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October 28, 2005

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Re: IRM Revisions for 80-100 Banks Avenue, Rockville Centre, New York

Dear Mr. Eaton,

P.W. Grosser Consulting, Inc. (PWGC) has reviewed your comments, dated September 14, 2005, regarding the proposed *Draft Interim Remedial Measure (IRM) Work Plan,* and has revised the Draft IRM, the *Community Air Monitoring Plan* (CAMP), and the *Health and Safety Plan* (HASP) to incorporate those comments. Two hard copies and one electronic PDF copy of the *Final IRM*, 80-100 Banks Avenue, Rockville Centre, New York, dated October 2005 are included. In addition, one hard copy has been sent to the Rockville Centre Public Library for public access.

A summary of revisions include:

- Section 3.2.5 – Added "security during the excavation of area "C" will be particularly stringent, due to the proximity to Morgan Days Park."
- Section 2.1.2 of the CAMP – Added paragraph "when excavating cell "C"...continuous vapor and dust monitoring location will be at the east end of the park property, at a point closest to the excavation."
- Section 2.2 and 3.1.8 Added paragraph "Clean soil, when present above impacted soil, will be removed and stockpiled separately for return as backfill into the excavation. Excavated soil intended for return as backfill will be verified "clean" through a soil testing program, including analysis for VOCs, SVOCs, and metals, commensurate with the amount of soil under consideration and consistent with current guidance... As part of the redevelopment plans for the site, excavations may not be completely filled, in order to allow for construction of a sub-grade parking garage."
- Section 4.2 – Added "As recommended by NYSDEC DER-10 Technical Guidance for Site Investigation and Remediation, the verification sampling approach will consist of collecting samples from..."
- Section 4.5 – Added "To ensure an adequate sampling network, any wells damaged during IRM activities will be replaced or relocated. The locations and specifications of additional wells will be verified with the NYSDEC prior to installation."
- Added Section 2.4 – Spot Treatment With Sodium Permanganate "To minimize the potential of upgradient PCE impacted groundwater from recontaminating excavated and backfilled cells, spot treatment using liquid sodium permanganate injections will be utilized at multiple locations to the north of the proposed excavation site..."
- Added Section 4.5 – Post IRM Monitoring and Sampling, to address non-IRM remediation activities.
- Section 3.2.2 –Added "During times that a vacuum truck or shallow tray air strippers are being used to remove DNAPL from wells or open excavations or treat water prior to discharge, air monitoring, as per the CAMP, will be conducted to ensure that impact to nearby community receptors is within allowable levels. If action levels are exceeded due to these activities, engineering controls such as exhaust pollution control devices will be used to reduce air emission levels to within acceptable levels."

ACEC
American Council of Engineering Companies

As per your letter, PWGC has incorporated the State's comments into a *Final Interim Remedial Measure Work Plan,* and with the submission of the enclosed copies, the IRM is considered complete and approved. Please contact me if you have questions, or to discuss the project further at 631.589.6353.

Very truly yours,

Kris Almskog
Senior Hydrogeologist

Charlie Sosik, P.G.
Senior Project Manager

Encl: IRM 80-100 Banks Avenue, Rockville Centre, New York, October 2005

cc: M. Minetti (NYSDOH) w/ 2 hard copies of enclosure
R. Rusinko (NYSDEC) w/ electronic PDF copy of enclosure
C. Hamilton

INTERIM REMEDIAL MEASURE WORK PLAN

80-100 Banks Avenue
Rockville Centre, New York



Prepared for:
Chase Partners, LLC and;

ADVANCE REALTY GROUP

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Project No.: ARC 0401

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October 2005

P.W. GROSSER CONSULTING INC.
PROJECT No. ARC0401

INTERIM REMEDIAL MEASURE

80-100 BANKS AVENUE
ROCKVILLE CENTRE, NEW YORK

SEPTEMBER 2004
Revised: OCTOBER 2005

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1.0 INTRODUCTION

1.1 Project Background

This Interim Remedial Measure (IRM) Work Plan has been prepared by P.W. Grosser Consulting Inc.(PWGC), on behalf of Chase Partners, LLC (Chase) and Advance Residential Communities, LLC (ARC) of Newark, NJ, for a commercial property located at 80-100 Banks Avenue, Rockville Centre, New York (**Figure 1**). Redevelopment plans for the property, formerly a pharmaceutical warehouse and distribution center, include a residential complex and associated grounds.

The chlorinated solvent, tetrachloroethylene (PCE), was first identified in shallow soil beneath the southwestern portion of the building, during a Phase II investigation performed at the site in November 2003. The PCE is believed to have been released between 1972 and 1978 when a textile company leased the southern parcel (80 Banks Avenue) of the site. The site was accepted into New York State's Brownfield Clean-up Program (BCP), and a Brownfield Clean-up Agreement (BCA) was executed on June 29, 2005.

A Remedial Investigation (RI), performed in accordance with the New York State Department of Environmental Conservation (NYSDEC) guidance (DER10), was initiated in March 2004, to characterize the nature and extent of PCE in soil and groundwater at the site. The results of the investigation, as documented in the Draft Remedial Investigation Report (PWGC, 8/04), recommended an IRM to expedite removal of mobile and residual dense non-aqueous phase liquid (DNAPL), and thereby reduce obvious risks to the environment.

The proposed IRM addresses the source areas of PCE contamination, by removing DNAPL which has accumulated at a clay boundary (11-17 ft below surface), and by excavating residually impacted soils down to the clay surface. Removal of the primary source area, through the use of direct "low-tech" methods such as extraction and excavation, will substantially reduce the threat of potential impact, while the process of developing a comprehensive remedial plan for the site proceeds.

1.2 Site Location and Description

The subject site is located at 80-100 Banks Avenue, Village of Rockville Centre, Town of Hempstead, Nassau County, New York. The site is situated at the northwest intersection of Nassau Street and the northern end of Banks Avenue. The property is shown as Lots 27 and 30, Block 539, Section 38 on the Nassau County Tax Maps and consists of a total of 7.1 acres.

The site is currently improved with a one-story, 150,000 square foot warehouse building and a 2-story 24,000 square foot office building, both of masonry construction. The subject site is currently owned by Darby Group Companies, Inc. (Darby), who ceased operation at the site in November 2000. Darby has occupied the building since 1978 and operated it as a pharmaceutical product warehouse and distribution center. The building is currently underutilized, serving a temporary storage function for miscellaneous supplies and equipment by Darby. ARC /Chase is contract vendee in an agreement to purchase the property from Darby. ARC/Chase is planning the demolition of the existing structures and the phased development of two residential buildings consisting of a 100,492 square foot (footprint) north complex and a 60,128 square foot (footprint) south complex.

1.3 Summary of Previous Investigations

1.3.1 Phase 1 Environmental Site Assessment, ESI, March 2002
A Phase I Environmental Site Assessment (Phase I) was conducted by EcolSciences, Inc. (ESI) in March, 2002 to determine if there were any recognized environmental conditions associated with the subject site.

The document search identified records from the Nassau County Department of Health (NCDH) detailing the proper removal of four heating oil underground storage tanks (USTs). In addition, during the site reconnaissance, ESI identified an electrical panel along the western wall of the southern warehouse area containing circuit breakers with faded labels for "well pumps" and "dry cleaning still unit".There was no record or information of a dry cleaning operation at the site. ESI recommended a test boring program beneath the concrete floor to assess potential impacts from possible former dry cleaning operations at the site, and soil samples in the vicinity of the heating oil tanks to verify the findings of the NCDH. A copy of the ESI Phase I report has been submitted with the BCP application.

1.3.2 Preliminary Soils and Foundation Investigation Report, MTA, August 2003
Melick-Tully and Associates (MTA) performed a number of borings on the subject property as part of a geotechnical analysis of site conditions to assist in the design of the proposed residential buildings. The investigation initially consisted of six soil borings with a recommendation that monitoring wells be installed for the basement design. A total of six monitoring wells were installed between January and May, 2003.

The MTA borings revealed that the geology beneath the site consists of 1 to 4 feet of sand fill material. Beneath the fill material is an orange-tan sand with gravel to a depth varying from 12 to 16 feet below grade. Beneath the sand and gravel unit is a black silty clay, which was determined to be 9 feet thick. The clay unit is underlain by sand to at least 31 feet below grade, the depth at which the borings were terminated.

MTA reported that the depth to water at the site varies between 5 to 9 feet below grade depending upon surface elevation. The water table was determined to exist within the sand unit situated above the black silty clay unit. Groundwater flow was determined to vary from a westerly to a southerly direction as you move west to east across the site.

1.3.3 Phase II Environmental Investigation, ESI, January 2004
The Phase II investigation was completed by ESI in January, 2004. ESI identified a total of seven areas of concern (AOC) as part of their scope of work. In addition to the former heating oil tanks and the former potential dry cleaning still unit, other AOC's were identified as a result of further field observation and a geophysical survey performed as part of the Phase II investigation. A total of nineteen borings were advanced during the investigation with thirty-one soil samples submitted for analysis. Eleven groundwater samples were analyzed including five from the soil borings and six from the pre-existing monitoring wells installed by MTA. The results of the Phase II Investigation identified significant concentrations of PCE in soil and groundwater beneath the southwest corner of the building. Concentrations exceeding the pure product solubility of PCE were found at some

locations just above the clay surface, indicating that DNAPL is present above the clay. Soil samples collected in the vicinity of the former fuel oil tanks did not indicate that a release had occurred at either location.

1.4 Summary of the Remedial Investigation

A Remedial Investigation (RI) was performed by PWGC during March 15 - March 26, 2004 to: collect data of sufficient quality and quantity to adequately characterize the nature and extent of contamination at the site, evaluate contaminant migration, characterize the potential exposure to human health and the environment and select the most appropriate remedial technology.

This work was performed in accordance with the Draft DER-10 Technical Guidance for Site Investigation and Remediation, as released by the NYSDEC on 12/25/02. Details of the RI are provided in "*Draft Remedial Investigation Report, 80-100 Banks Avenue, Rockville Centre, New York*," dated August 10, 2004.

1.4.1 Summary of the Nature and Extent of Contamination

The results of the RI confirmed the findings of the previous investigations and support a release scenario of liquid phase PCE beneath the floor near the western wall of the south building. From here, PCE as a DNAPL, migrated along the clay surface to a low point approximately 50 feet east of the release point. There is sufficient evidence to indicate that DNAPL remains in this area of the building. A competent clay layer, approximately 9 feet thick, was documented throughout the site. The presence of the clay limited the vertical migration of PCE in the soil column to a maximum depth of 18 feet below the surface. The clay surface was deepest in borings beneath the building and shallowest in borings at the property boundaries, effectively preventing further migration of mobile DNAPL.

Shallow soil contamination, above the guidance value of 1,400 µg/kg, is limited to an area approximately 40 feet by 60 feet. Contamination at the clay surface is more extensive, covering an area roughly 180 feet by 160 feet.

Significant PCE contamination in soil was also found at the clay surface outside of the building in the north end of the west parking area. This location is in the general vicinity of a suspected leaching structure. The structure, if present, may have received VOC-contaminated process water from the building.

The presence of DNAPL and high PCE concentrations in soil is acting as a continuing source of contamination to the shallow groundwater.

A shallow groundwater plume of chlorinated VOCs, primarily PCE, is emanating from the source area beneath the southwestern portion of the south building. PCE concentrations in the source area were reported at or above the pure product solubility, providing further evidence of DNAPL in this area. The plume is migrating south in the direction of groundwater flow, toward the Long Island Bus Depot. PCE concentrations at the south property line were reported at 28,000 µg/L.

1.4.2 Summary of the Exposure Assessment

Based on the historic use of the property, the release probably occurred sometime during the period of 1972 to1978 when the 80 Banks Avenue property was occupied by a textile company. Potential receptors for a dissolved VOC plume leaving the site would include the Rockville Centre Wellfield located on the west side of Mill River in Lister Park, and downgradient commercial and residential properties via vapor intrusion. The wellfield is not expected to be at risk of impact, since the wells are screened within the Magothy Aquifer and the plume appears to be confined to the upper 15 feet of the water column by a local clay layer. Furthermore, water quality data for the wells compiled by the Nassau County Department of Health do not indicate impact from an on-going source of contamination. With respect to vapor impacts, there are few developed properties between 80-100 Banks Avenue and Mill River, where the plume would be expected to discharge. Developed properties include the bus depot and 2 or 3 commercial buildings located along the north side of Sunrise Highway. If the plume fails to discharge to Mill River and continues south, it will encounter a residential area south of S. Village Avenue, approximately 1,750 feet from the site.

1.4.3 Summary of Data Gaps and Recommendations

The RI report identified several areas for further investigation including the assessment of water quality beneath the clay layer at the site, investigation of a suspected drainage structure in the west parking area and further delineation of the VOC plume along the western property line and to the south. These tasks would be performed by different parties according to the responsibilities as defined under the Brownfield Cleanup Program.

Assessment of Water Quality Beneath Clay Layer

The vertical migration of DNAPL appears to have been contained by the presence of a 9 foot thick clay layer. Since chlorinated solvents have been known to cause desiccant fracturing of certain clays, groundwater quality beneath the clay should be evaluated. This should only be attempted outside of the source area, and with adequate precautions to prevent contamination of groundwater beneath the clay.

Investigation of Suspected Drainage Structure in West Parking Lot

The isolated presence of PCE in the deep soil sample from B8 and the circular mark-outs from the ESI geophysical survey, suggest that a drainage structure exists in the area which had, at one time, received processing waste from the building. If the structure is present, it may be the source of the VOCs in groundwater detected at the west property line. To investigate this issue, test pits should be advanced at the circular mark-outs. If a drainage structure is present, samples should be collected to determine if it has received waste, and if so the extent of impact should be determined. All drain lines entering the structure should be traced to verify the point of origin, and to investigate the possibility of secondary drainage structures.

Delineation of VOC Plume Along Western Property Line

The concentration of VOCs in groundwater detected at location B9 (>30,000 µg/L) represent an isolated occurrence which may be related to the suspected drainage structure in the west parking lot. Further groundwater delineation should be performed in this area to identify the source and migration route of the VOCs in B9.

Delineation of VOC Plume Extent to the South

The plume is migrating south with groundwater flow toward the Long Island Bus Depot. PCE concentrations at the south property line were reported at 28,000 µg/L. It should be noted that data obtained from the Nassau County Department of Public Works, for observation wells installed previously on the bus depot to monitor an underground storage tank issue, were non-detect for chlorinated VOCs.

Based on the historic use of the property, the plume may have been in transit for 26 to 32 years, starting sometime during the textile company's occupancy, from1972 to 1978.

The RI report also recommended an Interim Remedial Measure to stop the influx of VOCs to groundwater from DNAPL and residual-phase PCE.

2.0 DESCRIPTION OF INTERIM REMEDIAL ACTION

The IRM recommendations for the site consists of the extraction of mobile DNAPL followed by soil excavation of the primary source area and treatment of the open excavation with chemical oxidation. To prevent re-contamination of the primary source area, a sodium permanganate solution will be injected into the subsurface, upgradient of the proposed excavation area. The topography of the clay surface beneath the building forms a "bowl" shape in the area of the B3 soil boring, which would collect the majority of mobile DNAPL. As such, DNAPL extraction would concentrate in this area. Since the amount of mobile DNAPL may be limited, event-based recovery methods utilizing several extraction wells will be used. The purpose in removing the mobile DNAPL is to reduce the possibility of DNAPL migration during the soil excavation process. The soil removal program will follow a sequenced excavation plan of seven sections which will be excavated individually to prevent re-contamination from adjacent areas. The excavation plan will utilize a shoring system advanced to the clay surface and dewatering to isolate the sections and prevent mixing of contaminated and clean groundwater.

2.1 DNAPL Extraction

Based upon soil and groundwater analysis from the Supplemental Field Investigation performed by PWGC, liquid phase PCE is believed to be present in the vicinity of ESI boring DC1, close to the suspected release area, and PWGC boring B3, where the surface of the clay boundary is deepest (**Figure 2**). This will be addressed by installing six 4-inch diameter PVC recovery wells to a depth from 16 to 18 feet, depending on the depth of the clay surface at each well location (**Figure 2**). The recovery wells will be installed with an auger drill rig and constructed with two feet of 0.020 slot pvc well screen with a No. 1 morie sand pack.

After installation, the wells will be checked manually for the presence of DNAPL using a groundwater probe. When sufficient DNAPL accumulates (at least one inch), it will be periodically removed through pumping into 55-gallon storage drums or extracted directly into a small vacuum truck. Based upon concentrations of PCE, DNAPL extraction is anticipated to continue over a four week period, though the decision to terminate operations will be based on recovery rates and the best judgment of the Project Manager with concurrence from the NYSDEC.

2.2 Soil Excavation and Disposal

The Remedial Investigation identified two areas with PCE concentrations more than an order of magnitude above the guidance levels; a large area beneath the southwestern portion of the building close to the source of the release, and a much smaller area in the west parking lot near a suspected drainage structure. The excavation plan divides the main areas beneath the building into subsections (A and B), based upon the extent of the contaminated soil column and the depth to the clay boundary (**Figure 3**). Area A has dimensions of approximately 100 by 130 feet with PCE impact from the bottom of the floor slab to the clay boundary layer, a thickness of approximately 16 feet. Area B has dimensions of 50 by 80 feet with PCE impact between 9 and 18 feet below grade. The area in the west parking lot is designated as Area C, and has dimensions of 30 by 30 feet with PCE impact from 9 feet below grade to the clay boundary at 12.5 feet below grade. In addition to these two proposed

excavation areas, a sample from soil boring B-14 from the Remedial Investigation, located in the south parking lot, had a PCE concentration of 1,800 µg/kg. This area, along with other soil and groundwater concerns outside of the primary source area, will be addressed in the remedial plan.

To assist in managing the excavation process, sections A and B are further divided into smaller excavation cells. Section A is divided into four cells and section B is dived into 2 cells. Each of the excavation "cells" will be created by installing an engineered slide rail shoring system around the perimeter of the targeted subsection to provide for a safe excavation (**Figure 4-6**). Since groundwater flow is to the south, soil will be excavated in stages from the north cells to the south cells to minimize re-contamination of soil and groundwater. Cell excavation will proceed in sequence as represented by the numerical designations shown in **Figure 3**. Due to the versatility of the slide rail system, limits of excavation areas may be extended based upon endpoint sample results, to ensure the removal of residually contaminated soils.

Each cell will be backfilled, compacted, and restored prior to excavation of the next cell. Following backfilling of the cells, the shoring system will be removed. As the excavation proceeds in each cell, groundwater present in the cell will be evacuated by pumping with surface pumps. Groundwater removed from the excavation will be filtered using a bag filter to remove fine soil particles and suspended materials and then treated using a shallow tray air stripper to remove VOCs to within discharge standards. The treated water will then be discharged to the Nassau County storm sewer system. See **Figure 7** for a flow diagram of the groundwater treatment system.

The excavated soil will be placed in constructed drying beds to remove excess water, and mixed with a drying agent, such as lime or kiln bottoms, as necessary, to meet the transportation and disposal requirements as a solid material. See **Figure 8** for details on the drying beds. The material will be analyzed according to the procedures described under section 4.3 of this Work Plan, to meet the waste acceptance criteria of the disposal facility. After characterization, the soil will be loaded into trucks for transport to a licensed off-site disposal facility, which meets all State and Federal standards. It is estimated that approximately 9,100 cubic yards of contaminated soil will be removed for disposal.

Soil may be treated within the drying beds using chemical oxidants or other methods to reduce VOCs to non-hazardous levels, or to remediate soils to within re-use guidance levels. The decision regarding treatment of excavated soils will be made by the Project Manager in consultation with and under the approval of, the NYSDEC.

Clean soil, when present above impacted soil, will be removed and stockpiled separately for return as backfill into the excavation. Excavated soil intended for return as backfill will be verified "clean" through a soil testing program, including analysis for VOCs, SVOCs, and metals, commensurate with the amount of soil under consideration and consistent with current guidance. Additional clean fill, as defined by 6NYCRR Part 360, may be brought in from off-site to backfill the excavations. The NYSDEC will be consulted, and must approve in advance, the return of excavated soil and the use of off-site fill. As part of the redevelopment plans for the site, excavations may not be completely filled, in order to allow for construction of a sub-grade parking garage. See **Figure 9** for a detail of the soil stockpile and **Figure 10** for the location of equipment and soil staging areas.

2.3 Dry Chemical Oxidation Treatment Within Excavation

Following excavation of soil down to the clay boundary, dry potassium permanganate will be placed in the excavation to address residual VOCs and to limit leaching from contaminants entrained in the clay. Potassium permanganate is a chemical oxidizer which will completely mineralize selected contaminants. Research has shown that potassium permanganate has been effective in soil and groundwater treatment for chlorinated solvents, such as PCE, and has been approved for use at hazardous waste sites by the NYSDEC and the USEPA. Potassium permanganate is highly effective on trichloroethene (TCE), PCE and chlorinated ethylenes, providing rapid treatment of these compounds in a predictable manner. Potassium permanganate will be added directly to the open excavation in powder form, prior to backfilling with clean soil. The powder will be mechanically dispersed at a rate of approximately 1.48 lbs/s.f.

Potassium permanganate is a safe product which has a long history of use in treating potable water supplies to remove iron, manganese, hydrogen sulfide and to generally improve taste and odor. Potassium permanganate is also commonly used in residential applications were it is installed as a pretreatment filter (greensand) to remove iron from private wells. See **Attachment A** for references on the use and application of potassium permanganate.

2.4 Spot Treatment Using Sodium Permanganate

To minimize the potential of upgradient PCE impacted groundwater from recontaminating excavated and backfilled cells, spot treatment using liquid sodium permanganate injections will be utilized at multiple locations to the north of the proposed excavation site.

Using direct push technology, approximately 5 gallons per linear foot, from the clay layer to six feet below land surface, of an 8% solution of potassium permanganate will be injected into the subsurface under an estimated pressure of 50 pounds per square inch. The injection points will be located in two "gates", running perpendicular to the groundwater flow direction, to the north of the proposed "A and B" cells. The individual points will be located approximately 10 feet apart, and the second row of each "gate" will be offset five feet from the first row, to allow for subsurface "overlap" of chemical oxidation solution. See **Figure 3** for proposed sodium permanganate injection locations.

This series of spot injection treatments will occur during or before the excavation phase of the IRM. Based upon conditions encountered during excavation and/or additional site investigation, additional sodium permanganate injection treatment locations may be added. This injection treatment round is being conducted to assist in removing the primary PCE source area. Additional impacted soil and groundwater areas will be addressed under the remedial plan.

3.0 ENGINEERING SPECIFICATIONS AND CONTROLS

3.1 Engineering Specifications

3.1.1 Building Demolition

The building demolition and general site preparation will be conducted in two phases. Prior to initiating Phase 1, the demolition contractor with support, as needed, from the Engineer will perform or make arrangements to perform the following:

- Obtain a demolition permit from the Village of Rockville Centre
- Erect a temporary fence around the work area to make the site safe (existing chain link perimeter fence may be utilized as part of the fence).
- Prepare an erosion control plan in accordance with local requirements.
- Perform an Asbestos Containing Material (ACM) and Lead Based Paint (LBP) survey.
- Arrange for utility disconnects and verification.
- Arrange for the removal and disposal of identified ACM and LBP, if present.

Phase 1 of the demolition will include the following items:

- Demolish and remove the 80 Banks Avenue Building completely.
- Demolish and remove the 100 Banks Avenue office portion of the building completely.
- Gut the interior of the 100 Banks Avenue that is to remain until Phase 2 including the slab on grade.
- Misc site demolition of fences, dumpster enclosure, guard shack, signage, bollards, etc. Asphalt and curbs to remain at this time.

Phase 2 will be performed after Phase 1 is completed and may be performed after the IRM is completed to allow the stockpiling of soils, drying beds and other features either within the 100 Banks Avenue shell or on the building's slab. Phase 2 will consist of the following items:

- Demolish and remove the remaining portion of the 100 Banks Avenue building.
- Demolish and remove all curbs, sidewalks, paving, retaining walls, etc.

3.1.2 Mobilization and Site Preparation

Mobilization will include the delivery of construction equipment, support facilities and equipment and materials to the site. All construction personnel will receive site orientation and training in accordance with the site specific Health and Safety Plan, Community Monitoring Plan and established policies and procedures to followed during the implementation of Interim Remedial Measure. The remediation contractor and all associated subcontractors will each receive a copy of the Interim Remedial Measure Work Plan, Site Specific Health and Safety Plan and Community Monitoring Plan and will be briefed on their contents.

Site preparation will include the set-up of site support facilities consisting of a field office trailer, a personnel break trailer and portable sanitary facilities. Also included in the site preparation phase will be the construction of personnel and equipment decontamination stations, using HDPE and geotextile liners, installation of the groundwater treatment system and the construction of the drying beds and clean soil stock pile area. See **Figure 9** for a detail of the soil stockpile and **Figure 10** for the location of equipment and soil staging areas.

3.1.3 Clean Soil Area Construction

The clean soil area will consist of a 60 ft. x 100 ft. area capable of holding approximately 1,700 cubic yards of material. The area will be graded to promote positive drainage and will be lined with 20-mil polyethylene and surrounded by a silt fence. Stockpiled material will be covered with 20-mil polyethylene and secured until it is either removed from the site or returned to the excavation, if approved by the NYSDEC. See **Figure 9** for a detail of the soil stockpile and **Figure 10** for the location of equipment and soil staging areas.

3.1.4 "Dry" Excavation Methods

The "dry" excavation method is the technique of pumping water out of an excavation to allow the material to be removed in solid form, and to visually monitor the progress of the excavation.

Shallow excavations within the upper 4 feet of soil can be conducted without the need for bracing or dewatering. Beyond 4 feet, and below the water table of 9 feet, excavations will require shoring and bracing to ensure safety around the excavation. The shoring method selected for this project is the ICON Engineered Slide Rail System (see **Figures 5 and 6**). This system has several advantages over conventional shoring for this application. The slide rail system will be installed and removed using a tracked excavator or front-end loader, eliminating the need for a crane and pile driving equipment, and the potential for noise and vibration impact to the surrounding area. Since the slide rail system is installed incrementally during excavation, side wall samples can be collected as the excavation proceeds. This will provide advance warning of the presence of impacted soil adjacent to the planned excavation area. If this occurs, the system can be expanded to include the adjacent area, something that could not be easily accomplished with conventional shoring. Another significant advantage of the system, for this project, is that it does not have to penetrate into the clay surface or beyond the excavation depth since the walls are braced internally.

Dewatering of the excavation will begin at the water table (approximately 9 feet below grade) using a surface pump. It is anticipated that approximately 290,000 gallons of groundwater will be removed from the excavations at a flow rate of from 1 to 20 gpm. Discharge water will be pumped into a weir tank to remove sediments and then through a shallow tray air stripper to reduce VOCs to required standards and then routed to the Nassau County storm drain system. See **Figure 7** for a flow diagram of the groundwater treatment system. Groundwater extraction rates of 1 to 20 gallons per minute (gpm) are anticipated. The air stripper specified is a North East Environmental Products shallow tray air stripper, model number 2331-P, capable of handling flow rates to 50 gpm. A copy of the air stripper's physical and performance specifications is included in **Attachment B**. If groundwater dewatering occurs at a rate that exceeds the capacity of the air stripper, one or more 20,000 gallon holding tank may be used to temporarily store water prior to treatment or prior to discharge. During dewatering activities, air monitoring, as per the CAMP, will be conducted to ensure that impact to

nearby community receptors is within allowable levels. If action levels are exceeded during these activities, engineering controls such as exhaust pollution control devices, will be used to reduce air emission levels to within acceptable levels.

3.1.5 "Flooded" Excavation Methods

Past the depth where the dry excavation could be unstable due to "bottom heave", it may be necessary to reduce the rate of dewatering and thus decrease the differential water pressure in the excavation. The soil would be excavated with a low solids content and transferred to the drying beds for removal of excess water. These conditions are not expected to occur due to the shallow depth of the excavation and the presence of the clay layer.

3.1.6 Drying Bed Construction

Soils excavated below the water table will be drained to remove excess water and achieve the solids content required by the disposal facilities. The removal of excess water will be accomplished by placing soil excavated below the water table in drying beds that will be constructed on the site.

Two drying beds will be utilized, with a combined area of 110 by 220 feet, and consist of a polyethylene plastic liner with bermed side walls. The bottom of the beds will be sloped so that when the water drains from the soils by gravity the water can be collected and treated through the air stripper. See **Figure 8** for drying bed construction details.

Excavated soil will be placed in the beds in 1 foot lifts and spread with a bulldozer. Wet soil may be mixed with drier soil to reduce the use of drying agents. If soils do not achieve the required solids content, as determined by the Paint Filter Test (EPA SW-846 Method 9095), a drying agent such as High Calcium Chemical Pebble Lime will be used.

Based on experience from similar projects, it is estimated that soils will remain in the drying bed for 5 days. Two beds will be utilized and will be managed so that while one bed is full, the other bed is available to receive soils. Each bed can contain approximately 1,800 cubic yards, and it estimated that each bed will be filled and emptied approximately three times during the project.

3.1.7 Disposal

Impacted soil and sediment from the weir tank will be sampled in accordance with the procedures described under **Section 4.3** of this document to meet the waste acceptance criteria of the disposal facility. Impacted soil to be removed from the site will be loaded into polyethylene-lined 18-wheeled dump trailers provided by a licensed hazardous waste transport company. Loading will be performed with a front-end loader equipped with load scales to ensure that each vehicle is properly loaded and within the weight limit. Loaded trailers will be covered with a tarp and may be sprayed prior with a seedless hydro- mulch product or an encapsulating foam to seal odors.

The proposed disposal facility is the Waste Management Model City Facility in Buffalo, NY. The trip to this facility will take approximately one day. To prevent a two-day hold over for trucks arriving at the facility after hours on a Friday, loading and transport will be limited to Monday through Thursday. It is estimated that approximately 541 loads will be shipped from the site at an average weight of 22 tons per load.

Soil may be treated within the drying beds using chemical oxidants or other methods to reduce VOCs to non-hazardous levels or to remediate soils to within re-use guidance levels.

3.1.8 Backfill and Site Restoration
Following collection of verification samples and the installation of dry potassium permanganate within the excavations, the excavations will be backfilled and compacted with clean fill. Clean soil, when present above impacted soil, will be removed and stockpiled separately for return as backfill into the excavation. Excavated soil intended for return as backfill will be verified "clean" through a soil testing program commensurate with the amount of soil under consideration and consistent with current guidance. Additional clean fill, as defined by 6NYCRR Part 360, may be brought in from off-site to backfill the excavations. The NYSDEC will be consulted, and must approve in advance, the return of excavated soil and the use of off-site fill.

As part of the redevelopment plans for the site, excavations may not be completely filled in order to allow for construction of a subsurface garage. Site restoration will be performed as per the redevelopment plans for the site.

Open excavations will be enclosed with fencing and monitored by a security service during off-work hours to limit access to the excavations by the public.

3.1.9 Dismantling Plan
Following the completion of interim remedial activities at the site, all equipment and remedial structures will be dismantled and removed from the site. The air stripper will be decontaminated, dismantled, and removed from the site.

The drying beds will be dismantled and removed by cutting the polyethylene plastic liner into smaller sheets and disposed of at the same landfill where the soils were disposed.

3.2 Engineering Controls

3.2.1 Dust Suppression
Dust generation will be minimized during excavation, loading, hauling, and dumping since the majority of the excavated material will be wet. Dry soils, free of contamination, will be stockpiled on site for return into the excavation subject to NYSDEC approval. Dust generation from stockpiled soils will be monitored as described under *Section 4.0 Monitoring and Maintenance.* If dust generation approaches action levels, suppression will be accomplished by the use of a water truck(s). Over application of water resulting in free liquids will be minimized due to additional requirements for handling surface runoff. Clean stockpiles and other work areas that have the potential of generating dust will require spraying with a water truck at the end of each work day, and as deemed necessary by the Supervisor. Contaminated dry soil, will be loaded directly into trucks for immediate off-site disposal.

3.2.2 Odor Control
The primary technique to be implemented for control of volatile organic odors from stockpiled soil loaded trucks or the open excavation will be the application of a hydro-mulch material or

encapsulating foam sealant. The hydro-mulch material is a seedless version of the hydro-seed product commonly used by commercial landscaping contractors to provide stabilization and rapid grow-in of grasses or wild flowers along highways, embankments and other large areas. Hydro-mulch or the encapsulating sealant will be sprayed over open excavation areas, temporary stockpile areas, drying beds and loaded trucks, as necessary. This is a highly effective method for controlling odors, because the release of odors is sealed immediately at the source. Additional steps for odor control around the excavation may include the installation and operation of a water curtain. As a final control, excavation will be limited to favorable wind and temperature conditions to minimize off-site odor migration.

During times that a vacuum truck or shallow tray air strippers are being used to remove DNAPL from wells or open excavations or treat water prior to discharge, air monitoring, as per the CAMP, will be conducted to ensure that impact to nearby community receptors is within allowable levels. If action levels are exceeded due to these activities, engineering controls such as exhaust pollution control devices will be used to reduce air emission levels to within acceptable levels. See **Figure 7** for a flow diagram of the groundwater treatment system.

3.2.3 Wastewater from Drying Beds

During and upon completion of drying of contaminated soils, wastewater generated from the drying beds will be pumped to holding tanks. The wastewater will then be treated using the shallow tray air stripper from the dewatering operations and discharged to the NC storm drain system.

3.2.4 Stormwater Management

Efforts will be made to prevent stormwater pollution from occurring due to project work. During excavation activities, stormwater runoff from excavation areas will be minimized by using proper control measures such as silt fences, as well as the shoring system. Upon completion of excavation activities, the excavated areas will be backfilled, as appropriate, to redevelop the area as per the development plans.

Stockpiles and drying beds will be covered during inclement weather to prevent infiltration of stormwater.

3.2.5 Security and Fencing

Orange safety fencing will be installed around open excavations to ensure on-site worker safety and to restrict access to the excavations by the public. Open excavations will be monitored by a security service during off-work hours to limit access to the area by the public. Security during the excavation of area "C" will be particularly stringent, due to the proximity to Morgan Days Park.

4.0 MONITORING AND MAINTENANCE

4.1 Construction Phase Monitoring

Monitoring during soil excavation will be performed to protect the health of site workers and the surrounding community. A Health and Safety Plan (HASP) and Community Air Monitoring Plan (CAMP) have been developed for this project. These plans specify the monitoring procedures, action levels, and contingency measures that are required to protect public health. Generally, air monitoring would include real-time measurement of volatile emissions and dust levels.

4.2 Post-Excavation Monitoring and Verification

The verification sampling of the excavated areas will be performed prior to the addition of dry potassium permanganate to document that cleanup goals are being met.

As recommended by NYSDEC DER-10 Technical Guidance for Site Investigation and Remediation, the verification sampling approach will consist of collecting samples from each excavated cell (A1 through A4, B1, B2, and C). The sampling frequency will be one sample from the bottom of each sidewall for every 30 linear feet of sidewall, excluding sidewalls shared with other sections, and one sample from the excavation bottom for every 900 square feet of bottom. Shared sidewalls will be removed during excavation of the next section, and therefore does not require sampling. A drawing depicting locations of proposed verification samples is provided in **Figure 11**.

Verification soil samples will be submitted to a NYSDOH certified analytical laboratory for analysis of VOC compounds according to EPA method 8260B in accordance with NYSDEC Analytical Sampling Protocol with Category-B deliverables (ASP-B) and third party data validation. The QA/QC program will include the preparation and analysis of field and laboratory QA/QC samples such as, trip blanks and matrix spike duplicates.

Soil sampling and equipment decontamination will be performed in accordance with USEPA *SOP # 2001 General Field Sampling Guidelines*, *SOP# 2012 Soil Sampling,* and *SOP# 2006 Sampling Equipment Decontamination.*

4.3 Waste Characterization

The initial waste characterization will be performed by collecting a composite soil sample from drill cuttings obtained during the installation of the DNAPL extraction wells. Sample analysis will be as specified by the requirements of the disposal facilities waste acceptance criteria (WAC). After the results of the analysis are complete, the remediation contractor will prepare a Waste Profile form which will be signed by the by the property owner. This form will then be submitted to the waste disposal facility for evaluation and final approval.

Waste soil samples will be collected from the drying beds at a rate of one per 250 cubic yards and submitted to a NYSDOH certified analytical laboratory for analysis of PCE as required by the facilities WAC. Analysis for waste characterization will be provided in a results-only format.

Soil sampling and equipment decontamination will be performed in accordance with USEPA *SOP # 2001 General Field Sampling Guidelines, SOP# 2012 Soil Sampling,* and *SOP# 2006 Sampling Equipment Decontamination.*

4.4 Discharge Water Sampling

Discharge water from the air stripper will be sampled in accordance with the discharge permit to ensure that the discharge limits to the Nassau County storm sewer system are not exceeded.

Discharge water samples will be collected at a rate of one sample per excavation cell, or as specified by the Nassau County Department of Public Works or the NYSDEC. Collected samples will be submitted to a New York State Department of Health (NYSDOH) certified analytical laboratory for analysis of VOC compounds according to USEPA Method 8260B or as specified by the NCDPW or NYSDEC. Expedited sample turn-around may be required to prevent interruption to the excavation process.

If necessary, pre-treatment or post-treatment water may be temporarily stored in 21,000 gallon holding tanks to facilitate treatment and/or discharge characterization. Provisions will be made for up to three holding tanks.

Water sampling and equipment decontamination will be performed in accordance with USEPA *SOP # 2001 General Field Sampling Guidelines* and *SOP# 2006 Sampling Equipment Decontamination.*

4.5 Post IRM Monitoring and Sampling

Following the completion of the DNAPL extraction, soil excavation, dry chemical oxidation treatment and backfilling, and spot treatment injections using sodium permanganate, post IRM sampling and monitoring activities may commence to further assess subsurface conditions of areas outside of the excavated cells. These Post IRM activities may include: monitoring well sampling, soil sampling, additional permanganate injections and other remedial activities. Post IRM activities are outside the scope of this IRM and will therefore be discuss in detail in the remedial plan.

To ensure an adequate sampling network, any wells damaged during IRM activities will be replaced or relocated. The locations and specifications of additional wells will be verified with the NYSDEC prior to installation.

5.0 HEALTH AND SAFETY PLAN

The Health and Safety Plan (HASP) takes into account the specific hazards inherent to the site and presents the minimum requirements which are to be met by P.W. Grosser Consulting Inc. (PWGC), its subcontractors, and other on-site personnel in order to avoid and, if necessary, protect against health and/or safety hazards. A HASP has been prepared and is provided in **Attachment C**.

PWGC sub-contractors will have the option of adopting this HASP or developing their own site-specific document. If a subcontractor chooses to prepare their own HASP, it must meet the minimum requirements as detailed in the site HASP prepared by PWGC and must be made available to PWGC and NYSDEC.

Activities performed under the HASP will comply with applicable parts of OSHA Regulations, primarily 29 CFR Parts 1910 and 1926, and the PWGC Corporate Environmental Health and Safety policy. Modifications to the HASP may be made with the approval of the PWGC Health and Safety Manager (HSM) and/or Project Manager (PM).

6.0 COMMUNITY AIR MONITORING PLAN

The Community Air Monitoring Plan (CAMP) provides measures for protection for on-site workers and the downwind community (i.e., off-site receptors including residences, businesses, and on-site workers not directly involved in the remedial work) from potential airborne contaminant releases resulting from remedial activities.

The action levels specified require increased monitoring, corrective actions to abate emissions, and/or work shutdown. Additionally, the CAMP helps to confirm that the remedial work did not spread contamination off-site through the air.

The primary concerns for this site are odors and dust particulates. A CAMP has been prepared and is provided in **Attachment D**.

7.0 SCHEDULE

Following the period to acquire necessary permits, which is assumed to be five (5) weeks, the estimated duration of the remediation project is six (6) weeks. The remediation project includes recovery well installation and DNAPL recovery, shoring system installation to isolate areas for excavation, excavation of soils, operations to dry the contaminated soils, application of potassium permanganate to the excavations and spot sodium permanganate injections to upgradient areas, and soil disposal. A conceptual schedule is provided as **Figure 12**.

Site restoration will be performed as per the redevelopment plans for the site, and is not shown in the schedule.

8.0 REFERENCES

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29 CFR Part 1910.120 - Hazardous Waste Operations and Emergency Response

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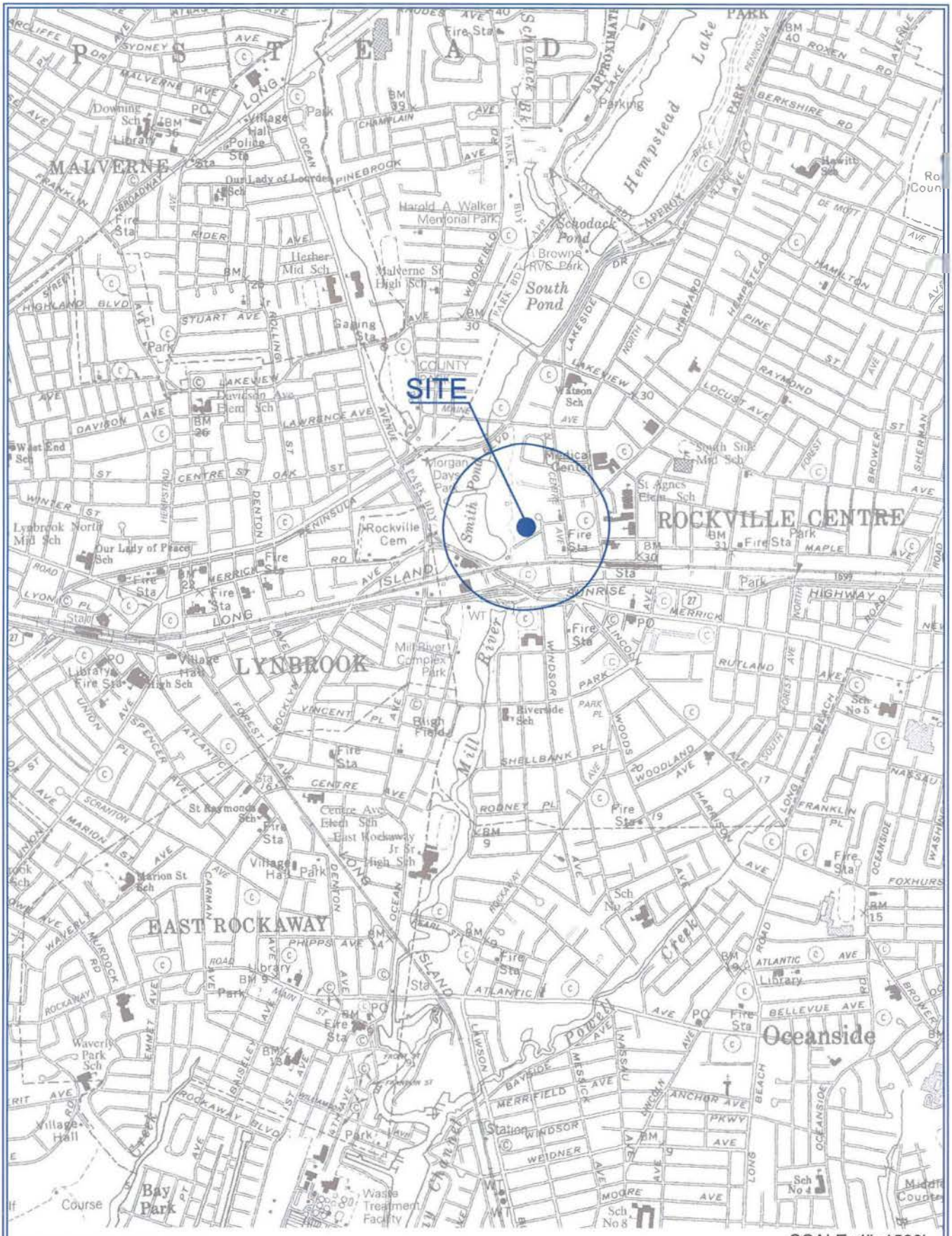
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U.S. Department of Energy, September 1999. *In Situ Chemical Oxidation Using Potassium Permanganate.*

FIGURES



J:\ALL\ARC\0401\CADD\RM WORK PLAN\figure 1

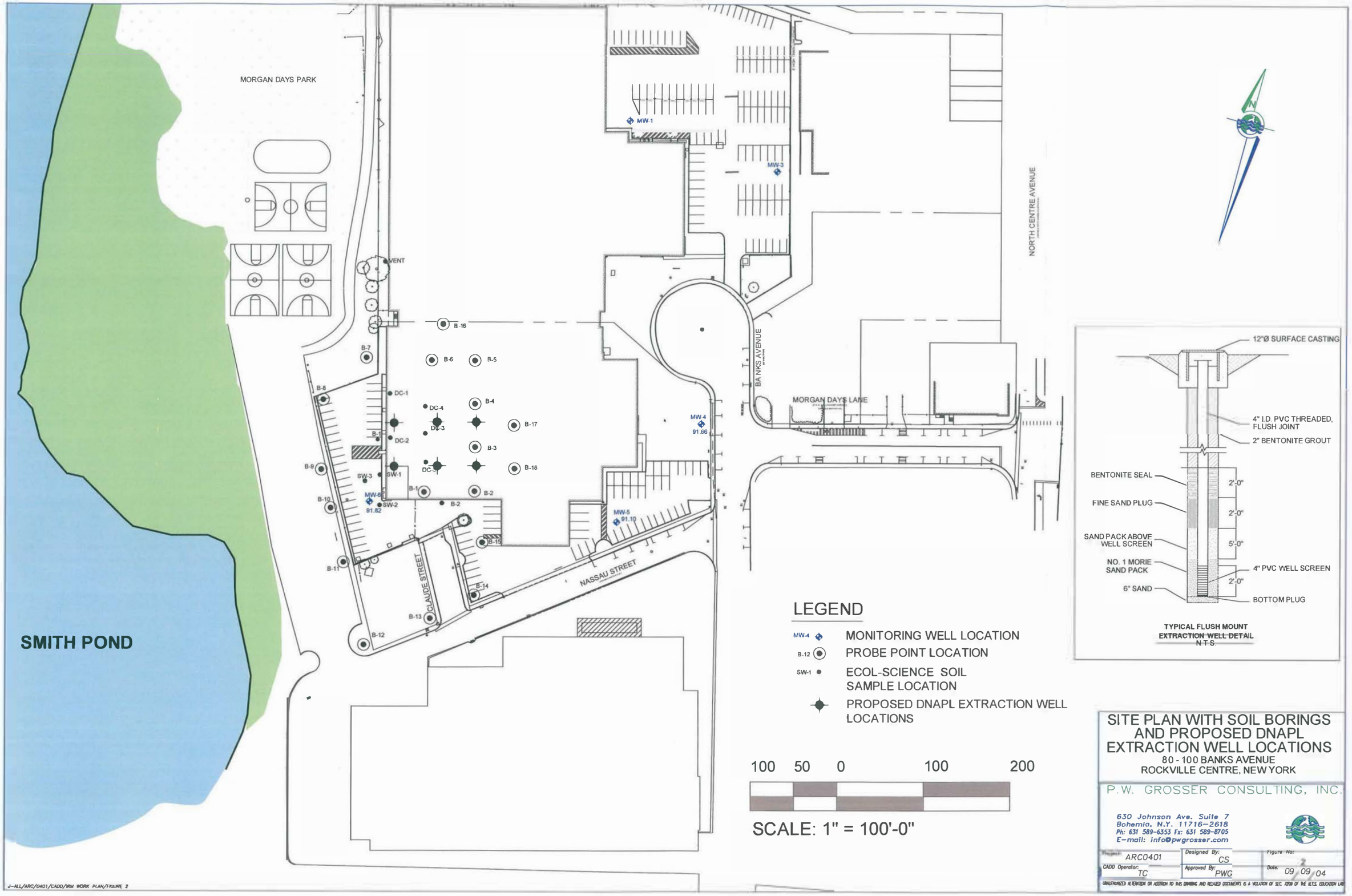
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SITE LOCATION MAP

80-100 BANKS AVENUE
ROCKVILLE CENTER, NEW YORK

Project	ARC0401
Drawn By	CS
Approved By	PWG
Drawn By	TC
Figure No	1
Date	08/10/04



TYPICAL FLUSH MOUNT EXTRACTION WELL DETAIL
N.T.S.

LEGEND

- MW-4 — MONITORING WELL LOCATION
- B-12 — PROBE POINT LOCATION
- SW-1 — ECOL-SCIENCE SOIL SAMPLE LOCATION
- PROPOSED DNAPL EXTRACTION WELL LOCATIONS

100 50 0 100 200

SCALE: 1" = 100'-0"

SITE PLAN WITH SOIL BORINGS AND PROPOSED DNAPL EXTRACTION WELL LOCATIONS

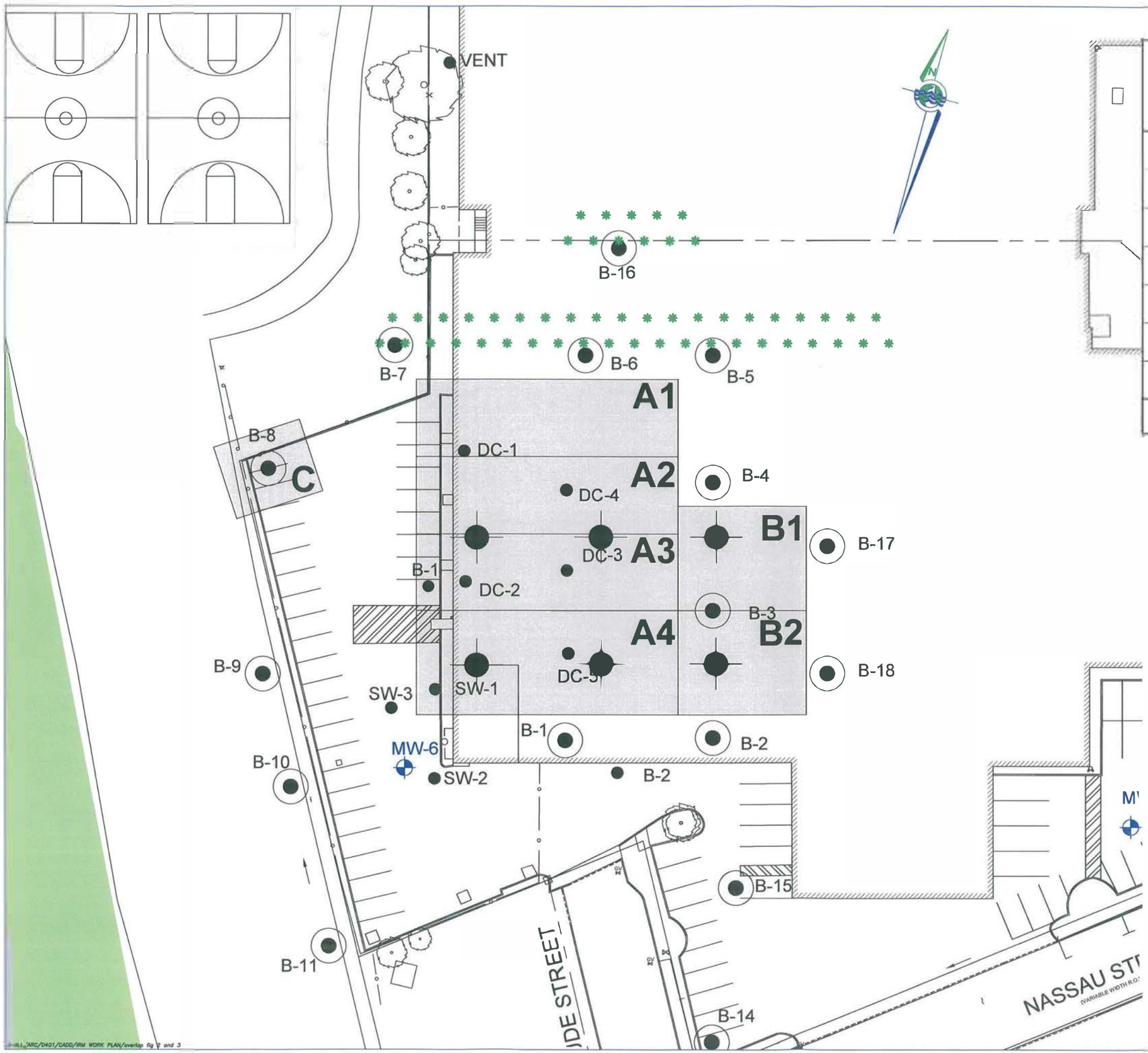
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Project: ARC0401	Designed By: CS	Figure No: 2
CADD Operator: TC	Approved By: PWG	Date: 09/09/04

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J:\ALL\ARC\0401\CADD\RIM WORK PLAN\FIGURE 2



CELL	ESTIMATED CONTAMINATED SOIL VOLUME (C.Y.)	EXCAVATION AREA (S.F.)	AVERAGE EXCAVATION DEPTH (FT.)	EXCAVATION SEQUENCE
A1	1,778	3,000	16	1
A2	1,778	3,000	16	2
A3	1,778	3,000	16	3
A4	2,370	4,000	16	5
B1	667	2,000	18	4
B2	667	2,000	18	6
C	117	900	12-1/2	7
TOTAL	9,155			

LEGEND

MW-6 MONITORING WELL LOCATION

B-12 PROBE POINT LOCATION

SW-1 ECOL-SCIENCE SOIL SAMPLE LOCATION

PROPOSED DNAPL EXTRACTION WELL LOCATIONS

PROPOSED SODIUM PERMANGANATE INJECTION LOCATIONS

40 20 0 40 80

SCALE: 1" = 40'

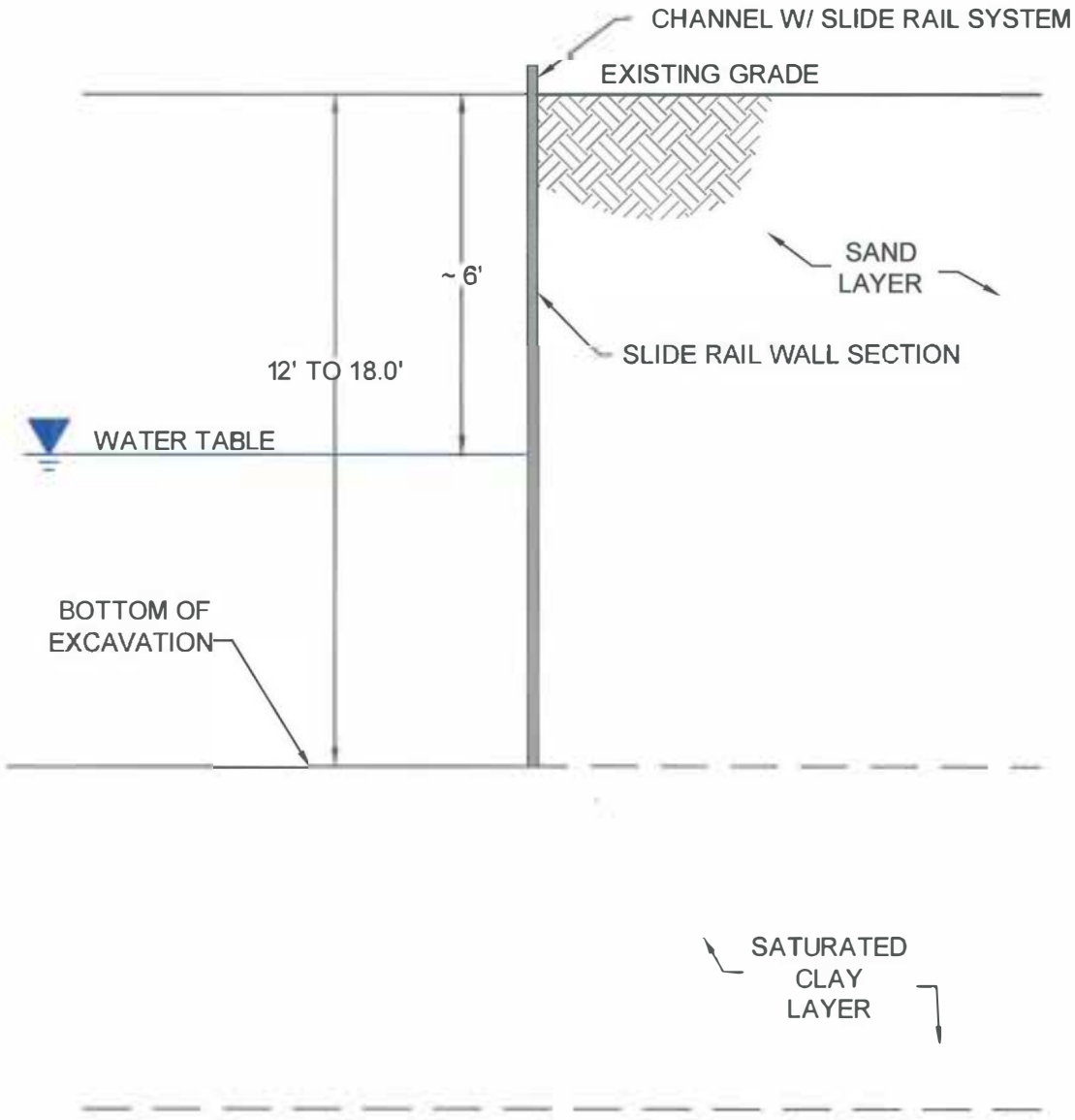
PROPOSED EXCAVATION AREA LAYOUT WITH SODIUM PERMANGANATE INJECTION LOCATIONS

80 - 100 BANKS AVENUE
ROCKVILLE CENTRE, NEW YORK

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ARC0401	CS	3
CADD Operator: TC	Approved By: PWG	Date: 10/18/05

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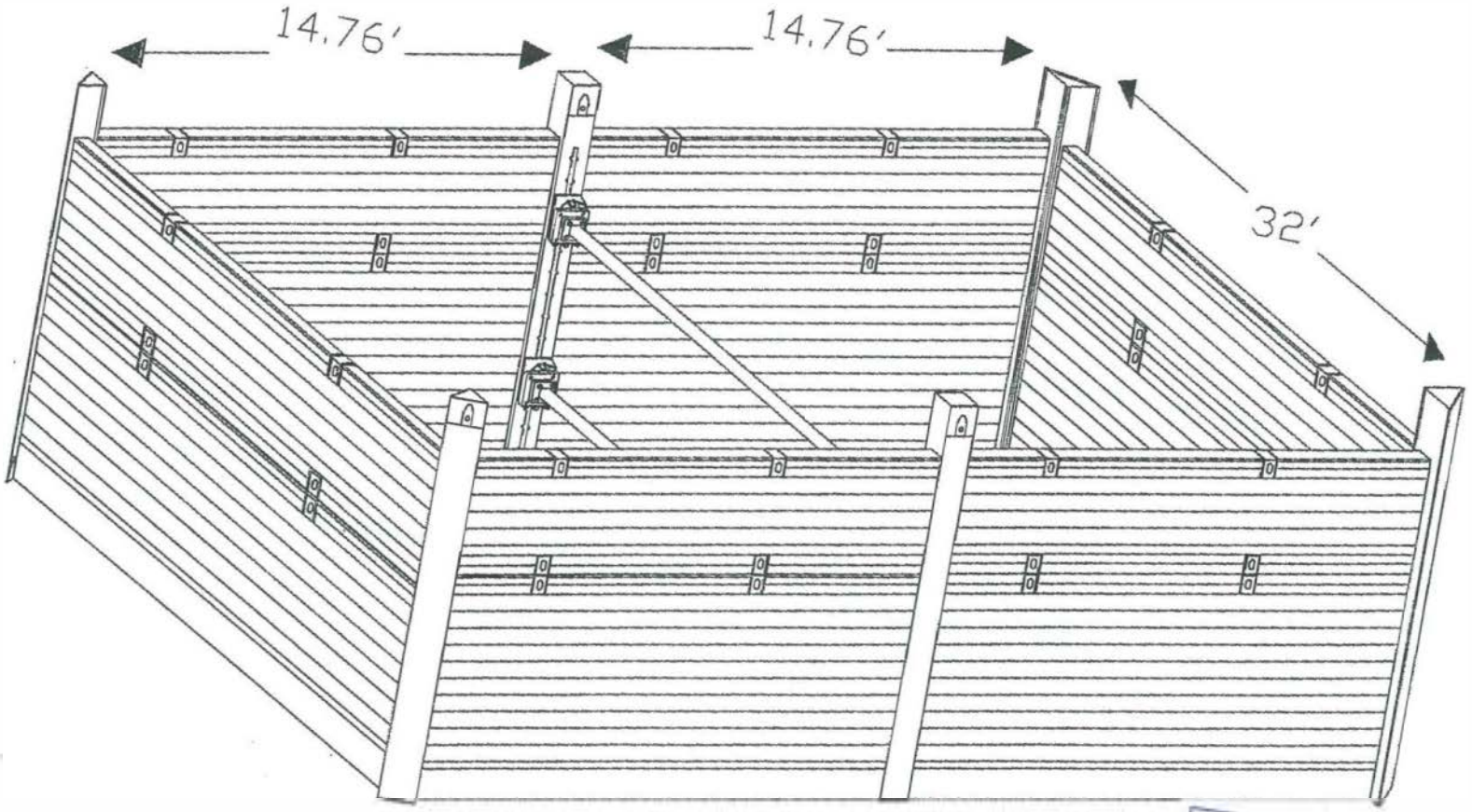
J:\Projects A-D\Arc-Advance Residential ...\FIGURE 4_02_28_05

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TYPICAL SLIDE RAIL SHORING ARRANGMENT
80-100 BANKS AVENUE
ROCKVILLE CENTER, NEW YORK

Project	Figure No.
ARC0401	4
Designed by: CS	
Approved by: PWG	
Drawn by: TC/TEB	Date: 02/28/05

TOTAL DEPTH OF CUT: 12.5'
SOIL TYPE: _____
OTHER:

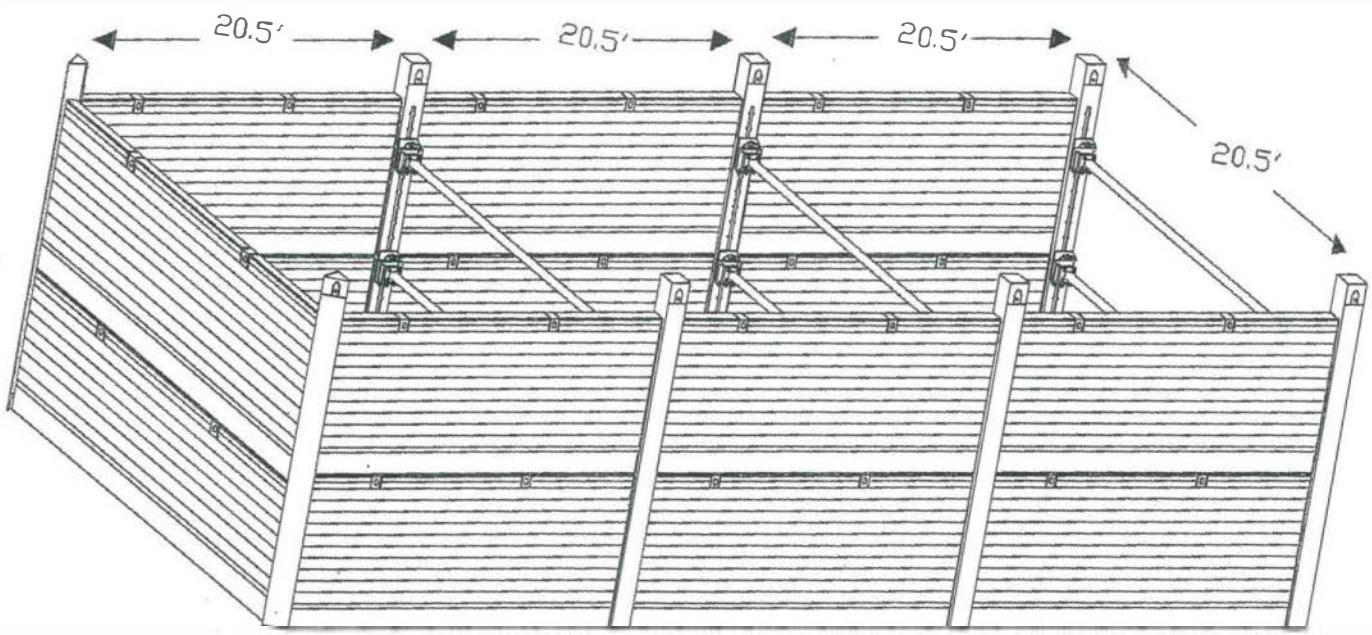


SIDE RAIL SYSTEM DETAILS FOR
12.5 FOOT CUT DEPTH
80 - 100 BANKS AVENUE
ROCKVILLE CENTRE, NEW YORK

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Project: ARC0401
Designed by: CS
CAD Operator: TEB

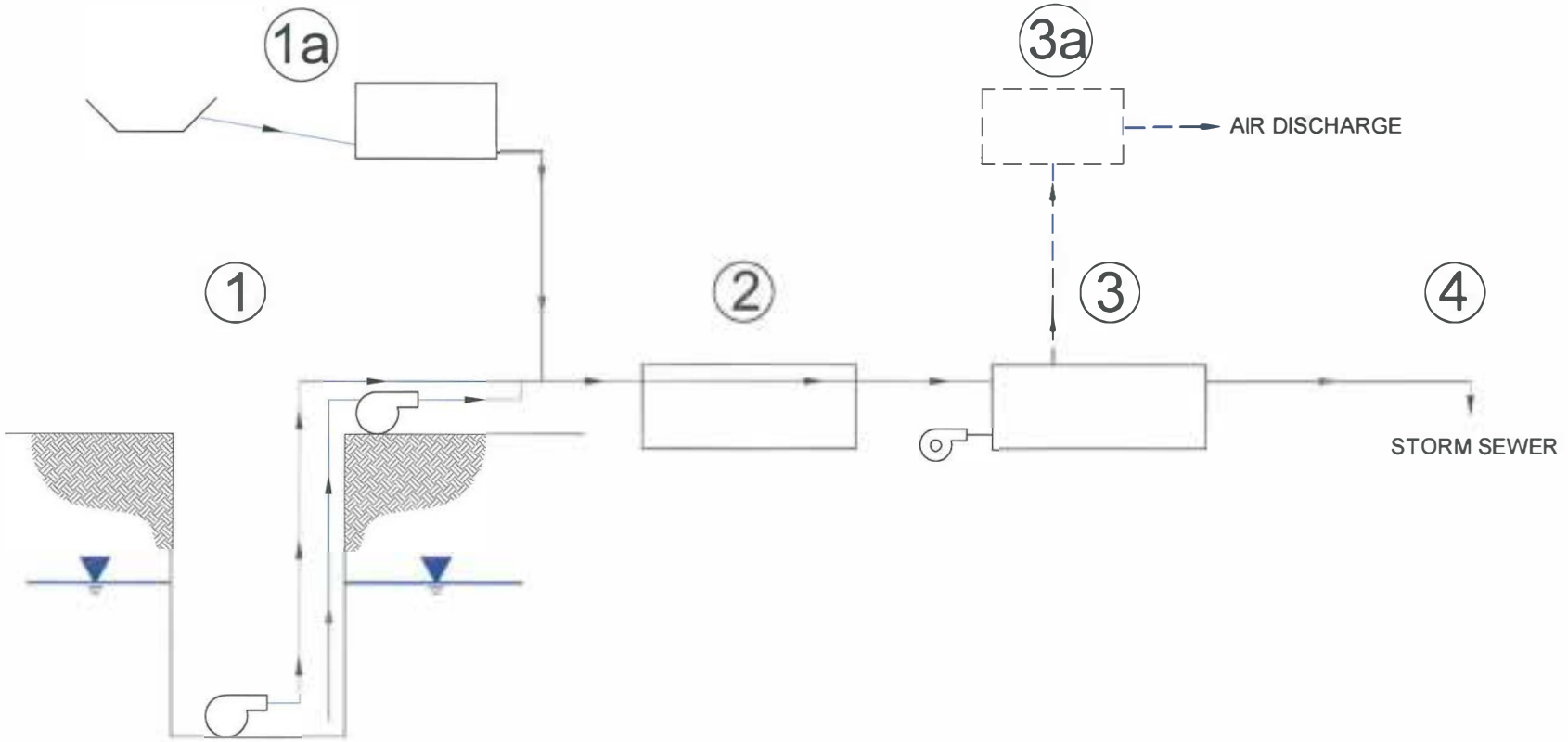
TOTAL DEPTH OF CUT: 16' to 18'
SOIL TYPE: _____
OTHER:



SIDE RAIL SYSTEM DETAILS FOR
16 TO 18 FOOT CUT DEPTH
80 - 100 BANKS AVENUE
ROCKVILLE CENTRE, NEW YORK

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Project ARC0401



1 SURFACE OR SUBMERSIBLE PUMP EXTRACTS GROUNDWATER FROM EXCAVATION

2 18,000 GAL WEIR TANK REMOVES SOLIDS FROM WATER

3 SHALLOW TRAY AIR STRIPPER REMOVES VOLATILE COMPOUNDS

4 TREATED WATER IS DISCHARGED TO NASSAU COUNTY STORM SEWER

1a LIQUIDS IN DRYING BEDS DRAIN TO COLLECTION TANK AND THEN ARE DISCHARGED TO TREATMENT SYSTEM

3a CARBON TO REMOVE VAPORS FROM EXHAUST AIR AS NEEDED

SCALE: N.T.S.

FLOW DIAGRAM OF GROUNDWATER TREATMENT SYSTEM

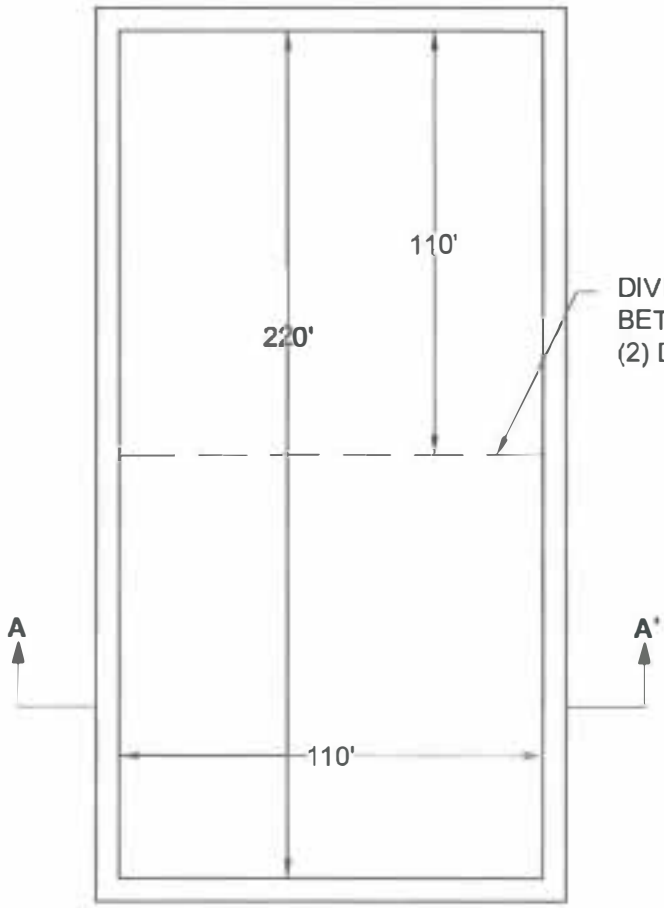
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Project:	Designed By:	Figure No:
ARC0401	BMM	7
CADD Operator: TC/TEB	Approved By: PWG	Date: 09/09/04

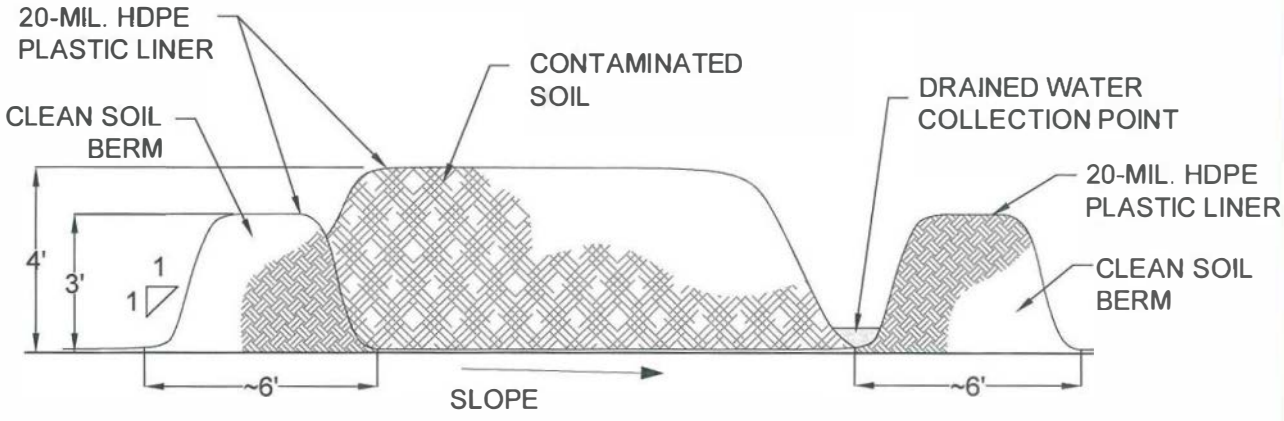
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J:\PROJECTS A-D\ERC\0401\CADD\RIM WORK PLAN\FIGURE 7



DRYING BED - PLAN VIEW

SCALE: 1"=50'



DRYING BED - SECTION A-A'

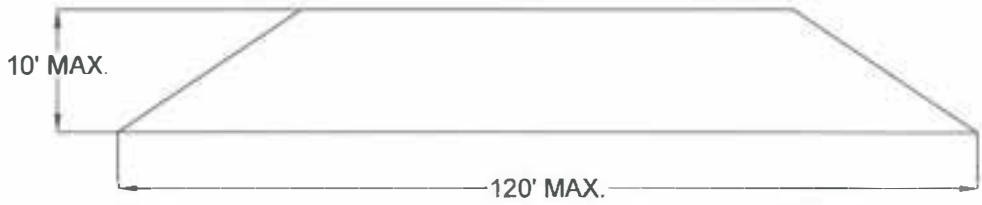
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J:/Projects 1-D/Arc- Advance Residential Communities/0401/CADD/IRM Work Plan/FIGURE 8.dwg

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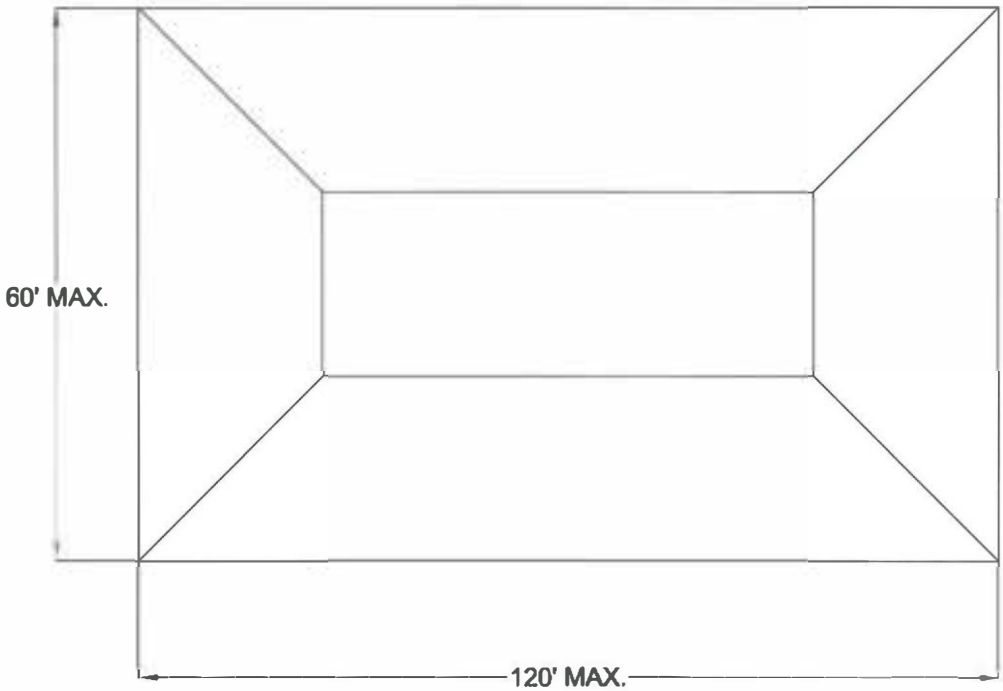
DRYING BED DETAILS
80-100 BANKS AVENUE
ROCKVILLE CENTER, NEW YORK

Project: ARC0401
Designed By: CS
Approved By: PWG
Drawn By: TC/TEB
Figure No.: 8
Date: 02/28/05



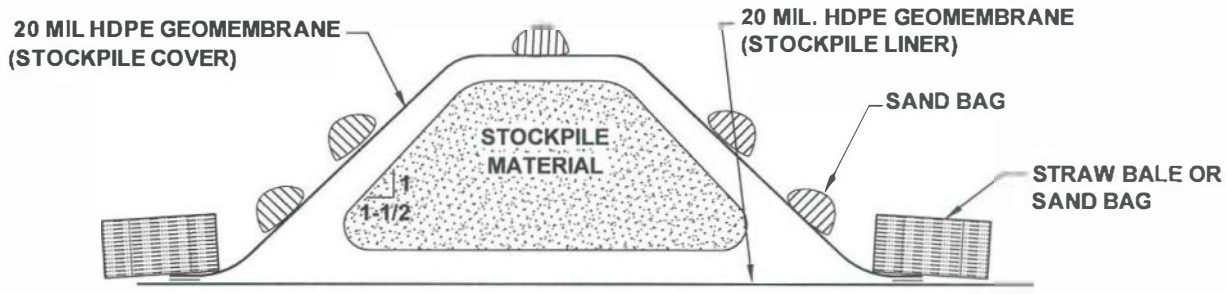
STOCKPILE DETAIL- SIDE VIEW

N.T.S.



STOCKPILE DETAIL- TOP VIEW

N.T.S.



LINER DETAIL

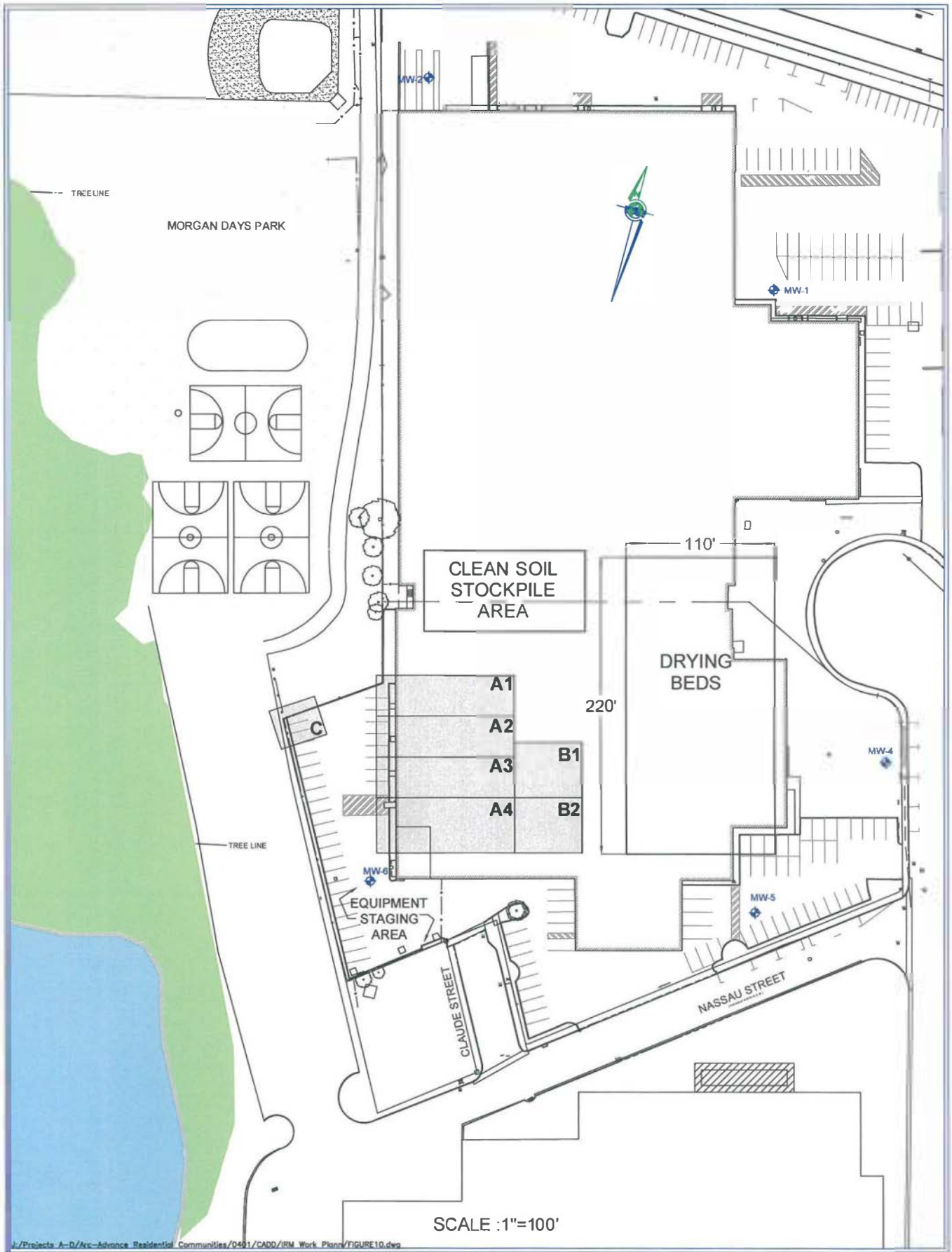
N.T.S.

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SOIL STOCKPILE DETAILS
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Project:	Figure No:
ARC0401	9
Designed by: CS	
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EQUIPMENT AND SOIL STAGING AREAS
80-100 BANKS AVENUE
ROCKVILLE CENTER, NEW YORK

Project:	ARC0401
Designed by:	CS
Approved by:	PWG
Drawn by:	TC/TEB
Figure No:	10
Date:	02/28/05

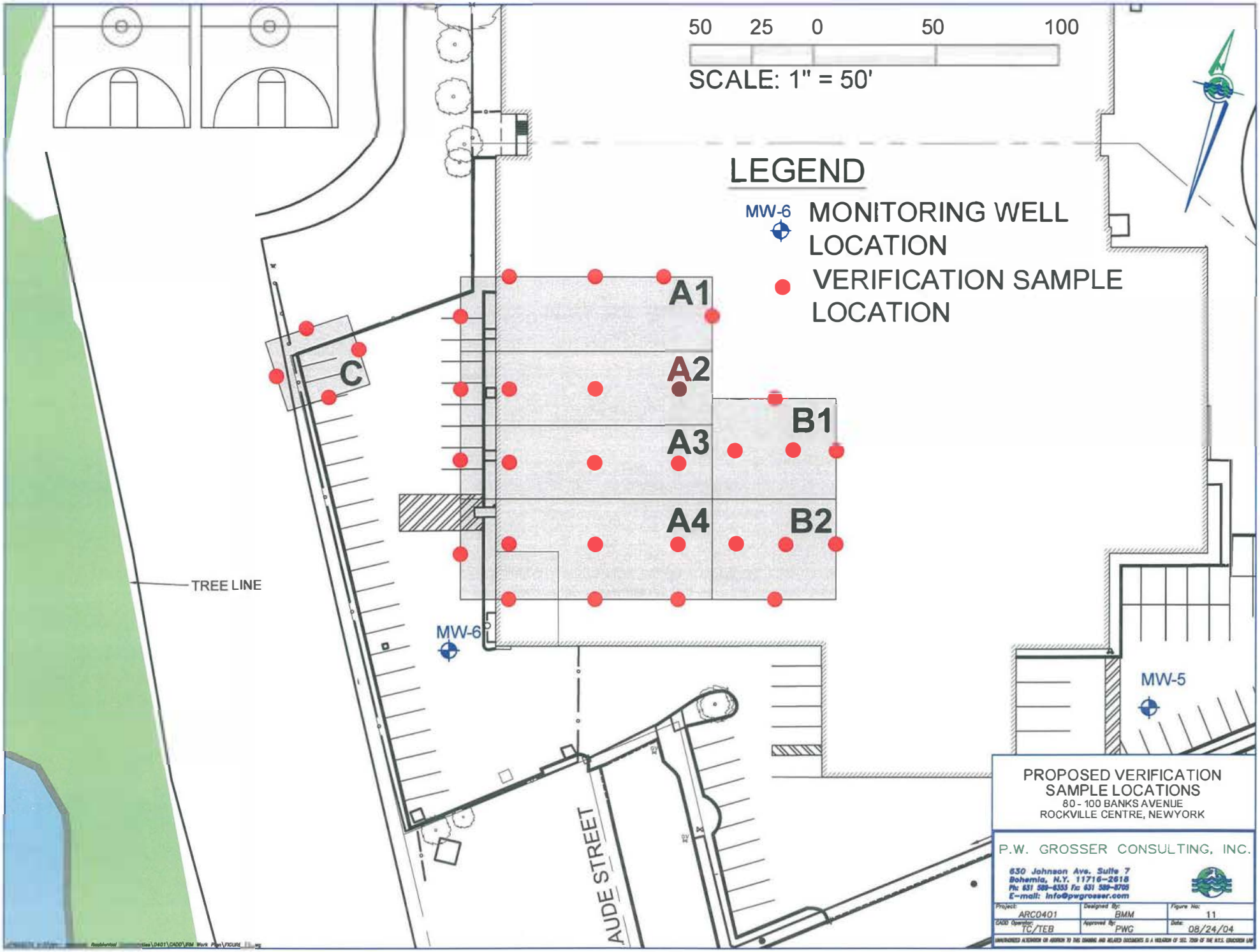
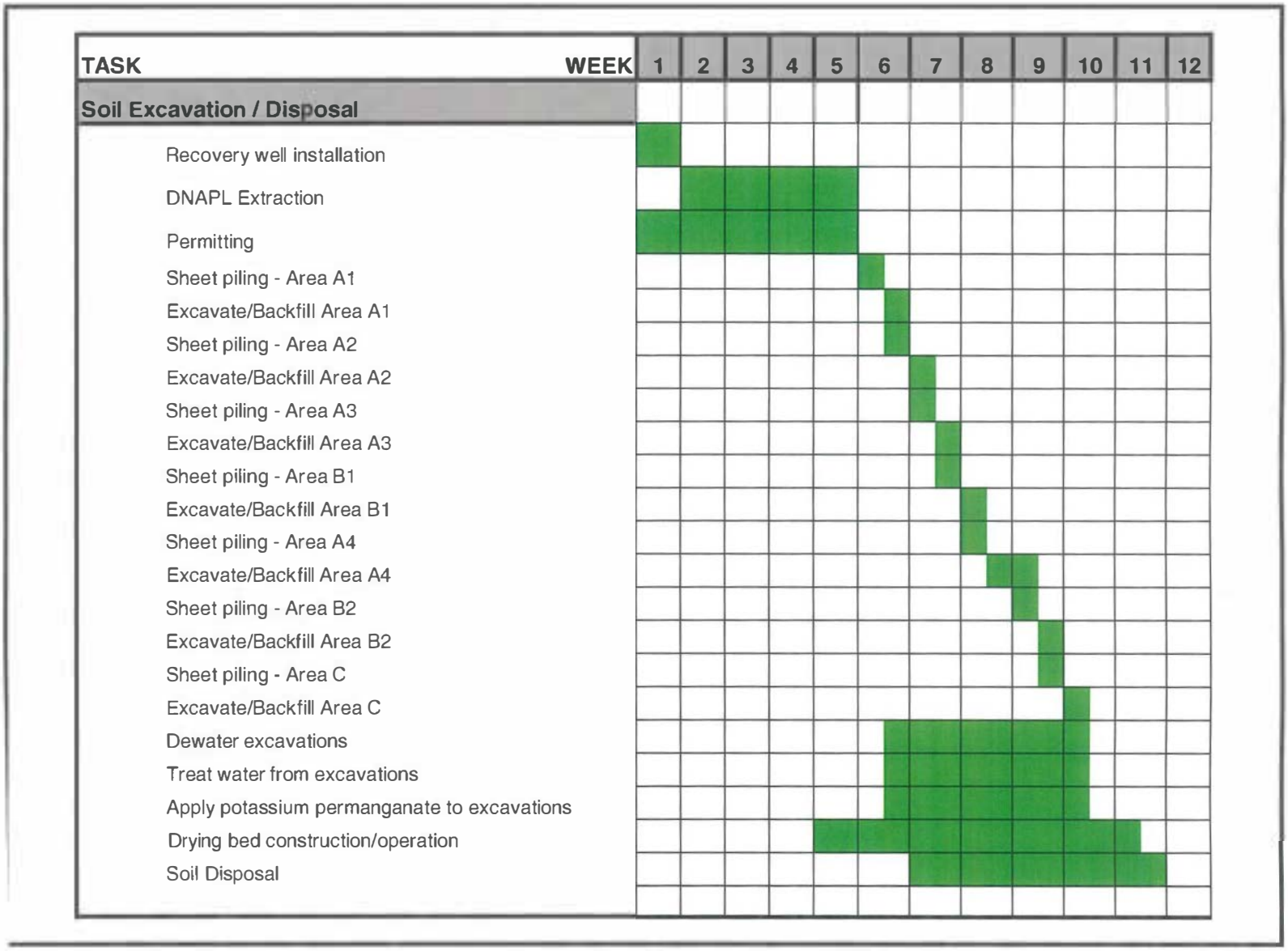

50 25 0 50 100
SCALE: 1" = 50'
LEGEND
MW-6 MONITORING WELL LOCATION
VERIFICATION SAMPLE LOCATION
A1
A2
A3
A4
B1
B2
C
TREE LINE
MW-6
MW-5
AUDE STREET
PROPOSED VERIFICATION SAMPLE LOCATIONS
80 - 100 BANKS AVENUE
ROCKVILLE CENTRE, NEWYORK
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Project: ARC0401
Designed By: BMM
Figure No: 11
CAD Operator: TC/TEB
Approved By: PWG
Date: 08/24/04

FIGURE 12

80-100 Banks Avenue
Village of Rockville Centre
IRM SCHEDULE



ATTACHMENT - A
Potassium Permanganate References

In-Situ Chemical Oxidation with Permanganate Annotated Bibliography

Chambers, J.; Leavitt, A.; Walti, C.; Schreier, C.; Melby, J. "Treatability Study-Fate of Chromium During Oxidation of Chlorinated Solvents." *Chem. Oxid. React. Barriers: Rem. Chlorinated Recalcitrant Compd., Int. Conf., 2nd*. Battelle Press, Columbus, Ohio, 2000, pp 57-65.

This laboratory study demonstrates the effectiveness of potassium permanganate solution in treating groundwater contaminated with cis-dichloroethylene and trichloroethylene. Soil permeability was not adversely affected by the formation of manganese dioxide, a by-product of the potassium permanganate reaction. Chromium (VI) levels were increased in the soil with addition of potassium permanganate. This is presumed to be due to the chromium content in potassium permanganate and the oxidation of soil chromium by potassium permanganate and manganese dioxide. The chromium (VI) levels diminished without the addition of a reducing agent establishing the fact that natural attenuation does occur within the soil.

Hood, E.D.; Thomson, N.R. "Numerical Simulation of *In Situ* Chemical Oxidation." *Chem. Oxid. React. Barriers: Rem. Chlorinated Recalcitrant Compd., Int. Conf., 2nd*. Battelle Press, Columbus, Ohio, 2000, pp 83-90.

A numerical model was created to simulate in-situ chemical oxidation. It found that increasing the concentration of an oxidant solution provided only a limited increase in oxidation efficiency. This result indicates that an adequate oxidant solution flow into a source zone plays a critical role in mass removal efficiency. It follows that application design, as well as the capability to monitor the effectiveness of the design, directly impact the success of an in-situ chemical oxidation project.

Hood, E.D.; Thomson, N.R.; Grossi, D.; Farquhar, G.J. "Experimental Determination of the Kinetic Rate Law for the Oxidation of Perchloroethylene by Potassium Permanganate." *Chemosphere*, 2000, Vol. 40(12), pp. 1383-1388.

Experiments were performed to determine the oxidation rate of perchloroethylene by a potassium permanganate solution. The goal of this analysis is to create a model for assistance in designing in-situ chemical oxidation projects. Although the simulation model has a high degree of accuracy, it tends to overestimate the oxidation rate of perchloroethylene near the maximum contamination levels. This could result in in-situ chemical oxidation projects taking longer to complete than predicted.

Huang, K.; Hoag, G.E.; Chheda, P.; Woody, B.A.; Dobbs, G.M. "Pilot-Scale Study of *In-Situ* Chemical Oxidation of Trichloroethene with Sodium Permanganate." *Chem. Oxid. React. Barriers: Rem. Chlorinated Recalcitrant Compd., Int. Conf., 2nd*, Battelle Press, Columbus, Ohio, 2000, pp 145-152.

This study verifies that sodium permanganate oxidizes both dissolved phase and free phase trichloroethylene in the subsurface. The oxidation rate of free phase trichloroethylene appears to be determined by the mass transfer rate of both the permanganate and trichloroethylene toward interface. This mass transfer rate seems to be negatively influenced by the presence of manganese dioxide, a by-product of the oxidation.

Huang, K.; Hoag, G.E.; Chheda, P.; Woody, B.A.; Dobbs, G.M. "Oxidation of Trichloroethylene in a Porous Medium with Permanganate." *Hazard. Ind. Wastes, 31st*, Technomic Publishing, 1999, pp 221-230.

This study indicates that potassium permanganate is effective at oxidizing dissolved phase and free phase trichloroethylene in sandy soil conditions. The oxidation potentially creates a low pH soil environment that promotes the leaching of metals from the soil. Manganese dioxide is the prominent manganese species created by the reaction, and this species negatively affects the permeability of the soil matrix.

Huang, K.; Hoag, G.E.; Chheda, P.; Woody, B.A.; Dobbs, G.M. "Soil Oxidant Demand during Chemical Oxidation of Trichloroethylene by Permanganate in Soil Media." *Hazard. Ind. Wastes,* 2000, 32nd, pp 617-626.

Two experiment methods were examined to determine Soil Oxidant Demand (SOD); column systems proved to be more accurate. Of two soil types tested, gravel-sand-silty soil had a substantially higher SOD after being spiked with trichloroethylene. It is theorized that protons produced by the potassium permanganate-trichloroethylene reaction react with this soil type to create oxidizable compounds.

Moes, M.; Peabody, C.; Siegrist, R.; Urynowicz, M.; "Permanganate Injection for Source Zone Treatment of TCE DNAPL." *Chem. Oxid. React. Barriers: Rem. Chlorinated Recalcitrant Compd., Int. Conf., 2nd*. Battelle Press, Columbus, Ohio, 2000, pp 117-124.

This study indicates that potassium permanganate is effective at oxidizing trichloroethylene in a subsurface setting; however, it is critical to the success of the project that the oxidant be evenly distributed. This emphasizes the importance of developing application methods, especially for soil with low permeability. Soluble metal concentrations, such as hexavalent chromium, and trihalomethane levels are found to increase temporarily after potassium permanganate is applied.

Mott-Smith, E.; Leonard, W.C.; Lewis, R.; Clayton, W.S.; Ramirez, J.; Brown, R. "In-Situ Oxidation of DNAPL using Permanganate: IDCC Cape Canaveral Demonstration." *Chem. Oxid. React. Barriers: Rem. Chlorinated Recalcitrant Compd., Int. Conf., 2nd*. Battelle Press, Columbus, Ohio, 2000, pp 125-134.

This case study recounts the effective oxidation of trichloroethylene by potassium permanganate in the subsurface. Groundwater and soil data are used to monitor the destruction. No hazardous chemical by-products are generated, and the occurrence of injection plugging is not significant. Chemical application and field monitoring methods are evaluated. A cost model is planned for development at the completion of the field study.

Nelson, C.H.; Barker, Craig S. "Treatment of TCE-Impacted Groundwater using *In-Situ* Chemical Oxidation." *Int. In Situ On-Site Biorem. Symp., 5th, Vol. 2*. Battelle Press, Columbus, Ohio, 1999, pp 199-204.

This case study details laboratory and field test results that verify the successful oxidation of trichloroethylene by potassium permanganate in a subsurface setting. Because of the clayey nature of the soil, mass transport issues of the potassium permanganate solution are emphasized. Pressure injection proved to be a more effective oxidant delivery method than injection well.

Seol, Y.; Schwart, F.W.; "Phase-transfer Catalysis Applied to the Oxidation of Nonaqueous Phase Trichloroethylene by Potassium Permanganate." *Journal of Contaminant Hydrology,* 2000, Vol. 44, pp 185-201.

This study indicates that phase-transfer catalysts increase the overall oxidation of chlorinated ethylenes by potassium permanganate. The catalyst enables oxidation to occur in the non-aqueous as well as the aqueous phase. Catalyst structure and concentration in addition to agitation of the reaction are determining factors in the success of a catalytic-aided oxidation. Further research is recommended to address realistic subsurface contaminant mixtures and soil matrix catalyst demand with regard to catalytic-aided oxidation.

Siegrist, R.L.; Lowe, K.S.; Murdoch, L.C.; Case, T.L.; *"In Situ* Oxidation by Fracture Emplaced Reactive Solids." *Journal of Environmental Engineering,* 1999, pp 429-440.

This study demonstrates that potassium permanganate successfully oxidizes trichloroethylene. In particular, potassium permanganate implanted as a horizontal reactive zone by hydraulic fracturing methods is shown to oxidize trichloroethylene in the subsurface. This capability is proven in low permeability soil up to ten months after initial installation.

Urynowicz, M.A.; Siegrist, R.L.; "Chemical Degradation of TCE DNAPL by Permanganate." *Chem. Oxid. React. Barriers: Rem. Chlorinated Recalcitrant Compd., Int. Conf., 2nd.* Battelle Press, Columbus, Ohio, 2000, pp 75-82.

This study evaluates the degradation of dense non-aqueous phase trichloroethylene by chemical oxidation with potassium permanganate. It is noted that the rate of reaction initially increases as the volume of permanganate increases; however, as the reaction proceeds, the rate actually decreases as manganese oxide by-products hinder the mass transfer process. Further study is underway to better understand the reaction conditions that result in a decreased degradation rate.

Vella, P.A.; Veronda, B. "Oxidation of Trichloroethylene: A Comparison of Potassium Permanganate and Fenton's Reagent." *Chem. Oxid.,* 1993, Vol. 3, pp 62-73.

This study demonstrates that potassium permanganate and Fenton's Reagent are effective, low cost oxidizing agents of trichloroethylene. Because these oxidizers are relatively safe and completely mineralize trichloroethylene, subsurface reactions are feasible. Potassium permanganate operates over a wide pH range while Fenton's Reagent requires a pH range of 3-5. Although potassium permanganate has a slower reaction time, the presence of carbonate/bicarbonate alkalinity slows oxidations with Fenton's Reagent.

Veronda, B.; Vlastnik, E.; Setchell, L.; Amarante, D.; Pisarczyk, K.; "Potassium/Sodium Permanganate for the *In-situ* Oxidation of Chlorinated Hydrocarbons. a: Effect of Reactant Concentration." *Industrial Wastewater,* January/February 2001, pp 36-39.

This study verifies that trichloroethylene and perchloroethylene are completely oxidized by potassium permanganate. The oxidation rate of each chlorinated ethylene depends on the potassium permanganate concentration and increases as the oxidant concentration increases. Trichloroethylene is oxidized approximately three times faster by potassium permanganate than perchloroethylene is; however, the rate of oxidation is increased by the same amount for each chlorinated ethylene as the potassium permanganate concentration is increased.

Yan, Y.E.; Schwartz, F.W. *"In-situ* Oxidative Dechlorination of Trichloroethylene by Potassium Permanganate." *Int. Conf. On AOTs, 3rd.* 1996.

This study confirms that potassium permanganate readily oxidizes trichloroethylene. The oxidation is quick with the rate increasing as pH is lowered within a range of 4-9. A low temperature will slow the reaction; however, the reaction is still relatively speedy for in-situ remediation. Competing oxidations occur within the soil and water and need to be considered when conducting in-situ remediation of trichloroethylene with potassium permanganate.

Yan, Y.E.; Schwartz, F.W. "Kinetics and Mechanisms for TCE Oxidation by Permanganate." *Environ. Sci. Technol.*, 2000, Vol 34(12), pp 2535-2541.

This study details the mechanisms involved in the oxidation of trichloroethylene by potassium permanganate. The intermediate and end products of the reaction are investigated.

Yan, Y.; Schwartz, F.W. "Oxidative Degradation and Kinetics of Chlorinated Ethylenes by Potassium Permanganate." *J. Contam. Hydrol.*, 1999, Vol 37(3-4), pp 343-365.

This study verifies that chlorinated ethylenes are readily oxidized by permanganate in an aqueous solution. Within a range of 4-8, pH has no significant affect on the oxidation rate. Degradation products of the oxidation reaction are less harmful than the parent compounds. Manganese dioxide produced during the reaction does exhibit limited oxidative properties.

Zhang, H.; Schwartz, F.W. "Simulating the In-Situ Oxidative Treatment of Chlorinated Ethylenes by Potassium Permanganate." *Water Resour. Res.*, 2000, Vol. 36(10), pp 3031-3042.

A computer simulation model is devised to predict the oxidation of chlorinated ethylenes by permanganate in a subsurface setting. The model considers the dissolution of non-aqueous phase liquids (NAPLs); chemical reactions among permanganate, chlorinated compounds and aquifer materials; and mass transport of the solutes. Research performed during the preparation of this model indicates that the accurate determination of NAPL saturation, the aqueous concentration of chlorinated compounds and the reactivity of aquifer material and permanganate are critical to a successful remediation project. This research also indicates that oxidation of chlorinated ethylenes is most successful at low saturation NAPL and oxidation takes place in the aqueous phase while dissolution of NAPL is rate-limited.

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INNOVATIVE TECHNOLOGY
Summary Report

DOE/EM-0496

In Situ Chemical Oxidation Using Potassium Permanganate

Subsurface Contaminants
Focus Area



Prepared for
U.S. Department of Energy
Office of Environmental Management
Office of Science and Technology

September 1999

INNOVATIVE TECHNOLOGY
Summary Report

In Situ Chemical Oxidation Using Potassium Permanganate

OST/TMS ID 167

Subsurface Contaminants
Focus Area

Demonstrated at
Portsmouth Gaseous Diffusion Plant
Piketon, Ohio



Purpose of this document

Innovative Technology Summary Reports are designed to provide potential users with the information they need to quickly determine whether a technology would apply to a particular environmental management problem. They are also designed for readers who may recommend that a technology be considered by prospective users.

Each report describes a technology, system, or process that has been developed and tested with funding from DOE's Office of Science and Technology (OST). A report presents the full range of problems that a technology, system, or process will address and its advantages to the DOE cleanup in terms of system performance, cost, and cleanup effectiveness. Most reports include comparisons to baseline technologies as well as other competing technologies. Information about commercial availability and technology readiness for implementation is also included. Innovative Technology Summary Reports are intended to provide summary information. References for more detailed information are provided in an appendix.

Efforts have been made to provide key data describing the performance, cost, and regulatory acceptance of the technology. If this information was not available at the time of publication, the omission is noted.

All published Innovative Technology Summary Reports are available on the OST Web site at http://ost.em.doe.gov under "Publications."

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SECTION 1

SUMMARY

Technology Summary

Problem

Groundwater and soils contaminated with organic compounds, such as solvents, are often difficult to remediate. The standard technology, pump and treat at the surface, is known to be expensive and to take years to complete. At some sites, low permeability zones contain a large percentage of the contaminant mass. The contaminants held within these zones are often not well accessed by standard pump and treat systems, thus prolonging the time required for remediation of the entire site and increasing the costs of remediation. Alternative technologies that can better access, especially source zones containing dense non-aqueous phase liquids (DNAPLs), to more efficiently remediate subsurface aquifers and rapidly treat the contaminants have recently been investigated.

How It Works

- In situ chemical oxidation is a developing class of remediation technologies in which organic contaminants are degraded in place by oxidants delivered to the subsurface. Successful implementation of this technology requires an effective means for dispersing the oxidant to the subsurface contaminated regions.
- In Situ Chemical Oxidation Using Potassium Permanganate ($KMnO_4$) for soil and groundwater treatment has been demonstrated at a number of sites on the following organics:
  - chlorinated solvents (alkenes such as trichloroethylene [TCE] and perchloroethylene [PCE]); and
  - napthalene and pyrene.
- In Situ Chemical Oxidation Using $KMnO_4$ through recirculation, the subject of this report, is the technique of delivering aqueous oxidant through multiple horizontal and/or vertical wells. In Situ Chemical Oxidation Using $KMnO_4$ used horizontal wells to provide improved access to a subsurface contaminant plume that contains TCE. Groundwater was extracted from one of the horizontal wells; $KMnO_4$ was added to oxidize the contaminants in the groundwater, which was then reinjected into the other parallel horizontal well.

Potential Markets

- Chemical oxidation using $KMnO_4$ has been widely used for treatment of pollutants in drinking water and wastewater applications for over 50 years. In situ chemical oxidation has more recently been used to remediate hazardous waste sites with soils and groundwater contaminated with organics utilizing various techniques for delivery of both aqueous and solid permanganate. Delivery processes that have been demonstrated include: deep soil mixing, hydraulic fracturing, multi-point vertical lancing, horizontal well recirculation, and vertical well recirculation.
- In Situ Chemical Oxidation using $KMnO_4$ is a rapid and cost-effective treatment when used to treat DNAPL source zones or zones of high residual contamination.
- In Situ Chemical Oxidation Using $KMnO_4$ is an alternative approach for sites where the physical disruption of contaminated soils is not desirable, feasible, or necessary.
- Most DOE sites contain groundwater plumes that contain organics, with source zones, that could be treated with In Situ Chemical Oxidation Using $KMnO_4$.

Advantages Over Baseline

- In Situ Chemical Oxidation Using $KMnO_4$ is cheaper than the baseline pump and treat technology for certain applications, because the time of remediation can be significantly reduced by targeting treatment of the DNAPL source zone.
- In Situ Chemical Oxidation Using $KMnO_4$ can also be cheaper than alternative technologies such as deep soil mixing, as larger volumes of soil can be treated with multiple oxidant dosings.
- In Situ Chemical Oxidation Using $KMnO_4$ is advantageous over the baseline and alternative technologies because it generates innocuous by-products (carbon dioxide and manganese dioxide solids), allows introduction of large volumes of oxidant solution; the recirculation process provides for better oxidant control within the treatment area as compared to well injection alone.

Demonstration Summary

- In Situ Chemical Oxidation Using $KMnO_4$ to treat TCE present as DNAPL and as a dissolved plume at the X-701B facility was demonstrated at the Portsmouth Gaseous Diffusion Plant (PORTS) in the spring of 1997.
- The demonstration at PORTS was implemented using a pair of parallel horizontal wells with 200-foot (ft) screened sections located in a 5-ft thick silty, gravel aquifer within the center of a groundwater plume originating from a known source of DNAPL. Crystalline $KMnO_4$ was added to groundwater extracted from the upgradient well and re-injected into the downgradient well approximately 90 feet from the extraction well.
- Oxidant solution (~2% $KMnO_4$) was recirculated through the horizontal wells for approximately one month. Subsequent injection of $KMnO_4$ into a nearby vertical well was conducted for 8 days to enhance uniform delivery of the oxidant in the region between the horizontal wells.
- The stratigraphy at the X-701B site consists of two unconsolidated units overlying bedrock:
  - the Minford silt and clay with a thickness of 25 to 30 ft;
  - the Gallia sand and gravel, which has a thickness varying from 2 to 10 ft (5 to 6 ft within the region between the horizontal wells). The Gallia sand and gravel was the target aquifer to be treated during this demonstration.

Key Results

- The recirculation concept to introduce oxidant into the subsurface was shown to be viable.
- Oxidant injection without extraction is feasible; however, extraction provides enhanced control of the subsequent movement of the oxidant after its release.
- Lateral and vertical heterogeneities within the aquifer significantly impacted uniform delivery of the oxidant through the horizontal wells.
- Significant reductions in TCE were measured in both groundwater and soil samples in areas where the oxidant was delivered. During post-treatment sampling, TCE was not detected (< 5 parts per billion [ppb]) in samples collected from the monitoring wells and soil borings in locations where the oxidant had permeated. However, because oxidant delivery was not uniform, TCE was not reduced to non-detectable levels in all groundwater and soil samples.
- A system for handling precipitated solids may need to be incorporated when high concentrations of oxidant are recirculated.

- The demonstration at PORTS (Figure 1) was conducted by Oak Ridge National Laboratory. It was sponsored by the U. S. Department of Energy (DOE), Office of Science and Technology, and the DOE Portsmouth Site Office. This demonstration was conducted as part of a larger ongoing project with contributions from: Bechtel Jacobs Company (formerly Lockheed Martin Energy Systems), Colorado School of Mines, Carus Chemical Company, Schumacher Filters of America, Allied Signal Corporation (Kansas City Plant), Millgard Environmental, and Geo-Con.

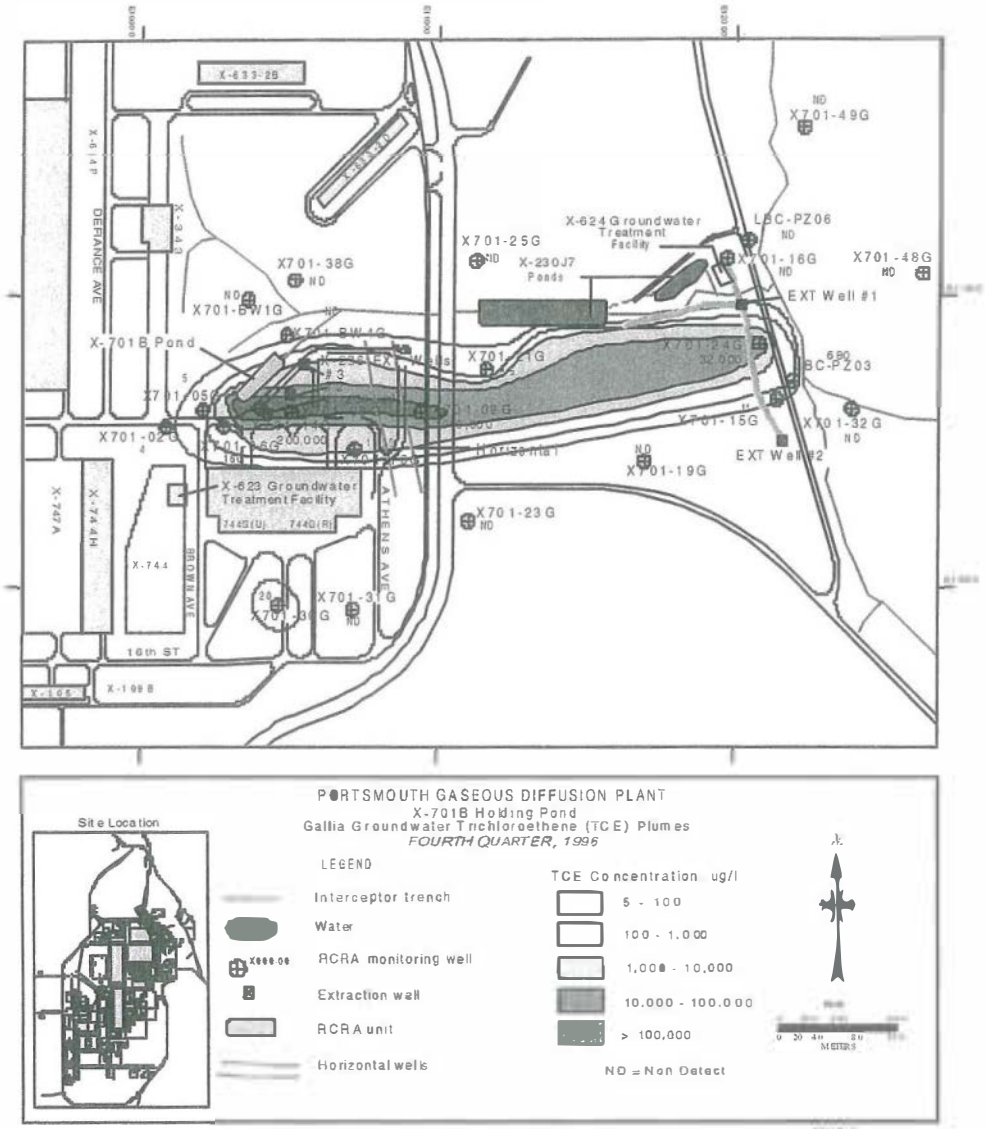


Figure 1. Location of the demonstration site within the X-701B plume at PORTS

- A summary of sites where In Situ Chemical Oxidation Using $KMnO_4$ has been demonstrated as initial treatment for source removal and as full-scale remediations for both DNAPL and BTEX contaminated sites follows:
  - vertical well flushing using $KMnO_4$ at Canadian Forces Base, Borden site ('96);
  - horizontal well-to-well flushing using $KMnO_4$ at the DOE Portsmouth Plant ('96-'98);
  - vertical well flushing and recirculation using $NaMnO_4$ at the DOE Portsmouth Plant ('98); and
  - numerous leaky underground storage tank sites.

- Two overview documents on the use of In Situ Oxidation to treat contaminated ground water are currently in preparation.
  - "Technology Status Review: In Situ Oxidation," prepared by the U.S. Department of Defense Environmental Security Technology Certification Program. This document, available Dec 1999 (http://www.estcp.org), is a brief summary and status of in situ oxidation methods (permanganate, Fenton's Reagent, and ozone) that have been field demonstrated for source zone treatment.
  - "Guidance for In Situ Chemical Oxidation at Contaminated Sites: An Overview with a Focus on Permanganate-Based Systems," prepared for the U.S. Department of Energy. This document, available through the PI in winter 1999, provides guidance on the evaluation and design of in situ chemical oxidation with a focus on the use of potassium and sodium permanganates for remediation of contaminated sites.

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ATTACHMENT - B
Air Stripper Specifications

ShallowTray®
low profile air strippers

System Performance Estimate

Client and Proposal Information:

P. W. Grosser, Inc.: Charlie Sofik
ARCO 301, NY
#404919

HIGH FLOW

Series chosen:	2300	
Water Flow Rate:	50.0 gpm	11.4 m3/hr
Air Flow Rate:	300 scfm	510 m3/hr
Water Temp:	55 °F	13 °C
Air Temp:	50 °F	10 °C
A/W Ratio:	45	45
Safety Factor:	None	

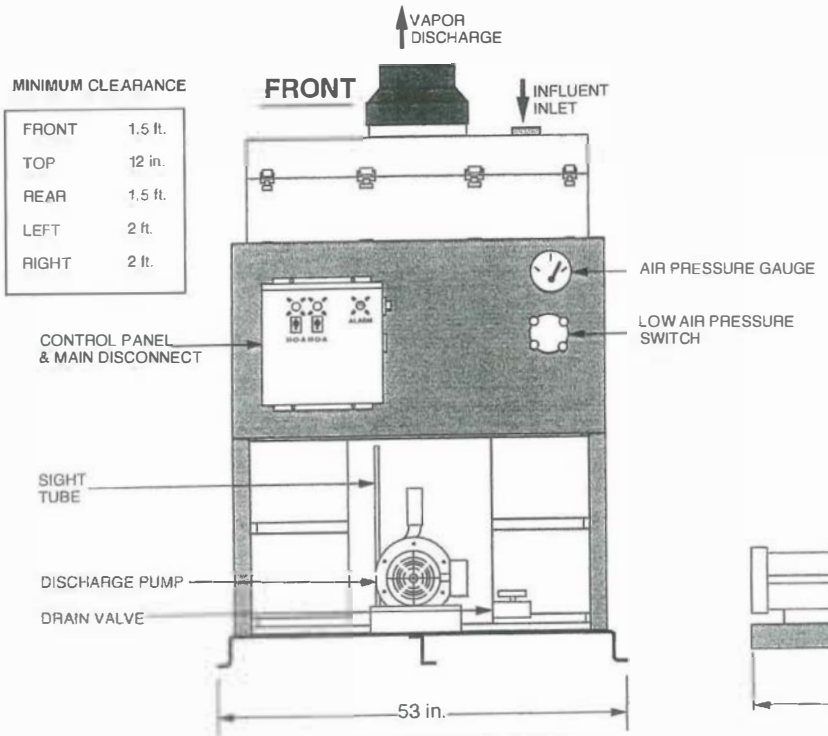
Contaminant	Untreated Influent / Effluent Target	Model 2311 Effluent lbs/hr PPMv %removal	Model 2321 Effluent lbs/hr PPMv %removal	Model 2331 Effluent lbs/hr PPMv %removal	Model 2341 Effluent lbs/hr PPMv %removal	Model 2351 Effluent lbs/hr PPMv %removal
Tetrachloroethylene	5000 ppb	1303 ppb	340 ppb	89 ppb	23 ppb	6 ppb
Solubility 150 ppm	100 ppb	0.09 11.8	0.12 14.8	0.12 15.6	0.12 15.9	0.13 15.9
Mwt 165.83		73.9340%	93.2056%	98.2290%	99.5384%	99.8797%

#REF!

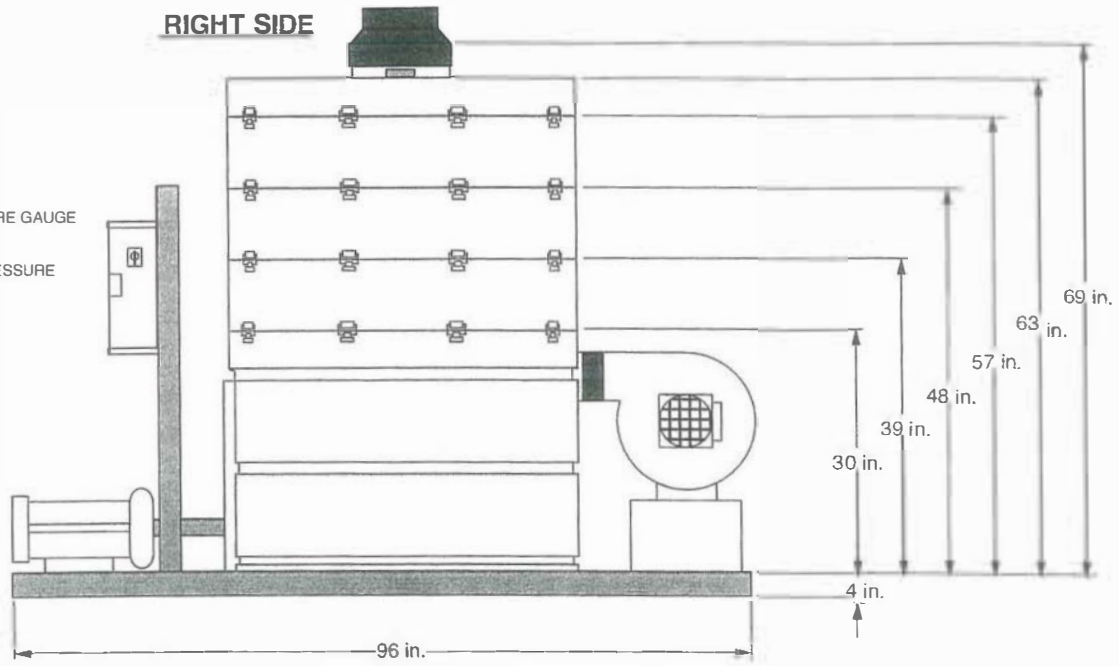
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MINIMUM CLEARANCE	
FRONT	1.5 ft.
TOP	12 in.
REAR	1.5 ft.
LEFT	2 ft.
RIGHT	2 ft.



BASIC SYSTEM

- ✓ SUMP TANK
- ✓ STRIPPER TRAYS
- ✓ BLOWER
- ✓ MIST ELIMINATOR
- ✓ PIPING
- ✓ SPRAY NOZZLE
- ✓ WATER LEVEL SIGHT TUBE
- ✓ GASKETS
- ✓ LATCHES

OPTIONAL ITEMS

- ✓ SKID & STANCHION
- ✓ AIR PRESSURE GAUGE
- GRAVITY DISCHARGE PIPING
- ✓ DISCHARGE PUMP
- — FEED PUMP
- — ADDITIONAL BLOWER
- — EXPLOSION-PROOF MOTOR(S)
- LOCAL DISCONNECT NEMA 7
- ✓ CONTROL PANEL
- ✓ MAIN DISCONNECT SWITCH
- I.S. COMPONENTS/REMOTE MOUNT
- ✓ INTERMITTENT OPERATION
- STROBE LIGHT
- — ALARM HORN
- — POWER LAPSE INDICATOR
- ✓ LOW AIR PRESSURE ALARM SWITCH(ES)
- ✓ HIGH WATER LEVEL ALARM SWITCH
- ✓ DISCHARGE PUMP LEVEL SWITCH
- — WATER PRESSURE GAUGE(S)
- — DIGITAL WATER FLOW INDICATOR
- — AIR FLOW METER
- — TEMPERATURE GAUGE(S)
- — LINE SAMPLING PORT(S)
- — AIR BLOWER SILENCER
- — WASHER WAND
- AUTO DIALER

NOTE: THIS DRAWING IS REPRESENTATIVE OF A STANDARD SHALLOWTRAY CONFIGURATION, AND IS NOT INTENDED FOR ENGINEERING DESIGN OR LAYOUT. ACTUAL ARRANGEMENT AND DIMENSIONS MAY VARY DEPENDING ON BLOWER SELECTION OR OTHER ACCESSORIES. PLEASE CONTACT NEEP FOR DETAILED DESIGN INFORMATION.

POWER: 3Ø, 230 Volts, 3 WIRE + GROUND 60 Hz

*CONSULT N.E.E.P. FOR AMPACITIES AND OTHER VOLTAGE OPTIONS

STRIPPER CONSTRUCTION:

ROTATIONALLY MOLDED (.43"Ø)
LOW DENSITY POLYETHYLENE (LDPE)

CONNECTION INFORMATION

ITEM	SIZE
GRAVITY DISCHARGE	3 in. Ø SOCKET, PVC80
DISCHARGE PUMP	1 1/4 in. Ø FNPT
WATER INLET	1-1/4 in. Ø FNPT
AIR EXHAUST NOZZLE	8 in. Ø STUB W/8x6 CPLG

NORTH EAST ENVIRONMENTAL PRODUCTS, INC.
7 COMMERCE AVENUE
WEST LEBANON, NEW HAMPSHIRE 03784
PHONE: 603-298-7061 FAX: 603-298-7063
www.neepsystems.com

TOLERANCES UNLESS OTHERWISE SPECIFIED: ± 1 INCH

DRAWING NAME: ShallowTray® Model 2331-P © 2002 NEE

DRAWING #: Proposal #404919

DRAWN: DCS

CUSTOMER: P.W.Grosser: ARCO 301, NY

DATE: 04/27/04

SCALE: NTS

SIZE: A

SHEET: 1 OF: 1

ATTACHMENT - C
Health & Safety Plan

P.W. GROSSER CONSULTING, INC.

HEALTH AND SAFETY PLAN
FOR
REMEDIAL ACTION

80-100 BANKS AVENUE
VILLAGE OF ROCKVILLE CENTRE
NASSAU COUNTY, NEW YORK

SEPTEMBER 2004
Revised OCTOBER 2005

HEALTH AND SAFETY PLAN

Site:	**Signature Place Residential Buildings**
Location:	**80-100 Banks Avenue, Rockville Centre, Nassau County, New York**
Prepared By:	**P.W. GROSSER CONSULTING, INC.**
Date Prepared:	**SEPTEMBER 2004, Revised February 2005**
Version:	**1**
Revision:	**1**
Project Description:	**REMEDIAL ACTION**
Waste types:	Solid, Liquid
Characteristics:	Volatile Organic Compounds
Background Review:	Complete
Overall Hazard:	Low to Moderate

P.W. GROSSER CONSULTING (PWGC) AND PWGC'S SUBCONTRACTORS DO NOT GUARANTEE THE HEALTH OR SAFETY OF ANY PERSON ENTERING THIS SITE. DUE TO THE NATURE OF THIS SITE AND THE ACTIVITY OCCURRING THEREON, IT IS NOT POSSIBLE TO DISCOVER, EVALUATE, AND PROVIDE PROTECTION FOR ALL POSSIBLE HAZARDS WHICH MAY BE ENCOUNTERED. STRICT ADHERENCE TO THE HEALTH AND SAFETY GUIDELINES SET FORTH HEREIN WILL REDUCE, BUT NOT ELIMINATE, THE POTENTIAL FOR INJURY AT THIS SITE. THE HEALTH AND SAFETY GUIDELINES IN THIS PLAN WERE PREPARED SPECIFICALLY FOR THIS SITE AND SHOULD NOT BE USED ON ANY OTHER SITE WITHOUT PRIOR RESEARCH AND EVALUATION BY TRAINED HEALTH AND SAFETY SPECIALISTS.

APPROVALS

By their signature, the undersigned hereby certify that this Health and Safety Plan (HASP) has been reviewed and approved for use in conducting remedial actions at 80-100 Banks Avenue, Rockville Centre, NY.

Project Manager	Date
Health and Safety Officer	Date

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1.0 INTRODUCTION

1.1 Purpose

This Health and Safety Plan (HASP) addresses the minimum health and safety practices that will be employed by site workers participating in remedial activities at the project site located in Rockville Centre, Nassau County, New York. Redevelopment plans for the former pharmaceutical warehouse and distribution center include residential buildings. A New York State Brownfield Cleanup Agreement (BCA) for the property was executed on June 29, 2005.

The HASP takes into account the specific hazards inherent to the site and presents the minimum requirements which are to be met by P.W. Grosser Engineer & Hydrogeologist, P.C. (PWGC), its' subcontractors, and other on-site personnel in order to avoid and, if necessary, protect against health and/or safety hazards. PWGC sub-contractors will have the option of adopting this HASP or developing their own site-specific document. If a subcontractor chooses to prepare their own HASP, it must meet the minimum requirements as detailed in this HASP and must be made available to PWGC.

Activities performed under this HASP will comply with applicable parts of OSHA Regulations, primarily 29 CFR Parts 1910 and 1926, and the PWGC Corporate Environmental Health and Safety policy. Modifications to the HASP may be made with the approval of the PWGC Health and Safety Manager (HSM) and/or Project Manager (PM).

Refusal to comply with the HASP or violation of any safety procedures by field personnel may result in their immediate removal from the site following consultation with the HSM and the Project Manager.

1.2 Scope

This HASP addresses the potential hazards related to the Site Remedial Action (RA). The primary RA activities include the following:

- Site Mobilization/Demobilization;
- Recovery well installation;
- Product (DNAPL) extraction;
- Shoring system;
- Excavation;
- Soil Sampling;
- Drying bed construction;
- Soil loading and hauling;
- Application of dry potassium permanganate; and,
- Application of liquid sodium permanagnate.

The potential hazards associated with this scope are listed below and are discussed in more detail in this HASP after the project organization and responsibilities section.

- Chemical Hazards
- Biological Hazards
- Physical Hazards

1.3 Application

The HASP applies to all personnel involved in the above tasks who wish to gain access to active work areas, including but not limited to:

- PWGC employees and subcontractors;
- Client representatives; and
- Federal, state or local representatives.

2.0 PROJECT ORGANIZATION AND RESPONSIBILITIES

This section specifies the project organization and responsibilities.

2.1 Project Manager

- Participates in major incident investigations;
- Ensures that the HASP has all of the required approvals before site work is conducted; and
- Has the overall project responsibility for project health and safety.

2.2 Field Operations Lead (FOL)/ Health and Safety Officer (HSO)

- Ensures that the HASP is implemented in conjunction with the Health and Safety Manager (HSM);
- Ensures that field work is scheduled with adequate equipment to complete the job safely;
- Enforces site health and safety rules;
- Ensures that proper personal protective equipment is utilized;
- Ensures that the HSM is informed of project changes which require modifications to the HASP;
- Ensures that the procedure modifications are implemented;
- Investigates incidents;
- Conducts the site safety briefing;
- Reports to HSM to provide summaries of field operations and progress; and
- Acts as Emergency Coordinator.

2.3 Health and Safety Manager

- Provides for the development of the HASP;
- Serves as the primary contact to review health and safety matters that may arise;
- Approves individuals who are assigned HSO responsibilities;
- Coordinates revisions of this HASP with field personnel; and
- Assists in the investigation of major accidents.

2.4 Site Personnel

- Report any unsafe or potentially hazardous conditions to the FOL/HSO;
- Maintain knowledge of the information, instructions and emergency response actions contained in this HASP; and
- Comply with rules, regulations and procedures as set forth in this HASP and any revisions.

3.0 SITE HISTORY AND PROJECT DESCRIPTION

3.1 Project Background

This Health and Safety Plan (HASP) has been prepared by P.W. Grosser Consulting Inc.(PWGC), on behalf of Advance Realty Group (ARC) and Chase Partners, LLC (Chase) of Newark, NJ, for the implementation of planned remedial action at a commercial property located at 80-100 Banks Avenue, Rockville Centre, New York. Redevelopment plans for the property, formerly a pharmaceutical warehouse and distribution center, include residential buildings and associated grounds.

The chlorinated solvent, tetrachloroethylene (PCE), was first identified in shallow soil beneath the southwestern portion of the building, in a Phase II Investigation Report completed in January 2004. The PCE is believed to have been released sometime between 1972 and 1978 when a textile business leased the 80 Banks Avenue parcel.

A Remedial Investigation (RI), performed in accordance with the Division of Environmental Remediation DER10, was initiated at the site in March 2004, to characterize the nature and extent of PCE impact in soil and groundwater at the site. The results of this investigation, as documented in the Remedial Investigation Report (PWGC, 9/04), recommended an IRM to remove mobile and residual dense non-aqueous phase liquid (DNAPL) to lessen obvious risks to the environment.

The proposed IRM addresses the source areas of PCE contamination by removing DNAPL which has accumulated at a clay boundary (11-17 ft below surface), and by excavating residually impacted soils down to the clay surface. Removing the primary source area using direct "low-tech" methods such as extraction and excavation will substantially reduce the threat of potential impact, while the process of developing a comprehensive remedial plan for the site proceeds.

3.2 Site Location and Description

The subject site is located at 80 - 100 Banks Avenue, Village of Rockville Centre, Town of Hempstead, Nassau County, New York. The site is situated at the northwest intersection of Nassau Street and the northern end of Banks Avenue. The property is shown as Lots 27 and 30, Block 539, Section 38 on the Nassau County Tax Maps and consists of a total of 7.1 acres.

The site is currently improved with a one and part two-story, 150,000 ft ^{2} (footprint) warehouse building of masonry construction. The subject site is currently owned by Darby Group Companies, Inc (Darby), who ceased operation at the site in November 2000. Darby has occupied the building since 1978 and operated it as a pharmaceutical product warehouse and distribution center. The building is currently underutilized, serving a temporary storage function for miscellaneous supplies and a few pieces of specialized equipment by Darby. ARC /Chase is contract vendee in an agreement to purchase the property from Darby. ARC/Chase is planning the demolition of the existing structures and the phased development of two apartment buildings consisting of a 100,492 ft ^{2} (footprint) north complex and a 60,128 ft^2 (footprint) south building.

4.0 POTENTIAL HAZARDS OF THE SITE

This section presents an assessment of the chemical, biological, and physical hazards that may be encountered during the tasks specified under Section 1.0. Additional information can be found in **Appendix A** - Material Safety Data Sheets or in **Appendix B** - Activity Hazard Analyses.

4.1 Chemical Hazards

Review of historical information from the site indicates that the soil and groundwater are contaminated primarily with volatile organic compounds (VOCs) especially PCE, which is present at ppm levels. Trichloroethene (TCE),1,1,1-Trichloroetane (1,1,1-TCA), 2-Butanone, 1,2-Dichlorothene (1,2-DCE) and vinyl chloride are also present, but at ppb levels in the groundwater and/or soil. These compounds may present an occupational exposure hazard during site operations.

The VOCs identified above generally have a depressant effect on the central nervous system, may cause chronic liver and kidney damage, and there is limited evidence of carcinogenicity in humans. Acute exposure may include headache, dizziness, nausea, and skin and eye irritation. Specific information on these compounds can be found in **Table 4-1** as well as on the Material Safety Data Sheets found in **Appendix A**.

In addition to the chemical hazards existing at the site, additional chemical hazards may be present due to materials being brought to the site, such as decontamination fluids and chemical oxidation products for remedial purposes. Prior to potential exposure to these materials on-site, material safety data sheets (MSDSs) shall be obtained by the HSO and reviewed by affected site personnel. Efforts to minimize exposure/risk from the hazards discussed in the sections will be implemented.

4.2 Biological Hazards

During the course of the project, there is a potential for workers to come into contact with biological hazards such as animals, insects and plants. The Activity Hazard Analyses found in **Appendix B** will include specific hazards and control measures for each task, if applicable.

4.2.1 Animals

It is not expected that workers will encounter animals such as dogs, cats, raccoons, skunks, mice and snakes as the Site is located in a predominantly commercial area. However, a small pond (Smith Pond) is located in close proximity to the Site which may support and attract some animals. Workers shall use discretion and avoid all contact with animals. If these animals present a problem, efforts will be made to remove these animals from the Site by contacting a licensed pest control technician.

4.2.2 Insects

Insects, such as mosquitoes, ticks, bees and wasps may be present during certain times of the year. Workers will be encouraged to wear repellents (DEET for Ticks) when working in areas where insects are expected to be present. If insects are prevalent, efforts will be made to remove them from the site by contacting a licensed pest control technician.

4.2.2.1 Lyme Disease

Since the site is located in the northeast, the potential for coming into contact with deer ticks exists. Lyme disease is caused by an infection from a deer tick, which is about the size of the head of a pin. During the painless tick bite, a microorganism (spirochete) may be transmitted into the bloodstream that may lead to Lyme disease. The effects of the disease vary from person to person, which often makes it difficult to diagnose. Typically, the incubation period ranges from two days to two weeks. In most cases, the infected area will resemble a red bulls-eye with concentric rings. Within the same period, flu-like symptoms may develop. If left untreated, the red ringed area will eventually fade and Lyme disease may further develop into an arthritis-like condition. Employees bitten by deer ticks during the course of employment, will be offered a medical examination. Control measures to prevent Lyme disease include the following:

- Self/Buddy check of neck, hairline, groin and body after working in areas that may contain deer ticks;
- Wear light colored Tyvek® or clothing;
- If a tick is found, remove it by pulling gently at the head with tweezers; and,
- Report any of the above symptoms and all tick bites to the FOL/HSO for evaluation.

4.2.3 Plants

Plants such as poison ivy and poison oak may be prevalent at the site during certain times of the year. Workers will be trained to recognize these plants and to minimize contact with them. Employees may wear PPE in order to reduce the potential for exposure. A pre-exposure topical lotion may be applied prophylactically.

4.3 Physical Hazards

Most safety hazards are discussed in the Activity Hazard Analyses (AHA) in **Appendix B** for the different phases of the project. In addition to the AHAs, general work rules and other safety procedures are described in Section 10 of this HASP.

4.3.1 Temperature Extremes

Heat Stress

Heat stress is a significant potential hazard, which is greatly exacerbated with the use of PPE in hot environments. The potential hazards of working in hot environments include dehydration, cramps, heat rash, heat exhaustion, and heat stroke.

Cold Stress

At certain times of the year, workers may be exposed to the hazards of working in cold environments. Potential hazards in cold environments include frostbite, trench foot or immersion foot, hypothermia as well as slippery surfaces, brittle equipment, and poor judgment.

Table 4-1
Chemical Data

COMPOUND	CAS#	ACGIH TLV	OSHA PEL	ROUTES OF EXPOSURE	SYMPTOMS OF EXPOSURE	TARGET ORGANS	PHYSICAL DATA
Tetrachloro-ethylene	127-18-4	25 ppm TWA,100 ppm STEL	100 ppm	Inhalation Skin Absorption Skin Contact Ingestion	Irritates eyes, nose, throat; nausea; flushed face & neck; vertigo, dizziness, incoordination, headache, somnolence; skin erythema; potential human carcinogen	Eyes, skin, resp. system, CNS, liver, kidneys	VP= 14 mm Hg Chloroform like odor, IP= 9.32 eV
Trichloroethene	79-01-6	50 ppm TWA, 100 STEL	100 ppm	Inhalation Ingestion Skin Contact	Irritates eyes, throat; redness, tearing, blurred vision, vertigo, dizziness, incoordination, irregular heart beat, potential human carcinogen	Heart, nervous system, liver and kidneys	VP= 60 mm Hg Irritating odor at high concentrations
Vinyl Chloride	75-01-04	5 ppm	1 ppm	Inhalation Ingestion Skin Contact	Mild irritation to eyes, blurred vision, dizziness, confusion, tingling in hands and feet, symptoms of frost bite, confirmed human carcinogen	Nervous system, liver, spleen, respiratory sys. and kidneys	VP= 35.3 psig, sweet etheral odor
1,1,1-trichloroethane	71-55-6	350 ppm TWA, 450 ppm STEL	350 ppm	Inhalation Ingestion Skin Contact	Irritates eyes, skin; headache, lassitude, CNS depression, poor equilibrium; dermatitis; cardiac arrhythmia	Eyes, skin, CNS, CVS, liver	VP= 100 mm Hg Chloroform like odor IP= 11.0 eV
2-Butanone	78-93-3	200 ppm TWA, 300 ppm STEL	200 ppm	Inhalation Skin Contact Ingestion	Irritates eyes, nose, and throat; headache; dizziness; nausea; shortness of breath; skin redness and itching	Eyes, skin, CNS, resp. system	VP= 78 mm Hg Sharp mint-like odor
1,2-Dichloroethylene	156-60-5	200 ppm TWA	200 ppm	Inhalation Skin Absorption Ingestion	Irritates eyes, nose, and throat; nausea; drowsiness	Eyes, skin, resp. system	VP= 400 mm Hg Pleasant odor

Abbreviations

ACGIH = American Conference of Governmental Industrial Hygienists

C = Ceiling limit, not to be exceeded

CNS = Central Nervous System

CVS = Cardiovascular System

eV = Electron volt

IP= Ionization Potential

OSHA = Occupational Safety and Health Administration

ppm = parts per million

STEL = Short-term exposure limit (15 minutes)

TWA = Time-weighted average (8 hours)

VP = vapor pressure at approximately 68° F in mm Hg (mercury)

4.3.2 Steam, Heat and Splashing

Exposure to steam/heat/splashing hazards can occur during steam cleaning activities. Splashing can also occur during recovery well development, product extraction events and sampling activities. Exposure to steam/heat/splashing can result in scalding/burns, eye injury, and puncture wounds.

4.3.3 Noise

Noise is a potential hazard associated with the operation of heavy equipment, drill rigs, shoring system, pumps and engines. Workers will wear hearing protection while in the work zone when machinery such as heavy equipment, drill rigs, or generators are operating.

4.3.4 Fire and Explosion

When conducting excavation or drilling activities, the opportunity of encountering fire and explosion hazards may exist from underground utilities and gases. Additionally, the use of a diesel engine equipment drill rig, could present the possibility of encountering fire and explosion hazards.

4.3.5 Manual Lifting/Material Handling

Manual lifting of heavy objects may be required. Failure to follow proper lifting technique can result in back injuries and strains. Back injuries are a serious concern as they are the most common work place injury, often resulting in lost or restricted work time, and long treatment and recovery periods.

4.3.6 Slips, Trips and Falls

Working in and around the site will pose slip, trip and fall hazards due to slippery surfaces that may be oil covered, or from surfaces that are steep inclines or are wet from rain or ice. Falls may result in twisted ankles, broken bones, head trauma or back injuries.

4.3.7 Heavy Equipment Operation

A backhoe excavator and/or clamshell excavator will be used to excavate the contaminated soil, a drill rig will be used to install recovery wells and either a drill rig or earth probe rig will be used to place rods in the subsurface for injection of sodium permanganate. Working with or near heavy equipment poses many potential hazards, including electrocution, fire/explosion, being struck by or against, or pinched/caught/crushed by, and can result in serious physical harm.

4.3.8 Electrocution

Encountering underground utilities may pose electrical hazards to workers. Additionally, overhead electrical lines can be a concern during drilling operations. Potential adverse effects of electrical hazards include burns and electrocution, which could result in death.

5.0 ACTIVITY HAZARD ANALYSES

The Activity Hazard Analysis (AHA) is a systematic way of identifying the potential health and safety hazards associated with major phases of work on the project and the methods to avoid, control and mitigate those hazards. The AHAs will be used to train work crews in proper safety procedures during phase preparatory meetings.

AHAs have been developed by PWGC for the following phases of work:

- Site Mobilization/Demobilization;
- Drilling and/or earth probing;
- Shoring system;
- Excavation and backfilling;
- Soil sampling; and
- Decontamination

Copies of these AHAs are included in **Appendix B** of this HASP.

6.0 PERSONAL PROTECTIVE EQUIPMENT

The personal protective equipment (PPE) specified in **Table 6-1** represents the hazard analysis and PPE selection required by 29 CFR 1910.132. Specific information on known potential hazards can be found under Section 4.0 and **Appendix B** - Activity Hazard Analyses. For the purposes of PPE selection, the HSM and FOL/HSO are considered competent persons. The signatures on the approval page of the HASP constitute certification of the hazard assessment. For activities not covered by **Table 6-1**, the FOL/HSO will conduct the hazard assessment, select the PPE, and ndocument changes in the appropriate field logs. PPE selection will be made in consultation with the HSM.

Modifications for initial PPE selection may also be made by the FOL/HSO in consultation with the HSM and changes documented accordingly. If major modifications occur, the HSM will notify the PM.

6.1 PPE Abbreviations

HEAD PROTECTION
HH = Hard Hat

HEARING PROTECTION
EP = ear plugs
EM = ear muffs

HAND PROTECTION
Cot = cotton
But = Butyl
LWG = Leather Work Gloves
Neo = Neoprene
Nit = Nitrile
Sur = Surgical

EYE/FACE PROTECTION
APR = Full Face Air Purifying Respirator
MFS = Mesh Face shield
PFS =Plastic Face shield
SG = ANSI approved safety glasses with side shields

BODY PROTECTION
WC = work clothes
Cot Cov = Cotton Coveralls
Poly = Polyethylene coated Tyvek® coveralls
Saran = Saranex coated coveralls
Tyvek® = Uncoated Tyvek® coveralls

FOOT PROTECTION
Neo = Neoprene
OB = Overboot
Poly = polyethylene coated boot
Rub = rubber slush boots
STB = Leather work boots with steel toe

RESPIRATORY PROTECTION
APR = Full-face air purifying respirator with organic vapor cartridges
ASR = Full face air supplied respirator with escape bottle
SCBA = Self-contained breathing apparatus

6.2 Hazard Assessment for Selection of Personal Protective Equipment

The initial selection of personal protective equipment for each task was done by performing a hazard assessment taking into consideration the following:

- Potential chemical and physical hazards present;
- Work operations to be performed;
- Potential routes of exposure;
- Concentrations of contaminants present; and
- Characteristics, capabilities and limitations of PPE and any hazard that the PPE presents or magnifies.

A review of the analytical data from previous sampling events indicates that volatile organic compounds identified in **Table 4-1** are the primary contaminants of concern, particularly PCE. PCE is believed to be present as a dense non-aqueous phase liquid. The maximum concentration detected in soil was 150,000 parts per million (ppm). The primary concern is inhalation; skin contact and ingestion are secondary routes of exposure. Chemical protective gloves will be required for all activities that involve sample handling and the likelihood for skin contact. Additionally, the type of respiratory protection will be dependent on real-time air monitoring results. The use of organic vapor cartridges, along with the air monitoring program, will provide adequate respiratory protection to minimize potential exposure via inhalation. The proper use of PPE and strict adherence to decontamination and personal hygiene procedures will effectively minimize skin contact and ingestion as potential routes of exposure.

Table 6-1
Personal Protective Equipment Selection

TASK	HEAD	EYE/FACE	FEET	HANDS	BODY	HEARING	RESPIRATOR
Mobilization/ Demobilization	HH	SG	STB	WG	WC	None	None
Recovery well installation and development	HH	SG	STB	WG, Nit & Sur as needed	WC, Tyvek® as needed	None	None initially APR if action levels exceeded
Shoring system	HH	SG	STB	WG	WC	EP or EM	None
Excavation and backfilling	HH	SG	STB	WG	WC	None	None initially APR if action levels exceeded
Soil sampling	HH	SG	STB	WG, Nit & Sur as needed	WC, Tyvek® as needed	None	None initially APR if action levels exceeded
Placement of dry potassium permanganate	HH	SG	STB	WG, Nit & Sur as needed	WC, Tyvek® as needed	None	None initially APR if action levels exceeded
Injection of liquid sodium permanganate	HH	SG	STB	WG, Nit & Sur as needed	WC, Tyvek® as needed	None	None initially APR if action levels exceeded
Decontamination	HH	SG	STB	Nit + Sur	WC, Tyvek® as needed	None	None initially APR if action levels exceeded

6.3 Respirator Cartridge Change-Out Schedule

A respirator cartridge change-out schedule has been developed in order to comply with 29 CFR 1910.134. If the use of respirators is necessary, the respirator cartridge change-out schedule for this project will be as follows:

- Cartridges shall be removed and disposed of at the end of each shift, when cartridges become wet or wearer experiences breakthrough, whichever occurs first; and
- If the humidity exceeds 85%, then cartridges shall be removed and disposed of after 4 hours of use.

Respirators shall not be stored at the end of the shift with contaminated cartridges left on. Cartridges shall not be worn on the second day, no matter how short of time period they were used the day before.

The schedule was developed based on the following scientific information and assumptions:

- Analytical data that is available regarding site contaminants;
- Using the Rule of Thumb provided by the AIHA;
- All of the chemicals have boiling points greater than 70°C;
- Total airborne concentration of contaminants is anticipated to be less than 200 ppm;
- The humidity is expected to be less than 85%; and
- Desorption of the contaminants (including those with poor warning properties) after partial use of the chemical cartridge can occur after a short period (hours) without use (eg, overnight) and result in a non-use exposure.

The following is a partial list of factors that may affect the usable cartridge service life and/or the degree of respiratory protection attainable under actual workplace conditions. These factors have been considered when developing the cartridge change-out schedule.

- Type of contaminant(s);
- Contaminant concentration;
- Relative humidity;
- Breathing rate; Temperature; Changes in contaminant concentration, humidity, breathing rate and temperature;
- Mixtures of contaminants;
- Accuracy in the determination of the conditions;
- The contaminant concentration in the workplace can vary greatly. Consideration must be given to the quality of the estimate of the workplace concentration;
- Storage conditions between multiple uses of the same respirator cartridges. It is recommended that the chemical cartridges be replaced after each work shift. Contaminants adsorbed on a cartridge can migrate through the carbon bed without airflow;
- Age of the cartridge;
- Condition of the cartridge and respirator;
- Respirator and cartridge selection respirator fit;
- Respirator assembly, operation, and maintenance;

- User training, experience and medical fitness;
- Warning properties of the contaminant; and
- The quality of the warning properties should be considered when establishing the chemical cartridge change schedule. Good warning properties may provide a secondary or back-up indication for cartridge change-out.

7.0 AIR MONITORING

Air monitoring will be performed for protection for on-site workers and the downwind community (i.e., off-site receptors including residences, businesses, and on-site workers not directly involved in the remedial work) from potential airborne contaminant releases resulting from remedial activities at the site. Air monitoring will be used to help to confirm that the remedial work will not spread contamination off-site through the air. The primary concerns for this site are odors from VOCs and dust particulates.

Real-time monitoring for VOCs and dust will be conducted both within the work area ,and along the site perimeter, during intrusive activities such as excavation, product recovery, manipulation of soil piles and extraction of the shoring system. The action levels specified herein require increased monitoring, corrective actions to abate emissions, and/or work shutdown.

Detailed information on the types, frequency and location of real-time monitoring and community air monitoring requirements are provided in the Community Air Monitoring Plan prepared for this project.

8.0 ZONES, PROTECTION AND COMMUNICATION

8.1 Site Control

Site zones are intended to control the potential spread of contamination throughout the site and to assure that only authorized individuals are permitted into potentially hazardous areas. A three-zone approach will be utilized. It shall include an Exclusion Zone (EZ), Contamination Reduction Zone (CRZ) and a Support Zone (SZ). Specific zones shall be established on the work site when operations begin. All maps will be posted at the site and used during initial site-specific training.

This project is a hazardous waste remediation project, and any person working in an area where the potential for exposure to site contaminants exists, will only be allowed access after providing the FOL/HSO with proper training and medical documentation.

The zones are based upon current knowledge of proposed site activities. It is possible that the zone configurations may be altered due to work plan revisions. Should this occur, the work zone will be adjusted accordingly, and documented through use of a field-change request form.

The following shall be used for guidance in revising these preliminary zone designations, if necessary.

Support Zone - The SZ is an uncontaminated area (trailers, offices, etc.) that will be the field support area for most operations. The SZ provides for field team communications and staging for emergency response. Appropriate sanitary facilities and safety equipment will be located in this zone. Potentially contaminated personnel/materials are not allowed in this zone. The only exception will be appropriately packaged/decontaminated and labeled samples.

Contamination Reduction Zone - The CRZ is established between the EZ and the SZ. The CRZ contains the contamination reduction corridor and provides for an area for decontamination of personnel and portable hand-held equipment, tools and heavy equipment. A personnel decontamination area will be prepared at each exclusion zone. The CRZ will be used for EZ entry and egress in addition to access for heavy equipment and emergency support services.

Exclusion Zone- All activities, which may involve exposure to site contaminants, hazardous materials and/or conditions, should be considered an EZ. This zone will be clearly delineated by cones, tapes or other means. The FOL/HSO may establish more than one EZ where different levels of protection may be employed or different hazards exist. The size of the EZ shall be determined by the site HSO allowing adequate space for the activity to be completed, field members and emergency equipment.

8.2 Contamination Control

Decontamination areas will be established for the following activities.

8.2.1 Personnel Decontamination Station

All personnel and portable equipment used in the EZ shall be subject to a thorough decontamination process, as deemed necessary by the FOL/HSO. Sampling equipment shall be decontaminated. As necessary, all boots and gloves will be decontaminated using soap and water solution and scrub brushes or simple removal and disposal. All used respiratory protective equipment will be decontaminated daily and sanitized with appropriate sanitizer solution.
All drums generated as a result of sampling and decontamination activities will be marked and stored at a designated area at the site until the materials can be property disposed of off-site.
All non-expendable sampling equipment will be decontaminated. This usually entails the use of Alconox, solvent and distilled/deionized water rinses to eliminate contaminants.

8.3 Communication

- Each team member will have a Nextel cell phone/radio for communication with the PM, HSO and other team members during field activities.
- Hand Signals - Hand signals shall be used by field teams, along with the buddy system. The entire field team shall know them before operations commence and their use covered during site-specific training. Typical hand signals are the following:

SIGNAL	MEANING
Hand gripping throat	Out of air, can't breathe
Grip on a partner's wrist or placement of both hands around a partner's waist.	Leave the area immediately, no debate.
Hands on top of head	Need assistance
Thumbs up	Okay, I'm all right, I understand.
Thumbs down	No, negative.

9.0 MEDICAL SURVEILLANCE PROCEDURES

All contractor and subcontractor personnel performing field work where potential exposure to contaminants exists at the site are required to have passed a complete medical surveillance examination in accordance with 29 CFR 1910.120(f).

9.1 Medical Surveillance Requirements

A physician's medical release for work will be confirmed by the HSM before an employee can work in the exclusion zone. The examination will be taken annually at a minimum and upon termination of hazardous waste site work if the last examination was not taken within the previous six months. Additional medical testing may be required by the HSM in consultation with the Corporate Medical Consultant and the FOL/HSO if an over-exposure or accident occurs, if an employee exhibits symptoms of exposure, or if other site conditions warrant further medical surveillance.

9.2 Medical Data Sheet

A medical data sheet is provided in **Appendix C**. This medical data sheet is voluntary and should be completed by all on-site personnel and will be maintained at the site. Where possible, this medical data sheet will accompany the personnel needing medical assistance. The medical data sheet will be maintained in a secure location, treated as confidential, and used only on a need-to-know basis.

10.0 SAFETY CONSIDERATIONS

10.1 General Health and Safety Work Practices

A list of general health and safety work practices is included as an included in **Appendix D**. The work rules will be posted in a conspicuous location at the site.

10.2 The Buddy System

At a minimum, employees shall work in groups of two in such a manner that they can observe each other and maintain line-of-sight for each employee within the work group. The purpose of the buddy system is to provide rapid assistance to employees in the event of an emergency.

10.3 Sample Handling

Personnel responsible for the handling of samples should wear the prescribed level of protection. Samples should be identified as to their hazard and packaged as to prevent spillage or breakage. Sample containers shall be decontaminated in the CRZ or EZ before entering a clean Support Zone area. Any unusual sample conditions, odors, or real-time readings should be noted. Laboratory personnel should be advised of sample hazard level and the potential contaminants present. This can be accomplished by a phone call to the lab coordinator and/or including a written statement with the samples reviewing lab safety procedures in handling, in order to assure that the practices are appropriate for the suspected contaminants in the sample.

10.4 Drill Rigs and Earth Probes

When conducting drilling and probing activities, the opportunity of encountering fire and explosion hazards exists from underground utilities and gases. The locations of underground utilities will be verified prior to performing any intrusive activities. Additionally, because of the inherently hazardous nature of drilling operations, safety and accident prevention are crucial when drilling operations are performed. Most drilling accidents occur as a direct result of lack of training and supervision, improper handling of equipment, and unsafe work practices. Hazards include: assembling and disassembling rigs, rotary and auger drilling, and grouting. The drilling contractor shall perform drilling in accordance with its own Health & Safety Program for Drill Rig Safety.

10.4.1 Safety During Drilling Operations

- Safety requires the attention and cooperation of every worker and site visitor.
- Do not drive the drill rig from hole to hole with the mast (derrick) in the raised position.
- Before raising the mast (derrick), look up to check for overhead obstructions.

- Maintain a minimum of 15 feet clearance from all overhead electric lines.

- Before raising the mast (derrick), all drill rig personnel (with the exception of the operator) and visitors shall be cleared from the areas immediately to the rear and the sides of the mast. All drill rig personnel and visitors shall be informed that the mast is being raised prior to raising it.

- Before the mast (derrick) of a drill rig is raised and drilling is commenced, the drill rig must first be leveled and stabilized with leveling jacks and/or solid cribbing. Lower the mast (derrick) only when the leveling jacks are down and do not raise the leveling jack pads until the mast (derrick) is lowered completely.

- The operator of a drill rig shall only operate a drill rig from the position of the controls.

- Throwing or dropping tools shall not be permitted. All tools shall be carefully passed by hand between personnel or a hoist line shall be used.

- Do not consume alcoholic beverages or other depressants or chemical stimulants prior to starting work on a drill rig or while on the job.

- All unattended boreholes must be adequately covered or otherwise protected to prevent drill rig personnel, site visitors, or animals form stepping or falling into the hole.

- Terminate drilling operations during an electrical storm and move the entire crew away from the drill rig.

10.5 Excavation and Trenching

Excavation will be conducted in accordance with the excavation contractor's Health & Safety Program for Excavation and Trenching and with the requirements contained in 29 CFR 1926, Subpart P-Excavations. It provides for the designation of a "Competent Person" and general requirements for safe excavating practices. The program also incorporates company standards for the monitoring of potentially hazardous atmospheres; protection from water hazards; analyzing and maintaining the stability of adjacent structures; daily competent person inspections; soil classification; sloping and benching; protective systems; and training.

The Competent Person will be the Field Operations Lead or other designee with appropriate training and experience. The Competent Person will be assisted in his/her duties by other technical personnel such as the HSM, geologists, structural engineers and soils engineers.

Excavations and trenches 4 feet or greater in depth will require atmospheric monitoring and ladders for safe entry/egress. The Competent Person will determine the need for cave-in protection. If trenches

exceed 5 feet in depth and personnel will enter, cave-in protection will be implemented in accordance with 29 CFR 1926, Subpart P.

11.0 DISPOSAL PROCEDURES

All discarded materials, waste materials or other objects shall be handled in such a way as to preclude the potential for spreading contamination, creating a sanitary hazard or causing litter to be left on site. All potentially contaminated materials, e.g., clothing, gloves, etc., will be bagged or drummed as necessary, labeled and segregated for disposal. All non-contaminated materials will be collected and bagged for appropriate disposal as non-hazardous solid waste. Additional waste disposal procedures may be developed as applicable.

12.0 EMERGENCY RESPONSE PLAN

This section establishes procedures and provides information for use during a project emergency. Emergencies happen unexpectedly and quickly, and require an immediate response; therefore, contingency planning and advanced training of staff is essential. Specific elements of emergency support procedures which are addressed in the following subsections include communications, local emergency support units, preparation for medical emergencies, first aid for injuries incurred on site, record keeping, and emergency site evacuation procedures.

12.1 Responsibilities

12.1.1 Health and Safety Manager (HSM)

The HSM oversees and approves the Emergency Response/Contingency Plan and performs audits to determine that the plan is in effect and that all pre-emergency requirements are met. The HSM acts as a liaison to applicable regulatory agencies and notifies OSHA of reportable accidents.

12.1.2 Field Operations Lead/Health and Safety Officer (FOL/HSO)

The FOL/HSO is responsible for ensuring that all personnel are evacuated safely and that machinery and processes are shut down or stabilized in the event of a stop work order or evacuation. The FOL/HSO is required to immediately notify the HSM of any fatalities or catastrophes (three or more workers injured and hospitalized) so that the HSM can ensure that OSHA is notified within the required time frame. The HSM will be notified of all OSHA recordable injuries, fires, spills, releases or equipment damage in excess of $500 within 24 hours.

12.1.3 Emergency Coordinator

The Emergency Coordinator for the project is the FOL/HSO.

The Emergency Coordinator shall make contact with Local Emergency Response personnel prior to beginning work on site. In these contacts the emergency coordinator will inform interested parties about the nature and duration of work expected on the site and the type of contaminants and possible health or safety effects of emergencies involving these contaminants. The emergency coordinator will locate emergency phone numbers and identify hospital routes prior to beginning work on site. The emergency coordinator shall make necessary arrangements to be prepared for any emergencies that could occur.

The Emergency Coordinator will implement the Emergency Response/Contingency Plan whenever conditions at the site warrant such action.

12.1.4 Site Personnel

Site personnel are responsible for knowing the Emergency Response/Contingency Plan and the procedures contained herein. Personnel are expected to notify the Emergency Coordinator of situations that could constitute a site emergency.

12.2 Communication

A variety of communication systems may be utilized during emergency situations. These are discussed in the following sections.

12.2.1 Hand Signals

Downrange field teams will employ hand signals where necessary for communication during emergency situations. Hand signals are found in Section 8.3.

12.2.2 Field Radios and Cell Phones

PWGC field personnel are provided Nextel cellular phones with telephone and two-way radio capabilities for site communication and emergency use.

12.3 Local Emergency Support Units

In order to be able to deal with any emergency that might occur during remedial activities at the site, **Table 12-1** will be posted prominently in the field office and in all places where telephone service is available.

A route map from the site to the nearest hospital can be found in **Appendix E.** This map will be posted adjacent to the above emergency telephone numbers in the field office and in all places where telephone service is available. It should also be placed in all on-site vehicles.

12.4 Pre-Emergency Planning

PWGC will communicate directly with administrative personnel from the emergency room at the hospital to determine whether the hospital has the facilities and personnel needed to treat cases of trauma resulting from exposure to any of the contaminants expected to be found on the site. Instructions for finding the hospital will be posted conspicuously in the site office and in each site vehicle.

Before the field activities begin, the local emergency response personnel will be notified of the schedule for field activities and about the materials that are thought to exist on the site so that they will be able to respond quickly and effectively in the event of a fire, explosion, or other emergency. Before fieldwork on the site commences, each person who will be working there or observing the operations

will complete a medical data sheet (**Appendix C**). These data sheets will be filled out during site-specific training and will be kept on the site.

In the event of an incident where a team member becomes exposed or suffers from an acute symptom of exposure to site materials and has to be taken to a hospital, a copy of his/her medical data sheet will be presented to the attending physician.

Table 12-1
Emergency Telephone Numbers

Contact	Firm or Agency	Telephone Number
Police		911
Fire		911
Hospital	South Nassau Communities Hospital	(516) 763-3938
Ambulance		911
Project Manager	TBD	
Health & Safety Mngr.	TBD	
NYSDEC Site Contact	TBD	
Poison Control Center		(800) 962-1253
Chemtrec		(800) 424-9300

12.5 Emergency Medical Treatment

The procedures and rules in this HASP are designed to prevent employee injury. However, should an injury occur, no matter how slight, it will be reported to the FOL/HSO immediately. First aid equipment will be available on site at the following locations:

First Aid Kit:	Support Zone (or designated by FOL/HSO upon arrival)
Emergency Eye Wash:	Support Zone (or designated by FOL/HSO upon arrival)

During site-specific training, project personnel will be informed of the location of the first aid station(s) that has been set up. Unless they are in immediate danger, severely injured persons will not be moved until paramedics can attend to them. Some injuries, such as severe cuts and lacerations or burns, may require immediate treatment. Any first aid instructions that can be obtained from doctors or paramedics, before an emergency-response squad arrives at the site or before the injured person can be transported to the hospital, will be followed closely.

There will be at least two people with current First Aid and CPR certification on each active work shift. When personnel are transported to the hospital, the FOL/HSO will provide a copy of the Medical Data Sheet to the paramedics and treating physician.

Only in non-emergency situations will an injured person be transported to the hospital by means other than an ambulance. A map and directions to the hospital can be found in **Appendix E**.

12.6 Emergency Site Evacuation Routes and Procedures

In order to mobilize the manpower resources and equipment necessary to cope with a fire or other emergency, a clear chain of authority will be established. The EC will take charge of all emergency response activities and dictate the procedures that will be followed for the duration of the emergency. The EC will report immediately to the scene of the emergency, assess the seriousness of the situation, and direct whatever efforts are necessary until the emergency response units arrive. At his/her discretion, the EC also may order the closure of the site for an indefinite period.

All project personnel will be instructed on proper emergency response procedures and locations of emergency telephone numbers during the initial site safety meeting. If an emergency occurs, including but not limited to fire, explosion or significant release of toxic gas into the atmosphere, an air horn will be sounded on the site. The horn will sound continuously for one blast, signaling that immediate evacuation of all personnel is necessary due to an immediate or impending danger. All heavy equipment will be shut down and all personnel will evacuate the work areas and assemble at the evacuation meeting point, which will be determined upon arrival at the site by the FOL/HSO, prior to work beginning. This will then be conveyed to all crew members during the site-specific briefing.

The EC will give directions for implementing whatever actions are necessary. Any project team member may be assigned to be in charge of emergency communications during an emergency. He/she

will attend the site telephone specified by the EC from the time the alarm sounds until the emergency has ended.

After sounding the alarm and initiating emergency response procedures, the EC will check and verify that access roads are not obstructed. If traffic control is necessary, as in the event of a fire or explosion, a project team member, who has been trained in these procedures and designated at the site safety meeting, will take over these duties until local police and fire fighters arrive.

The EC will remain at the site to provide any assistance requested by emergency-response squads as they arrive to deal with the situation. A map showing evacuation routes, meeting places, and location of emergency equipment will be posted in all trailers and used during site-specific training.

12.7 Fire Prevention and Protection

In the event of a fire or explosion, procedures will include immediately evacuating the site (air horn will sound for a single continuous blast), and notification of local fire and police departments. No personnel will fight a fire beyond the stage where it can be put out with a portable extinguisher (incipient stage).

12.7.1 Fire Prevention

Adhering to the following precautions will prevent fires:

- Good housekeeping and storage of materials;
- Storage of flammable liquids and gases away from oxidizers;
- No smoking in the exclusion zone or any work area;
- No hot work without a properly executed hot work permit;
- Shutting off engines to refuel;
- Grounding and bonding metal containers during transfer of flammable liquids;
- Use of UL approved flammable storage cans;
- Fire extinguishers rated at least 10 pounds ABC located on all heavy equipment, in all trailers and near all hot work activities; and
- Monthly inspections of all fire extinguishers.

12.8 Overt Chemical Exposure

The following are standard procedures to treat chemical exposures. Other, specific procedures detailed on the Material Safety Data Sheet or recommended by the Corporate Medical Consultant will be followed, when necessary.

SKIN AND EYE CONTACT: Use copious amounts of soap and water. Wash/rinse affected areas thoroughly, then provide appropriate medical attention. Eyes should be rinsed for 15 minutes upon chemical contamination. Skin should also be rinsed for 15 minutes if contact with caustics, acids or hydrogen peroxide occurs.

INHALATION: Move to fresh air. Decontaminate and transport to hospital or local medical provider.

INGESTION: Decontaminate and transport to emergency medical facility.

PUNCTURE WOUND OR LACERATION: Decontaminate and transport to emergency medical facility.

12.9 Decontamination During Medical Emergencies

If emergency life-saving first aid and/or medica treatment is required, normal decontamination procedures may need to be abbreviated or postponed. The FOL/HSO or designee will accompany contaminated victims to the medical facility to advise on matters involving decontamination, when necessary. The outer garments can be removed if they do not cause delays, interfere with treatment or aggravate the problem. Respiratory equipment must always be removed. Protective clothing can be cut away. If the outer contaminated garments cannot be safely removed on-site, a plastic barrier placed between the injured individual and clean surfaces should be used to help prevent contamination of the inside of ambulances and/or medical personnel. Outer garments may then be removed at the medical facility. No attempt will be made to wash or rinse the victim if his/her injuries are life threatening, unless it is known that the individual has been contaminated with an extremely toxic or corrosive material which could also cause severe injury or loss of life to emergency response personnel. For minor medical problems or injuries, the normal decontamination procedures will be followed.

12.10 Accident/Incident Reporting

As soon as first aid and/or emergency response needs have been met, the following parties are to be contacted by telephone:

- Health and Safety Manager;
- Project Manager; and
- The employer of any injured worker who is not a PWGC employee.

Written confirmation of verbal reports are to be completed by the FOL/HSO using the Incident Report Form and submitted within 24 hours. The incident report and investigation form is found **Appendix F**. If the employee involved is not a employee, his employer will receive a copy of the report.

12.11 Adverse Weather Conditions

In the event of adverse weather conditions, the FOL/HSO will determine if work can continue without potentially risking the safety of all field workers. Some of the items to be considered prior to determining if work should continue are:

- Potential for heat stress and heat-related injuries;
- Potential for cold stress and cold-related injuries;

- Treacherous weather-related working conditions (hail, rain, snow, ice, high winds);
- Limited visibility (fog);
- Potential for electrical storms;
- Earthquakes; and
- Other major incidents.

Site activities will be limited to daylight hours, or when suitable artificial light is provided, and acceptable weather conditions prevail. The FOL/HSO will determine the need to cease field operations or observe daily weather reports and evacuate, if necessary, in case of severe inclement weather conditions.

12.12 Spill Control and Response

All small hazardous spills/environmental releases shall be contained as close to the source as possible. Whenever possible, the MSDS will be consulted to assist in determining the best means of containment and cleanup. For small spills, sorbent materials such as sand, sawdust or commercial sorbents should be placed directly on the substance to contain the spill and aid recovery. Any acid spills should be diluted or neutralized carefully prior to attempting recovery. Berms of earthen or sorbent materials can be used to contain the leading edge of the spills. Drains or drainage areas should be blocked. All spill containment materials will be properly disposed. An exclusion zone of 50 to 100 feet around the spill area should be established depending on the size of the spill. The following seven steps should be taken by the Emergency Coordinator:

- Determine the nature, identity and amounts of major spill components;
- Make sure all unnecessary persons are removed from the spill area;
- Notify appropriate response teams and authorities;
- Use proper PPE in consultation with the FOL/HSO;
- If a flammable liquid, gas or vapor is involved, remove all ignition sources and use nonsparking and/or explosive proof equipment to contain or clean up the spill (diesel only vehicles, air operated pumps, etc.);
- If possible, try to stop the leak with appropriate material; and,
- Remove all surrounding materials that can react or compound with the spill.

12.13 Emergency Equipment

The following minimum emergency equipment shall be kept and maintained on-site:

- Industrial first aid kit;
- Burn kit portable eye washes (one per field team);
- 15-minute continuous flow eyewash;
- Fire extinguishers (one per work area); and
- Absorbent material /spill kit.

12.14 Postings

The following information will be posted at various, conspicuous locations throughout the site and notices are contained in this HASP:

- Emergency telephone numbers (**Table 12-1**);
- Work Practices (**Appendix D**);
- Evacuation Routes (**Appendix E**); and
- OSHA Poster.

12.15 Restoration and Salvage

After an emergency, prompt restoration of utilities, fire protection equipment, medical supplies and other equipment will reduce the possibility of further losses. Some of the items that may need to be addressed are:

- Refilling fire extinguishers;
- Refilling medical supplies;
- Recharging eye washes and/or showers; and
- Replenishing spill control supplies.

13.0 TRAINING

13.1 General Health and Safety Training

In accordance with PWGC corporate policy, and pursuant to 29 CFR 1910.120, hazardous waste site workers shall, at the time of job assignment, have received a minimum of 40 hours of initial health and safety training for hazardous waste site operations unless otherwise noted in the above reference. At a minimum, the training shall have consisted of instruction in the topics outlined in the standard. Personnel who have not met the requirements for initial training shall not be allowed to work in any site activities in which they may be exposed to hazards (chemical or physical).

13.1.1 Three Day Supervised On the Job Training

In addition to the required initial hazardous waste operations training, each employee shall have received three days of directly supervised on-the-job training. This training will address the duties the employees are expected to perform.

13.2 Annual Eight-Hour Refresher Training

Annual eight-hour refresher training will be required of all hazardous waste site field personnel in order to maintain their qualifications for fieldwork. The training will cover a review of 1910.120 requirements and related company programs and procedures.

13.3 Site-Specific Training

Prior to commencement of field activities, all field personnel assigned to the project will have completed training that will specifically address the activities, procedures, monitoring, and equipment used in the site operations. It will include site and facility layout, hazards and emergency services at the site, and will highlight all provisions contained within this HASP. This training will also allow field workers to clarify anything they do not understand and to reinforce their responsibilities regarding safety and operations for their particular activity.

13.4 On-Site Safety Briefings

Project personnel and visitors will be given on-site health and safety briefings daily by the FOL/HSO to assist site personnel in safely conducting their work activities. A copy of the Daily Briefing Sign-In Sheet is contained in **Appendix G**. The briefings will include information on new operations to be conducted, changes in work practices or changes in the site's environmental conditions, as well as periodic reinforcement of previously discussed topics. The briefings will also provide a forum to facilitate conformance with safety requirements and to identify performance deficiencies related to safety during daily activities or as a result of safety inspections. The meetings will also be an opportunity to periodically update the crews on monitoring results. Prior to starting any new activity, a training session using the Activity Hazard Analysis will be held for crew members involved in the activity.

13.5 First Aid and CPR

The HSM will identify those individuals requiring first aid and CPR training to ensure that emergency medical treatment is available during field activities. It is anticipated that a minimum of one field person on-site at any one time will have first aid and CPR training. The training will be consistent with the requirements of the American Red Cross Association or American Heart Association. If none are available on-site, then the HSM shall be notified.

13.6 Hazard Communication

Hazard communication training will be provided in accordance with PWGC's corporate policy.

13.7 Supervisory Training

Supervisors and health and safety personnel shall have completed an additional eight hours of specialized training in accordance with 29 CFR 1910.120.

14.0 LOGS, REPORTS AND RECORDKEEPING

Changes to the HASP will be documented in the Health and Safety log book and as appropriate, the HSM and/or PM will be notified. Daily tailgate meetings will be documented in the H&S log book as well as personnel on-site.

14.1 Medical and Training Records

Copies or verification of training (40-hour, 8-hour, supervisor, site-specific training and documentation of three day OJT) and medical clearance for hazardous waste site work and respirator use will be maintained on-site. Records for all subcontractor employees will also be kept on-site.

14.2 Incident Report and Investigation Form

The incident report and investigation form is to be completed for all accidents and incidents, including near misses. The form can be found in **Appendix F**.

14.3 Health and Safety Logbooks

The FOL/HSO will maintain a logbook during site work. The daily site conditions, personnel, monitoring results and significant events will be recorded. The original logbooks will become part of the exposure records file.

14.4 Hazard Communication Program/MSDS

Material Safety Data Sheets (MSDS) will be obtained for applicable substances and included in the site hazard communication file. The hazard communication program will be maintained on-site in accordance with 29 CFR 1910.1200.

15.0 FIELD PERSONNEL REVIEW

This form serves as documentation that field personnel have read, or have been informed of, and understand the provisions of the HASP. It is maintained on site by the FOL/HSO as a project record. Each field team member shall sign this section after site-specific training is completed and before being permitted to work on site.

I have read, or have been informed of, the Health and Safety Plan and understand the information presented. I will comply with the provisions contained therein.

Name (Print and Sign)	*Date*

APPENDIX A

MATERIAL SAFETY DATA SHEETS

APPENDIX B

ACTIVITY HAZARD ANALYSES

Project Identification 80-100 Banks Avenue	**Location** Rockville Centre, NY	**Estimated Dates** Winter - Spring 2006
Phase of Work Mobilization/ Demobilization	**Page 1 of 1**	**Analysis Approved by** Charles B. Sosik, PM
TASKS	**HAZARDS**	**CONTROL MEASURES**
1. Mobilization and demobilization of equipment site tools, personnel	Slips/trips/falls	• Maintain alertness to slip/trip/fall hazards; • Maintain good housekeeping; • Walk, do not run; • Wear footwear with soles that grip; • Unloading areas should be on even terrain; and • Mark and repair if possible tripping hazards.
2. Set up/remove staging and decontamination areas	Manual lifting and material handling	• Instruct personnel on proper lifting techniques; • Use proper lifting techniques; and • Team lifting will be used for heavy loads or use mechanical lifting devices.
	Temperature extremes	• Drink plenty of fluids; • Train personnel of signs/symptoms of heat/cold stress; • Monitor air temperatures when extreme weather conditions are present; and • Stay in visual and verbal contact with your buddy.
	Vehicular traffic	• Spotters will be used when backing up trucks and heavy equipment and when moving equipment.
	Overhead hazards	• Personnel will be required to wear hard hats that meet ANSI Standard Z89.1; • All ground personnel will stay clear of suspended loads; • All equipment will be provided with guards, canopies or grills to protect the operator from falling or flying objects; and • All overhead hazards will be identified prior to commencing work operations.
	Noise	• Ear plugs or ear muffs shall be worn for operations that exceed 85 decibels.
	Electrocution	• Equipment will be equipped with GFCI; • A licensed electrician will conduct all electrical work; • All equipment will stay a minimum of 15 feet from overhead-energized electrical lines (50 kV). This distance will increase .4 inches for each 1 kV above 50 kV.
	Biological hazards	• Be alert to the presence of biological hazards; • Wear insect repellent; • Follow procedures in Section 4.2.2 for tick bites; • FOL/HSO should be aware of on-site personnel with allergic reactions in insect bites and stings.

Project Identification 80-100 Banks Avenue	**Location** Rockville Centre, NY	**Estimated Dates** Winter - Spring 2006
Phase of Work Drilling, Shoring System, and Excavation Operations	**Page 1 of 2**	**Analysis Approved by** Charles B. Sosik, PM
TASKS	**HAZARDS**	**CONTROL MEASURES**
1. Install recovery wells. 2. Install shoring system.	Chemical hazards	• Wear appropriate PPE per Table 6-1; • Perform air monitoring per Community Air Monitoring Plan; • Practice contamination avoidance; • Follow proper decontamination procedures; and • Wash hands/face before eating, drinking or smoking.
3. Excavate soils. 4. Backfill excavations.	Hand and power tool usage	• Equip all electrical equipment with GFCI's; • Inspect all electrical equipment and tools prior to use; • Daily inspections will be performed; • Remove broken or damaged tools from service; • Use the tool for its intended purpose; • Use in accordance with manufacturer instructions; and • Tag and remove defective equipment.
5. Steam clean/ decontaminate equipment.	Temperature extremes	• Drink plenty of fluids: • Train personnel of signs/symptoms of heat/cold stress; • Monitor air temperatures when extreme weather conditions are present; and, • Stay in visual and verbal contact with your buddy.
	Manual lifting and material handling	• Instruct personnel on proper lifting techniques: • Use proper lifting techniques; and • Team lifting will be used for heavy loads or use mechanical lifting devices.
	Drill rigs	• Follow Contractor's Drill Rig Safety Program
	Fire/Explosion	• ABC type fire extinguishers shall be readily available; • No smoking in work area.
	Biological hazards	• Be alert to the presence of biological hazards; • Wear insect repellent; • Follow procedures in Section 4.2.2 for tick bites; • FOL/HSO should be aware of on-site personnel with allergic reactions in insect bites and stings.
	Heavy equipment	• Ground personnel will stay clear of all suspended loads; • Ground personnel will stay out of the swing radius; • Eye contact with operators will be made before approaching equipment; • Equipment will not be approached on blind sides; • All equipment will be equipped with backup alarms or spotters shall be used.
	Slips/Trips/Falls	• Maintain alertness to slip/trip/fall hazards; • Maintain good housekeeping: • Walk, do not run: • Wear footwear with soles that grip; • Unloading areas should be on even terrain: and • Mark and repair if possible tripping hazards.

Project Identification 80-100 Banks Avenue	**Location** Rockville Centre, NY	**Estimated Dates** Winter - Spring 2006
Phase of Work Drilling, Shoring system, and Excavation Operations	**Page 2 of 2**	**Analysis Approved by** Charles B. Sosik, PM
TASKS	**HAZARDS**	**CONTROL MEASURES**
	None	• Hearing protection mandatory at or above 85 dBA. • Instruct personnel how to properly wear heating protective devices. • Disposable ear plugs or other hearing protection required when working near noisy equipment..
	Steam/Heat/Splashing	• Use face shield and safety glasses or goggles; • Stay out of the splash/steam radius; • Do not direct steam at anyone; • Do not hold objects with your foot and steam area near it; • Ensure that the direction of spray minimizes spread of constituents of concern; and • Use shielding as necessary.
	Excavation hazards	• Follow 29 CFR 1926 Subpart P.
	Overhead hazards	• Personnel will be required to wear hard hats that meet ANSI Standard Z89.1; • All ground personnel will stay clear of suspended loads; • All equipment will be provided with guards, canopies or grills to protect the operator from falling or flying objects; and • All overhead hazards will be identified prior to commencing work operations.

Project Identification 80-100 Banks Avenue	**Location** Rockville Centre, NY	**Estimated Dates** Winter - Spring 2006
Phase of Work Soil Sampling	**Page 1 of 1**	**Analysis Approved by** Charles B. Sosik, PM
TASKS	**HAZARDS**	**CONTROL MEASURES**
1. Collect soil samples.	Chemical hazards	• Wear appropriate PPE per Table 6-1; • Practice contamination avoidance; • Follow proper decontamination procedures; and • Wash hands/face before eating, drinking or smoking.
	Temperature extremes	• Drink plenty of fluids; • Train personnel of signs/symptoms of heat/cold stress; • Monitor air temperatures when extreme weather conditions are present; and • Stay in visual and verbal contact with your buddy.
	Manual lifting and material handling	• Site personnel will be instructed on proper lifting techniques; mechanical devices should be used to reduce manual handling of materials; team lifting should be utilized if mechanical devices are not available.
	Slips/Trips/Falls	• Maintain alertness to slip/trip/fall hazards; • Maintain good housekeeping; • Walk, do not run; • Wear footwear with soles that grip; • Unloading areas should be on even terrain; and • Mark and repair if possible tripping hazards.

Project Identification 80-100 Banks Avenue	**Location** Rockville Centre, NY	**Estimated Dates** Winter - Spring 2006
Phase of Work Application of Dry Potassium Permanganate	**Page 1 of 1**	**Analysis Approved by** Charles B. Sosik, PM
TASKS	**HAZARDS**	**CONTROL MEASURES**
1. Apply dry potassium permanganate to open excavations	Chemical hazards	• Wear appropriate PPE per Table 6-1; • Follow proper decontamination procedures; and • Wash hands/face before eating, drinking or smoking.
	Temperature extremes	• Drink plenty of fluids: • Train personnel of signs/symptoms of heat/cold stress; • Monitor air temperatures when extreme weather conditions are present; and • Stay in visual and verbal contact with your buddy.
	Manual lifting and material handling	• Site personnel will be instructed on proper lifting techniques; mechanical devices should be used to reduce manual handling of materials; team lifting should be utilized if mechanical devices are not available.
	Slips/Trips/Falls	• Maintain alertness to slip/trip/fall hazards; • Maintain good housekeeping; • Walk, do not run; • Wear footwear with soles that grip; • Unloading areas should be on even terrain; and • Mark and repair if possible tripping hazards.

Project Identification 80-100 Banks Avenue	**Location** Rockville Centre. NY	**Estimated Dates** Winter - Spring 2006
Phase of Work Application of Liquid Sodium Permanganate	**Page 1 of 1**	**Analysis Approved by** Charles B. Sosik, PM
TASKS	**HAZARDS**	**CONTROL MEASURES**
1. Inject liquid sodium into subsurface earth probe rods	Chemical hazards	• Wear appropriate PPE per Table 6-1; • Follow proper decontamination procedures; and • Wash hands/face before eating, drinking or smoking.
	Temperature extremes	• Drink plenty of fluids: • Train personnel of signs/symptoms of heat/cold stress; • Monitor air temperatures when extreme weather conditions are present; and • Stay in visual and verbal contact with your buddy.
	Manual lifting and material handling	• Site personnel will be instructed on proper lifting techniques; mechanical devices should be used to reduce manual handling of materials; team lifting should be utilized if mechanical devices are not available.
	Slips/Trips/Falls	• Maintain alertness to slip/trip/fall hazards; • Maintain good housekeeping; • Walk, do not run; • Wear footwear with soles that grip; • Unloading areas should be on even terrain; and • Mark and repair if possible tripping hazards.

APPENDIX C

MEDICAL DATA SHEET

MEDICAL DATA SHEET

The brief medical data sheet shall be completed by on-site personnel and will be kept in the Support Zone by the HSO as a project record during the conduct of site operations. It accompanies any personnel when medical assistance is needed or if transport to a hospital is required.

Project:
Name: _____ Home Telephone: _____
Address: _____
Age: _____ Height: _____ Weight: _____ Blood Type: _____

Name and Telephone Number of Emergency Contact: _____

Drug or Other Allergies: _____

Particular Sensitivities: _____

Do You Wear Contacts? _____

Provide A Check List Of Previous Illnesses: _____

What Medications Are You Presently Using?_____

Do You Have Any Medical Restrictions? _____

Name, Address, And Phone Number Of Personal Physician:

APPENDIX D

GENERAL HEALTH AND SAFETY WORK PRACTICES

GENERAL HEALTH AND SAFETY WORK PRACTICES

1. All site personnel must attend each day's Daily Briefing and sign the attendance sheet.

2. Any individual taking prescribed drugs shall inform the FOL/HSO of the type of medication. The FOL/HSO will review the matter with the HSM and the Corporate Medical Consultant (CMC), who will decide if the employee can safely work on-site while taking the medication.

3. The personal protective equipment specified by the FOL/HSO and/or associated procedures shall be worn by all site personnel. This includes hard hats and safety glasses which must be worn at all times in active work areas.

4. Facial hair (beards, long sideburns or mustaches) which may interfere with a satisfactory fit of a respirator mask is not allowed on any person who may be required to wear a respirator.

5. Personnel must follow proper decontamination procedures and shower as soon as possible upon completion of work shift.

6. Eating, drinking, chewing tobacco or gum, smoking and any other practice that may increase the possibility of hand-to-mouth contact is prohibited in the exclusion zone or the contamination reduction zone. (Exceptions may be permitted by the HSM to allow fluid intake during heat stress conditions).

7. All lighters, matches, cigarettes and other forms of tobacco are prohibited in the Exclusion Zone.

8. All signs and demarcations shall be followed. Such signs and demarcation shall not be removed, except as authorized by the FOL/HSO.

9. No one shall enter a permit-required confined space without a permit and appropriate training. Confined space entry permits shall be implemented as issued.

10. All personnel must follow Hot Work Permits as issued.

11. All personnel must use the Buddy System in the Exclusion Zone.

12. All personnel must follow the work-rest regimens and other practices required by the heat stress program.

13. All personnel must follow lockout/tagout procedures when working on equipment involving moving parts or hazardous energy sources.

14. No person shall operate equipment unless trained and authorized.

15. No one may enter an excavation greater than four feet deep unless authorized by the Competent

Person. Excavations must be sloped or shored properly. Safe means of access and egress from excavations must be maintained.

16. Ladders and scaffolds shall be solidly constructed, in good working condition, and inspected prior to use. No one may use defective ladders or scaffolds.

17. Fall protection or fall arrest systems must be in place when working at elevations greater than six feet for temporary working surfaces and four feet for fixed platforms.

18. Safety belts, harnesses and lanyards must be selected by the Supervisor. The user must inspect the equipment prior to use. No defective personal fall protection equipment shall be used. Personal fall protection that has been shock loaded must be discarded.

19. Hand and portable power tools must be inspected prior to use. Defective tools and equipment shall not be used.

20. Ground fault interrupters shall be used for cord and plug equipment used outdoors or in damp locations. Electrical cords shall be kept out walkways and puddles unless protected and rated for the service.

21. Improper use, mishandling, or tampering with health and safety equipment and samples is prohibited.

22. Horseplay of any kind is prohibited.

23. Possession or use of alcoholic beverages, controlled substances, or firearms on any site is forbidden.

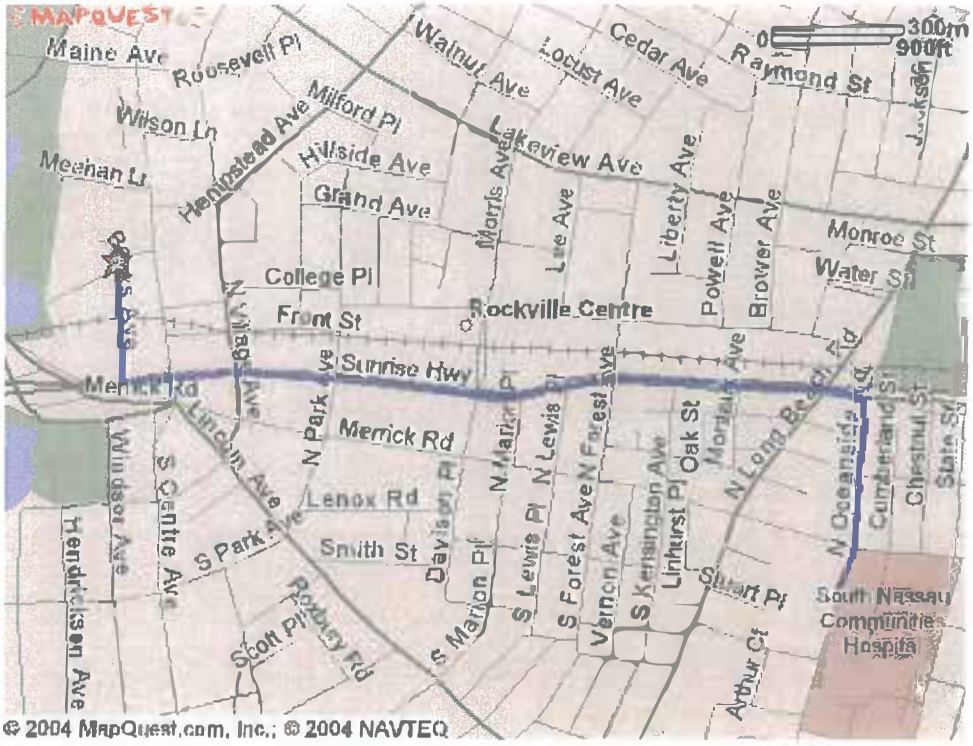
24. All incidents, no matter how minor, must be reported immediately to the Supervisor.

25. All personnel shall be familiar with the Site Emergency Response Plan, which is contained in Section 12 of the HASP.

The above Health and Safety Rules are not all inclusive and it is your responsibility to comply with all regulations set forth by OSHA, the client, PWGC Supervisors, and the FOL/HSO.

APPENDIX E

HOSPITAL ROUTE MAP



Directions:

Proceed south on Banks Avenue to Sunrise Highway.
Make a left (east) on Sunrise Highway and follow to Oceanside Road.
Make a right (south) on Oceanside Road and follow to South Nassau Communities Hospital.

Total distance: Approx. 1.7 miles

Address:

South Nassau Communities Hospital
2445 Oceanside Road
Oceanside, New York
(516) 763-3938

APPENDIX F

INCIDENT REPORT FORM / INVESTIGATION FORM

INCIDENT / NEAR MISS REPORT AND INVESTIGATION - PAGE 1 OF 2

TYPE OF INCIDENT - CHECK ALL THAT APPLY

☐ INJURY/ILLNESS ☐ VEHICLE DAMAGE ☐ PROPERTY DAMAGE ☐ FIRE
☐ SPILL/RELEASE ☐ PERMIT EXCEEDENCE ☐ NEAR MISS ☐ OTHER

GENERAL INFORMATION

PROJECT NAME: DATE OF REPORT: REPORT NO.:

DATE OF INCIDENT: TIME: DAY OF WEEK:

LOCATION OF INCIDENT:

WEATHER CONDITIONS: ADEQUATE LIGHTING AT SCENE? ☐ YES ☐ NO ☐ N/A

DESCRIBE WHAT HAPPENED (STEP BY STEP - USE ADDITIONAL PAGES IF NECESSARY)

AFFECTED EMPLOYEE INFORMATION

NAME: EMPLOYEE: ☐ YES ☐ NO

HOME ADDRESS:

SOCIAL SECURITY NO.: HOME PHONE NO.:

JOB CLASSIFICATION: YEARS IN JOB CLASSIFICATION:

HOURS WORKED ON SHIFT PRIOR TO INCIDENT: AGE:

DID INCIDENT RELATE TO ROUTINE TASK FOR JOB CLASSIFICATION? ☐ YES ☐ NO

INJURY/ILLNESS INFORMATION

NATURE OF INJURY OR ILLNESS:

OBJECT/EQUIPMENT/SUBSTANCE CAUSING HARM:

FIRST AID PROVIDED? ☐ YES ☐ NO

IF YES, WHERE WAS IT GIVEN: ☐ ON-SITE ☐ OFF-SITE

IF YES. WHO PROVIDED FIRST AID:

WILL THE INJURY/ILLNESS RESULT IN: ☐ RESTRICTED DUTY ☐ LOST TIME ☐ UNKNOWN

INCIDENT / NEAR MISS REPORT AND INVESTIGATION - PAGE 2 OF 2 REPORT NO.
MEDICAL TREATMENT INFORMATION
WAS MEDICAL TREATMENT PROVIDED? □ YES □ NO
IF YES, WAS MEDICAL TREATMENT PROVIDED: □ ON-SITE □ DR.'S OFFICE □ HOSPITAL
NAME OF PERSON(S) PROVIDING TREATMENT:
ADDRESS WHERE TREATMENT WAS PROVIDED:
TYPE OF TREATMENT:
VEHICLE AND PROPERTY DAMAGE INFORMATION
VEHICLE/PROPERTY DAMAGED:
DESCRIPTION OF DAMAGE:
SPILL AND AIR EMISSIONS INFORMATION:
SUBSTANCE SPILLED OR RELEASED: FROM WHERE: TO WHERE:
ESTIMATED QUANTITY/DURATION:
CERCLA HAZARDOUS SUBSTANCE? □ YES □ NO
REPORTABLE TO AGENCY? □ YES □ NO SPECIFY:
WRITTEN REPORT: □ YES □ NO TIME FRAME:
RESPONSE ACTION TAKEN:
PERMIT EXCEEDENCE
TYPE OF PERMIT: PERMIT #:
DATE OF EXCEEDENCE: DATE FIRST KNOWLEDGE OF EXCEEDENCE:
PERMITTED LEVEL OR CRITERIA:
EXCEEDENCE LEVEL OR CRITERIA:
REPORTABLE TO AGENCY? □ YES □ NO SPECIFY:
WRITTEN REPORT: □ YES □ NO TIME FRAME:
RESPONSE ACTION TAKEN:
NOTIFICATIONS
NAMES OF PERSONNEL NOTIFIED: DATE/TIME:
CLIENT NOTIFIED: DATE/TIME:
AGENCY NOTIFIED: DATE/TIME:
CONTACT NAME:
PERSONS PREPARING REPORT
EMPLOYEE'S NAME:(PRINT) SIGN:
SUPERVISOR'S NAME:(PRINT) SIGN:

INVESTIGATIVE REPORT

DATE OF INCIDENT: DATE OF REPORT: REPORT NUMBER:

INCIDENT COST: ESTIMATED: $_____ ACTUAL: $_____

OSHA RECORDABLE(S): □ YES □ NO # RESTRICTED DAYS ____ # DAYS AWAY FROM WORK ____

CAUSE ANALYSIS

IMMEDIATE CAUSES - WHAT ACTIONS AND CONDITIONS CONTRIBUTED TO THIS EVENT?

BASIC CAUSES - WHAT SPECIFIC PERSONAL OR JOB FACTORS CONTRIBUTED TO THIS EVENT?

ACTION PLAN

REMEDIAL ACTIONS - WHAT HAS AND OR SHOULD BE DONE TO CONTROL EACH OF THE CAUSES LISTED?

ACTION	PERSON RESPONSIBLE	TARGET DATE	COMPLETION DATE

PERSONS PERFORMING INVESTIGATION

INVESTIGATOR'S NAME: (PRINT) SIGN: DATE:

INVESTIGATOR'S NAME: (PRINT) SIGN: DATE:

INVESTIGATOR'S NAME: (PRINT) SIGN: DATE:

MANAGEMENT REVIEW

PROJECT MANAGER: (PRINT) SIGN: DATE:

COMMENTS:

H&S MANAGER: (PRINT) SIGN: DATE:

COMMENTS:

Examples of Immediate Causes

Substandard Actions

1. Operating equipment without authority
2. Failure to warn
3. Failure to secure
4. Operating at improper speed
5. Making safety devices inoperable
6. Removing safety devices
7. Using defective equipment
8. Failure to use PPE properly
9. Improper loading
10. Improper placement
11. Improper lifting
12. Improper position for task
13. Servicing equipment in operation
14. Under influence of alcohol/drugs
15. Horseplay

Substandard Conditions

1. Guards or barriers
2. Protective equipment
3. Tools, equipment, or materials
4. Congestion
5. Warning system
6. Fire and explosion hazards
7. Poor housekeeping
8. Noise exposure
9. Exposure to hazardous materials
10. Extreme temperature exposure
11. Illumination
12. Ventilation
13. Visibility

Examples of Basic Causes

Personal Factors

1. Capability
2. Knowledge
3. Skill
4. Stress
5. Motivation

Job Factors

1. Supervision
2. Engineering
3. Purchasing
4. Maintenance
5. Tools/equipment
6. Work Standards
7. Wear and tear
8. Abuse or misuse

Management Programs for Control of Incidents

1. Leadership and administration
2. Management training
3. Planned inspections
4. Task analysis and procedures
5. Task observation
6. Emergency preparedness
7. Organizational rules
8. Accident/incident analysis
9. Personal protective equipment
10. Health control
11. Program audits
12. Engineering controls
13. Personal communications
14. Group meetings
15. General promotion
16. Hiring and placement
17. Purchasing controls

APPENDIX G

DAILY BRIEFING SIGN-IN SHEET

DAILY BRIEFING SIGN-IN SHEET

Date: _____ Project Name/Location:

_____

Person Conducting Briefing:_____

1. AWARENESS (topics discussed, special safety concerns, recent incidents, etc.)

_____

_____

_____

_____

_____

2. OTHER ISSUES (HASP changes, attendee comments, etc.)

_____

_____

_____

_____

_____

3. ATTENDEES (Print Name):

1.	21.
2.	22.
3.	23.
4.	24.
5.	25.
6.	26.
7.	27.
8.	28.
9.	29.
10.	30.
11.	31.
12.	32.
13.	33.
14.	34.
15.	35.
16.	36.
17.	37.
18.	38.
19.	39.
20.	40.

ATTACHMENT - D
Community Air Monitoring Plan

P.W. GROSSER CONSULTING, INC.

COMMUNITY AIR MONITORING PLAN
FOR REMEDIAL ACTION
AT
80-100 BANKS AVENUE
VILLAGE OF ROCKVILLE CENTRE
NASSAU COUNTY, NEW YORK

SEPTEMBER 2004
Revised October 2005

APPROVALS

By their signature, the undersigned hereby certify that this Community Air Monitoring Plan (CAMP) has been reviewed and approved for use in conducting remedial actions at 80-100 Banks Avenue, Rockville Centre, NY.

_____	_____
Project Manager	Date
_____	_____
Health and Safety Officer	Date

COMMUNITY AIR MONITORING PLAN
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2.0 AIR MONITORING 2
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2.1.1 Work Area 2
2.1.2 Community Air Monitoring Requirements 2

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4.0 MAJOR VAPOR EMISSION RESPONSE PLAN 5

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Table 1-2 Real-Time Air Monitoring Action Levels 3

1.0 INTRODUCTION

The Community Air Monitoring Plan (CAMP) provides measures for protection for on-site workers and the downwind community (i.e., off-site receptors including residences, businesses, and on-site workers not directly involved in the remedial work) from potential airborne contaminant releases resulting from remedial activities at 80-100 Banks Avenue, Rockville Centre, New York.

The action levels specified herein require increased monitoring, corrective actions to abate emissions, and/or work shutdown. Additionally, the CAMP helps to confirm that the remedial work did not spread contamination off-site through the air.

The primary concerns for this site are odors and dust particulates.

1.1 Regulatory Requirements

This CAMP was established in accordance with the following requirements:

- 29 CFR 1910.120(h): This regulation specifies that air shall be monitored to identify and quantify levels of airborne hazardous substances and health hazards, and to determine the appropriate level of protection for workers.

- New York State Department of Health's (NYSDOH) Generic Community Air Monitoring Plan: This guidance specifies that a community air-monitoring program shall be implemented to protect the surrounding community and to confirm that the work does not spread contamination off-site through the air.

- New York State Department of Environmental Conservation (NYSDEC) Technical and Guidance Memorandum (TAGM) #4031 - Fugitive Dust Suppression and Particulate Monitoring Program at Inactive Hazardous Waste Sites: This guidance provides a basis for developing and implementing a fugitive dust suppression and particulate monitoring program as an element of a hazardous waste site's health and safety program.

2.0 AIR MONITORING

The following sections contain information describing the types, frequency and location of real-time monitoring.

2.1 Real-Time Monitoring

This section addresses the real-time monitoring that will be conducted within the work area ,and along the site perimeter, during intrusive activities such as excavation, product recovery, manipulation of soil piles, extraction of shoring systems, etc.

2.1.1 Work Area

The following instruments will be used for work area monitoring:

- PhotoionizationDetector (PID)
- Dust Monitor

Table 1-1 presents a breakdown of each main activity and provides the instrumentation, frequency and location of the real-time monitoring for the site. Table 1-2 lists the Real-Time Air Monitoring Action Levels to be used in all work areas.

2.1.2 Community Air Monitoring Requirements

To establish ambient air background concentrations, air will be monitored at several locations around the site perimeter before construction activities begin. These points will be monitored periodically in series during the site work. When the excavation area is within 20 feet of potentially exposed populations or occupied structures, the perimeter monitoring points will be located to represent the nearest potentially exposed individuals. This situation will occur when excavating cell "C" located adjacent to the parking area for Morgan Days Park. When intrusive activities are occurring at this location, the continuous vapor and dust monitoring location will be at the east end of park property, at a point closest to the excavation.

Fugitive respirable dust will be monitored using a MiniRam Model PDM-3 aerosol monitor. Air will be monitored for VOCs with a portable Photovac MicroTip photoionization detector (PID), or equivalent. Table 1-1 presents a breakdown of each main activity and provides the instrumentation, frequency and location of the real-time monitoring for the site. Table 1-2 lists the Real-Time Air Monitoring Action Levels to be used in all work areas. All air monitoring data is documented in a site log book by the designated site safety officer. PWGC's site safety officer or delegate must ensure that air monitoring instruments are calibrated and maintained in accordance with manufacturer's specifications. All instruments will be zeroed daily and checked for accuracy. A daily log will be kept. If additional monitoring is required, the protocols will be developed and appended to this plan.

Table 1-1
Frequency and Location of Air Monitoring

ACTIVITY	AIR MONITORING INSTRUMENT	FREQUENCY AND LOCATION
Drilling, Probing, Excavation, and Drying Bed Operations	PID, Dust Monitor	Continuous in Breathing Zone (BZ) during intrusive activities or if odors become apparent, screening in the BZ every 30 minutes during non-intrusive activities

Table 1-2
Real-Time Air Monitoring Action Levels

AIR MONITORING INSTRUMENT	MONITORING LOCATION	ACTION LEVEL	SITE ACTION	REASON
PID	Breathing Zone	0-25 ppm, non-transient	None	Exposure below established exposure limits
PID	Breathing Zone	25-100 ppm, non-transient	Don APR	Based on potential exposure to tetrachloroethylene
PID	Breathing Zone	>100 ppm, non-transient	Don ASR or SCBA, Institute vapor/odor suppression measures, Notify HSM.	Increased exposure to site contaminants, potential for vapor release to public areas.
PID	Work Area Perimeter	< 5 ppm	None	Exposure below established exposure limits.
PID	Work Area Perimeter	> 5 ppm	Stop work and implement vapor release response plan until readings return to acceptable levels, Notify HSM.	Increased exposure to site contaminants, potential for vapor release to public areas
Mini Ram	Work Area Perimeter	< 150 $\mu g/m^3$	None	Exposure below established exposure limits.
Mini Ram	Work Area Perimeter	>150 $\mu g/m^3$	Don ASR or SCBA, Institute dust suppression measures, Notify HSM.	Stop work and implement dust suppression techniques until readings return to acceptable levels, Notify HSM.

3.0 VAPOR EMISSION RESPONSE PLAN

This section is excerpted from the NYSDOH guidance for Community Air Monitoring Plan - Ground Intrusive Activities.

If the ambient air concentration of organic vapors exceeds 5 ppm above background at the perimeter of the work area, activities will be halted and monitoring continued. If the organic vapor level decreases below 5 ppm above background, work activities can resume. If the organic vapor levels are greater than 5 ppm over background but less than 25 ppm over background at the perimeter of the work area, activities can resume provided:

- the organic vapor level 200 feet downwind of the work area or half the distance to the nearest residential or commercial structure, whichever is less, is below 5 ppm over background.

If the organic vapor level is above 25 ppm at the perimeter of the work area, activities must be shut down. When work shutdown occurs, downwind air monitoring as directed by the Health & Safety Officer will be implemented to ensure that vapor emission does not impact the nearest residential or commercial structure at levels exceeding those specified in the Major Vapor Emission Response Plan Section.

4.0 MAJOR VAPOR EMISSION RESPONSE PLAN

If any organic levels greater than 5 ppm over background are identified 200 feet downwind from the work area or half the distance to the nearest 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, organic levels persist above 5 ppm above background 200 feet downwind or half the distance to the nearest residential or commercial property from the work area, then the air quality must be monitored within 20 feet of the perimeter of the nearest residential or commercial structure (20 Foot Zone).

If efforts to abate the emission source are unsuccessful and if organic vapor levels are approaching 5 ppm above background for more than 30 minutes in the 20 Foot Zone, then the Major Vapor Emission Response Plan shall automatically be placed into effect.

However, the Major Vapor Emission Response Plan shall be immediately placed in effect if organic vapor levels are greater than 10 ppm above background.

Upon activation, the following activities will be undertaken:

1. All emergency Response Contacts are listed in the Health & Safety Plan will go into effect.

2. The local police authorities will immediately be contacted by the Health & Safety Officer and advised of the situation.

3. Frequent air monitoring will be conducted at 30-minute intervals within the 20 Foot Zone. If two successive readings below action levels are measured, air monitoring may be halted or modified by the Health & Safety Officer.

5.0 VAPOR / ODOR SUPPRESSION TECHNIQUES

Vapor / odor suppression techniques must be employed when action levels warrant the use of these techniques.

The primary technique to be implemented for control of volatile organic odors from stockpiled soil loaded trucks or the open excavation will be the application of a hydro-mulch material or encapsulating foam sealant. The hydro-mulch material is a seedless version of the hydro-seed product commonly used by commercial landscaping contractors to provide stabilization and rapid grow-in of grasses or wild flowers along highways, embankments and other large areas. Hydro-mulch or the encapsulating sealant will be sprayed over open excavation areas, temporary stockpile areas, drying beds and loaded trucks, as necessary. This is a highly effective method for controlling odors, because the release of odors is sealed immediately at the source. Additional steps for odor control around the excavation may include the installation and operation of a water curtain. As a final control, excavation will be limited to favorable wind and temperature conditions to minimize off-site odor migration.

During times that a vacuum truck or shallow tray air strippers are being used to remove DNAPL from wells or open excavations, air monitoring as per Section 2.1.2, will be conducted to ensure that impact to nearby community receptors is within allowable levels. If action levels are exceeded due to these activities, engineering controls such as exhaust pollution control devices, will be used to reduce air emission levels to within acceptable levels. Canisters of air phase granular activated carbon could be used to reduce air emission levels under these circumstances.

6.0 DUST SUPPRESSION TECHNIQUES

Reasonable dust-suppression techniques must be employed during all work that may generate dust, such as excavation, grading, placement of clean fill, and loading of contaminated soils.
The following techniques were shown to be effective for controlling the generation and migration of dust during remedial activities:

- Wetting equipment and excavation faces;
- Spraying water on buckets during excavation and dumping;
- Hauling materials in properly covered containers; and,
- Restricting vehicle speeds to 10 mph.

Using atomizing sprays will prevent overly wet conditions, conserve water, and offer an effective means of suppressing fugitive dust. It is imperative that utilizing water for suppressing dust will not create surface runoff.

7.0 DATA QUALITY ASSURANCE

7.1 Calibration

Instrument calibration shall be documented on instrument calibration and maintenance sheets or in the designated field logbook. All instruments shall be calibrated before and after each shift. Calibration checks may be used during the day to confirm instrument accuracy. Duplicate readings may be taken to confirm individual instrument response.

7.2 Operations

All instruments shall be operated in accordance with the manufacturer's specifications. Manufacturers' literature, including an operations manual for each piece of monitoring equipment will be maintained on-site by the FOL/HSO for reference.

7.3 Data Review

The FOL/HSO will interpret all monitoring data based on Table 1-2 and his/her professional judgment. The FOL/HSO shall review the data with the HSM to evaluate the potential for worker exposure, upgrades/downgrades in level of protection, comparison to direct reading instrumentation and changes in the integrated monitoring strategy.

Monitoring and sampling data, along with all sample documentation will be periodically reviewed by the HSM.

8.0 RECORDS AND REPORTING

All reading must be recorded and available for review by personnel from NYSDEC and NYSDOH. Should any of the action levels be exceeded, the NYSDEC Division of Air Resources must be notified in writing within five (5) working days.

The notification shall include a description of the control measures implemented to prevent further exceedances.