but generally include:

  1) Shivering
  2) Apathy (i.e., a change to an indifferent or uncaring mood)
  3) Unconsciousness
  4) Bodily freezing

Employees exhibiting signs of hypothermia should be treated by medical professionals. Steps that can be taken while awaiting help include:

1) Remove the victim from the cold environment and remove wet or frozen clothing. (Do this carefully as frostbite may have started.)
2) Perform active re-warming with hot liquids for drinking (Note: do not give the victim any liquid containing alcohol or caffeine) and a warm water bath (102 to 108 degrees Fahrenheit).
3) Perform passive re-warming with a blanket or jacket wrapped around the victim.

In any potential cold stress situation, it is the responsibility of the SSHO to encourage the following:

- Education of workers to recognize the symptoms of frostbite and hypothermia.
- Workers should dress warmly, with more layers of thin clothing as opposed to one thick layer.
- Personnel should remain active and keep moving.
- Personnel should be allowed to take shelter in a heated area, as necessary.
- Personnel should drink warm liquids (no caffeine or alcohol if hypothermia has set in).
- For monitoring the body's recuperation from excess cold, oral temperature recordings should occur:
    - At the Site Safety Technicians discretion when suspicion is based on changes in a worker's performance or mental status.
    - At a workers request.
    - As a screening measure, two times per shift, under unusually hazardous conditions (e.g., wind chill less than 20 degrees Fahrenheit or wind chill less than 30 degrees Fahrenheit with precipitation).

- As a screening measure whenever anyone worker on site develops hypothermia.

Any person developing moderate hypothermia (a core body temperature of 92 degrees Fahrenheit) will not be allowed to return to work for 48 hours without the recommendation of a qualified medical doctor.

# 11.0 WORK ZONES AND SITE CONTROL

Work zones around the areas designated for construction activities will be established on a daily basis and communicated to all employees and other site users by the SSHO. It shall be the responsibility of each Subcontractor's SSHO to ensure that all site workers are aware of the work zone boundaries and to enforce proper procedures in each area. The zones will include:

- **Exclusion Zone ("Hot Zone")** - The area where contaminated materials may be exposed, excavated or handled and all areas where contaminated equipment or personnel may travel. The zone will be delineated by flagging tape. All personnel entering the Exclusion Zone must wear the prescribed level of PPE identified in Section 7.0.

- **Contamination Reduction Zone** - The zone where decontamination of personnel and equipment takes place. Any potentially contaminated clothing, equipment and samples must remain in the Contamination Reduction Zone until decontaminated.

- **Support Zone** - The part of the site that is considered non-contaminated or "clean." Support equipment will be located in this zone, and personnel may wear normal work clothes within this zone.

In the absence of other task-specific work zone boundaries established by the SSHO, the following boundaries will apply to all remedial activities involving disruption or handling of site soils or groundwater:

- **Exclusion Zone:** 50 foot radius from the outer limit of the sampling/construction activity.

- **Contaminant Reduction Zone:** 100 foot radius from the outer limit of the sampling/construction activity.

- **Support Zone:** Areas outside the Contaminant Reduction Zone.

Access of non-essential personnel to the Exclusion and Contamination Reduction Zones will be strictly controlled by the SSHO. Only personnel who are essential to the completion of the task and are wearing the prescribed PPE will be allowed access to these areas. Entrance of all personnel must be approved by the SSHO.

The SSHO will maintain a Health and Safety Logbook containing the names of Benchmark workers and their level of protection. The zone boundaries may be changed by the SSHO as environmental conditions warrant, and to respond to the necessary changes in work locations on-site.

# 12.0 DECONTAMINATION

## 12.1 Decontamination for Benchmark Employees

The degree of decontamination required is a function of a particular task and the environment within which it occurs. The following decontamination procedure will remain flexible, thereby allowing the decontamination crew to respond appropriately to the changing environmental conditions that may arise at the site. All Benchmark personnel on-site shall follow the procedure below, or the Subcontractor's procedure (if applicable), whichever is more stringent.

**Station 1 - Equipment Drop:** Deposit visibly contaminated (if any) re-useable equipment used in the contamination reduction and exclusion zones (tools, containers, monitoring instruments, radios, clipboards, etc.) on plastic sheeting.

**Station 2 - Boots and Gloves Wash and Rinse:** Scrub outer boots and outer gloves. Deposit tape and gloves in waste disposal container.

**Station 3 - Tape, Outer Boot and Glove Removal:** Remove tape, outer boots and gloves. Deposit tape and gloves in waste disposal container.

**Station 4 - Canister or Mask Change:** If worker leaves Exclusion Zone to change canister (or mask), this is the last step in the decontamination procedure. Worker's canister is exchanged, new outer gloves and boot cover donned, and worker returns to duty.

**Station 5 - Outer Garment/Face Piece Removal:** Protective suit removed and deposited in separate container provided by the Subcontractor. Face piece or goggles are removed if used. Avoid touching face with fingers. Face piece and/or goggles deposited on plastic sheet. Hard hat removed and placed on plastic sheet.

**Station 6 - Inner Glove Removal:** Inner gloves are the last personal protective equipment to be removed. Avoid touching the outside of the gloves with bare fingers. Dispose of these gloves in waste disposal container.

Following PPE removal, personnel shall wash hands, face, and forearms with absorbent wipes. If field activities proceed for 6 consecutive months or longer, shower facilities will be provided for worker use in accordance with OSHA 29 CFR 1910.120(n).

## 12.2 Decontamination for Medical Emergencies

In the event of a minor, non-life threatening injury, personnel should follow the decontamination procedures as defined and then administer first-aid.

In the event of a major injury or other serious medical concern (e.g., heat stroke), immediate first-aid is to be administered and the victim transported to the hospital in lieu of further decontamination efforts unless exposure to a site contaminant would be considered "Immediately Dangerous to Life or Health."

## 12.3 Decontamination of Field Equipment

Decontamination of heavy equipment will be conducted by the Subcontractor in accordance with his approved Health and Safety Plan in the Contamination Reduction Zone. At a minimum, this will include manually removing heavy soil contamination, followed by steam cleaning on an impermeable pad.

Decontamination of all tools used for sample collection purposes will be conducted by Benchmark personnel. It is expected that all tools will be constructed of nonporous, nonabsorbent materials (i.e., metal), which will aid in the decontamination effort. Any tool or part of a tool made of porous, absorbent material (i.e., wood) will be placed into suitable containers and prepared for disposal.

Decontamination of bailers, split-spoons, spatula knives, and other tools used for environmental sampling and examination shall be as follows:

- Disassemble the equipment
- Wash with water to remove all visible foreign matter.
- Wash with detergent.
- Rinse all parts with distilled-deionized water.
- Allow to air dry.
- Wrap all parts in aluminum foil or polyethylene.

## 13.0 CONFINED SPACE ENTRY

OSHA 29 CFR 1910.146 defines a confined space as a space that is large enough and so configured that an employee can physically enter and do assigned work; has limited or restricted means for entry and exit; and is not intended for continuous employee occupancy. Confined spaces include, but are not limited to, trenches, storage tanks, process vessels, pits, sewers, tunnels, underground utility vaults, pipelines, sumps, wells, and excavations.

Confined space entry by Benchmark employees is not anticipated to be necessary to complete the site activities identified in Section 1.5. In the event that the scope of work changes or confined space entry appears necessary, the Project Manager will be consulted to determine if feasible engineering alternatives to confined space entry can be implemented. If confined space entry by Benchmark employees cannot be avoided through reasonable engineering measures, task-specific confined space entry procedures will be developed and a confined-space entry permit will be issued through Benchmark's corporate Health and Safety Director. Benchmark employees shall not enter a confined space without these procedures and permits in place.

# 14.0 FIRE PREVENTION AND PROTECTION

## 14.1 General Approach

Recommended practices and standards of the National Fire Protection Association (NFPA) and other applicable regulations will be followed in the development and application of Project Fire Protection Programs. When required by regulatory authorities, project management will prepare and submit a Fire Protection Plan for the approval of the contracting officers, authorized representative or other designated official. Essential considerations for the Fire Protection Plan will include:

- Proper site preparation and safe storage of combustible and flammable materials.
- Availability of coordination with private and public fire authorities.
- Adequate job-site fire protection and inspections for fire prevention.
- Adequate indoctrination and training of employees.

## 14.2 Equipment and Requirements

Fire extinguishers will be provided by each Subcontractor and are required on all heavy equipment and in each field trailer. Fire extinguishers will be inspected, serviced, and maintained in accordance with the manufacturer's instructions. As a minimum, all extinguishers shall be checked monthly, weighed semi-annually, and recharged if necessary. Recharge or replacement shall be mandatory immediately after each use.

## 14.3 Flammable and Combustible Substances

All storage, handling or use of flammable and combustible substances will be under the supervision of qualified persons. All tanks, containers and pumping equipment, whether portable or stationary, used for the storage and handling of flammable and combustible liquids, will meet the recommendations of the National Fire Protection Association.

## 14.4 Hot Work

If the scope of work necessitates welding or blowtorch operation, the hot work permit presented in Appendix C of this HSCP will be completed by the SSHO and reviewed/issued by the Project Manager.

## 15.0 EMERGENCY INFORMATION

In accordance with OSHA 29 CFR Part 1910, an Emergency Response Plan is attached to this HSCP as Appendix A. The hospital route map is presented within Appendix A as Figure 1.

# 16.0 REFERENCES

1. Obrien & Gere Engineers, Inc., November 1971. *Peter Cooper Corporations, Gowanda, NY - Solid Waste Management.*

2. RECRA Research, 1983. *Phase I Investigation Report, Peter Cooper Gowanda and Markhams Site.*

3. RECRA Research, August 1985. *Phase II Investigation Report, Peter Cooper Gowanda and Markhams Site.*

4. Obrien & Gere Engineers, Inc. January 1989. *Remedial Investigation Report, Peter Cooper Corporations, Gowanda, New York.*

5. Obrien & Gere Engineers, Inc. March 1991. *Feasibility Study, Peter Cooper Corporations, Gowanda, New York.*

6. Malcolm Pirnie, Inc., 1993. *Sampling Inspection Report, Peter Cooper Markhams Site.*

7. Geomatrix Consultants, Inc. & Benchmark Environmental Engineering and Science, PLLC, February 2001 and revised September 2001. *Remedial Investigation/Feasibility Study Work Plan, Peter Cooper Markhams Site, Dayton, New York.*

8. Geomatrix Consultants, Inc. & Benchmark Environmental Engineering and Science, PLLC, February 2005. *Remedial Investigation Report, Peter Cooper Markhams Site, Dayton, New York, Volumes I and II.*

9. Geomatrix Consultants, Inc., July 2006. *Baseline Human health Risk Assessment, Peter Cooper Markhams Site, Dayton, New York.*

10. New York State Department of Health, December 2002. *Generic Community Air Monitoring Plan, Appendix B, Draft DER-10 Technical Guidance for Site Investigation and Remediation.*

# TABLES

# TABLE 1

## CONSTITUENTS OF POTENTIAL CONCERN

### Health and Safety Contigency Plan
### Peter Cooper Markhams NPL Site
### Dayton, New York

| Parameter | Maximum Concentration[1] |
|---|---|
| **Soils (mg/kg)** | |
| Arsenic | 95.5 |
| Benzo(a)pyrene | 0.071 |
| Chromium | 65,300 |
| Hexavalent Chromium | 63.3 |
| Manganese | 561 |
| **Groundwater (mg/L)** | |
| Cadmium | 0.051 |
| Thallium | 1.3 |

**Notes:**

1. Maximum concentrations per Baseline Human Health Risk Assessment.

# TABLE 2

## TOXICITY DATA FOR CONSTITUENTS OF POTENTIAL CONCERN [1]

## Health and Safety Contigency Plan
## Peter Cooper Markhams NPL Site
## Dayton, New York

| Parameter | Synonyms | CAS No. | Code | Concentration Limits [3] | | |
|---|---|---|---|---|---|---|
| | | | | PEL | TLV | IDLH |
| *Polycyclic Aromatic Hydrocarbons (PAHs)[2]: ppm* | | | | | | |
| Benzo(a)pyrene | *none* | *50-32-8* | *none* | 0.2 | -- | 80 |
| *Soils (mg/m³)* | | | | | | |
| Arsenic | *none* | *7440-38-2* | Ca | 0.01 | 0.01 | 5 |
| Chromium | *none* | *7440-47-3* | *none* | 0.5 | 0.5 | 250 |
| Hexavalent Chromium | *none* | *18540-29-9* | *none* | 0.1 | 0.05 | 30 |
| Manganese | *none* | *7439-96-5* | *none* | 5 | 5 | 10000 |
| *Groundwater (mg/m³)* | | | | | | |
| Cadmium | *none* | *7440-43-9* | Ca | 0.005 | 0.01 | 9 |
| Thallium | *none* | *7440-28-0* | *none* | 0.1 | 0.1 | 15 |

**Notes:**

1. Concentration limits as reported by NIOSH Pocket Guide to Chemical Hazards (2005)
2. Concentration Limits for PAHs as listed in NIOSH for Coal Tar Pitch Volatiles [Benzo(a)pyrene] and Coke Oven Emissions references used.
3. " -- " = concentration limit not available; exposure should be minimized to the extent feasible through appropriate engineering controls & PPE.

**Explanation:**

Ca = NIOSH considers constituent to be a potential occupational carcinogen.

C-## = Ceiling Level equals the maximum exposure concentration allowable during the work day.

IDLH = Immediately Dangerous to Life or Health.

TLV = Threshold Limit Value, established by American Conference of Industrial Hygienists (ACGIH), equals the max. exposure concentration allowable for 8 hrs/day@ 40 hrs/week.

TLVs are the amounts of chemicals in the air that almost all healthy adult workers are predicted to be able to tolerate without adverse effects. There are three types.

(a) TLV-TWA (TLV-Time-Weighted Average) which is averaged over the normal eight-hour day/forty-hour work week. (Most TLVs.)

(b) TLV-STEL or Short Term Exposure Limits are 15 minute exposures that should not be exceeded for even an instant. It is not a stand alone value but is accompanied by the TLV-TWA. It indicates a higher exposure that can be tolerated for a short time without adverse effect as long as the total time weighted average is not exceded.

(c) TLV-C or Ceiling limits are the concentration that should not be exceeded during any part of the working exposure.

Unless the initials "STEL" or "C" appear in the Code column, the TLV value should be considered to be the eight-hour TLV-TWA.

PEL = Permissible Exposure Limit, established by OSHA, equals the maximium exposure conconcentration allowable for 8 hours per day@ 40 hours per week

# TABLE 3

# POTENTIAL ROUTES OF EXPOSURE TO THE CONSTITUENTS OF POTENTIAL CONCERN

## Health and Safety Contigency Plan
## Peter Cooper Markhams NPL Site
## Dayton, New York

| Activity [1] | Direct Contact with Soil/Fill | Inhalation of Vapors or Dust | Direct Contact with Groundwater |
|---|---|---|---|
| 1. Monitoring Well Installation/Decommission Oversight. | x | x | x |
| 2. Oversight of Construction/Cover System Installation | x | x | |

Notes:
1. Activity as described in Section 1.5 of the Health and Safety Contingency Plan.

# TABLE 4

## REQUIRED LEVELS OF PROTECTION FOR REMEDIAL ACTION TASKS

### Health and Safety Contigency Plan
### Peter Cooper Markhams NPL Site
### Dayton, New York

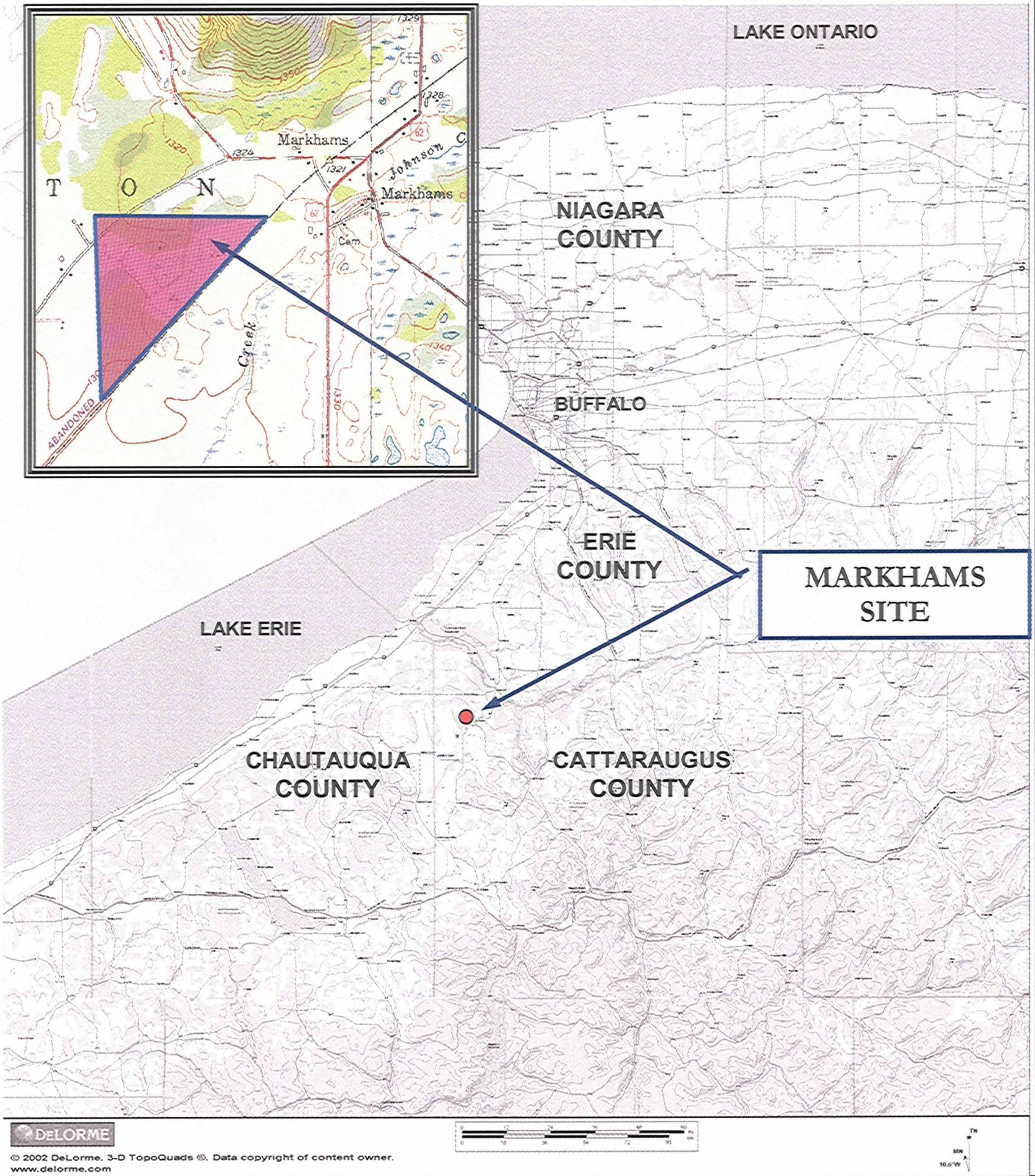
| Activity | Respiratory Protection[1] | Clothing | Gloves[2] | Boots[2,3] | Other Required PPE/Modifications[2,4] |
|---|---|---|---|---|---|
| 1. Monitoring Well Installation/ Decommission Oversight | Level D<br>(upgrade to Level C if necessary) | Poly-coated Tyvek or S | L/N | outer: L<br>inner: STSS | HH<br>SGSS |
| 2. Oversight of Construction/Cover System Installation | Level D<br>(upgrade to Level C if necessary) | Work Uniform or Tyvek | L/N | outer: L<br>inner: STSS | HH<br>SGSS |

Notes:

1. Respiratory equipment shall conform to guidelines presented in Section 7.0 of this HASP. The Level C requirement is an air-purifying respirator equiped with organic compound/acid gas/dust cartridge.
2. HH = hardhat; L = Latex; L/N = latex inner glove, nitrile outer glove; N = Nitrile; S = Saranex; SG = safety glasses; SGSS = safety glasses with sideshields; STSS = steel toe safety shoes.
3. Latex outer boot (or approved overboot) required whenever contact with contaminated materials may occur. SSHO may downgrade to STSS (steel-toed safety shoes) if contact will be limited to cover/replacement soils.
4. Dust masks shall be donned as directed by the SSHO (site safety and health officer) or site safety technician whenever potentially contaminated airborne particulates (i.e., dust) are present in significant amounts in the breathing zone. Goggles may be substituted with safety glasses w/side-shields whenever contact with contaminated liquids is not anticipated.

# FIGURES

## FIGURE 1



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PROJECT NO.: 0021-003-400

DATE: DECEMBER 2007

DRAFTED BY: AJZ

# SITE LOCATION AND VICINITY MAP

HEALTH AND SAFETY CONTINGENCY PLAN

PETER COOPER MARKHAMS SITE
DAYTON, NEW YORK

PREPARED FOR
RESPONDENTS FOR PETER COOPER MARKHAMS SITE

FILEPATH:F:\Benchmark\Clients\Collier Shannon\Peter Cooper - Markhams\Design\HSCP\CAD\figure 1;site location and vicinity map.dwg

# APPENDIX A

## EMERGENCY RESPONSE PLAN

# EMERGENCY RESPONSE PLAN
for

# PETER COOPER MARKHAMS NPL SITE
# DAYTON, NEW YORK

February 2008 0021-003-400

# APPENDIX A: EMERGENCY RESPONSE PLAN
# HEALTH AND SAFETY CONTINGENCY PLAN

## PETER COOPER MARKHAMS NPL SITE

## Table Of Contents

## LIST OF FIGURES

# 1.0 GENERAL

This is the site-specific Emergency Response Plan. This chapter of the Health and Safety Contingency Plan describes potential emergencies at the site, procedures for responding to those emergencies, roles and responsibilities during emergency response, and training that workers must receive in order to follow emergency procedures. This plan also describes the provisions this site has made to coordinate its emergency response planning with other contractors on-site and with off-site emergency response organizations.

This emergency response plan is consistent with the requirements of 29 CFR 1910.120(l) and provides the following site-specific information:

- Pre-emergency planning.
- Personnel roles, lines of authority, and communication.
- Emergency recognition and prevention.
- Safe distances and places of refuge.
- Evacuation routes and procedures.
- Decontamination procedures.
- Emergency medical treatment and first aid.
- Emergency alerting and response procedures.
- Critique of response and follow-up.
- Emergency PPE and equipment.

## 2.0 PRE-EMERGENCY PLANNING

This Site has been evaluated for potential emergency occurrences, based on site hazards, the required work tasks, the site topography, and prevailing weather conditions. The results of that evaluation indicate the potential for the following site emergencies to occur at the locations indicated.

Type of Emergency:
- Medical, due to physical injury

Source of Emergency:
- Slip/trip/fall

Location of Source:
- Non-specific

## 3.0 ON-SITE EMERGENCY RESPONSE EQUIPMENT

Emergency procedures may require specialized equipment to facilitate worker rescue, contamination control and reduction, or post-emergency clean-up. Emergency response equipment stocked on this site is listed below. The equipment inventory and storage locations are based on the potential emergencies described above. This equipment inventory is designed to meet on-site emergency response needs and any specialized equipment needs that off-site responders might require because of the hazards at this site but not ordinarily stocked.

Any additional PPE required and stocked for emergency response is also listed in below. During an emergency, the Emergency Response Coordinator is responsible for specifying the level of PPE required for emergency response. At a minimum, personal protective equipment used by emergency responders will comply with Chapter 7, Personal Protective Equipment, of this HASP. Emergency response equipment is inspected at regular intervals and maintained in good working order. The equipment inventory is replenished as necessary to maintain response capabilities.

| Emergency Equipment | Quantity | Location |
|---|---|---|
| First Aid Kit | 1 | Site Trailer |
| Fire Extinguisher | 1 (minimum) | All heavy equipment and Site Trailer |

| Emergency PPE | Quantity | Location |
|---|---|---|
| Full-face respirator | 1 (minimum) | Site Trailer |
| Chemical-resistant suits | 2 (minimum) | Site Trailer |

## 4.0 EMERGENCY PLANNING MAPS

Due to the size of the site and likely performance of the work on an area-specific basis, area-specific maps of the site will be developed prior to initiation of field activities. The maps will be clearly marked with critical on-site emergency planning information. Emergency evacuation route(s), places of refuge, assembly point(s), and the locations of key site emergency equipment are identified. Site zone boundaries are shown to alert responders to known areas of contamination. Major topographical features and the direction of prevailing winds/weather conditions that could affect emergency response planning are also marked on the map(s). The map will be provided to all site personnel.

## 5.0 EMERGENCY CONTACTS

The following identifies the emergency contacts for this ERP.

Emergency Telephone Numbers:

**Project Manager:** *Thomas H. Forbes*
Work: (716) 856-0599
Mobile: (716) 864-1730

**Corporate Health and Safety Director:** *Thomas H. Forbes*
Work: (716) 856-0599
Mobile: (716) 864-1730

**Site Safety and Health Officer (SSHO):** *Richard Dubisz*
Work: (716) 856-0635
Mobile: (716) 998-4334

**Alternate SSHO:** *Allen Zgaljaridc*
Work: (716) 856-0599
Mobile: (716) 598-0656

| | |
|---|---|
| **TRI-COUNTY MEMORIAL HOSPITAL:** | (716) 532-3377 |
| **FIRE:** | 911 |
| **AMBULANCE:** | 911 |
| **BUFFALO POLICE:** | 911 |
| **STATE EMERGENCY RESPONSE HOTLINE:** | (800) 457-7362 |
| **NATIONAL RESPONSE HOTLINE:** | (800) 424-8802 |
| **NYSDOH:** | (716) 847-4385 |
| **NYSDEC:** | (716) 851-7220 |
| **NYSDEC 24-HOUR SPILL HOTLINE:** | (800) 457-7252 |
| **USEPA** | (212) 637-4273 |

**NEW YORK STATE DEPARTMENT OF HEALTH:**

Mr. Cameron O'Connor
584 Delaware Avenue
Buffalo, New York 14202

Mr. Michael Kadlec
2 University Place
Albany, New York 12203

<u>The Site location is</u>:

Peter Cooper Markhams Site
Bentley Road
Markhams, New York
(site is approximately 6 miles south of Gowanda, NY)

**SITE PHONE**: (Insert Cell Phone or Field Trailer) ________________

## 6.0 EMERGENCY ALERTING & EVACUATION

Internal emergency communication systems are used to alert workers to danger, convey safety information, and maintain site control. Any effective system can be employed. Two-way radio headsets or field telephones are often used when work teams are far from the command post. Hand signals and air-horn blasts are also commonly used. Every system must have a backup. It shall be the responsibility of the construction contractor's Site Health and Safety Officer to ensure that an adequate method of internal communication is understood by all personnel entering the site. Unless all personnel are otherwise informed, the following signals shall be used.

1) Emergency signals by portable air horn, siren, or whistle: two short blasts, personal injury; continuous blast, emergency requiring site excavation.

2) Visual signals: hand gripping throat, out of air/cannot breathe; hands on top of head, need assistance; thumbs up, affirmative/ everything is OK; thumbs down, no/negative; grip partner's wrist or waist, leave area immediately.

If evacuation notice is given, site workers leave the worksite with their respective buddies, if possible, by way of the nearest exit. Emergency decontamination procedures detailed in Chapter 12 of this HASP are followed to the extent practical without compromising the safety and health of site personnel. Appropriate primary and alternate evacuation routes and assembly areas have been identified and are shown on the Emergency Response Map. The routes and assembly area will be determined by conditions at the time of the evacuation based on wind direction, the location of the hazard source, and other factors as determined by rehearsals and inputs from emergency response organizations. Wind direction indicators are located so that workers can determine a safe up wind or cross wind evacuation route and assembly area if not informed by the emergency response coordinator at the time the evacuation alarm sounds. Since work conditions and work zones within the site may be changing on daily basis, it shall be the responsibility of the construction contractor's Site Health and Safety Officer to review evacuation routes and procedures as necessary and to inform all site workers of any changes.

Personnel exiting the site gather at a designated assembly point. To determine that everyone has successfully exited the site, personnel will be accounted for at the assembly site.

If any worker cannot be accounted for, notification is given to the SSHO (Richard Dubisz) so that appropriate action can be initiated. Contractors and subcontractors on this site have coordinated their emergency response plans to ensure that these plans are compatible and that source(s) of potential emergencies are recognized, alarm systems are clearly understood, and evacuation routes are accessible to all personnel relying upon them.

# 7.0 EXTREME WEATHER CONDITIONS

In the event of adverse weather conditions, the Site Safety and Health Officer in conjunction with the Contractor's SSHO will determine if engineering operations can continue without sacrificing the health and safety of site personnel. Items to be considered prior to determining if work should continue include but are not limited to:

- Potential for heat/cold stress.
- Weather-related construction hazards (viz., flooding or wet conditions producing undermining of structures or sheeting, high wind threats, etc).
- Limited visibility.
- Potential for electrical storms.
- Limited site access/egress (e.g., due to heavy snow)

# 8.0 EMERGENCY MEDICAL TREATMENT & FIRST AID

## Personnel Exposure:

The following general guidelines will be employed in instances where health impacts threaten to occur acute exposure is realized:

- Skin Contact: Use copious amounts of soap and water. Wash/rinse affected area for at least 15 minutes. Decontaminate and provide medical attention. Eyewash stations will be provided on site. If necessary, transport to Tri-County Memorial Hospital.

- Inhalation: Move to fresh air and, if necessary, transport to Tri-County Memorial Hospital.

- Ingestion: Decontaminate and transport to Tri-County Memorial Hospital.

## Personal Injury:

Minor first-aid will be applied on-site as deemed necessary. In the event of a life threatening injury, the individual should be transported to Tri-County Memorial Hospital via ambulance. The construction contractor's Site Health and Safety Officer will supply available chemical specific information to appropriate medical personnel as requested.

First aid kits will conform to Red Cross and other applicable good health standards, and shall consist of a weatherproof container with individually sealed packages for each type of item. First aid kits will be fully equipped before being sent out on each job and will be checked weekly by the SSHO to ensure that the expended items are replaced.

## Directions to Hospital (see Figure 1):

The following directions describe the best route from the Site to Tri-County Memorial Hospital:

- From the Site turn right onto Bentley Rd
- Head east to Route 62 and turn left on Route 62
- Continue on Route 62 (Jamestown St.) into Gowanda until you are at a five-way intersection
- Make a sharp left turn on West Main Street
- Turn right on Aldrich Street and proceed north to the first street on the left
- Turn left on Memorial Drive and proceed to the Tri-County Memorial Hospital at 100 Memorial Drive. The hospital will be on the right side of Memorial Drive. Follow signs to Emergency Room.

## 9.0 EMERGENCY RESPONSE CRITIQUE & RECORD KEEPING

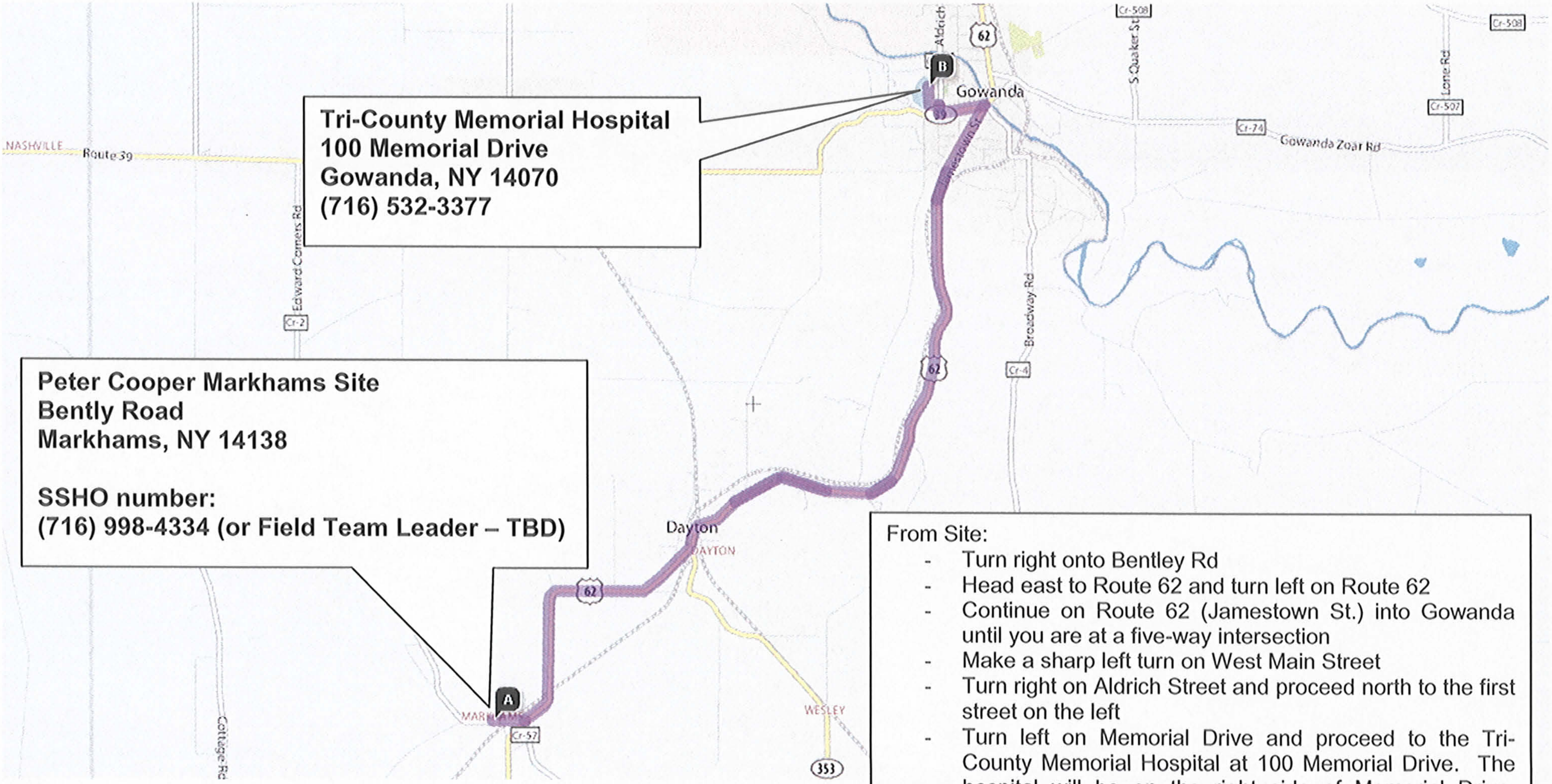
Following and emergency, the SSHO and Project Manager shall review the effectiveness of this Emergency Response Plan in addressing notification, control and evacuation requirements. Updates and modifications to the Emergency Response Plan shall be made accordingly. It shall be the responsibility of each employer to establish and assure adequate records of all:

- Occupational injuries and illnesses.
- Accident investigations.
- Reports to insurance carrier or State compensation agencies.
- Reports required by the client.
- Records and reports required by local, state, federal and/or international agencies.
- Property or equipment damage.
- Third party injury or damage claims.
- Environmental testing logs.
- Explosive and hazardous substances inventories and records.
- Records of inspections and citations.
- Safety training.

## 10.0 EMERGENCY RESPONSE TRAINING

All persons who enter this worksite, including visitors, receive a site-specific briefing about anticipated emergency situations and the emergency procedures by the Contractor's SSHO. Where this site relies on off-site organizations for emergency response, the training of personnel in those off-site organizations has been evaluated and is deemed adequate for response to this site.

# FIGURES



**Tri-County Memorial Hospital**
**100 Memorial Drive**
**Gowanda, NY 14070**
**(716) 532-3377**

**Peter Cooper Markhams Site**
**Bently Road**
**Markhams, NY 14138**

**SSHO number:**
**(716) 998-4334 (or Field Team Leader – TBD)**

From Site:

- Turn right onto Bentley Rd
- Head east to Route 62 and turn left on Route 62
- Continue on Route 62 (Jamestown St.) into Gowanda until you are at a five-way intersection
- Make a sharp left turn on West Main Street
- Turn right on Aldrich Street and proceed north to the first street on the left
- Turn left on Memorial Drive and proceed to the Tri-County Memorial Hospital at 100 Memorial Drive. The hospital will be on the right side of Memorial Drive. Follow signs to Emergency Room.

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DATE: DECEMBER 2007
DRAFTED BY: AJZ

# HOSPITAL ROUTE MAP
EMERGENCY RESPONSE PLAN

PETER COOPER MARKHAMS SITE
DAYTON, NEW YORK

PREPARED FOR
RESPONDENTS FOR PETER COOPER MARKHAMS SITE

FIGURE 1

# APPENDIX B

## NYSDOH GENERIC COMMUNITY AIR MONITORING PLAN

# APPENDIX 1A

## New York State Department of Health
## Generic Community Air Monitoring Plan

A Community Air Monitoring Plan (CAMP) requires real-time monitoring for volatile organic compounds (VOCs) and particulates (i.e., dust) at the downwind perimeter of each designated work area when certain activities are in progress at contaminated sites. The CAMP is not intended for use in establishing action levels for worker respiratory protection. Rather, its intent is to provide a measure of protection for the downwind community (i.e., off-site receptors including residences and businesses and on-site workers not directly involved with the subject work activities) from potential airborne contaminant releases as a direct result of investigative and remedial work activities. The action levels specified herein require increased monitoring, corrective actions to abate emissions, and/or work shutdown. Additionally, the CAMP helps to confirm that work activities did not spread contamination off-site through the air.

The generic CAMP presented below will be sufficient to cover many, if not most, sites. Specific requirements should be reviewed for each situation in consultation with NYSDOH to ensure proper applicability. In some cases, a separate site-specific CAMP or supplement may be required. Depending upon the nature of contamination, chemical- specific monitoring with appropriately-sensitive methods may be required. Depending upon the proximity of potentially exposed individuals, more stringent monitoring or response levels than those presented below may be required. Special requirements will be necessary for work within 20 feet of potentially exposed individuals or structures and for indoor work with co-located residences or facilities. These requirements should be determined in consultation with NYSDOH.

Reliance on the CAMP should not preclude simple, common-sense measures to keep VOCs, dust, and odors at a minimum around the work areas.

### Community Air Monitoring Plan

Depending upon the nature of known or potential contaminants at each site, real-time air monitoring for volatile organic compounds (VOCs) and/or particulate levels at the perimeter of the exclusion zone or work area will be necessary. Most sites will involve VOC and particulate monitoring; sites known to be contaminated with heavy metals alone may only require particulate monitoring. If radiological contamination is a concern, additional monitoring requirements may be necessary per consultation with appropriate NYSDEC/NYSDOH staff.

**Continuous monitoring** will be required for all ground intrusive activities and during the demolition of contaminated or potentially contaminated structures. Ground intrusive activities include, but are not limited to, soil/waste excavation and handling, test pitting or trenching, and the installation of soil borings or monitoring wells.

**Periodic monitoring** for VOCs will be required during non-intrusive activities such as the collection of soil and sediment samples or the collection of groundwater samples from existing monitoring wells. "Periodic" monitoring during sample collection might reasonably consist of taking a reading upon arrival at a sample location, monitoring while opening a well cap or overturning soil, monitoring during well baling/purging, and taking a reading prior to leaving a sample location. In some instances, depending upon the proximity of potentially exposed individuals, continuous monitoring may be required during sampling activities. Examples of such situations include groundwater sampling at wells on the curb of a busy urban street, in the midst of a public park, or adjacent to a school or residence.

## VOC Monitoring, Response Levels, and Actions

Volatile organic compounds (VOCs) must be monitored at the downwind perimeter of the immediate work area (i.e., the exclusion zone) on a continuous basis or as otherwise specified. Upwind concentrations should be measured at the start of each workday and periodically thereafter to establish background conditions. The monitoring work should be performed using equipment appropriate to measure the types of contaminants known or suspected to be present. The equipment should be calibrated at least daily for the contaminant(s) of concern or for an appropriate surrogate. The equipment should be capable of calculating 15-minute running average concentrations, which will be compared to the levels specified below.

- If the ambient air concentration of total organic vapors at the downwind perimeter of the work area or exclusion zone exceeds 5 parts per million (ppm) above background for the 15-minute average, work activities must be temporarily halted and monitoring continued. If the total organic vapor level readily decreases (per instantaneous readings) below 5 ppm over background, work activities can resume with continued monitoring.

- If total organic vapor levels at the downwind perimeter of the work area or exclusion zone persist at levels in excess of 5 ppm over background but less than 25 ppm, work activities must be halted, the source of vapors identified, corrective actions taken to abate emissions, and monitoring continued. After these steps, work activities can resume provided that the total organic vapor level 200 feet downwind of the exclusion zone or half the distance to the nearest potential receptor or residential/commercial structure, whichever is less - but in no case less than 20 feet, is below 5 ppm over background for the 15-minute average.

- If the organic vapor level is above 25 ppm at the perimeter of the work area, activities must be shutdown.

All 15-minute readings must be recorded and be available for State (DEC and DOH) personnel to review. Instantaneous readings, if any, used for decision purposes should also be recorded.

## Particulate Monitoring, Response Levels, and Actions

Particulate concentrations should be monitored continuously at the upwind and downwind perimeters of the exclusion zone at temporary particulate monitoring stations. The particulate monitoring should be performed using real-time monitoring equipment capable of measuring particulate matter less than 10 micrometers in size (PM-10) and capable of integrating over a period of 15 minutes (or less) for comparison to the airborne particulate action level. The equipment must be equipped with an audible alarm to indicate exceedance of the action level. In addition, fugitive dust migration should be visually assessed during all work activities.

- If the downwind PM-10 particulate level is 100 micrograms per cubic meter (mcg/m$^3$) greater than background (upwind perimeter) for the 15-minute period or if airborne dust is observed leaving the work area, then dust suppression techniques must be employed. Work may continue with dust suppression techniques provided that downwind PM-10 particulate levels do not exceed 150 mcg/m$^3$ above the upwind level and provided that no visible dust is migrating from the work area.

- If, after implementation of dust suppression techniques, downwind PM-10 particulate levels are greater than 150 mcg/m$^3$ above the upwind level, work must be stopped and a re-evaluation of activities initiated. Work can resume provided that dust suppression measures and other controls are successful in reducing the downwind PM-10 particulate concentration to within 150 mcg/m$^3$ of the upwind level and in preventing visible dust migration.

All readings must be recorded and be available for State (DEC and DOH) personnel to review.

# APPENDIX C

## HOT WORK PERMIT FORM

BENCHMARK
ENVIRONMENTAL
ENGINEERING &
SCIENCE, PLLC

# HOT WORK PERMIT

## PART 1 - INFORMATION

Issue Date:

Date Work to be Performed: Start: Finish (permit terminated):

Performed By:

Work Area:

Object to be Worked On:

## PART 2 - APPROVAL

(for 1, 2 or 3: mark Yes, No or NA)*

Will working be on or in: Finish (permit terminated):

1. Metal partition, wall, ceiling covered by combustible material? yes no
2. Pipes, in contact with combustible material? yes no
3. Explosive area? yes no

* = If any of these conditions exist (marked "yes"), a permit will not be issued without being reviewed and approved by Thomas H. Forbes (Corporate Health and Safety Director). Required Signature below.

## PART 3 - REQUIRED CONDITIONS**

(Check all conditions that must be met)

| | PROTECTIVE ACTION | | PROTECTIVE EQUIPMENT |
|---|---|---|---|
| | Specific Risk Assessment Required | | Goggles/visor/welding screen |
| | Fire or spark barrier | | Apron/fireproof clothing |
| | Cover hot surfaces | | Welding gloves/gauntlets/other: |
| | Move movable fire hazards, specifically | | Wellintons/Knee pads |
| | Erect screen on barrier | | Ear protection: Ear muffs/Ear plugs |
| | Restrict Access | | B.A.: SCBA/Long Breather |
| | Wet the ground | | Respirator: Type: |
| | Ensure adequate ventilation | | Cartridge: |
| | Provide adequate supports | | Local Exhaust Ventilation |
| | Cover exposed drain/floor or wall cracks | | Extinguisher/Fire blanket |
| | Fire watch (must remain on duty during duration of permit) | | Personal flammable gas monitor |
| | Issue additional permit(s): | | |

Other precautions:

** Permit will not be issued until these conditions are met.

## SIGNATURES

Orginating Employee: Date:

Project Manager: Date:

Part 2 Approval: Date:

Prepared By: ___________

# ATTACHMENT 1

## PERSONAL PROTECTIVE EQUIPMENT

# ATTACHMENT 1

## PERSONAL PROTECTIVE EQUIPMENT

Equipment designed to protect the body against contact with known or anticipated chemical hazards have been divided into four categories according to the degree of protection afforded:

- Level A: Should be selected when the highest level of respiratory, skin and eye protection is needed.
- Level B: Should be selected when the highest level of respiratory protection is needed, but a lesser level of skin protection is required; Level B protection is the minimum level recommended on initial site entries until the hazards have been further defined by on-site studies.
- Level C: Should be selected when the types of airborne substances are known, the concentrations have been measured and the criteria for using air-purifying respirators are met. In atmospheres where no airborne contaminants are present, Level C provides dermal protection only.
- Level D: Should not be worn on any site with respiratory or skin hazards. This is primarily a work uniform providing minimal protection.

The level of protection selected is based primarily on:

- Types and measured concentrations of the chemical substances in the ambient atmosphere and their associated toxicity.
- Potential or measured exposure to substances in air, splashes of liquids or other indirect contact with material due to the task being performed.

In situations where the types of chemicals, concentrations, and possibilities of contact are not known, the appropriate level of protection must be selected based on professional experience and judgment until the hazards may be further characterized. The individual components of clothing and equipment must be assembled into a full protective ensemble to protect the worker from site-specific hazards, while at the same time minimizing hazards and drawbacks of the personal protective gear itself. Ensemble components based on the widely used United States Environmental Protection Agency (USEPA) Levels of Protection are detailed below for levels B, C, and D protection.

## Level B Protection Ensemble

### Recommended

- Pressure-demand, full-face piece self-contained breathing apparatus (MSHA/-NIOSH approved) or pressure-demand supplied-air respirator with escape self-contained breathing apparatus (SCBA).

- Chemical-resistant clothing (overalls and long-sleeved jacket; hooded one-or two-piece chemical splash suit; disposable chemical-resistant one-piece suit); disposable chemical-resistant one-piece suit).

- Inner and outer chemical resistant gloves.

- Chemical-resistant safety boots/shoes.

- Hardhat.

### Optional

- Coveralls.
- Disposable boot covers.
- Face shield.
- Long cotton underwear.

Meeting any one of the following criteria warrant the use of Level B protection. The types and atmospheric concentrations of toxic substances have been identified and require the highest level of respiratory protection, but a lower level of skin and eye protection. These would be atmospheres:

- With concentrations Immediately Dangerous to Life and Health (IDLH).

- Exceeding limits of protection afforded by a full-face air-purifying mask.

- Containing substances for which air-purifying canisters do not exist or have low removal efficiency.

- Containing substances requiring air-supplied equipment, but substances and/or concentrations do not represent a serious skin hazard.

- Containing less than *19.5%* oxygen.

- With evidence of incompletely identified vapors or gases as indicated by direct reading organic vapor detection instrument, but those vapors and gases are not suspected of containing high levels of chemicals harmful to skin or capable of being absorbed through the intact skin.

Level B equipment provides a high level of protection to the respiratory tract, but a somewhat lower level of protection to skin. The chemical-resistant clothing required in Level B is available in a wide variety of styles, materials, construction detail and permeability. These factors all affect the degree of protection afforded. Therefore, a specialist should select the most effective, chemical-resistant clothing based on the known or anticipated hazards and task. Level B skin protection is selected by:

- Comparing the concentrations of identified substances in the air with skin toxicity data.

- Assessing the effect of the substance (at its measured air concentrations or splash potential) on the small area of the head and neck unprotected by chemical-resistant clothing.

Level C Protection Ensemble

Recommended

- Full-face piece, air-purifying respirator equipped with MSHA and NIOSH approved organic vapor/acid gas/dust/mist combination cartridges or as designated by the Site Health and Safety Officer;

- Chemical-resistant clothing (overalls and long-sleeved jacket, hooded, one or two-piece chemical splash suit or disposable chemical-resistant one-piece suit);

- Inner and outer chemical-resistant gloves;

- Chemical-resistant safety boots/shoes; and

- Hardhat.

Optional

- Coveralls.
- Disposal boot covers.
- Face shield.

- Escape mask.
- Long cotton underwear.

The use of Level C protection is permissible upon satisfaction of these criteria:

- Measured air concentrations of identified substances will be reduce by the respirator to below the substance's permissible exposure limit (PEL), threshold limit value (TLV), and/or the concentration is within the service limit of the cartridge;

- Atmospheric contaminant concentrations do not exceed IDLH levels; and

- Atmospheric contaminants, liquid splashes or other direct contact will not adversely affect the small area of skin left unprotected by chemical-resistant clothing.

Level C protection is distinguished from Level B by the equipment used to protect the respiratory system, assuming the same type of chemical-resistant clothing is used. The main selection criterion for Level C is that conditions permit wearing an air-purifying device. The device (when required) must be an air purifying respirator (MSHA/NIOSH approved) equipped with filter cartridges. Cartridges must be able to remove the substances encountered. Respiratory protection will be used only with proper fitting, training and the approval of a qualified individual. In addition, an air-purifying respirator can be used only if:

- Oxygen content of the atmosphere is at least 19.5% in volume.

- Substances are identified and concentrations measured.

- Substances have adequate warning properties.

- Individual passes a qualitative fit-test for the mask.

- Appropriate cartridge/canister is used, and its service limit concentration is not exceeded.

An air monitoring program is part of all response operations when atmospheric contamination is known or suspected. It is particularly important that the air be monitored thoroughly when personnel are wearing air-purifying respirators. Continual surveillance using direct-reading instruments is needed to detect any changes in air quality necessitating a higher level of respiratory protection.

Level D Protection Ensemble

Recommended

- Coveralls.
- Safety boots/shoes.
- Safety glasses or chemical splash goggles.
- Hardhat.

Optional

- Gloves.
- Escape mask.
- Face shield.

The use of Level D protection is permissible upon satisfaction of these criteria:

- No hazardous air pollutants have been measured.

- Work functions preclude splashes, immersion or the potential for unexpected inhalation of any chemicals.

- Atmospheric contains at least *19.5%* oxygen.

Level D protection is primarily a work uniform. It can be worn in areas where only boots can be contaminated, or where there are no inhalable toxic substances.

# APPENDIX E

## POST-REMEDIAL OPERATION, MAINTENANCE, AND MONITORING (OM&M) PLAN

# OPERATION, MAINTENANCE & MONITORING (OM&M) PLAN

## for

# PETER COOPER MARKHAMS SITE

## DAYTON, NY

January 2008
Revised June 2008

0021-003-400

# OPERATION, MAINTENANCE & MONITORING PLAN
# PETER COOPER MARKHAMS SITE

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# OPERATION, MAINTENANCE & MONITORING PLAN
# PETER COOPER MARKHAMS SITE

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## LIST OF FIGURES

## APPENDICES

# 1.0 INTRODUCTION

This Operation Maintenance & Monitoring (OM&M) Plan has been prepared to identify required monitoring and maintenance tasks for the constructed remedial measures at the Peter Cooper Markhams National Priority List (NPL) Site, located in the Town of Dayton, New York (see Figure 1 for location). Specifically, this report presents operation and maintenance requirements for the final cover system and appurtenances, as well as groundwater, surface water and gas monitoring requirements.

This plan is considered preliminary and is subject to modification following construction of the remedial measures. The final OM&M Plan will be employed with other post-construction site management measures (i.e., soil/fill management and institutional controls certification) to assure the continued effectiveness of the remedy in protecting human health and the environment

## 1.1 Constructed Remedial Measures

The basis for the remedial approach and design are presented in detail in the January 2008 Remedial Design Report and associated Design Plans and Specifications (Ref. 2) prepared by Benchmark Environmental Engineering & Science, PLLC (Benchmark). The remedial measures to be constructed at the site include:

- Preparing the site by clearing and grubbing.
- Consolidating the waste/fill into an area of 5 acres or less.
- Capping the consolidated wastes with a low-permeability soil cover followed by seeding to foster natural habitat.
- Installing a passive gas venting system.
- Monitoring groundwater to check for changes in groundwater chemistry.

Figure 2 illustrates the planned completed remedial measures. A brief description of the construction is presented below.

### 1.1.1 Site Preparation

Site preparation involves clearing, grubbing, and improving access required for the consolidation and covering work. To facilitate heavy equipment access to the site, the access drive extending from Bentley Road to the northwestern limit of the waste fill will be re-established and shored, if necessary, with crushed concrete or aggregate. In addition to the access drive, clearing will be performed in and around the area of waste consolidation to allow equipment access. Trees, shrubs, and brush within the work limits will be removed to facilitate construction and post-closure maintenance work. Vegetation will be stripped off the surface of the waste fill piles. The vegetative layer as well as excess soil/fill generated from the clearing work will be disposed beneath the cover soils.

### 1.1.2 Waste Fill Consolidation and Grading

Waste/fill consolidation will involve relocating the waste/fill piles presently located at various location across the center of the Site into a single waste/fill area. Following clearing, grubbing, and consolidation of waste fill, the sub-grade will be uniformly graded to the lines and grades depicted on construction grading plans to promote surface water drainage. The resultant waste/fill consolidation area will have a footprint of approximately 4.5 acres.

### 1.1.3 Cover System

The final cover system will provide long-term minimization of leachate formation by limiting the infiltration of surface water during the post-closure period. The final cover system will be constructed so that it functions with minimum maintenance, promotes drainage, and minimizes erosion. The design of the cover system calls for providing a minimum 18-inch thick recompacted low permeability ($1x10^{-6}$ cm/sec) soil barrier layer and 6 inches of topsoil. The outlying areas formerly covered by waste fill as well as the waste/fill cover soils will be seeded to promote vegetative growth.

### 1.1.4 Passive Gas Venting System

Passive gas venting wells will be installed through the waste/fill to relieve gas buildup beneath the cover system at a density of approximately one per acre to yield 5 wells. In general, the gas venting wells will be constructed of 4-inch Schedule 40 PVC with 180 degree (gooseneck) risers and wire bird screens. Gas venting wells will be installed a minimum of 5 feet into the waste or to the top of native soils, whichever is encountered sooner, and will be screened in an approximate 3-foot diameter annular space filled with washed backfill material having a minimum permeability of 1 x $10^{-3}$ cm/s. Waste material excavated during gas vent installation will be disposed within the consolidation area subgrade.

### 1.1.5 Groundwater Monitoring Network

The July 2006 Post-Remedial Groundwater Monitoring Plan (Ref. 3) prepared for the Peter Cooper Markhams Site will be used to detect changes in Site conditions following implementation of remedial measures. Groundwater monitoring will include both water quality and water level monitoring. Samples will be collected on a semi-annual (spring and fall) basis for the first two years of monitoring, and may be reduced to annually thereafter if the data supports the reduction. The Post-Remedial Groundwater Monitoring Plan identifies groundwater and surface water sampling locations; collection procedures; analytical parameters and methodology; and data reporting and interpretation requirements that will be implemented following construction of the recommended remedial measures.

Groundwater monitoring will be performed at the following network locations, where the "S" identifier indicates a shallow overburden monitoring well:

- Upgradient monitoring well MW-9S.
- Perimeter downgradient monitoring wells MW-5S, MW-7S, and MW-8S.
- Downgradient Wetland F (surface water).

In addition, the following locations will be monitored for water elevation information to facilitate preparation of overburden isopotential maps:

- Monitoring wells MW-4S and MW-6S.

Monitoring well MW-2SR (between Wetland B and waste/fill consolidation area) is slated to undergo replacement and sampling during the remedial measures construction. Depending on analytical results, monitoring well MW-2SR may be retained for continued monitoring.

# 2.0 POST-CONSTRUCTION ACTIVITIES

## 2.1 Program Responsibilities

Post remedial construction activities at the Peter Cooper Markhams Site are the responsibility of the Respondents who entered into a Consent Decree to complete the remedial measures. Benchmark Environmental Engineering & Science, PLLC will assist in performing monitoring and maintenance related to the site, including routine cover system maintenance and repairs; environmental monitoring; and preparation of reports.

## 2.2 Site Contacts

As indicated above, post-remedial operations, maintenance, and monitoring requirements as well as corrective measures, if necessary, are the responsibility of the Respondents. The United States Environmental Protection Agency (USEPA) will serve as the regulating agency for these efforts. The contact persons for these parties are listed below:

**Representatives for Respondents**

Dr. Michael Joy
Lipman Biltekoff, LLP
333 International Drive
Williamsville, NY 14221

Mr. John Wittenborn
Kelley Drye & Warren, LLP
Washington Harbour, Suite 400
3050 K Street, NW
Washington, DC 20007-5108

**USEPA**

Ms. Sherrel Henry
Peter Cooper Markhams Superfund Site Project Coordinator
U.S. Environmental Protection Agency, Region II
Emergency and Remedial Response Division
290 Broadway - 20th Floor
New York, NY 10007-1866

## 2.3 Site Monitoring

The July 2006 Post-Remedial Groundwater Monitoring Plan (Ref. 3) prepared for the Peter Cooper Markhams Site will be used to detect changes in Site conditions following implementation of remedial measures. Groundwater monitoring will include both water quality and water level monitoring. Samples will be collected on a semi-annual (spring and fall) basis for the first two years of monitoring, and may be reduced to annually thereafter if the data supports the reduction. The Post-Remedial Groundwater Monitoring Plan identifies groundwater and surface water sampling locations; collection procedures; analytical parameters and methodology; and data reporting and interpretation requirements that will be implemented following construction of the recommended remedial measures.

## 2.4 Site Inspection

Inspection and maintenance of the Peter Cooper Markhams Site will be performed by Benchmark personnel experienced in the construction and inspection of remedial measures involving cover systems. During the first year of post-closure care and monitoring, the site will be inspected by Benchmark after major rainfall events or, in the absence of major rainfall events, on a minimum of two occasions coincidental with groundwater monitoring events. For the purposes of these inspections, a major rainfall event refers to a 2-year, 6-hour storm with a rainfall accumulation of approximately 1.6 inches (Northeast Regional Climate Center). The Peter Cooper Markhams Site will be inspected for:

- Integrity of cover, including:
  - Erosion or settling of cap materials
  - Cracking/breaches in cover
  - Loss of slope
  - Pooling or ponding of surface water
  - Loss of vegetative cover
  - Presence of undesirable plant or animal species

- Visible debris, litter and waste from illegal dumping activities.

- Integrity of gas vents.

- Integrity of access roads and gate.

- Integrity of monitoring wells, including but not limited to working locks, adequate surface seals and protective casings, and sediment intrusion.

Inspection findings will be recorded on the Post-Closure Field Inspection Report (see Appendix B). The results of the inspections shall be transmitted to the USEPA Project Coordinator following review and any problems recorded over the course of the year will be summarized in the annual groundwater monitoring report described in Appendix A. After the first two years of post-closure care and monitoring, site inspections will be performed on an annual basis.

## 2.5 Routine Site Maintenance

A discussion of typical site maintenance requirements is presented below.

### 2.5.1 Cover System Maintenance

Cover system maintenance will be performed over the 30-year post-closure care period. Routine maintenance will include the hand or small equipment removal of woody vegetation on the cover system to prevent the development of deep rooted vegetation. This operation will be scheduled annually, in mid-summer to avoid disturbance of potential ground-nesting wildlife.

The need for cover repairs due to minor erosion and/or settling will be determined each time the site is inspected and mowed. Any signs of erosion, burrowing or other site maintenance problems will be corrected as soon as possible. All bare spots in the final cover vegetation will be reseeded and fertilized. Seed and fertilizer will be of the same general type and quality as originally specified (see Appendix C).

If erosion or settling indicates the need for cover soil repair, it will be made following the same procedures and will use the same materials that were used during the original construction activities.

### 2.5.2 Access Road and Gate

The access road to the Site will be maintained in passable condition by vehicle so that routine inspections and required maintenance activities on the consolidated waste fill area can be carried out. The gate will be inspected concurrent with the access road and will be repaired, if necessary, to assure working condition and discourage trespassing.

### 2.5.3 Gas Vent System

During the quarterly site inspections, gas vents will be inspected for overall integrity, plugging, and damage. Plugged gas vents will be assessed to determine the source of the blockage and mitigated during the inspection as necessary. Damaged gas vents will be repaired or rebuilt to restore them to original design configuration. Any sign of stressed vegetation (i.e., yellowed, browned, or absent) either immediately around the gas vents or across the site will be noted on the Post-Closure Inspection Report.

### 2.5.4 Groundwater Monitoring System

The integrity of all groundwater monitoring wells will be evaluated as part of routine groundwater monitoring events scheduled during post-closure. Monitoring well integrity, including but not limited to sediment intrusion, working locks, adequate surface seals, and protective casings, will be evaluated. In addition, the well riser will be inspected for cracks and damage. Well repair, if necessary, will be performed to restore the well to original construction conditions.

If it is determined through long-term monitoring that a well no longer provides adequate information pertinent to post-closure monitoring or a monitoring well requires replacement, a well decommissioning request will be drafted, submitted to the USEPA for approval, and implemented in accordance with Benchmark's standard operating procedures presented in the Post-Closure Groundwater Monitoring Plan (see Appendix A). A procedure for new well installation will be submitted for replacement wells, if required.

## 2.6 Remedial Measures Performance Evaluation

The remedial measures performance evaluation will focus on the efficacy of the waste/fill consolidation and low-permeability cover system in reducing off-site groundwater contaminant loadings. As such, it is necessary to periodically confirm that the remedial measures are in fact preventing off-site migration of contaminant concentrations at an unacceptable level. This will be accomplished through a combination of: off-site (downgradient) groundwater monitoring southwest of the consolidated waste fill area and groundwater elevation monitoring. The

Groundwater Monitoring Plan for the site, presented as Appendix A, describes the proposed monitoring approach in detail.

The performance evaluation will consider the off-site groundwater monitoring data against NYSDEC Class GA groundwater quality standards and guidance values, as well as historic and ongoing results to check for concentration trends.

# 3.0 CONTINGENCY MEASURES

## 3.1 General

The objective of this Section is to establish procedures for handling cover system damage or other detrimental Site conditions that occur outside the scope of routine maintenance.

Natural occurrences such as storms, drought, and subsidence should be considered "expected occurrences" and are addressed under Section 2.3. Other occurrences that are not expected to occur but may be discovered during a routine post-closure inspection are presented below. All corrective action, where appropriate, will be executed in a timely fashion after notifying the USEPA Site Project Coordinator.

## 3.2 Leachate Breakout

Leachate breakouts through the cover system would typically be discovered during regularly scheduled site inspections. Breakouts are often characterized by clear or discolored localized seepage through the consolidation area cover. The most likely location for such a breakout would be along the lower slope or toe of the consolidated fill area. Damage from such a breakout will be repaired as quickly as possible with soil materials and methods as specified in the remedial construction specifications (see Appendix C). Areas where leachate breakouts occur will receive additional cover material that shall be compacted and covered with topsoil for vegetative growth.

If cover repair/supplement methods to control leachate are unsuccessful Benchmark will prepare a work plan, for submittal to and approval by USEPA, to determine appropriate response efforts. These may include more aggressive actions to control, minimize, or eliminate the conditions that are contributing to leachate breakout, or collection and onsite or offsite treatment and disposal of leachate.

## 3.3 Severe Erosion and Compromise of Cover System Integrity

Similar to leachate breakouts, erosion and a compromise of cover system integrity would be discovered during regularly scheduled site inspections. The cause of severe erosion will be investigated and repairs will be made consistent with the remedial construction specifications. These may include:

- Stripping and stockpiling topsoil and barrier protection layer material from the affected area for major soil cover material repairs.

- Regrading and recompacting the affected area with barrier soils in accordance with the specifications for barrier layer construction.

- Replacing topsoil and reseeding in accordance with the specifications for topsoil and turf.

If the cause of severe erosion is attributable to a condition that is likely to be frequently repeated (e.g., a surface water shedding pattern), Benchmark will prepare and submit to USEPA for approval a proposed design modification to mitigate the problem.

## 3.4 Unauthorized Dumping or Disposal

Unauthorized dumping or waste disposal will be reported to the USEPA, NYSDEC and local law enforcement officials. Appropriate measures will be taken to determine the waste characteristics, containment requirements, and necessary removal techniques. The waste will be removed and disposed of at an approved disposal facility. Efforts will be taken to eliminate further dumping and restrict subsequent entry to the site. Persons found responsible for illegal dumping will be prosecuted according to the law and will be held accountable for all costs incurred in removing and disposing the waste.

## 3.5 Vectors

As a part of each site inspection event, evidence of vectors will be recorded and described in the Post-Closure Field Inspection Report. Vectors include but are not limited to rodents, insects and birds. In the event that a vector problem does arise, a plan for corrective action (e.g., trapping or extermination program implemented by licensed professionals) will be submitted to the USEPA for approval and implemented accordingly.

## 3.6 Air Contamination

Based on Remedial Investigation findings, gas venting to the atmosphere is not anticipated to present a health or fire risk based on conditions measured during advancement of waste fill soil borings. Should it be suspected that methane gas generation poses an explosion or human health hazard, Benchmark will notify the USEPA. If it is determined that such a hazard is present, a work plan will be developed, for submission to and approval by the USEPA, to determine if the venting system is functioning properly and to determine the appropriate response actions. Possible response actions include replacing portions of the venting system, adding new vents, or installing an active gas withdrawal system. Any proposed remedial actions would be approved through the USEPA prior to implementation

## 3.7 Fire

Fires will be immediately reported to the local fire department. Fires will be quenched according to approved fire department protocol. Damage to the gas vents, surface drainage system, or final cover materials will be repaired where these systems have been compromised.

## 3.8 Vandalism

Vandalism will be reported to the local law enforcement authorities. If vandals have gained entry to the site, appropriate measures will be taken to eliminate or restrict future access. Vandalism to site structures, including gas and groundwater collection, groundwater monitoring and surface water management systems will be repaired as appropriate where the damage is determined to have compromised the integrity of the final cover or the function of the surface drainage system. Persons found in the act of site vandalism will be prosecuted according to the law and will be held responsible for all costs incurred in repairing the damage to pre-existing conditions.

## 3.9 Emergency Phone Numbers

The following telephone numbers should be used in the event of an emergency at the site:

| | |
|---|---|
| **<u>Hospital</u>** | **<u>Fire Department</u>** |
| **Tri-County Memorial Hospital** | **Dayton Fire District #1** |
| 100 Memorial Drive | 9604 Allen Street |
| Gowanda, NY 14070-1111 | Dayton, NY 14041 |
| (716) 532 -3377 | (716) 532-2627 |
| **<u>Ambulance</u>** | **<u>Police</u>** |
| **Gowanda Ambulance Service** | **Gowanda Police Dept.** |
| 56 Chestnut Street | 27 E Main Street |
| Gowanda, NY 14070 | Gowanda, NY 14070 |
| (716) 532-2323 | (716) 532-2020 |

The site location is:
Peter Cooper Markhams Site
Bentley Road
Markhams, New York
(approximately 6 miles south of Gowanda, NY)

## 3.10 Emergency Procedures and Evacuation Route

Benchmark employees, local fire, police, emergency response teams, hospitals, and/or contractors who may be working at the site will be informed of the site location, layout, and potential site safety hazards. In case of an emergency, all on-site personnel will meet at the northwest end of the access road where it intersects with Bentley Road and await further instruction. Figure 3 presents the hospital route. Directions to the hospital are as follows (approximately 8.3 miles):

1. From the Site turn right onto Bentley Rd.
2. Make a slight right onto Markham Road (Route 57)
3. Make a slight left onto Route 62 (Fair Plains Rd.).
4. Continue on Route 62 (Jamestown St.) into Gowanda until the five-way intersection
5. Turn left at the intersection onto West Main Street and travel west for 3 blocks.
6. At Aldrich Street turn right and proceed north to the first street on the left, Memorial Drive.

7. Make a left onto Memorial Drive and proceed to the Tri-County Memorial Hospital at 100 Memorial Drive

8. The hospital will be on the right side of Memorial Drive. Follow signs to ER.

# 4.0 HEALTH AND SAFETY PLAN

The Site-Specific Health and Safety Contingency Plan (HSCP) developed for use during implementation of remedial measures will be used during post-remedial on-site activities. Site representatives, contractors, and any other persons performing work at the Site shall be required to develop and enforce a HSCP as or more stringent than Benchmark's HSCP.

# 5.0 DOCUMENTATION REQUIREMENTS

## 5.1 Semi-Annual Reporting

All groundwater monitoring data will be submitted to the site contacts listed in Section 2.3 on a semi-annual basis approximately 60 days after completion of sampling activities unless otherwise agreed to with the USEPA. This information will be accompanied by a brief cover letter from Benchmark that summarizes the environmental data, describes the monitoring covered by the reporting period, and notifies the USEPA of any problems/corrective measures taken.

It is the intention of the Post-Closure Groundwater Monitoring Plan to perform semi-annual (i.e., spring and fall) monitoring for the first two years of post-closure. Subsequent to completion and semi-annual report submission, groundwater monitoring will be conducted on an annual basis thereafter. Annual reporting will thereafter be performed in accordance with Section 5.2 of this Plan.

## 5.2 Annual Reporting

An Annual Monitoring and Maintenance Summary Report, which will include the following, will be prepared and submitted to the site contacts listed in Section 2.3:

- Results of post-closure site inspections.
- A discussion of site maintenance activities.
- A summary of groundwater elevation measurements. These results will be tabulated and used to prepare groundwater isopotential contour maps.
- A summary of semi-annual monitoring results including contraventions of New York State Water Quality Standards.
- A discussion of sample analytical results, including elevations of parameters above background concentrations.
- A discussion of changes in groundwater quality that has occurred throughout the year.
- Any proposed changes to the Post-Closure Groundwater Monitoring Plan.

# 6.0 REFERENCES

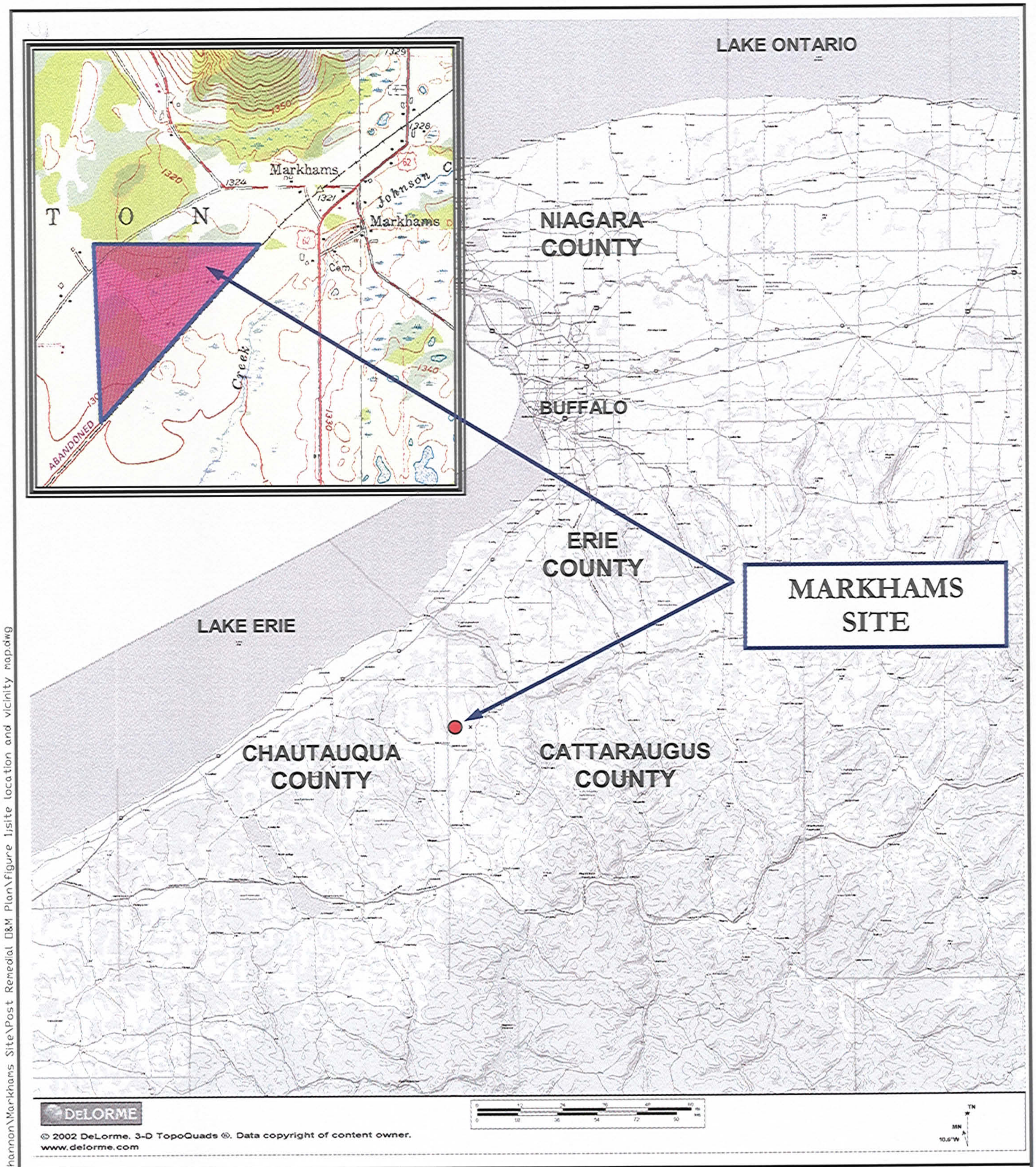
1. Obrien & Gere Engineers, Inc. 1971. *Peter Cooper Corporations, Gowanda, NY - Solid Waste Management*. November.

2. Benchmark Environmental Engineering and Science, PLLC. 2007. *Remedial Design Work Plan for Peter Cooper Markhams Site, Dayton, New York*. May.

3. Benchmark Environmental Engineering and Science, PLLC. 2006. *Post-Remedial Groundwater Monitoring Plan for Peter Cooper Markhams Site, Dayton, New York*. July.

# FIGURES

## FIGURE 1



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**BENCHMARK**
ENVIRONMENTAL ENGINEERING & SCIENCE, PLLC

726 EXCHANGE STREET
SUITE 624
BUFFALO, NEW YORK 14210
(716) 856-0599

PROJECT NO.: 0021-003-400

DATE: JANUARY 2008

DRAFTED BY: AJZ

# SITE LOCATION AND VICINITY MAP

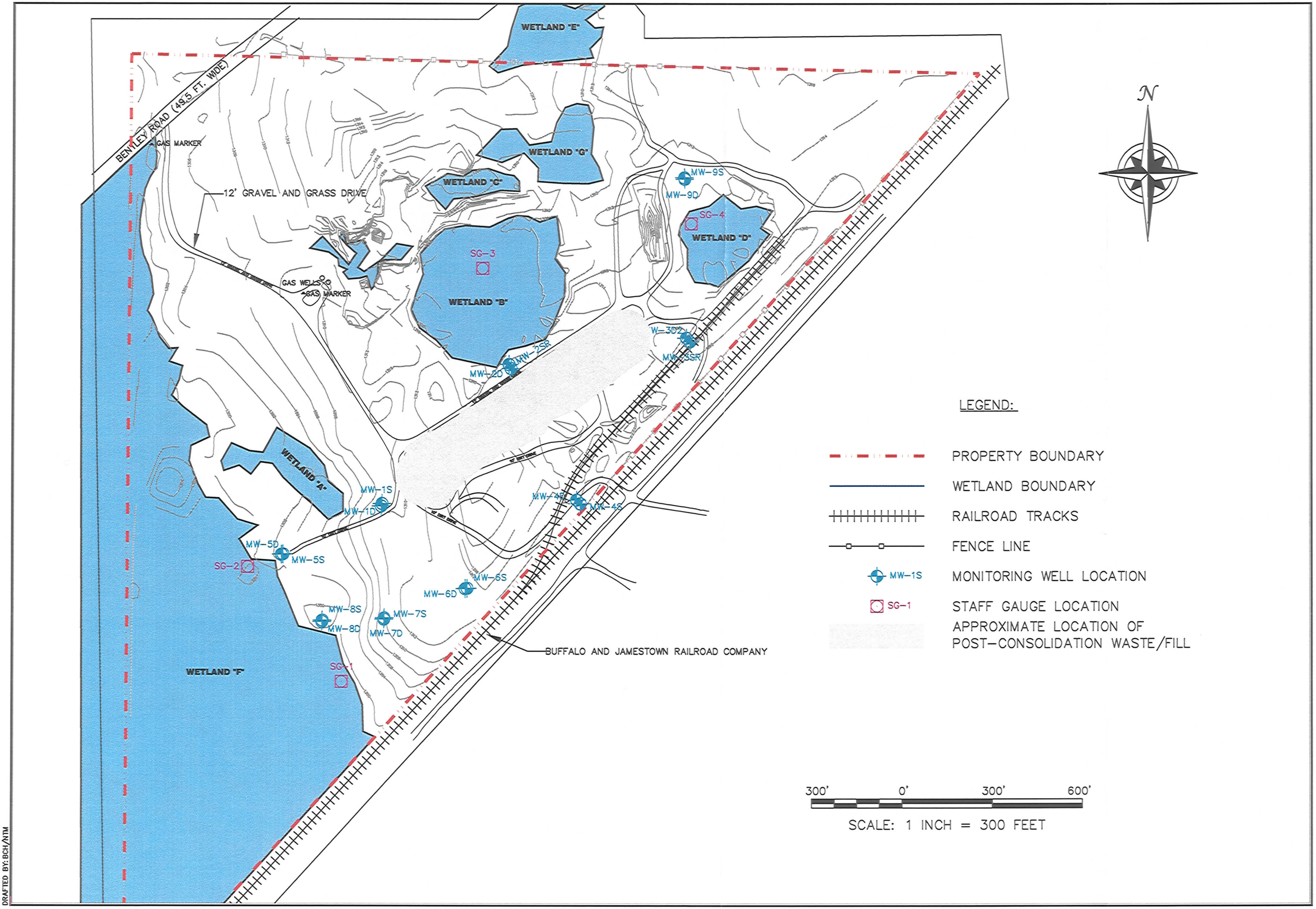
POST-REMEDIAL OPERATION & MAINTENANCE PLAN

PETER COOPER MARKHAMS SITE
DAYTON, NEW YORK

PREPARED FOR

RESPONDENTS FOR PETER COOPER MARKHAMS SITE

ILEPATH:\CAD\Benchmark\Collier Shannon\Markhams Site\Post Remedial O&M Plan\figure 1;site location and vicinity map.dwg



F:\CAD\Benchmark\Collier Shannon\Markhams Site\Post Remedial O&M Plan\Figure 2; Existing Site Plan.dwg, 1/9/2008 2:39:08 PM

DATE: JANUARY 2008
DRAFTED BY: BCH/NTM

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(716) 856-0599

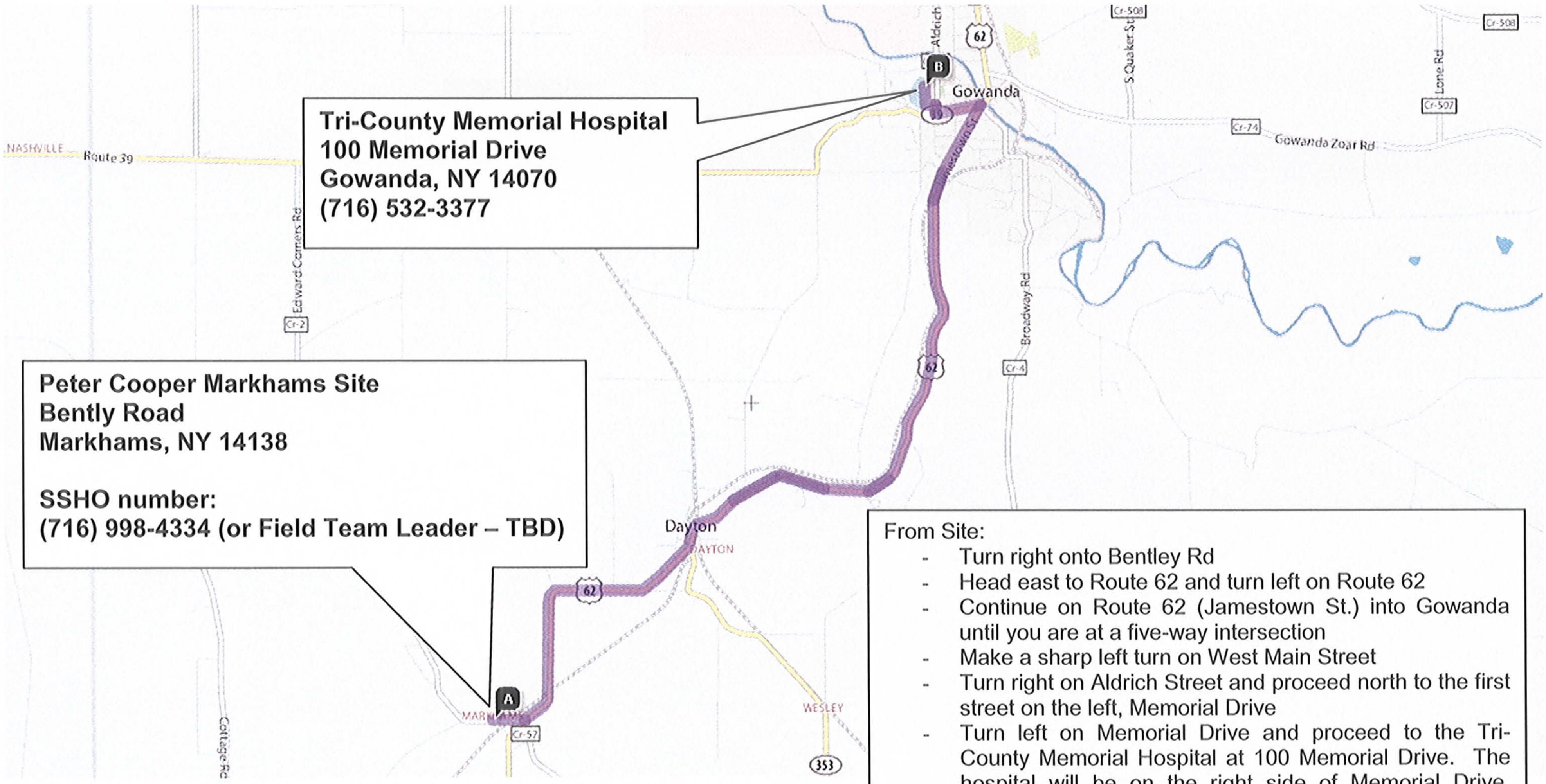
JOB NO.: 0021-003-400

## SITE PLAN

POST-REMEDIAL OPERATION & MAINTENANCE PLAN
PETER COOPER MARKHAMS SITE

DAYTON, NEW YORK
PREPARED FOR
RESPONDENTS FOR PETER COOPER MARKHAMS

**FIGURE 2**



**Tri-County Memorial Hospital**
**100 Memorial Drive**
**Gowanda, NY 14070**
**(716) 532-3377**

**Peter Cooper Markhams Site**
**Bently Road**
**Markhams, NY 14138**

**SSHO number:**
**(716) 998-4334 (or Field Team Leader – TBD)**

From Site:

- Turn right onto Bentley Rd
- Head east to Route 62 and turn left on Route 62
- Continue on Route 62 (Jamestown St.) into Gowanda until you are at a five-way intersection
- Make a sharp left turn on West Main Street
- Turn right on Aldrich Street and proceed north to the first street on the left, Memorial Drive
- Turn left on Memorial Drive and proceed to the Tri-County Memorial Hospital at 100 Memorial Drive. The hospital will be on the right side of Memorial Drive. Follow signs to Emergency Room.

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PROJECT NO.: 0021-003-400

DATE: JANUARY 2008

DRAFTED BY: AJZ

# HOSPITAL ROUTE MAP

POST-REMEDIAL OPERATION & MAINTENANCE PLAN

PETER COOPER MARKHAMS SITE
DAYTON, NEW YORK

PREPARED FOR
RESPONDENTS FOR PETER COOPER MARKHAMS SITE

**FIGURE 3**

# APPENDIX A

# POST-CLOSURE GROUNDWATER and SURFACE WATER MONITORING PLAN

## PETER COOPER MARKHAMS SITE
## DAYTON, NEW YORK

January 2008 0021-003-400

# POST-CLOSURE GROUNDWATER AND SURFACE WATER MONITORING PLAN

# PETER COOPER MARKHAMS SITE
# DAYTON, NEW YORK

## Table of Contents

# POST-CLOSURE GROUNDWATER AND SURFACE WATER MONITORING PLAN

# PETER COOPER MARKHAMS SITE
# DAYTON, NEW YORK

## Table of Contents

## LIST OF TABLES

## LIST OF FIGURES

## APPENDICES

# 1.0 PURPOSE AND OBJECTIVES

The purpose of this Post-Closure Groundwater and Surface Water Monitoring Plan is to identify and document the methods that will be employed at the Peter Cooper Markhams Site to detect changes in Site conditions following implementation of remedial measures. Accordingly, this Plan identifies groundwater and surface water sampling locations; collection procedures; analytical parameters and methodology; and data reporting and interpretation requirements that will be implemented following construction of the recommended remedial measures.

This Plan contains eight sections:

- Section 2.0 identifies the post-remedial monitoring locations to be sampled.
- Section 3.0 identifies the monitoring parameters and frequency.
- Section 4.0 presents field sampling procedures to be employed at the Site.
- Section 5.0 specifies analytical methods and quality control requirements.
- Section 6.0 presents corrective action measures to be taken in the event of changed field conditions or failure to meet quality assurance goals.
- Section 7.0 identifies data evaluation and reporting requirements
- Section 8.0 presents references cited in this report.

## 2.0 MONITORING NETWORK

The Remedial Investigation Report for the Peter Cooper Markhams Site indicates that overburden groundwater flows in a southwesterly direction across the Site toward Wetland F. There are comparable hydraulic conductivities between shallow and deep wells, with no separating confining layer and similar geochemistry, indicating that the shallow and deeper units represent a single hydrostratigraphic unit. Accordingly, monitoring of select upgradient and downgradient shallow overburden wells and surface water from Wetland F will provide representative data to evaluate changes in site conditions. The planned groundwater and surface water monitoring network is described below.

### 2.1 Monitoring Locations

Groundwater monitoring will be performed at the following network locations (see Figure A-1), where the S identifier indicates a shallow overburden monitoring well:

- Upgradient monitoring well MW-9S.
- Cross-gradient monitoring well MW-2SR (between Wetland B and waste/fill consolidation area). Well MW-2SR will be installed as a replacement for MW-2S during remedial construction measures.
- Perimeter downgradient monitoring wells MW-5S, MW-7S, and MW-8S.
- Downgradient Wetland F (surface water).

In addition, the following locations will be monitored for water elevation information to facilitate preparation of overburden isopotential maps:

- Monitoring wells MW-4S and MW-6S.

Construction logs for the groundwater monitoring wells identified above are included in Appendix A-1. A borehole log for MW-2S will be generated following construction.

# 3.0 MONITORING PROGRAM

As described in Section 3.0, on-site groundwater monitoring will be conducted at specific monitoring wells and Wetland F. Details concerning the planned monitoring frequency, parameters, and analytical methods are described below. A summary of the monitoring program requirements is presented in Table 1.

Groundwater monitoring will include both water quality and water level monitoring. Water level monitoring is intended to detect seasonal changes in the groundwater flow direction Groundwater elevation monitoring will be performed at all monitoring well locations identified on Table 1.

Samples will be collected at the surface water and monitoring well locations identified in Section 2.1 and summarized in Table 1. Procedures for well sampling are discussed in Section 5.0. Groundwater levels and surface water elevation will be recorded prior to well purging. Samples will be collected on a semi-annual (spring and fall) basis for the first two years of monitoring, and may be reduced to annually thereafter if the data supports the reduction. Samples will be analyzed for the parameters identified on Table 1. Laboratory and field parameters will be evaluated for reduction following two years of monitoring.

## 4.0 FIELD SAMPLING PROCEDURES

This section describes the sampling procedures that will be implemented at the Peter Cooper Markhams Site during routine environmental monitoring events.

### 4.1 Pre-Sampling Preparation

Prior to a scheduled sampling event, the following steps will be taken by sampling personnel:

- Review the sampling procedures.
- Assemble and inspect all field equipment necessary for sample collection.
- Verify that equipment is clean and in proper working order.
- Calibrate field test equipment at the beginning of each sampling day according to manufacturer's specifications. Field instrumentation will be maintained and operated according to the applicable guidelines presented in Appendix A-2.
- Examine shuttles, bottles, labels, and preservatives; contact laboratory immediately if any problems are discovered.
- Confirm sample delivery time and method of shipment with the laboratory.
- Establish a sampling team of at least two people.
- Establish monitoring well evacuation and sampling schedule for the activities of each day.

### 4.2 Groundwater Sampling

Applicable guidelines to be employed for collecting representative groundwater samples from monitoring wells and surface water samples from the wetland are provided in Appendix A-2. Applicable guidelines include:

- Groundwater Level Measurement
- Low-Flow (Minimal Drawdown) Groundwater Purging Procedures
- Groundwater Sample Collection Procedures
- Surface Water Collection Procedure

Groundwater sample collection equipment will consist of a peristaltic pump and dedicated pump tubing following low-flow purge and sample collection procedures. Prior to sample collection, groundwater will be evacuated from each well at a low-flow rate (approximately 0.1 L/min) and field measurements for pH, Eh, specific conductance, temperature, turbidity, dissolved oxygen, visual/olfactory observations, and water level will be periodically recorded and monitored for stabilization. Purging will be considered complete when pH, specific conductivity and temperature stabilize and when the turbidity is measured below 50 NTU, or stabilized above 50 NTU. Stability is defined as the variation between field measurements of 10 percent or less and no overall upward or downward trend in the measurements. Upon stabilization of field parameters, groundwater samples will be collected and analyzed for the parameters presented in Table 1.

Surface water samples will be collected by carefully immersing a sample collection jar, attached to a dipper, into the water column. The contents of the collection jar will then be transferred to preserved laboratory bottles for analysis.

Prior to and immediately following collection of groundwater samples, field measurements for pH, specific conductance, temperature, turbidity, Eh, dissolved oxygen, as well as visual/olfactory observations and water level, will be recorded.

## 4.3 Post-Sampling Handling

All collected samples will be placed in pre-cleaned, pre-preserved laboratory provided sample bottles, cooled to 4°C in the field, and transported under proper chain-of-custody command to a qualified testing laboratory for analysis within proper holding times (see Section 6.2). A chain-of-custody form will be completed for each bulk container (i.e., cooler) of collected samples. The chain-of-custody form will be signed and dated by the person who performed sample collection, the person the samples were relinquished to for transport to the laboratory (if applicable) and the laboratory sample custodian who receives the samples. The applicable guideline for sample labeling, storage, and shipment is presented in Appendix A-2. The types and frequencies of field QA/QC samples to be collected are discussed in Section 6.0.

## 4.4 Field Equipment Cleaning

Non-dedicated purging equipment and water level monitoring probes will be cleaned before each use in accordance with the procedure for Non-Disposable and Non-Dedicated

Sampling Equipment Decontamination presented in Appendix A-2. Peristaltic pump tubing will be dedicated to each monitoring well and will not require cleaning other than that provided by the manufacturer. Dedicated equipment must be maintained within the sealed original manufacturer's packaging prior to installation at each monitoring location.

## 4.5 Documentation of Field Activities

The results of all field measurements and associated calculations will be recorded on standard forms included with the guidelines presented in Appendix A-2. During all activities, the following general information will be recorded on appropriate data sheets:

- Date
- Field sampling crew members
- Meteorological conditions
- Brief description of field activities planned for date indicated
- Tailgate Health and Safety meeting topics
- Location where work is performed
- Problems encountered and corrective actions taken
- All field measurements or descriptions made
- Any modifications made to sampling procedures

In addition, the following information will be recorded by the Field Team Leader during the collection of all environmental samples:

- Sample Locations and summary of the samples collected
- Completeness of the sampling effort
- Sample descriptions
- Results of all field measurements
- Results of field instrument calibrations
- Sample preservation used (if applicable)
- Chain-of-custody information.

All original forms and field notebooks will be placed in a project record file maintained at an agreed upon location.

# 5.0 SAMPLE ANALYTICAL PROGRAM

## 5.1 Parameters for Physical/Chemical Analysis

The analytical parameters that will be analyzed in the monitoring programs discussed in this Plan are listed in Tables 1 and 2.

## 5.2 Analytical Methods/Protocols

The methods that will be used for chemical analysis of all samples collected during this monitoring program are presented in Table 2. The sampling holding times, preservation, and container requirements are also presented.

## 5.3 Groundwater Monitoring Program Field Quality Control Samples

The following field quality control samples will be analyzed in support of the monitoring program at the Peter Cooper Markhams Site:

- **Blind Duplicate** - One blind duplicate will be collected and analyzed per 20 samples collected during each sampling event. The field sample containers will be returned to the laboratory identified only as the "blind duplicate". The well or sample location will be recorded in the Project Field Book and on the respective Water Sample Collection Log (see Appendix A-2) and the results will be compared to review analytical precision.

- **MS/MSD** – A sufficient volume of sample will be collected at one sampling location per sampling event for matrix spike/matrix spike duplicate (MS/MSD) analysis. The laboratory will report the results of the MS/MSD analysis, which will be reviewed for sampling and analysis precision and accuracy.

## 5.4 Laboratory Quality Control/Reporting Requirements

Laboratory quality control and reporting requirements will be as identified in the sections below.

### 5.4.1 General

- The laboratory will perform all standard in-house quality assurance/quality control (QA/QC) necessary to control the introduction of contamination in the lab and to insure the accuracy and precision of the data.

- The laboratory will strictly adhere to the quality control requirements specified in the analytical method references presented in Table 2.

- All laboratories involved in the monitoring program must be certified in the New York State Department of Health (NYSDOH) National Environmental Laboratory Approval Program (NELAP) for the parameters being analyzed.

### 5.4.2 Laboratory Quality Control Analyses

The laboratory will analyze the following quality control samples in addition to the field quality control samples described above:

- **Method Blanks** – Method Blanks will be analyzed at least once per batch. If a particular reagent or piece of analytical equipment used is changed during preparation of a sample batch, additional testing will be required.

- **Surrogates** – For volatile organic analyses, surrogate standards are added to each sample and recoveries are calculated for method performance accuracy. Surrogate standard recoveries will be reported according to USEPA SW-846 reporting and deliverable requirements.

### 5.4.3 Reporting and Deliverable Requirements

The laboratory must adhere to USEPA SW-846 reporting and deliverable requirements unless otherwise directed. The laboratory will submit the analytical report within 30 business days of receipt of the last batch of samples. The analytical report will also include for each sample:

- Sample location/sample number
- Date collected
- Date extracted or digested
- Date analyzed
- Analytical methodology (including preparation methodology)
- Method detection limits
- Sample dilution factor (if applicable)
- Chain-of-Custody forms

The analytical report also must contain a case narrative that will describe all QA/QC problems encountered during sample analysis. For each sample for which QA/QC problems are encountered, the following specific information will be reported in the case narrative:

- Sample identification number
- Sample matrix
- Parameters analyzed
- Data acceptance criteria exceeded
- Specific analytical problems that occurred
- Corrective action taken or attempted to resolve the problem(s)

## 5.5 Custody Procedures

Sample custody is controlled and maintained throughout the sample collection and analysis process. These procedures track and control the possession of sample from their source, in the field, to their final disposition, the laboratory. Laboratory chain-of-custody procedures further track the custody of samples during their tenure at the laboratory. A sample is in custody if it is:

- In someone's physical possession.
- In someone's view after being in physical possession.
- In a designated secure area.
- Placed in a locked container by an authorized individual.

This section discusses procedures to be used to adequately control and document sample custody.

### 5.5.1 Chain-of-Custody (COC) Forms

Chain-of-custody (COC) forms will be used to document the possession and transfer of custody of all samples. Typical information that will be supplied on the forms includes, but is not limited to:

- Field sample identification.
- Sample date and time of collection.
- Type of sample container.
- Sample location and depth (if applicable).
- Size and number of containers.
- Analyses required.

The COC form will be initiated and signed by the field sampling team. The method of shipment, name of the courier and any other pertinent information should be entered in the "remarks" section. The original copy accompanies the sample shipment and a copy is retained by the Field Team Leader. The completed COC form will be placed in a resealable plastic bag and taped to the underside of the lid of the cooler containing the samples designated on the form. A copy of the carrier air-bill (if applicable) will be retained as part of the permanent COC documentation.

When relinquishing custody, the transferor and transferee must sign, date and time the COC form. Each person accepting custody of sample(s) will note their condition on the form. This record documents transfer of custody of samples from the sampler to another person, to the laboratory or to/from a secure storage area.

### 5.5.2 Custody Seals

Custody seals are preprinted adhesive-backed seals with security slots designed to break if the seals are disturbed. Custody seals should be placed on sample shipping containers as necessary to detect tampering. Seals must be signed and dated before using. Clear strapping tape should be placed over the seals to ensure that the seals are not accidentally broken during shipment, while maintaining an accurate assessment of the shipment integrity.

### 5.5.3 Field Custody Procedures

The sample packaging and shipment procedures summarized below will ensure that the samples will arrive at the laboratory with the COC intact. The procedures for sample numbering are included in the field operating procedures presented in Appendix A-2. The basic COC sequence is as follows:

1. Use laboratory supplied sample containers.
2. Collect and preserve sample (if not pre-preserved) and seal container.
3. Complete sample label and place on container.
4. Document the sampling procedures and related information in the Project Field Book and on a Water Sample Collection Log form.
5. Complete COC record form.

6. Document custody transfers from field sampling personnel to anyone else with signatures, date, and time on COC record form.

7. Pack sample containers for shipment with proper preservatives and custody forms into cooler.

The Field Team Leader is personally responsible for the care and custody of the samples until they are transferred or properly dispatched. All bottles will be identified by the use of sample labels with unique sample numbers. The sample numbering system is presented in the FOP for sample labeling; storage and shipment (see Appendix A-2). The Field Team Leader is also responsible for the following:

- Ensuring only precleaned sample containers will be used and the coolers and/or boxes containing the empty sample containers are sealed with a custody tape seal during transportation to the field and while in storage prior to use. In the field, the precleaned sample containers will be stored in a secure location.

- Maintaining custody to so that as few individuals as possible handle the samples.

- Accurately recording and maintaining all sample data in the Project Field Book and ensuring all appropriate forms are completed.

- Determining whether proper custody procedures were followed during the sampling event and decide if additional samples are required.

- Ensuring proper completion of COC for each cooler in which samples are shipped. The samples must be shipped to the laboratory as soon as practical and must arrive within 24 hours of shipping.

### 5.5.4 Laboratory Custody Procedures

Laboratory custody procedures for sample receiving and log-in; sample storage and numbering; tracking during sample preparation and analysis; and storage of data will be performed in accordance with the analytical laboratory's QA/QC procedures.

# 6.0 CORRECTIVE ACTION

Corrective action is the process of identifying, recommending, approving, and implementing measures to counter unacceptable procedures or performance that can affect data quality. Corrective action can occur during field activities, laboratory analyses, data validation (if applicable) and data assessment. All corrective action proposed and implemented will be documented on a Corrective Measures Report (see sample report in Appendix A-3). Corrective action should be implemented only after approval by the Project Manager, or his or her designee. If immediate corrective action is required, approvals should be secured by telephone from the Project Manager.

It shall be the responsibility of the project team, sampling team and laboratory staff to ensure that all measurement and sampling procedures are followed as specified and that measurement data meet the prescribed acceptance criteria. If problems are discovered, prompt corrective action will be taken.

## 6.1 Field Corrective Action

If errors in field procedures are found during the observation or review of field activities by project staff, corrective action will be initiated. Nonconformance to the QA/QC requirements of the field procedures will be identified immediately by project staff that know or suspect that a procedure is not being performed in accordance with the requirements. The Project Manager or his/her designee will be informed immediately upon discovery of all deficiencies. Timely action will be taken if corrective action is necessary.

Corrective actions in the field may be required when the sample network is changed or when sampling procedures and/or field analytical procedures require modification, due to unexpected conditions. In general, the Field Team Leader and Project Manager may identify the need for corrective action. The Project Manager will approve the corrective measure that will be that will be implemented by the field team and it will be the responsibility of the Project Manager to ensure that corrective action has been implemented.

Corrective actions will be documented in the Project Field Book and on a Corrective Measures Report (see sample report in Appendix A-3). No staff member will initiate corrective action without prior communication of findings to the Project Manager. If corrective actions are insufficient, work may be stopped by the Project Manager. Once a corrective action is implemented, the effectiveness of the action will be verified by the Project Manger.

## 6.2 Laboratory Corrective Action

Corrective actions may be initiated if the quality assurance goals of the project are not achieved. The initial step in a corrective action is to instruct the analytical laboratory to examine its procedures to assess whether analytical or computational errors caused the anomalous result. Sample collection and handling procedures will be concurrently reviewed to assess whether they could have contributed to the anomalous result. If no error in laboratory procedures or sample collection and handling procedures can be identified, then the laboratory Project Director will assess whether reanalysis or resampling is required, or whether any protocol should be modified for future sampling events.

## 6.3 Corrective Action during Data Assessment

The need for corrective action may be identified during the data assessment process. Potential types of corrective action may include resampling by the field team or reinjection/reanalysis of samples by the laboratory. These actions are dependent upon the ability to mobilize the field team, and whether the data to be collected is necessary to meet the QA objectives (e.g., the holding times for samples is not exceeded, etc.). All required corrective actions will be documented by the Project Manager and/or the laboratory.

## 7.0 DATA EVALUATION AND REPORTING

Groundwater and surface water monitoring data generated in support of the Peter Cooper Markhams Site post-remedial monitoring program will be entered into a computer spreadsheet. The spreadsheet will be used for generating graphs showing the status and history of individual sampling points and compounds. The graphs and spreadsheets will also be used for historical trend analysis and to track environmental conditions within and offsite, as well as to assess performance of the remedial measures. A letter report will be prepared following the first semi-annual monitoring event. The letter reports will include:

- Sample collection date
- Groundwater elevation data
- Analytical results as compared to Class GA groundwater or surface water quality standards, as appropriate
- Upgradient well designation
- Sample location number
- QA/QC values
- Method detection limits
- Field sampling notes
- Chain-of-custody forms

An annual report will be prepared following the second semi-annual sampling event. In addition to the information described above, the annual report will include the following:

- A groundwater isopotential contour map for shallow overburden groundwater.

- A discussion of sample analytical results including elevations of parameters above background concentrations and historical trends evident from the data.

- A discussion of changes in water quality that has occurred from the previous year.

- A discussion of any proposed changes to the Peter Cooper Markhams Site Post-Remedial Monitoring Plan.

- A review of the data to either reduce the sampling frequency or reduce the parameter list, if warranted.

# 8.0 REFERENCES

1. Geomatrix Consultants, Inc. & Benchmark Environmental Engineering and Science, PLLC, Revised July 2006. *Remedial Investigation Report – Final, Peter Cooper Markhams Site, Dayton, New York.*

# Tables

# TABLE 1

## MONITORING PROGRAM REQUIREMENTS

### Peter Cooper Markhams Site
### Dayton, New York

| Sample Location | Est. Number of Samples Per Event[1] | Parameters | Frequency |
|---|---|---|---|
| *Upgradient Monitoring Well* | | | |
| MW-9S | 1 | Total Metals[2]<br>Field Measurements[3]<br>Water Quality Parameters[4] | Semi-Annually |
| *Cross-Gradient Monitoring Well* | | | |
| MW-2SR | 1 | Total Metals[2]<br>Field Measurements[3]<br>Water Quality Parameters[4] | Semi-Annually |
| *Monitoring Network Wells (water level and quality)* | | | |
| MW-5S | 1 | Total Metals2<br>Field Measurements3<br>Water Quality Parameters4 | Semi-Annually |
| MW-8S | 1 | | |
| MW-7S | 1 | | |
| Wetland F (Surface Water) | 1 | | |
| *QA/QC Samples [1]* | | | |
| Blind Duplicate | 1 | Total Metals[2] | Semi-Annually |
| Matrix Spike | 1 | | |
| Matrix Spike Duplicate | 1 | | |
| *Monitoring Network Wells (water level only)* | | | |
| MW-6S | -- | -- | Semi-Annually |
| MW-4S | | | |

Notes:

1. QA/QC samples will be collected at a frequency of 1 per 20 for each matrix.
2. Total metals include: arsenic, chromium, hexavalent chromium, manganese and iron; if field measured turbidity is greater than 50 NTU, dissolved metals will also be collected.
3. Field measurements include: pH, temperature, specific conductance, turbidity, Eh
4. Water quality parameters include: ammonia, nitrate, alkalinity, and total sulfide.

# TABLE 2

## SAMPLE CONTAINER, VOLUME, PRESERVATION & HOLDING TIME REQUIREMENTS

**Peter Cooper Markhams Site**
**Dayton, New York**

| Matrix | Parameter | Method (Reference 1) | Container Type | Minimum Volume | Preservation (Cool to 4°C for all samples) | Holding Time from Sample Date |
|---|---|---|---|---|---|---|
| Groundwater/Surface Water | Total Metals (excluding Hex Chrome) | 6010B | plastic | 600 ml | $HNO_3$ to $pH<2$ | 6 months |
| | Hexavalent Chromium | 7196A | plastic | 400 ml | Cool to 4 °C | 24 hours |
| | Ammonia | 350.1 | plastic | 500 ml | $H_2SO_4$ to $pH<2$ | 28 days |
| | Nitrate | 300 | plastic | 100 ml | $H_2SO_4$ to $pH<2$ | 48 hours |
| | Alkalinity | 310.1 | plastic | 100 ml | Cool to 4 °C | 14 days |
| | Sulfide, Total | 9030B | plastic | 500 ml | $C_4H_6O_4Zn+NaOH$ to pH 9 | 7 days |

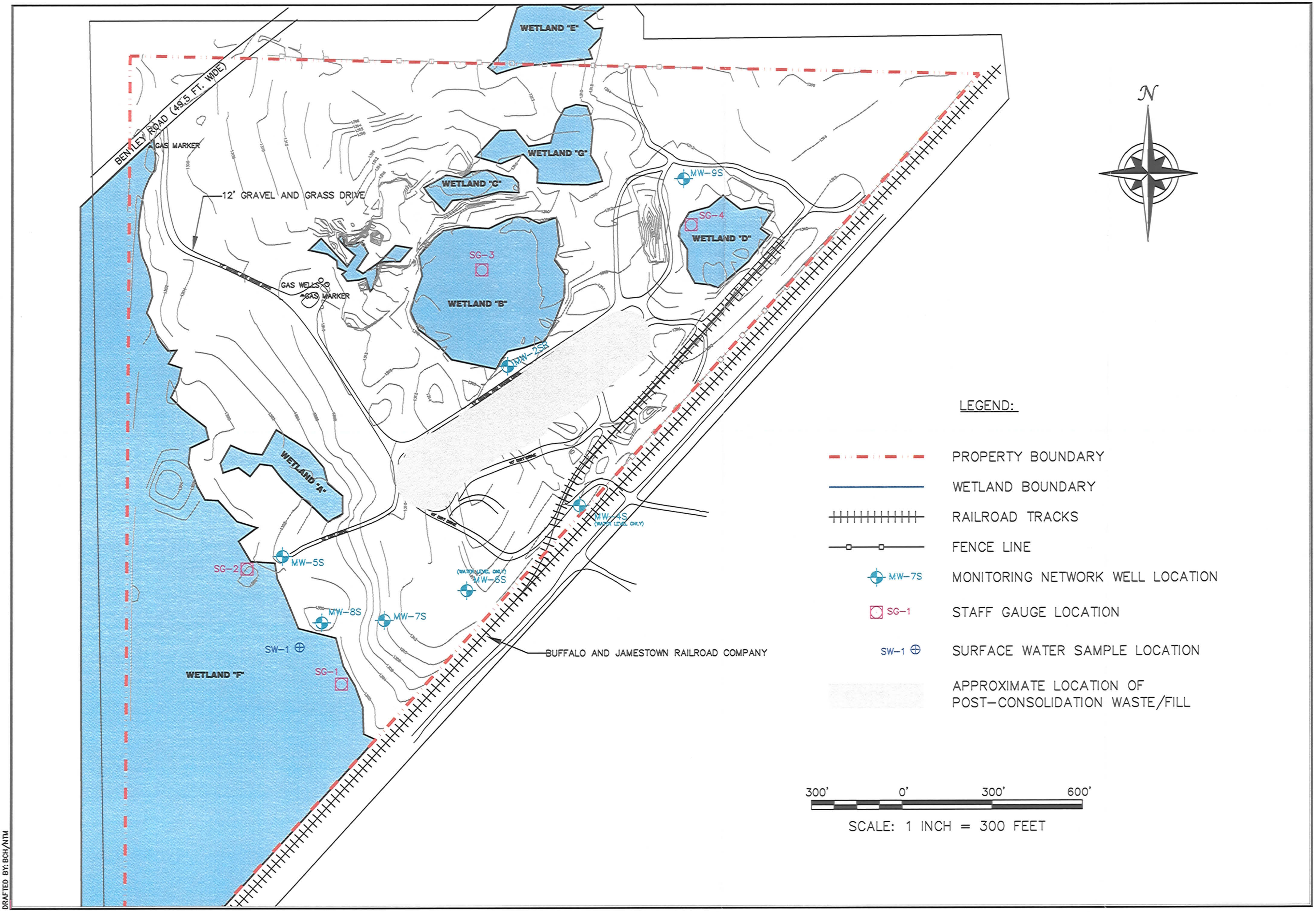
**References:**

1. Test Methods for Evaluating Solid Wastes, USEPA SW-846, Update III, 1991.

**Notes:**

1. Total metals include: arsenic, chromium, manganese and iron; if field measured turbidity is greater than 50 NTU, dissolved metals will also be collected.

# Figures



LEGEND:

PROPERTY BOUNDARY

WETLAND BOUNDARY

RAILROAD TRACKS

FENCE LINE

MW-7S MONITORING NETWORK WELL LOCATION

SG-1 STAFF GAUGE LOCATION

SW-1 ⊕ SURFACE WATER SAMPLE LOCATION

APPROXIMATE LOCATION OF POST-CONSOLIDATION WASTE/FILL

BENCHMARK
ENVIRONMENTAL
ENGINEERING &
SCIENCE, PLLC

726 EXCHANGE STREET
SUITE 624
BUFFALO, NEW YORK 14210
(716) 856-0599

JOB NO.: 0021-003-400

# SITE MONITORING NETWORK

POST-REMEDIAL GROUNDWATER MONITORING PLAN
PETER COOPER MARKHAMS SITE

DAYTON, NEW YORK
PREPARED FOR
RESPONDENTS FOR PETER COOPER MARKHAMS

**FIGURE A-1**

F:\CAD\Benchmark\Collier Shannon\Markhams Site\Groundwater Monitoring Plan\Figure A-1; Existing Site Plan.dwg, 2/1/2008 3:13:03 PM

DATE: JANUARY 2008
DRAFTED BY: BCH/NTM

# Appendix A-1

## BOREHOLE LOGS FOR NETWORK MONITORING WELLS

MW-4S

DATE STARTED 5/29/84
DATE FINISHED 5/29/84
SHEET 1 OF 1

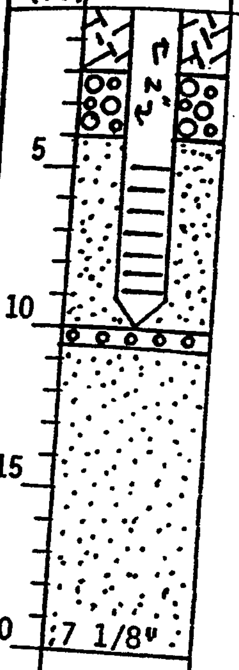
RECRA RESEARCH, INC.
SUBSURFACE LOG

HOLE NO. B-4
SURFACE ELEV. 1307.90
G.W. DEPTH 1302.99
6/20/84

PROJECT Peter Cooper Markhams
2EM84001.5000

LOCATION 150' West of Railroad
80' North of B-1

**DEPTH (ft)** / **LOG**



| SAMPLE # | BLOWS ON SAMPLER 0-6 / 12-18 | BLOWS ON SAMPLER 6-12 / 18-24 |
|---|---|---|
| 1 | 4 | 8 |
|  | 4 | 6 |
| 2 | 7 | 7 |
|  | 7 | 5 |
| 3 | 6 | 5 |
|  | 5 | 4 |
| 4 | 5 | 3 |
|  | 5 | 4 |
| 5 | 2 | 1 |
|  | 1 | 1 |
| 6 | 1 | 3 |
|  | 5 | 9 |
| 7 | 12 | 20 |
|  | 22 | 21 |
| 8 | 8 | 11 |
|  | 7 | 7 |
| 9 | 3 | 5 |
|  | 7 | 15 |
| 10 | 5 | 17 |
|  | 25 | 40 |

**DESCRIPTION**

Clayey silt dark brown, organic grading to reddish brown clayey silt, moist occasional gravel grading to abundant gravel and coarse sand

Silty sand greyish brown saturated

Coarse sand greyish brown reddish brown, saturated

Fine-medium sand, grey, layers of black and reddish brown medium sand

Silty fine sand grey

**NOTES**

S#3 retained for chemical analysis sand

Screened material clayey silt, silty sand and coarse sand

Permeability: 2.0 x 10-7

S#8 retained for chemical analysis

CLASSIFICATION ASTM D-2488
METHOD OF INVESTIGATION ASTM D1452-80
D1586-74

O'BRIEN & GERE
ENGINEERS, INC.

TEST BORING LOG
File Name: PC013B.BL

Report of Boring No. B-5
Sheet 1 of 1

mw-5

Project Location: Markhams, NY

Client: Peter Cooper Corporations

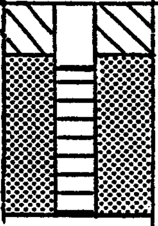
SAMPLER
Type: SPLIT SPOON
Hammer: 140 lbs.
Fall: 30"

Ground Water Depth 1299.43 Date 12/17/86
Depth Date

File No. 1171-005-130

Boring Co.: Parratt-Wolfe
Foreman: Mark Beck
OBG Geologist: Peter Bogardus

Boring Location: Southwest Area: Wooded Area
Ground Elevation: 1300.50'
Dates: Started:08/28/86 Ended:08/28/8

| Depth | Sample | | | | Sample Description | Stratum Change Depth | Equipment Installed | Field Testing | | | R m k s |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | "N" Value | Penetrn/ Recovery | Depth | Blows /6" | | | | Sal. 0/00 | So. Cond. | HNU | |
| 0 | | | | | | |  | | | | |
| 5 | | | | | | | | | | | |
| 10 | | | | | | | | | | | |
| 15 | | | | | | | | | | | |
| 20 | | | | | | | | | | | |
| 25 | | | | | NOT SAMPLED<br>(SEE 5D) | | | | | | |
| 30 | | | | | | | | | | | |
| 35 | | | | | | | | | | | |
| 40 | | | | | | | | | | | |
| 45 | | | | | | | | | | | |
| 50 | | | | | | | | | | | |
| 55 | | | | | | | | | | | |

5' screen installed from 7.85' to 2.85'
5.85' of packed sand installed from 7.85' to 2'
2' of bentonite pellets installed from 2' to surface
4" protective lockable cover installed

| O'BRIEN & GERE ENGINEERS, INC. | TEST BORING LOG | Report of Boring No.: MW-6D, 6S |
|---|---|---|
| Project Location: Markhams, NY<br>Client: Peter Cooper Corporation | SAMPLER<br>Type: Split-Spoon<br>Hammer: 140 lbs. Fall: 30 inches | Ground Water Depth Date<br>Depth Date<br>File No.: 1171.005 |

Boring Co.: Buffalo Drilling
Foreman: Keith Scott
OBG Geologist: Peter Bogardus

Boring Location: South East Corner of Site
Ground Elevation:
Dates: Started: 6/1/88 Ended: 6/6/88

| Depth | Sample | | | | | Sample Description | Stratum Change General Descript | Equipment Installed | Field Testing | | | Rmks* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | No | Depth in ft. | Blows /6" | Penetr/ Recovry | "N" Value | | | | pH | Sp Cond | HNU | |
| 0 | 1 | 0-2 | 3-2-3-4 | 12 | 5 | Rusty Brown moist silt, little fine to medium sand, trace of medium gravel. | | | | | .2 | |
| | | | | | | | 3 | | | | .2 | |
| | 2 | 2-4 | 4-5-6-7 | 15 | 13 | Brown moist, medium to coarse sand, trace of silt. | | | | | | |
| | | | | | | | | | | | | |
| | 3 | 4-6 | 4-5-5-3 | 15 | 10 | | 4 | | | | .2 | |
| 5 | | | | | | | | | | | .2 | |
| | 4 | 6-8 | 4-5-8-4 | 15 | 13 | Brown moist fine to medium gravel, fine to coarse sand, little silt. | | | | | | |
| | | | | | | | 8 | | | | .2 | |
| | 5 | 9-11 | 2-6-10-5 | 15 | 16 | Brown Very moist medium to coarse sand, some fine to medium gravel, little silt. | | | | | | |
| 10 | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | 6 | 14-16 | 11-14 | 15 | 42 | Brown Wet fine to medium sand, trace of silt. | | | | | .4 | |
| 15 | | | 28-28 | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | Gray Wet fine sand and silt. | 18 | | | | .4 | |
| | | | | | | | | | | | | |
| | 7 | 19-21 | 14-40 | 15 | 84 | | | | | | | |
| 20 | | | 44-47 | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | 8 | 24-26 | 12-20 | 15 | 40 | Same as above, 3 ft of blow up in auger. | | | | | .2 | |
| 25 | | | 20-24 | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | 29-31 | | | | Same as above, 3 ft of blow up in auger. | | | | | | |
| 30 | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |

6D 33-28 .010" Slot Screen
33-26 2 q Washed Silica Sand
26-23 Bentonite Pellets

6S 18.5 - 13.5 .010" Slot Screen
18.5 - 11.0 2 q Washed Silica Sand
11.0 - 10.2 Bentonite Seal

PROJECT: Peter Cooper Markhams R.I.
Dayton, New York

# Log of Well No. MW-7S

BORING LOCATION: See Site Plan for MW locations

TOP OF RISER ELEVATION: 1312.52 fmsl

DATUM: NAD 83

DRILLING CONTRACTOR: Nothnagle Drilling, Inc.

DATE STARTED: 10/9/01

DATE FINISHED: 10/9/01

DRILLING METHOD: 4 1/4" dia. Hollow Stem Augers

TOTAL DEPTH: 16.0 fbgs

SCREEN INTERVAL: 6-16 fbgs

DRILLING EQUIPMENT: CME 750 ATV

DEPTH TO WATER: FIRST 13 ft COMPL.

CASING: 2" dia. PVC

SAMPLING METHOD: Not sampled for lithology

LOGGED BY: MAC

HAMMER WEIGHT: Autohammer

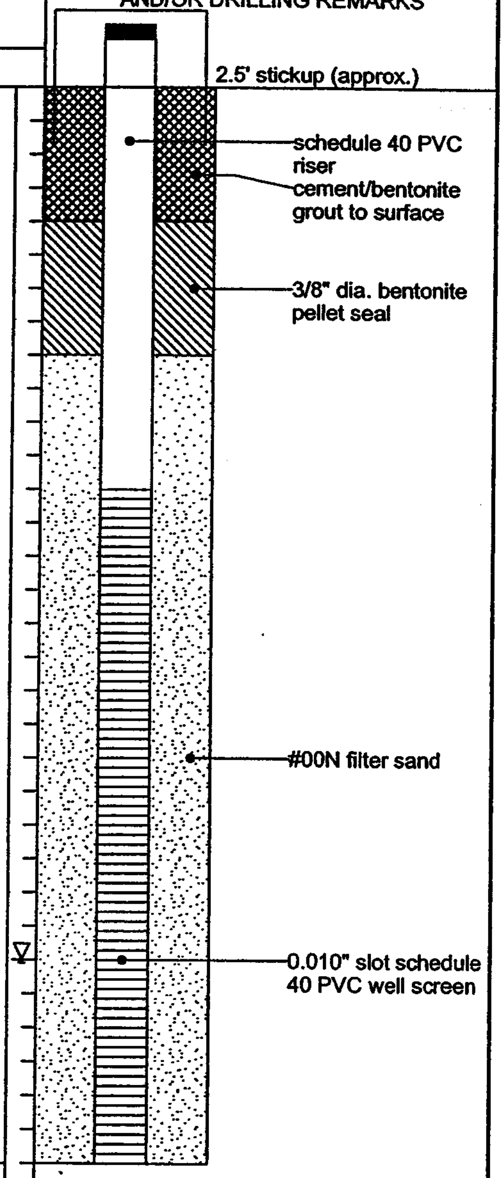
DROP: NA

RESPONSIBLE PROFESSIONAL: Richard H. Frappa

REG. NO.

| DEPTH (feet) | SAMPLES Sample No. | SAMPLES Sample | SAMPLES Blows/ foot | OVM (ppm) | DESCRIPTION NAME (USCS Symbol): color, moist, % by weight, plast., structure, cementation, react. w/HCl, geo. inter. |
|---|---|---|---|---|---|
| | | | | | Surface Elevation: 1309.62 fmsl |
| 1–16 | | | | | MW-7S not logged for lithology. See log of MW-7D for lithologic descriptions. |
| 16–20 | | | | | End of boring at 16.0 fbgs. |

WELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS



WELL_OVM MARKHAMS MWS.GPJ (2/05)

PROJECT: Peter Cooper Markhams R.I.
Dayton, New York

# Log of Well No. MW-8S

BORING LOCATION: See Site Plan for MW locations

TOP OF RISER ELEVATION: 1303.93 fmsl

DATUM: NAD 83

DRILLING CONTRACTOR: Nothnagle Drilling, Inc.

DATE STARTED: 10/5/01

DATE FINISHED: 10/5/01

DRILLING METHOD: 4 1/4" dia. Hollow Stem Augers

TOTAL DEPTH: 10.0 fbgs

SCREEN INTERVAL: 5-10 fbgs

DRILLING EQUIPMENT: CME 750 ATV

DEPTH TO WATER: FIRST 6 ft COMPL.

CASING: 2" dia. PVC

SAMPLING METHOD: Not sampled for lithology

LOGGED BY: MAC

HAMMER WEIGHT: Autohammer

DROP: NA

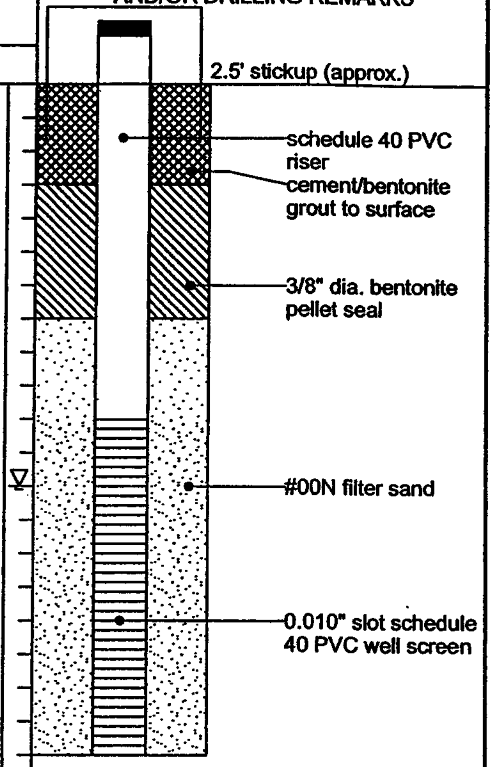
RESPONSIBLE PROFESSIONAL: Richard H. Frappa

REG. NO.

| DEPTH (feet) | SAMPLES: Sample No. | SAMPLES: Sample | SAMPLES: Blows/ foot | OVM (ppm) | DESCRIPTION NAME (USCS Symbol): color, moist, % by weight, plast., structure, cementation, react. w/HCl, geo. inter. |
|---|---|---|---|---|---|
| | | | | | Surface Elevation: 1301.06 fmsl |
| 0-10 | | | | | MW-8S not logged for lithology. See log of MW-8D for lithologic descriptions. |
| 10 | | | | | End of boring at 10.0 fbgs. |

Depth scale: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

WELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS



PROJECT: Peter Cooper Markhams R.I.
Dayton, New York

# Log of Well No. MW-9S

BORING LOCATION: See Site Plan for MW locations

TOP OF RISER ELEVATION: 1313.95 fmsl

DATUM: NAD 83

DRILLING CONTRACTOR: Nothnagle Drilling, Inc.

DATE STARTED: 10/2/04

DATE FINISHED: 10/2/01

DRILLING METHOD: 4 1/4" dia. Hollow Stem Augers

TOTAL DEPTH: 11.0 fbgs

SCREEN INTERVAL: 6-11 fbgs

DRILLING EQUIPMENT: CME 750 ATV

DEPTH TO WATER: FIRST 7 ft COMPL.

CASING: 2" dia. PVC

SAMPLING METHOD: 2" dia. S.S. Split Spoons

LOGGED BY: MAC

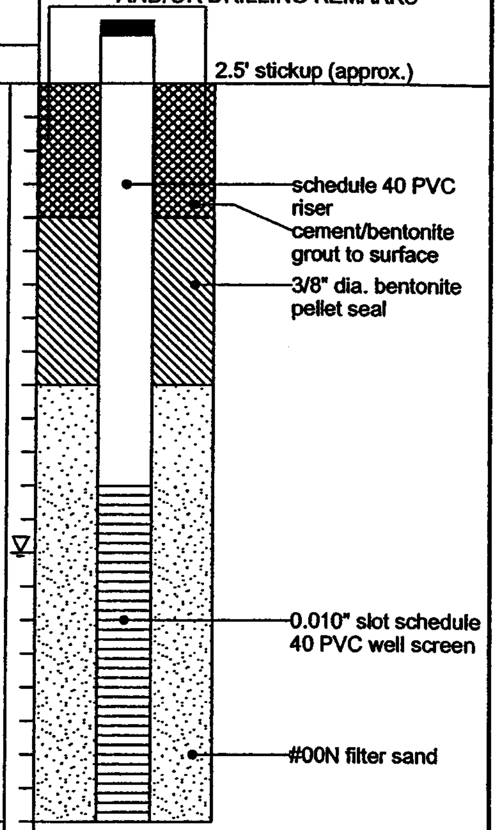
HAMMER WEIGHT: Autohammer

DROP: NA

RESPONSIBLE PROFESSIONAL: Richard H. Frappa

REG. NO.

| DEPTH (feet) | SAMPLES Sample No. | Sample | Blows/ foot | OVM (ppm) | DESCRIPTION NAME (USCS Symbol): color, moist, % by weight, plast., structure, cementation, react. w/HCl, geo. inter. | WELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS |
|---|---|---|---|---|---|---|
| | | | | | Surface Elevation: 1311.49 fmsl | |
| 0-11 | | | | | MW-9S not logged for lithology. See log of MW-9D for lithologic descriptions. | |
| 11-20 | | | | | End of boring at 11.0 fbgs. | |



WELL_OVM MARKHAMS MWS.GPJ (2/05)

Project No. 7603

Geomatrix Consultants

# Appendix A-2

## FIELD OPERATING PROCEDURES (FOPS)

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FIELD OPERATING PROCEDURES

# Surface Water Sampling Procedures

# FOP 064.0

# SURFACE WATER SAMPLING PROCEDURES

## PURPOSE

This procedure describes a method for collecting surface water samples. Sediment samples typically are collected in conjunction with surface water samples as dictated by the site-specific work plan. It should be noted, however, sediment sample collection procedures are not presented herein and Benchmark's sediment sampling FOPs 049 and 050 should be reviewed prior to sediment sample collection. This surface water sampling method incorporates the use of the laboratory provided sample bottle for collecting the sample, which eliminates the need for other equipment and hence, reduces the risk of introducing other variables into a sampling event.

## PROCEDURE

1. Locate the surface water sample location.
2. Calibrate all field meters (i.e., pH/Eh, turbidity, specific conductance, dissolved oxygen, PID etc.) in accordance with the Benchmark Field Operating Procedure for Calibration and Maintenance of the specific field meter.
3. Wearing appropriate protective gear (i.e., latex gloves, safety glasses), as required in the Project Health and Safety Plan, prepare sample bottles for use.
4. If samples are to be collected from a stream, creek or other running water body, collect downstream samples first to minimize impacts on sample quality.
5. Surface water samples should be collected during a dry (non-precipitation) event to avoid any dilution effect from precipitation.
6. Pre-label all sample bottles in the field using a waterproof permanent marker in accordance with the Benchmark Sample Labeling, Storage and Shipment

FOP. The following information, at a minimum, should be included on the label:

- Project Number;
- Sample identification code (as per project specifications);
- Date of sample collection (mm, dd, yy);
- Time of sample collection (military time only) (hh:mm);
- Specify "grab" or "composite" sample type;
- Sampler initials;
- Preservative(s) (if applicable); and
- Analytes for analysis (if practicable).

7. Collect the surface water sample from the designated location by slowly submerging each sample bottle with minimal surface disturbance. If the sample location cannot be sampled in this manner due to shallow water conditions, a small depression can be created with a standard shovel to deepen the location to facilitate sample collection by direct grab. It should be noted, prior to disturbing sediment at any location for this purpose, all required sediment samples should be collected. All sediment cuttings will be removed from the area and the surface water allowed to flow through the depression for several minutes prior to collecting samples until clear (i.e., no visible sediment).

8. Collect samples from near shore. If water body is over three feet deep, check for stratification. Check each stratum for contamination using field measured water quality parameters. Collect samples from each stratum showing evidence of impact. If no stratum shows signs of impact, collect a composite sample having equal parts of water from each stratum.

9. Collect samples into pre-cleaned bottles provided by the analytical laboratory with the appropriate preservative(s) added based on the volatilization sensitivity or suite of analytical parameters required, as designated below:

   - Volatile Organic Compounds (VOCs)
   - Total Organic Halogens (TOX)

- Total Organic Carbon (TOC)
- Extractable Organic Compounds (i.e., BNAs, SVOCs, etc.)
- Total metals (Dissolved Metals)
- Total Phenolic Compounds
- Cyanide
- Sulfate and Chloride
- Turbidity
- Nitrate and Ammonia
- Radionuclides

10. For pre-preserved bottles, avoid completely submerging the bottle and overfilling to prevent preservative loss. Pre-preserved VOC vials should be filled from a second, unpreserved, pre-cleaned glass container. Never transfer samples from dissimilar bottle types (i.e., plastic to glass or glass to plastic).

11. Collect a separate sample of approximately 200 ml into an appropriate container prior to collecting the first and following the last surface water sample collected to measure the following field parameters:

| Parameter | Units |
|---|---|
| Dissolved Oxygen | parts per million (ppm) |
| Specific Conductance | $\mu$mhos/cm or $\mu$S or mS |
| pH | pH units |
| Temperature | °C or °F |
| Turbidity | NTU |
| Eh (*optional*) | mV |
| PID VOCs (*optional*) | ppm |

Record all field measurements on a Surface Water Quality Field Collection Log form (sample attached).

12. Record available information for the pond, stream or other body of water that was sampled, such as its size, location and depth in the Project Field Book and

on the Surface Water Quality Field Collection Log form (sample attached). Approximate sampling points should be identified on a sketch of the water body.

13. Label, store and ship all samples in accordance with the Benchmark Field Operating Procedure for Sample Labeling, Storage and Shipment Procedures.

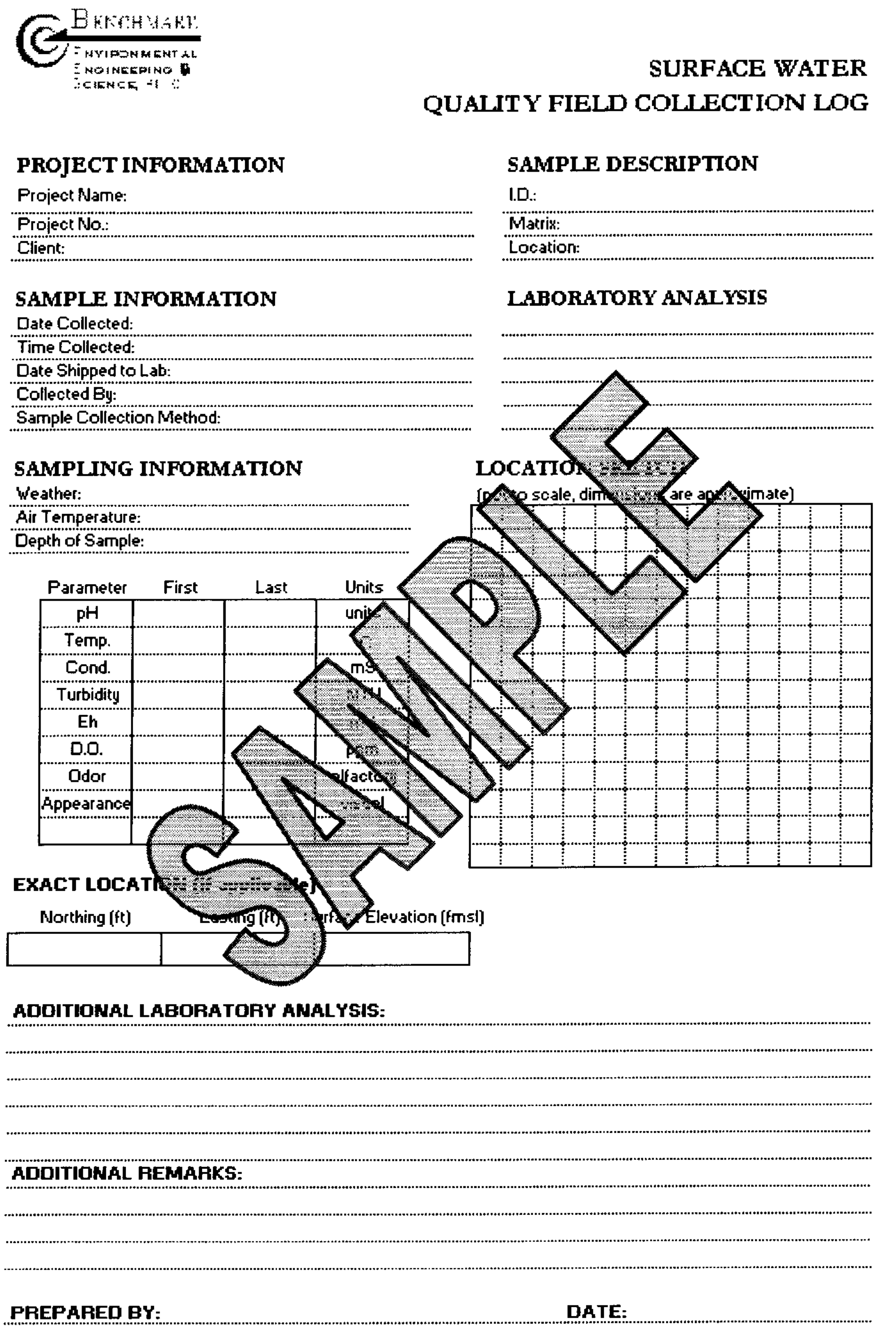
## ATTACHMENTS

Surface Water Quality Field Collection Log (sample)

## REFERENCES

Benchmark FOPs:

| | |
|---|---|
| *007* | *Calibration and Maintenance of Portable Dissolved Oxygen Meter* |
| *008* | *Calibration and Maintenance of Portable Field pH/Eh Meter* |
| *009* | *Calibration and Maintenance of Portable Field Turbidity Meter* |
| *012* | *Calibration and Maintenance of Portable Specific Conductance Meter* |
| *046* | *Sample Labeling, Storage and Shipment Procedures* |



BENCHMARK ENVIRONMENTAL ENGINEERING & SCIENCE, PLLC

## SURFACE WATER QUALITY FIELD COLLECTION LOG

### PROJECT INFORMATION

Project Name:
Project No.:
Client:

### SAMPLE DESCRIPTION

I.D.:
Matrix:
Location:

### SAMPLE INFORMATION

Date Collected:
Time Collected:
Date Shipped to Lab:
Collected By:
Sample Collection Method:

### LABORATORY ANALYSIS

### SAMPLING INFORMATION

Weather:
Air Temperature:
Depth of Sample:

| Parameter | First | Last | Units |
|---|---|---|---|
| pH | | | units |
| Temp. | | | [illegible] |
| Cond. | | | mS |
| Turbidity | | | NTU |
| Eh | | | mV |
| D.O. | | | ppm |
| Odor | | | olfactory |
| Appearance | | | visual |
| | | | |

### LOCATION SKETCH

(not to scale, dimensions are approximate)

### EXACT LOCATION (if applicable)

| Northing (ft) | Easting (ft) | Surface Elevation (fmsl) |
|---|---|---|
| | | |

**ADDITIONAL LABORATORY ANALYSIS:**

**ADDITIONAL REMARKS:**

**PREPARED BY:**

**DATE:**

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FIELD OPERATING PROCEDURES

# Non-Disposable and Non-Dedicated Sampling Equipment Decontamination

# FOP 040.0

# NON-DISPOSABLE AND NON-DEDICATED SAMPLING EQUIPMENT DECONTAMINATION

## PURPOSE

This procedure is to be used for the decontamination of non-disposable and non-dedicated equipment used in the collection of environmental samples. The purpose of this procedure is to remove chemical constituents from previous samples from the sampling equipment. This prevents these constituents from being transferred to later samples, or being transported out of controlled areas.

## HEALTH AND SAFETY

Nitric acid is a strong oxidizing agent as well as being extremely corrosive to the skin and eyes. Solvents such as acetone, methanol, hexane and isopropanol are flammable liquids. Limited contact with skin can cause irritation, while prolonged contact may result in dermatitis. Eye contact with the solvents may cause irritation or temporary corneal damage. Safety glasses with protective side shields, neoprene or nitrile gloves and long-sleeve protective clothing must be worn whenever acids and solvents are being used.

## PROCEDURE – GENERAL EQUIPMENT

Bailers, split-spoons, steel or brass split-spoon liners, Shelby tubes, submersible pumps, soil sampling knives, and similar equipment will be decontaminated as described below.

1. Wash equipment thoroughly with non-phosphate detergent and potable-quality water, using a brush where possible to remove any particulate matter or surface film. If the sampler is visibly coated with tars or other phase-separated hydrocarbons, pre-wash with acetone or isopropanol, or by steam cleaning. Decontamination will adhere to the following procedure:

a. Rinse with potable-quality water;

b. Rinsed with 10% nitric acid ($HNO_3$) solution [1] ;

c. Rinse with potable-quality water;

d. Rinse with pesticide grade acetone or methanol [2];

e. Rinse with pesticide grade hexane [2];

f. Rinse with deionized water demonstrated analyte-free, such as distilled water;

g. Air dry; and

h. Store in a clean area or wrap in aluminum foil (shiny side out) or new plastic sheeting as necessary to ensure cleanliness.

2. All non-dedicated well evacuation equipment, such as submersible pumps and bailers, which are put into the well, must be decontaminated following the procedures listed above. All evacuation tubing must be dedicated to individual wells (i.e., tubing cannot be reused). However, if submersible pump discharge tubing must be reused, the tubing and associated sample valves or flow-through cells used in well purging or pumping tests will be decontaminated as described below:

---

[1] Omit this step if metals are not being analyzed. For carbon steel split spoon samplers, a 1% rather than 10% $HNO_3$ solution should be used.

[2] This solvent rinse can be omitted if organics are not being analyzed. Alternatively, if approval from the NYSDEC has been granted, use pesticide grade isopropanol as the cleaning solvent. Isopropanol is better suited as a cleaning solvent that acetone, methanol and hexane for the following reasons:

- Acetone is a parameter analyzed for on the Target Compound List (TCL); therefore the detection of acetone in samples collected using acetone rinsed equipment is suspect;
- Almost all grades of methanol contain 2-butanone (Methyl Ethyl Ketone, MEK) contamination. As for acetone, 2-butanone is a TCL compound. Thus, the detection of 2-butanone in samples collected using methanol rinsed equipment is suspect. In addition, methanol is much more hazardous than either isopropanol or acetone.
- Hexane is not miscible with water (hydrophobic) and therefore, is not an effective rinsing agent unless the sampling equipment is dry. Isopropanol is extremely miscible in water (amphoteric), making it an effective rinsing agent on either wet or dry equipment.

   a. Pump a mixture of potable water and a non-phosphate detergent through the tubing, sample valves and flow cells, using the submersible pump.

   b. Steam clean or detergent wash the exterior of the tubing, sample valves, flow cells and pump.

   c. Pump potable water through the tubing, sample valve, and flow cell until no indications of detergent (e.g. foaming) are observed.

   d. Double rinse the exterior of the tubing with potable water.

   e. Rinse the exterior of the tubing with distilled water.

   f. Store in a clean area or wrap the pump and tubing assembly in new plastic sheeting as necessary to ensure cleanliness until ready for use.

3. All unused sample bottles and sampling equipment must be maintained in such a manner that there is no possibility of casual contamination.

4. Manage all waste materials generated during decontamination procedures as described in the Benchmark Field Operating Procedure for Management of Investigation Derived Waste.

## PROCEDURE – SUBMERSIBLE PUMPS

Submersible pumps used in well purging or purging tests will be decontaminated thoroughly each day before use as well as between well locations as described below:

### Daily Decontamination Procedure:

1. Pre-rinse: Operate the pump in a basin containing 8 to 10 gallons of potable water for 5 minutes and flush other equipment with potable water for 5 minutes.

2. Wash: Operate the pump in 8 to 10 gallons of non-phosphate detergent solution (i.e., Alconox) for 5 minutes and flush other equipment with fresh detergent solution for 5 minutes.
3. Rinse: Operate the pump in a basin of potable water for 5 minutes and flush other equipment with potable water for 5 minutes.
4. Disassemble pump.
5. Wash pump parts with a non-phosphate detergent solution (i.e., Alconox). Scrub all pump parts with a test tube brush or similar device.
6. Rinse pump with potable water.
7. Rinse the inlet screen, the shaft, the suction interconnection, the motor lead assembly, and the stator housing with distilled/deionized water.
8. Rinse the impeller assembly with 1% nitric acid ($HNO_3$).
9. Rinse the impeller assembly with isopropanol.
10. Rinse the impeller assembly with distilled/deionized water.

**Between Wells Decontamination Procedure:**

1. Pre-rinse: Operate the pump in a basin containing 8 to 10 gallons of potable water for 5 minutes.
2. Wash: Operate the pump in 8 to 10 gallons of non-phosphate detergent solution (i.e., Alconox) for 5 minutes.
3. Rinse: Operate the pump in a basin of potable water for 5 minutes.
4. Final rinse the pump in distilled/deionized water.

## ATTACHMENTS

None

## REFERENCES

Benchmark FOPs:

*032 Management of Investigation-Derived Waste*

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FIELD OPERATING PROCEDURES

# Low-Flow (Minimal Drawdown) Groundwater Purging & Sampling Procedure

# FOP 031.0

# LOW FLOW (MINIMAL DRAWDOWN) GROUNDWATER PURGING & SAMPLING PROCEDURES

## PURPOSE

This procedure describes the methods used for performing low flow (minimal drawdown) purging, also referred to as micro-purging, at a well prior to groundwater sampling to obtain a representative sample from the water-bearing zone. This method of purging is used to minimize the turbidity of the produced water. This may increase the representativeness of the groundwater samples by avoiding the necessity of filtering suspended solids in the field prior to preservation of the sample.

Well purging is typically performed immediately preceding groundwater sampling. The sample should be collected as soon as the parameters measured in the field (i.e., pH, specific conductance, dissolved oxygen, Eh, temperature, and turbidity) have stabilized.

## PROCEDURE

1. Water samples should not be taken immediately following well development. Sufficient time should be allowed to stabilize the groundwater flow regime in the vicinity of the monitoring well. This lag time will depend on site conditions and methods of installation but may exceed one week.

2. Prepare the electronic water level indicator (e-line) in accordance with the procedures referenced in the Benchmark's Groundwater Level Measurement FOP and decontaminate the e-line probe and a lower portion of cable following the procedures referenced in the Benchmark's Non-disposable and Non-dedicated Sampling Equipment Decontamination FOP. Store the e-line in a protected area until use. This may include wrapping the e-line in clean plastic until the time of use.

3. Calibrate all sampling devices and monitoring equipment in accordance with manufacturer's recommendations, the site Quality Assurance Project Plan (QAPP) and/or Field Sampling Plan (FSP). Calibration of field

instrumentation should be followed as specified in Benchmark's Calibration and Maintenance FOP for each individual meter.

4. Inspect the well/piezometer for signs of vandalism or damage and record condition on the Groundwater Well Purge & Sample Collection Log form (sample attached). Specifically, inspect the integrity of the following: concrete surface seal, lock, protective casing and well cover, well casing and J-plug/cap. Report any irregular findings to the Project Manager.

5. Unlock and remove the well protective cap or cover and place on clean plastic to avoid introducing foreign material into the well.

6. Monitor the well for organic vapors using a PID, as per the Work Plan. If a reading of greater than 5 ppm is recorded, the well should be allowed to vent until levels drop below 5 ppm before proceeding with purging.

7. Lower the e-line probe slowly into the monitoring well and record the initial water level in accordance with the procedures referenced in Benchmark's Groundwater Level Measurement FOP. Refer to the construction diagram for the well to identify the screened depth.

8. Decontaminate all non-dedicated pump and tubing equipment following the procedures referenced in the Benchmark's Non-disposable and Non-dedicated Sampling Equipment Decontamination FOP.

9. Lower the purge pump or tubing (i.e., low-flow electrical submersible, peristaltic, etc.) slowly into the well until the pump/tubing intake is approximately in the middle of the screened interval. Rapid insertion of the pump will increase the turbidity of well water, and can increase the required purge time. This step can be eliminated if dedicated tubing is already within the well.

   Placement of the pump close to the bottom of the well will cause increased entrainment of solids, which may have settled in the well over time. Low-flow purging has the advantage of minimizing mixing between the overlying stagnant casing water and water within the screened interval. The objective of low-flow purging is to maintain a purging rate, which minimizes stress (drawdown) of the water level in the well. Low-flow refers to the velocity with which water enters the pump intake and that is imparted to the formation pore water in the immediate vicinity of the well screen.

10. Lower the e-line back down the well as water levels will be frequently monitored during purge and sample activities.

11. Begin pumping to purge the well. The pumping rate should be between 100 and 500 milliliters (ml) per minute (0.03 to 0.13 gallons per minute) depending on site hydrogeology. Periodically check the well water level with the e-line adjusting the flow rate as necessary to stabilize drawdown within the well. If possible, a steady flow rate should be maintained that results in a stabilized water level (drawdown of 0.3 feet or less). If the water level exceeds 2 feet below static and declining, slow the purge rate until the water level generally stabilizes. Record each pumping rate and water level during the event.

    The low flow rate determined during purging will be maintained during the collection of analytical samples. At some sites where geologic heterogeneities are sufficiently different within the screened interval, high conductivity zones may be preferentially sampled.

12. Measure and record field parameters (pH, specific conductance, Eh, dissolved oxygen (DO), temperature, and turbidity) during purging activities. In lieu of measuring all of the parameters, a minimum subset could be limited to pH, specific conductance, and turbidity or DO.

    Water quality indicator parameters should be used to determine purging needs prior to sample collection in each well. Stabilization of indicator parameters should be used to determine when formation water is first encountered during purging. In general, the order of stabilization is pH, temperature, and specific conductance, followed by Eh, DO and turbidity. Performance criteria for determination of stabilization should be based on water-level drawdown, pumping rate and equipment specifications for measuring indicator parameters. An in-line flow through cell to continuously measure the above parameters may be used. The in-line device should be disconnected or bypassed during sample collection.

13. Purging will continue until parameters of water quality have stabilized. Record measurements for field indicator parameters (including water levels) at regular intervals during purging. The stability of these parameters with time can be used to guide the decision to discontinue purging. Proper adjustments must be made to stabilize the flow rate as soon as possible.

14. Record well purging and sampling data in the Project Field Book or on the attached Groundwater Well Purge & Sample Collection Log (sample attached). Measurements should be taken approximately every three to five minutes, or as merited given the rapidity of change.

15. Purging is complete when field indicator parameters stabilize. Stabilization is achieved after all field parameters have stabilized for three successive readings. Three successive readings should be within ± 0.1 units for pH, ± 3% for specific conductance, ± 10 mV for Eh, and ± 10% for turbidity and dissolved oxygen. These stabilization guidelines are provided for rough estimates only, actual site-specific knowledge may be used to adjust these requirements higher or lower.

    An in-line water quality measurement device (e.g., flow-through cell) should be used to establish the stabilization time for several field parameters on a well-specific basis. Data on pumping rate, drawdown and volume required for parameter stabilization can be used as a guide for conducting subsequent sampling activities.

16. Collect all project-required samples from the discharge tubing at the flow rate established during purging in accordance with Benchmark's Groundwater Sample Collection Procedures FOP. **If a peristaltic pump and dedicated tubing is used, collect all project-required samples from the discharge tubing as stated before, however volatile organic compounds should be collected in accordance with the procedure presented in the next**

**section.** Continue to maintain a constant flow rate such that the water level is not drawn down as described above. Fill sample containers with minimal turbulence by allowing the ground water to flow from the tubing along the inside walls of the container.

17. If field filtration is recommended as a result of increased turbidity, an in-line filter equipped with a 0.45-micron filter should be utilized.

18. Replace the dedicated tubing down the well taking care to avoid contact with the ground surface.

19. Restore the well to its capped/covered and locked condition.

20. Upon purge and sample collection completion, slowly lower the e-line to the bottom of the well/piezometer. Record the total depth to the nearest 0.01-foot and compare to the previous total depth measurement. If a significant discrepancy exists, re-measure the total depth. Record observations of purge water to determine whether the well/piezometer had become silted due to inactivity or damaged (i.e., well sand within purge water). Upon confirmation of the new total depth and determination of the cause (i.e., siltation or damage), notify the Project Manager following project field activities.

## PERISTALTIC PUMP VOC SAMPLE COLLECTION PROCEDURE

The collection of VOCs from a peristaltic pump and dedicated tubing assembly shall be collected using the following procedure.

1. Once all other required sample containers have been filled, turn off the peristaltic pump. The negative pressure effects of the pump head have not altered groundwater remaining within the dedicated tubing assembly and as such, this groundwater can be collected for VOC analysis.

2. While maintaining the pressure on the flexible tubing within the pump head assembly, carefully remove and coil the polyethylene tubing from the well; taking care to prevent the tubing from coming in contact with the ground

surface and without allowing groundwater to escape or drain from the tubing intake.

3. Once the polyethylene tubing is removed, turn the variable speed control to zero and reverse the pump direction.

4. Slowly increase the pump rate allowing the groundwater within the polyethylene tubing to be "pushed" out of the intake end (i.e., positive displacement) making sure the groundwater within the tubing is not "pulled" through the original discharge end (i.e., negative displacement). Groundwater pulled through the pump head assembly CANNOT be collected for VOC analysis.

5. Slowly fill each VOC vial by holding the vial at a 45-degree angle and allowing the flowing groundwater to cascade down the side until the vial is filled with as minimal disturbance as possible. As the vial fills, slowly rotate the vial to vertical. **DO NOT OVERFILL THE VIAL, AS THE PRESERVATIVE WILL BE LOST.** The vial should be filled only enough so that the water creates a slight meniscus at the vial mouth.

6. Cap the VOC vials leaving no visible headspace (i.e., air-bubbles). Gently tap each vial against your hand checking for air bubbles.

7. If an air bubble is observed, slowly remove the cap and repeat Steps 5 and 6.

## ATTACHMENTS

Groundwater Well Purge & Sample Collection Log (sample)

## REFERENCES

United States Environmental Protection Agency, 540/S-95/504, 1995. *Low-Flow (Minimal Drawdown) Ground-Water Sampling Procedures.*

Benchmark FOPs:

*007 Calibration and Maintenance of Portable Dissolved Oxygen Meter*
*008 Calibration and Maintenance of Portable Field pH/Eh Meter*
*009 Calibration and Maintenance of Portable Field Turbidity Meter*
*011 Calibration and Maintenance of Portable Photoionization Detector*
*012 Calibration and Maintenance of Portable Specific Conductance Meter*
*022 Groundwater Level Measurement*
*024 Groundwater Sample Collection Procedures*
*040 Non-Disposable and Non-Dedicated Sampling Equipment Decontamination*
*046 Sample Labeling, Storage and Shipment Procedures*

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## LOW FLOW METHOD GROUNDWATER PURGE & SAMPLE COLLECTION LOG

Project Name: WELL LOCATION:
Project Number: Sample Matrix: groundwater
Client: Weather:

***WELL DATA:*** DATE: TIME:

| | |
|---|---|
| Casing Diameter (inches): | Casing Material: |
| Screened interval (fbTOR): | Screen Material: |
| Static Water Level (fbTOR): | Bottom Depth (fbTOR): |
| Elevation Top of Well Riser (fmsl): | Ground Surface Elevation (fmsl): |
| Elevation Top of Screen (fmsl): | Stick-up (feet): |
| Standing volume in gallons:<br>[(bottom depth - static water level) x vol calculation in table per well diameter]: | |

Volume Calculation

| Well Diameter | Volume gal/ft |
|---|---|
| 1" | 0.041 |
| 2" | 0.163 |
| 3" | 0.367 |
| 4" | 0.653 |
| 5" | 1.020 |
| 6" | 1.469 |

***PURGING DATA:*** Pump Type:

Is equipment dedicated to location? yes no
Is tubing dedicated to location? yes no
Depth of Sample (i.e. Level of Intake) (fbTOR):
Approximate Purge Rate (gal/min):

| Time | Water Level (fbTOR) | Accumulated Volume (gallons) | pH (units) | Temperature (degrees C) | Specific Conductance (uS/cm) | Turbidity (NTU) | DO (mg/L) | ORP (mV) | Appearance & Odor |
|---|---|---|---|---|---|---|---|---|---|
| | Initial | | | | | | | | |
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***SAMPLING DATA:*** DATE: START TIME: END TIME:

| | |
|---|---|
| Method: low-flow with dedicated tubing | Was well sampled to dryness? yes no |
| Initial Water Level (fbTOR): | Was well sampled below top of sand pack? yes no |
| Final Water Level (fbTOR): | Field Personnel: |

***PHYSICAL & CHEMICAL DATA:***

Appearance:
Color:
Odor:
Sediment Present?

WATER QUALITY MEASUREMENTS

| pH (units) | TEMP. (°C) | SC (uS) | TURB. (NTU) | DO (ppm) | ORP (mV) |
|---|---|---|---|---|---|
| | | | | | |
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**REMARKS:**

**PREPARED BY:**

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FIELD OPERATING PROCEDURES

# Sample Labeling, Storage, and Shipment Procedures

# FOP 046.0

# SAMPLE LABELING, STORAGE & SHIPMENT PROCEDURES

## PURPOSE

The collection and analysis of samples of environmental media, including soils, groundwater, surface water, and sediment, are the central activities of the field investigation. These samples must be properly labeled to preserve its identity, and properly stored and shipped in a manner that preserves its integrity and chain of custody. This procedure presents methods for these activities.

## SAMPLE LABELING PROCEDURE

1. Assign each sample retained for analysis a unique 9-digit alphanumeric identification code or as indicated in the Project Work Plan. Typically, this code will be formatted as follows:

| **Sample I.D. Example: GW051402047** | |
|---|---|
| **GW** | **Sample matrix**<br>GW = groundwater; SW = surface water;<br>SUB = subsurface soil; SS = surface soil;<br>SED = sediment; L = leachate; A = air |
| **05** | Month of sample collection |
| **14** | Day of sample collection |
| **02** | Year of sample collection |
| **047** | Consecutive sample number |

2. Consecutive sample numbers will indicate the individual sample's sequence in the total set of samples collected during the investigation/sampling event. The sample number above, for example, would indicate the 47th sample retained for analysis during the field investigation, collected on May 14, 2002.

3. Affix a non-removable (when wet) label to each sample container. The following information will be written on the label with black or blue ink that will not smudge when wet:

    - Project number
    - Sample ID (see Step 1 above)
    - Date of sample collection
    - Time of sample collection (military time only)
    - Specify "grab" or "composite" sample with an "X"
    - Sampler initials
    - Preservative(s) (if applicable)
    - Analytes for analysis (if practicable)

4. Record all sample label information in the Project Field Book and on a Sample Summary Collection Log (see attached samples), keyed to the sample identification number. In addition, add information regarding the matrix, sample location, depth, etc. to provide a complete description of the sample.

## SAMPLE STORAGE PROCEDURE

1. Immediately after collection, placement in the proper container, and labeling, place samples to be retained for chemical analysis into resealable plastic bags.

2. Place bagged samples into an ice chest filled approximately half-full of double bagged ice. Blue ice is not an acceptable substitute for ice.

3. Maintain samples in an ice chest or in an alternative location (e.g. sample refrigerator) as approved by the Benchmark Field Team Leader until time of shipment. Periodically drain melt-water off coolers and replenish ice as necessary.

4. Ship samples on a daily basis, unless otherwise directed by the Benchmark Field Team Leader.

5. Maintain appropriate custody procedures on coolers and other sample storage containers at all times. These procedures are discussed in detail in the Project Quality Assurance Project Plan, Monitoring Plan or Work Plan.

6. Samples shall be kept in a secure location locked and controlled (i.e., locked building or fenced area) so that only the Project Field Team Leader has access to the location or under the constant visual surveillance of the same.

## SAMPLE SHIPPING PROCEDURE

1. Fill out the chain-of-custody form completely (see attached sample) with all relevant information. The white original goes with the samples and should be placed in a resealable plastic bag and taped inside the sample cooler lid; the sampler should retain the copy.

2. Place a layer of inert cushioning material such as bubble pack in the bottom of cooler.

3. Place each bottle in a bubble wrap sleeve or other protective wrap. To the extent practicable, then place each bottle in a resealable plastic bag.

4. Open a garbage bag (or similar) into a cooler and place sample bottles into the garbage bag (or similar) with volatile organic analysis (VOA) vials near the center of the cooler.

5. Pack bottles with ice in plastic bags. At packing completion, cooler should be at least 50 percent ice, by volume. Coolers should be completely filled, so that samples do not move excessively during shipping.

6. Duct tape (or similar) cooler drain closed and wrap cooler completely in two or more locations to secure lid, specifically covering the hinges of the cooler.

7. Place laboratory label address identifying cooler number (i.e., 1 of 4, 2 of 4 etc.) and overnight delivery waybill sleeves on cooler lid or handle sleeve (Federal Express).

8. Sign the custody seal tape with an indelible soft-tip marker and place over the duct tape across the front and back seam between the lid and cooler body.

9. Cover the signed custody seal tape with an additional wrap of transparent strapping tape.

10. Place "Fragile" and "This Side Up" labels on all four sides of the cooler. "This Side Up" labels are yellow labels with a black arrow with the arrowhead pointing toward the cooler lid.

11. For coolers shipped by overnight delivery, retain a copy of the shipping waybill, and attach to the chain-of-custody documentation.

## ATTACHMENTS

Soil/Sediment Sample Summary Collection Log (sample)
Groundwater/Surface Water Sample Summary Collection Log (sample)
Wipe Sample Summary Collection Log (sample)
Air Sample Summary Collection Log (sample)
Chain-Of-Custody Form (sample)

## REFERENCES

None

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### AIR SAMPLE COLLECTION SUMMARY LOG

| Field ID | Location | QC Type | Analytical Parameters | Containers | Date | Time | Sampler Initials | Comments (e.g. problems encountered, ref. to variance, location changes, important observations or descriptions, etc.) |
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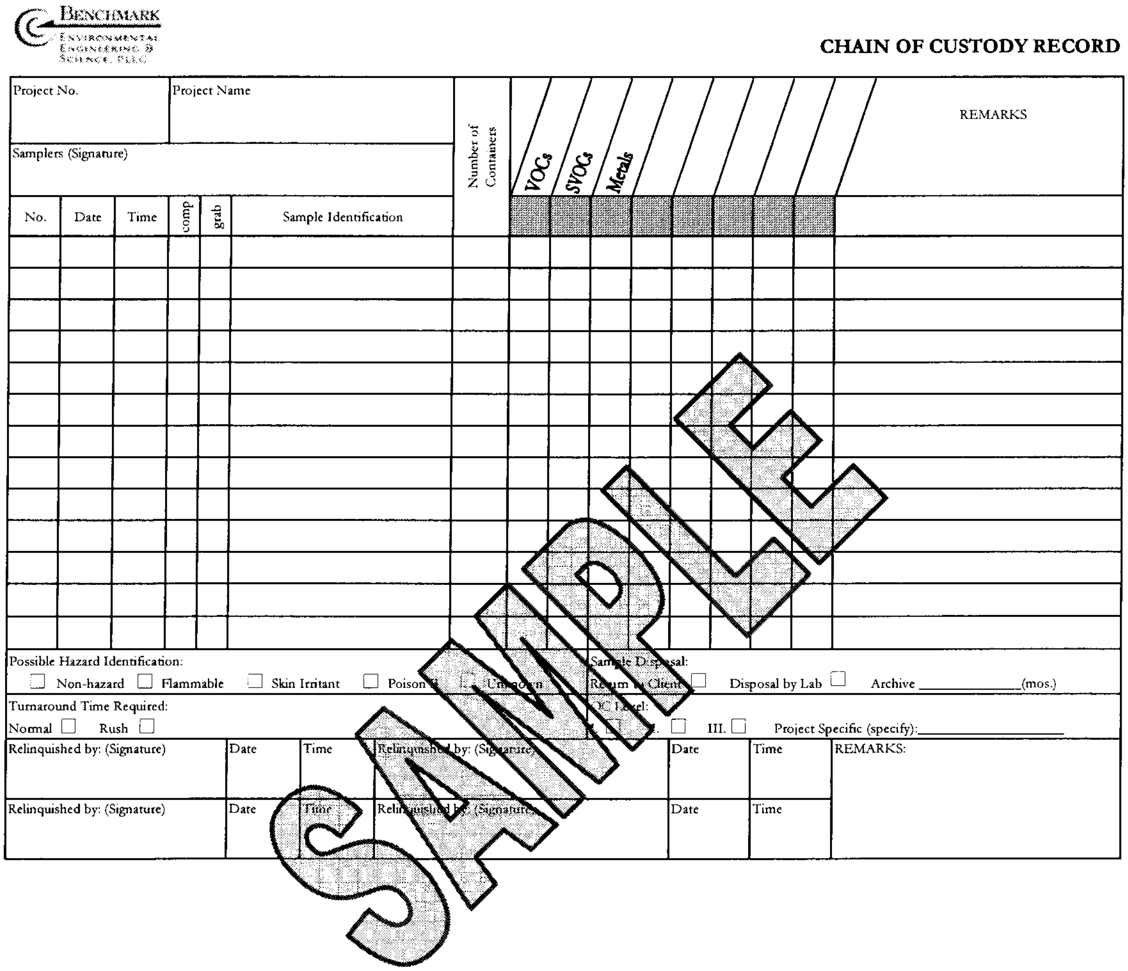
***Notes:***

1. See QAPP for sampling frequency and actual number of QC samples.
2. SC - Summa Canister.
3. TB - Tedlar Bag (quantity).
4. No Matrix Spike, Matrix Spike Duplicate, Matrix Spike Blanks, Field Duplicate, Field Blanks or Rinsates collected for air samples.



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**CHAIN OF CUSTODY RECORD**

Project No.

Project Name

Samplers (Signature)

| No. | Date | Time | comp | grab | Sample Identification | Number of Containers | VOCs | SVOCs | Metals | | | | | | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
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Possible Hazard Identification:
☐ Non-hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown

Sample Disposal:
Return to Client ☐ Disposal by Lab ☐ Archive ____________(mos.)

Turnaround Time Required:
Normal ☐ Rush ☐

QC Level:
I. ☐ II. ☐ III. ☐ Project Specific (specify):________________

| Relinquished by: (Signature) | Date | Time | Relinquished by: (Signature) | Date | Time | REMARKS: |
|---|---|---|---|---|---|---|
| | | | | | | |
| Relinquished by: (Signature) | Date | Time | Relinquished by: (Signature) | Date | Time | |
| | | | | | | |

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## WIPE SAMPLE COLLECTION SUMMARY LOG

| Field ID | Location | QC Type | Analytical Parameters | Containers | Date | Time | Sampler Initials | Comments (e.g. problems encountered, ref. to variance, location changes, important observations or descriptions, etc.) |
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***Notes:***

1. See QAPP for sampling frequency and actual number of QC samples.
2. CWM - clear, wide-mouth glass jar with Teflon-lined cap.
3. FD - Field Duplicate.
4. FB - Field Blank.
5. RS - Rinsate.
6. No Matrix Spike, Matrix Spike Duplicate or Matrix Spike Blanks for wipe samples.
7. Rinsates should be taken at a rate of 1 per day during wipe sampling. Only take when reusable equipment is used.
8. Wipe sample FB collected by wiping unused gloves (and any other sampling equipment coming into contact with sampled surface) with prepared gauze pad and place in sample jar. Take at a rate of 1 FB per 20 samples.
9. Wipe sample FDs taken adjacent to original sample at a rate of 1 FD per 20 samples.
10. **EH** : Extract and Hold

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## AIR SAMPLE COLLECTION SUMMARY LOG

| Field ID | Location | QC Type | Analytical Parameters | Containers | Date | Time | Sampler Initials | Comments (e.g. problems encountered, ref. to variance, location changes, important observations or descriptions, etc.) |
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***Notes:***

1. See QAPP for sampling frequency and actual number of QC samples.
2. SC - Summa Canister.
3. TB - Tedlar Bag (quantity).
4. No Matrix Spike, Matrix Spike Duplicate, Matrix Spike Blanks, Field Duplicates, Field Blanks or Rinsates collected for air samples.

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CHAIN OF CUSTODY RECORD

Project No.

Project Name

Samplers (Signature)

| No. | Date | Time | comp | grab | Sample Identification | Number of Containers | VOCs | SVOCs | Metals | | | | | | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
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Possible Hazard Identification:
☐ Non-hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown

Sample Disposal:
Return to Client ☐ Disposal by Lab ☐ Archive __________(mos.)

Turnaround Time Required:
Normal ☐ Rush ☐

QC Level:
I. ☐ II. ☐ III. ☐ Project Specific (specify):__________

| Relinquished by: (Signature) | Date | Time | Relinquished by: (Signature) | Date | Time | REMARKS: |
|---|---|---|---|---|---|---|
| Relinquished by: (Signature) | Date | Time | Relinquished by: (Signature) | Date | Time | |

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FIELD OPERATING PROCEDURES

# Abandonment of Monitoring Wells Procedure

# FOP 002.0

# ABANDONMENT OF MONITORING WELLS PROCEDURE

## PURPOSE

This guideline presents a method for the abandonment and decommissioning of wells that are no longer reliable as competent monitors of formation groundwater. Well abandonment and decommissioning is required in order to remove a potential pathway for the vertical migration of impacted groundwater and/or surface water.

## PROCEDURE

1. Examine the existing well to be abandoned/decommissioned and review well construction detail information (if applicable) to determine well depth,, screened interval, diameter, material of composition and other construction details. Establish appropriate equipment requirements for removal of the well.

2. Determine the most suitable seal materials as discussed in the next section.

3. Attempt to remove the well using a drilling rig, by using the following procedures:
    - Attaching the winch line to the well to see if it can be removed by pulling;
    - Using the rig's hydraulics to advance casing incrementally;
    - If a cable tool rig is available, bump back the casing using the cathead and drive block.

3. Upon removal of the well, ream the borehole by advancing the augers approximately one foot beyond the total depth of the well. Rotate the augers at a speed sufficient to remove the construction materials (i.e., filter pack, bentonite seal, etc.) from the borehole annulus (if possible). Backfill the resulting borehole with cement/bentonite grout, by tremie method, to approximately one foot below ground surface. Fill the remaining borehole to match the existing grade elevation and material of construction (i.e., clean native soil, concrete or asphalt, as necessary). Go to Step 10.

4. If the well cannot be removed from the borehole over-drill the borehole and well to approximately two (2) feet below the well depth. Upon reaching the desired depth, remove the well from within the augers and go back to Step 3.

5. If the borehole cannot be reamed out using conventional drilling techniques (i.e., over-drilled), remove or puncture the base plate of the well screen using the drill rig and associated equipment by pounding with the drill rods. Upon filling the well with grout by tremie method, slowly pull the well from the ground surface to allow the grout to evacuate through the bottom of the well to fill the void space created by removal of the well casing. Continue adding grout mix to the well casing, as necessary, to fill the void space to approximately one foot below ground surface. Fill the remaining borehole to match the existing grade elevation and material of construction (i.e., clean native soil, concrete or asphalt, as necessary). Go to Step 10.

   If the driller is unsuccessful at removing or puncturing the base plate of the well due, in part, to well construction materials (i.e., stainless steel or black iron), go to Step 6.

6. Insert a tremie pipe down the well to the bottom and pump a cement/bentonite grout mixture to a depth one to two feet above the top of the screen.

7. Perform a hydraulic pressure test on the portion of the well casing above the grouted screen section. Allow the grout to set up for a period not less than 72 hours before pressure testing of the grouted interval. Place a pneumatic packer a maximum of 4.5 feet above the top of the slotted screen section of the well. The infiltration pressure applied to the packer shall not exceed the pressure rating of the well casing material. If the interval between the top of the grout and the bottom of the packer is not saturated, potable water will be used to fill the interval. A gauge pressure of 5 psig at the well head shall be applied to the interval for a period of 5 minutes to allow for temperature stabilization. After 5 minutes, the pressure will be maintained at 5 psig for 30 minutes. The grout seal shall be considered acceptable if the total loss of water to the seal does not exceed 0.5 gallons over a 30-minute period.

8. If the grout seal is determined to be unacceptable, tremie grout an additional 5 feet of well riser above the failing interval and retest as specified above (see Step 7).

9. If the grout seal is determined to be acceptable, tremie grout the remainder of the well until grout displaces all formation water and a grout return is visible in the well at the surface. Cut off well casing at a depth of five feet or greater below ground surface and backfill the remaining borehole to match the existing grade elevation and material of construction (i.e., clean native soil, concrete or asphalt, as necessary).

10. Record all well construction details and abandonment procedures on the **Well Abandonment/Decommissioning Log** (sample attached).

## CEMENT/BENTONITE GROUT MIXTURE

The cement/bentonite grout mixture identified below is generally considered the most suitable seal material for monitoring well advancement and abandonment. Grout specifications generally have mixture ratios as follows:

Grout Slurry Composition (% Weight)

1.5 to 3.0% - Bentonite (Quick Gel)
40 to 60% - Cement (Portland Type I)
40 to 60% - Potable Water

## MISCELLANEOUS

All removed well materials (PVC, stainless steel, steel pipe) should be decontaminated (if necessary) as per the project specific **Drilling and Excavation Equipment Decontamination FOP** and removed from the site. The project manager will determine the destination of final disposal for all well materials. All drill cuttings (depending on site protocol) should be placed in DOT-approved 55-gallon drums, labeled and sampled in accordance with Benchmark's field operating procedure **Management of Investigation-Derived Waste** in order to determine proper removal and disposal procedures. The drilling subcontractor will provide any potable water utilized during this field activity from a known and reliable source (see Notes section).

## ATTACHMENTS

Well Abandonment/Decommissioning Log (sample)

## REFERENCES

New York State Department of Environmental Conservation, July 1988, *Drilling and Monitoring Well Installation Guidance Manual.*

Driscoll, F.G., 1987, *Groundwater and Wells*, Johnson Division, St. Paul, Minnesota, p. 1089.

Benchmark FOPs:
*018 Drilling/Excavation Equipment Decontamination Protocols*
*032 Management of Investigation-Derived Waste*

## NOTES

Tap water may be used from any municipal water treatment system. The use of an untreated potable water supply is not an acceptable substitute.

## WELL ABANDONMENT/ DECOMMISSIONING LOG

| PROJECT INFORMATION | WELL INFORMATION |
|---|---|
| Project Name: | WELL I.D.: |
| Client: | Stick-up (fags): |
| Project Job Number: | Total Depth (fbgs): |
| Date: | Screen Interval (fbgs): |
| Weather: | Well Material: |
| | Diameter (inches): |
| BM/TK Personnel: | |
| Drilling Company: | Drilling Company Personnel: |
| Drill Rig Type: | |

| DECOMMISSIONING PROCEDURES | |
|---|---|
| Time | Description of Field Activities |
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# Appendix A-3

## CORRECTIVE MEASURES REPORT

BENCHMARK
ENVIRONMENTAL
ENGINEERING &
SCIENCE, PLLC

| DAILY LOG | |
|---|---|
| DATE | |
| REPORT NO. | |
| PAGE | OF |

# CORRECTIVE MEASURES REPORT

Date:
Project:
Job No:
Location:
CQA Monitor(s):
Client:
Contractor:
Contractor's Supervisor:

**WEATHER CONDITIONS:**
Ambient Air Temp. - A.M.:
Ambient Air Temp. - P.M.:
Wind Direction:
Wind Speed:
Precipitation:

Corrective Measures Undertaken (reference Problem Identification Report No.)

Retesing Location:

Suggested Method of Minimizing Re-Occurrence:

Approvals (initial):

CQA Engineer:

Project Manager:

Signed:

CQA Representative

# Appendix B

## POST-CLOSURE FIELD INSPECTION REPORT

BENCHMARK
ENVIRONMENTAL
ENGINEERING &
SCIENCE, PLLC

# Field Inspection Report
# Post-Remedial Operation & Maintenance Plan

Property Name: Project No.:

Client:

Property Address: City, State: Zip Code:

Property ID: (Tax Assessment Map) Section: Block: Lot(s):

Preparer's Name: Date/Time:

## CERTIFICATION

The results of this inspection were discussed with the Site Manager. Any corrective actions required have been identified and noted in this report, and a supplemental Corrective Action Form has been completed. Proper implementation of these corrective actions have been discussed with the Site Manager, agreed upon, and scheduled.

**Preparer / Inspector:** **Date:**

**Signature:**

Next Scheduled Inspection Date:

## Property Access

1. Is the access road in need of repair? ☐ yes ☐ no ☐ N/A
2. Sufficient signage posted (No Trespassing)? ☐ yes ☐ no ☐ N/A
3. Has there been any noted or reported trespassing? ☐ yes ☐ no ☐ N/A

Please note any irregularities/ changes in site access and security:

## Final Surface Cover / Vegetation

The integrity of the vegetative soil cover or other surface coverage (e.g., asphalt, concrete) over the entire Site must be maintained. The following documents the condition of the above.

1. Final Cover is in Place and in good condition? ☐ yes ☐ no ☐ N/A
   Cover consists of (mainly):
2. Evidence of erosion? ☐ yes ☐ no ☐ N/A
3. Cracks visible in pavement? ☐ yes ☐ no ☐ N/A
4. Evidence of distressed vegetation/turf? ☐ yes ☐ no ☐ N/A
5. Evidence of unintended traffic and/or rutting? ☐ yes ☐ no ☐ N/A
6. Evidence of uneven settlement and/or ponding? ☐ yes ☐ no ☐ N/A

# Field Inspection Report
# Post-Remedial Operation & Maintenance Plan

---

## Final Surface Cover / Vegetation

7. Damage to any surface coverage? ☐ yes ☐ no ☐ N/A

If yes to any question above, please provide more information below.

______________________________

______________________________

______________________________

---

## Gas Vent System Monitoring and Maintenance

Are there signs of stressed vegetation around gas vents? ☐ yes ☐ no ☐ N/A

Are the gas vents currently intact and operational? ☐ yes ☐ no ☐ N/A

Has regular maintenance and monitoring been documented and enclosed or referenced?
☐ yes ☐ no ☐ N/A

---

## Groundwater Monitoring

Is there a plan in place and currently being followed? ☐ yes ☐ no ☐ N/A

Are the wells currently intact and operational? ☐ yes ☐ no ☐ N/A

When was the most recent sampling event report and submittal? Date: ______________

When is the next projected sampling event? Date: ______________

---

## Property Use Changes / Site Development

Has the property usage changed, or site been redeveloped since the last inspection?
☐ yes ☐ no ☐ N/A

If yes, please list with date: ______________________________

______________________________

______________________________

______________________________

______________________________

______________________________

## New Information

Has any new information been brought to the owner/engineer's attention regarding any and/or all engineering and institutional controls and their operation and effectiveness?

☐ yes ☐ no ☐ N/A

Comments: ____________________

## This space for Notes and Comments

## Please include the following Attachments:

1. Site Sketch
2. Photographs

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# Corrective Action Certification
# Post-Remedial Operation & Maintenance Plan

Property Name: Project No.:

Client:

Property Address: City, State: Zip Code:

Property ID: (Tax Assessment Map) Section: Block: Lot(s):

Preparer's Name: Date/Time:

## Issue Addressed

The Environmental Inspection of the above property determined the need for corrective action. This form has been completed to document the required corrective action and it's implementation.

Description of Site Issue identified during Environmental Inspection (include sketch & photographs):

## Corrective Action Taken

Date Completed:

Describe Action Taken (include sketch & photographs):

## Certification of Implementation

The signatory hereby certifies that the corrective action as described in this form has been completed in accordance with all relevant requirements of the Soil/Fill Management Plan and other applicable documents.

**Preparer / Inspector:** **Date:**

**Signature:**

**Please verify inclusion of the following Attachments:**

1. Site Sketch
2. Photographs

# Appendix C

## LANDSCAPING SPECIFICATIONS

SECTION 02101, CLEARING AND GRUBBING

SECTION 02200, FINAL CONSTRUCTION COVER

SECTION 02901, TOPSOIL

SECTION 02902, TURF

# SECTION 02110
# CLEARING AND GRUBBING

## PART 1- GENERAL

### 1.1 DESCRIPTION

A. Scope: Subcontractor shall furnish all labor, materials, equipment and incidentals required to perform all clearing and grubbing as shown and specified.

B. Related Work Specified Elsewhere:
   1. Section 02901, Topsoil.
   2. Section 02902, Turf

### 1.2 JOB CONDITIONS

A. Protection:

   1. Streets, roads, adjacent property and other works and structures shall be protected throughout the entire project. Subcontractor shall return to original condition, satisfactory to Benchmark, damaged facilities caused by the Subcontractor's operations.

   2. Trees, shrubs and grassed areas which are to remain shall be protected from damage. Equipment, stockpiles, etc. shall not be permitted within tree branch spread. Trees shall not be removed without approval of Benchmark unless shown or specified.

## PART 2- PRODUCTS

(Part 2 omitted this Section)

## PART 3- EXECUTION

### 3.1 CLEARING AND GRUBBING

A. Limits of clearing shall be all areas within the Contract limit lines except as otherwise shown. Damage outside these limits caused by the Subcontractor's operations shall be corrected at the Subcontractor's expense.

B. Cut all existing vegetation within the Clearing Limit lines and all existing vegetation on waste/fill piles to grade.

C. Strip all vegetation from areas requiring cover soils. Place no final cover system materials directly on top of grass or vegetation.

E. Stumps within the work limits shall be removed.

F. Bury waste, vegetation and debris within the consolidation area subgrade in a manner to prevent soil settlement from occurring. Do not bury large pockets or piles of stumps, mulch or other debris.

G. For large trees the Subcontractor shall have the following options:

1. Dispose of the trunk wood off-site.
2. Cut the trunks in pieces 24-inches or less in length and bury the wood within the consolidation area subgrade in a manner to prevent settlement from occurring. Do not bury large pockets of wood.
3. Cut and mulch wood. Mulch shall be spread in a layer no more than two inches across the landfill subgrade prior to cover system placement, or stockpiled or spread on-site in a location acceptable to Benchmark.

H. Brush and tree branches shall be mulched. The mulch shall either be disposed of in a location acceptable to Benchmark, or buried in a layer no more than two inches thick across the surface of the subgrade prior to cover system placement.

I. Burning on site shall not be done unless approved by authorities having jurisdiction. All burning, on or off the site, shall be in complete accordance with rules and regulations of local authorities having jurisdiction.

J. Control air pollution caused by dust and dirt, and comply with governing regulations.

---END OF SECTION---

# SECTION 02220
# EXCAVATION, BACKFILL, AND GRADING

## PART 1 - GENERAL

### 1.1 DESCRIPTION

A. Scope:

1. Subcontractor shall provide all labor, materials, equipment and incidentals required to perform all excavating, backfilling, filling and grading, and disposing of waste, debris and earth materials as shown, specified, and required for construction of the final cover system, roads, and other facilities required to complete the Work in every respect.
2. All temporary means needed to prevent discharge of sediment to water courses from dewatering systems or erosion are included.

B. Related Work Specified Elsewhere:

1. Section 02110, Clearing and Grubbing.
2. Section 02250, Final Construction Cover
3. Section 02901, Topsoil

### 1.2 QUALITY ASSURANCE

A. Material Tests:

1. Benchmark has engaged the services of a qualified testing laboratory (Soils Laboratory) to conduct tests and determine maximum re-compacted density and optimum moisture content of onsite waste/fill material. Subcontractor shall provide all other third party material testing services and test reports as required under this section.

B. Permits and Regulations:

1. Obtain all necessary permits for work in roads, rights-of-way, etc. Also obtain permits as required by local, state and federal agencies for discharging water from the work area.
2. Perform excavation and grading work in compliance with applicable requirements of governing authorities having jurisdiction.

C. Reference Standards: Comply with applicable provisions and recommendations of the following except as otherwise shown or specified.

1. ASTM D 422-63, Method for Particle-Size Analysis of Soils.
2. ASTM D 1557, Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort
3. ASTM D 2922-96, Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

4. OSHA Standard, Title 29, Code of Federal Regulations, Part 1926, Section.650 (Subpart P - Excavations).

## 1.3 SUBMITTALS

A. Test Reports - Backfill and Grading:
   1. Benchmark will provide Subcontractor with copies of the following reports:
      a. Field density tests.
      b. Maximum density curve for each soil and fill material used for backfill

B. Submit samples of all fill, gravel and subgrade materials required.
   1. Deliver samples to Benchmark's designated Soils Laboratory.

## 1.4 JOB CONDITIONS

A. Subsurface Information: Refer to Supplementary Conditions for Data on subsurface conditions. Data is not intended as a representation or warranty of continuity of conditions between soil borings nor of groundwater levels at dates and times other than date and time when measured. Benchmark will not be responsible for interpretations or conclusions drawn there from by Subcontractor. Data are solely made available for the convenience of Subcontractor.
   1. Additional test borings and other exploratory operations may be made by Subcontractor at no cost to OWNER.

B. Existing Utilities: Locate existing underground utilities in the areas of Work. If utilities are to remain in place, provide adequate means of protection during all operations.
   1. Should uncharted or incorrectly charted piping or other utilities be encountered during excavation, consult piping or utility owner and Benchmark immediately for directions as to procedure. Cooperate with OWNER and utility owner in keeping services and facilities in operation. Repair damaged utilities to satisfaction of utility owner.

C. Use of Explosives:
   1. The use of explosives will not be permitted.

D. Protection of Persons and Property: Barricade open excavations occurring as part of the Work and post with warning lights. Operate warning lights during hours from dusk to dawn each day and as otherwise required.
   1. Protect utilities, and other facilities from damage caused by settlement, lateral movement, undermining, washout and other hazards created by earthwork operations.

E. Dust Control: Conduct all operations and maintain areas of activity, including sweeping and sprinkling of roadways, to minimize creation and dispersion of dust. Calcium chloride may not be used to control dust problems.

## PART 2 - PRODUCTS

### 2.1 WASTE/FILL MATERIALS

A. Subgrade Waste/Fill Material:
   1. Excavate and transport on-site Waste/Fill material to the consolidation area as shown on the Contract Drawings.

B. Gas Vent Spoils:
   1. Spoils from gas vent construction shall be placed and compacted in the consolidation area subgrade.

### 2.2 AGGREGATE (FOR ACCESS DRIVE AND PERIMETER ACCESS ROAD)

A. All materials furnished shall be well graded, suitable for intermittent vehicular travel, and free from organic or other deleterious material.

B. Benchmark shall approve aggregate material. Subcontractor shall provide information as to the source of the material and gradation information.

C. Recycled materials potentially containing hazardous or toxic wastes, petroleum or other hazardous chemical substances shall not be accepted.

D. No segregation of large and fine particles will be required, but the material as spread shall be well-graded with no pockets of fine materials.

## PART 3 -EXECUTION

### 3.1 INSPECTION

A. Provide Benchmark with sufficient notice and with means to examine the areas and conditions under which excavating, filling, and grading are to be performed. Benchmark will notify Subcontractor if conditions are found that may be detrimental to the proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions have been corrected in an acceptable manner.

### 3.2 EXCAVATION AND GRADING

A. Perform all excavation and grading required to complete the Work as shown, specified and required. Excavations and grading shall include earth, waste/fill, and all other materials within the excavation limits.

B. Excavate waste/fill outside consolidation areas until native soils are achieved as determined by Benchmark.

C. Landfill subgrade shall be firm, dense, and thoroughly compacted and consolidated; shall be free from mud, muck, and other soft or unsuitable materials; and shall remain firm and intact under all construction operations.

## 3.3 UNAUTHORIZED EXCAVATION

A. All excavation outside the lines and grades shown, and native soil excavation which is not approved by Benchmark, together with the removal and disposal of the associated material shall be at Subcontractor's expense. Unauthorized excavations shall be filled and compacted with select backfill by Subcontractor at his expense.

## 3.4 GENERAL REQUIREMENTS FOR BACKFILL AND COMPACTION

A. Furnish, place and compact all waste/fill required to conform to the finished grades shown and specified, unless otherwise specified or directed by Benchmark.

B. Restore excavations as promptly as Work permits in accordance with Section 02902.

C. Unless otherwise specified or directed by Benchmark, waste/fill shall be placed in horizontal loose lifts not exceeding 12 inches in thickness and shall be mixed and spread in a manner assuring uniform lift thickness after placing.

D. Control the water content of waste/fill material during placement within the range necessary to obtain the compaction specified. In general, the moisture content of the waste/fill shall be within 3 percent of the optimum moisture content for compaction as determined by laboratory tests. Perform all necessary work to adjust the water content of the material to within the range necessary to permit the compaction specified. Do not place fill material when free water is standing on the surface of the area where the fill is to be placed. No compaction of fill will be permitted with free water on any portion of the fill to be compacted.

E. Do not place or compact waste/fill in a frozen condition or on top of frozen material.

F. Perform compaction of waste/fill with equipment suitable for the type of material placed and which is capable of providing the densities required. Subcontractor shall select the type of compaction equipment to be used.

G. Compact waste/fill shall be compacted by at least two coverages of all portions of the surface of each lift by compaction equipment. One coverage is defined as the condition obtained when all portions of the surface of the fill material have been subjected to the direct contact of the compactor.

H. Test the effectiveness of the equipment selected by Subcontractor at the commencement of compaction by construction of a small section of fill within the area where fill is to be placed. If tests on this section of fill show that the specified compaction is not obtained, Subcontractor shall increase the number of coverages, decrease the lift thicknesses or obtain a different type of compactor. No additional cost to Benchmark or Respondents shall be incurred.

I. The minimum density for backfill shall be 90 percent of maximum density obtained in the Soils Laboratory in accordance with ASTM D 1557-91. This percentage is of Modified Proctor density.

J. If the specified densities are not obtained because of improper control of placement or compaction procedures, or because of inadequate or improperly functioning compaction equipment, the Subcontractor shall perform whatever work is required to provide the required densities. This work shall include complete removal of unacceptable fill areas, and replacement and recompaction until acceptable fill is provided.

K. Subcontractor shall repair, at his own expense, any settlement that occurs. He shall make all repairs and replacements necessary within 30 days after notice from Benchmark.

## 3.5 GRADING

A. General: Uniformly grade areas within limits of grading under this Section, including adjacent transition areas. Smooth subgrade surfaces within specified tolerances, compact with uniform levels or slopes between points where elevations are shown, or between such points and existing grades.

B. Compaction:

1. After grading, compact subgrade surfaces to the depth and percentage of maximum density for each area classification.

C. Proof-rolling:

1. Proof-roll consolidation area subgrade prior to placement of Barrier Layer.

## 3.6 QUALITY CONTROL

A. Quality Control Testing During Construction: Benchmark must inspect and approve subgrade before final cover layers are placed.

B. If testing service reports or inspections show subgrade or fills are below specified density, Subcontractor shall provide additional compaction and testing at no additional expense to Benchmark or Respondents.

C. Waste/Fill Material Tests:
   1. Benchmark will perform in-place soil density testing to determine the degree of compaction of the re-compacted waste/fill. A 1-acre, 12-inch thick test pad shall be constructed by the Subcontractor and a minimum of nine in-place moisture-density tests, using a nuclear densitometer, shall be performed by Benchmark for the test pad layer. Benchmark will determine the exact location of the moisture-density tests. The location of all nuclear densitometer tests will be referenced to the existing horizontal grid system. Following satisfactory test results on the test pad, Benchmark will perform one moisture-density test using a nuclear densitometer per acre, per lift of completed waste/fill layer going forward. The Subcontractor shall be responsible for providing grade control at all times during waste/ fill placement to facilitate test identification and coordination by Benchmark.
   2. The waste/fill shall be compacted to wet of the optimum moisture content and not less than the minimum density as described in the CQA Plan and item 3.4 of this Section. If the specified moisture and density is not obtained, the Subcontractor shall perform all work required to provide the specified amounts. This work shall include re-compaction and/or complete removal and replacement of unacceptable waste/fill material until the specified moisture and density is achieved. All additional excavation and compaction work shall be performed by the Subcontractor at no additional cost to Benchmark until the specified degree of compaction is obtained.
   3. Benchmark will perform one moisture content test per acre of the previous lift before placement of additional lifts. No additional lifts of waste/fill material will be permitted unless the moisture content of the waste/fill is greater than the optimum. The Subcontractor shall obtain the approval of Benchmark before proceeding with placement of additional lifts.
   4. Soils testing of material shall be performed in accordance with the following references:
      a. ASTM D 421, Dry Preparation of Soil Samples for Particle-Size Analysis and Determination of Soil Constants.
      b. ASTM D 422, Particle-Size Analysis of Soils.
      c. ASTM D 689, Moisture-Density Relations of Soils.
      d. ASTM D 2922, Standard Test Methods for Soil and Soil Aggregates In-Place by Nuclear Methods (for shallow depths).

e. ASTM D 1557, Moisture-Density Relations of Soils, Using 10 lb. Rammer and 18-inch Drop.

f. ASTM D 2216, Laboratory Determination of Water (Moisture) Content of Soil, Rock, and Soil Aggregate Mixtures.

g. ASTM D 5084, Recompacted Constant-Head Permeability of Soils.

h. ASTM D 4318, Liquid Limit Plastic Unit, and Plasticity Index of Soils.

5. The Subcontractor shall be thoroughly familiar with the requirements of the Engineer's Construction Quality Assurance (CQA) Plan. The quality assurance testing specified in the CQA Plan will be performed by Benchmark; however, the Subcontractor shall assist Benchmark in implementation of the CQA Plan. This includes performing site surveying, providing equipment and personnel to assist Benchmark in collection of soil samples, and implementation of corrective measures as described in the CQA Plan at no additional cost to Benchmark.

# SECTION 02250
# FINAL CONSTRUCTION COVER

## PART 1 – GENERAL

### 1.1 DESCRIPTION

A. Scope:

1. Subcontractor shall furnish all labor, materials, equipment, accessories and services necessary to excavate, screen, transport, place and compact soil and materials specified for the final cover as shown on the Drawings and herein specified.

B. Related Work Specified Elsewhere:
1. Section 02110, Clearing and Grubbing
2. Section 02901, Topsoil
3. Section 02902, Turf

### 1.2 QUALITY ASSURANCE/QUALITY CONTROL (QA/QC)

A. Barrier Layer Material Tests:
1. Benchmark will perform in-place soil density testing to determine the degree of compaction of the recompacted barrier layer soil. A minimum of nine moisture-density tests using a nuclear densitometer shall be performed per acre per lift of completed barrier layer. Benchmark will determine the exact location of the moisture-density tests. The location of all nuclear densitometer tests will be referenced to the existing horizontal grid system. The Subcontractor shall be responsible for providing grade control at all times during barrier layer placement to facilitate test identification and coordination by Benchmark.
2. The soil shall be compacted to wet of the optimum moisture content and not less than the minimum density as described in the CQA Plan and item 3.4 of this Section. If the specified moisture and density is not obtained, the Subcontractor shall perform all work required to provide the specified amounts. This work shall include recompaction and/or complete removal and replacement of unacceptable barrier material until the specified moisture and density is achieved. All additional excavation and compaction work shall be performed by the Subcontractor at no additional cost to Benchmark until the specified degree of compaction is obtained.
3. Benchmark will perform one moisture content test per acre of the previous lift before placement of additional lifts. No additional lifts of final cover material will be permitted unless the moisture content of the soil is greater than the optimum. The Subcontractor shall obtain the approval of Benchmark before proceeding with placement of additional lifts.

The Subcontractor shall assist Benchmark in collecting the Shelby tube samples required for the performance of the permeability tests. The location of all permeability shall be referred to the existing horizontal grid system. The Subcontractor shall achieve maximum in-place soil permeability for the barrier layer material of 1.0 x $10^{-6}$ cm/sec.

5. Soils testing of material shall be performed in accordance with the following references:
    a. ASTM D 421, Dry Preparation of Soil Samples for Particle-Size Analysis and Determination of Soil Constants.
    b. ASTM D 422, Particle-Size Analysis of Soils.
    c. ASTM D 689, Moisture-Density Relations of Soils.
    d. ASTM D 2922, Standard Test Methods for Soil and Soil Aggregates In-Place by Nuclear Methods (for shallow depths).
    e. ASTM D 1557, Moisture-Density Relations of Soils, Using 10 lb. Rammer and 18-inch Drop.
    f. ASTM D 2216, Laboratory Determination of Water (Moisture) Content of Soil, Rock, and Soil Aggregate Mixtures.
    g. ASTM D 5084, Recompacted Constant-Head Permeability of Soils.
    h. ASTM D 4318, Liquid Limit Plastic Unit, and Plasticity Index of Soils.
6. The Subcontractor shall be thoroughly familiar with the requirements of the Engineer's Construction Quality Assurance (CQA) Plan. The quality assurance testing specified in the CQA Plan will be performed by Benchmark; however, the Subcontractor shall assist Benchmark in implementation of the CQA Plan. This includes performing site layout surveying, providing equipment and personnel to assist Benchmark in collection of soil samples, and implementation of corrective measures as described in the CQA Plan at no additional cost to Benchmark.

B. Benchmark shall perform all quality assurance testing on the topsoil as required under Section 02901, Topsoil.

C. Coordination:
1. The Subcontractor shall coordinate soil placement activities with the Benchmark's CQA Inspector to keep him fully informed regarding amounts of soil material needed, and when it will be placed.

## PART 2 – MATERIALS

### 2.1 SOIL MATERIALS

A. General:

1. The Subcontractor shall be responsible for obtaining all the necessary State and Local permits required for the excavation of borrow source material.
2. All soil material shall be natural soil, free from excessive moisture or frost.
3. The Subcontractor shall remove al stumps, roots, muck, marl and stones exceeding 3-inches in greatest dimension prior to placement.
4. Stones smaller than 3-inches in diameter shall be kept apart and not permitted to accumulate in-groups.
5. Use no frozen material.
6. Benchmark shall collect the soil samples for analysis. The Subcontractor shall provide surveying, personnel and heavy equipment to assist Benchmark in the collection of the samples.

B. Barrier Layer Material:

1. In addition to Paragraph 2.1.A requirements, material shall contain no sod or vegetative matter.
2. Benchmark will perform CQA testing on the barrier layer material prior to placement. The Subcontractor will either stockpile the proposed material in 1000 cubic yard piles for testing by Benchmark or else dig representative test holes at the borrow area for testing. Specific requirements are described in the CQA Plan. The Subcontractor will not be permitted to use the soil for the barrier layer construction until after CQA testing has been completed and Benchmark approves the material.
3. Barrier layer material will conform to the following requirements:
    a. Recompacted Permeability: less than or equal to 1.0 x $10^{-6}$ cm/sec.
    b. Approximate Gradation:

| Seize Size Designation | Percent Minimum Passing by Weight |
|---|---|
| 3 – inch | 100 |
| No. 4 | 85 |
| No. 200 | 50 |

C. Topsoil:

1. Soil material capable of supporting adequate vegetative growth meeting the requirements of Section 02901, Topsoil.

## 2.2 SEED

A. Refer to Section 02902, Turf.

## PART 3 – EXECUTION

### 3.1 EXCAVATION

A. All miscellaneous excavation and grading shall be to the required lines, grades, depths and dimensions necessary as shown on the Contract Drawings.

B. In any case where the excavation or grading extends deeper than the required elevations, the over-excavated areas shall, at the discretion of Benchmark, be filled with acceptable material at no additional cost to Benchmark.

### 3.2 BARRIER LAYER PREPARATION

A. The Subcontractor shall be responsible for scarifying the top inch of the existing barrier layer as directed by Benchmark, prior to placement of additional barrier layer material.

### 3.3 GAS VENT INSTALLATION

A. Waste material excavated during gas vent installation shall be disposed of on-site within the waste fill area, the same day it is excavated, at a location specified by Benchmark.

### 3.4 BARRIER LAYER CONSTRUCTION

A. The Subcontractor shall utilize all soil material representative of one composite sample (approximately 5,000 cubic yards) before beginning to utilize other material representative of the next composite.

B. The barrier layer material shall be placed in loose lifts, approximately nine inches thick and shall be compacted to maximum lift thickness of six inches.

C. Each layer of barrier material shall be thoroughly tamped or rolled to the required degree of compaction and moisture. Successive layers shall not be placed until the layer under construction has been thoroughly compacted, tested, and approved by Benchmark.

D. The top inch of each completed and approved lift shall also be scarified or rolled with a pad-foot roller, unless otherwise directed by Benchmark, prior to placement of successive layers.

E. Material shall be mixed and spread in a manner to assure uniform lift thickness after placement.

F. Barrier layer material containing lumps, pockets or concentrations of rubble and stones, debris, wood or other organic matter shall not be placed. Fill containing unacceptable material shall be removed and disposed .

G. The Subcontractor shall remove existing vegetation prior to barrier layer placement.

H. All excavation, transportation and placement operations shall be such as will produce satisfactory gradation of materials after they have been spread and compacted. Dumping, spreading, sprinkling and compacting operations shall be carried out systematically so as not to interfere with each other.

I. Intermediate lifts will be seal rolled when subsequent lifts will not be placed within 48 hours of completion.

J. Damage to compacted lifts (viz., rutting by equipment or erosion) will be repaired prior to placing any overlying materials at no additional cost.

K. Any perforations in the barrier layer material resulting from grade stake removal or other causes shall be backfilled with acceptable barrier layer soil material or a dry soil-bentonite (50/50) mixture by the Subcontractor before material may be placed on the next lift.

L. Moisture Control:

   1. The barrier layer material moisture content shall be maintained greater than optimum moisture content during placement.
   2. Barrier layer material shall not be placed unless the moisture content of the previous lift is also greater than optimum.
   3. When necessary, moisture will be added using approved sprinkling equipment. The Subcontractor shall, at his own expense, add sufficient water during rolling and tamping to assure complete compaction of material.
   4. Place no more barrier material than can be compacted and tested the same day.
   5. If, in the opinion of Benchmark, the material is too wet for satisfactory compaction, or compaction efforts may damage preceding layers of final cover, the Subcontractor shall temporarily stop work and the material will be allowed to dry. There shall be no additional cost to Benchmark for time and materials required to spread, dry and rework the material.
   6. The placement or compaction of material will not be permitted during or immediately following rainfall. Construction of the barrier layer shall be conducted in such manner that a minimum of rainwater will be retained thereon. Compacted material that is damaged by washing shall be replaced by the Subcontractor in an acceptable manner at no additional cost.
   7. No compaction of material will be permitted with free water on any portion of the layer to be compacted.
   8. Place topsoil on each completed segment of cap immediately after CQA tests are approved by Benchmark to control moisture and prevent desiccation cracking.

M. Compaction:

   1. Each lift of the barrier layer shall be compacted to not less than 90 percent of the modified proctor maximum density, in pounds per cubic foot, as

determined by the Modified Proctor Compaction Test, ASTM-D-1557 and as specified in the CQA Plan.

2. Benchmark will perform the compaction and moisture content tests in accordance with the CQA Plan.
3. The Subcontractor shall select equipment, which is capable of providing the minimum densities required by these specifications, and shall submit a description of the type of equipment he proposes to use to Benchmark for approval. Compaction equipment will be a tamping foot or sheepsfoot roller. A smooth roller shall not be used for compaction.
4. Lift thicknesses, water content (of the material), compactor weight and the number of passes of the compacting equipment will be adjusted as required to obtain the minimum specified density.
5. If the field and laboratory tests indicate unsatisfactory results, the Subcontractor shall provide the additional work effort necessary to achieve the desired degree of in-place moisture, density and permeability to the satisfaction of Benchmark. All additional compaction work or removing and replacing of soil material shall be performed by the Subcontractor at no additional cost to Benchmark.

## 3.5 TOPSOIL AND VEGETATIVE COVER

A. Following the completion of the barrier layer construction, six inches of topsoil will be placed to support vegetative growth. Refer to Sections 02901 and 02902 for specifications regarding topsoil and vegetative cover.

## 3.6 MINIMUM COVER SYSTEM THICKNESS

A. The Subcontractor shall obtain the approval of Benchmark for the minimum layer thickness of each layer before beginning the placement of subsequent layers.

B. The barrier layer shall have a minimum overall thickness of 18-inches.

C. The topsoil layer shall have a minimum thickness of 6-inches.

## 3.7 INSPECTION

A. Benchmark shall examine the areas and conditions under which the compaction work is to be performed and notify the Subcontractor of conditions detrimental to the proper and timely completion of the Work. Subcontractor shall not proceed with the work until unsatisfactory conditions have been corrected in an acceptable manner.

END OF SECTION

# SECTION 02901
# TOPSOIL

## PART 1- GENERAL

### 1.1 DESCRIPTION

A. Scope:
   1. Subcontractor shall provide all labor, materials, equipment and incidentals as shown, specified and required to furnish and install topsoil Work.
   2. The types of topsoil Work required include the following:
      a. Spreading topsoil.
      b. Maintenance Work.

B. Coordination:
   1. Review installation procedures under other Sections and coordinate the installation of items that must be installed with the topsoil.

C. Related Work Specified Elsewhere:
   1. Section 02101, Clearing and Grubbing.
   2. Section 02902, Turf.

### 1.2 QUALITY ASSURANCE

A. Benchmark will perform QA testing on the topsoil material prior to placement. The Subcontractor will either stockpile the material in 5000 cubic yard piles for testing by Benchmark or will dig representative test holes at the borrow area for testing. Specific requirements are described in the Construction Quality Assurance Plan and Paragraph 2.1. The Subcontractor will not be permitted to place topsoil until after QA testing has been completed and Benchmark approves the material.

B. Source Quality Control:
   1. Off-Site Topsoil: Obtain topsoil only from naturally well-drained sites where topsoil occurs in depth of not less than 4-inches; do not obtain from bogs or marshes.

C. Reference Standards: Comply with applicable provisions and recommendations of the following, except where otherwise shown or specified:
   1. ASTM C 602, Agricultural Liming Materials.
   2. ASTM D 421-85, Dry Preparation of Soil Samples for Particle-Size Analysis and Determination of Soil Constants.
   3. ASTM D 422-63, Particle-Size Analysis of Soils.
   4. ASTM D 2487-93, Classifications of Soils for Engineering Purposes (USCS).
   5. ASTM D 2974-87, Moisture, Ash, and Organic Matter of Peat and Other

Organic Soils.
6. ASTM D 4972-95 a, pH of Soils.
7. Association of Official Analytical Chemists, Official Methods of Analysis.

## 1.3 JOB CONDITIONS

A. Environmental Requirements: Do not spread topsoil if condition is unsuitable due to frost, excessive moisture or other conditions. Cease Work until the topsoil is in a suitable condition as determined by Benchmark.

## PART 2- PRODUCTS

## 2.1 MATERIALS

A. General:
   1. The Subcontractor shall be responsible for obtaining all the necessary State and Local permits required for the excavation of borrow source material.

B. Topsoil:
   1. Fertile, friable, natural loam, surface soil, capable of sustaining vigorous plant growth, free of any admixture of subsoil, clods of hard earth, plants or roots, sticks or other extraneous material harmful to plant growth. Topsoil will meet the following criteria:

      a.

| Sieve Size Designation | Percent Passing By Weight |
|---|---|
| 3-inch | 100 |
| 1-inch | 80-100 |
| 1/4-inch | 65-100 |
| No. 200 | 20-80 |

      b. Clay content of material passing No. 200 sieve not greater than 20 percent, as determined by hydrometer tests.
      c. pH 5.0 to pH 7.6. pH may be amended to meet these limits
      d. Organic content at least 2.5 percent, as determined by ignition loss (may be amended to meet this requirement).
      e. Free of pests and pest larvae.
      f. Soluble salt content not greater than 500 ppm.

## PART 3- EXECUTION

## 3.1 INSPECTION

A. Benchmark will examine the subgrade, observe the conditions under which the Work is to be performed, and notify Subcontractor of unsatisfactory conditions.

Do not proceed with the Work until unsatisfactory conditions have been corrected in a manner acceptable to Benchmark.

## 3.2 INSTALLATION

A. Place and spread topsoil, over the areas shown, to a minimum depth of 6-inches after natural settlement and light rolling, in a manner that the completed work conforms to the lines and grades shown.

B. Do not spread topsoil while in a frozen condition or when moisture content is so great that excessive compaction will occur nor when so dry that dust will form in the air or that clods will not break readily.

C. Do not compact topsoil.

D. Alter the topsoil is spread, remove all large, stiff clods, rocks, roots or other foreign matter over 2-inches.

F. Manipulate topsoil to attain a properly drained surface.

G. Grade topsoil areas to smooth, even surface with loose, uniform, fine texture.

H. Roll and rake and remove ridges and fill all depressions, ruts, low spots or unsuitable areas which result after settlement.

I. Topsoil placed and graded on slopes steeper than 5 percent shall be promplty fertilized, seeded, mulched and stabilized by "tracking" with suitable equipment.

## 3.3 MAINTENANCE

A. Maintain topsoiled areas by filling in erosion channels and correcting drainage as required.

B. Maintain the topsoil in a loose, friable condition until seeding operations begin.

## 3.4 INSPECTION AND ACCEPTANCE

A. When the topsoiling Work is completed, including maintenance, Benchmark will make an inspection to determine acceptability.

B. Where inspected topsoil Work does not comply with the requirements, regrade rejected Work and maintain until reinspected by Benchmark and found to be acceptable.

END OF SECTION

# SECTION 02902
# TURF

## PART 1- GENERAL

### 1.1 DESCRIPTION

A. Scope:

1. Subcontractor shall provide all labor, materials, equipment and incidentals as shown, specified and required to furnish and install turf Work.
2. The extent of the turf Work shall include:
    a. All areas where Subcontractor places cover soils.
    b. All areas within the limits of clearing where existing vegetation is deemed insufficient as determined by Benchmark.
    c. All areas where Subcontractor's performance of Work damages existing vegetation as determined by Benchmark.
3. The types of turf Work required include the following.
    a. Seeded areas.
    b. Soil amendments.
    c. Mulch.
    d. Replant unsatisfactory or damaged turf.

B. Coordination:

1. Review installation procedures under other Sections and coordinate the installations of items that must be installed with the turf.

C. Related Work Specified Elsewhere:

1. Section 02101, Clearing and Grubbing.
4. Section 02901, Topsoil.

### 1.2 QUALITY ASSURANCE

A. Source Quality Control:

1. General: Ship turf materials with certificates of inspection as required by governmental authorities. Comply with governing regulations applicable to turf materials.
2. Analysis and Standards: Package standard products with manufacturer's certified analysis.

C. Reference Standards: Comply with applicable provisions and recommendations of the following, except where otherwise shown or specified:

1. Association of Official Analytical Chemists, Official Methods of Analysis.
2. American Joint Committee on Horticultural Nomenclature, Standardized Plant Names.
3. ASTM C 602, Agricultural Liming Materials.

4. ASTM D 2487-93, Classification of Soils for Engineering Purposes (USCS).
5. FSO-F-241D, Fertilizer, Mixed, Commercial.
6. FSO-P-166E, Peat Moss; Peat, Humus; and Peat, Reed-sedge.
7. Official Seed Analysts of North America, Standards of Quality.

## 1.4 PRODUCT DELIVERY. STORAGE AND HANDLING

A. Delivery of Materials:
   1. Do not deliver seed until site conditions are ready for planting.
   2. Deliver packaged materials in containers showing weight, analysis and name of manufacturer. Protect materials from deterioration during delivery.
   3. Furnish seed in sealed, standard containers.
   4. Notify Benchmark of delivery schedule in advance so turf material may be inspected upon arrival at job site.
   5. Remove unacceptable material immediately from job site.

B. Storage of Materials:
   1. Store and cover materials to prevent deterioration. Remove packaged materials that have become wet or show deterioration or water marks from the project site.
   2. Seed that is wet or moldy or that has been otherwise damaged in transit or storage is not acceptable. Replace at no further cost to Benchmark or Respondents.

## 1.5 JOB CONDITIONS

A. Environmental Requirements:
   1. Proceed with and complete the turf Work as rapidly as portions of the site become available, working within the seasonal limitations for each type of turf required.
   2. Do not spread seed when wind velocity exceeds 5 miles per hour.
   3. Do not plant turf when drought, or excessive moisture, or other unsatisfactory conditions prevail.

B. Scheduling:
   1. Plant or install materials only during normal planting seasons. Correlate planting with specified maintenance periods and provide maintenance as specified herein.

## 1.6 ALTERNATIVES

A. If specified turf material is not obtainable, submit to Benchmark proof of non-availability and proposal for use of equivalent material.

## PART 2- PRODUCTS

## 2.1 MATERIALS

A. Grass Materials:

1. Grass Seed Mixture: Provide fresh, clean, new-crop seed complying with the tolerance for purity and germination established by the Official Seed Analysts of North America. Provide seed of the grass species, proportions and minimum percentages of purity, germination, and maximum percentage of weed seed, as specified.
2. Areas requiring seeding shall be seeded with 196 lbs/acre of seed conforming to the following:

| Name of Grass | Application Rate Per Acre | % of Mix | Variety |
|---|---|---|---|
| Tall Fescue | 70.6 pounds | 36% | KY-31 |
| Orchard Grass | 29.4 pounds | 15% | PENNLATE |
| Creeping Red Fescue | 39.2 pounds | 20% | ENSYLVA |
| Perrenial Ryegrass | 49 pounds | 25% | POLLY |
| Birds-Foot Trefoil | 7.8 pounds | 4% | VIKING |

a. Germination and purity percentages should equal or exceed the minimum seed standard listed. If it is necessary to use seed as the germination percentage less than the minimum recommended above, increase the seeding rate accordingly to compensate for the lower germinations.

b. Weed seed content not over 0.25 percent and free of noxious weeds.

c. All seed shall be rejected if the label lists any of the following grasses:
   1) Timothy.
   2) Sheep Fescue.
   3) Meadow Fescue.
   4) Canada Blue.
   5) Alta Fescue.
   6) Kentucky 31 Fescue.
   7) Bent Grass.

B. Soil Amendments:

1. Lime: Natural limestone containing not less than 85 percent of total carbonates, ground so that not less than 90 percent passes a 10-mesh sieve and not less than 50 percent passes a 100-mesh sieve.

C. Fertilizers:

1.Commercial Fertilizer: Complete fertilizer of neutral character, with a minimum of 75 percent nitrogen derived from natural organic sources or urea form; 40-50 percent of the nitrogen shall be water-soluble. Available phosphoric acid derived from superphosphate, bone, or tankage. Potash derived from muriate of potash, containing 60 percent potash. Uniform in composition, free flowing and suitable for application with approved equipment. Provide fertilizer with the following

percentages of available plant nutrients:
    a. Provide fertilizer with not less than 4 percent phosphoric acid and not less than 2 percent potassium, and the percentage of nitrogen required to provide not less than 1.5 pounds of actual nitrogen per 1000 square feet of seeded area. Provide nitrogen in a form that will be available to the grasses during the initial period of growth.
2. Superphosphate: Soluble mixture of treated minerals; 20 percent available phosphoric acid.

D. Mulch:
1. Anti-Erosion Mulch: Provide clean, seed-free salt hay or threshed straw of wheat, rye, oats or barley, free from noxious weeds. Materials that are low grade and unfit for farm use such as "U.S. Sample Grade" are acceptable.
2. Wood Cellulose Fiber Pulp (Hydromulch):
    a. Provide specially prepared wood cellulose fiber, processed to contain no growth or germination inhibiting factors, and dyed an appropriate color to facilitate visual metering of application of the materials.
    b. Supply in packages having a gross weight not in excess of 60 pounds.
    c. Moisture content not to exceed 10 percent air dry weight, manufactured so that after addition and agitation in slurry tank the fibers become uniformly suspended to form a homogeneous slurry that when hydraulically sprayed on the ground the material will form a blotter like ground cover impregnated uniformly with seed and which after application allows the absorption of moisture, either rainfall or mechanical watering, to percolate to the underlying soil.
    d. Product and Manufacturer: Provide one of the following:
        1) Conwed Virgin Wood Fiber Mulch by Conwed Incorporated.
        2) Silva Fiber by Weyerhaeuser Company.
        3) Or equal.
3. Hydromulch Adhesive:
    a. On areas and slopes graded between 1:3 and 1:5 provide 8.25 pounds of adhesive per 1000 square yards of seedbed incorporated into the hydroseed slurry.
    b. Provide the following:
        1) A non-ionic galatomannan polysaccharide that forms a colloidal dispersion. Once adhesive film is formed and has been allowed to dry or cure, its resistance to solubility increases. Adhesive film shall be biodegradable, so that it eventually is broken down by water and/or by microbial action.
        2) pH: 6 to 7.

E. Water: Potable.

## PART 3- EXECUTION

### 3.1 INSPECTION

A. Subcontractor shall examine the topsoil, verify the elevations, and depth of topsoil, observe the conditions under which Work is to be performed, and notify Benchmark of unsatisfactory conditions. Do not proceed with the Work until unsatisfactory conditions have been corrected in a manner acceptable to Benchmark.

### 3.2 SOIL PREPARATION

A. Apply ground limestone, by machine, over all areas to receive turf, as required, to bring the soil to a neutral pH. Work lightly into the top 3 inches of topsoil at least five days before applying the commercial fertilizers.

B. Apply commercial fertilizers in the following quantities:
   1. For grass apply only at a rate sufficient to supply 1.5 pounds of nitrogen per 1000 square feet.

C. Apply commercial fertilizers within 10 days of planting.

D. Apply commercial fertilizers in 2 operations. First application shall be 3/4 of total amount.

E. Thoroughly and evenly incorporate commercial fertilizers with the soil to depth of 3 inches by discing, or other approved method.
   1. In areas inaccessible to power equipment, use hand tools.
   2. Adjacent to existing trees, adjust depth to avoid disturbing roots.

F. Apply superphosphate for turf areas at the rate of 20 pounds per 1000 square feet and incorporate into the top 3 inches of topsoil.

G. Grade planting areas to smooth, even surface with loose, uniformly fine texture. Remove all stones and extraneous foreign material in excess of 2-inch diameter. Roll and rake and remove ridges and fill depressions, as required to meet finish grades. Limit fine grading to areas which can be planted immediately after grading.

H. Apply a second dressing of fertilizer. Use 1/4 of the total required amount.

I. Moisten prepared planting areas before seeding, if soil is dry. Water thoroughly and allow surface moisture to dry before planting. Do not create a muddy soil condition.

J. Restore planting areas to specified condition if eroded or otherwise disturbed after fine grading and prior to seeding.

## 3.3 INSTALLATION

A. General: Maintain grade stakes until removal is mutually agreed upon by all parties concerned.

B. Seeding:
   1. Sow seed using a spreader or seeding machine.
   2. Distribute seed evenly over entire area by sowing equal quantity in 2 directions at right angles to each other.
   3. Sow not less than the quantity of seed specified.
   4. Cultipacker, or approved similar equipment, may be used to cover the seed and to firm the seedbed in one operation. In areas inaccessible to cultipacker:
      a. Rake the seed lightly into top 1/8 inch of soil, roll in two directions with a water ballast roller, weighing not less than 100 pounds per linear foot.
      b. Take care during raking that seed is not raked from one spot to another.
   5. Protect seeded areas against erosion by spreading specified mulch after completion of seeding operations.
      a. Protect seeded areas against hot, dry weather or drying winds by applying peat moss mulch not more than 24 hours after completion of seeding operations. Presoak and scatter evenly to a depth of from 1/8-inch to 3/16-inches thick and roll to a smooth surface. Do not mound.
      b. Spread anti-erosion mulch to form a continuous blanket not less than 1-1/2-inch loose measurement over seeded areas. Provide mulch with a partial coating of emulsified liquid tackifier. Place mulch using either of the following methods:
         1) Anchor mulch by spraying with liquid tackifier at the rate of 10 to 13 gallons per 1000 square feet.
         2) Place mulch with equipment that will blow or eject, by means of a constant air stream, controlled quantities of the mulch and tackifier in a uniform pattern over the specified area. If the mulch is excessively cut or broken take measures to reduce the cutting or breakage to a limit approved by Benchmark. Introduce the tackifier into the air stream by means of a spray arranged so that it will partially coat the mulch with a spotty tack prior to the depositing of the mulch covering. Rate of application not less than 75 gallons per ton of mulch.
   6. Do not leave seeded areas unmulched for longer than 3 days. Reseed areas which remain without mulch for longer than 3 days.
   7. Prevent damage or staining of construction or other plantings adjacent to mulched areas.
   8. Prevent foot or vehicular traffic, or the movement of equipment, over the mulched area. Reseed areas damaged as a result of such activity.
   9. Water seeded areas thoroughly with a fine spray.

## 3.4 MAINTENANCE

A. Begin maintenance immediately after planting.

B. Maintain turf for not less than the period stated below, and longer as required to establish an acceptable stand, as determined by Benchmark.
   1. Seeded areas, not less than 60 days.
   2. If planted in fall and not given full 60 days of maintenance, or if not considered acceptable at that time, continue maintenance the following spring until acceptable turf is established.

C. Maintain seeded areas by watering, fertilizing, weeding, and other operations such as rolling, regrading and replanting as required to establish a smooth, acceptable lawn, free of eroded or bare areas. After grass has started, re-seed repeatedly all areas greater than 8 inches square which fail to show a uniform stand of grass for any reason whatsoever until all areas are covered with a satisfactory stand of grass is achieved, as determined by Benchmark.

D. Cutting: to be performed by Others.

E. Watering: Provide and maintain temporary watering equipment as required to convey water from water sources and to keep lawn areas uniformly moist as required for proper growth.

F. For seeded areas lay out temporary watering system and arrange watering schedule to avoid walking over muddy and newly seeded areas. Use equipment and water to prevent puddling and water erosion and displacement of seed or mulch (if any).

## 3.5 CLEANUP AND PROTECTION

A. Keep work area in an orderly condition.

B. Protect turf Work and materials from damage. Maintain protection during installation and maintenance periods. Treat, repair or replace damaged turf Work as directed.

C. Remove all rubbish, equipment and rejected materials from the project site.

D. Protection includes all temporary fences, barriers and signs and other work incidental to proper maintenance.

END OF SECTION