GEI Consultants

Geotechnical
Environmental and
Water Resources
Engineering

LIRR Excavation/Temporary Track Relocation
Interim Remedial Measure Work Plan and Design

Brightwaters Yard/Bay Shore Former MGP Site

Operable Unit No. 3
Bay Shore, New York
NYSDEC AOC Index No. D1-0001-98-11

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1. Introduction

National Grid is preparing to implement an Interim Remedial Measure (IRM) to address the remediation of subsurface impacts located within the Long Island Rail Road (LIRR) right-of-way (ROW) immediately south of the Bay Shore/Brightwaters former manufactured gas plant (MGP) site Operable Unit No. 3 (OU-3), in the Village of Brightwaters, in the Town of Islip, Suffolk County, New York (Site). An Area Location Map and Site Plan are provided as Figure 1 and 2, respectively.

The scope of work detailed in this IRM Work Plan involves the excavation of the impacted material within the LIRR ROW in 2 phases. For the Phase I excavation, the existing railroad tracks will be temporarily relocated to the north to allow for excavation of the material beneath and south of the existing tracks, within the LIRR ROW. Once the Phase I excavation and restoration activities are completed, the tracks will be relocated back to the original location per specification from LIRR, and the Phase II excavation will be completed within the LIRR ROW north of the existing tracks.

National Grid provided the general scope of the OU-3 LIRR IRM activities and the proposed extent of excavation within the LIRR ROW to the New York State Department of Environmental Conservation (NYSDEC) in a letter report dated November 13, 2008. The NYSDEC provided approval to the proposed extent of excavation within the LIRR ROW in a letter dated December 23, 2008, conditional to incorporation of comments. The comments were incorporated in a revised letter report submitted to the NYSDEC dated January 16, 2009. The approved extent of excavation within the LIRR ROW was selected to address the most highly impacted soil and all soil in exceedance of the Restricted Use Commercial Soil Cleanup Objectives (Commercial SCOs) listed in Table 375-6.8(b) of 6 NYCRR Part 375.

National Grid has been working closely with the LIRR to complete the design of these IRM activities and is currently in the final design phase. The purpose of this Work Plan is to present the approach for the proposed IRM activities to the NYSDEC for approval, and to provide information relating to their implementation.

1.1 Work Plan Organization

This document has been prepared in accordance with Title 6 of the New York Code of Rules and Regulations Part 375 (6 NYCRR Part 375) and organized in accordance with the NYSDEC Draft DER-10 Technical Guidance for Site Investigation and Remediation Section 5.3 Remedial Action (RA) Work Plan. Pursuant to Section 5.1(a) of DER-10, the general guidance for design and implementation applies to this IRM. The report includes the following:

- Introduction
- Summary of Site History and Activity
- Identification of Site-Specific Standards, Criteria, and Guidances
- Description of the Proposed Remedy
- Soil and Sediment Erosion and Control Plan
- Waste Management Plan
- Site Restoration Plan
- Air Monitoring and Vapor/Odor Control Plan
- Dust Control Plan
- Health and Safety Plan
- Proposed IRM Schedule

1.2 Summary of Site History and IRM Pre-Design Investigation

This section summarizes the data collected to design the activities proposed by this IRM. This is not intended as a summary of all historical data, but as a summary of those portions pertinent and critical to the design of the activities of this IRM. A more detailed discussion of the historical data is presented in Dvirka and Bartilucci's Final Remedial Investigation Report (January 2003).

1.2.1 Site Description and History

The Brightwaters Yard, currently owned by National Grid, is near the south shore of Long Island, approximately 6,000 feet north of the Great South Bay. The surrounding neighborhood is suburban, and land use is mostly commercial and residential, with some light industry. The Brightwaters property is bounded on the east by a small parcel related to the Bay Shore former MGP, small businesses, a residence, and commercial establishments on Clinton Avenue; to the north and west by residences and small commercial businesses; and to the south by the LIRR Montauk line. An Area Location Map and Site Plan are provided as Figures 1 and 2, respectively. This Work Plan focuses on the supplemental IRM for the site area referred to as OU-3. OU-3 consists of the Brightwaters Yard and the groundwater plume that extends south to southeast from the Brightwaters Yard.

The following IRMs have been performed in OU-3:

- In-Situ Chemical Oxidation (ISCO) IRMs: Three rounds of ISCO by In-Situ Oxidative Technologies, Inc. (ISOTEC) were used to treat the Brightwaters Yard groundwater plume source area in May of 2001, September of 2001, and October of 2004. The treatment involved the injection of a chelated iron complex and stabilized hydrogen peroxide (H^2O^2) within the IRM area (Foster Wheeler Environmental Corporation [FW], 2000).

- Excavation IRM: A source area excavation was effective in removing 1,500 tons of source contaminated soils from May to July of 2004 (Paulus, Sokolowski and Sartor Engineering, PC [PS&S], 2004).
- Oxygen Injection IRM: A groundwater treatment system utilizing oxygen injection technology was installed in the third quarter 2000 as part of an IRM at the intersection of Union Boulevard and Lanier Lane. The treatment system consists of one injection line which injects oxygen into the upper glacial aquifer to increase aerobic biological activity and reduce the concentrations of MGP-related contaminants in groundwater prior to discharge into O-Co-Nee Pond. MGP-related impacts are limited to the upper glacial aquifer. The underlying Magothy aquifer, which is the primary source of public water supply in Nassau and Suffolk Counties, is not impacted from former MGP operations.
- Oxygen Injection IRM: A second groundwater treatment system utilizing oxygen injection technology was installed in the fourth quarter 2004 as part of an IRM on the Brightwaters Yard adjacent to the LIRR. The treatment system consists of three injection lines which inject oxygen into the upper glacial aquifer to increase aerobic biological activity and reduce the concentrations of MGP-related contaminants in groundwater leaving the Site boundary (PS&S, 2004). MGP-related impacts are limited to the upper glacial aquifer. The underlying Magothy aquifer, which is the primary source of public water supply in Nassau and Suffolk Counties, is not impacted from former MGP operations.
- OU-3 Storm Sewer Rehabilitation IRM: Sections of the stormwater collection network located within OU-3 were rehabilitated in Q4 2008. This included the replacement of catch basins and the cured in-place lining of drainage piping that is located within the OU-3 groundwater plume.

Please refer to the following reports for more specific details regarding the site history and background.

Final Remedial Investigation Report, Bay Shore/Brightwaters Former Manufactured Gas Plant, Bay Shore, New York, Dvirka & Bartilucci's (D&B), January 2003.

Final Supplemental Investigation Report, Bay Shore/Brightwaters Former MGP Site OU-3 Brightwaters Yard Groundwater Plume IRM OU-3A, Foster Wheeler Environmental Corporation, May 2003.

Supplemental Interim Remedial Measure (IRM) Completion Report for the Bay Shore/Brightwaters Former MGP site OU-3 Brightwaters Yard, Paulus, Sokolowski, and Sartor Engineering, PC. August 2005.

Despite performing the IRM activities as summarized above, current groundwater analytical data indicate that source material contributing to the groundwater impacts remain on the Brightwaters Yard portion of OU-3 and beneath the LIRR ROW just south of the Brightwaters Yard. Therefore, several remedial alternatives were evaluated to address the impacts within the LIRR ROW. Due to the specific conditions of the source material at this location, remedial excavation was selected as the most reliable plan to mitigate the potential source material within the LIRR ROW.

National Grid has implemented a soil and groundwater sampling program to further define the remaining impacts on the Brightwaters Yard. The results of this program will be used to develop a remedial approach to address impacts on the Brightwaters Yard following completion of the LIRR ROW excavation presented in this IRM Work Plan. A work plan will be submitted at a later date to address the impacts remaining outside of the LIRR ROW.

1.2.2 Summary of IRM Pre-design Investigation Activities

1.2.2.1 Soil Borings

Seven angled borings were performed along the length of impacts within the LIRR in June, 2008. The borings were performed at an angle of approximately 20 degrees from horizontal such that the depth of the borings were approximately 4 feet below ground surface (ft bgs) beneath the northern-most rail of the track and extended to approximately 10 to 12 ft bgs towards the southern-most rail of the track. Continuous 4-inch-diameter cores were collected. A total of 21 soil samples were collected from the seven horizontal boring locations.

The results of this investigation were presented to the NYSDEC in a letter report dated January 16, 2009. The sample locations (OU3HSB-01 through OUHSB-07) are illustrated on Figure 3 of this report and the analytical data and boring logs are provided in Appendix A.

1.2.3 IRM Goals – Standards, Criteria and Guidance

The limits of excavation presented in the January 16, 2009 letter report, and approved by the NYSDEC, extend from the property line of the LIRR ROW to the south, soil boring OU3HSB-01 to the west, soil boring OU3HSB-05 to the east and approximately 5-feet north of the LIRR/National Grid Brightwaters Yard fence line to the north. Due to updated survey data and LIRR restrictions associated with the minimum distance from the excavation support systems to the centerline of the active tracks, the extent of the excavation has been modified to be approximately 8-feet west of the OU3HSB-05 and approximately 3-feet west of OU3HSB-01, reducing the overall length of the excavation by approximately 5 feet and by a volume of approximately 100 cubic yards. The total volume currently specified to be excavated is approximately 4,500 cubic yards. These changes are reflected in Figure 3 and were submitted to

the NYSDEC in an e-mail dated June 2, 2009. The current available data indicate that excavation to 10 ft bgs, or elevation 8.5 ft above mean sea level (MSL) will address impacts present in the silt/peat/clay unit beneath the LIRR tracks. However, the excavation support system will be designed to allow for excavation to a depth of 12 ft bgs or 6.5 ft above MSL. The decision to extend from 10 ft to 12 ft bgs will be made upon visual observations of the excavated material in the bucket. Due to the excavation support method (i.e. sheet pile), tight time constraints on the excavation, and the wet excavation method, sidewall and bottom confirmation samples are not feasible.

The extent of excavation within the LIRR ROW was selected to address the most highly impacted soil and all soil in exceedance of the Commercial SCOs. The northern extent of impacts was set at 5-feet north of the LIRR/National Grid fence line to address all areas that may potentially impact LIRR operations. Previous excavation areas on the Brightwaters Yard were restricted to within approximately 5 feet of the National Grid/LIRR fence line to avoid impacting LIRR operations.

1.3 Project Organizational Structure and Responsibility

Approval of this Work Plan by the NYSDEC and New York State Department of Health (NYSDOH) will be obtained prior to excavation activities. It is anticipated that the NYSDEC may have representatives on site during the IRM for purposes of general oversight.

National Grid will have final responsibility and authority for all aspects of the IRM activities. National Grid will be responsible for all communication with regulatory agencies, the LIRR, members of the press, and members of the surrounding community. National Grid is also responsible for approving all change orders to this Work Plan. A National Grid representative, or their designee, will be on site at all times during IRM activities.

The selected Contractor will be responsible for all on-site construction activities to include, but not be limited to, compliance with all applicable Occupational Safety and Health Administration (OSHA) health and safety regulations, construction personnel health and safety, implementation of appropriate emission control measures (as necessary), traffic control, site security, excavation and material handling activities associated with the IRM, and any other specified tasks outlined in this Work Plan.

The Engineer (GEI), under contract to National Grid, will serve as the Engineer of Record for the IRM and act as National Grid's representative on site. As such, the Engineer will be responsible for engineering design, oversight of Contractor to ensure compliance with Contract Documents, implementation of the CAMP, collection of confirmation/documentation samples, maintenance of site sampling logs, meteorological logs, and Contractor invoice and change order review on behalf of National Grid. The Engineer will not direct the Contractor on specific means and

methods to perform the work; however, the Engineer will advise the Contractor of non-compliance with the contract documents and identify required corrective action.

GEI will also serve as the Site Health and Safety Officer for National Grid and monitor compliance with all approved site-specific health and safety plans. The Contractor will work under their approved site-specific HASP and will be responsible for the Health and Safety of their work and workers. NYSDEC's representative will be invited to attend all regular job progress meetings, including pre-construction meetings.

The following are the key personnel or agencies involved with IRM activities at the Bay Shore OU3 IRM Site:

National Grid:	Mr. William Ryan Project Manager National Grid Corporation Site Investigation and Remediation Department 175 East Old Country Rd. Hicksville, NY 11801 (516) 545-2586
NYSDEC:	Mr. Amen M. Omorogbe, P.E. Project Manager MGP Remedial Section Division of Environmental Remediation New York State Department of Environmental Conservation 625 Broadway Albany, New York, 12233 (518) 402-9662
NYSDOH:	Mr. Stephen Karpinski Public Health Specialist II Bureau of Environmental Exposure Investigation New York State Department of Health 547 River Street Troy, New York 12180 (518) 402-7880

Selected Contractor:	Mr. Tom Cawley Creamer Environmental, Inc. 215 Union Street Hackensack, NJ 07601 (201) 698-3300
LIRR:	Mr. Edward Maines MTA Long Island Rail Road Hillside Maintenance Complex 93-95 183 Street Hollis, NY 11423
Railroad Design Engineer:	Mr. Christopher Kaiser Associate STV Incorporated 255 Park Avenue South New York, NY 10003-1604
GEI:	Mr. Timothy Olean Project Manager GEI Consultants, Inc. 455 Winding Brook Drive, Suite 201 Glastonbury, CT 06033 (860) 368-5300

2. Scope of Work

This section provides a general overview of the proposed IRM activities, which consist of the following:

- Temporarily relocating LIRR tracks in order to excavate impacted soil from beneath the LIRR ROW for off-site disposal via thermal desorption (Phase I)
- Backfilling and restoring the LIRR tracks to its original alignment
- Excavating north of the existing tracks within the LIRR ROW (Phase II)

2.1 Execution of the IRM

The excavation area runs approximately 171 feet along the length of the tracks, is approximately 70 feet wide, and up to 12 feet deep. The excavation will be performed in two phases. During Phase I, the tracks will be temporarily relocated to the north, while the southern portion of the excavation area is excavated and backfilled. Staging for all remediation excavation activities during the first phase will be located on National Grid property located south of the LIRR property, and west of North Clinton Avenue. LIRR will stage all track relocation activities north of the tracks on the National Grid Brightwaters Yard property. After the Phase I excavation is completed and backfilled, the mainline tracks will be reconstructed in their original orientation prior to beginning Phase II of the excavation on the LIRR ROW. Staging for the Phase II excavation will be on the National Grid property north of the LIRR ROW on the Brightwaters Yard property. The extent of each of the excavation phases and its staging and construction areas are illustrated in Drawings 02A and S-02B of the Final Design Submittal included in Appendix B.

As illustrated in Drawing S-04 of the Final Design Submittal, the Phase I and II excavation areas are further segregated into discrete excavation cells. Each cell will be excavated and backfilled prior to proceeding to the next cell to control odors and to limit the potential for recontamination of clean areas via contact with adjacent areas to be excavated. The Phase I area is divided into 7 cells (Cell 1 through Cell 7) and the Phase II area is divided into 4 cells (Cell 8 through Cell 11). The sheeting will be installed to a depth of approximately 35 ft bgs to accommodate a maximum excavation depth of approximately 12 ft bgs or 6.5 ft above MSL. The proposed temporary track alignment and associated design criteria variances are presented in further detail in Volume II of the Final Design Submittal, the track relocation design.

The estimated time required for the temporary track to be in service is approximately 6 months, which is the time required for installation and removal of sheeting, excavation, backfill and compaction.

Site work will commence at 0730 Monday through Friday with no heavy truck traffic until 0800. All work must be completed and the work area closed for the evening at 1700 unless otherwise authorized by the on-site National Grid representative. During working hours, the selected Contractor will make every effort to minimize potential community impacts. These include, but are not limited to, noise and traffic concerns associated with the execution of the IRM. Site work, with the exception of LIRR track work, will not be conducted on weekends or holidays without prior approval of National Grid. Traffic management and trucking routes are discussed in subsequent sections of this document.

2.2 Mobilization and Site Access

Prior to mobilization, the selected Contractor will prepare and submit all required documents for review and approval by GEI, National Grid, and the NYSDEC as required. GEI will review selected Contractor submittals to ensure conformance with this IRM Work Plan.

The selected Contractor will submit a site-specific Health and Safety Plan (HASP) prepared and endorsed by a certified health and safety professional in accordance with 29 CFR 1910 and 1926. All work will be performed in accordance with all OSHA, state, and industry safety standards. All on-site personnel performing intrusive activities that have the potential to come in contact with impacted materials will have the requisite 1910.120 OSHA Hazardous Waste Operations and Emergency Response (HAZWOPER) Training and LIRR Consultant/Contractor Safety Training. All personnel performing work associated with this IRM will be required to have both general and site-specific training. The general training includes all applicable OSHA and state required training, such as 40-hour HAZWOPER and the 8-hour Refresher Training. Supervisory personnel will also have Supervisory training. All personnel will be in a medical surveillance program. Also, site-specific training will be given to all personnel performing fieldwork at the site on a daily basis. This site-specific training will include, but is not limited to, a review of potential site hazards, required personal protective equipment (PPE), and site warning and evacuation procedures.

The selected Contractor will apply for and obtain all necessary federal, state, and local permits associated with the IRM scope of work. These permits may include, but are not limited to, traffic routing, road opening, construction/zoning, etc. Conditions of these permits will be complied with during the construction.

National Grid will obtain the appropriate access agreements as needed for conducting IRM activities on properties owned by third parties. National Grid is working on a comprehensive access agreement with LIRR to cover all remedial activities.

The selected Contractor will be responsible for contacting the New York City – Long Island One Call Center to request that all utilities on the Site and immediately adjacent to the excavation area be located and marked. The selected Contractor is responsible for resolving all potential conflicts. Underground utility protection will be the responsibility of the selected Contractor. When all utilities have been verified/confirmed/protected, then intrusive activities may be initiated.

GEI will conduct a pre-construction site meeting with the selected Contractor and National Grid prior to the commencement of IRM implementation. The meeting will be conducted to review specified construction requirements and schedules, as well as to review the responsibilities of the selected Contractor, GEI, and National Grid with respect to the IRM implementation.

Prior to the start of work, a third party contractor selected by National Grid will conduct a pre-construction photographic (or video) survey and inspection of all non-National Grid owned work areas to document existing conditions. The survey will be conducted under the oversight of GEI.

The selected Contractor will mobilize all necessary labor, equipment, supplies and materials to complete the IRM. Lay down areas for equipment, supplies and materials, the appropriate exclusion zone(s) and support area(s) will be identified to conduct the planned activities safely and effectively. All equipment will be inspected prior to utilization for the IRM and checked periodically for performance and corrective repair. All equipment will be clean prior to arrival on the job site. The National Grid property south of the LIRR property and west of North Clinton Avenue and Brightwaters Yard properties will be utilized for equipment and material staging and temporary storage during the work for the Phase I and II excavations, respectively. The limits of the staging areas available to the selected contractor are detailed on Drawings S-02A and S-02B of the Final Design Submittal.

2.3 Site Preparation

The Site will be prepared to facilitate the implementation of the planned remedial construction activities. Site preparation activities will include, but not be limited to, removal of vegetation along with any on-site debris within the limits of the remedial work, installation of soil erosion and sediment control (SESC) measures, establishing existing conditions by photo or video documentation and/or surveying, clearing and grubbing, establishing site facilities and staging areas, establishing/upgrading site haul roads, truck routes, and ingress/egress points, establishing site security measures, preparing the decontamination area and installing the decontamination pad, decommissioning of or relocating existing utilities, mobilizing and erecting temporary

fabric enclosure(s) including vapor management system(s), installing permanent sheet piling along and within the remediation area per LIRR approval, establishing vibration and noise monitoring locations, and conducting selective demolition. Critical site features and protocol required for each phase of this IRM are detailed further in the Final Design Submittal.

A National Grid contractor will be responsible for removing/replacing any fences, and structures/appurtenances, required for implementation of each phase of this IRM. Temporary construction fencing and barriers will be erected to enclose and control access to the work area for the duration of the IRM. The location and installation of the temporary fence is detailed in the Final Design Submittal.

2.3.1 Soil Erosion and Sediment Control

SESC measures will be implemented in accordance with New York Guidelines for Urban Erosion and Sediment Control. The elements of the proposed SESC measures are depicted in the Final Design Submittal.

The selected Contractor will, at a minimum, install silt fence and berms as depicted in the Final Design Submittal. In addition, the selected Contractor will install silt fencing and berms in locations deemed appropriate by GEI, National Grid, or NYSDEC for completion of this IRM. Soil erosion and sediment controls will be installed and functional prior to initiating land disturbing activities. Stone access roads will be constructed or maintained throughout the work area or exclusion zone to ensure truck traffic remains on clean materials prior to decontamination and exiting the site. Controls will be continuously monitored and inspected to ensure they are functioning properly and positioned adequately to be effective. Maintenance inspections will be performed routinely and within 24 hours of a rain event. Deficiencies will be corrected as soon as noted and observations will be recorded.

The proposed SESC measures will include:

- Sediment/Silt Fence - Sediment/silt fence will be installed around the exclusion zone for each excavation phase as shown on the Final Design Submittal. Additional sediment/silt fence or hay bales will be installed as required in strategic locations based on visual observation of flow patterns and topography of work areas to control sediment entrained stormwater from entering and exiting work areas or per direction from GEI, National Grid, or NYSDEC. Sediment/silt fence or hay bales will also be installed around the perimeter of the decontamination pad and any stockpile areas which may be constructed.
- Decontamination Pad - A decontamination pad will be constructed to clean trucks and equipment by mechanical means as well as with the use of high pressure, low volume, and hot water, as needed. The decontamination pad will be located as shown in the Final

Design Submittal, and be large enough to accommodate the largest anticipated piece of construction equipment. The decontamination pad will be well marked to aid truck drivers that are directed to the decontamination pad prior to exiting the exclusion zone. The decontamination pad will be constructed as detailed on the Final Design Submittal and will include a sump to allow decontamination rinse water to be captured and transferred to a 55-gallon drum or a frac tank. Collected rinse water will be sampled for waste characterization analysis and disposed of accordingly. Residual soil or waste materials generated during decontamination will be collected and managed with the excavated impacted soils.

2.3.2 Site Survey

A professional land surveyor licensed in the State of New York will be utilized to perform necessary surveying activities. Survey activities will include a pre-remedial site survey, establishing work areas, establishing locations of utilities, verifying field quantities for pay items, and preparation of as-built drawings. The selected surveyor will provide a final as-built survey stamped by a surveyor licensed in the State of New York.

2.3.3 Clearing and Grubbing

Vegetation and debris will be removed from the work zones and other areas where remedial activities will occur. Debris, stumps, roots and other vegetation that is generated during clearing operations will be stockpiled, characterized and disposed of off-site at an appropriate disposal facility.

2.3.4 Temporary Site Facilities

The temporary facilities required to facilitate the remedial activities will include as needed office trailers, temporary utilities, equipment staging areas, material staging areas, a decontamination area and pads, and ingress/egress to the exclusion zone. The proposed locations of required features are shown on the Final Design Submittal. The selected Contractor will either use existing on-site utilities or provide temporary utilities if not already provided. These utilities will consist of electricity, telephone service, water supply, and sanitary facilities.

2.3.5 Equipment Staging Areas

The proposed equipment staging areas for each phase are indicated on the Final Design Submittal. The staging areas will be located so as to facilitate equipment ingress and egress and allow for proper sequencing of the remedial construction activities. Construction equipment will be mobilized on an as needed basis.

2.3.6 Material Staging Areas

The proposed material staging areas for each phase are located within the temporary fabric structures as shown in the Final Design Submittal. The staging areas will be established for excavated material, debris and liquid wastes. Clean backfill may be stockpiled in the staging area outside of the structure or adjacent to the excavation area. The materials will be physically segregated to prevent cross-contamination or commingling of impacted and un-impacted materials. To the extent feasible, materials intended for off-site transportation and disposal will be staged in areas of the work area that are not proximate to existing off-site roadways in order to minimize the potential for off-site impacts. Staging areas for excavated soils and impacted debris will be principally located in the temporary fabric structure to minimize odors and risks to the community. The staging area for impacted soil and debris will be underlain by a high-density polyethylene (HDPE) liner with a minimum thickness of 40 millimeters with perimeter berms to contain run-on and run-off and covered by plastic sheeting.

Material drying, stockpiling and load out activities will be conducted under the temporary fabric structure (TFS) as shown on the Final Design Submittal. The enclosure will be delivered and assembled during the site preparation phase

2.3.6.1 Vapor Management System

The STF will be equipped with a vapor management system (VMS) designed to process recovered air from within the STF while maintaining negative air pressure within the enclosure. The VMS is designed to treat the recovered air from within the enclosure in order to meet NYSDEC air emission standards and the requirements of the HASP. The selected Contractor will continuously monitor the emissions from the VMS utilizing a properly calibrated photoionization detector (PID). If the PID readings exceed 10 parts per million (ppm) or greater above background concentrations, then appropriate actions per the IRM HASP will be taken to return emissions to acceptable levels. The selected Contractor will ensure that the type and quantity of carbon media used in the VMS will meet the emission limits for Benzene, Toluene, Ethyl Benzene, Xylenes (BTEX).

2.3.7 Ingress/Egress

A total of two ingress/egress points are proposed for the remediation activities. The primary ingress and egress to Site Activity will be from North Clinton Avenue for both phases of excavation, south of the rail line through the LIRR ROW and National Grid property south of the tracks and west of North Clinton Avenue for Phase I, and north of the rail line onto the Brightwaters Yard for Phase II. The Phase II excavation will have a secondary ingress/egress from Orinoco Drive. The proposed ingress/egress locations are indicated in the Final Design Submittal. The proposed ingress and egress points are all ready constructed and will be maintained in good condition during IRM activity.

2.3.8 Utility Clearance and Temporary Relocation

Utility lines and pertinent support structures associated with the LIRR (electric, fiber optic, etc.) that are within the work areas will be temporarily removed and relocated prior to IRM activities. All utility lines and pertinent support structures will be reinstalled after completion of IRM activities.

2.3.9 In-situ Waste Characterization Sampling

The objectives of the in-situ waste characterization sampling activities are to:

1) Characterize impacted soils for the purposes of off-site thermal desorption/waste disposal,

2) Generate sufficient data to obtain initial facility approvals for the anticipated waste volume to allow direct load-out of wastes,

3) Minimize contaminated soil stockpiling and on-site handling, and

4) Avoid delays associated with facility approvals.

In general, in-situ waste characterization will be performed using direct push drilling technology. The characterization approach will be designed to capture all necessary analysis required to obtain initial approvals at the perspective disposal facilities. Prior to beginning IRM excavations, a comprehensive review of each facility requirement by analyte and corresponding sampling frequency will be completed. The analytes and frequency of sampling will focus on the most stringent facility requirements.

2.3.10 Groundwater Monitoring Well Abandonment

Consistent with the June 1, 2009, letter work plan approved by NYSDEC on June 2, 2009, the required groundwater wells were decommissioned in June 2009.

2.3.11 Oxygen Injection System Relocation

Consistent with the June 1, 2009, letter work plan approved by NYSDEC on June 2, 2009, the existing OU-3 Brightwaters Yard oxygen injection system was decommissioned in June 2009.

2.3.12 Sheet Pile Shoring Installation

Sheet piling will be utilized to provide support to the excavation area to prevent damage to LIRR property. Installation of the sheet piling will be done during the preparation of each phase to prevent interruption during excavation phases and will be installed to the limits depicted in Figure 3. Sheets will extend from ground surface to approximately 35 feet deep and remain in-place post-remediation to prevent potential settlement or movement of soils beneath the rail road

tracks. The tops of the sheet piling will be cut to 3 feet below grade at the completion of excavation activities according to LIRR specifications prior to final compaction as detailed in the Final Design Submittal.

The sheet piling will carry a minimum permeability of 10^{-6} centimeter per second (cm/s). A groundwater flow model was completed for the site to evaluate the effect of the sheeting on groundwater flow patterns. The model results indicate minimal deflection of groundwater flow around and under the sheetpile wall.

Prior to installation, the alignment of the permanent sheet pile will be surveyed and field marked according to the Final Design Submittal. In addition, the elevation of the LIRR tracks will be surveyed at 50 foot intervals to monitor potential movement of the tracks during installation of the permanent sheet pile. Installation of the sheeting for each phase will not begin until the LIRR has installed temporary railroad tracks for Phase I or the permanent tracks for Phase II, respectively.

2.4 Remedial Excavation

The proposed excavation activities to be performed as part of this IRM consist of excavating contaminant source materials to a depth of 10 to 12 ft bgs beneath the LIRR ROW, or 8.5 to 6.5 feet above MSL, to the extents discussed in previous sections of this document. Excavation activities will proceed once all Site preparation activities, including track relocations, are complete and the TFS and VMS are operable. The excavation design has been explicitly coordinated with the LIRR as detailed in the Final Design Submittal. Therefore, the excavation activities proposed by this IRM have been carefully designed and sequenced to minimize disruption to the LIRR schedule and damage to the tracks.

2.4.1 Remedial Excavation Areas

The extents of excavation are defined and discussed in previous sections and illustrated in Figure 3. Because of the design considerations and implications to the LIRR tracks, the excavation will be strictly limited to these extents and will not be expanded laterally. Per direction from NYSDEC via letter correspondence dated January 16, 2009, the sheeting is designed to allow the excavation vertically to 12 ft bgs, or 6.5 ft above MSL if necessary. Assuming an average excavation depth of 10 to 12 ft bgs over a width of 71 ft and length of 171 ft, the volume of material to be removed ranges between 4,500 to 5,400 cubic yards in place.

2.4.2 Remedial Excavation Sequence

The excavation will be performed in two phases. During Phase I, the tracks will be temporarily relocated to the north, while the southern portion of the excavation area is excavated and backfilled. Staging for all excavation activities during Phase I will be located on the National

Grid property located south of the LIRR property, and west of North Clinton Avenue (Figure 2). After the Phase I excavation is completed and backfilled, the mainline tracks will be reconstructed to their original orientation to begin Phase II of the excavation on the LIRR ROW. Staging for the second phase of the excavation will be on the Brightwaters Yard property north of the LIRR ROW. The extent of each of the excavation phases is illustrated in Figure 3 and in the Final Design Submittal.

The northern and southern excavation areas are further segregated into cells. Each cell will be excavated and backfilled prior to proceeding to the next cell to control odors and to limit the potential for recontamination of clean areas via contact with adjacent areas to be excavated. The Phase I excavation area is divided into 7 cells (Cell 1 through Cell 7) and the Phase II excavation area is divided into 4 cells (Cell 8 through Cell 11), as illustrated in the Final Design Submittal.

The basic remedial excavation approach will proceed with the following construction sequence:

1.) Relocate track north towards National Grid property (Brightwaters Yard)
2.) Install sheeting for Phase I excavation support
3.) Excavate contaminated soil and backfill each cell
4.) Cut the top of the sheeting and backfill to LIRR specifications
5.) Replace track to original ROW
6.) Install sheeting for Phase II excavation support
7.) Excavate contaminated soil and backfill each cell

Excavations will proceed once appropriate track relocations are complete and the TFS and VMS are constructed and operational. Soil excavated from the unsaturated zone above the groundwater elevation will be removed from the excavation area with a standard excavator and placed into a lined transport vehicle. Materials will be transferred from the excavation to the TFS within lined trucks to prevent any discharge to surface. Soil excavated from the saturated zone will be allowed to briefly drain back into the excavation until suitable for transport in lined vehicles to the TFS. Within the TFS, drier soils, lime kiln dust, cement kiln dust, and/or other NYSDEC-approved drying agent may be used to mix with or amend the wet soils until soils meet the disposal facility parameters for moisture content. An adequate supply of drying agent will be maintained on site throughout excavation activities. Drying agents will be delivered to the Site and stored inside the TFS or staged outside and covered with polyethylene sheeting.

If source material is visually observed to extend vertically beyond the excavation boundary of 10 ft bgs (8.5 ft above MSL) National Grid and NYSDEC will be notified. National Grid and the on-site NYSDEC representative will make the final determination as to whether or not encountered material constitutes source material that requires removal.

2.5 Backfilling and Compaction

As previously described, backfilling and compaction activities will be done immediately following the excavation of each individual cell as depicted in the Final Design Submittal. Backfilling cell by cell will help to minimize the amount of time an excavated area remains open and to maintain level surfaces for movement of vehicles throughout the IRM. Backfill material, consisting of NYSDEC- and LIRR-approved materials, will be placed to within 2 feet of final grade. Self compacting, stone backfill will be used below the groundwater table elevation. Backfill to grade will be placed according to the Final Design Submittal.

2.5.1 Vibration and Noise Monitoring

A vibration and noise monitoring plan is being prepared and submitted under separate cover.

2.6 Survey

Following completion of the specific IRM activities, a New York State Licensed Land Surveyor will survey the sheeting walls and final grades. All locations and elevations will be tied to the New York State Plane Coordinate System (NAD 83 NGVD 88). The railroad tracks will be surveyed according to the Final Design Submittal presented under separate cover.

2.7 Site Restoration

Site restoration activities outside of the required specifications for the LIRR ROW restorations, as detailed in the Final Design Submittal, will consist of the restoring fencing between the LIRR ROW and National Grid properties, removing all exclusion zone features and returning the area to the original grade.

3. Air Monitoring and Vapor/Odor/Particulate Management Plan

In accordance with NYSDEC and NYSDOH requirements, a Community Air Monitoring Plan (CAMP) will be implemented at the Site during each phase of the excavation activities. The objective of the CAMP is to provide a measure of protection for the downwind community (i.e., off-site receptors, including residences and businesses and on-site workers not involved with site IRM activities) from potential airborne contaminant releases as a direct result of intrusive IRM activities. Air monitoring stations will be placed up-wind and down-wind of each intrusive work area (i.e., boring locations for well installations). Volatile organic compounds (VOCs) and respirable particulates (PM-10) will be monitored at the up-wind and downwind stations on a continuous basis. In addition to the fixed stations, VOCs and particulates will be monitored in the work zone using hand held equipment. VOCs and particulates will also be monitored around the perimeter of the work zone on a regular basis (hourly) by the GEI air monitoring personnel.

Odor will be primarily controlled by sequencing excavation in a manner that will result in manageable areas of open excavation (e.g. excavating and backfilling cell by cell). However, in anticipation that excavating the material from the beneath the LIRR ROW will generate odor potentially hazardous and offensive to the surrounding community, the selected Contractor will mitigate such conditions by utilizing odor suppressant methods. This may include tarps and/or chemical foam, (e.g., Rusmar™ foam) or other National Grid-approved method. The selected Contractor will keep sufficient odor suppressant materials on site to suppress heavy odors from the excavation. The material will be stored near the excavation and will be easily mobile in case of need. The CAMP is provided in Appendix C.

3.1 Fugitive Dust Control

In anticipation that excavating the material from the beneath the LIRR ROW will generate fugitive dust potentially hazardous and offensive to the surrounding community, construction activities will be performed so as to limit the potential for fugitive dust emissions. Dust control measures will be implemented to minimize the potential for dust generation during soil excavation and handling, and placement of fill. Dust control measures will include water spraying, and/or suppressant foams. Furthermore, all material mixing or amendments made to excavated material to meet disposal requirements will be conducted within a TFS prior to loading for off-site disposal. In addition, the selected Contractor will provide materials to act as a dust suppressant. This may include tarps and/or water, or chemical foam, (e.g., Rusmar™ foam) or other National Grid-approved method. The selected Contractor will keep sufficient

dust suppressant materials on site to suppress fugitive dust from the excavation. The material will be stored near the excavation and will be easily mobile in case of need.

Heavily traveled truck routes within the exclusion zone and support zones will be wet down to minimize dust emissions. These truck routes will be continuously monitored for excessive dirt or dust. Proper cleaning of trucks exiting the exclusion zone will aid in minimizing/eliminating dusty conditions on site. A decontamination pad large enough to accommodate equipment and truck traffic will be constructed at exit points to clean tires of transport trucks exiting the Site.

Truck routes within the exclusion zone will be inspected continuously during high truck traffic periods for excessive dirt or dust. Proper cleaning of trucks exiting the exclusion zone will eliminate dusty conditions on adjacent roadways. Transport trucks exiting the exclusion zone will pass through an inspection area and/or be inspected to ensure tires and undercarriages are clean and that tarps are secured. Excessive mud and loose dirt observed on the trucks will be manually removed with brooms and brushes as necessary.

Dust monitoring will take place in accordance with the CAMP and HASP, provided in Appendix C.

3.2 Monitoring

3.2.1 Air Monitoring

The NYSDOH CAMP requires that during construction/excavation at contaminated sites, real-time monitoring for total volatile organic compounds (TVOCs) and particulates (i.e., dust) be conducted at the downwind perimeter of each designated work area. As such, the CAMP established for this Site describes the proposed air monitoring means and methods that will be implemented during the intrusive remedial construction work. The following summarizes the overall objectives and procedures contained within the CAMP. The detailed CAMP is provided in Appendix C.

As part of the pre-mobilization activities, the CAMP monitoring locations will be designated to accommodate sufficient monitoring during both Phase I and Phase II excavation activities. Monitoring locations will be established per NYSDEC and NYSDOH approval. Once the Phase I excavation activities are completed, the CAMP monitors will be relocated to approved locations for the Phase II excavation activities. All the locations will be located in accordance with the CAMP.

4. Site Security Plan

The objectives of the Site Security Plan at the Site are to prevent the vandalism/destruction of construction and equipment and to minimize health and safety concerns for the surrounding residential neighborhood.

4.1 Perimeter Security

The selected Contractor will erect a temporary fence around the perimeter of the IRM work area. At a minimum, this will consist of temporary construction fencing and barriers surrounding all work areas to include waste handling equipment, storage areas, excavation areas, and construction equipment. The fence will be secured at the end of each working day.

4.2 Equipment Security

All vehicles and/or equipment left in the work area must be secured at the end of each working day. In addition, vehicles and equipment must remain in a secured location overnight or during non-work days. No vehicles or equipment may be left overnight in an unsecured location. It is the responsibility of the selected Contractor to ensure that all non-essential equipment is de-energized when left on site and not in use to prevent electrical/fire/explosive hazards. No equipment will run overnight and/or on non-working days.

The selected Contractor will make every effort to minimize the storage of equipment or materials in areas others than OU-3.

4.3 Overnight Security

Overnight security measures will be provided by National Grid.

5. Decontamination Plan

The objectives of the Decontamination Plan at the Site are to provide the procedures and equipment necessary to decontaminate personnel and equipment to prevent cross-contamination from the excavation area to public areas (i.e., highways, roads, support trailer, vehicles, etc.). This plan does not replace the decontamination procedures outlined in the HASP (Appendix D). This plan provides additional guidelines on decontamination locations, necessary equipment, and procedures.

Primarily, the Site will be divided into three primary zones: the exclusion zone (EZ), the contamination reduction zone (CRZ), and the support zone (SZ) during the implementation of remedial activities. These locations are detailed in the Final Design Submittal and will be further defined in the field based on work activities being conducted in an individual area as well as the results of air monitoring activities.

5.1 Decontamination Procedures

The selected Contractor will establish decontamination areas for the following activities.

- Personnel decontamination
- Equipment decontamination

5.1.1 On-Site Personnel Decontamination

Personnel field decontamination/cleanup will take place at the exit of the established EZs in CRZs. If possible, these field decontamination facilities will be located upwind of the EZs.

Once removed, disposable PPE will be collected at the field decontamination site in a drum or large plastic bag. The drum or plastic bag will be secured to prevent the accidental spread of contamination. Disposable PPE that has been worn in an EZ will be removed and placed in the disposal container before leaving the CRZ. Additional details for personnel decontamination are presented in the HASP contained in Appendix C.

The designated personnel field decontamination area will be equipped with basins for water and detergent, and drums or trash bags for containing disposable PPE and discarded materials. Once personnel have decontaminated at this station and taken off their PPE, they will proceed to a final basin where they will wash themselves as a secondary means of personal hygiene (e.g., hands, face, etc.).

The specific decontamination procedures and requirements for the disposal of decontamination wastewater are outlined in the HASP (Appendix C) and the Waste Management Plan discussed in a subsequent section.

5.1.2 Equipment Decontamination

Equipment decontamination will take place on a decontamination pad that will, at a minimum, be a plastic lined, bermed, wastewater collection sump. Decontamination activities shall include the removal of contaminated soil, debris and other miscellaneous materials from all construction equipment and tools utilized within the EZ using a high-pressure, low volume cleaner. In addition, physical/mechanical agitation (scraping with hand tools) of soil may be utilized during winter months to prevent freezing and icy conditions.

The decontamination pad will be constructed to adequately facilitate decontamination of the largest mobile construction equipment and to withstand the anticipated traffic loads throughout the duration of the project. The decontamination pad will be located and constructed as detailed in the Final Design Submittal.

Drilling equipment, hand tools, and miscellaneous small equipment that come in contact with excavated soils or impacted groundwater will be decontaminated on the decontamination pad in buckets of water and detergent.

Any generated wastes will be containerized and transported at the end of each workday to a designated area for bulk storage until characterization and ultimate disposal.

Within the CRZ, the selected Contractor will clean equipment in accordance with the HASP. Water for decontamination will need to be staged at the Site in close vicinity to the decontamination area. The decontamination pad will be sufficiently sized to ensure that the largest piece of selected Contractor equipment can be adequately decontaminated. Provisions will be made to control overspray at the decontamination pad.

All equipment leaving OU-3 will be decontaminated per these guidelines. In addition, any equipment previously utilized to excavate impacted material will be decontaminated prior to use in backfilling (e.g., excavator bucket).

Wastewaters produced during decontamination will be collected from the decontamination pad and placed into United States Department of Transportation/United Nations (USDOT/UN)-approved drums, labeled and stored at the established waste storage area at the Site or transferred to an on-site frac tank. The wastewaters will be characterized and properly disposed of by National Grid. Disposal of the wastewater will be handled in accordance with the Waste Management Plan.

Soils collected from the decontamination pads will be bulked with the excavated material and disposed of in accordance with the Waste Management Plan.

5.1.3 Material Transport Vehicle Decontamination

Trucks transporting soil off-site for ultimate disposal will enter OU-3 or the National Grid property south of the LIRR property west of North Clinton Avenue at the primary ingress/egress locations as depicted in the Final Design Submittal. Care will be exercised when loading trucks not to spill material on the outside of the trucks. Before exiting the Site, the selected Contractor will stage the trucks on the equipment decontamination pad. Trucks will then be visually inspected (i.e., box sidewalls, box tailgate, and tires, etc.) and decontaminated as necessary prior to being allowed to leave the Site. In addition, the loads in the transport trucks will be required to be covered in tarp prior to departing the EZ. All soil and decontamination fluids will be collected and managed in accordance with the Waste Management Plan.

5.2 Decontamination Equipment

The selected Contractor will be responsible for maintaining a sufficient supply of equipment required to implement decontamination procedures.

6. Waste Management Plan

During the implementation of remedial construction activities, the selected Contractor will be required to coordinate and manage transportation and disposal of generated wastes to National Grid-approved disposal facilities. Remediation derived waste (RDW) generated during remedial activities may include excavated impacted soils, containerized and absorbed non-aqueous phase liquid (NAPL), rinse-waters from decontamination procedures, spent PPE, incidental water generated during site activities, spent carbon associated with the vapor management system and miscellaneous refuse.

Solid, liquid, and hazardous waste treatment/disposal facilities will be approved by National Grid prior to use. Disposal facilities are reviewed by National Grid for permitting and licensing requirements, licenses and regulatory enforcement status. Only National Grid-approved disposal facilities will be used.

6.1 Disposal Record Keeping

A Manifest Form will accompany each load and will be signed by an approved agent for National Grid and the truck driver before the material leaves the Site; and by a representative of disposal facility when the load is received. A copy of the signed Manifest will be maintained on file in the selected Contractor administrative trailer by the Engineer (GEI). Upon arrival at the disposal facility, the Manifest will be signed and a copy returned to the Engineer, complete with all applicable signatures as proof of delivery. The returned manifests will be cross checked and matched with the original copy of the manifest already on file.

Upon completion of the IRM, National Grid will receive all logs and manifests and/or bills of lading. The logs, manifests, and bills of lading will be included in the IRM Report following completion of the IRM to create a permanent record of disposal.

6.2 Material Shipping Procedures

Waste transporters, properly permitted by the NYSDEC, will be utilized to ship the impacted soils to approved disposal facilities. The selected Contractor will manage all disposal documentation including, but not limited to, all necessary manifests, bill-of-ladings, weight tickets, and certificates of treatment/destruction.

The selected Contractor will coordinate with the transport and disposal facilities to schedule an appropriate amount of transport trucks and to schedule deliveries of materials to the disposal facilities. Coordination with the disposal and transport facilities will be critical to accommodate

the sequence of proposed excavation activities. To eliminate the need for staging of trucks on local roadways, trucks will be scheduled in a manner that will minimize the amount of trucks waiting to be loaded. Trucks that are waiting to be loaded will be directed to the on-site staging area, or the support zone (SZ) as detailed in the Final Design Submittal.

Transport trucks will enter the Site and either be directed to the temporary storage facility in the exclusion zone (EZ) where they will be loaded or to the SZ. Upon entry to the Site, the trucks will be inspected to ensure the proper placards, decals and permits are displayed. While on–site, transport trucks will remain on designated haul routes. All loaded trucks leaving the EZ will follow the Decontamination Plan detailed in a subsequent section. Transport trucks will utilize the most direct hauling route between the Site and the disposal facility.

All material transportation vehicles leaving the Site must be tarped, watertight, have turnbuckles, and will be decontaminated in accordance with the Decontamination Plan prior to departing the EZ.

Individual waste streams will be handled as follows.

6.2.1 Non-Impacted Soils for Reuse

It is anticipated that most excavated material from the IRM area will be impacted and will not be suitable for reuse as backfill. However, any excavated soils suitable for reuse that are not used to backfill will be transported off site for disposal/landfill at a licensed facility capable of handling such material.

6.2.2 Impacted Soils and Bulky Waste

When impacted soils are encountered, the impacted soils will be excavated and processed accordingly, as discussed in previous sections. All processed materials will be transported to an approved thermal desorption facility for disposal.

6.2.3 Uncontaminated Bulky Waste

Uncontaminated bulky waste (i.e., asphalt pavement sections, concrete, and debris) will be separated, if possible, from impacted soil upon excavation, immediately placed in a roll-off container or temporarily placed on the OU-3 site for future loading, and transported for disposal as construction debris at an approved facility/landfill.

6.2.4 Decontamination Water and Impacted Groundwater

Contaminated liquids from decontamination of equipment and personnel will be containerized for off-site disposal.

It is not anticipated that impacted groundwater will be collected during this IRM. However, in the event that impacted groundwater is collected, it will be containerized for off-site disposal.

The selected Contractor will retain a licensed liquid waste hauler to remove impacted water and liquids from decontamination of equipment and personnel. The licensed liquid waste hauler will remove the liquids from the site and properly dispose of this material in accordance with all applicable federal, state, and local requirements.

6.3 Soil Disposal Characterization Analyses

Samples collected from MGP-impacted materials for disposal will be analyzed in accordance with the receiving facilities' guidelines and all Local, State and Federal laws.

7. Traffic Control Plan

The objectives of the Traffic Control Plan at the Site are to describe the traffic objectives and concerns and indicate the traffic routes to and from the site for trucking soil and bulky waste off site, importing clean fill to the site, liquid waste hauler off loading liquids if necessary, selected Contractor access, parking, equipment access, and storage.

Vehicles for hauling of contaminated soil, fill materials, and supplies shall enter Bay Shore from Sunrise Highway (RT 27) at the 5th Avenue (CR13) Exit. The vehicles shall follow 5th Avenue south to where it becomes Clinton Avenue and shall continue south on Clinton Avenue.

As depicted in the Final Design Submittal, vehicles shall make a right hand turn through the primary ingress/egress gates on Clinton Avenue to access the Bay Shore OU-3 Site or the National Grid property south of the LIRR property for equipment storage, laydown, etc. Vehicles exiting the Bay Shore OU-3 Site or the National Grid property south of the LIRR property will exit via the same gates and make a right turn onto Clinton Avenue. Vehicles will continue on Clinton Avenue to the intersection of Clinton Avenue and Union Boulevard. Vehicles shall make a left turn onto Union Boulevard followed by a left turn onto 5th Avenue. Vehicles shall then retrace the site entry route to exit Bay Shore.

The selected Contractor shall provide traffic control personnel when all trucks are exiting onto Clinton Avenue. Traffic control personnel shall also direct traffic as needed upon delivery of equipment, trailers, excavation support materials, the temporary enclosure, etc.

8. IRM Implementation Schedule

The construction sequence will be as follows, with two planned LIRR outages. The start dates for each task are provided below:

1.) Relocate track towards National Grid property (Brightwaters Yard) (10/17/2009)
2.) Install sheeting for Phase I excavation support (11/12/09)
3.) Excavate contaminated soil and backfill each cell (12/29/09)
4.) Modify the top of the sheeting and backfill to LIRR specifications (2/17/10)
5.) Replace track to original ROW (4/23/10)
6.) Install sheeting for Phase II excavation support (4/27/10)
7.) Excavate contaminated soil and backfill each cell (5/17/10)

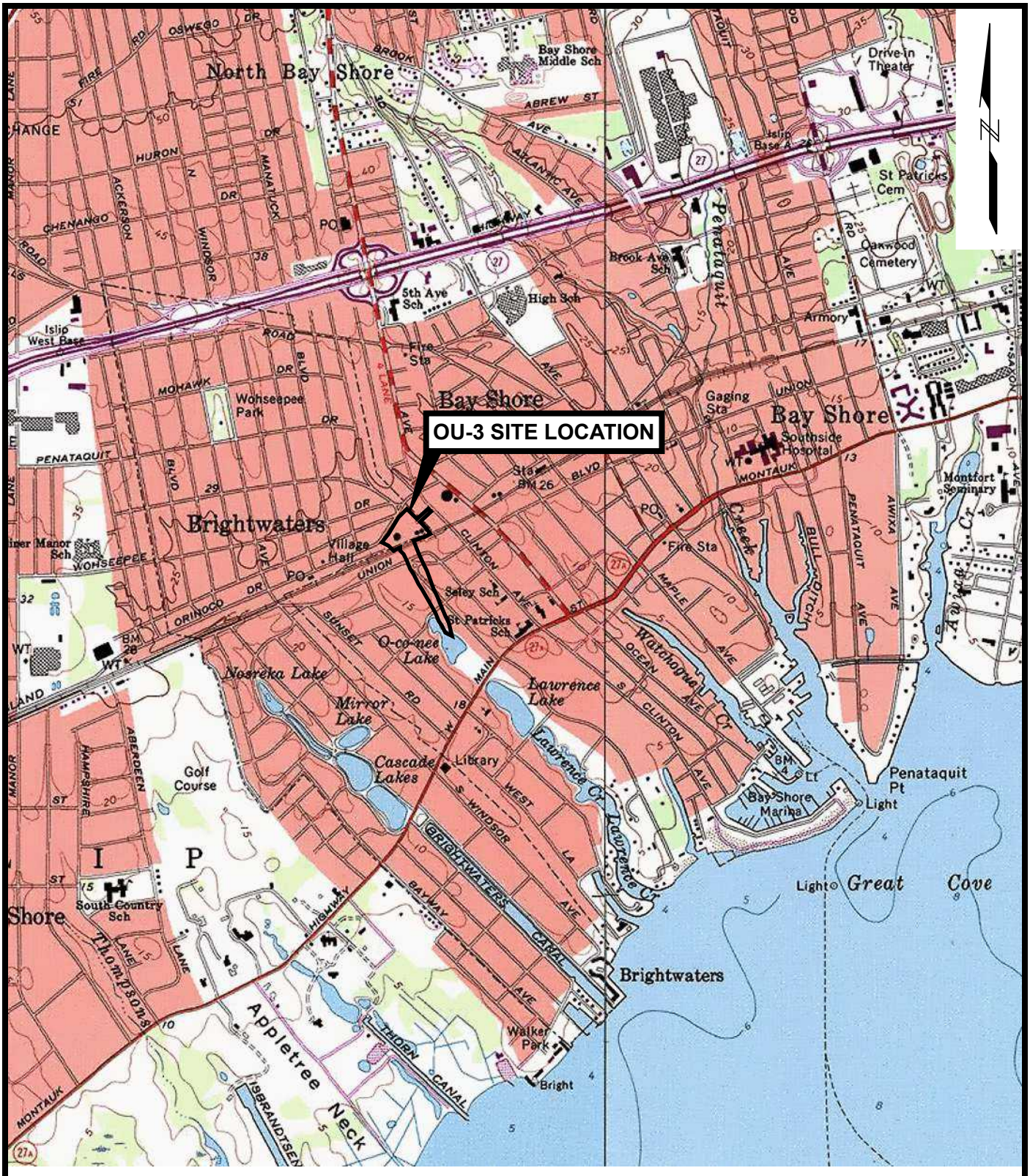
The estimated time required for the temporary track to be in service is 6 months. LIRR outages will be accommodated by bus service supplied by National Grid and coordinated with LIRR. The project schedule for implementation of the IRM activities is presented in Appendix D. The schedule may be affected by regulatory review time periods, selected Contractor response timeframes, timeframes necessary to negotiate community issues, permit review and approval timeframes, train schedules, or other unknown factors.

9. IRM Summary Report Preparation

Following completion of the construction phase of the IRM, an IRM Construction Summary Report will be prepared and stamped by an engineer licensed to practice in the State of New York. The IRM Summary Report will include a summary of IRM activities, document any changes to the work plan, document the final disposal of wastes, and contain a statement that the work was performed in accordance with the IRM Work Plan, contract drawings, specifications, and any approved changes to those documents. Specific components of the IRM Construction Summary Report will include:

- Record drawings, specifications, addenda, and approved changes
- The actual volumes of excavated material and treated/discharged wastewater
- Other plans and figures (if required), photographs, cross sections, data summary tables and appendices that will provide an accurate accounting of the remedial measures implemented at the site
- Approval documents from NYSDEC

Figures



SOURCE: Map created with TOPO! ® ©2001 National Geographic (www.nationalgeographic.com/topo)

0 2000 4000

SCALE, FEET

BAY SHORE/BRIGHTWATERS
FORMER MGP SITE
BAY SHORE, NEW YORK

nationalgrid

GEI Consultants

Project 061140-11-2003

SITE LOCATION MAP

July 2009

Figure 1

NATIONAL GRID\BAY SHORE\OU-3\RR DESIGN\FIGS\BAY SHORE-LOCATION.CDR

SOURCES:

1. DRAWING TITLED "BOUNDARY AND TOPOGRAPHIC SURVEY, PORTION OF SEC. 006, BLOCK 1 SUFFOLK COUNTY, NEW YORK" PREPARED BY KS ENGINEERS, P.C., 24 COMMERCE STREET, NEWARK, N.J. 07102 DATED 5/31/09.
2. MAP TITLED "LOCATION OF VARIES WELLS , BORINGS AND SAMPLES SITUATED AT BRIGHTWATERS PROPERTY, SUFFOLK COUNTY , NEW YORK" PREPARED BY NATIONALGRID ENGINEERING & SURVEY, INC., SURVEY DIVISION, HICKSVILLE, NEW YORK, SCALE 1"=50' DATED 4/21/09.

LEGEND:

- EXISTING BUILDING
- SURVEYED PROPERTY LINE
- APPROXIMATE PROPERTY LINE
- FENCE
- EDGE OF GRAVEL/PAVEMENT
- OVERHEAD ELECTRIC LINE
- EXISTING GROUND SURFACE CONTOUR (FT)
- EXISTING RAILROAD RAIL
- RAILROAD TIE
- BOLLARD
- BOX ELECTRICAL/POWER
- CATCH BASIN (RECTANGLE)
- CATCH BASIN (ROUND)
- FIRE HYDRANT
- MANHOLE DRAINAGE
- MANHOLE ELECTRICAL
- MANHOLE GAS
- MANHOLE SEWER
- MANHOLE TELEPHONE
- MANHOLE UNKNOWN
- MANHOLE WATER
- LIGHT POLE
- UTILITY POLE
- VALVE UNKNOWN
- VALVE WATER
- METER WATER
- POST
- RAIL ROAD GATE
- SIGN W/1 BOARD
- TREE DECIDUOUS
- OXYGEN INJECTION POINT (TO BE ABANDONED BY OTHERS)
- MW-04 MONITORING WELL
- MW-59 MONITORING WELL TO BE ABANDONED BY OTHERS

0 60 120

SCALE, FEET

BAY SHORE/BRIGHTWATERS
FORMER MGP SITE
BAY SHORE, NEW YORK

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EXISTING CONDITIONS

Project 061140-11-2003 | July 2009 | Figure 2

I:\GEI\National Grid\Bay Shore\OU-3\RR DESIGN\ BAY SHORE OU-3 RR Plan Sheets.dwg \Jul 16, 2009

LEGEND:

- OU3HSB-01 — HORIZONTAL BORING LOCATION PERFORMED AT AN ANGLE OF APPROXIMATELY 20-DEGREES FROM HORIZONTAL COMPLETED JUNE 2008
- GVZ-42 — PREVIOUS BORING LOCATIONS
- OU3SB-05 — BORINGS COMPLETED IN MAY 2007
- OU3GSB-01 — GEOTECHNICAL SOIL BORINGS COMPLETED IN FEBRUARY 2009
- OU3SB-03 — SOIL BORINGS COMPLETED IN MARCH 2009
- EXISTING RAILROAD RAIL
- RAILROAD TIE
- TEMPORARY RAILROAD RAIL
- FENCE
- APPROXIMATE EXTENT OF PHASE I EXCAVATION
- APPROXIMATE EXTENT OF PHASE II EXCAVATION

SOURCES:

1. MAP TITLED "BAY SHORE/BRIGHTWATERS, FORMER MGP SITE FINAL REMEDIAL INVESTIGATION, BAY SHORE, NEW YORK, OFF-SITE SAMPLE LOCATION MAP" DATED: SEPT. 2002 BY DVIRKA AND BARTILUCCI.
2. FIGURE 2, GROUNDWATER MONITORING WELL AND SURFACE WATER GAUGING STATION LOCATION MAP, BAY SHORE/BRIGHTWATERS FORMER MGP SITE, SCALE: 1"=200', DATED JANUARY 2004, PREPARED BY VANASSE HANGEN BRUSTLIN, INC., MIDDLETOWN, CONNECTICUT.
3. DRAWING C-1, OFF-SITE SAMPLE LOCATION MAP, BAY SHORE/BRIGHTWATERS FINAL REMEDIAL INVESTIGATION, SCALE: 1"=200', DATED OCTOBER 15, 2003, PREPARED BY VANASSE HANGEN BRUSTLIN, INC., MIDDLETOWN, CONNECTICUT.
4. FIGURE 4, PHASE II SUPPLEMENTAL IRM ACTIVITIES, DATED DEC. 2004, PREPARED BY PS&S ENGINEERING, PC.
5. TEMPORARY TRACK ALIGNMENT PREPARED BY STV GROUP, INC.
6. DRAWING TITLED "BOUNDARY AND TOPOGRAPHIC SURVEY, PORTION OF SEC. 006, BLOCK 1 SUFFOLK COUNTY, NEW YORK" PREPARED BY KS ENGINEERS, P.C., 24 COMMERCE STREET, NEWARK, N.J. 07102 DATED 5/31/09.

EXCAVATION LOCATION

0 20 40

SCALE, FEET

BAY SHORE/BRIGHTWATERS
FORMER MGP SITE
BAY SHORE, NEW YORK

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EXTENT OF EXCAVATION

Project 061140-11-2003 | July 2009 | Figure 3

I:\GEI\National Grid\Bay Shore\OU-3\RR DESIGN\ BAY SHORE OU-3 RR Plan Sheets.dwg \Jul 16, 2009

Appendix A

Soil Boring Data

TAR STAINING, SHEEN, AND
TAR/NAPHTHA ODORS

BLEBS, GLOBS, LENSES,
COATINGS AND TAR/NAPTHA ODORS

BAY SHORE/BRIGHTWATERS FORMER MGP SITE
BAY SHORE, NEW YORK

nationalgrid

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VISUAL IMPACTS

Project 061140-11-2002

July 2008

I:\GEI\National Grid\Bay Shore\ Bay-RR Colors.dwg \Jul 22, 2008

GEI Consultants, Inc.
455 Winding Brook Road
Glastonbury, CT 06033
(860) 368-5300

CLIENT: National Grid
PROJECT NAME: OU-3 LIRR HSBs
CITY/STATE: Bay Shore/Brightwaters, NY
GEI PROJECT NUMBER: 061140-11-2002

BORING LOG
PAGE 1 of 1
OU3HSB-01

GROUND SURFACE ELEVATION (FT): 18.53 **LOCATION:** Brightwaters
NORTHING: 203218.767 **EASTING:** 1189276.672 **TOTAL DEPTH (FT):** 13.68
DRILLED BY: Boart Longyear / Craig Marsh **DATUM VERT. / HORZ.:** NAVD 88 / NAD 83
LOGGED BY: Chris Scharkopf **DATE START / END:** 6/2/2008 - 6/2/2008
DRILLING DETAILS: Sonic Coring / Cored at 20 degree angle from the horizontal from north to south under LIRR / Core Size: 4 in.
WATER LEVEL DEPTHS (FT):

DEPTH FT.	SAMPLE INFO TYPE and NO.	PEN FT.	REC IN.	PID (ppm)	STRATA	ODOR	ANALYZED SAMPLE ID	SOIL / BEDROCK DESCRIPTION
0	S-1	3.4	90	0				0 - 0.76 ORGANIC SOIL (OL); ~50% fines, ~25% gravel, fine to coarse, ~25% sand, fine to coarse; wet, dark brown, FILL, roots, plastic, loose.
				0				0.76 - 1.94 SILTY SAND WITH GRAVEL (SM); ~60% sand, fine to coarse, ~25% fines, ~15% gravel, fine to coarse; wet, brown, loose.
				0				1.94 - 3.42 SILTY SAND (SM); ~50% sand, fine to coarse, ~40% fines, ~10% gravel, fine to coarse; wet, brown, dense.
5	S-2	3.4	120				OU3HSB-1 (4.23-4.35)-C	3.42 - 3.85 SILTY SAND (SM); ~50% sand, fine to coarse, ~40% fines, ~10% gravel, fine to coarse; wet, gray, dense. 3.85 - 6.84 PEAT (PT); ~35% fines, medium plasticity, ~5% sand, fine to coarse; ~60% peat, wet, dark brown, roots, vegetation, soft, slight to moderate organic-like odor.
	S-3	3.4	120	981			OU3HSB-1 (6.64-6.76)-C OU3HSB-1 (7.13-7.25)-C	6.84 - 7.75 SILTY SAND WITH GRAVEL (SM); ~65% sand, fine to coarse, ~20% gravel, fine to coarse, ~15% fines; wet, brown, loose, moderate to slight organic-like odor.
				26				7.75 - 8.55 WIDELY GRADED SAND WITH SILT AND GRAVEL (SW-SM); ~70% sand, fine to coarse, ~20% gravel, fine to coarse, ~10% fines; wet, gray and tan, loose. 8.55 - 10.26 WIDELY GRADED SAND WITH SILT AND GRAVEL (SW-SM); ~70% sand, fine to coarse, ~20% gravel, fine to coarse, ~10% fines; wet, gray and tan, loose.
10	S-4	3.4	104	1.7				10.26 - 13.68 WIDELY GRADED SAND WITH SILT AND GRAVEL (SW-SM); ~70% sand, fine to coarse, ~20% gravel, fine to coarse, ~10% fines; wet, light brown and tan, loose.
				1.1				Bottom of borehole at 13.68 feet.

NOTES:

PEN = PENETRATION LENGTH OF SAMPLER OR CORE BARREL
REC = RECOVERY LENGTH OF SAMPLE
PID = PHOTOIONIZATION DETECTOR READING (JAR HEADSPACE)
ppm = PARTS PER MILLION
IN. = INCHES
FT. = FEET
NLO = NAPHTHALENE LIKE ODOR
PLO = PETROLEUM LIKE ODOR
TLO = TAR LIKE ODOR
CLO = CHEMICAL LIKE ODOR
ALO = ASPHALT LIKE ODOR
CrLO= CREOSOTE LIKE ODOR
OLO = ORGANIC LIKE ODOR
SLO = SULFUR LIKE ODOR
MLO = MUSTY LIKE ODOR

ENVIRONMENTAL BORING LOG LIRR HSBS.GPJ GEI CONSULTANTS.GDT 7/18/08

GEI Consultants, Inc.
455 Winding Brook Road
Glastonbury, CT 06033
(860) 368-5300

CLIENT: National Grid
PROJECT NAME: OU-3 LIRR HSBs
CITY/STATE: Bay Shore/Brightwaters, NY
GEI PROJECT NUMBER: 061140-11-2002

BORING LOG
PAGE 1 of 1
OU3HSB-02

GROUND SURFACE ELEVATION (FT): 18.75 **LOCATION:** Brightwaters
NORTHING: 203236.321 **EASTING:** 1189317.234 **TOTAL DEPTH (FT):** 13.68
DRILLED BY: Boart Longyear / Craig Marsh **DATUM VERT. / HORZ.:** NAVD 88 / NAD 83
LOGGED BY: Chris Scharkopf **DATE START / END:** 5/30/2008 - 5/30/2008
DRILLING DETAILS: Sonic Coring / Cored at 20 degree angle from the horizontal from north to south under LIRR / Core Size: 4 in.
WATER LEVEL DEPTHS (FT): ▽ 6.50 5/30/2008

DEPTH FT.	SAMPLE INFO TYPE and NO.	PEN FT.	REC IN.	PID (ppm)	STRATA	VISUAL IMPACTS	ODOR	ANALYZED SAMPLE ID	SOIL / BEDROCK DESCRIPTION
0	S-1	3.4	78	0.2 0.1 0.2					0 - 1.18 ORGANIC SOIL (OL); ~50% fines, ~25% gravel, fine to coarse, ~25% sand, fine to coarse; wet, dark brown, FILL, roots, plastic. 1.18 - 3.42 SILTY SAND WITH GRAVEL (SM); ~45% sand, fine to coarse, ~40% fines, ~25% gravel, fine to coarse; wet, brown, dense.
	S-2	3.4	84	38.4					3.42 - 4.56 SILTY SAND WITH GRAVEL (SM); ~65% sand, fine to coarse, ~20% gravel, fine to coarse, ~15% fines; wet, tan with gray, medium dense.
5								OU3HSB-2 (4.64-5.31)-G OU3HSB-2 (5.45-5.62)-C	4.56 - 6.84 PEAT (PT); high plasticity, ~10% sand, fine to coarse; ~50% peat, wet, dark brown, soft.
▽				<9999					
	S-3	3.4	120	1680				OU3HSB-2 (7.27-7.48)-C	6.84 - 7.67 WIDELY GRADED SAND WITH SILT AND GRAVEL (SW-SM); ~65% sand, fine to coarse, ~25% gravel, fine to coarse, ~10% fines; wet, brown, loose, sheen on water. 7.67 - 8.78 CLAYEY SAND WITH GRAVEL (SC); ~60% sand, fine to coarse, ~25% fines, ~15% gravel, fine to coarse; wet, brown with gray, medium dense, strong sewage-like odor. 8.78 - 10.26 SILTY SAND WITH GRAVEL (SM); ~70% sand, fine to coarse, ~15% gravel, fine to coarse, ~15% fines; wet, brown with gray, loose, strong sewage-like odor.
10				<9999					
	S-4	3.4	120	230					10.26 - 11.97 WIDELY GRADED SAND WITH SILT AND GRAVEL (SW-SM); ~70% sand, fine to coarse, ~20% gravel, fine to coarse, ~10% fines; wet, tannish gray, loose, moderate sewage-like odor. 11.97 - 13.68 WIDELY GRADED SAND WITH SILT AND GRAVEL (SW-SM); ~70% sand, fine to coarse, ~20% gravel, fine to coarse, ~10% fines; wet, tannish gray, loose.
				19					Bottom of borehole at 13.68 feet.

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CLO = CHEMICAL LIKE ODOR
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SLO = SULFUR LIKE ODOR
MLO = MUSTY LIKE ODOR

ENVIRONMENTAL BORING LOG LIRR HSBS.GPJ GEI CONSULTANTS.GDT 7/18/08

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CLIENT: National Grid
PROJECT NAME: OU-3 LIRR HSBs
CITY/STATE: Bay Shore/Brightwaters, NY
GEI PROJECT NUMBER: 061140-11-2002

BORING LOG
PAGE 1 of 1
OU3HSB-03

GROUND SURFACE ELEVATION (FT): 18.64 **LOCATION:** Brightwaters
NORTHING: 203257.084 **EASTING:** 1189356.15 **TOTAL DEPTH (FT):** 13.68
DRILLED BY: Boart Longyear / Craig Marsh **DATUM VERT. / HORZ.:** NAVD 88 / NAD 83
LOGGED BY: Chris Scharkopf **DATE START / END:** 5/29/2008 - 5/29/2008
DRILLING DETAILS: Sonic Coring / Cored at 20 degree angle from the horizontal from north to south under LIRR / Core Size: 4 in.
WATER LEVEL DEPTHS (FT):

DEPTH FT.	SAMPLE INFO: TYPE and NO.	PEN FT.	REC IN.	PID (ppm)	STRATA	VISUAL IMPACTS	ODOR	ANALYZED SAMPLE ID	SOIL / BEDROCK DESCRIPTION
0	S-1	3.4	120	0					0 - 1.23 ORGANIC SOIL (OL); ~50% fines, ~30% sand, fine to coarse, ~20% gravel, fine to coarse; wet, dark brown, FILL, loose.
				0					1.23 - 1.91 SILTY SAND WITH GRAVEL (SM); ~60% sand, fine to coarse, ~20% gravel, fine to coarse, ~20% fines; wet, brown, medium dense.
				0					1.91 - 3.42 SILTY SAND WITH GRAVEL (SM); ~50% sand, fine to coarse, ~35% fines, ~15% gravel, fine to coarse; wet, brown, medium dense.
	S-2	3.4	120						3.42 - 4.16 SILTY SAND WITH GRAVEL (SM); ~50% sand, fine to coarse, ~35% fines, ~15% gravel, fine to coarse; wet, brown with gray, medium dense.
5				456					4.16 - 6.84 PEAT (PT); ~10% sand, fine to coarse; ~90% peat, wet, dark brown, soft, moderate to strong organic-like odor.
				1938				OU3HSB-3 (5.89-6.17)-C	
	S-3	3.4	120	2988				OU3HSB-3 (7.01-7.19)-C	6.84 - 8.21 WIDELY GRADED SAND WITH SILT AND GRAVEL (SW-SM); ~65% sand, fine to coarse, ~25% gravel, fine to coarse, ~10% fines; wet, brown, loose, slight brown staining.
								OU3HSB-3 (8.03-8.35)-C	8.21 - 8.32 WIDELY GRADED SAND WITH SILT AND GRAVEL (SW-SM); ~65% sand, fine to coarse, ~25% gravel, fine to coarse, ~10% fines; wet, brown, loose, slight brown staining, NAPL coated grains.
10				3.7					8.32 - 9.03 WIDELY GRADED SAND WITH SILT AND GRAVEL (SW-SM); ~65% sand, fine to coarse, ~25% gravel, fine to coarse, ~10% fines; wet, brown, loose, slight brown staining.
	S-4	3.4	120						9.03 - 10.26 CLAYEY SAND WITH GRAVEL (SC); ~50% sand, fine to coarse, ~35% fines, ~15% gravel, fine to coarse; wet, gray with brown, medium dense.
									10.26 - 12.45 WIDELY GRADED SAND WITH SILT AND GRAVEL (SW-SM); ~75% sand, fine to coarse, ~15% gravel, fine to coarse, ~10% fines; wet, brown, loose.
									12.45 - 13.28 WIDELY GRADED SAND WITH SILT AND GRAVEL (SW-SM); ~75% sand, fine to coarse, ~15% gravel, fine to coarse, ~10% fines; wet, brown, loose.
									Bottom of borehole at 13.68 feet.

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ENVIRONMENTAL BORING LOG LIRR HSBS.GPJ GEI CONSULTANTS.GDT 7/18/08

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GEI PROJECT NUMBER: 061140-11-2002

BORING LOG
PAGE 1 of 1
OU3HSB-04

GROUND SURFACE ELEVATION (FT): 19.17 **LOCATION:** Brightwaters
NORTHING: 203276.95 **EASTING:** 1189397.841 **TOTAL DEPTH (FT):** 11.97
DRILLED BY: Boart Longyear / Craig Marsh **DATUM VERT. / HORZ.:** NAVD 88 / NAD 83
LOGGED BY: Chris Scharkopf **DATE START / END:** 5/29/2008 - 5/29/2008
DRILLING DETAILS: Sonic Coring / Cored at 20 degree angle from the horizontal from north to south under LIRR / Core Size: 4 in.
WATER LEVEL DEPTHS (FT): ▽ 6.50 5/29/2008

DEPTH FT.	SAMPLE INFO TYPE and NO.	PEN FT.	REC IN.	PID (ppm)	STRATA	VISUAL IMPACTS	ODOR	ANALYZED SAMPLE ID	SOIL / BEDROCK DESCRIPTION
0	S-1	3.4	120	0.2					0 - 0.88 ORGANIC SOIL (OL); ~50% fines, ~30% sand, fine to coarse, ~20% gravel, fine to coarse; wet, dark brown, FILL, wood, plastic, loose.
				0.0					0.88 - 2.31 SANDY SILT (ML); ~60% fines, ~30% sand, fine to coarse, ~10% gravel, fine to coarse; wet, brown, medium dense.
				0.0					2.31 - 3.42 WIDELY GRADED SAND WITH SILT AND GRAVEL (SW-SM); ~70% sand, fine to coarse, ~20% gravel, fine to coarse, ~10% fines; wet, tan and brown, loose.
	S-2	3.4	120	100				OU3HSB-4 (3.42-4.73)-G	3.42 - 5.07 PEAT (PT); ~10% gravel, fine to coarse, ~10% sand, fine to coarse; ~80% peat, wet, dark brown, soft.
5								OU3HSB-4 (4.02-4.26)-C	
				1468					5.07 - 6.84 SILTY SAND WITH GRAVEL (SM); ~60% sand, fine to coarse, ~20% gravel, fine to coarse, ~20% fines; wet, dark brown, loose, strong sweet chemical-like odor, slight sheen.
▽				1018				OU3HSB-4 (5.62-5.8)-C	
	S-3	3.4	120	65.2				OU3HSB-4 (7.13-7.36)-C	6.84 - 8.09 SILTY SAND WITH GRAVEL (SM); ~65% sand, fine to coarse, ~20% fines, ~15% gravel, fine to coarse; wet, dark brown with brown, loose.
				48					8.09 - 8.72 CLAYEY SAND WITH GRAVEL (SC); ~60% sand, fine to coarse, ~25% fines, ~15% gravel, fine to coarse; wet, brown with gray, medium dense.
10				336					8.72 - 10.26 SILTY SAND (SM); ~75% sand, fine to coarse, ~15% fines, ~10% gravel, fine to coarse; wet, brown, loose, brown staining, slight sheen.
	S-4	1.7	60	50.8					10.26 - 11.97 WIDELY GRADED SAND WITH SILT AND GRAVEL (SW-SM); ~75% sand, fine to coarse, ~15% gravel, fine to coarse, ~10% fines; wet, brown, loose, brown staining.
				457					Bottom of borehole at 11.97 feet.

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ENVIRONMENTAL BORING LOG LIRR HSBS.GPJ GEI CONSULTANTS.GDT 7/18/08

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GEI PROJECT NUMBER: 061140-11-2002

BORING LOG
PAGE 1 of 1
OU3HSB-05

GROUND SURFACE ELEVATION (FT): 19.29 **LOCATION:** Brightwaters
NORTHING: 203292.305 **EASTING:** 1189437.553 **TOTAL DEPTH (FT):** 11.97
DRILLED BY: Boart Longyear / Craig Marsh **DATUM VERT. / HORZ.:** NAVD 88 / NAD 83
LOGGED BY: John Schafer **DATE START / END:** 5/28/2008 - 5/28/2008
DRILLING DETAILS: Sonic Coring / Cored at 20 degree angle from the horizontal from north to south under LIRR / Core Size: 4 in.
WATER LEVEL DEPTHS (FT): ▽ 2.20 5/28/2008

DEPTH FT.	SAMPLE INFO TYPE and NO.	PEN FT.	REC IN.	STRATA	ANALYZED SAMPLE ID	SOIL / BEDROCK DESCRIPTION
0	S-1	3.4	84			0 - 1.34 SILTY SAND WITH GRAVEL (SM); fine to coarse sand, with silt, fine to coarse gravel, brown.
					OU3HSB-5 (1.37-1.71)-C	1.34 - 2.44 SILT (ML); silt, trace coarse gravel, wet, brown.
▽						2.44 - 2.69 SILTY GRAVEL (GM); crushed shale and slate, some silt, trace fine gravel, wet, black, possibly coal.
	S-2	3.4	120			2.69 - 3.42 POORLY GRADED GRAVEL (GP); crushed shale and slate, trace fine gravel, wet, black, possibly coal.
						3.42 - 4.45 WIDELY GRADED SAND WITH GRAVEL (SW); fine to coarse sand, with fine to coarse gravel, wet, tan to dark brown, wood from 3.94-4.29.
					OU3HSB-5 (4.45-5.13)-C	4.45 - 5.13 PEAT (PT); peat, moist, dark brown, soft, plastic, wood from 4.81-5.13, slight odor.
5						5.13 - 6.84 SILT WITH SAND (ML); silt, with fine to medium sand, trace fine to coarse gravel, wet, dark brown, cobbles 5.47-6.84'.
					OU3HSB-5 (6.16-6.84)-C	
	S-3	3.4	120			6.84 - 11.97 WIDELY GRADED SAND WITH GRAVEL (SW); fine to coarse sand, with fine to coarse gravel, trace cobbles, moist, dark brown.
10					OU3HSB-5 (9.57-10.26)-C	
	S-4	1.7	60			
						Bottom of borehole at 11.97 feet.

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ENVIRONMENTAL BORING LOG LIRR HSBS.GPJ GEI CONSULTANTS.GDT 7/18/08

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GEI PROJECT NUMBER: 061140-11-2002

BORING LOG
PAGE 1 of 1
OU3HSB-06

GROUND SURFACE ELEVATION (FT): 19.36 **LOCATION:** Brightwaters
NORTHING: 203313.427 **EASTING:** 1189482.599 **TOTAL DEPTH (FT):** 11.97
DRILLED BY: Boart Longyear / Craig Marsh **DATUM VERT. / HORZ.:** NAVD 88 / NAD 83
LOGGED BY: Chris Scharkopf **DATE START / END:** 5/22/2008 - 5/22/2008
DRILLING DETAILS: Sonic Coring / Cored at 20 degree angle from the horizontal from north to south under LIRR / Core Size: 4 in.
WATER LEVEL DEPTHS (FT):

DEPTH FT.	SAMPLE INFO: TYPE and NO.	PEN FT.	REC IN.	PID (ppm)	STRATA	ODOR	ANALYZED SAMPLE ID	SOIL / BEDROCK DESCRIPTION
0	S-1	3.4	120					0 - 0.5 SILTY GRAVEL WITH SAND (GM); ~70% gravel, fine to coarse, ~20% fines, ~10% sand, fine to coarse; max. size 1.5 in., moist, dark brown, FILL, roots, glass, loose. 0.5 - 2 SILTY SAND WITH GRAVEL (SM); ~70% sand, fine to coarse, ~15% gravel, fine to coarse, ~15% fines; max. size 4 in., moist, brown, FILL, roots, brick fragments. 2 - 3 WIDELY GRADED SAND WITH GRAVEL (SW); ~80% sand, medium to coarse, ~15% gravel, fine to coarse, ~5% fines; max. size 0.5 in., moist, brown, FILL, loose.
5	S-2	3.4	77	0.3 2.5			OU3HSB-6 (3.4-3.6)-C OU3HSB-6 (3.4-3.9)-G OU3HSB-6 (5-6.5)-C	3 - 3.3 WELL GRADED SAND (SW); ~85% sand, fine to coarse, ~10% gravel, fine to coarse, ~5% fines; max. size 1 in., moist, dark brown, FILL, brick, loose. 3.3 - 3.42 ORGANIC SOIL (OL); ~10% sand, fine to medium, ~5% gravel, fine; ~85% organics, max. size 0.5 in., wet, dark brown, soft. 3.42 - 3.97 PEAT (PT); ~75% fines, ~15% sand, fine to coarse, ~10% gravel, fine to coarse; wet, dark brown, roots, soft. 3.97 - 6.84 SILTY SAND (SM); ~60% sand, fine to coarse, ~30% fines, ~10% gravel, fine to coarse; wet, dark brown, loose.
10	S-3	3.4	110	0.2 2.9				6.84 - 10.26 WIDELY GRADED SAND WITH GRAVEL (SW); ~70% sand, fine to coarse, ~20% gravel, fine to coarse, ~10% fines; wet, brown, loose, lens of gray clay at 9.33' bgs.
	S-4	1.7	60	2.8			OU3HSB-6 (11.7-11.9)-C	10.26 - 11.13 SANDY LEAN CLAY (CL); ~75% fines, ~15% sand, fine to coarse, ~10% gravel, fine to coarse; wet, brown and dark gray, dense, slight musty-like odor. 11.13 - 11.97 SILTY SAND WITH GRAVEL (SM); ~70% sand, fine to coarse, ~15% gravel, fine to coarse, ~15% fines; wet, brown, loose. Bottom of borehole at 11.97 feet.

NOTES:

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ENVIRONMENTAL BORING LOG LIRR HSBS.GPJ GEI CONSULTANTS.GDT 7/18/08

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PROJECT NAME: OU-3 LIRR HSBs
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GEI PROJECT NUMBER: 061140-11-2002

BORING LOG
PAGE 1 of 1
OU3HSB-07

GROUND SURFACE ELEVATION (FT): 18.36 **LOCATION:** Brightwaters
NORTHING: 203207.368 **EASTING:** 1189245.702 **TOTAL DEPTH (FT):** 10.26
DRILLED BY: Boart Longyear / Craig Marsh **DATUM VERT. / HORZ.:** NAVD 88 / NAD 83
LOGGED BY: Chris Scharkopf **DATE START / END:** 6/2/2008 - 6/2/2008
DRILLING DETAILS: Sonic Coring / Cored at 20 degree angle from the horizontal from north to south under LIRR / Core Size: 4 in.
WATER LEVEL DEPTHS (FT):

DEPTH FT.	SAMPLE INFO: TYPE and NO.	PEN FT.	REC IN.	PID (ppm)	STRATA	VISUAL IMPACTS	ODOR	ANALYZED SAMPLE ID	SOIL / BEDROCK DESCRIPTION
0	S-1	3.4	120	0.5					0 - 0.94 ORGANIC SOIL (OL); ~50% fines, ~25% gravel, fine to coarse, ~25% sand, fine to coarse; wet, dark brown, FILL, leaves, plastic, loose.
				3.3					0.94 - 4.05 SILTY SAND WITH GRAVEL (SM); ~45% fines, ~30% sand, fine to coarse, ~15% gravel, fine to coarse; wet, brown with gray□□□gray, dense.
	S-2	3.4	108						
5								OU3HSB-7 (5.16-5.8)-G OU3HSB-7 (5.8-5.94)-C OU3HSB-7 (6.32-6.49)-C OU3HSB-7 (7.01-7.07)-C	4.05 - 6.84 PEAT (PT); ~90% fines, low plasticity, ~10% sand, fine to coarse; wet, dark brown, soft, slight to moderate organic-like odor.
	S-3	3.4	120	59.6					6.84 - 7.7 SILTY SAND WITH GRAVEL (SM); ~70% sand, fine to coarse, ~15% gravel, fine to coarse, ~15% fines; wet, light brown, loose, slight sheen on water.
10				1.6					7.7 - 10.26 WIDELY GRADED SAND WITH SILT AND GRAVEL (SW-SM); ~75% sand, fine to coarse, ~15% gravel, fine to coarse, ~10% fines; wet, light brown with gray□□□gray, loose.

Bottom of borehole at 10.26 feet.

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ENVIRONMENTAL BORING LOG LIRR HSBS.GPJ GEI CONSULTANTS.GDT 7/18/08

Appendix B

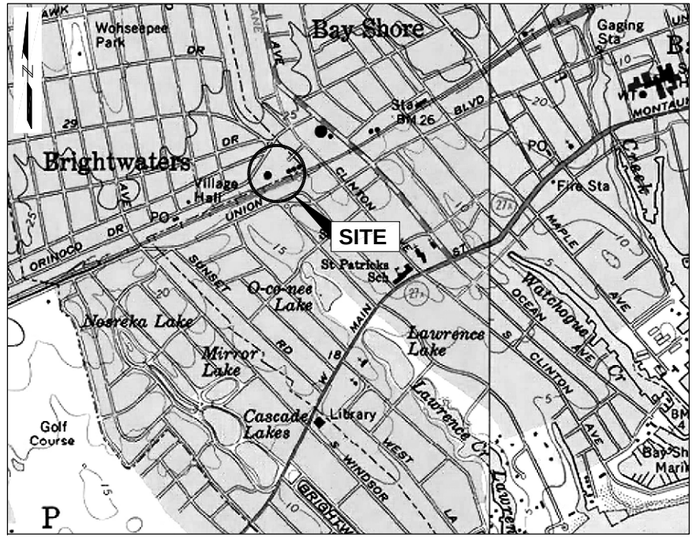
VOLUME I - Final Environmental Design Drawings

VOLUME II – Final Track Design Drawings

VOLUME I
INTERIM REMEDIAL MEASURE - BRIGHTWATERS/BAY SHORE
FORMER MGP SITE OPERABLE UNIT 3/
LONG ISLAND RAILROAD RIGHT-OF-WAY EXCAVATION
DESIGN PLAN - ENVIRONMENTAL

OPERABLE UNIT NO. 3
BAY SHORE/BRIGHTWATERS FORMER MANUFACTURED GAS PLANT SITE
BAY SHORE, NEW YORK

REV. NO.	DATE	DESCRIPTION	DES	DR	CH	APP
0	6/05/09	100% DRAFT FOR AGENCY REVIEW	MJL	SG	KS	DW
1	7/15/09	100% FINAL ISSUED FOR CONSTRUCTION	MJL	SG	TO	DW



SITE LOCATION

SCALE: 1" = 1000'

VOLUME I
SCHEDULE OF DRAWINGS

T-01	TITLE SHEET AND INDEX TO SHEETS
S-01	EXISTING CONDITIONS AND EXTENT OF EXCAVATION
S-02A	SITE PREPARATION AND EROSION AND SEDIMENT CONTROL PLAN FOR PHASE I
S-02B	SITE PREPARATION AND EROSION AND SEDIMENT CONTROL PLAN FOR PHASE II
S-03	EXCAVATION SUPPORT GENERAL NOTES AND CONSTRUCTION SEQUENCING
S-04	EXCAVATION SUPPORT PLAN
S-05	EXCAVATION SUPPORT CROSS SECTIONS AND DETAILS
S-06	SITE RESTORATION PLAN
S-07	DETAILS

PREPARED FOR:

nationalgrid

175 EAST OLD COUNTRY ROAD
HICKSVILLE, NEW YORK 11801

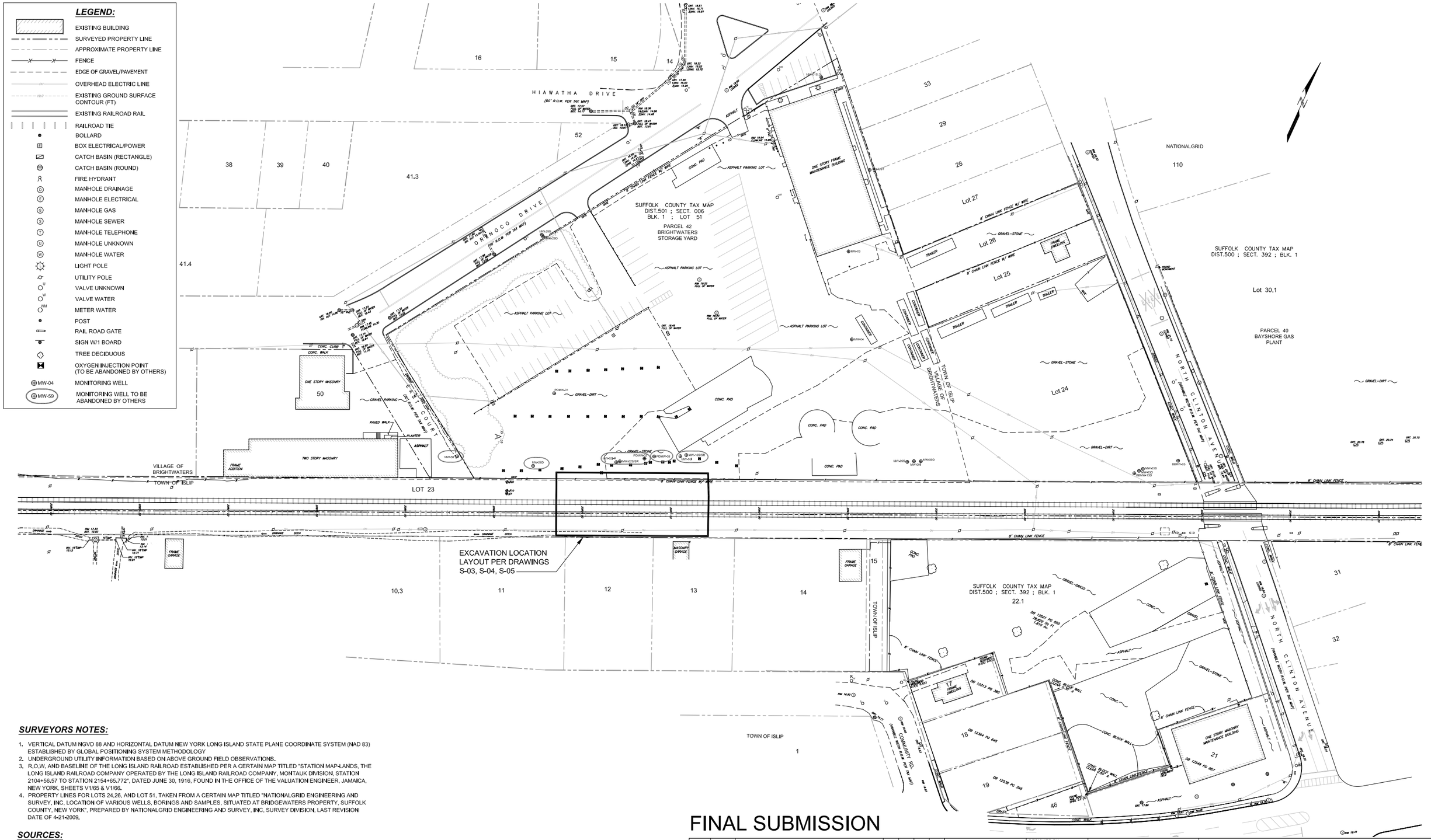
GEI Consultants

455 WINDING BROOK DRIVE, SUITE 201
GLASTONBURY, CT 06033
860-368-5300, FAX 860-368-5307
www.geiconsultants.com

PROJECT NUMBER: 061140-11-2003

JULY 2009

FINAL SUBMISSION



SURVEYORS NOTES:

1. VERTICAL DATUM NGVD 88 AND HORIZONTAL DATUM NEW YORK LONG ISLAND STATE PLANE COORDINATE SYSTEM (NAD 83) ESTABLISHED BY GLOBAL POSITIONING SYSTEM METHODOLOGY
2. UNDERGROUND UTILITY INFORMATION BASED ON ABOVE GROUND FIELD OBSERVATIONS.
3. R.O.W. AND BASELINE OF THE LONG ISLAND RAILROAD ESTABLISHED PER A CERTAIN MAP TITLED "STATION MAP-LANDS, THE LONG ISLAND RAILROAD COMPANY OPERATED BY THE LONG ISLAND RAILROAD COMPANY, MONTAUK DIVISION, STATION 2104+56.57 TO STATION 2154+65.772", DATED JUNE 30, 1916, FOUND IN THE OFFICE OF THE VALUATION ENGINEER, JAMAICA, NEW YORK, SHEETS V1/65 & V1/66.
4. PROPERTY LINES FOR LOTS 24,26, AND LOT 51, TAKEN FROM A CERTAIN MAP TITLED "NATIONALGRID ENGINEERING AND SURVEY, INC, LOCATION OF VARIOUS WELLS, BORINGS AND SAMPLES, SITUATED AT BRIDGEWATERS PROPERTY, SUFFOLK COUNTY, NEW YORK", PREPARED BY NATIONALGRID ENGINEERING AND SURVEY, INC, SURVEY DIVISION, LAST REVISION DATE OF 4-21-2009.

SOURCES:

1. DRAWING TITLED "BOUNDARY AND TOPOGRAPHIC SURVEY, PORTION OF SEC. 006, BLOCK 1 SUFFOLK COUNTY, NEW YORK" PREPARED BY KS ENGINEERS, P.C., 24 COMMERCE STREET, NEWARK, N.J. 07102 DATED 5/31/09.
2. TEMPORARY TRACK ALIGNMENT PREPARED BY STV GROUP, INC., 225 PARK AVENUE SOUTH, NEW YORK, NY.
3. MAP TITLED "LOCATION OF VARIES WELLS , BORINGS AND SAMPLES SITUATED AT BRIGHTWATERS PROPERTY, SUFFOLK COUNTY , NEW YORK" PREPARED BY NATIONALGRID ENGINEERING & SURVEY, INC., SURVEY DIVISION, HICKSVILLE, NEW YORK, SCALE 1"=50' DATED 4/21/09.

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DESIGNED BY *MJL*
DRAWN BY *DM/SG*
CHECKED BY *TO*
APPROVED BY *DW*
DATE *06/09*

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EXISTING CONDITIONS AND EXTENT OF EXCAVATION

DRAWING S-01

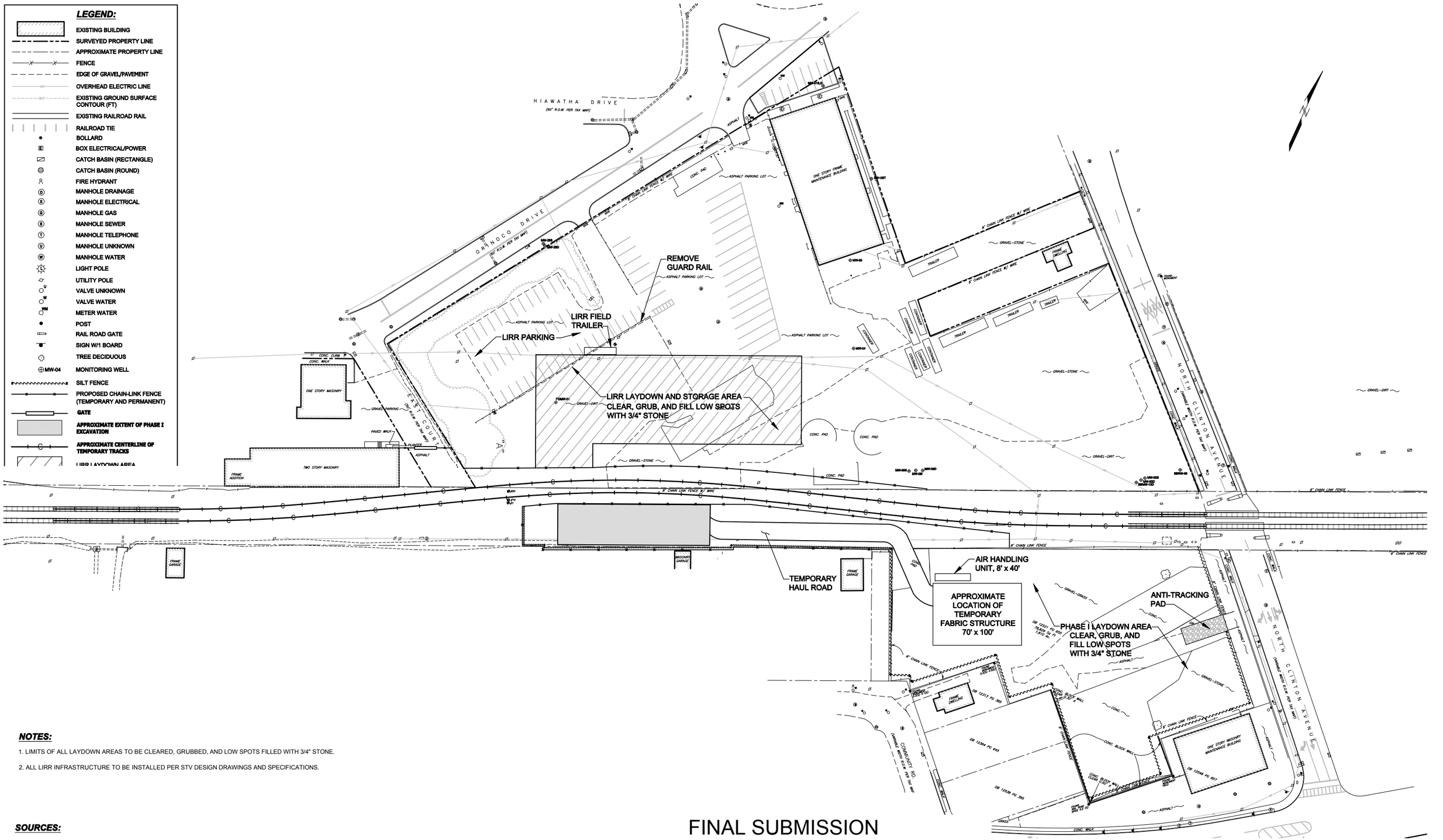
GEI PROJECT 061140-11-2003

SHEET NO. 1 of 7

ISSUE 0

LEGEND:

- EXISTING BUILDING
- SURVEYED PROPERTY LINE
- APPROXIMATE PROPERTY LINE
- FENCE
- EDGE OF GRAVEL/PAVEMENT
- OVERHEAD ELECTRIC LINE
- EXISTING GROUND SURFACE CONTOUR (FT)
- EXISTING RAILROAD RAIL
- RAILROAD TIE
- BOLLARD
- BOX ELECTRICAL/POWER
- CATCH BASIN (RECTANGLE)
- CATCH BASIN (ROUND)
- FIRE HYDRANT
- MANHOLE DRAINAGE
- MANHOLE ELECTRICAL
- MANHOLE GAS
- MANHOLE SEWER
- MANHOLE TELEPHONE
- MANHOLE UNKNOWN
- MANHOLE WATER
- LIGHT POLE
- UTILITY POLE
- VALVE UNKNOWN
- VALVE WATER
- METER WATER
- POST
- RAIL ROAD GATE
- SIGN W/1 BOARD
- TREE DECIDUOUS
- MW-04 MONITORING WELL
- SILT FENCE
- PROPOSED CHAIN-LINK FENCE (TEMPORARY AND PERMANENT)
- GATE
- APPROXIMATE EXTENT OF PHASE I EXCAVATION
- APPROXIMATE CENTERLINE OF TEMPORARY TRACKS
- LIRR LAYDOWN AREA



NOTES:

1. LIMITS OF ALL LAYDOWN AREAS TO BE CLEARED, GRUBBED, AND LOW SPOTS FILLED WITH 3/4" STONE.
2. ALL LIRR INFRASTRUCTURE TO BE INSTALLED PER STV DESIGN DRAWINGS AND SPECIFICATIONS.

SOURCES:

1. DRAWING TITLED "BOUNDARY AND TOPOGRAPHIC SURVEY, PORTION OF SEC. 006, BLOCK 1 SUFFOLK COUNTY, NEW YORK" PREPARED BY KS ENGINEERS, P.C., 24 COMMERCE STREET, NEWARK, N.J. 07102 DATED 5/31/09.
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0 50 100
SCALE, FEET

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SITE PREPARATION AND EROSION AND SEDIMENT CONTROL PLAN FOR PHASE I EXCAVATION

DRAWING: S-02A
GEI PROJECT: 061140-11-2003
SHEET NO.: 2A of 7
ISSUE: 0

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LEGEND:

- EXISTING BUILDING
- SURVEYED PROPERTY LINE
- APPROXIMATE PROPERTY LINE
- FENCE
- EDGE OF GRAVEL/PAVEMENT
- OVERHEAD ELECTRIC LINE
- EXISTING GROUND SURFACE CONTOUR (FT)
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- RAIL ROAD GATE
- SIGN W/1 BOARD
- TREE DECIDUOUS
- MW-04 MONITORING WELL
- SILT FENCE
- PROPOSED CHAIN-LINK FENCE (TEMPORARY AND PERMANENT)
- GATE
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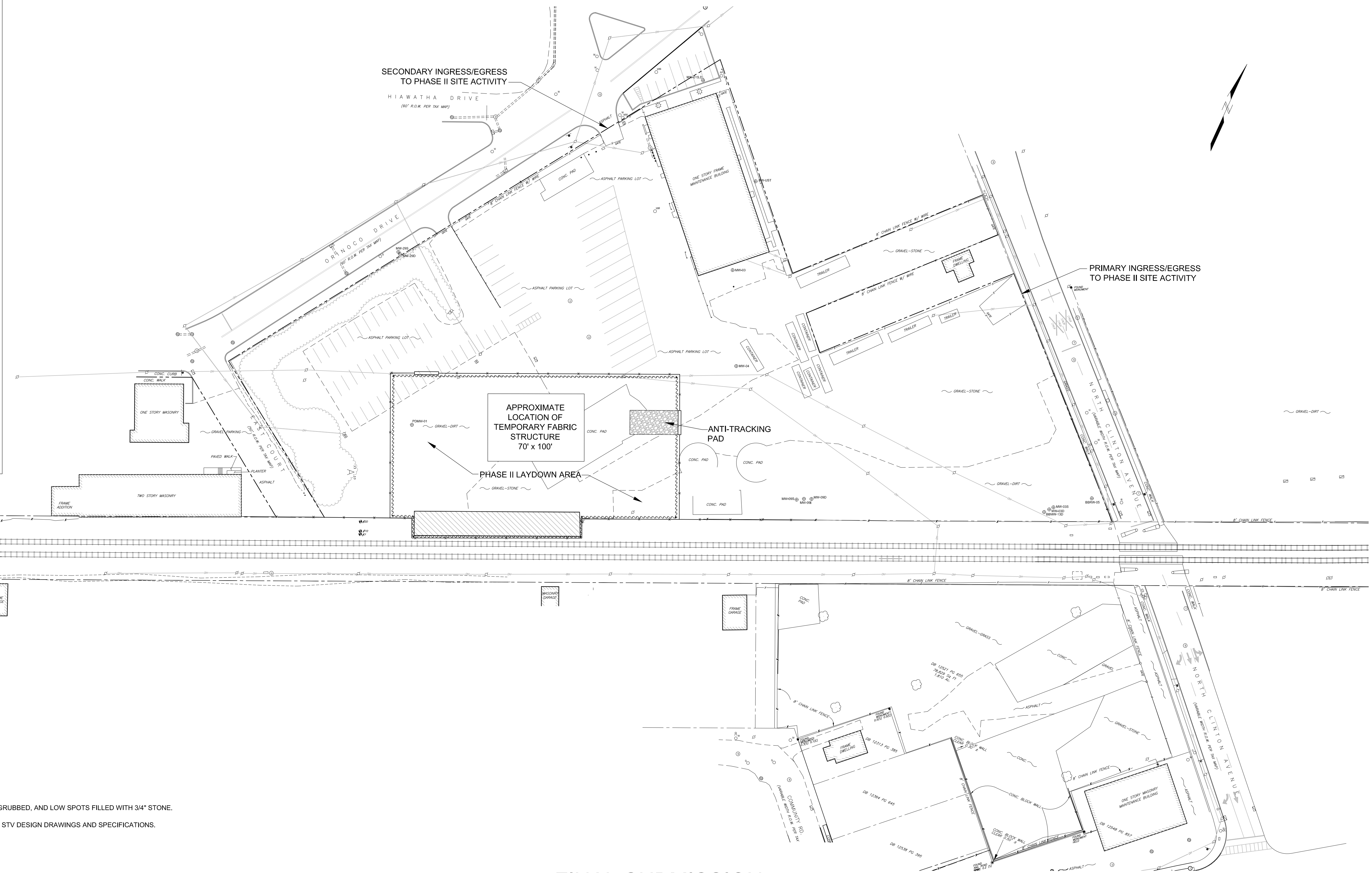

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SITE PREPARATION AND EROSION AND SEDIMENT CONTROL PLAN FOR PHASE II EXCAVATION

DRAWING: S-02B
GEI PROJECT: 061140-11-2003
SHEET NO.: 2B of 7
ISSUE: 0

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GENERAL NOTES

1. VERTICAL AND HORIZONTAL SURVEY CONTROL:
   A. VERTICAL CONTROL: NAVD 88
   B. HORIZONTAL CONTROL: N.Y.S.P.S. (NAD83) L.I. ZONE

2. THE CONTRACTOR SHALL BE RESPONSIBLE TO DETERMINE THE LOCATION AND EXISTENCE OF ALL OVERHEAD AND UNDERGROUND UTILITIES AND INSTRUMENTATION AND TAKE THE NECESSARY PRECAUTIONS IN THE EXECUTION OF THE WORK TO AVOID DAMAGING SAID UTILITIES AND INSTRUMENTATION.

3. ALL WORKING DIMENSIONS SHALL BE TAKEN FROM THE FIGURED DIMENSIONS OR BY ACTUAL MEASUREMENTS AT THE WORK SITE. IN NO CASE SHALL THE DIMENSIONS BE DETERMINED BY SCALING FROM THE PLANS.

4. THE CONTRACTOR SHALL PREPARE AND SUBMIT THE CONSTRUCTION METHODOLOGY, MATERIALS, SEQUENCE OF WORK, AND SCHEDULE BEFORE START OF CONSTRUCTIONS AND SHALL NOT BEGIN CONSTRUCTION UNTIL THE SUBMITTAL IS REVIEWED BY GEI.

5. CONTRACTOR SHALL PROTECT ADJOINING PROPERTY DURING CONSTRUCTION. ANY FAILURES, DAMAGES, SUBSIDENCE, UPHEAVAL, OR CAVE-INS THAT ARE THE RESULT OF POOR WORKMANSHIP OR THE CONTRACTOR'S METHODS ARE THE SOLE RESPONSIBILITY OF THE CONTRACTOR.

6. GEOTECHNICAL INFORMATION HAS BEEN PREPARED FOR THIS PROJECT AND IS AVAILABLE FOR INFORMATION ONLY. CONTRACTOR IS RESPONSIBLE FOR INTERPRETING THE DATA AND MAKING ADDITIONAL TEST BORINGS AS NECESSARY TO DESIGN AND/OR CONSTRUCT ANY PORTION OF THE SUPPORT OF EXCAVATION SYSTEM.

7. THE CONTRACTOR SHALL ALLOW THE OWNER'S REPRESENTATIVE UNRESTRICTED ACCESS TO PERFORM ALL NECESSARY TESTING AND OBSERVATION TO EVALUATE COMPLIANCE OF WORK WITH PROJECT SPECIFICATIONS.

8. A RECORD SET OF APPROVED SHOP DRAWINGS SHALL BE MAINTAINED IN THE FIELD BY THE GENERAL CONTRACTOR.

9. UNLESS OTHERWISE NOTED, DETAILS, SECTIONS, AND NOTES SHOWN ON ANY CONTRACT DRAWINGS SHALL BE CONSIDERED TYPICAL FOR ALL SIMILAR CONDITIONS.

10. ABBREVIATIONS

BOTT.	BOTTOM	O.C., o.c.	ON CENTER
COL.	COLUMN	OPNG.	OPENING
CONT.	CONTINUOUS	PL.	PLATE
ø, DIA.	DIAMETER	REQ'D.	REQUIRED
E.F.	EACH FACE	SPA.	SPACES
EL.	ELEVATION	STIFF.	STIFFENER
EMB.	EMBEDMENT	T & B	TOP AND BOTTOM
E.W.	EACH WAY	T.O.S.	TOP OF STEEL
EXIST.	EXISTING	T.O.C.	TOP OF CONC.
MAX.	MAXIMUM	T.O.W.	TOP OF WALL
TYP.	TYPICAL	U.O.N.	UNLESS OTHERWISE NOTED
CJP	COMPLETE JOINT PENETRATION	V.I.F.	VERIFY IN FIELD

GENERAL REQUIREMENTS

1. EXCAVATION SUPPORT DRAWINGS SHALL BE USED IN CONJUNCTION WITH THE SPECIFICATIONS AND OTHER PROJECT REQUIREMENTS & CONTRACT DOCUMENTS.

2. ALL EXCAVATION SUPPORT WORK SHALL BE COORDINATED WITH THAT OF RELATED TRADES. EXCAVATION SUPPORT DRAWINGS SHALL BE USED IN CONJUNCTION WITH OTHER PROJECT DRAWINGS, AND EXISTING CONDITIONS DATA.

3. THE CONTRACTOR SHALL VERIFY ALL DIMENSIONS AND EXISTING CONDITIONS. ANY DISCREPANCIES SHALL BE BROUGHT TO THE ATTENTION OF GEI FOR CLARIFICATION BEFORE PROCEEDING WITH FABRICATION AND CONSTRUCTION.

4. PROPOSED CHANGES, SUBSTITUTIONS, OR OMISSIONS, MADE BY THE GENERAL CONTRACTOR OR THEIR SUBCONTRACTORS, TO THE CONTRACT DOCUMENTS SHALL BE SUBMITTED TO THE ENGINEER FOR APPROVAL. THE SUBMISSION SHALL HIGHLIGHT AND NOTE THE PROPOSED CHANGE, SUBSTITUTION, OR OMISSION. PROPOSED CHANGES, SUBSTITUTIONS, OR OMISSIONS TO THE CONTRACT DOCUMENTS WHICH DO NOT FOLLOW THIS APPROVAL PROCEDURE SHALL BE CONSIDERED AS NOT APPROVED.

5. CONTRACTOR SHALL FURNISH ALL LABOR, MATERIAL, TOOLS, AND EQUIPMENT TO PERFORM THE WORK SPECIFIED IN THE CONTRACT DOCUMENTS AND DRAWINGS.

MATERIALS

1. EARTHWORK MATERIALS

   ALL EARTHWORK MATERIALS SHALL BE FREE OF ICE, SNOW, ROOTS, SOD, RUBBISH, AND OTHER DELETERIOUS MATERIAL. SUBMIT 75 POUND SAMPLES, RESULTS OF RECENT GRAIN SIZE ANALYSES, AND MODIFIED PROCTOR DENSITY TEST RESULTS (ASTM D1557) FOR EACH SOIL MATERIAL AT LEAST TWO WEEKS PRIOR TO USE. RESUBMIT IF NOTABLE CHANGE OF MATERIAL OR CHANGE OF SUPPLIER.

   A. PEASTONE - AGGREGATE SHALL CONSIST OF HARD, DURABLE PARTICLES OF FRAGMENTS OF STONE. MATERIALS THAT BREAK UP WHEN ALTERNATELY FROZEN AND THAWED OR WETTED AND DRIED SHALL NOT BE USED. PEASTONE SHALL MEET THE FOLLOWING GRADATION REQUIREMENTS OR APPROVED EQUAL:

SIEVE SIZE	PERCENT PASSING BY WEIGHT
1/2 INCH	100
3/8 INCH	85-100
No. 4	20-50
No. 8	0-15
No. 16	0-5

   B. ¾" STONE - AGGREGATE SHALL CONSIST OF HARD, DURABLE PARTICLES OF FRAGMENTS OF STONE. MATERIALS THAT BREAK UP WHEN ALTERNATELY FROZEN AND THAWED OR WETTED AND DRIED SHALL NOT BE USED. ¾" STONE SHALL MEET THE FOLLOWING GRADATION REQUIREMENTS OR APPROVED EQUAL:

SIEVE SIZE	PERCENT PASSING BY WEIGHT
1 INCH	100
3/4 INCH	90-100
1/2 INCH	10-50
3/8 INCH	0-20
No. 4	0-5

   C. DENSE GRADE BASE COURSE - DENSE GRADE BASE COURSE SHALL CONSIST OF HARD, DURABLE SAND AND AGGREGATE, FREE OF CLAY, ORGANIC MATTER, SURFACE COATINGS, AND OTHER DELETERIOUS MATERIALS. SOILS FINER THAN THE No. 200 SIEVE (THE FINES) SHALL BE NONPLASTIC. DENSE GRADE BASE COARSE SHALL MEET ASTM D2940-03 AS LISTED IN AREMA 1.4.1.5, AND THE FOLLOWING GRADATION REQUIREMENTS OR APPROVED EQUAL:

SIEVE SIZE	PERCENT PASSING BY WEIGHT
2 INCHES	100
1 ½ INCHES	95 - 100
¾ INCH	70 - 92
⅜ INCH	50 - 70
No. 4	15 - 25
No. 50	12 - 25
No. 200 (FINES)	0 - 8

   D. BALLAST - TYPE A BALLAST SHALL BE USED FOR NEW TRACK CONSTRUCTION INCLUDING TEMPORARY TRACK AS INDICATED ON THE CONTRACT DRAWINGS. CRUSHED QUARRY ROCK, CONTAINING NO SLAG, AND WHICH HAS HARD, STRONG ANGULAR, DURABLE PARTICLES, FREE FROM INJURIOUS AMOUNTS OF VEGETABLE MATTER AND OTHER DELETERIOUS SUBSTANCES, HAVING PHYSICAL AND CHEMICAL PROPERTIES AS SPECIFIED IN THIS SECTION. ACCEPTABLE MATERIALS ARE GRANITE, TRAPROCK, DOLOMITE, AND LIMESTONE. SAMPLING AND TESTING SHALL CONFORM TO CHAPTER 1, PART 2, OF AREMA MRE WITH RESPECT TO QUALITY, SOUNDNESS, AND GRADATION.

SIEVE SIZE	PERCENT PASSING BY WEIGHT
2 ½ INCHES	100
1 ½ INCHES	90 - 100
1 INCH	40 - 50
¾ INCH	5 - 15

2. STRUCTURAL STEEL

   A. ALL STRUCTURAL STEEL WORK SHALL BE IN STRICT ACCORDANCE WITH THE 2005 A.I.S.C. SPECIFICATIONS FOR STRUCTURAL STEEL BUILDINGS. WHERE THESE DRAWINGS SHOW REQUIREMENTS EXCEEDING THOSE OF THE A.I.S.C., THE DRAWING REQUIREMENTS SHALL GOVERN.

   B. STRUCTURAL STEEL SHALL CONFORM TO THE FOLLOWING: ASTM A572, Gr. 50 KSI. FOR WIDE FLANGE SHAPES, CHANNELS, BRACING MEMBERS, OTHER ANGLES, PLATES, AND STIFFENERS.

   C. MISCELLANEOUS STEEL SHALL CONFORM TO THE FOLLOWING: ASTM A36, Gr. 36 KSI FOR SHIMS AND BLOCKING.

   D. ALL CONNECTIONS SHALL BE DESIGNED AND DETAILED IN ACCORDANCE WITH THE A.I.S.C. MANUAL OF STEEL CONSTRUCTION (ASD NINTH EDITION), PART 4, UNLESS OTHERWISE INDICATED. CONNECTION MATERIAL SHALL BE A36.

   E. CONNECTIONS, UNLESS OTHERWISE INDICATED, SHALL BE DESIGNED AND FABRICATED TYPE 2 (SIMPLE FRAMING) AS DEFINED IN SECTION A2.2 OF THE A.I.S.C. SPECIFICATION.

   F. ALL WELDING ELECTRODES SHALL BE E70XX.

   G. ALL FILLET WELDS SHALL BE 5/16" FILLET WELDS MINIMUM UNLESS OTHERWISE NOTED.

   H. ALL STEEL SHEET PILING SHALL BE PZC 18 WITH SECTION MODULUS S=33.5IN^3 PER WIDTH FOOT. STEEL SHEET PILING SHALL CONFORM TO ASTM A572 Gr. 50 KSI.

EXECUTION

1. INSTALLATION OF SUPPORT OF EXCAVATION SYSTEM AND EXCAVATION

   A. SHEET PILES SHALL BE DRIVEN OR VIBRATED INTO PLACE IN ONE-PIECE AND TIGHTLY INTERLOCKED TO FOR A CONTINUOUS BARRIER. EXPOSED FACES OF SHEETPILING SHALL BE ACCURATELY ALIGNED TO VARY NOT MORE THAN TWO (2) INCHES FROM A HORIZONTAL LINE AND NOT MORE THAN 1:120 OUT OF VERTICAL ALIGNMENT.

   B. TOP OF SHEETPILES SHALL BE AT EL. 19. CENTERLINE OF BRACING SHALL BE INSTALLED AT EL. 17. SHEETPILES BETWEEN WP 105 AND WP 106 SHALL BE AT LEAST 35-FEET LONG INSTALLED TO TIP EL. -16. ALL OTHER SHEETPILES SHALL BE AT LEAST 30-FEET LONG INSTALLED TO TIP EL. -11.

   C. REMNANT FOUNDATIONS AND MISCELLANEOUS FILL MAY BE ENCOUNTERED WHILE DRIVING SHEETPILES. CONTRACTOR SHALL NOTIFY GEI IMMEDIATELY IF ANY SHEETPILE ENCOUNTERS A SUBSURFACE OBSTRUCTION THAT PREVENTS INSTALLATION TO DESIGN ELEVATION. AFTER NOTIFYING GEI, CONTRACTOR SHALL SUBMIT A METHOD TO GEI TO REMOVE OR CLEAR SUBSURFACE OBSTRUCTION.

   D. ALL BRACING INSTALLATIONS SHALL BE REVIEWED BY GEI PRIOR TO EXCAVATION BELOW EL. 16.

   E. CONTRACTOR SHALL MONITOR RAILS OF RAILROAD AS NEEDED DURING EXCAVATION TO MEASURE VERTICAL AND HORIZONTAL MOVEMENT.
      E1. INSTALL SURVEY MONITORING POINTS AND ESTABLISH BASELINE READINGS, PRIOR TO ANY EXCAVATION.
      E2. SURVEY EQUPMENT SHALL HAVE A RESOLUTION OF AT LEAST 0.01 FEET.
      E3. MINIMUM MONITORING FREQUENCY SHALL BE DAILY WHILE CELL IS EXCAVATED BELOW EL. 16.
      E4. MAINTAIN AN ACCURATE LOG OF SURVEYED LOCATIONS FOR COMPARISON WITH BASELINE LOCATIONS.
      E5. PROVIDE GEI SURVEY DATA REDUCED IN TABULAR SPREADSHEET FORM WEEKLY.
      E6. PROMPTLY NOTIFY GEI IF LATERAL OR VERTICAL CHANGES OCCUR GREATER THAN (0.25 in.).
      E7. IF ANY MOVEMENT IS GREATER THAN (0.5 in.) STOP WORK, AND NOTIFY GEI IMMEDIATELY. A MEETING WITH GEI WILL BE HELD TO MODIFY WORK PLAN TO MINIMIZE ANY ADDITIONAL SETTLEMENT.

   F. EXCAVATION TO BE PERFORMED IN THE WET. MAINTAIN WATER LEVEL INSIDE EXCAVATED CELL AT EL. 8.5 OR HIGHER AT ALL TIMES.

2. BACKFILLING

   A. FILLING SHALL BE ON NON-FROZEN, SNOW FREE AND STABLE SUBGRADES. PLACE PEASTONE, ¾" STONE, AND DENSE GRADE BASE COURSE TO THE GRADES AND THICKNESSES SPECIFIED ON THE CONTRACT DOCUMENTS.

   B. THE REQUIRED DEGREE OF COMPACTION IS A PERCENTAGE OF THE RELATIVE DENSITY AS DETERMINED BY A MODIFIED PROCTOR DENSITY TEST (ASTM D1557) AND THE DENSITY MEASURED IN THE FIELD BY SAND CONE DENSITY TEST (ASTM D1556) OR NUCLEAR DENSITY TEST (ASTM D2922).

   C. STONE FILL PLACED UNDER WATER SHALL BE COMPACTED USING THE EXCAVATOR BUCKET.

   D. CONTRACTOR SHALL OBTAIN AN INDEPENDANT TESTING TESTING COMPANY ACCEPTABLE TO GEI TO PERFORM COMPACTION TESTING ON BACKFILL MATERIAL.

   E. DENSE GRADE BASE COURSE AND STONE ABOVE THE WATER LEVEL SHALL BE COMPACTED TO 95 PERCENT RELATIVE DENSITY AS DETERMINED BY THE MODIFIED PROCTOR DENSITY TEST (ASTM D1557). DENSE GRADE BASE COURSE AND STONE ABOVE THE WATER LEVEL SHALL BE PLACED IN MAXIMUM LIFT THICKNESSES OF 8-INCHES. PRIOR TO MOBILIZATION, CONTRACTOR SHALL SUBMIT TYPE OF COMPACTION EQUIPMENT TO GEI FOR REVIEW.

   F. MINIMUM OF TWO DENSITY TESTS SHALL BE PERFORMED PER CELL OR AS NEEDED. TEST RESULTS SHALL BE SUBMITTED TO GEI WITH 48 HOURS.

3. REMOVAL OF TEMORARY EXCAVATION SUPPORT SYSTEM

   A. WALES, CORNER STRUTS, AND CENTER STRUTS SHALL REMAIN IN PLACE UNTIL EXCAVATION IS BACKFILLED TO EL. 16. WALES, CORNER STRUTS, CENTER STRUTS, AND SUPPORT BRACKETS SHALL BE REMOVED THEREAFTER IN THE WORK SEQUENCE INDICATED ON THE CONTRACT DOCUMENTS.

   B. STEEL SHEET PILING SHALL BE CUT OR REMOVED AT OR BELOW EL. 16.

WORK SEQUENCE

1. INSTALL PZC 18 SHEETING TO THE TIP ELEVATION SPECIFIED ON THE CONTRACT DRAWINGS FOR CELL.
2. EXCAVATE TO EL. 16.
3. INSTALL BRACING AT EL. 17.
4. EXCAVATE TO EL. 8.5.
5. MAINTAIN WATER LEVEL INSIDE EXCAVATED CELL AT EL. 8.5 OR HIGHER AT ALL TIMES.
6. EXCAVATE TO EL. 6.5 (IF REQUIRED).
7. BACKFILL TO EL. 16.
8. REMOVE BRACING.
9. BACKFILL TO 18 INCHES BELOW BOTTOM OF TIE ELEVATION (ELEVATION VARIES).
10. EXCAVATE LOCALLY AND REMOVE SHEETING AT OR BELOW EL. 16.
11. PLACE BALLAST TO REQUIRED ELEVATION.

FINAL SUBMISSION

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0	6/5/09	100% DRAFT FOR AGENCY REVIEW	JLC	DM	AS	MW
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DATE: 06/09

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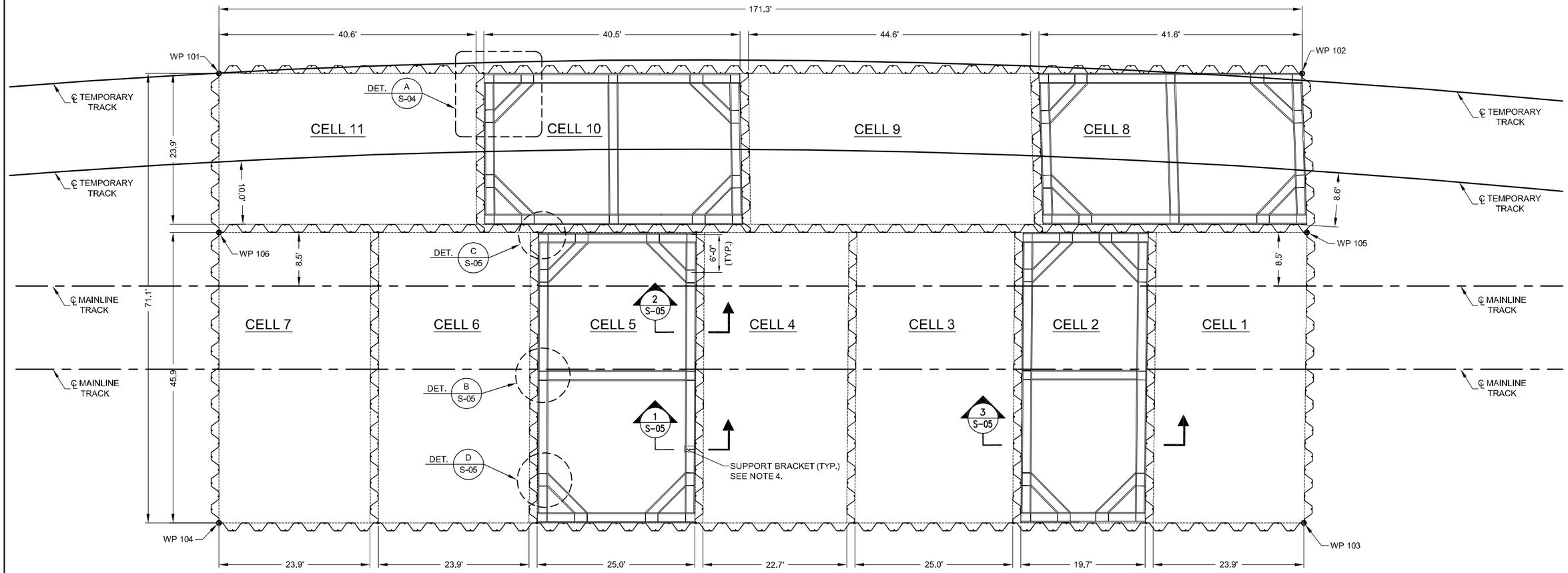
OPERABLE UNIT NO. 3
BAYSHORE/BRIGHTWATERS FORMER MANUFACTURED GAS PLANT SITE
BAY SHORE, NEW YORK

GEI Consultants
455 WINDING BROOK DRIVE
SUITE 201
GLASTONBURY, CT 06033
860-368-5300, FAX: 860-368-5307
www.geiconsultants.com

EXCAVATION SUPPORT, GENERAL NOTES & CONSTRUCTION SEQUENCING

DRAWING: S-03
GEI PROJECT: 061140-11-2003
SHEET NO.: 3 of 7
ISSUE: 0

M:\DATA_GEOSTRUCTURAL\LIRR Bay Shore Shoring\7_15_09 Final Submittal\7_15_09 11x17\061140-11 7-14 update_11x17.dwg Jul 16, 2009



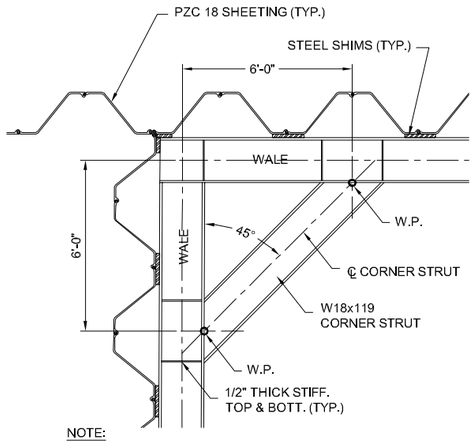
PLAN

0 8 16

1/8" = 1'-0"

NOTES:

1) SEE DRAWING S-03 FOR GENERAL NOTES AND CONSTRUCTION SEQUENCE.
2) DIMENSIONS SHOWN ON PLAN ARE FOR REFERENCE ONLY. CONTRACTOR SHALL VERIFY ALL CELL DIMENSIONS IN THE FIELD AND ADJUST THE WALE LENGTHS BASED ON ACTUAL FIELD MEASUREMENTS.
3) CENTER STRUT SHALL BISECT WALES ALONG LONGER DIMENSION OF EACH CELL. LENGTH OF WALE TO BE MEASURED AND VERIFIED IN THE FIELD.
4) BRACKETS TO BE INSTALLED TO SHEETPILES AT EQUAL SPACING, THREE BRACKETS ALONG THE LONGER DIMENSION AND TWO BRACKETS ALONG THE SHORTER DIMENSION OF EACH CELL.
5) BRACING OMITTED IN CELLS 1,3,4,6,7,9, AND 11 FOR CLARITY.



NOTE:

SEE DETAILS C AND D AND SECTIONS 1 AND 2 SHOWN ON S-05 FOR TYPICAL WELDING DETAILS.

DETAIL A S-04

TYPICAL CORNER STRUT LAYOUT

0 2 4

3/8" = 1'-0"

WORK POINT SCHEDULE			
WP ID	NORTHING	EASTING	
WP-101	203254.0	1189307.1	
WP-102	203324.2	1189463.4	1
WP-103	203259.5	1189492.8	
WP-104	203189.2	1189336.2	
WP-105	203301.6	1189474.4	1
WP-106	203231.1	1189317.4	

FINAL SUBMISSION

REV. NO.	DATE	DESCRIPTION	DES	DR	CH	APP
0	6/5/09	100% DRAFT FOR AGENCY REVIEW	JLC	DM	AS	MW
1	7/15/09	100% FINAL ISSUED FOR CONSTRUCTION	JLC	MH	AS	MW

DESIGNED BY JLC
DRAWN BY DM/SG
CHECKED BY AS
APPROVED BY MW
DATE 06/09

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EXCAVATION SUPPORT PLAN

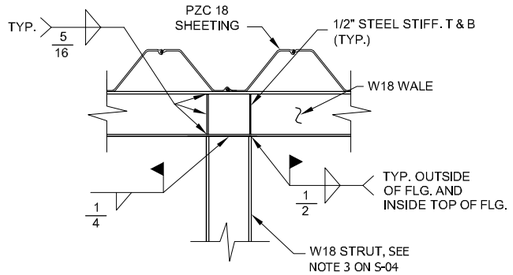
DRAWING S-04

GEI PROJECT 061140-11-2003

SHEET NO. 4 of 7

ISSUE 0

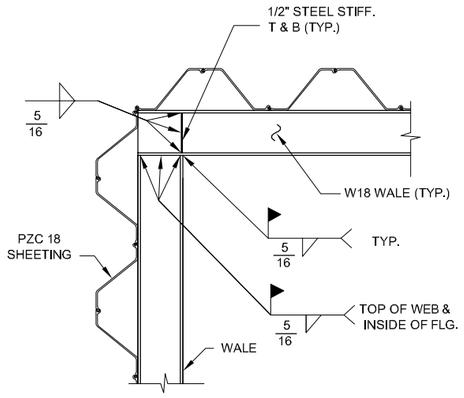
M:\DATA_GEOSTRUCTURAL\LIRR Bay Shore Shoring\7_15_09 Final Submittal\7_15_09 11x17\061140-09 7-14 update_11x17.dwg \Jul 16, 2009



NOTES:
1. ALIGN WEB OF WALE WITH WEB OF STRUT.
2. STEEL SHIMS OMITTED FOR CLARITY.

TYPICAL STRUT TO WALE DETAIL — B / S-04

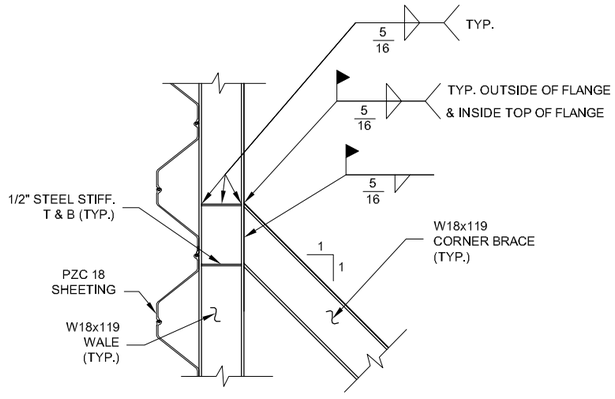
0 2 4
3/8" = 1'-0"



NOTES:
1. ALIGN WEB OF WALES.
2. CORNER BRACE OMITTED FOR CLARITY.
3. STEEL SHIMS OMITTED FOR CLARITY.

TYPICAL WALE CORNER DETAIL — C / S-04

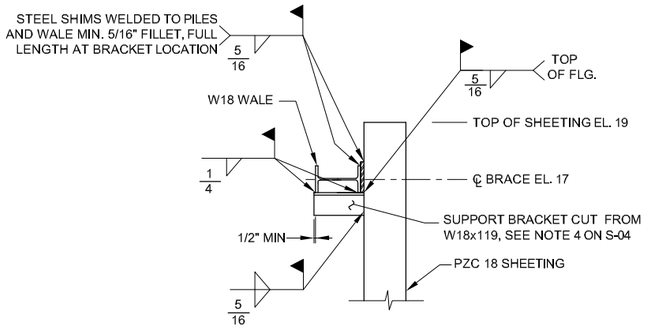
0 2 4
3/8" = 1'-0"



NOTES:
1. ALIGN WEB OF CORNER BRACE WITH WEB OF WALE.
2. STEEL SHIMS OMITTED FOR CLARITY.

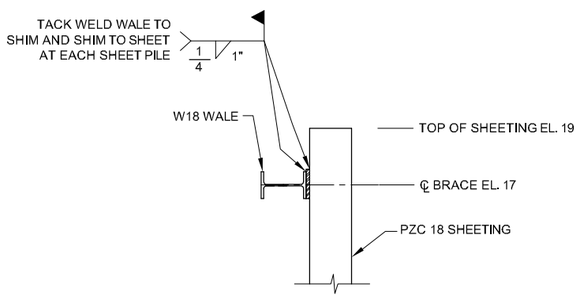
CORNER BRACE TO WALE DETAIL — D / S-04

0 2 4
3/8" = 1'-0"



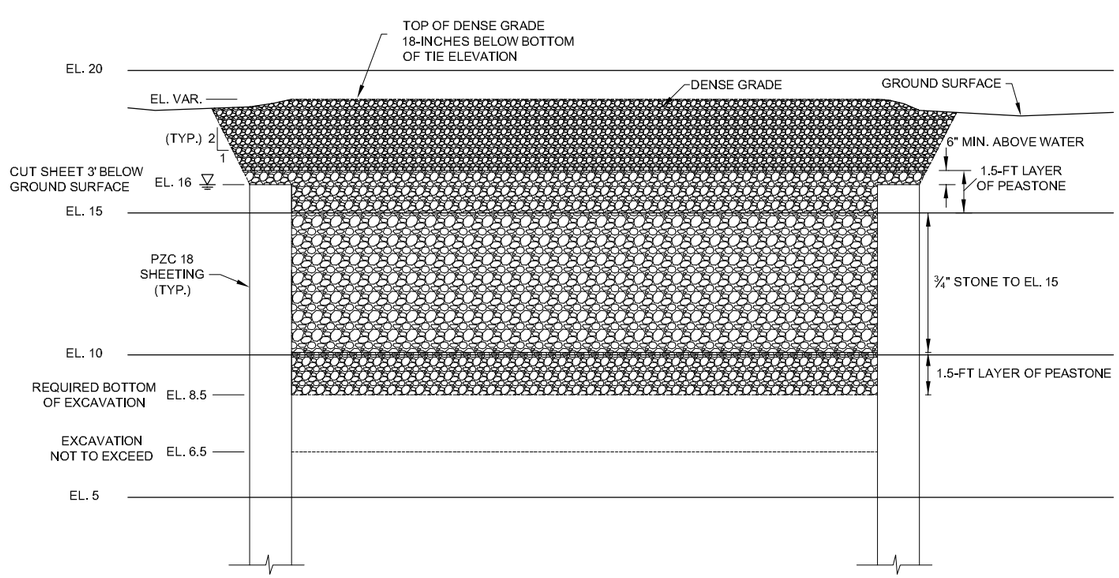
TYPICAL WALE SUPPORT SECTION — 1 / S-04

0 2 4
3/8" = 1'-0"



TYPICAL WALE TO SHEET SECTION — 2 / S-04

0 2 4
3/8" = 1'-0"



TYPICAL SECTION OF BACKFILLED CELL — 3 / S-04

0 2 4
3/8" = 1'-0"

FINAL SUBMISSION

REV. NO.	DATE	DESCRIPTION	DES	DR	CH	APP
0	6/5/09	100% DRAFT FOR AGENCY REVIEW	JLC	DM	AS	MW
1	7/15/09	100% FINAL ISSUED FOR CONSTRUCTION	JLC	MH	AS	MW

DESIGNED BY: JLC
DRAWN BY: DM/SG
CHECKED BY: AS
APPROVED BY: MW
DATE: 06/09

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EXCAVATION SUPPORT CROSS SECTIONS AND DETAILS

DRAWING: S-05
GEI PROJECT: 061140-11-2003
SHEET NO.: 5 of 7
ISSUE: 0

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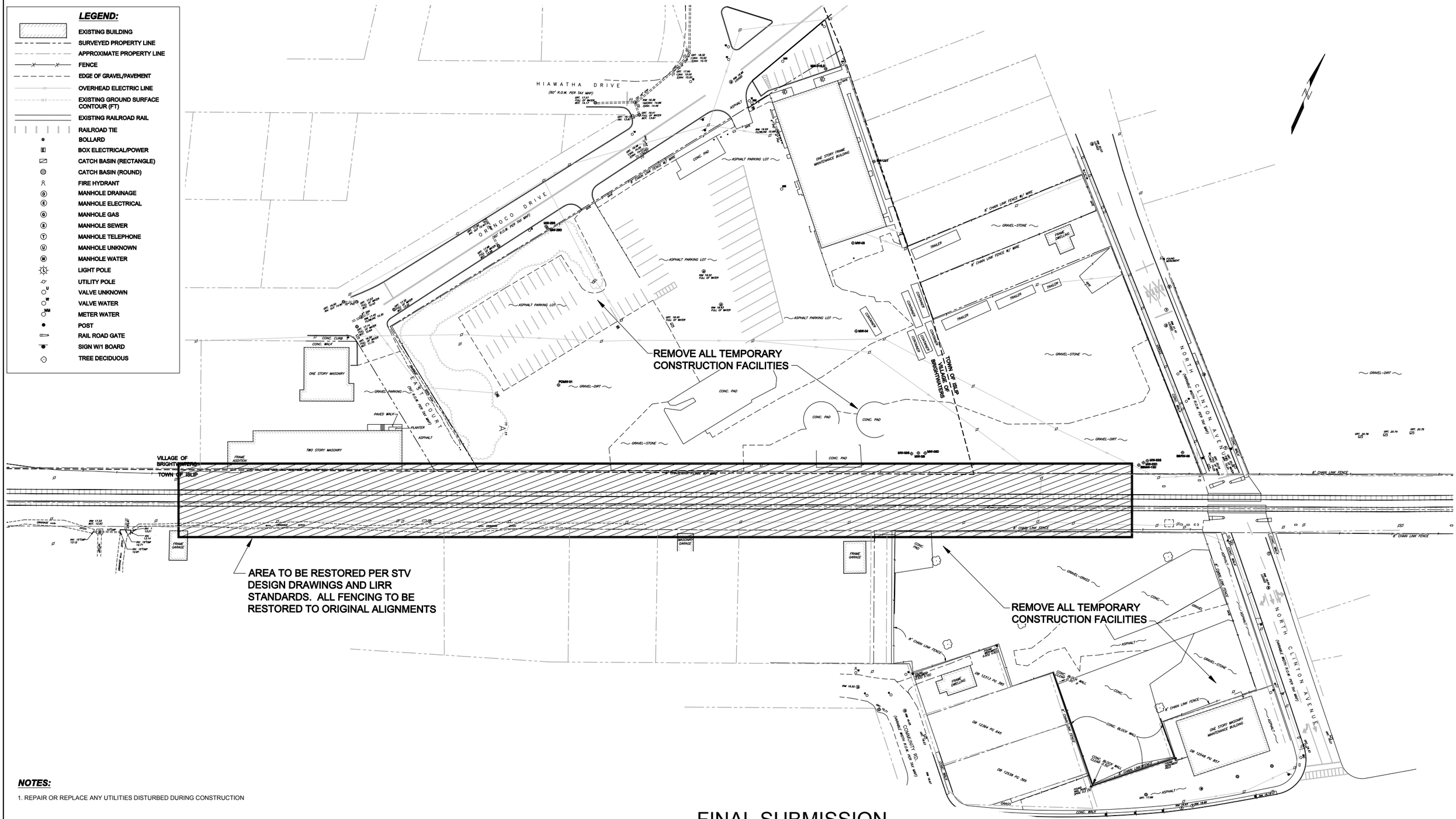
LEGEND:

- EXISTING BUILDING
- SURVEYED PROPERTY LINE
- APPROXIMATE PROPERTY LINE
- FENCE
- EDGE OF GRAVEL/PAVEMENT
- OVERHEAD ELECTRIC LINE
- EXISTING GROUND SURFACE CONTOUR (FT)
- EXISTING RAILROAD RAIL
- RAILROAD TIE
- BOLLARD
- BOX ELECTRICAL/POWER
- CATCH BASIN (RECTANGLE)
- CATCH BASIN (ROUND)
- FIRE HYDRANT
- MANHOLE DRAINAGE
- MANHOLE ELECTRICAL
- MANHOLE GAS
- MANHOLE SEWER
- MANHOLE TELEPHONE
- MANHOLE UNKNOWN
- MANHOLE WATER
- LIGHT POLE
- UTILITY POLE
- VALVE UNKNOWN
- VALVE WATER
- METER WATER
- POST
- RAIL ROAD GATE
- SIGN W/1 BOARD
- TREE DECIDUOUS



NOTES:

1. REPAIR OR REPLACE ANY UTILITIES DISTURBED DURING CONSTRUCTION

SOURCES:

1. DRAWING TITLED "BOUNDARY AND TOPOGRAPHIC SURVEY, PORTION OF SEC. 006, BLOCK 1 SUFFOLK COUNTY, NEW YORK" PREPARED BY KS ENGINEERS, P.C., 24 COMMERCE STREET, NEWARK, N.J. 07102 DATED 5/31/09.
2. TEMPORARY TRACK ALIGNMENT PREPARED BY STV GROUP, INC., 225 PARK AVENUE SOUTH, NEW YORK, NY.
3. MAP TITLED "LOCATION OF VARIES WELLS , BORINGS AND SAMPLES SITUATED AT BRIGHTWATERS PROPERTY, SUFFOLK COUNTY , NEW YORK" PREPARED BY NATIONALGRID ENGINEERING & SURVEY, INC., SURVEY DIVISION, HICKSVILLE, NEW YORK, SCALE 1"=50' DATED 4/21/09.

0 50 100
SCALE, FEET

FINAL SUBMISSION

REV. NO.	DATE	DESCRIPTION	DES	DR	CH	APP
0	6/05/09	100% DRAFT FOR AGENCY REVIEW	MJL	SG	TO	DW
1	7/15/09	100% FINAL ISSUED FOR CONSTRUCTION	MJL	SG	TO	DW

DESIGNED BY: MJL
DRAWN BY: DM/SG
CHECKED BY: TO
APPROVED BY: DW
DATE: 06/09

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GLASTONBURY, CT 06033
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RESTORATION PLAN
AFTER PHASE I EXCAVATION

DRAWING: S-06
GEI PROJECT: 061140-11-2003
SHEET NO.: 6 of 7
ISSUE: 0

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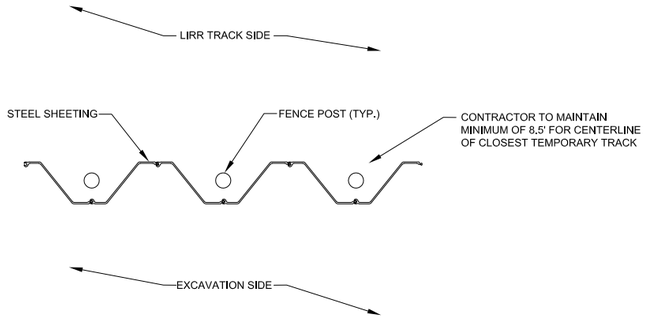
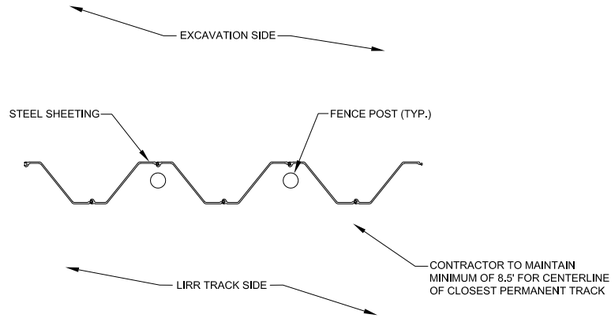


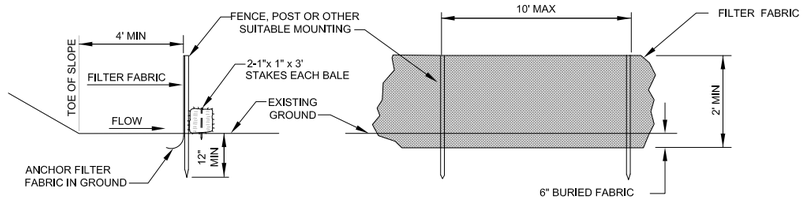
PHASE I SHORING/FENCE DETAIL

NOT TO SCALE



PHASE II SHORING/FENCE DETAIL

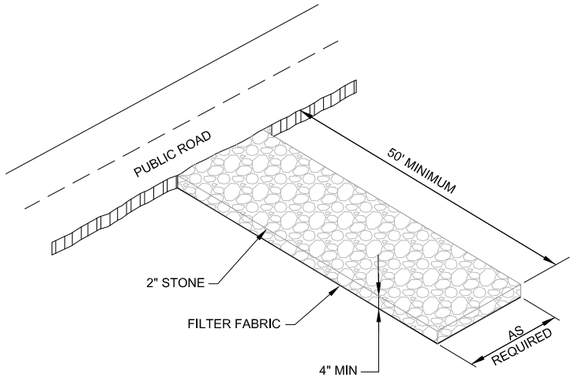
NOT TO SCALE



NOTE:
POST SPACING AND EMBEDMENT VARIES BASED
ON THE FABRIC MANUFACTURER REQUIREMENTS.

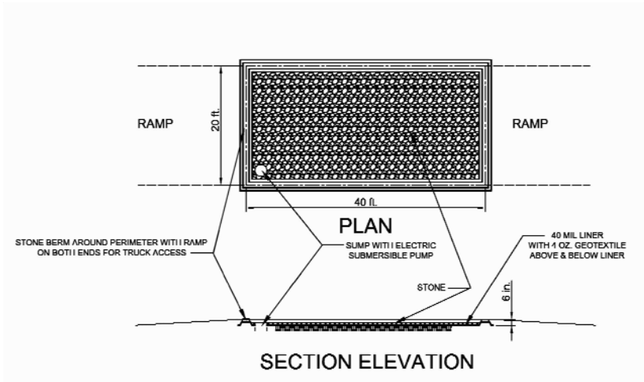
SILT FENCE

NOT TO SCALE



ANTI-TRACKING PAD

NOT TO SCALE

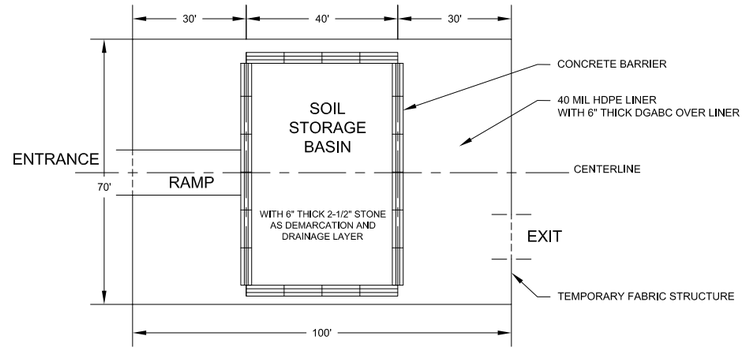


TEMPORARY DECON PAD

NOT TO SCALE

SOURCE:

DRAWING TITLED *TEMPORARY SOIL STOCKPILE PLAN*
BY CREAMER ENVIRONMENTAL, INC., HACKENSACK, NJ,
DATED 5/18/09.



TEMPORARY SOIL STOCKPILE PLAN

NOT TO SCALE

SOURCE:

DRAWING TITLED *TEMPORARY SOIL STOCKPILE PLAN*
BY CREAMER ENVIRONMENTAL, INC., HACKENSACK, NJ,
DATED 5/18/09.

FINAL SUBMISSION

REV. NO.	DATE	DESCRIPTION	DES	DR	CH	APP
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1	7/15/09	100% FINAL ISSUED FOR CONSTRUCTION	MJL	SG	TO	DW

DESIGNED BY *MJL*
DRAWN BY *DM/SG*
CHECKED BY *TO*
APPROVED BY *DW*
DATE *06/09*

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OPERABLE UNIT NO. 3
BAYSHORE/BRIGHTWATERS FORMER MANUFACTURED GAS PLANT SITE
BAY SHORE, NEW YORK

GEI Consultants
455 WINDING BROOK DRIVE
SUITE 201
GLASTONBURY, CT 06033
860-368-5300, FAX 860-368-5307
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DETAILS

DRAWING S-07

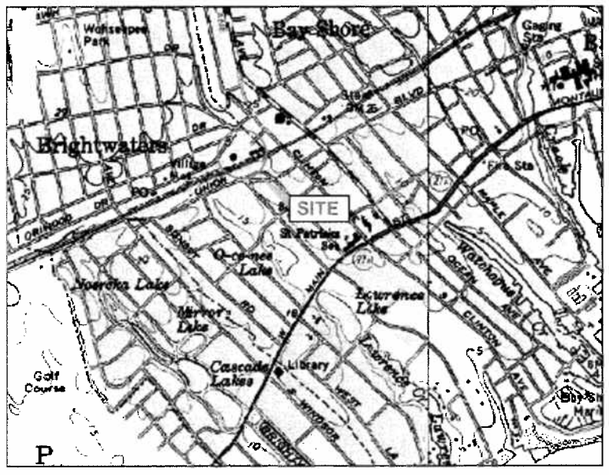
GEI PROJECT 061140-11-2003

SHEET NO. 7 of 7

ISSUE 0

VOLUME II
INTERIM REMEDIAL MEASURE - BRIGHTWATERS/BAY SHORE
FORMER MGP SITE OPERABLE UNIT 3/
LONG ISLAND RAILROAD RIGHT-OF-WAY EXCAVATION
DESIGN PLAN - TRACK RELOCATION

OPERABLE UNIT NO. 3
BAY SHORE/BRIGHTWATERS FORMER MANUFACTURED GAS PLANT SITE
BAY SHORE, NEW YORK



SITE LOCATION

PREPARED FOR:

nationalgrid

175 EAST OLD COUNTRY ROAD
HICKSVILLE, NEW YORK 11801

STV Incorporated
Engineers/Architects/Planners/Construction Managers
225 Park Avenue South, New York, NY 10003

PROJECT NUMBER: 3511900-11-2003
DECEMBER 2009

VOLUME II OF II

FINAL SUBMISSION

SHEET No.	DWG No.	REVISION No.	DESCRIPTION
			BAY SHORE
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3	SP-2		EXISTING SITE PLAN - SHEET 2
4	SP-3		EXISTING SITE PLAN - SHEET 3
5	MA-1		TEMPORARY TRACK ALIGNMENT PLAN - SHEET 1
6	MA-2		TEMPORARY TRACK ALIGNMENT PLAN - SHEET 2
7	MA-3		TEMPORARY TRACK ALIGNMENT PLAN - SHEET 3
8	PM1-1		TEMPORARY TRACK 1 PROFILE (35 MPH) - SHEET 1
9	PM1-2		TEMPORARY TRACK 1 PROFILE (35 MPH) - SHEET 2
10	PM2-1		TEMPORARY TRACK 2 PROFILE (35 MPH) - SHEET 1
11	PM2-2		TEMPORARY TRACK 2 PROFILE (35 MPH) - SHEET 2
12	TG-1		TEMPORARY GRADING PLAN - SHEET 1
13	TG-2		TEMPORARY GRADING PLAN - SHEET 2
14	TG-3		TEMPORARY GRADING PLAN - SHEET 3
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16	CS-2		CROSS SECTIONS - SHEET 2
17	CS-3		CROSS SECTIONS - SHEET 3
18	CS-4		CROSS SECTIONS - SHEET 4
19	CS2-1		CROSS SECTIONS AT BUILDING LINE AND PROPERTY LINE OF GARAGE
20	TM-1		TRACKS MANUAL ROADWAY STONE BALLAST
21	SYS-1		SYSTEMS RELOCATION PLAN - SHEET 1
22	SYS-2		SYSTEMS RELOCATION PLAN - SHEET 2
23	SYS-3		SYSTEMS RELOCATION PLAN - SHEET 3
24	RA-1		DEMOLITION AND RESTORATION ALIGNMENT PLAN - SHEET 1
25	RA-2		DEMOLITION AND RESTORATION ALIGNMENT PLAN - SHEET 2
26	RA-3		DEMOLITION AND RESTORATION ALIGNMENT PLAN - SHEET 3
27	PR1-1		RESTORED TRACK 1 PROFILE (35 MPH) - SHEET 1
28	PR1-2		RESTORED TRACK 1 PROFILE (35 MPH) - SHEET 2
29	PR2-1		RESTORED TRACK 2 PROFILE (35 MPH) - SHEET 1
30	PR2-2		RESTORED TRACK 2 PROFILE (35 MPH) - SHEET 2
31A	CD-1A		CURVE DATA-SHEET 1
31B	CD-1B		CURVE DATA-SHEET 2
32	VA-1		TRACK VARIANCE LIST
33	SR-1		CONSTRUCTION STAGING AND RESTORATION PLAN - PRIOR TO CONSOLIDATION
34	SR-2		CONSTRUCTION STAGING AND RESTORATION PLAN - PRIOR TO FIRST CUT AND THROW
35	SR-3		CONSTRUCTION STAGING AND RESTORATION PLAN - DURING FIRST CUT AND THROW
36	SR-4		CONSTRUCTION STAGING AND RESTORATION PLAN - IMMEDIATELY AFTER FIRST CUT AND THROW
37	SR-5		CONSTRUCTION STAGING AND RESTORATION PLAN - IMMEDIATELY AFTER INITIAL REMEDIATION
38	SR-6		CONSTRUCTION STAGING AND RESTORATION PLAN - DURING SECOND CUT AND THROW
39	SR-7		CONSTRUCTION STAGING AND RESTORATION PLAN - AFTER SECOND CUT AND THROW
40	SR-8		CONSTRUCTION STAGING AND RESTORATION PLAN - POST LIRR PROPERTY REMEDIATION

$PRFNAME$
$TBLNAME$
$TIME$
$DATE$
$DGNNAME$
$REF1$
$REF2$
$REF3$
$REF4$
$REF5$
$REF6$

STV
225 Park Avenue South
New York, New York 10003
212-777-4400

No.	DATE	REVISIONS

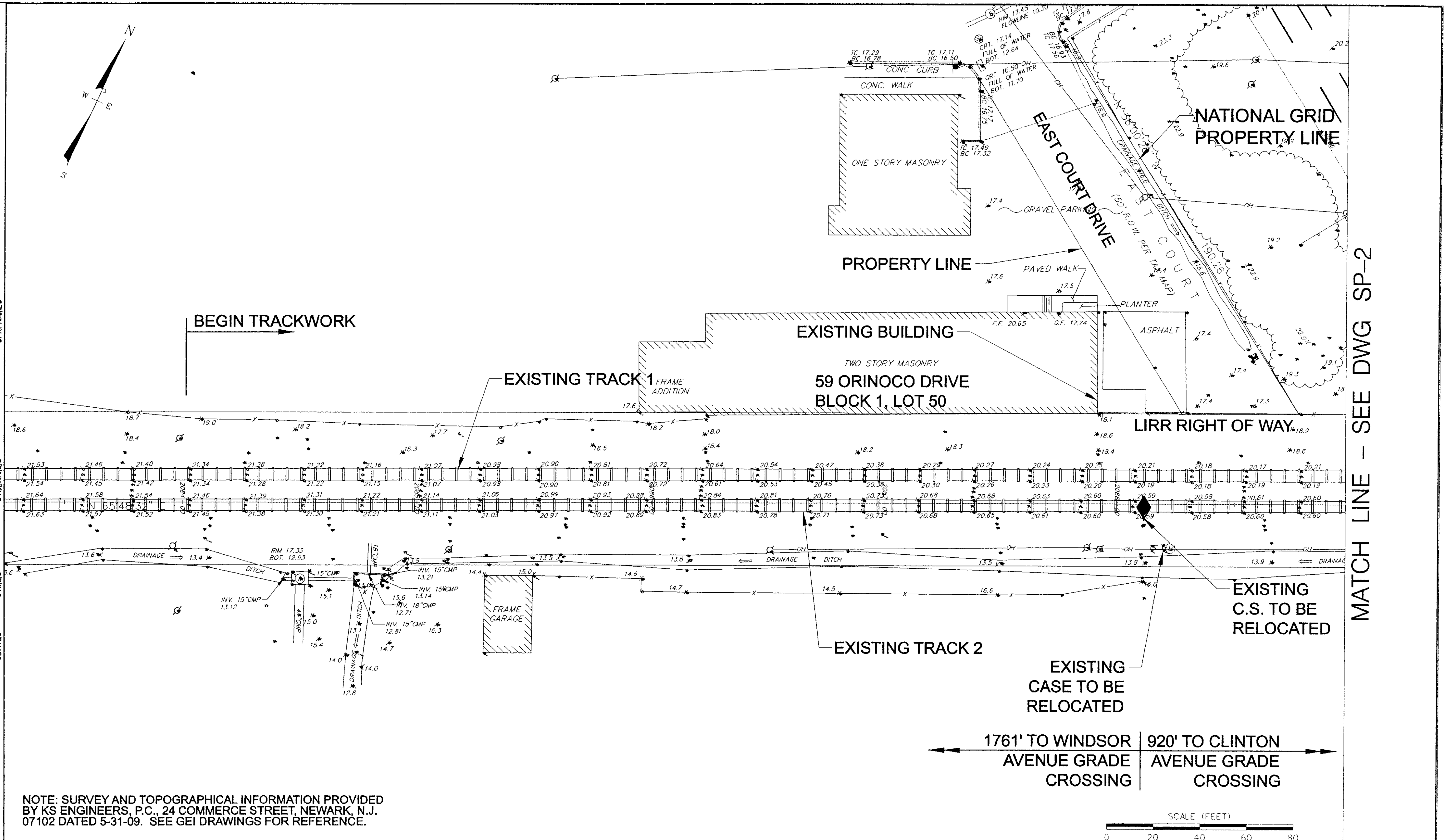
DESIGNED BY: AEV /CMK
DRAWN BY: E. Colleran
CHECKED BY: A. Vogel
COORDINATED BY: E. Colleran
APPROVED BY: C. Kaiser

STATE OF NEW YORK — DAVID HERRERA — N.S.2109 — LICENSED PROFESSIONAL ENGINEER

BAY SHORE/BRIGHTWATERS
FORMER MGP SITE
BAY SHORE, NEW YORK
nationalgrid

INDEX OF DRAWINGS

SCALE: Not to Scale
DRAWING NUMBER: IS-1
DATE: 7-13-09
REVISION NUMBER: 0
CONTRACT No.
ISSUE: FINAL
SHEET No. 1 OF 40



NOTE: SURVEY AND TOPOGRAPHICAL INFORMATION PROVIDED BY KS ENGINEERS, P.C., 24 COMMERCE STREET, NEWARK, N.J. 07102 DATED 5-31-09. SEE GEI DRAWINGS FOR REFERENCE.

STV
225 Park Avenue South
New York, New York 10003
212-777-4400

DATE:	REVISIONS	No.

DESIGNED BY: AEV /CMK
DRAWN BY: E. Colleran
CHECKED BY: A. Vogel
COORDINATED BY: E. Colleran
APPROVED BY: C. Kaiser

BAY SHORE/BRIGHTWATERS FORMER MGP SITE
BAY SHORE, NEW YORK
national grid

EXISTING SITE PLAN
SHEET 1

SCALE: 40 Scale
DRAWING NUMBER: SP-1
DATE: 7-13-09
REVISION NUMBER: 0
CONTRACT No. -----
ISSUE: FINAL
SHEET No. 2 OF 40

MATCH LINE – SEE DWG SP–1

MATCH LINE – SEE DWG SP–3

GRAVEL–DIRT

GRAVEL–STONE

CONC. PAD

ASPHALT PARKING LOT

STOCK PILE

UTILITY TRAILER

CONTAINER

GRT. 18.45 FULL OF WATER

EXISTING C.S. TO BE RELOCATED

PROPERTY LINE

NATIONAL GRID RIGHT OF WAY

816.72

EXISTING TRACK 1

LIRR RIGHT OF WAY

S 65°48'52" W

5' CHAIN LINK FENCE W/ WIRE

6' CHAIN LINK FENCE

6' STOCKADE FENCE

MASONRY GARAGE

FRAME GARAGE

NATIONAL GRID PROPERTY

EXISTING TRACK 2

EXISTING POLE TO BE RELOCATED

REMEDIATION AREA

EXISTING POLE TO BE RELOCATED

EXISTING LIRR CABLES TO BE RELOCATED NORTH OF TEMPORARY MAINLINE TRACKS
1 - FIBER OPTIC CABLE
2C4 - SIGNAL POWER CABLE
37C14 - SIGNAL LINE CABLE
1-100 PAIR COPPER LIRR COMM. CABLE
ASBESTOS CABLES TO BE ABATED AND REMOVED

NOTE: SURVEY AND TOPOGRAPHICAL INFORMATION PROVIDED BY KS ENGINEERS, P.C., 24 COMMERCE STREET, NEWARK, N.J. 07102 DATED 5-31-09. SEE GEI DRAWINGS FOR REFERENCE.

SCALE (FEET)
0 20 40 60 80

$REFNAMES
$REF1S
$REF2S
$REF3S
$REF4S
$REF5S
$REF6S
$DGNNAMES
$TBLNAMES
$TIMES
$DATES

STV
225 Park Avenue South
New York, New York 10003
212–777–4400

No.	REVISIONS	DATE:

DESIGNED BY: AEV /CMK
DRAWN BY: E. Colleran
CHECKED BY: A. Vogel
COORDINATED BY: E. Colleran
APPROVED BY: C. Kaiser

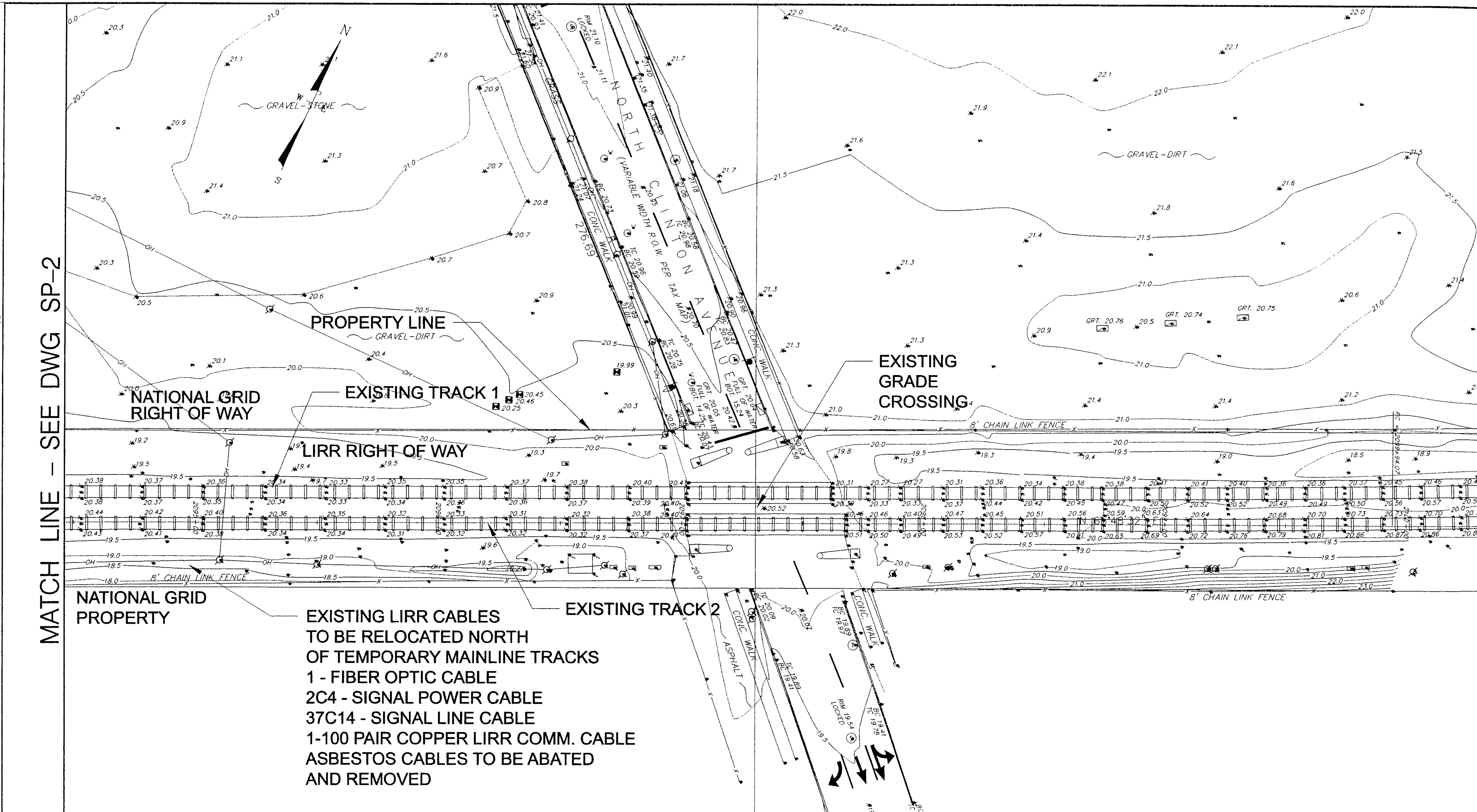
STATE OF NEW JERSEY — RICHARD M. REDA — 21 — LICENSED PROFESSIONAL ENGINEER

BAY SHORE/BRIGHTWATERS FORMER MGP SITE
BAY SHORE, NEW YORK
national grid

EXISTING SITE PLAN
SHEET 2

SCALE: 40 Scale
DRAWING NUMBER: SP-2
DATE: 7-13-09
REVISION NUMBER: 0

CONTRACT No. ------
ISSUE FINAL
SHEET No. 3 OF 40



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STV
225 Park Avenue South
New York, New York 10003
212-777-4400

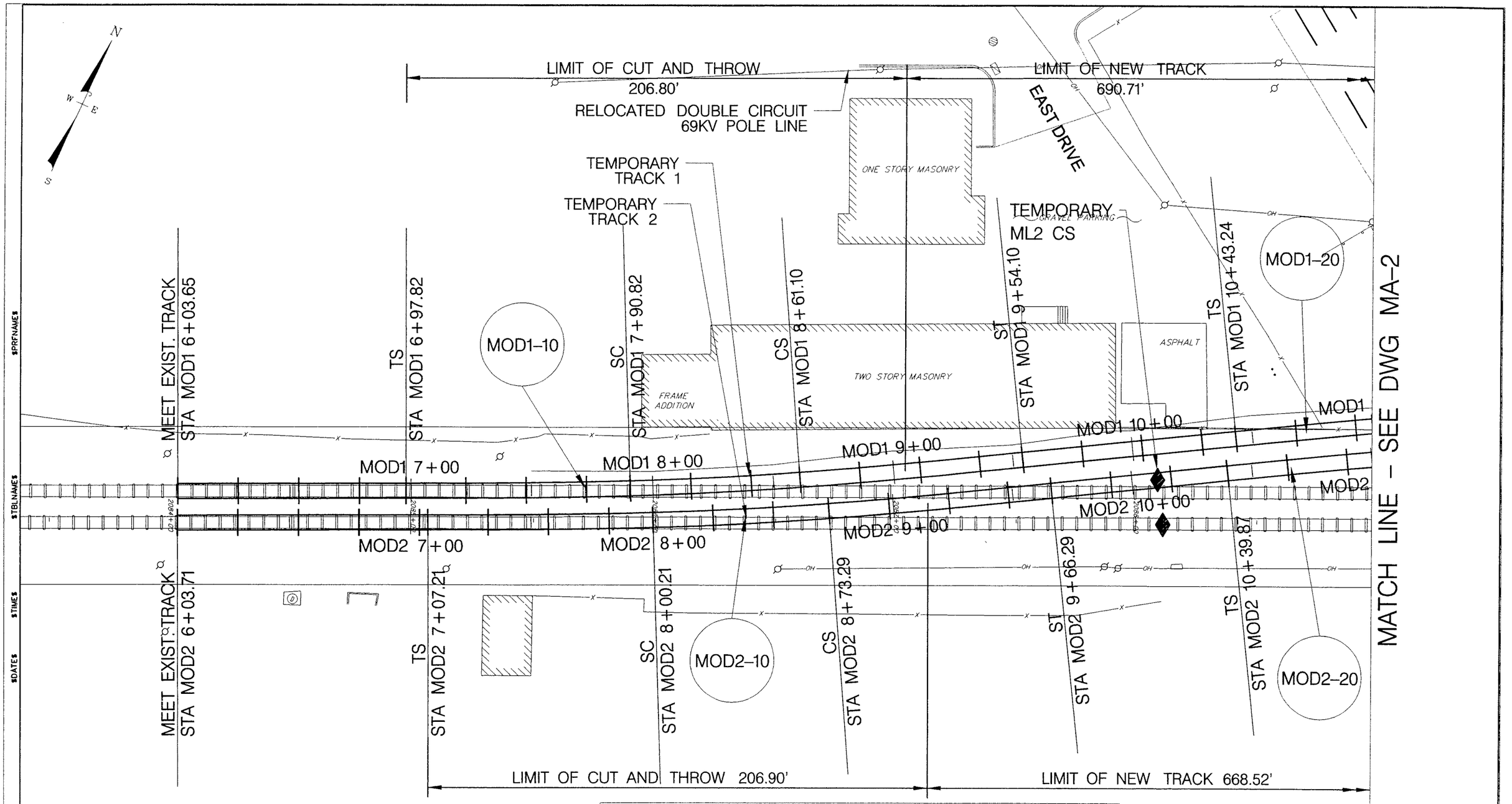
DATE:	REVISIONS	No.

DESIGNED BY: AEV /CMK
DRAWN BY: E. Colleran
CHECKED BY: A. Vogel
COORDINATED BY: E. Colleran
APPROVED BY: C. Kaiser

BAY SHORE/BRIGHTWATERS FORMER MGP SITE
BAY SHORE, NEW YORK
nationalgrid

EXISTING SITE PLAN
SHEET 3

SCALE: 40 Scale
DRAWING NUMBER: SP-3
DATE: 7-13-09
REVISION NUMBER: 0
CONTRACT No. -----
ISSUE: FINAL
SHEET No. 4 OF 40



NOTE: FOR CURVE DATA INFORMATION AND TRACK BEARINGS AND LOCATION, SEE DWG CD-1A.

LEGEND			
FENCE	⟶×⟵	EXTENT OF BALLAST	
SHEETING		REMEDIATION	
		DOUBLE CIRCUIT 69KV POLE LINE	

SCALE (FEET)
0 20 40 60 80

STV
225 Park Avenue South
New York, New York 10003
212–777–4400

DATE: | REVISIONS | No.

DESIGNED BY: _ AEV /CMK
DRAWN BY: _ E. Colleran
CHECKED BY: _ A. Vogel
COORDINATED BY: E. Colleran
APPROVED BY: C. Kaiser

STATE OF NEW YORK — RICHARD HEDAA — 210... — PROFESSIONAL ENGINEER

BAY SHORE/BRIGHTWATERS
FORMER MGP SITE
BAY SHORE, NEW YORK
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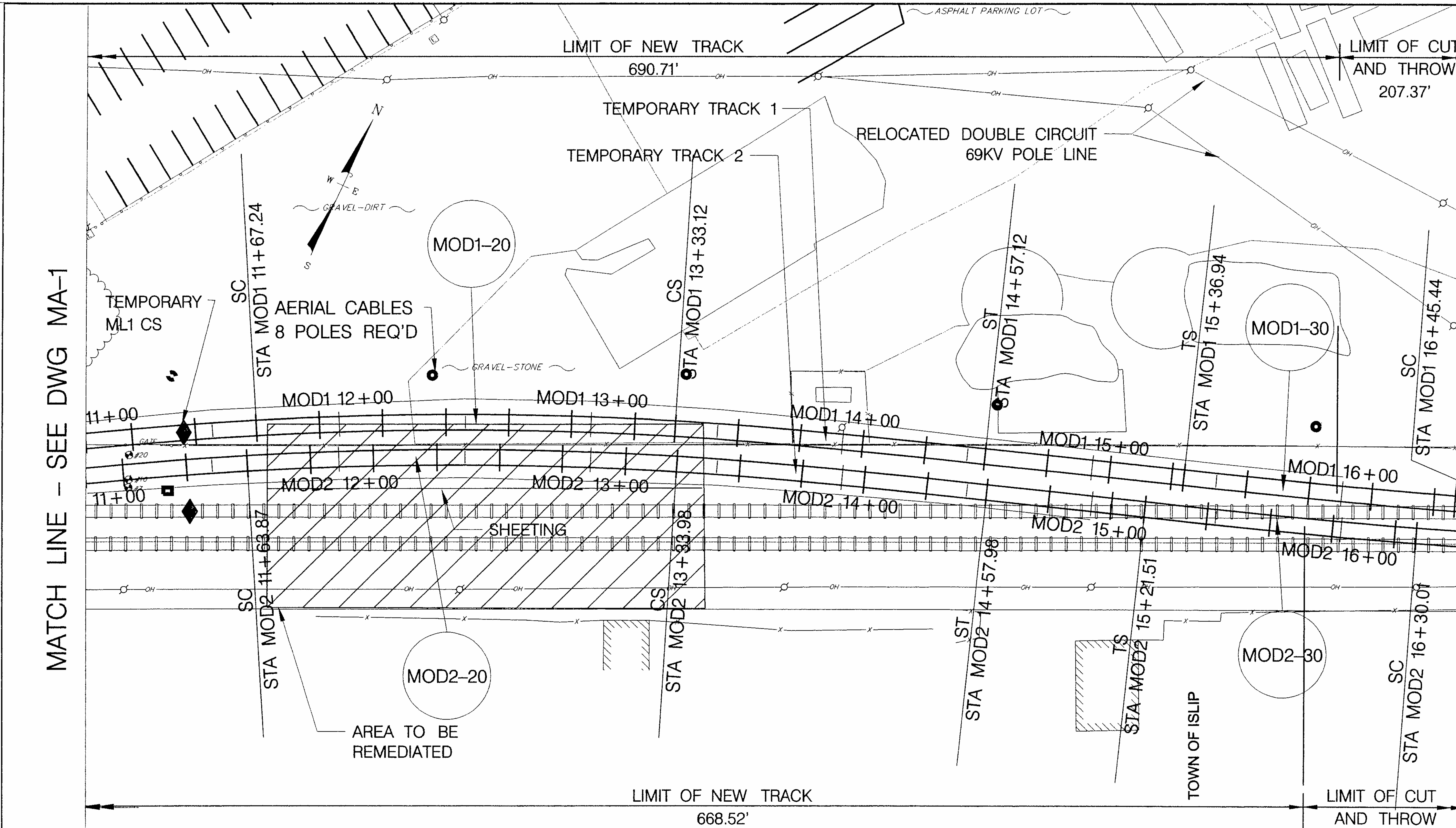
TEMPORARY TRACK
ALIGNMENT PLAN
SHEET 1

SCALE: _40 Scale
DRAWING NUMBER: _ MA–1
DATE: 7–13–09
REVISION NUMBER: 0
CONTRACT No. ------
ISSUE: FINAL
SHEET No. 5 OF 40

$REF1$ $REF2$ $REF3$ $REF4$ $REF5$ $REF6$ $REF7$ $DGNNAME$ $DATE$ $TIME$ $TBLNAME$ $PRFNAME$



NOTE: FOR CURVE DATA INFORMATION AND TRACK BEARINGS AND LOCATION, SEE DWG CD-1A.

LEGEND

FENCE	—X—	EXTENT OF BALLAST	— · — · —
SHEETING	— · — · —	REMEDIATION	//////
		DOUBLE CIRCUIT 69KV POLE LINE	- - - - -

SCALE (FEET)
0 20 40 60 80

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225 Park Avenue South
New York, New York 10003
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DESIGNED BY: AEV /CMK
DRAWN BY: E. Colleran
CHECKED BY: A. Vogel
COORDINATED BY: E. Colleran
APPROVED BY: C. Kaiser

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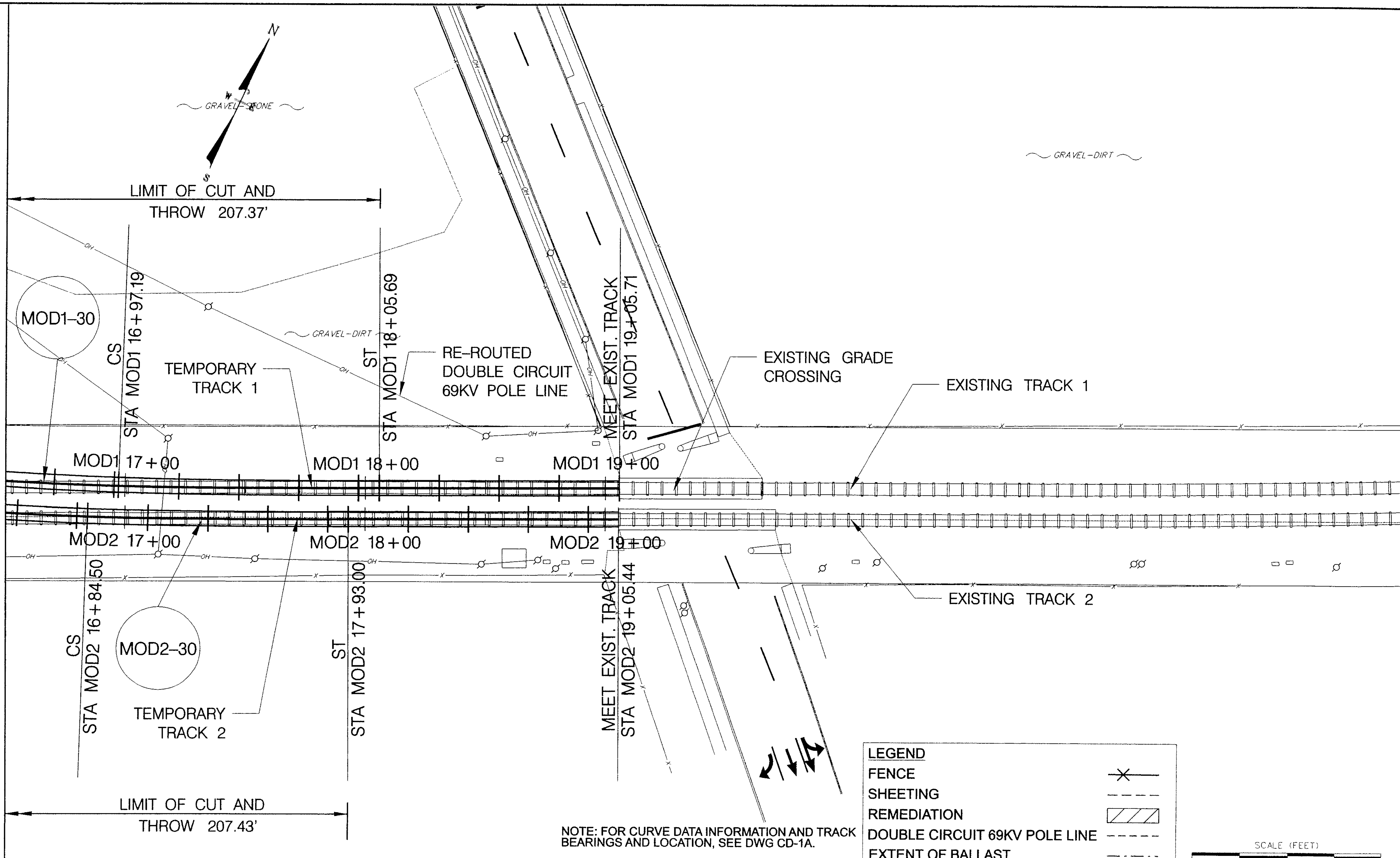
TEMPORARY TRACK
ALIGNMENT PLAN
SHEET 2

SCALE: 40 Scale
DRAWING NUMBER: MA-2
DATE: 7-13-09
REVISION NUMBER: 0
CONTRACT No. -----
ISSUE: FINAL
SHEET No. 6 OF 40



NOTE: FOR CURVE DATA INFORMATION AND TRACK BEARINGS AND LOCATION, SEE DWG CD-1A.

LEGEND

Item	Symbol
FENCE	—x—
SHEETING	- - - -
REMEDIATION	(hatched box)
DOUBLE CIRCUIT 69KV POLE LINE	- - - -
EXTENT OF BALLAST	— · — ·

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DRAWN BY: E. Colleran
CHECKED BY: A. Vogel
COORDINATED BY: E. Colleran
APPROVED BY: C. Kaiser

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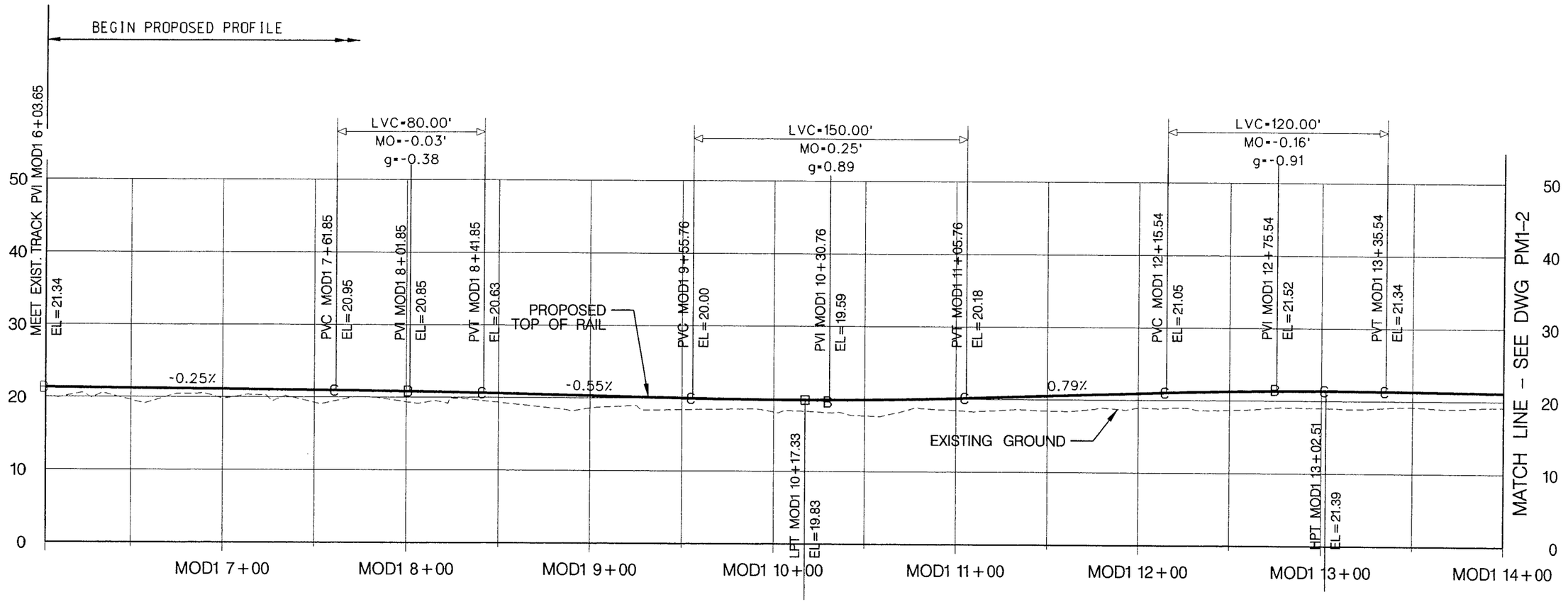
TEMPORARY TRACK ALIGNMENT PLAN SHEET 3

SCALE: 40 Scale
CONTRACT No. -----
DRAWING NUMBER: MA-3
ISSUE: FINAL
DATE: 7-13-09
REVISION NUMBER: 0
SHEET No. 7 OF 40



LEGEND	
EXISTING	- - -
PROPOSED	———
VERTICAL SCALE	4.0
HORIZONTAL SCALE	1.0

$PRFNAME$
$TBLNAME$
$DATE$ $TIME$
$REF1$
$REF2$
$REF3$
$REF4$
$REF5$
$DGNNAME$

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CHECKED BY: A. Vogel
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APPROVED BY: C. Kaiser

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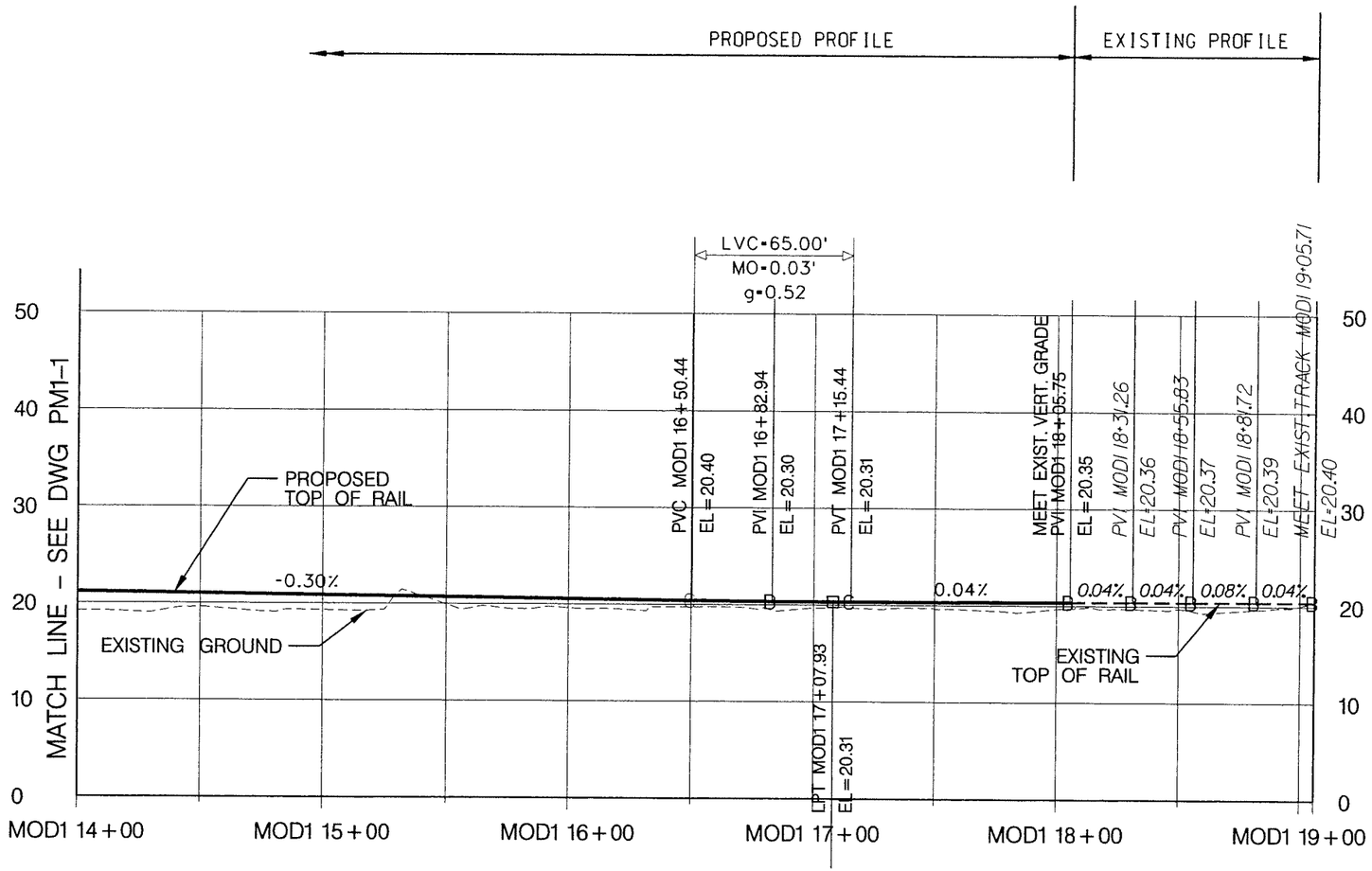
TEMPORARY TRACK 1
PROFILE
(35 MPH)
SHEET 1

SCALE: 60 Scale
DRAWING NUMBER: PM1-1
DATE: 7-13-09
REVISION NUMBER: 0
CONTRACT No.: ------
ISSUE: FINAL
SHEET No.: 8 OF 40



LEGEND	
EXISTING	- - -
PROPOSED	———
VERTICAL SCALE	4.0
HORIZONTAL SCALE	1.0

$REF1S
$REF2S
$REF3S
$REF4S
$REF5S
$REF6S
$DGNNAME$ $TBLNAME$ $TIME$ $DATE$ $PRFNAME$

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CHECKED BY: A. Vogel
COORDINATED BY: E. Colleran
APPROVED BY: C. Kaiser

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BAY SHORE/BRIGHTWATERS
FORMER MGP SITE
BAY SHORE, NEW YORK

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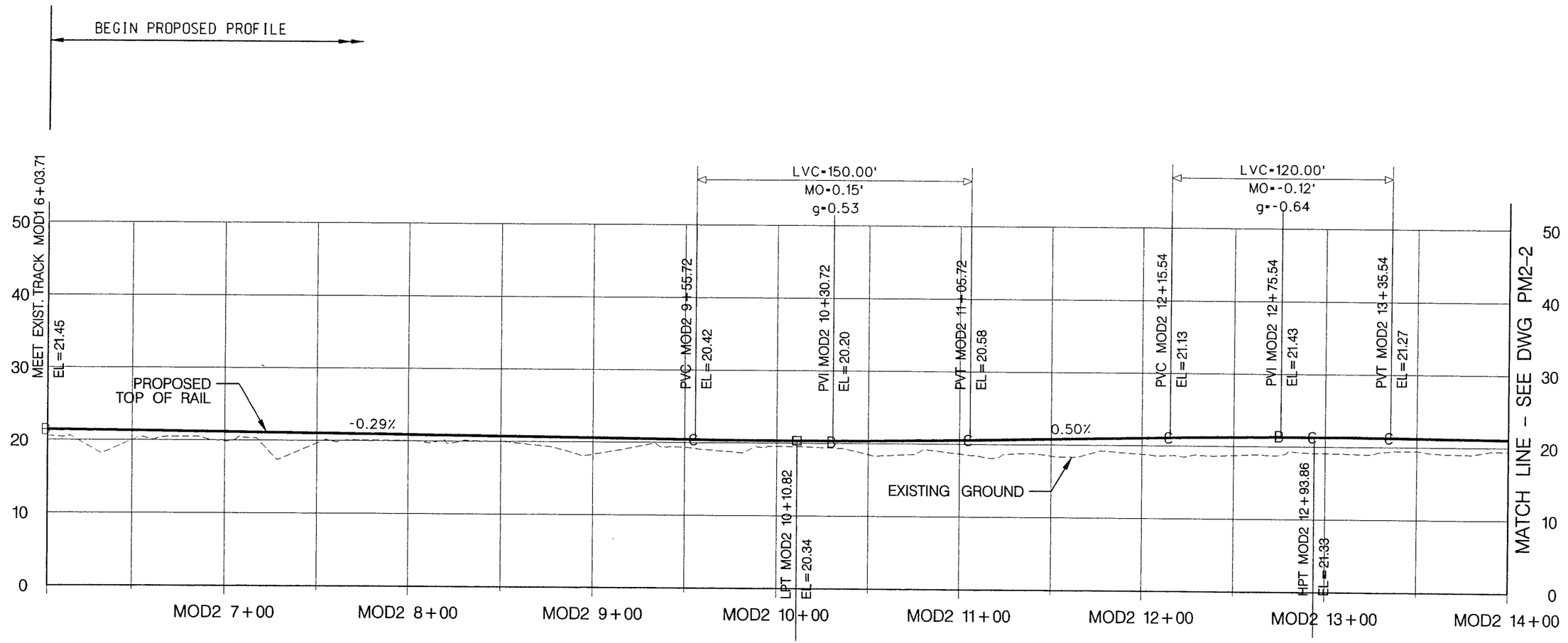
TEMPORARY TRACK 1
PROFILE
(35 MPH)
SHEET 2

SCALE: 60 Scale
DRAWING NUMBER: PM1-2
DATE: 7-13-09
REVISION NUMBER: 0

CONTRACT No. -----
ISSUE FINAL
SHEET No. 9 OF 40



LEGEND	
EXISTING	- - -
PROPOSED	———
VERTICAL SCALE	4.0
HORIZONTAL SCALE	1.0

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DATE	REVISIONS	No.

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APPROVED BY: C. Kaiser

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BAY SHORE, NEW YORK
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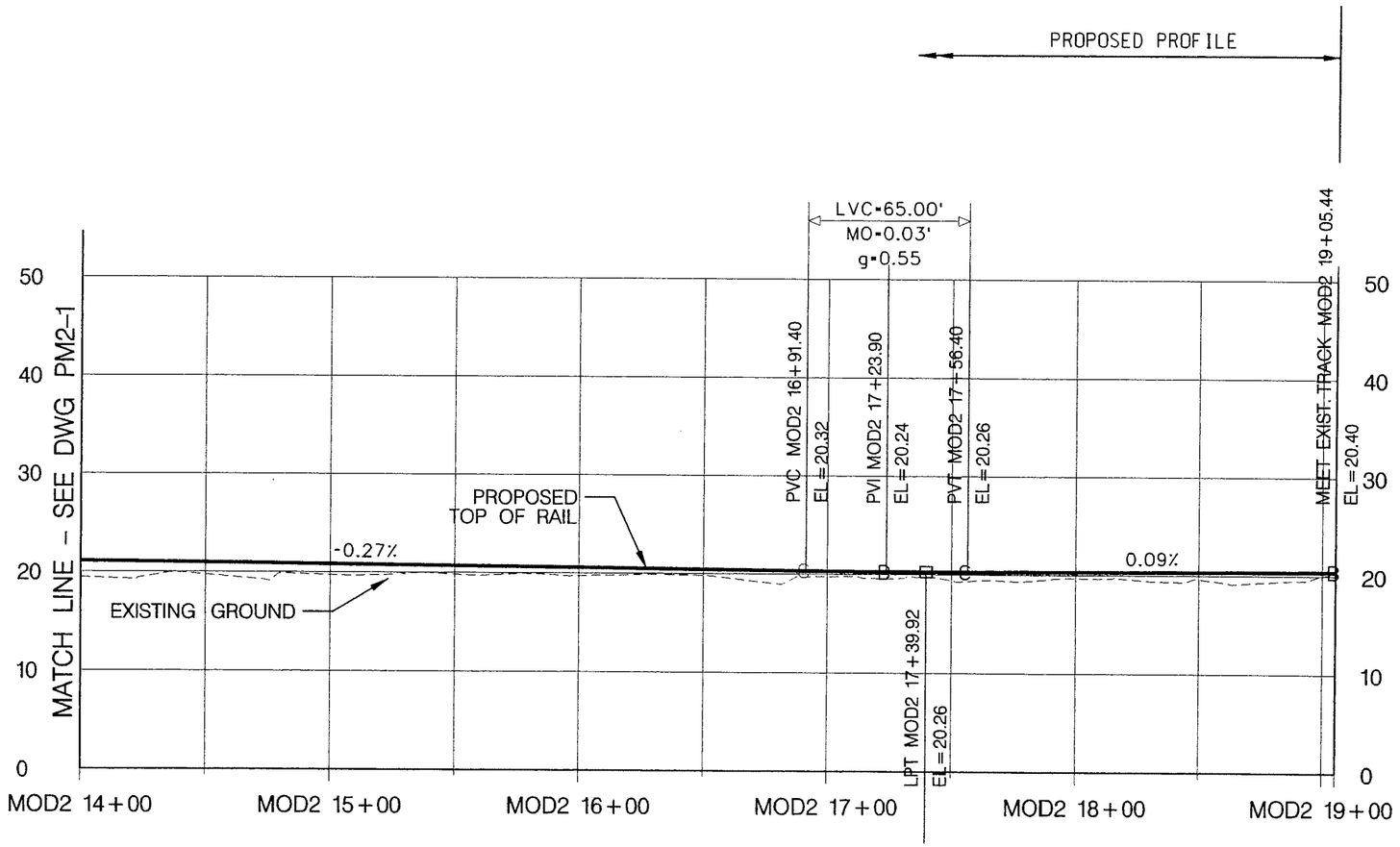
TEMPORARY TRACK 2 PROFILE (35 MPH) SHEET 1

SCALE: 60 Scale
DRAWING NUMBER: PM2-1
DATE: 7-13-09
REVISION NUMBER: 0
CONTRACT No. -----
ISSUE: FINAL
SHEET No. 10 OF 40

$REFNAMES $TBLNAMES $TIMES $DATES $REFFS $CONNAMES
$REF1S $REF2S $REF3S $REF4S $REF5S $REF6S



LEGEND	
EXISTING	- - -
PROPOSED	———
VERTICAL SCALE	4.0
HORIZONTAL SCALE	1.0

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CHECKED BY: A. Vogel
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APPROVED BY: C. Kaiser

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BAY SHORE, NEW YORK

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TEMPORARY TRACK 2
PROFILE
(35 MPH)
SHEET 2

SCALE:	60 Scale
DRAWING NUMBER:	PM2-2
DATE:	7-13-09
REVISION NUMBER:	0
CONTRACT No.	------
ISSUE	FINAL
SHEET No.	11 OF 40

$REF1S
$REF2S
$REF3S
$REF4S
$REF5S
$REF6S
$DGNNAMES $DATES $TIMES $TBLNAMES $PRFNAMES

N
W
E
S

EXISTING FENCING TO REMAIN

RELOCATED DOUBLE CIRCUIT 69KV POLE LINE

EAST DRIVE

ONE STORY MASONRY

PROPOSED TEMPORARY FENCING MEET EXISTING

GRAVEL PARKING

MEET EXISTING FENCE STA. MOD2 10+53

LIMIT OF GRADING

TEMPORARY TRACK 1

TEMPORARY TRACK 2

PROPOSED FENCE 60'

CONTRACTOR ACCESS GATE

F.F. 20.65

G.F. 17.74

TWO STORY MASONRY

FRAME ADDITION

1.1' BETWEEN BALLAST AND BUILDING

REMOVE FENCING

MATCH LINE – SEE DWG TG-2

STA. EX1 9+92.18

STA. EX1 10+28.32

SEE CROSS SECTIONS FOR ADDITIONAL DETAILED CLEARANCES AT THESE LOCATIONS

LEGEND			
FENCE	—X—	REMEDIATION	
SHEETING	—·—·—	DOUBLE CIRCUIT 69KV POLE LINE	-----
		EXTENT OF BALLAST	—·—·—

NOTES
1. SECTIONS AT 50' INTERVALS SHOWN ON CROSS SECTION DWGS CS-1 THROUGH CS-4.
2. SEE DWG. "TRACK MANUAL ROADWAY STONE BALLAST" FOR TYPICAL SECTION, DWG TM-1.
3. SHOULDER WIDTHS OF 1 FT ON TANGENT TRACK AND 1.5 FT ON CURVED TRACK SHOWN.

SCALE (FEET)
0 20 40 60 80

$PRFNAME$
$TBLNAME$
$TIME$
$DATE$
$REF1$
$REF2$
$REF3$
$REF4$
$REF5$
$REF6$
$DGNNAME$

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STATE OF NEW YORK — DAVID HERRERA — 210... — PROFESSIONAL ENGINEER

BAY SHORE/BRIGHTWATERS FORMER MGP SITE
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TEMPORARY GRADING PLAN SHEET 1

SCALE: 40 Scale
DRAWING NUMBER: TG-1
DATE: 7-13-09
REVISION NUMBER: 0

CONTRACT No.
ISSUE: FINAL
SHEET No. 12 OF 40

RELOCATED DOUBLE CIRCUIT 69KV POLE LINE

"NO CLEARANCE" SIGNS TO BE INSTALLED ALONG TRACKSIDE FACE OF FENCE STA. MOD2 11+31 TO STA. MOD2 13+44

FENCE TO BE INSTALLED APPROXIMATELY 16' FROM CENTER OF TEMP. TRACK 1 (TYP) (LENGTH APPROX. 461')

TEMPORARY TRACK 1

BAY SHORE WEST PARCEL

PROPOSED TEMPORARY FENCING MEET EXISTING

TEMPORARY TRACK 2

LIMIT OF GRADING

MEET EXISTING FENCE STA. MOD1 15+67

PROPOSED REMEDIATION FENCING 19.1'

40'

SHEETING

FENCING LOCATED 8.5' FROM ℄ TRACK 2

43.1'

PROPOSED REMEDIATION FENCING 304.8'

CONTRACTOR ACCESS GATE

AREA TO BE REMEDIATED

LIMIT OF GRADING

FENCING LOCATED 8.5' FROM ℄ TRACK 2

PROPOSED NORTH SOUTH REMEDIATION FENCING 47.2'

PROPOSED REMEDIATION FENCING 209.1' FENCE TO BE INSTALLED NORTH OF AND ABUTTING INITIAL SHEETING

MATCH LINE – SEE DWG TG–1

MATCH LINE – SEE DWG TG–3

LEGEND			
FENCE	⟶×⟵	EXTENT OF BALLAST	— · — · —
SHEETING	— · — · —	REMEDIATION	▨
		DOUBLE CIRCUIT 69KV POLE LINE	– – – – –

NOTES
1. SECTIONS AT 50' INTERVALS SHOWN ON CROSS SECTION DWGS CS-1 THROUGH CS-4.
2. SEE DWG. "TRACK MANUAL ROADWAY STONE BALLAST" FOR TYPICAL SECTION, DWG TM-1.
3. SHOULDER WIDTHS OF 1 FT ON TANGENT TRACK AND 1.5 FT ON CURVED TRACK SHOWN.

SCALE (FEET)
0 20 40 60 80

$REFFS $REF2S $REF3S $REF4S $REF5S $REF6S $DGNNAMES $DATES $TIMES $TBLNAMES $PRFNAMES

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225 Park Avenue South
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DRAWN BY: _ E. Colleran
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COORDINATED BY: E. Colleran
APPROVED BY: C. Kaiser

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TEMPORARY GRADING PLAN SHEET 2

SCALE: _40 Scale
DRAWING NUMBER: - TG-2
DATE: 7-13-09
REVISION NUMBER: 0
CONTRACT No. - - - - -
ISSUE FINAL
SHEET No. 13 OF 40

MATCH LINE – SEE DWG TG-2

RELOCATED DOUBLE CIRCUIT 69KV POLE LINE

TEMPORARY TRACK 1

TEMPORARY TRACK 2

NORTH CLINTON AVENUE

LEGEND			
FENCE	⟶✕⟵	EXTENT OF BALLAST	
SHEETING		REMEDIATION	
		DOUBLE CIRCUIT 69KV POLE LINE	

NOTES
1. SECTIONS AT 50' INTERVALS SHOWN ON CROSS SECTION DWGS CS-1 THROUGH CS-4.
2. SEE DWG. "TRACK MANUAL ROADWAY STONE BALLAST" FOR TYPICAL SECTION, DWG TM-1.
3. SHOULDER WIDTHS OF 1 FT ON TANGENT TRACK AND 1.5 FT ON CURVED TRACK SHOWN.

SCALE (FEET)
0 20 40 60 80

$PRFNAME$
$TBLNAME$
$TIMES$
$DATES$
$REF1$
$REF2$
$REF3$
$REF4$
$REF5$
$REF6$
$CONNAME$

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225 Park Avenue South
New York, New York 10003
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DATE	No.	REVISIONS

DESIGNED BY: AEV /CMK
DRAWN BY: E. Colleran
CHECKED BY: A. Vogel
COORDINATED BY: E. Colleran
APPROVED BY: C. Kaiser

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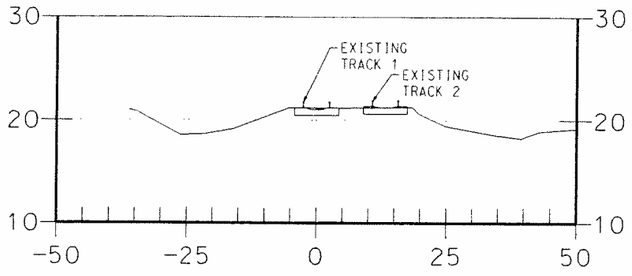
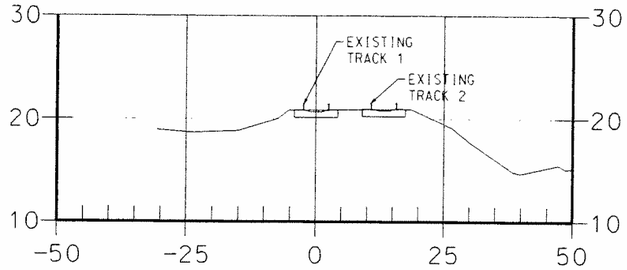
TEMPORARY GRADING PLAN
SHEET 3

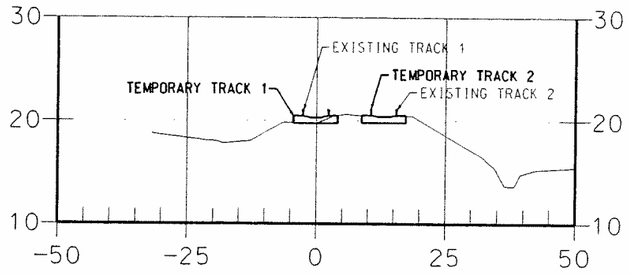
SCALE: 40 Scale
DRAWING NUMBER: TG-3
DATE: 7-13-09
REVISION NUMBER: 0
CONTRACT No. ----- -----
ISSUE: FINAL
SHEET No. 14 OF 40



EX1 4+00.00



EX1 5+50.00



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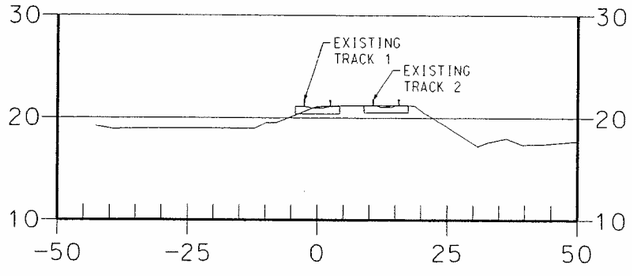

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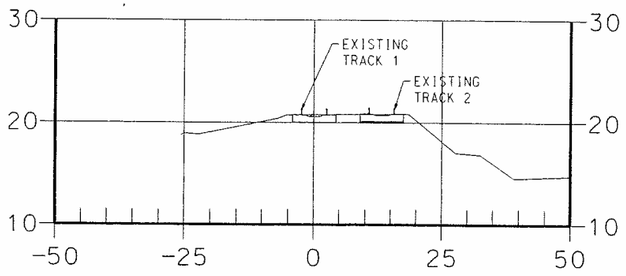

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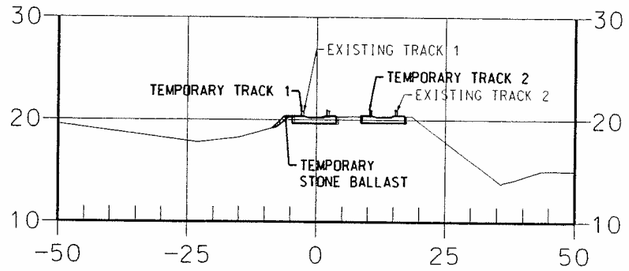

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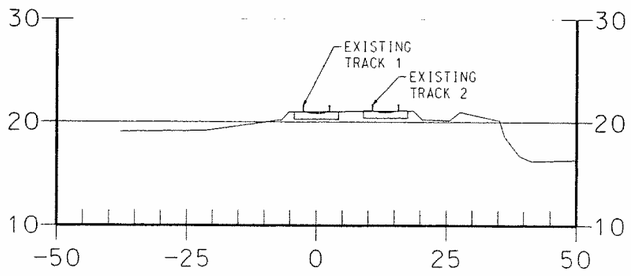

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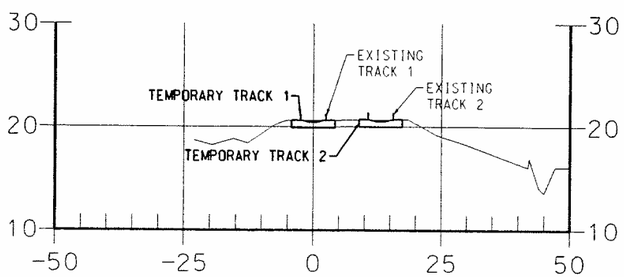

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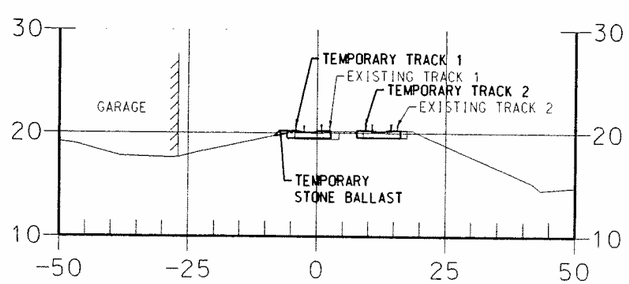

EX1 8+00.00

NOTES
1. THESE DRAWINGS ARE REFERENCING NAD-83 AND NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD-88).
2. 119 RE RAIL ASSUMED.
3. ALL SECTIONS BASED ON PROVIDING FULL 1'-9" BALLAST/ SUBBASE BENEATH TIE.

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DRAWN BY: E. Colleran
CHECKED BY: A. Vogel
COORDINATED BY: E. Colleran
APPROVED BY: C. Kaiser

STATE OF NEW YORK — MARIO MEDICI — 62119 — LICENSED PROFESSIONAL ENGINEER

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BAY SHORE, NEW YORK
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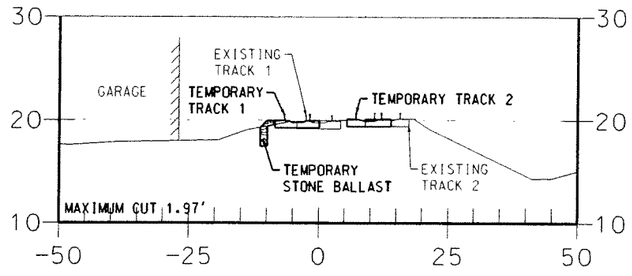
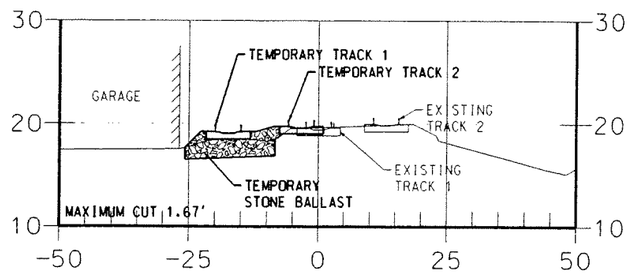
CROSS SECTIONS
SHEET 1

SCALE: 30 Scale
DRAWING NUMBER: CS-1
DATE: 7-13-09
REVISION NUMBER: 0
CONTRACT No.
ISSUE: FINAL
SHEET No. 15 OF 40

$PRFNAME$ $TBLNAME$ $DATE$ $TIME$ $REF1$ $REF2$ $REF3$ $REF4$ $REF5$ $REF6$ $DGNNAME$



EX1 8+50.00



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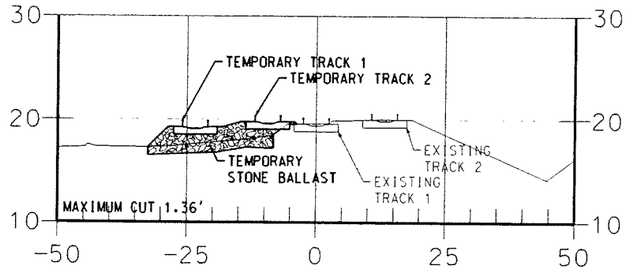

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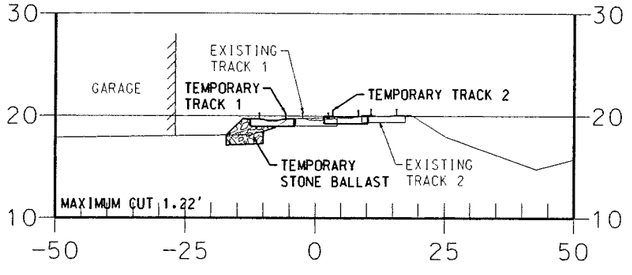
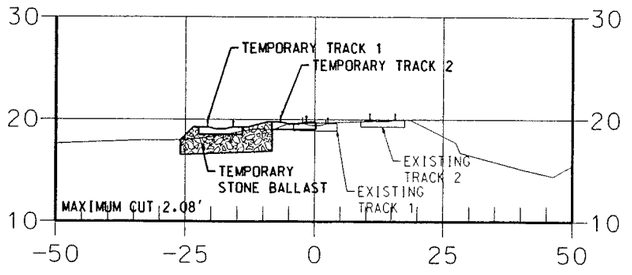
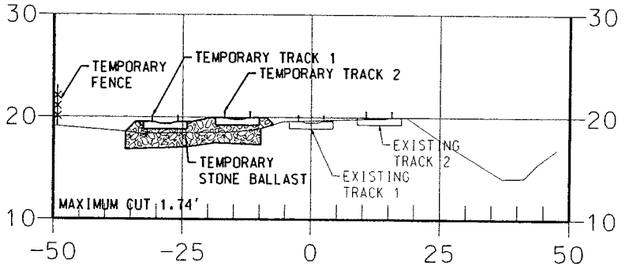


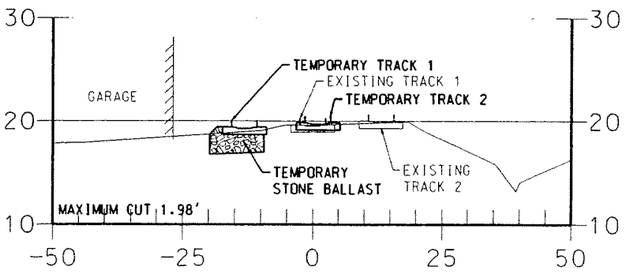
EX1 9+00.00



EX1 10+00.00



EX1 11+00.00



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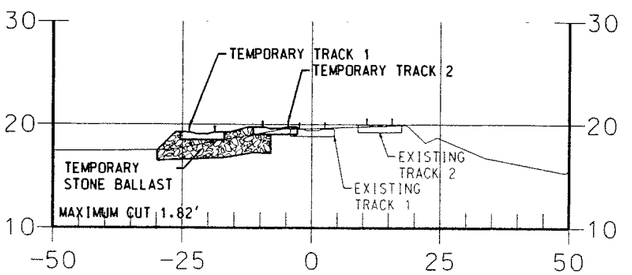
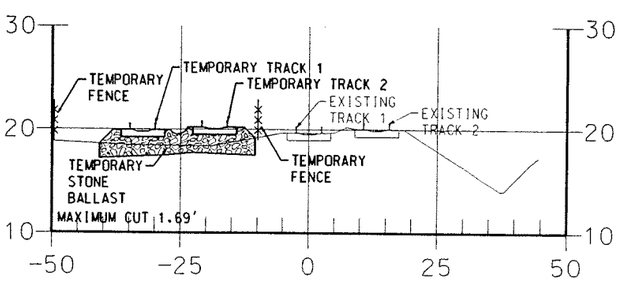


EX1 10+28.32



EX1 11+50.00

NOTES
1. THESE DRAWINGS ARE REFERENCING NAD-83 AND NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD-88).
2. 119 RE RAIL ASSUMED.
3. ALL SECTIONS BASED ON PROVIDING FULL 1'-9" BALLAST/ SUBBASE BENEATH TIE.

STV
225 Park Avenue South
New York, New York 10003
212-777-4400

DATE: REVISIONS No.

DESIGNED BY: AEV /CMK
DRAWN BY: E. Colleran
CHECKED BY: A. Vogel
COORDINATED BY: E. Colleran
APPROVED BY: C. Kaiser

STATE OF NEW YORK — HAMID WEDDADY — 62192 — LICENSED PROFESSIONAL ENGINEER

BAY SHORE/BRIGHTWATERS
FORMER MGP SITE
BAY SHORE, NEW YORK
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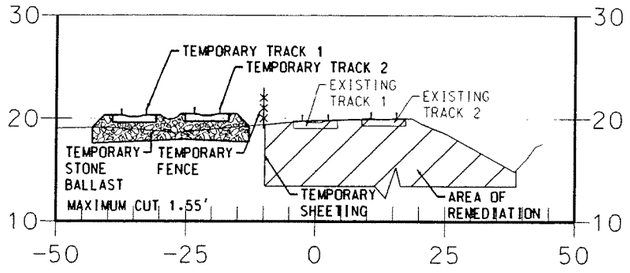
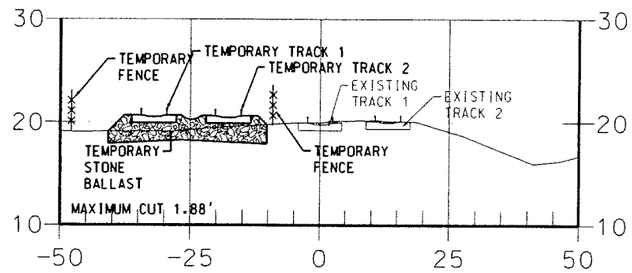
CROSS SECTIONS
SHEET 2

SCALE: 30 Scale
DRAWING NUMBER: CS-2
DATE: 7-13-09
REVISION NUMBER: 0
CONTRACT No.
ISSUE: FINAL
SHEET No. 16 OF 40

$PRFNAME$ $TBLNAME$ $DATE$ $TIME$ $REF1$ $REF2$ $REF3$ $REF4$ $REF5$ $REF6$ $REF7$ $REF8$ $DGNNAME$



EX1 12+00.00



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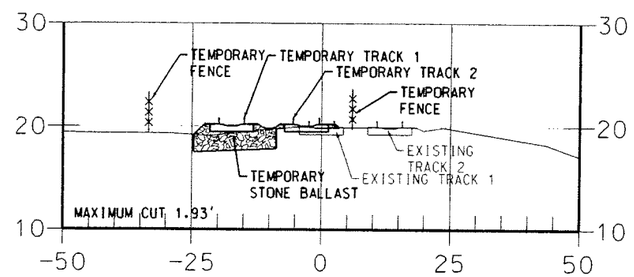

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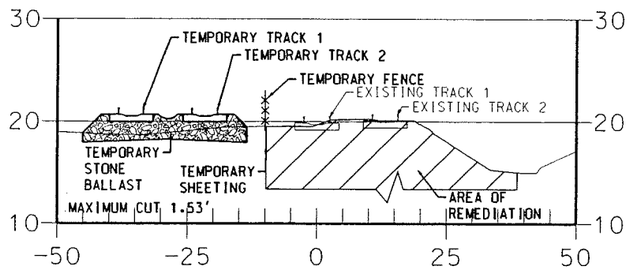

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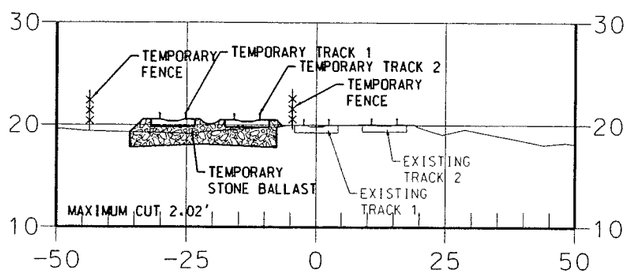
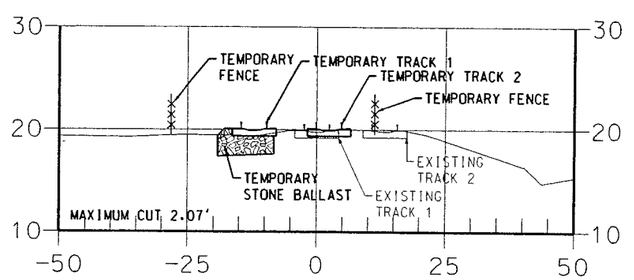


EX1 14+00.00



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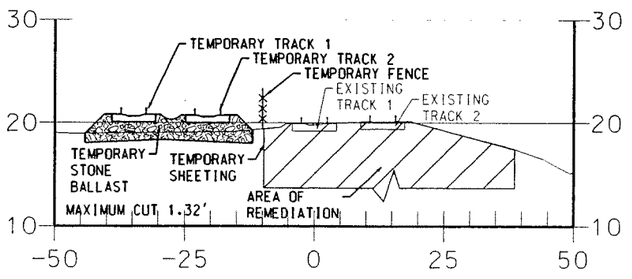
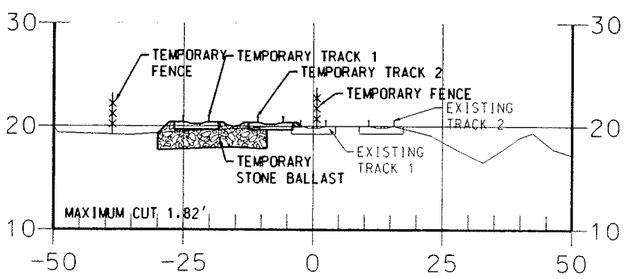
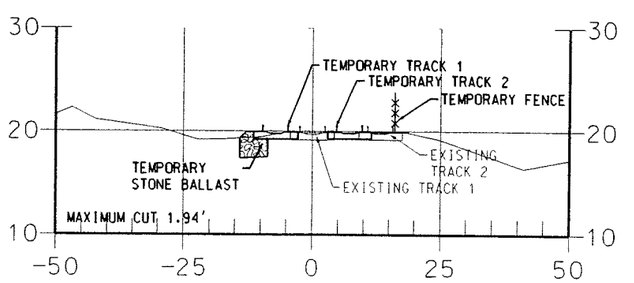


EX1 13+00.00



EX1 14+50.00



EX1 16+00.00

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DRAWN BY: E. Colleran
CHECKED BY: A. Vogel
COORDINATED BY: E. Colleran
APPROVED BY: C. Kaiser

STATE OF NEW YORK — DAVID HEO — 076210 — LICENSED PROFESSIONAL ENGINEER

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BAY SHORE, NEW YORK
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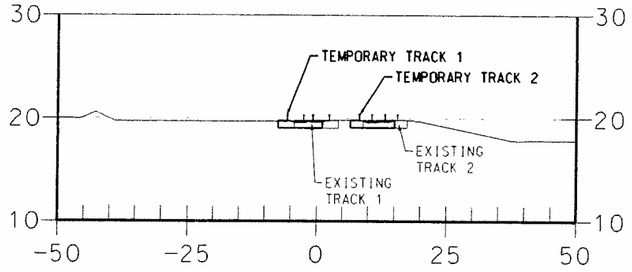
CROSS SECTIONS
SHEET 3

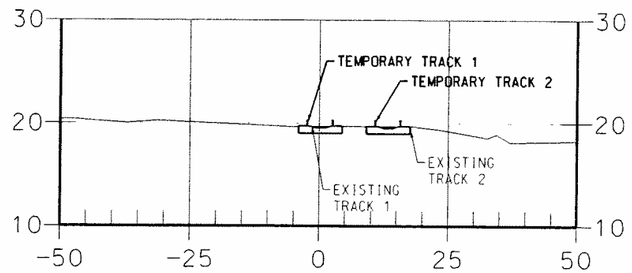
SCALE: 30 Scale
DRAWING NUMBER: CS-3
DATE: 7-13-09
REVISION NUMBER: 0

CONTRACT No.
ISSUE: FINAL
SHEET No. 17 OF 40

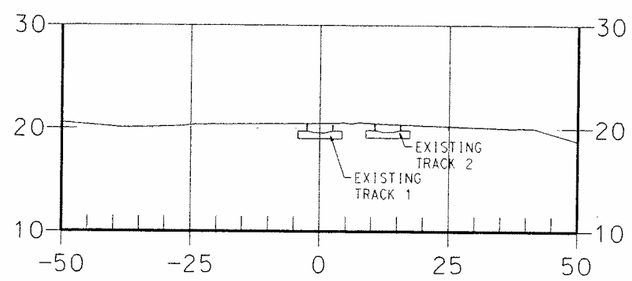
$PRFNAME$ $TBLNAME$ $DATE$ $TIME$ $DGNNAME$
$REF1$ $REF2$ $REF3$ $REF4$ $REF5$ $REF6$



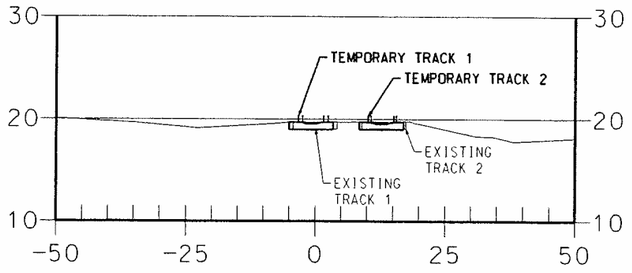
EX1 16+50.00



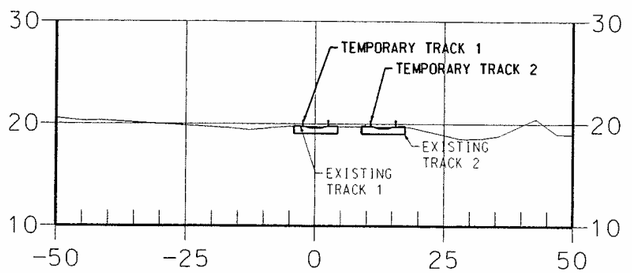
EX1 18+00.00



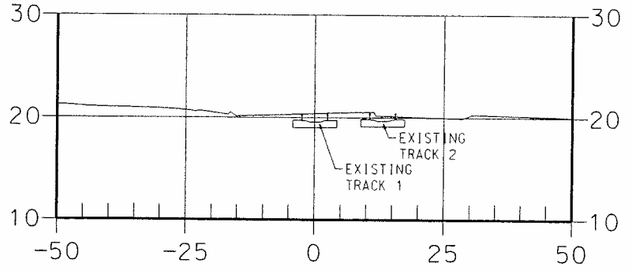
EX1 19+32.68



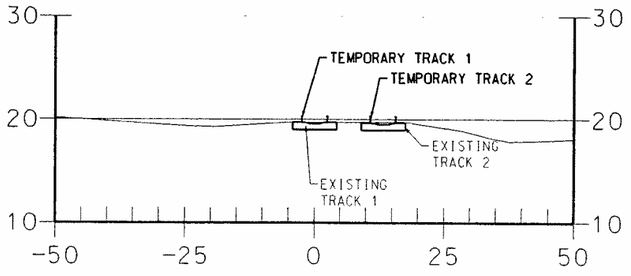
EX1 17+00.00



EX1 18+50.00



EX1 19+50.00



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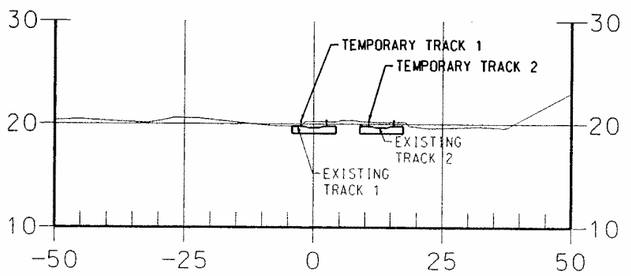

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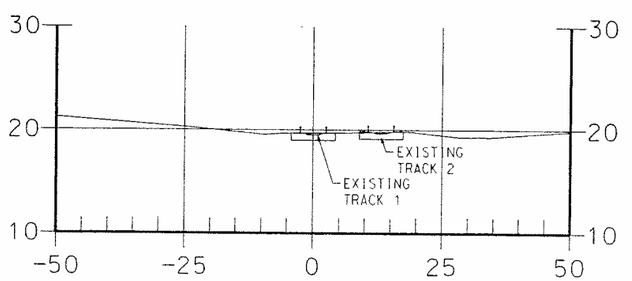

EX1 20+00.00

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212-777-4400

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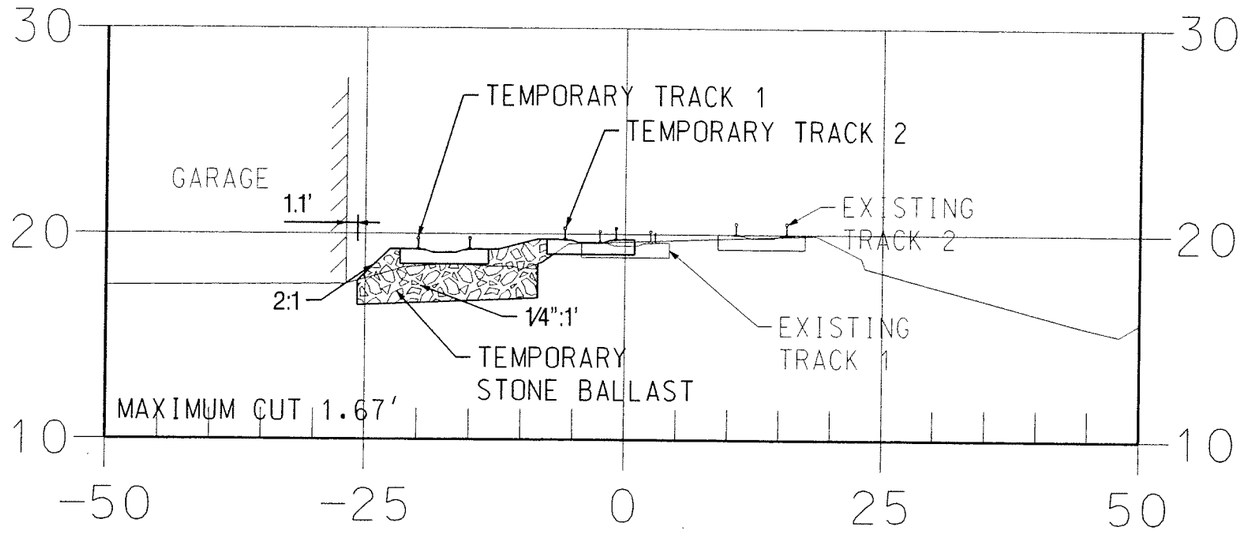
DRAWN BY: E. Colleran
CHECKED BY: A. Vogel
COORDINATED BY: E. Colleran
APPROVED BY: C. Kaiser

BAY SHORE/BRIGHTWATERS
FORMER MGP SITE
BAY SHORE, NEW YORK
national grid

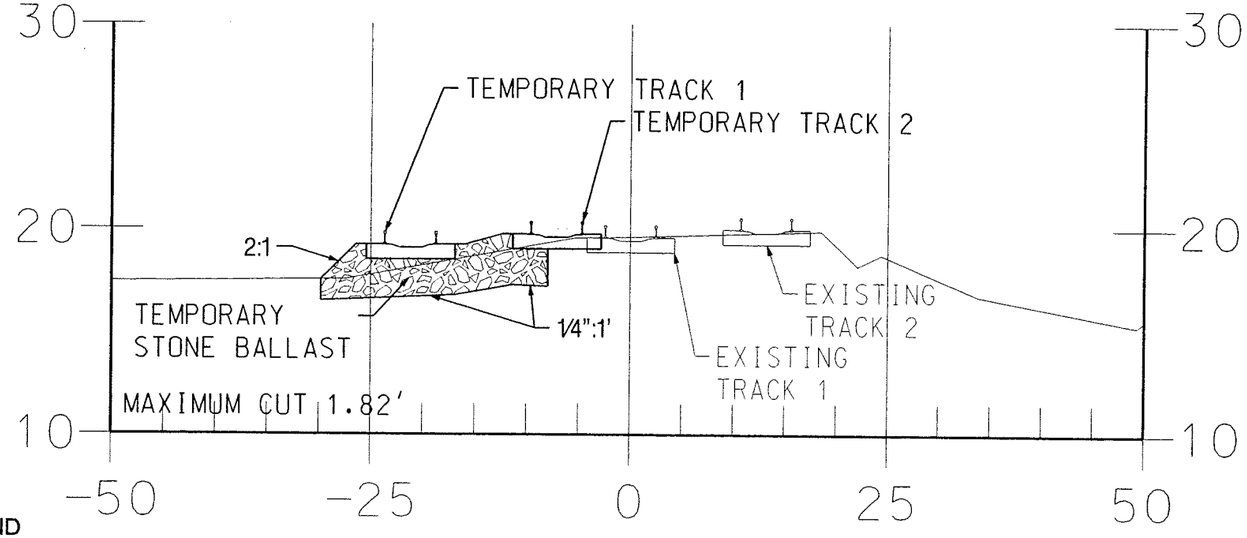
CROSS SECTIONS
SHEET 4

SCALE: 30 Scale
DRAWING NUMBER: CS-4
DATE: 7-13-09
REVISION NUMBER: 0
CONTRACT No.
ISSUE: FINAL
SHEET No. 18 OF 40

$PRFNAME$ $TBLNAME$ $TIME$ $DATE$ $REF1$ $REF2$ $REF3$ $REF4$ $REF5$ $REF6$ $DGNNAME$



EX1 9+92.18



EX1 10+28.32

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SCALE (FEET)
0 15 30

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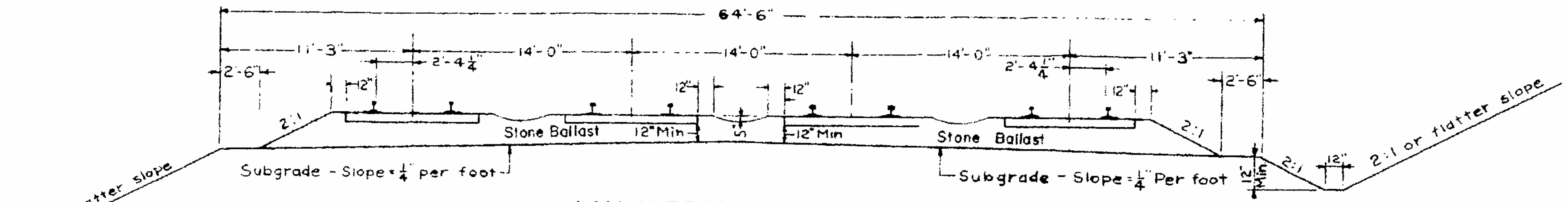
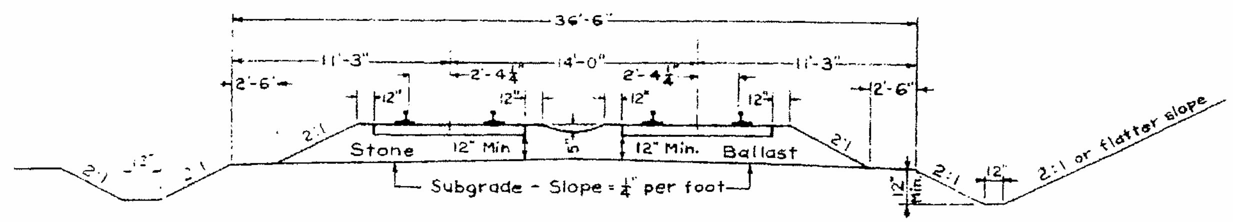
CROSS SECTIONS AT BUILDING LINE AND PROPERTY LINE OF GARAGE

SCALE: 15 Scale
DRAWING NUMBER: CS2-1
DATE: 7-13-09
REVISION NUMBER: 0
CONTRACT No.
ISSUE: FINAL
SHEET No. 19 OF 40

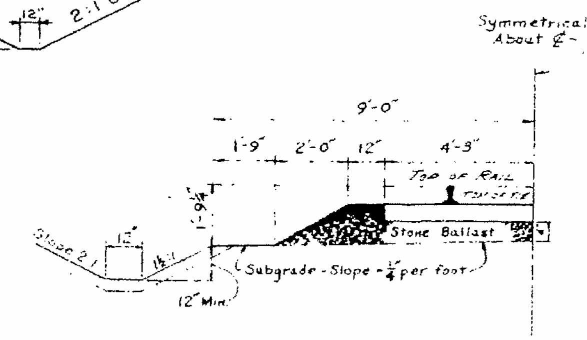
$PREFIX$ $PRFNAME$ $DATE$ $TIME$ $TBLNAME$
$SPEF1$ $SPEF2$ $SPEF3$ $SPEF4$ $SPEF5$ $SPEF6$ $DONNAME$



4 MAIN TRACKS – TANGENT

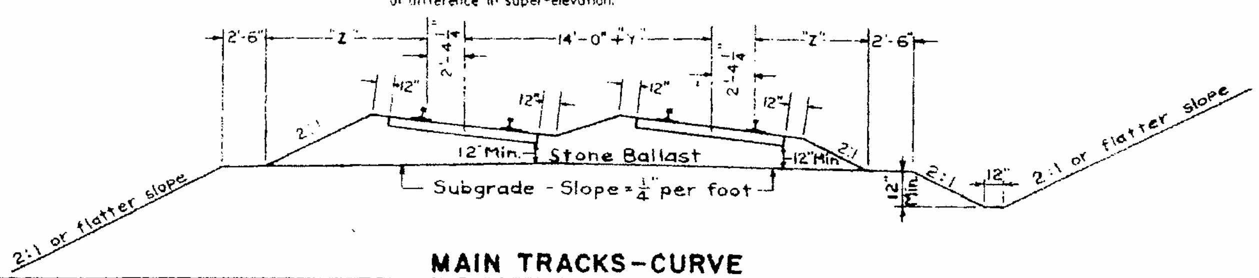


2 MAIN TRACKS – TANGENT

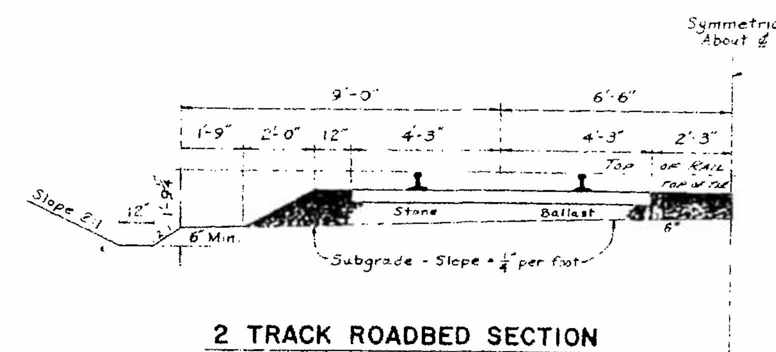


PERMANENT PRIVATE SIDETRACK

"Y" = On adjacent tracks — Where super-elevation is the same or the outer track has the lesser, this dimension shall be increased 1" for every 1/2 degree of curvature on curves greater than 6°. Where super-elevation on outer track is greater, this dimension shall be increased as above, plus 3 1/2 times the amount of difference in super-elevation.



MAIN TRACKS – CURVE



2 TRACK ROADBED SECTION
TEMPORARY TRACK

TABLE OF DIMENSIONS "Z"

OUTSIDE EDGE OF BALLAST FROM GAGE OF NEAR RAIL FOR CURVED TRACK

SUPER-ELEVATION	INSIDE OF CURVE	OUTSIDE OF CURVE
1"	6'-3"	6'-10"
2"	6'-2"	7'-2"
3"	6'-1"	7'-6"
4"	6'-0"	7'-10"
5"	5'-11"	8'-2"
6"	5'-10"	8'-6"

NOTES

Cross Drains of cast iron or other material, shall drain into side ditch and be located midway between rail joints.

All tracks shall be brought to the same elevation laterally at highway crossings and over open or solid floor bridges.

All other requirements shall conform to the L.I.R.R. Specifications for Construction and Maintenance of Ballasted Track, M.W-1

METROPOLITAN TRANSPORTATION AUTHORITY
THE LONG ISLAND RAIL ROAD
JAMAICA, N.Y.

BRANCH
LOCATION STANDARD

ROADWAY
STONE BALLAST

OFFICE OF THE CHIEF ENGINEER
APPROVED

DWG NO 10-10
SHEET
SCALE
DATE 6-30-72
DWN BY
CHKD BY C.H.G.
IN CHARGE

STV
225 Park Avenue South
New York, New York 10003
212-777-4400

DATE: | REVISIONS | No.

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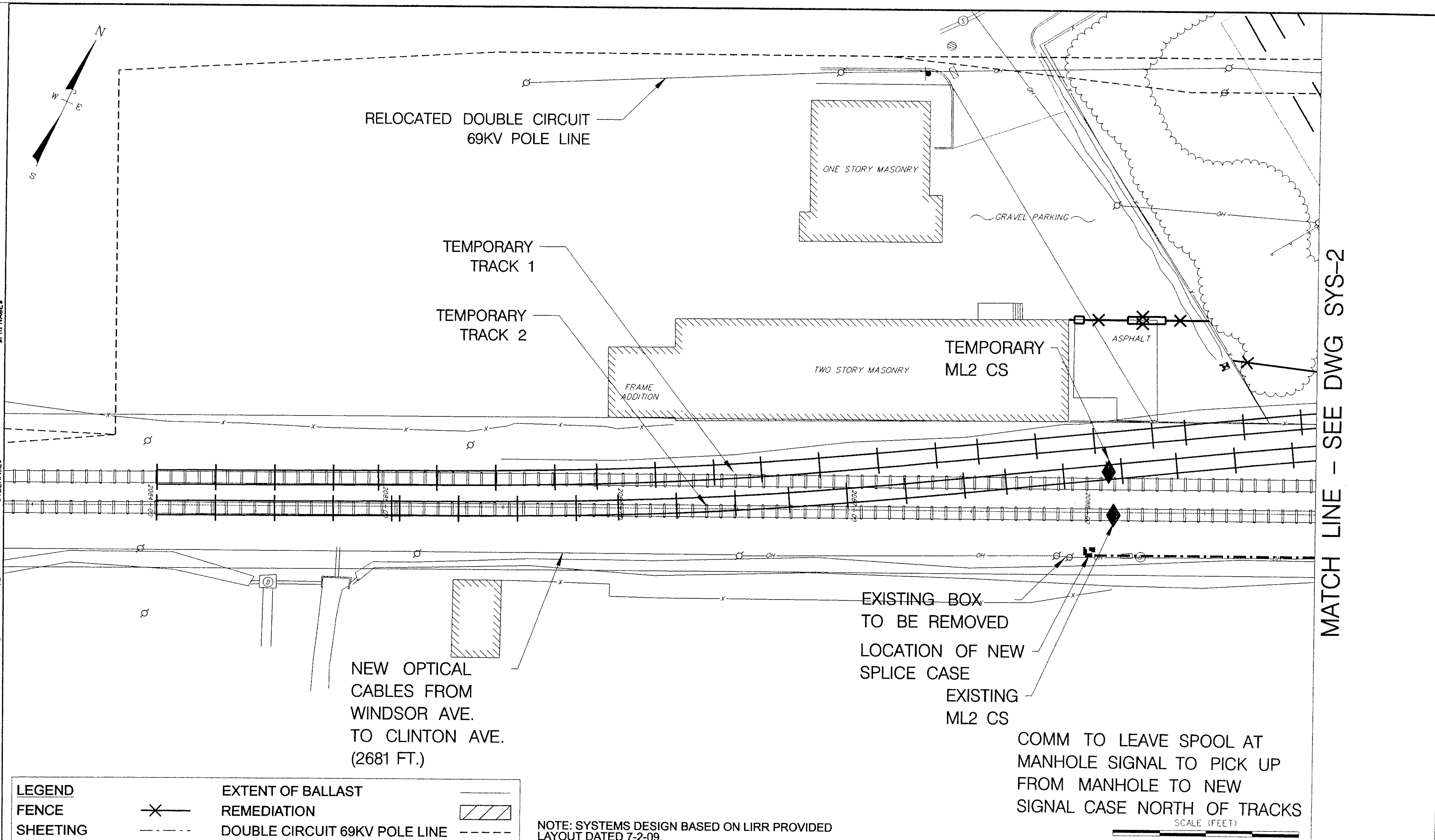
TRACK MANUAL
ROADWAY STONE BALLAST

SCALE: Not to Scale
DRAWING NUMBER: TM-1
DATE: 7-13-09
REVISION NUMBER: 0
CONTRACT No.
ISSUE: FINAL
SHEET No. 20 OF 40



LEGEND			
FENCE		EXTENT OF BALLAST	
SHEETING		REMEDIATION	
		DOUBLE CIRCUIT 69KV POLE LINE	

NOTE: SYSTEMS DESIGN BASED ON LIRR PROVIDED LAYOUT DATED 7-2-09.

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STATE OF NEW YORK PROFESSIONAL ENGINEER

BAY SHORE/BRIGHTWATERS FORMER MGP SITE
BAY SHORE, NEW YORK
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SYSTEMS RELOCATION PLAN SHEET 1

SCALE: 40 Scale
CONTRACT No. -----
DRAWING NUMBER: SYS-1
ISSUE: FINAL
DATE: 7-13-09
REVISION NUMBER: 0
SHEET No. 21 OF 40

RELOCATED DOUBLE CIRCUIT 69KV POLE LINE

GRT. 18.45 FULL OF WATER

SIGNAL TO INSTALL NEW C–CASE
– 72 FIBER
– 100 PAIR COMM CABLE
– SIGNAL 37 CONCUCTOR & 2C#1 (TYP)

TEMPORARY ML1 CS

SIGNAL TO INSTALL MANHOLE

BAY SHORE WEST PARCEL

TEMPORARY TRACK 1

TEMPORARY TRACK 2

100' 100' 125' 125' 130'

SHEETING

MATCH LINE – SEE DWG SYS–1

MATCH LINE – SEE DWG SYS–3

EXISTING ML1 CS

SIGNAL TO INSTALL 2 – 6 INCH CONDUITS FROM CASE TO MANHOLE (SPARE FOR COMM)

NEW POLE AND HANDHOLD

POLE TEMPORARILY REMOVED DURING MAINLINE REMEDIATION

EXISTING LIRR CABLES TO BE RELOCATED NORTH OF TEMPORARY MAINLINE TRACKS
1 - FIBER OPTIC CABLE (LIRR)
2C4 - SIGNAL POWER CABLE
37C14 - SIGNAL LINE CABLE
1-100 PAIR COPPER LIRR COMM. CABLE
ASBESTOS CABLES TO BE ABATED AND REMOVED

FIBER OPTICS REPLACED BETWEEN CLINTON AVE. AND WINDSOR AVE.

SIGNAL AND POWER REPLACED BETWEEN SPLICE BOX AND CLINTON AVE.

LEGEND			
FENCE	×——	EXTENT OF BALLAST	—·—·—
SHEETING	—·—·—	REMEDIATION	▨
		DOUBLE CIRCUIT 69KV POLE LINE	– – – – –

NOTE: SYSTEMS DESIGN BASED ON LIRR PROVIDED LAYOUT DATED 7-2-09.

SCALE (FEET)
0 20 40 60 80

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BAY SHORE, NEW YORK
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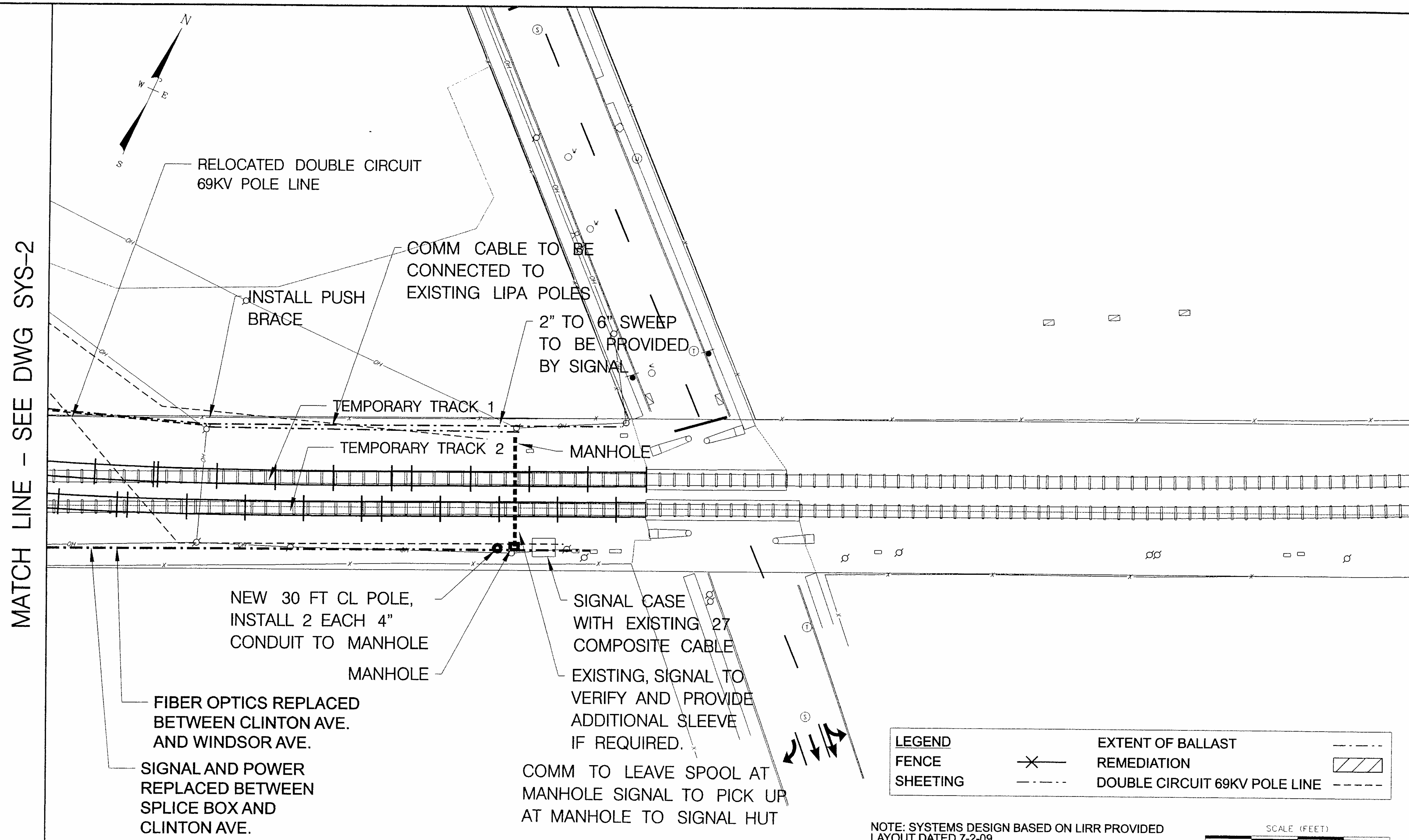
SYSTEMS RELOCATION PLAN
SHEET 2

SCALE: 40 Scale
DRAWING NUMBER: SYS-2
DATE: 7–13–09
REVISION NUMBER: 0
CONTRACT No. ------
ISSUE: FINAL
SHEET No. 22 OF 40

$REF1$ $REF2$ $REF3$ $REF4$ $REF5$ $REF6$ $DGNNAME$ $DATE$ $TIME$ $TBLNAME$ $PRFNAME$



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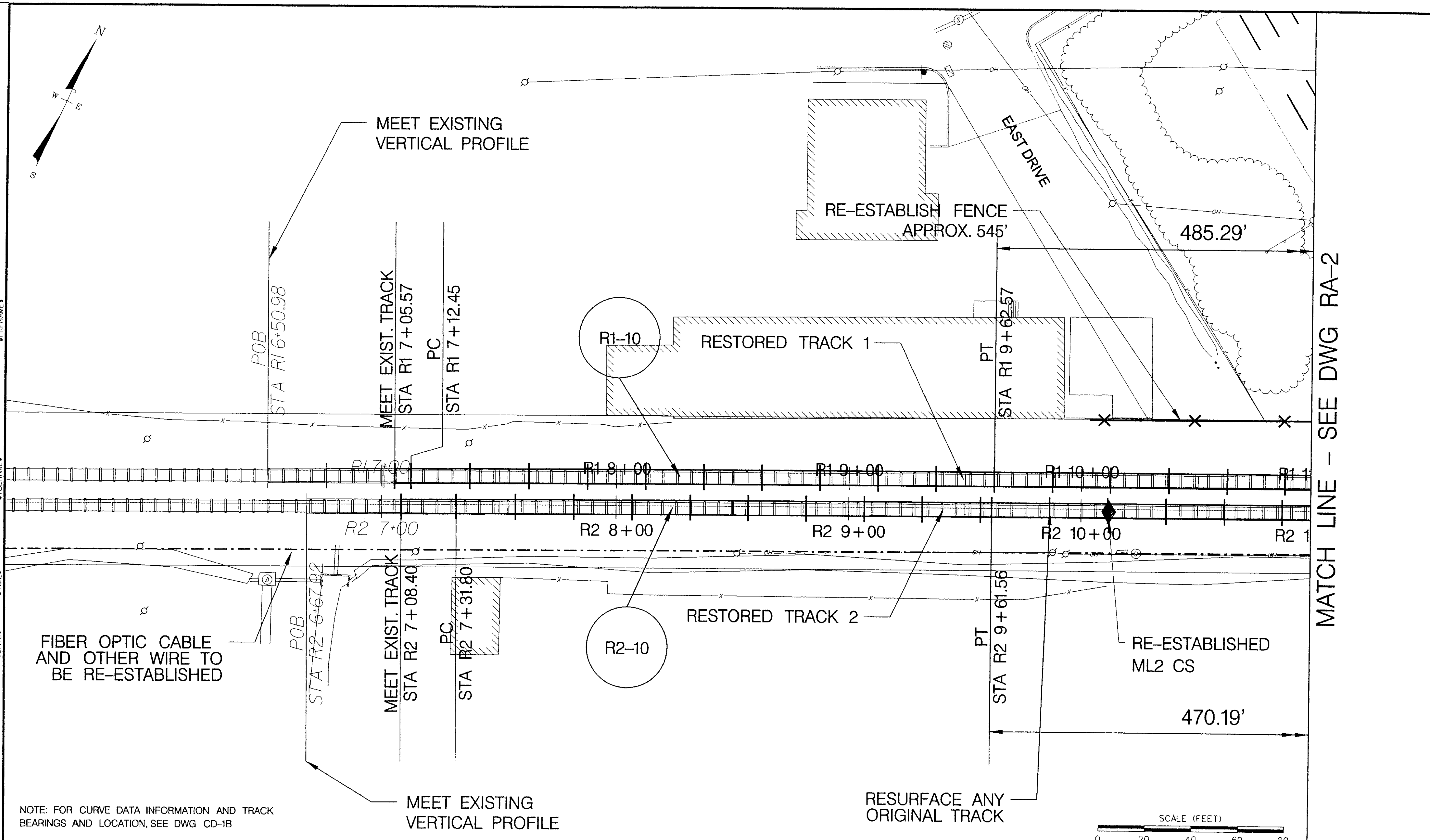
SYSTEMS RELOCATION PLAN SHEET 3

SCALE: 40 Scale
CONTRACT No. -----
DRAWING NUMBER: SYS-3
ISSUE: FINAL
DATE: 7-13-09
REVISION NUMBER: 0
SHEET No. 23 OF 40



NOTE: FOR CURVE DATA INFORMATION AND TRACK BEARINGS AND LOCATION, SEE DWG CD-1B

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BAY SHORE, NEW YORK
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DEMOLITION AND RESTORATION ALIGNMENT PLAN SHEET 1

SCALE: 40 Scale
DRAWING NUMBER: RA-1
DATE: 7-13-09
REVISION NUMBER: 0
CONTRACT No. ----
ISSUE FINAL
SHEET No. 24 OF 40

MATCH LINE – SEE DWG RA–1

MATCH LINE – SEE DWG RA–3

BAY SHORE WEST PARCEL

485.29'

RESTORED TRACK 1

REESTABLISH FENCE 545'

PC STA R1 14+47.86

PT STA R1 16+43.19

R1–20

R1 1+00 | R1 12+00 | R1 13+00 | R1 14+00 | R1 15+00 | R1 16+00

R2 1+00 | R2 12+00 | R2 13+00 | R2 14+00 | R2 15+00 | R2 16+00

RE–ESTABLISHED ML1 CS

RESTORED TRACK 2

PC STA R2 14+31.75

PT STA R2 16+41.17

R2–20

NEW POLE REPLACED AT PREVIOUS LOCATIONS (TYP)

REMOVE GATE AND REPLACE FENCE APPROX 93'

470.19'

NOTE: FOR CURVE DATA INFORMATION AND TRACK BEARINGS AND LOCATION, SEE DWG CD–1B

SCALE (FEET)

0 20 40 60 80

$REF1S $REF2S $REF3S $REF4S $REF5S $REF6S $OGNNAMES $TBLNAMES $TIMES $DATES $PRFNAMES

STV

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212–777–4400

DATE: | No. | REVISIONS

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BAY SHORE, NEW YORK

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DEMOLITION AND RESTORATION
ALIGNMENT PLAN
SHEET 2

SCALE: 40 Scale
DRAWING NUMBER: BA-2
DATE: 7–13–09
REVISION NUMBER: 0

CONTRACT No. ------
ISSUE FINAL
SHEET No. 25 OF 40

MATCH LINE – SEE DWG RA-2

N
W
E
S

MEET EXISTING
VERTICAL PROFILE

133.89'

99.91'

MEET EXIST. TRACK
STA R1 17+77.08

POE
STA R1 18+02.75

RESTORED TRACK 1

EXISTING GRADE
CROSSING

EXISTING TRACK 1

R1 17+00

R1 18+00

R2 17+00

MEET EXIST. TRACK
STA R2 17+72.31

POE
STA R2 17+90.00

RESTORED TRACK 2

FIBER OPTIC
RE-ESTABLISHED

EXISTING TRACK 2

112.67'

131.15'

MEET EXISTING
VERTICAL PROFILE

NOTE: FOR CURVE DATA INFORMATION AND TRACK BEARINGS AND LOCATION, SEE DWG CD-1B

SCALE (FEET)
0 20 40 60 80

$PRFNAME$
$TBLNAME$
$DATE$
$TIME$
$REF1$
$REF2$
$REF3$
$REF4$
$REF5$
$REF6$
$REF7$
$DGNNAME$

STV
225 Park Avenue South
New York, New York 10003
212-777-4400

No.	REVISIONS	DATE:

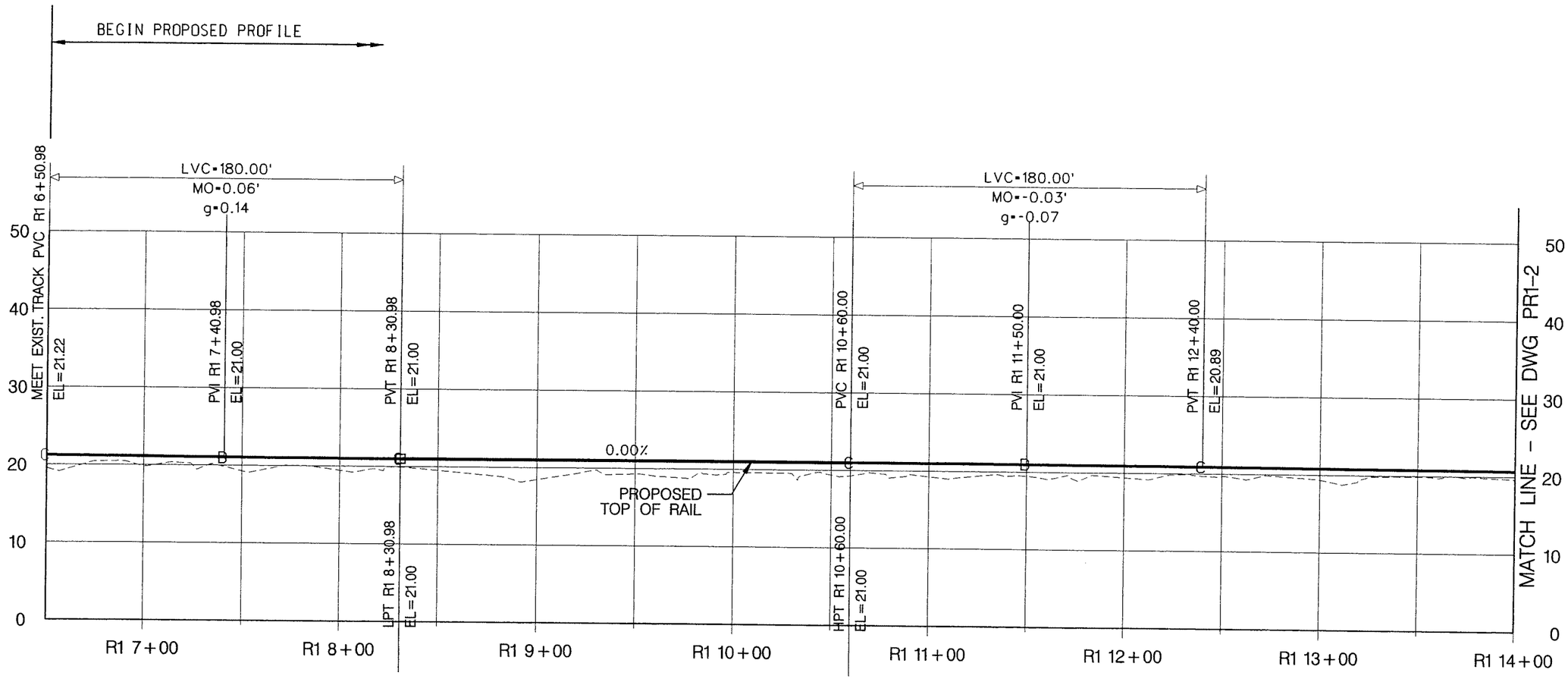
DESIGNED BY: AEV /CMK
DRAWN BY: E. Colleran
CHECKED BY: A. Vogel
COORDINATED BY: E. Colleran
APPROVED BY: C. Kaiser

BAY SHORE/BRIGHTWATERS
FORMER MGP SITE
BAY SHORE, NEW YORK

national grid

DEMOLITION AND RESTORATION
ALIGNMENT PLAN
SHEET 3

SCALE: 40 Scale
DRAWING NUMBER: BA-3
DATE: 7-13-09
REVISION NUMBER: 0
CONTRACT No. ------
ISSUE: FINAL
SHEET No. 26 OF 40



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PRE-MODIFICATION	- - -
RESTORED	———
VERTICAL SCALE	4.0
HORIZONTAL SCALE	1.0

$PRFNAME$ $TBLNAME$ $TIME$ $DATE$ $CONNAME$
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225 Park Avenue South
New York, New York 10003
212-777-4400

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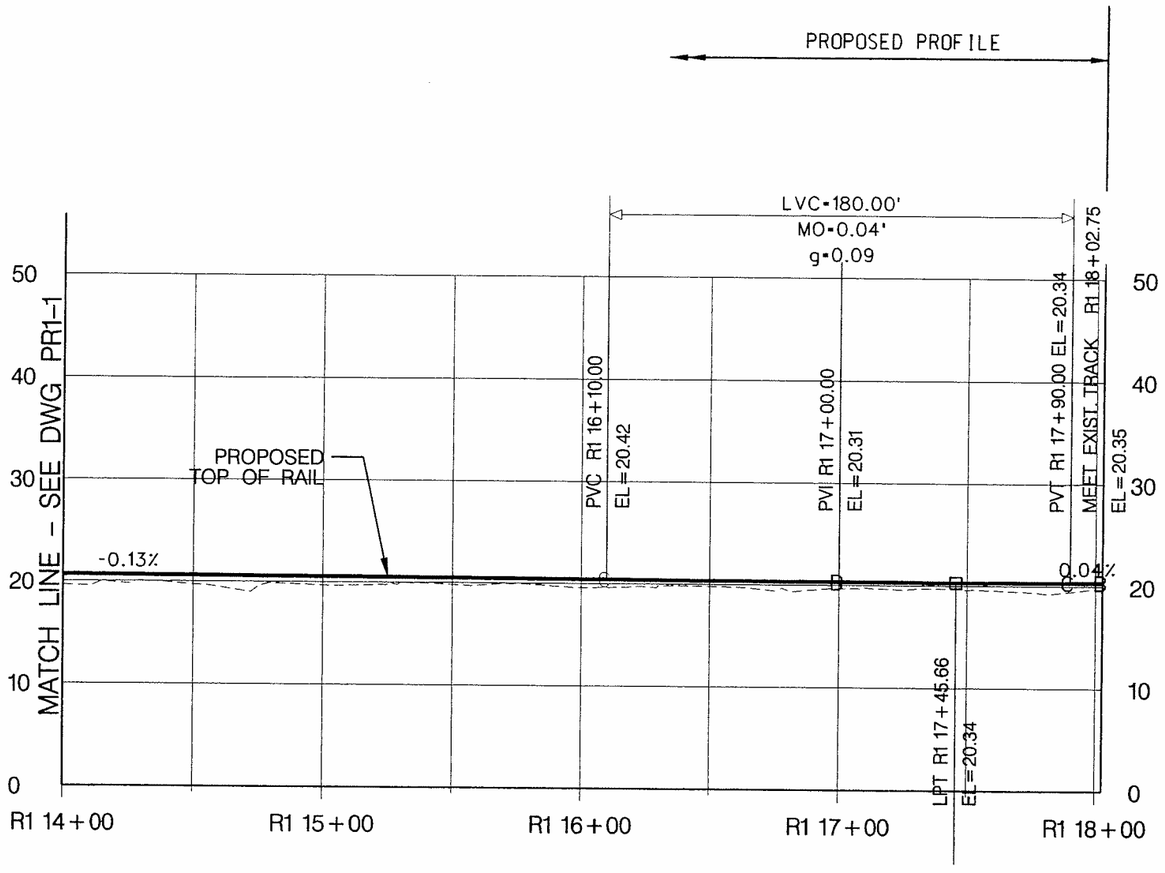
APPROVED BY: C. Kaiser

BAY SHORE/BRIGHTWATERS
FORMER MGP SITE
BAY SHORE, NEW YORK
nationalgrid

RESTORED TRACK 1
PROFILE
(35 MPH)
SHEET 1

SCALE: 60 Scale
DRAWING NUMBER: PR1-1
DATE: 7-13-09
REVISION NUMBER: 0
CONTRACT No. ------
ISSUE FINAL
SHEET No. 27 OF 40



LEGEND	
PRE-MODIFICATION	- - -
RESTORED	———
VERTICAL SCALE	4.0
HORIZONTAL SCALE	1.0

$REF18
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$REF35
$REF41
$REF53
$REF65
$DGNNAME$ $DATE$ $TIME$ $TBLNAME$ $PRFNAME$

STV
225 Park Avenue South
New York, New York 10003
212-777-4400

DATE:	No.	REVISIONS

DESIGNED BY: AEV /CMK
DRAWN BY: E. Colleran
CHECKED BY: A. Vogel
COORDINATED BY: E. Colleran
APPROVED BY: C. Kaiser

STATE OF NEW YORK — LICENSED PROFESSIONAL ENGINEER

BAY SHORE/BRIGHTWATERS
FORMER MGP SITE
BAY SHORE, NEW YORK
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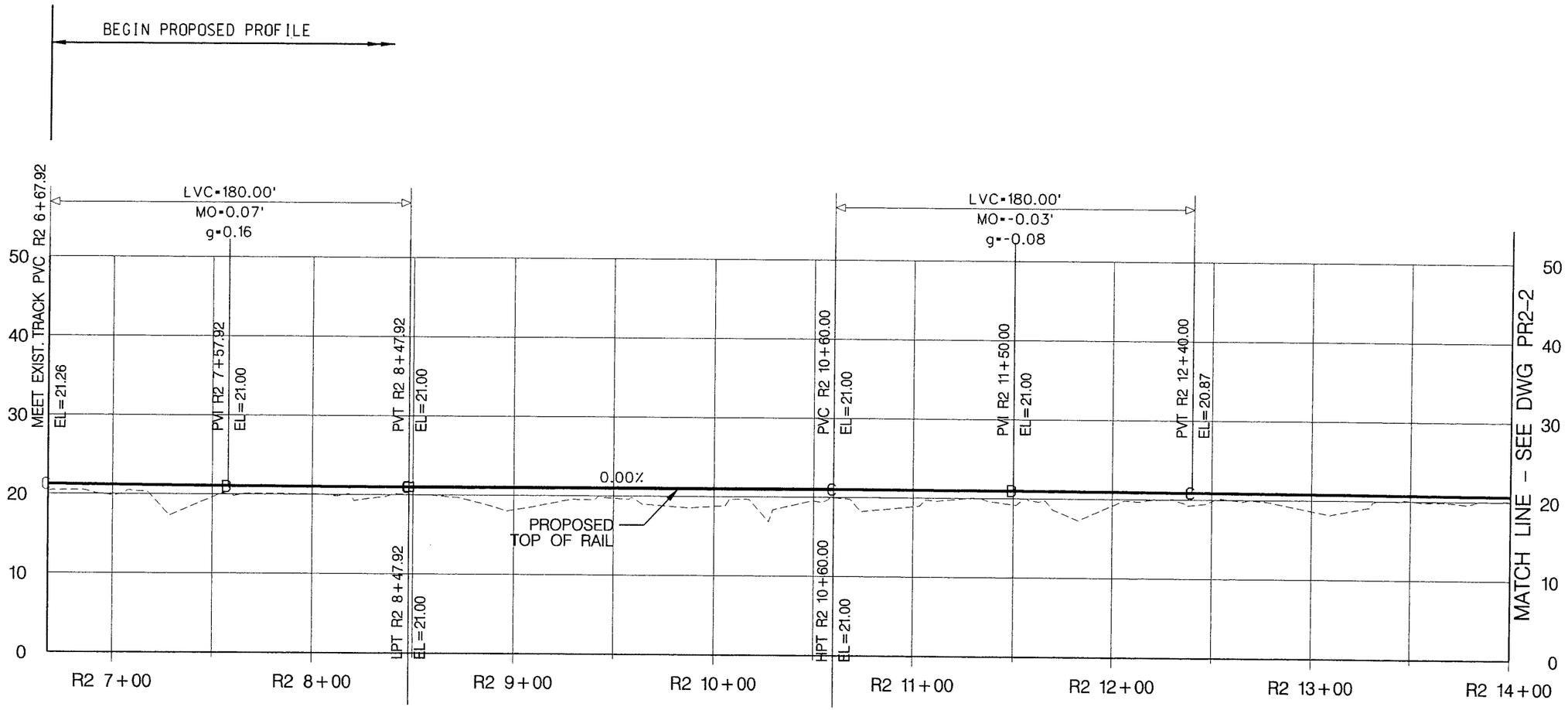
RESTORED TRACK 1
PROFILE
(35 MPH)
SHEET 2

SCALE: 60 Scale
DRAWING NUMBER: PR1-2
DATE: 7-13-09
REVISION NUMBER: 0
CONTRACT No. -----
ISSUE: FINAL
SHEET No. 28 OF 40



LEGEND	
PRE-MODIFICATION	- - -
RESTORED	———
VERTICAL SCALE	4.0
HORIZONTAL SCALE	1.0

$PRFNAME$
$TBLNAME$
$TIME$
$DATE$
$REF1$
$REF2$
$REF3$
$REF4$
$REF5$
$REF6$
$CONNAME$

STV
225 Park Avenue South
New York, New York 10003
212-777-4400

DATE	No.	REVISIONS

DESIGNED BY: AEV /CMK
DRAWN BY: E. Colleran
CHECKED BY: A. Vogel
COORDINATED BY: E. Colleran
APPROVED BY: C. Kaiser

STATE OF NEW YORK — KEVIN HEALY — 62109 — LICENSED PROFESSIONAL ENGINEER

BAY SHORE/BRIGHTWATERS
FORMER MGP SITE
BAY SHORE, NEW YORK
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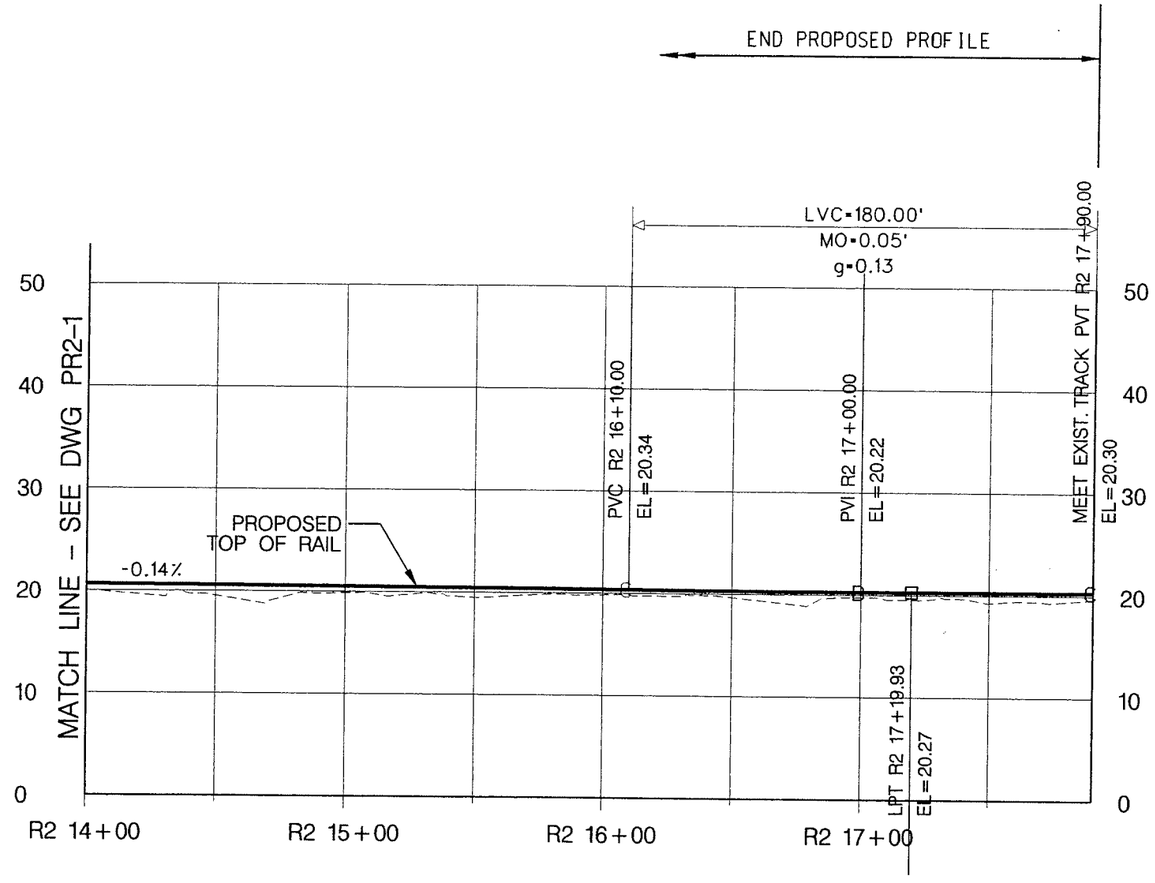
RESTORED TRACK 2
PROFILE
(35 MPH)
SHEET 1

SCALE: 60 Scale
DRAWING NUMBER: PR2-1
DATE: 7-13-09
REVISION NUMBER: 0
CONTRACT No. -----
ISSUE: FINAL
SHEET No. 29 OF 40



LEGEND	
PRE-MODIFICATION	- - -
RESTORED	———
VERTICAL SCALE	4.0
HORIZONTAL SCALE	1.0

$PRFNAME$ $TBLNAME$ $DATE$ $TIME$ $TBLNAME$

$REF1$ $REF2$ $REF3$ $REF4$ $REF5$ $REF6$ $DGNNAME$

STV
225 Park Avenue South
New York, New York 10003
212-777-4400

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APPROVED BY: C. Kaiser

BAY SHORE/BRIGHTWATERS
FORMER MGP SITE
BAY SHORE, NEW YORK
nationalgrid

RESTORED TRACK 2
PROFILE
(35 MPH)
SHEET 2

SCALE: 60 Scale
DRAWING NUMBER: PR2-2
DATE: 7-13-09
REVISION NUMBER: 0
CONTRACT No. -----
ISSUE: FINAL
SHEET No. 30 OF 40

TRACK	CURVE ID	POINT	STATION	NORTHING	EASTING	BEARING	TOTAL ANGLE	LENGTH	RADIUS	DEGREE OF CURVATURE	DELTA ANGLE	LENGTH SPIRAL	THETA	L.T.	S.T.	Xs	Ys	Ea	Eu	V (MPH)	REMARKS
TRACK MOD1		POB	MOD1 6+03.65	202990.4061	1188803.0494																
						N 65° 39'13.6" E		94.17													
	MOD1-10	TS	MOD1 6+97.82	203029.2262	1188888.8417							93.00	1° 37'38.1"	62.00	31.00	92.99	0.88				
		SC	MOD1 7+90.82	203068.3643	1188973.2016			70.29	1637.28	3° 30'00.0"	2° 27'35.3"							1.50"	1.50"	35	
		CC		204540.2741	1188256.1468																
		PI		203082.0861	1189005.6622		5° 42'51.5"														
		CS	MOD1 8+61.10	203100.4956	1189035.7132							93.00	1° 37'38.1"	62.00	31.00	92.99	0.88				
		ST	MOD1 9+54.10	203146.3149	1189116.6389																
						N 59° 56'22.1" E		89.15													
	MOD1-20	TS	MOD1 10+43.24	203190.9691	1189193.7938							124.00	2° 31'52.1"	82.68	41.34	123.98	1.83				
		SC	MOD1 11+67.24	203251.4902	1189302.0090			165.91	1403.46	4° 05'00.0"	6° 46'23.7"							2.00"	1.50"	35	
		CC		202006.9386	1189950.6932																
		PI		203294.9170	1189373.3984		11° 50'07.8"														
		CS	MOD1 13+33.12	203319.3101	1189453.3191							124.00	2° 31'52.1"	82.68	41.34	123.98	1.83				
		ST	MOD1 14+57.12	203359.8176	1189570.5048																
						N 71° 46'29.9" E		79.82													
	MOD1-30	TS	MOD1 15+36.94	203384.7819	1189646.3223							108.50	2° 03'23.8"	72.34	36.17	108.49	1.30				
		SC	MOD1 16+45.44	203419.9438	1189748.9603			51.76	1511.37	3° 47'30.0"	1° 57'44.4"							1.75"	1.50"	35	
		CC		204837.6091	1189225.0667																
		PI		203426.8378	1189774.0483		6° 04'32.0"														
		CS	MOD1 16+97.19	203438.7146	1189797.1973							108.50	2° 03'23.8"	72.34	36.17	108.49	1.30				
		ST	MOD1 18+05.69	203482.1760	1189896.6056																
						N 65° 41'58.0" E		100.02													
		POE	MOD1 19+05.71	203523.3359	1189987.7622																
TRACK MOD2		POB	MOD2 6+03.71	202978.3223	1188808.3900																
						N 65° 40'14.7" E		103.50													
	MOD2-10	TS	MOD2 7+07.21	203020.9633	1188902.7010							93.00	1° 37'38.1"	62.00	31.00	92.99	0.88				
		SC	MOD2 8+00.21	203060.0765	1188987.0725			73.09	1637.28	3° 30'00.0"	2° 33'27.4"							1.50"	1.50"	35	
		CC		204532.1987	1188270.4538																
		PI		203074.3659	1189020.8139		5° 48'43.6"														
		CS	MOD2 8+73.29	203093.5214	1189052.0507							93.00	1° 37'38.1"	62.00	31.00	92.99	0.88				
		ST	MOD2 9+66.29	203139.4549	1189132.9116																
						N 59° 51'31.1" E		73.58													
	MOD2-20	TS	MOD2 10+39.87	203176.4040	1189196.5463							124.00	2° 31'52.1"	82.68	41.34	123.98	1.83				
		SC	MOD2 11+63.87	203237.0777	1189304.6760			170.15	1403.46	4° 05'00.0"	6° 56'46.3"							2.00"	1.50"	35	
		CC		201993.4425	1189955.1154																
		PI		203281.6808	1189377.8566		12° 00'30.5"														
		CS	MOD2 13+33.98	203306.6121	1189459.8521							124.00	2° 31'52.1"	82.68	41.34	123.98	1.83				
		ST	MOD2 14+57.98	203346.9311	1189577.1027																
						N 71° 52'01.6" E		63.53													
	MOD2-30	TS	MOD2 15+21.51	203366.7026	1189637.4763							108.50	2° 03'23.8"	72.34	36.17	108.49	1.30				
		SC	MOD2 16+30.01	203401.6994	1189740.1706			54.50	1511.37	3° 47'30.0"	2° 03'58.3"							1.75"	1.50"	35	
		CC		204820.2053	1189218.5573																
		PI		203408.9808	1189766.5755		6° 10'45.9"														
		CS	MOD2 16+84.50	203421.4280	1189790.9744							108.50	2° 03'23.8"	72.34	36.17	108.49	1.30				
		ST	MOD2 17+93.00	203464.9098	1189890.3738																
						N 65° 41'15.7" E		112.43													
		POE	MOD2 19+05.44	203511.1991	1189992.8345																

$PREFIX$ $SPEC2$ $SPEC3$ $SPEC4$ $SPEC5$ $SPEC6$ $DISCIPLINE$

$PRFNAME$ $TBLNAME$ $TIME$ $DATE$

STV Consultants
225 Park Avenue South
New York, New York 10003
212-777-4400

DATE	REVISIONS	No.

DESIGNED BY: AEV /CMK
DRAWN BY: E. Colleran
CHECKED BY: A. Vogel
COORDINATED BY: E. Colleran
APPROVED BY: C. Kaiser

BAY SHORE/BRIGHTWATERS
FORMER MGP SITE
BAY SHORE, NEW YORK

national grid

CURVE DATA
SHEET 1

SCALE: Not to Scale
DRAWING NUMBER: CD-1A
DATE: 7-13-09
REVISION NUMBER: 0
CONTRACT No.
ISSUE: FINAL
SHEET No.: 31A OF 40

TRACK	CURVE ID	POINT	STATION	NORTHING	EASTING	BEARING	TOTAL ANGLE	LENGTH	RADIUS	DEGREE OF CURVATURE	DELTA ANGLE	LENGTH SPIRAL	THETA	L.T.	S.T.	Xs	Ys	Ea	Eu	V (MPH)	REMARKS
RESTORED TRACK 1		POB	R1 7+05.57	203032.4223	1188895.9051																
						N 65° 39'13.6" E		6.88													
	R1-10	PC	R1 7+12.45	203035.2569	1188902.1697			250.12	68754.94	0° 05'00.0"	0° 12'30.4"							0.00"	0.21"	60	
		PI		203086.8137	1189016.1101		0° 12'30.4"														
		CC		140394.6246	1217246.3571																
		PT	R1 9+62.57	203137.9556	1189130.2374																
						N 65° 51'44.0" E		485.29													
	R1-20	PC	R1 14+47.86	203336.4053	1189573.0935			195.34	68754.94	0° 05'00.0"	0° 09'46.0"							0.00"	0.21"	60	
		PI		203376.3453	1189662.2226		0° 09'46.0"														
		CC		266079.7363	1161456.9738																
		PT	R1 16+43.19	203416.5383	1189751.2379																
						N 65° 41'58.0" E		133.89													
		POE	R1 17+77.08	203471.6363	1189873.2632																
RESTORED TRACK 2		POB	R2 7+08.40	203021.4517	1188903.7812																
						N 65° 40'14.7" E		23.40													
	R2-10	PC	R2 7+31.80	203031.0936	1188925.1065			229.75	68754.94	0° 05'00.0"	0° 11'29.3"							0.00"	0.21"	60	
		PI		203078.4207	1189029.7819		0° 11'29.3"														
		CC		140382.0668	1217250.7347																
		PT	R2 9+61.56	203125.3978	1189134.6150																
						N 65° 51'44.0" E		470.19													
	R2-20	PC	R2 14+31.75	203317.6741	1189563.6948			209.42	68754.94	0° 05'00.0"	0° 10'28.3"							0.00"	0.21"	60	
		PI		203360.4934	1189659.2493		0° 10'28.3"														
		CC		266061.0051	1161447.5751																
		PT	R2 16+41.17	203403.6035	1189754.6730																
						N 65° 41'15.7" E		131.15													
		POE	R2 17+72.31	203457.5980	1189874.1893																

$PREFIX $DATE$ $TIME$ $TBLNAME$

$PREF1$
$PREF2$
$PREF3$
$PREF4$
$PREF5$
$PREF6$
$DGNNAME$

STV Consultants
225 Park Avenue South
New York, New York 10003
212-777-4400

No.	REVISIONS	DATE:

DESIGNED BY: AEV /CMK
DRAWN BY: E. Colleran
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COORDINATED BY: E. Colleran
APPROVED BY: C. Kaiser

BAY SHORE/BRIGHTWATERS
FORMER MGP SITE
BAY SHORE, NEW YORK

national grid

CURVE DATA
SHEET 2

SCALE: Not to Scale
DRAWING NUMBER: CD-1B
DATE: 7-13-09
REVISION NUMBER: 0
CONTRACT No.
ISSUE: FINAL
SHEET No. 31B OF 40

Bay Shore Mainline Track Temporary Relocation - 35mph Design

7/1/2009

Horizontal Curves

Track	Curve	Dc	R (ft)	Ls (ft)	Lc (ft)	Ea (in)	Eu (in)	Mid-Ordinate (in) Absolute	Mid-Ordinate (in) Relative	Spiral Variance	Curve Variance	Unbalance Variance
Track 1	MOD1-10	3-30-00.0	1637.28'	93.00'	70.29'	1.50"	1.50"	1.17"	0.50"		65' < Lc < 3V = 105'	
Track 1	MOD1-20	4-05-00.0	1403.46'	124.00'	165.91'	2.00"	1.50"	1.03"	0.44"			
Track 1	MOD1-30	3-47-30.0	1511.37'	108.50'	51.76'	1.75"	1.50"	1.09"	0.46"		Lc < 65' < 3V = 105'	
Track 2	MOD2-10	3-30-00.0	1637.28'	93.00'	73.09'	1.50"	1.50"	1.17"	0.50"		65' < Lc < 3V = 105'	
Track 2	MOD2-20	4-05-00.0	1403.46'	124.00'	170.15'	2.00"	1.50"	1.03"	0.44"			
Track 2	MOD2-30	3-47-30.0	1511.37'	108.50'	54.50'	1.75"	1.50"	1.09"	0.46"		Lc < 65' < 3V = 105'	

Horizontal Tangents

Track	West Curve	Tangent (Lt)	East Curve	Tangent Variance
Track 1	MOD1-10	89.15'	MOD1-20	65' < Lt < 3V = 105'
Track 1	MOD1-20	79.82'	MOD1-30	65' < Lt < 3V = 105'
Track 2	MOD2-10	73.58'	MOD2-20	65' < Lt < 3V = 105'
Track 2	MOD2-20	63.53'	MOD2-30	Lt < 65' < 3V = 105'

Horizontal Clearance to Grade Crossing

Track	Distance	Distance
Track 1	100.02'	< 150' Requested
Track 2	112.43'	< 150' Requested

Track Centers

Track	Location	Min. Dist.	Req'd Dist.*
Tracks 1 & 2	Curves 10	13.55'	13.58'

*NOTE: Track centers based in 13' with 1" added for every 30' of curvature

NOTE: Track curves numbered from west to east

Vertical Curves

Track	PVC	PVT	LVC (ft)	Crest / Sag	Rate of Change (g)	Vertical Curve Length Variance	Rate of Change Variance
MOD1	7+61.85	8+41.85	80.00'	Crest	0.38	80' < 100' MIN < 3V = 105'	on curve MOD1-10, max g allowed = 0
MOD1	9+55.76	11+05.76	150.00'	Sag	0.89		0.89 > 0.88 MAX
MOD1	12+15.54	13+35.54	120.00'	Crest	0.91		0.91 > 0.88 MAX
MOD1	16+50.44	17+15.44	65.00'	Sag	0.52	65' < 100' MIN < 3V = 105'	on curve MOD1-30, max g allowed = 0
MOD2	9+55.72	11+05.72	150.00'	Sag	0.53		on curves MOD2-10 and MOD2-20, max g allowed = 0
MOD2	12+15.54	13+35.54	120.00'	Crest	0.64		on curve MOD2-20, max g allowed = 0
MOD2	16+91.40	17+56.40	65.00'	Sag	0.55	65' < 100' MIN < 3V = 105'	on curve MOD2-30, max g allowed = 0

$PRFNAME$ $TBLNAME$ $TIME$ $DATE$ $REF1$ $REF2$ $REF3$ $REF4$ $REF5$ $REF6$ $DGNNAME$

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DATE: | No. | REVISIONS

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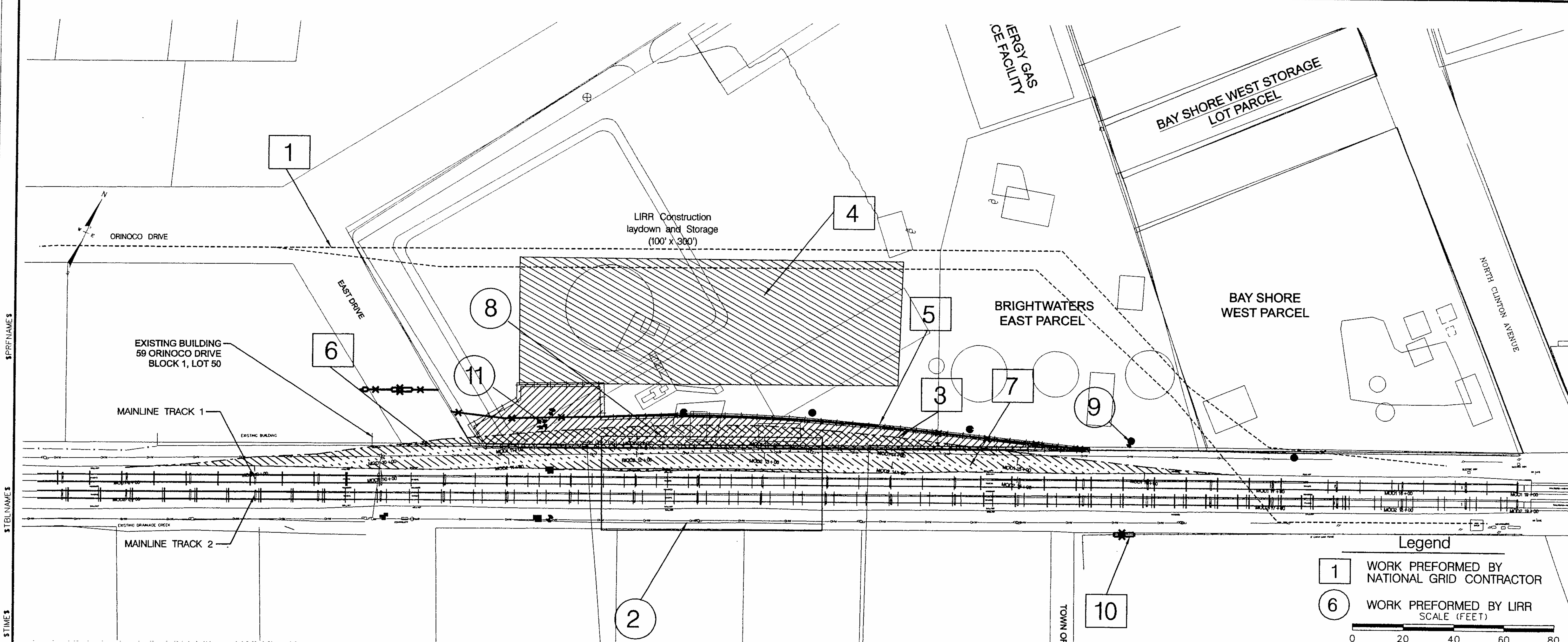
BAY SHORE/BRIGHTWATERS FORMER MGP SITE
BAY SHORE, NEW YORK
nationalgrid

TRACK VARIANCE LIST

SCALE: Not to Scale
DRAWING NUMBER: VA-1
DATE: 7-13-09
REVISION NUMBER: 0
CONTRACT No.
ISSUE: FINAL
SHEET No. 32 OF 40



Track and Civil effort prior to consolidation

				Start Date[1]	End Date[1]
1)	Relocation of high tension cables and poles	National Grid		4/20/09	5/22/09
2)	Removal of inactive asbestos cables from LIRR Utility poles between Windsor Ave and Clinton Ave	LIRR - contractor	2681 lf		10/02/09
3)	Removal of conflicting high tension poles and other physical obstuructions within temporarary railroad alignment (inclusive of monitoring well lowering if required)	National Grid		6/01/09	6/15/09
4)	Clear and grade LIRR construction (apprx 1275 sf) and potential Laydown area (approx 100ft x 300 ft)	National Grid		6/01/09	6/29/09
5)	Construct boundary fencing north of the Temporary Mainline tracks within East Court with vehicle and pedestrian gates. Construct temporary fence on National Grid property north of the Temporary Mainline Tracks.	National Grid	565 ft 2 - gates	6/01/09	6/12/09
6)	Remove existing fencing north of Mainline tracks from approx station 10+05 to station 15+55 .	National Grid	550 ft	6/15/09	6/29/09

Notes: 1. Interim scheduled events subject to modifications due to increased production rates and / or modifed LIRR coordination assumptions

2. Cut and throw date should not be modified.

Track and Civil effort prior to consolidation

				Start Date[1]	End Date[1]
7)	Contractor to install a minimum of 12 inches of subbase 9 inches below the bottom of proposed temporary Mainline track ties. Sufficient ballast to be installed to preconsolide the site. Maximum length of permissable open cut will vary with the proxcimity to the active LIRR Mainline Tracks. Contactor to maintain a minimum distance of 8.5 ft to centerline of track or to the edge of existing ballast.	National Grid	17,200 sf	6/29/09	7/10/09
8)	LIRR to construct track panels within the modified trackway and/or LIRR site laydown area	LIRR		6/29/09	8/21/09
9)	Construct temporary LIRR utility poles north of the temporary tracks. National Grid contractor to dispose of all excavated contaminated material. (2 pole south of the existing tracks and 6 poles north of the temp tracks with LIRR's utilization of existing utility pole east of Station 17+00)	LIRR	8 poles	7/13/09	7/17/09
10)	Install construction access gate south of the Mainline Tracks	National Grid	1 - gate	6/15/09	6/15/09
11)	LIRR Signal forces build and install new equipment and cut section (CS) case.	LIRR - Signal/Comm		LIRR to complete to support track throw on 10/16/09.[2]	

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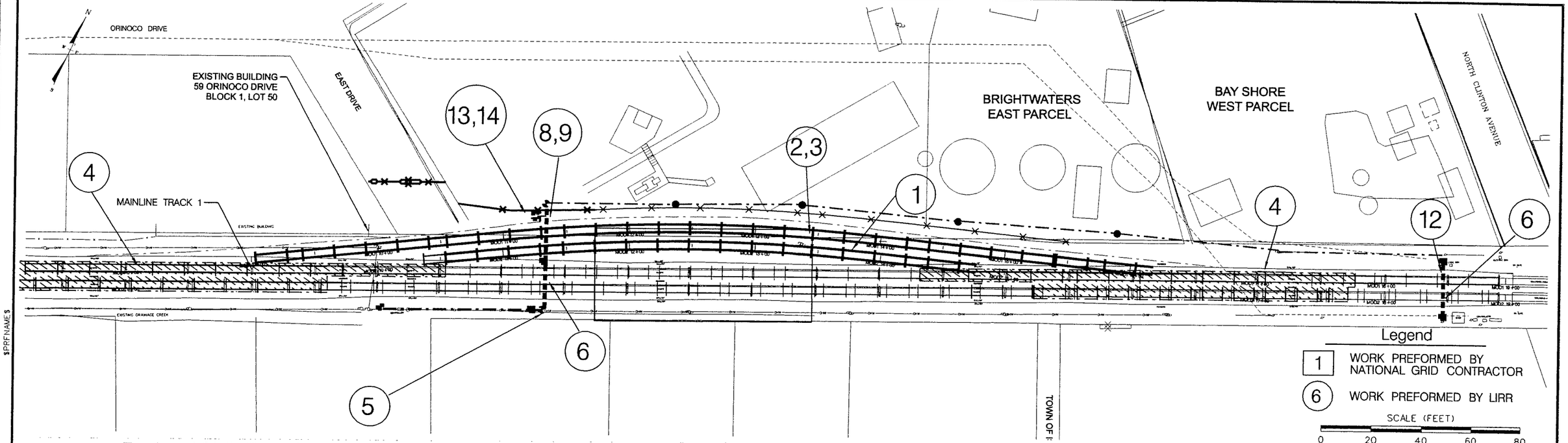
COORDINATED BY: E. Colleran
APPROVED BY: C. Kaiser

BAY SHORE/BRIGHTWATERS FORMER MGP SITE
BAY SHORE, NEW YORK
national grid

CONSTRUCTION STAGING AND RESTORATION PLAN PRIOR TO CONSOLIDATION

SCALE: 40 Scale
DRAWING NUMBER: SR-1
DATE: 7-13-09
REVISION NUMBER: 0
CONTRACT No.
ISSUE: FINAL
SHEET No. 33 OF 40



Track and Civil effort prior to Cut and Throw

				Start Date[1,2]	End Date[1]
1)	Post-consolidation, install ballast to bottom of tie (approx 9") and grade temporary Mainline alignment to proposed bottom of tie location. Ballast to be extended to level existing ballast side slope within cut and throw areas.	LIRR		8/24/09	8/26/09
2)	LIRR to construct track / panels to cut and throw locations including relocated signal IJ's.	LIRR	1360 lf	8/27/09	10/09/09
3)	Install ballast within tie cribbing of temporary mainline tracks.	LIRR		10/12/09	10/15/09
4)	Prep existing mainline tracks within cut and throw areas	LIRR		10/1/2009	10/15/09

Signal and Communications effort prior to Cut and Throw

				Start Date[2]	End Date[2]
5)	LIRR Signal forces build and install splice case on south side.	LIRR		LIRR to complete to support	
6)	LIRR Signal forces install conduit under track (east and west conduits, if required) including new splice case to new CS case for 37c14 line cable and 2c/0 power cable.	LIRR	130 lf	LIRR to complete to support track throw on 10/16/09.	
7)	LIRR Signal forces install two 37c14 cables and two 2c/0 power cables between new CS case and splice case for line east and line west.	LIRR		LIRR to complete to support track throw on 10/16/09.	

Signal and Communications effort prior to Cut and Throw

				Start Date[2]	End Date[2]
8)	LIRR Signal forces install conduit under track from new CS case to temporary tracks for track wire connections.	LIRR		LIRR to complete to support track throw on 10/16/09.	
9)	LIRR Signal forces install conduit under track from new CS case to existing track for track wire connection.	LIRR		LIRR to complete to support track throw on 10/16/09.	
10)	LIRR Signal forces install track wires between new CS case and temporary #1 and 2 tracks.	LIRR		LIRR to complete to support track throw on 10/16/09.	
11)	LIRR Signal forces install track wires between new CS case and existing tracks # 1 and track #2.	LIRR		LIRR to complete to support track throw on 10/16/09.	
12)	LIRR Signal forces design and install crossing approach circuit revisions at necessary crossings to reflect speed change on temporary tracks (if required).	LIRR		LIRR to complete to support track throw on 10/16/09.	
13)	LIRR Communications forces install 37c14 line cable (temp) and 2c/0 power cable (temp) between Clinton Ave case and new CS case along new poles (temp) north of new track alignment.	LIRR	990 lf	LIRR to complete to support track throw on 10/16/09.	
14)	LIRR Communications forces install fiber optic cable (temp) on temporary poles between Clinton Ave and Windsor Ave.	LIRR	2700 lf	LIRR to complete to support track throw on 10/16/09.	
15)	LIRR Signal forces prep 37c14 and 2c/0 cables run by Communication forces at Clinton Ave and new CS case.	LIRR		LIRR to complete to support track throw on 10/16/09.	

Notes: 1. Interim scheduled events subject to modifications due to increased production rates and / or modifed LIRR coordination assumptions
2. Cut and throw date should not be modified.

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DATE | REVISIONS | No.

DESIGNED BY: AEV /CMK
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COORDINATED BY: E. Colleran
APPROVED BY: C. Kaiser

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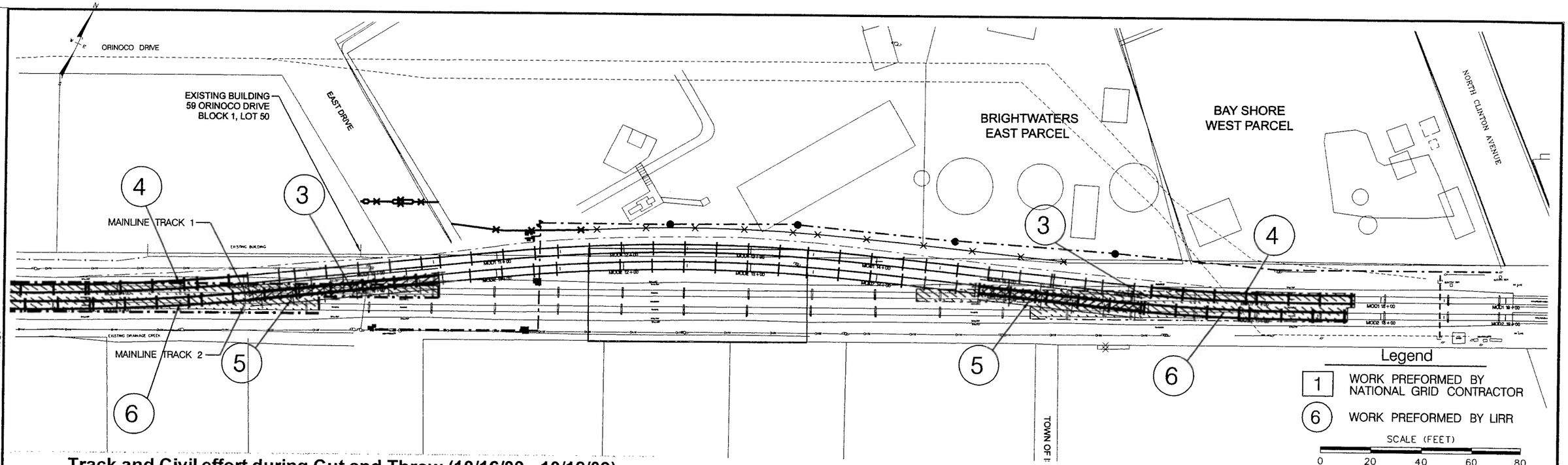
CONSTRUCTION STAGING AND RESTORATION PLAN
PRIOR TO FIRST CUT AND THROW

SCALE: 40 Scale
DRAWING NUMBER: SR-2
DATE: 7-13-09
REVISION NUMBER: 0
CONTRACT No.
ISSUE: FINAL
SHEET No. 34 OF 40

$PRFNAME$ $TBLNAME$ $TIME$ $DATE$ $SHEETS$ $SCRIPNAME$ $SHEET1$ $SHEET2$ $SHEET3$ $SHEET4$ $SHEET5$ $SHEET6$



Track and Civil effort during Cut and Throw (10/16/09 - 10/18/09)

1)	Saw cut Mainline 1 approx Stations 9+05 and 16+00	LIRR	
2)	Saw cut Mainline 1 at Temporary Mainline 2 crossing location (approx Stations 10+40 and 14+50)	LIRR	
3)	Remove Mainline 1 conflicting track with Temporary Mainline 2 (140 ft for western cut and throw and 150 ft eastern cut and throw) and grade ballast to Temporary Mainline 2 bottom of tie elevations	LIRR	
4)	Throw western Mainline Track 1 between stations 6+98 and 9+05 and eastern Mainline Track 1 between 16+00 and 18+06	LIRR	
5)	Extend Temporary Mainline 2 with previously made panels through Mainline 1 cleared trackbed to Mainline 2 cut and throw limit.	LIRR	170 lf east 135 lf west
6)	Throw western Mainline Track 2 between stations 7+07 and 9+15 and eastern Mainline Track 2 between 15+87 and 17+93	LIRR	
7)	Perform all track welds and connections	LIRR	
8)	Install and tamp Temporary Mainline 1 and 2 track	LIRR	
9)	Installation of temporary speed restriction signs east of Clinton Ave and west of Windsor Ave.	LIRR	

Signal and Communications effort during Cut and Throw

10)	LIRR Signal forces install jumpers on necessary crossings as required.	LIRR
11)	LIRR Signal forces swing existing 37c14 line west and 2c/0 power into splice case.	LIRR
12)	LIRR Signal forces tie in 37c14 and 2c/0 at Clinton Ave and Windsor Road.	LIRR
13)	LIRR Communications forces tie in (splice) and test fiber optic cable.	LIRR
14)	LIRR Signal forces disconnect track wires from existing track and connect new track wires from new CS case to temporary tracks.	LIRR
15)	LIRR Signal forces install circuit revisions for crossing approaches at necessary crossing to reflect change in speed on temporary track (if required).	LIRR
16)	LIRR Signal forces perform testing for track circuits, crossings and signals as required.	LIRR
17)	LIRR Signal forces remove jumpers from all crossings.	LIRR

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CONSTRUCTION STAGING AND RESTORATION PLAN DURING FIRST CUT AND THROW

SCALE: 40 Scale
DRAWING NUMBER: SR-3
DATE: 7-13-09
REVISION NUMBER: 0
CONTRACT No.
ISSUE: FINAL
SHEET No. 35 OF 40

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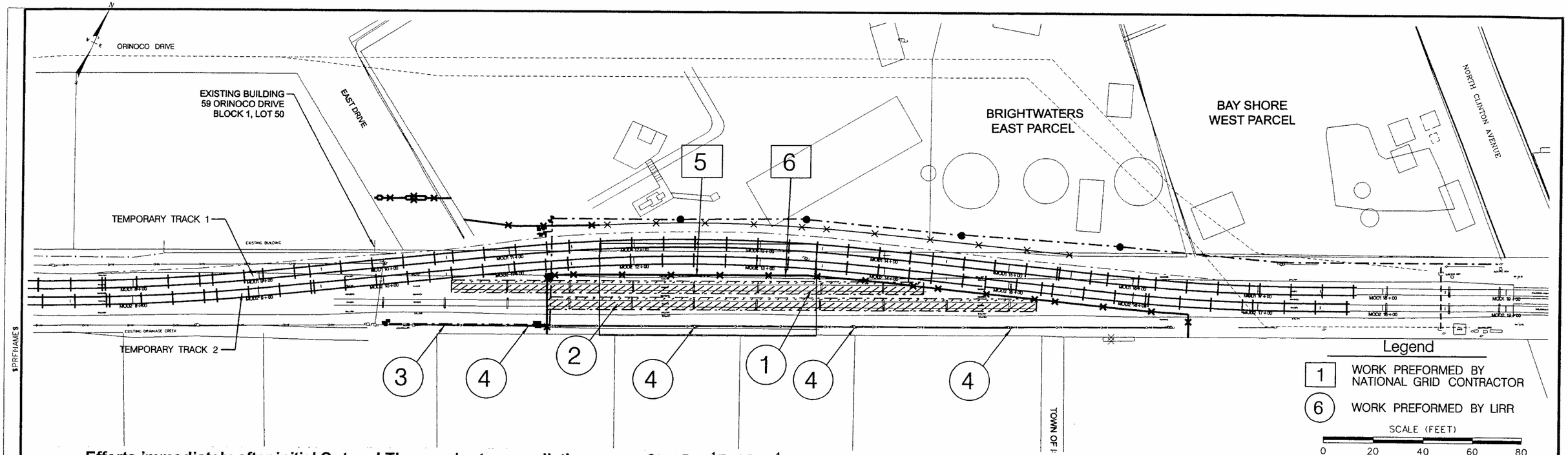

Efforts immediately after initial Cut and Throw prior to remediation

				Start Date[1]	End Date[1]
1)	Removal of remaining Mainline 1 rail and ties between cut and throw limits	LIRR	370 lf	10/19/09	10/23/09
2)	Removal of remaining Mainline 2 rail and ties within 40 feet of remediation	LIRR	390 lf	10/19/09	10/23/09
3)	Removal of all abandoned track wires and fiber optic cables between Clinton Ave and Windsor Road.	LIRR	2681 lf	10/19/09	10/23/09
4)	Removal of four LIRR utility poles within/adjacent to the remediation area to southern access gate including associated wires	LIRR	4 poles	10/19/09	10/23/09
5)	Install Initial Sheeting and monitor LIRR Temporary Mainline Tracks during sheeting installation. Initial sheeting to be placed a minimum of 8.5 ft from Temporary Mainline Tracks	National Grid		10/26/09	11/06/09
6)	Installation of LIRR protective fencing north of and adjacent to the Initial Sheeting and north-south remediation isolation fencing (to be installed following installation of Initial Sheeting)	National Grid	580 lf	11/09/09	11/10/09

Notes: 1. Interim scheduled events subject to modifications due to increased production rates and / or modifed LIRR coordination assumptions

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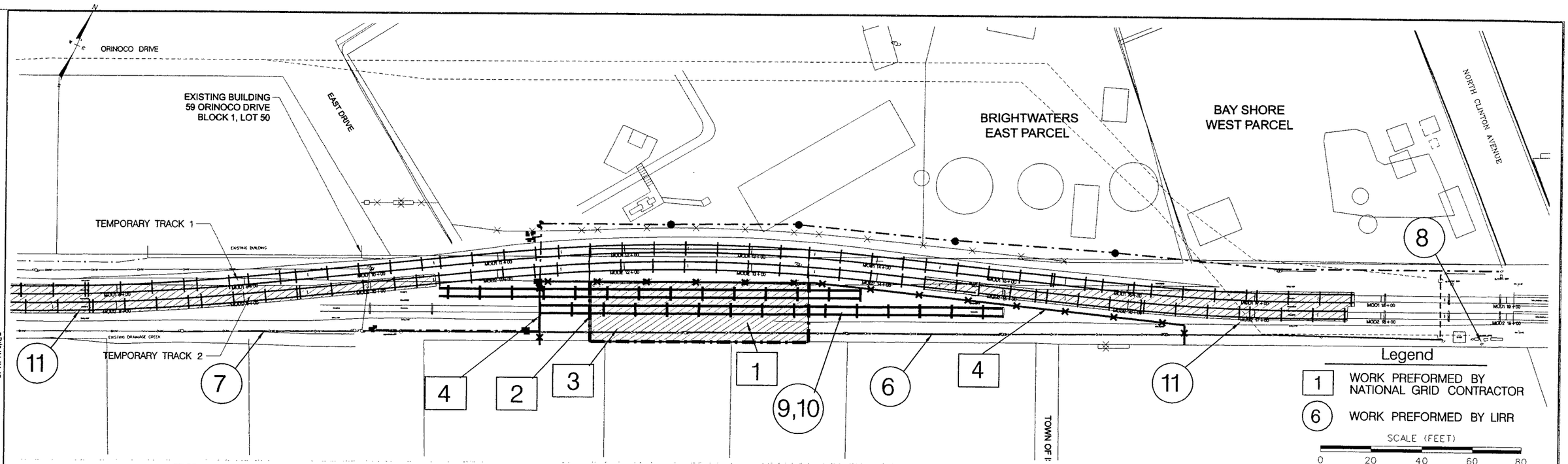
CONSTRUCTION STAGING AND RESTORATION PLAN
IMMEDIATELY AFTER FIRST CUT AND THROW

SCALE: 40 Scale
DRAWING NUMBER: SR-4
DATE: 7-13-09
REVISION NUMBER: 0
CONTRACT No.
ISSUE: FINAL
SHEET No.: 36 OF 40

$PRFNAME$
$TBLNAME$
$TIME$
$DATE$
$SCONAME$
$REF1$
$REF2$
$REF3$
$REF4$
$REF5$
$REF6$



Efforts to be preformed after initial remediation

				Start Date[1,2]	End Date[1,2]
1)	Remediation area to be backfilled with compacted with LIRR approved material	National Grid		1/11/10	2/23/10
2)	All sheeting except for Initial northern sheeting to be cut and removed within three feet of the bottom of Restored Mainline tie elevations	National Grid		1/12/10	3/02/10
3)	Install a minimum of 12 inch ballast 9 inches below the bottom of tie within remediation area	National Grid		3/03/10	3/09/10
4)	Removal of fencing which traverses north-south across the LIRR property.	National Grid		4/19/10	4/22/10
5)	LIRR Communications forces install new pole line between Clinton Ave and new splice case south of new normal running tracks.	LIRR	4 poles	3/15/10	3/19/10
6)	LIRR Communications forces install 37c14 and 2c/0 cables along new pole line between Clinton Ave and new splice case.	LIRR	850 lf	LIRR to complete to support track throw on 4/23/10.[2]	
7)	LIRR Communications forces install fiber optic cable between Clinton Ave and Windsor Ave.	LIRR	2861 ft	LIRR to complete to support track throw on 4/23/10.[2]	
8)	LIRR Signal forces prep cables at Clinton Ave and new splice case.	LIRR		LIRR to complete to support track throw on 4/23/10.[2]	
9)	Installation ties and rail from 10+50 to 14+50 on Restored Mainline 1 and 11+30 to 15+80 on Restored Mainline 2 including reestablished signal IJ's	LIRR	850 ft	3/10/10	4/16/10
10)	Install ballast within tie cribbing of Restored Mainline tracks.	LIRR		4/19/10	4/22/10
11)	Prep existing Temporary Tracks within cut and throw areas	LIRR		LIRR to complete to support track throw on 4/23/10.[2]	

Notes: 1. Interim scheduled events subject to modifications due to increased production rates and / or modifed LIRR coordination assumptions
2. Cut and throw date should not be modified.

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CONSTRUCTION STAGING AND RESTORATION PLAN IMMEDIATELY AFTER INITIAL REMEDIATION

SCALE: 40 Scale
DRAWING NUMBER: SR-5
DATE: 7-13-09
REVISION NUMBER: 0
CONTRACT No.
ISSUE: FINAL
SHEET No. 37 OF 40

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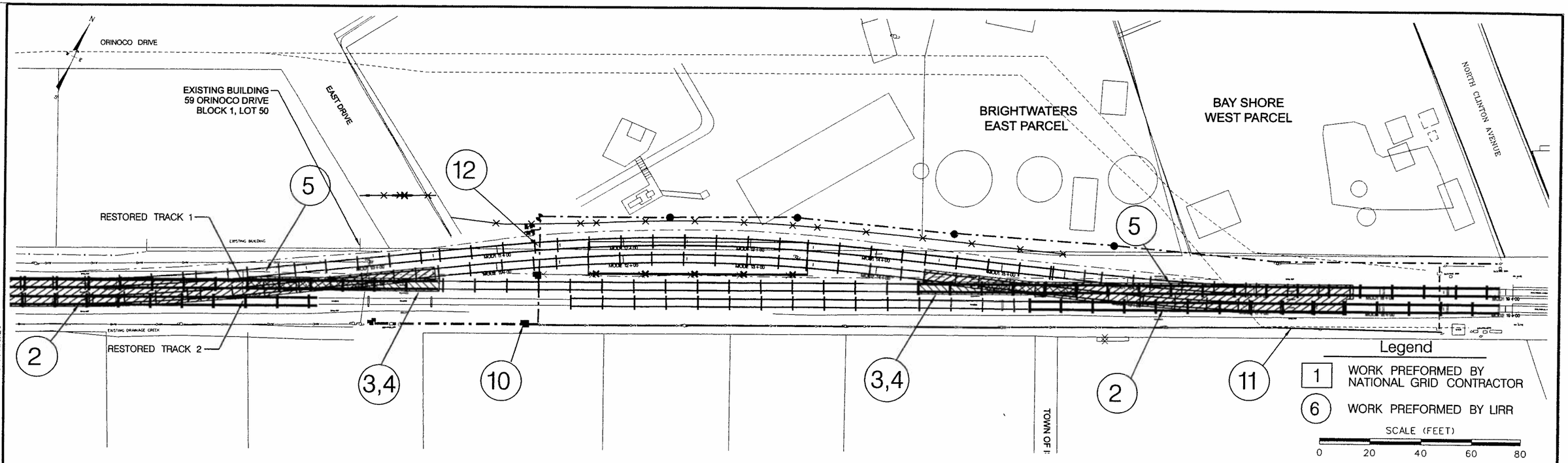

Track and Civil effort during Second Cut and Throw (4/23/10 - 4/25/10)

1)	Saw cut Mainline 2 approx Stations 9+15 and 15+87	LIRR	
2)	Throw western Mainline Track 2 between stations 7+07 and 9+15 and eastern Mainline Track 2 between 15+87 and 17+93	LIRR	
3)	Remove Temporary Mainline 2 conflicting track with Restored Mainline 1 and grade ballast to Restored Mainline 1 bottom of tie elevations	LIRR	
4)	Extend Restored Mainline 1 with previously made panels through cleared trackbed to Temporary Mainline 1 cut and throw limit.	LIRR	170 lf east 135 lf west
5)	Throw western Restored Mainline Track 1 between stations 6+98 and 9+05 and eastern Restored Mainline Track 1 between 16+00 and 17+93	LIRR	
6)	Perform all track welds and connections	LIRR	
7)	Install and tamp Temporary Mainline 1 and 2 track	LIRR	
8)	Remove of temporary speed restriction signs east of Clinton Ave and west of Windsor Ave.	LIRR	

Signal and Communications effort prior to final Cut and

9)	LIRR Signal forces install jumpers on necessary crossings.	LIRR
10)	LIRR Signal forces tie in and test new cable from Clinton Ave to new CS case.	LIRR
11)	LIRR Communications forces tie in (splice) and test fiber optic cable.	LIRR
12)	LIRR Signal forces disconnect track wires from temporary track and connect new track wires to new normal running track.	LIRR
13)	LIRR Signal forces remove circuit revisions for crossing approaches installed during first cut and throw (if required).	LIRR
14)	LIRR Signal forces perform testing for track circuits, crossings and signals as required.	LIRR
15)	LIRR Signal forces remove jumpers from all crossings.	LIRR

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CONSTRUCTION STAGING AND RESTORATION PLAN DURING SECOND CUT AND THROW

SCALE: 40 Scale
DRAWING NUMBER: SR-6
DATE: 7-13-09
REVISION NUMBER: 0
CONTRACT No.
ISSUE: FINAL
SHEET No. 38 OF 40

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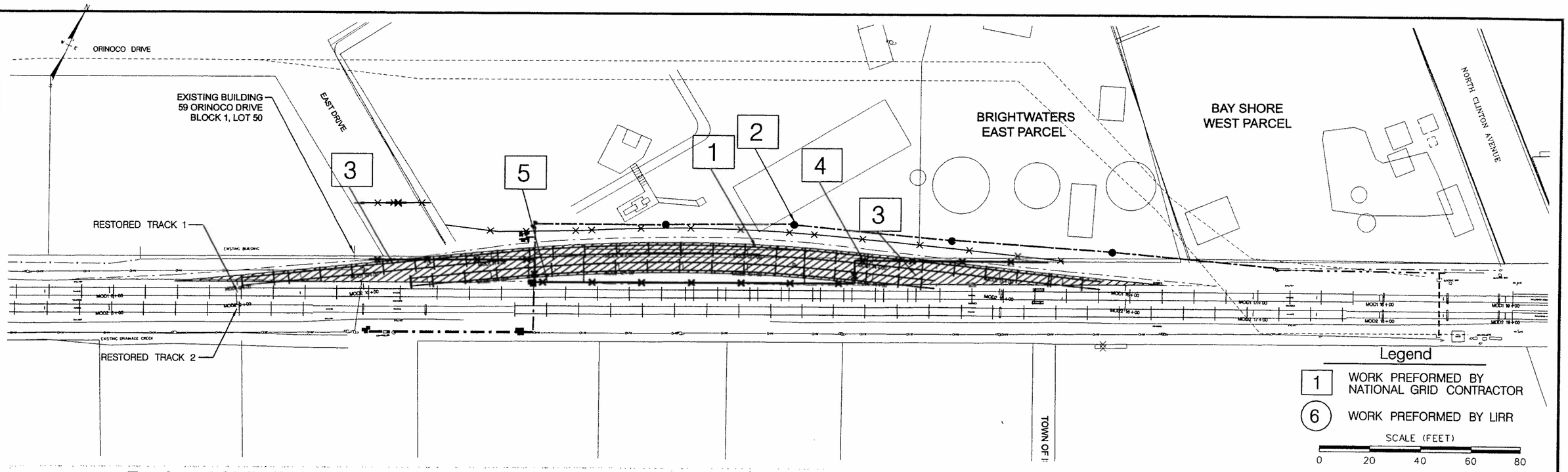

Track and Civil effort after Second Cut and Throw

				Start Date[1]	End Date[1]
1)	Remove Temporary Mainline rail and ties	National Grid		4/26/10	4/30/10
2)	Remove temporary system poles and associated cables north of severed Temporary Tracks	National Grid		4/26/10	4/30/10
3)	Final grading within LIRR right of way outside of remaining remediation area (if required).	National Grid		4/26/10	4/27/10
4)	Reconfigure railroad property fencing east and west of remediation area.	National Grid	310 lf	4/26/10	4/30/10
5)	Fencing to be constructed adjacent and south of the Initial Sheeting within previously remediation area (fencing to be extended to provide 40 ft work zone east and west of remaining remediation area) including north-south connections to the reconfigured LIRR fencing.	National Grid	290 lf	4/26/10	4/30/10

Notes: 1. Interim scheduled events subject to modifications due to increased production rates and / or modifed LIRR coordination assumptions

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APPROVED BY: C. Kaiser

STATE OF NEW YORK — PATRICK HEALY — 210... — LICENSED PROFESSIONAL ENGINEER

BAY SHORE/BRIGHTWATERS
FORMER MGP SITE
BAY SHORE, NEW YORK
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CONSTRUCTION STAGING
AND RESTORATION PLAN
AFTER SECOND
CUT AND THROW

SCALE: 40 Scale
DRAWING NUMBER: SR-7
DATE: 7-13-09
REVISION NUMBER: 0
CONTRACT No.
ISSUE: FINAL
SHEET No.: 39 OF 40

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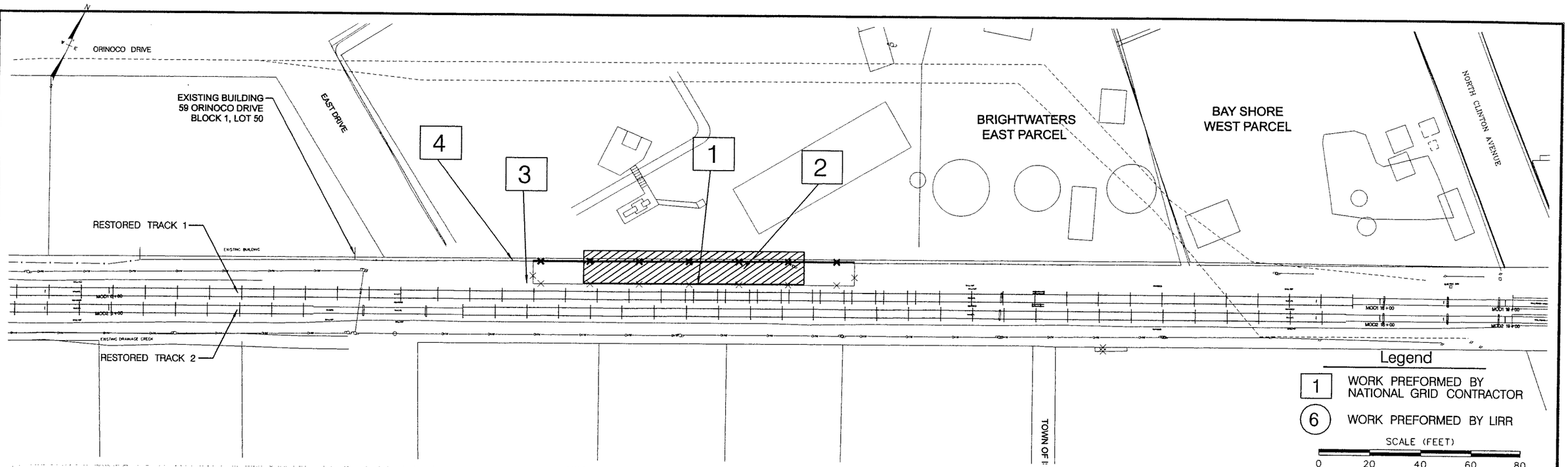

Track and Civil effort after LIRR Property Remediation Completed

				Start Date[1]	End Date[1]
1)	Initial northern sheeting to be cut and removed within three feet of the proposed grade	National Grid		6/23/10	6/30/10
2)	Remediation area to be backfilled with compacted to final grade with LIRR approved material	National Grid		5/19/20	6/22/10
3)	Fencing within LIRR property to be removed	National Grid	290 lf	7/15/10	7/21/10
4)	Fencing to be installed along LIRR property line	National Grid	255 lf	7/15/10	7/21/10

Notes: 1. Interim scheduled events subject to modifications due to increased production rates and / or modifed LIRR coordination assumptions

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APPROVED BY: C. Kaiser

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FORMER MGP SITE
BAY SHORE, NEW YORK

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CONSTRUCTION STAGING AND RESTORATION PLAN

POST LIRR PROPERTY REMEDIATION

SCALE: 40 Scale
DRAWING NUMBER: SR-8
DATE: 7-13-09
REVISION NUMBER: 0
CONTRACT No.
ISSUE: FINAL
SHEET No. 40 OF 40

$PRFNAME$ $TBLNAME$ $STIME$ $DATE$ $SHEETS$ $CONNAME$
$SEE1$ $SEE2$ $SEE3$ $SEE4$ $SEE5$

Appendix C

NATIONAL GRID MGP Program Documents (Electronic Copy – HASP and CAMP)

SITE-SPECIFIC CONTRACTOR HASP WILL BE AVAILABLE ON SITE FOR REVIEW

SITE SPECIFIC HEALTH AND SAFETY PLAN (HASP)

Site(s):	**NATIONAL GRID CORPORATION BAY SHORE FORMER MANUFACTURED GAS PLANT (MGP) OU-3 Long Island Rail Road Excavation Project**
Location:	**BAY SHORE, NEW YORK**
Date Prepared:	**JULY 2009**
Revision:	**0**
Project Description:	**Site preparation, Construction, Excavation, Shoring and Impacted Soil Handling**
Waste types:	Impacted Soils and Groundwater
Characteristics:	Volatile, Toxic
Unusual Site Features:	None
Status:	Industrial (Off-site areas are residential)
Background Review:	Site Investigations have been performed
Overall Hazard:	Low

NATIONAL GRIDNATIONAL GRID, NATIONAL GRID CONTRACTORS AND 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 THAT 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 GUIDANCE IN THIS PLAN WAS PREPARED TO SERVE AS AN EXAMPLE TO POTENTIAL CONTRACTORS AND SUBCONTRACTORS THAT MAY WORK AT THIS SITE AND SHOULD NOT BE USED ON ANY SPECIFIC PROJECT WITHOUT PRIOR RESEARCH AND EVALUATION BY TRAINED HEALTH AND SAFETY SPECIALISTS.

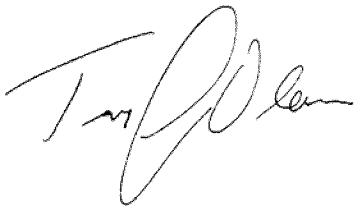
CONTRACTOR APPROVALS

By their signature, the undersigned hereby certify that this HASP has been reviewed and approved for use at the National Grid Corporation (National Grid) Bay Shore, New York site.

July 6, 2009

TIMOTHY J. OLEAN
PROJECT MANAGER
GEI CONSULTANTS, INC.

DATE



July 6, 2009

TIMOTHY J. OLEAN
PROJECT HEALTH AND SAFETY OFFICER
GEI CONSULTANTS, INC.

DATE

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1.0 INTRODUCTION

1.1 Purpose

This Health and Safety Plan (HASP) addresses the health and safety practices that will be employed by workers participating in investigation and remediation activities at the site that are under the direction of **CONSULTANT**. This work will be performed at the National Grid Corporation (National Grid) Former Manufactured Gas Plant (MGP) Bay Shore, NY site (Site). The HASP takes into account the specific hazards inherent to the Site, and presents procedures to be followed by **CONSULTANT**, **CONTRACTOR**, **SUBCONTRACTORS**, and all site visitors in order to avoid and if necessary, protect against health and/or safety hazards. Activities performed under this HASP will comply with applicable parts of OSHA Regulations, primarily 29 CFR Parts 1910 and 1926 and attached National Grid policies and procedures. A copy this HASP will be maintained on-site for the duration of work.

All workers who may participate in activities at the Site that are under the direction of **CONSULTANT** are required to comply with the provisions specified in this HASP. All site visitors who enter designated work zones must also comply with this HASP. Refusal or failure to comply with the HASP or violation of any safety procedures by field personnel and/or subcontractors performing work covered by this HASP may result in immediate removal from the site following consultation with **CONTRACTOR**.

1.2 Scope

This HASP has been developed to address the health and safety concerns during site investigation and remedial actions at the Site that are under the direction of **CONSULTANT**. Although the HASP addresses all activities listed below, work at the individual locations may include all, or only some of these tasks.

The HASP addresses the following activities:

Mobilization/Demobilization

- Mobilization/Demobilization of Equipment and Supplies
- Establishment of Site Security, Work Zones and Staging Areas

Pre Construction, Excavation, and Trenching Activities

- Locate All Utilities to and from the Site
- Locate All Active Utility Lines on Site

Construction Activities

- Utility Connections (Water, Sewer, Electrical)
- Excavation and Trenching (see Excavation and Trenching Activities)

Excavation and Trenching Activities

- Excavate Overburden Material
- Stockpile and Segregate Overburden Material
- Confined Space Entry/Trench Box Use
- Dewater Excavation
- Trenching
- Break Lines
- Cut, Fill and Cap Lines
- Backfill Excavation
- Site Restoration

Other Remediation Activities

- Installation of Injection Wells
- Injection of Chemical Oxidants
- Operation and Maintenance Tasks

Soil and Groundwater Sampling Activities

- Soil Borings and Soil Sampling
- Monitoring Well Installation, Development, and Sampling

1.3 Application

The HASP applies to all personnel involved in the above tasks, that are under the direction of **CONSULTANT**, who wish to gain access to active work areas, including but not limited to:

- National Grid representatives, contractors, and subcontractors performing tasks under the direction of the **CONSULTANT;**
- Federal, State or local representatives;
- **CONSULTANT** Employees; and
- **CONSULTANT** Subcontractors.

2.0 PROJECT ORGANIZATION AND RESPONSIBILITIES

This section specifies the **CONTRACTOR** Project Organization.

2.1 Project Manager (PM)

The Project Manager is Timothy Olean. The PM responsibilities include the following:

- Ensures implementation of this program;
- Conducts periodic inspections;
- Participates in incident investigations;
- Ensures the HASP has all of the required approvals before any site work is conducted;
- Ensures that the Site Manager is informed of project changes which require modifications of the site safety plan; and
- Has overall project responsibility for Project Health and Safety.

2.2 Site Manager (SM)

The Site Manager is Timothy Olean. The SM responsibilities include the following:

- Ensures that the HASP is implemented and that all health and safety activities identified in site safety plans are conducted and/or implemented;
- Ensures that field work is scheduled with adequate personnel and equipment resources to complete the job safely and enforce site health and safety rules;
- Ensures that adequate communication between field crews and emergency response personnel is maintained;
- Ensures that field site personnel are adequately trained and qualified to work at the site and that proper personal protective equipment is utilized by field teams;
- Investigate and report all accidents/incidents to the PM;
- Conducts and documents daily safety briefings;
- Stop work if necessary;
- Acts as the primary point of contact with National Grid for site related activities and coordination with non-project related site operations;
- Identifies operational changes which require modifications to health and safety procedures and site safety plans, and ensures that the procedure modifications are implemented and documented through changes to the HASP, with CHSO approval;
- Direct and coordinate health and safety monitoring activities;
- Determines upgrades or downgrades of personal protective equipment (PPE) based on site conditions and/or real-time monitoring results;
- Ensures that monitoring instruments are calibrated; and
- Reports to the CHSO to provide summaries of field operations and progress.

2.3 Corporate Health and Safety Officer (CHSO)

The CHSO is a qualified health and safety professional with experience in hazardous waste site remediation activities. The CHSO is Robin Dehate. The CHSO responsibilities include the following:

- Provides for the development and approval of the HASP;
- Serves as the primary contact to review health and safety matters that may arise;
- Approves revised or new safety protocols for field operations;
- Coordinates revisions of this HASP with field personnel;
- Coordinates upgrading or downgrading of personal protective equipment with the SM; and
- Assists in the investigation of all accidents/incidents;

2.4 Site Supervisor

The Site Supervisor is Tim Olean. The Site Supervisor responsibilities include the following:

- Provide for the necessary training of field crews in accordance with OSHA regulations and provides proof of training to the SM prior to entering the site;
- Conduct routine safety inspections of their work areas;
- Conduct incident investigations and together with the SM, prepares appropriate reports;
- Enforces health and safety rules and compliance with the HASP; and
- Plans field work using appropriate safe procedures and equipment.

2.5 Site Personnel

The Site Personnel responsibilities include the following:

- Report any unsafe or potentially hazardous conditions to the SM;
- Maintain knowledge of the information, instructions and emergency response actions contained in the HASP;
- Comply with rules, regulations and procedures as set forth in this HASP and any revisions;
- Prevent admittance to work sites by unauthorized personnel; and
- Inspect all tools and equipment, including PPE, prior to use.

3.0 SITE HISTORY AND PROJECT DESCRIPTION

3.1 Location

The National Grid Bay Shore Site is located in Suffolk County, Long Island, within the State of New York. See the Site-Specific Information provided in Appendix A for the Site Location Map.

3.2 Background and Site Description

The Bay Shore MGP opened as a gas plant in 1889 under the ownership of the Mutual Gas and Light Company. The Suffolk Gas and Electric Light Company owned and operated the site from 1889 to 1917. In 1918, the Long Island Lighting Company (LILCO) became the legal owner. Gas manufacturing occurred at the site between 1889 and approximately 1973. The plant was demolished in the mid-1970's. In 1918, LILCO began operating a carbureted water gas MGP. Later in the life of the plant, it was converted to an oil-gas MGP. Manufacturing operations were conducted on the Bay Shore Property, while the Brightwaters Yard was used to support gas manufacturing and distribution operations. Further description of the site history can be found in the Final Remedial Investigation Report for the Bay Shore/Brightwaters Former MGP Site (January 2003).

In an effort to manage the remediation of the Bay Shore/Brightwaters former MGP site, the site has been divided into four operable units (OUs), including:

- **Operable Unit 1** - Bay Shore Site, Bay Shore West Parcel and Adjacent Off-site Areas north of Union Boulevard.
- **Operable Unit 2** - Bay Shore Site Groundwater Plume.
- **Operable Unit 3** - Brightwaters Yard and Groundwater Plume.
- **Operable Unit 4** - Watchogue Creek/Crum's Brook.

The geographic boundaries of each operable unit are shown on Figures provided in Appendix A. Work covered by this HASP may be performed within or near any of these operable units.

4.0 POTENTIAL HAZARDS AT THE SITE

This section presents an assessment of the chemical, biological, and physical hazards that may be encountered during the tasks specified under HASP Section 1.2. A Hazard Communication Program is included in Appendix B. The Hazard Communication Program describes procedures for: 1) determining chemical hazards, 2) providing training on chemical hazards, 3) and transmitting chemical hazard information.

4.1 Properties of Chemical Contamination

The characteristics of compounds at the Site are discussed below for information purposes. Adherence to the safety and health guidelines in this HASP should reduce the potential for exposure to the compounds discussed below. Extensive analytical testing has been done within each Site OU and known chemical hazards within each OU are different so personnel should familiarize themselves with the know hazards of each area. Table 4-1 presents chemical data regarding exposure and monitoring for the chemical types listed below.

Polyaromatic hydrocarbons (PAHs) are present at the Site in impacted soil and groundwater and as a dense nonaqueous phase liquid (DNAPL) by-product of gas production. These compounds generally have a depressant effect on the central nervous system (CNS), may cause chronic liver and kidney damage, and some are suspected human carcinogens. Acute exposure may include headache, dizziness, nausea, and skin and eye irritation.

Volatile organic chemicals (VOCs), such as benzene, toluene, ethyl benzene, and xylene (BTEX) may be present as soil and groundwater contaminants and in some cases as free product in abandoned pipelines. These compounds generally have a depressant effect on the CNS, may cause chronic liver and kidney damage, and some are suspected human carcinogens. Benzene is a known human carcinogen. Acute exposure may include headache, dizziness, nausea, and skin and eye irritation.

Polychlorinated Biphenyls (PCBs) have also been detected at the Site in certain areas. The primary routes of exposure for PCBs are inhalation, absorption, ingestion, and contact. This compound causes eye irritation, liver damage and an acne-like skin rash (chloracne).

The Site potentially contains elevated levels of lead and arsenic. The primary routes of this exposure for these compounds are inhalation and ingestion. Exposure to lead may cause acute symptoms such as eye irritation, weakness, weight loss, abdominal pain, and anemia. Chronic exposure to lead may result in kidney disease, effects to the reproductive system, blood forming organs, and CNS. Acute exposure to arsenic may cause dermatitis, GI disturbances and respiratory irritation. Chronic exposure to arsenic has resulted in lung cancer in humans.

The Site potentially contains asbestos containing materials (ACM) in the forms of ACM pipe insulation and asbestos cement pipe. The primary route of exposure for asbestos is inhalation. Chronic exposure to asbestos may cause asbestosis and mesothelioma.

Cyanide compounds are common by-products of manufactured gas production. Analysis of soils from the Site did not indicate elevated levels of cyanides.

4.1.1 Other Chemical Hazards

Chemicals not identified in this HASP may be used during investigation and remediation activities. Prior to the initiation of these tasks, Material Safety Data Sheets will be obtained for each of the chemicals to be used and all site workers and visitors who may potentially be exposed will be made aware of these hazards.

If the CHSO determines that monitoring will be required to determine if these chemicals are potentially migrating off-site, a monitoring program will be established that is consistent with the provisions stated in Section 7.

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. Workers will be instructed in hazard recognition, health hazards, and control measures during site-specific training.

4.2.1 Animals

During the conduct of site operations, wild animals such as stray dogs or cats, raccoons, and mice may be encountered. Workers shall use discretion and avoid all contact with wild animals. If these animals present a problem, efforts will be made to remove these animals from the site by contacting a licensed animal control technician.

4.2.2 Insects

Insects, including bees, wasps, hornets, and spiders, may be present at the Site making the chance of a bite possible. Some individuals may have a severe allergic reaction to an insect bite or sting that can result in a life threatening condition; any individuals who have been bitten or stung by an insect should notify the SM. The following is a list of preventive measures:

- Apply insect repellent prior to performing any field work and as often as needed throughout the work shift.
- Wear proper protective clothing (work boots, socks and light colored pants).
- When walking in wooded areas, avoid contact with bushes, tall grass, or brush as much as possible.
- Field personnel who may have insect allergies shall have bee sting allergy medication on site and should provide this information to the SM prior to commencing work.

Table 4-1
Chemical Data

Compound	CAS #	ACGIH TLV	OSHA PEL	Route of Exposure	Symptoms of Exposure	Target Organs	Physical Data
Benzene	71-43-2	0.5 ppm (skin)	1 ppm TWA 5 ppm STEL	Inhalation Skin Absorption Ingestion Skin Contact	Irrit eyes, skin, nose, resp system, nausea; potential carcinogen	Eyes, skin, CNS, bone marrow, blood	FP: 12° F IP: 9.24 eV LEL: 1.2% UEL: 7.8% VP: 75 mm
Ethylbenzene	100-41-4	100 ppm	100 ppm	Inhalation Ingestion Skin Contact	Eye, skin, mucous membrane irritation; headache; dermatitis, narcosis; coma	Eyes, skin, respiratory system, CNS	FP: 55° F IP: 8.76 eV LEL: 0.8% UEL: 6.7% VP: 7 mm
Toluene	108-88-3	50 ppm	200 ppm	Inhalation Skin Absorption Ingestion Skin Contact	Eye, nose irritation; fatigue, weakness, confusion, euphoria, dizziness, headache; dilated pupils, lacrimation; nervousness, muscle fatigue, insomnia, tingling in limbs; dermatitis	Eyes, skin, resp system, CNS, liver, kidneys	FP: 40° F IP: 8.82 eV LEL: 1.1% UEL: 7.1% VP: 21 mm
Xylene	1330-20-7	100 ppm	100 ppm	Inhalation Skin Absorption Ingestion Skin Contact	Eye, skin, nose, throat irritation; dizziness, excitement, drowsiness; incoordination, staggering gait; corneal damage; appetite loss, nausea, vomiting, abdominal pain; dermatitis	Eyes, skin, resp system	FP: 90° F IP: 8.56 eV LEL: 0.9% UEL: 6.7% VP: 9 mm
Arsenic	7440-38-2	0.01 mg/m^3	0.01 mg/m^3	Inhalation Skin Absorption Ingestion Skin Contact	Ulceration of nasal septum, derm, GI disturbances, peripheral neuropathy, resp irrt, hyperpig of skin, potential carcinogen	Liver, kidneys, skin, lungs, lymphatic system	Metal: Silver-gray or tin-white, brittle, odorless solid FP: NA IP: NA LEL: NA UEL: NA VP: 0 mm
Asbestos	1332-21-4	0.1 f/cc	0.1 f/cc	Inhalation Ingestion Skin Contact	Asbestosis (chronic exposure); mesothelioma, breathing difficulty, interstital fibrosis' restricted pulmonary function, finger clubbing; irritate eyes	Respiratory system, eyes	White, greenish, blue, or gray-green fibrous solids FP: NA IP: NA LEL: NA UEL NA VP: 0 mm
Lead	7439-92-1	0.050 mg/m^3	0.05 mg/m^3	Inhalation Ingestion Skin Contact	Weak, lass, insom; facial pallor; pal eye, anor, low-wgt, malnut; constip, abdom pain, colic;	Eyes, GI tract, CNS, kidneys, blood, gingival	A heavy, ductile, soft, gray solid. FP: NA IP: NA

Table 4-1
Chemical Data

Compound	CAS #	ACGIH TLV	OSHA PEL	Route of Exposure	Symptoms of Exposure	Target Organs	Physical Data
					anemia; gingival lead line; tremor; para wrist, ankles; irrit eyes	tissue	LEL: NA UEL: NA VP: 0 mm
Naphthalene	91-20-3		10 ppm (50 mg/m^3) TWA	inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes; headache, confusion, excitement, malaise (vague feeling of discomfort); nausea, vomiting, abdominal pain; irritation bladder; profuse sweating; jaundice; hematuria (blood in the urine), renal shutdown; dermatitis, optical neuritis, corneal damage	Eyes, skin, blood, liver, kidneys, central nervous system	FP: 174 F IP: 8.12 eV, LEL: 0.8% UEL:6.7%, VP: 0.08 mm
PAH's as Coal tar pitch Volatiles (CTPV)	65996-93-2	0.2 mg/m3	0.2 mg/m3	Inhalation Skin contact Ingestion	Irritant to eyes, swelling, acne contact dermatitis, chronic bronchitis	Respiratory system, CNS, liver, kidneys, skin, bladder, carc	Black or dark brown amorphous residue.
PCBs	11097-69-1	0.5 mg/m^3 (Skin)	0.5 mg/m^3 (Skin)	Inhalation Skin Absorption Ingestion Skin Contact	Irritate eyes; chloracne; liver damage;	Skin, eyes, liver, reproductive system	Colorless liquid or solid with a mild, hydro-carbon odor VP = 0.00006 mm
Hydrogen cyanide	74-90-8	4.7 ppm (5 mg/m^3) STEL [skin]	10 ppm (11 mg/m^3) [skin]	Inhalation Ingestion Absorption Skin/Eye Contact	Asphyxia; weakness, headache, confusion; nausea, vomiting; increased rate and depth of respiration or respiration slow and gasping; thyroid, blood changes	CNS, CVS, thyroid, blood	Colorless or pale-blue liquid or gas (above 78°F) with a bitter, almond-like odor. VP: 630 mmHg IP: 13.60 eV
Hydrogen sulfide	7783-06-4	10 ppm TWA, 15 ppm STEL	20 ppm C, 50 ppm [10-min. Maximum peak]	Inhalation Skin/Eye Contact	Irritation eyes, respiratory system; apnea, coma, convulsions; conjunctivitis, eye pain, lacrimation (discharge of tears), photophobia (abnormal visual intolerance to light), corneal vesiculation; dizziness,	Eyes, respiratory system, CNS	Colorless gas with a strong odor of rotten eggs. VP: 17.6 atm IP: 10.46 eV

Table 4-1
Chemical Data

Compound	CAS #	ACGIH TLV	OSHA PEL	Route of Exposure	Symptoms of Exposure	Target Organs	Physical Data
					headache, fatigue, irritability, insomnia; gastrointestinal disturbance; liquid: frostbite		

Abbreviations	
C = ceiling limit, not to be exceeded	LEL = Lower explosive limit
CNS = Central Nervous System	mm = millimeter
CVS = Cardiovascular System	ppm = parts per million
eV = electron volt	Skin = significant route of exposure
FP = Flash point	STEL = Short-term exposure limit (15 minutes)
IP = Ionization Potential	TWA = Time-weighted average (8 hours)
GI = Gastro-intestinal	UEL = Upper explosive limit
	VP = vapor pressure approximately 68° F in mm Hg (mercury)

4.2.2.1 Lyme Disease

Lyme disease is caused by infection from a deer tick that carries a spirochete. During the painless tick bite, the spirochete may be transmitted into the bloodstream that could lead to the worker contracting Lyme disease.

Lyme disease may cause a variety of medical conditions including arthritis, which can be treated successfully if the symptoms are recognized early and medical attention is received. Treatment with antibiotics has been successful in preventing more serious symptoms from developing. Early signs may include a flu-like illness, an expanding skin rash and joint pain. If left untreated, Lyme disease can cause serious nerve or heart problems as well as a disabling type of arthritis.

Symptoms can include a stiff neck, chills, fever, sore throat, headache, fatigue and joint pain. This flu-like illness is out of season, commonly happening between May and October when ticks are most active. A large expanding skin rash usually develops around the area of the bite. More than one rash may occur. The rash may feel hot to the touch and may be painful. Rashes vary in size, shape, and color, but often look like a red ring with a clear center. The outer edges expand in size. It's easy to miss the rash and the connection between the rash and a tick bite. The rash develops from three days to as long as a month after the tick bite. Almost one third of those with Lyme disease never get the rash.

Joint or muscle pain may be an early sign of Lyme disease. These aches and pains may be easy to confuse with the pain that comes with other types of arthritis. However, unlike many other types of arthritis, this pain seems to move or travel from joint to joint.

Lyme disease can affect the nervous system. Symptoms include stiff neck, severe headache, and fatigue usually linked to meningitis. Symptoms may also include pain and drooping of the muscles on the face, called Bell's Palsy. Lyme disease may also mimic symptoms of multiple sclerosis or other types of paralysis.

The disease can also cause serious but reversible heart problems, such as irregular heartbeat. Finally, Lyme disease can result in a disabling, chronic type of arthritis that most often affects the knees. Treatment is more difficult and less successful in later stages. Often, the effects of Lyme disease may be confused with other medical problems.

It is recommended that personnel check themselves when in areas that could harbor deer ticks, wear light color clothing and visually check themselves and their buddy when coming from wooded or vegetated areas. If a tick is found biting an individual, the SM should be contacted immediately. The tick can be removed by pulling gently at the head with tweezers. The affected area should then be disinfected with an antiseptic wipe. The employee will be offered the option for medical treatment by a physician, which typically involves prophylactic antibiotics. If personnel feel sick or have signs similar to those above, they should notify the SM immediately. Workers' pants should be tucked into their socks to prevent ticks from crawling up their legs.

4.2.3 Plants

The potential for contact with poisonous plants exists when performing field work in undeveloped and wooded areas. Poison ivy, sumac, and oak may be present on site. Poison ivy can be found as vines on tree trunks or as upright bushes. Poison ivy consists of three leaflets with notched edges. Two leaflets form a pair on opposite sides of the stalk, and the third leaflet stands by itself at the tip. Poison ivy is red in the early spring and turns shiny green later in the spring. Poison sumac can be present in the form of a flat-topped shrub or tree. It has fern-like leaves, which are velvety dark green on top and pale underneath. The branches of immature trees have a velvety "down." Poison sumac has white, "hairy" berry clusters. Poison oak can be present as a sparingly branched shrub. Poison oak is similar to poison ivy in that it has the same leaflet configuration, however, the leaves have slightly deeper notches. Prophylactic application of Tecnu may prevent the occurrence of exposure symptoms. Post exposure over the counter products are available and should be identified at the local pharmacist. Susceptible individuals should be identified by the SM.

Contact with poison ivy, sumac, or oak may lead to a skin rash, characterized by reddened, itchy, blistering skin which needs first aid treatment. If you believe you have contacted one of these plants, immediately wash skin thoroughly with soap and water, taking care not to touch your face or other body parts.

4.3 Physical Hazards

Physical hazards will be addressed as necessary. More detailed safety procedures are provided as appendices where applicable.

4.3.1 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, poor judgment and unauthorized procedural changes. The procedures to be followed are found in Appendix C, the Cold Stress Program.

4.3.2 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. A heat stress prevention program will be implemented when ambient temperatures exceed 70ºF for personnel wearing impermeable clothing. The procedures to be followed are found in Appendix D, the Heat Stress Program.

4.3.3 Noise

Noise is a potential hazard associated with the operation of heavy equipment, power tools, pumps and generators. Site workers who will perform suspected high noise tasks and operations for short durations (less than 1-hour) will be provided with earplugs. If deemed necessary by the SM, the CHSO will be consulted on the need for additional hearing protection and the need to monitor sound levels for site activities.

4.3.4 Hand and Power Tools

In order to complete the various tasks for the project, personnel will utilize hand and power tools. The use of hand and power tools can present a variety of hazards, including physical harm from being struck by flying objects, being cut or struck by the tool, fire, and electrocution. Work gloves, safety glasses, and hard hats will be worn by the operating personnel at all times when utilizing hand and power tools and GFI-equipped circuits will be used for all power tools.

4.3.5 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 wet from rain or ice. Excavation at the sites will cause uneven footing in the trenches and around the spoil piles.

4.3.6 Fire and Explosion

When conducting excavating activities, the opportunity of encountering fire and explosion hazards exists from contamination in the soil and the possibility of free product in the underground pipelines. This will be especially hazardous when pipelines are sawed or broken to grout the ends. Additionally, the use of a diesel engine on excavating equipment could present the possibility of encountering fire and explosion hazards.

4.3.7 Manual Lifting

Manual lifting of heavy objects such as sections of pipe may be required. Failure to follow proper lifting technique can result in back injuries and strains. Site workers will be instructed to use power equipment to lift heavy loads when ever possible and to evaluate loads before trying to lift them (i.e. they should be able to easily tip the load and then return it to its original position). Carrying heavy loads with a buddy and proper lifting techniques, 1) make sure footing is solid, 2) make back straight with no curving or slouching, 3) center body over feet, 4) grasp the object firmly and as close to your body as possible, 5) lift with legs, and 6) turn with your feet, don't twist, will be stressed. Back injuries are a serious concern as they are the most common workplace injury, often resulting in lost or restricted work time, and long treatment and recovery periods. In addition, hand digging for pipes may present lifting/ergonomic hazards.

4.3.8 Steam, Heat, Splashing

Exposure to steam/heat/splashing hazards can occur during steam cleaning activities. Exposure to steam/heat/splashing can result in scalding/burns, eye injury, and puncture wounds. Proper PPE will be worn during all steam cleaning activities including rain gear or tyvek, hardhat equipped with splashguard, and water resistant gloves and boots.

5.0 PROCESS SAFETY MANAGEMENT

Process Safety Management 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. Process Safety Management Program guidance can be found in Appendix E. Process Safety Management guidelines will be developed for all activities as necessary, prior to start-up. Process Safety Management will be used to train work crews in proper safety procedures during phase preparatory meetings.

Mobilization/Demobilization

- Mobilization/Demobilization of Equipment and Supplies
- Establishment of Site Security, Work Zones and Staging Areas

Pre Construction, Excavation, and Trenching Activities

- Locate All Utilities to and from the Site
- Locate All Active Utility Lines on Site

Construction Activities

- Utility Connections (Water, Sewer, Electrical)
- Excavation and Trenching (see Excavation and Trenching Activities

Excavation and Trenching Activities

- Excavate Overburden Material
- Stockpile and Segregate Overburden Material
- Confined Space Entry/Trench Box Use
- Dewater Excavation
- Trenching
- Break Lines
- Cut, Fill and Cap Lines
- Backfill Excavation
- Site Restoration

Other Remediation Activities

- Installation of Injection Wells
- Injection of Chemical Oxidants
- Operation and Maintenance Tasks

Soil and Groundwater Sampling Activities

- Soil Borings and Soil Sampling
- Monitoring Well Installation, Development, and Sampling

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 the selection rationale for each activity can be found under Section 4.0 and Appendix F - Personal Protective Equipment (PPE): Selection and Use. For the purposes of PPE selection, the CHSO and SM (if they have completed the 8-hour OSHA Site Supervisor Training) are considered competent persons. The signatures on the front of the HASP constitute certification of the hazard assessment. For activities not covered by Table 6-1, the SM will conduct the hazard assessment and select the PPE using the information provided in Appendix F. PPE selection will be made in consultation with the CHSO.

Modifications for initial PPE selection may also be made by the SM in consultation with the CHSO using the same form. A written justification for major downgrades will be provided to the CHSO for approval on a field change request form.

Table 6-1 describes the anticipated task-specific PPE.

6.1 PPE Abbreviations

HEAD PROTECTION HH = Hard Hat HEARING PROTECTION EP = ear plugs EM = ear muffs	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	FOOT PROTECTION Neo = Neoprene OB = Overboot Poly = polyethylene coated boot Rub = rubber slush boots STB = Leather work boots with steel toe.
HAND PROTECTION Cot = cotton But = Butyl LWG = Leather Work Gloves Neo = Neoprene Nit = Nitrile Sur = Surgical Nit Sur - Nitrile Surgical	BODY PROTECTION Cot Cov = Cotton Coveralls Poly = Polyethylene coated tyvek coveralls Saran = Saranex coated tyvek coveralls Tyvek = Uncoated paper tyvek coveralls WC = Work clothes	RESPIRATORY PROTECTION Level D = No respiratory protection required Level C = Full face air purifying respirator with approved cartridges Level B = Full face air supplied respirator with escape bottle

TABLE 6-1

PERSONAL PROTECTIVE EQUIPMENT SELECTION

TASK	HEAD	EYE/FACE	FEET	HANDS	BODY	HEARING	RESPIRATOR
Mobilization/Demobilization							
Mobilization/ demobilization of equipment and supplies	HH	SG	STB	LWG as needed	WC	EP as needed	Level D
Establishment of site security, work zones and staging area	HH	SG	STB	LWG as needed	WC	EP as needed	Level D
Pre Construction, Excavation, and Trenching Activities							
Locate all utilities to and from the site	HH	SG	STB	LWG as needed	WC	EP as needed	Level D
Locate all active utility lines on site	HH	SG	STB	LWG as needed	WC	EP as needed	Level D
Construction Activities							
Utility Connections	HH	SG	STB	LWG as needed	WC	EP as needed	Level D
Excavation and Trenching Activities							
Excavate overburden material	HH	SG, APR as needed	STB, OB	Nit Sur, LWG	WC, tyvek or Poly as needed	EP as needed	Level D initially, Level C as needed
Segregate overburden material	HH	SG, APR as needed	STB, OB	Nit Sur, LWG	WC, tyvek or Poly as needed	EP as needed	Level D initially, Level C as needed
Confined space entry/ trench box use	HH	SG, APR as needed	STB, OB	Nit Sur, LWG	WC, tyvek or Poly as needed	EP as needed	Level D initially, Level C as needed
Dewater excavation	HH	SG, APR as needed	STB, OB	Nit Sur, LWG	WC, tyvek or Poly as needed	EP as needed	Level D initially, Level C as needed
Break lines	HH	SG, APR as needed	STB, OB	Nit Sur, LWG	WC, tyvek or Poly as needed	EP as needed	Level D initially, Level C as needed
Cut, fill and cap lines	HH	SG, APR as needed	STB, OB	Nit Sur, LWG	WC, tyvek or Poly as	EP as needed	Level D initially, Level C as needed

TASK	HEAD	EYE/FACE	FEET	HANDS	BODY	HEARING	RESPIRATOR
					needed		
Backfill excavation	HH	SG	STB, OB	LWG as needed	WC, tyvek or Poly as needed	EP as needed	Level D
Trenching	HH	SG	STB STB + OB for entry	LWG Nit + Sur for entry	WC WC + Tyvek for entry	EP or EM Note: EM may not be worn over hardhat liner	As required based upon real-time monitoring results as compared to action levels in Table 7-2.
Site Restoration	HH	SG	STB	LWG as needed	WC	EP as needed	Level D
Heavy equipment decontamination	HH	SG, PFS	STB, OB	Sur, Nit	WC, Poly	EP as needed	Level D
Other Remediation Activities							
Installation of Injection Wells	HH	SG	STB	Nit Sur, LWG	WC	EP as needed	Level D
Injection of Chemical Oxidants	HH	SG	STB	Nit Sur, LWG, need for additional gloves will be evaluated	WC	EP as needed	Level D
Operation and Maintenance Task	HH	SG	STB	Nit Sur, LWG	WC	EP as needed	Level D
Soil and Groundwater Sampling Activities							
Soil Borings and Soil Sampling	HH	SG	STB	Nit Sur, LWG	WC	EP as needed	Level D
Monitoring Well Installation, Development, and Sampling	HH	SG	STB	Nit Sur, LWG	WC	EP as needed	Level D

6.2 OSHA Requirements for Personal Protective Equipment

All personal protective equipment used during the course of this field investigation must meet the following OSHA standards:

Type of Protection	Regulation	Source
Eye and Face	29 CFR 1910.133	ANSI Z87.1-1968
Respiratory	29 CFR 1910.134	ANSI Z88.1-1980
Head	29 CFR 1910.135	ANSI Z89.1-1969
Foot	29 CFR 1910.136	ANSI Z41.1-1967

ANSI = American National Standards Institute

Any on-site personnel who have the potential to don a respirator must have a valid fit test certification and documentation of medical clearance. The CHSO will maintain such information on file for **CONTRACTOR** personnel. The SM will obtain such information from the subcontractor's site supervisor prior to the initiation of any such work. Both the respirator and cartridges specified for use in Level C protection must be fit-tested prior to use in accordance with OSHA regulations (29 CFR 1910.1025; 29 CFR 1910.134). Air purifying respirators cannot be worn under the following conditions:

- Oxygen deficiency;
- IDLH concentrations; and
- If contaminant levels exceed designated use concentrations.

SECTION 7.0 - MONITORING

7.1 Monitoring Requirements

Environmental Health and Safety Monitoring will be performed by _____ in accordance with this section.

7.1.1 On-site Monitoring

The following monitoring instruments will be available for use during field operation as necessary:

- Photoionization Detector (PID), Photovac Microtip with 10.6 eV lamp or equivalent; or
- Flame Ionization Detector (FID), Foxboro OVA model 128 or equivalent; and
- Dust Meter, MIE Miniram model PDM-3 or equivalent; and
- Combustible Gas Indicator (CGI)/Oxygen (O2) / H2S / HCN meter, MSA model 361 or equivalent; and
- Sound Level Meter if deemed necessary by the SM and CHSO, type to be appropriate to the activities performed.

All air monitoring equipment will be calibrated and maintained in accordance with manufacturer's requirements and the Monitoring Instruments: Use, Care, and Calibration program included in Appendix G.

Organic vapor concentrations shall be measured using the PID and/or FID during excavating and other intrusive activities. During intrusive operations, organic vapor concentrations shall be measured continuously; during other activities, readings shall be taken at least once every hour. Organic vapor concentrations shall be measured upwind of the work site(s) to determine background concentrations at least twice a day, (once in the morning and once in the afternoon). The SM will interpret monitoring results using professional judgment.

A dust meter shall be used to measure airborne particulate matter during intrusive activities. Monitoring will be continuous and readings will be averaged over a 15-minute period for comparison with the action levels. Monitoring personnel will make a best effort to collect dust monitoring data from downwind of the intrusive activity. If off-site sources are considered to be the source of the measured dust, upwind readings will also be collected.

A CGI/O2 meter shall be used to monitor for combustible gases and oxygen content in the trenches and surrounding areas and elsewhere as necessary. The CGI will also be equipped with a hydrogen sulfide sensor and hydrogen cyanide sensor. H2S monitoring will be completed every fifteen minutes, or if a sulfur odor is present, monitoring will be continuous. HCN monitoring will be completed every fifteen minutes, or if an almond odor is detected, monitoring will be continuous.

All trenches will be monitored before entry at the beginning of each shift.

Guidelines have been established by the National Institute for Occupational Safety and Health (NIOSH) concerning the action levels for work in a potentially explosive environment. These

guidelines are as follows: 10% LEL- Limit all activities to those which do not generate sparks, 20% LEL- Cease all activities in order to allow time for the combustible gases to vent.

TABLE 7-1

REAL TIME AIR MONITORING ACTION LEVELS

Air Monitoring Instrument	Monitoring Location	Action Level	Site Action
PID/FID	Breathing Zone	.5 ppm	Use detector tube for benzene or z-nose to verify
PID/FID	Breathing Zone	0 - 10 ppm	No respiratory protection is required if benzene is not detected
		10 - 250 ppm	Level C, stop work, withdraw from work
		> 250 ppm	Stop work, withdraw from work area; notify CHSO
Oxygen meter	Breathing Zone	< 19.5%	Stop work; withdraw from work area; notify CHSO.
		> 22%	Stop work; withdraw from work area; notify CHSO.
H2S meter	Breathing Zone	<5 ppm	No respiratory protection is required
		>5 ppm	Stop work, cover excavation, notify CHSO
HCN meter	Breathing Zone	<2.5 ppm	No respiratory protection is required
		>2.5 ppm	Stop work, cover excavation, notify CHSO
CGI	Excavation	< 10 % LEL	Investigate possible causes, allow excavation to ventilate; use caution during procedures.
		> 10% LEL	Stop work; allow excavation, borehole to ventilate to < 10% LEL; if ventilation does not result in a decrease to < 10% LEL, withdraw from work area; notify CHSO.
Dust Meter	Excavation	> 1.5 mg/m^3	Implement work practices to reduce/minimize airborne dust generation, e.g., spray/misting of soil with water
		> 2.5 mg/m^3	Upgrade to Level C PPE

7.2 Community Air Monitoring Plan

This community air monitoring plan has been designed to conform with the guidelines presented by the New York State Department of Health in Appendix 1A of the Draft New York State Department of Conservation DER-10 Technical Guidance for Site Investigation and Remediation. Real-time air monitoring for volatile compounds at the perimeter of the exclusion zone will be conducted. If particulates become a concern at the site, possibly as a result of excavating activities or wind erosion of soils, this community plan will be modified accordingly. Contaminants on-site are not anticipated to pose a problem as particulates because of the anticipated high moisture content of the soil during field activities. The following procedures will be implemented during field activities as appropriate:

- Volatile organic compounds will be monitored at the downwind perimeter of the exclusion zone on a continuous basis. If 15-minute average total organic vapor levels exceed 5 ppm (or 5 ppm above background as determined at an upwind location), excavating activities will be temporarily halted and monitoring continued until total organic vapor levels drop below the action level. If the organic vapor level is above 25 ppm at the perimeter of the exclusion area, activities must be shut down. Monitoring will continue and the CHSO will be consulted regarding a proper course of action. All 15-minute average readings must be recorded and be available for regulatory personnel to review.

- Particulates will become a concern if visible dust emissions occur from site investigation activities or wind erosion or if intrusive activities are performed. When particulates become a concern, the following protocol will be followed. PM10 particulate levels will be continuously monitored downwind at the perimeter of the exclusion zone with a portable real-time PM10 particulate monitor that will have an alarm set at 100 ug/m3. If downwind particulate levels integrated over a period of 15 minutes exceed 100 ug/m3, then particulate levels upwind of the exclusion zone will be measured. If the downwind particulate level is more than 100 ug/m3 greater than the upwind particulate level, dust suppression techniques (e.g. spraying water, covering exposed soils with poly sheeting) will be employed. If after implementation of dust suppression techniques, the downwind PM10 particulate level exceeds the upwind PM10 particulate level by greater than 150 ug/m3, activities will be halted and the CHSO will be consulted. All readings will be recorded and be available for regulatory personnel to review. These action levels can be modified if particulates are better characterized and identified.

7.2.1 Vapor Emission Response Plan

If the ambient air concentration of organic vapors exceeds 5 ppm above background levels at the perimeter of the exclusion zone, excavating activities will cease and monitoring continued. If the organic vapor level decreases below 5 ppm (above background), excavating activities may resume. If the organic vapor levels are greater than 5 ppm, but less than 5 ppm over background at the perimeter of the work area, activities may resume provided:

- The organic vapor level 200 feet downwind of the exclusion zone or half the distance to

the nearest residence or commercial structure, whichever is less, is below 5 ppm over background, and
- More frequent intervals of monitoring, as directed by the SM in consultation with the CHSO, are conducted.

If the organic vapor level is above 5 ppm over background at the perimeter of the exclusion zone, work activities will halt and odor control contingencies will be implemented. Exposed soils will be covered with poly sheeting or a biodegradable, surfactant-based foam concentrate, will then be sprayed onto the excavated soils to control the fugitive vapors. When work shutdown occurs, downwind air monitoring will be implemented to ensure that vapor emissions do not impact the nearest residential or commercial structure.

If organic vapor levels greater than 5 ppm over background are identified 200 feet downwind from the exclusion zone, or half the distance to the nearest residential or commercial property line, whichever is less, all work must cease. Following cessation of work activities and implementation of odor control contingencies, if organic vapor levels persist above 5 ppm above background 200 feet downwind or half the distance to the nearest residential or commercial property from the exclusion zone, then air quality must be monitored within 20 feet of the perimeter of the nearest residential/commercial structure (the "20 foot zone").

If organic vapor levels approach 5 ppm above background within the "20 foot zone" for a period of more than 30 minutes, or organic vapor levels greater than 10 ppm above background for any time period occur within the "20 foot zone", then the following steps will be taken:

- 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 within the 20 foot zone may be halted and the perimeter reduced back to the exclusion zone perimeter, or as determined by the SM.

7.3 Data Quality Assurance

7.3.1 Calibration

Instrument calibration shall be documented and included in a dedicated safety and health logbook or on separate calibration pages. 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.

7.3.2 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 SM for reference.

7.4 Noise Monitoring

Work areas or tasks that pose an exposure risk greater than 85 dBA will require hearing protection. If there is a reasonable possibility that workers may be exposed to an 8-hour time-weighted average exceeding 85 dBA, noise monitoring will be conducted.

8.0 ZONES, PROTECTION, AND COMMUNICATION

8.1 Site Control

Site zones are intended to control the potential spread of contamination 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 for each task requiring such delineation (i.e. construction, excavation, trenching in impacted areas of the site). Maps will be available at the Site and used during initial site-specific training.

This project is being conducted under the requirements of 29 CFR 1910.120, and any personnel working in an area where the potential for exposure to site contaminants exists, will only be allowed access after proper training and medical documentation as required by National Grid. These records are maintained by the CHSO, and copies are provided to the SM prior to mobilization for project activities.

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

Support Zone - The SZ is an uncontaminated area 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 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 Exclusion Zone 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 exclusion zone. This zone will be clearly delineated by cones, tapes or other means. The SM 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 SM allowing adequate space for the activity to be completed, field members and emergency equipment.

8.2 Contamination Control

8.2.1 Personnel Decontamination Station

Personnel hygiene, coupled with diligent decontamination, will significantly reduce the potential for exposure.

8.2.2 Minimization of Contact With Contaminants

During completion of all site activities, personnel should attempt to minimize the degree of contact with contaminated materials. This involves a conscientious effort to keep "clean" during site activities. All personnel should minimize kneeling, splash generation, and other physical contact with contamination. This may ultimately minimize the degree of decontamination required and the generation of waste materials from site operations.

Field procedures will be developed to control overspray and runoff and to ensure that unprotected personnel working nearby are not affected.

8.2.3 Personnel Decontamination Sequence

Consideration will be given to prevailing wind directions so that the decontamination line, the support zone, and contamination reduction zone exit is upwind from the exclusion zone and the first station of the decontamination line. Decontamination will be performed by removing all PPE used in EZ and placing in drums/trash cans at CRZ. Baby wipes shall be available for wiping hands and face.

8.2.4 Emergency Decontamination

If circumstances dictate that contaminated clothing cannot be readily removed, then remove gross contamination, wrap injured personnel with clean garments/blankets to avoid contaminating other personnel or transporting equipment.

If the injured person can be moved, he/she will be moved to the exclusion zone boundary and decontaminated by site personnel as described above before emergency responders handle the victim. If the person cannot be moved because of the extent of the injury (a back or neck injury) provisions shall be made to ensure that emergency response personnel will be able to respond to victim without being exposed to potentially hazardous atmospheric conditions. If the potential for inhalation hazards exist, such as with open excavation, this area will be covered with poly to eliminate any potential inhalation hazards. All emergency personnel are to be immediately informed of the injured person's condition, potential contaminants, and provided with all pertinent chemical data.

8.2.5 Hand Held Equipment Decontamination

Hand held equipment includes all monitoring instruments, samples, hand tools, and notebooks. The hand held equipment is dropped at the first decontamination station to be decontaminated by one of the decontamination team members. These items must be decontaminated or discarded as waste prior to removal from the exclusion zone.

To aid in decontamination, monitoring instruments can be sealed in plastic bags or wrapped in polyethylene. This will also protect the instruments against contaminants. The instruments will be wiped clean using wipes or paper towels if contamination is visually evident.

Decontamination procedures for sampling equipment, hand tools, etc., shall include the use of steam cleaning or a detergent wash, as appropriate for the site conditions.

8.2.6 Heavy Equipment Decontamination

Decontamination of chemically contaminated heavy equipment will be accomplished using high-pressure steam or dry decon with brushes and shovels. Decontamination shall take place on a decontamination pad and all liquids used in the decontamination procedure will be collected. Vehicles or equipment brought into an exclusion zone will be treated as contaminated, and will be decontaminated prior to removal. All liquids used in the decontamination procedure will be collected, stored and disposed of in accordance with federal, state and local regulations. Personnel performing this task will wear the proper PPE as prescribed in Table 6-1.

8.3 Communications

The following communications equipment shall be specified as appropriate:

- Telephones - A cellular telephone will be located in the SZ for communication with emergency support services/facilities and the home office. Personnel in the EZ can carry cellular telephones for communication as well if Level D PPE has been determined to be appropriate.
- Hand Signals - Hand signals shall be used by field teams along with the buddy system. They shall be known by the entire field team 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 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 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) and, where applicable, expanded health standards.

9.1 Medical Surveillance Requirements

A physician's medical release for work will be confirmed by the SM before a worker can enter 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 CHSO in consultation with the SM if an over-exposure or accident occurs, if an employee exhibits symptoms of exposure, or if other site conditions warrant further medical surveillance.

10.0 SAFETY CONSIDERATIONS

10.1 High Loss Potential Hazards

Activities to be conducted at the site may involve operations that have the potential for a serious injury to occur, to included the following:

- Lockout/Tagout
- Heavy Equipment Operation
- Excavation and Trenching
- Confined Space Entry
- Line Breaking

10.1.1 Lockout-Tagout

Site personnel will assume that all electrical equipment at surface and overhead locations is energized, until the equipment has been designated as de-energized by a National Grid representative. If the equipment cannot de-energized, work will stop and the SM will consult with the PM and CHSO. **CONTRACTOR** will notify National Grid prior to working adjacent to this equipment, and will verify that the equipment is energized or de-energized in the vicinity of the excavation location. The Control of Hazardous Energy Program "Lock Out/Tag Out" is included in Appendix H.

All power lines which have been indicated by National Grid to be de-energized must be locked out, such that the lines cannot be energized when personnel are working near them. The lines shall not be unlocked and re-energized until **CONTRACTOR** notifies National Grid that they have completed work in the area and that all personnel are clear of the area. National Grid representatives will thoroughly familiarize **CONTRACTOR** personnel with site-specific lockout/tagout procedures during the site orientation. The lockout procedures must be equivalent in effectiveness to those found in Appendix H.

If power lines cannot be de-energized, the SM will consult with Long Island Power Authority (LIPA) safety personnel to determine the safe working distance from the energized line. Work tasks will only commence after determination that a safe working distance can be maintained and all personnel working in the area have been informed of the limitation.

10.1.3 Heavy Equipment Operation

Heavy equipment will be operated under the following conditions:

- The operation of heavy equipment will be limited to authorized personnel specifically trained in its operation. The subcontractor site supervisors must provide this information to the SM.
- The operator will use the safety devices provided with the equipment, including seat belts. Backup warning indicates and horns will be operable at all times.
- While in operation, all personnel not directly required in the area will keep a safe

distance from the equipment.

- Personnel directly involved in activity will avoid moving in the path of operating equipment or any portion thereof. Areas blinded from the operator's vision will be avoided. Spotters will be used when personnel may be in areas where the operator's view is obstructed.
- Additional riders will not be allowed on equipment unless it is specifically designed for that purpose.

10.1.4 Excavation and Trenching

The safety requirements for each excavation must be determined by a competent person who is capable of identifying existing and predictable hazards and work conditions that are unsanitary, hazardous, or dangerous to employees. The competent person must also have the authorization to take prompt corrective measures to eliminate unsatisfactory conditions. The Contractor performing the excavation will identify their competent person in their HASP. OSHA defines *competent person* in 29 CFR 1926.32(f) as "one who is capable of identifying existing and predictable hazards in the surroundings or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them."The Contractor shall present the qualifications of the designated Competent Person able to clearly identify excavation hazards as described in 29 CFR 1926.650-652 to National Grid prior to any excavation activities.

The following are general requirements for work activities in and around excavations:

- Prior to initiation of any excavation activity, the location of underground installations will be determined. The New York State one-call center will be contacted by the excavation subcontractor a minimum of 72 hours prior to excavation activities.
- All excavations will be inspected daily by the competent person prior to commencement of work activities. Evidence of cave-ins, slides, sloughing, or surface cracks or excavations will be cause for work to cease until necessary precautions are taken to safeguard employees.
- Excavated and other materials or equipment that could fall or roll into the excavation shall be placed at least 5 feet from the edge of the excavation.

10.1.5 Confined Space Entry

All trenches and excavations deeper than five feet will be considered potential Permit Required Confined Spaces. All trenches deeper than 5 feet will be monitored for oxygen content, combustible gases, and toxic gases and vapors if entry is required. All trenches which contain hazardous atmospheres at concentrations above the action levels found in Table 7-1 will be classified as Permit Required Confined Spaces. All entry into these trenches will be performed in accordance with the Confined Space/Hot Work Permitting Procedure which is found in Appendix I.

10.1.6 Line Breaking

During line breaking activities, the potential exists for exposure to suspect asbestos containing materials (ACM). If suspect ACM is encountered, work will stop and will not resume until involved personnel have been upgraded to gray tyvek and Level C respiratory protection, and water is available to keep the work area and the suspect ACM wetted. Workers are to have completed asbestos awareness training prior to working with suspect ACM. The PM and CHSO are to be notified if suspect ACM is encountered.

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 shall be collected and bagged for appropriate disposal as non-hazardous solid waste. The waste management procedures as specified in the Field Sampling Plan and the applicable work plan for activities being performed, shall be complied with.

12.0 EMERGENCY RESPONSE / CONTINGENCY 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 are 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 Corporate Health and Safety Officer (CHSO)

The CHSO 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 CHSO acts as a liaison to applicable regulatory agencies and notifies OSHA of reportable accidents.

12.1.2 Site Manager (SM)

The SM 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 SM is required to immediately notify the PM and CHSO of any fatalities or catastrophes (three or more workers injured and hospitalized) so that the CHSO can notify OSHA within the required time frame. The CHSO will be notified of all OSHA recordable injuries, fires, spills, releases or equipment damage in excess of $500 within 24 hours. The SM also serves as the Alternate Emergency Coordinator.

12.1.3 Emergency Coordinator

In the event of an emergency, the Emergency Coordinator, with National Grid representatives, shall make contact with Local Emergency Response personnel. In these contacts, the Emergency Coordinator will inform response personnel about the nature of work on the Site, the type of contaminants and associated health or safety effects, and the nature of the emergency, particularly if it is related to exposure to contaminants.

The Emergency Coordinator shall review this plan and verify 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 shall 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 Communications

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

The primary form of communication during an emergency between field groups in the exclusion zone and the Emergency Coordinator will be verbal communications. During an emergency situation, the lines will be kept clear so that instructions can be received by all field teams.

12.2.1 Telephone Communications

A cellular telephone will be available on-site.

12.2.2 Hand Signals

Hand signals will be employed by downrange field teams where necessary for communication during emergency situations. Hand signals are found in Section 8.3.

12.3 Pre-Emergency Planning

Before the field activities begin, the local emergency response personnel may be notified by National Grid 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.

In order to be able to deal with any emergency that might occur during remedial activities at the Site, emergency telephone numbers will be readily available in the SM vehicle or Construction Office. These telephone numbers are presented in the Site Specific Appendix A to this Health and Safety Plan. Hospital route maps will also be readily available in the SM vehicle and/or Construction Office. The Emergency phone numbers listed are preliminary. Immediately prior to mobilization the SM shall verify all numbers, and document any changes in the Site Logbook.

12.4 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 SM immediately. First-aid equipment will be available on-site.

During the site safety briefing, project personnel will be informed of the location of the first aid station(s) that have 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.

12.5 Emergency Site Evacuation Routes and Procedures

In the event of a Site Emergency that would require the evacuation of personnel, the Emergency Coordinator will immediately contact the project-specific dedicated National Grid Corporation contact (this person may or may not be on-site).

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 at the work area, including but not limited to fire, explosion or significant release of toxic gas into the atmosphere, 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 a pre-determined location.

If any task covered under this HASP has the potential for significant hazards, evacuation drills will be performed as deemed necessary by the SM and CHSO.

12.6 Fire Prevention and Protection

In the event of a fire or explosion, procedures will include immediately evacuating the work area, the Emergency Coordinator will immediately notify the 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).

Fires will be prevented by adhering to the following precautions:

- 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
- Monthly inspections of all fire extinguishers

The person responsible for the maintenance of fire prevention and/or control equipment is the Site Supervisor. The person responsible for the control of fuel source hazards is the Site Manager.

12.7 Overt Chemical Exposure

The following are standard procedures to treat chemical exposures. Other, specific procedures detailed on the Material Safety Data Sheet will be followed as necessary. If first aid or emergency medical treatment is necessary the Emergency Coordinator will contact the appropriate emergency facilities.

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.

12.8 Decontamination During Medical Emergencies

If emergency life-saving first aid and/or medical treatment is required, normal decontamination procedures may need to be abbreviated or postponed. The SM 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 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.

12.9 Accident/Incident Reporting

Incident reporting will be done following the guidelines established in the Incident Reporting Program presented in Appendix J.

Written confirmation of verbal reports are to be submitted within 24 hours. The accident/incident report is found in Appendix J.

In addition to the incident reporting procedures and actions described in the HASP, the SM will coordinate with National Grid relative to reporting and notification for all environmental, safety, and other incidents.

If necessary, a site safety briefing will be held to discuss accidents/incidents and any findings from the investigation of the incident. The HASP will be modified if deemed necessary by the CHSO.

12.10 Adverse Weather Conditions

In the event of adverse weather conditions, the SM 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
- Other major incidents

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

12.11 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, absorbent 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 50-100 feet around the spill area should be established depending on the size and type of the spill.

The following steps should be taken by the Emergency Coordinator:

1. Determine the nature, identity and amounts of major spill components;
2. Make sure all unnecessary persons are removed from the spill area;
3. Notify appropriate response teams and authorities;
4. Use proper PPE in consultation with the SM;
5. 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.);
6. If possible, try to stop the leak with appropriate material; and,
7. Remove all surrounding materials that can react or compound with the spill.
8. Notify the Project-Specific National Grid Corporation Dedicated Contact.

12.12 Emergency Equipment

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

- Industrial first aid kit
- Portable eye washes
- Fire extinguishers (one per vehicle and heavy equipment)
- Absorbent material

12.13 Postings

The following information shall be posted or be readily visible and available at conspicuous locations throughout the site:

- Emergency telephone numbers
- Hospital Route Map

12.14 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 eyewashes and/or showers
- Replenishing spill control supplies
- Replacing used air horns

13.0 TRAINING

13.1 General Health and Safety Training

In accordance with 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). Proof of training shall be submitted to the SM prior to the start of field activities.

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 29 CFR 1910.120 requirements and related company programs and procedures.

13.3 Supervisor Training

Personnel acting in a supervisory capacity shall have received 8 hours of instruction in addition to the initial 40 hours training.

13.4 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. Personnel that have not received site-specific training will not be allowed on-site.

13.5 On-Site Safety Briefings

Project personnel and visitors will be given health and safety briefings daily by the SM to assist site personnel in safely conducting their work activities. 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.

13.6 First Aid and CPR

The SM will identify those individuals requiring first aid and CPR training in order to ensure that emergency medical treatment is available during field activities. The training will be consistent with the requirements of the American Red Cross Association and will include training on bloodborne pathogens.

13.7 Hazard Communication

Hazard communication training will be provided in accordance with the requirements contained in the Health and Safety Hazard Communication Program in Appendix B.

14.0 LOGS, REPORTS, AND RECORD KEEPING

The following is a summary of required health and safety logs, reports, and record keeping.

14.1 Medical and Training Records

Copies or verification of training (40 hour, 8 hour, supervisor, and site-specific training) and medical clearance for hazardous waste site work and respirator use will be maintained by the CHSO and copies provided to the SM prior to the initiation of work on-site.

14.2 On-Site Log

A log of personnel on-site each day will be kept by the SM in a field logbook.

14.3 Exposure Records

All personal monitoring results, laboratory reports, calculations and air sampling data sheets will be maintained by the SM during site work. At the end of the project they may be maintained in employee files if deemed necessary by the CHSO.

14.4 Accident/Incident Reports

The incident reporting and investigation during site work will follow the Incident Reporting Program in Appendix J.

14.5 OSHA Form 300

An OSHA Form 300 will be kept on-site by the SM and coordinated with the CHSO. All recordable injuries or illnesses will be recorded on this form. The incident report form referenced in Section 12.11 meets the requirements of the OSHA Form 101(supplemental record) and must be maintained with the OSHA Form 300 for all recordable injuries or illnesses.

14.6 Hazard Communication Program/MSDS

Material Safety Data Sheets (MSDSs) will be obtained for applicable substances and included in the site hazard communication file. The hazard communication program will be maintained onsite in accordance with 29 CFR 1910.1200 and the Hazard Communication Program in Appendix B.

14.7 Work Permits

All work permits, including confined space entry, hot work, lockout/tagout, and line breaking permits will be maintained in the project files. Copies of the work permits shall also be provided to the SM, and the Project-Specific National Grid Corporation Dedicated Contact.

15.0 FIELD PERSONNEL REVIEW

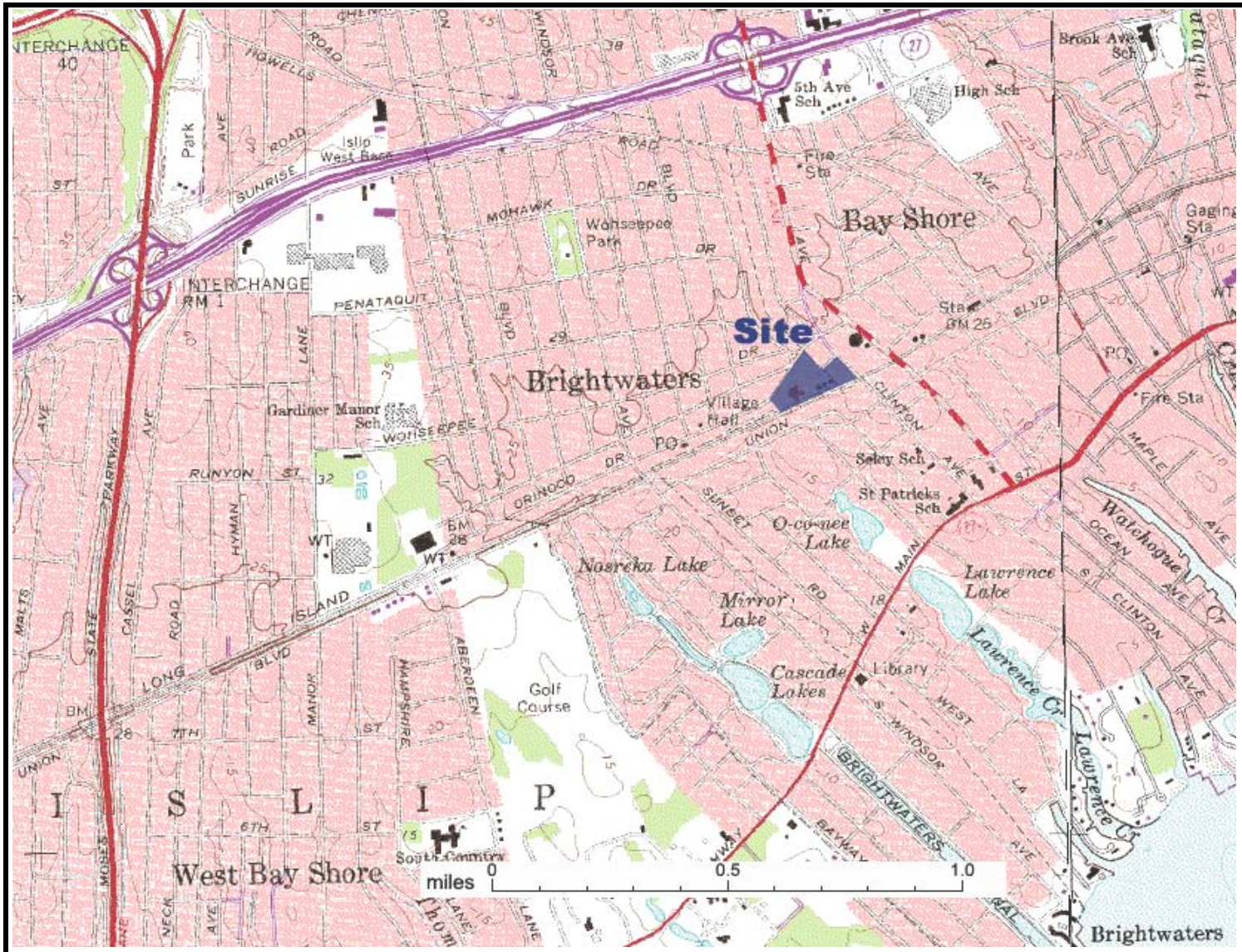
This form serves as documentation that field personnel have read, or have been informed of, and understand the provisions of this HASP for the Bay Shore Site. It is maintained on-site by the SM as a project record. Each field team member shall sign this section after training in the contents of this HASP has been completed. Site workers must sign this form 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 have also completed site-specific training for the work detailed in the project Work Plan. I will comply with the provisions contained therein.

NAME (PRINT AND SIGN)	DATE

APPENDIX A

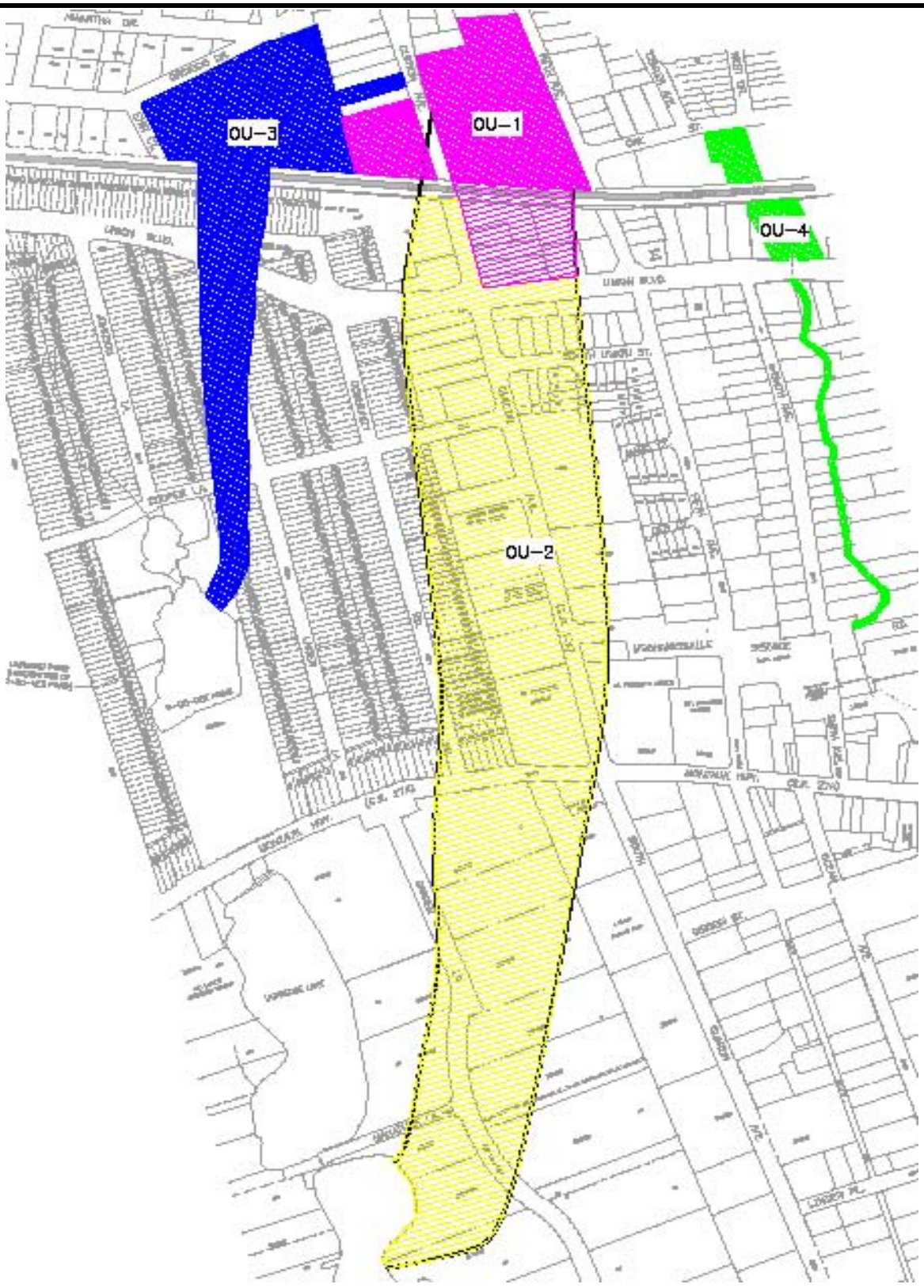
SITE SPECIFIC INFORMATION



SITE LOCATION MAP

BayShore / Brightwaters Former Manufactured Gas Plant

Bay Shore, New York



Site Plan with Operable Units

BayShore / Brightwaters Former Manufactured Gas Plant

Bay Shore, New York

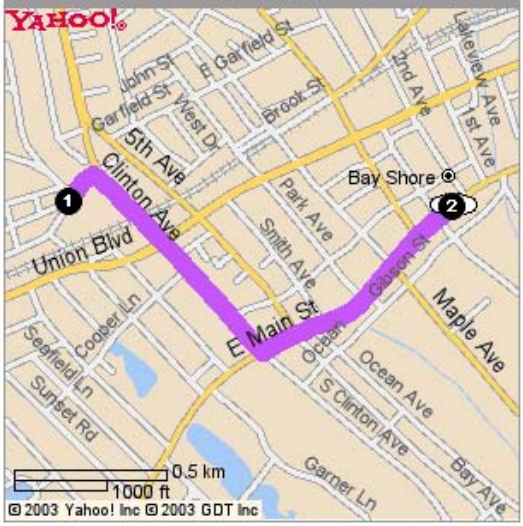
HOSPITAL MAP TO:
North Shore University Hospital - South Side
301 E. Main Street

BAY SHORE, NY 11706-8458

631-968-3000

Starting from:	1 orinoco drive, Bay Shore, NY 11706-7110
Arriving at:	301 E. Main Street, Bay Shore, NY 11706-8408
Distance:	1.1 miles **Approximate Travel Time:** 1 mins

Full Route



Destination

Directions		Miles	
1.	Start on **ORINCO DR/ORINOCO DR**	0.0	↑
2.	Continue on **ORINOCO DR**	0.0	↑
3.	Continue on **ACKERSON ST**	0.0	↗
4.	Turn Right on **RAMP**	0.1	↱
5.	Continue on **CLINTON AVE**	0.4	↗
6.	Turn Left on **E MAIN ST**	0.5	↰
Distance: 1.1 miles **Approximate Travel Time:** 1 mins			

APPENDIX B

HAZARD COMMUNICATION PROGRAM

1.0 INTRODUCTION

The intent of the Hazard Communication Program is to provide employees with information about the potential health hazards from exposure to workplace chemicals in accordance with the OSHA Hazard Communication Standard promulgated on August 24, 1987. In order to accomplish its goal of transmitting this information to its employees, a written hazard communication program specifying how this goal will be achieved has been formulated. This document represents **CONTRACTOR'S** Hazard Communication Program (HCP).

Employee participation is the key ingredient to the HCP. It is extremely important that employees not only follow the procedures, but also understand the reasoning. The Hazard Communication Program is an integral part of **CONTRACTOR'S** effort to provide its employees with a healthy and safe workplace.

Although most **CONTRACTOR** field projects do not involve the use of hazardous substances, it is imperative that all hazardous materials be managed in accordance with this program. This applies to any usage of hazardous materials regardless of volume.

2.0 PURPOSE

To make information available to employees concerning chemical hazards known to be present in the workplace under normal conditions, or in a foreseeable emergency.

3.0 SCOPE

This Hazard Communication Program (HCP) applies to any chemical obtained in excess of retail amounts known to be present in the workplace that employees may be exposed to under normal conditions of use, or may be exposed to in a foreseeable emergency. The HCP describes procedures for: determining chemical hazards in operations; providing training on chemical hazards to employees; and transmitting chemical hazard information through proper labeling and Material Safety Data Sheets (MSDSs). Field staff are responsible for keeping MSDSs for work performed at each job site.

4.0 RESPONSIBILITIES

The following individuals and groups are responsible for implementing the Hazard Communication Program (HCP).

1. Health and Safety Assessment Division

    a. Provide general training to all new and existing employees as appropriate under the HCP. This training will include hazardous material monitoring and recognition, emergency response and understanding labels.

    b. Maintain documentation for HCP training, inform division/section managers of annual training requirements.

c. Periodically update and review Hazard Communication Program.

d. Maintain file of current MSDSs and arrange for retention of all obsolete MSDSs.

e. Review operations with division/section managers to determine what jobs require HCP training.

f. Obtain all missing MSDSs.

g. Audit job sites and work areas for compliance with the HCP.

h. Annually audit chemical listing to ensure that the most current MSDSs are on file and maintain a complete chemical inventory of chemicals in use.

i. Act as liaison to outside authorities responding to chemical emergencies or conducting inspections to verify compliance with the HCP.

2. Department/Section Manager

a. Inventory and compile listing of chemicals used in Department/Section annually and each job site.

b. Provide specific training as appropriate for Department/Section/Client location.

c. Notify H&S Division of any changes in operations that could affect the way hazardous chemicals are handled.

d. Identify all jobs requiring the use or handling of hazardous chemicals.

e. Notify H&S Division of employees requiring hazard specific training.

f. Notify H&S Division when new hazards are presented.

g. Ensure proper labeling procedures and MSDS review is being followed.

3. Employee

a. Follow HCP procedures.

b. Use PPE as instructed by training procedures.

c. Inform division/section manager or H&S Division of:

- Any symptoms of overexposure that may be related to handling hazardous chemicals.

- Missing or inappropriate labels.

- Missing or unavailable MSDSs.
- Malfunctioning or unavailable safety equipment.
- Read, understand and comply with information on labels and MSDSs.
- Leave labels affixed to containers.
- Use only approved containers for hazardous chemicals.
- Know the location of emergency equipment on site and in the facility (if applicable).
- Know your role in contingency plans.
- Understand all changes in chemical handling and procedures.
- Attend training sessions as scheduled.

4. Purchasing Department

   a. Request Material Safety Data Sheets (MSDS) from suppliers on each order of a chemical subject to this Program.

   b. Document the request for an MSDS on the purchase order.

5.0 TRAINING

1. General Training: Training on this program will be part of **CONTRACTOR** annual refresher training or supplied on an as-needed basis.

   General training will consist of the following items:

   a. Requirement of OSHA HCS (29 CFR 1910.1200)

   b. Details of **CONTRACTOR**'s HCP including:

      - Labeling
      - MSDSs
      - How employees can obtain and use appropriate hazard information.

   c. Detailed explanation on how to read and interpret an MSDS including:

- Description
- Sections
- Explanations of each section
- Usefulness of each section
- Applicability of each section

2. Specific Training

a. Listing of hazardous materials in each department/location/site.

b. Location of MSDSs in each department/site.

c. Methods and observations to detect hazardous materials in the workplace, including:

- Exposure monitoring
- Continuous monitoring
- Visual inspection
- Odor
- Other physical or unusual appearances

d. Physical and health hazards of chemicals present in the workplace.

e. Protection measures and procedures:

- Appropriate work practices
- Emergency procedures
- PPE

f. Field operations where hazardous chemicals are present.

5.1 Nonroutine Tasks

CONTRACTOR typically uses low quantities of hazardous materials on job sites and in the laboratory. **CONTRACTOR** projects that involve large quantities of hazardous materials, extremely hazardous substances or exposure to a client's hazardous materials that are not on **CONTRACTOR**'s inventory are to be reviewed on a case by case basis to determine the necessary training to safely work with these materials. Clients regulated under the Process Safety Management program require affected employees to attend the Client's site-specific safety training program before being allowed access to the site. The **CONTRACTOR** Safety Department will provide training to employees when client training is not provided. All training will be documented and repeated as necessary. For example, **CONTRACTOR** does provide task specific training to DOT regulated employees for General Awareness, Shipping and Driving for workers involved in the shipping of hazardous materials and this training is provided every three years. Project Managers will notify the Safety Department when conducting non-routine tasks or when

working with extremely hazardous substances in order to properly train employees before the project commences.

6.0 TRAINING DOCUMENTATION

a. Record names of attendee(s).
b. Request that employees initial by their names.
c. Complete training documentation form.
d. Submit copies to H&S Coordinator for employee training file.

7.0 MATERIAL SAFETY DATA SHEETS (MSDSs)

1. MSDS Requirements

a. An MSDS must be available for each hazardous material used in the workplace. Field staff are responsible for keeping MSDSs for work performed at each job site. The Windsor MSDSs are located at the entrance to the laboratory where all chemicals are stored. Copies of MSDSs can be obtained by contacting the Safety Department. MSDSs for each office should be located near the area where hazardous materials are stored.

b. The H&S Assessment Division will ensure that all MSDSs are complete, legible and in English. Employees that cannot read or understand English will be provided training as needed in a manner that the employee can understand.

c. A file containing appropriate MSDSs for each **CONTRACTOR** facility will be readily available to all employees.

d. A cover sheet will identify all MSDSs in the file – Appendix B.
e. The H&S Assessment Division will audit the file.

f. The Facility Manager will keep a master list of chemicals by department and listed alphabetically, by division.

g. The H&S Assessment Division will distribute, to each department, new or updated MSDSs as they become available and make changes in the master list.

h. Old MSDSs will remain on file permanently.

i. MSDSs must be capable of being cross-referenced to their container labels, where appropriate.

j. Where a process or group of hazardous chemicals presents a health hazard greater than or not indicated by the individual MSDSs, written operating procedures will also be provided or readily accessible. Standard operating procedures by the manufacturer, job descriptions, etc. may be useful for this information.

2. Procedure for Obtaining MSDSs

   a. The Purchasing Department will make an initial request for an MSDS from the manufacturer, either by phone, facsimile or mail. A copy of the request will be maintained with the name of the individual contacted and the date and included in the purchase order.

   b. Employees who are working at a manufacturing location should request a MSDS from the site contact for both raw materials and finished product.

   c. If MSDSs are not received within a reasonable time, approximately 30 days, the H&S Assessment Division or Facility Manager will send a second request to the manufacturer via certified mail, with a return receipt requested.

   d. If, after the second request, no MSDS is sent, the H&S Assessment Division will contact the appropriate local OSHA area office by telephone, informing them of **CONTRACTOR**'s inability to obtain an MSDS from the manufacturer.

   e. The H&S Assessment Division will document the following information: date; name; title of OSHA contact; and, summary of conversation.

   f. A copy of this information will be placed in the master file with the H&S Division for a 30-day period.

   g. If the MSDS is not received or OSHA does not contact the H&S Assessment Division within 30 days, H&S Assessment Division will contact the local OSHA area office again.

   h. If the MSDS is not received within 60 days, the H&S Assessment Division will contact the regional OSHA office.

3. Labeling

   a. All manufacturers' labels will be left on containers.

   b. All container labels will be legible, prominently displayed, and in English as well as any other prevalent language. **CONTRACTOR** will provide interpretation to employees who do not read or understand English when necessary.

   c. Minimum label contents include chemical identity; appropriate hazard warnings; and the name and address of the manufacturer.

   d. **CONTRACTOR** has generated a label for use when portable containers are poured off from the original container to a compatible unlabeled container for field, laboratory or facility use. This label should also be sued for samples and mixtures suspected of containing hazardous materials. The appropriate MSDS will be referenced in order to complete the " Hazard Warning" portion of the label and

determine if the chemical is compatible with the container in which it is being stored.

e. **CONTRACTOR** uses the International Air Transport Association/Department of Transportation Hazard Classification System for labeling hazardous material shipments by **CONTRACTOR**. Each office that ships hazardous materials must obtain appropriate labels for the shipment and transport of hazardous materials.

4. Outside Contractors

a. Unless required by the nature of services to be provided, **CONTRACTOR** will attempt to restrict contractors from contact with hazardous chemicals on **CONTRACTOR** property or projects.

b. The Office Manager will notify the H&S Coordinator of all outside contractors on **CONTRACTOR** property or subcontracted to perform on **CONTRACTOR** projects.

c. The Project Manager will review the work and determine all hazardous chemicals to which the outside contractor's employees may be exposed.

d. The Project Manager will provide to the contractor a list of hazardous chemicals to which their employees may be exposed, and copies of corresponding MSDSs.

e. The Project Manager will inform the contractor of precautionary measures contained within the MSDS.

f. The Project Manager will inform the contractor of the labeling system used in the location of the contractor's work.

g. Records will be retained permanently with the H&S Coordinator.

References:

1. 29 CFR 1910.1200, Hazard Communication.

2. OSHA Instruction CPL 2-2.38A, CH-1, July 18, 1986.

3. ACGIH, Threshold Limit Values and Biological Exposure Indices for 1991-92, 1991.

4. Genium Publishing Corporation, MSDS Pocket Dictionary, August, 1988.

5. National Institute of Occupational Safety and Health, Pocket Guide to Chemical Hazards, June, 1990.

6. United States Department of Agriculture, Hazard Communication: A Program Guide for Federal Agencies; August, 1987.

APPENDIX C

COLD STRESS PROGRAM

1.0 PURPOSE & INTRODUCTION

The purpose of this document is to educate the employee about exposure to cold environments and the effects of hypothermia and other cold-related injuries. Through proper use of Personal Protective Equipment (PPE), engineering and administrative controls; and education, cold injury, both to the extremities and the body's core temperature, can be prevented.

2.0 SCOPE

This program is intended for use by employees engaged in work with the potential for exposure to cold environments. This program will be reviewed annually by the Health and Safety Division. Training will be provided annually to all those potentially affected, and will include this written program.

3.0 WORKING IN COLD ENVIRONMENTS

1. Metabolic Responses

The human body is designed to function best at a rectal temperature of 99-100F. The body maintains this temperature in two ways: by gaining heat from food and muscular work; or, by losing it through radiation and sweating. By constricting blood vessels of the skin and/or shivering, the body uses its first line of cold defense.

Temperature control of the body is better understood by dividing the body into two main parts: the shell; and, the core. The shell is comprised of the skin, capillaries, nerves, muscles and fat. Other internal organs such as the heart, lungs, brain and kidneys make up the core.

During exposure to cold, the skin is first affected. Blood in the peripheral capillaries is cooled, sending a signal to a portion of the brain called the hypothalamus. Regulating body temperature is one of the many basic body functions of the hypothalamus. Acting like a thermostat, adjustments are performed in order to maintain normal body temperatures. When a chill signal is received, two processes are begun by the hypothalamus: conserve heat already in the body; and, generate new heat.

Heat conservation is performed through constriction of the blood vessels in the skin (shell), thus reducing heat loss from the shell and acting as an insulator for the core. Sweat glands are also inhibited, thus preventing heat loss by evaporation.

Additional fuel for the body is provided in the form of glucose. Glucose causes the heart to beat faster, sending oxygen and glucose-rich blood to the tissue where needed. In an attempt to produce heat, the muscles rapidly contract. This process is better known as "shivering", and generates heat similarly to that created by strenuous activity, raising the body's metabolic rate.

During physical activity and fatigue, the body is more prone to heat loss. As exhaustion approaches, blood vessels can suddenly enlarge, resulting in rapid loss of heat. Exposure to

extreme cold causes nerve pulses to be slowed, resulting in fumbling, sluggish and clumsy reactions.

4.0 COLD INJURIES

Cold injuries are classified into two categories: local; or, general. Local injuries include frostbite, frostnip, chilblain and trenchfoot. General injuries include hypothermia and blood vessel abnormalities (genetically or chemically induced). Major factors contributing to cold injury are exposure to humidity and high winds; contact with wetness or metal; inadequate clothing; age; and, general health. Allergies, vascular disease, excessive smoking and/or drinking, and certain drugs and medicines are physical conditions that can compound the effects of exposure to a cold environment.

1. Hypothermia

Hypothermia is a condition of reduced body temperature. Most cases develop in air temperatures between 30-50°F, not taking wind-chill factor in consideration.

Symptoms of hypothermia are uncontrolled shivering and the sensation of cold. The heartbeat slows and sometimes becomes irregular, weakening the pulse and changing blood pressure. Changes in the body chemistry cause severe shaking or rigid muscles; vague or slow slurred speech; memory lapses; incoherence; and, drowsiness. Cool skin, slow irregular breathing, low blood pressure, apparent exhaustion, and fatigue after rest can be seen before complete collapse.

As the core temperature drops, the victim can become listless, confused, and make little or no effort to keep warm. Pain in the extremities can be the first warning of dangerous exposure to cold. Severe shivering must be taken as a sign of danger. At a core body temperature of about 85°F, serious problems develop due to significant drops in blood pressure, pulse rate and respiration. In some cases, the victim may die.

Sedative drugs and alcohol increase the risk of hypothermia. Sedative drugs interfere with the transmission of impulses to the brain. Alcohol dilates blood vessels near the skin's surface, increasing heat loss and lowering body temperature.

Table I provides information on the onset of hypothermia and metabolic responses at different body temperatures.

2. Raynaud's Phenomenon

Raynaud's Phenomenon is the abnormal constriction of the blood vessels of the fingers on exposure to cold temperatures, resulting in blanching of the ends of the fingers. Numbness, itching, tingling or a burning sensation may occur during related attacks. The disease is also associated with the use of vibrating hand tools in a condition sometimes called White Finger Disease. Persistent cold sensitivity, ulceration and amputations can occur in severe cases.

3. Acrocyanosis

Acrocyanosis is caused by exposure to the cold and reduces the level of hemoglobin in the blood, resulting in a slightly blue, purple or gray coloring of the hands and/or feet.

4. Thromboangitis Obliterans

Thromboangitis obliterans is clotting of the arteries due to inflammation and fibrosis of connective tissue surrounding medium-sized arteries and veins. This is one of the many disabling diseases that can also result from tobacco use. Gangrene of the affected limb often requires amputation.

5. Frostbite

Frostbite is the freezing of the body tissues due to exposure to extremely low temperatures, resulting in damage to and loss of tissue. Frostbite occurs because of inadequate circulation and/or insulation, resulting in freezing of fluids around the cells of the body tissues. Most vulnerable parts of the body are the nose, cheeks, ears, fingers and toes.

Frostbite can affect outer layers of skin or can include the tissues beneath. Damage can be serious, with permanent loss of movement in the affected parts, scarring, necrotic tissue, and amputation are all possibilities. Skin and nails that slough off can grow back.

The freezing point of the skin is about 30F. As wind velocity increases, heat loss is greater and frostbite will set in more rapidly.

There are three (3) degrees of frostbite: first degree, freezing without blistering and peeling; second degree, freezing with blistering and peeling; and, third degree, freezing with death of skin tissues and possibly the deeper tissues.

The following are symptoms of frostbite:

a. Skin changes color to white or grayish-yellow, progresses to reddish-violet, and finally turns black as the tissue dies;

b. Pain may be felt at first, but subsides;

c. Blisters may appear;

d. Affected part is cold and numb.

The first symptom of frostbite is usually an uncomfortable sensation of coldness followed by numbness. Tingling, stinging, cramping and aching feelings will be experienced by the victim. Frostbite of the outer layer of the skin has a waxy or whitish look and is firm to the touch. Cases of deep frostbite cause severe injury. The tissues are cold, pale and solid. The victim is often unaware of the frostbite until someone else observes these symptoms. It is

therefore important to use the "buddy system" when working in cold environments, so that any symptoms of overexposure can be noted.

Table II describes the cooling power of wind on exposed flesh. This information can be used as a guide for determining equivalent chill temperatures when the wind is present in cold environments.

6. Trench Foot and Chilblains

Trench foot is swelling of the foot caused by long, continuous exposure to cold without freezing, combined with persistent dampness or immersion in water. Edema (swelling), tingling, itching and severe pain occurs, followed by blistering, necrotic tissue and ulcerations. Chilblains have similar symptoms as trench foot, except that other areas of the body are affected.

7. Frostnip

Frostnip occurs when the face or extremities are exposed to a cold wind, causing the skin to turn white.

5.0 PREVENTION OF COLD STRESS

Cold Stress can be prevented through a combination of various factors: acclimation; water and salt displacement; medical screening, proper clothing selection; and, training and education. Through the use of engineering controls, work practices, work/rest schedules, environmental monitoring and consideration of the wind-chill temperature, the employee can be protected.

1. Acclimation

Acclimation can be achieved to some degree. Sufficient exposure to cold causes the body to undergo changes to increase comfort and reduce the risk of injury. But, these changes are minor and require repeated exposure to cold and uncomfortable temperatures to induce them.

2. Dehydration

The dryness of cold air causes the body to lose a significant amount of water through the skin and lungs. It is essential that caffeine-free, non-alcoholic beverages be available at the worksite for fluid replacement. Dehydration also increases the risk of injury due to cold and affects blood flow to the extremities.

3. Diet

A well-balanced diet is important for employees working in cold environments. Diets restricted only to certain foods may not provide the necessary elements for the body to withstand cold stress, leaving the worker vulnerable.

4. Control Measures

When the windchill factor results in an equivalent temperature of -26F, continuous exposure of the skin will not be permitted. Any worker exposed to temperatures of 36F or less who becomes immersed in water will be given dry clothing immediately and treated for hypothermia at the local hospital if any symptoms of hyperthermia are present. Notification of this incident will be provided to the Health and Safety Division immediately after sending the worker to the hospital.

5. Engineering Controls

The following are some ways that environmental controls can be used to reduce the effects of a cold environment:

a. General or spot heating should be used to increase temperature in certain areas in the workplace;

b. Warm air jets, radiant heaters or contact warm plates can be used to warm the worker's hands if fine work is to be performed with bare hands for 10 to 20 minutes or more;

c. Shield the work area if air velocity at the work site is increased by wind, draft or ventilating equipment;

d. Metal handles of tools and control bars should be covered with thermal insulating material at temperatures below 30F;

e. Unprotected metal chair seats will not be used in cold environments;

f. When appropriate and feasible, equipment and processes will be substituted, isolated, relocated, or redesigned;

g. Power tools, hoists, cranes or lifting aids will be used to reduce the metabolic workload;

h. Heated warming shelters will be made available for continuous work being performed in an equivalent temperature of 20F or below. Workers will be encouraged to use the shelters regularly.

6. Administrative Work Practice Controls

Work practices and guidelines can be designed and developed to reduce exposure to cold stress. Some of these may include:

a. Work-rest schedules to reduce the peak of cold stress;

b. Enforce scheduled breaks;

c. Enforce intake of caffeine-free, non-alcoholic beverages;

d. Schedule work that has potential exposure to cold stress for the warmest part of the day;

e. Move work to warmer areas, whenever possible;

f. Assign extra workers for high-demand tasks;

g. Provide relief workers for other workers needing breaks;

h. Teach basic principles of recognizing and preventing cold stress;

i. Use the buddy system for work at 10F or below, and keep within eyeshot;

j. Allow new employees to adjust to the conditions before they work full-time in cold environments;

k. Minimize sitting and standing in one place for long periods of time;

l. Include weight and bulkiness of clothing when estimating work performance requirements and weights to be lifted;

Table III provides a work/warm-up schedule for cold environments, with wind chill taken into account.

7. Special Considerations

Older workers and workers with circulatory problems should be extra careful in cold environments. Sufficient sleep and good nutrition are important preventive measures for maintenance tolerance to the cold. Double shifts and overtime work should be avoided when working in cold environments.

If any of the following symptoms are observed on site, the affected worker will immediately go to warm shelter:

- Onset of heavy shivering;
- Frostnip;
- Feeling of excessive fatigue;
- Drowsiness;
- Euphoria.

After entering the warm shelter, the outer layer of clothing should be removed. If the clothing is wet from sweat and perspiration, dry clothing should be provided. If this is not feasible, then the clothing should be loosened to allow sweat to evaporate.

Anyone working in cold environments and on prescribed medication should consult their physician concerning any possible side effects due to cold stress. Those individuals suffering from diseases and/or taking medication that interferes with normal body temperature regulation or reduces the tolerance to cold will not be allowed to work in temperatures of 30F or below.

6.0 PERSONAL PROTECTIVE EQUIPMENT (PPE)

In choosing PPE for cold environments, it is important to maintain airspace between the body and outer layer of clothing to retain body heat. The more air pockets, the better the insulation. The clothing should also allow for the evaporation of sweat if the skin is wet.

The most important parts of the body to protect are the feet, hands, head and face. Hands and feet become cooled most easily, because of their distance from the heart. Keeping the head covered is equally important. As much as 40% of body heat loss is through the head when it is exposed.

Ideal clothing for exposure to cold environments is made of cotton. Cotton picks up sweat off the body and brings it to the surface. Loosely fitted clothing also aids in sweat evaporation. Recommended clothing may include the following:

a. Polypropylene under shirt and shorts under thermal underwear (preferably two-piece);

b. Wool socks;

c. Wool or thermal pants, lapped over boot tops to keep out snow and water;

d. Suspenders (belts can constrict and reduce circulation);

e. Insulated work boots, preferably waterproof. Safety toe, if necessary;

f. Wool or cotton shirt;

g. Parka;

h. Knit cap/hard hat liner;

i. Wool mittens or gloves (depending on the dexterity required);

j. Face mask or scarf.

Dirty or greasy clothing loses much of its insulation value. Dirty clothing crushes air pockets, allowing air to escape more easily. Also, denim is not a good protective fabric. It is loosely woven and allows water to penetrate and wind to blow away body heat.

TABLE I
Progressive Clinical Presentation of Hypothermia*

Core Temperature Deg. C	Deg. F	Clinical Signs
37.6	99.6	"Normal" rectal temperature.
37	98.6	"Normal" oral temperature.
36	96.8	Metabolic rate increases in an attempt to compensate for heat loss.
35	95.0	Maximum shivering.
34	93.2	Victim conscious and responsive, with normal blood pressure.
33	91.4	Severe hypothermia below this temperature.
32	89.6	Consciousness clouded; blood pressure becomes difficult to obtain;
31	87.8	pupils dilated but react to light; shivering ceases.
30	86.0	Progressive loss of consciousness; muscular rigidity increases;
29	84.2	pulse and blood pressure difficult to obtain; respiratory rate decreases.
28	82.4	Ventricular fibrillation possible with myocardial irritability.
27	80.6	Voluntary motion ceases; pupils non-reactive to light; deep tendon and superficial reflexes absent.
26	78.8	Victim seldom conscious.
25	77.0	Ventricular fibrillation may occur spontaneously.
24	75.2	Pulmonary edema.
22	71.6	Maximum risk of ventricular fibrillation.
20	68.0	Cardiac standstill.
18	64.4	Lowest accidental hypothermia victim to recover.
17	62.6	Isoelectric electroencephalogram.
9	48.2	Lowest artificially cooled hypothermia patient to recover.

* Presentations approximately related to core temperature. Reprinted from the January 1982 issue of American Family Physician, published by the American Academy of Family Physicians.

TABLE II

Cooling Power of Wind on Exposed Flesh as Equivalent Temperature (under calm conditions)*

Estimated Wind Speed (mph)	**Actual Temperature Reading (Degrees Fahrenheit)**											
	50	**40**	**30**	**20**	**10**	**0**	**-10**	**-20**	**-30**	**-40**	**-50**	**-60**
	Equivalent Chill Temperature (°F)											
Calm	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
5	48	37	27	16	6	-5	-15	-26	-36	-47	-57	-68
10	40	28	16	4	-9	-24	-33	-46	-58	-70	-83	-95
15	36	22	9	-5	-18	-32	-45	-58	-72	-85	-99	-112
20	32	18	4	-10	-25	-39	-53	-67	-82	-96	-110	-121
25	30	16	0	-15	-29	-44	-59	-74	-88	-104	-118	-133
30	28	13	-2	-18	-33	-48	-63	-79	-94	-109	-125	-140
35	27	11	-4	-20	-35	-51	-67	-82	-98	-113	-129	-145
40	26	10	-6	-21	-37	-53	-69	-85	-100	-116	-132	-148
(Wind speeds greater than 40 mph have little additional effect).	LITTLE DANGER In < hr with dry skin. Maximum danger of false sense of security.				INCREASING DANGER Danger from freezing of exposed flesh within one minute.			GREAT DANGER Flesh may freeze within 30 seconds.				
	Trenchfoot and immersion foot may occur at any point on this chart.											

* Developed by the U.S. Army Research Institute of Environmental Medicine, Natick, MA

Note #1: Wind speeds greater than 40 mph have little additional effect.

Note #2: Trenchfoot and immersion foot may occur at any point on this chart

TABLE III
Threshold Limit Values Work/Warm-up Schedule for 4 Hour Shift (*)

Air Temp.-Sunny Sky		**No Noticeable Wind**		**5 mph Wind**		**10 mph Wind**		**15 mph Wind**		**20 mph Wind**	
˚C (approx)	**˚F (approx)**	**Max. Work Period**	**No. of Breaks**	**Max. Work PERIOD**	**No. of Breaks**	**Max. Work Period**	**No. of Breaks**	**Max. Work Period**	**No. of Breaks**	**Max. Work Period**	**No. of Breaks**
-26˚ to -28˚	-15˚ to -19˚	(Norm. Breaks) 1		(Norm.Breaks) 1		75 min.	2	55 min.	3	40 min.	4
-29˚ to -31˚	-20˚ to -24˚	(Norm. Breaks) 1		75 min	2	55 min.	3	40 min.	4	30 min.	5
-32˚ to -34˚	-25˚ to -29˚	75 min	2	55 min.	3	40 min.	4	30 min.	5	Non-emergency work should cease	
-35˚ to -37˚	-30˚ to -34˚	55 min.	3	40 min.	4	30 min.	5	Non-emergency work should cease			
-38˚ to -39˚	-35˚ to -39˚	40 min.	4	30 min.	5	Non-emergency work should cease					
-40˚ to -42˚	-40˚ to -44˚	30 min.	5	Non-emergency work should cease							
-43˚ & below	-45˚ & below	Non-emergency work should cease									

Notes for TABLE III:

1. Schedule applies to moderate to heavy work activity with warm-up breaks of 10 minutes in a warm location. For light to moderate work (limited physical motion), apply the schedule one step lower. For example, at -30F with no noticeable wind (step 4, a worker at a job with little physical movement should have a maximum work period of 40 minutes with 4 breaks in a 4 hour period.

2. The following is suggested as a guide for estimating wind velocity if accurate information is not available: 5 mph, light flag moves; 10 mph, light flag fully extended; 15 mph, raises newspaper sheet; 20 mph, blowing drifting snow.
3. If only the wind-chill cooling rate is available, a rough rule of thumb for applying it rather than the temperature and wind velocity factors given above would be: 1) special warm-up breaks should be initiated at a wind-chill cooling rate of about 17 W/m2; 2) all non-emergency work should have ceased at or before a wind-chill of 2250 W/m2. In general the warm-up schedule provided above slightly under-compensates for the wind at the warmer temperatures, assuming acclimatization and clothing appropriate for winter work. On the other hand, the chart over-compensates for the actual temperatures in the colder ranges, since windy conditions prevail at extremely low temperatures.

4. TLVs apply only for workers in dry clothing.

* Adapted from Occupational Health and Safety Division, Saskatchewan Department of Labour.

APPENDIX D

HEAT STRESS PROGRAM

1.0 INTRODUCTION

Heat stress is one of the most common (and potentially serious) illnesses at job sites. Although it is caused by a number of interacting factors, the wearing of PPE puts the worker at a much higher risk during warmer environmental conditions. The results of heat stress range from fatigue to serious illness or death. Through regular fluid replacement and other preventive measures, heat stress can be controlled, leading to increased efficiency and a higher level of safety on the job.

2.0 PURPOSE

To create an awareness among employees concerning the body's physiologic responses to heat; different types of heat stress that can affect the body; recognition of signs and symptoms; first aid treatment; and, preventive measures.

3.0 SOURCES OF HEAT

There are two sources of heat that are important to anyone working in a hot environment:

- Internally generated metabolic heat;
- Externally imposed environmental heat.

4.0 PHYSIOLOGIC RESPONSES TO HEAT

The human body maintains a fairly constant internal temperature, even though it is exposed to varying environmental temperatures. To keep internal body temperatures within safe limits, the body must get rid of its excess heat, primarily through varying the rate and amount of blood circulation through the skin and the release of fluid onto the skin by the sweat glands. These automatic responses usually occur when the temperature of the blood exceeds 98.6°F and are kept in balance and controlled by the brain. In this process of lowering internal body temperature, the heart begins to pump more blood, blood vessels expand to accommodate the increased flow, and the microscopic blood vessels (capillaries) which thread through the upper layers of the skin begin to fill with blood. The blood circulates closer to the surface of the skin, and the excess heat is lost to the cooler environment.

If the heat loss from increased blood circulation through the skin is not adequate, the brain continues to sense overheating and signals the sweat glands in the skin to release large quantities of sweat onto the skin surface. Evaporation of sweat cools the skin, eliminating large quantities of heat from the body.

As environmental temperatures approach normal skin temperature, cooling of the body becomes more difficult. If air temperature is as warm as or warmer than the skin, blood brought to the body surface cannot lose its heat. Under these conditions, the heart continues to pump blood to the body surface, the sweat gland pour liquids containing electrolytes onto the surface of the skin, and the evaporation of the sweat becomes the principal effective means of maintaining a constant body temperature. Sweating does not cool the body unless the moisture is removed from the skin by evaporation. In high humidity, the evaporation of sweat from the skin is decreased and the body's efforts to maintain an acceptable body temperature may be significantly impaired. These conditions

adversely affect an individual's ability to work in the hot environment. With so much blood going to the external surface of the body, relatively less goes to the active muscles, the brain, and other internal organs; strength declines; and fatigue occurs sooner than it would otherwise. Alertness and mental capacity also may be affected. Workers who must perform delicate or detailed work may find their accuracy suffering, and others may find their comprehension and retention of information lowered.

When temperature differences exist between two or more bodies, heat can be transferred. Net heat transfer is always from the body (or object) of higher temperature to that of lower temperature and occurs by one or more of the following mechanisms:

Conduction. The transfer of heat from one point to another within the body, or from one body to another when both bodies are in physical contact. Conduction can be a localized source of discomfort from direct physical contact with a hot or cold surface, it is normally not a significant factor to total heat stress.

Convection. The transfer of heat from one place to another by moving gas or liquid. Natural convection results from differences in density caused by temperature differences. Thus warm air is less dense than cool air.

Radiation. The process by which energy, electromagnetic (visible and infrared), is transmitted through space without the presence or movement of matter in or through this space.

5.0 PREDISPOSING FACTORS TO HEAT STRESS

Factors that may predispose an individual to heat stress vary according to the individual. These factors include:

- Lack of physical fitness;
- Lack of acclimatization;
- Age;
- Dehydration;
- Obesity;
- Drug/alcohol abuse;
- Infection;
- Sunburn;
- Diarrhea;
- Chronic disease.

Predisposing factors and an increased risk of excessive heat stress are both directly influenced by the type and amount of PPE worn. PPE adds weight and bulk, reduces the body's access to normal heat exchange mechanisms (evaporation, convection and radiation) and increases energy expenditure.

6.0 FORMS OF HEAT STRESS AND FIRST AID

(The following excerpts were taken from NIOSH Publication No. 86-112, Working in Hot Environments):

"Excessive exposure to a hot work environment can bring about a variety of heat-induced disorders. Among the most common are heat stroke, heat exhaustion, heat cramps, fainting and heat rash.

Heat Stroke

Heat Stroke is the most serious of health problems associated with working in hot environments. It occurs when the body's temperature regulatory system fails and sweating becomes inadequate. The body's only effective means of removing excess heat is compromised with little warning to the victim that a crisis stage has been reached.

A heat stroke victim's skin is hot, usually dry, red or spotted. Body temperature is usually 105°F or higher, and the victim is mentally confused, delirious perhaps in convulsions, or unconscious. Unless the victim receives quick and appropriate treatment, death can occur.

Individuals with signs or symptoms of heat stroke require immediate hospitalization. First aid should be immediately administered. This includes removing the victim to a cool area, thoroughly soaking the clothing with water, and vigorously fanning the body to increase cooling. Further treatment, at a medical facility, should be directed to the continuation of the cooling process and the monitoring of complications which often accompany heat stroke. Early recognition and treatment are the only means of preventing permanent brain damage or death.

Heat Exhaustion

Heat Exhaustion includes several clinical disorders having symptoms which may resemble the early symptoms of heat stroke. Heat exhaustion is caused by the loss of large amounts of fluid by sweating, sometimes with excessive loss of salt. A worker suffering from heat exhaustion still sweats but experiences weakness or fatigue, giddiness, nausea or headache. In more serious cases, the victim may vomit or lose consciousness. The skin is clammy and moist, the complexion is pale or flushed, and the body temperature is normal or only slightly elevated.

In most cases, treatment involves having the victim rest in a cool place and drink plenty of liquids. Victims with mild cases of heat exhaustion usually recover spontaneously with this treatment. Those with severe cases may require extended care for several days. There are no known permanent effects.

Heat Cramps

Heat cramps are painful spasms of the muscles that occur among those who sweat profusely in heat, drink large quantities of water, but do not adequately replace the body's

salt loss. The drinking of large amounts of water tends to dilute the body's fluids, while the body continues to lose salt. Shortly after, the low salt level in the muscles causes painful cramps. The affected muscles may be part of the arms, legs, or abdomen; but tired muscles (those used in performing the work) are usually the ones most susceptible to cramps. Cramps may occur during or after work hours and may be relieved by taking salted liquids by mouth.

Fainting

Fainting occurs in workers not accustomed to hot environments and who stand erect and immobile in the heat.

With enlarged blood vessels in the skin and in the lower part of the body due to the body's attempts to control internal temperature, blood may pool there rather than return to the heart to be pumped to the brain. Upon lying down, the worker should soon recover. By moving around, and thereby preventing blood from pooling, the patient can prevent further fainting.

Heat Rash (Prickly Heat)

Heat rash, also known as prickly heat, is likely to occur in hot, humid environments where sweat is not as easily removed from the surface of the skin by evaporation and the skin remains wet most of the time. The sweat ducts become plugged, and a skin rash soon appears. When the rash is extensive or when it is complicated by infection, prickly heat can be very uncomfortable and may reduce a worker's performance. The worker can prevent this condition by resting in a cool place part of each day and by regularly bathing and drying the skin."

7.0 SELECTION OF PERSONAL PROTECTIVE EQUIPMENT (PPE)

During work periods where the increased risk of heat stress exists, each item's benefit will be carefully evaluated. Once the PPE is chosen, safe work durations/rest periods will be determined based on the following conditions:

- Anticipated work rate;
- Ambient temperature and humidity;
- Level of protection.

8.0 PREVENTION OF HEAT STRESS

Prevention of heat stress will be addressed in the following manner:

1. Adjustment of work schedules.

    a. Modify work/rest schedules.
    b. Enforce work slowdowns, as needed.
    c. Rotate personnel to minimize overstress or overexertion.

d. When possible, work will be scheduled and performed during cooler hours.

1. Provide shelter or shaded areas to protect personnel during rest periods.

2. Maintain worker's body fluids at normal levels.

   a. Drink approximately 12 to 16 ounces of non-caffeinated liquid (preferably water, Gatorade or equivalent) prior to the start of work. Caffeinated fluids act to dehydrate the worker.

   b. Workers will be urged to drink a cup or two every 15 to 20 minutes, or at each break. A total of 1 to 1.5 gallons of water per individual per day are recommended for fluid replacement under heat stress conditions, but more may be required.

3. Encourage physical fitness among the workers.

   Gradually acclimatize workers on site to help build up an "immunity" to the conditions.

   - Heat acclimatization can usually be induced in 5 to 7 days of exposure at a hot job. For workers with previous experience with the job, acclimatization will include exposures of 50% for day 1, 60% for day 2, 80% for day 3, and 100% for the remaining additional days.

4. Provide cooling devices during prolonged work or severe heat exposure.

   a. Supply field showers or hose down areas.

   b. Supply personnel with cooling jackets, vests, and suits.

5. Train workers in recognition and treatment of heat stress.

6. Use of the buddy system that depends on the recognition of signs and symptoms of heat stress.

7. Identification of heat-intolerant individuals through medical screening.

APPENDIX E

PROCESS SAFETY MANAGEMENT

1.0 PROCESS SAFETY INTRODUCTION

The OSHA Process Safety Management (PSM) Standard applies to users of extremely hazardous substances and flammable substances that exceed certain thresholds. The regulation requires users of these substances to conduct a thorough comprehensive analysis of processes that use these hazardous materials. The EPA Risk Management Program regulations are closely related to the OSHA Standard. Many **CONTRACTOR** clients must comply with PSM/RMP and it is **CONTRACTOR**'s responsibility to meet the Client's requirements as a vendor to the client. The purpose of the OSHA PSM and EPA RMP regulations is to minimize the impact of catastrophic releases of extremely hazardous materials. These substances include toxic, reactive, flammable and explosive substances. **CONTRACTOR** employees are required to be properly trained and informed when working at sites regulated under the PSM/RMP rule.

2.0 PROCESS HAZARD ANALYSIS

Regulated facilities are required to conduct a Process Hazard Analysis of all regulated processes. All **CONTRACTOR** project managers are required to discuss the applicability of the Process Hazard Analysis to **CONTRACTOR**'s work. Copies of the Process Hazard Analysis (PHA) should be obtained if available prior to starting the work. The PHAs applicable to **CONTRACTOR**'s work will be identified and provided to **CONTRACTOR**'s affected employees. Each employee will be familiar with the hazards related to **CONTRACTOR**'s work and the proper response in the event of an emergency. This response could include evacuation, sheltering in place or the use of emergency escape equipment. The escape routes must be known before beginning work. **CONTRACTOR** staff should meet with the Client's Safety Department whenever possible to review safety issues associated with **CONTRACTOR**'s work.

3.0 TRAINING

All **CONTRACTOR** employees will receive site-specific training prior to working at a site regulated by the Process Safety Standard. Training will review the known potential fire, explosion, and toxic hazards present on site. Most clients provide this training as part of the site admissions process. Varying levels of training may be needed depending on the type of access and proximity to regulated processes. Only documented trained **CONTRACTOR** employees will be allowed to work at a site regulated by the Process Safety Standard. Records of the training will be maintained in each employee's personnel record.

4.0 SITE SPECIFIC EMERGENCY ACTION PLAN

4.1 Emergency Action Plan

Emergency Action Plans are required by all facilities. The plan will be reviewed by **CONTRACTOR** staff before beginning work on site. Exit routes, gathering locations and shelters in place will be reviewed relative to **CONTRACTOR**'s work. The review of the plan will be part of **CONTRACTOR**'s daily toolbox safety meeting.

4.2 Response Procedures

CONTRACTOR will be familiar with the alarms or other notification systems used by the client. CONTRACTOR will place all equipment in a neutral state, if possible, before leaving the work area during an emergency. **CONTRACTOR** employees should remain together and identify themselves to the response coordinator. Re-access to the work area will not take place until permission has been obtained and the emergency mitigated.

4.3 Material Safety Data Sheets

CONTRACTOR will maintain on-site a compilation of MSDSs for chemicals used by **CONTRACTOR**. **CONTRACTOR** will obtain from the client MSDSs for facility chemicals that could be encountered by **CONTRACTOR** employees during this work. **CONTRACTOR** will review **CONTRACTOR**'s work with the client including the chemical usage to determine if there will be significant impact with the client's processes.

4.4. Accidents/Incidents

Accidents and near-miss incidents will be investigated in accordance with client and **CONTRACTOR** Corporate Health and Safety requirements.

5.0 TRADE SECRETS

All **CONTRACTOR** employees have an obligation to keep client information confidential and are not allowed to discuss the client's processes with outside personnel. All communication with regulatory personnel or other observers of **CONTRACTOR**'s work is to be directed to the client unless written permission has been obtained from the client. The results of all data collected by **CONTRACTOR** is also considered confidential and must not be discussed without client permission.

6.0 SAFE WORK PRACTICES

CONTRACTOR's work is typically non-intrusive and should not interfere with the clients operation. Unique hazards associated with **CONTRACTOR**'s work should be identified and reviewed with the client. Special procedures that may need to be followed could include lockout/tagout, confined space entry, hot work, or other operational issues that may need to be addressed. **CONTRACTOR** will review **CONTRACTOR**'s work with the Client to determine if **CONTRACTOR**'s work will create unique hazards or interfere with the client's operation.

6.1 Hot-work and Lockout/tagout

CONTRACTOR will adhere to client's requirements for lockout/tagout procedures. Hot work permits may be necessary in certain situations and **CONTRACTOR** will discuss these permit conditions with the client before starting work.

APPENDIX F

PERSONAL PROTECTIVE EQUIPMENT (PPE) PROGRAM: SELECTION AND USE

1.0 PURPOSE

This program has been written to help the worker choose the correct Personal Protective Equipment (PPE) for the job. Familiarity with the different levels of protection (A, B, C and D) will help speed up the selection process. Careful selection and use of adequate PPE should protect the respiratory system, skin, eyes, face, hands, feet, head, body and hearing. **CONTRACTOR** employees may work at a variety of job sites and locations which may require different types of protective equipment. Client specific requirements will always be adhered to. **CONTRACTOR** will supply all PPE or reimburse the employee for the costs of PPE if the PPE is required as part of the project.

2.0 SCOPE

This program establishes criteria for the selection, use, donning and doffing, inspection, maintenance, storage, decontamination of PPE, and evaluation. This information is general, and specific PPE use should be included in the site-specific health and safety plan prepared for each project.

3.0 OSHA REQUIREMENTS (29 CFR 1910.120)

A written personal protective equipment program, which is part of the employer's safety and health program and also part of the site-specific health and safety plan shall be established. The PPE program shall address the elements listed below.

- PPE selection based upon site hazards;
- PPE use and limitations of the equipment;
- Work mission duration;
- PPE Maintenance and storage;
- PPE decontamination and disposal;
- PPE training and proper fitting;
- PPE donning and doffing procedures;
- PPE inspection procedures prior to, during and after use;
- Evaluation of the effectiveness of the PPE program; and
- Limitations during temperature extremes, heat stress, and other appropriate medical considerations.

OSHA Standard 29 CFR 1910.132 requires employers to assess the employer's workplace and determine if hazards are present that necessitate the use of personal protective equipment (PPE). This assessment must be certified in writing and documented.

Due to the variety of job sites and situations that **CONTRACTOR** personnel may be involved in, it is important that **CONTRACTOR** maintain a consistent approach in complying with health and safety procedures. The project manager and/or site supervisor are responsible for ensuring that all personnel wear the appropriate PPE. Failure to comply with these requirements may result in disciplinary action. Employee safety is a paramount concern for all **CONTRACTOR** managers and employees. We all must make every effort to protect ourselves and each other from harm. These procedures will now require the following:

1. Protective footwear must be worn by all field personnel working in the field. Footwear must at a minimum include steel toe and shank protection. **CONTRACTOR** will reimburse employees up to $90 for the purchase of protective footwear which must be dedicated for work. Protective footwear must meet ANSI Z 41-1991. Additionally, chemical protective footwear may also be required if the potential for contaminated materials exists. This type of protection will be required on a site-specific basis.

2. Eye protection must be worn by all field personnel during all sampling activities, stack sampling, and inside manufacturing facilities. Eye protection must include side shields. Prescription lenses worn as eye protection and other protective eyewear must meet ANSI Z87.1-1989.

3. Hardhats are to be worn by all field personnel when in the field. New hardhats must meet ANSI Z89-1986.

4. Hand protection is to be worn on a site-specific basis. The hand protection must be selected based on the chemical hazards expected to be encountered. **CONTRACTOR** maintains a stock of a variety of gloves including:

   Best: Nitrile N-Dey
   PVC
   Latex
   Vinyl
   Solvex, Nitrile
   Leather Work Gloves

   These gloves are available from the Windsor office on a project specific basis.

   Additionally, nitrile coated Kevlar gloves or other types of puncture resistant gloves are to be worn by all personnel working with or cleaning glass impingers. Manufacturers that supply these gloves include Ansell Edmont, Jomac and Wells Lamont. Insulated electrical gloves with outer leather gloves is required when working around high-voltage systems. **CONTRACTOR** is responsible for supplying all personal protective equipment required for **CONTRACTOR**'s projects.

4.0 WORK MISSION DURATION

Before donning any PPE ensembles, workers will estimate their anticipated work duration. There are several limiting factors that affect the length of work time. These factors must be addressed:

- Air supply consumption
- Permeation and penetration of the Chemical Protective Clothing/ensemble;
- Ambient temperature; and
- Coolant supply (ice or chilled area to keep the worker's body temperature at a normal temperature).

5.0 LEVEL OF PROTECTION

The following section describes the different levels of protection (A through D). Each level is described in the following manner: the protection provided; when this particular level of protection should be used; recommended and optional equipment; and, any limiting criteria.

1. Level A

   a. Protection provided:

      - Level A provides the highest available level of respiratory, skin and eye protection.

   b. Should be used when:

      - The chemical substance has been identified and requires the highest level of protection for skin, eyes, and the respiratory system based on any of the following circumstances;

      - Measured (or potential for) high concentration of atmospheric vapors, gases or particulates;

      - Site operations and work functions involving a high potential for splash, immersion, or exposure to unexpected vapors, gases or particulates of materials that are harmful to skin or capable of being absorbed through intact skin;

      - Substances with a high degree of hazard to the skin are known or suspected to be present, and skin contact is possible;

      - The Operations must be conducted in confined, poorly ventilated areas until absence of conditions requiring Level A protection is determined.

   c. Recommended equipment:

- Pressure-demand, full facepiece SCBA or pressure-demand supplied-air respirator with escape SCBA;

- Fully-encapsulating, chemical-resistant suit (pressure-tested immediately before use);

- Inner chemical-resistant suit;

- Inner chemical-resistant gloves;

- Chemical-resistant safety boots/shoes; and

- Two-way radio communications.

d. Optional equipment:

- Cooling unit;
- Coveralls;
- Long cotton underwear;
- Hard hat; and
- Disposable gloves and boot covers.

e. Limiting criteria:

- Fully encapsulating suit material must be compatible with the substances involved.

2. Level B

a. Protection provided:

- The same level of respiratory protection, but less skin protection than Level A.

b. Should be used when:

- The type and atmospheric concentration of substances have been identified and require a high level of respiratory protection, but less skin protection. This involves atmospheres with IDLH concentrations of specific substances that do not represent a severe skin hazard, or that do not meet the criteria for use of air purifying respirators;

- Atmospheres contain less than 19.5% oxygen; and

- Presence of incompletely identified vapors or gases indicated by direct-reading organic vapor detection instrument, but vapors and gases are not suspected of

containing high levels of chemicals harmful to skin or capable of being absorbed through the intact skin.

c. Recommended equipment:

- Pressure-demand, full facepiece SCBA or pressure-demand supplied-air respirator with escape SCBA;
- Chemical-resistant clothing (overalls and long-sleeved jacket; hooded, one- or two-piece chemical splash suit; disposable chemical-resistant one-piece suit);
- Inner and outer chemical-resistant gloves;
- Chemical-resistant safety boots/shoes;
- Hard hat; and
- Two-way radio communications.

d. Optional equipment:

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

e. Limiting criteria:

- Use only when the vapors or gases present are not suspected of containing high concentrations of chemicals that are harmful to skin or capable of being absorbed through the intact skin.
- Use only when it is highly unlikely that the work being done will generate either high concentrations of vapors, gases or splashes of material that will affect the exposed skin.

3. Level C

a. Protection provided:

- Level C provides the same level of skin protection as Level B, but a lower level of respiratory protection.

b. Should be used when:

- The atmospheric contaminants, liquid splashes, or other direct contact will not adversely affect any exposed skin;

- The types of air contaminants have been identified, concentrations measured, and a canister/ cartridge is available that can remove the contaminant; and

- All criteria for the use of air-purifying respirators are met.

c. Recommended equipment:

- Full facepiece or half facepiece air-purifying negative pressure respirator;
- Chemical-resistant clothing;
- Inner and outer chemical-resistant gloves;
- Chemical-resistant safety boots and shoes;
- Disposable boot covers;
- Hard hat; and
- Two-way radio communications.

d. Optional equipment:

- Coveralls;
- Face shield;
- Escape bottle; and
- Long cotton underwear.

e. Limiting criteria:

- Atmospheric concentration of chemicals must not exceed IDLH levels; and
- The atmosphere must contain at least 19.5% oxygen.

4. Level D

a. Protection provided:

- No respirator protection and minimal skin protection.

b. Should be used when:

- The atmosphere contains no known hazard; and

- Work functions preclude splashes, immersion, or the potential for unexpected inhalation of or contact with hazardous levels of any chemicals.

c. Recommended equipment:

- Coveralls;

- Safety boots/shoes;
- Safety glasses or chemical splash goggles; and
- Hardhat.

d. Optional equipment:

- Gloves;
- Escape bottle; and
- Face shield.

e. Limiting criteria:

- This level should not be worn in the exclusion zone; and
- The atmosphere must contain at least 19.5% oxygen.

6.0 LEVEL OF PROTECTION UTILIZED BY CONTRACTOR PERSONNEL

Due to the nature of our work, it can be reasonably expected that personnel will not be performing any work that will require the use of Level A protection. **CONTRACTOR** will not directly undertake assignments and **CONTRACTOR** does not generally train or equip its personnel to handle circumstances involving Level A protection. If **CONTRACTOR** is working on a site and Level A is deemed necessary, the work will be subcontracted to a qualified firm. **CONTRACTOR** personnel should not directly undertake these tasks.

Sites where **CONTRACTOR** is working often require the use of Level C or D, with Level B equipment available on-site for emergency rescue. Any questions concerning the level of protection necessary to complete a certain task will be directed to the Health and Safety Assessment Division before setting up the job.

7.0 TYPES OF PPE OWNED AND UTILIZED BY CONTRACTOR

The following list contains all types of PPE owned by **CONTRACTOR** and their uses on the job, as they may apply to a specific site.

1. Respiratory Equipment:

a. SCBAs:

- Used for emergency rescue and exposures greater than maximum use concentration limits set for canister/cartridge type negative pressure respirators.

b. Supplied-air respirators:

- MSA Premaire system.

c. Negative pressure respirators:

- Half face and full face, used for exposure to certain types of acid gases, organic vapors and particulates not greater than the canister/cartridge maximum use concentration limit.

2. Chemical protective apparel suits:

   a. Polycoated Tyvek, Saranex, Chemrel and Tyvek (porous). Provide protection against certain liquid chemicals.

      - Tyvek provides protection against particulates only.

   b. Fire/flame retardant coveralls:

      - Provide protection against flash fires.

3. Insulated clothing (Provides protection against exposure to the cold:

   a. Chemical resistant gloves:

      - Provide protection for the hands against chemical splashes.

   b. Disposable boot covers:

      - Protect safety boots from contamination and feet from contact with chemicals.

4. Eye protection:

   a. Safety glasses and chemical splash goggles.

      - Safety glasses protect the eyes against large particles and projectiles.
      - Chemical splash goggles protect the eyes against vaporized chemicals, splashes, large particles, and projectiles.

   b. Vented goggles do not provide protection against vapors and are not adequate for splashes, as material may seep inside the goggles.

5. Hard hat:

   - Provides protection against blows to the head. When worn with a liner, provides protection against the cold.

6. Construction safety boots:

   - Steel-toe and shank construction boots with chemically resistant soles protect the feet from heavy and sharp objects, and contact with chemicals.

7. Safety harnesses and lifelines:

   - Enable the individual to work in elevated areas or enter confined spaces to prevent falls and aid in rescue.

8. Hearing protection:

   - Provides protection against physiological damage and psychological effects.

9. Canvas work gloves:

   - Provide protection for the hands against abrasions and slivers.

8.0 SELECTION OF CHEMICALLY PROTECTIVE CLOTHING

1. Chemically-protective clothing (CPC) will be chosen in the following manner:

   a. Determine what chemicals are present on the site.

   b. CPC chosen must be resistant to permeation, degradation and penetration of the chemical(s).

      - Permeation - Process by which a chemical dissolves in and/or moves through a protective clothing material on a molecular level.

      - Degradation - The loss of or change in the fabric's chemical resistance or physical properties due to exposure to chemicals, use or ambient conditions (e.g., sunlight).

      - Penetration - The movement of chemicals through zippers, stitched seams or imperfections (e.g., pinholes) in CPC.

   c. Review manufacturer's permeation data to determine the performance characteristics of the material to the specific chemical. See Appendix A for "Permeation Guides".

   d. Select CPC that protects against the greatest range of chemicals on the site and has the longest breakthrough time.

   e. Discuss choice of CPC with the Health and Safety division prior to setting up the job.

9.0 DONNING AND DOFFING PROCEDURES

The following procedures will be used by **CONTRACTOR** employees for donning and doffing PPE at protection Levels B and C. Donning and doffing will be performed with the assistance of an individual(s) located in the Support Zone and Contamination Reduction Zone, respectively. This individual will help the worker tape up and adjust PPE for proper fit, as well as remove PPE after decontamination.

1. Donning PPE

   - Inspect the clothing and respirator before donning.
   - Unzip the suit.
   - Step into the legs of the suit, slipping the feet through the legs. Push arms through the sleeves.
   - Pull leg cuffs over the feet.
   - Put on chemical-resistant safety boots over the feet. Tape the leg cuff over the tops of the boots.
   - Pull over chemical-resistant boot covers and tape over the leg cuff.
   - If suit contains protective feet, wear chemical-resistant safety boots inside the suit with chemical-resistant boot covers over the suit and taped securely to the leg.
   - If wearing a SCBA, don the facepiece and adjust it to be secure, but comfortable. Do not connect the breathing hose. Open valve on the air tank.
   - If wearing a negative pressure respirator, pull hood over the head and perform positive and negative pressure facepiece seal test.
   - Pull on chemical protective inner gloves.
   - Pull on chemical protective outer gloves and tape securely to the sleeve of the suit.
   - Securely tape the suit to protect all exposed skin around the neck area, and if wearing a full facepiece, tape around the edge of the hood-to-facepiece junction.
   - Put on hardhat, if needed, and tape securely on top of head so that the hard hat does not slide off.

2. Doffing PPE

- Doffing of PPE will not take place until the individual has been properly decontaminated by a suitably attired assistant. Both the worker and assistant will make every effort to avoid any direct contact with the outside of the suit.

- If the individual is wearing a SCBA, the hose connection to the diaphragm will be disconnected, leaving the facepiece on the wearer. The remainder of the unit will be removed and decontaminated before proceeding further.

- If the individual is wearing a half-face or full-face negative pressure respirator, she/he will be instructed to leave it on until the doffing procedure is complete.

NOTE: Decontamination is to be performed in accordance with the Site-Specific Health and Safety Plan for the site.

10.0 DECONTAMINATION OF PPE

Whenever possible, disposable PPE will be used on-site. Disposable PPE includes the following:

- Chemical protective suits;
- Gloves; and
- Chemical protective boot covers.

After decontaminating the worker, PPE is disposed of on-site in labeled disposal containers.

11.0 INSPECTION OF PPE

PPE will be inspected prior to, during and after each use according to the procedure outlined below.

1. Prior to use (Reusable and Disposable PPE):

    a. Through reviewing available literature, determine that the clothing material is correct for the task.

    b. Visually inspect for:

        - Imperfect seams;
        - Non-uniform coatings;
        - Tears or holes; and
        - Malfunctioning closures.

    c. Hold up to the light and check for pinholes (inflate gloves and check for leaks).

    d. Flex and check for:

        - Cracks; and

- Shelf deterioration.

e. If previously used, check for:

- Discoloration;
- Swelling;
- Stiffness and cracking; and
- Holes and tears.

2. During use (Reusable and Disposable PPE), check for:

a. Evidence of chemical attack.
b. Discoloration, swelling, stiffening, softening and/or cracking.
c. Tears.
d. Punctures.
e. Seam discontinuities.

Note: Report any sense of breakthrough to the Health and Safety Assessment Division. Medical monitoring may be necessary to determine the extent of exposure.

3. After use (Reusable PPE), check for:

a. Malfunctioning parts.
b. Evidence of chemical attack.
c. Punctures.
d. Tears.
e. Cracks.

12.0 MAINTENANCE AND STORAGE OF PPE

PPE, other than respiratory equipment, will be maintained and stored in accordance with the manufacturer's recommendations at a minimum to prevent damage due to exposure to dust, moisture, sunlight, chemicals, temperature extremes and sudden impact.

Employees are given Field Operations Equipment bags prior to working on any **CONTRACTOR** sites. PPE that is given to the individual solely for his/her use will be stored in this bag. Before and after each use, the PPE will be inspected to determine whether or not it is still "field worthy". Any PPE found to be defective will be reported to the Health and Safety Assessment Division and either discarded or repaired, as appropriate. Under no circumstances will defective PPE be used in the field.

8. The Health and Safety Assessment Division will periodically inspect PPE issued for individual use.

a. Unless the equipment can be repaired, any PPE found to be defective will be removed from service and discarded immediately.

b. Repairable PPE will be tagged, returned to the Facility Manager and sent out for repair.

13.0 EVALUATION OF PPE PROGRAM

CONTRACTOR's Personal Protection Equipment Program will be reviewed annually by the Health and Safety Assessment Division. Any program deficiencies that are identified by a **CONTRACTOR** employee will be reported to the Health and Safety Assessment Division, so that changes will be made immediately. All employees affected by the change(s) will be notified in writing.

Review of the PPE Program will include, but not be limited to, the following:

- Accident and illness experience on various job sites.
- Type and degree of exposure.
- Adequacy of equipment selection process.
- Degree of fulfillment of program objectives.
- Employee acceptance.
- Coordination with overall health and safety program elements.
- Recommendations for program improvements and modifications.
- Adequacy of program records.

APPENDIX G

MONITORING INSTRUMENTS: USE, CARE, AND CALIBRATION

1.0 INTRODUCTION

Prior to beginning any work at **CONTRACTOR** sites, a preliminary site evaluation must be conducted to identify the hazards or suspected hazards of the site. Through area and personal monitoring with direct-reading instruments and personal sampling pumps, hazardous conditions can be evaluated, and the proper level of protection chosen for the specific type of work activity. Monitoring equipment used by **CONTRACTOR** personnel includes the following: Oxygen/Combustible Gas Meters (CGM); Organic Vapor Analyzers (OVA); Photoionization Detectors (PID); Personal Sampling Pumps; and, Colorimetric Tubes. This program contains a description of each type of monitoring equipment; hazards for which it can be used to monitor; Applications; Care and Maintenance; Limitations; and, Calibration.

2.0 SCOPE

This program covers the use, application, care and maintenance, limitations and calibration of CGMs, OVAs, PIDs, Personal Sampling Pumps and Colorimetric Tubes used by **CONTRACTOR** employees in hazardous materials operations. **CONTRACTOR** employees engaged in activities involving hazardous materials includes the Hazardous Waste Division and the Air Division.

3.0 INSTRUMENTATION

1. Photoionization Detectors (PIDs)

   Introduction

   PIDs measure a variety of gases in many industrial, as well as hazardous material, operations. These analyzers employ the principle of photoionization, which is the absorption of ultraviolet light by molecules, for detection.

   The sensor consists of a sealed ultraviolet light. The energy ionizes many trace species (particularly organics) but does not ionize the major components of air, such as O_2, N_2, CO, CO_2, or H_2O. A chamber adjacent to the ultraviolet source contains a pair of electrodes. When a positive potential is applied to one electrode, the field created drives any ions, which are formed by absorption of the UV light, to the collector electrode, where the current (proportional to the concentration) is measured.

   To minimize absorption of various sample gases, the ion chamber is made up of an inert fluorocarbon material, located at the sampling point, and a rapid flow of sampling gas is maintained through the small ion chamber volume.

   The analyzer will operate either from a rechargeable battery for up to 10 hours, or continuously from the AC battery charger.

   The useful linear range of the instrument is from a fraction of a part per million to about 2000 PPM.

Theory

CONTRACTOR utilizes the HNu meter as its PID. The HNu is a portable, non-specific vapor/gas detector. The HNu employs the principle of photoionization to detect a variety of chemical compounds, both organic and inorganic.

The HNu contains an ultraviolet light source within its sensor chamber. Ambient air is drawn into the chamber with the aid of a small fan (PI-101) or positive displacement pump (HW-101). If the ionization potential (IP) of any contaminant present in the ambient air is equal to or lower than the energy of the UV light source, ionization will take place, causing a deflection in the meter.

Response time for the HNu is approximately 90% at 3 seconds. The meter reading is expressed in parts per million (PPM) relative to the calibration gas. All readings must be stated as equivalent readings that depend on the calibration gas being used to calibrate the HNu. The calibration gas used is Isobutylene. Formerly, benzene was used as the calibration gas, but due to its hazard it is no longer used. Isobutylene, used as an equivalent in place of benzene, allows the instrument to provide results in benzene equivalents.

A list of IPs for various gases is provided in the latest edition of the NIOSH Pocket Guide to Chemical Hazards.

Basic Operation of the HNu

A sample of air is drawn through a chamber and an ultraviolet light causes certain contaminants present to be broken apart into positive and negative charged particles. These charged particles are passed between electrodes and converted into an electrical impulse displayed on the readout.

Checkout and Use Procedures

Attach the probe to the readout assembly. Be sure pins and "slot/key" are properly aligned. DO NOT FORCE CONNECTION INTO THE RECEPTACLE. Turn the connector clockwise until it snaps into place with a clicking noise, which will be both heard and felt.

Turn the function switch to "BATT". The needle should deflect to the right ("BATT CHK"). Listen for the humming of the fan or the pump. Look briefly into the probe and check to see if the lamp is on (look for a purple glow). Do not use the probe extension. Do not look into the lamp for more than a brief moment to see if the lamp is on. Prolonged exposure to the ultraviolet light rays of the lamp will cause eye damage.

Turn the function switch to "STANDBY". The fan will stay on, but the light will go out. Check the readout, which will read close to 0, and adjust the "ZERO" control knob. Check the "SPAN", which should be 9.8 for the 10.2 eV lamp. The lock should be on and should not be touched unless the unit is being calibrated.

Turn the function switch to "0-20". Check the unit with a magic marker, lighter (unlit), etc. to make sure it is working properly. Turn the function switch to 0-200, 0-2000 or 0-20 to sample, as necessary.

Field Applications/Limitations

a. The H Nu will only detect organic materials with an ionization potential less than 10.2eV.

b. It is a non-specific detection device, but provides continuous information on airborne concentrations.

c. It will not respond equally to all contaminants, and does not detect methane.

d. High humidity will cause the instrument to give lower readings than the actual airborne concentration.

e. Transfer of the instrument from a cold to a warm environment may cause condensation to form on the UV light source window, causing erroneous results.

f. The readout may also be affected by electrical power lines or power transformers.

g. Total concentrations are relative to the calibration gas used (isobutylene). Therefore, true concentrations cannot be identified. And, while the instrument scale reads 0-2000 ppm, response is linear (to isobutylene) from 0-600 ppm.

h. Wind speeds of greater than 3 mph may affect the fan speed on the PI-101 and readings, depending on the position of the probe relative to wind direction.

Calibration Procedure

Calibration Checklist: H Nu Meter (Probe and box); Span gas (HNu Manufactured); Regulator; Tygon tubing.

Cleaning and Calibration Checklist: Same materials as above; H Nu cleaning compound; Fine screwdrivers, flat and Phillips head; Sonnicator; Drying/Toaster oven.

Inventory Items: Battery; Lamp; ION chamber; O-Rings; Screws.

a. Obtain calibration gas, Isobutylene at Span 9.8 with 10.2 eV, manufactured by HNu.

b. Connect the calibration gas to the end of the probe extension. Open the gas flow valve.

c. Turn the selection knob to the 0-200 range and observe the meter needle. The concentration should read the same as that listed on the cylinder. If not, the span should be adjusted until the meter reads accurately.

d. The above procedure can be used until the span reading is approximately 5. At this time, the meter needs to be cleaned and internally calibrated. See Step 5.

e. For cleaning and internal calibration:

- Disassemble the probe, carefully removing the lamp.
- Clean the lamp.
- Clean the ION chamber and probe extension.
- Remove the instrument from its housing to expose the calibration screw, located on the side of the instrument.
- Once the probe parts have cooled (assuming it has been used), assemble the probe and connect it to the instrument.
- Connect the calibration gas to the end of the probe extension and open the gas flow.
- Turn the selection knob to the 0-200 range and observe the needle. The concentration should read the same as the concentration listed on the cylinder. If not, then the calibration screw must be adjusted with a fine screwdriver.

Maintenance and Calibration Records

a. Protect the instrument from excessive abuse, such as moisture, shock, vibration, etc.

b. Maintenance and calibration records will be recorded in a logbook specific to the HNu meter.

Troubleshooting

Below are some points that should be considered if the instrument is not running appropriately:

a. Check the battery condition. Recharge it if necessary.

b. If unstable readings are obtained, a faulty probe cable or electrical connection could be the problem. To check this, hold the probe normally and flex the cable firmly. Watch the meter needle for fluctuations as the cable is flexed. Individual wires in the readout can be checked in a similar way.

c. Check the coaxial connector on the amplifier board in the probe for any separation.

d. Determine whether or not the meter is being used in close proximity to AC power lines or power transformers. This can cause the instrument to read erroneously. To check for this interference, zero the instrument in an electrically quiet area in the standby position, and then move the instrument into the area in question. If AC pick-up is a problem in the area, then the meter will indicate the magnitude of the problem.

e. No response on any setting may mean that the meter movement is broken. Tip the instrument from side-to-side. The needle should move freely and return to zero.

f. No response may mean that the electrical connection to the meter is broken. Check all wires leading to the meter and clean the contacts of the quick-disconnects.

g. No response may mean that the battery is completely dead. Disconnect the battery and check the voltage with a volt-ohm meter. Also check the 2-amp fuse.

h. If the meter responds in the BATT CHK mode, but reads zero or near zero for all other modes, the power supply may be defective.

- Replace the power supply.
- Check the input signal connection, which may be broken in the probe or readout.
- Check the input connector on the printed circuit board inside the probe. It should be firmly pressed down.
- Check the components on the backside of the circuit board. All connections should be solid and no wires should touch any other object.
- Check all wires in the readout for solid connections.

i. When the instrument responds appropriately in the "BATT CHK" and "STANDBY" positions, but not in the measuring mode, check to see that the light source is on.

j. If the instrument responds correctly in all settings, but the signal is lower than expected:

- Check the span setting.
- Clean the window of the light source.
- Check the fan for proper insertion.

k. If the instrument response is slow and/or not reproducible, either the fan is operating improperly (check the fan voltage), or the instrument needs to be recalibrated.

l. A low battery indication comes on if the battery charge is low. It will also come on if the ionization voltage is too high.

2. Organic Vapor Analyzer

Introduction

The OVA 128 is a sensitive instrument designed to measure trace quantities of organic materials in air. It is essentially a flame ionization detector such as that utilized in laboratory gas chromatographs and has similar analytical capabilities. The Flame Ionization Detector (FID) is an almost universal detector for organic compounds with the sensitivity to measure in parts per million range in the presence of atmospheric moisture, nitrogen oxides, carbon monoxide and carbon dioxide.

The instrument has broad application since it has a chemically resistant air sampling system and can be readily calibrated to measure almost all organic vapors. It has a single linearly scaled readout from 0 ppm to 10 ppm with a X1, X10, X100 range switch. This range expansion feature provides accurate readings across a wide concentration range with either the 10, 100, or 1000 ppm full-scale deflection. Designed for use as a portable survey instrument, it can also be readily adapted to fixed remote monitoring or mobile installations. It is ideal for the determination of many organic air pollutants and for monitoring the air in potentially contaminated areas.

The OVA 128 is certified by Factory Mutual Research Corporation for use in Class 1, Groups A, B, C and D Division 1 hazardous locations. Similar foreign certifications have been obtained, including BASEEFA. This requirement is especially significant in industries where volatile flammable petroleum or chemical products are manufactured or used and for instruments which are used in portable surveying or for analyzing concentrations of gases and vapors. Such instruments must not be capable, under normal or abnormal conditions, of causing ignition of hazardous mixtures in the air. In order to maintain the certified safety, it is important that the precautions outlined in this manual be practiced and that no modifications be made to these instruments.

Theory

The OVA 128 analyzer is designed to detect and measure hazardous organic vapors and gases found in most industries. It has broad application since it has a chemically resistant sampling system and can be calibrated to almost all organic vapors. It can provide accurate indication of gas concentration in one of three ranges: 0-10 ppm, 0-100 ppm, 0-1000 ppm. While designed as a lightweight portable instrument, it can be permanently installed to monitor a fixed point.

The instrument utilizes the principle of hydrogen flame ionization for detection and measurement of organic vapors. The instrument measures organic vapor concentration by producing a response to an unknown sample, which can be related to a gas of known composition to which the instrument has previously been calibrated. During normal survey mode operation, a continuous sample is drawn into the probe and transmitted to the detector chamber by an internal pumping system.

The sample stream is metered and passed through particle filters before reaching the detector chamber. Inside the detector chamber, the sample is exposed to a hydrogen flame

which ionizes the organic vapors. When most organic vapors burn, they leave positively charged carbon-containing ions. An electric field drives the ions to a collecting electrode. As the positive ions are collected, a current corresponding to the collection rate is generated. This current is measured with a linear electrometer preamplifier which has an output signal proportional to the ionization current. A signal-conditioning amplifier is used to amplify the signal from the pre-amp and to condition it for subsequent meter or external recorder display. The display is an integral part of the probe/readout assembly and has 270-degree scale deflection.

In general, the hydrogen flame ionization detector is more sensitive for hydrocarbons than any other class of organic compounds. The response of the OVA varies from compound to compound, but gives repeatable results with all types of hydrocarbons, i.e. saturated hydrocarbons (alkanes), unsaturated hydrocarbons (alkenes and alkynes) and aromatic hydrocarbons.

Applications

a. Measurement of most toxic organic vapors present in industry for compliance with OSHA requirements.

b. Evaluation and monitoring applications in the air pollution field.

c. Source identification and measurement for fugitive emissions (leaks) as defined by the EPA.

d. Forensic science applications.

e. Controlling and monitoring atmospheres in manufacturing and packaging operations.

f. Leak detection related to volatile fuel handling equipment.

g. Monitoring the background level of organic vapors at hazardous waste sites.

h. Quality control procedures geared to leak checking, pressurized system checks, combustion efficiency checks, etc.

Limitations

a. The OVA will not detect any inorganic compounds.

b. The OVA will see methane, which is explosive, but relatively non-toxic in other than high concentrations. The user should determine if the contaminant involved is or is not methane.

c. DOT shipping regulations are strict for the OVA when shipping pressurized oxygen.

d. A relative humidity greater than 95% will cause inaccurate and unstable responses.

e. A temperature of less than 40 deg. F will cause poor and slow response.

f. Actual contaminant concentrations are measured relative to the calibration gas used. Therefore, specific contaminants and their quantities cannot be easily identified.

Battery Charging

a. Plug charging connector into mating connector on battery cover and insert AC plug into 115V AC wall outlet.

b. Move the battery charger switch to the ON position. The lamp above the switch button should illuminate.

c. Battery charge condition is indicated by the meter on the front panel of the charger; meter will deflect to the left when charging. When fully charged, the pointer will be in line with "CHARGED" marker above the scale.

d. Approximately 1 hour of charging time is required for each hour of operation. However, an overnight charge is highly recommended. The charger can be left on indefinitely without damaging the battery. When finished, move the battery charger switch to "OFF" and disconnect from the SIDE PACK ASSEMBLY.

Calibration

The OVA 128 is capable of responding to nearly all organic compounds. At the time of manufacture, the analyzer is calibrated to mixtures of methane in air.

The instrument is calibrated by using a mixture of a specific vapor in air, with a known concentration. After the instrument is in operation and the normal background is zeroed, draw a sample of the calibration gas into the instrument. The GAS SELECT knob on the panel is then used to set the readout meter indication to correspond to the concentration of the calibration gas mixture.

The instrument has now been calibrated to the vapor mixture being used. After this adjustment, the setting on the DIGIDIAL should be recorded for that particular organic vapor compound. This exercise can be performed for a variety of compounds, thereby generating a library which can be used for future reference without need for additional calibration standards.

To read a particular compound, the GAS SELECT control is turned to the predetermined setting for the compound. Calibration on any one range automatically calibrates the other 2 ranges.

Startup Procedure

a. Connect the Probe/Readout Assembly to the Sidepack Assembly by attaching the sample line first, then connect electronic jack to the side pack.

b. Select the desired sample probe (close area sampler or telescoping probe) and connect the probe handle. Before tightening the knurled nut, check that the probe accessory is firmly seated against the flat seals in the probe handle and in the tip of the telescoping probe.

c. Move the instrument/BATT switch to the test position. The meter needle should move to a point beyond the white line, indicating that the integral battery has more than four (4) hours of operating life before recharging is necessary.

d. Move the instrument/BATT switch to the "ON" position and allow a five (5) minute warm-up.

e. Move PUMP switch to "ON" position, then place instrument panel in vertical position and check SAMPLE FLOW RATE indication. The normal range is 1.5 - 2.5 units. If less, check filters.

f. Perform a leak test. (See "Sampling Fixtures")

g. Activate audible alarm:

- Use the CALIBRATE ADJUST knob to set the meter needle to the level desired for activating the audible alarm. If this alarm level is other than zero, the CALIBRATE SWITCH must be set to the appropriate range.

- Turn the VOLUME knob fully clockwise.

- Using the ALARM LEVEL ADJUST knob, turn the knob until the audible alarm is activated.

h. Move the CALIBRATION SWITCH to X1 and adjust the meter reading to zero using the CALIBRATE ADJUST (zero knob).

i. Open the Hydrogen TANK VALVE one or two turns and observe the reading on the HYDROGEN TANK PRESSURE INDICATOR. Approximately 150 psi of pressure is required for each hour of operation.

j. Open the HYDROGEN SUPPLY VALVE one or two turns and observe the reading on the HYDROGEN SUPPLY PRESSURE INDICATOR. The reading should be between 8 and 12 psi.

k. After approximately 10 seconds, depress the IGNITER BUTTON until the hydrogen flame lights. The meter needle will travel upscale and begin to read " TOTAL ORGANIC VAPORS".

CAUTION: Do not depress the igniter for more than 6 seconds. If the flame does not ignite, wait <u>one minute</u> and try again.

l. Calibrate instrument (see "Calibration").

m. The instrument is ready for use.

NOTE: If the ambient background organic vapors are "zeroed out" using the CALIBRATE ADJUST KNOB, the meter may move off scale in the negative direction when the OVA is moved to a location with lower background levels. If the OVA are to be used in the 0-10 ppm range, it should be "zeroed" in an area with very low background.

<u>Shut Down Procedure</u>

a. Close the HYDROGEN SUPPLY VALVE.

b. Close the HYDROGEN TANK VALVE.

c. Move the INSTR switch and PUMP switch to OFF.

d. Instrument is now in the shut down configuration.

<u>Operation Procedure</u>

Set the CALIBRATE switch to the desired range. Survey the areas of interest while observing the meter and/or listening for the audible alarm indicator. For ease of operation, carry the SIDE PACK ASSEMBLY positioned on the side opposite the hand which holds the PROBE/READOUT ASSEMBLY. For broad surveys out doors, the pick-up fixture should be positioned several feet above ground level. When making quantitative readings or pinpointing, the pick-up fixture should be positioned at the point of interest.

When organic vapors are detected, the meter pointer will move upscale. If the audible alarm is utilized, it will sound when the set point is exceeded. The frequency of the alarm will increase as the detection level increases.

If a flameout occurs, check that the pump is running, then press the igniter button. Under normal conditions, flameout results from sampling a gas mixture that is above the Lower Explosion Limit (LEL) which causes the hydrogen flame to extinguish. If this is the case, re-ignition is all that is required to resume monitoring. Another possible cause for flameout is restriction of the sample flow line which would not allow sufficient air into the chamber to support combustion. The normal cause for such restriction is a clogged particle filter.

It should be noted that the chamber exhaust port is on the bottom of the case and blocking this port with the hand will cause fluctuations and/or flameout.

Maintenance and Troubleshooting

IMPORTANT NOTE: This section describes routine maintenance procedures for troubleshooting instrument malfunctions. Maintenance personnel should be thoroughly familiar with instrument operation before performing maintenance. All written portions of this section must be thoroughly understood relating to safety of operation, servicing and maintenance. There should be no potential ignition sources in the area when filling, emptying or purging the hydrogen system and the instrument should be turned off.

Replacement parts that are specified by Foxboro must be used for repair. No modifications are permitted. Disassembly of the instrument must take place in a non-hazardous atmosphere only.

Primary Filter Cleaning

This filter is located behind the sample inlet connector (fitting assembly) on the SIDE PACK ASSEMBLY and is removed for cleaning by using a 7/16" thin screwdriver to unscrew the fitting assembly. The filter cup, "O" ring and loading spring will then come out. The porous stainless filter cup can be cleaned by blowing out. Reassemble in reverse order, ensuring that the "O" ring seal on the fitting assembly is intact.

Secondary Filter Cleaning

A particle filter is located in each pick-up fixture. One of these filters must be in the sample line whenever the instrument is in use. The OVA 128 uses a porous metal filter which can be replaced and cleaned.

Mixer/Burner Assembly Filter

A porous metal particle filter is incorporated in the Mixer/Burner Assembly, which screws into the Pre-Amp Assembly. This filter is used as the sample mixer and inlet flame arrestor in the chamber. The filter should not become contaminated under normal conditions but can be cleaned or the assembly replaced, if necessary.

Access to this filter or output surface does not require removing the instrument from the case. For access, remove the safety cover using a hex key wrench (supplied) then unscrew the exhaust port. The Filter Assembly can now be seen on the side of the chamber (Pre-Amp Assembly) and can be cleaned with a small wire brush.

Exhaust Flame Arrestor

A porous metal flame arrestor is located in the exhaust port of the detector chamber (Pre-Amp Assembly). It acts as a particle filter on the chamber output and restricts foreign matter from entering the chamber. This filter may be cleaned by removing the exhaust port. For access, see Mixer/Burner section above. Note that the filter is captive to the exhaust port.

Sampling Fixtures

Sampling fixtures should be periodically cleaned with an air hose and/or detergent solution to eliminate foreign particle matter.

The OVA is equipped with a flow gauge that provides a method to check for air leaks. Assemble the pick-up probe selected for use to the readout assembly and then position the side pack vertically so the flow gauge may be observed. Cover the end of the pick-up probe with your finger and observe that the ball in the flow gauge goes to the bottom, indicating no air flow (If the ball has a slight chatter while on the bottom, this is acceptable). Cover the center of the chamber exhaust port with your thumb and again observe the ball going to the bottom. Another simple check is to expose the pick-up probe to cigarette smoke or a light vapor (butane) and observe that the meter responds in approximately 2 seconds. It should be noted that the slow meter response might also indicate restriction in the air sampling.

Failure of the ball to go to the bottom when the inlet is blocked indicates a leak in the system between the probe and the pump inlet or the inlet check valve. To isolate the problem, remove the parts, one at a time, and again block off the air inlet. Remove the pick-up probes and cover the air inlet at the readout assembly. If the ball goes to the bottom, check that the "readout to probe" seal washer is in place and replace the probes, holding them back against this seal while tightening the nut. Recheck, and if leakage is still present, it is probably in the probe (pick-up fixture), which should be repaired or replaced.

If leakage is indicated as being past the readout handle when the connection to the sidepack is tight, disconnect the sample line at the fitting on the sidepack and cover this inlet with your finger. If the flow gauge ball goes to the bottom, the problem should be a leak in the umbilical cord/readout assembly. which should be investigated and repaired. There is also the possibility of a leaking check valve in the pump which would not show up on this test. If the leakage is not found in the umbilical cord, it is most likely in the pump check valve. If the ball does not go to the bottom following these corrective actions, contact the manufacturer for further instructions, and do not use the instrument.

Using Empirical Data

Relative response data can be used to estimate the concentration of a vapor without need to recalibrate the analyzer. With the instrument calibrated to methane, obtain the concentration reading for a calibration sample of the test vapor. The response factor (**R**) in percent for that vapor is:

$$\mathbf{R} = \frac{\text{Actual Conc.}}{}$$

Measured Conc.

To determine the concentration of an unknown sample of that vapor, multiply the measured concentration by **R.** See the alphabetical list of compounds and Relative Response values in Appendix B.

3. Colorimetric Indicator Tubes

Colorimetric indicator tubes are used to measure concentrations of specific gases and vapors, both organic and inorganic. When used appropriately, an indicator tube specific to a certain compound will produce a stain in the tube. The length of the stain (or color change) is proportional to the compound's concentration. Minimal operator training and expertise is required to operate this type of sampling instrument.

Limitations

Colorimetric indicator tubes are cross-sensitive, meaning that other compounds may trigger a similar response, which will give the user a false reading. The user must take this fact into account when he/she dealing with a situation containing unknowns.

Other limitations include individual interpretation concerning the length of the stain, the limited accuracy of the tube, and use in high humidity. The greatest sources of error occur in different interpretations that are obtained between individuals as to how far the stain has gone on the tube, and the tubes limited accuracy. Users must remember that the tubes are **25% accurate**. A simple calculation will tell the user the range in which the correct reading could possibly occur.

With this in mind, any discoloration on the tube should alert the user as to the appropriate protection required for the site. High humidity also affects the readings. Use in humid environments tends to clog the filtering medium, not allowing the gases or vapors to be drawn properly through the tube.

Maintenance and Calibration

CONTRACTOR utilizes the Draeger Model 31 Bellows-type pump for colorimetric tube sampling. General maintenance for this type of instrument includes: avoiding rough handling which may cause channeling; performing a leakage test before sampling each day (including documentation); calibrating the unit at least quarterly; providing an inventory of tubes, with expiration dates; and, appropriate storing.

Rough handling of this instrument may cause erroneous results due to channeling (leakage). Therefore, the unit must be handled carefully and not be stored outside of its protective carrying case when not in use.

It may be necessary to clean the rubber bung (tube holder) if a large number of tubes have been taken with the pump. A mild soap and water solution can be used.

Leak Test

Before each day's use, the user will perform a leak test on the instrument. This is a simple test and includes the following:

a. Squeeze the bellows of the pump and insert an unopened detector tube, attempting to draw 100 ml of air.

b. After a few minutes, examine the bellows for any expansion. Document the findings in the Site Monitoring Log Book. If the pump does not pass the leak test, it will be removed from service immediately and returned to the Facility Manager, to be sent out for repair.

Calibration Test

At least quarterly, the instrument will be calibrated for proper volume measurement. Equipment needed for the calibration test is: 100 ml burette and ring stand; stopwatch; soap solution; detector tube with both ends broken off; and, tygon tubing.

The calibration test is performed as follows:

a. Break both ends of a colorimetric tube and connect it in-line with the pump.

b. Connect the instrument directly to a bubble burette, and create a bubble inside the burette by touching the bottom of the burette to the soap solution.

c. Squeeze the bellows to exhaust all the air out of the unit.

d. Release the bellows and wait 5 minutes for the full volume of air to be drawn into the bellows. The bubble should stop between the 95 and 105 cc marks. Errors of 5% are permissible; if the error is greater than 5%, return the pump to the Facility Manager, to be sent out for repair.

Inventory and Storage Requirements

To inventory the tubes, check the expiration date marked on the storage container. No tubes will be allowed for use past the manufacturer's expiration date. A listing of tubes that are readily available will be maintained by the Health and Safety Coordinator. This list will contain the name of the tube and the expiration date of those available. The list will be updated monthly and provided to the Facility Manager and each Field Division. All colorimetric tubes will be stored in the refrigerator in the Chemical Storage Area. Refrigeration helps to maintain shelf life. Any tubes that have been previously opened and inadvertently stored in the refrigerator will not be used in the field. Colorimetric tubes are not reusable, and any reuse will result in erroneous results.

4. Personal Monitoring Pumps

Personal monitoring involves the collection of an air sample by a sampling device worn by the worker. The sampling device is worn as close as possible to the breathing zone of the individual so that the data collected closely approximates the concentration inhaled. Personal monitoring pumps are used when it is necessary to monitor the workers' exposure to air contaminants.

Personal monitoring pumps can be classified into three basic categories:

a. Low-Flow Pumps (0.5 - 500 ml/min);

b. High-Flow Pumps (500 - 4500 ml/min);

c. Dual Range Pumps.

Low-flow pumps are used for gas and vapor sampling. For example, the common flow rate for organic vapors is 200 ml/min.

High-flow pumps are used for particulate sampling as well as gas and vapor sampling. A common flow rate for fumes or dust sampling (i.e. zinc fume or asbestos) is 2 L/min.

Limitations

The major disadvantage in personal monitoring is the lag time between sampling and obtaining analysis results, which may take weeks, days or months if a remote laboratory is used. If a situation requires an immediate decision concerning worker safety, this can be a serious problem. Therefore, personal monitoring is rarely used for site characterization. Its main purpose is to assure effectiveness of work practice and engineering controls.

A second disadvantage is that multiple exposures may require the use of a variety of sampling media. Unfortunately, workers cannot carry multiple sampling media because of the added strain. Also, it is not usually possible to draw air through different sampling media using a single, portable battery operated pump. Several days may be required to measure the exposure of a specific individual to the variety of chemicals on site. Alternatively, if workers are in teams, a different monitoring device can be assigned to each team member.

Calibration

The following procedure will be used for calibration with a primary calibration source for all personal monitoring pumps used by **CONTRACTOR**. It has been taken from OSHA Instruction CPL 2-2.20B, Appendix 1-C, Manual Bubble Meter Technique.

Electronic bubble meters are also used as primary calibration sources. These meters have a digital read-out and the ability to give a printed copy for documentation of the pump flow rate. **CONTRACTOR** uses a Spectrex Model BFM-4000 for this purpose.

NOTE:
When calibrating with a bubble meter (either manual or electronic), the use of adapters can cause moderate to severe pressure drop in the sampling train, which will affect the calibration result. If adapters are used for sampling, then they should be used when calibrating.

a. Connect the collection device, tubing, pump and calibration apparatus.

b. Conduct a visual inspection on all tygon tubing connections.

c. Wet the inside of a one-liter burette with a soap solution.

d. Turn on the pump and adjust the pump rotameter to the appropriate flow rate setting.

e. Momentarily submerge the opening of the burette in order to catch a film of soap.

f. Draw 2 or 3 bubbles up to the burette in order to insure that the bubbles will complete their run.

g. Visually capture a single bubble and time the bubble from 0 - 1000 ml for high flow pumps or 0 - 100 ml for low flow pumps.

h. The timing accuracy must be within 1 second of the time corresponding to the desired flow rate.

i. If the time is not within the range of accuracy, adjust the flow rate and repeat steps g and h until the correct flow rate is achieved.

j. While the pump is running, mark the pump or record on the air sampling worksheet the position of the center of the float in the pump rotameter as a reference.

k. Repeat bubble timing for 3 times. Calculate the average time given by these measurements.

l. Calculate the flow rate as follows:
(NOTE: 1L = 1000 ml)

$$\frac{\text{Measured Volume (L)}}{\text{Average Seconds}} \times \frac{\text{60 Seconds}}{\text{1 Min}} = \text{L/min}$$

For Example:

$$\frac{\text{1 L}}{\text{38 sec}} \times \frac{\text{60 Sec}}{\text{min}} = \text{1.6 L/min (round to m 2 digits)}$$

Repeat the procedures for all pumps to be used for all calibrations involving the same sampling method.

Different contaminants have different sampling protocols, which may result in different calibration protocol. Contact the **CONTRACTOR** Certified Industrial Hygienist or Health and Safety Coordinator for chemical-specific calibration protocols.

Checklist for Using Personal Monitoring Pumps

a. Look at measurement method in NIOSH Pocket Guide to Chemical Hazards (Latest edition).

b. Calibrate with a primary calibration source, as described in the calibration procedures.

c. Record information of air sampling worksheet and calibration logbook.

d. Make sure battery is fully charged. Air pumps have NiCd battery, which creates a memory. Care needs to be used so as to not recharge a battery that has been used for only a few hours. Recharge a battery only if it has been used for at least 8 hours. There are chargers which will completely discharge a battery before recharging; or, the pumps can be left running until the battery is rundown completely and then recharged to eliminate this memory, also.

e. Check sample requirement sheet or NIOSH method to see the minimum time/volume for the sample. An 8-hour sample period would allow for the best measure, giving an 8-hour TWA exposure.

5. Combination Oxygen and Combustible Gas Meter

Combination meters measure the concentration of combustible gas or vapor present in an area, as well as the oxygen content. The concentration is reported as a percent, with 1% equal to 10,000 ppm. Although it is an easy instrument to operate, its effective use requires that the operator understand the operating principles and procedures behind the instrument. Certain atmospheres may cause erroneous readings or damage to the instrument. Typically, the instrument can be used as long as the battery lasts, or for the recommended interval between calibrations.

Maintenance

Maintenance of combination meters is fairly simple. Batteries must be recharged at the end of a continuous day's use. Occasionally, the rechargeable battery must be replaced. Most batteries last for approximately 2 years of continued use. Also, oxygen and combustible gas sensors will need to be replaced periodically. These sensors last approximately 6 months

with continued use. Sensors that can no longer be calibrated within the manufacturers' acceptable range indicate the need for replacement.

If, after an attempted calibration, the instrument cannot be calibrated due to problems other than the need for battery or sensor replacement, the problem must be reported to the Facility Manager immediately, so that the instrument can be sent out for repair.

Detection Method

The instrument contains 2 analyzers: 1 for combustible gases and vapors; and 1 for oxygen content. The combustible gas analyzer contains a battery operated electrical circuit called a Wheatstone Bridge. Basically, the Wheatstone Bridge is a filament, usually made of platinum, that is exposed to the air in the instrument. When heated by a burning combustible gas or vapor, the increase in heat over the filament is measured as electrical resistance. Another part of the bridge contains similar filaments, but it has been sealed. They are heated in the same fashion, but not directly in the air stream. Thus, this filament is not capable of causing combustion of the gas or vapor, because it is sealed. The net effect of the change in resistance to the electrical current flow in the air stream is due only to the presence of a combustible gas. These changes in electrical current are registered as "percent LEL" (Lower Explosion Limit) on the instrument.

The oxygen analyzer senses oxygen concentration by a galvanic cell. The cell contains 1 gold and 1 lead electrode, and is encapsulated in inert plastic. Oxygen diffusing through the plastic initiates a redox reaction, which generates a small electrical current that is proportional to the oxygen partial pressure. The instrument contains a temperature-compensated electronic circuit that converts the electrical current to a proportional voltage. This voltage is displayed on the instrument as the concentration of oxygen.

Limitations

The combination meter contains some inherent limitations. Knowledge of these limitations will help the user make an educated decision regarding the accuracy of the instrument.

Accuracy of the instrument depends, in part, on the difference between the calibration and sampling temperatures. Differences in temperature may cause a lack of sensitivity in the instrument when brought from a warm to a cold environment.

Another aspect of sensitivity of the instrument is a function of the differences in the chemical and physical properties between the calibration gas (pentane) and the gas being sampled. The chemical and physical properties of the calibration gas are slightly different from those being sampled, so all gases being sampled are compared to the combustion of pentane. In order to get a true reading of the LEL, the gas that is present must also be used as the calibration gas.

The filament can be damaged by certain compounds such as silicones, halides, tetraethyl lead, and oxygen enriched atmospheres. Each manufacturer’s instrument handbook should

contain a listing of compounds that should not be sampled with this instrument, or serious damage could result.

Under oxygen deficient atmospheres, the oxygen analyzer must be read first. Otherwise, the CGM analyzer may not provide a valid reading and give the user a false sense of security.

APPENDIX H

CONTROL OF HAZARDOUS ENERGY PROGRAM "LOCK OUT/TAG OUT"

1.0 INTRODUCTION

The Lock Out/Tag Out Standard, 29 CFR 1910.147, is believed to prevent about 120 deaths and 60,000 injuries per year, according to OSHA officials. Although this standard is aimed at the industrial community, in environmental engineering applications, it is very important that employees understand and implement these procedures when working with and around energized equipment. Under this standard, **CONTRACTOR** is required to establish a program that utilizes procedures for locking out and/or tagging to isolate and disable the equipment to prevent accidental start-up or release of stored energy. **CONTRACTOR** employees will identify, locate and control these energy sources, as necessary.

2.0 PURPOSE

To establish procedures for locking out and/or tagging to isolate and disable equipment to prevent accidental startup or release of stored energy, and possible injury to employees.

3.0 SCOPE

This procedure applies to all field/facility operations that require all operative energy sources, including line breaking, in the work area to be shut down, locked out and tagged, so that **CONTRACTOR** employees may safely perform their job. Contractors and subcontractors performing work on **CONTRACTOR** projects will be required to comply with these requirements if their employer does not have a comparable lock out/tag out program already in place.

4.0 PROCEDURE

1. The authorized employee will evaluate the scope of work and all equipment, machines or industrial processes in the area that require the use of stored energy. Energized equipment that may cause a safety hazard will be shut down to eliminate the potential for injury.

2. Prior to beginning the work, the authorized employee will be sure that appropriate lock out/tag out equipment is available to isolate the energy source.

3. The authorized employee will ensure that all affected employees have been advised of the following topics:

    a. Scope of Work.

    b. Energy sources.

    c. Energy isolation devices.

    d. Lock out devices.

    e. Tags.

    f. Test procedures.

g. Authorized personnel. Those individuals charged with the responsibility for deenergizing and reenergizing energy sources).

4. The safety meeting will be documented and placed in the job folder for future reference. All employees will sign the Lockout Worksheet prior to starting the work. See Exhibit A for a copy of the Lockout Worksheet.

5. All energized equipment will be shut down before **CONTRACTOR** personnel or its contractors/subcontractors begin work on site. Shut down will take place in the following manner:

   a. The authorized employee will inform the client's representative of the need to shut down the equipment.

   b. The authorized employee, with assistance from the client's representative, will locate all power sources on the process or equipment.

   c. All power sources will be shut down and verified as such by the authorized employee.

   d. When possible, a lockout device will be applied by both parties to isolate each source.

   e. Any necessary testing of equipment will be conducted to ensure that the process or equipment is free of energy.

   f. The authorized employee will attempt to operate the machine to be sure that it remains inoperative. All activation controls will be returned to the "off" position after testing.

   g. The authorized employee will apply a tag that bears the following warning, "DANGER - EQUIPMENT LOCKOUT" along with the authorized employee's name, the date, and the time of the lockout.

   h. The authorized employee will complete the Lockout Worksheet.

   i. Equipment may now be released for work by the authorized employee. No release will be given until all required inspections and testing are performed.

6. Residual energy, i.e. pneumatic/hydraulic power, spring compression, and residual electrical energy in transformers are examples of residual energy that, when unsuspected, may present a greater hazard to the employee. These sources of energy will be identified, located and controlled in the following manner:

   a. Residual electrical energy can be controlled through grounding.

   b. Pneumatic/hydraulic line pressure can be released, allowing the weight to come to a rest.

c. Spring tensions can be relieved.

d. Product lines will be double blocked (panned) and bled to prevent product from being released.

e. A lockout device and tag will be applied and secured by the authorized employee for the duration of the job to prevent residual energy from reaccumulating and creating a hazard to employees.

f. The lockout/tagout will be documented by the authorized employee on the Lockout Worksheet.

7. After all work is completed, the authorized employee will perform the following:

a. The authorized employee will inform everyone that the job is complete.

b. The Lockout Worksheet will be reviewed by the authorized employee with all employees to make sure that all employees are accounted for before re-energizing the equipment.

c. The authorized employee will be sure that all tools, debris or other material that could be placed into motion are removed before the equipment or process is re-energized. All employees will be instructed to stay clear of movable parts of the equipment or process.

d. All residual energy controls will be removed by the authorized employee, as well as all energy isolation lockouts and tags.

e. In the presence of the client's representative, energy will be restored to the equipment or process.

f. All lockout equipment removal will be documented on the Lockout Worksheet by the authorized employee. The Lockout Sheet will be placed in the job file at the end of the shift.

8. All employees must be accounted for before re-energizing equipment. When employees that have worked on the job are absent from the final inspection before re-energizing the equipment, the authorized employee will initiate the following:

a. The lockout sheet will be checked to account for all employees.

b. The authorized employee will obtain a Lockout/Tagout Absent Employee form (See Exhibit B).

c. The authorized employee will appoint employees to look for the individual, paying special attention to high hazard areas where physical harm could result from the start-up of the equipment or process.

d. After a complete search of the equipment or process, and it has been determined by the authorized employee that the employee is not present, all outlying areas surrounding the site will be searched.

e. The area surrounding the site will be guarded to prevent the absent employee from inadvertently entering a hazardous situation.

f. The equipment or process will be cleared for re-energization only by the authorized employee once all of the above conditions are met.

g. A copy of the completed Absent Employee form will be posted conspicuously in the work area, and not removed until the employee has been located. The client's representative will be notified of the situation so that the absent employee does not endanger himself/herself by entering an energized process or equipment.

9. When appropriate, contractors and subcontractors working under **CONTRACTOR**'s direction will be informed of their responsibilities, under the Lockout/Tagout Standard, to provide protection against hazardous energy.

a. When necessary within the scope of work, contractors and subcontractors without such a program, at the discretion of **CONTRACTOR**, will be disqualified from bidding on these projects.

b. Contractors and subcontractors with such a program will submit their program to the Health and Safety Division for review. The contractor or subcontractor program must be comparable or more strict than **CONTRACTOR**'s program.

- Programs found to be insufficient in some areas will be returned, with the requested changes to be made before the program is acceptable for implementation.

- The copy of the program will be returned to the contractor or subcontractor, and will not be duplicated by **CONTRACTOR** or any of its employees.

10. All affected employees will be given training in these procedures prior to performing any lockout/tagout work. This training will be documented and maintained in the employees' training file with the Health and Safety Division.

11. This procedure will be reviewed annually by the Health and Safety Division to ensure that it is relevant to **CONTRACTOR** operations.

DEFINITIONS

Affected Employee: An employee whose job requires operation/use of equipment or machines on which servicing or maintenance is being performed under lockout or tagout, or whose job requires him/her to work in an area in which such servicing or maintenance is being performed. All

CONTRACTOR personnel or subcontractors working in these circumstances are "affected employees".

Authorized Employee: A person who locks out or implements a tagout system procedure on machines or equipment in connection with the servicing or maintenance on that machine or equipment. An authorized person and an affected employee may be the same person when the affected employee's duties also include performing a lock out or tag out on a machine or equipment.

Capable of being Locked Out: An energy isolating device will be considered to be capable of being locked out either if it designed with a hasp or other attachment or integral part to which, or through which, a lock can be affixed, or if it has a locking mechanism built into it. Other energy isolating devices will also be considered to be capable of being locked out, if lockout can be achieved without the need to dismantle, rebuild, or replace the energy isolating device or permanently alter its energy control capability.

Energized: Connected to an energy source or containing residual or stored energy.

Energy Isolating Device: A mechanical device that physically prevents the transmission or release of energy, including but not limited to the following: a manually operated electrical circuit breaker; a disconnect switch; a manually operated switch by which the conductors of a circuit can be disconnected from all ungrounded supply conductors, and, in addition, no pole can be operated independently; a slide gate; a slip blind; a line valve; a block; and, any similar device used to block or isolate energy. The term does not include a push button, selector switch, and other control circuit type devices.

Energy Source: Any source of electrical, mechanical, hydraulic, pneumatic, chemical, thermal, or other energy.

Lockout: The placement of a lockout device on an energy isolating device, in accordance with an established procedure, ensuring that the energy isolating device and the equipment being controlled cannot be operated until the lockout device is removed.

Lockout Device: A device that utilizes a positive means such as a lock, either key or combination type, to hold an energy isolating device in the safe position and prevent the energizing of a machine or equipment.

Tagout: The placement of a tagout device on an energy isolating device, in accordance with an established procedure, to indicate that the energy isolating device and the equipment being controlled may not be operated until the tagout device is removed.

Tagout Device: A prominent warning device, such as a tag and a means of attachment, which can be securely fastened to an energy isolating device in accordance with an established procedure, to indicate that the energy isolating device and the equipment being controlled may not be operated until the tagout device is removed.

Exhibit A

LOCKOUT WORKSHEET

LOCKOUT WORKSHEET

Job Location: _____ Project Manager: _____

Date: _____ Time: _____ a.m./p.m.

Description of Lockout to be Performed: _____

Energy Source(s): _

Pre-Work Safety Meeting Minutes: _____

Lockout Hardware Used: _____

Energy Restoration (Check each as you Progress):	Time Completed
___ All personnel accounted for and in the clear.	_____
___ Point(s) of operation free of tools and debris.	_____
___ Points of operation restraints removed.	_____
___ Lockout hardware removed.	_____
___ Personnel clear of points of operation.	_____
___ Energy restored.	_____
___ Equipment operation verified, client's rep on site.	_____
___ Lockout terminated.	_____

Employees' Signatures: _____

Exhibit B

LOCKOUT/TAGOUT ABSENT EMPLOYEE FORM

LOCKOUT/TAGOUT ABSENT EMPLOYEE FORM

NOTICE

Upon completion of work performed under lockout/tagout conditions, the following employee(s) listed below could not be located or accounted for:

_____

_____

_____

All attempts have been made to locate this employee at the jobsite. It has been verified that this employee is not in the vicinity of the hazardous energy source and will not be affected by the startup of equipment which was under lockout conditions.

_____ _____

Signature of Authorized Employee Date

APPENDIX I

CONFINED SPACE/HOT WORK PERMITTING PROCEDURE

1.0 INTRODUCTION

Welding, cutting, brazing and other hot work operations are a necessary part of the industrial world, both in manufacturing and construction. Too often, the people who hire, use, or supervise the use of these processes don't understand the hazards behind them, which can result in loss of life, property, or both, by fire and explosion.

Any material that is combustible or flammable is susceptible to ignition by heat-producing activity. Common materials such as floors, partitions, roofs, wooden members, paper, textiles, plastics, chemicals, flammable liquids and gases, and grass or brush are very likely to become involved in fire during hot work operations if adequate precautions are not taken.

Hot work is any work that requires the use of tools/equipment that have the potential to produce temperatures which could reasonably be expected to ignite flammable/combustible material or atmospheres in the vicinity of the work area. These tools/equipment have the capability of producing sparks, open flames, heat, or an electrical arc during use. Hot work is not limited to just welding, cutting and brazing, but also grinding, sawing (metal to metal) and chipping operations.

Confined spaces are spaces that can be bodily entered but are not meant for human occupancy. Confined space hazards exist if the potential for hazardous or explosive atmospheres and/or oxygen deficient hazards exist. Other hazards that could exist include mechanical sources and falls. Two types of confined spaces exist: permit required and non-permit required.

2.0 PURPOSE

To provide **CONTRACTOR** employees, who oversee hot work performed and confined space entry on projects, with a standard permitting and safety procedure to prevent injury or loss of life and property. To be used as a reference in instances where hot work/confined space entry is performed and as a permit procedure in instances where one is not available.

3.0 SCOPE

This procedure will apply to all **CONTRACTOR** employees who oversee hot work on projects utilizing welding, cutting, brazing, grinding, chipping, portable heaters, and other potential heat-producing equipment for field/facility activities. This procedure is also to be followed for all confined space entry situations. This procedure will apply to all contractors or subcontractors working under **CONTRACTOR** that do not have an adequate Permitting Procedure in place with the company in which they are currently employed. All **CONTRACTOR** employees involved with confined space entry will be properly trained for the role and duties performed. Training will consist of hands-on training with **CONTRACTOR**'s confined space entry equipment including harnesses, retrieval equipment, air-line respirators and monitoring equipment. Certification that the training was satisfactorily complete will be provided and documentation maintained.

4.0 PROCEDURE

1. Hazard Identification

a. The Project Manager will identify all work that requires tools, equipment, or operations that may produce sparks or temperatures that are sufficient to ignite flammable/combustible materials or atmospheres.

b. The Project Manager will determine if a confined space entry is required and determine if the entry requires a permit. Any situation that has the potential to produce hazardous atmospheres or deplete oxygen will require a permit.

c. This information will be included in the Site Specific Health and Safety Plan to be reviewed with the Health and Safety Division prior to starting the project.

d. The Project Manager will determine if the work can be performed without the use of hot work, i.e. alternative method to reduce the hazard.

e. The Project Manager should consult the Health and Safety Division if the Project Manager has questions on hazard determination. The Project Manager will act as the Entry Supervisor.

f. The Safety Director will review entry with the Project Manager and review this program at least annually to make sure the Program is effective and enforced. Copies of completed permits will be retained for at least one year.

g. The permit program will be reviewed to determine if it is adequate for the projects conducted. Incident reports will be reviewed, employee issues raised and entries reviewed. The permit program will be evaluated to determine if all hazards were adequately identified and evaluated. Additional protective equipment will be purchased, if necessary, for future entries if the review process shows that all hazards were not properly controlled. This review will be part of annual confined space training.

2. Area Preparation

a. The following preparation for the work area will be made once it is determined that hot work is necessary:

- All flammable/combustible materials will be relocated at least 35 feet away from the work area.

- All combustible materials that cannot be reasonably removed from the area will be covered with a fire blanket.

- An appropriate fully charged fire extinguisher and/or charged fire hose will be available at the work area before, during and 1/2 hour after hot work procedures have ended.

- All safety equipment will be on-site and functional.

The confined space entry area will be appropriately marked and barricaded to prevent impact from external hazards and vehicles. Ground level entries will be ringed with a toe board to prevent objects from inadvertently being dropped into the space.

3. Pre-Work Safety Meeting

a. The Project Manager will assure that a pre-work safety meeting has been provided to the crew prior to any hot work/confined space entry being performed. Individuals involved with confined space entry will be identified as the authorized entrant(s), attendant and the entry supervisor. Additional individuals may be designated to conduct monitoring for multiple entries. This meeting will include, but not be limited to:

- Permitting conditions (environmental conditions, type of work to be performed). This would include reviewing the results of the initial monitoring of the test results, ventilation requirements, potential hazards and continuous testing procedures.

- Personnel authorized to sign-off on the permit. All personnel involved with the confined space entry must sign the permit and acknowledge the hazards expected to be encountered.

- Location of the permit. (Must be conspicuously posted.)

- Type of monitoring required. Employees involved with the entry may request additional monitoring or increasing monitoring frequency at any time.

- Designation of attendant and discussion of duties.

- Returning completed permit to Project Manager or client when work is complete and project has concluded.

b. During the pre-work safety meeting the authorized entrants will be identified and the entry procedure reviewed. The attendant will be specified and the monitoring and communication procedures reviewed. The entry will be reviewed with the designated entry supervisor before entry. The attendant will be responsible for conducting the air monitoring during the entry and providing results to the entrants and entry supervisor. The designated positions will be posted on the entry permit.

c. The entry supervisor will be responsible for meeting with the client prior to entry to identify if other contractors or client personnel will be working in close proximity to the confined space entry. The entry supervisor will coordinate entry activities in order to make sure the other work does not impact the entry or endanger entry personnel. The entry supervisor will attend scheduled project meetings with the

client and other contractor representatives in order to properly coordinate the entry with other projects.

d Initial air-monitoring results will be reviewed with the entry supervisor and the authorized entrants prior to entry. Air-monitoring procedures and alarm levels will also be reviewed. Ventilation of the space will be initiated before entry and periodic monitoring conducted prior to entry to verify the ventilation is adequate. Monitoring will be performed throughout entry by the attendant and entrants will wear dosimeters with alarms to conduct monitoring during the entry.

e The Project Manager will meet with the client to arrange for adequate rescue services from the client, if available, or from outside rescue operations. The Project Manager will discuss rescue procedures with representatives of the rescue operation and allow the rescue team to examine the area, practice the rescue and decline to act as the rescue team if they feel they are not adequately staffed or equipped. The entry cannot be conducted until adequate rescue services are provided.

f The Project Manager will meet with the client to discuss other projects or contractors that could interfere with **CONTRACTOR**'s confined space work. **CONTRACTOR** will coordinate the entry to have minimal impact on other contractors in the area and to make sure **CONTRACTOR** personnel are not endangered by other contractors work.

4. Permit Completion

The Confined Space Work Permit (see Exhibit C) will be completed by the Project Manager prior to beginning work each day. The permit will not be considered valid until all personnel involved with the entry have reviewed and signed the entry permit. The entry supervisor will review each permit at the completion of the entry to determine if monitoring and safety procedures are adequate for this project. The permit will be modified if appropriate. The permit will be conspicuously posted at the site of the work.

5. Attendant

A designated Attendant will be present to observe the hot work/confined space operation. The Attendant will maintain contact with personnel and conduct air monitoring. The Attendant will oversee safety retrieval systems and initiate the alarm if rescue is necessary. The Attendant will not perform entry rescue or enter the confined space unless relieved of duty by another authorized Attendant and is equipped with maximum respirator protection. The Attendant will monitor only one confined space entry at one time.

6. Entrant

Entrants will be identified on the permit and instructed on the purpose for the entry of the confined space. Entrants are responsible for adhering to the permit requirements and communicating with the Attendant. Once work tasks are completed the Entrant is responsible for removing equipment, sampling devices and exiting the confined space safely.

7. Atmospheric Monitoring

a. When cutting, grinding, heating or welding surfaces coated with epoxy finishes or paint, or when cutting certain metals with a welding torch, toxic fumes or vapors can be emitted in the process. In these instances, monitoring may be required under the OSHA Standard. Therefore, it is the responsibility of the Project Manager to notify the Health and Safety Coordinator of these coatings and have them sampled (if unknown) to determine what type of monitoring will be required.

b. Occasionally, a "liner" will be adhered to the inside of a metal duct or tank. When hot work will be performed on such material, the liner will be removed at least 4 inches to each side of the cut to prevent toxic vapors from being emitted, or fire from occurring.

c. After moving all flammable materials out of the work area, the area will be monitored with a Combustible Gas Meter immediately before hot work takes place. LEL readings at or above 5% will necessitate that the area be ventilated before hot work operations begin. **Hot work should not proceed if readings of five percent or below cannot be achieved.**

d. All area monitoring must be performed a minimum of once every 10 minutes when the hot work area is located in a low lying area down slope from a storage area containing flammable and/or combustible liquids.

e. Hot work performed in confined spaces requires that contaminant specific air monitoring be performed. Contact the Health and Safety Division to determine the type of air monitoring required for the contaminant.

f. Hot work performed on containers that previously contained flammable liquids (i.e. underground storage tanks) will not be performed until the Health and Safety Division has been contacted and has approved the work to be performed. **CONTRACTOR**'s Site Specific Health and Safety Plan for Flammable and Combustible Underground Storage Tank Removals contains detailed procedures for cleaning, inerting and cutting these types of containers.

g. Entrants and the attendant will continuously evaluate the permit-required space to determine if additional monitoring or more frequent monitoring is necessary. The permit may be revoked or modified accordingly. All entrants will leave the space if unsafe conditions are observed or measured. The permit will be invalidated and reviewed with the supervisor before re-entry is allowed. Additional monitoring will be performed at the request of employees or attendants.

8. Prohibitive Circumstances

a. Hot work will be prohibited if any of the following conditions exist:

- Oxygen levels greater than 21%.
- LEL greater than 5%.
- Organic vapor concentration greater than Permissible Exposure Limits depending on contaminant (ventilation may reduce this hazard).
- Confined space entry will not be permitted if oxygen levels are below 19.5% or if the LEL is > 10%. Individual hazardous constituents will be monitored and appropriate levels of respiratory protection will be issued.

9. Conditions of Permit Validity

a. A permit is not valid unless all necessary inspections and air monitoring (if required) have been performed and all required signatures appear on the permit.

b. Work permits will be judged as valid for the following time durations:

- Shift or significant change in personnel.
- Duration of the hot work.
- When atmospheric changes dictate ceasing the operation, abate the hazard and reinspect the work area before completing another permit.

c. Permits are valid up to one day and new permits must be completed each day or whenever the permit conditions change.

d. The local Fire Department or client emergency services will be contacted prior to entry into confined spaces. They will be notified of the reason for entry and be requested to be available for rescue and administrating first aid. If emergency rescue cannot be provided within three minutes **CONTRACTOR** will not conduct the entry. The permit program will be reviewed to determine if it is adequate for the projects conducted. Incident reports will be reviewed, employee issues raised and entries reviewed. The permit program will be evaluated to determine if all hazards were adequately identified and evaluated. Additional protective equipment will be purchased, if necessary, for future entries if the review process shows that all hazards were not properly controlled. This review will be part of annual confined space training.

e. **CONTRACTOR** will coordinate the entry with client and/or other contractors present at the job site. Work will be evaluated to determine the impact by non-**CONTRACTOR** staff on the work being conducted.

f. If conditions change and **CONTRACTOR** employees are at risk the permit will be considered invalid.

g. The permit will be canceled once the project is complete or conditions change that warrant leaving the site. A new permit will be issued for future entries once a permit has been canceled.

10. Training and Program Review

All workers involved with confined space entry will receive training relative to their role on the project. Since **CONTRACTOR** conducts confined space entry infrequently training will be conducted prior to each project in order to refresh **CONTRACTOR** employees on the use of the equipment, monitoring procedures and the confined space entry program. The program will be reviewed annually or when new equipment is acquired. All completed permits will be reviewed and critiqued at the completion of each entry. The entrants and attendants will be interviewed after entry to determine if there were significant problems or concerns.

DEFINITIONS

Fire Blanket: Blanket made of fire-resistant material, such as NOMEX or KEVLAR (**not asbestos**), or treated wool, which can be used to cover combustible materials to prevent their ignition from sparks, flames or heat during hot work.

Attendant: Person who observes the confined space activities/hot work to ensure that ignition of the surrounding material does not occur. The Attendant will be equipped with a fully charged, suitable fire extinguisher and/or charged fire hose at the work area at the time of the hot work. The Attendant will not be assigned to any other duties.

Confined Space: Confined spaces are spaces that can be bodily entered but are not meant for human occupancy.

Entrant: Person who is trained and authorized to enter a confined space. Entrants are required to review air-monitoring data prior to entry into a PRCS and understand the hazards.

Exhibit C A

CONFINED SPACE PERMIT

CONTRACTOR

Confined Space Entry Permit

- Location of Confined Space _____ Date/time _____
  Purpose of entry _____ Duration _____

  AUTHORIZED BY _____ **EXPIRES ON** _____

Attendant _____

Authorized Entrants _____

Measures for Isolating Equipment	**YES**	**NO**	Measures for Isolating Equipment	**YES**	**NO**
LOTO			Protective clothing		
Lines capped			Communications equipment		
Purging			Hot work permit needed		
Ventilation			Other PPE		
Secure area			Special conditions		
Harness and retrieval system					
Fire extinguishers					
Air line system					
SCBAs					
Other Respirators					

Atmospheric Monitoring

Tests to be Taken	yes	no	Acceptable Entry Conditions	Test # Date: Time:	1	2	3	4	5	6	7	8	9	10
Oxygen			19.5-23.5%											
LEL			<10%											
CO			<25 ppm											
H_2S			<5 ppm											
Other														

Individual conducting test: _____

Supervisor authorizing entry _____

Instruments used:

Instrument(s) name	Type	Serial #

Standby persons: _____

Emergency and rescue contact: _____

Entry supervisor approval to conduct entry _____ Date/time _____

APPENDIX J

INCIDENT REPORTING

1.0 ACCIDENT AND INCIDENT REPORTING

It is important that all accidents and incidents that result in injury, illness, or medical treatment be reported immediately. Reporting consists of calling the Teleclaim Center and providing information on the injury. The Teleclaim Center will complete the first report of injury and file it accordingly. Copies will be sent to the Safety Director. Supervisors are required to complete the Supervisor's Report of Accident included in this section. It is **CONTRACTOR**'s responsibility to investigate each incident, file appropriate paperwork and conduct a follow-up analysis of each incident.

2.0 REPORTING PHONE NUMBERS

Safety and Health Director:	XXX-XXX-XXXX
Human Resources Director:	XXX-XXX-XXXX

3.0 FIRST AID AND MEDICAL TREATMENT

CONTRACTOR provides a First Aid Kit on each site and in each Company vehicle. It is there for use in the treatment of minor scratches, burns, headaches, nausea, etc. Each employee should verify the location of the nearest first aid kit and should make use of it whenever needed. Each kit is fully stocked and restocked monthly by an outside vendor. The kit includes bandages, over the counter medications, disinfecting supplies and topical ointments. The user of each kit is responsible for contacting the vendor to replace items used or submitting the kit to **CONTRACTOR** for replacement. Kits are to be inventoried by the Project Manager before being sent in the field. Only completely stocked kits are to be brought into the field. The kits are maintained in a weatherproof container and in accordance with ANSI Standard Z308.1-1998. The first aid supplies in each kit are included in Exhibit D.

Any work related injury or illnesses that requires professional medical assistance should be reported immediately. Failure to promptly notify of a work related injury could make the claim questionable and subject to stricter review. The nearest medical center or hospital will be identified for each project. The phone number and location for this center will be determined before commencing field activities and be included in the Health and Safety Plan. The phone numbers will be posted by Health and Safety Director or the Project Manager and available to all employees in order to provide prompt response to all injuries. The Project Manager will contact the nearest medical facility to determine the facility's capabilities and verify that the facility is willing to provide emergency medical services.

4.0 FIRST AID

Each **CONTRACTOR** project will have at least one certified CPR/first aid trained person on site at all times. All Project Managers and anyone acting as the on-site Health and Safety Officer must be current in First Aid/CPR. First aid training sponsored by the American Red Cross is acceptable and must be renewed every three years. CPR training must be renewed annually. Other first aid training will be reviewed to see if it is comparable to the Red Cross training.

1. Minor First Aid Treatment

First aid kits are stored in each company vehicle. If an injury is sustained or results in minor first aid treatment:

a. Inform your supervisor.
b. Administer first aid treatment to the injury or wound.
c. If a first aid kit is used, indicate usage on the accident investigation report.
d. Access to a first aid kit is not intended to be a substitute for medical attention.
e. Provide details for the completion of the accident investigation report.

2. Non-Emergency Medical Treatment

For non-emergency work-related injuries requiring professional medical assistance, management must first authorize treatment. If you sustain an injury requiring treatment other than first aid:

a. Inform your supervisor.

b. Proceed to the posted medical facility. Your supervisor will assist with transportation, if necessary.

c. Provide details for the completion of the accident investigation report.

3. Emergency Medical Treatment

If you sustain a severe injury requiring emergency treatment:

a. Call for help and seek assistance from a co-worker.

b. Use the emergency telephone numbers and instructions posted next to the telephone in your work area to request assistance and transportation to the local hospital emergency room.

c. Provide details for the completion of the accident investigation report.

d. The Project Manager will identify an ER provider for each long-term project for emergency medical services. The phone number will be posted at each job site.

4. First Aid Training

Each employee will receive training and instructions from his or her supervisor on our first aid procedures.

5. Wounds

a. Minor - Cuts, lacerations, abrasions, or punctures

- Wash the wound using soap and water; rinse it well.
- Cover the wound using clean dressing.

b. Major - Large, deep and bleeding

- Stop the bleeding by pressing directly on the wound, using a bandage or cloth.
- Keep pressure on the wound until medical help arrives.

6. Broken Bones

a. Do not move the victim unless it is absolutely necessary.

b. If the victim must be moved, "splint" the injured area. Use a board, cardboard, or rolled newspaper as a splint.

7. Burns

a. Thermal (Heat)

- Rinse the burned area, without scrubbing it, and immerse it in cold water; do not use ice water.

- Blot dry the area and cover it using sterile gauze or a clean cloth.

c. Chemical

- Flush the exposed area with cool water immediately for 15 to 20 minutes.

8. Eye Injury

a. Small particles

- Do not rub your eyes.

- Use the corner of a soft clean cloth to draw particles out, or hold the eyelids open and flush the eyes continuously with water.

b. Large or stuck particles

- If a particle is stuck in the eye, do not attempt to remove it.
- Cover both eyes with bandage.

c. Chemical

- Immediately irrigate the eyes and under the eyelids, with water, for 30 minutes.

9. Neck And Spine Injury

If the victim appears to have injured his or her neck or spine, or is unable to move his or her arm or leg, do not attempt to move the victim unless it is absolutely necessary.

10. Heat Exhaustion

a. Loosen the victim's tight clothing.
b. Give the victim "sips" of cool water.
c. Make the victim lie down in a cooler place with the feet raised.

5.0 WORKERS' COMPENSATION

Every state has a Workers' Compensation Law to provide benefits to employees for lost wages and medical bills resulting from a work related injury or illness. You are covered under Workers' Compensation. You may request Workers' Compensation benefits from your supervisor. Qualification for benefits is determined by the state, not **CONTRACTOR**. Employees are responsible for keeping appointments, following doctors' instructions on and off the job, maintaining good communication with your supervisor, and to fully cooperating with all instructions given.

Workers' Compensation provides wages at a <u>lower pay scale</u> than what you may earn by working.

1. <u>Employee Safety Rights</u>

Employees have several important rights concerning safety, which are protected by federal, state and local laws that you should be aware of. They are:

a. The right to a safe work-place free from recognized hazards.

b. The right to request information on safety and health hazards in the workplace, precautions that may be taken, and procedures to be followed if an employee is injured or exposed to toxic substances.

c. The right to know about the hazards associated with the chemicals you work with, and the safety procedures.

d. The right to question any instruction which may violate a safety rule, which puts someone in unnecessary danger of serious injury.

e. The right of freedom from retaliation for demanding safety rights.

2. Safety Responsibilities

Employees also have some important responsibilities concerning safety. These are:

a. The responsibility of reporting all injuries and illnesses to your supervisor, no matter how small.

b. The responsibility of always following the safety rules for every task performed.

c. The responsibility of reporting any hazards seen.

d. The responsibility of helping co-workers recognize unsafe actions or conditions.

e. The responsibility of asking about the safety rules.

3. Employee Safety Rules

It is impossible to list or include all safety rules for all the possible tasks. But the following rules have been prepared to help the employee avoid hazards, which may cause injury while doing some of the more common tasks. Failure to follow safety rules and /or safe practices will result in disciplinary action, up to and including termination.

6.0 GENERAL SAFETY RULES

a. Read and follow the safety notices and other information that is posted.

b. Observe and follow all safety instructions, signs, and operation procedures.

c. Help your fellow employee when they ask for assistance or when needed for their safety.

d. Never participate in "horseplay". Horseplay that results in injury is often not covered by Workers' Compensation.

e. Clean up spills immediately.

f. Report all unsafe conditions, hazards, or equipment immediately. Make sure other people are warned of the problem so that they may avoid it.

g. Wear personal protective equipment as required to reduce injury potential. Use gloves, safety glasses, back support belts, etc., as necessary.

h. Never stand on chairs, furniture, or anything other than an approved ladder or step stool.

i. Never use intoxicating beverages or controlled drugs before or during work. Prescription medication should only be used at work with your Doctor's approval.

1. Fire Safety

a. Report all fire hazards to your supervisor immediately.

b. Fire fighting equipment shall be used only for fire fighting purposes.

c. Smoking is not permitted at any time in the areas where "No Smoking" signs are posted.

d. Do not block off access to fire fighting equipment.

e. Keep doors, aisles, fire escapes and stairways completely unobstructed at all times.

f. In the case of a fire, your first consideration must be the safety of all persons, then attention should be directed to the protection of property.

g. Change clothes immediately if they are soaked with oil, gasoline, paint thinner or any other flammable liquid.

h. Know how to report a fire and how to turn on a fire alarm.

i. Know the location of all fire extinguishers, and how to use them.

j. Know the fire exits to be used in an emergency.

7.0 HAND TOOL SAFETY

a. Wear protective equipment necessary for the job you are performing. Discuss any required safety equipment with your supervisor as changes occur.

b. Defective tools must not be used.

c. Do not carry sharp hand tools in clothing.

d. Check all wiring on electric hand tools for proper insulation and 3-prong plug grounding.

e. **Hammers:** Use eye protection at all times!

f. **Screwdrivers:** Use the right size and type of screwdriver for the job. Do not use a screwdriver as a chisel.

g. **Wrenches:** In using any wrench, it is better to pull than to push. If you have to push, use your open palm. Use the proper wrench for the job.

h. **Handsaws:** Saws that are sharp and rust free are less likely to bind or jump. Insure the object being cut is secured tightly to a flat surface.

8.0 PROTECTIVE EQUIPMENT

a. Approved eye protection (safety glasses with side shields, goggles, etc.) must be worn at all times when assigned any certain job classifications. It is important to check with your supervisor to assure compliance.

b. Moccasins and shoes with open toes or high heels are not permitted.

c. Wear protective clothing and equipment as required by your job classification to protect against hazards at hand. These include, but are not limited to, hard hats, steel-toed shoes, gloves, fall safety harnesses, earplugs, etc.

9.0 MATERIAL HANDLING SAFETY RULES

a. When lifting, lift properly. Keep the back straight, stand close to the load, and use your leg muscles to do the lifting, keeping the load close to the body. Never twist your upper body while carrying a load.

b. When lifting heavy objects, utilize a two-wheeled dolly, or, ask for assistance from another employee.

c. Inspect the object you are going to lift for sharp corners, nails, black widow spiders, or other things that may cause injury.

d. Use gloves when handling rough or sharp materials.

10.0 HOUSEKEEPING

a. Do not place materials in aisles, stairways, or any designated path of travel.

b. Stack material at a safe height so that material will not fall if bumped. Insure heavy loads have proper support, and make sure there is no overhanging or irregular stacking of material.

c. Place all trash or scrap in places provided. Clean up all spills immediately.

d. Report worn or broken flooring, stair treads, handrails, furniture, or other office equipment.

e. Smoking is permitted only in designated areas. Use ashtrays for disposing of butts. Do not throw butts on the floor.

Supervisor's Report of Accident

Supervisor's Name: _____

Basic Rules for Accident Investigation

- Find the cause to prevent future accidents - Use an unbiased approach during investigation
- Interview witnesses & injured employees at the scene - conduct a walkthrough of the accident
- Conduct interviews in private - Interview one witness at a time.
- Get signed statements from all involved.
- Take photos or make a sketch of the accident scene.
- What hazards are present - what unsafe acts contributed to accident
- Ensure hazardous conditions are corrected immediately.

Date & Time		**Location**	
Tasks performed		**Witnesses**	
Resulted in	**__ Injury __ Fatality** **__Property Damage**	**Property Damage**	
Injured		**Injured**	
Describe Accident Facts & Events			

Supervisor's Root Cause Analysis	*Check ALL that apply to this accident*		
Unsafe Acts		**Unsafe Conditions**	
Improper work technique		Poor Workstation design	
Safety rule violation		Unsafe Operation Method	
Improper PPE or PPE not used		Improper Maintenance	
Operating without authority		Lack of direct supervision	
Failure to warn or secure		Insufficient Training	
Operating at improper speeds		Lack of experience	
By-passing safety devices		Insufficient knowledge of job	
Protective equipment not in use		Slippery conditions	
Improper loading or placement		Excessive noise	
Improper lifting		Inadequate guarding of hazards	
Servicing machinery in motion		Defective tools/equipment	
Horseplay		Poor housekeeping	

Drug or alcohol use		Insufficient lighting	
Unsafe Acts require a written warning and re-training before the Employee resumes work			
Date		**Date**	
Re-Training Assigned		Unsafe Condition Guarded	
Re-Training Completed		Unsafe Condition Corrected	
Supervisor Signature		**Supervisor Signature**	

Accident Report Review

Supervisor _____ Date _____

Department Superintendent _____ Date _____

Safety Manager _____ Date _____

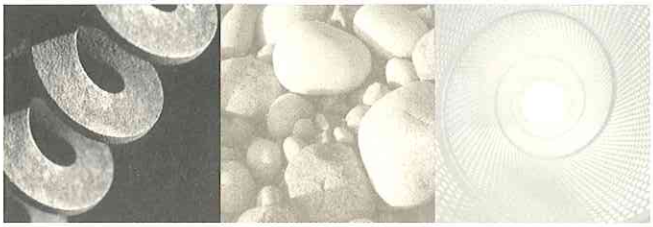
Plant Manager _____ Date _____

EXHIBIT D

First Aid Kits

Each first aid kit is in a weather proof container and contains the following:

Item	Amount
Ear Plugs	2 pair
Band-aids	2 boxes
Sterile pads	5 2”x2”
Oval eye pads	2
Tylenol	10
Burn cream	1 tube
Tweezers	1 each
Scissors	1 each
Triangular bandage	1
Antiseptic wipes	1 box
Ammonia inhalants	1 box
Flexible gauze	1 roll
First aid guide	
Latex gloves	2 pair



GEI Consultants

Geotechnical
Environmental and
Water Resources
Engineering

Community Air Monitoring Program Work Plan

Bay Shore/Brightwaters Former MGP Site
Operable Unit 3
LIRR Excavation/Temporary Track Relocation
Interim Remedial Measure

Suffolk County, New York
NYSDEC Consent Index No. D1-0001-98-11

Submitted to:
National Grid, Inc.
175 East Old Country Road
Hicksville, NY 11801

Submitted by:
GEI Consultants, Inc.
455 Winding Brook Dr., Suite 201
Glastonbury, NY 06033
860-368-5300

June 5, 2009
061140-11-2003

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Executive Summary

This Community Air Monitoring Program (CAMP) Work Plan has been developed to provide procedures for measuring, documenting, and responding to potential airborne contaminants during Phase I and Phase II excavation activities associated with the Long Island Railroad (LIRR) excavation activities and temporary track relocation at Operable Unit No. 3 (OU-3) of the Bay Shore/Brightwaters former Manufactured Gas Plant (MGP) Site. The procedures in this CAMP focus on air monitoring techniques and contingency measures designed to mitigate potential airborne contaminants. This CAMP Work Plan is based on the CAMP guidelines established by the New York State Department of Health (NYSDOH) in the New York State Department of Environmental Conservation (NYSDEC) *Draft DER-10 Technical Guidance for Site Investigation and Remediation* (DER-10) (December 2002). Site activities related to excavation activities are expected to take place from October 2009 through March 2010 for Phase I and from April 2010 through June 2010 for Phase II.

The CAMP provides Air Monitoring Procedures, Alert Limits, Action Limits, and Contingency Measures, if Action Limits are approached. An Alert Limit is a contaminant concentration that triggers contingent measures. An Alert Limit serves as a screening tool to trigger contingent measures if necessary, to assist in minimizing off-site transport of contaminants during remedial activities. An Action Limit is a contaminant concentration that triggers work stoppage and implementation of contingent measures to mitigate potential airborne contaminants prior to resuming work activities.

During times of excavation activity and potential related ground intrusive activities, perimeter air monitoring will be conducted using a combination of fixed-station, moveable tripod-mounted, and "walk-around" air monitoring equipment (as appropriate). Monitoring will be performed for total volatile organic compounds (VOC), dust, and odors along the Site perimeter. The Contingency Plan defines Alert Limits, Action Limits, and specific contingency measures to be implemented. The response actions, potentially including work stoppage and work area controls by various methods, are intended to prevent or significantly reduce the migration of airborne contaminants from the Site.

GEI will implement the CAMP and will report any exceedance of Alert and Action Limits to the excavation contractor, National Grid, and NYSDEC. The excavation contractor will be responsible for enacting contingency measures to respond to the exceedance of Alert and Action Limits as they may occur. GEI will provide data

summary reports to the excavation contractor, National Grid, and NYSDEC each week during excavation activity.

1. Introduction

The New York State Department of Health (NYSDOH) Generic Community Air Monitoring Plan (CAMP), as presented in New York State Department of Environmental Conservation's (NYSDEC) document *Draft DER-10 Technical Guidance for Site Investigation and Remediation*, recommends that real-time monitoring for total volatile organic compounds (TVOC) and particulates (i.e. dust) be conducted at the downwind perimeter of each designated work area during ground intrusive activities at contaminated sites. As such, this work plan describes the proposed air monitoring means and methods that will be implemented during Phase I and Phase II excavation activities associated with the Long Island Railroad (LIRR) excavation activities and temporary track relocation at Operable Unit No. 3 (OU-3) of the Bay Shore/Brightwaters former manufactured gas plant (MGP) site. A site location map is shown on Figure 1.

The purpose of the Air Monitoring Plan is to provide early detection in the field of potential short-term emissions. The Plan will be conducted in accordance with the generic NYSDOH CAMP.

The objectives of the CAMP are as follows:

- Provide an early warning system to alert the excavation contractor, NYSDEC, and National Grid that concentrations of TVOCs or dust in ambient air are approaching Action Limits due to Site activities.
- Provide potential contingency measures to be enacted by the excavation contractor and related contractors that are designed to reduce the off-site migration of contaminants if established Action Limits are approached or exceeded.
- Determine whether construction controls are effective in reducing ambient air concentrations to below Action Limits and make appropriate and necessary adjustments.
- Develop a permanent record that includes a database of perimeter air monitoring results, equipment maintenance, calibration records, and other pertinent information.

1.1. Roles and Responsibilities

GEI will implement the monitoring and reporting components of this CAMP under contract with National Grid. The excavation contractor is responsible for the selection and implementation of appropriate contingency measures that will mitigate the off-site migration of contaminants in response to Action Limits being approached or exceeded. The remainder of this section specifies the roles and responsibilities of each entity relative to the CAMP. A communication flowchart is shown on Figure 6 with each entity and lines of communication for the Community Air Monitoring Program.

1.1.1 GEI Consultants, Inc.

The scope of GEI's activities will be limited to CAMP monitoring and reporting used for the CAMP. GEI is responsible for the Health and Safety of their employees. GEI's CAMP roles and responsibilities are as follows:

- GEI will monitor and record total volatile organic compound (TVOC) and dust at various locations around the site as described in the following sections of this CAMP Work Plan.
- On a daily basis, GEI will communicate to the following entities whether TVOCs or dust exceeded Alert Limits or Action Limits specified in Section 2.1, and suggest corrective actions required to address the situation. GEI will convey the CAMP results to the entities listed below and inform them if the Alert or Action Limits have been exceeded.GEI will direct contractors at the site to take action if warranted. .

  Excavation contractor
  Mr. Tom Cawley
  Creamer Environmental, Inc.
  215 Union Street
  Hackensack, NJ 07601
  (201) 698-3300

  - **New York State Dept. of Environmental Conservation**
    Mr. Amen Omorogbe – Project Manager
    (518) 402-9662
    MGP Remedial Section, Division of Environmental Remediation
    Bureau of Western Remedial Action, 11th Floor
    625 Broadway
    Albany, New York 12233-7017

- **National Grid**
  Mr. William Ryan – Project Manager
  Mobile: (516) 790-7660
  Office: (516) 545-2586
  175 East Old Country Road
  Hicksville, NY 11801

- GEI will provide, maintain, and operate the equipment utilized to implement the CAMP.
- GEI will provide data summary reports to National Grid and NYSDEC each week during excavation activity. The reports will identify any potential Alert or Action Limit exceedances and will include data summary reports for all TVOC and dust data collected.

1.1.2 Excavation contractor

The excavation contractor is the lead contractor responsible for site activities pertaining to the Phase I and Phase II excavation areas and related removal activity. The excavation contractor will be responsible for taking contingent actions in conjunction with National Grid in response to Alert and/or Action Limit exceedances. The excavation contractor is responsible for the Health and Safety of their employees.

1.1.3 National Grid

National Grid has the responsibility to provide mitigation services related to the release of MGP-related vapors in excess of CAMP Alert and/or Action Limits. National Grid is also ultimately responsible for the remediation of the Site under an approved work plan with NYSDEC.

1.1.4 New York State Department of Environmental Protection

NYSDEC is responsible for the environmental regulatory enforcement for all activities conducted at the site including compliance with this CAMP, stormwater runoff mitigation (erosion and sediment control), and all environmental and remediation regulations, policies, and guidance applicable to the site. NYSDEC may provide on-site oversight personnel for the work being conducted.

2. Sampling and Analytical Procedures

This section of the CAMP presents a detailed description of the air monitoring sampling and analytical procedures, including data management that will be used during ground intrusive site activities. The intent of the real-time monitoring program is to provide early detection in the field of short-term emissions and off-site migration of site-related TVOCs and dust.

Real-time sampling methods will be utilized to determine ambient air concentrations during the project. Monitoring for TVOC and respirable particulate matter (PM-10) will occur at up to six locations. Wind direction will be monitored under all monitoring approaches. A meteorological station will be established if a centralized data logger system is implemented. Supplemental walk-around perimeter monitoring for TVOC and PM-10, will occur along the perimeter of the project site shown in Figures 2a and 2b on an as-needed basis. In the event of an exceedance of an Alert Limit or Action Limit for TVOC or PM-10, GEI will compare upwind to downwind to determine if site activity is causing the Alert Limit or Action Limit. The air monitoring procedures and equipment are detailed below.

2.1 Alert Limit and Action Limit

An Alert Limit is a contaminant concentration that when exceeded triggers contingent measures. For example, if high concentrations of dust are detected on the Site, contingent measures such as the use of spraying water may be required to reduce the concentrations to below Action Limits. An Action Limit is a contaminant concentration that when exceeded requires a work stoppage and implementation of contingent measures to mitigate that condition prior to resuming work activities.

The following target compounds and corresponding Alert Limits and Action Limits were developed in accordance with the NYSDOH Generic CAMP.

Target Compounds	Alert Limit
TVOCs (15-minute average concentration)	3.7 ppm greater than background*
Respirable Particulate Matter (PM-10)	100 $\mu g/m^3$ greater than background*

Target Compounds	Action Limit (**)
TVOCs (15-minute average concentration)	5.0 ppm greater than background*
TVOCs (1-minute concentration)	25 ppm greater than background*
Respirable Particulate Matter (PM-10)	150 μg/m^3 greater than background*

ppm - parts per million
μg/m^3 - micrograms per meter cubed
TVOCs – total Volatile Organic Compounds
* Background is defined as the current upwind fifteen-minute average concentration.
** Action Limit Exceedance Requires Work Stoppage and Mitigation of the condition causing the Exceedance

2.2 Air Monitoring Procedures

Monitoring for TVOC and respirable particulate matter (PM-10) will occur at up to four locations using real-time sampling equipment. Readings will be checked manually on a predetermined periodic basis or transmitted to a centralized data logger system station once per minute. Monitoring will be conducted during working hours during construction activity along the Site perimeter. Supplemental "walk-around" perimeter monitoring for TVOC and PM-10, and odor will occur along the perimeter of the project site on an as-needed basis. Each approach is detailed below.

2.2.1 Periodic Monitoring Procedures

Real-time air monitoring for TVOCs and suspended particulates will be conducted upwind and downwind of the work area along the Site perimeter during working hours. Instruments will be positioned along the Site perimeter to monitor the air based on a particular day's ground intrusive activities at up to six locations. Real-time monitors will continuously gather data during periods of excavation activity during working hours. The equipment will be manually read on a predetermined periodic cycle during the work activity. Wind direction will be determined by using a wind sock or flagging placed on a pole at the Site.

Each air monitoring station would include the following:

1. Station Tripod and enclosure
2. An organic vapor analyzer
3. A particulate monitor

Each monitoring station will continuously measure and record TVOCs and PM-10. All TVOC and PM-10 will be stored in dataloggers located within each monitoring station. Data from each piece of equipment will be downloaded daily at the completion of excavation/construction activities and stored on a central computer system. The location of each station, the work zone, and the wind direction will be noted daily. At each monitoring station location, the 15-minute average value of TVOC and PM-10 will be recorded. The 15-minute average value of TVOC and PM-10 data from the upwind and downwind station will be compared and resultant downwind concentration will be calculated and recorded.

2.2.2 Central Station Monitoring Procedures

Real-time air monitoring for TVOCs and suspended particulates may be conducted upwind and downwind of the work area along the Site perimeter. Instruments will be positioned to monitor around the active work zone based on a particular day's activities at up to six locations adjacent to the work area. Real-time monitors will continuously gather data during periods of excavation activity during working hours. The air monitoring system consists of up to four air monitoring stations, one meteorological tower, and one central computer system. The central computer system will be located in the project trailer or similar work area.

Each real-time air monitoring station contains the following:

1. Station enclosure
2. An organic vapor analyzer or PhotoVac Voyager gas chromatograph (GC)
3. A particulate monitor
4. A radio telemetry device

Each monitoring station is housed in a weather-tight NEMA-4 type enclosure. Each monitoring station will continuously measure and record TVOCs and PM-10 at a rate of one sample per minute. Each portable particulate meter will be equipped with a PM-10 impactor to monitor particulate matter less than 10 microns (PM-10). Figure 3 shows an example of a typical air monitoring station.

In addition to the air monitoring stations, a Campbell Scientific, Inc. Met Data1 meteorological monitoring system, or equivalent, will be established onsite. The meteorological system will continuously monitor temperature, relative humidity, wind speed, and wind direction. Fifteen-minute average values for each meteorological parameter will be stored in the meteorological system and downloaded once per week.

Wind direction and wind speed will be displayed on the central computer in real-time to determine upwind and downwind stations for assessing Action and Alert Limits.

All TVOC, PM-10, and meteorological data will be stored in dataloggers located within each monitoring station. Stored analytical data along with system performance data from each station will be sent in real-time, via radio telemetry, to the Site central computer system for monitoring and analysis.

2.2.3 Supplemental and Perimeter Walk-around Monitoring

Supplemental walk-around perimeter monitoring for TVOC and PM-10 will occur along the perimeter of the project site on an as-needed basis. Specific site conditions that may trigger walk-around perimeter monitoring include:

- Visible dust
- Detection of TVOCs and/or PM-10 at an air monitoring station at concentrations exceeding an Alert Limit or Action Limit
- Direction by the construction manager or NYSDEC

Fifteen-minute average TVOC and PM-10 readings will be collected continuously at a downwind location between the work area and the nearest receptors.

When a triggering condition is observed during ground intrusive activity, the supplemental downwind perimeter monitoring will occur continuously until the conditions that triggered the monitoring have subsided. TVOC concentrations will be monitored and recorded using an organic vapor analyzer. PM-10 will be measured and recorded using a portable aerosol monitor equipped with a PM-10 impactor. At each monitoring point, the 15-minute average value of TVOC and PM-10, sample time, and sample location will be collected and recorded. Additional temporary monitoring points may be established due to changing site or meteorological conditions.

2.2.4 Equipment Calibration

Equipment calibration will be performed according to manufacturer's instructions. Each organic vapor analyzer will be calibrated once daily using a certified standard isobutylene gas. Particulate monitors for PM-10 will be zeroed daily. Other hand-held portable equipment will be calibrated before each use, or a minimum of once per week when not in use.

2.3 Data Management Procedures

This section of the Plan discusses the data management procedures that will be used during the remedy. Data may be generated from a variety of sources, including real-time fixed station analytical monitoring, supplemental walk-around monitoring, tripod-mounted monitoring stations, and meteorological monitoring. These data must be reduced, evaluated, verified, and presented to related parties in a timely manner to facilitate decision-making. The data management process for each source of data is discussed below.

Analytical data generated at each fixed-station are sent to the central computer system via radio telemetry or will be manually downloaded daily. The monitoring data will also be downloaded to the project database for data evaluation. The following daily charts or tables will be prepared:

- Instantaneous and averaged TVOC concentrations compared to the TVOC Action Limit
- Instantaneous and averaged PM-10 concentrations compared to the PM-10 Action Limit
- Supplemental Perimeter Walk-Around PM-10 concentrations compared to the Action Limit (if any)
- Supplemental Perimeter Walk-Around TVOC concentrations compared to the TVOC Action Limit (if any)
- Air monitoring station locations

The following weekly charts or tables will be prepared:

- Meteorological conditions
- Maximum 15-minute average concentrations of TVOC and PM-10
- Upwind and downwind comparison of Alert and Action Limits reached during the week
- Summary of site activities
- Air monitoring station locations

GEI will review all real-time data in a timely manner following collection and transmit the final summary report to National Grid.

3. Alert Response

The purpose of this section is to identify the procedures to be followed in response to elevated levels of target compounds measured during ground intrusive activities. Response actions will be enacted by the excavation contractor and National Grid contractors. GEI will report any occurrences where an Alert or Action Limit is exceeded, which would require response measures to be enacted. In general, a tiered approach to site conditions with corresponding response actions will be implemented during the air monitoring program. The three tiers of site conditions are defined as follows.

- **Site Condition 1.** Normal or ambient air-conditions where all target concentrations are less than the Alert Limit.
- **Site Condition 2.** Concentration of at least one target is equal to or greater than Alert Limit, but less than the Action Limit.
- **Site Condition 3.** Concentration of at least one target is equal to or greater than the Action Limit.

The response plan will rely on real-time data generated from the fixed-station monitoring, portable equipment monitoring, and meteorological monitoring. These data sources will be evaluated together in order to make appropriate decisions concerning site conditions and potential control measures.

An explanation of the notification system, specific conditions, and response actions for TVOCs and PM-10 are presented below.

3.1 Total Volatile Organic Compounds

TVOC concentrations in air will be measured and recorded by station monitors. Figure 4 presents the TVOC decision diagram that will be used to determine the appropriate site condition based on contaminant concentrations. Alert Level site conditions will be in effect when the TVOC concentration is less than the Alert Limit (3.7 ppm).

Under an Alert Level 1 site condition, each organic vapor analyzer located at the monitoring stations will collect and analyze a TVOC sample at a frequency of one sample per minute.

A preliminary Alert Level 2 site condition will occur if the TVOC concentration measured at a station is greater than or equal to the Alert Limit (3.7 ppm) but less than the Action Limit (5.0 ppm). The excavation contractor and National Grid (or designated construction manager), and NYSDEC, will be notified by GEI of elevated measurements and a possible Alert Level 2 site condition.

At this time, the upwind and downwind concentrations will be compared to determine if the preliminary Alert Level 2 site condition is due to site activities. If downwind TVOC concentrations are greater than upwind concentrations, then it will be assumed that the preliminary site condition is due to site activities.

If the above condition is true, then an Alert Level 2 site condition will be verified. Under a verified Alert Level 2 site condition, a contingency meeting attended by GEI, Harvic, and National Grid (or designated construction manager), and NYSDEC, will be held. The excavation contractor and National Grid (or designee) and NYSDEC will determine appropriate response actions. This meeting will be held within 60 minutes of the Alert Level 2 site condition verification. Possible Alert Level 2 response actions are listed in Table 1. The site will remain in Alert Level 2 as long as the TVOC concentration is between 3.7 ppm (Alert Limit) and 5.0 ppm (Action Limit), based on 15-minute averages.

If average TVOC concentrations increase to greater than the Action Limit of 5.0 ppm, then the site will enter into an Action Limit site condition. An Action Limit site condition will remain in effect if one of the following conditions is true.

- The average TVOC concentration, measured over a 15-minute period, is greater than or equal to 5.0 ppm (Action Limit)
- The instantaneous TVOC concentrations are greater than 25 ppm.

Under an Action Limit site condition, all construction activities will be halted. A meeting attended by GEI, the excavation contractor and National Grid (or designated construction manager), and NYSDEC, will be held within 60 minutes of the Action Limit notification. The excavation contractor and National Grid (or designee), and NYSDEC will determine appropriate response actions. Possible Action Limit corrective measures/actions are listed in Table 1. After appropriate corrective measures/actions are taken, work activities may resume provided that the TVOC concentration at the Site perimeter is no more than 5.0 ppm above background for the 15-minute average.

If average TVOC concentrations fall below the Action Limit, then the site will be returned to an Alert Level 2 site condition, at which time work activities may resume. The Alert Level 2 site condition will remain in effect as long as the following condition is true.

- The 15-minute average concentration for TVOCs is greater than 3.7 ppm (Alert Limit) and less than 5.0 ppm (Action Limit).

The site will return to Alert Level 1 site condition if the following condition is true.

- The 15-minute average concentrations for TVOCs at each of the monitoring stations are less than 3.7 ppm (Alert Limit).

Specific TVOC target concentrations for Alert Level 1, Alert Level 2, and Action Level site conditions are summarized in Table 2.

3.2 Respirable Particulate Matter

PM-10 concentration in air will be measured and recorded by the station monitors and may be temporarily suspended during periods of rain. Figure 5 presents the PM-10 decision diagram. Alert Level 1 site condition will be in effect when the downwind 15-minute average PM-10 concentration is greater than 100 $\mu g/m^3$ above the current average upwind conditions (Alert Limit). A preliminary Alert Level 2 site condition will occur if the PM-10 concentration at a station is greater than 100 $\mu g/m^3$. At this time, Harvic and National Grid (or designee), and NYSDEC will be notified by GEI of elevated measurements and a possible Alert Level 2 site condition. Under a preliminary Alert Level 2 site condition, upwind and downwind PM-10 concentrations will be compared to determine if the preliminary Alert Level 2 site condition is due to site activities. If downwind PM-10 concentrations are 100 ug/m^3 greater than upwind concentrations (Alert Limit), then it will be assumed that the preliminary Alert Level 2 site condition is due to site activities.

If elevated PM-10 concentrations are found to be related to site activities, then PM-10 measurements will be collected over a 15-minute period and averaged. If the 15-minute average PM-10 concentration is equal to or greater than 100 $\mu g/m^3$ above the upwind PM-10 (alert limit), then the Alert Level 2 site condition will be verified. The Alert Limit 2 site condition will remain in effect as long as the average PM-10 concentration is greater than or equal to 100 $\mu g/m^3$ above upwind conditions (Alert Limit), and less than or equal to 150 $\mu g/m^3$ (Action Limit). Under a verified Alert Level 2 site condition, dust

suppression techniques must be implemented by the excavation contractor and/or National Grid contractors. At this point, routine monitoring continues and 15-minute averages continue to be evaluated. Work may continue with dust suppression techniques provided that downwind PM-10 levels do not exceed 150 ug/m^3 above the upwind level (Action Limit) and provided that no visible dust is migrating offsite from the work area. A contingency meeting attended by GEI, the excavation contractor, National Grid (or designee), and NYSDEC will be held within 60 minutes of the verified Alert Level 2 site condition if the condition is not mitigated by dust suppression techniques. Possible response actions for dust control are listed in Table 1.

An Action Limit site condition will go into effect if the average 15-minute PM-10 concentration exceeds 150 µg/m^3 above the current average upwind concentration (Action Limit). Under an Action Limit site condition, work must be stopped and a meeting attended by GEI, the excavation contractor, National Grid (or designee), and NYSDEC will be held within 60 minutes of the Action Limit notification. The excavation contractor, National Grid and NYSDEC will determine appropriate response actions. Possible Action Limit response actions for PM-10 are listed in Table 1. Work may resume provided that dust suppression measures and other controls are successful in reducing the downwind PM-10 concentration to within 150 ug/m^3 of the upwind level and in preventing visible dust migration.

Specific PM-10 target concentrations for Alert Level 1, Alert Level 2, and Action Level site conditions are summarized in Table 2.

3.3 Visible Dust

In addition to measured PM-10 levels, the CAMP requires monitoring of visible dust conditions. If visible airborne dust is observed leaving the work area, then dust suppression techniques must be employed. Work may continue with dust suppression techniques provided that downwind PM-10 levels do not exceed 150 µg/m^3 above the upwind level and provided that no visible dust is migrating from the work area.

4. Reporting

GEI will prepare and submit bi-weekly reports to the excavation contractor, NYSDEC, and National Grid summarizing the CAMP monitoring data. Each report will consist of a letter-style report and charts/tables summarizing the following:

- Maximum 15-minute average concentrations of TVOC, and PM-10
- Upwind and downwind comparison of Alert and Action Limits reached during the bi-weekly period
- Summary of site activities
- Air monitoring station locations
- Meteorological conditions

Tables

Table 1
Levels and Response Actions
Community Air Monitoring Program Work Plan
Bay Shore/Brightwaters Former MGP Site
Operable Unit 3
LIRR Excavation/Temporary Track Relocation
Interim Remedial Measure

Site Condition	Response Action
Alert Level 1	▪ Normal Site Operations – No Response Action Required
Alert Level 2	▪ Establish trend of data and determine if evaluation/wait period is warranted ▪ Temporarily stop work ▪ Temporarily relocate work to an area with potentially lower emission levels ▪ Apply water to area of activity or haul roads to minimize dust levels ▪ Reschedule work activities ▪ Cover all or part of the excavation area ▪ Apply VOC emission suppressant foam over open excavation areas ▪ Slow the pace of construction activities ▪ Change construction process or equipment that minimize air emissions ▪ Install a perimeter barrier fence
Action Level	▪ Encapsulate construction area and treat air exhaust ▪ Perform work during cold weather ▪ Cease construction activities ▪ Re-evaluate air monitoring work plan

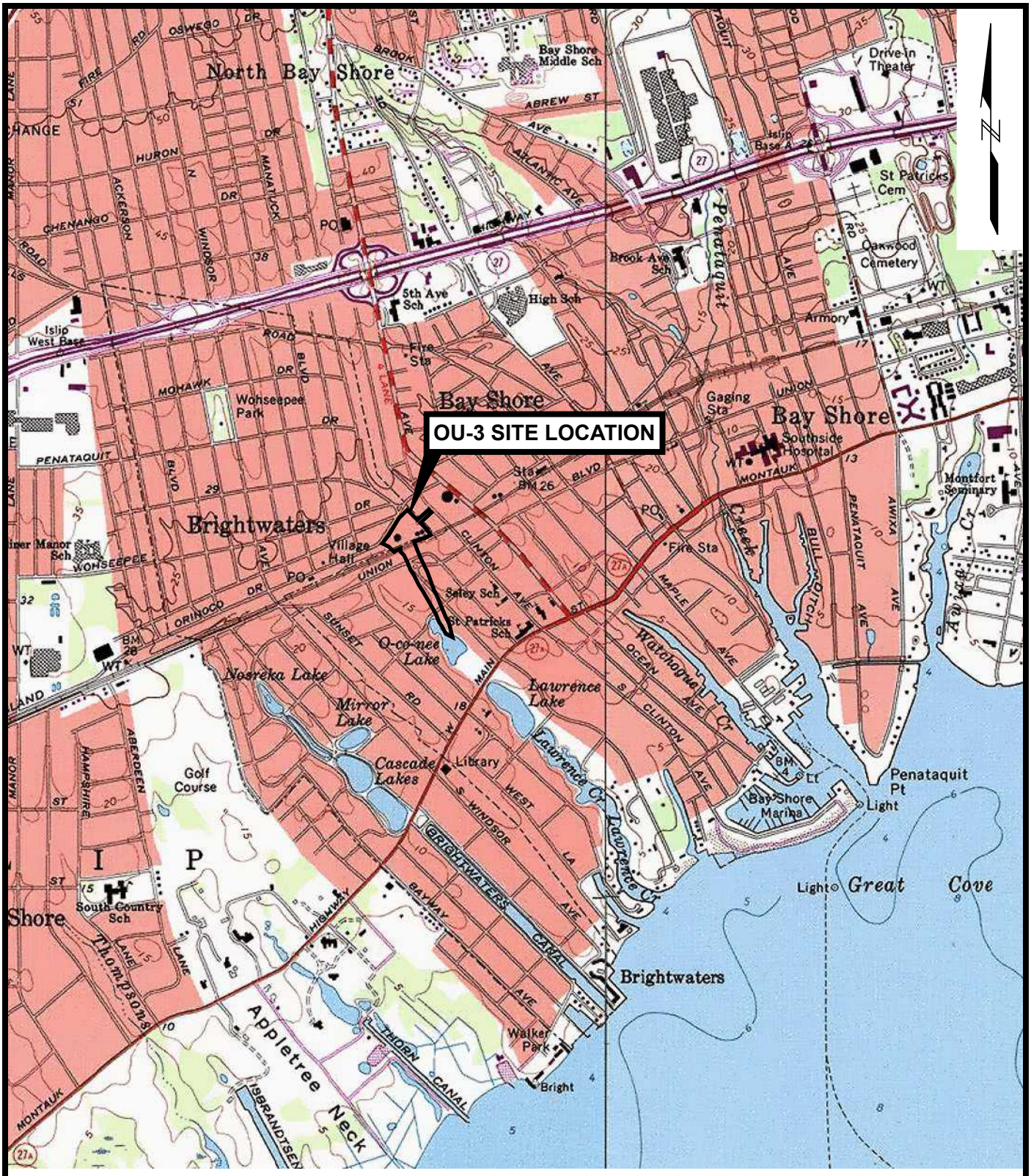
Notes:
The bulleted response actions specified under each site condition can be implemented in any order that is most appropriate under the existing site conditions.

Table 2
Target Concentrations for Site Conditions
Community Air Monitoring Program Work Plan
Bay Shore/Brightwaters Former MGP Site
Operable Unit 3
LIRR Excavation/Temporary Track Relocation
Interim Remedial Measure

Target	Alert Limit	Action Limit	Site Condition			
			Alert Level 1	Preliminary Alert Level 2	Alert Level 2	Action Level
Total VOC by GC (ppmv)	3.7	5.0	[C]<3.7	[C]>=3.7	NM	NM
Total VOC by PID (ppmv)	3.7	5.0	[C]<3.7	3.7<=[C]<=5.0	3.7<=[C_{avg}]<=5.0	[C_{avg}]>5.0
PM-10 (ug/m^3)	100	150 greater than upwind	[C]<100	100<=[C]<=150	100<=[C_{avg}]<=150	[C_{avg}]>150

Notes:
VOC = Volatile Organic Compound
PID = Photoionization Detector
GC = Gas Chromatograph
PM-10 = Respirable Particulate Matter
ppmv = parts per million volume
ug/m^3 = micrograms per cubic meter
[C] = Concentration of target collected from a discrete sample.
[C_{avg}] = 15-minute average concentration of target
NM = Target is not measured during this site condition.

Figures



SOURCE: Map created with TOPO! ® ©2001 National Geographic (www.nationalgeographic.com/topo)

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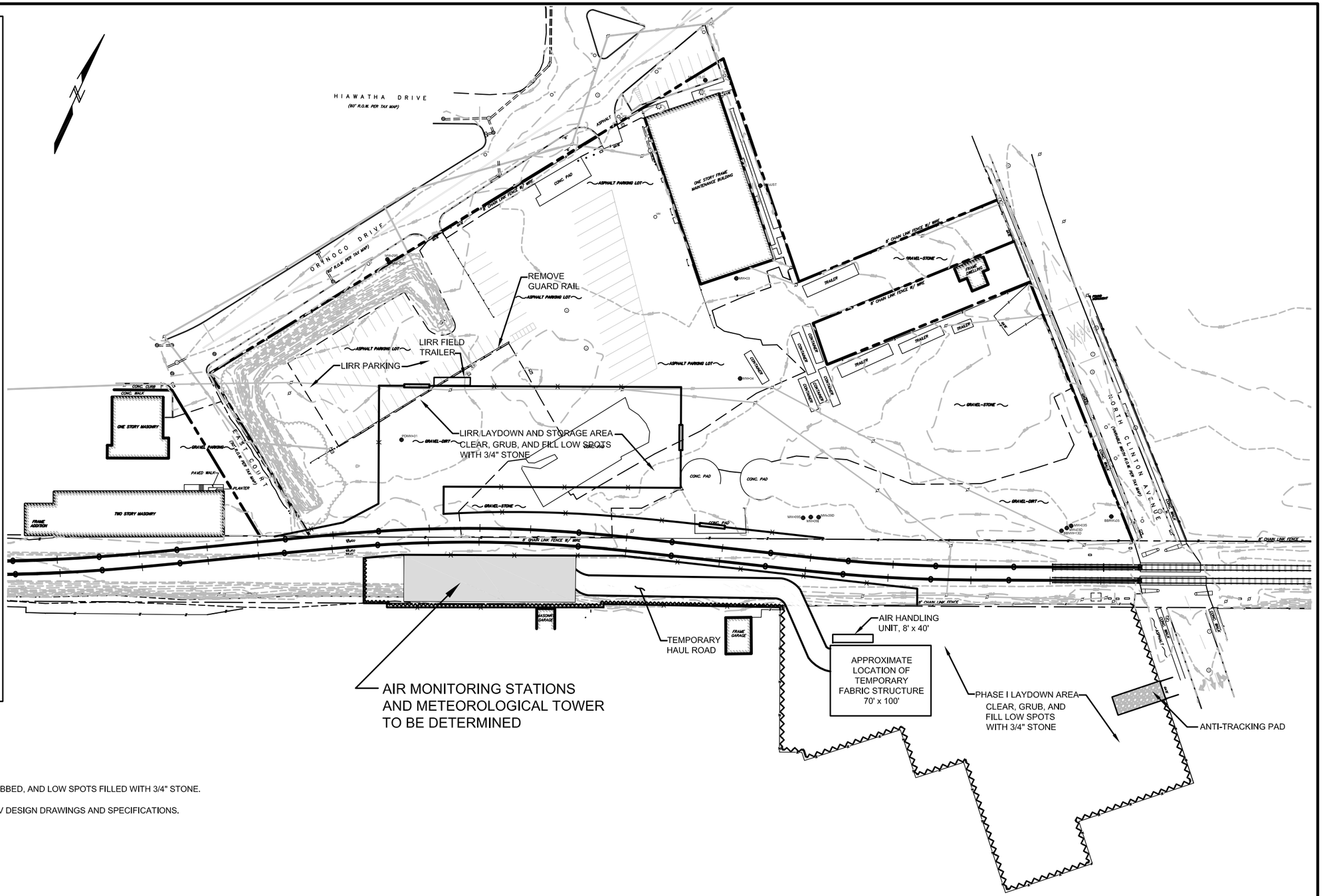
BAY SHORE/BRIGHTWATERS FORMER MGP SITE LIRR EXCAVATION/TEMPORARY TRACK RELOCATION INTERIM REMEDIAL MEASURE BAY SHORE, NEW YORK	GEI Consultants	**SITE LOCATION MAP**
nationalgrid	Project 061140-11-2003	June 2009 Figure 1

NATIONAL GRID\BAY SHORE\OU-3\RR DESIGN\FIGS\BAY SHORE-CAMP LOCATION.CDR

LEGEND:

- EXISTING BUILDING
- SURVEYED PROPERTY LINE
- APPROXIMATE PROPERTY LINE
- FENCE
- EDGE OF GRAVEL/PAVEMENT
- OHL — OVERHEAD ELECTRIC LINE
- 10.0 — EXISTING GROUND SURFACE CONTOUR (FT)
- EXISTING RAILROAD RAIL
- RAILROAD TIE
- BOLLARD
- E — BOX ELECTRICAL/POWER
- CATCH BASIN (RECTANGLE)
- CATCH BASIN (ROUND)
- FIRE HYDRANT
- D — MANHOLE DRAINAGE
- E — MANHOLE ELECTRICAL
- G — MANHOLE GAS
- S — MANHOLE SEWER
- T — MANHOLE TELEPHONE
- U — MANHOLE UNKNOWN
- W — MANHOLE WATER
- LIGHT POLE
- UTILITY POLE
- U — VALVE UNKNOWN
- W — VALVE WATER
- WM — METER WATER
- POST
- RAIL ROAD GATE
- SIGN W/1 BOARD
- TREE DECIDUOUS
- MW-04 — MONITORING WELL
- SILT FENCE
- PROPOSED CHAIN-LINK FENCE
- GATE
- APPROXIMATE EXTENT OF PHASE I EXCAVATION
- APPROXIMATE CENTERLINE OF TEMPORARY TRACKS



NOTES:

1. LIMITS OF ALL LAYDOWN AREAS TO BE CLEARED, GRUBBED, AND LOW SPOTS FILLED WITH 3/4" STONE.
2. ALL LIRR INFRASTRUCTURE TO BE INSTALLED PER STV DESIGN DRAWINGS AND SPECIFICATIONS.

SOURCES:

1. DRAWING TITLED "BOUNDARY AND TOPOGRAPHIC SURVEY, PORTION OF SEC. 006, BLOCK 1 SUFFOLK COUNTY, NEW \ PREPARED BY KS ENGINEERS, P.C., 24 COMMERCE STREET, NEWARK, N.J. 07102 DATED 5/31/09.
2. TEMPORARY TRACK ALIGNMENT PREPARED BY STV GROUP, INC., 225 PARK AVENUE SOUTH, NEW YORK, NY.
3. MAP TITLED "LOCATION OF VARIES WELLS , BORINGS AND SAMPLES SITUATED AT BRIGHTWATERS PROPERTY, SUFFC COUNTY , NEW YORK" PREPARED BY NATIONALGRID ENGINEERING & SURVEY, INC., SURVEY DIVISION, HICKSVILLE, NI SCALE 1"=50' DATED 4/21/09.

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SCALE, FEET

BAY SHORE/BRIGHTWATERS FORMER MGP SITE
LIRR EXCAVATION/TEMPORARY TRACK RELOCATION
INTERIM REMEDIAL MEASURE
BAY SHORE, NEW YORK

nationalgrid

GEI Consultants

Project 061140-11-2003

June 2009

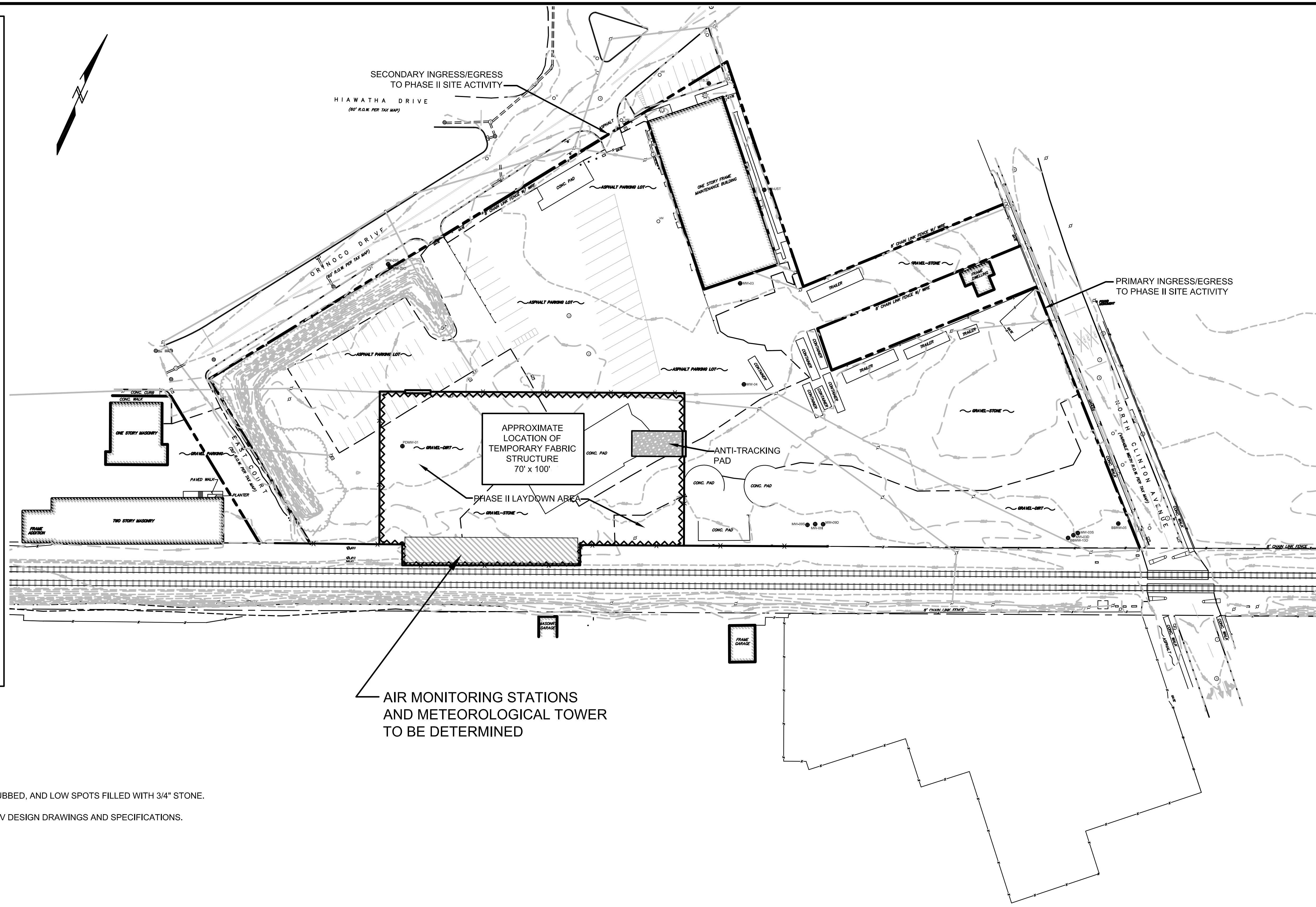
SITE MAP AND AIR MONITORING STATION LOCATIONS FOR PHASE I

Figure 2A

I:\GEI\National Grid\Bay Shore\OU-3\RR DESIGN\ BAY SHORE OU-3 RR CAMP.dwg \Jun 05, 2009

LEGEND:

- EXISTING BUILDING
- SURVEYED PROPERTY LINE
- APPROXIMATE PROPERTY LINE
- FENCE
- EDGE OF GRAVEL/PAVEMENT
- OVERHEAD ELECTRIC LINE
- EXISTING GROUND SURFACE CONTOUR (FT)
- EXISTING RAILROAD RAIL
- RAILROAD TIE
- BOLLARD
- BOX ELECTRICAL/POWER
- CATCH BASIN (RECTANGLE)
- CATCH BASIN (ROUND)
- FIRE HYDRANT
- MANHOLE DRAINAGE
- MANHOLE ELECTRICAL
- MANHOLE GAS
- MANHOLE SEWER
- MANHOLE TELEPHONE
- MANHOLE UNKNOWN
- MANHOLE WATER
- LIGHT POLE
- UTILITY POLE
- VALVE UNKNOWN
- VALVE WATER
- METER WATER
- POST
- RAIL ROAD GATE
- SIGN W/1 BOARD
- TREE DECIDUOUS
- MW-04 MONITORING WELL
- SILT FENCE
- PROPOSED CHAIN-LINK FENCE
- GATE
- APPROXIMATE EXTENT OF PHASE II EXCAVATION



NOTES:

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2. ALL LIRR INFRASTRUCTURE TO BE INSTALLED PER STV DESIGN DRAWINGS AND SPECIFICATIONS.

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SCALE, FEET

BAY SHORE/BRIGHTWATERS FORMER MGP SITE
LIRR EXCAVATION/TEMPORARY TRACK RELOCATION
INTERIM REMEDIAL MEASURE
BAY SHORE, NEW YORK

nationalgrid

GEI Consultants

SITE MAP AND AIR MONITORING STATION LOCATIONS FOR PHASE II

Project 061140-11-2003	June 2009	Figure 2B

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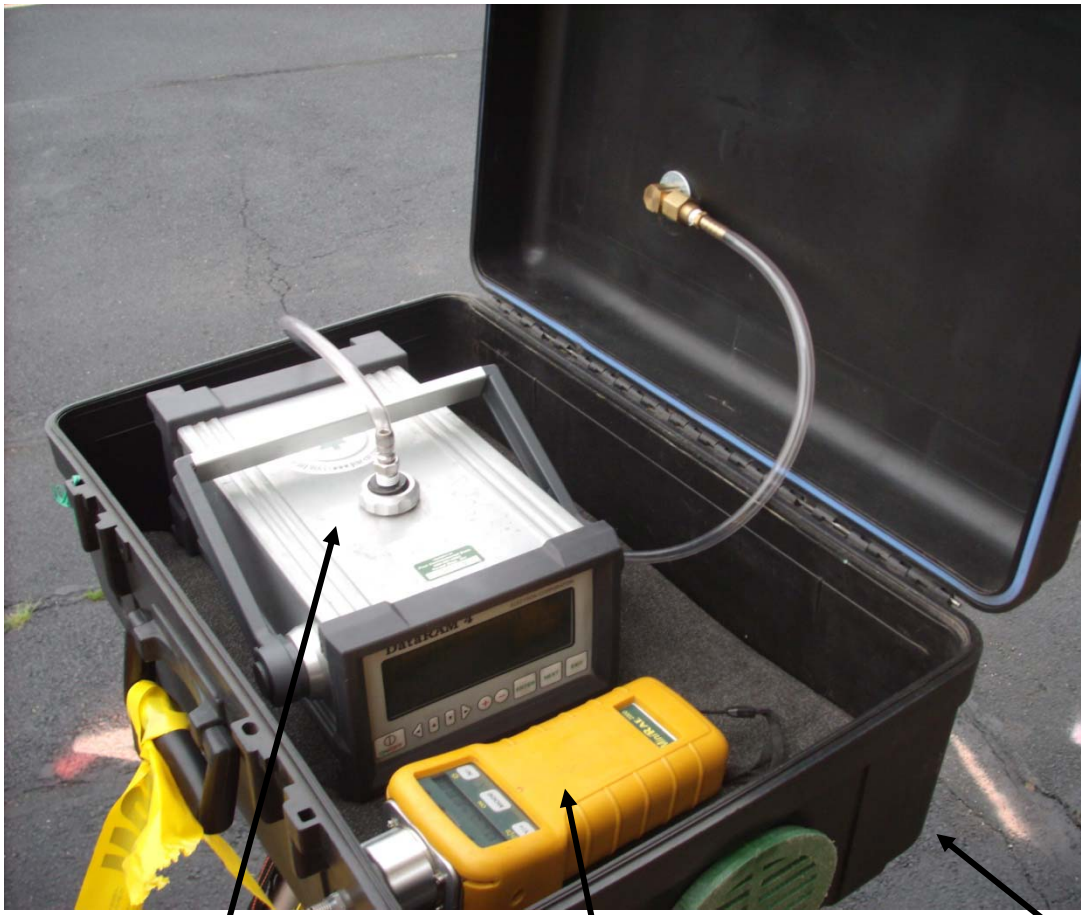

Particulate Meter

Organic Vapor Analyzer

Station Enclosure

Note: Figure depicts an Air Monitoring System from Pine Environmental as an example and may not be representative of the actual system or components that will be employed at the Site

BAY SHORE/BRIGHTWATERS FORMER MGP SITE
LIRR EXCAVATION/TEMPORARY TRACK RELOCATION
INTERIM REMEDIAL MEASURE
BAY SHORE, NEW YORK

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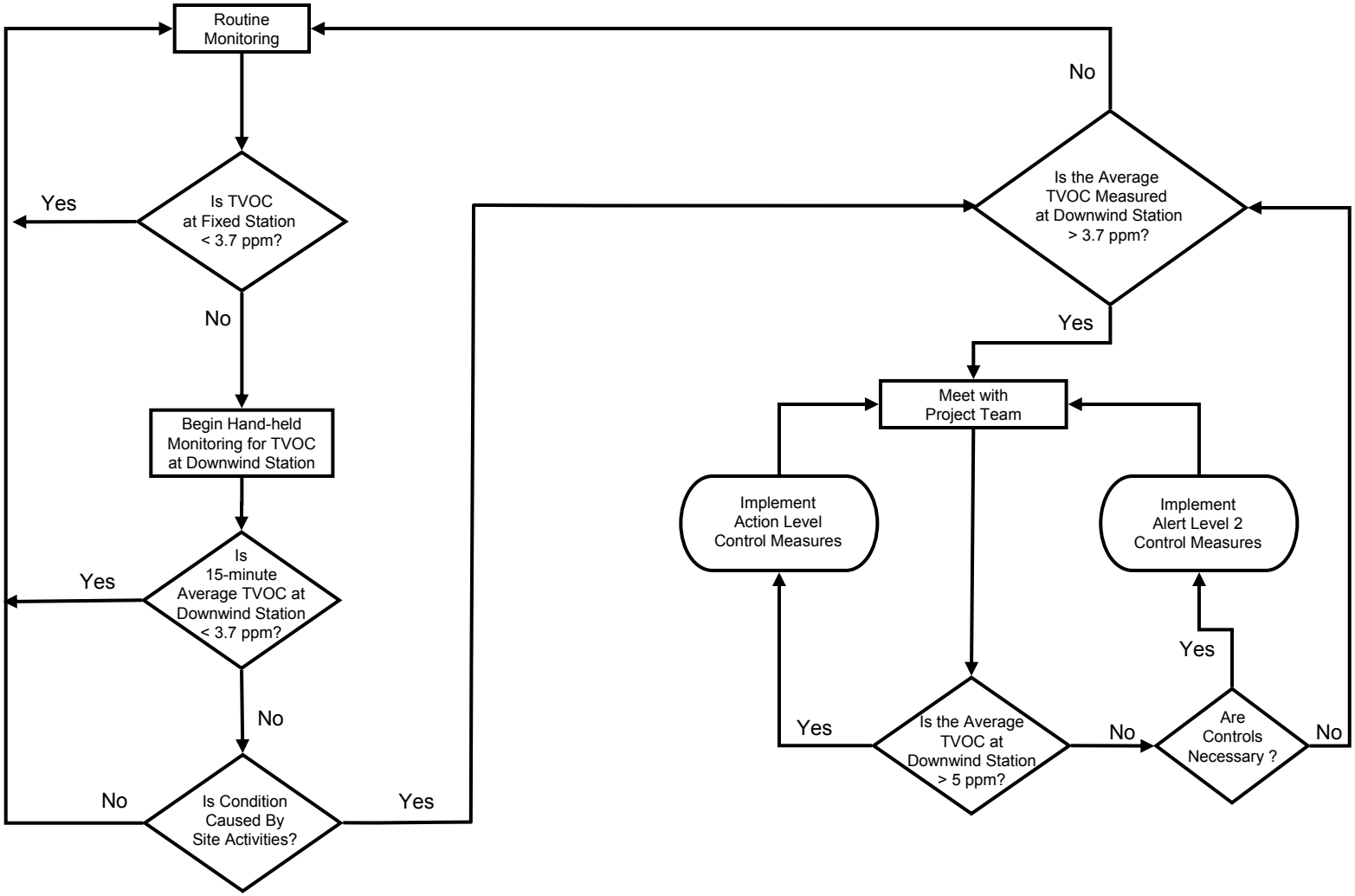
PROJECT 061140-11

EXAMPLE FIXED STATION INTERNAL COMPONENTS

JUNE 2009

Figure 3



TVOC – Total Volatile Organic Compound

ppm – parts per million

BAY SHORE/BRIGHTWATERS FORMER MGP SITE
LIRR EXCAVATION/TEMPORARY TRACK RELOCATION
INTERIM REMEDIAL MEASURE
BAY SHORE, NEW YORK

nationalgrid

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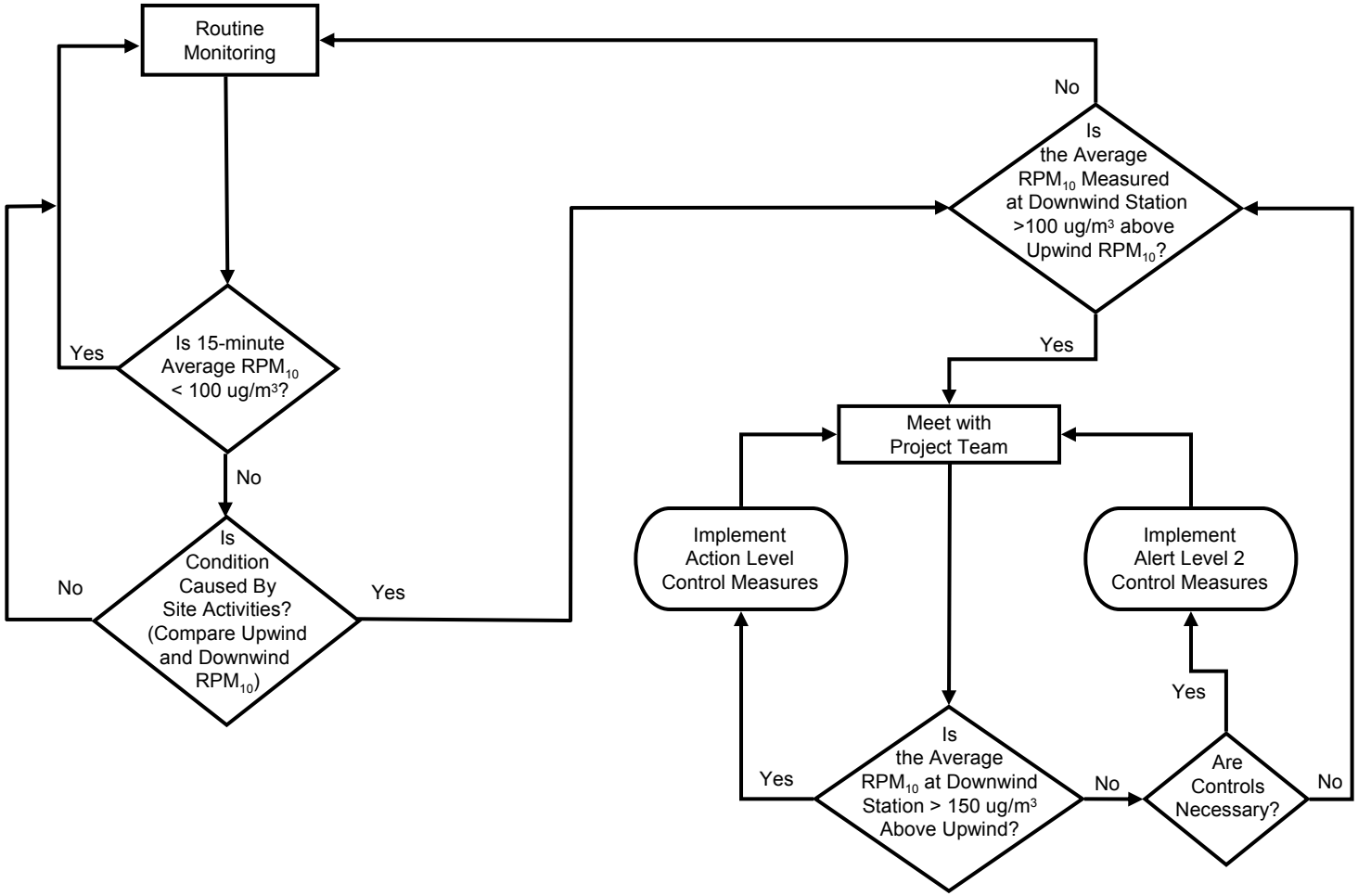
TVOC DECISION DIAGRAM

PROJECT 061140-11 | JUNE 2009 | Figure 4



RPM_{10} – Respirable Particulate Matter

ug/m³ – micrograms per cubic meter

BAY SHORE/BRIGHTWATERS FORMER MGP SITE
LIRR EXCAVATION/TEMPORARY TRACK RELOCATION
INTERIM REMEDIAL MEASURE
BAY SHORE, NEW YORK

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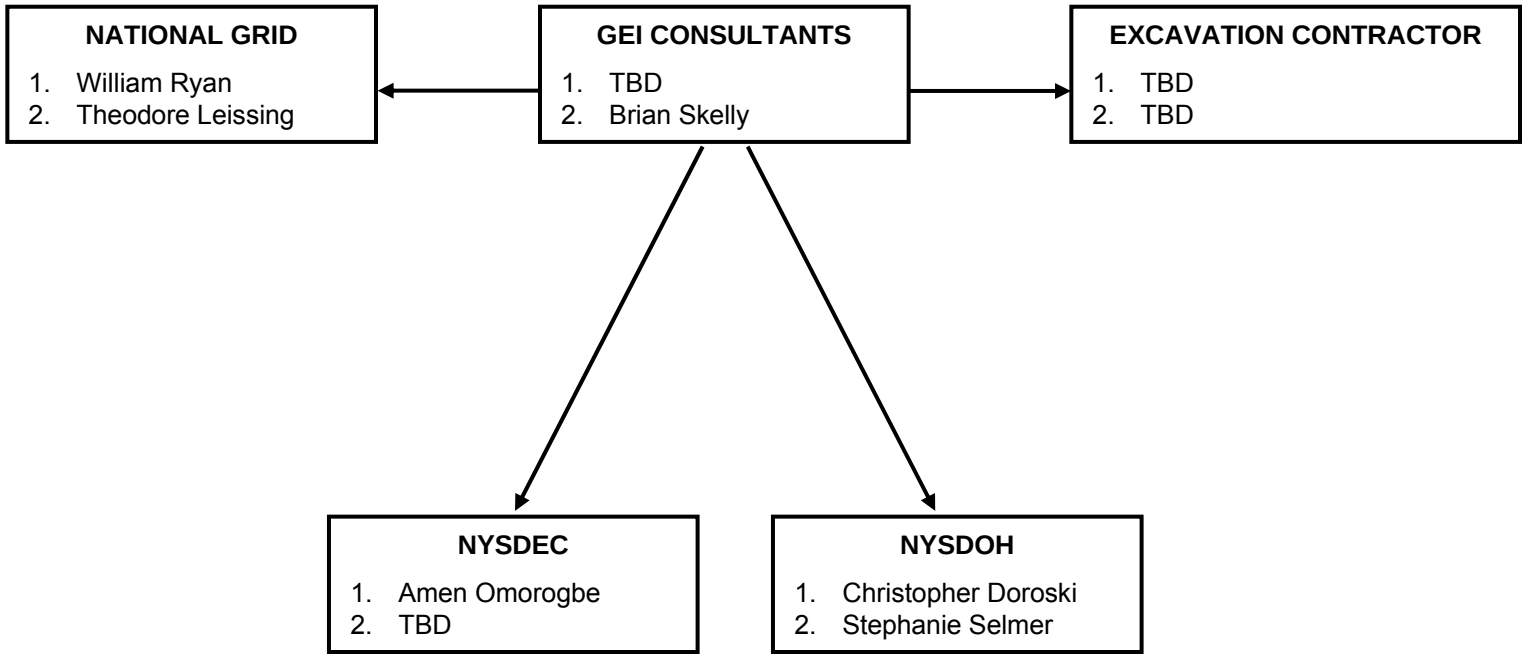
PROJECT 061140-11

RESPIRABLE PARTICULATE MATTER DECISION DIAGRAM

JUNE 2009

Figure 5

H:\WPROC\Project\KEYSPAN\Bay Shore\OU-3 LIRR Excavation IRM Design\IRM June 2009\CAMP\DRAFT Bay Shore OU-3 LIRR CAMP 060409.doc



National Grid, GEI, excavation contractor, and NYS Representatives

Meet at the Field Office and/or Confer by Phone Within 60 Minutes of the Alert

If the primary contact is unavailable, contact alternatives in the order noted, or as shown on the contact list.

TBD – To Be Determined

BAY SHORE/BRIGHTWATERS FORMER MGP SITE
LIRR EXCAVATION/TEMPORARY TRACK RELOCATION
INTERIM REMEDIAL MEASURE
BAY SHORE, NEW YORK

nationalgrid

GEI Consultants

PROJECT 061140-11

COMMUNICATION FLOWCHART

JUNE 2009

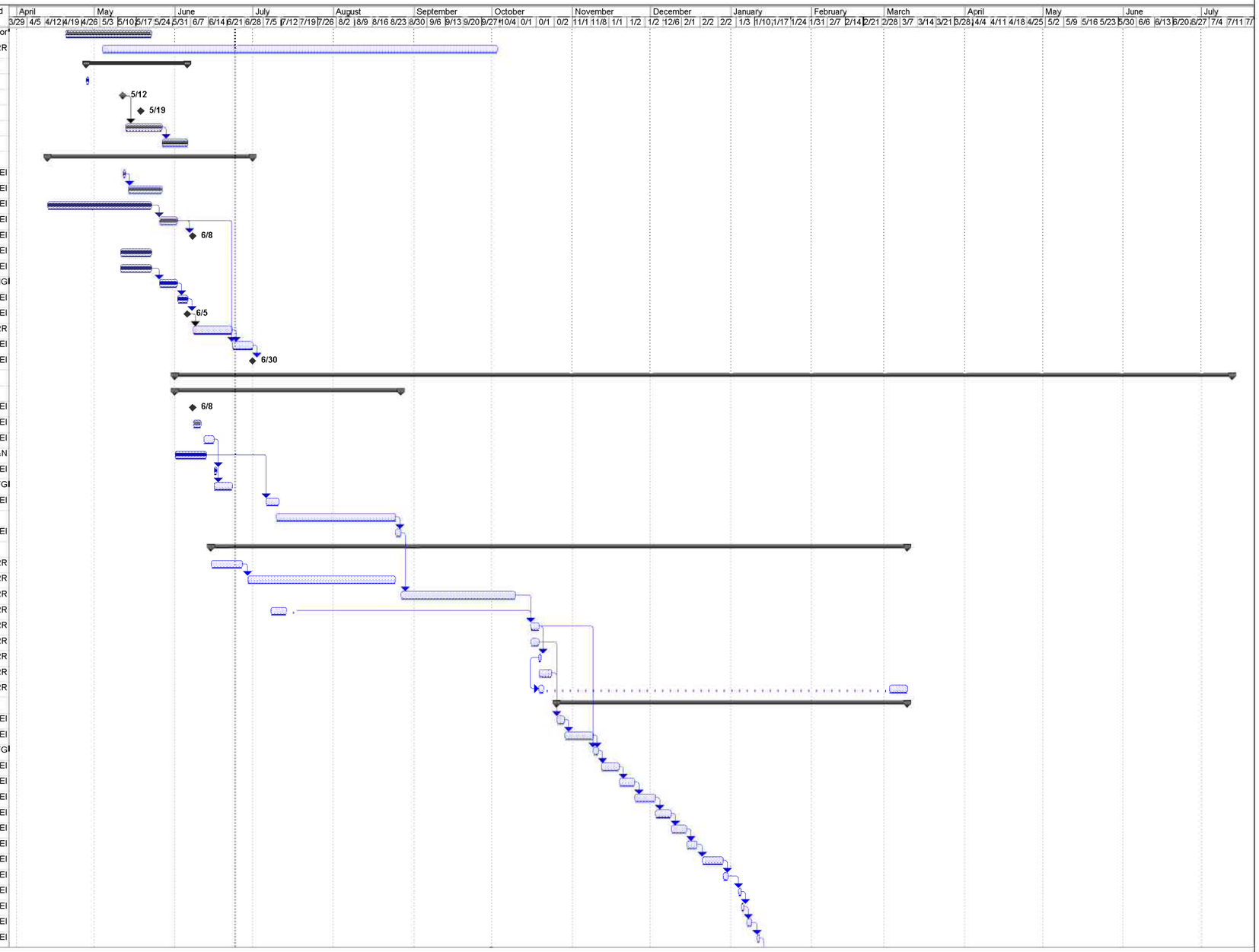
Figure 6

Appendix D

Project Schedule

Schedule
LIRR Temporary Track Relocation/Excavation
Bay Shore/Brightwaters Former MGP Site Operable Unit No. 3 (OU-3)

ID	ID	Task Name	Start	Finish	% Complete	Work Performed By
1	1	High Tension Tower Relocation	Mon 4/20/09	Fri 5/22/09	100%	NGRID Contractor
2	2	Removal of Inactive Asbestos Cables on Signal Power Poles	Mon 5/4/09	Fri 10/2/09	0%	LIRR
3	3	**Track Design Submittals**	**Tue 4/28/09**	**Fri 6/5/09**	**100%**	
4	4	LIRR Site meeting	Tue 4/28/09	Tue 4/28/09	100%	
5	5	Submit 90% Track & Signal Reloacation Design	Tue 5/12/09	Tue 5/12/09	100%	
6	6	Submit Detail Track relocation Scope of Work Narrative	Tue 5/19/09	Tue 5/19/09	100%	
7	7	LIRR Review	Wed 5/13/09	Tue 5/26/09	100%	
8	8	Submit Final 100% Track Design and Scope	Wed 5/27/09	Fri 6/5/09	100%	
9	9	**Remediation Design**	**Mon 4/13/09**	**Tue 6/30/09**	**81%**	
10	10	Kick Off Meeting	Tue 5/12/09	Tue 5/12/09	100%	GEI/NG/CEI
11	11	Draft Contractor Design Input	Thu 5/14/09	Tue 5/26/09	100%	CEI
12	12	IRM Work Plan	Mon 4/13/09	Fri 5/22/09	100%	GEI
13	13	IRM Work Plan Team Review	Tue 5/26/09	Mon 6/1/09	100%	GEI
14	14	IRM Work Plan Submit to LIRR & NYDEC	Mon 6/8/09	Mon 6/8/09	100%	GEI
15	15	Draft 100% Shoring Design	Mon 5/11/09	Fri 5/22/09	100%	GEI
16	16	Draft 100% Remediation Design Package Development	Mon 5/11/09	Fri 5/22/09	100%	GEI
17	17	Team Review	Tue 5/26/09	Mon 6/1/09	100%	GEI/NG
18	18	Final Revisions	Tue 6/2/09	Fri 6/5/09	100%	GEI
19	19	Submit100% Design Package to LIRR	Fri 6/5/09	Fri 6/5/09	100%	GEI
20	20	LIRR Review	Mon 6/8/09	Mon 6/22/09	0%	LIRR
21	21	Incorporate LIRR Comments	Tue 6/23/09	Tue 6/30/09	0%	GEI
22	22	Submit Revised 100% Design Package to LIRR	Tue 6/30/09	Tue 6/30/09	0%	GEI
23	23	**Remediation**	**Mon 6/1/09**	**Mon 7/12/10**	**4%**	
24	24	**Site Prpearation - North**	**Mon 6/1/09**	**Wed 8/26/09**	**23%**	
25	25	Mobilization - NGRID Contractor	Mon 6/8/09	Mon 6/8/09	100%	CEI
26	26	Clear & Grade LIRR Staging	Mon 6/8/09	Wed 6/10/09	100%	CEI
27	27	Remove Poles & Obstructions in Temp RR Allignment	Fri 6/12/09	Mon 6/15/09	0%	CEI
28	28	Remove 02 System and Abandon Wells	Mon 6/1/09	Fri 6/12/09	100%	F&N
29	29	Install Temporary Construction Fencing	Tue 6/16/09	Tue 6/16/09	100%	CEI
30	30	Install Temporary Protective Fencing	Tue 6/16/09	Mon 6/22/09	0%	RFGI
31	31	Grade & Install Ballast to Final Grade	Mon 7/6/09	Fri 7/10/09	0%	CEI
32	32	Grade Consolidation	Fri 7/10/09	Mon 8/24/09	0%	
33	33	Post Consolidation Grading	Tue 8/25/09	Wed 8/26/09	0%	CEI
34	34	**LIRR Temporary Track relocation**	**Mon 6/15/09**	**Tue 3/9/10**	**0%**	
35	35	LIRR Site Mobilization and Parts Delivery	Mon 6/15/09	Fri 6/26/09	0%	LIRR
36	36	Temporary Track Prep/Panel Construction	Mon 6/29/09	Mon 8/24/09	0%	LIRR
37	37	Construct Temporary Track on Trackbed	Thu 8/27/09	Fri 10/9/09	0%	LIRR
38	38	Install Temporary Signal Power Poles	Wed 7/8/09	Fri 7/17/09	0%	LIRR
39	39	Cut and Throw Tracks Mainline Tracks	Fri 10/16/09	Sun 10/18/09	0%	LIRR
40	40	Relocate Signal Power Lines	Fri 10/16/09	Sun 10/18/09	0%	LIRR
41	41	Saw Cut Mainline Tracks	Mon 10/19/09	Mon 10/19/09	0%	LIRR
42	42	Remove Singal Power Poles	Mon 10/19/09	Fri 10/23/09	0%	LIRR
43	43	Remove Mainline Tracks	Mon 10/19/09	Tue 3/9/10	0%	LIRR
44	44	**Install Southern Sheeting, Excavate and Backfill**	**Mon 10/26/09**	**Tue 3/9/10**	**0%**	
45	45	Install Temporary Haul Road South of Tracks	Mon 10/26/09	Wed 10/28/09	0%	CEI
46	46	Install Initial N/S Sheeting Line	Wed 10/28/09	Mon 11/9/09	0%	CEI
47	47	Install Temporary Protective Fencing	Mon 11/9/09	Tue 11/10/09	0%	RFGI
48	48	Install sheets cell 1	Thu 11/12/09	Wed 11/18/09	0%	CEI
49	49	Install sheets cell 2	Thu 11/19/09	Tue 11/24/09	0%	CEI
50	50	Install sheets cell 3	Wed 11/25/09	Wed 12/2/09	0%	CEI
51	51	Install sheets cell 4	Thu 12/3/09	Tue 12/8/09	0%	CEI
52	52	Install sheet cell 5	Wed 12/9/09	Mon 12/14/09	0%	CEI
53	53	Install sheet cell 6	Tue 12/15/09	Fri 12/18/09	0%	CEI
54	54	Install sheet cell 7	Mon 12/21/09	Mon 12/28/09	0%	CEI
55	55	Excavate Cell 1	Tue 12/29/09	Wed 12/30/09	0%	CEI
56	56	Backfill and Compact Cell 1	Mon 1/4/10	Mon 1/4/10	0%	CEI
57	57	Cut sheets below grade cell 1	Tue 1/5/10	Tue 1/5/10	0%	CEI
58	58	Excavate Cell 2	Thu 1/7/10	Fri 1/8/10	0%	CEI
59	59	Backfill and Compact Cell 2	Mon 1/11/10	Mon 1/11/10	0%	CEI



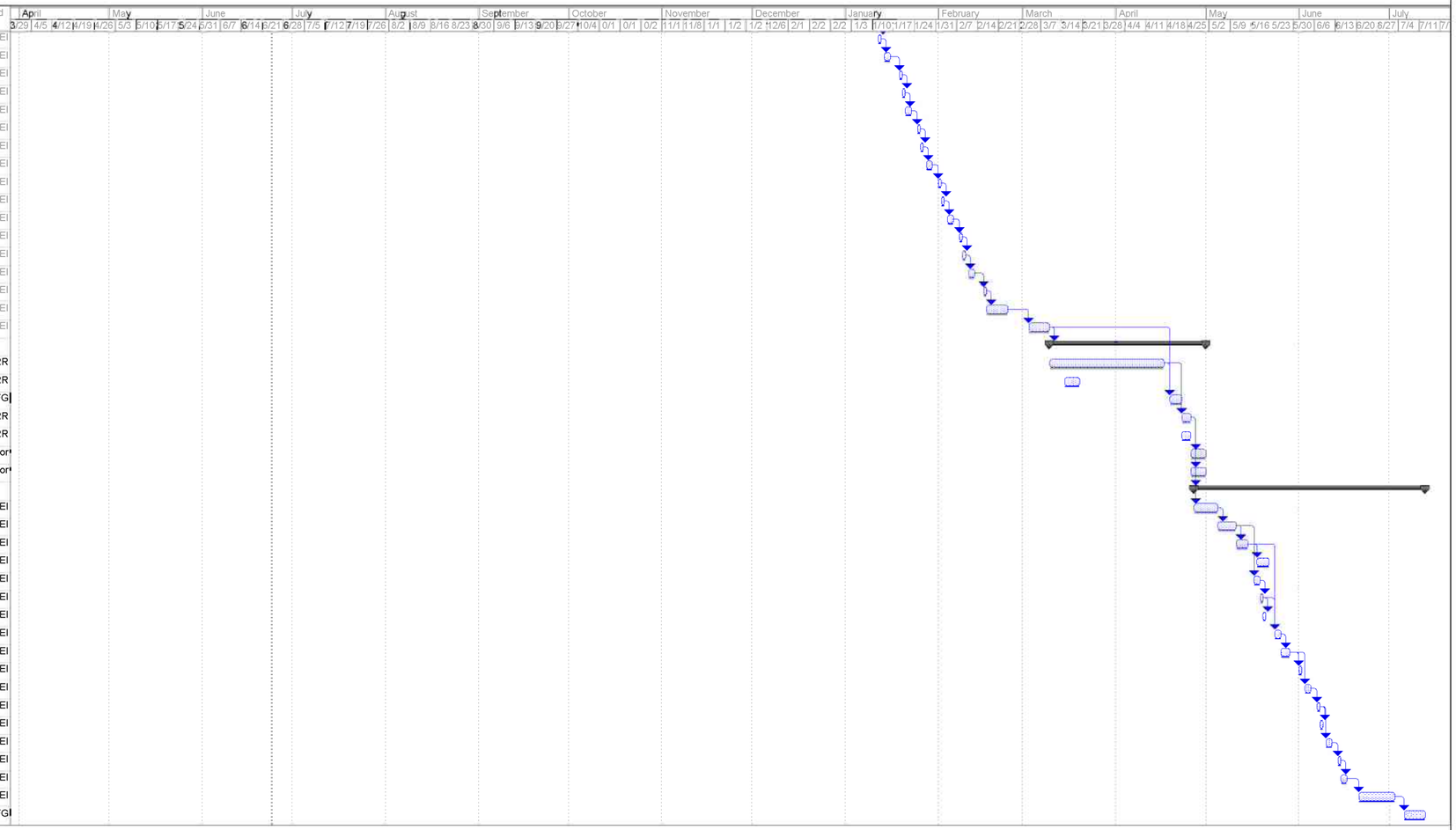
Project: LIRR-schedule
Date: Wed 6/24/09

Task | Split | Progress | Milestone | Summary | Project Summary | External Tasks | External MileTask | Split

GEI JOB #061140-11-2002
Wed 6/24/09

Schedule
LIRR Temporary Track Relocation/Excavation
Bay Shore/Brightwaters Former MGP Site Operable Unit No. 3 (OU-3)

ID	ID	Task Name	Start	Finish	% Complete	Work Performed By
60	60	Cut sheets below grade cell 2	Tue 1/12/10	Tue 1/12/10	0%	CEI
61	61	Excavate Cell 3	Thu 1/14/10	Fri 1/15/10	0%	CEI
62	62	Backfill and Compact Cell 3	Tue 1/19/10	Tue 1/19/10	0%	CEI
63	63	Cut sheets below grade cell 3	Wed 1/20/10	Wed 1/20/10	0%	CEI
64	64	Excavate Cell 4	Thu 1/21/10	Fri 1/22/10	0%	CEI
65	65	Backfill and Compact Cell 4	Mon 1/25/10	Mon 1/25/10	0%	CEI
66	66	Cut sheets below grade cell 4	Tue 1/26/10	Tue 1/26/10	0%	CEI
67	67	Excavate Cell 5	Thu 1/28/10	Fri 1/29/10	0%	CEI
68	68	Backfill and Compact Cell 5	Mon 2/1/10	Mon 2/1/10	0%	CEI
69	69	Cut sheets below grade cell 5	Tue 2/2/10	Tue 2/2/10	0%	CEI
70	70	Excavate Cell 6	Thu 2/4/10	Fri 2/5/10	0%	CEI
71	71	Backfill and Compact Cell 6	Mon 2/8/10	Mon 2/8/10	0%	CEI
72	72	Cut sheets below grade cell 6	Tue 2/9/10	Tue 2/9/10	0%	CEI
73	73	Excavate Cell 7	Thu 2/11/10	Fri 2/12/10	0%	CEI
74	74	Backfill and Compact Cell 7	Tue 2/16/10	Tue 2/16/10	0%	CEI
75	75	Cut sheets below grade cell 7	Wed 2/17/10	Tue 2/23/10	0%	CEI
76	76	Grade LIRR ROW	Wed 3/3/10	Tue 3/9/10	0%	CEI
77	77	**Reconstruct Mainline Tracks**	**Wed 3/10/10**	**Fri 4/30/10**	**0%**	
78	78	Place Mainline Tracks	Wed 3/10/10	Fri 4/16/10	0%	LIRR
79	79	Install Signal Power Poles South of Mainline Tracks	Mon 3/15/10	Fri 3/19/10	0%	LIRR
80	80	Remove Construction Fencing	Mon 4/19/10	Thu 4/22/10	0%	RFG
81	81	Cut and Throw Tracks	Fri 4/23/10	Sun 4/25/10	0%	LIRR
82	82	Relocate Signal Power Lines	Fri 4/23/10	Sun 4/25/10	0%	LIRR
83	83	Salvage Temporary Materials - Remove Track	Mon 4/26/10	Fri 4/30/10	0%	NGRID Contractor
84	84	Reconfigure Protective Fencing	Mon 4/26/10	Fri 4/30/10	0%	NGRID Contractor
85	85	**Install Northern Sheeting, Excavate and Backfill**	**Tue 4/27/10**	**Mon 7/12/10**	**0%**	
86	86	Install sheet cell 8	Tue 4/27/10	Tue 5/4/10	0%	CEI
87	87	Install sheet cell 9	Wed 5/5/10	Mon 5/10/10	0%	CEI
88	88	Install sheet cell 10	Tue 5/11/10	Fri 5/14/10	0%	CEI
89	89	Install sheet cell 11	Tue 5/18/10	Fri 5/21/10	0%	CEI
90	90	Excavate Cell 8	Mon 5/17/10	Tue 5/18/10	0%	CEI
91	91	Backfill and Compact Cell 8	Wed 5/19/10	Wed 5/19/10	0%	CEI
92	92	Cut sheets below grade Cell 8	Thu 5/20/10	Thu 5/20/10	0%	CEI
93	93	Excavate Cell 9	Mon 5/24/10	Tue 5/25/10	0%	CEI
94	94	Backfill and Compact Cell 9	Wed 5/26/10	Fri 5/28/10	0%	CEI
95	95	Cut sheets below grade Cell 9	Tue 6/1/10	Tue 6/1/10	0%	CEI
96	96	Excavate Cell 10	Thu 6/3/10	Fri 6/4/10	0%	CEI
97	97	Backfill and Compact Cell 10	Mon 6/7/10	Mon 6/7/10	0%	CEI
98	98	Cut sheets below grade Cell 10	Tue 6/8/10	Tue 6/8/10	0%	CEI
99	99	Excavate Cell 11	Thu 6/10/10	Fri 6/11/10	0%	CEI
100	100	Backfill and Compact Cell 11	Mon 6/14/10	Mon 6/14/10	0%	CEI
101	101	Cut sheets below grade Cell 11	Tue 6/15/10	Wed 6/16/10	0%	CEI
102	102	Remove Materials From LIRR Property/Restore	Mon 6/21/10	Fri 7/2/10	0%	CEI
103	103	Restore LIRR Northern Perimeter Fencing	Tue 7/6/10	Mon 7/12/10	0%	RFG



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