REMEDIAL DESIGN REPORT
FOR SOURCE AREA SOIL

FRONTIER CHEMICAL SITE
NIAGARA FALLS, NEW YORK
NYSDEC INDEX #89-0571-00-01

Prepared For:
Frontier Chemical Site Potentially Responsible Parties Group

Prepared by:
Conestoga-Rovers & Associates

651 Colby Drive
Waterloo, Ontario
Canada N2V 1C2

Office: (519) 884-0510
Fax: (519) 884-0525

web: http://www.CRAworld.com

DECEMBER 2011
REF. NO. 047392 (9)

TABLE OF CONTENTS

TABLE OF CONTENTS

Page

LIST OF FIGURES
(Following Text)

LIST OF TABLES
(Following Text)

LIST OF ACRONYMS AND ABBREVIATIONS

ARAR	Applicable or Relevant and Appropriate Requirement
ASTM	American Society for Testing and Materials
BMP	Best Management Practice
btu	British thermal unit
cm/sec	Centimeters per Second
CRA	CRA Infrastructure & Engineering, Inc.
COC	Contaminant of Concern
cy	Cubic Yard
ESA	Environmental Services Associates, Inc.
ESC	Erosion and Sediment Control
eV	electron volt
feet bgs	Feet Below Ground Surface
Frontier Group	Frontier Chemical Site Potentially Responsible Parties Group
FFS	Focused Feasibility Study
GAC	Granular Activated Carbon
HASP	Health and Safety Plan
ISCO	ISCO Chemical Company
NAPL	Non-Aqueous Phase Liquid
MCL	Maximum Contaminant Level
mg/kg	Milligrams per Kilogram
NYCRR	New York Codes, Rules and Regulations
NYSDEC	New York State Department of Environmental Conservation
NYSDOT	New York State Department of Transportation
OM&M	Operation, Maintenance, and Monitoring
PID	Photoionization Detector
ppm	parts per million
RA	Remedial Action
RAOs	Remedial Action Objectives
RCRA	Resource Conservation and Recovery Act
RD	Remedial Design
RI	Remedial Investigation
RI/FS	Remedial Investigation and Feasibility Study
ROD	Record of Decision

LIST OF ACRONYMS AND ABBREVIATIONS

Site	Frontier Chemical Site
TCLP	Toxicity Characteristic Leaching Procedure
TSD	Treatment, Storage, Disposal
U.S. EPA	United States Environmental Protection Agency
VOCs	Volatile Organic Compounds
SIU	Significant Industrial User

1.0 INTRODUCTION

1.1 GENERAL

CRA Infrastructure & Engineering, Inc. (CRA), on behalf of the Frontier Chemical Site Potentially Responsible Parties Group (Frontier Group), has prepared this Remedial Design (RD) Report for submittal to the New York State Department of Environmental Conservation (NYSDEC) for the Frontier Chemical Site (NYSDEC Index # 89-0571-00-01) (Site). This RD has been prepared in accordance with NYSDEC guidance to address the requirements for remedial design to address the implementation of a Site remedy, including the source area soil component and Site conditions (i.e., cover). In the Record of Decision (ROD) issued for the Site in 2006, the selected soil remedy consisted of excavation, trucking, and off-Site treatment / disposal of source area soil at a permitted waste facility. In 2008 through 2010, the Frontier Group performed pre-design investigation activities associated with the soil remedy, resulting in an improved understanding of Site conditions over that which was available at the time the ROD was issued. In the past several years, there have also been improvements in remedial technologies for soil that have now been proven at many locations. Based upon the improvements in the understanding of Site conditions and remedial technologies for soil, it was determined that other remedial alternatives may be more suitable than the ROD-selected "dig and haul" remedy. Consequently, the NYSDEC requested that the Frontier Group re-evaluate the soil remediation alternatives for the Site. This re-evaluation was performed and a Focused Feasibility Study (FFS) outlining the results of the re-evaluation was submitted to the NYSDEC in November 2011. Based upon this re-evaluation, it has been determined that the remedial alternative consisting of excavation and on-Site thermal treatment of source area soil is a superior remedy to the ROD-selected remedy. In addition, the excavation and on-Site treatment of source area soil remedy is more consistent with New York's green remedy mandate (NYSDEC DER-31 / Green Remediation) and therefore is a more appropriate remedial alternative.

Given this determination, the Frontier Group has prepared this RD providing the details of the various components of an excavation and on-Site treatment remedy for the source area soil on the Site. This RD presents the measures necessary to meet the Remedial Action Objectives (RAOs) for the Site and provides the technical requirements in sufficient detail to define the functional aspects of the remedy. Some of the specific details of the design can not be provided until a remediation contractor has been selected, as each contractor employs slightly different methods and equipment for performing the thermal desorption and destruction of the Site contaminants of concern. Consequently, submittal of the final details of some of the RD components will await the selection and awarding of a contract to a qualified remediation contractor.

1.2 REMEDIAL ACTION OBJECTIVES

RAOs were identified in the 2006 ROD and are still valid. The RAOs for the source area soil are summarized as follows:

- Eliminate to the extent practicable the potential for direct contact with the contaminated subsurface soil
- Reduce the risk of further contamination of the groundwater by reducing the potential for leaching of contaminants into the groundwater
- Eliminate to the extent practicable the potential for human exposures to organic vapors in Site buildings, structures, and subsurface utilities

In conjunction with the implementation of institutional controls, the excavation and on-Site treatment of source area soil best achieves these RAOs. Further, this remedy will also enhance and complement the remedial components selected for the Site groundwater and other Site conditions.

1.3 PURPOSE OF REPORT AND REPORT ORGANIZATION

The purpose of this RD is to provide a detailed description of the design based on the results from the Supplemental Remedial Investigation (Ecology & Environment Engineering, P.C., 2002); Feasibility Study (FS) (Ecology & Environment Engineering P.C., 2004); Remedial Pre-Design Investigation (Conestoga-Rovers & Associates, September 2010) and Focused Feasibility Study (FFS) (Conestoga-Rovers & Associates, November 2011).

The content of this RD follows the requirements specified in the NYSDEC DER-10 Technical Guidance for Site Investigation and Remediation. The remainder of this Report is organized as follows:

Section 2.0	Project Description
Section 3.0	Summary of the Remedy
Section 4.0	Remedial Pre-Design Investigation Results
Section 5.0	Remedy Elements
Section 6.0	Institutional Controls

Section 7.0	Operation, Maintenance, & Monitoring Requirements
Section 8.0	Project Delivery Strategy
Section 9.0	Remedial Action Permits Plan
Section 10.0	Preliminary Easement and Access Requirements
Section 11.0	Outline of General Specifications
Section 12.0	Preliminary Schematics and Drawings
Section 13.0	Preliminary Remedial Action Schedule
Section 14.0	Summary
Section 15.0	References

2.0 PROJECT DESCRIPTION

The following subsections present a brief description of the Site, its history of operation, and the selected remedy for the source area soil. Additional Site background and project details can be found in the previously mentioned reports.

2.1 SITE DESCRIPTION

This former permitted Treatment, Storage, Disposal (TSD) Site is an inactive 9-acre parcel located at 4626 Royal Avenue within the industrial area of the City of Niagara Falls, New York (see Figure 2.1). The Niagara River lies about 1 mile south of the Site.

The Site is bordered to the north by property identified as owned by the Niagara Junction Railway Company, to the northwest by property identified as owned by the Niagara County Industrial Development Agency, to the south by Elkem Metal Company and to the southwest by Frank's Vacuum Truck Service (both along Royal Avenue), and to the east by 47^{th} Street, beyond which is an industrial site (Strator).

The property had historically been the site of a chemical manufacturing facility and then later became a NYSDEC TSD-permitted facility storing and treating chemical wastes from 1974 until December 1992, when the facility closed. When in operation, approximately 25,000 tons of chemical wastes were treated each year.

2.2 SITE HISTORY

The Site was originally developed in 1906 by ISCO Chemical Company (ISCO) as a caustic-chlorine plant. During World War II, the International Minerals and Chemicals Corporation bought the Site and operated the facility as a caustic soda/potash and chlorine plant. In 1974, the Frontier Chemical Company, which provided hazardous and non-hazardous chemical treatment, moved their operations to the Site from Pendleton, New York. Frontier Chemical expanded its on-Site operations, which included wastewater treatment, fuels blending, and bulking chemicals for off-Site disposal. The Site held a NYSDEC permit.

In 1985, Frontier Chemical and a sister company, BLT Services, Inc., became wholly owned subsidiaries of Environmental Services Associates, Inc. (ESA). In February 1990, ROE Consolidated Holdings assumed operational control of ESA, which had operational control of the Site. The current Site owner is 5335 River Road, Inc.

The facility ceased operations in December 1992. Beginning in 1999, most of the Site's buildings were demolished to grade and some rubble remains on Site. The Site remains a vacant industrial property and is secured with a perimeter fence.

2.3 SUBSURFACE CONDITIONS

The overburden thickness ranges from 14.7 feet to 17.1 feet. It consists of up to 2 feet of fill material (topsoil, silt, sand, and gravel with some cinder blocks, glass, wood, slag, bricks, crushed stone, concrete, and asphalt) followed by 12 feet to 15 feet of silty clays overlying the bedrock. The natural soils encountered generally consist of brown to red to green silty clays or fine sand and silt, with trace gravel at most localities.

Bedrock underneath the Site is classified as Lockport Dolomite.

2.4 NATURE AND EXTENT OF SOURCE AREA SOIL

Due to the long history of industrial activities at the Site, there are a variety of contaminants detected in the subsurface (soil and groundwater). The nature and extent of source area soil were originally determined through the remedial investigations that were performed on the Site in the 1990s and early 2000s. Additional delineation was performed as part of the pre-design work for the final remedy that has expanded the understanding of the nature and extent of source area soil. The additional investigation and pre-design were implemented pursuant to NYSDEC-approved work plans.

Although there are a variety of contaminants present on the Site, Volatile Organic Compounds (VOCs) are the primary contaminants of concern with regard to the soil remediation. This was determined in the 2004 Feasibility Study based on the following factors:

- Historic operations at the Site included treatment and storage of chemical wastes that primarily included a variety of VOCs
- VOCs were the contaminants detected most frequently and at the highest concentrations
- In general, other types of contamination detected were located proximate to the areas significantly contaminated with VOCs

Consequently, VOCs were used in the Supplemental Remedial Investigation (2002) to delineate the source area soil that requires remediation. That report used the analytical data from 29 soil samples that had been collected and analyzed for chemical presence to delineate the extent of contamination in the soil. NYSDEC used this initial delineation to select the remedy for the source area soil in the ROD.

As part of the remedial pre-design investigation performed by the Frontier Group in 2008 through 2010, an additional 174 samples were collected and analyzed. This work vastly improved the delineation of the nature and extent of the source area soil in both the horizontal and vertical direction. This delineation of the source area soil requiring remediation was approved by the NYSDEC on October 13, 2010 as part of the approval of the Remedial Pre-Design Investigation Report (CRA September 2010).

Using all of the available soil data, a set of figures depicting the source area soil approved for remediation is presented on Figures 2.2 through 2.9. Each successive figure presents a 2-foot interval of the soil horizon, starting with the interval at the ground surface and descending to the bottom interval overlying the top of bedrock which is located at a depth of approximately 16 feet below ground surface (ft bgs). As can be seen on the figures, there are considerable discontinuities in the adjoining and overlying/underlying areas that are considered source area soil. This is indicative of a multi-release site.

This delineation of source area soil extends beyond the vertical and horizontal limits of the soil that exceeds the cleanup criteria in 6 NYCRR Part 375-6 that was promulgated after the ROD was issued. Although the 6 NYCRR Part 375-6 criteria would require considerably less soil to be defined as source area soil requiring remediation, the NYSDEC and Frontier Group have established the horizontal and vertical delineation of the source area soil to constitute the remediation area identified through the NYSDEC-approved remedial pre-design investigation. This delineation is consistent with the remedial objectives of the 2006 ROD.

3.0 SUMMARY OF THE REMEDY

This section describes the major components of the remedy as defined in the ROD. Some of the remedial components have already been implemented. Some are yet to be completed, such as the institutional controls, but will be implemented by the property owner in a timely manner consistent with the remedial decision process. All of the remedial components are briefly discussed in this section to demonstrate that the combined effect, once implemented in conjunction with the soil remedy, will eliminate any significant threats to public health and the environment and will ensure continued protection of human health and the environment. This RD will remain focused on the Site's soil remedial component.

The remedial components consist of the following:

- Physical Controls

  Fencing and warning signs will be used to restrict access to the facility to deter vandalism and control trespasser exposure. Upon completion of the soil remediation component, those areas of the Site that have been disturbed by the soil excavation will be capped with one foot of clean material. All existing soil-exposed surfaces across the Site will be similarly capped with one foot of clean material. The remainder of the Site is covered with concrete or asphalt and will remain with these hard surface covers.

- Institutional Controls

  Institutional controls will be emplaced to reduce the potential for exposure to the residual contaminants of concern. The Site will remain as an industrial zoned property and deed restrictions / title notices will be put in place by the property owner to document appropriate precautions for any residual constituents that will remain, appropriately covered, on the Site following the planned remedial activities. The NYSDEC regulates the installation of new groundwater extraction projects in New York State and therefore, in conjunction with the institutional controls, is in a position to confirm that groundwater beneath the Site is not inappropriately extracted or diverted from its current flow path without proper precautions being taken. The institutional controls ensure that future Site buildings incorporate appropriate vapor control measures to protect indoor air quality. The owners of the property will allow and monitor all appropriate institutional controls placed upon the Site.

- Groundwater Remedies

  The overburden and shallow bedrock groundwater beneath the Site is hydraulically controlled by the bedrock sewer tunnels along 47th Street and Royal Avenue. These tunnels draw all of the shallow groundwater in the area (including from beneath the Frontier Site) toward them. The groundwater, once having infiltrated the tunnels, flows to the City of Niagara Falls wastewater treatment plant where it is treated. A Significant Industrial User Permit has been issued to the Frontier Group by the Niagara Falls Water Board to allow this infiltration and treatment of Site groundwater to occur under proper authorization.

  The deep bedrock groundwater was investigated during the remedial pre-design and determined to be protected from the chemicals on the Site by upward hydraulic gradients that prevent any aqueous phase chemical from reaching the deep bedrock groundwater flow regime. While there are some chemicals detected in the deep bedrock groundwater, their concentrations are low and they do not pose a significant environmental risk. A monitored natural attenuation remedy has been selected for the deep bedrock groundwater.

- Site Conditions

  Most of the Site buildings / structures were demolished in 1999 or shortly thereafter. A few buildings and structures remain and will be demolished in the near future. The Site is currently vacant, but plans are being prepared to use the Site in the near future as a vehicle storage area. This use would be in compliance with the industrial zoning for the Site.

- Site Cap

  Most of the current surface area on the Site is hard surface cover consisting of asphalt or concrete. This surface prevents contact with Site contaminants. Smaller areas of the Site have soil cover and the proposed soil remediation (excavation and on-Site treatment of source area soil) will create additional soil covered areas. Upon completion of the soil remedy, the soil cover areas will be capped with one foot of clean material. Based on the expectation that the Site will be used as a vehicle storage area in the near future, the most practical material to use as the cover material is quarried stone or crushed concrete / demolition debris. This material will be capable of supporting truck traffic that would be traversing the Site in its future use as a vehicle storage area. Figure 3.1 shows the final cover areas following the completion of the soil remediation.

- Long-Term Operation, Maintenance, and Monitoring

  Once the source area soil is treated, there will be no need for ongoing operation, maintenance, and monitoring (OM&M) activities associated with the remaining soil.

However, it is noted that the groundwater remedies will require some OM&M activities, primarily groundwater sampling. The only other physical remedial component at the Site will be the fence and appropriate signage that will provide for the continued security of the Site. All other long term remedial components will be institutional in nature. This includes restrictions and guidelines associated with potential future use or activity at the Site. These restrictions and guidelines will be defined by the institutional controls established for the Site and are provided in the Site Management Plan, which is included as Appendix A to this RD.

4.0 REMEDIAL PRE-DESIGN INVESTIGATION RESULTS

Remedial pre-design investigation activities, as outlined in the Supplemental Soil Characterization and Pilot Test Work Plan (CRA 2007), were conducted in 2008 through 2010 to obtain additional data required for the RD and to address known and potential challenges related to the major components of the ROD-selected remedy. The following sections summarize the remedial pre-design investigation activities that were completed to assist in performing the RD.

4.1 SOURCE AREA SOIL DELINEATION

A total of 33 additional boreholes were drilled during the remedial pre-design investigation to supplement the chemical concentration and soil stratigraphy information that was generated in the previous investigations. The results of the previous investigations were presented in the Supplemental Remedial Investigation report by Ecology & Environment P.C. (2004). The additional boreholes drilled during the remedial pre-design investigation provided 174 additional chemical samples to augment the 29 taken during the remedial investigation phase. This information has vastly improved the delineation of the nature and extent of the source area soil in both the horizontal and vertical direction. This delineation of the source area soil requiring remediation was approved by the NYSDEC on October 13, 2010 as part of the approval of the Remedial Pre-Design Investigation Report (CRA 2010). Using all of the available soil data, a set of figures depicting the source area soil approved for remediation is presented on Figures 2.2 through 2.9. Each successive figure presents a 2-foot interval of the soil horizon starting with the interval at the ground surface and descending to the bottom interval overlying the top of bedrock which is located at a depth of approximately 16 feet below ground surface (ft bgs). As can be seen on the figures, there are considerable discontinuities in the adjoining and overlying /underlying areas that are considered source area soil. This is indicative of a multi-release site.

Based upon this approved delineation, it has been determined that there is on the order of 15,000 cubic yards of source area soil. Since the source area soil is interspersed throughout the soil horizon and surrounded by soil that does not require remediation, considerable additional soil will have to be excavated in order to access the source area soil. Based on the available information, it is expected that on the order of 32,000 cubic yards of soil will have to be excavated in order to access the 15,000 cubic yards of source area soil. Only the source area soil will be thermally treated prior to placement back into the excavation.

4.2 REMEDIAL ALTERNATIVE RE-EVALUATION

Over the past several years, there has been a dramatic advancement in soil remediation technology with regard to thermal treatment. This advancement has been particularly pronounced for sites where VOCs are the targeted contaminants of concern. While it has been known for a long time that VOCs can be readily removed from soil through the application of heat, it has only recently become commercially viable to do so. Mobile thermal treatment units are now readily available for applications such as exist at the Site. Further, the documentation exists from numerous sites across New York and the rest of the country demonstrating the effectiveness of these mobile units. And further yet, the technology has advanced to the point (with regard to vapor controls, destruction efficiency, etc.) that allows mobile thermal treatment to be performed as an economically viable option.

In addition to the technological advancements, New York State has implemented a process for evaluating remedial alternatives to include consideration of the overall impact of a remedy's implementation. This includes consideration of the remedy's impact with respect to its environmental footprint, sustainability, and the use of "green technologies". In essence, all of the environmental aspects of the remedy are now being evaluated in the remedy selection process, not just the specific impacts on human health and the environment.

The Frontier Group, as a result of discussions with the NYSDEC, researched the possibility of implementing a thermal treatment option for the source area soil. Through discussions with the NYSDEC, it was agreed that it would be appropriate to re-evaluate the Site's soil remedy factoring in these advances in remedial options. As a result, the Frontier Group completed a FFS comparing the ROD-selected excavation, trucking, and off-Site treatment / disposal alternative against an excavation and on-Site thermal treatment alternative.

The FFS was submitted in November 2011 and showed that the excavation and on-Site thermal treatment alternative ranked higher in the feasibility study evaluation factors and higher in the sustainability / green concept evaluation. Based on this outcome, the alternative re-evaluation showed that excavation and on-Site thermal treatment is the highest ranked alternative, has been proven through application at multiple Sites, successfully meets the RAOs, has a smaller environmental footprint than the ROD-selected remedy, and therefore is the preferred remedy for this Site.

4.3 SUMMARY

Based upon the results of the remedial pre-design investigation and FFS, it has been determined that a remedy consisting of excavation and on-Site thermal treatment of source area soil is the appropriate remedy for the Remedial Action. The defined source area soil consists of approximately 15,000 cubic yards of soil. Treating this volume of soil far exceeds the current regulatory cleanup requirements for the Site but is consistent with the remedial objectives of the 2006 ROD and therefore has been agreed upon between the NYSDEC and Frontier Group as the appropriate performance goal of the planned remediation.

5.0 REMEDY ELEMENTS

The RD of the soil remedy for the Site has been developed through discussions with the NYSDEC and input from experienced thermal remediation contractors in addition to CRA's remediation experience. Each of the components of the Site's soil remedy is presented in the following subsections. Figure 5.1 provides a conceptual layout of the Site features that will be required to complete the soil remediation project.

5.1 EROSION AND SEDIMENT CONTROL AND STORM WATER MANAGEMENT

The Site is primarily flat and about 80 percent of the surface is covered with asphalt or concrete. Areas where soil is exposed at the ground surface are currently vegetated with scrub shrubs and grasses. The soil on the Site is primarily fine grained and, consequently, relatively resistant to water penetration. Consequently, the primary means of precipitation event handling on the Site involves surface sheet flow over the hard surface areas. Some precipitation infiltrates into the subsurface via cracks and joints in the hard surfaces. Some infiltrates via the soil surface areas. Some evaporates from the surface and the remainder, when sufficient precipitation occurs, flows from the Site onto the neighboring properties and adjacent roadways (47th Street and Royal Avenue). Given that the current surface of the Site is clean, there is no precipitation contact with Site contaminants of concern for the surface water. Given that all of the surfaces on the Site are either hard cover or soil areas with vegetative cover, there is no sediment erosion concern under existing conditions.

However, the planned soil remediation will involve the excavation of a large area of the Site (approximately 2 acres) which will result in soil with Site contaminants of concern being exposed during remedial activities. The exposed soil will be in two settings: either in the excavation itself or being handled on a portion of the remaining surface area of the Site. All water will be handled in accordance with plans to ensure that Site contaminants of concern do not migrate off-Site. The following surface water handling practices will be implemented to meet this requirement:

<u>Within Excavation Area</u>

All precipitation that falls within the excavation will be considered impacted. All such water will be retained within the excavation and either allowed to infiltrate into the surrounding unexcavated soil or into the bedrock or will be pumped to the sanitary sewer system in compliance with the Site's Significant Industrial User Permit that was issued by the Niagara Falls Water Board. The volume of water discharged to the sewer system will be metered and the quality will be brought into compliance with the discharge Permit's requirements. Expectations are that the water will have to be pre-filtered to minimize solids content. The water infiltrating into the soil and bedrock forming the excavation's boundaries will eventually be captured by the sanitary sewer system. Consequently, the infiltrating water will remain within a controlled and authorized discharge environment.

Peripheral to the Excavation Area

To minimize the flow of precipitation into the open excavation, clean soil berms may be established around certain areas of the excavation. Noting that the Site is relatively flat, there may be minimal precipitation that can or needs to be prevented from entering the excavation. The limits of such berms will be field determined based on actual conditions encountered or expected.

Soil Handling Area

All soil removed from the excavation will be placed into specific storage areas where surface water will be controlled. The pathways used by trucks and equipment that handle or transport soil on-Site will similarly be segregated as surface water control areas. All precipitation falling within the surface water control areas will be retained within the area and either allowed to infiltrate via surface cracks, evaporate, or be pumped to the sanitary sewer in compliance with the Site's Significant Industrial User Permit.

The water control areas will be enclosed by soil berms constructed using low permeable soil or plastic lined material. Concrete or asphalt curbs may also be used. The locations of the water control areas are shown on Figure 5.2.

Sediment Control

By providing surface water control in the designated storage and transfer areas, sediment will also be controlled. Equipment working in surface water control areas will be required to undergo appropriate decontamination procedures before leaving a controlled area.

Any trucks or vehicles making deliveries to the Site will be required to remain outside of the surface water control areas and on hard surfaces to avoid tracking any soil off-Site.

5.2 SITE PREPARATION

A series of tasks will have to be performed to prepare the Site for the soil remediation. These tasks include the following:

Personnel and Equipment Decontamination Facilities
Any person or piece of equipment that enters the surface water control area will have to be decontaminated prior to exiting the area. All other areas on the Site will be deemed as clean areas within which decontamination will not be required. The decontamination facilities for personnel will consist of temporary stations that will be set up at strategic points of entry / egress. The stations will be equipped and maintained in accordance with the procedures specified in the Health & Safety Plan that is provided in Appendix B.

One equipment decontamination station consisting of a concrete pad complete with curb and sump will be set up at a strategic point of entry / egress into the surface water control area. The equipment decontamination water will be discharged to the sanitary sewer in compliance with the Site's Significant Industrial User Permit. All accumulated soil removed from the equipment will be placed into the appropriate stockpile of soil, either requiring treatment or being available for placement back into the excavation, as appropriate.

Site Trailers
Mobile trailers will be set up on the Site to provide appropriate accommodation for the following functions:

- Lunch / break room for workers
- Lockers for on-Site workers
- Contractor office
- Engineer office
- NYSDEC office
- Meeting room

The trailers will be equipped with running water, washrooms, and electricity.

Building Demolition
There are three buildings and two tank farms that are within the footprint of the source area soil excavation. These will have to be removed in order to access the source area

soil. One of the buildings is a 14 foot tall brick and block building (30 feet by 80 feet). The second is a wood-framed pump house (20 feet by 9 feet) and the third is an electrical motor control center building for the wood-framed pump house. This building is of concrete block construction (9 feet by 15 feet). These two attached buildings sit on a one-foot-thick concrete slab. There is a large steel frame and blending tank in the larger building. The pump house contains pump frames and heads. Otherwise, the buildings are empty. These units will be demolished in accordance with safe demolition procedures. The tank farms contain one polyethylene tank and six fiberglass tanks. The polyethylene tank is 9 feet high and 8 feet in diameter. The fiberglass tanks are 20 to 26 feet high and 12 to 15 feet in diameter. All of the tanks are empty. The tanks will be properly dismantled and shipped off-Site for disposal or resale.

Foundation, Slab, and Pavement Demolition

The surface area within the footprint of the source area soil excavation includes areas covered with concrete slabs from former and, to be demolished, buildings, asphalt pavement areas, and soil-covered areas.

The areas covered with concrete are mostly the floor slabs of former buildings and tank farms. It is expected that all of the concrete floor slab areas will be encircled with foundations that extend below grade and will be comprised of reinforced concrete. The concrete will have to be broken up using a hoe-ram or other suitable mechanical equipment. The concrete will then be pulverized to 2-inch-minus size and stockpiled for reuse as final cover over the excavation area. The reinforcing steel will be separated and shipped off-Site for salvage.

The areas covered with asphalt will be removed with a backhoe and be sent off-Site for recycling.

The soil-covered areas will be excavated and placed into the stockpile for reuse as backfill for the excavation.

Utilities

There is an existing water service onto the Site that will be reactivated to provide a potable water source to the Site trailers and utility areas (decontamination pads and thermal treatment unit), as necessary. The connections to the utility areas will be above ground installations that will be protected from damage.

Arrangements will be made with the local electrical provider to reactivate the electrical service to the Site. The service will be above-grade, pole-mounted installations. If desirable or necessary, the electrical supply could be sourced from one of the neighboring industries.

Arrangements will be made with the local natural gas provider to supply a large volume natural gas feed to the thermal treatment unit. If desirable or necessary, the natural gas supply could be sourced from one of the neighboring industries. Alternatively, propane may be used.

Arrangements will be made with the Niagara Falls Water Board to install a connection to the sanitary sewer to handle sanitary discharge and surface water control discharges from the Site. The discharges will be controlled under the Site's Significant Industrial User Permit.

Site Clearing

Portions of the Site are overgrown with vegetation, some of which has grown up through cracks in the concrete and asphalt surface areas. To the extent that this vegetation is in areas that will be used to perform the soil remediation, it will be cut and taken to a sanitary landfill for disposal. Loose construction debris will be consolidated into the existing construction debris stockpile located in the southeast corner of the Site. Other miscellaneous debris will be consolidated and sent off-Site for disposal at a sanitary landfill or recycled, as appropriate.

Monitoring Well Closures

Monitoring wells located within the excavation area and in the soil stockpile / treatment area will be decommissioned by grouting in place in accordance with NYSDEC's CP-43: Groundwater Monitoring Wells Decommissioning Policy. To the extent that the wells are in the source area soil excavation area, the encountered portions of the grouted wells will also be removed. Effort will be made to preserve wells currently included in the Site's long-term OM&M Plan that are used for the Site's Significant Industrial User Permit discharge compliance monitoring program. Wells that can not be preserved may have to be replaced.

5.3 EXCAVATION OF SOURCE AREA SOIL

The limits of source area soil have been delineated and will be used to define the limits of the excavation area. Within the excavation area, the field protocol will rely upon results of the soil characterization investigations that have been performed to guide the excavation of soil and to distinguish between source area soil and non-source area soil. Because the source area soil is interspersed amongst soil intervals that do not require treatment, it is necessary to devise a method for separating the excavated soil into the two categories as the excavation progresses. While visual evidence of staining would provide some indication of source area soil (although not necessarily correct in all cases), it will not identify all of the source area soil. Consequently, another method of segregating the soil into the two categories is necessary.

During the remedial pre-design investigation, each two-foot soil sample interval from the boreholes included in the soil characterization program was screened with a photoionization detector (PID). A sample of each 2-foot interval was also submitted to a New York State Department of Health certified laboratory for VOC analysis using precision analytical laboratory instruments. As noted in the Remedial Pre-Design Investigation report (CRA 2010), a comparison of the results from these two analytical methods shows very good correlation. The evaluation shows that, in general, the soil samples that had confirmed laboratory concentrations in excess of 100 ppm, also registered as having concentrations in excess of 100 ppm on the PID. While there are some outlier samples (where one method measured a concentration greater than 100 ppm but the other did not), the basic trend was that the results did match. The outliers were as follows:

- 20 of the 109 soil intervals that were analyzed to be below 100 ppm in the laboratory results, exceeded 100 ppm using the PID
- 13 of the 62 soil intervals that were analyzed to be above 100 ppm in the laboratory results, were below 100 ppm using the PID

In both cases, about 20 percent of the samples were inaccurately characterized. It is noted that most (8 of the 13) of the soil intervals for which the PID measurements showed a concentration less than 100 ppm, the laboratory result was in the 100 to 200 ppm range. Another two were in the 200 to 300 ppm range, two in the 300 to 400 ppm range, and one in the 600 to 700 ppm range. The complete set of comparative results is presented in Table 5.1. While the PID method did underestimate the actual laboratory confirmed result in these 13 samples, all of these samples met the current regulatory cleanup criteria as promulgated in 6 NYCRR Part 375-6. As a result, the PID still provided conservatively accurate results in identifying source area soil according to current regulations. The fact that the PID method identified 20 of the soil samples that were not identified as being source area soil by the laboratory analysis shows that this method for identifying source area soil is conservative. The net result is that more soil would have been designated as source area soil using the PID than was actually confirmed by laboratory analysis as exceeding current regulatory criteria.

Based upon this comparison, it is evident that the PID is suitably accurate to be used as the field tool to determine whether the soil being excavated from a specific layer and area is source area soil. This conclusion is based upon the following:

- The clean up criteria used in the ROD for selecting the soil remedy was more restrictive than the current Part 375 regulatory soil clean up criteria for an industrial site
- The Frontier Group has agreed to remediate the source area soil within the more restrictive limits delineated during the pre-design investigation and recognizes that this results in the treatment of more soil than would be required under the current regulations as applied to an industrial site
- In those cases in which the PID inaccurately determined that the soil being examined was not source area soil, the soil would still have met the current promulgated regulations and therefore would not have required treatment
- The PID reliably and conservatively identifies soils that should be included as source area soil

Based upon the above factors, a PID will be used as the screening tool during the soil excavation to segregate the soil into two distinct categories: source area soil and non-source area soil. A composite sample (consisting of three equal samples) will be accumulated as the soil is excavated from each particular visually identifiable soil layer / type. The composite sample will be placed in a plastic bag from which the PID reading will be taken. The soil associated with each sample will then be directed to one of two stockpiles: either the one for source area soil or the one for non-source area soil. A minimum of one PID reading per 100 cubic yards of visually similar soil type will be performed. For those cases in which visually different materials are encountered, one PID reading from each different material will be taken for delineation purposes. The PID will be equipped with an 11.7 eV lamp, which has been determined to be suitable for identifying the primary contaminants of concern at the Site.

5.4 SOIL STOCKPILES

Following characterization of the soil layers using the PID, the soil will be transported either by truck or conveyor to either the source area soil stockpile or the non-source area soil stockpile. The non-source area soil stockpile will be encircled by a soil or asphalt/concrete berm to control surface water and sediment. Soil placed within the non-source area soil stockpile will be available for immediate reuse as backfill for the excavation on an as needed basis.

The locations of the proposed stockpiles are shown on Figure 5.1. The locations may be modified subject to confirmation once the remediation contractor has been selected and fine tuning of the Site setup is complete.

The stockpile for the source area soil will be within an enclosed structure. The anticipated enclosure will consist of a metal frame structure over which an impermeable fabric is stretched. The enclosure will be on the order of 20,000 square feet, the details of which will be provided by the selected remediation contractor. The final size of the enclosure will be dependent upon the remediation contractor's expected rate of excavation and treatment, with the primary consideration being to ensure that a steady feed of source area soil can be supplied to the thermal treatment unit.

Within the enclosure for the source area soil, the remediation contractor will be preparing the soil for treatment. The preparation involves the blending of soil with varying moisture contents and chemical concentrations to provide as consistent a feed stock to the thermal treatment unit as possible. Due to the fine-grained nature of the soil requiring treatment, some mechanical manipulation of the soil will also be required. The soil will be passed through a pug mill, or other suitable mechanical device to reduce the size of any soil clumps to less than 3 inches, the size most suitable for the thermal treatment unit.

The enclosure will also be encircled with a soil, asphalt, or concrete berm to control surface water and sediment.

The enclosure will be equipped with air purification equipment to protect workers and to manage the vapors emitted from the source area soil as it is handled within the enclosure.

A treated soil stockpile area will also be created adjacent to the thermal treatment unit as shown on Figure 5.1. The treated soil area will be set up to segregate the treated soil into 200 cubic yard piles. Confirmation sampling of the treated soil will be performed by collecting one five-point composite sample from each 200 cubic yard pile. The sample will be submitted to a New York State Department of Health certified laboratory for VOC analysis. Upon receipt of confirmation that each 200 cubic yard pile has a total VOC concentration of less than 100 ppm, the pile can be released for use as backfill in the excavation. Any pile for which the confirmatory sample result exceeds 100 ppm total VOCs will be removed from the treated soil stockpile area and returned to the source area soil stockpile for reprocessing / treatment.

5.5 SOIL VAPOR & PARTICULATE MANAGEMENT

Since the excavated soil is impacted with VOCs, vapor and dust management controls will be provided throughout the working area to protect Site workers and the surrounding community. The components of the vapor and dust management plan include the following:

Within the Excavation

Best management practices will be employed within the excavation to minimize the generation of soil vapors. These practices will include:

- The size of the excavation will be maintained at the smallest size possible, consistent with the practicality of reasonably being able to extract the necessary soil
- The sequence of soil excavation to the various depths will be planned to minimize the size of the excavation open at any given time
- Areas excavated to final depth will be backfilled with non-source area soil or treated source area soil as soon as practicable
- Any odiferous exposed surfaces will be covered with polyethylene sheeting or foam at the end of each working day
- If necessary, the rate of soil extraction or the amount of open excavation faces will be reduced to ensure that there is no adverse risk to Site workers, the public, or the environment
- Water spray can be used to control vapor and dust generation

Non-Source Area Soil Stockpile

The non-source area soil stockpile will be covered at the end of each day with polyethylene sheeting to minimize VOC volatilization. The sheeting will be left in place during the daily advance of the excavation and stockpiling process to the extent practicable.

Source Area Soil Stockpile

The area within the enclosure for the source area stockpile will be under negative pressure with air constantly being evacuated from the interior. The rate of air exchange will be a minimum of two times per hour, or at a higher rate to maintain air quality at levels suitable for worker protection, if necessary. The evacuated air will be passed through carbon adsorption units to remove the VOCs from the airstream prior to discharge to the atmosphere. Two carbon beds in series will be used with lead / lag interchange capability. Carbon changeouts will be scheduled in accordance with observed breakthrough of the various VOCs at concentrations that exceed air quality criteria entering the polishing bed, consistent with appropriate air quality management practices.

Treated Soil Stockpile

Once treated, the source area soil will no longer contain any appreciable VOCs. Consequently, no vapor controls will be required with regard to the treated soil stockpile.

5.6 AIR MONITORING

The excavation and handling of Site soil will result in the generation of dust and the volatilization of some chemicals. While best management practices will be used to minimize uncontrolled volatilization, some will occur nonetheless. To ensure that there is no adverse risk to the Site workers, the public, or the environment, particulate and vapor monitoring will be performed. The results of the air monitoring program will be used, if necessary, to restrict excavation or soil handling operations to maintain air quality compliance with New York State criteria.

Air monitoring will be performed around the active soil management area using hand-held PIDs and dust particulate monitoring equipment. Background (upwind) air quality will be compared to downwind air quality to determine the effect of Site operations. The measurement locations will be established daily based upon climatological conditions and repositioned as necessary throughout the day. Measurements will be made on a continuous basis while actively excavating the soil and transferring to the stockpiles.

The details of the trigger points establishing proper personnel protective equipment and work suspension / modification are provided in the Health & Safety Plan.

5.7 BACKFILLING OF EXCAVATION

The backfilling of the excavation will be sequenced to match as closely as possible with the excavation operation. As soon as practicable, once an area of the excavation has reached the maximum depth required to remove the delineated source area soil, the backfilling of that area will begin.

The backfill material will be taken either from the treated source area soil stockpile (upon receipt and acceptance of confirmation testing) or from the non-source area soil stockpile. The soil will be placed in the excavation in layers not exceeding 6 inches in thickness and be compacted with a minimum of five passes with a 10-ton roller, or equivalent.

To the extent practicable, treated soil will be placed within the higher elevations of the excavation, keeping them as close to the ground surface as possible. The non-source area soil will be used to backfill the lower portion of the excavation. A filter fabric material will be placed between the source area soil and non-source area soil backfill layers as a delineation feature for future reference. Similarly, filter fabric will also be placed over the sidewalls of the excavation as a delineation feature for future reference.

Backfilling areas will be free of standing water at the time the backfill material is placed.

The final elevation of the top of the backfill material in the soil excavation area will be set one foot below the elevation of the surrounding surface areas. In accordance with the ROD, this final foot of material must be clean material. In consideration of the expected use of this Site as a vehicle storage area, the final foot will be backfilled with crushed concrete and select demolition material from the Site. The material will be crushed to 2-inch-minus in size.

Only authorized personnel will be allowed in the excavation and their entry will be limited to an as-needed basis. To the extent practical, work will be directed from perimeter areas outside the excavation using a mobile communication system. High visibility vests will be required for all individuals entering the excavation and procedures set up to maintain appropriate separation distances between individuals and equipment.

5.8 GROUNDWATER HANDLING

Groundwater encountered in the excavation or entering the excavation will be kept separate from the active excavation area to the maximum extent practicable. The groundwater will either be pumped to a separate excavation area / sump area where it will be allowed to infiltrate back into the surrounding groundwater flow regime or be pumped to the sanitary sewer under the Site's Significant Industrial User Permit.

5.9 NAPL

In the event that mobile non-aqueous phase liquids (NAPL) are encountered in the excavated soil, it will be separated from the soil and placed in 55-gallon NYSDOT-approved steel drums. A composite sample will be collected from the accumulated NAPL and sent for characterization analysis as applicable for treatment. The NAPL will then be sent to a permitted off-Site facility for treatment.

5.10 RADIOLOGICAL SCANNING

Consistent with recent findings in the Niagara Falls area, any slag encountered during the excavation of Site soil will be scanned for radiological activity. A Ludlum hand-held meter will be used to measure the radiation levels. The volume, radiological readings, position, and circumstances regarding the finding of radiological material will determine the impact on the soil remediation project. Plans on how or whether to proceed with the soil remediation will be developed by the Frontier Group in consultation with the NYSDEC.

5.11 THERMAL TREATMENT

The source area soil will be treated in an on-Site thermal treatment unit that is designed to heat the soil to temperatures above the boiling point of the contaminants of concern. Table 5.2 provides the boiling points of the contaminants of concern. The contaminants are desorbed from the soil and become airborne which allows them to be captured in the off-gas from the thermal treatment unit. The off-gases are then treated by passing through a thermal oxidation unit that further heats the gases to temperatures that break the chemical bonds of the contaminants, thereby destroying the contaminants and converting them into innocuous breakdown components. A schematic of a typical thermal treatment unit is shown on Figure 5.3. The off-gas from the thermal oxidation unit is scrubbed to meet New York State air emission concentrations. Each of these components of the treatment process is further described in the following subsections. Some of the details of the treatment system will not be available until the soil remediation contractor is selected since contractors will have differences in the equipment and specifications that they use. Once the soil remediation contractor is selected, more specific details will be available and will be provided to the NYSDEC.

Soil Preparation

As described in Section 5.4, the soil will be processed within a fabric enclosed building that houses the source area soil to prepare the soil for thermal treatment. The contractor will establish working piles within the enclosure that will allow the excavated soil to be separated according to the following criteria, as appropriate for their specific treatment process:

- Moisture content
- Chemical concentrations
- Soil characteristics
- Adhesive characteristics

The soil preparation also needs to take into consideration the BTU value of the source area soil to prevent "flash" burning of the soil within the thermal treatment unit and / or overheating of the thermal treatment unit.

Working from these piles, the contractor will blend the available soil from the working piles to create as consistent a feedstock as possible to the thermal unit. To the extent that any of the soil has excess adhesion (clumps) and to remove / separate irregular objects and large gravel, the soil will be processed through a jaw crusher or other suitable mechanical separating unit and screen to reduce the size of soil clumps to three inch minus. To the extent necessary for proper preparation, the soil may be amended with lime or kiln dust to improve the workability of the soil. Lime helps to break down clayey soil and helps neutralize the soil.

Soil Transfer to the Thermal Unit

The blended soil will be transferred to the thermal unit either by truck, bucket loader, or conveyor system. The soil will be deposited into the feed hopper of the thermal treatment unit.

Thermal Treatment Unit

There are two types of thermal treatment systems. One is a direct fired system where the combustion gases come in direct contact with the soil and the second is an indirect fired system where the flame heats the outside of the container holding the soil or uses a heat transfer medium (such as heated gases) but does not come into direct contact with the soil. Recovery of the contaminants of concern is simpler for an indirect fired unit because the high volume of combustion gas does not mix with the desorbed chemicals. This greatly reduces the volume of gas requiring treatment prior to release to the atmosphere. It will be up to the thermal treatment contractor to provide the method that will be used for this project and to comply with all air discharge requirements for whichever method is selected.

The thermal treatment unit will be an inclined rotary kiln, rotary dryer, or equivalent. It will be a mobile unit that is brought to and erected on the Site. The thermal treatment unit may be either a direct fired or indirect fired unit. The preferred fuel source for the thermal unit is natural gas and the supply source needs to be able to provide sufficient natural gas to generate on the order of 65,000,000 btu/hr (dependent upon the mobile unit). Again subject to the specific mobile unit used, it is expected that the thermal treatment unit would be able to process on the order of 40 tons of source area soil per hour. The unit would run 24 hours a day, and possibly 7 days per week.

The process involves heating the soil to well above the boiling point of all of the VOC contaminants of concern. Based on the boiling points listed in Table 5.2, the temperature would need to be greater than approximately 450° F. Once the soil approaches this temperature, the VOCs are readily desorbed from the soil. In order to achieve this temperature using the least amount of fuel, the incoming soil should have a moisture content less than 18 percent. Soil blending and the addition of lime will be the primary methods to control the moisture content of the incoming soil. Residence time within the thermal unit will depend upon the specific design of the thermal unit, the soil feed rate, the sustainable temperature within the unit, and the chemical and moisture conditions of the soil. Expectations are that the residence time would be in the 10- to 15-minute range but will have to be proven during the Proof of Performance test burns that are to be performed prior to the thermal unit going into active production. The test burns will be performed as part of the thermal treatment unit approval process following set up of the equipment on the Site. It is anticipated that the mobile thermal treatment unit will have its own permit and that the results of the test burns will be used to ensure compliance with the requirements of such permit. During the test burn, all of the operating parameters will be fine tuned and appropriate minimums and maximums set. The off-gas and soil treatment concentrations will be confirmed through monitoring and sampling.

The soil exiting the thermal unit will have been treated to a total VOC concentration of less than 100 ppm. This will be confirmed in 200-cubic-yard batches by collecting five-point composite samples and having the samples analyzed for VOCs at a New York State Department of Health certified laboratory. Once the laboratory data are available to confirm that a specific 200-cubic-yard batch has achieved the cleanup criteria, it will be available for reuse as backfill in the excavation.

The soil exiting the thermal treatment unit will be cooled and rehydrated with water to a moisture content in the range of 9 to 13 percent to facilitate good compaction when the soil is backfilled into the excavation. The soil will be processed through a pug mill or other suitable mechanical mixing device as part of the rehydrating process to further prepare the soil for use as backfill material.

5.12 OFF-GASES FROM THERMAL TREATMENT

The off-gas from the thermal treatment unit will be hot and will contain the desorbed VOCs and dust. The off-gas will be treated in one of three following ways:

- Condensation
- Carbon adsorption
- Thermal destruction

Condensation and carbon adsorption rely on the contaminants being removed from the air stream and either condensing into a water solution (subject to further treatment) or adsorbing to carbon. In the case of thermal destruction, the off-gas is further heated using an afterburner, to raise the temperature of the off-gas to on the order of 1700° F. This additional heating breaks the chemical bonds of the VOCs and converts them to their innocuous breakdown components. The off-gas will be blended with a cool air stream in an evaporative cooling chamber bringing the off-gas down to on the order of 450° F. At this temperature, the off-gas can be filtered through a bag house to capture dust particles. The dust will be mixed with the treated soil and be placed back into the excavation. Due to the presence of hydrogen and chlorine in the treated off-gas, it will be necessary to pass the off-gas through a scrubber unit that will remove these compounds. The scrubber will use on the order of 5 gallons per minute of water and will also serve to quench the off-gas to an acceptable discharge temperature. The scrubbing will generate salt water which will be discharged to the sanitary sewer under the Significant Industrial User Permit. Specific details on the off-gas treatment will be available once the remedial contractor has been selected and the specific equipment planned to be used has been determined.

5.13 PROOF OF PERFORMANCE

Proof of Performance tests (trial burns) are used to determine the envelope of operational parameters which will achieve the soil cleanup objective in a cost effective and technically implementable manner. Operating parameters to be quantified include:

- Temperature range
- Residence time
- Feed stock rate
- Air flow rates
- Pretreatment amendments and soil preparation requirements

Prior to performance of the trial burns, an air permit equivalency package and Proof of Performance Test Plan will be submitted to the NYSDEC. These documents will provide emissions estimates, control technology parameters, air dispersion modeling results, and comparisons of emission rates and concentrations with State and Federal air emission limitations.

It is anticipated that up to three test burns will be made:

i) Low temperature
ii) High temperature
iii) Middle temperature

The first test burn will be at the minimum temperature believed to be possible of treating all of the contaminants of concern. The second test will be at a much higher temperature. These results will be modeled to determine the temperature that optimizes the feed stock rate and heat penetration, while minimizing fuel consumption. If necessary, a third test would be run, likely at a middle temperature, to confirm the optimum temperature selected.

The trial burns will be conducted at worst case conditions, which include:

i) Soil with high VOC concentrations
ii) Soil with high fines content
iii) Operating the thermal treatment unit at the highest possible production rate

At a minimum, the following operating parameters will be monitored and recorded during the test burns and during operation of the unit:

i) Treated waste exit temperature

ii) Baghouse pressure drop, venture pressure drop, or drop in liquid/gas ratio

iii) Waste feed rate

iv) Exit air temperature from the desorption chamber

v) An indication of stack gas velocity (if applicable)

vi) Flow rate and pH of acid gas scrubber liquor

Other operating parameters may be required as a result of Site and equipment specific conditions. It may also be useful to monitor the BTU value of the source area soil prior to the test burn, particularly if direct burn technology is planned.

During the test burns and for the operating phase of the soil remediation project, the thermal treatment unit will operate under waste feed cutoff or system shutdown conditions. Typical shutdown conditions are provided below. For continuous feed units, the listed conditions would trigger an automatic shutdown of the waste feed. For batch units, the conditions would trigger shutdown of the unit. Other automatic waste feed cutoff / shutdown requirements may be added on a case by case basis, if warranted by equipment design and contaminants of concern.

Condition	**Initiate Waste Feed Cutoff/Shutdown**
1. Primary Burner Failure	Instantaneous
2. Outlet waste temperature falls below set point which is based on type and amount of contamination, waste type, and test burns	10 minute delay
3. Afterburner temperature (if applicable) falls below set point used in test burns	30 second to 2 minute delay
4. Blower failure or positive pressure at the desorber	Instantaneous
5. Bag house pressure drop, venture pressure drop, or drop in liquid/gas ratio (if applicable) outside the operating	Instantaneous
6. Carbon monoxide in exhaust gas (afterburner units only)	10 minute delay
7. Waste feed rate exceeds approved limit	10 minute delay

Condition	Initiate Waste Feed Cutoff/Shutdown
8. An appropriate indicator of significant change outside the operating parameter for gas velocity through secondary treatment device	10 minute delay

To the extent that stack testing is required as part of the permit / approval process, the initial stack testing parameters will include:

- Contaminants of concern
- Hydrochloric acid (if applicable)
- Other acid gas (if applicable)
- Total hydrocarbons
- Particulates
- Visible emissions
- Carbon monoxide
- Oxygen
- Applicable metals

6.0 INSTITUTIONAL CONTROLS

Institutional controls will be implemented to ensure the integrity of the Remedial Action for the Site. The institutional controls also prevent or eliminate the frequency of trespassers onto the Site and to prevent potable use of impacted groundwater. The following is a listing of potential institutional controls:

1. Implementation of deed restrictions and title notices to remain in effect until NYSDEC, or their successor(s) approve modifications or rescission of the restrictions. A copy of the deed restrictions and title notices shall be provided to all future owners, heirs, successors, lessees, assigns, and transferees by the person transferring the interest.
2. Implementation of enforcement tools (e.g., Consent Order), which will protect the remedy and ensure the long-term reliability of the controls.
3. A requirement that any development of the Site will comply with the Site Management Plan and be done in such a manner that does not interfere with subsurface features associated with the remedy.
4. A requirement that any building constructed on the Site incorporates vapor intrusion prevention design features.
5. Prohibit the consumption or otherwise use of the groundwater underlying the Site absent NYSDEC approval.
6. The implementation of a Site Management Plan.

7.0 OPERATION, MAINTENANCE, AND MONITORING REQUIREMENTS

Once the soil remedy is complete, there will be no future OM&M requirement specifically associated with the Site soil. However, the Site Management Plan (which includes an OM&M Plan) does provide the restrictions and limitations that must be followed in maintaining security at the Site and for any future development of the Site. OM&M will include routine inspection and any necessary repairs to the Site cover system and security system. In addition, the OM&M Plan also specifies the monitoring that is required in conjunction with the groundwater remedies for the Site.

8.0 PROJECT DELIVERY STRATEGY

This RD provides the specifics necessary to obtain NYSDEC approval of the proposed soil remediation for the Site. It is acknowledged that some of the details of this RD have been presented in a generalized format that can only be finalized in detail after the soil remediation contractor has been selected. Each contractor will employ equipment that they have in their possession or are reliant upon and those specifics will have a bearing on the capabilities, operating methods, and output results of the remedy. Consequently, some of these design parameters will have to be modified after the soil remediation contractor is selected. These modifications will in no way affect the design objective of properly treating the delineated 15,000 cubic yards of source area soil to concentrations less than 100 ppm.

NYSDEC will be notified of the name and qualifications of the proposed contractor and significant subcontractors who will conduct activities associated with this soil remediation project. Further, NYSDEC will be given a set of the specific modifications to this RD that the proposed contractor intends to use for review and comment.

The RD field activities will be initiated following approval of this RD by NYSDEC, agreement upon a suitable Consent Order between the Frontier Group and the NYSDEC, and procurement of the necessary permits, approvals, waivers, access agreements, and contractors. All of the RD field activities will be performed in compliance with the quality control measures outlined in Appendix C of this report - Construction Quality Assurance Plan. The field activities include but are not limited to the following:

- Locating utilities
- Mobilizing construction facilities, material, equipment, and personnel necessary to perform the work
- Providing and maintaining construction facilities and temporary controls
- Preparing the Site, including:
  - Emergency first aid facility
  - Fire suppression equipment
  - Decontamination facilities
  - Temporary utilities
  - Temporary parking areas
  - Access roads

- Land preparation (as required)
- Work zone identification
- Temporary staging facilities
- Implementing a Site-specific Health and Safety Plan

- Implementation of environmental controls
- Excavation, handling, treating, and backfilling of soil/sediment including:
  - Layout of excavation limits
  - Excavation and treatment of soil per the RD to achieve clean up criterion
  - Test burns
  - Collection of confirmation samples of treated soil
  - Backfilling/grading, and restoration of excavated and disturbed areas, with excavated material
  - Collection and off-Site disposal of any encountered mobile NAPL
  - Surface and groundwater management
  - Decommissioning of all monitoring wells no longer needed on-Site
- Completion of Remedial Action closeout activities including:
  - Restoration of support areas
  - Final decontamination of construction equipment and temporary facilities
  - Placement of one foot of crushed concrete / select demolition debris over the excavation area and other soil cover areas on the Site
- Demobilization of temporary facilities, temporary services, and equipment from the Site

9.0 REMEDIAL ACTION PERMITS PLAN

As described in Environmental Conservation Law Article 27, Title 13 and 6 NYCRR Part 375, and Section 121(e) of the Comprehensive Environmental Response, Compensation, and Liability Act and Section 300.400(e) of the National Hazardous Substance and Oil Contingency Plan, no permits are necessary for implementation of the RA for activities conducted entirely within or in very close proximity to the areal extent of impacts (i.e., the Site), However, the applicable technical aspects of the permit applications will be completed and filed to ensure that the substantive technical requirements are met. Accordingly, Federal, State, county, and local permits are not required to implement the RA but the RD will provide for compliance with ARARs and meeting substantive permitting requirements.

Such substantive requirements for implementation of the RA include the following:

- Notification and coordination with utility companies (e.g., electric, telephone, gas, sanitary sewer, storm drainage, etc.) and the local municipality (City of Niagara Falls) during the excavation of the source area soil and other subsurface intrusive activities
- An Erosion & Sediment Control Plan and Storm Water Pollution Prevention Plan compliant with NYSDEC regulations and guidance
- Road Opening Permits and grading permit (if required) through the City of Niagara Falls
- Air Permit Equivalency Package related to the operation of the thermal treatment unit for the source area soil
- Modification of Significant Industrial User Permit #72 issued by the Niagara Falls Water Board to accept remediation water generated during implementation of the RA

10.0 PRELIMINARY EASEMENT AND ACCESS REQUIREMENTS

All of the proposed remedial activity will be performed on the Site. The property owner (5335 River Road, Inc.) has participated with the Frontier Group in developing this RD and has granted the Frontier Group and its contractors and consultants access to the Site to perform the RA.

11.0 OUTLINE OF GENERAL SPECIFICATIONS

Engineering specifications for the source area soil remediation and other related remedy components will be prepared. The typical specifications that will be provided to the remediation contractor will include the following:

DIVISION 1 - GENERAL REQUIREMENTS

Section 01000 - General Requirements

Section 01100 - Summary

Section 01200 - Price and Payment Procedures

Section 01300 - Administrative Requirements

Section 01351 - Health and Safety

Section 01400 - Quality Requirements

Section 01500 - Temporary Facilities and Controls

Section 01571 - Temporary Soil Erosion and Sediment Control

Section 01600 - Product Requirements

Section 01700 - Execution Requirements

Section 01800 - Facility Operation

DIVISION 2 - SITE CONSTRUCTION

Section 02117 - Material Handling and On-Site Transportation

Section 02200 - Site Preparation

Section 02316 - Fill

Section 02317 - Excavation

Section 02901 - Soil Treatment

12.0 PRELIMINARY SCHEMATICS AND DRAWINGS

Preliminary engineering schematics and drawings for the source area soil remediation have been referenced throughout the body of this Report. A complete listing of this information can be found in the front section of this Report.

13.0 PRELIMINARY REMEDIAL ACTION SCHEDULE

The soil remediation remedy for the Site is best performed during warm weather. Cold, freezing weather imparts complications for the excavation, handling of soils, handling of water, and the soil treatment process and therefore must be avoided. Given that it is also undesirable to have to suspend the remedy at some midpoint due to the onset of winter weather, it is therefore necessary that the soil remediation be initiated early in the construction season. As the remedy is expected to take on the order of 7 months to complete and winter weather arrives in Niagara Falls usually in December, it is necessary that the project be completely set to mobilize by May 1 of any given year. It is also necessary to solicit bids and retain an experienced thermal treatment contractor prior to mobilization and this process requires about 2 months to complete. Therefore, all approvals, permits, and authorizations needed to implement this remedy need to be in place by March 1. If this can be accomplished by March 1, 2012, the soil remediation can be completed in 2012. Otherwise, it will not be feasible to implement the remedy until the following construction season.

The schedule is further outlined in Appendix D – Citizen Participation Plan.

14.0 SUMMARY

This RD sufficiently details the functional aspects of the remedy, and as a result, can be used directly for the procurement of an experienced thermal treatment contractor. The functional aspects of the various remedy components may be modified once the contractor has been selected and specific details based upon the contractor's capabilities and equipment are finalized. Any such modifications, including supporting documentation, will be presented to the NYSDEC for final approval prior to implementation of the remedy.

15.0 REFERENCES

Ecology & Environment Engineering, P.C., 2002. *Supplemental Remedial Investigation.*

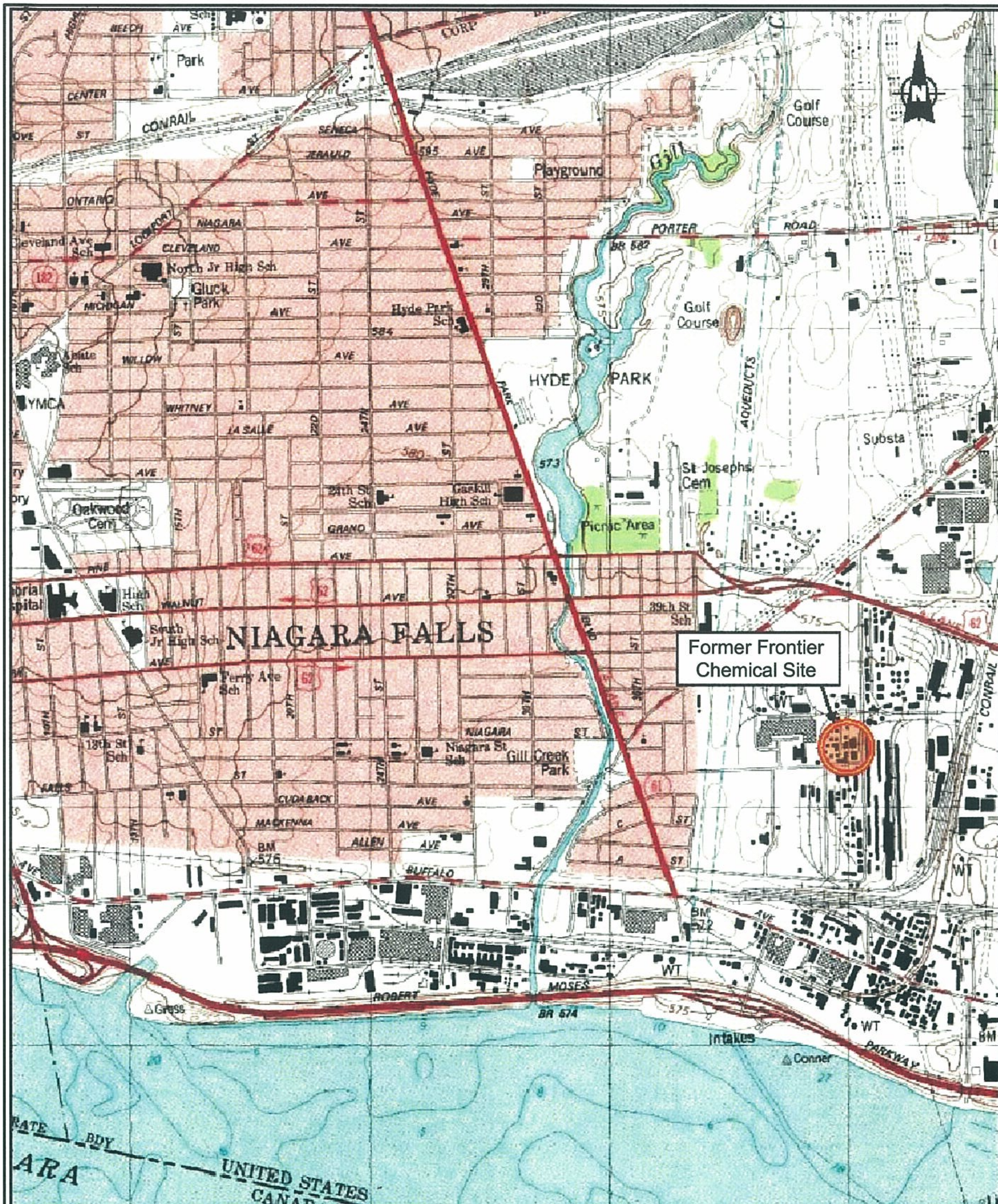
Ecology & Environment Engineering, P.C., 2004. *Feasibility Study.*

Conestoga-Rovers & Associates, 2010. *Remedial Pre-Design Investigation*.

Conestoga-Rovers & Associates, 2011. *Focused Feasibility Study*.

New York State Department of Environmental Conservation, March 2006. *Record of Decision*. Frontier Chemical Royal Avenue Site - Operable Unit No. 1 - City of Niagara Falls, Niagara County, New York - Site Number 9-32-110.

FIGURES



SOURCE: E & E, 2002

figure 2.1

SITE LOCATION MAP

Frontier Chemical Site - Niagara Falls, New York

47392-00(009)GN-WA004 DEC 14/2011

SOURCE: E & E, 2002

figure 2.2

SOURCE AREA SOIL
0 TO 2 FT.

Frontier Chemical Site - Niagara Falls, New York

47392-00(009)GN-WA005 DEC 14/2011

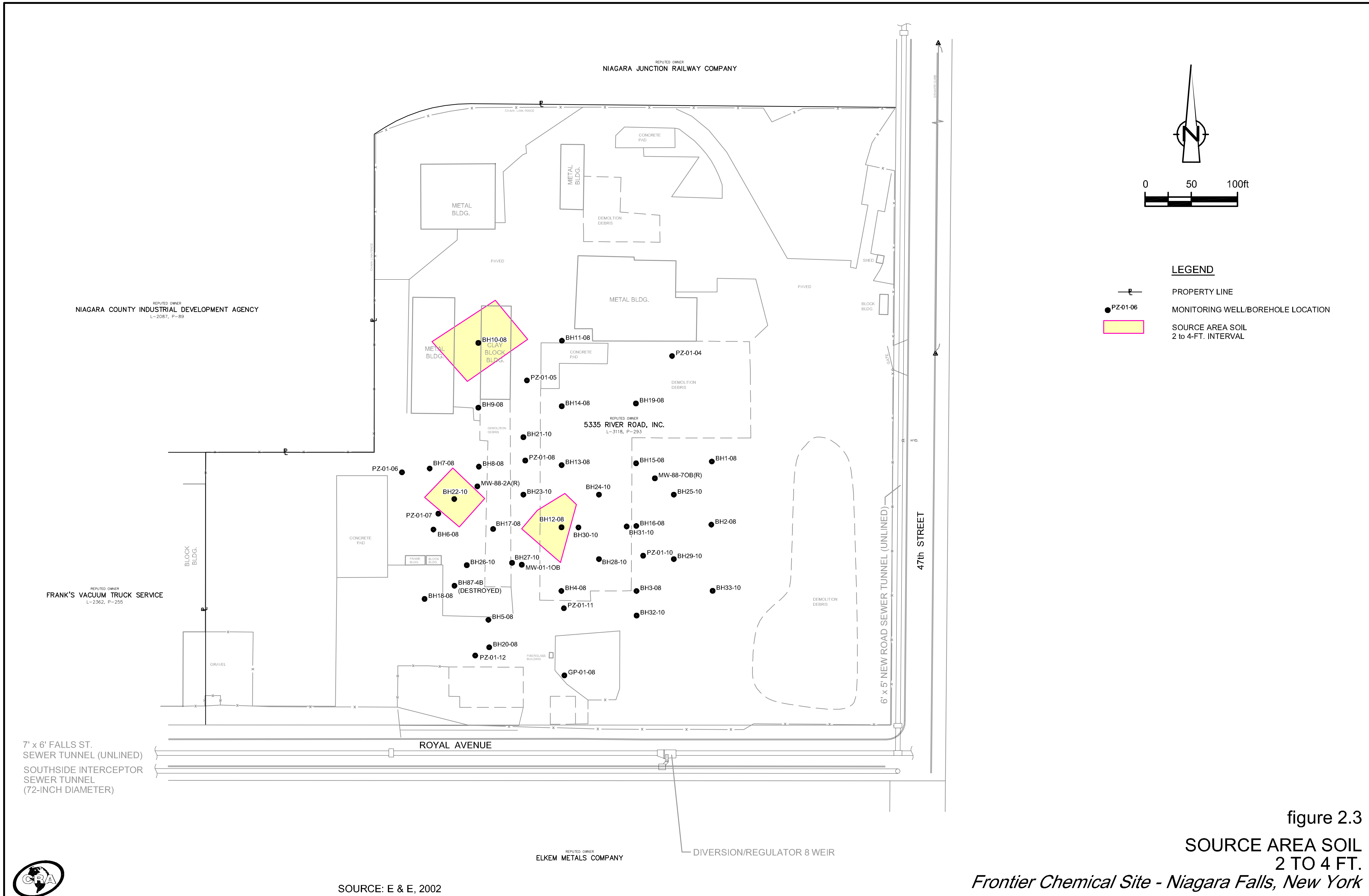


figure 2.3

SOURCE AREA SOIL
2 TO 4 FT.
Frontier Chemical Site - Niagara Falls, New York

47392-00(009)GN-WA006 DEC 14/2011

figure 2.4

SOURCE AREA SOIL
4 TO 6 FT.

Frontier Chemical Site - Niagara Falls, New York

47392-00(009)GN-WA007 DEC 14/2011

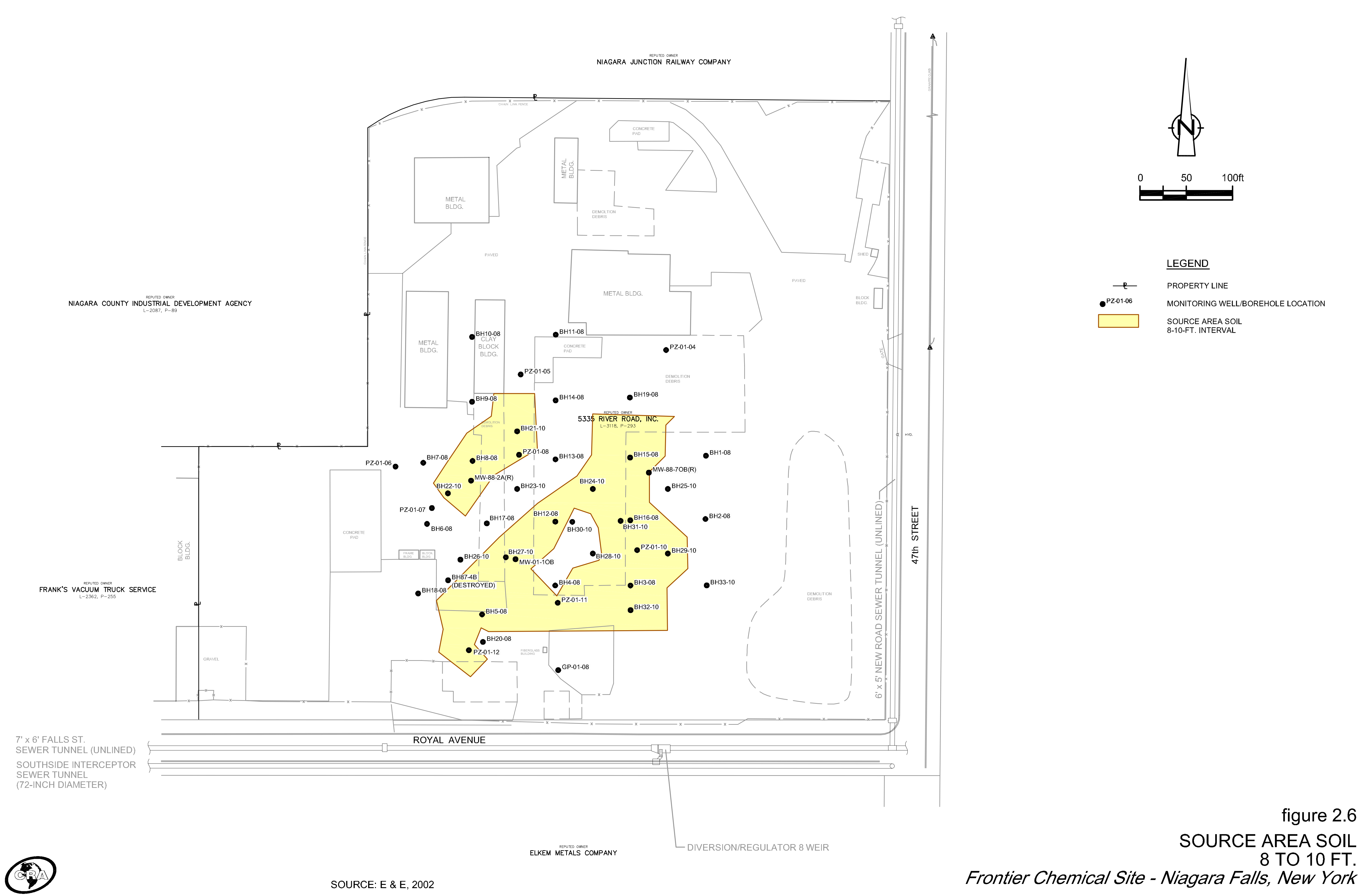
figure 2.5

SOURCE AREA SOIL
6 TO 8FT.

Frontier Chemical Site - Niagara Falls, New York

SOURCE: E & E, 2002

47392-00(009)GN-WA008 DEC 14/2011



SOURCE: E & E, 2002

figure 2.6

SOURCE AREA SOIL
8 TO 10 FT.

Frontier Chemical Site - Niagara Falls, New York

47392-00(009)GN-WA009 DEC 14/2011

figure 2.7

SOURCE AREA SOIL
10 TO 12 FT.

Frontier Chemical Site - Niagara Falls, New York

47392-00(009)GN-WA010 DEC 14/2011

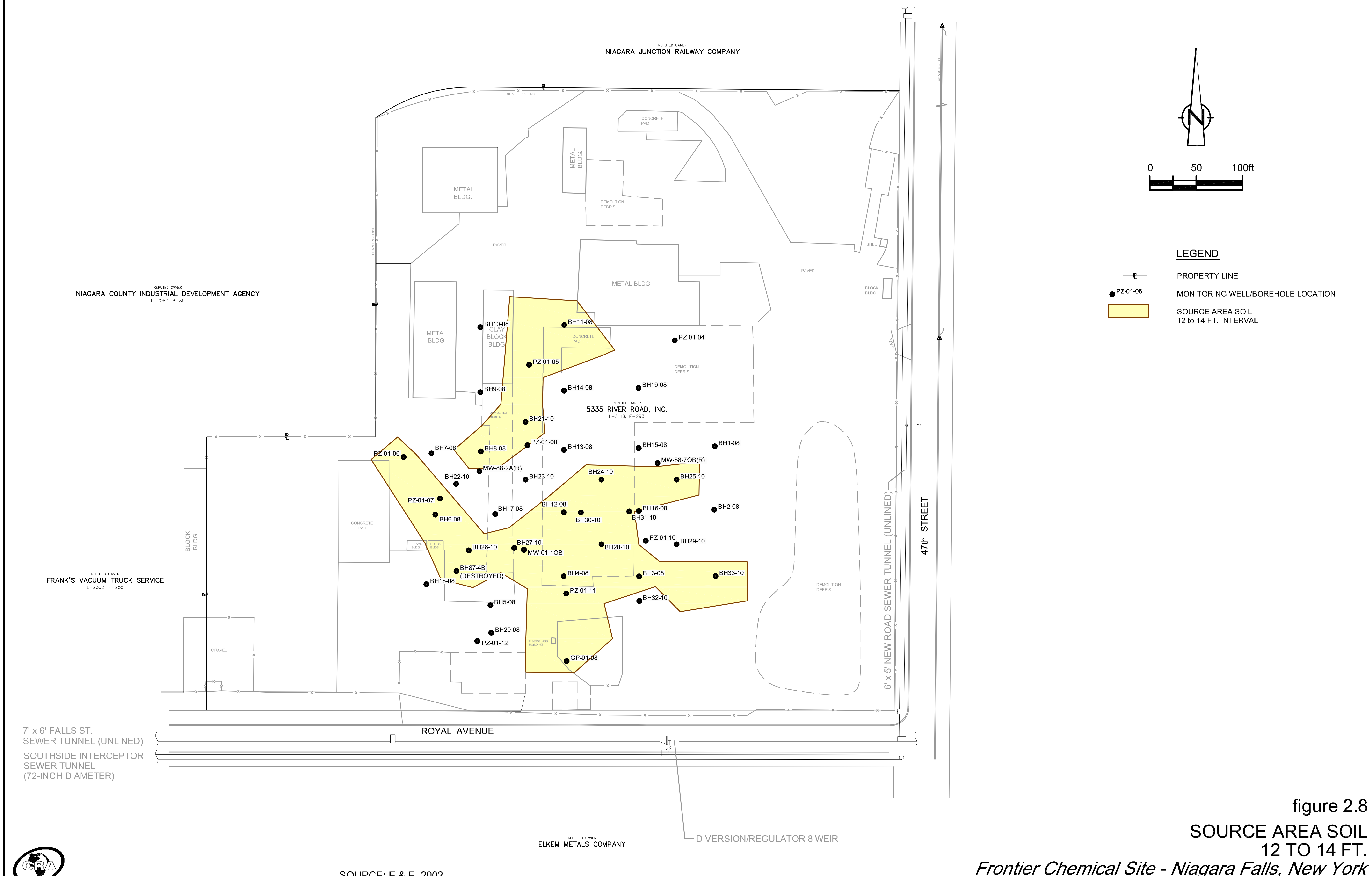


figure 2.8

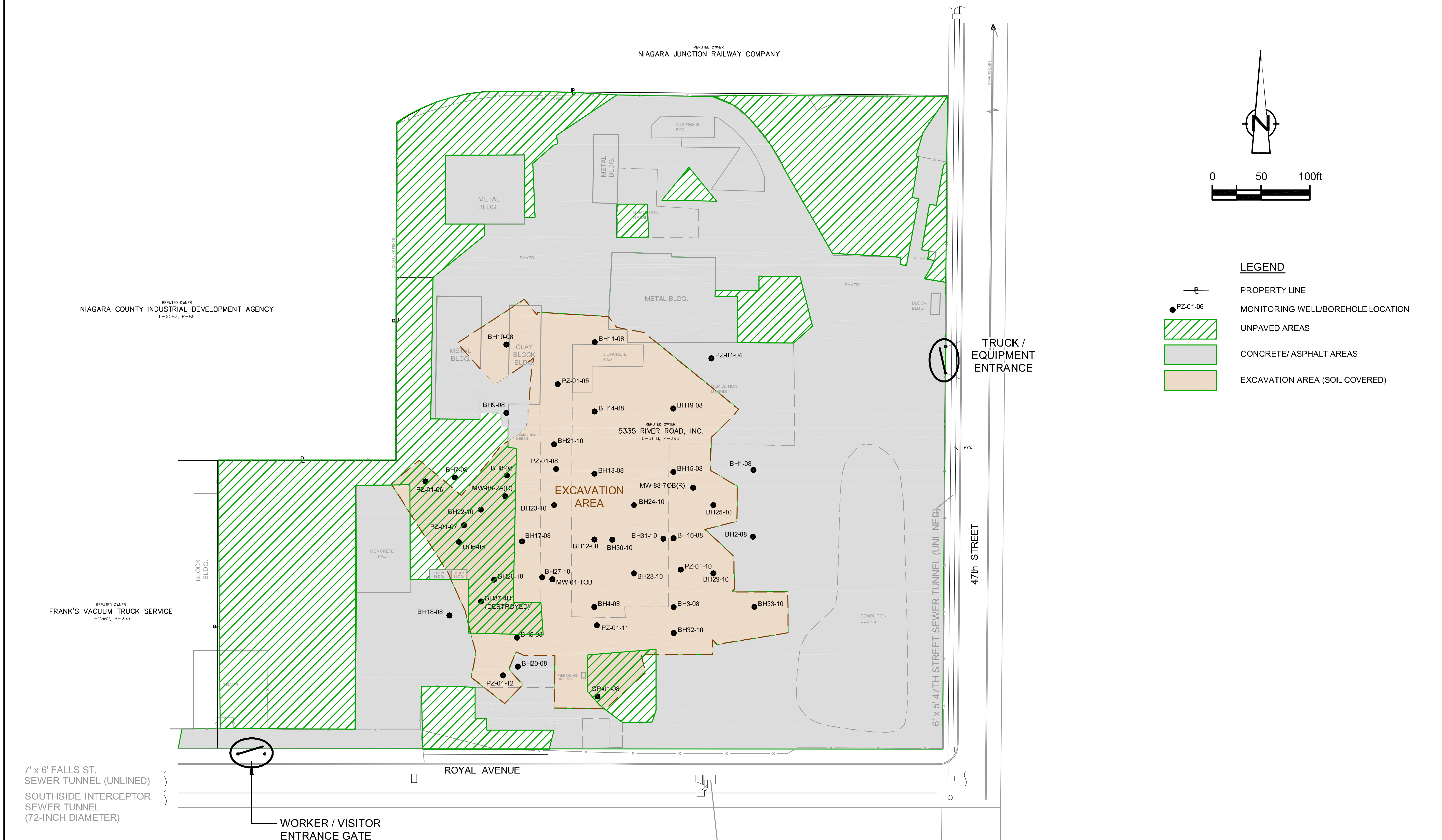
SOURCE AREA SOIL
12 TO 14 FT.
Frontier Chemical Site - Niagara Falls, New York

figure 2.9

SOURCE AREA SOIL
14 TO 16 FT.

Frontier Chemical Site - Niagara Falls, New York

47392-00(009)GN-WA012 DEC 14/2011



SOURCE: E & E, 2002

figure 3.1

FINAL SITE COVER

Frontier Chemical Site - Niagara Falls, New York

47392-00(009)GN-BU014 DEC 14/2011

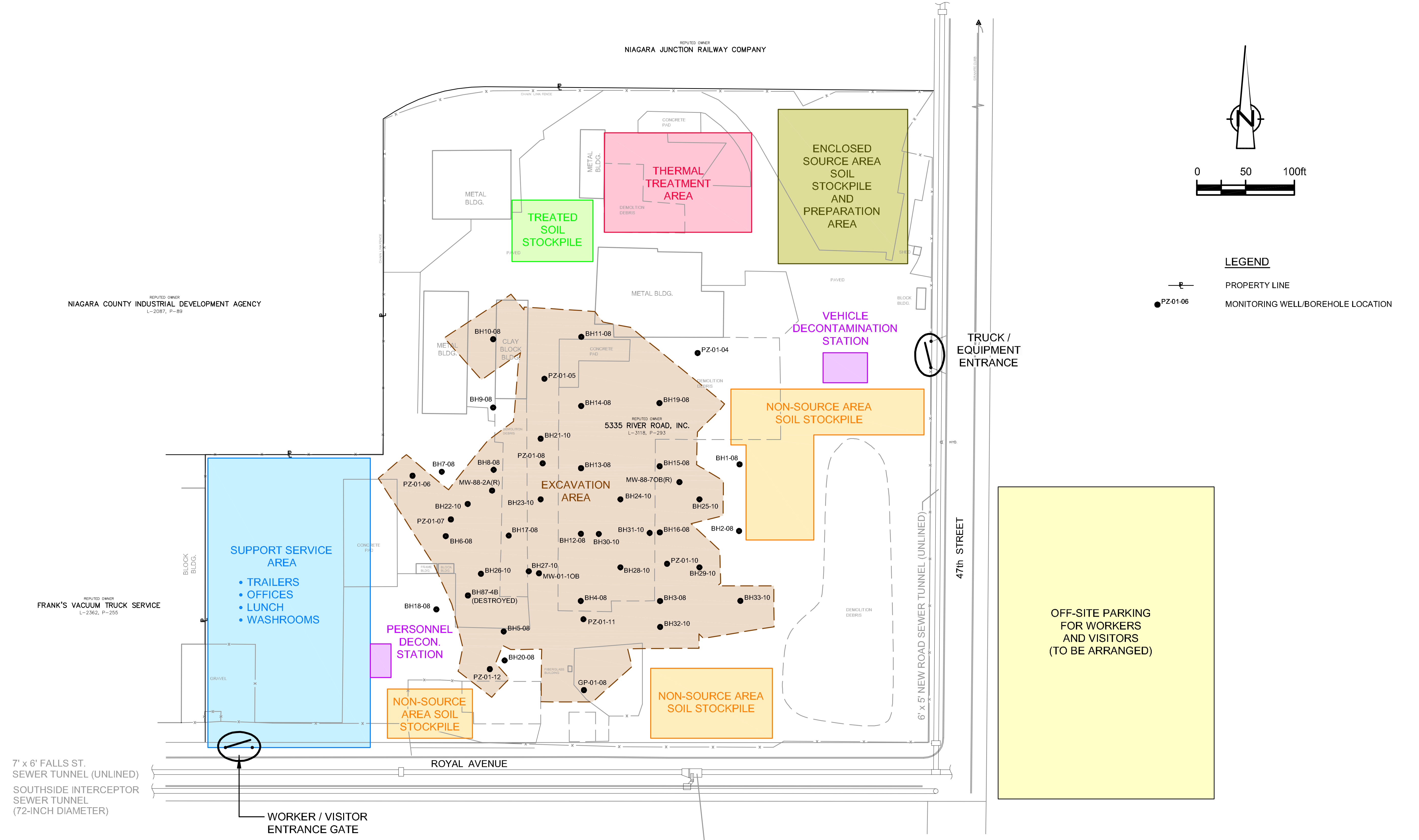


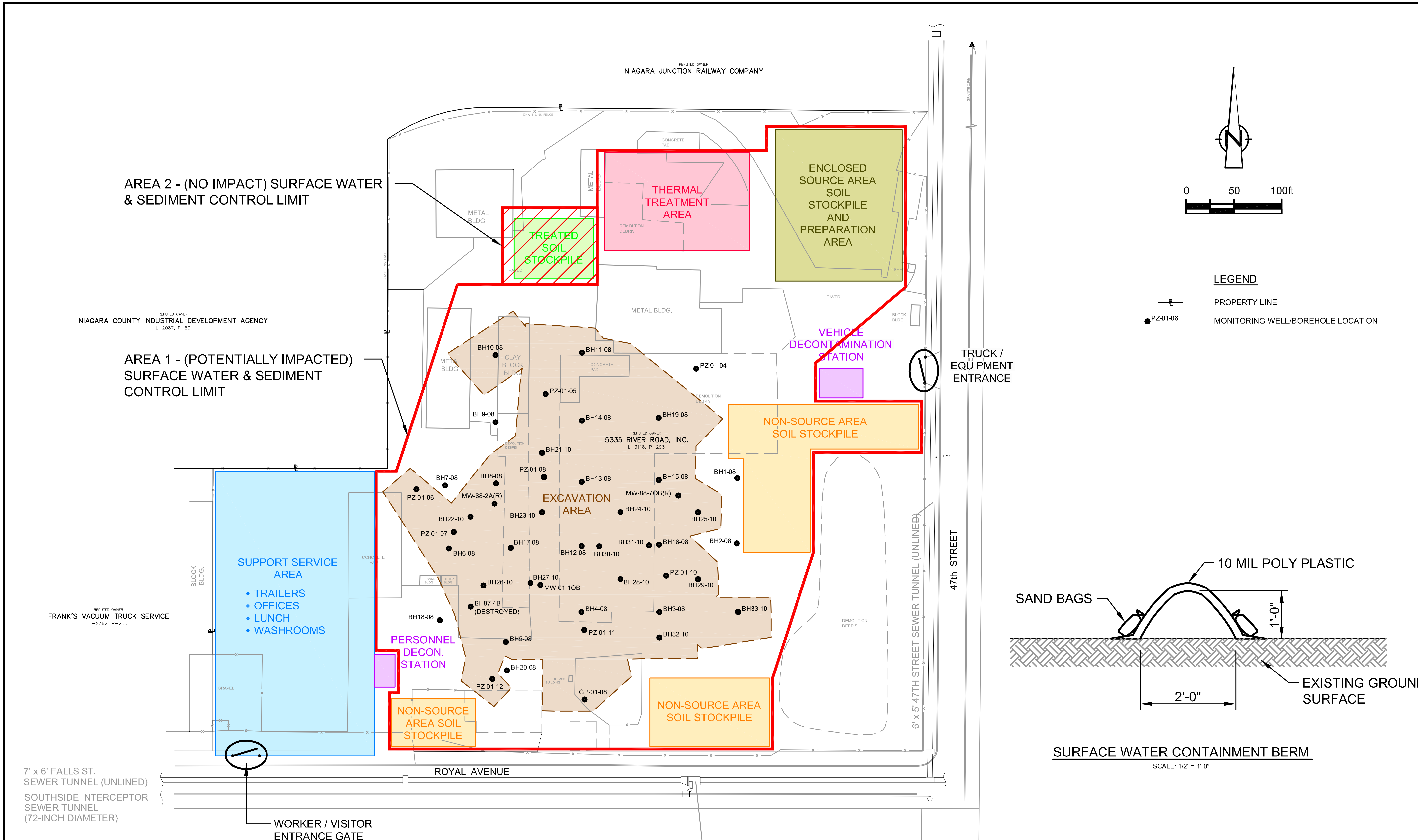
figure 5.1

CONCEPTUAL SITE LAYOUT FOR REMEDIATION

Frontier Chemical Site - Niagara Falls, New York

SOURCE: E & E, 2002

47392-00(009)GN-WA003 DEC 14/2011



SOURCE: E & E, 2002

figure 5.2

TEMPORARY (DURING CONSTRUCTION) SURFACE WATER AND SEDIMENT CONTROL PLAN

Frontier Chemical Site - Niagara Falls, New York

47392-00(009)GN-BU015 DEC 14/2011

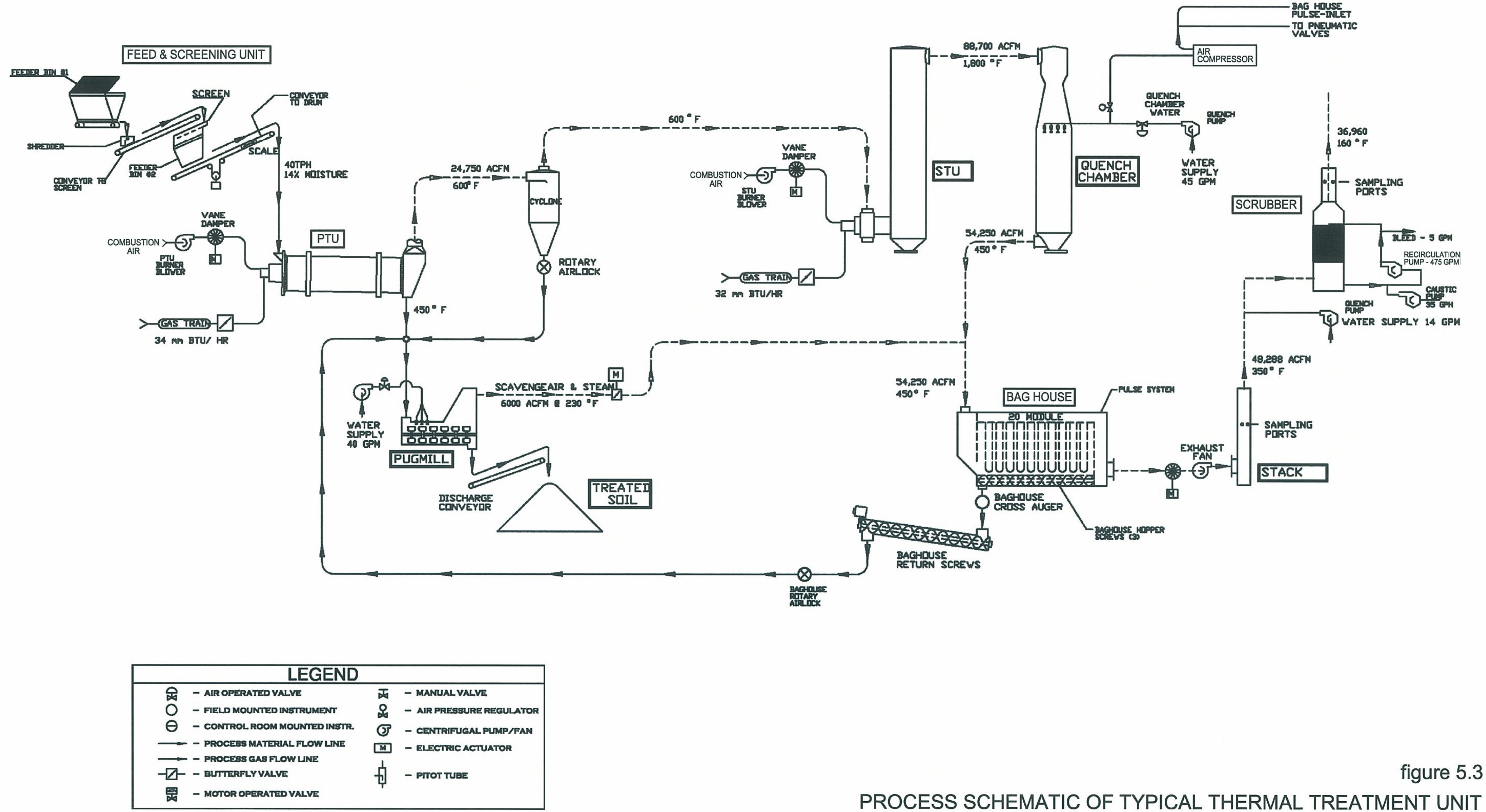


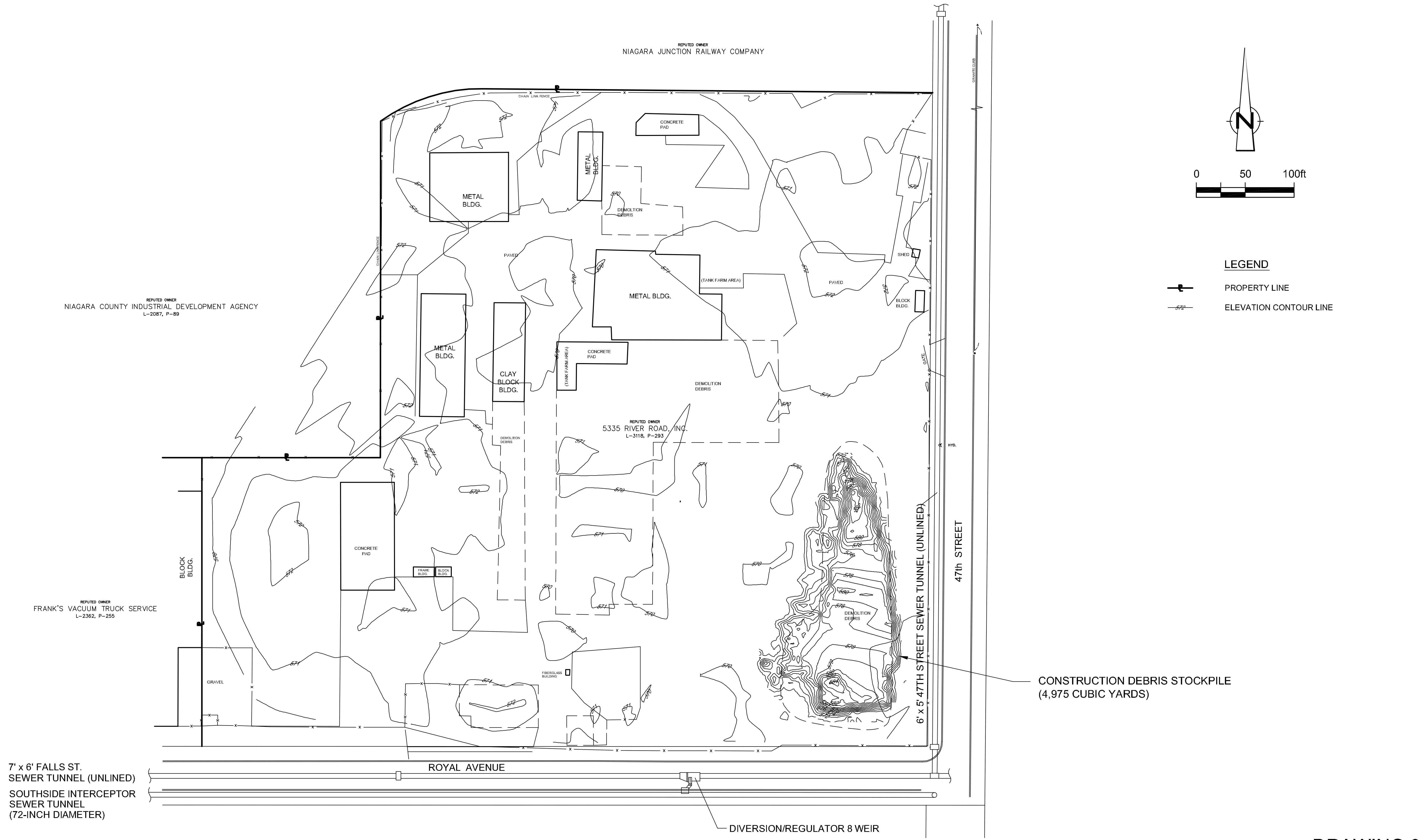
figure 5.3

PROCESS SCHEMATIC OF TYPICAL THERMAL TREATMENT UNIT
FRONTIER CHEMICAL SITE
Niagara Falls, New York

SOURCE: D.A. COLLINS

47392-00(009)GN-WA002 DEC 14/2011

DRAWINGS



DRAWING 01

EXISTING SITE CONDITIONS
NOVEMBER 9, 2011
Frontier Chemical Site - Niagara Falls, New York

CRA

47392-00(009)GN-BU013 DEC 14/2011

TABLES

TABLE 5.1

COMPARISON OF PRE-DESIGN INVESTIGATION PID READINGS AND ANALYTICAL RESULTS
FRONTIER CHEMICAL SITE
NIAGARA FALLS, NEW YORK

< 100 ppm	*< 100*	*< 100*	*<100 totals*	*100-200*	*200-300*	*300-400*	*400-500*	*500-600*	*600-700*	*700-800*	*800-900*	*900-1,000*	*>1,000*
19	2	11		40	53	566	385	423	10	181		378	174
6	7	25		53	315	315	1690	718	131			5395	299
20	6	7		16	70	18	230	4174	136				349
70	92	33		7	153	385							114
11	28	8		1298	133	234							216
20	4	5		674	121	29							690
42	77	107		6	140	127							671
59	1291	41		240		115							292
4	77	20		60									2533
1	68	1357		23									113
8	219	114		153									239
24	68	210		197									842
123	225	182		64									174
92	4	125		1310									1379
50	35	38		228									7081
28	2	27		160									6445
19	112			161									
188	68			183									
61	128			117									
104	164												
95	117												
136	5												
5	56												
51	21												
64	44												
66	19												
35	8												
215	8												
87	2												
61	7												
15	8												
11	0												
27	1												
18	0												
17	12												
37	1												
83	1												
2	2												
55	2												
29	90												
38	24												
14	28												
24	12												
14	5												
79	9												
86	110												
	348												
2313	3617	2310	8240	4990	985	1789	1920	5315	277	181	0	5773	21611
Average PID Concentration			**75.6**	**262.6**	**140.7**	**223.6**	**640.0**	**1771.7**	**92.3**	**181.0**	**0.0**	**2886.5**	**1350.7**
			20 >100ppm	8 <100ppm	2 <100ppm	2 <100ppm			1 <100ppm				

TABLE 5.2

PRIMARY SOIL CONTAMINANTS OF CONCERN
FRONTIER CHEMICAL SITE
NIAGARA FALLS, NEW YORK

Contaminant of Concern	Boiling Point (°C)	Boiling Point (°F)
Monochlorotoluene	160	320
Tetrachloroethene	121	250
Chlorobenzene	132	270
1,2-dichlorobenzene	179	354
1,3-dichlorobenzene	172	342
1,4-dichlorobenzene	173	343
1,2,4-trichlorobenzene	213	415
1,1-dichloroethane	57	135
Trichloroethene	87	189
Toluene	110	230
Benzene	80	176

APPENDIX A

SITE MANAGEMENT PLAN

APPENDIX A

SITE MANAGEMENT PLAN

FRONTIER CHEMICAL SITE
NIAGARA FALLS, NEW YORK
NYSDEC INDEX #89-0571-00-01

Prepared For:
Frontier Chemical Site Potentially Responsible Parties Group

DECEMBER 2011
REF. NO. 047392 (9)
This report is printed on recycled paper.

TABLE OF CONTENTS

TABLE OF CONTENTS

Page

LIST OF FIGURES
(Following Text)

LIST OF TABLES
(Following Text)

LIST OF ATTACHMENTS

1.0 INTRODUCTION AND DESCRIPTION OF REMEDIAL PROGRAM

This Site Management Plan (SMP) is required as an element of the remedial program at the Frontier Chemical Site (hereinafter referred to as the "Site") under the New York State (NYS) Inactive Hazardous Waste Disposal Site Remedial Program administered by the New York State Department of Environmental Conservation (NYSDEC).

1.1 GENERAL

The Frontier Chemical Site Potentially Responsible Parties Group (Frontier Group) entered into an Order on Consent (Index #89-0571-00-01) with the NYSDEC to perform additional Site characterization of the conditions at the Site. The Site is a 9-acre property located in the industrialized area of Niagara Falls, New York. A figure showing the Site location and boundaries is provided in Figure A1.1. The boundaries of the Site are more fully described in the metes and bounds Site description that is part of the Environmental Easement, which is included as Attachment A to this SMP.

Following completion of the additional Site characterization, the Frontier Group continued to work with the NYSDEC to develop and implement the various components of the Site remedy. The overburden and shallow bedrock groundwater remedy was implemented as specified in the 2006 Record of Decision (ROD). The deep bedrock groundwater was investigated and a remedial action consisting of monitored natural attenuation has been determined to be the appropriate remedy. For the source area soil, a remedy consisting of excavation and ex-situ thermal treatment has been determined to be the appropriate remedy. The source area soil component of the remedy is the focus of the Remedial Design Report to which this SMP is attached.

After completion of the remedial work described in this Remedial Design Report, some residual contamination will be left in place at subsurface locations on the Site, which is hereafter referred to as "remaining contamination." This SMP was prepared to manage remaining contamination at the Site until the Environmental Easement is repealed in accordance with ECL Article 71, Title 36. All reports associated with the Site can be viewed by contacting the NYSDEC.

This SMP was prepared by CRA Infrastructure and Engineering, Inc. (CRA), on behalf of the Frontier Group, in accordance with the requirements in NYSDEC DER-10 Technical Guidance for Site Investigation and Remediation, dated May 2010, and the guidelines provided by NYSDEC. This SMP addresses the means for implementing the Institutional Controls (ICs) and Engineering Controls (ECs) that will be put in place following the conclusion of the source area soil remediation which, in conjunction with the Site cap, is the last component of the remedy to be completed. The ICs and ECs are required by the Environmental Easement for the Site.

1.2 PURPOSE

There will be remaining contamination left in place after completion of the Remedial Action. ECs have been incorporated into the Site remedy to control exposure to remaining contamination during future use of the Site that ensures protection of public health and the environment. An Environmental Easement granted to the NYSDEC, and recorded with the Niagara County Clerk, will require compliance with this SMP and all ECs and ICs placed on the Site. The ICs place restrictions on Site use, and mandate operation, maintenance, monitoring, and reporting measures for all ECs and ICs. This SMP specifies the methods necessary to ensure compliance with all ECs and ICs required by the Environmental Easement for the remaining contamination. Once approved by the NYSDEC, compliance with this plan is required by the grantor of the Environmental Easement and the grantor's successors and assigns. This SMP may only be revised with the approval of the NYSDEC.

This SMP provides a detailed description of all procedures required to manage remaining contamination at the Site after completion of the Remedial Action, including:

(1) Implementation and management of all ECs and ICs

(2) Groundwater monitoring

(3) Performance of periodic inspections, certification of results, and submittal of Periodic Review Reports

To address these needs, this SMP includes two plans:

(1) An Engineering and Institutional Control Plan for implementation and management of ECs and ICs

(2) A Monitoring Plan for implementation of Site Monitoring

An Operation and Maintenance Plan for implementation of remedial collection, containment, treatment, and recovery systems is not required, as no active systems will be in place at the Site.

This plan includes a description of Periodic Review Reports for the periodic submittal of data, information, recommendations, and certifications to NYSDEC.

It is important to note that:

- This SMP details the Site-specific implementation procedures that are required by the Environmental Easement. Failure to properly implement the SMP is a violation of the environmental easement, which is grounds for revocation of the Certificate of Completion (COC).
- Failure to comply with this SMP is also a violation of Environmental Conservation Law, 6NYCRR Part 375.

1.3 REVISIONS

Revisions to this plan will be proposed in writing to the NYSDEC project manager. In accordance with the Environmental Easement for the Site, the NYSDEC will provide a notice of any approved changes to the SMP and append these notices to the SMP that is retained in its files.

2.0 SITE BACKGROUND

2.1 SITE LOCATION AND DESCRIPTION

The Site is located in an industrial area of the City of Niagara Falls, County of Niagara, New York and is identified as Block 1 and Lot 6 on the Niagara County Tax Map (160.09). The Site is an approximately 9-acre area parcel bordered to the north by property identified as owned by Niagara Junction Railway Company, to the northwest by property identified as owned by the Niagara County Industrial Development Agency, to the south by Elkem Metal Company and to the southwest by Frank's Vacuum Truck Service (both along Royal Avenue), and to the east by 47th Street, beyond which is an industrial site (Strator). The boundaries of the Site are more fully described in Attachment A – Metes and Bounds.

2.2 SITE HISTORY

The Site was originally developed in 1906 by ISCO Chemical Company (ISCO) as a caustic-chlorine plant. During World War II, the International Minerals and Chemicals Corporation bought the Site and operated the facility as a caustic soda/potash and chlorine plant. In 1974, the Frontier Chemical Company, which provided hazardous and non-hazardous chemical treatment, moved their operations to the Site from Pendleton, New York. Frontier Chemical expanded its on-Site operations, which included wastewater treatment, fuels blending, and bulking chemicals for off-Site disposal. The Site held a NYSDEC permit.

In 1985, Frontier Chemical and a sister company, BLT Services, Inc., became wholly owned subsidiaries of Environmental Services Associates, Inc. (ESA). In February 1990, ROE Consolidated Holdings assumed operational control of ESA, which had operational control of the Site. The current Site owner is 5335 River Road, Inc.

The facility ceased operations in December 1992. In 1995, the NYSDEC listed the Site as a Class 2 site in the Registry of Inactive Hazardous Waste Disposal Sites in New York State. A Class 2 site is a site where hazardous waste presents a significant threat to the public health or the environment and action is required. Beginning in 1999, most of the Site's buildings were demolished to grade and some rubble remains on Site. The Site remains a vacant industrial property and is secured with a perimeter fence.

Contaminants of concern at the Site include various volatile organic compounds (such as trichlorobenzene, dichlorobenzene, chlorobenzene, tetrachloroethene, trichloroethene, acetone, benzene, chlorotoluene, toluene, etc.), and various semivolatile organics (such as phenol, dichlorophenol, etc.). Impacted media include soil, overburden groundwater, and bedrock groundwater. Overburden and upper bedrock groundwater contaminant migration has been limited by the presence of the unlined bedrock tunnels on the east (the New Road Tunnel under 47th Street) and south sides (the Falls Street Tunnel under Royal Avenue) of the Site. The Site's groundwater remedies are already in place, leaving just the source area soil to be addressed, as will occur in accordance with the Remedial Design Report to which this SMP is attached. Thereafter, the Site remedy will be complete.

2.3 GEOLOGIC CONDITIONS

2.3.1 SITE GEOLOGY

The surface of the Site is mostly covered by either asphalt or concrete. Up to 2 feet of fill material (generally gravel with some cinders, glass, wood, slag, bricks, etc.) overlies an overburden mostly comprised of a silty-clay, with some discontinuous seams of silty sand and clay. The total depth of the overburden is 14 to 17 feet.

The bedrock immediately beneath the overburden is Lockport Dolomite. Distinct horizontal fracture systems have been characterized in the bedrock during the remedial investigations and have identified the following water-bearing zones:

i) The A-Zone is identified as the fracture system consisting of the upper 3 to 5 feet of weathered bedrock

ii) The B-Zone is identified as the fracture system approximately 8 to 10 feet below the A-Zone

iii) The C-Zone is identified as the fracture system approximately 20 feet below the B-Zone

iv) The D-Zone is identified as the fracture system approximately 49 to 63 feet below the top of bedrock

v) The E-Zone is identified as the fracture system approximately 70 to 92 feet below the top of bedrock

2.3.2 HYDROGEOLOGY

2.3.2.1 REGIONAL HYDROGEOLOGY

Regionally, bedrock groundwater is recharged by water from the upper Niagara River (above the Falls), transmitted through fractures in the rock, and discharged to the lower Niagara River (at the gorge downstream from the Falls). There are two man-made structures which exert a significant influence on the flow of bedrock groundwater in the region: the New York Power Authority Conduits (Power Conduits) and the Falls Street Tunnel (FST). These structures and their effects on regional groundwater are described below.

NYPA Power Conduits

The Power Conduits are two parallel reinforced concrete lined tunnels which were excavated by open cut methods and installed within the bedrock to convey upper Niagara River water to the Robert Moses power generating station in Lewiston, New York. They are each approximately 65 feet high by 46 feet wide and run 4 miles in length in a south (river intake end) to north (power plant location) direction. The conduits pass approximately 1,100 feet to the west of the Site.

The Power Conduits were constructed with a series of continuous drains along the outside of the concrete walls and floors. These drains are connected to the inside of the conduits at two locations and were designed to regulate the bedrock groundwater height around the exterior of the conduits. Given the length and depth of the Power Conduits, the drain systems intersect and influence a significant portion of the upper bedrock groundwater in the Niagara Falls area. The drain systems essentially create a preferential pathway for upper bedrock groundwater, and the result is a groundwater "sink" along the length of the conduits. It has been estimated that the influence of the conduits on the bedrock groundwater flow regime extends approximately 3,000 to 4,000 feet to the east and west of the Power Conduits' alignment.

The Power Conduits pass under the unlined bedrock FST (described in detail below) on Royal Avenue. A significant amount of bedrock groundwater transmitted along the Power Conduit drain system flows upward and into the FST at this crossing. A 2003 estimate performed on behalf of New York Power Authority calculated infiltration of approximately 6.5 million gallons of bedrock groundwater per day into the FST from the Power Conduit drain system.

Falls Street Tunnel

The FST is an unlined bedrock sewer tunnel that passes along the south side of the Site. It runs east to west for approximately 3.5 miles from 56th Street to the Niagara Gorge. The FST is approximately 7 feet wide by 6 feet high (in the vicinity of the Site on Royal Avenue) and it intersects the Site B-Zone bedrock fracture system. The FST has drop shafts constructed at all major street intersections. These drop shafts are brick lined within the overburden and unlined within the bedrock.

Other Local Sewers

In the immediate vicinity of the Site, there are several sewers that either influence Site hydrogeology or play a role in the collection and discharge of local groundwater and storm water. As discussed above, the FST is a major sewer which runs under Royal Avenue along the south side of the Site. Running parallel, and also located beneath Royal Avenue just south of the FST, is the South Side Interceptor (SSI). In addition, the New Road Tunnel runs along the eastern side of the Site under 47th Street. The SSI and the New Road Tunnel (47th Street Tunnel) are described in detail below.

South Side Interceptor

The FST was originally constructed as a combined storm and sanitary sewer. However, most of the waters from the area to the east of 47th Street were diverted after 1972, when the concrete lined SSI was constructed. The SSI is located slightly south of the FST and runs from the intersection of 47th Street and Royal Avenue to its discharge point at the Niagara Falls wastewater treatment plant (WWTP). The SSI sewer serves various industrial waste dischargers with connections between its origin and its termination at the WWTP. Regulating dams, constructed in the FST just west of 47th Street (adjacent to the Site) and at 38th Street (about 1/2- mile to the west) divert dry weather and low FST flows to the SSI. High water flows within the FST (such as those accompanying significant storm events) result in an "overtopping" of the diversion dams, and allow flow to continue along the FST to the west instead of being diverted to the SSI.

47th Street Tunnel

The 47th Street Tunnel is an unlined bedrock sewer tunnel that passes along the eastern side of the Site. It runs from north to south under 47th Street, and connects into the FST at Royal Avenue. The 47th Street Tunnel is approximately 6 feet wide by 5 feet high, and like the FST, the tunnel intersects the B-Zone bedrock fracture system.

2.3.2.2 SITE HYDROGEOLOGY

Depth to groundwater within the overburden ranges from about 2 to 10 feet below ground surface. However, the groundwater in the overburden exists only as a perched water zone with the majority of the overburden being in a dewatered state due to the presence of the FST and the 47th Street Tunnel. There is a horizontal overburden groundwater gradient in the perched zone toward the southeast, with a localized overburden 'sink' (inwardly directed groundwater depression) in the south-central portion of the Site. A downward vertical groundwater gradient exists between the overburden and the top of the bedrock. Information obtained during the 2008 and 2010 investigations has found that a considerable portion of the overburden on the Site is in a dewatered state with minimal groundwater present.

Within the upper 35 feet of bedrock, three distinct horizontal fracture zones have been identified. The A-Zone consists of the highly weathered upper 3 to 5 feet of bedrock. The B-Zone is a fracture system which is up to 2 feet thick and is located approximately 8 to 10 feet below the A-Zone. A downward vertical groundwater gradient exists from the A-Zone to the B-Zone. The A and B-Zones are designated as the shallow bedrock groundwater regime and are within the capture zone of the unlined sewer system. The effect of the FST as an upper bedrock groundwater interceptor has been well documented in numerous hydrogeologic studies of the area. The location, depth, and hydraulic influence of the tunnels have effectively intercepted Site overburden and upper bedrock groundwater and have prevented it from migrating beyond the Royal Avenue and 47th Street Tunnel alignments. For this reason, this naturally-occurring remedy was selected as the appropriate remedy for the shallow groundwater in the 2006 ROD.

The C-Zone is a fracture system approximately 20 feet below the B-Zone. The data available prior to the 2008 investigation showed that the C-Zone has a slight upward vertical groundwater gradient from the C-Zone to the B-Zone. The additional investigations performed by the Frontier Group in 2008 through 2010 confirmed that an upward gradient exists between the C-Zone and the B-Zone. The investigations also identified that there is an upward gradient from the D-Zone (49 to 63 feet below top of rock) to the C-Zone and also from the E-Zone (70 to 92 feet below top of rock) to the D-Zone. These upward gradients which extend all the way from the E-Zone up to the B-Zone have protected the deep bedrock groundwater from chemical releases from the Site. Since there is no significant threat to human health or the environment associated with the deep bedrock groundwater (the C-Zone and deeper), and natural attenuation is addressing the chemicals present in the deep bedrock groundwater, the Focused Feasibility Study performed to evaluate remedial alternatives for the deep bedrock groundwater selected monitored natural attenuation with institutional controls as the appropriate remedy. This remedy will be put in place upon completion of the source area soil remedy.

2.4 SUMMARY OF REMEDIAL INVESTIGATION FINDINGS

Previous chemical characterization of subsurface soils (unsaturated and saturated) and groundwater has been presented in the Supplemental Remedial Investigation Report (Ecology & Environment – November 2002) and was updated with the data collected by the Frontier Group, which was reported in the Remedial Pre-Design Investigation Report (CRA September 2010).

The following provides a brief summary of the investigation findings.

2.4.1 SOIL

2.4.1.1 SURFACE SOIL

The majority of the Site is currently covered with either concrete or asphalt pavement. These surfaces are clean and pose no chemical contact exposure potential for Site visitors or workers. The small remaining areas of the Site's surface are soil–covered. Chemical sampling of these surface areas has shown minimal chemical presence. Consequently, there is minimal risk of exposure to Site chemicals anywhere on the surface of the Site.

2.4.1.2 SUBSURFACE SOIL

Volatile organic compound (VOC) contamination is widespread in overburden soils in the central and south-central portions of the Site. The primary VOCs include monochlorotoluene, various chlorobenzene compounds, tetrachloroethene, trichloroethene, and toluene. In some areas, non-aqueous phase liquids (NAPL) are present, resulting in elevated VOC concentrations. The 2006 ROD specified that soils with elevated VOC concentrations be remediated. The soils with elevated VOC concentrations are designated as source area soil. The delineation of source area soil extends beyond the vertical and horizontal limits of the soil that exceeds the cleanup criteria in 6 NYCRR Part 375-6 that was promulgated after the ROD was issued. Although the 6 NYCRR Part 375-6 criteria would require considerably less soil to be defined as source area soil requiring remediation, the NYSDEC and Frontier Group have established the horizontal and vertical delineation of the source area soil to constitute the remediation area identified through the NYSDEC-approved remedial pre-design investigation. This delineation is consistent with the remedial objectives of the 2006 ROD.

2.4.2 GROUNDWATER

Site groundwater has been contaminated by both Treatment, Storage, and Disposal Facility (TSDF) activities; and prior manufacturing operations. As a large area of the overburden soil has been contaminated by various VOCs, overburden groundwater has been similarly affected. Due to the influence of the adjacent unlined bedrock tunnels on the overburden groundwater (drawing it downward into the fractured bedrock aquifer), some of the Site contamination (both dissolved phase and NAPL) has migrated downward into the fractured bedrock. As described in Section 2.3.2.1, the location and influence of the FST and 47th Street tunnel have effectively intercepted the lateral movement of overburden and upper bedrock groundwater and prevented it from migrating off Site beyond the FST and 47th Street tunnel alignments.

As noted in the ROD, although the nearby tunnels provide an effective groundwater control system for the Site, achievement of groundwater standards on the former TSDF within a reasonable time frame is considered technically impracticable. The ROD also provided that control of the impacted groundwater within the shallow zones at the Site was adequately addressed by the containment provided by the tunnels. This remedy has been adopted and now operates under a Significant Industrial User Permit that was issued by the Niagara Falls Water Board to the Frontier Group.

3.0 ENGINEERING AND INSTITUTIONAL CONTROL PLAN

Since remaining contaminated soil, groundwater, and soil vapor exist beneath the Site, ECs and ICs are required to protect human health and the environment into the future. This Engineering and Institutional Control Plan describes the procedures for the implementation and management of all ECs/ICs at the Site. The EC/IC Plan is one component of the SMP and is subject to revision through consultation with the NYSDEC, as appropriate.

3.1 PURPOSE

This plan provides:

- A description of all ECs/ICs on the Site
- The basic implementation and intended role of each EC/IC
- A description of the key components of the ICs set forth in the Environmental Easement
- A description of the features to be evaluated during each required inspection and periodic review
- A description of plans and procedures to be followed for implementation of ECs/ICs, such as the implementation of the Excavation Work Plan for the proper handling of remaining contamination that may be disturbed during maintenance or redevelopment work on the Site
- Any other provisions necessary to identify or establish methods for implementing the ECs/ICs required by the Site remedy, as determined by the NYSDEC

3.2 ENGINEERING CONTROL SYSTEMS

The ROD requires that the Site surface either be covered with the existing asphalt or concrete surface or 1 foot of clean fill material. At the completion of excavation activities associated with the source area soil remediation, the cover system must be made compliant with the ROD. This will allow that existing undisturbed asphalt and concrete-covered areas remain "as is". All existing soil cover areas and the area disturbed due to the excavation of the source area soil will be required to be covered with new asphalt, concrete, or clean fill material. Since the expected near future use of the Site will be as a vehicle storage area, it is planned to use recycled concrete and hard demolition material as the planned 1 foot clean surface material that will be placed over all existing (and post-excavation) soil cover areas. The recycled concrete/demolition material will be crushed to 2 inch minus prior to placement and compacted in place.

If there is a desire to change the type of cover system from that which exists following the source area soil remediation, this constitutes a modification of the cover element of the remedy and the upper surface of the remaining contamination. A figure showing the proposed modified surface must be included in the subsequent Periodic Review Report (Section 6.3) and in any updates to this SMP. The initial cover system (the one that will exist following the source area soil remediation) is shown in Figure A3.1.

3.3 INSTITUTIONAL CONTROLS

A series of ICs is required by the ROD to:

(1) Implement, maintain, and monitor EC systems

(2) Prevent future exposure to remaining contamination by controlling disturbances of the subsurface contamination

(3) Limit the use and development of the Site to industrial uses only

Adherence to these ICs on the Site is required by the Environmental Easement and will be implemented under this Site Management Plan. The ICs that are to be implemented are as follows:

- Compliance with the Environmental Easement and this SMP by the Grantor (Site owner) and the Grantor's successors and assigns
- All ECs must be operated and maintained as specified in this SMP
- All ECs on the Controlled Property must be inspected at a frequency and in the manner defined in this SMP
- Groundwater and other environmental or public health monitoring must be performed as defined in this SMP
- Data and information pertinent to Site Management of the Controlled Property must be reported at the frequency and in the manner defined in this SMP

ICs identified in the Environmental Easement may not be discontinued without an amendment to or extinguishment of the Environmental Easement.

The Site has a series of ICs in the form of Site restrictions. Adherence to these ICs is required by the Environmental Easement. Site restrictions that apply to the Controlled Property are:

- The property may only be used for industrial use provided that the long-term ECs and ICs included in this SMP are employed
- The property may not be used for a higher level of use, such as unrestricted, restricted residential, or commercial use without additional evaluation (including possible additional remediation) and amendment of the Environmental Easement, as approved by the NYSDEC
- All future activities on the property that will disturb remaining contaminated material must be conducted in accordance with this SMP
- The use of the groundwater underlying the property as a source of potable or process water is prohibited without treatment rendering it safe for the intended use as determined by the NYSDEC, NYSDOH, or Niagara County Health Department
- The potential for vapor intrusion must be evaluated for any buildings developed on the Site and any potential impacts that are identified must be monitored or managed through implementation of appropriate vapor mitigation measures
- Vegetable gardens and farming on the property are prohibited
- The Site owner or remedial party will submit to NYSDEC a written statement that certifies, under penalty of perjury, that:

  (1) Controls employed at the Controlled Property are unchanged from the previous certification or that any changes to the controls were approved by the NYSDEC

  (2) Nothing has occurred that impairs the ability of the controls to protect public health and the environment or that constitute a violation or failure to comply with the SMP. NYSDEC retains the right to access such Controlled Property at any time in order to evaluate the continued maintenance of any and all controls. This certification shall be submitted annually, or an alternate period of time that NYSDEC may allow and will be made by an expert that the NYSDEC finds acceptable

3.4 EXCAVATION WORK PLAN

The Site will be remediated to a condition that allows for future use of the Site as restricted industrial. Any future intrusive work that will penetrate the soil cover or cap, or encounter or disturb the remaining contamination, including any modifications or repairs to the existing cover system will be performed in compliance with the Post-Remediation Excavation Work Plan (EWP) that is attached as Attachment B to this SMP. Any work conducted pursuant to the EWP must also be conducted in accordance with the procedures defined in the Health and Safety Plan (HASP) and Community Air Monitoring Plan (CAMP) prepared for the Site. The HASP is attached as Appendix B to the Remedial Design Report. The HASP is compliant with current DER-10, and 29 CFR 1910, 29 CFR 1926, and all other applicable Federal, State, and local regulations. Based on future changes to State and federal health and safety requirements, and specific methods employed by future contractors, the HASP and CAMP will be updated and re-submitted with the notification provided in Section 1.0 of the EWP. Any intrusive construction work will be performed in compliance with the EWP, HASP, and CAMP, and will be reported upon in the periodic inspection and certification reports submitted under the Site Management Reporting Plan (See Section 6).

The Site owner and associated parties preparing the remedial documents submitted to the State, and parties performing this work, are completely responsible for the safe performance of all intrusive work, the structural integrity of excavations, proper disposal of excavation water, control of runoff from open excavations and surface contamination areas, and for structures that may be affected by excavations (such as building foundations and footings). The Site owner will ensure that Site development activities will not interfere with, or otherwise impair or compromise, the ECs described in this SMP.

3.5 SOIL VAPOR INTRUSION EVALUATION

The potential for soil vapor intrusion (SVI) into Site structures may exist due to the presence of soils with remaining VOC concentrations. Prior to the construction of any enclosed structures on the Site and for which the potential for SVI has been confirmed, an SVI evaluation will be performed to determine whether any mitigation measures are necessary to eliminate potential exposure to vapors in the proposed structure. Alternatively, an SVI mitigation system may be installed as an element of the building foundation without first conducting an investigation. This mitigation system will include a vapor barrier and passive sub-slab depressurization system that is capable of being converted to an active system.

Prior to conducting an SVI investigation or installing a mitigation system, a work plan will be developed and submitted to the NYSDEC for approval. This work plan will be developed in accordance with the most recent NYSDOH "Guidance for Evaluating Vapor Intrusion in the State of New York." Measures to be employed to mitigate potential vapor intrusion will be evaluated, selected, designed, installed, and maintained based on the SVI evaluation, the NYSDOH guidance, and construction details of the proposed structure.

In the event that SVI sampling data is collected, it will be forwarded to the NYSDEC, along with a recommendation for follow-up action, such as mitigation. SVI data will also be transmitted to the property owner within 30 days of validation.

SVI sampling results, evaluations, and follow-up actions will also be summarized in the next Periodic Review Report.

3.6 INSPECTIONS AND NOTIFICATIONS

3.6.1 INSPECTIONS

Inspections of all remedial components installed at the Site will be conducted at the frequency specified in the SMP Monitoring Plan schedule. A comprehensive Site-wide inspection will be conducted annually, or as may be specified in the future in agreement with the NYSDEC. The inspections will determine and document the following:

- Whether ECs continue to perform as designed
- If the ECs continue to be protective of human health and the environment
- Compliance with requirements of this SMP and the Environmental Easement
- Achievement of remedial performance criteria
- Sampling and analysis of appropriate media during monitoring events
- If Site records are complete and up to date
- Changes, or needed changes, to the remedial or monitoring system

Inspections will be conducted in accordance with the procedures set forth in the Monitoring Plan of this SMP (Section 4). The reporting requirements are outlined in the Periodic Review Reporting section of this plan (Section 6).

3.6.2 NOTIFICATIONS

Notifications will be submitted by the property owner to the NYSDEC as needed for the following reasons:

- 60-day advance notice of any proposed changes in Site use that are required under the terms of the Remedial Action Order on Consent, 6NYCRR Part 375, and/or Environmental Conservation Law
- 7-day advance notice of any proposed ground-intrusive activities pursuant to the Excavation Work Plan
- Notice within 48-hours of any damage or defect to the foundations or structures that reduces or has the potential to reduce the effectiveness of other ECs and likewise any action to be taken to mitigate the damage or defect
- Verbal notice by noon of the following day of any emergency, such as a fire, flood, or earthquake that reduces or has the potential to reduce the effectiveness of ECs in place at the Site, with written confirmation within 7 days that includes a summary of actions taken, or to be taken, and the potential impact to the environment and the public
- Follow-up status reports on actions taken to respond to any emergency event requiring ongoing responsive action shall be submitted to the NYSDEC within 45 days and shall describe and document actions taken to restore the effectiveness of the ECs

Any change in the ownership of the Site or the responsibility for implementing this SMP will include the following notifications:

- At least 60 days prior to the change, the NYSDEC will be notified in writing of the proposed change. This will include a certification that the prospective purchaser has been provided with a copy of the Remedial Action Order on Consent, and all approved work plans and reports, including this SMP
- Within 15 days after the transfer of all or part of the Site, the new owner's name, contact representative, and contact information will be confirmed in writing

3.7 CONTINGENCY PLAN

Emergencies may include injury to personnel, fire or explosion, environmental release, or serious weather conditions. In the event of any environmentally-related situation or unplanned occurrence requiring assistance, the Owner or Owner's representative(s) should contact the appropriate party from the contact list below. For emergencies, appropriate emergency response personnel should be contacted. These emergency contact lists must be maintained in an easily accessible location at the Site.

Organization/Name	***Title/Location***	***Telephone***
Medical, Fire, and Police		911
Niagara Falls Memorial Medical Center	621 Tenth Street Niagara Falls, NY	716-278-4000
One Call Center (3-day notice required for utility markout)		800-272-4480
Poison Control Center		800-222-1222
Pollution Toxic Chemical Oil Spills		800-424-8802
NYSDEC Spills Hotline		800-457-7362
OWNER	5335 River Road, Inc. Joe Williams	813-610-0169
Frontier Group	Webster Szanyi LLP 1400 Liberty Building Buffalo, NY 14202 Tim Webster	716-842-2800
Frontier Group's Consultant	CRA Infrastructure & Engineering 285 Delaware Ave, Suite 500 Buffalo, NY 14202 Jim Kay	716-856-2142

In the case of an emergency, Niagara Falls Memorial Medical Center is the nearest health facility to the Site. The hospital is located at 621 Tenth Street, Niagara Falls, New York, a distance of approximately 2.4 miles (8 minutes).

From the Site, proceed west down Royal Avenue for 0.6 miles. Turn right onto Hyde Park Boulevard and travel north for 0.5 miles. Turn left onto Walnut Avenue and travel west for 1.3 miles. The hospital is on the right at the corner of Walnut Avenue and Tenth Street.

4.0 SITE MONITORING PLAN

The Monitoring Plan describes the measures for evaluating the performance and effectiveness of the remedy to reduce or mitigate contamination at the Site, the soil cover system, and the affected Site media identified below. Monitoring of other ECs is described in Chapter 5: Operation, Monitoring, and Maintenance Plan. This Monitoring Plan may only be revised with the approval of NYSDEC.

If an emergency, such as a natural disaster or an unforeseen failure of any of the ECs occurs, an inspection of the Site will be conducted within 5 days of the event to verify the effectiveness of the ECs/ICs implemented at the Site by a qualified environmental professional as determined by NYSDEC.

4.1 PURPOSE AND SCHEDULE

This Monitoring Plan describes the methods to be used for:

- Sampling and analysis of groundwater
- Assessing compliance with applicable NYSDEC standards, criteria, and guidance, particularly ambient groundwater standards
- Assessing achievement of the remedial performance criteria
- Evaluating site information periodically to confirm that the remedy continues to be effective in protecting public health and the environment
- Preparing the necessary reports for the various monitoring activities

To adequately address these issues, this Monitoring Plan provides information on:

- Sampling locations, protocols, and frequency
- Information on all designed monitoring systems (e.g., well logs)
- Analytical sampling program requirements
- Reporting requirements
- Quality Assurance/Quality Control (QA/QC) requirements
- Inspection and maintenance requirements for monitoring wells
- Monitoring well decommissioning procedures
- Annual Site inspection and periodic certification

Semi-annual monitoring of the performance of the remedy and overall reduction in contamination on-Site will be conducted in conjunction with the monitoring required by the Significant Industrial User Permit #72 (groundwater discharge permit) issued by the Niagara Falls Water Board. Trends in contaminant levels in groundwater will be evaluated to determine if the remedy continues to be effective in achieving remedial goals. Monitoring programs are outlined in detail in Sections 4.2 through 4.4 below.

4.2 ASPHALT/CONCRETE COVER SYSTEM MONITORING

The cover system at the Site is designed solely to prevent contact between Site visitors / workers and the remaining contaminants in the Site soil. The asphalt and concrete cover systems are intended to be generally low-maintenance covers. Assessment of the severity of deterioration or damage to asphalt pavement or concrete is subjective, and inspection personnel must use professional judgment in assessing what type and extent of deterioration/damage warrants repair or maintenance. As a guideline, areas of asphalt pavement or concrete will be repaired when the pavement is deteriorated/damaged to the extent that a significant amount of underlying soil or sub-base material is exuded from beneath the pavement. As a minimum, soil exposed beneath the asphalt or concrete over an area greater than 1 square foot would require repair of the asphalt or concrete.

Deteriorated asphalt pavement will be evaluated, and repaired using cold mix for areas less than 4 square feet, or hot mix asphalt and/or liquid bituminous material for larger areas. Concrete surfaces, will be repaired using one or more appropriate methods selected based on the type and extent of concrete deterioration or damage. Such methods may include:

- Patching with cold mix asphalt (for areas less than 4 square feet)
- Patching with hot mix asphalt or bituminous material
- Saw cutting and removing the damaged concrete and replacement with new concrete
- Use of low-slump concrete
- Replacement using one foot of clean quarried stone or crushed demolition material

For cases where concrete material is used to make the repairs, the use of reinforcing mesh or re-bar and bonding agents may be used.

4.3 SOIL COVER SYSTEM MONITORING

At the conclusion of the source area soil remediation, the remaining soil-covered areas will be replaced with one foot of crushed concrete or demolition material. The material will be underlain with a filter fabric material to provide delineation between the cover and subsurface soil. From time to time, it may be necessary to place a top skiff of new stone, crushed concrete, or demolition material to restore the surface, suitable with the intended use.

In the event that a soil cover is placed over some of the Site at a later date, the following procedures will be used. Assessment of the severity of deterioration or damage to the soil cover system is subjective, and inspection personnel must use professional judgment in assessing what type and extent of deterioration/damage warrants repair or maintenance. As a guideline, the soil cover system will be repaired if an area of the 1-foot cover soil layer is eroded or otherwise disturbed to a depth of 1 foot. Repair will consist of placement of clean soil material over the area to restore the cover thickness to 1 foot.

4.4 GROUNDWATER MONITORING

4.4.1 GROUNDWATER QUALITY MONITORING

Groundwater quality monitoring will be performed to assess the performance of the remedy. The remedy includes both a shallow groundwater component and a deep bedrock groundwater component. The requirements for the shallow groundwater sampling are provided in the terms of the Significant Industrial User Permit that was issued for the Site by the Niagara Falls Water Board. The purpose of the sampling is to quantify the volume and quality of the groundwater that infiltrates the FST and the 47th Street Tunnel that provide the containment of Site groundwater. The network of monitoring wells included in the monitoring program already exists along the downgradient boundaries of the Site. The program consists of:

- Monitoring wells that were installed as part of the remedial investigation of the Site.
- Five monitoring wells in the A-Zone bedrock for groundwater quality (Figure A4.1). The wells are located along Royal Avenue to monitor groundwater discharge to the FST.
- Six monitoring wells in the B-Zone bedrock for groundwater quality (Figure A4.2). The downgradient wells are located along Royal Avenue and 47th Street to monitor groundwater discharge to the FST and 47th Street Tunnel, respectively.

The wells are listed on Table A4.1. Figures A4.1 and A4.2 show the locations of the monitoring wells included. The wells are to be sampled on a semi-annual basis, as specified in the Permit. Copies of the well construction details for those wells to be included in the groundwater quality monitoring program are provided in Attachment C. The monitoring wells will be sampled for the Site-specific contaminants of concern listed as specified in the Permit (see Table A4.2) and in accordance with EPA Low-Flow (Minimal Drawdown) Groundwater Sampling Procedures.

In addition to the sampling required for the Significant Industrial User Permit, groundwater samples will also be collected from the C-Zone beneath the Site as part of the monitored natural attenuation remedy selected for the deep bedrock groundwater. Three monitoring wells in the C-Zone bedrock (see Figure A4.3) will be monitored for groundwater quality to assess the improvement in bedrock groundwater quality over time. These wells will be sampled on an annual basis for 5 years. Thereafter, a determination will be made as to the need for and frequency of future sampling. The samples will be analyzed for VOCs.

The noted sampling frequencies may be modified with the approval of the NYSDEC and/or the Niagara Falls Water Board, as applicable. The SMP will be modified to reflect changes in sampling plans approved by the NYSDEC and the Niagara Falls Water Board.

Deliverables for the groundwater monitoring program are specified in Section 6.3.

4.4.2 HYDRAULIC MONITORING

In conjunction with the groundwater quality monitoring described above, all available monitoring wells shown on Figures A4.1 through A4.3 will be hydraulically monitored to assess groundwater flow conditions in and between bedrock Zones A, B, and C. Water level measurements will be collected on the same frequency as the groundwater quality monitoring program and groundwater flow diagrams will be updated to evaluate the flow conditions at the Site.

4.5 GROUNDWATER SAMPLING PROTOCOL

All monitoring well sampling activities will be recorded in a field book and the groundwater sampling form presented in Attachment D. Other observations (e.g., well integrity, etc.) will be noted on the well sampling form. The completed well sampling forms will be provided with the Periodic Review Report discussed in Section 6.3.

4.5.1 WELL GAUGING

Prior to groundwater sampling, each monitoring well listed in Table A4.1 will be gauged using a groundwater probe. The depth of each well and the depth to groundwater will be measured from the top of the well casing. If observed, the presence of NAPL will be noted. The available water volume and gauging data will be recorded on the groundwater sampling form.

During well gauging, the monitoring well will be inspected for structural damage to the well cap, seal, protective pad and visible portion of the well casing. The presence and condition of plugs and locks will also be noted. Well maintenance and/or repairs will be completed as necessary and to the extent practicable. Any structural damage or repairs will be noted on the Site inspection form provided in Attachment E.

4.5.2 GROUNDWATER PURGING AND SAMPLING

Monitoring wells will be purged and sampled using low-flow purging (LFP) techniques in accordance with the USEPA's *Low Stress (Low Flow) Purging and Sampling Procedure for the Collection of Ground Water Samples from Monitoring Wells*. LFP results in minimal drawdown during well purging, so less purging is required before formation water is removed, as well as less agitation and mobilization of sediments compared to traditional sampling techniques.

An adjustable rate, submersible pump (e.g., bladder, centrifugal, peristaltic), constructed of stainless steel or Teflon, is used for LFP. The pump is positioned in the well so that the pump intake is set at the mid-point of the well screen, or a minimum of 2 feet (0.6 m) above the bottom of the well or accumulated sediment level.

During LFP, the pumping rate should be between 100 and 500 milliliters per minute (mL/min). Groundwater levels are measured during purging to maintain a maximum 0.4 feet (0.1 m) of drawdown.

Field parameters including pH, temperature, specific conductance, oxidation-reduction potential (ORP), dissolved oxygen (DO), and turbidity should be monitored and recorded at 5-minute intervals during LFP. The measurement of these field parameters is used to evaluate if stabilization of the purged groundwater has occurred prior to the collection of groundwater samples. Groundwater stabilization is considered achieved when three consecutive readings for each of the field parameters, taken at 5-minute intervals, are within the following limits:

- pH ±0.1 pH units of the average value of the three readings
- temperature ±2°F of the average value of the three readings
- conductivity ±3 percent of the average value of the three readings
- ORP ±10 millivolts (mV) of the average value of the three readings
- DO ±10 percent of the average value of the three readings
- turbidity ±10 percent of the average value of the three readings, or a final value of less than 50 NTU

Field parameters are measured using a flow-through cell apparatus. At the start of LFP, the purge water is visually inspected for clarity prior to connecting to the flow-through cell. If the purge water is turbid, LFP continues until the purge water is visually less turbid prior to connecting to the flow-through cell. All meters must be calibrated daily in accordance with the manufacturer's instructions, and a calibration record maintained in the field book.

4.5.3 GROUNDWATER SAMPLING PARAMETERS

Groundwater samples will be collected at the specified frequencies from each well within the monitoring well network. Collected groundwater samples will be analyzed for the parameters listed in Table A4.2. Analytical methods, holding times, and quality assurance/quality control (QA/QC) requirements are presented in the Site-specific Quality Assurance Project Plan (QAPP) provided as Attachment F.

4.6 MONITORING WELL REPAIRS, REPLACEMENT AND DECOMMISSIONING

The monitoring well network will be inspected annually as part of the monitoring program. If biofouling or silt accumulation occurs in the monitoring wells, the wells will be physically agitated/surged and redeveloped. Additionally, monitoring wells will be properly decommissioned and replaced (as per the Monitoring Plan), if an event renders the wells unusable.

Repairs and/or replacement of wells in the monitoring well network will be performed based on assessments of structural integrity and overall performance.

The NYSDEC will be notified prior to any repair or decommissioning of monitoring wells for the purpose of replacement, and the repair or decommissioning and replacement process will be documented in the subsequent Periodic Review Report. Well decommissioning without replacement will be done only with the prior approval of NYSDEC. Well abandonment will be performed in accordance with NYSDEC's "Groundwater Monitoring Well Decommissioning Procedures." Monitoring wells that are decommissioned because they have been rendered unusable will be reinstalled in the nearest available location, unless otherwise approved by the NYSDEC.

4.7 MONITORING QUALITY ASSURANCE/QUALITY CONTROL

All sampling and analyses will be performed in accordance with the requirements of the QAPP prepared for the Site (Attachment F).

4.8 MONITORING REPORTING REQUIREMENTS

Forms and any other information generated during regular monitoring events and inspections will be kept on file on-Site or at the Owner's office. All forms, and other relevant reporting formats used during the monitoring/inspection events, will be subject to approval by NYSDEC and submitted at the time of the Periodic Review Report, as specified in the Reporting Plan of this SMP.

All monitoring results will be reported to NYSDEC on a periodic basis in the Periodic Review Report. The report will include, at a minimum:

- Date of sampling event
- Description of the activities performed
- Type of samples collected (i.e., groundwater)
- Sampling results in comparison to appropriate standards/criteria
- A figure illustrating sample type and sampling locations
- Copies of all laboratory data sheets and the required laboratory data deliverables required for all points sampled (to be submitted electronically in the NYSDEC-identified format)

- Any observations, conclusions, or recommendations
- A determination as to whether groundwater conditions have changed since the last reporting event.

5.0 OPERATION AND MAINTENANCE PLAN

The Site remedy does not rely on any mechanical systems, such as sub-slab depressurization systems or air sparge / soil vapor extraction systems to protect public health and the environment. Therefore, the operation and maintenance of such components is not needed for this SMP.

6.0 INSPECTIONS, REPORTING, AND CERTIFICATIONS

6.1 SITE INSPECTIONS

6.1.1 INSPECTION FREQUENCY

All inspections will be conducted at the frequency specified in the schedules provided in Section 4 Monitoring Plan of this SMP. At a minimum, a Site-wide inspection will be conducted annually.

If an emergency, such as a natural disaster or an unforeseen failure of any of the ECs occurs, an inspection of the Site will be conducted within 5 days of the event to verify the effectiveness of the ECs/ICs implemented at the Site by a qualified environmental professional as determined by NYSDEC.

6.1.2 INSPECTION FORMS, SAMPLING DATA, AND MAINTENANCE REPORTS

All inspections and monitoring events will be recorded on the general Site-wide inspection form contained in Attachment E. This form is subject to NYSDEC revision.

All applicable inspection forms and other records, including all media sampling data, generated for the Site during the reporting period will be provided in electronic format in the Periodic Review Report.

6.1.3 EVALUATION OF RECORDS AND REPORTING

The results of the inspection and Site monitoring data will be evaluated as part of the EC/IC certification to confirm that the:

- ECs/ICs are in place, are performing properly, and remain effective
- The Monitoring Plan is being implemented
- Site is being maintained in an appropriate condition
- Site monitoring wells are being maintained
- Site management activities are being conducted
- The Site remedy continues to be protective of public health and the environment and is performing as designed in the Remedial Design Report and FER

6.2 CERTIFICATION OF ENGINEERING AND INSTITUTIONAL CONTROLS

After the annual inspection, a Professional Engineer licensed to practice in New York State or the Site Owner will prepare the following certification, consistent with the then current NYS Site Management Periodic Review Report format:

For each institutional or engineering control identified for the site, I certify that all of the following statements are true:

- *The inspection of the Site to confirm the effectiveness of the institutional and engineering controls required by the remedial program was performed under my direction;*
- *The institutional control and/or engineering control employed at this Site is unchanged from the date the control was put in place, or last approved by the Department;*
- *Nothing has occurred that would impair the ability of the control to protect the public health and environment;*
- *Nothing has occurred that would constitute a violation or failure to comply with any Site management plan for this control;*
- *Access to the Site will continue to be provided to the Department to evaluate the remedy, including access to evaluate the continued maintenance of this control;*
- *Use of the Site is compliant with the environmental easement;*
- *The engineering control systems are performing as designed and are effective;*
- *To the best of my knowledge and belief, the work and conclusions described in this certification are in accordance with the requirements of the Site remedial program; and*
- *The information presented in this report is accurate and complete.*

I certify that all information and statements in this certification form are true. I understand that a false statement made herein is punishable as a Class "A" misdemeanor, pursuant to Section 210.45 of the Penal Law. I, [name], of [business address], am certifying as [Owner or Owner's Designated Site Representative] for the site.

The signed certification will be included in the Periodic Review Report described below.

6.3 PERIODIC REVIEW REPORT

A Periodic Review Report will be submitted to the Department every year, beginning eighteen months after the Certificate of Completion is issued. In the event that the Site is subdivided into separate parcels with different ownership, a single Periodic Review Report will be prepared that addresses the Site described in Attachment A (Metes and Bounds). The report will be prepared in accordance with NYSDEC DER-10 and submitted within 45 days of the end of each certification period. Media sampling results will also be incorporated into the Periodic Review Report. The report will include:

- Identification, assessment, and certification of all ECs/ICs required by the remedy for the Site
- Results of the required annual site inspections
- All applicable inspection forms and other records generated for the Site during the reporting period in electronic format
- A summary of any discharge monitoring data and/or information generated during the reporting period with comments and conclusions
- Data summary tables and graphical representations of contaminants of concern by media (groundwater, soil vapor), which include a listing of all compounds analyzed, along with the applicable standards, with all exceedances highlighted. These will include a presentation of past data as part of an evaluation of contaminant concentration trends
- Results of all analyses and the required laboratory data deliverables for all samples collected during the reporting period will be submitted electronically in a NYSDEC-approved format
- A site evaluation, which includes the following:
    - The compliance of the remedy with the requirements of the Site-specific ROD
    - Any new conclusions or observations regarding Site contamination based on inspections or data generated by the Monitoring Plan for the media being monitored;
    - Recommendations regarding any necessary changes to the remedy and/or Monitoring Plan
    - The overall performance and effectiveness of the remedy

The Periodic Review Report will be submitted, in hard-copy format (or electronic if requested), to the NYSDEC Region 9 Office.

6.4 CORRECTIVE MEASURES PLAN

If any component of the remedy is found to have failed, or if the periodic certification cannot be provided due to the failure of an EC or IC, a corrective measures plan will be submitted to the NYSDEC for approval. This plan will explain the failure and provide the details and schedule for performing work necessary to correct the failure. Unless an emergency condition exists, no work will be performed pursuant to the corrective measures plan until it is approved by the NYSDEC.

figure A1.1

SITE MAP
SITE MANAGEMENT PLAN
Frontier Chemical Site - Niagara Falls, New York

SOURCE: E & E, 2002

47392-00(009)GN-BU003 DEC 14/2011

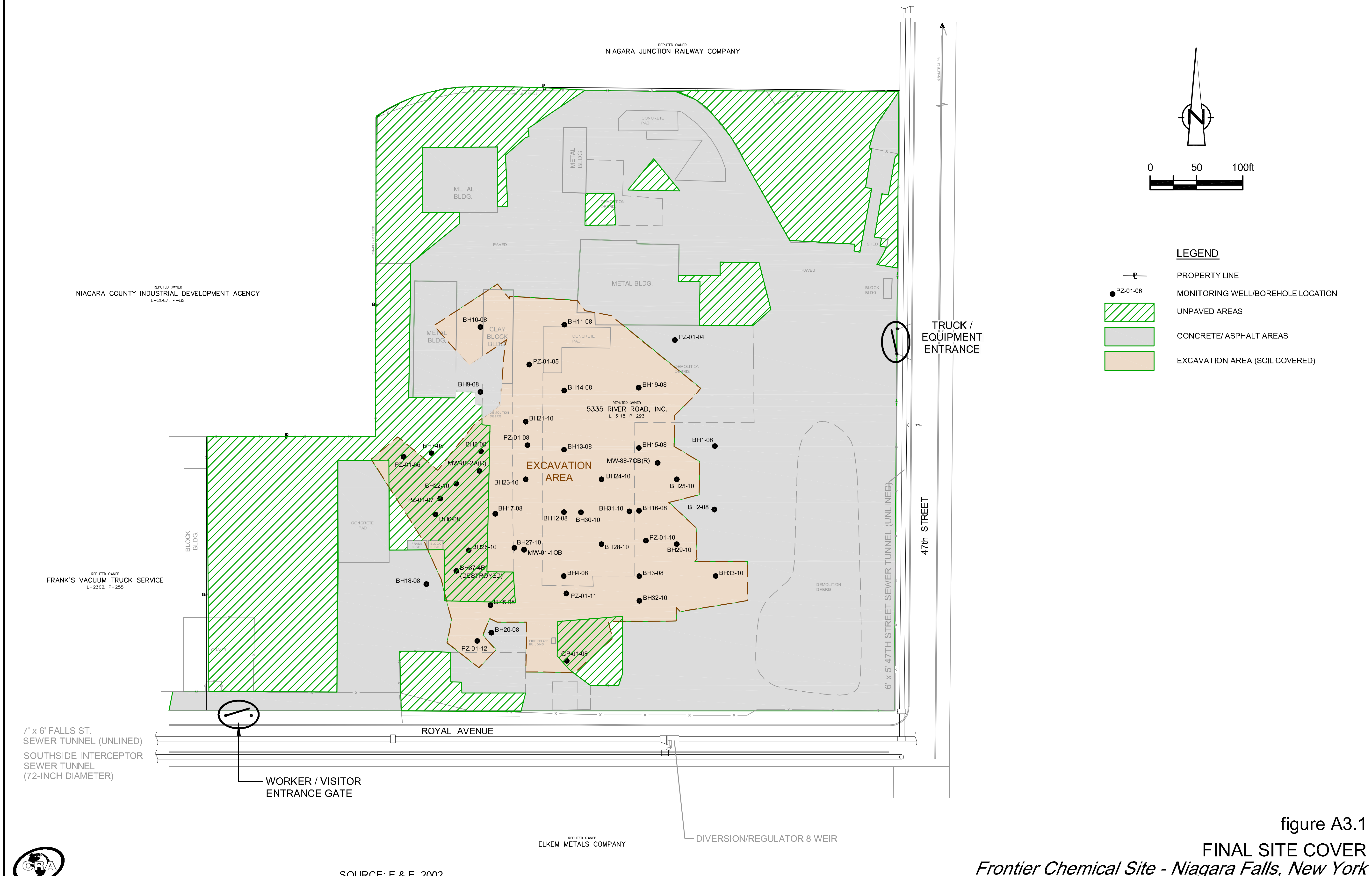


figure A3.1

FINAL SITE COVER

Frontier Chemical Site - Niagara Falls, New York

47392-00(009)GN-BU014 DEC 14/2011

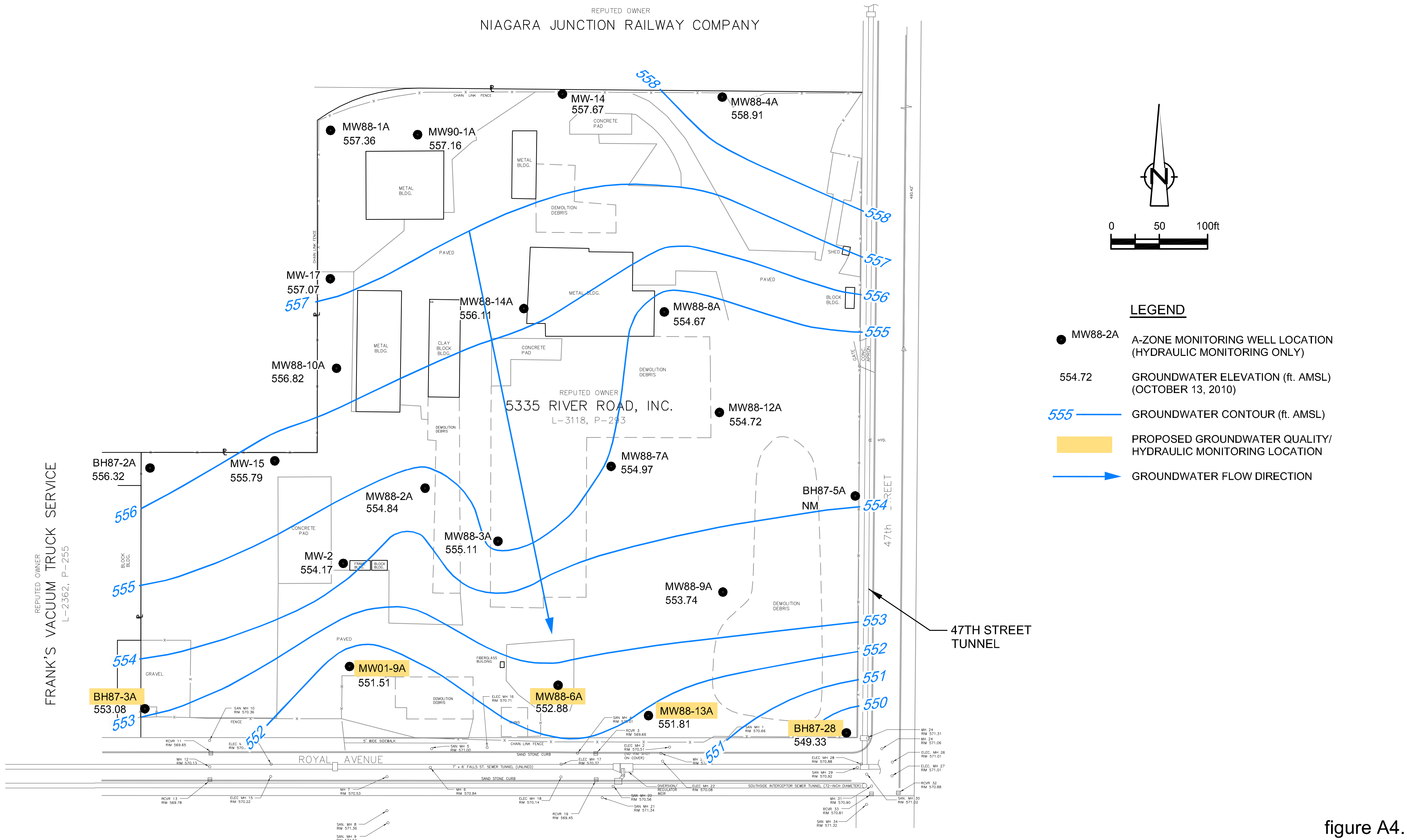


figure A4.1

PROPOSED GROUNDWATER MONITORING LOCATIONS - ZONE A
SITE MANAGEMENT PLAN

Frontier Chemical Site - Niagara Falls, New York

47392-00(009)GN-BU010 DEC 14/2011

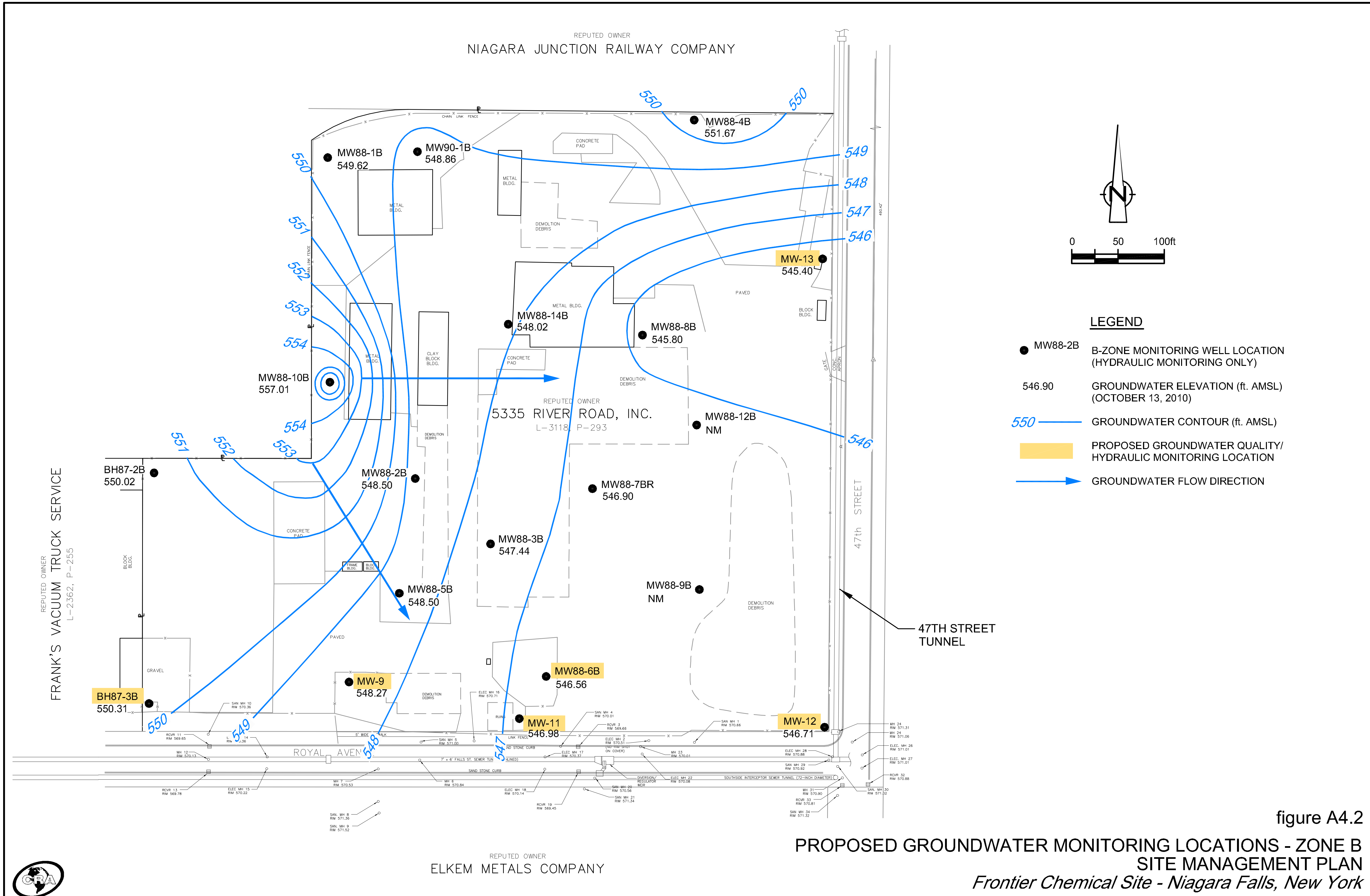
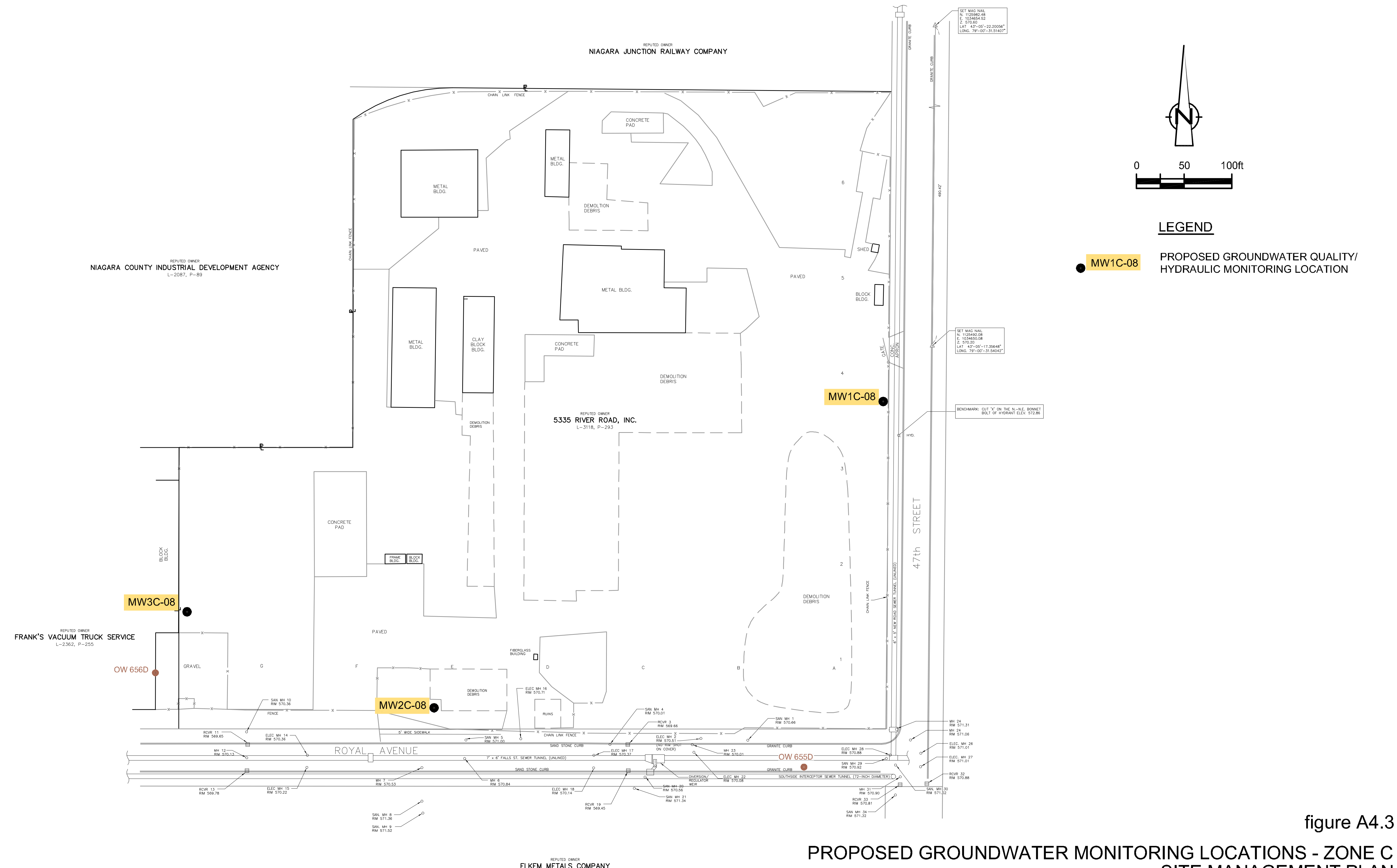


figure A4.2

PROPOSED GROUNDWATER MONITORING LOCATIONS - ZONE B
SITE MANAGEMENT PLAN
Frontier Chemical Site - Niagara Falls, New York

47392-00(009)GN-BU011 DEC 14/2011



SOURCE: E & E, 2002

figure A4.3

PROPOSED GROUNDWATER MONITORING LOCATIONS - ZONE C
SITE MANAGEMENT PLAN
Frontier Chemical Site - Niagara Falls, New York

47392-00(009)GN-BU012 DEC 14/2011

TABLE A4.1

GROUNDWATER MONITORING NETWORK
FRONTIER CHEMICAL SITE
NIAGARA FALLS, NEW YORK

Zone A Wells	*Zone B Wells*	*Zone C Wells*
BH87-3A	MW-13	MW3C-08
MW01-9A	BH87-3B	MW2C-08
MW88-6A	MW-9	MW1C-08
MW88-13A	MW-11	
BH87-28	MW88-6B	
	MW-12	

TABLE A4.2

SITE-SPECIFIC GROUNDWATER QUALITY PARAMETERS
FRONTIER CHEMICAL SITE
NIAGARA FALLS, NEW YORK

Parameters

Volatile Organic Compounds
1,1-Dichloroethane
1,2,4-Trichlorobenzene
1,2-Dichlorobenzene
1,3-Dichlorobenzene
1,4-Dichlorobenzene
Acetone
Benzene
Chlorobenzene
cis-1,2-Dichloroethene
Tetrachloroethene
Toluene
Trichloroethene
Vinyl Chloride
Monochlorotoluene

Inorganics
Arsenic
Iron
Potassium
Sodium
Total Phenol

ATTACHMENT A

METES AND BOUNDS

City of Niagara Falls, County of Niagara and
State of New York, part of Lots 47 and 48 of the
Mile Reserve, more particularly described in
Parcel "A" below

PARCEL "A"

All that tract or parcel of land situate in the City of Niagara Falls, County of Niagara and State of New York, being part of Lots 47 and 48 of the Mile Reserve, bounded and described as follows: Beginning at the point of intersection of the north line of Royal Avenue with the west line of 47th Street, formerly Union Street; thence westerly along the north line of Royal Avenue 741.15 feet to the southwest corner of lands conveyed to Kimberly-Clark Corporation by deed recorded in liber 570 of Deeds page 397; thence northerly making an interior angle of 89° 49' 15" and along the west line of lands so conveyed to Kimberly-Clark Corporation by deed aforesaid 295.13 feet to the southwest corner of lands conveyed by Innis, Speiden & Co. to Kimberly-Clark Corporation by deed recorded in liber 948 of Deeds page 32; thence easterly along said south line of lands so conveyed by said last mentioned deed 182.44 feet to the southeast corner of said lands; thence northerly along a line making an exterior angle of 90° 10' 45" with the last mentioned course and along the east line of lands so conveyed to Kimberly-Clark Corporation by last mentioned deed 344.2 feet more or less to the northwest line of lands conveyed by the Niagara Falls Power Company to Isco Chemical Company, Inc. by deed recorded in liber 565 of Deeds page 288, said northwest line being a curved line having a radius of 291.67 feet; thence northeasterly along said curved line 67.51 feet to an iron pin at a point of tangency; thence northeasterly tangent to said curve 38.35 feet to an iron pin in the south line of a railway reserve, 32 feet wide; thence easterly making an interior angle of 168° 08' 30", 460.20 feet to an iron pin in the west line of 47th Street; thence southerly along the west line of 47th Street 668.52 feet to the north line of Royal Avenue at the place of beginning

ATTACHMENT B

POST-REMEDIAL ACTION EXCAVATION WORK PLAN

TABLE OF CONTENTS

LIST OF TABLES
(Following Report)

1.0 INTRODUCTION

This Post Remedial Action Excavation Work Plan (EWP) presents the procedures to be followed in the event that an activity that results in excavation beneath the Site cover occurs following implementation of the Remedial Action for the Frontier Chemical Site (Site) located in Niagara Falls, New York.

2.0 NOTIFICATION

At least 7 days prior to the start of any subsurface activity, the Site owner or their representative will notify the New York State Department of Environmental Conservation (NYSDEC). Currently, this notification will be made to:

Mr. Gregory Sutton
NYSDEC Region 9
270 Michigan Avenue
Buffalo, NY 14203
(716) 851-7220

This notification will include:

- A detailed description of the work to be performed, including the location and areal extent, plans for Site re-grading, intrusive elements or utilities to be installed below the Site cover, estimated volumes of contaminated soil to be excavated and any work that may impact an engineering control
- Whether the subsurface work will be performed within the treated soil backfill area (which is demarcated in the field by a filter fabric) or the non-source area soil
- A summary of environmental conditions anticipated in the work areas, including the nature and concentration levels of contaminants of concern, potential presence of grossly contaminated media, and plans for any pre-construction sampling
- A schedule for the work, detailing the start and completion of all intrusive work
- A summary of the applicable components of this EWP
- A statement that the work will be performed in compliance with this EWP and 29 CFR 1910.120
- A copy of the contractor's health and safety plan, in electronic format, if it differs from the HASP provided in Appendix B of the Remedial Design Report
- Identification of disposal facilities for potential waste streams
- Identification of sources of any anticipated backfill, along with all required chemical testing results

3.0 SOIL SCREENING METHODS

Excavated soil will be segregated based on previous environmental data and screening results into material that is removed from a treated soil area and soil that is removed from non-source area soil. All excavated soil can be returned to the subsurface into the designated area from which it came. Cover material (asphalt, concrete, and the top 1 foot of soil material) shall be similarly segregated and reused to the extent practicable.

Visual, olfactory, and instrument-based soil screening (e.g., PID screening) will be performed by a qualified environmental professional during all remedial and development excavations into known or potentially-contaminated material (remaining contamination). Soil screening will be performed regardless of when the invasive work is done and will include all excavation and invasive work performed during development, such as excavations for foundations and utility work, after issuance of the Certificate of Completion.

Soil with PID field screening results of less than 100 ppm can be placed in a non-impacted soil stockpile for later use as backfill of the excavation. If PID field screening results exceed 100 ppm, further testing will be required. For excavated soil/fill that requires testing, soil shall be placed in separate stockpiles. Composite 5 point soil samples will be collected for analysis of volatile organic compounds (VOCs) based on the volume of material as shown below:

Excavated Soil Quantity (CY)	***Sample Quantity***
0 - 50	1
50 – 100	2
100 – 200	3
200 – 400	4
400 – 500	5
500 – 800	6
800 – 1,000	7
>1,000	Add two samples for every 1,000 CY

Soil that exceeds the 6 NYCRR Part 375-6 (or current regulation) soil cleanup objectives for restricted industrial use will require off-Site disposal/treatment. All other soil will be used as backfill.

If the soil/fill material requires off-site disposal, additional parameters (e.g., semivolatile organic compounds, metals, PCBs, and/or TCLP) may be analyzed as required by the disposal facility.

4.0 STOCKPILE METHODS

Soil with PID readings less than 100 ppm will be placed in a separate stockpile(s) from soil with a PID reading greater than 100 ppm. Soil/fill stockpiles will be continuously encircled with a soil or asphalt/concrete berm and/or silt fence to prevent surface water run-off from the stockpiles and surface water run-on from the surrounding ground surface. Hay bales will be used as needed near catch basins, surface water, and other discharge points.

Stockpiles will be kept covered at all times with appropriately anchored tarps. The piles will be inspected at a minimum once each week and after every storm event. Results of inspections will be recorded in a logbook and maintained at the Site and available for inspection by NYSDEC. Any damaged tarp covers will be promptly replaced.

5.0 MATERIALS EXCAVATION AND LOAD OUT

A qualified environmental professional or person under their supervision will oversee all invasive work and the excavation and load-out of all excavated material.

The owner of the property and its contractors are solely responsible for safe execution of all invasive and other work performed under this EWP.

The presence of utilities and easements on the Site will be investigated by the qualified environmental professional. It will be determined whether a risk or impediment to the planned work is posed by utilities or easements on the Site.

Loaded vehicles leaving the Site will be appropriately lined, tarped, securely covered, manifested, and placarded in accordance with appropriate Federal, State, local, and NYSDOT requirements (and all other applicable transportation requirements).

A truck wash will be operated on-Site. The qualified environmental professional will be responsible for ensuring that all outbound trucks will be washed at the truck wash before leaving the Site until the activities performed under this section are complete. As an alternative, truck routes on the Site can be delineated in such a manner as to prevent the truck's tires and undercarriages from coming in contact with contaminated soil. If this method is used, trucks need only be inspected (and cleaned if necessary) rather than washed.

Locations where vehicles enter or exit the Site shall be inspected daily for evidence of off-Site soil tracking.

The qualified environmental professional will be responsible for ensuring that all egress points for truck and equipment transport from the Site are clean of dirt and other materials derived from the Site during intrusive excavation activities. Cleaning of the adjacent streets will be performed as needed to maintain a clean condition with respect to Site-derived materials.

6.0 MATERIALS TRANSPORT OFF-SITE

All transport of excavated soil will be performed by licensed haulers in accordance with appropriate local, State, and Federal regulations, including 6 NYCRR Part 364, consistent with the material being hauled. Haulers will be appropriately licensed and trucks properly placarded.

Excavated soil transported by trucks exiting the Site will be secured with tight-fitting covers. Loose-fitting canvas-type truck covers will be prohibited. If loads contain wet material capable of producing free liquid, truck liners will be used.

With the noted exception described in Section 5.0, all trucks will be washed prior to leaving the Site. Truck wash waters will be collected and disposed off-Site in an appropriate manner. Sediment from the truck washing will be disposed off-Site with one of the loads of soil being exported.

The truck transport route is as follows:

- Upon exiting the Site, trucks shall travel north on 47th Street to US Route 62 (Niagara Falls Blvd.)
- US Route 62 is a designated truck route with direct access to Interstate I-90 and other truck routes

All trucks loaded with Site materials will enter and exit the Site using only this approved truck route. This is the most appropriate route and takes into account:

i) Limiting transport through residential areas and past sensitive areas
ii) Use of city mapped truck routes
iii) Prohibiting off-Site queuing of trucks entering the facility
iv) Limiting total distance to major highways
v) Promoting safety in access to highways
vi) Overall safety in transport

Trucks will be prohibited from stopping and idling on the roadways surrounding the project Site.

Egress points for truck and equipment transport from the Site will be kept clean of dirt and other materials during the work.

Queuing of trucks will be performed on-Site or in pre-designated areas in order to minimize off-Site disturbance.

7.0 MATERIALS DISPOSAL OFF-SITE

All soil/fill/solid waste excavated and removed from the Site will be treated as contaminated and regulated material (unless otherwise determined through appropriate testing or knowledge) and will be transported and disposed in accordance with all local, State (including 6NYCRR Part 360), and Federal regulations. If disposal of soil/fill from this Site is proposed for unregulated off-Site disposal (i.e., clean soil removed for development purposes), a formal request with an associated plan will be made to the NYSDEC. Unregulated off-Site management of materials from this Site will not occur without formal NYSDEC approval.

Off-Site disposal locations for excavated soil will be identified in the pre-excavation notification. This will include estimated quantities and a breakdown by class of disposal facility if appropriate, i.e., hazardous waste disposal facility, solid waste landfill, petroleum treatment facility, construction/demolition recycling facility, etc. Actual disposal quantities and associated documentation will be reported to the NYSDEC in the Periodic Review Report. This documentation will include: waste profiles, test results, facility acceptance letters, manifests, bills of lading, and facility receipts.

Non-hazardous historic fill and contaminated soil taken off-Site will be handled, at a minimum, as a Municipal Solid Waste per 6NYCRR Part 360-1.2. Material that does not meet Track 1 unrestricted soil cleanup objectives (SCOs) is prohibited from being taken to a New York State recycling facility (6NYCRR Part 360-16 Registration Facility).

8.0 MATERIALS REUSE ON-SITE

Excavated soil will be segregated (based on previous environmental data and screening results) into material that requires testing and potential off-Site disposal, material that can be returned to the subsurface, and material that can be used as cover soil (the top 1 foot of material).

Soil stockpiles will be managed in accordance with Section 4.0.

The qualified environmental professional will ensure that procedures defined for materials reuse in this SMP are followed and that unacceptable material does not remain on-Site. Contaminated on-Site material, including historic fill and contaminated soil, that is acceptable for re-use on-Site will be placed below the demarcation layer or impervious surface, and will not be reused within the cover, within landscaping berms, within the treated soil backfill area, or as backfill for subsurface utility lines.

Excavated soil removed from the treated soil backfill area can be reused anywhere on-Site but preferably should be used as backfill within the delineated treated soil backfill area.

Any demolition material proposed for reuse on-Site will be sampled for asbestos, where appropriate, and the results will be reported to the NYSDEC for acceptance. Concrete crushing or processing on-Site will not be performed without prior NYSDEC approval. Organic matter (wood, roots, stumps, etc.) or other solid waste derived from clearing and grubbing of the Site will not be reused on-Site.

9.0 FLUIDS MANAGEMENT

The Site maintains a Significant Industrial User Permit from the Niagara Falls Water Board. The permit covers discharges of untreated impacted groundwater from the Site into the City sanitary sewer system. All liquids generated from the Site, including excavation dewatering, truck washing, and groundwater monitoring well purge and development waters, can be discharged to the sanitary sewer system under the active permit. The volume of water discharged will be metered and the water quality must be compliant with the permit requirements. Construction water may have to be pre-filtered to minimize solids content to meet the permit discharge limitations.

10.0 COVER SYSTEM RESTORATION

After the completion of soil removal and any other invasive activities, the cover system will be restored in a manner that complies with the Record of Decision (ROD). The ROD requires that site soils be covered with asphalt, concrete, or one foot of clean fill material. If the type of cover system changes from that which exists prior to the excavation (i.e., a soil cover is replaced by asphalt), this will constitute a modification of the cover element of the remedy and the upper surface of the remaining contamination. A figure showing the modified surface will be included in the subsequent Periodic Review Report and in any updates to the SMP.

11.0 BACKFILL FROM OFF-SITE SOURCES

All materials proposed for import onto the Site will be approved by the qualified environmental professional and will be in compliance with provisions in this SMP prior to receipt at the Site. Off-Site borrow areas will be documented as having no evidence of disposal or release of solid or hazardous wastes, hazardous or toxic substances, radioactive materials, or petroleum products. Material from industrial sites, spill sites, or other environmental remediation sites or potentially contaminated sites will not be imported to the Site. Off-Site soil intended for use as backfill cannot otherwise be defined as a solid waste in accordance with 6 NYCRR Part 360.

Solid waste will not be imported onto the Site.

Sampling of imported soil shall be conducted at a rate of one representative composite sample per source for virgin soil, and one composite sample per 500 cubic yards of material for non-virgin soil. If more than 1,000 cubic yards of soil are obtained from a given off-Site non-virgin soil source area, the sample collection frequency will be reduced to one composite sample for every 2,500 cubic yards. For sources greater than 5,000 cubic yards, the sampling frequency may be reduced further to one sample per 5,000 cubic yards. All samples will be analyzed for Target Compound List (TCL) volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), pesticides, and PCBs, as well as arsenic, barium, cadmium, chromium, lead, mercury, selenium, silver, and cyanide. The soil may not exceed any standards listed in Table B-1.

Trucks entering the Site with imported soil will be securely covered with tight fitting covers. Imported soil will be stockpiled separately from excavated material and covered to prevent dust releases.

12.0 STORMWATER POLLUTION PREVENTION

Runoff from the Site could impact storm and sanitary sewers along 47th Street and Royal Avenue. For small excavations, silt fencing, hay bales, or berms will be installed around the entire perimeter of the disturbed construction area. Barriers and hay bale checks will be installed and inspected once a week and after every storm event. Results of inspections will be recorded in a logbook and maintained at the Site or property owner's office and available for inspection by NYSDEC. All necessary repairs shall be made immediately. Accumulated sediments will be removed as required to keep the barrier and hay bale check functional.

If silt fencing is used, all undercutting or erosion of the silt fence toe anchor shall be repaired immediately with appropriate backfill materials. Manufacturer's recommendations will be followed for replacing silt fencing damaged due to weathering.

Erosion and sediment control measures identified in the SMP shall be observed to ensure that they are operating correctly. Where discharge locations or points are accessible, they shall be inspected to ascertain whether erosion control measures are effective in preventing significant impacts to receiving waters.

Any disturbance of more than one acre of the Site will require the Owner to follow the requirements for coverage under the Construction Storm Water General Permit including the submittal of a Notice of Intent (NOI) form and the development of a Storm Water Pollution Prevention Plan (SWPPP). The SWPPP must fulfill all permit requirements and must be prepared in accordance with Part III of the New York State General Permit No. GP-0-10-001. The SWPPP, in accordance with permit requirements, must provide the following information:

- A background discussion of the scope of the construction project
- A statement of the storm water management objectives
- An evaluation of post-development runoff conditions
- A description of proposed storm water control measures
- A description of the type and frequency of maintenance activities required to support the control measure

The SWPPP will address issues such as erosion prevention, sedimentation control, hydraulic loading, pollutant loading, ecological protection, physical site characteristics that impact design, and Site management planning. All descriptions of proposed features and structures at the Site will include a description of structure placement, supporting engineering data and calculations, construction scheduling, and references to established detailed design criteria. The SWPPP will conform to all requirements as established by applicable regulatory agencies.

13.0 CONTINGENCY PLAN

If underground tanks, drums, or other previously unidentified contaminant sources are found during post-remedial subsurface excavations or development-related construction, excavation activities will be suspended until sufficient equipment is mobilized to address the condition.

Sampling will be performed on product, sediment, and surrounding soil, etc. as necessary to determine the nature of the material and proper disposal method. Chemical analysis will be performed for VOCs unless the Site history and previous sampling results provide a reasonable justification to extend the list of analytes.

Identification of unknown or unexpected contaminated media identified by screening during invasive Site work will be promptly communicated by phone to NYSDEC's Project Manager. Reportable quantities of petroleum product will also be reported to the NYSDEC spills hotline. These findings will also be included in the Periodic Review Reports prepared pursuant to Section 6 of the SMP.

14.0 COMMUNITY AIR MONITORING PLAN

The Community Air Monitoring Plan (CAMP) requires real-time monitoring for VOCs and particulates (i.e., dust) at the Site property boundary downwind of each designated work area when intrusive and certain non-intrusive activities are in progress at contaminated sites. All monitoring will be conducted in accordance with the CAMP submitted to the NYSDEC as part of the December 2011 Remedial Design Report. A copy of this plan will be kept on-Site during construction activities.

Exceedances of action levels listed in the CAMP will be reported to the NYSDEC Project Manager.

15.0 ODOR CONTROL PLAN

This odor control plan is capable of controlling emissions of nuisance odors off-Site. Specific odor control methods to be used on a routine basis will include screening excavated soils with a PID and storage of soils with PID readings in excess of 100 ppm beneath tarps or possibly within an enclosed structure. If nuisance odors are identified at the Site boundary, or if odor complaints are received, work will be halted and the source of odors will be identified and corrected. Work will not resume until all nuisance odors have been appropriately abated to the extent necessary. NYSDEC and NYSDOH will be notified of all odor events and of any other complaints about the project. Implementation of all odor controls, including the halt of work, is the responsibility of the property owner's engineer, and any measures that are implemented will be discussed in the Periodic Review Report.

All necessary means will be employed to prevent on- and off-Site nuisances. At a minimum, these measures will include:

i) Limiting the area of open excavations and size of soil stockpiles

ii) Shrouding open excavations with tarps and other covers

iii) Using foams to cover exposed odorous soil

If odors develop and cannot be otherwise controlled, additional means to eliminate odor nuisances will include:

iv) Direct load-out of soil to trucks for off-Site disposal

v) Use of chemical odorants in spray or misting systems

vi) Use of staff to monitor odors in surrounding neighborhoods

If nuisance odors develop during intrusive work that cannot be corrected, or where the control of nuisance odors cannot otherwise be achieved due to on-Site conditions or close proximity to sensitive receptors, odor control will be achieved by sheltering the excavation and handling areas in a temporary containment structure equipped with appropriate air venting/filtering systems, or other appropriate methods developed in conjunction with the NYSDEC.

16.0 DUST CONTROL PLAN

A dust suppression plan that addresses dust management during invasive on-Site work will include, at a minimum, the items listed below:

- Dust suppression will be achieved though the use of a dedicated on-Site water truck or system for road wetting. The truck (or system) will be equipped with a water cannon capable of spraying water directly onto off-road areas including excavations and stockpiles.
- If necessary, gravel will be used on roadways to provide a clean and dust-free road surface.
- On-Site roads will be limited in total area to minimize the area required for water sprinkling.

17.0 OTHER NUISANCES

A plan for rodent control will be developed and utilized by the contractor prior to and during all remedial work, in case it is necessary.

A plan will be developed and utilized by the contractor for all remedial work to ensure compliance with local noise control ordinances.

TABLE B-1
IMPORTED SOIL QUALITY STANDARDS
FRONTIER CHEMICAL SITE
NIAGARA FALLS, NEW YORK

Contaminant	***CAS Number***	***Criteria (mg/kg)***
Volatiles		
1,1,1-Trichloroethane	71-55-6	0.68
1,1-Dichloroethane	75-34-3	0.27
1,1-Dichloroethene	75-35-4	0.33
1,2-Dichlorobenzene	95-50-1	1.1
1,2-Dichloroethane	107-06-2	0.02
cis-1,2-Dichloroethene	156-59-2	0.25
trans-1,2-Dichloroethene	156-60-5	0.19
1,3-Dichlorobenzene	541-73-1	2.4
1,4-Dichlorobenzene	106-46-7	1.8
1,4-Dioxane	123-91-1	0.1
Acetone	67-64-1	0.05
Benzene	71-43-2	0.06
Butylbenzene	104-51-8	12
Carbon tetrachloride	56-23-5	0.76
Chlorobenzene	108-90-7	1.1
Chloroform	67-66-3	0.37
Ethylbenzene	100-41-4	1
Hexachlorobenzene	118-74-1	3.2
Methyl ethyl ketone	78-93-3	0.12
Methyl tert-butyl ether	1634-04-4	0.93
Methylene chloride	75-09-2	0.05
n-Propylbenzene	103-65-1	3.9
sec-Butylbenzene	135-98-8	11
tert-Butylbenzene	98-06-6	5.9
Tetrachloroethene	127-18-4	1.3
Toluene	108-88-3	0.7
Trichloroethene	79-01-6	0.47
1,2,4-Trimethylbenzene	95-63-6	3.6
1,3,5- Trimethylbenzene	108-67-8	8.4
Vinyl chloride	75-01-4	0.02
Xylene (mixed)	1330-20-7	1.6
Semivolatiles		
Acenaphthene	83-32-9	98
Acenapthylene	208-96-8	107
Anthracene	120-12-7	500
Benz(a)anthracene	56-55-3	1
Benzo(a)pyrene	50-32-8	1
Benzo(b)fluoranthene	205-99-2	1.7
Benzo(g,h,i)perylene	191-24-2	500

TABLE B-1
IMPORTED SOIL QUALITY STANDARDS
FRONTIER CHEMICAL SITE
NIAGARA FALLS, NEW YORK

Contaminant	***CAS Number***	***Criteria (mg/kg)***
Benzo(k)fluoranthene	207-08-9	1.7
Chrysene	218-01-9	1
Dibenz(a,h)anthracene	53-70-3	0.56
Fluoranthene	206-44-0	500
Fluorene	86-73-7	386
Indeno(1,2,3-cd)pyrene	193-39-5	5.6
m-Cresol	108-39-4	0.33
Naphthalene	91-20-3	12
o-Cresol	95-48-7	0.33
p-Cresol	106-44-5	0.33
Pentachlorophenol	87-86-5	0.8
Phenanthrene	85-01-8	500
Phenol	108-95-2	0.33
Pyrene	129-00-0	500
PCBs/Pesticides		
2,4,5-TP Acid (Silvex)	93-72-1	3.8
4,4'-DDE	72-55-9	17
4,4'-DDT	50-29-3	47
4,4'-DDD	72-54-8	14
Aldrin	309-00-2	0.19
alpha-BHC	319-84-6	0.02
beta-BHC	319-85-7	0.09
Chlordane (alpha)	5103-71-9	2.9
delta-BHC	319-86-8	0.25
Dibenzofuran	132-64-9	210
Dieldrin	60-57-1	0.1
Endosulfan I	959-98-8	102
Endosulfan II	33213-65-9	102
Endosulfan sulfate	1031-07-8	200
Endrin	72-20-8	0.06
Heptachlor	76-44-8	0.38
Lindane	58-89-9	0.1
Polychlorinated biphenyls	1336-36-3	1
Metals		
Arsenic	7440-38-2	16
Barium	7440-39-3	400
Beryllium	7440-41-7	47
Cadmium	7440-43-9	7.5
Chromium, hexavalent	18540-29-9	19

TABLE B-1
IMPORTED SOIL QUALITY STANDARDS
FRONTIER CHEMICAL SITE
NIAGARA FALLS, NEW YORK

Contaminant	*CAS Number*	*Criteria (mg/kg)*
Chromium, trivalent	16065-83-1	1,500
Copper	7440-50-8	270
Total Cyanide		27
Lead	7439-92-1	450
Manganese	7439-96-5	2,000
Total Mercury		0.73
Nickel	7440-02-0	130
Selenium	7782-49-2	4
Silver	7440-22-4	8.3
Zinc	7440-66-6	2,480

ATTACHMENT C

GROUNDWATER MONITORING WELL CONSTRUCTION LOGS

CONESTOGA-ROVERS & ASSOCIATES

PROJECT No.: 47392

PROJECT NAME: Frontier Chemical Site

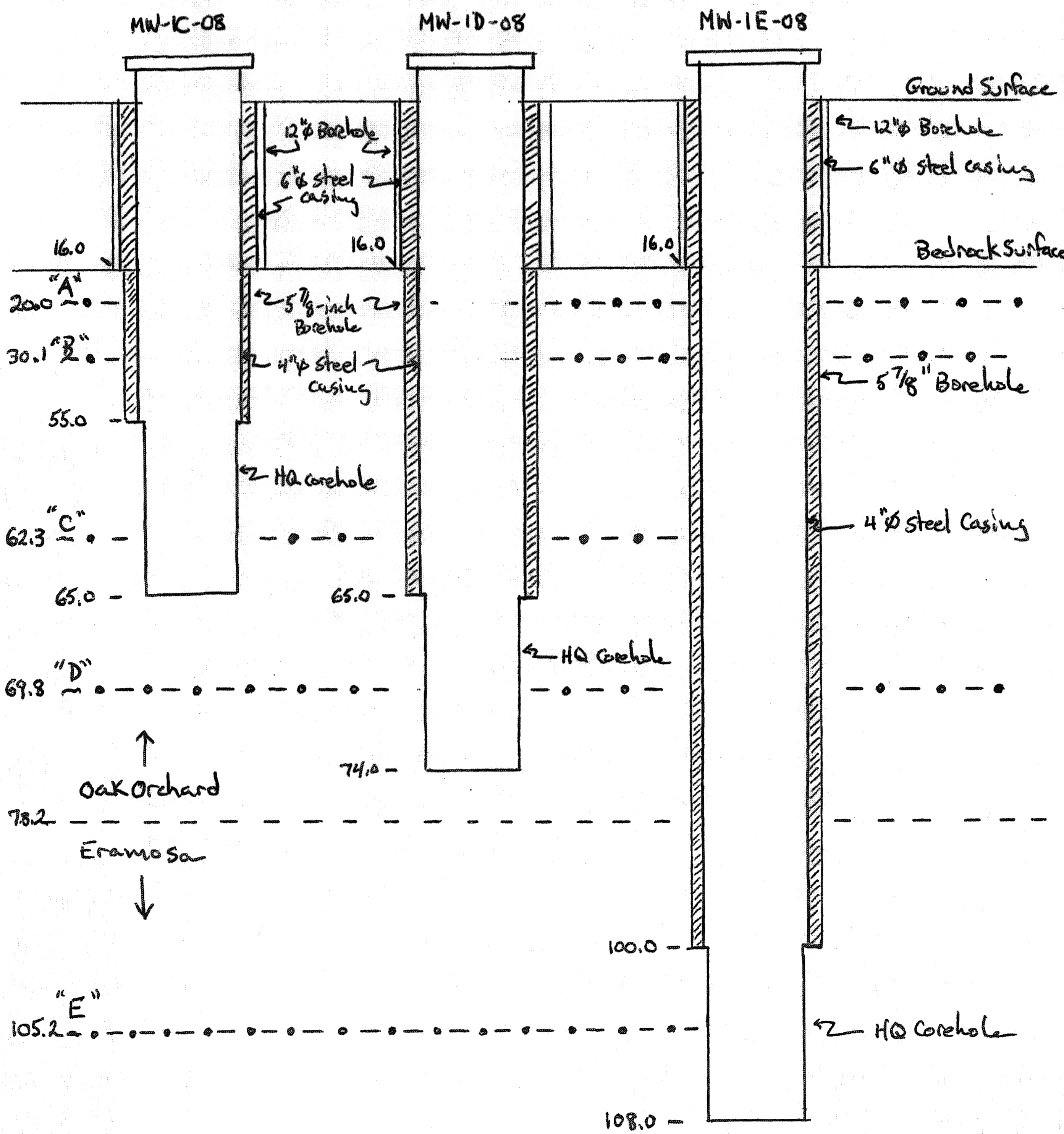
DESIGNED BY: J. Williams

DATE:

CHECKED BY:

PAGE ____ OF ____

Monitoring Well MW-1 Well Cluster Construction Details



CONESTOGA-ROVERS & ASSOCIATES

PROJECT No.: 47392

PROJECT NAME: Frontier Chemical Site

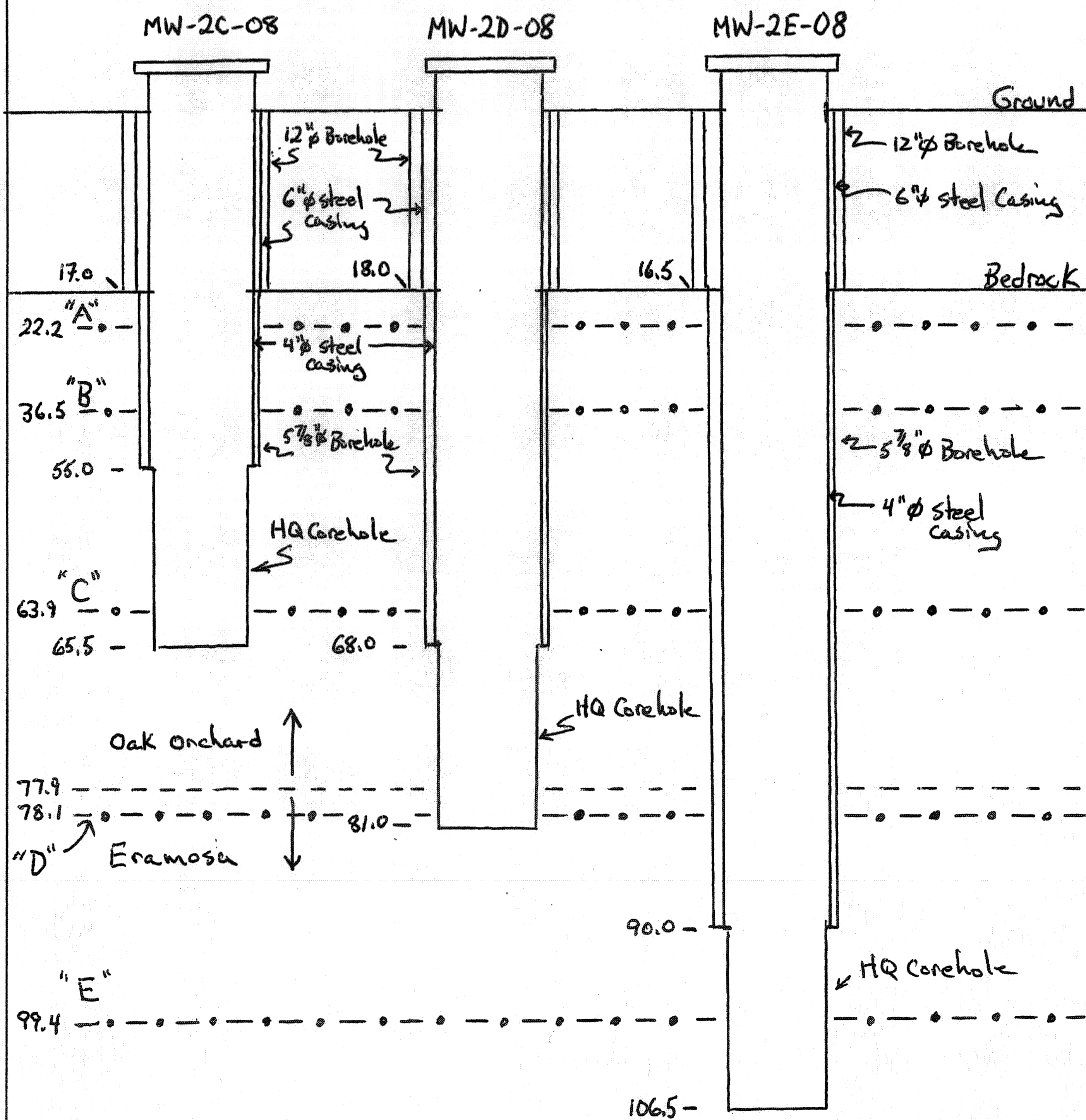
DESIGNED BY: J. Williams

DATE:

CHECKED BY:

PAGE ____ OF ____

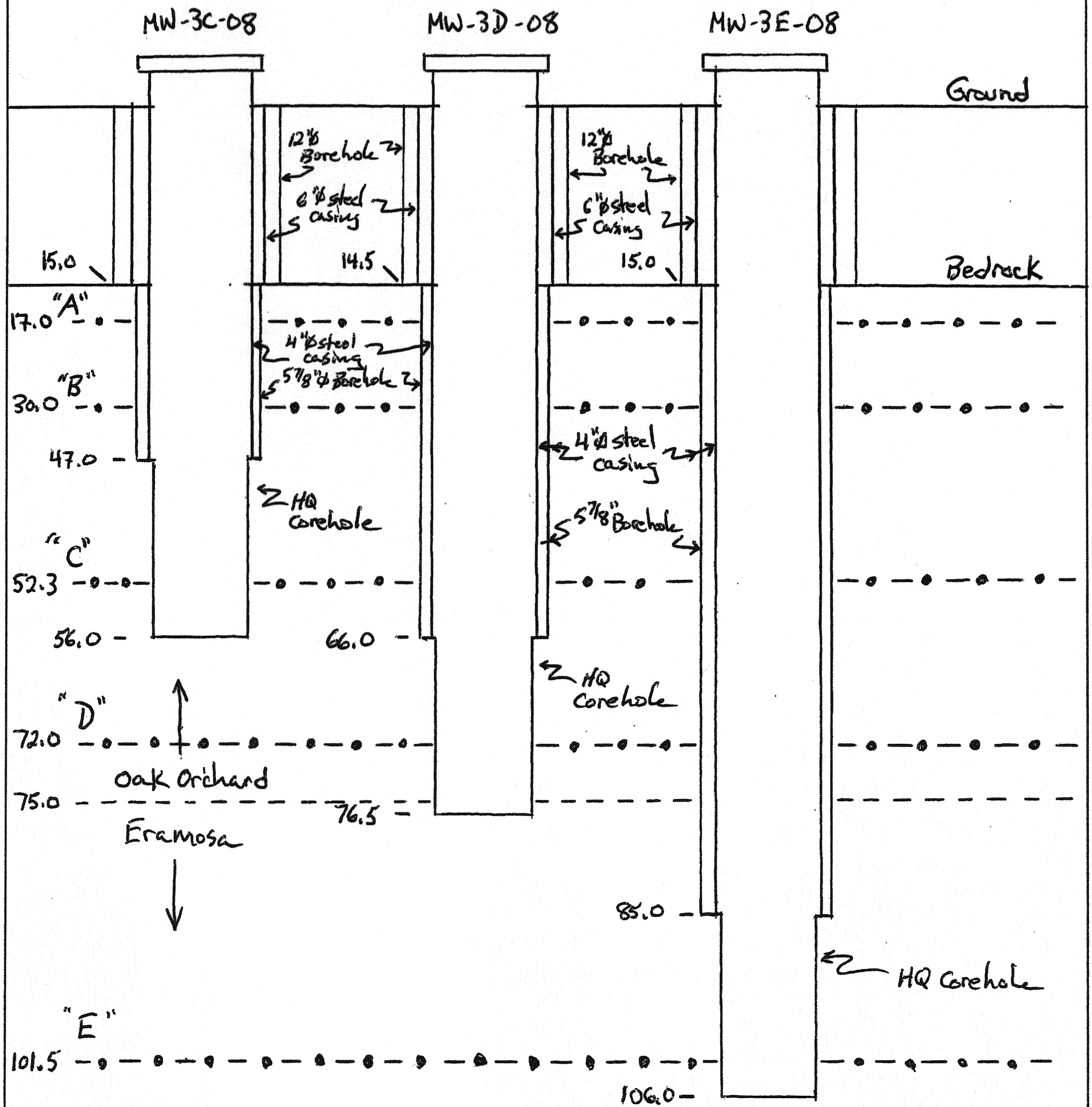
Monitoring Well MW-2 Well Cluster Construction Details



CONESTOGA-ROVERS & ASSOCIATES

CONESTOGA-ROVERS & ASSOCIATES	PROJECT No.: 47392	DATE:
	PROJECT NAME: Frontier Chemical Site	CHECKED BY:
	DESIGNED BY: J. Williams	PAGE ____ OF ____

Monitoring Well MW-3 Well Cluster Construction Details



ATTACHMENT D

LOW-FLOW GROUNDWATER SAMPLING FORM

MONITORING WELL RECORD FOR LOW-FLOW PURGING

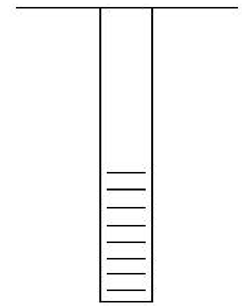
Project Data:

Project Name: ____________________ Date: ____________________

Ref. No.: ____________________ Personnel: ____________________

____

Monitoring Well Data:



Well No.: ____________________

Vapour PID (ppm): ____________________ Saturated Screen Length (m/ft): ____________________

Measurement Point: ____________________ Depth to Pump Intake (m/ft)[1]: ____________________

Constructed Well Depth (m/ft): ____________________ Well Diameter, D (cm/in): ____________________

Measured Well Depth (m/ft): ____________________ Well Screen Volume, V_S (L)[2]: ____________________

Depth of Sediment (m/ft): ____________________ Initial Depth to Water (m/ft): ____________________

Time	*Pumping Rate (mL/min)*	*Depth to Water (m/ft)*	*Drawdown from Initial Water Level[3] (m/ft)*	*Temperature °C*	*Conductivity (mS/cm)*	*Turbidity NTU*	*DO (mg/L)*	*pH*	*ORP (mV)*	*Volume Purged, Vp (L)*	*No. of Well Screen Volumes Purged[4]*
			Precision Required:	*±3 %*	*±3 %*	*±10 %*	*±10 %*	*±0.1 Units*	*±10 mV*		

Notes:

(1) The pump intake will be placed at the well screen mid-point or at a minimum of 0.6 m (2 ft) above any sediment accumulated at the well bottom.

(2) The well screen volume will be based on a 1.52 metres (5-foot) screen length (L). For metric units, $V_s=\pi*(r^2)*L$ in mL, where r (r=D/2) and L are in cm. For Imperial units, $V_s=\pi*(r^2)*L*(2.54)^3$, where r and L are in inches

(3) The drawdown from the initial water level should not exceed 0.1 m (0.3 ft). The pumping rate should not exceed 600 mL/min.

(4) Purging will continue until stabilization is achieved or until 20 well screen volumes have been purged (unless purge water remains visually turbid and appears to be clearing, or unless stabilization parameters are varying slightly outside of the stabilization criteria and appear to be stabilizing), No. of Well Screen Volumes Purged= Vp/Vs.

ATTACHMENT E

SITE INSPECTION FORM

SITE INSPECTION FORM
FRONTIER CHEMICAL SITE
NIAGARA FALLS, NEW YORK
NYSDEC SITE NO. 932110

INSPECTION DATE: ____________________

INSPECTED BY: ____________________

Overall Site

Has the Site use changed since the last inspection? ***Yes*** ________ ***No*** ________

If yes, please describe the changes: ____

____

Have neighboring property uses changed? ***Yes*** ________ ***No*** ________

If yes, please describe the changes: ____

____

Asphalt/Concrete Cover System

Potential Problems	***Concern***	***Corrective Action***
Potholes and cracks	• Deterioration of asphalt pavement or concrete • Safety hazard	• Use cold mix or hot mix asphalt and liquid bituminous material to patch, repair, or replace asphalt • For concrete, select repair method based on type and extent of damage
Ponding water	• Safety hazard	• No action required if ponding is minor • If ponding is significant, install drainage holes in asphalt/concrete pavement
Obstructions/Debris	• Safety hazard	• Remove obstructions as soon as possible

Inspect For	*Inspection Item Identified (circle one)*		*Action Required (circle one)*		*Comments*
Deterioration	Yes	No	Yes	No	
Obstruction/Debris	Yes	No	Yes	No	
Potholes	Yes	No	Yes	No	
Drainage/Puddles	Yes	No	Yes	No	
Other	Yes	No	Yes	No	

SITE INSPECTION FORM
FRONTIER CHEMICAL SITE
NIAGARA FALLS, NEW YORK
NYSDEC SITE NO. 932110

INSPECTION DATE: ______________________

INSPECTED BY: ______________________

Soil Cover System

Potential Problems	*Concern*	*Corrective Action*
Erosion	• Deterioration of integrity of crushed concrete cover • Washed out cover	• Backfill with additional imported crushed stone as needed • If persistent erosion occurs, erosion control mats may be required in selected areas
Animal burrows	• Potential for crushed concret erosion • Safety hazard	• Contract exterminator regarding trapping and relocation of persistent rodents • Fill all holes with crushed stone
Damage to fence	• Potential access to Site by unauthorized persons	• No action if damage is minor and does not allow access by unauthorized persons • Repair fence if appropriate

Inspect For	***Inspection Item Identified (circle one)***		***Action Required (circle one)***		***Comments***
Erosion	Yes	No	Yes	No	
Animal Burrows	Yes	No	Yes	No	
Damage to fence	Yes	No	Yes	No	
Other	Yes	No	Yes	No	

SITE INSPECTION FORM
FRONTIER CHEMICAL SITE
NIAGARA FALLS, NEW YORK
NYSDEC SITE NO. 932110

INSPECTION DATE: ____________________

INSPECTED BY: ____________________

Monitoring Wells

Potential Problems	***Concern***	***Corrective Action***
Missing locks	• Potential access by unauthorized persons	• Replace lock
Missing J-plugs	• Potential well contamination from surface water or rain water	• Replace J-plug
Concrete surface seal	• Damaged seal can allow water infiltration around casing and contamination of groundwater	• Contract drilling subcontractor to have surface seal replaced
Damaged flush-mount or stickup casing	• Damaged casing can result in damage to riser	• Contract drilling subcontractor to have casing replaced

Monitoring Well	*Well Condition (circle one)*			*Comments*
MW3C-08	Good	Fair	Needs Repair	
BH87-3A	Good	Fair	Needs Repair	
BH87-3B	Good	Fair	Needs Repair	
MW01-9A	Good	Fair	Needs Repair	
MW-9	Good	Fair	Needs Repair	
MW2C-08	Good	Fair	Needs Repair	
MW-11	Good	Fair	Needs Repair	
MW88-6A	Good	Fair	Needs Repair	
MW88-6B	Good	Fair	Needs Repair	
MW88-13A	Good	Fair	Needs Repair	
BH87-28	Good	Fair	Needs Repair	
MW-12	Good	Fair	Needs Repair	
MW1C-08	Good	Fair	Needs Repair	
MW-13	Good	Fair	Needs Repair	

ATTACHMENT F

SITE-SPECIFIC QUALITY ASSURANCE PROJECT PLAN (QAPP)

TABLE OF CONTENTS

<u>LIST OF TABLES</u>
(Following Text)

1.0 INTRODUCTION

This Quality Assurance Project Plan (QAPP) has been prepared by CRA Infrastructure & Engineering Inc. (CRA) on behalf of the Frontier Chemical Site Potentially Responsible Parties (Frontier Group). This QAPP presents the policies, organization, objectives, functional activities, and quality assurance/quality control (QA/QC) activities designed to achieve the specific data quality goals associated with the post-remedial construction site management for the Frontier Chemical Site located in Niagara Falls, New York (Site). It has been prepared in accordance with the following documents:

i) United States Environmental Protection Agency (USEPA) "Preparation Aids for the Development of Category III Quality Assurance Plans", USEPA/600/8-91-005, February 1991

ii) "EPA Requirements for Quality Assurance Project Plans", USEPA QA/R-5, March 2001

The protocols for sample collection through reporting have been selected to meet the program objectives outlined in Section 2.0. The Data Quality Objectives (DQOs) are to obtain data of acceptable quality for use in meeting the overall project objectives. The quality of the data will be determined based on the results of various QC measurements described in these protocols. Data will be usable if the QC requirements outlined herein are met.

Any deviations to the QAPP protocols must be approved by the Project QA Officer and Project Manager.

The objective of this QAPP is to provide sufficiently thorough and concise descriptions of the measures to be applied during this program such that the data generated will be of a known and acceptable level of precision and accuracy. The QAPP has been prepared to identify procedures for sample preparation and handling, sample Chain of Custody, laboratory analysis, and data reporting to be implemented during this investigation to ensure the accuracy and integrity of the data generated.

2.0 PROJECT DESCRIPTION

2.1 GENERAL

As detailed in the Site Management Plan (SMP), the activities at the Site will involve the collection and chemical analysis of groundwater samples from the Site.

Sample collection activities will be performed in accordance with the SMP. Details of the sampling program are presented in the SMP.

2.2 SITE BACKGROUND

2.2.1 HISTORY

The Site background information pertinent to the sampling program is presented in the SMP.

2.2.2 SITE LOCATION AND CONDITION

Pertinent details regarding the Site location and conditions are specified in the SMP.

3.0 PROJECT MANAGEMENT

The site management activities may be conducted by CRA or other parties. The project management structure for QA/QC activities associated with the SMP sampling program is described below, along with a brief description of the duties of the key personnel.

Consultant Project Manager – (CRA-Jim Kay)

- Provides day-to-day project management
- Provides managerial guidance to the project technical group
- Provides technical representation at meetings as appropriate
- Acts as liaison between the technical group and the client
- Acts as liaison with the agencies involved
- Prepares and reviews reports
- Conducts preliminary chemical data interpretation

Consultant Quality Assurance/Quality Control Officer - Analytical Activities – (CRA-Sheri Finn)

- Overviews and reviews laboratory activities
- Determines laboratory data corrective action
- Performs analytical data validation and assessment
- Reviews laboratory QA/QC
- Assists in preparation and review of final report
- Provides technical representation for analytical activities

Quality Assurance/Quality Control Officer - Field Activities

- Provides immediate supervision of all on-Site activities
- Provides field management of sample collection and field QA/QC
- Assists in preparation and review of final report
- Provides technical representation for field activities
- Is responsible for maintenance of the field equipment

Laboratory Project Manager

- Ensures resources of laboratory are available on an as-required basis
- Coordinates laboratory analyses

- Supervises laboratory's in-house Chain of Custody
- Schedules analyses of samples
- Oversees review of data
- Oversees preparation of analytical reports

Laboratory Quality Assurance/Quality Control Officer

- Overviews laboratory QA/QC
- Overviews QA/QC documentation
- Conducts detailed data review
- Decides laboratory corrective actions, if required
- Provides laboratory representation for laboratory QA/QC procedures
- Approves final analytical reports prior to submission to the client

Laboratory Sample Custodian - Analytical Contractor

- Receives and inspects the sample containers
- Records the condition of the sample containers
- Signs appropriate documents
- Verifies Chain of Custody and their correctness
- Notifies laboratory project manager and laboratory QA Officer of sample receipt and inspection
- Assigns a unique laboratory identification number correlated to the field sample identification number, and enters each into the sample receiving log
- Initiates transfer of the samples to the appropriate lab sections with assistance from the laboratory project manager
- Controls and monitors access to and storage of samples and extracts

Primary responsibility for data quality rests with the QA Officers. Ultimate responsibility for project quality rests with the Consultant Project Manager. Independent QA will be provided by the laboratory's Project Manager and QA Officer prior to release of the data.

All chemical analyses will be conducted by an analytical laboratory certified in the State of New York.

4.0 QUALITY ASSURANCE OBJECTIVES FOR MEASUREMENT DATA

The overall QA objective for the SMP sampling program is to develop and implement procedures for sample collection and analyses which will provide data with an acceptable level of accuracy and precision.

The purpose of this section is to define the QA goals required to meet the DQOs of the project. QA goals for accuracy, precision, and sensitivity of analyses; and completeness, representativeness, and comparability of measurement data are established in the following sections.

The sampling and analysis program is summarized in Table 4.1A and Table 4.1B.

4.1 ACCURACY, PRECISION, AND SENSITIVITY OF ANALYSES

The fundamental QA objective with respect to the accuracy, precision, and sensitivity of analytical data is to meet the QC acceptance criteria of each analytical protocol. Analytical methods and targeted detection limits have been specified to meet the analytical objectives of the SMP sampling program.

Analytical methods are listed in Table 4.1A and Table 4.1B and targeted quantitation limits are listed in Table 4.2A and Table 4.2B.

The method accuracy (percent recovery) will be determined by spiking selected samples (matrix spikes) with representative spiking compounds as specified in the analytical methods. Accuracy will be reported as the percent recovery of the spiking compound(s) and will be compared to the criteria specified in the appropriate methods as identified in Section 8.0. The analytical methods used specify acceptance criteria.

The method(s) precision (reproducibility between duplicate analyses) will be determined based on the analysis of field duplicate samples and duplicate sample analyses. Precision will be reported as relative percent differences (RPDs) between duplicate analyses; acceptance criteria will be as specified in the appropriate analytical methods identified in Section 8.0.

4.2 COMPLETENESS, REPRESENTATIVENESS, AND COMPARABILITY

A completeness requirement of 90 percent will be targeted for the SMP (see Section 13.1.3 for a definition of completeness).

The quantity of samples to be collected has been determined in an effort to effectively represent the population being studied.

Analytical methods selected for this study are consistent with those used for previous studies (if applicable) to assure comparability of the data. All standards used by the laboratory will be traceable to reliable sources and will be checked with an independent standard.

5.0 SAMPLING PROCEDURES

All monitoring and sampling activities will be performed in accordance with the protocols specified in the SMP.

Sampling equipment will be decontaminated as follows:

1. Non-phosphate detergent rinse
2. Tap water rinse
3. Distilled water rinse
4. Isopropanol rinse
5. Air dry
6. Distilled water rinse

Required sample preservation methods and maximum holding times, are summarized in Table 5.1. A submersible or centrifugal pump will be used to collect the groundwater samples as described in the SMP. The samples will be collected in dedicated containers supplied by the laboratory and sent to the laboratory for analysis.

6.0 SAMPLE CUSTODY AND DOCUMENT CONTROL

The following documentation procedures will be used during sampling and analysis to provide Chain of Custody control during transfer of samples from collection through storage. Recordkeeping documentation will include use of the following:

i) Field log books (bound with numbered pages) to document sampling activities in the field
ii) Labels to identify individual samples
iii) Chain of Custody record sheets to document sample IDs and analyses to be performed
iv) Laboratory sample custody log books
v) Evidentiary files

6.1 FIELD LOG BOOK

Log books will be used in the field to record information. The field log book will be bound and the information will be entered in indelible ink. Each field log book page will be signed by the sampler. Field measurements and observations will assist in the interpretation of analytical results obtained and it is important that these measurements and observations be as complete as possible.

For each sample collected, the following shall be recorded in indelible ink in the field log book if applicable:

i) Site location identification
ii) Unique sample identification number
iii) Date and time (in 2400 hour time format) of sample collection
iv) Weather conditions
v) Designation as to the type of sample (soil, etc.)
vi) Designation as to the means of collection
vii) Brief description of the sample
viii) Name of sampler
ix) Analyses to be performed on sample
x) Departure from established QA/QC field procedures

xi) Any other relevant comments such as odor, staining, texture, size of area sampled, etc.

6.2 SAMPLE LABELS

Sample labels are necessary to identify and prevent misidentification of the samples. The labels shall be affixed to the sample container (not the caps) prior to the time of sampling. The labels shall be filled out in waterproof ink at the time of collection. The labels will include the following information:

i) Sample number/identification code

ii) Name of collector

iii) Date and time of collection

iv) Client and geographic location

v) Project number

vi) Required analysis

A unique sample numbering system will be used to identify each collected sample. This system will provide a tracking number to allow retrieval and cross-referencing of sample information. The sample numbering system to be used is described as follows:

Example:	W-047392 - AA-XXX
where:	W- Designates sample type (W- Water)
071207	date of collection (mm,dd,yy)
AA	sampler initials
xxx	unique sample number

QC samples will also be numbered with a unique sample number. Samples to be used for matrix spike/matrix spike duplicate (MS/MSD) analyses will be noted as such on the Chain of Custody. Field duplicate samples are to be "blind" to the laboratory and will be identified with sample IDs similar to the investigative samples.

6.3 CHAIN OF CUSTODY RECORDS

Chain of Custody forms will be completed for all samples collected during the program. Chain of Custody forms will be completed to document the transfer of sample containers.

The Chain of Custody record, completed at the time of sampling, will contain, but not be limited to, the sample number, date and time of sampling, and the name of the sampler. The Chain of Custody document will be signed, timed, and dated by the sampler when transferring the samples.

The Chain of Custody form will consist of four copies which will be distributed to the shipper, the receiving laboratory, and two copies to the Consultant. The shipper will keep one copy while the other three copies will be enclosed in a waterproof envelope within the cooler with the samples. The laboratory, upon receiving the samples, will complete the three remaining copies. The laboratory will maintain one copy for their records; one copy will be returned to the Consultant upon receipt of the samples by the laboratory; one copy will be submitted to the client with the data deliverables package.

6.4 SAMPLE SHIPMENT

Sample bottles will be sealed with custody tape, wrapped with bubble wrap, and packed carefully in coolers with adequate bubble wrap to prevent sample breakage. The samples will be refrigerated using wet ice immediately after collection and will be maintained at 4°C (±2°C) during transport and storage. Custody seals will be placed around each cooler and the coolers will be sealed with packing tape for shipment to the analytical laboratory within 24 hours of collection by either commercial courier or Consultant personnel.

6.5 LABORATORY SAMPLE CUSTODY LOG BOOKS

Upon receipt at the laboratory, the shipping cooler and the custody seal will be inspected by the designated sample custodian. The condition of the cooler and the custody seal will be noted on the Chain of Custody record sheet by the sample custodian.

The sample custodian will record the temperature of one sample (or temperature blank) from each cooler and the temperature will be noted on the Chain of Custody. If the shipping cooler seal is intact, the sample containers will be accepted for analyses. The sample custodian will document the date and time of receipt of the container, and sign the form.

If damage or discrepancies are noticed (including sample temperature exceedances), they will be recorded in the remarks column of the record sheet, dated and signed. Any damage or discrepancies will be reported to the lab supervisor who will inform the Lab Manager and the project QA Officer before samples are processed.

6.6 EVIDENTIARY FILES

The laboratory will be responsible for maintaining analytical log books and laboratory data as well as a sample (on hand) inventory for submittal to the Consultant on an "as required" basis. Raw laboratory data produced from the analysis of samples submitted for this program will be inventoried and maintained by the laboratory for a period of 5 years at which time the Consultant will advise the laboratory regarding the need for additional storage.

Evidentiary files for the entire project shall be inventoried and maintained by the Consultant and shall consist of the following:

i) Project related plans
ii) Project log books
iii) Field data records
iv) Sample identification documents
v) Chain of Custody records
vi) Report notes, calculations, etc.
vii) Lab data, etc.
viii) References, copies of pertinent literature;
ix) Miscellaneous - photos, maps, drawings, etc.
x) Copies of all final reports pertaining to the project

The evidentiary file materials shall be the responsibility of the project manager with respect to maintenance and document removal.

7.0 CALIBRATION PROCEDURES AND FREQUENCY

All method-specified calibration procedures will be performed and acceptance criteria will be met prior to sample analyses. Instrument calibrations will be documented on either standardized forms or in bound logbooks.

The standard curve will be used with each subsequent sample analysis provided the standard curve is verified by using at least one standard at a level normally encountered or expected in such samples at the frequency described in the method. If the results of the verification are not acceptable, a new curve will be prepared and analyzed.

All data used in drawing or describing the curve will be so indicated on the curve or its description. A record will be made of the verification.

8.0 ANALYTICAL PROCEDURES

8.1 ANALYTICAL METHODS

All investigative samples will be analyzed for the parameters listed in Table 4.2A and Table 4.2B using the methods cited in Table 4.1A and Table 4.1B. These methods have been selected to meet the DQOs for the sampling activity.

8.2 QUANTITATION

The procedures for quantitation of analytes are discussed in the appropriate analytical methods.

8.3 QUANTITATION LIMIT REQUIREMENTS

The analytical laboratory will target the quantitation limits specified in Table 4.2A and Table 4.2B. When matrix interferences are noted during sample analysis, actions will be taken by the laboratory to achieve the specified detection limits. Samples will not be diluted by more than a factor of five to reduce matrix effects. Samples may be diluted to a greater extent if the concentrations of analytes of concern exceed the calibration range of the instrument. In such cases, the laboratory QA Officer will assure that the laboratory demonstrates good analytical practices and that such practices are documented in order to achieve the specified detection limits.

9.0 DATA REDUCTION, VALIDATION, ASSESSMENT, AND REPORTING

9.1 GENERAL

The contract laboratory will perform analytical data reduction and validation in-house under the direction of the laboratory QA Officer. The laboratory QA Officer will be responsible for assessing data quality and advising of any data which were rated "preliminary" or "unacceptable" or other qualifications based on the QC criteria outlined in the analytical methods, which would caution the data user of possible unreliability. Data reduction, validation, and reporting by the laboratory will be conducted as detailed in the following:

i) Raw data produced and checked by the responsible analysts is turned over for independent review by another analyst

ii) The area supervisor reviews the data for attainment of quality control criteria presented in the referenced analytical methods

iii) Upon completion of all reviews and acceptance of the raw data by the laboratory operations manager, a computerized report will be generated and sent to the laboratory quality assurance officer

iv) The laboratory QA Officer will complete a thorough inspection of all reports

v) The laboratory QA Officer and area supervisor will decide whether any sample reanalysis is required

vi) Upon acceptance of the preliminary reports by the project QA Officer, final reports will be generated and signed by the laboratory manager

Validation of the analytical data (if required) will be performed by the Project QA Officer, for analytical activities. The data validation will be performed in accordance with the "USEPA National Functional Guidelines for Organic Data Review", USEPA 540/R-99/008, October 1999 and "USEPA National Functional Guidelines for Inorganic Data Review", USEPA February 1994, USEPA 540/R-94/013.

Assessment of analytical and in-house data will include checks on data consistency by looking for comparability of duplicate analyses, comparability to previous data from the same sampling location (if available), adherence to accuracy and precision control criteria detailed in this QAPP and anomalously high or low parameter values. The results of these data validations will be reported to the project manager and the contract laboratory, noting any discrepancies and their effect upon acceptability of the data.

Data from field measurements and sample collection activities that are used in project reports will be appropriately identified and appended to the report. Where data have been reduced or summarized, the method of reduction will be documented in the report.

9.2 LABORATORY REPORTING

Data deliverables for this program will include Level II packages, including all items listed in Table 9.1.

All sample data and corresponding QA/QC data as specified in the analytical methods shall be maintained accessible to the Consultant as an electronic file.

10.0 INTERNAL QUALITY CONTROL CHECKS AND FREQUENCY

10.1 QC FOR FIELD MEASUREMENTS

Initial and continuing calibration of any field instruments used for field measurements will be performed in accordance with instrument manufacturer guidelines. Additional QC procedures for any field measurements will be limited to checks in the reproducibility of field measurements by obtaining multiple readings.

10.2 QC FOR LABORATORY ANALYSES

Specific procedures related to internal laboratory QC samples are described in the following subsections.

10.2.1 REAGENT BLANKS

Reagent blanks will be analyzed by the laboratory at the frequency specified in the analytical methods. The reagent blank, an aliquot of analyte-free water or solvent, will be carried through the entire analytical procedure.

10.2.2 MATRIX SPIKE/MATRIX SPIKE DUPLICATE (MS/MSD) ANALYSES

An MS/MSD will be analyzed for inorganic parameters at the frequency specified in Table 4.1A. Acceptable criteria and analytes that will be used for matrix spikes are identified in the analytical methods. Percent spike recoveries will be used to evaluate analytical accuracy while the RPD between duplicate analyses will be used to assess analytical precision.

10.3 QC FOR SAMPLING PROTOCOL

To assess the quality of data resulting from the field sampling program, field QA/QC samples will be collected (where appropriate) and submitted to the analytical laboratory as samples.

10.3.1 FIELD DUPLICATE SAMPLES

Field duplicate samples will be collected at the frequency specified in Table 4.1A and Table 4.1B. These samples will be submitted "blind" to the laboratory for analysis and the results will be compared and RPD values will be assessed against a control limit of 100 percent.

10.3.2 RINSE BLANK SAMPLES

Rinse blanks will be used to assess decontamination procedures of non-dedicated collection equipment used for multiple samples. The rinse blanks will be prepared using analyte-free deionized water when non-dedicated equipment is used in the field. The deionized water used to make the blanks will be analyzed prior to use in the field. The rinse blanks will be analyzed by the laboratory as samples. Rinse blanks will be prepared at a frequency of one per equipment type, per decontamination event, not to exceed one rinsate blank per 20 samples.

10.4.2 TRIP BLANK SAMPLES

Trip blanks will be used to assess whether samples have been exposed to volatile constituents during sample storage and transport. The trip blanks will be analyzed at a frequency of one per cooler containing groundwater samples to be analyzed for volatile organic constituents. A trip blank will consist of a container filled with analyte-free water (supplied and prepared by the laboratory) which remains unopened with the field samples throughout the sampling event. Trip blanks will only be analyzed for volatile organic constituents.

11.0 PERFORMANCE AND SYSTEM AUDITS AND FREQUENCY

11.1 LABORATORY

For the purpose of external evaluation, performance evaluation check samples are analyzed periodically by the laboratory. Internally, the evaluation of data from these samples is done on a continuing basis over the duration of a given project.

The project QA Officer may carry out performance and/or systems audits to insure that data of known and defensible quality are consistently produced during this program.

Systems audits are qualitative evaluations of all components of laboratory quality control measurement systems. They determine if the measurement systems are being used appropriately. The audits may be carried out before all systems are operational, during the program, or after completion of the analytical report by the laboratory. Such audits typically involve a comparison of the activities given in the QA/QC Plan described herein, with activities actually scheduled or performed. A special type of systems audit is the data management audit. This audit addresses only data collection and management activities, and can be used to track data generation and manipulation through the lab.

The performance audit is a quantitative evaluation of the measurement systems used for a monitoring program. It requires testing the measurement systems with samples of known composition or behavior to quantitatively evaluate precision and accuracy. A performance audit may be carried out by or under the auspices of the project QA Officer without the knowledge of the analyst during each sampling event for this program.

It should be noted, however, that any additional external QA audits will only be performed if deemed necessary.

11.2 FIELD

Audits of field techniques will be conducted by the Field QA Officer. These audits will include review of the sample collection and Chain of Custody documents. Field inspections will also be performed to review sample collection and handling techniques, on-Site supplies of sampling equipment, and availability of relevant project documents.

12.0 PREVENTIVE MAINTENANCE

All analytical instruments to be used in this project will be serviced by laboratory personnel at regularly scheduled intervals in accordance with the manufacturers' recommendations. Instruments may also be serviced at other times due to failure. Requisite servicing beyond the abilities of laboratory personnel will be performed by the equipment manufacturer or their designated representative.

Daily checks of each instrument will be performed by the analyst who has been assigned responsibility for that instrument. Manufacturers' recommended procedures will be followed in every case.

Maintenance procedures and schedules and instrument logbooks will be documented in bound notebooks and made available to the project QA Officer upon request.

13.0 SPECIFIC ROUTINE PROCEDURES USED TO ASSESS DATA PRECISION, ACCURACY, AND COMPLETENESS

13.1 QA MEASUREMENT QUALITY INDICATORS

13.1.1 PRECISION

Precision will be assessed by comparing the analytical results between duplicate sample analyses. Precision as percent relative difference will be calculated as follows for values significantly greater than the associated detection limit:

Sample Duplicates

$$\text{Precision} = \left| \frac{\{D_2 - D_1\}}{\{D_1 + D_2/2\}} \right| \times 100$$

D_1 = original sample result

D_2 = duplicate sample result

For results near the associated detection limits, precision will be assessed based on the following criteria:

$$\text{Precision} = \left| \text{original result - duplicate result} \right| < \text{Quantitation Limit}$$

The criteria for precision will be in accordance with the methods cited in Table 4.1A and Table 4.1B.

13.1.2 ACCURACY

Accuracy will be assessed by comparing a set of analytical results to the accepted or "true" values that would be expected. In general, MS and check sample recoveries will be used to assess accuracy. Accuracy as percent recovery will be calculated as follows:

$$\text{Accuracy} = \frac{A-B}{C} \times 100$$

A = The analyte determined experimentally from the spike sample

B = The background level determined by a separate analysis of the unspiked sample

C = The amount of spike added

The criteria for accuracy will be in accordance with the methods cited in Table 4.1A and Table 4.1B.

13.1.3 COMPLETENESS

Completeness is a measure of the amount of valid data obtained from a measurement system compared with the amount that was expected to be obtained under normal conditions.

To be considered complete, the data set must contain all QC check analyses verifying precision and accuracy for the analytical protocol. In addition, all data are reviewed in terms of stated goals in order to determine if the database is sufficient.

When possible, the percent completeness for each set of samples will be calculated as follows:

$$\text{Completeness} = \frac{\text{valid data obtained}}{\text{total data planned}} \times 100 \text{ percent}$$

For this program, a completeness goal of 90 percent has been established.

13.1.4 OUTLIERS

Procedures discussed previously will be followed for documenting deviations. As specified in the analytical methods, appropriate actions will be taken by the laboratory to correct any QC outliers caused by problems with analytical techniques. All QC outliers will be addressed in the data validation, and the data validator will use professional judgment to determine whether the data are usable to meet the project objectives.

14.0 CORRECTIVE ACTION

The need for corrective action may be identified by system or performance audits or by standard QC procedures. The essential steps in the corrective action system will be:

i) Checking the predetermined limits for data acceptability beyond which corrective action is required

ii) Identifying and defining problems

iii) Assigning responsibility for investigating the problem

iv) Investigating and determining the cause of the problem

v) Determination of a corrective action to eliminate the problem (this may include reanalysis or resampling and analyses)

vi) Assigning and accepting responsibility for implementing the corrective action

vii) Implementing the corrective action and evaluating the effectiveness

viii) Verifying that the corrective action has eliminated the problem

ix) Documenting the corrective action taken

For each measurement system, the Laboratory QA Officer will be responsible for initiating the corrective action and the laboratory supervisor will be responsible for implementing the corrective action. For field activities, the project manager or project coordinator will be responsible for initiating and implementing corrective action.

15.0 QUALITY ASSURANCE REPORT TO MANAGEMENT

The Consultant QA Officer will receive reports on the performance of the measurement system and the data quality following each sampling round and at the conclusion of the project.

Minimally, these reports will include:

i) Assessment of measurement quality indicator (i.e., data accuracy, precision, and completeness)

ii) Results of system audits

iii) QA problems and recommended solutions

The project QA Officer will be responsible within the organizational structure for preparing these periodic reports. The final report for the project will also include a separate QA section which will summarize data quality information contained in the periodic QA/QC reports to management, and present an overall data assessment and validation in accordance with the data quality objectives outlined in this QAPP.

REFERENCES

- "Preparation Aids for the Development of Quality Assurance Project Plans", United States Environmental Protection Agency, Office of Research and Development, USEPA/600/8-91/005, February 1991.
- "EPA Requirements for Quality Assurance Project Plans", USEPA QA/R-5, March 2001.
- "USEPA National Functional Guidelines for Organic Data Review", USEPA 540/R-99/008, October 1999.
- "USEPA National Functional Guidelines for Inorganic Data Review", USEPA 540/R-94-103, February 1994.

TABLES

TABLE 4.1A

SUMMARY OF SAMPLING AND ANALYSIS PROGRAM
SEMI-ANNUAL ZONE A & B
SITE MANAGEMENT PLAN
FRONTIER CHEMICAL SITE
NIAGARA FALLS, NEW YORK

Sample Matrix	*Analytical Parameters*	*Analytical Methods*	*Field*	*Lab*	*Estimated Number of Samples*	*Field Duplicates*	*Trip Blanks*	*Field Blanks*	*MS/MSD/Dup*	*Total*
Groundwater	SSPL [1] VOCs (including MCT) [4]	EPA 624 [2]		X	11	1	1/day [3]	1/20 samples	1/1/0	16
	SSPL Metals	EPA 200.7		X	11	1	0	1/20 samples	1/1/0	15
	Total Phenol	EPA 420.4		X	11	1	0	1/20 samples	1/1/0	15
	Dissolved Oxygen	DO Meter	X		11	0	0	0	0/0/0	11
	Oxidation/Reduction (redox) Reaction Potential (Eh)	ORP meter	X		11	0	0	0	0/0/0	11
	pH	pH Meter	X		11	0	0	0	0/0/0	11
	Conductivity	Conductivity Meter	X		11	0	0	0	0/0/0	11

Notes:

(1) SSPL - Site Specific Parameter List.
(2) "Methods for Chemical Analysis of Water and Wastes", United States Environmental Protection Agency (USEPA) A-600/4-79-220, March 1983(with all subsequent revisions).
(3) Assume each sampling event will require 1 day.
(4) Monochlorotoluene (MCT)

TABLE 4.1B

SUMMARY OF SAMPLING AND ANALYSIS PROGRAM
ANNUAL ZONE C
SITE MANAGEMENT PLAN
FRONTIER CHEMICAL SITE
NIAGARA FALLS, NEW YORK

Sample Matrix	*Analytical Parameters*	*Analytical Methods*	*Field*	*Lab*	*Estimated Number of Samples*	*Field Duplicates*	*Trip Blanks*	*Field Blanks*	*MS/MSD/Dup*	*Total*
Groundwater	VOCs (including MCT) [3]	EPA 624 [1]		X	3	1	1/day [2]	1/20 samples	1/1/0	8
	Dissolved Oxygen	DO Meter	X		3	0	0	0	0/0/0	3
	Oxidation/Reduction (redox) Reaction Potential (Eh)	ORP meter	X		3	0	0	0	0/0/0	3
	pH	pH Meter	X		3	0	0	0	0/0/0	3
	Conductivity	Conductivity Meter	X		3	0	0	0	0/0/0	3

Notes:

(1) "Methods for Chemical Analysis of Water and Wastes", United States Environmental Protection Agency (USEPA) A-600/4-79-220, March 1983(with all subsequent revisions).
(2) Assume each sampling event will require 1 day.
(3) Monochlorotoluene (MCT)

TABLE 4.2A

TARGET COMPOUND AND TARGET ANALYTE PARAMETER LIST
SEMI-ANNUAL ZONE A & B
SITE MANAGEMENT PLAN
FRONTIER CHEMICAL SITE
NIAGARA FALLS, NEW YORK

Compound	*Targeted Quantitation Limits (TQL)* [1] *Water (µg/L)*
Site Specific Parameter List(SSPL) Volatile Organic Compounds (VOC)	
1,1-Dichloroethane	5
1,2-Dichlorobenzene	5
1,2,4-Triclorobenzene	5
1,3-Dichlorobenzene	5
1,4-Dichlorobenzene	5
Acetone	25
Benzene	5
Chlorobenzene	5
cis-1,2-Dichloroethene	5
Tetrachloroethene	5
Toluene	5
2-Chlorotoluene	5
3-Chlorotoluene	5
4-Chlorotoluene	5

Analyte	*Targeted Quantitation Limits (TQL)* [1] *Water (µg/L)*
Site Specific Parameter List(SSPL) Metals	
Arsenic	10
Iron	100
Potassium	5000
Sodium	5000

Analyte	*Targeted Quantitation Limits (TQL)* [1] *Water (µg/L)*
General Chemistry	
Total Phenol	10

Notes:
(1) Please note that these are estimated quantitation limits and are presented for guidance only. Actual quantitation limits are highly matrix dependent and may be elevated due to matrix effects, QA/QC problems and high concentrations of target and non-target analytes.
(2) Method Detection Limits (MDL) are also presented for guidance only. Laboratory MDLs are updated on a periodic basis and the MDLs in effect when the samples are analyzed will be used for reporting purposes.

TABLE 4.2B

TARGET COMPOUND PARAMETER LIST
ANNUAL ZONE C
SITE MANAGEMENT PLAN
FRONTIER CHEMICAL SITE
NIAGARA FALLS, NEW YORK

Compound	*Targeted Quantitation Limits (TQL)* [1] *Water (µg/L)*
Target Compounds List Volatiles	
Dichlorodifluoromethane	5
Chloromethane	5
Vinyl Chloride	2
Bromomethane	5
Chloroethane	5
Trichlorofluoromethane	5
1,1-Dichloroethene	5
1,1,2-Trichloro-1,2,2-trifluoroethane	5
Acetone	50
Carbon Disulfide	60
Methyl Acetate	5
Methylene Chloride	5
trans-1,2-Dichloroethene	5
Methyl tert-Butyl Ether	10
1,1-Dichloroethane	5
cis-1,2-Dichloroethene	5
2-Butanone	50
Chloroform	7
1,1,1-Trichloroethane	5
Cyclohexane	5
Carbon Tetrachloride	5
Benzene	1
1,2-Dichloroethane	0.6
Trichloroethene	5
Methylcyclohexane	5
1,2-Dichloropropane	5
Bromodichloromethane	50
cis-1,3-Dichloropropene	5
4-Methyl-2-pentanone	5
Toluene	5
trans-1,3-Dichloropropene	0.4
1,1,2-Trichloroethane	1

TABLE 4.2B

TARGET COMPOUND PARAMETER LIST
ANNUAL ZONE C
SITE MANAGEMENT PLAN
FRONTIER CHEMICAL SITE
NIAGARA FALLS, NEW YORK

Compound	*Targeted Quantitation Limits (TQL)* (1) *Water (µg/L)*
Target Compounds List Volatiles	
Tetrachloroethene	5
2-Hexanone	50
Dibromochloromethane	50
1,2-Dibromoethane	5
Chlorobenzene	5
Ethylbenzene	5
Xylenes (Total)	5
Styrene	5
Bromoform	50
Isopropylbenzene	5
1,1,2,2-Tetrachloroethane	5
1,3-Dichlorobenzene	3
1,4-Dichlorobenzene	3
1,2-Dichlorobenzene	3
1,2-Dibromo-3-chloropropane	0.04
1,2,4-Trichlorobenzene	5
2-Chlorotoluene	5
3-Chlorotoluene	5
4-Chlorotoluene	5

Notes:

(1) Please note that these are estimated quantitation limits and are presented for guidance only. Actual quantitation limits are highly matrix dependent and may be elevated due to matrix effects, QA/QC problems and high concentrations of target and non-target analytes.

TABLE 5.1

CONTAINER, PRESERVATION, SHIPPING AND PACKAGING REQUIREMENTS
SITE MANAGEMENT PLAN
FRONTIER CHEMICAL SITE
NIAGARA FALLS, NEW YORK

Analyses	*Sample Containers*	*Preservation*	*Maximum Holding Time From Sample Collection*	*Volume of Sample*	*Shipp*
Groundwater					
SSPL VOCs & TCL VOCs	Three 40 mL teflon-lined septum vials per analysis	HCl to pH < 2 Iced, 4 ± 2° C	14 days for analysis	Fill completely, no air bubbles	Overnight or I Overnight or I
SSPL Metals	One 500-ml polyethylene	HNO_3 to pH <2	180 days for analysis		Overnight or I
Total Phenol	1-liter amber glass jars	H_2SO_4 to pH <2, Cool to 4° ± 2°C	28 days for analysis		Overnight or I

Notes:
NA Not Applicable.
VOCs Volatile Organic Compounds.

TABLE 9.1

LABORATORY REPORTING DELIVERABLES
SITE MANAGEMENT PLAN
FRONTIER CHEMICAL SITE
NIAGARA FALLS, NEW YORK

A. Chain of Custody Documentation and Detailed Narrative. [1]

B. Sample Information:
- i) date collected
- ii) date digested
- iii) date analyzed

C. Results (Including CLP-Like Summary Forms):
- i) sample results
- ii) duplicate
- iii) blanks
- iv) spikes

D. Supporting QA/QC:
- i) methodology
- ii) method detection limits

All sample data and its corresponding QA/QC data shall be maintained accessible to the Consultant either in hard copy or on magnetic tape or disc (computer data files).

Notes:

1 A detailed report narrative should accompany each submission, summarizing the contents, results, and all relevant circumstances of the work.

CLP Contract Laboratory Program.

QA Quality Assurance.

QC Quality Control.

APPENDIX B

HEALTH & SAFETY PLAN

APPENDIX B

SITE-SPECIFIC HEALTH AND SAFETY PLAN
REMEDIAL DESIGN REPORT

FRONTIER CHEMICAL SITE
NIAGARA FALLS, NEW YORK

Prepared For:
The Frontier Chemical PRP Group

DISCLAIMER:
SOME FORMATTING CHANGES MAY HAVE OCCURRED WHEN THE ORIGINAL DOCUMENT WAS PRINTED TO PDF; HOWEVER, THE ORIGINAL CONTENT REMAINS UNCHANGED.

Prepared by:
Conestoga-Rovers & Associates

651 Colby Drive
Waterloo, Ontario
Canada N2V 1C2

Office: (519) 884-0510
Fax: (519) 884-0525

web: http://www.CRAworld.com

DECEMBER 2011
REF. NO. 047392 (9) APPB

TABLE OF CONTENTS

TABLE OF CONTENTS

Page

TABLE OF CONTENTS

Page

LIST OF FIGURES
(Following Text)

LIST OF TABLES
(Following Text)

LIST OF ATTACHMENTS
(Following Text)

1.0 INTRODUCTION

This Health and Safety Plan (HASP) describes the health and safety procedures and emergency response guidelines that will be implemented during the Remedial Action (RA) activities for the source area soil at the Frontier Chemical Site (Site) in Niagara Falls, New York. An Emergency Response Plan and Community Air Monitoring Plan are included as part of this HASP. This HASP shall be implemented and adhered to during all RA activities that are presented in the Remedial Design (RD) Report. Figures presenting the Site location are included in the RD Report.

The scope of work to be completed by the selected contractors during the RA activities include the following:

i) Mobilization and demobilization of labor, materials, and equipment to and from the Site, which include Site preparation/setup and Site restoration activities.

ii) Surveying activities.

iii) Installation of storm water and sediment erosion control measures.

iv) General earthwork (excavation and stockpiling) activities, which will include the handling/placement of contaminated soils into piles and transfer of soil on Site.

v) Installation of a kiln, catox unit, and carbon unit to perform the ex situ thermal desorption and destruction of contaminants from the soil and off-gases.

vi) Blending/manipulation of soil in preparation for thermal treatment (some of which will occur within an enclosed structure so that vapor release can be controlled).

vii) Setup and operation of vapor control measures (within enclosed structure and in excavation and stockpile areas).

viii) Placement and compaction of soil back into excavation (including treated source area soil and non-source area soil).

ix) Completion of Site cap.

x) Management and handling of heated soil following passage through thermal treatment unit.

xi) Collection, storage, and disposal of accumulated water back into the ground or to the City of Niagara Falls sanitary sewer system, as appropriate.

xii) Soil sampling activities.

xiii) Potential groundwater sampling activities.

xiv) Demolition of buildings, structures, and tank farms.

xv) Performance of operation and maintenance (O&M) activities on the soil treatment system.

xvi) Equipment and personnel decontamination activities.

During a portion of these activities, personnel may come in contact with waste materials, debris, soils, groundwater, surface water, sediment, and wash waters, which may contain hazardous substances. This HASP has been developed to minimize direct contact by project personnel with materials potentially having chemical presence by ensuring:

i) That project personnel are not adversely exposed to the contaminants of concern.

ii) that public health and the environment are not adversely impacted by materials with elevated chemical presence that may potentially migrate outside of the work zone during project activities at the Site.

iii) Compliance with applicable governmental and non-governmental (American Conference of Governmental Industrial Hygienists [ACGIH]) regulations and guidelines. In particular, the amended rules of the Occupational Safety and Health Administration (OSHA) for Part 1926, of Title 29 Code of Federal Regulations (CFR). Part 1926.65 will be implemented for all Site work where project personnel may come into contact with the health and safety hazards that are present at the Site.

iv) Initiation of proper emergency response procedures to minimize the potential for any adverse impact to project personnel, the general public, or the environment.

A vital element of the selected contractor's Health and Safety Program will be the implementation of a Site-specific HASP for all field activities.

This project HASP requires the following measures:

i) The communication of the contents of this HASP to project personnel.

ii) The elimination of unsafe conditions. Efforts shall be initiated to identify conditions that can contribute to an accident and to remove exposure to these conditions.

iii) The review of all activities prior to undertaking the task/job, after an incident, and/or as a result of any unusual circumstances. Stop activities to think about the task, analyze the task hazards, determine methods to reduce risk, and review the results with affected personnel.

iv) The review of existing or the development of new Job Safety Analysis (JSA) forms for each project activity. Supervisors and affected personnel are responsible for the development and ongoing revisions of JSAs. The JSAs for all known work activities are presented Attachment A.

v) The reduction of unsafe acts. Project personnel shall make a conscious effort to work safely. A high degree of safety awareness must be maintained so those safety factors involved in a task become an integral part of the task. Supervisory personnel shall ensure that project personnel committing unsafe acts are held accountable via counseling, mentoring, and, if necessary, reprimand.

vi) The frequent inspection of project activities. Regular safety inspections of the work site, materials, and equipment by qualified persons ensure early detection of unsafe conditions. Safety and health deficiencies shall be corrected as soon as possible, and project activities shall be temporarily suspended until the appropriate corrective actions are taken. Documentation of the daily inspections and corrective actions taken should be kept with the project files.

For the purpose of this HASP, activities performed at the Site involving contact with materials, which potentially have an elevated chemical presence will be considered contaminated operations requiring the use of Personal Protective Equipment (PPE). A detailed description of the required PPE is presented in Section 5.1 and is also identified on each JSA form.

The applicability of this HASP extends to all project personnel who will be on Site, including State and Federal Agency personnel, contractor personnel, subcontractor personnel, and visitors to the Site.

All project activities at the Site will be conducted in accordance with the provisions of an approved Site-specific HASP. A copy of the Site-specific HASP and employer-specific Standard Operating Procedures (SOPs) will be maintained on Site whenever activities are in progress. This HASP shall be used in conjunction with the selected contractor's Safety and Health Program.

1.1 PROJECT ORGANIZATION

All personnel conducting activities on the Site must conduct their activities in compliance with all applicable Safety and Health standards as specified by OSHA including, but not limited to, the OSHA 29 CFR 1910, 29 CFR 1926. Project personnel must also be familiar with the procedures and requirements in their approved

Site-specific HASP and the applicable procedures found within their company's SOPs and Safety and Health Policy Manual. In the event of any conflicting safety procedures/requirements, personnel shall implement those safety practices, which afford the highest level of safety and protection.

Project Management and Safety Organization

Project Manager Contractor – (to be determined)

The Contractor's Project Manager (CPM) shall be responsible for the overall implementation of the HASP, and for ensuring that all health and safety responsibilities are carried out in conjunction with this project. This shall include, but is not limited to, review and approval of the HASP; qualifying/directing subcontractors relative to safety and health performance; coordinating all safety and health submittals; providing the appropriate technical information to write submittals; and consultation with the Frontier Chemical Site Potentially Responsible Parties Group (Frontier Group) regarding appropriate changes to the HASP.

Site Safety & Health Officer Contractor – (to be determined)

The Contractor's Safety & Health Officer (CSHO) is the person who, under the supervision of the CPM and the contractor's Corporate Safety and Health Manager, shall be responsible for the communication of the Site requirements to project personnel and any subcontractor personnel. It is planned that the thermal treatment unit will run 24 hours a day. Additional qualified safety officers will be assigned to work during shifts when the CSHO is not on Site. These safety officers will be under the watchful eye of the CSHO and will contact the CSHO after hours if necessary. The CSHO and additional safety officers will have prior experience in working at hazardous waste sites and together they will be responsible for carrying out the health and safety responsibilities by making sure that:

i) He/she is on Site at all times during active excavation activities with a designated qualified individual on Site at all times when other active remediation work is ongoing.

ii) All necessary clean-up and maintenance of safety equipment is conducted by project personnel.

iii) Emergency services are contacted when necessary.

iv) A Site-specific Hazard Communication (HAZCOM) Program is maintained on Site.

v) Project safety forms attached to the HASP are correctly completed and filed.

vi) A pre-entry briefing is conducted, which will serve to familiarize project personnel with the procedures, requirements, and provisions of this HASP.

vii) All necessary records are maintained in the project files (e.g., air monitoring results, calibration log sheets, incident reports, daily toolbox meeting sheets, daily safety logbook entries, training certificates and/or certifications, etc.). The selected contractor may use either their employer-specific safety forms or the forms that are provided in Attachment B.

viii) Daily safety meetings are held and documented.

ix) Safe work practices for project personnel are enforced.

x) Safety of any visitors who enter the Site is ensured.

xi) Communication is maintained with the CPM and Frontier Group.

xii) Orders the immediate shutdown of Site activities in the case of a medical emergency, unsafe condition, or unsafe practice.

xiii) Designates work areas and defines minimum PPE requirements.

xiv) Provides the safety equipment, PPE, and other items necessary for project personnel.

xv) Conducts the required air monitoring program.

xvi) Enforces the use of required safety equipment, PPE, and other items necessary for project personnel safety.

xvii) Oversees any potential confined space entry work including preplanning rescue activities with the local community responders.

xviii) Ensures that there is a competent person in place who will be supervising trenching and excavation work.

xix) Conducts job site inspections with the Construction Superintendent (CS) or Site Supervisor (SS) as a part of quality assurance for safety and health.

xx) Reports safety and health concerns to the selected contractor's management as necessary.

Emergency Coordinator

The CSHO or his/her designate including the additional safety officers will act as the Emergency Coordinator (EC). The EC shall be able to implement the emergency procedures and is responsible for implementing the following activities in the event of an emergency:

i) The EC shall immediately respond to all imminent or actual emergency situations. The EC shall notify all project personnel and emergency response agencies, identify the problem, assess the health or environmental hazards, and take all reasonable measures to stabilize the situation.

ii) The EC shall take all reasonable measures necessary to ensure that fire, explosion, emission or discharge does not occur, re-occur, or spread. These measures may include stopping operations, collecting and containing released materials, and/or removing or isolating containers.

iii) The EC shall develop Emergency Evacuation Routes on a daily basis and communicate them to all project personnel.

iv) The EC shall also be responsible for follow-up activities after any incident such as the cleanup of the affected area, maintenance and decontamination of emergency equipment, and completion and submission of an incident report.

Construction Superintendent/Site Supervisor - Contractor (to be determined)

Health and safety is a line management responsibility, and as such, the CS and/or SS will implement the overall onsite direction and enforcement of the health and safety for this project. The CS and/or SS must meet the requirements of the "competent person" as per the OSHA regulations. The CS and/or SS will report to the CPM for this project.

The CS and/or SS is the person who, under the supervision of the CPM, shall be responsible for the communication of the Site requirements to project personnel and subcontractors, and is responsible for carrying out the health and safety responsibilities by making sure that:

i) All underground utilities have been properly located prior to initiating work activities.

ii) Each work area is secured with fencing at the end of each day.

iii) All necessary cleanup and maintenance of safety equipment is conducted by project personnel.

iv) JSA forms are developed, reviewed, and revised accordingly.

v) Project personnel stop, think about, act accordingly and review the work activities that they are about to start before initiating activities.

vi) Project safety forms attached to the HASP are completed properly and then filed.

vii) A pre-entry briefing is conducted for all project personnel, which will serve to familiarize everyone with the procedures, requirements, and provisions of this HASP.

viii) Orders the immediate shutdown of project activities in the case of a medical emergency, unsafe condition, or unsafe practice.

ix) Provides the safety equipment, PPE, and other items necessary for project personnel.

x) Enforces the use of required safety equipment, PPE, and other items necessary for personnel or community safety.

xi) Conducts job site inspections as a part of quality assurance for safety and health.

xii) Reports safety and health concerns to the CPM as necessary.

xiii) Is responsible for the overall implementation of the HASP, and ensuring that all health and safety responsibilities are carried out during the project work activities. This shall include, but is not limited to, review and approval of any subcontractor HASPs, communication of site requirements to Subcontractor personnel, and consultation with the CPM and PRP Group regarding appropriate changes to the HASP.

xiv) THE CS and/or SS also have the responsibility for enforcing safe work practices for all project personnel.

xv) The CS and/or SS watch all personnel for any ill affects, especially those symptoms caused by heat stress and/or chemical exposure.

xvi) The CS and/or SS oversee the safety of any visitors who enter the Site.

Corporate Safety & Health Manager Contractor – (to be determined)

The Corporate Safety & Health Manager (CSHM) is an individual who is trained as a health and safety professional, works full-time for the selected contractor in a health and safety role, and who serves in a consulting role to the CPM, CSHO, and CS and/or SS regarding potential health and safety issues.

Equipment Operators

All equipment operators are responsible for the safe operation of heavy equipment. Operators are responsible for inspecting their equipment on a daily basis to ensure safe performance. Brakes, hydraulic lines, backup alarms, and fire extinguishers must be inspected routinely throughout the project. Documentation of daily inspections will be required via an equipment inspection checklist. Heavy equipment inspections will be submitted to the CS for review and subsequently placed in the project files. Unsafe conditions/acts are to be immediately reported to the CS. Equipment will be taken out of service if an unsafe condition occurs.

Project Personnel Safety Responsibilities

Project personnel are responsible for their own safety as well as the safety of those around them and shall use any equipment provided in a safe and responsible manner, as directed by their supervisor. Project personnel will follow the policies set forth in this HASP and those in their employer-specific SOPs and Safety and Health Program.

Project personnel are directed to take the following actions when appropriate:

i) Review all activity hazards and preventative measures before initiating work

ii) Assist in the development/revision of JSA forms that are appropriate to their current work activities

iii) Suspend any operations that may cause an imminent health hazard to project personnel

iv) Inspect tools and other equipment before each use or as the manufacturer and/or OSHA mandates

v) Correct job site hazards when possible without endangering life or health

vi) Report safety and health concerns to the CSHO, CS, and/or SS

Subcontractors

Selected subcontractor(s) will be responsible for providing a CS and/or SS ("competent person") and a SHO to direct their activities and to meet all applicable OSHA Regulations. This may be the same individual if so qualified. These individuals will be responsible for ensuring that all contract specifications are met, including those related to project health and safety. The names of these individuals will be presented in the subcontractor Site-specific HASP.

The selected contractor will review any subcontractor HASP prior to the subcontractor's mobilization to the Site. Subcontractors will be responsible for the health and safety of their personnel, which includes following all applicable OSHA Regulations and the subcontractors' Site-specific HASP. Subcontractors will be required to attend an initial Site briefing put on by the selected contractor and subsequent daily safety meetings.

Authorized Visitors

Authorized Visitors shall be provided with all known information with respect to the project operations and hazards, as applicable to the purpose of their visit.

2.0 SITE CHARACTERIZATION AND POTENTIALLY HAZARDOUS COMPOUNDS

Table B2.1 presents the available information pertaining to the Site Contaminants of Concern (COCs) and their properties including the identification of the maximum detected concentrations of the COCs in Site soils milligrams per kilogram (mg/kg). The exposure routes and regulatory Time Weighted Averages (TWA) exposure levels for the COCs are also listed in Table B2.1. These levels are set to protect the health of workers.

3.0 BASIS FOR DESIGN

Regulations set forth by OSHA in Title 29, CFR, Parts 1910 and 1926 (29 CFR 1910 and 1926) form the basis of this HASP. Emphasis is placed on Section 1926.65 (Hazardous Waste Operations and Emergency Response), 1910 Subpart I (Personal Protective Equipment), 1910 Subpart Z (Toxic and Hazardous Substances), 1926 Subpart O (Motor Vehicles, Mechanized Equipment, and Marine Operations), and 1926 Subpart F (Excavations). Some of the specifications within this section are in addition to the OSHA regulations, and reflect the positions of U.S. EPA, and the National Institute for Occupational Safety and Health (NIOSH), regarding safe operating procedures at hazardous waste sites.

The health and safety of the public and Site personnel and the protection of the environment will take precedence over cost and scheduling considerations for all project work.

4.0 PERSONNEL TRAINING

4.1 GENERAL

Required project personnel as discussed in Section 1.1 shall complete hazardous waste operations and emergency response related training, as required by the OSHA Standard 29 CFR 1926.65. Project personnel shall also initially receive a minimum of 3 days of actual field experience under the direct supervision of a trained, experienced supervisor. Personnel who completed their training more than 12 months prior to the start of this project shall have also completed an 8-hour refresher course within the past 12 months. The CS and or SS shall complete the additional 8 hours of training that is required for supervisors along with any "competent persons" training that may be needed for the required work.

Additional safety training for specific tasks/activities may include safety training for fall protection, ladder safety, confined space entry work, excavation safety, and the control of hazardous energy etc. Further safety training may also be required based on the scheduled scope of work. This safety training is to be conducted and documented before any tasks that require additional training are initiated. It is the responsibility of the CSHO and CS and/or SS to ensure that personnel have the necessary training and skills prior to activity assignment. Task safety training requirements are included on each JSA form.

4.2 BASIC 40-HOUR COURSE

The following is a list of the topics typically covered in a 40-hour training course:

i) General safety procedures

ii) Physical hazards (fall protection, noise, heat stress, cold stress)

iii) Names and job descriptions of key personnel responsible for Site health and safety

iv) Safety, health, and other hazards typically present at hazardous waste sites

v) Use, application, and limitations of PPE

vi) Work practices by which employees can minimize risks from hazards

vii) Safe use of engineering controls and equipment on Site

viii) Medical surveillance requirements

ix) Recognition of symptoms and signs, which might indicate overexposure to hazards

x) Worker right-to-know (Hazard Communication OSHA 1926.59/1910.1200)

xi) Routes of exposure to contaminants

xii) Engineering controls and safe work practices that may be implemented

xiii) Components of a project HASP

xiv) Decontamination practices for personnel and equipment

xv) Confined space entry procedures

xvi) General emergency response procedures

4.3 SUPERVISOR COURSE

Management and supervisors (i.e., the CS and SS) are required to receive an additional 8 hours of training in topics that are pertinent to the management of hazardous waste operations, which typically includes:

i) Instruction in detailed project safety and health procedures dealing with emergencies

ii) PPE programs

iii) Implementation of specialized emergency response procedures

iv) Air monitoring techniques

4.4 SITE-SPECIFIC TRAINING

All project personnel attending the initial safety meeting will accomplish the project-specific training on the contents of this HASP before work begins. The review will include a discussion of the chemical, physical, and biological hazards that may be present at the Site, the protective equipment and safety procedures to be used and followed, and emergency procedures that will be implemented at the Site. The Training Acknowledgment Form that project personnel will sign off on is provided in Attachment B (Project Safety Forms).

4.5 DAILY SAFETY MEETINGS

Daily safety meetings (tailgate safety talks) will be held to cover the work that is anticipated to be accomplished each day, the associated hazards, the PPE, procedures required to minimize exposure to these hazards, and the required emergency response procedures. The CS, SS, and/or CSHO will preside over these meetings prior to beginning the day's fieldwork. No work will be performed in an Exclusion Zone (EZ) before the daily safety meeting has been held. Additional safety meetings shall also be held prior to initiating new tasks, and repeated if new hazards are encountered. The form for documenting the daily safety meetings is also found in Attachment B.

4.6 FIRST AID AND CPR

At least one individual, for each work shift, with current certification in First Aid/CPR will be assigned to the work crew and will be on the Site during all field activities. Refresher training in First Aid and CPR is required to keep the certificate current. These individuals must also receive training regarding the precautions and protective equipment necessary to protect against exposure to blood-borne pathogens. Blood-borne pathogen training should be included as part of the First Aid/CPR training course delivered by the training provider.

5.0 PERSONAL PROTECTIVE EQUIPMENT

PPE will be required to safeguard project personnel from various hazards. Varying levels of protection may be used depending on the level of contaminants and the degree of any physical hazard. This section presents the various levels of personal protection and defines the conditions of use for each level. Subcontractor Site-specific HASPs, if required, will adequately address PPE concerns for each specific task activity based on their proposed scope of work.

5.1 LEVELS OF PROTECTION

Protection levels are determined based upon chemicals and physical hazards present in the work area. The specific protection levels to be employed at the Site for each work task are presented on each JSA form, which are presented in Attachment A.

5.1.1 LEVEL D PROTECTION

The minimum level of protection that will be required for all project personnel will be Level D. Level D will only be used in clean areas where there is no potential for exposure to the COCs. The following equipment is to be worn as Level D PPE:

i) Work clothing as prescribed by the weather.

ii) Steel toed work boots meeting American National Standard Institute (ANSI) Z41.

iii) Safety glasses or goggles, meeting ANSI Z87.

iv) Leather work gloves. Note: Heat resistant gloves such as an Ansell Crusader Flex Delux Hot Mill Glove or a Wells Lamont Extra Heavy Weight Terry Glove shall be worn in any work area where there is a potential to project personnel to accidentally touch or come into contact with components of the thermal treatment unit or with soil that has an elevated temperature of 400°F and above.

v) High visibility safety vest (Class II) when working near moving equipment.

vi) Hard hat, meeting ANSI Z89.

vii) Hearing protection, if necessary.

5.1.2 MODIFIED LEVEL D PROTECTION

Modified Level D will be worn when airborne contaminants are not present at levels where respiratory protection is required, but where project activities present an increased potential for skin contact with hazardous substances. The following equipment is to be worn as Modified Level D:

i) Tyvek® coveralls or polyethylene coated Tyvek® coveralls (if liquids/splash hazards are present).

ii) Steel toed work boots meeting ANSI Z41.

iii) Neoprene, or polyvinyl chloride (PVC) overboots.

iv) Safety glasses or goggles.

v) Hard hat.

vi) Face shield in addition to safety glasses or goggles when projectiles and/or splashing liquids pose a hazard.

vii) Disposable nitrile inner gloves (NDEX 8005, as manufactured by Best, or equivalent).

viii) Nitrile over gloves. Note: Heat resistant gloves such as an Ansell Crusader Flex Delux Hot Mill Glove or a Wells Lamont Extra Heavy Weight Terry Glove shall be worn in any work area where there is a potential to project personnel to accidentally touch or come into contact with components of the thermal treatment unit or with soil that has an elevated temperature of 400°F and above.

ix) Hearing protection (if necessary) (if noise levels exceed 85 dBA, then hearing protection with a Noise Reduction Rating (NRR) of at least 20 dBA must be used).

x) High visibility safety vest (Class II) when working near moving equipment.

5.1.3 LEVEL C PROTECTION

Level C protection will be required when the airborne concentration of suspected contaminants are present in the worker's breathing zone at sustained levels of greater than 1 part per million (ppm) as measured with a photoionization detector (PID) or 1.0 milligram per cubic metre (mg/m^3) measured with a particulate monitor (MIE personal Data Ram or equivalent). Supplied air will be required when the PID readings are sustained at levels greater than 25 ppm. If PID readings subside, workers can downgrade as necessary. The selected contractor shall attempt to obtain additional information on the chemicals present in the work area when readings are sustained above 25 ppm.

The following equipment will be used for Level C protection:

i) Full-face air purifying respirator (APR) with organic vapor/acid gas cartridges in combination with particulate filters (P-100) which are NIOSH approved (MSA GME P100 cartridges or equivalent).

ii) Polyethylene coated Tyvek® or Saranex® hooded suit (if liquids/splash hazards are present) or Tyvek® coveralls, ankles, and cuffs taped to boots and gloves.

iii) A chemical splash apron and/or a polycoated Tyvek® suit when handling NAPL.

iv) Nitrile over glove, as manufactured by Best or equivalent. Note: Heat resistant gloves such as an Ansell Crusader Flex Delux Hot Mill Glove or a Wells Lamont Extra Heavy Weight Terry Glove shall be worn in any work area where there is a potential to project personnel to accidentally touch or come into contact with components of the thermal treatment unit or with soil that has an elevated temperature of 400°F and above.

v) Inner nitrile disposable gloves (NDEX 8005, as manufactured by Best, or equivalent).

vi) Safety toe work boots, ANSI approved.

vii) Chemical resistant neoprene or rubber boots with steel toes, or latex/PVC booties over safety toe shoes.

viii) Hard hat, ANSI approved.

ix) Hearing protection (if necessary).

x) High visibility safety vest (Type 2).

5.1.4 LEVEL B PROTECTION

Level B protection will be worn when the airborne concentrations of suspended contaminants are present at sustained levels greater than 25 ppm due to the presence of organic vapors or if carbon monoxide levels exceed 35 ppm. The presence of certain volatile organic compounds (tetrachloroethene, 1,4-dichlorobenzene, 1,1,1-trichloroethane, and trichloroethene), precludes the use of Level C protection as these chemical compounds have poor warning properties. Therefore, Level B protection will be required when sustained readings reach 25 ppm as 25 ppm is the level where supplied air respiratory protection becomes required.

The action level necessitating Level B protection may be revised subject to determination of the compounds triggering the Level B protection requirement. However, if CSHO is unable to identify/quantify the contaminants, supplied air will continue to be required when the PID reading is greater than 25 ppm.

The following equipment will be used for Level B protection:

i) Supplied air respirator (NIOSH approved). Respirators may be positive pressure-demand self-contained breathing apparatus (SCBA), or positive pressure-demand airline respirator (with 5-minute escape bottle for immediately dangerous to life and health (IDLH) situations).

ii) Polyethylene coated Tyvek®(equipment operators) or Saranex® hooded coverall (directly exposed personnel or personnel working with NAPL) with ankles and cuffs taped to boots and gloves. (Note: Kimberly Clark Kleenguard A80 Hazard-Gard II Saranex® coveralls or equivalent).

iii) A chemical splash apron and/or a polycoated Tyvek® suit when handling NAPL.

iv) Nitrile over gloves, as manufactured by Best or equivalent (when handling NAPL Best Viton 890 gloves or equivalent will be required). Note: Heat resistant gloves such as an Ansell Crusader Flex Delux Hot Mill Glove or a Wells Lamont Extra Heavy Weight Terry Glove shall be worn in any work area where there is a potential to project personnel to accidentally touch or come into contact with components of the thermal treatment unit or with soil that has an elevated temperature of 400°F and above.

v) Inner nitrile disposable gloves (NDEX 8005, as manufactured by Best, or equivalent).

vi) Safety toe work boots, ANSI approved.

vii) Chemical resistant neoprene or rubber boots with steel toes, or latex/PVC booties over safety toe shoes.

viii) Hard hat, ANSI approved.

ix) hearing protection (if necessary).

x) High visibility safety vest (Type 2).

5.1.5 SELECTION OF PPE

Equipment for personal protection will be selected based on the potential for contact, Site conditions, ambient air quality, and the judgment of the CPM, CS, SS, CSHO, and the CSHM. The PPE used will be chosen to be effective against the compound(s) present on the Site.

5.2 RESPIRATORY PROTECTION

Respiratory protection is an integral part of personnel health and safety at sites with potential airborne contamination.

5.2.1 SITE RESPIRATORY PROTECTION PROGRAM

The Site respiratory protection program will consist of the following:

i) All project personnel who may use respiratory protection will have an assigned respirator.

ii) All project personnel who may use respiratory protection will have been fit tested and trained in the use of all respirators within the past 12 months.

iii) All project personnel who may use respiratory protection must, within the past year, have been medically certified as being capable of wearing a respirator. Documentation of the medical certification must be provided to the CSHO prior to commencement of Site work.

iv) Only cleaned, maintained, NIOSH approved respirators are to be used on this Site.

v) If respirators are used, the respirator cartridge is to be properly disposed of at the end of each work shift, prior to expected breakthrough, or when breathing becomes labored (filter load-up occurs).

vi) Contact lenses may be worn with a full-face respirator.

vii) All project personnel who may use respiratory protection must be clean-shaven. Mustaches and sideburns are permitted, but they must not interfere with the sealing surface of the respirator.

viii) Respirators will be inspected and a negative pressure test performed prior to each use.

ix) After each use, the respirator will be wiped with a disinfectant cleansing wipe or washed during a formal respirator cleaning procedure. When used, the respirator will be thoroughly cleaned at the end of the work shift. The respirator will be stored in a clean plastic bag, away from direct sunlight in a clean, dry location, in a manner that will not distort the facepiece.

Respiratory protection may be required during some of the project activities. This is to ensure worker protection from potentially contaminated particulates and volatile organic carbons (VOCs). It is expected that Modified Level D personal protection will be worn during the majority of the project activities involving the handling of impacted materials. However, the CSHO will make the determination of the acceptable level of protection based upon the results of the air-monitoring program. Also, if during these field activities, the real-time air monitoring program indicates the need for an upgrade in protection to Level C or Level B, then these activities will be continued with the increased level of personal protection and additional source controls (e.g., forced ventilation, foam, plastic sheeting, modified production rate, water spray, etc.) to control vapors and/or particulates.

A PID with an 11.7 or greater eV lamp will be used to determine if organic vapors are present. A background reading will be established prior to commencing work activities at each active work area.

Action levels to determine the level of respiratory protection necessary for organic vapors are based on the sustained (15-minute) concentration of COCs measured within the breathing zone. The action levels and appropriate respiratory protection are referenced in Table B8.1 of this document. The PID action levels have been set based on the presence of the known VOCs, which have been identified at the Site. However, if the ambient concentrations of organic vapors are due to identifiable substances, the level of respiratory protection may be altered by the CSHO.

The appropriate air purifying respirator cartridges to be used at the Site are a combination organic vapor/acid gas and P-100 cartridge. The cartridge must be of the same manufacturer as the respirator face piece.

A personal aerosol monitor (e.g., MIE® Personal DataRam or equivalent) will also be utilized to determine airborne dust/particulate concentrations. A background reading will be established prior to commencing work activities at the upwind perimeter of each active work area.

Action levels to determine the level of respiratory protection necessary for dust levels are based on the concentration of the COCs measured within the breathing zone. The action levels and appropriate respiratory protection for particulates are included in Table D8.1 of this document.

5.3 USING PPE

Depending upon the level of protection selected for this project, specific donning and doffing procedures may be required. The procedures presented in this section are mandatory if Level B or Level C PPE is used.

All personnel entering the EZ must put on the required PPE in accordance with the requirements of this plan. When leaving the EZ, PPE will be removed in accordance with the procedures listed, to minimize the spread of contamination.

5.3.1 DONNING PROCEDURES

These procedures are mandatory only if Level B or Level C PPE is used on the project:

i) Remove bulky outerwear. Remove street clothes and store in clean location.
ii) Put on work clothes or coveralls.
iii) Put on the required chemical protective coveralls or rain gear.
iv) Put on the required chemical protective boots or boot covers.
v) Tape the legs of the coveralls to the boots with duct tape.
vi) Put on the required chemical protective gloves.
vii) Tape the wrists of the protective coveralls to the gloves.
viii) Don the required respirator and perform appropriate fit check.
ix) Put hood or head covering over head and respirator straps and tape hood to facepiece.
x) Check and secure all seams.
xi) Don remaining PPE, such as hard hat.

When these procedures are instituted, one person (bottle watch/decon attendant) must remain outside the work area to ensure that each person entering has the proper protective equipment.

5.3.2 DOFFING PROCEDURES

The following procedures are only mandatory if Level B or C PPE is required for this project. Whenever a person leaves a Level B or C work site, the following decontamination sequence will be followed:

i) Upon entering the Contamination Reduction Zone (CRZ) rinse contaminated materials from the boots or remove contaminated boot covers.

ii) Clean reusable protective equipment.

iii) Remove protective garments, equipment, and respirator. All disposable clothing should be placed in a covered container, which is labeled.

iv) Clean the respirator using the appropriate method as determined by the CSHO.

v) Wash hands, face, and neck and shower as soon as possible at the end of the day.

vi) Proceed to clean area and dress in clean clothing.

vii) Clean and disinfect respirator for next use.

All disposable equipment, garments, and PPE must be placed in covered containers and labeled for disposal. See Section 9.0 for detailed information on decontamination procedures.

5.4 SELECTION MATRIX

The level of personal protection selected will be based upon real-time air monitoring of the work environment and an assessment by the CSHO and CS and/or SS of the potential for skin contact with contaminated materials. The PPE selection matrix is given in each JSA form that is provided in Attachment A. This matrix is based upon information available at the time this HASP was written.

5.5 DURATION OF WORK TASKS

The duration of activities involving the usage of PPE will be established by the CSHO based upon ambient temperature and weather conditions, the capacity of personnel to work in the designated level of PPE (heat stress, see Section 7.3) and the limitations of the protective equipment (i.e., ensemble permeation rates, life expectancy of air purifying respirator (APR) cartridges, etc.).

All rest breaks will be taken in the Support Zone (SZ) after full decontamination and PPE removal. Rest breaks will be observed, based upon the heat stress monitoring guidelines presented in Section 7.3.

5.6 LIMITATIONS OF PROTECTIVE CLOTHING

PPE ensembles have been selected to provide protection against contaminants at anticipated concentrations. However, no protective garment, glove, or boot is chemical-proof, nor will it afford protection against all chemical types. Permeation of a given chemical through PPE is a complex process governed by contaminant concentrations, environmental conditions, physical condition of the protection garment, and the resistance of a garment to a specific contaminant. Chemical permeation may continue even after the source of contamination has been removed from the garment.

In order to obtain optimum usage from PPE, the following procedures are to be followed by all Site personnel using PPE:

i) When using disposable coveralls, don a clean, new garment after each rest break or at the beginning of each shift

ii) Inspect all clothing, gloves, and boots both prior to and during use for:

  a) Imperfect seams
  b) Non-uniform coatings
  c) Tears
  d) Poorly functioning closures

iii) Inspect reusable garments, boots, and gloves both prior to and during use for:

  a) Visible signs of chemical permeation
  b) Swelling
  c) Discoloration
  d) Stiffness
  e) Brittleness
  f) Cracks
  g) Any sign of puncture
  h) Any sign of abrasion

Reusable gloves, boots, or coveralls exhibiting any of the characteristics listed above will be discarded. PPE used in areas known or suspected to exhibit elevated concentrations of contaminants will not be reused.

Project personnel also carry certain responsibilities for their own health and safety, and are required to observe the following safe work practices:

i) Familiarize themselves with this HASP.

ii) Use the "buddy system" when working in a contaminated operation.

iii) Use the safety equipment in accordance with training received, labeling instructions, and common sense.

iv) Maintain safety equipment in good condition and proper working order.

v) Refrain from activities that would create additional hazards (e.g., smoking, eating, etc., in restricted areas, leaning against dirty, contaminated surfaces).

vi) Smoking, eating, and drinking will be prohibited except in designated areas. These designated areas may change during the duration of the project to maintain adequate separation from the active work area(s). Designation of these areas will be the responsibility of the CSHO.

vii) Soiled disposable outerwear shall be removed and placed into a covered container prior to washing hands and face, eating, using lavatory facilities, or leaving the Site.

6.0 SITE CONTROL

Site control is provided by the implementation of the following measures:

i) The CPM, CSHO, CS, and/or SS are to be advised of the dates and purpose of all field activities

ii) All visitors must sign in and sign out each time they pass the Site access gate

iii) The selected contractor will ensure that a secure fence is in place around the Site or each active work area during the project activities

6.1 AUTHORIZATION TO ENTER

All personnel working in EZs must have completed hazardous waste operations initial training as defined under OSHA Regulation 29 CFR 1926.65. They shall also have completed their training or refresher training within the past 12 months, and have been certified by a physician as fit for hazardous waste operations in order to enter a Site area designated as an EZ or CRZ. Personnel without such training or medical certification may enter the designated SZ only. The CSHO will maintain a list of authorized persons; only personnel on the authorized list will be allowed within the EZ or CRZ.

6.2 SITE ORIENTATION AND HAZARD BRIEFING

No person will be allowed in the general work area during project activities without first being given a Site orientation and hazard briefing. This orientation will be presented by the CSHO, and will consist of attending an initial safety meeting. This training will cover the chemical, physical, and biological hazards, protective equipment, safe work procedures, and emergency procedures for the project. A Training Acknowledgment Form for documentation purposes is provided in Attachment B. In addition to this meeting, daily safety meetings will be held each day before work begins. All individuals on Site, including visitors, must document their attendance to this briefing as well as to each daily safety meeting on the form that is also provided in Attachment B.

6.3 CERTIFICATION DOCUMENTS

A training and medical file will be established for the project and kept on Site during all project activities. The 40-hour training, update, and respirator fit test certificates, as well as current medical clearance for all project field personnel will be maintained within that file. Subcontractor personnel, if needed, will provide a copy of their training, respirator fit test, and medical documentation to the CSHO prior to the start of fieldwork. Additional safety training certification documents (e.g., fall protection) may be necessary based on the scheduled task activity.

6.4 ENTRY LOG

A log-in/log-out sheet must be maintained at the Site by the CSHO. Personnel may sign in and out on a log sheet as they enter and leave the CRZ, or the CSHO may document entry and exit in the field notebook.

6.5 ENTRY REQUIREMENTS

In addition to the authorization, hazard briefing and certification requirements listed above, no person will be allowed to enter the Site unless he/she is wearing the minimum SZ PPE as described in Section 5.0. Personnel entering the EZ or CRZ must wear the required PPE for those locations as identified on each JSA form.

6.6 EMERGENCY ENTRY AND EXIT

Individuals who must enter the Site on an emergency basis will be briefed of the hazards by the CSHO. All hazardous activities will cease in the event of an emergency and any sources of emissions will be controlled, if possible.

Individuals exiting the Site because of an emergency will gather in a safe area, as determined by the CSHO for a head count. The CSHO is responsible for ensuring that all individuals who entered the work area have exited in the event of an emergency. See Section 11.0 of this HASP for additional information.

6.7 CONTAMINATION CONTROL ZONES

Contamination control zones are maintained to prevent the spread of contamination and to prevent unauthorized people from entering hazardous areas.

6.7.1 EXCLUSION ZONE (EZ)

The EZ consists of the specific work area, or may be the entire area of suspected contamination. All employees entering the EZ must use the required PPE, and must have the appropriate training and medical clearance for hazardous waste work. The EZ is the defined area where there is a possible respiratory and/or contact health hazard. Barrier tape, fencing, or other appropriate means will identify the location of each EZ.

6.7.2 CONTAMINATION REDUCTION ZONE (CRZ)

The CRZ or transition area will be established to perform decontamination of personnel and equipment and to provide a buffer zone around the EZ. All personnel entering or leaving the EZ will pass through this area to prevent any cross-contamination. Tools, equipment, and machinery will be decontaminated in the CRZ (or a separate CRZ decontamination area) that may be set up to better address equipment decontamination. The decontamination of all personnel will be performed on Site in the CRZ that is adjacent to each EZ. Personal protective outer garments and respiratory protection will be removed in the CRZ and prepared for cleaning or disposal. This zone is the only appropriate corridor between the EZ and the SZ.

6.7.3 SUPPORT ZONE (SZ)

The SZ is a clean area outside of the CRZ located to prevent project personnel from exposure to hazardous substances. Eating and drinking will be permitted in the SZ only after proper decontamination. Smoking will not be allowed in any portion of the SZ.

7.0 ACTIVITY HAZARD/RISK ANALYSIS AND GENERAL SAFETY PRACTICES

This section identifies and evaluates the potential chemical, physical, and biological hazards, which may be encountered while conducting project activities. Specific JSA forms (see Attachment A) have been developed to address the hazards associated with scheduled/known project activities, which are outlined in Section 1.0 of this HASP.

Note: If a non-routine task or previously unidentified task becomes necessary, then a JSA that addresses the new task shall be developed and implemented before initiating the new activity.

In addition to the chemical hazards identified in Table D2.1 of this HASP, physical and biological hazards may exist at the Site including: potential heat/cold stress; hazards presented by the use of heavy equipment; underground/overhead utility hazards; hazards presented by excavations/trenches; biological hazards including, mosquitoes, bees, wasps, snakes; uneven terrain and slippery surfaces; electrical and other hazardous energy sources, hazards presented by undertaking hot work and handling heated soil, and the use of decontamination equipment. It will be the responsibility of the CSHO and all project personnel to identify the physical and/or biological hazards posed by the various project activities that they are partaking in and implement all necessary preventative measurers.

7.1 GENERAL PRACTICES

Additional general safety practices to be implemented are as follows:

i) At least one copy of this HASP must be at the Site, in a location readily available to all personnel.

ii) All project personnel must use the buddy system (working in pairs or teams).

iii) Food, beverages, or tobacco products must not be present or consumed in the EZ and CRZ. Cosmetics must not be applied within these zones.

iv) Emergency equipment such as eyewash, fire extinguishers, etc., must be removed from storage areas and staged in readily accessible locations.

v) Contaminated waste, debris, and clothing must be properly contained and legible and understandable precautionary labels must be affixed to the containers.

vi) Removing contaminated soil or waste debris from protective clothing and/or equipment using compressed air, shaking, or any other means that disperses contaminants into the air is prohibited.

vii) Containers must be moved only with the proper equipment, and must be secured to prevent dropping or loss of control during transport.

viii) Visitors to the Site must be instructed to stay outside of the EZ and CRZ and remain within the SZ during the extent of their stay. Visitors must be cautioned to avoid skin contact with surfaces, which are contaminated or suspected to be contaminated.

7.1.1 BUDDY SYSTEM

All project personnel shall use the buddy system. Visual contact must be maintained between project team members at all times, and personnel must observe each other for signs of chemical exposure and heat stress. Indications of adverse effects include, but are not limited to:

i) Changes in complexion and skin coloration

ii) Changes in coordination

iii) Excessive salivation and papillary response

iv) Changes in speech pattern

Team members must also be aware of potential exposure to possible safety hazards, unsafe acts, or noncompliance with safety procedures. Personnel shall inform their partners, fellow team members, CSHO, CS, and/or the SS of non-visible effects of exposure to toxic materials. The symptoms of such exposure may include:

i) Headaches

ii) Dizziness

iii) Nausea

iv) Blurred vision

v) Cramps

vi) Irritation of eyes, skin, or respiratory tract

If protective equipment or noise levels impair communications, pre-arranged hand signals must be used for communication. Personnel must stay within line of sight of another team member. Downrange field teams in conjunction with the "buddy" system will use the following hand signals. These signals are very important when working with heavy equipment. The entire field team shall know them before operations commence.

Signal	***Meaning***
Hand Gripping Throat	Out of Air; Can't Breathe
Grip Partner's Wrist	Leave Area Immediately
Hands on Top of Head	Need Assistance
Thumbs Up	Ok, I'm All Right, I Understand
Thumbs Down	No, Negative

7.1.2 SANITATION

Sanitation at the Site will be maintained according to OSHA and Department of Health requirements.

7.1.3 BREAK AREA

Breaks must be taken in the SZ, away from the active work area after project personnel go through decontamination procedures. There will be no eating, drinking, or chewing gum in any area other than the SZ.

7.1.4 POTABLE WATER

The following rules apply for all project field operations:

i) An adequate supply of potable water will be provided in each CRZ. Potable water must be kept away from hazardous materials, contaminated clothing, and contaminated equipment.

ii) Portable containers used to dispense drinking water must be capable of being tightly closed, and must be equipped with a tap dispenser. Water must not be drunk directly from the container, nor dipped from the container.

iii) Containers used for drinking water must be clearly marked and not used for any other purpose.

iv) Disposable cups must be supplied, and both a sanitary container for unused cups and a receptacle for disposing of used cups must be provided.

7.1.5 WASHING FACILITIES

Access to facilities for washing ones hands, face and neck before eating, drinking, or smoking will be provided.

7.1.6 LAVATORY

If permanent toilet facilities are not available, an adequate number of portable chemical toilets will be provided.

7.1.7 TRASH COLLECTION

Trash collected from the CRZ will be separated as potentially contaminated waste. Trash collected in the support and break areas will be disposed of as non-hazardous waste. Trash receptacles will be set up in the CRZ and in the SZ.

7.2 CHEMICAL EXPOSURE

Preventing exposure to toxic chemicals is a primary concern. Chemical substances can enter the unprotected body by inhalation, skin absorption, ingestion, or through a puncture wound (injection). A contaminant can cause damage at the point of contact or can act systematically, causing a toxic effect at a part of the body distant from the point of initial contact. The COCs and their properties are identified in Table D2.1

Chemical exposures are generally divided into two categories: acute and chronic. Symptoms resulting from acute exposures usually occur during or shortly after exposure to a sufficiently high concentration of a contaminant. The concentration required to produce such effects varies widely from chemical to chemical. The term "chronic exposure" generally refers to exposures to "low" concentrations of a contaminant over a long period of time. The "low" concentrations required to produce symptoms of chronic exposure depend upon the chemical, the duration of each exposure, and the number of exposures. For a given contaminant, the symptoms of an acute exposure may be completely different from those resulting from chronic exposure.

For either chronic or acute exposure, the toxic effect may be temporary and reversible, or may be permanent (disability or death). Some chemicals may cause obvious symptoms such as burning, coughing, nausea, tearing eyes, or rashes. Other chemicals may cause health damage without any such warning signs (this is a particular concern for chronic exposures to low concentrations). Health effects such as cancer or respiratory disease may not become evident for several years or decades after exposure. In addition, some toxic chemicals may be colorless and/or odorless, may dull the sense of smell, or may not produce any immediate or obvious physiological sensations. Thus, a worker's senses or feelings cannot be relied upon in all cases to warn of potential toxic exposure.

The effects of exposure not only depend on the chemical, its concentration, route of entry, and duration of exposure, but may also be influenced by personal factors such as the individual's smoking habits, alcohol consumption, medication use, nutrition, age, and sex.

An important exposure route of concern at the Site is inhalation. The lungs are extremely vulnerable to chemical agents. Even substances that do not directly affect the lungs may pass through lung tissue into the bloodstream, where they are transported to other vulnerable areas of the body. Some toxic chemicals present in the atmosphere may not be detected by human senses (e.g., they may be colorless, odorless, and their toxic effects may not produce any immediate symptoms). Respiratory protection is therefore extremely important if there is a possibility that the work site atmosphere may contain such hazardous substances. Chemicals can also enter the respiratory tract through punctured eardrums. Where this is a hazard, individuals with punctured eardrums should be medically evaluated specifically to determine if such a condition would place them at an unacceptable risk and preclude their working at the task in question.

Direct contact of the skin and eyes by hazardous substances is another important route of exposure. Some chemicals directly injure the skin. Some pass through the skin into the bloodstream where they are transported to vulnerable organs. Abrasions, cuts, heat, and moisture enhance skin absorption. The eye is particularly vulnerable because airborne chemicals can dissolve in its moist surface and be carried to the rest of the body through the bloodstream (capillaries are very close to the surface of the eye). Wearing protective equipment, not using contact lenses in contaminated atmospheres (since they may trap chemicals against the eye surface), keeping hands away from the face, and minimizing contact with liquid and solid chemicals can help protect against skin and eye contact.

Although ingestion should be the least significant route of exposure at the Site, it is important to be aware of how this type of exposure can occur. Deliberate ingestion of chemicals is unlikely; however, personal habits such as chewing gum or tobacco, drinking, eating, smoking cigarettes, and applying cosmetics at the Site may provide a route of entry for chemicals.

The last primary route of chemical exposure is injection, whereby chemicals are introduced into the body through puncture wounds (e.g., by stepping or tripping and falling onto contaminated sharp objects). Wearing safety shoes, avoiding physical hazards, and taking common sense precautions are important protective measures against injection.

Chemical Hazard Controls

Airborne exposure or contact with the contaminants of concern at the Site shall be controlled by:

i) Skin contact with chemicals may be controlled by use of the proper PPE and good housekeeping procedures. The proper PPE (e.g., polycoated Tyvek®, gloves) as described in Section 5.0 of this HASP shall be worn for all activities where contact with potentially harmful media or materials is anticipated.

ii) Monitoring air concentrations for VOCs and particulates shall be conducted in the breathing zone with a PID with an 11.7 eV lamp or greater and a particulate monitor, as described in Section 8.0.

iii) Dust control measures, such as wetting the immediate area, shall be employed when visible dust is generated in active work areas.

iv) Contact the CSHM for additional information regarding a particular product's or activity's exposure hazards.

v) Using respiratory protection as appropriate, in areas known to have concentrations above the specified action level.

Hazard Communication

Personnel required to handle or to use hazardous materials as part of their job duties will be trained and educated in accordance with the Hazard Communication Standard. The training shall include instruction on the safe usage, and handling procedures of hazardous materials, how to read and access Material Safety Data Sheets (MSDSs), and the proper labeling requirements.

The MSDSs for those chemicals in use at the Site will be available to project personnel. The CSHO will be responsible for maintaining a copy of all MSDSs on Site.

7.3 HEAT STRESS

Heat stress is caused by a number of interacting factors including environmental conditions, clothing, workload, etc., as well as the physical and conditioning characteristics of the individual. Since heat stress is one of the most common illnesses associated with heavy outdoor work conducted with direct solar load, and in particular, because wearing PPE can increase the risk of developing heat stress, workers must be capable of recognizing the signs and symptoms of heat-related illnesses. Personnel must be aware of the types and causes of heat-related illnesses and be able to recognize the signs and symptoms of these illnesses in both themselves and their co-workers.

Heat Rashes: Are one of the most common problems in hot work environments. Commonly known as prickly heat, a heat rash is manifested as red papules and usually appears in areas where the clothing is restrictive. As sweating increases, these papules give rise to a prickling sensation. Prickly heat occurs in skin that is persistently wetted by unevaporated sweat, and heat rash papules may become infected if they are not treated. In most cases, heat rashes will disappear when the affected individual returns to a cool environment.

Heat Cramps: Are usually caused by performing hard physical labor in a hot environment. These cramps have been attributed to an electrolyte imbalance caused by sweating. It is important to understand that cramps can be caused both by too much and too little salt.

Cramps appear to be caused by the lack of water replenishment. Because sweat is a hypotonic solution (plus or minus 0.3 percent NaCl), excess salt can build up in the body if the water lost through sweating is not replaced. Thirst cannot be relied on as a guide to the need for water; instead, water must be taken every 15 to 20 minutes in hot environments.

Under extreme conditions, such as working for 6 to 8 hours in heavy protective gear, a loss of sodium may occur. Drinking commercially available carbohydrate-electrolyte replacement liquids is effective in minimizing physiological disturbances during recovery.

Heat Exhaustion: Occurs from increased stress on various body organs due to inadequate blood circulation, cardiovascular insufficiency, or dehydration. Signs and symptoms include pale, cool, moist skin, heavy sweating, dizziness, nausea, headache, vertigo, weakness, thirst, and giddiness. Fortunately, this condition responds readily to prompt treatment.

Heat exhaustion should not be dismissed lightly, however, for several reasons. One is that the fainting associated with heat exhaustion can be dangerous because the victim may be operating machinery or controlling an operation that should not be left unattended; moreover, the victim may be injured when he or she faints. Also, the signs and symptoms seen in heat exhaustion are similar to those of heat stroke, which is a medical emergency.

Workers suffering from heat exhaustion should be removed from the hot environment, be given fluid replacement, and be encouraged to get adequate rest.

Heat Stroke: Is the most serious form of heat stress. Heat stroke occurs when the body's system of temperature regulation fails and the body's temperature rises to critical levels. This condition is caused by a combination of highly variable factors, and its occurrence is difficult to predict.

Heat stroke is a medical emergency. The primary signs and symptoms of heat stroke are confusion, irrational behavior, loss of consciousness, convulsions, a lack of sweating (usually), hot, dry skin, and an abnormally high body temperature, e.g., a rectal temperature of 41°C (105.8°F). If body temperature is too high, it causes death. The elevated metabolic temperatures caused by a combination of workload and environmental heat load, both of which contribute to heat stroke, are also highly variable and difficult to predict.

If a worker shows signs of possible heat stroke, professional medical treatment should be obtained immediately. The worker should be placed in a shady area and the outer clothing should be removed. The worker's skin should be wetted and air movement around the worker should be increased to improve evaporative cooling until professional methods of cooling are initiated and the seriousness of the condition can be assessed. Fluids should be replaced as soon as possible. The medical outcome of an episode of heat stroke depends on the victim's physical fitness and the timing and effectiveness of first aid treatment.

Regardless of the worker's protestations, no employee suspected of being ill from heat stroke should be sent home or left unattended unless a physician has specifically approved such an order.

Proper training and preventive measures will help avert serious illness and loss of work productivity. Preventing heat stress is particularly important because once someone suffers from heat stroke or exhaustion, that person may be predisposed to additional heat injuries.

Heat Stress Safety Precautions: Heat stress monitoring and work rest cycle implementation should commence when the ambient adjusted temperature exceeds 72°F. A minimum work rest regimen and procedures for calculating ambient adjusted temperature are described below.

Adjusted Temperature(1)	*Work-Rest Regimen Normal Work Ensemble*(2)	*Work-Rest Regimen Impermeable Ensemble*
90°C (32.°C) or above	After each 45 minutes of work	After each 15 minutes of work
87.5° to 90°F (30.8°C to 32.2°C)	After each 60 minutes of work	After each 30 minutes of work
82.5° to 87.5°F (28.1° to 30.8°C)	After each 90 minutes of work	After each 60 minutes of work
77.5° to 82.5°F (25.3° to 28.1°C)	After each 120 minutes of work	After each 90 minutes of work
72.5° to 77.5°F (30.8° to 32.2°C)	After each 150 minutes of work	After each 120 minutes of work

Notes:

(1) Calculate the adjusted air temperature (ta adj) by using this equation: ta adj °F=ta °F + (13 x percent sunshine). Measure air temperature (ta) with a standard thermometer, with the bulk shielded from radiant heat. Estimate percent sunshine by judging what percent of the time the sun is not covered by clouds that are thick enough to produce a shadow (100 percent sunshine = no cloud cover and a sharp, distinct shadow; 0 percent sunshine = no shadows).

(2) A normal work ensemble consists of cotton coveralls or other cotton clothing with long sleeves and pants.

In order to determine if the work rest cycles are adequate for the personnel and specific Site conditions, additional monitoring of individual heart rates will be conducted during the rest cycle. To check the heart rate, count the radial pulse for 30 seconds at the beginning of the rest period. If the heart rate exceeds 110 beats per minute, shorten the next work period by one-third and maintain the same rest period.

Additionally, one or more of the following control measures can be used to help control heat stress and are mandatory if any Site worker has a heart rate (measure immediately prior to rest period) exceeding 115 beats per minute:

i) Project personnel will be encouraged to drink plenty of water and electrolyte replacement fluids throughout the day.

ii) On-Site drinking water will be kept cool (50 to 60°F).

iii) A work regimen that will provide adequate rest periods for cooling down will be established, as required.

iv) All personnel will be advised of the dangers and symptoms of heat stroke, heat exhaustion, and heat cramps.

v) Cooling devices such as vortex tubes or cooling vests should be used when personnel must wear impermeable clothing in conditions of extreme heat.

vi) Project personnel shall be instructed to monitor themselves and co-workers for signs of heat stress and to take additional breaks as necessary.

vii) A shaded rest area must be provided. All breaks should take place in the shaded rest area.

viii) Project personnel must not be assigned to other tasks during breaks.

ix) Project personnel must remove impermeable garments during rest periods. This includes Tyvek® garments.

x) All project personnel must be informed of the importance of adequate rest, acclimation (usually takes about 2 hours/day for 1 to 2 weeks to become acclimated), and proper diet in the prevention of heat stress disorders.

7.4 SUN EXPOSURE

Overexposure to sunlight is a common concern when field activities occur during warm weather conditions. Overexposure can occur on clear, sunny days as well as on overcast and cloudy days. Ultraviolet (UV) rays from the sun can cause skin damage or sunburn, but can also result in vision problems, allergic reactions, and other skin concerns. Two types of UV rays are emitted from the sun: UVA and UVB rays.

UVB rays cause sunburn, skin cancer, and premature aging of the skin. UVB rays stimulate tanning but are also linked to other problems such as impaired vision, skin rashes, and some allergic and other reactions to certain drugs. Extra care should be taken if activities are to be conducted on or near water. Sunlight reflected off the surface of the water is intensified resulting in accelerated effects. The following steps should be taken to protect against overexposure to sunlight:

i) Always use sunscreen: Apply a broad-spectrum sunscreen with Sun Protection Factor (SPF) of at least 15 or higher liberally on exposed skin. Reapply every 2 hours or more. Even waterproof sunscreen can come off when you towel off or sweat.

ii) Cover up: Wearing tightly woven, loose-fitting, and full-length clothing is a good way to protect your skin from UV rays.

iii) Wear a hat: A hat with a wide brim offers good sun protection to your eyes, ears, face, and the back of your neck – areas particularly prone to overexposure to the sun.

iv) Wear sunglasses that block 99 to 100 percent of UV radiation: Sunglasses that provide 99 to 100 percent UVA and UVB protection will greatly reduce sun exposure that can lead to cataracts and other eye damage. Check the label when buying sunglasses.

v) Seek shade: Shade is a good source of protection, but keep in mind that shade structures (e.g., trees, umbrellas, canopies) do not offer complete sun protection.

vi) Limit time in the midday sun: The sun's rays are strongest between 10 a.m. and 4 p.m. Whenever possible, limit exposure to the sun during these hours.

7.5 COLD STRESS

Cold stress is similar to heat stress in that it is caused by a number of interacting factors including environmental conditions, clothing, workload, etc., as well as the physical and conditioning characteristics of the individual. Fatal exposures to cold have been reported in individuals failing to escape from low environmental air temperatures or from immersion in low temperature water. Hypothermia, a condition in which the body's deep core temperature falls significantly below 98.6°F (37°C), can be life threatening. A drop in core temperature to 95°F (35°C) or lower must be prevented.

Air temperature is not sufficient to determine the cold hazard of the work environment. The wind chill must be considered as it contributes to the effective temperature and insulating capabilities of clothing. The equivalent chill temperature should be used when estimating the combined cooling effect of wind and low air temperatures on exposed skin or when determining clothing insulation requirements to maintain the body's core temperature.

The body's physiologic defense against cold includes constriction of the blood vessels, inhibition of the sweat glands to prevent loss of heat via evaporation, glucose production, and involuntary shivering to produce heat by rapid muscle contraction.

The frequency of accidents increases with cold temperature exposures as the body's nerve impulses slow down, individuals react sluggishly, and numb extremities make for increased clumsiness. Additional safety hazards include ice, snow blindness, reflections from snow, and possible skin burns from contact with cold metal.

Pain in the extremities may be the first early warning of danger to cold stress. During exposure to cold, maximum severe shivering develops when the body temperature has fallen to 95°F (35°C). This must be taken as a sign of danger to the individuals on Site, and cold exposures should be immediately terminated for any individual when severe shivering becomes evident. Useful physical or mental work is limited when severe shivering occurs.

Predisposing Factors for Cold Stress

There are certain predisposing factors that make an individual more susceptible to cold stress. It is the responsibility of the project team members to inform the CSHO/SS to monitor an individual, if necessary, or use other means of preventing/reducing the individual's likelihood of experiencing a cold related illness or disorder.

Predisposing factors that will increase an individual's susceptibility to cold stress are listed below:

- **Dehydration:** The use of diuretics and/or alcohol, or diarrhea can cause dehydration. Dehydration reduces blood circulation to the extremities.
- **Fatigue during Physical Activity:** Exhaustion reduces the body's ability to constrict blood vessels. This results in the blood circulation occurring closer to the surface of the skin and the rapid loss of body heat.
- **Age:** Some older and very young individuals may have an impaired ability to sense cold.
- **Poor Circulation:** Vasoconstriction of peripheral vessels reduces blood flow to the skin surface.
- **Heavy Work Load:** Heavy workloads generate metabolic heat and make an individual perspire even in extremely cold environments. If perspiration is absorbed by the individual's clothing and is in contact with the skin, cooling of the body will occur.

- **The Use of PPE:** PPE usage that traps sweat inside the PPE may increase an individual's susceptibility to cold stress.
- **Lack of Acclimatization:** Acclimatization, the gradual introduction of workers into a cold environment, allows the body to physiologically adjust to cold working conditions.
- **History of Cold Injury:** Previous injury from cold exposures may result in increased cold sensitivity.

Prevention of Cold Stress

There are a variety of measures that can be implemented to prevent or reduce the likelihood of individuals developing cold related ailments and disorders. These include acclimatization, fluid and electrolyte replenishment, eating a well balanced diet, wearing warm clothing, the provision of shelter from the cold, thermal insulation of metal surfaces, adjusting work schedules, and personnel education.

- **Acclimatization:** Acclimatization is the gradual introduction of workers into the cold environment to allow their bodies to physiologically adjust to cold working conditions. However, the physiological changes are usually minor and require repeated uncomfortably cold exposures to induce them.
- **Fluid and Electrolyte Replenishment:** Cold, dry air can cause individuals to lose significant amounts of water through the skin and lungs. Dehydration affects the flow of blood to the extremities and increases the risk of cold injury. Warm, sweet, caffeine-free, non-alcoholic drinks and soup are good sources to replenish body fluids.
- **Eating a Well Balanced Diet:** Restricted diets including low salt diets can deprive the body of elements needed to withstand cold stress. Eat high-energy foods throughout the day.
- **Warm Clothing:** It is beneficial to maintain air space between the body and outer layers of clothing in order to retain body heat. However, the insulating effect provided by such air spaces is lost when the skin or clothing is wet.
- **Work/Rest Regimes:** Schedule work during the warmest part of the day, if possible. Rotate personnel and adjust the work/rest schedule to enable individuals to recover from the effects of cold stress.

The parts of the body most important to keep warm are the feet, hands, head, and face. As much as 40 percent of body heat can be lost when the head is exposed.

7.6 EARTHWORK - EXCAVATION AND TRENCHING

Project activities will involve excavation and stockpiling of contaminated soil. Prior to initiating excavation activities, the CS is responsible for making sure that the following conditions are in place:

i) Ensure that all above and underground utilities have been properly located prior to initiating work activities

ii) Ensure that approved protective shoring devices are available for use at the Site if this means of protection is going to be used

iii) Ensure that a Confined Space Entry Permit has been put in place prior to allowing project personnel to enter any excavation

iv) Ensure that the local Community Responders have been contacted and confirmed that they can provide emergency rescue services in support of the project for permit-required confined space work or that the selected contractor has staff on Site who meet the annual training requirements for providing rescue services in permit-required confined spaces

v) Ensure that the proper fencing materials are available to secure each active work area

Before excavation begins, the existence and location of underground utilities (e.g., pipe, electrical equipment, and gas lines) will be determined. This will be done, if possible, by contacting the appropriate client representative to mark the location of the lines. If the client's knowledge of the area is incomplete, an appropriate device, such as a magnetometer, will be used to locate the line. A Property Access Utility Clearance Form shall be developed and used to document that nearby utilities have been marked on the ground and that the excavation site has been cleared. The form shall be in the possession of the SS prior to commencement of the excavation.

The selected contractor's competent person shall observe all excavation and trenching operations where project personnel will enter. The competent person shall be responsible for evaluating, classifying and inspecting excavation and trenching operations to prevent possible cave-in and entrapment, and to avoid other hazards presented by excavation activities.

It is the responsibility of the CS and CSHO to implement the following components of the selected contractor's Excavation and Trenching Safety Program as they relate to project activities:

i) Ensure that all excavations are completed in accordance with the approved Excavation and Trenching Safety Program

ii) Ensure that the proper protective materials and equipment are available and being used to complete the excavation and/or trenching procedures

iii) Ensure that the necessary inspections of the excavation are completed as required

Personnel required to enter or work in the excavation at any time must be protected from the hazards of cave-ins. This requires the use of sloping and/or shoring systems that comply with State and Federal OSHA standards. Excavation and trenching operations require pre-planning to develop appropriate designs for such systems. The selected contractor will make the appropriate plans.

The estimated location of all underground installations shall be determined before excavation begins. If there are any nearby buildings, walls, sidewalks, trees, or roads that may be threatened or undermined by the excavation, where the stability of any of these items may be endangered by the excavation, they must be removed or supported by adequate shoring, bracing, or underpinning.

Excavations may not go below the base of footings, foundations, or retaining walls, unless they are adequately supported or a person who is registered as a PE has determined that they will not be affected by the soil removal. OSHA recommends using civil engineers or those with licenses in a related discipline and experience in the design and use of sloping and shoring systems. PE qualifications shall be documented in writing and available at the Site.

The selected contractor's Excavation and Trenching Safety Program and the OSHA Excavation Standard (29 CFR 1926 Subpart P) will be followed during all excavation activities and provide detailed information regarding such activities.

Access and Egress

Personnel access and egress from trench and/or excavations are as follows:

i) A stairway, ladder, ramp, or other means of egress must be provided in excavations greater than 4 feet deep and for every 25 feet of lateral travel

ii) All ladders shall extend 3 feet above the top of the excavation

Atmosphere Monitoring and Testing

Air quality is measured by the following three parameters:

Oxygen concentration

Flammability

Presence of toxic substances

There is a potential for hazardous atmospheres to exist in each proposed excavation. As such, project personnel will not be allowed to be exposed to any hazardous atmosphere. Whenever potentially hazardous atmospheres are suspected in excavations, the competent person shall test the atmosphere. A gas monitor capable of measuring the oxygen level, lower explosive limit (LEL) and toxicity will be used to take readings prior to and while workers are in any excavation. A hazardous atmosphere is defined as one that could contain less than 19.5 percent of oxygen, concentrations of hazardous substances greater than their permissible exposure level (PEL) including carbon monoxide and a LEL reading greater than 10 percent. A forced air ventilator will first be used to pump fresh air into the excavation and to push out (purge) any potentially contaminated air.

In the event that an unusual odor or liquid is suspected in excavations, the competent person shall stop work and arrange for air quality assessment and mitigation, if necessary.

Daily Inspections

The competent person shall perform daily inspections of excavations, the adjacent areas, and all protective systems for situations that could potentially result in slope failure.

The competent person shall inspect, evaluate, and document the inspection of the excavation on an Excavation Inspection Checklist at the following intervals:

i) Prior to the start of work, after each extended halt in work, and as needed throughout the shift as new sections of the excavation are opened

ii) After every rainstorm and other natural or man-made event that may increase the load on the walls of the excavation, or otherwise affect their stability

The competent person shall stop the work and instruct all project personnel to leave the excavation when any potential hazards are detected. The competent person has the ***authority*** to immediately suspend work if any unsafe condition is detected.

7.7 HEAVY EQUIPMENT SAFETY

Personnel operating heavy equipment (such as backhoes) and personnel working in the vicinity of heavy equipment shall adhere to the following practices:

i) Heavy equipment is to be inspected when equipment is initially mobilized/delivered to a job site or after it is repaired and returned to service to ensure that it meets all manufacturer and OSHA specifications.

ii) Heavy equipment is to be inspected on a daily basis. Documentation of this daily pre-operational inspection is to be filed with the project files.

iii) Heavy equipment is only to be operated by authorized, competent operators.

iv) Seat belts are to be provided on heavy equipment that is not designed for stand up operation.

v) Equipment/vehicles whose payload is loaded by a crane, excavator, loader, etc. will have a cab shield and/or canopy to protect the operator.

vi) Personnel will not be raised/lowered in buckets.

vii) Personnel will not ride on fender steps or any place outside the cab.

viii) Before leaving the equipment controls, ensure that the equipment is in its safe resting position. For a backhoe, apply the parking brake, put the front loader bucket down on ground level, and ensure that the rear excavator bucket is locked in the travel position. Bulldozers and scraper blades, loader buckets, dump bodies, and similar equipment will be fully lowered or blocked when not in use.

ix) Before raising any booms, buckets, etc., check for overhead obstructions.

x) Project personnel involved in the operation shall not wear any loose-fitting clothing, which has the potential to be caught in moving machinery.

xi) Personnel shall wear high visibility safety vests, steel-toed shoes, safety glasses, hearing protection, and hard hats during heavy equipment operations.

xii) When moving heavy equipment or when working in tight quarters, a spotter will be used.

7.8 DRILLING SAFETY

The primary physical hazards for this activity are associated with the use of drilling equipment. Rig accidents can occur as a result of improperly placing the rig on uneven or unstable terrain, or failing to adequately secure the rig prior to the start of operations. Underground and overhead utility lines can create hazardous conditions if contacted by drilling equipment. Tools and equipment such as elevators, cat lines, and wire rope have the potential of striking, pinning, or cutting personnel.

Wire Rope: Worn or frayed wire rope presents a laceration hazard if loose wires protrude from the main bundle.

Cat Lines: Cat lines are used on drilling rigs to hoist material. Accidents that occur during cat line operations may injure personnel doing the rigging as well as injure the operator. Minimal hoisting control causes sudden and erratic load movements, which may result in hand and foot injuries.

Working Surfaces: The most common type of accident that occurs in material handling operations is the "caught between" situation when a load is being handled and a finger or toe gets caught between two objects. Rolling stock can shift and/or fall from a pipe rack or truck bed.

7.8.1 DRILLING SAFETY PROCEDURES

Drill Crews: All drillers must possess required State or local licenses to perform such work. All members of the drill crew shall receive Site-specific training prior to beginning work.

The driller is responsible for the safe operation of the drill rig as well as the crew's adherence to the requirements of their HASP. The driller must ensure that all safety equipment is in proper condition and is properly used. The members of the crew must follow all instructions of the driller, wear all PPE, and be aware of all hazards and control procedures. The drill crews must participate in the Daily Safety Meetings and be aware of all emergency procedures.

Rig Inspection: Each day, prior to the start of work, the driller and/or drill crew must inspect the drill rig and associated equipment. The following items must be inspected:

i) Vehicle condition

ii) Proper storage of equipment

iii) Condition of all wire rope

iv) Fire extinguisher

v) First aid kit

Drill Rig Setup: The drill rig must be properly blocked and leveled prior to raising the derrick. The wheels, which remain on the ground, must be chocked. The leveling jacks shall not be raised until the derrick is lowered. The rig shall be moved only after the derrick has been lowered.

Site Drilling Rules: Before drilling, the existence and location of underground utilities (e.g., pipe, electrical equipment, and gas lines) will be determined. This will be done, if possible, by contacting the appropriate client representative to mark the location of the lines. If the client's knowledge of the area is incomplete, an appropriate device, such as a magnetometer, will be used to locate the line. A Property Access Utility Clearance Form shall be developed and used to document that nearby utilities have been marked on the ground and that the drill site has been cleared. The form shall be in the possession of the SS prior to commencement of the intrusive investigation.

Under no circumstances will personnel be permitted to ride the traveling block or elevators, nor will the cat line be used as a personnel carrier.

Overhead Electrical Clearances: If drilling is conducted in the vicinity of overhead power lines, the power to the lines must be shut off or the equipment must be positioned and blocked such that no part, including cables, can come within the minimum clearances as follows:

Nominal System Voltage	***Minimum Required Clearance***
0 to 50 kV	10 Feet
51 to 100 kV	12 Feet
101 to 200 kV	15 Feet
201 to 300 kV	20 Feet
301 to 500 kV	25 Feet
501 to 750 kV	35 Feet
751 to 1,000 kV	45 Feet

When the drill rig is in transit with the boom lowered and no load, the equipment clearance must be at least 4 feet for voltages less than 50 kV, 10 feet for voltages of 50 kV to 345 kV, and 16 feet for voltages above 345 kV.

Rig Set Up: All well sites will be inspected by the driller prior to the location of the rig to verify a stable surface exists. This is especially important in areas where soft, unstable terrain is common.

All rigs will be properly blocked and leveled prior to raising the derrick. Blocking provides a more stable drilling structure by evenly distributing the weight of the rig. Proper blocking ensures that differential settling of the rig does not occur.

When the ground surface is soft or otherwise unstable, wooden blocks, at least 24 inches by 24 inches and 4 inches to 8 inches thick shall be placed between the jack swivels and the ground. The emergency brake shall be engaged, and the wheels that are on the ground shall be chocked.

Hoisting Operations: Drillers should never engage the rotary clutch without watching the rotary table and ensuring it is clear of personnel and equipment.

Unless the draw-works is equipped with an automatic feed control, the brake should not be left unattended without first being tied down.

Auger strings or casing should be picked up slowly.

During instances of unusual loading of the derrick or mast, such as when making an unusually hard pull, only the driller should be on the rig floor, no one else should be on the rig or derrick.

The driller should test the brakes on the draw-works of the drill rig each day. The brakes should be thoroughly inspected by a competent individual each week.

A hoisting line with a load imposed should not be permitted to be in direct contact with any derrick member or stationary equipment, unless it has been specifically designed for line contact.

Workers should never stand near the borehole when any wire device is being run.

Hoisting control stations should be kept clean and controls labeled as to their functions.

Cat Line Operations: Only experienced workers will be allowed to operate the cathead controls. The kill switch must be clearly labeled and operational prior to operation of the cat line. The cathead area must be kept free of obstructions and entanglements.

The operator should not use more wraps than necessary to pick up the load. More than one layer of wrapping is not permitted.

Personnel should not stand near, step over, or go under a cable or cat line, which is under tension.

Personnel rigging loads on cat lines shall:

i) Keep out from under the load
ii) Keep fingers and feet where they will not be crushed
iii) Be sure to signal clearly when the load is being picked
iv) Use standard visual signals only and not depend on shouting to co-workers
v) Make sure the load is properly rigged, since a sudden jerk in the cat line will shift or drop the load

Wire Rope: When two wires are broken or rust or corrosion is found adjacent to a socket or end fitting, the wire rope shall be removed from service or resocketed. Special attention shall be given to the inspection of end fittings on boom support, pendants, and guy ropes.

Wire rope removed from service due to defects shall be cut up or plainly marked as being unfit for further use as rigging.

Wire rope clips attached with u-bolts shall have the u-bolts on the dead or short end of the rope; the clip nuts shall be retightened immediately after initial load carrying use and at frequent intervals thereafter.

When a wedge socket fastening is used, the dead or short end of the wire rope shall have a clip attached to it or looped back and secured to it by a clip; the clip shall not be attached directly to the live end.

Protruding ends of strands in splices on slings and bridles shall be covered or blunted. Except for eye splices in the ends of wires and for endless wire rope slings, wire rope used in hoisting, lowering, or pulling loads, shall consist of one continuous piece without knot or splice.

An eye splice made in any wire rope shall have not less than five full tucks.

Knots shall not secure wire rope. Wire rope clips shall not be used to splice rope.

Eyes in wire rope bridles, slings, or bull wires shall not be formed by wire clips or knots.

Auger/Drill Pipe Handling: Auger/drill pipe sections shall be transported by cart or carried by two persons. Individuals should not carry auger/drill pipe sections without assistance.

Workers should not be permitted on top of the load during loading, unloading, or transferring of rolling stock.

When equipment is being hoisted, personnel should not stand where the bottom end of the equipment could whip and strike them.

Augers/drill pipe stored in racks, catwalks, or on flatbed trucks should be secured to prevent rolling.

7.9 CRANE SAFETY

The use of cranes by selected contractors may take place during project activities. The selected contractor will address crane safety plan procedures within their Site-specific HASP. The procedures will be compliant with the OSHA Standard for Cranes and Derricks in Construction (1926.1400 - .1442).

There are many hazards associated with using cranes. Potential contact with overhead electrical lines and potential crushing of workers who may wander into the swing path radius of the crane are just two. OSHA has specific standards that deal with these issues. At a minimum, when cranes are brought on Site for use, the selected contractor will ensure that adequate barriers are installed around the crane to ensure workers will not be able to accidentally wander into the swing radius. Additionally, the contractor will provide the CSHO with a copy of the cranes annual inspection report, a copy of the crane operator's certification and proof that the individual(s) performing the daily crane inspection and hand signaling activities are qualified.

Rigging personnel and crane operators shall adhere to the following minimum practices:

i) Equipment shall be inspected daily by the operator in accordance with the OSHA Standard to ensure that there are no operational problems.

ii) Before leaving the controls, ensure that the crane is in a safe position. Before leaving the vicinity of the crane, shut down the crane engine.

iii) Before raising the mast and/or load, check for overhead obstructions.

iv) Before the mast of a crane is raised, the crane must first be leveled and stabilized with leveling jacks and cribbing. Re-level the crane if it settles after initial setup. Lower the mast only when the leveling jacks are down and do not raise the leveling jack pads until the mast is lowered completely.

v) Personnel shall wear steel toed shoes, safety glasses, work gloves, hearing protection, and hard hats during crane operations.

vi) The swing radius and lifting area shall be roped off, marked or posted, to keep the area clear of pedestrian traffic or spectators.

vii) Personnel should be instructed in the location and safe work practices associated with the swing radius of the crane.

7.10 DEMOLITION HAZARDS AND CONTROLS

Demolition activities can present a variety of hazards including severe injury and even death. Methods that minimize the hazards such as a deliberate controlled collapse should be employed whenever possible. The use of a balling machine, heavy duty grab, pusher arm or shears, can make working at heights unnecessary, but the contractor must ensure that sufficient area is available for their safe use and that the equipment is capable of performing the required duty.

Safe working procedures for demolition work include the following:

i) Determine the sequence and method of demolition, with details on means of access and equipment requirements.

ii) Determine specific details of any pre-weakening of structures, if required.

iii) Ensure that measures are in place that will protect all project personnel working at the Site and the public.

iv) Develop details for the removal or making safe of electric, gas, or other services.

v) Determine methods of dealing with flammable materials and gases which may remain from previous processes or storage.

vi) Determine methods of determining the presence of hazardous substances, the means of disposal of such substances and the requirements for any protective equipment.

vii) Make arrangements for controlling transport used for the removal of waste.

viii) Identify project personnel with special responsibilities for the control and co-ordination of safety arrangements.

ix) Survey and then remove asbestos or other toxic waste before starting to demolish any structure. The asbestos survey will be performed by a certified technician.

x) Set up restricted areas and safe distances affected by each phase of work where access will need to be restricted or made safe. Restrictions and control may be necessary during:

   a) The dropping of debris

   b) The operation of heavy equipment

   c) Pre-weakening activities and

   d) Deliberate collapse or pulling over of buildings

xi) Control all health hazards that may arise from the inhalation, ingestion, and absorption (through the skin) of hazardous materials. Noise and vibration must also be considered.

xii) Ensure that a competent person directs all demolition activities.

7.10.1 REMOVAL OF ABOVE GROUND STORAGE TANKS

The CSHO shall ensure that the tank is vapor free prior to the tank's removal. Vapor free means the internal atmosphere of the tank must be less than 10 percent of the Lower Explosive Limit (LEL) or less than 10 percent oxygen (O_2) concentration as prescribed by the following methodology.

Degassing

Degassing the tank may be performed by purging the tank using an eductor or diffuser. An extension to the eductor shall be installed at a minimum of 12 feet above grade in order to discharge vapors from the tank to atmosphere. The suction line for the eductor must extend to the bottom of the tank to effectively create a vacuum at the lowest point of the tank. This will ensure the proper evacuation of vapors from the tank. The tank will be monitored routinely to ensure that the internal atmosphere is less than 10 percent of the Lower Explosive Limit (LEL).

Inerting

Inerting the tank is a process of displacing oxygen within the tank using an inert gas. Inerting may be performed by introducing nitrogen into the tank or inserting solid carbon dioxide (dry ice) on the bottom of the tank. Allow the inerting media to displace the oxygen to a level below 10 percent O_2 concentration in the vapor zone.

Vent pipes, fill pipes, or tanks may not be cut or torched using any device until the tank has been purged of explosive gases at less than 10 percent LEL.

7.11 WORKING NEAR OBJECTS WITH ELEVATED TEMPERATURES

Serious potential physical injury, most noticeably burns, can occur during this project by the nature of the work being performed. There is a potential for accidental contact with soil in excess of 400°F and hot piping or other pieces of hot equipment that can cause burns. To guard against these potential burn injuries, it is imperative that all project personnel be thoroughly familiar with the areas where high temperatures are located, be thoroughly trained as to the proper PPE that will need to be worn, and the handling procedures that are to be followed for designated tasks. Refer to each JSA for specific PPE that is to be worn and the procedures that will be followed. It is important that all project personnel stay alert when working in areas with elevated temperatures as they will be expected to keep an eye on their coworkers in helping to control this hazard. Reviewing, understanding, and abiding by this written HASP is probably the first and most important aspect in knowing how to control this potential hazard at the Site.

7.12 CONFINED SPACES

A confined space provides the potential for unusually high concentrations of contaminants, explosive atmospheres, oxygen deficient atmospheres, potential cave-ins, limited visibility, and restricted movement. Each excavation that project personnel must enter that is greater than 4 feet in depth will be treated as a confined space. This section establishes requirements for safe entry into, continued work in, and safe exit from confined spaces. Additional information regarding confined space entry can be found in 29 CFR 1926.21, 29 CFR 1910.146, and NIOSH-106.

It may be necessary to enter confined spaces (e.g., excavations) during project activities. Prior to initiating these activities the CSHO will pre-plan for potential emergency rescue. This may involve meeting with the local emergency responders to pre-plan emergency rescue activities per OSHA's standard for permit-required confined spaces. All confined space entry work will follow the guidelines presented in the selected contractor's approved Confined Space Entry Program.

Site-Specific Confined Space Entry Procedures

All confined space entries shall be evaluated to determine the entry status as a permit or non-permit confined space. Prior to entry the following shall be conducted:

i) The atmosphere of the space shall be tested for oxygen, LEL, and toxic concentrations

ii) The appropriate level of protection shall be determined by conducting a task hazard analysis

iii) A forced air ventilator will be used to vent hazardous atmospheres and to introduce fresh air into each excavation and may be used to maintain air quality in excavations at appropriate working levels

iv) At a minimum, two persons trained in confined space entry shall be available for the entry, which includes an entrant, and an attendant/supervisor

v) The confined space entry permit shall be filled out, signed by the entry supervisor, and posted at the confined space

vi) Rescue services as identified on the confined space permit shall be available, verified, and notified of the entry

During entry operations, air monitoring shall be conducted continuously and communication between the attendant and the entrant shall be maintained. The confined space entry permit(s) shall be maintained in a file located at the Site. It is noted that the excavation for source area soil removal is expected to be sufficiently large and equipped with multiple points of egress such that the excavation will be defined as a non-permit confined space.

7.13 FALL HAZARDS

Site personnel may be exposed to fall hazards greater than 6 feet above another surface and where there are no barriers in place to protect them. These hazards may be found next to each excavation and on top of any of the structures (buildings) that are on Site. Project personnel exposed to fall hazards greater than 6 feet will follow the selected contractor's Fall Protection Program.

The CSHO, CS and/or SS will control all fall hazards as they relate to project activities. It is their responsibility to implement the following components of the project's fall protection requirements as they relate to project activities:

i) Ensure appropriate fall protection systems are utilized for project activities.

ii) Verify that all project personnel are fully protected from fall hazards.

iii) Ensure that necessary materials for proper fall protection (PPE including a harness and lanyard etc.) are available for project activities.

iv) Provide for proper inspection and replacement of fall protection devices.

v) Provide and ensure that all personnel have received the required training in the use, inspection, and the need for fall protection devices (proper fit, proper use, and proper inspection procedures). Note: This includes additional training required for the usage of ladders, scaffolds, and manlifts/aerial lifts.

vi) Develop a written emergency rescue plan for retrieval of any worker who falls and is suspended in air while wearing personal fall arrest equipment.

Slip/Trip/Hit/Fall Injuries

Slip/trip/hit/fall injuries are the most frequent of all injuries to workers. They occur for a wide variety of reasons, but can be minimized by the following prudent practices:

i) Spot check the work area to identify hazards

ii) Establish and utilize a pathway which is free of slip and trip hazards

iii) Beware of trip hazards such as slippery and uneven surfaces or terrain

iv) Carry only loads which you can see over

v) Keep work areas clean and free of clutter, especially walkways

vi) Communicate hazards to project personnel

7.14 NOISE

Exposure to noise over the OSHA action level can cause temporary impairment of hearing; prolonged and repeated exposure can cause permanent damage to hearing. The risk and severity of hearing loss increases with the intensity and duration of exposure to noise. In addition to damaging hearing, noise can impair voice communication, thereby increasing the risk of accidents on Site. The selected contractor's Hearing Conservation Program will be implemented for affected project personnel.

Control: All personnel must wear hearing protection with a Noise Reduction Rating (NRR) of at least 20 when noise levels exceed 85 dBA. When it is difficult to hear a co-worker at normal conversation distance, the noise level is approaching or exceeding

85 dBA, and hearing protection is necessary. All Site personnel who may be exposed to noise must also receive baseline and annual audiograms and training as to the causes and prevention of hearing loss.

Whenever possible, equipment that does not generate excessive noise levels will be selected for this project. If the use of noisy equipment is unavoidable, barriers or increased distance will be used to minimize worker exposure to noise, if feasible.

7.15 ELECTRICAL HAZARDS

Electricity may pose a particular hazard to project personnel due to the use of portable electrical equipment. When electrical work is needed, a qualified electrician must perform it.

General electrical safety requirements include:

i) All electrical wiring and equipment must be a type listed by Underwriters Laboratory (UL), Factory Mutual Engineering Corporation (FM), or other recognized testing or listing agency.

ii) All installations must comply with the National Electrical Safety Code (NESC), the National Electrical Code (NEC), or United States Coast Guard regulations.

iii) A multi-conductor cord having an identified grounding conductor and a multi-contact polarized plug-in receptacle must ground portable and semi-portable tools and equipment.

iv) Tools protected by an approved system of double insulation, or its equivalent, need not be grounded. Double insulated tools must be distinctly marked and listed by UL or FM.

v) Live parts of wiring or equipment must be guarded to prevent persons or objects from touching them.

vi) Electric wire or flexible cord passing through work areas must be covered or elevated to protect it from damage by foot traffic, vehicles, sharp corners, projections, or pinching.

vii) All circuits must be protected from overload.

viii) Temporary power lines, switch boxes, receptacle boxes, metal cabinets, and enclosures around equipment must be marked to indicate the maximum operating voltage.

ix) Plugs and receptacles must be kept out of water unless of an approved submersible construction.

x) All extension outlets must be equipped with ground fault circuit interrupters (GFCIs).

xi) Attachment plugs or other connectors must be equipped with a cord grip and be constructed to endure rough treatment.

xii) Extension cords or cables must be inspected prior to each use, and replaced if worn or damaged. Cords and cables must not be fastened with staples, hung from nails, or suspended by bare wire.

xiii) Flexible cords must be used only in continuous lengths without splice, with the exception of molded or vulcanized splices made by a qualified electrician.

xiv) The OSHA requirements for electrical safety will be adhered to as minimum requirements to be followed by all Site personnel, including subcontractors. Electrical inspections are to occur during initial Site setup and monthly thereafter. These inspections are to be documented via either the CS's and/or the SS's logbook, the CSHO's logbook, or on specific forms that the selected contractor may have as part of their Electrical Safety Program.

7.16 CONTROL OF HAZARDOUS ENERGY

During operation and maintenance (O&M) activities of the soil treatment system, the procedures set forth in this section for the control of hazardous energy shall be followed to prevent accidental energization of equipment and injury to project personnel who are performing maintenance activities on the soil treatment system. In addition to the guidelines set forth in this section, project personnel will also need to follow the selected Contractor's SOP on lockout/tagout and the equipment specific energy control procedures.

OSHA's "The Control of Hazardous Energy Sources" standard, 29 CFR 1910.147, outlines lockout/tagout requirements for:

i) Identification of hazardous energy sources

ii) Safe shutdown and start-up

iii) Isolation

iv) Dissipation of hazardous energy

Lockout/tagout covers the servicing and maintenance of all machines and equipment in which the unexpected start-up or the release of stored energy could cause possible injury to project personnel.

It is mandatory to develop, document, and use procedures to control potentially hazardous energy sources. Because the project work varies by nature, specific procedures must be developed to complete each project when a hazardous energy source is a concern.

Personnel Classifications

The standard differentiates between individuals authorized to implement lockout/tagout and those who are affected by it. As the definitions states:

i) Authorized individuals are those who physically lock or tag out a piece of equipment so they can perform service or maintenance. In some cases, the affected and authorized individual can be the same person.

ii) Affected personnel are those who meet either of two criteria:

  a) Their job requires them to operate equipment that is subject to lockout/tagout

  b) Their job requires them to work in areas where lockout/tagout is used

Lockout/Tagout Procedures

Lockout

Lockout procedure consists of placing a lock on an energy-isolating device to ensure that the device and the equipment it controls cannot be operated until the lock is removed. The locks used at the Site will be of standard size, shape and color. The locks must only have one key.

Tagout

Tags are warnings affixed to energy isolating devices that do not provide the physical restraint of a lock. Locks must always be used when possible. Project personnel must understand the following:

i) A tag should only be removed by or with the authorization of the person who attached it. It must never be bypassed, ignored, or otherwise defeated.

ii) Tags must be legible and understandable by all authorized and affected personnel, and by all other personnel whose work operations may be in the area.

iii) Tags and their methods of attachment must be able to withstand the environmental conditions.

iv) Because tags may evoke a sense of false security, training on their limitations must be given to all employees involved with the project.

v) A tag's means of attachment must not be easily defeated (e.g., using string, cord, or adhesive is not permissible). All-environment-tolerant nylon cable ties capable of resisting 50 pounds of force must be used.

Site-Specific Lockout/Tagout Procedures

Operation and maintenance (O&M) activities where hazardous energy sources are present require the use of energy control procedures. The selected contractor will develop the energy control procedures that will be needed for the Site. They will be developed for each piece of equipment or process where known hazardous energy is present. Any new procedures written will follow this basic process flow:

i) Prepare equipment for shutdown and notify affected personnel

ii) Shut down equipment or machines

iii) Isolate the specific energy sources

iv) Place locks and tags on the specific isolation points

v) Verify isolation of hazards by trying to start the specific machine or equipment

vi) Return controls to the neutral or off position and begin work

These specific energy control procedures will ensure the proper shutdown of electrical components, process lines, and pneumatics prior to performing replacement, repair, renovation, or modification of machines or equipment.

In addition to the specific energy control procedures, project personnel must also adhere to the following practices regarding lockout/tagout:

i) Lockout devices must always be affixed so that energy isolating devices are held in the "off" or "safe" position

ii) Lockout must only be implemented by project personnel authorized or designated by the project manager

iii) Project personnel authorized to implement a lockout procedure must have had adequate training in lockout/tagout procedures

iv) Project personnel must be retrained whenever a new energy control hazard is present or energy control procedures are changed

Additionally, whenever replacement, repair, renovation, or modification of machines or equipment is performed, and whenever new equipment or machines are installed, energy isolating devices for such machines must accept a lockout device.

When any equipment is being serviced the lockout/tagout standard requires employers to:

i) Ensure that new equipment or overhauled equipment can accommodate locks

ii) employ additional means, such as a tagout program, to ensure safety when locks are used

iii) Establish procedures for releasing of the lockout/tagout that include machine inspection, notification and safe positioning of workers, and removal of the lockout/tagout device

iv) Obtain standardized locks and tags that indicate the identity of the worker using them, making sure locks and tags are of sufficient quality and durability to ensure their effectiveness

As important as a lockout is, it can be effective only if project personnel are aware of the system and use it properly; thus, training of all project personnel is a key requirement to a successful lockout/tagout program.

7.17 MATERIAL HANDLING

Material handling operations to be conducted at the Site will include manual lifting of materials to and from trucks, placement of soil in stockpiles, placement and compaction of soil in excavations, and the setup/maintenance of thermal treatment units, soil handling equipment, soil storage areas, and storage enclosures.

Hoisting and Rigging

Wire ropes, chains, ropes, and other rigging equipment will be inspected prior to each use and as necessary during use to assure their safety. Defective rigging equipment will be immediately removed from service.

Rigging will not be used unless the weight of the load falls within the rigging's safe work operating range. The authorized rigger prior to any "pick" or lifting operation must verify this.

Only personnel trained in safe rigging procedures will be authorized to engage in rigging procedures. Additionally, the rigger must understand and use recognized crane signals.

Job or shop hooks and links and other makeshift fasteners **will not** be used. When U-bolts are used for eye splices, the U-bolt will be applied so the "U" section is in contact with the dead end of the rope.

Wire ropes, chains, ropes, and other rigging equipment will be stored where they will remain clean, dry, and protected from the weather and corrosive fumes.

The proper length of rope or chain slings will be used to avoid wide-angle lifts and dangerous slack. Knotted ropes or lengths of ropes reduced by bolts, knots, or other keepers will not be used.

General Storage Practices

The basic safety requirement for storage areas is that the storage of materials and supplies shall not create a hazard. Additional general storage area practices include the following:

i) Bags, containers, bundles, etc. stored in tiers shall be stacked, blocked, interlocked, and limited in height so that they are stable and secure against sliding or collapse.

ii) All stacked materials, cargo, etc. shall be examined for sharp edges, protrusions, signs of damage, or other factors likely to cause injury to persons handling these objects. Defects should be corrected as they are detected.

iii) Storage areas shall be kept free from accumulation of materials that constitute hazards from tripping, fire, explosion, or pest harborage.

iv) Storage areas shall have provisions to minimize manual lifting and carrying. Aisles and passageways shall provide for the movement of mechanical lifting and conveyance devices.

v) Stored materials shall not block or obstruct access to emergency exits, fire extinguishers, alarm boxes, first aid equipment, lights, electrical control panels, or other control boxes.

vi) "NO SMOKING" signs shall be conspicuously posted, as needed, in areas where combustible or flammable materials are stored and handled.

vii) Cylindrical materials such as pipes and poles shall be stored in racks, or stacked on the ground and blocked.

Special Precautions for Hazardous or Incompatible Materials Storage

Generally, materials are considered hazardous if they are ignitable, corrosive, reactive, or toxic. Manufacturers and suppliers of these materials must provide the recipient with MSDSs, which describe their hazardous characteristics, and give instructions for their safe handling and storage.

Many hazardous materials are incompatible, which means they form mixtures that may have hazardous characteristics not described on the individual MSDSs. The following special precautions shall be followed regarding the storage of hazardous materials:

i) Based on the information available on the MSDSs, incompatible materials shall be kept in separate storage areas

ii) Warning signs shall be conspicuously posted, as needed, in areas where hazardous materials are stored

Hand Protection

Hand protection is the most important form of PPE when handling materials manually. The CSHO will select the appropriate hand protection for the task/activity. Gloves are often relied upon to prevent against abrasions, cuts and burns during material handling activities and many types of gloves actually improve your grip factor. Therefore, it is most important that the most appropriate glove (leather, cotton, Kevlar, metal mesh, nitrile, etc.) is selected for the given situation. The following table presents protection factors for commonly used gloves.

Type of Glove	***Protection***
Rubber	Acids, bases, alcohol – moderate resistance to cuts
Canvas or cloth	Dirt, wood slivers, sharp edges – some resistance to cuts
Metal mesh or Kevlar	Highly resistant to cuts and scratches and caught between hazards (crushing, etc.)
Insulated	Electrical charges
Cuffed	Protects against liquids trickling into glove and protects the wrist/forearm area from cuts and abrasions

Type of Glove	*Protection*
Leather	Moderate resistance to cuts and abrasions and caught between hazards

It is important to wash hands frequently when wearing gloves to prevent the build-up of sweat and dirt on the hands. Check gloves regularly for cracks, holes and rips/tears. Keep gloves clean and dry as much as possible.

7.17.1 MANUAL LIFTING

When lifting objects, use the following proper lifting techniques:

i) Feet must be parted, with one foot alongside the object being lifted and one foot behind. When the feet are comfortably spread, a more stable lift can occur and the rear foot is in a better position for the upward thrust of the lift.

ii) Do not lift more than 50 pounds without the assistance of another individual.

iii) Use the squat position and keep the back straight - but remember that straight does not mean vertical. A straight back keeps the spine, back muscles, and organs of the body in correct alignment. It minimizes the compression of the guts that can cause a hernia.

iv) Grip is one of the most important elements of correct lifting. The fingers and the hand are extended around the object you're going to lift - using the full palm. Fingers have very little power - use the strength of your entire hand.

v) The load must be drawn close, and the arms and elbows must be tucked into the side of the body. Holding the arms away from the body increases the strain on the arms and elbows. Keeping the arms tucked in helps keep the body weight centered.

vi) The body must be positioned so that the weight of the body is centered over the feet. This provides a more powerful line of thrust and also ensures better balance. Start the lift with a thrust of the rear foot. Do not twist your back while lifting or moving heavy objects.

7.18 HAND AND POWER TOOLS

Hand Tools Requirements:

i) Hand tools must meet the manufacturer's safety standards

ii) Hand tools must not be altered in any way

iii) At a minimum, eye protection must be used when working with hand tools

iv) Wrenches (including adjustable, pipe, end, and socket wrenches) must not be used when jaws are sprung to the point that slippage occurs

v) Impact tools (such as drift pins, wedges, and chisels) must be kept free of mushroom heads

vi) Wooden handles must be free of splinters or cracks and secured tightly to the tool

Power Tools Requirements:

i) All power tools must be inspected regularly and used in accordance with the manufacturer's instructions and the tool's capabilities

ii) Electric tools must not be used in areas subject to fire or explosion hazards, unless they are approved for that purpose

iii) Portable electric tools must be connected to a Ground Fault Circuit Interrupter (GFCI) when working in wet areas

iv) Proper eye protection must be used when working with power tools

v) Personnel must be trained in the proper use of each specific tool

vi) Any damaged or defective power tools must be immediately tagged and removed from service

7.19 ADVERSE WEATHER CONDITIONS

The CSHO, CS and/or SS shall decide on the continuation or discontinuation of work based on current and pending weather conditions. Electrical storms, tornado warnings, and strong winds (approximately 40 mph) are examples of conditions that would call for the discontinuation of work and evacuation of the Site. Strong winds can generate hazardous conditions during the handling of materials.

In addition, no work with elevated super structures (e.g., drilling, crane operations, etc.) will be permitted during any type of electrical storm or during wind events that have wind speeds exceeding 25 mph.

7.20 HOT WORK

Project activities may involve cutting with torches. Because of the serious potential for fire and explosion, safe work practices and procedures must be employed. All Hot Work activities will adhere to the selected contractor's approved specific Hot Work procedures. The primary objective is that hot work be done only in a safe designated area and with appropriate precautions in place. Prior to any hot work being performed, the selected contractor will issue a hot work permit.

7.21 BIOLOGICAL HAZARDS

Biological hazards may include snakes, thorny bushes, ticks, mosquitoes, and other pests.

7.21.1 VEGETATION OVERGROWTH

Overgrown weeds, bushes, trees, grass and other vegetation are fire and safety hazards. There are a number of hidden hazards not immediately recognized due to the overgrowth of vegetation in areas where field activities may occur, including discarded junk, litter, and debris. Construction materials such as boards, nails, concrete, and other debris may be hidden beneath blades of tall grass, weeds, and bushes. Other hazards may include steep slopes, potholes, trenches, soft spots, dips, etc.; all dangerously concealed from the view of the individual walking or operating motorized equipment in the area. Additionally, there are biological hazards such as snakes, ticks, chiggers, and mosquitoes that breed in overgrowth conditions.

Actions to be taken are:

i) Assess the work area and determine if the area requires vegetation clearance. Consider that overgrowth that extends above the lowest level of motorized equipment (i.e., bumper or fender) or 6 inches above your ankle has hidden hazards that you will not be able to readily identify.

ii) Determine if the area is safe to walk or whether you need motorized equipment. Consider the limitations of the equipment.

iii) Identify slip, trip, and fall hazards and remove from the general work area. Remember to give adequate clearance so that the items being removed do not pose future hazards.

iv) Adequately protect yourself against the hazards by wearing boots that protect the ankles, long pants, and using insecticides.

v) Consider the limitations of manual or mechanical equipment for the clearance of overgrowth, particularly the safety hazards when using sling blades, machetes, weed eaters, bush hogs, or other brush removing equipment.

Before taking any action, determine whether there are any ecological issues that would affect or prevent the removal of overgrowth in protected areas such as wetlands, wildlife habitats, or sanctuaries for endangered and/or protected species.

7.21.2 TICK-BORNE DISEASES

Lyme Disease, Erlichiosis, and Rocky Mountain Spotted Fever (RMSF) are diseases transmitted by ticks and occur throughout the United States during spring, summer, and fall.

Lyme Disease: The disease commonly occurs in summer and is transmitted by the bite of infected ticks. "Hot spots" in the United States include New York, New Jersey, Pennsylvania, Massachusetts, Connecticut, Rhode Island Minnesota, and Wisconsin. Few cases have been identified in other states.

Erlichiosis: The disease also commonly occurs in summer and is transmitted by the bite of infected ticks. "Hot spots" in the United States include New York, Massachusetts, Connecticut, Rhode Island Minnesota, and Wisconsin. Few cases have been identified in other states.

Primarily the Deer Tick transmits these diseases, which is smaller and redder than the common Wood Tick. The disease may be transmitted by immature ticks, which are small and hard to see. The tick may be as small as a period on this page.

Symptoms of Lyme disease include a rash or a peculiar red spot, like a bull's eye, which expands outward in a circular manner. The victim may have headache, weakness, fever, a stiff neck, swelling and pain in the joints, and eventually, arthritis. Symptoms of Erlichiosis include muscle and joint aches, flu-like symptoms, but there is typically no skin rash.

Control: Tick repellent containing diethyltoluamide (DEET) should be used in tick-infested areas, and pants legs should be tucked into boots. In addition, workers should search the entire body every 3 or 4 hours for attached ticks. Ticks should be removed promptly and carefully without crushing, since crushing can squeeze the disease-causing organism into the skin. A gentle and steady pulling action should be used to avoid leaving the head or mouth parts in the skin. Hands should be protected with surgical gloves when removing ticks.

7.21.3 POISONOUS PLANTS

Common Poison Ivy (Rhus radicans) grows as a small plant, a vine, and a shrub. Poison Ivy occurs in every state. The leaves always consist of three glossy leaflets. Poison Sumac (Rhus vernix) grows as a woody shrub or small tree 5 to 25 feet tall. It usually contains nine leaves, with eight paired leaves and one on top, and is common in swampy areas. The plants are potent sensitizers and can cause a mild to severe allergic reaction. This reaction is called contact dermatitis.

Dermatitis, in Rhus-sensitive persons, can result from contact with the milky sap found in the roots, stems, leaves, and fruit. The sap may retain its potency for months or years in a dry atmosphere, and can occur during any time of the year. The sap may also be carried by animals, equipment or apparel.

The best form of prevention is to avoid contact. This can occur by wearing long sleeves and gloves if necessary. Disposable clothing, such as Tyvek, is recommended in high-risk areas to avoid exposure from contaminated apparel. Barrier creams and cleaners are also recommended.

7.21.4 INSECTS

Construction work presents many opportunities to be exposed to a variety of insects. Many these insects may present health and safety hazards. Wasps, bees, spiders, and mosquitoes present the bulk of these hazards.

Bees and wasps present problems to people working outdoors due to being stung and having adverse reactions to the venom injected during the sting. Mosquitoes on the other hand cause hazards by transmitting disease(s) from other infected animals and humans.

It is important to recognize the venomous spiders (spiders dangerous to humans) that are present in your work environment. Inspect boots, clothing, and other areas before using/entering, as spiders tend to hide in dark places. Many spiders are nocturnal.

Preventing Exposure

Preventing exposure to insects can be accomplished by the following:

i) Wearing proper clothing and PPE
ii) Inspecting work areas for wasp or bee nests prior to conducting work activities
iii) Awareness of regional insects and their behavioral habits
iv) Shaking out clothing and shoes and inspecting areas for spiders
v) Using repellants

Proper Clothing

While working outdoors it is important to wear proper clothing and PPE. Insects tend to be attracted to bright colors, floral, prints, black, white, green, tan and khaki colors. Also it is important to wear long pants and if possible a long-sleeved shirt. Personnel should tuck the pant bottoms into the tops of boots and use insect proof work gloves (leather, thick cloth, etc).

Repellants

It is important to ensure that there is an adequate supply of insect repellent. Use insect repellent, which contains DEET. Apply it to any exposed skin in accordance with the manufacturer's directions.

Reaction to insect bites can range from mild reactions to severe allergic reactions. In addition, mosquitoes may carry life-threatening diseases such as West Nile virus.

Bee (and Wasp) Stings

Reaction to bee stings may range from painful swelling, redness, itching all the way to shock. Swelling, redness, and itching should stop hurting within a day or two. Treatment for these items can be done at home. The treatment will involve initially removing any stinger left in the skin by scraping away from the skin and towards the venom sac (thus preventing one from squeezing more venom into the wound).

Afterwards apply ice and anti-histamine cream. If irritation, swelling and/or pain persist seek medical attention.

If the victim of a bee sting is aware that they are allergic to bees, or if they begin to exhibit signs such as difficulty swallowing, difficulty breathing, abdominal cramps, nausea, then they may be going into anaphylactic shock and will require medical treatment.

If personnel know that they are allergic to insects then they will be required to carry their own insect sting kit as directed by their personal physician. The victim must be taken to hospital immediately.

Mosquito Bites

Mosquito bites can range from mild skin irritation to severe viral infections. One of the most common viruses that mosquitoes carry is the West Nile virus. West Nile virus can cause encephalitis (swelling of the brain) and meningitis (swelling of the spinal cord).

First symptoms are as follows: rapid onset of headaches, dizziness, difficulty swallowing, deep muscle aches, nausea, stiff neck, high-fever, high fever, confusion, muscle weakness. Once any of these symptoms are exhibited seek medical attention.

7.21.4.1 POISONOUS SPIDERS

Spider Bites

Spider bites can range from mild skin irritation to severe infections and tissue damage depending on the type of spider. The United States has only two spiders that are considered dangerous to humans (the black widow and the brown recluse).

A brown recluse spider (or fiddleback) possesses a V-shaped marking on its back. Its bite will cause tissue damage/destruction for up to 6 weeks. Symptoms can start with little initial pain followed by severe pain, headaches, fever, skin rash, muscle spasms, renal failure and possible coma. A halo may form around the bite. Medical treatment is to be sought immediately.

A black widow spider is an outdoor, nocturnal and non-aggressive spider. She's shiny, black with an hourglass shape on her abdomen. Only about 1 percent of her bites are fatal. The bite is not painful and may not be noticed until later when stomach, muscular, or feet pains begin. Other symptoms include heavy sweating, swollen eyelids, erratic saliva production, and difficulty breathing. Seek medical treatment if bitten.

7.21.5 THREATENING DOGS

If you are approached by a frightened or menacing dog:

i) Do not attempt to run and don't turn your back.

ii) Stay quiet, and remember to breathe.

iii) Be still, with arms at sides or folded over chest with hands in fists.

iv) Slowly walk away sideways.

v) Don't stare a dog in the eyes, as this will be interpreted as a threat.

vi) Avoid eye contact.

vii) If you have a jacket, you could wrap it around your arm and should he snap, take the bite harmlessly.

viii) Try calling its bluff. Yell, "sit!" "stay!" or "go home!". You might convince the dog that you are the stronger in the situation.

7.21.6 RODENTS

Rodentia: (rats, mice, beavers, squirrels, guinea pigs, capybaras, coypu)

Rodents, or Rodentia, are the most abundant order of mammals. There are hundreds of species of rats; the most common being the black and brown rat.

The **Brown Rat** has small ears, blunt nose, and short hair. It is approximately 14 to 18 inches long (with tail). They frequently infest garbage/rubbish, slaughterhouses, domestic dwellings, warehouses, shops, super-markets, in fact, anywhere there is an easy meal and potential nesting sites.

The **Black Rat** can be identified by its' tail, which is always longer than the combined length of the head and body. It is also slimmer and more agile than the Norwegian or Brown rat. Its size varies according to its environment and food supply.

The **House Mouse** has the amazing ability to adapt and it now occurs more or less in human dwellings. In buildings, mice will live anywhere and they are very difficult to keep out. Mice are also totally omnivorous; in other words, they will eat anything.

Rats and mice often become a serious problem in cold winter months when they seek food and warmth inside buildings. They may suddenly appear in large numbers when excavation work disturbs their in-ground nesting locations or their food source is changed.

There are six major problems caused by rats and mice:

i) They eat food and contaminate it with urine and excrement.

ii) They gnaw into materials such as paper, books, wood, or upholstery, which they use as nest material. They also gnaw plastic, cinder blocks, soft metals such as lead and aluminum, and wiring, which may cause a fire hazard.

iii) Rats occasionally bite people and may kill small animals.

iv) They, or the parasites they carry (such as fleas, mites, and worms), spread many diseases such as salmonella, trichinosis, rat bite fever, Hantavirus, Weils disease, and the bubonic plague.

v) Rats can damage ornamental plants by burrowing among the roots or feeding on new growth or twigs. They also eat some garden vegetables, such as corn and squash.

vi) Rats and mice are socially unacceptable. These rodents have been a problem for centuries, chiefly because they have an incredible ability to survive and are so difficult to eliminate. In addition, they are extremely compatible with human behavior and needs.

The CHSO will determine what actions to take should rodents become an issue.

8.0 AIR MONITORING PROGRAM

This section of the HASP presents the requirements for conducting air monitoring at the Site. The air-monitoring program is designed to ensure protection for personnel working on Site as well as the surrounding community. The on-Site monitoring program will be conducted by the CSHO or designee (i.e., Environmental Monitoring Technician) and will consist of monitoring project personnel exposures to VOCs, dust/particulate matter, oxygen and combustible gas levels, and carbon monoxide. A Community Air Monitoring Plan will also be conducted at the Site and is presented in Attachment C. The air monitoring program will be completed with the use of real-time direct reading instruments and with sampling media that will be sent to a laboratory for analysis.

Inhalation hazards are caused from the intake of vapors and contaminated dust. Air monitoring shall be performed when potential exposure to on-Site contaminants is anticipated and during all confined space entry work. The purpose of air monitoring is to identify and quantify airborne contaminants in order to determine the level of worker protection needed. Initial screening for identification is often qualitative, but the determination of its concentration (quantification) must wait subsequent testing. Two principle approaches are available for identifying and/or quantifying airborne contaminants:

i) The use of real-time (on-Site) reading instruments (i.e., photoionization detector etc.)

ii) Laboratory analysis of air samples obtained by the use of various sampling equipment and methods

Direct reading instruments may be used to rapidly detect flammable or explosive atmospheres, oxygen deficiency, certain gases and vapors, and dusts. They are the primary tools of initial Site characterization and remediation. The information provided by direct reading instruments can be used to institute appropriate measures (i.e., PPE, evacuation), and determine the most appropriate equipment for future monitoring. All direct reading instruments have inherent constraints in their ability to detect hazards. It is imperative that direct reading instruments are operated, and the data interpreted by qualified individuals who are thoroughly familiar with the particular devices, operating principles and limitations. At hazardous waste sites, where unknown and multiple contaminants are the rule rather than the exception, instrument readings should be interpreted conservatively. The following guidelines may facilitate accurate recording and interpretation:

i) Calibrate instruments according to the manufacturer's instructions before and after each use.

ii) Develop chemical response curves if the instrument manufacturer does not provide these. Response curves/response factors are necessary to adapt PID action levels to actual PID readings when a specific contaminant of concern is detected via air sampling.

iii) Remember that the instrument readings have limited value where contaminants are unknown. When reading unknown contaminants, report them as "needle deflection", or "positive instruments response", or "units", rather than a specific concentration (i.e., ppm). Conduct additional monitoring at any location where a positive response occurs.

iv) A reading of zero should be reported as "no instrument response" rather than "clean" because quantities of the chemicals may be present that are not detectable by the instrument.

v) The survey should be repeated with several detection systems to maximize the number of chemicals detected.

The data collected throughout the monitoring effort shall be used to determine the appropriate levels of protection.

8.1 SITE AIR MONITORING

The CSHO or designee (i.e., Environmental Monitoring Technician) will perform air monitoring to evaluate the exposure of project personnel to chemical and physical hazards, verify the effectiveness of engineering controls, evaluate the effectiveness of Site control measures, and to determine the proper level of PPE. During the progress of remedial activities, the CSHO will monitor the levels of VOCs, oxygen and combustible gases, carbon monoxide, and particulate levels on an hourly basis or more frequently as necessary based on Site conditions. The following monitoring equipment will be used for this purpose:

i) A PID equipped with an 11.7 or greater eV lamp

ii) A three-gas monitor capable of measuring oxygen, combustible gas and carbon monoxide

iii) A particulate monitor

An EZ perimeter air monitoring program will be implemented. PID and particulate monitoring will be conducted on an hourly basis or more frequently as necessary at the perimeter of the EZ in order to evaluate the effectiveness of Site control measures and verifies the integrity of the Site's clean areas. If necessary, the CSHO in conjunction with the SS will adjust the EZ and CRZ boundaries.

In the event that an EZ perimeter air sample identifies readings that are above background conditions, then air monitoring readings will also be taken at the Site perimeter. The CSHO will evaluate all air sampling results and modify operating conditions on the Site as necessary to ensure all potentially exposed receptors are within safe limits.

All instruments will be calibrated on a daily basis in accordance with the manufacturer's instructions. Records of all calibrations and real-time measurements will be kept in a bound field logbook or documented via air monitoring and calibration log sheets. All air monitoring data collected by CSHO will be filed and made available upon request.

8.1.1 REAL-TIME VOC MONITORING

The CSHO or designee will continuously monitor for the presence of VOCs during the handling of impacted soil, intrusive activities, and operation of the soil treatment system. PID readings will be taken in and around all EZs. Action levels for upgrading or downgrading of PPE have been established and Table B8.1 presents the action levels for the on-Site Air Monitoring Program.

An action level is a point at which increased protection or cessation of activities is required due to the concentration of contaminants in the work area. Most activities shall be initiated in Modified Level D. The appropriate actions will be taken at designated action levels.

In addition to the action levels, an upgrade to Level C, supplied air, or evacuation of the immediate area is required if:

i) Any symptoms occur, as described in Section 7.2

ii) Sustained readings (15 minutes or greater) occur in the worker's breathing zone that are above the applicable action levels

iii) Requested by an individual performing the task

iv) Any irritation to eye, nose, throat, or skin occurs

8.1.2 COMBUSTIBLE GAS, OXYGEN AND CARBON MONOXIDE

Air monitoring for combustible gases, carbon monoxide, and oxygen will be conducted during excavation activities, soil handling activities, O&M activities, and during other activities where oxygen deficient, elevated carbon monoxide readings, and/or flammable atmospheres may be encountered (e.g., confined space entries, entry into excavations etc.). The point of excavation and the immediate work area around these activities must be monitored to ensure that an adequate level of oxygen is present, and to determine if a flammable atmosphere exists. Air monitoring for these gases will be conducted continuously while in any confined space. All work activity must stop where monitoring indicates the flammable vapor concentration is 10 percent of the lower explosive limit (LEL) at a location with a potential ignition source. Such an area must be ventilated to reduce the concentration to an acceptable level.

Action levels for combustible gases, oxygen, and carbon monoxide are presented in Table B8.1.

8.1.3 PARTICULATE MONITORING

Based upon the results of an industrial hygiene air monitoring modeling program, the mixture PEL total dust levels have been calculated using "worst case" scenario concentrations for the principal contaminants identified in the Site soil. The particulate action levels are located in Table B8.1. Dust control measures (water spray, etc.) should be implemented at the Site to control visible dust emissions. All readings should be taken in the worker's breathing zone.

8.1.4 PERSONAL AIR SAMPLING PROGRAM

The selected contractor shall also implement a personnel air sampling program for those project personnel who have the highest risk of potential for exposure to chemicals present on Site. This monitoring will be done in compliance with 1926.65(h). Samples will be collected during startup of those project activities where personnel face potential exposure. The CSHO and PM will determine what chemicals will be sampled and the number and frequency of sampling events. Appropriate National Institute of Occupational Safety and Health (NIOSH) methodology will be followed and all samples will be sent to an American Industrial Hygiene Association (AIHA) accredited laboratory. Results for all personnel air sampling will be posted for all project personnel to review.

9.0 DECONTAMINATION PROCEDURES

In general, everything that enters the EZ at this Site must either be decontaminated or properly discarded upon exit from the EZ. All personnel, including any State and local officials must enter and exit the EZ through the CRZ. Prior to demobilization, potentially contaminated equipment will be decontaminated on a wash pad (decontamination pad) which has a built in sump and the equipment will be inspected by the CSHO before it is moved into the clean zone. A decontamination facility complete with water supply and sump for collection of wash water will be constructed at the Site. Any material that is generated by decontamination procedures will be collected and stored in a designated area in the EZ until disposal arrangements are made. Decontamination water will be discharged to the City sanitary sewer system under the Site's Significant Industrial User Permit. Soil and sediment will be placed into the excavation on Site.

The type of decontamination solution to be used is dependent on the type of chemical hazards. The decontamination solution for heavy equipment and for any reusable PPE is Alconox/Liqui-nox soap. The MSDSs for Liqui-nox and any other chemical containing products brought to the Site will be maintained on Site by the CSHO.

9.1 EQUIPMENT DECONTAMINATION PROCEDURES

All equipment that comes in contact with waste material must be decontaminated within the CRZ by high-pressure water cleaner upon exit from the EZ. Decontamination procedures will include knocking soil/mud from machines; water brush scrubbing using a solution of water and Liqui-nox; and a final water rinse. Personnel shall wear Level C or Modified Level D protection, as determined by the CSHO, when decontaminating equipment. All decontamination wash water and residues will be carefully collected and disposed of in accordance with the appropriate environmental regulations. Following decontamination and prior to exiting from the EZ, the CSHO shall be responsible for ensuring that the item has been sufficiently decontaminated. This inspection shall be included in the Site log.

9.2 PERSONNEL DECONTAMINATION PROCEDURES

Procedures for decontamination must be followed to prevent the spread of contamination and to eliminate the potential for chemical exposure. Personnel decontamination will be completed in accordance with the procedures that are presented below. Potentially contaminated PPE and trash will be stored in covered and labeled containers until disposal arrangements are made. It will be kept separate from trash generated in clean areas of the Site.

All disposable equipment shall be doffed before meal breaks and at the conclusion of the workday and replaced with new equipment prior to commencing work. Spent PPE will be kept in covered containers.

Personnel - Decontamination will take place upon exiting the contaminated work area in the CRZ.

Modified Level D decontamination procedures are as follows:

Step 1: Remove all visible contamination and loose debris by washing with clean water

Step 2: Remove all outer clothing that came in contact with the contamination (i.e., boot covers and outer gloves) and either dispose of in disposable container or wash in detergent solution and rinse

Step 3: Remove protective clothing; dispose of in used PPE storage container

Step 4: Remove inner gloves, dispose of in used PPE storage container

Step 5: Wash and rinse hands

Level C decontamination procedures to be utilized as follows:

Step 1: Remove all visible contamination and loose debris by washing with clean water

Step 2: Remove all outer clothing that came in contact with the contamination (i.e., boot covers and outer gloves) and either dispose of in used PPE container or wash in detergent solution and rinse

Step 3: Remove protective clothing; dispose of in used PPE container

Step 4: Remove respirator, sanitize prior to reuse

Step 5: Remove inner gloves; dispose of in used PPE container

Step 6: Wash and rinse hands with soap and water

10.0 MEDICAL SURVEILLANCE

In accordance with the requirements detailed in 29 CFR 1926.65 and 29 CFR 1910.134, all project personnel who will come in contact with potentially contaminated materials will have received medical surveillance by a licensed physician or physician's group.

Medical records for all project personnel will be maintained by their respective employers. The medical records will detail the tests that were taken and will include a copy of the consulting physician's statement regarding the tests and the individual's suitability for work as per the employer's medical surveillance program which is to be in accordance with 29 CFR 1926.65.

The medical records will be available to the employee or his designated representative upon written request, as outlined in 29 CFR 1910.1020.

If it becomes necessary to use subcontractors, they will also provide certifications to the CSHO showing that their personnel involved in Site activities have all necessary medical examinations prior to commencing work. The certifications will show proof of medical surveillance and respiratory fit testing. Personnel not obtaining medical certification will not perform work within contaminated areas.

Interim medical surveillance will be completed if an individual exhibits poor health or high stress responses due to any project activity or when accidental exposure to elevated concentrations of contaminants occur.

11.0 EMERGENCY RESPONSE AND CONTINGENCY PROCEDURES

It is essential that project personnel be prepared in the event of an emergency. Emergencies can take many forms; illnesses or injuries, chemical exposure, fires, explosions, spills, leaks, releases of harmful contaminants, or sudden changes in the weather. The following sections outline the general procedures for emergencies.

Emergency information should be posted as appropriate. Radios will be provided for contact purposes. All emergencies will be reported to the appropriate emergency responders. They may give the selected contractor further direction as to the responsibilities during any emergency situation. In general, project personnel will shut down equipment and evacuate to a safe pre-determined meeting area (rally point) during Site emergencies.

The CSHO will contact and meet on Site with local emergency response agencies (e.g., fire department, police department, etc.) prior to initiating construction activities. The purpose of this meeting is to inform these local authorities of the nature of the work and potential risks, to ensure that these responders are equipped to respond to a Site emergency, and to identify and resolve any potential problems, concerns, or conflicts.

The CSHO will be informed of Site hazards and activities prior to project initiation so those emergency situations can be handled most efficiently. A general orientation meeting to discuss emergency response procedures is to be held prior to initiating project activities.

In case of an emergency, an evacuation alarm would sound, which means that all the personnel should evacuate the area and proceed to a rally point for further instruction.

The CSHO will notify all project personnel of the emergency through radio/cell phone communications. Radios and cell phones will be taken to the rally point to enable further receipt of instruction(s) from the CSHO.

11.1 ACCIDENT, INJURY AND ILLNESS REPORTING

Any work-related incident, accident, injury, illness, exposure, or property loss shall be immediately reported to the CSHO and the SS. The SS and/or CSHO will report the accident details to the CSHM and will submit a completed accident report form. A sample Incident Reporting Form is provided in Attachment B. The selected contractor may use their own company-specific form if they so choose. The report must be filed for the following circumstances:

i) Accident, injury, illness, or exposure to project personnel

ii) Injury to any subcontractor personnel

iii) Damage, loss, or theft of property

iv) Any motor vehicle accident regardless of fault, which involves a company vehicle, rental vehicle, or personal vehicle while the individual is acting in the course of employment for the Site

The CSHO and CPM will investigate occupational accidents resulting in employee injury or illness. This investigation will focus on determining the cause of the accident and modifying future work activities to eliminate the hazard.

All project personnel have the obligation and right to report unsafe work conditions, previously unrecognized safety hazards, or safety violations of others. If anyone wish to make such a report, it may be made orally to the CSHO, a supervisor, or other member of management, or it may be submitted in writing, either signed or anonymously.

11.2 EMERGENCY CONTACTS

Fire Department	911
Police Department	911
Ambulance	911
Hospital: Niagara Falls Memorial Medical Center	(716) 278-4000

See Figure D11.1 – Hospital Route Map Directions to the Hospital.

Communication between work areas and the command post, located within the CZ, will be via verbal communication, auto horn, or two-way radio. The CSHO will use a mobile telephone to communicate with outside emergency and medical facilities.

The following signals shall be established for use with auto or compressed air-type horns:

i) Three Blasts: Evacuate exclusion area and meet at the northwest corner of the intersection of 47th Street and Royal Avenue

ii) An "All Clear" will be conveyed by radio communication

11.3 ADDITIONAL EMERGENCY NUMBERS

National Response Center (NRC)	800-424-8802
Poison Information	800-764-7661
Utility Locating Commission (One Call Nationwide)	811
Agency for Toxic Substances and Disease Registry	404-488-4100 (24 Hours)
U.S. EPA Emergency Response	800-424-8802
State of New York Emergency Response Commission	513-457-9996
Contractor Project Manager	TO BE DETERMINED
Contractor Corporate Safety and Health Manager	TO BE DETERMINED
Contractor Site Superintendent	TO BE DETERMINED
Contractor Safety and Health Officer	TO BE DETERMINED

11.4 EMERGENCY AND FIRST AID EQUIPMENT

Emergency safety equipment will be available for use by project personnel and will be located and maintained on Site. The safety equipment will include, but is not limited to, the following:

i) Portable emergency eye wash and drench shower (pressurized)

ii) Two 20-pound ABC type dry chemical fire extinguishers

iii) Field eye wash/flush bottles

iv) Approved first-aid kit for a minimum of twenty personnel

v) Fire blanket

vi) Spill response kit containing absorbent materials (booms/socks, pads, and earth/clay), overpack drum, shop vacuum, and hand tools (shovel, rake/hoe, etc.)

vii) Two Self Contained Breathing Apparatus (SCBA) units; and

viii) Portable air horn

11.5 PROJECT PERSONNEL RESPONSIBILITIES DURING EMERGENCIES

Contractor Safety and Health Officer (CSHO)

As the administrator of the HASP, the CSHO has primary responsibility for responding to and correcting emergency situations. The CSHO will:

i) Take appropriate measures to protect personnel including: posting of acceptable Site evacuation routes, withdrawal from the EZ, total evacuation and securing of the Site or upgrading or downgrading the level of protective clothing and respiratory protection.

ii) Take appropriate measures to protect the public and the environment including isolating and securing the Site, preventing runoff to surface waters, and ending or controlling the emergency to the extent possible.

iii) Ensure that appropriate Federal, State, and local agencies are informed, and emergency response plans are coordinated. In the event of fire or explosion, the local fire department should be summoned immediately. In the event of an air release of toxic materials, the local authorities should be informed in order to assess the need for evacuation. In the event of a spill, sanitary districts and drinking water systems may need to be alerted.

iv) Ensure that appropriate decontamination treatment or testing for exposed or injured personnel is obtained.

v) Determine the cause of the incident and make recommendations to prevent the reoccurrence.

vi) Ensure that all required reports have been prepared.

11.6 MEDICAL EMERGENCIES

Any person who becomes ill or injured in the EZ must be decontaminated to the maximum extent possible. If the injury or illness is minor, full decontamination should be completed and first aid administered prior to transport. If the patient's condition is serious, at least partial decontamination should be completed as much as possible without causing further harm to the patient. First aid should be administered while awaiting an ambulance or paramedics. All injuries and illnesses must immediately be reported to the CSHO, SS, and CPM.

Any person transporting an injured/exposed person to a clinic or hospital for treatment should take with them directions to the hospital and a copy of the identified chemicals on Site to which they may have been exposed.

Any vehicle used to transport contaminated personnel, will be cleaned or decontaminated as necessary.

11.7 FIRE OR EXPLOSION

In the event of a fire or explosion, the local fire department should be summoned immediately. Upon their arrival, the CSHO or designated alternate will advise the fire commander of the location, nature, and identification of the hazardous materials on Site.

If it is safe to do so, Site personnel should:

i) Report to the CPM
ii) Use fire fighting equipment available on Site
iii) Remove or isolate flammable or other hazardous materials, which may contribute to the fire

11.8 SPILL CONTROL AND COUNTERMEASURES

If a spill has occurred, the first step is personal safety, then controlling the spread of contamination if possible. Contractor personnel will immediately contact the CPM and/or CSHO to inform them of the spill and activate emergency spill procedures.

General Spill Response Procedures

If a spill occurs, the following general procedures will be followed:

i) Notify the CSHO, SS, and CPM
ii) Evacuate immediate area of spill
iii) Determine the needed level of PPE
iv) Don required levels of PPE and prepare to make entry to apply spill containment and control procedures
v) No entry will be made until atmosphere is less than 20 percent of the LEL

vi) After obtaining the proper spill response tools (shovels, booms and pads, absorbent socks, etc.) and PPE, personnel will attempt to contain the spill so that it does not enter any conveyance (sewer, drainage ditch, etc.) that eventually discharges to surface water

vii) Locate and abate source of spill

viii) Absorb or otherwise clean up the spill and containerize the material, sorbent, and affected soils

ix) Clean and decontaminate the affected area(s)

x) Replace used/spent spill kit contents

All spill material and debris will be managed in a manner that complies with applicable federal, state, and local environmental rules regarding recycling or disposal of wastes.

The CSHO and SS have the authority to commit resources as needed to contain and control released material and to prevent its spread to off-Site areas.

12.0 RECORDKEEPING

The CSHO shall establish and maintain records of all necessary and prudent monitoring activities as described below:

i) Name and job classification of the employees involved on specific tasks

ii) Records of fit testing and medical surveillance results for project personnel

iii) Records of all OSHA and other applicable safety training certifications for project personnel

iv) Records of Site safety inspections

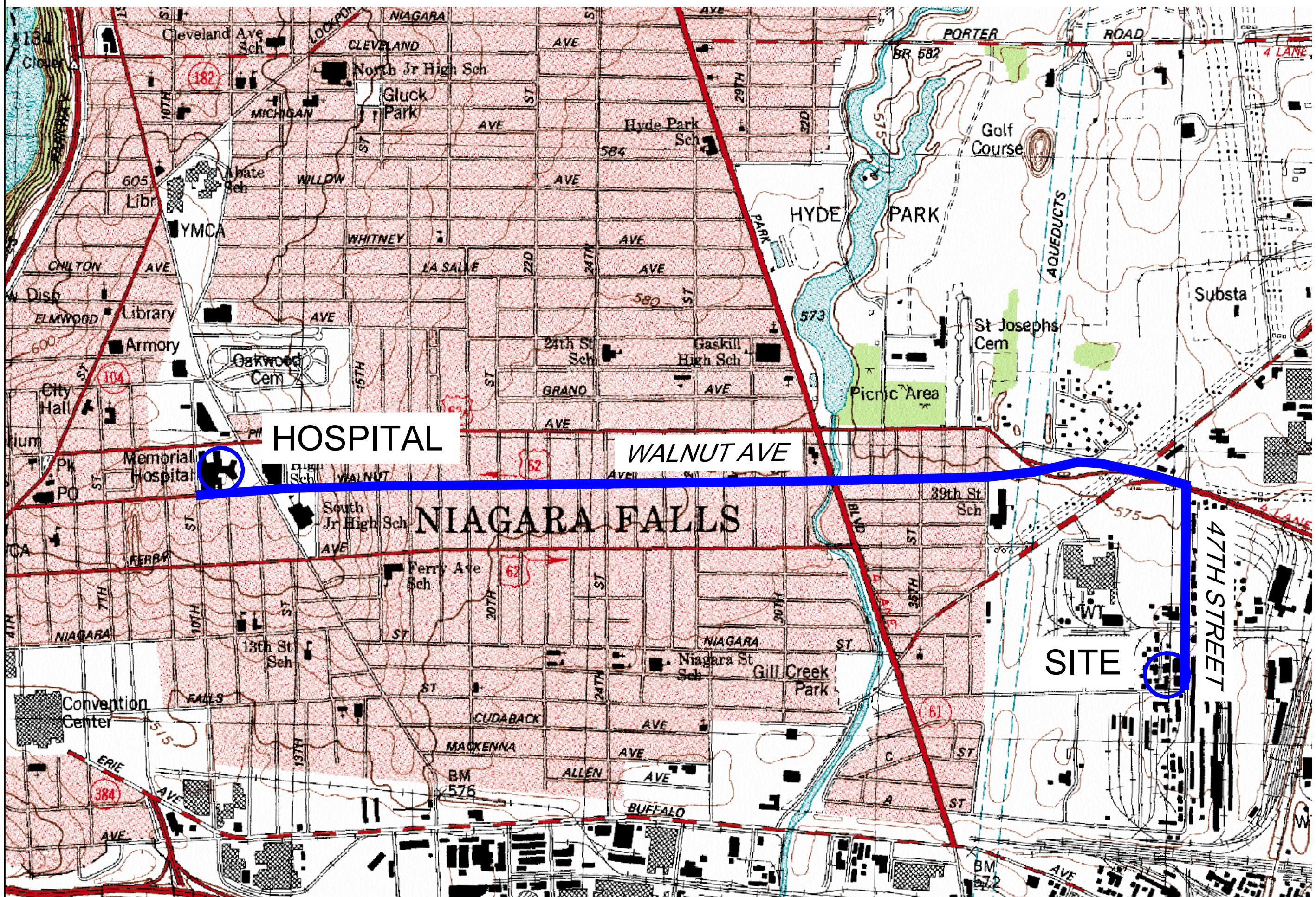
v) Records of training acknowledgment forms and daily safety meetings

vi) Emergency report sheets describing any incidents or accidents

vii) Air monitoring equipment calibrations

viii) Air monitoring data

FIGURES



DIRECTIONS TO NIAGARA FALLS MEMORIAL HOSPITAL

1. TURN LEFT ONTO 47TH STREET
2. TURN LEFT ONTO PINE AVE.
3. TURN LEFT ONTO WALNUT AVE.
4. TURN RIGHT ONTO 10TH STREET

NIAGARA FALLS MEMORIAL MEDICAL CENTER
621 10TH ST,
NIAGARA FALLS, NY 14301
(716) 278-4000

figure B11.1

ROUTE TO HOSPITAL
FRONTIER CHEMICAL SITE
Niagara Falls, New York

47392-00(009)GN-BU001 OCT 14/2011

TABLES

Table B2.1

Properties of Potential Site Contaminants
Frontier Chemical Site

Chemical Name	Chemical Name (Synonyms)	Maximum Concentration in Site Soils mg/kg	Exposure Limits	Routes Of Entry	Symptoms/Health Effects	Chemical Properties	Physical Characteristics
1,1,1 Trichloroethane	1,1,1 Trichloroethane Methyl chloroform Chlorothene CAS-71-55-6	510	TLV: 350 ppm PEL: 350 ppm STEL: 450 ppm IDLH: 700 ppm	Inhalation Ingestion Skin contact Eye contact	ACUTE: Irritating to eyes, skin and respiratory tract. May affect CNS, heart, liver and kidneys resulting in cardiac disorders and respiratory failure. High level exposure may cause death. CHRONIC: Defatting of the skin, may cause liver damage.	(FP) NE (VP) 100 mm (IP) 11.00 eV (UEL) 12.5% (LEL) 7.5%	Colorless liquid with a mild, chloroform-like odor.
1,1 Dichloroethane	1,1 Dichloroethane Ethylidene chloride CAS-75-34-3	45	TLV: 100 ppm PEL: 100 ppm STEL: NE IDLH: 3,000 ppm	Inhalation Ingestion Skin contact Eye contact	ACUTE: Central nervous system depression, irritation of skin. Exposure at high levels may result in unconsciousness. CHRONIC: Defatting of the skin. Liver and kidney damage.	(FP) 2°F (VP) 182 mm (IP) 11.06 eV (UEL) 11.4% (LEL) 5.4%	Colorless, oily liquid with a chloroform-like odor.
1,2,4-Trichlorobenzene CAS-120-82-1	1,2,4-Trichlorobenzene; unsym-Trichlorobenzene; 1,2,4-Trichlorobenzol CAS-120-82-1	33,000	TLV: NE PEL: N/A STEL: C 5 ppm IDLH: NE	Inhalation Skin Absorption Ingestion Skin contact Eye contact	ACUTE: Irritation eyes, skin, and mucous membrane. CHRONIC: In animals: liver, kidney damage; possible teratogenic effects.	(FP) N/A (VP) 1 mm (IP) NA (UEL) 6.6% (LEL) 2.5%	Colorless liquid or crystalline solid (below 63°F) with an aromatic odor.
1,2-Dichlorobenzene CAS-95-50-1	1,2-Dichlorobenzene o-DCB ortho-Dichlorobenzene o-Dichlorobenzol CAS-95-63-6	23,000	TLV: 25 ppm PEL: 50 ppm STEL: 50 ppm IDLH: 200 ppm	Inhalation Ingestion Skin Contact Eye Contact	ACUTE: Irritation eyes, nose; skin blisters. CHRONIC: liver, kidney damage	(FP) 151°F (VP) 1 mm (IP) 9.06 eV (UEL) 9.2% (LEL) 2.2%	Colorless to pale-yellow liquid with a pleasant, aromatic odor. [herbicide].
1,2-Dichloroethane CAS-107-06-2	1,2 Dichloroethane Ethylene dichloride Glycol dichloride CAS-107-06-2	24	TLV: 10 ppm PEL: 50 ppm, 200 ppm C STEL: NE IDLH: 50 ppm	Inhalation Absorption Ingestion	ACUTE: Inhalation causes lung edema. May affect CNS, kidneys, and liver. Vapors cause irritation to eyes, skin and respiratory tract. CHRONIC: Defatting of the skin. May cause kidney and liver damage.	(FP) 56°F (VP) 64 mm (IP) 11.05 eV (UEL) 16.0% (LEL) 6.2%	Colorless, viscous liquid with a pleasant chloroform-like odor. Turns dark on exposure to air, moisture and light.

Table B2.1

Properties of Potential Site Contaminants
Frontier Chemical Site

Chemical Name	Chemical Name (Synonyms)	Maximum Concentration in Site Soils mg/kg	Exposure Limits	Routes Of Entry	Symptoms/Health Effects	Chemical Properties	Physical Characteristics
1,3-Dichlorobenzene	1-3-Dichlorobenzene	2,300	Not Established	No Information	No Information	No Information	No Information
1,4-Dichlorobenzene CAS-106-46-7	1,4-Dichlorobenzene p-DCB para-Dichlorobenzene Dichlorocide CAS-106-46-7	4,600	TLV: 10 ppm PEL: 75 ppm STEL: NE IDLH: Ca [150 ppm]	Inhalation Ingestion Skin Contact Eye Contact	ACUTE: Eye irritation, swelling periorbital (situated around the eye); profuse rhinitis; headache, anorexia, nausea, vomiting CHRONIC: weight loss, jaundice, cirrhosis; in animals: liver, kidney injury; [potential occupational carcinogen].	(FP) 150°F (VP) 1.3 mm (IP) 8.98 eV (UEL) N/A (LEL) 2.5%	Colorless or white crystalline solid with a mothball-like odor. [insecticide]
2 - Chlorotoluene	No Information	7,884	Not Established	No Information	No Information	No Information	No Information
4 - Chlorotoluene	No Information	11,000	Not Established	No Information	No Information	No Information	No Information
4-methyl-2-pentanone CAS-108-10-1	MIBK Methyl isobutyl ketone Hexone 4-methyl-2-pentanone CAS-108-10-1	56	TLV: 50 ppm PEL: 100 ppm STEL: 75 ppm IDLH: 500 ppm	Inhalation Ingestion Skin contact Eye contact	ACUTE: Irritation of eyes, skin and respiratory tract. Ingestion risks chemical pneumonitis. May effect CNS at high concentrations, resulting in narcosis. CHRONIC: Dermatitis.	(FP) 64°F (VP) 16 mm (IP) 9.30 eV (UEL) 8.0% (LEL) 1.2%	Colorless liquid with a pleasant odor.

Table B2.1

Properties of Potential Site Contaminants
Frontier Chemical Site

Chemical Name	Chemical Name (Synonyms)	Maximum Concentration in Site Soils mg/kg	Exposure Limits	Routes Of Entry	Symptoms/Health Effects	Chemical Properties	Physical Characteristics
Acetone CAS-67-64-1	Acetone 2-Propanone Methyl ketone Dimethyl ketone CAS-67-64-1	48	TLV: 500 ppm PEL:1,000 ppm STEL:750 ppm IDLH: 2,500 ppm	Inhalation Ingestion Skin contact Eye contact	ACUTE: Vapors irritating to eyes and respiratory tract. May cause headaches and dizziness, effects on CNS, liver, kidneys and gastrointestinal tract. CHRONIC: Prolonged contact causes defatting of the skin, possibly dermatitis. Substance may affect blood and bone marrow.	(FP) 0°F (VP) 180 mm (IP) 9.69 eV (UEL) 12.8% (LEL) 2.5%	Colorless liquid, with a fragrant mint-like odor.
Aluminium CAS-7429-90-5	Aluminium Aluminum metal Aluminum powder Elemental Aluminum CAS-7429-90-5	13,900	TLV: 1 mg/m3 [R] PEL: 15 mg/m3 (total) 5 mg/m3 (resp) STEL: NE IDLH: NE	Inhalation Skin contact Eye contact	ACUTE: Irritation eyes, skin, respiratory system. CHRONIC: Eyes, skin, respiratory system.	(FP) NE (VP) NE (IP) NE (UEL) NE (LEL) NE	Silvery-white, malleable, ductile, odorless metal. Combustible Solid, finely divided dust is easily ignited; may cause explosions.
Antimony Metal/Powder CAS-7440-36-0	Antimony Metal/Powder Stibium CAS-7440-36-0	12.5	TLV: 0.5 mg/m3 PEL: 0.5 mg/m3 STEL: NE IDLH: 50 mg/m3	Inhalation Ingestion Skin Contact Eye Contact	ACUTE: Irritation eyes, skin, nose, throat, mouth; cough, dizziness, headache, nausea, vomiting, diarrhea, stomach cramps. CHRONIC: Insomnia, anorexia. Unable to smell properly.	(FP) NA (VP) 0 mm (IP) NA (UEL) NA (LEL) NA	Silver-white, lustrous, hard, brittle solid; scale-like crystals; or a dark-gray, lustrous powder.
Arsenic CAS-7440-38-2	Arsenic CAS-7440-38-2	19.2	TLV: 0.01 mg/m3 PEL: 0.010 mg/m3 STEL: NE IDLH: 5 mg/m3 (as As)	Inhalation Absorption Ingestion	ACUTE: Contact dermatitis, gastrointestinal disturbances, ulceration of the nasal septum, and respiratory irritation. CHRONIC: Hyperpigmentation of the skin and cancers of the skin, lungs, and lymphatic system.	(FP) NA (VP) 0 mm (approx.) (IP) NA (UEL) NA (LEL) NA	Silver-gray or tin-white, brittle, odorless, solid.
Benzene CAS-71-43-2	Benzene Benzol CAS-71-43-2	4,500	TLV: 0.5 ppm [skin] PEL: 1 ppm STEL: 2.5 ppm IDLH: 500 ppm	Inhalation Absorption (skin) Ingestion	ACUTE: Irritation to eyes, skin, respiratory tract; dizziness; headache; nausea; staggered gait; fatigue, abdominal pain. CHRONIC: Defatting of the skin, may have effects on bone marrow and immune system, decrease in blood cells. Carcinogenic to humans.	(FP) 12°F (VP) 75 mm (IP) 9.24 eV (UEL) 7.8% (LEL) 1.2%	Colorless to light-yellow liquid with an aromatic odor. Solid below 42°F.

Table B2.1

Properties of Potential Site Contaminants
Frontier Chemical Site

Chemical Name	Chemical Name (Synonyms)	Maximum Concentration in Site Soils mg/kg	Exposure Limits	Routes Of Entry	Symptoms/Health Effects	Chemical Properties	Physical Characteristics
Beryllium (metal) CAS-7440-41-7	Beryllium (metal) CAS-7440-41-7	3.5	TLV: 0.00005 mg/m3 (I) PEL: 0.002 mg/m3 STEL: NE IDLH: 4 mg/m3	Inhalation Skin Contact Eye Contact	ACUTE: Chest pain, cough, irritation of eyes; weight loss, lassitude (weakness, exhaustion). CHRONIC: Berylliosis, anorexia; clubbing of fingers, cyanosis, pulmonary insufficiency, dermatitis; (potential occupational carcinogen)	(FP) NA (VP) 0 mm (IP) NA (UEL) NA (LEL) NA	Hard, brittle, gray-white solid metal
Cadmium (dust/metal) CAS-7440-43-9	Cadmium (dust/metal) CAS-7440-43-9	8.3	TLV: 0.01 mg/m3 PEL: 0.005 mg/m3 STEL: NE IDLH: 9 mg/m3	Inhalation Ingestion	ACUTE: Irritation to eyes and respiratory tract. Pulmonary edema, coughing, tightness in chest, headache, chills, muscle aches, nausea, mild anemia. CHRONIC: Damage to respiratory system and kidneys, resulting in proteinuria and kidney dysfunction. Potential occupational carcinogen	(FP) NA (VP) NA (IP) NA (UEL) NA (LEL) NA	Metal: silver-white, blue tinged, lustrous, odorless solid.
Chlorobenzene CAS-108-90-7	Chlorobenzene Benzene chloride Chlorobenzol Phenyl chloride CAS-108-90-7	950	TLV: 10 ppm PEL: 75 ppm STEL: NE IDLH: 1,000 ppm	Inhalation Ingestion Skin contact Eye contact	ACUTE: Irritation of the eyes, nose and skin; causes drowsiness and uncoordination. Chemical pneumonitis if swallowed. CNS depression CHRONIC: Defatting of the skin. May cause liver and kidney damage.	(FP) 82°F (VP) 9 mm (IP) 9.07 eV (UEL) 9.6% (LEL) 1.3%	Colorless liquid with an almond-like odor.
Chloroethane CAS-75-00-3	Ethyl chloride Hydorchloric ether Monochloroethane Muriatic ether CAS-75-00-3	5	TLV: 100 ppm PEL: 1,000 ppm STEL: NE IDLH: 3,800 ppm	Inhalation Absorption (liquid) Ingestion (liquid) Skin/eye contact	ACUTE: Incoordination; inebriation; abdominal cramps CHRONIC: Cardiac arrhytmia; cardiac arrest; liver and kidney damage	(FP) NA (gas) -58 F (liquid) (VP) 1,000 mm (IP) 10.97 eV (UEL) 15.4% (LEL) 3.8%	Colorless gas or liquid (below 54 F) with a pungnt, ether-like odor. Shipped as a liquefied compressed gas
Chromium (metal) CAS-7440-47-3	Chromium (metal) Chrome CAS-7440-47-3	562	TLV: 0.5 mg/m3 PEL: 1 mg/m3 STEL: NE IDLH: 250 mg/m3	Inhalation Ingestion Skin contact Eye contact	ACUTE: Irritation to eyes, skin and lungs. CHRONIC: Skin sensitization, fibrosis (histologic)	(FP) NA (VP) NA (IP) NA (UEL) NA (LEL) NA	Blue-white to steel gray, lustrous, brittle, hard, odorless solid.

Table B2.1

Properties of Potential Site Contaminants
Frontier Chemical Site

Chemical Name	Chemical Name (Synonyms)	Maximum Concentration in Site Soils mg/kg	Exposure Limits	Routes Of Entry	Symptoms/Health Effects	Chemical Properties	Physical Characteristics
Chrysene CAS-65996-93-2 218-01-9	Chrysene CAS-65996-93-2 218-01-9	3	TLV: -(L) PEL: 0.2 mg/m3 benzene -soluable fraction STEL: NE IDLH: 80 mg/m3	Inhalation Skin contact Eye contact	ACUTE: Bronchitis. CHRONIC: Dermatitis, may cause damage to bladder, kidneys and lungs. Potential occupational carcinogen	(FP) Varies (VP) NE (IP) Varies (UEL) NE (LEL) NE	Black or dark brown amorphous residue. A polycyclic aromatic hydrocarbon (PAH). Pure chrysene is a colorless crystalline solid that is virtually insoluble in water. Animal Carcinogen.
Cobalt metal (dust/fume) CAS-7440-48-4	Cobalt Metal dust, Cobalt metal fume CAS-7440-48-4	24.6	TLV:0.02 mg/m3 PEL: 0.1 mg/m3 STEL: NE IDLH: 20 mg/m3	Inhalation Ingestion Skin Contact Eye Contact	ACUTE: Cough, dyspnea (breathing difficulty), wheezing, decreased pulmonary function. CHRONIC: Weight loss, dermatitis, diffuse nodular fibrosis, respiratory hypersensitivity, asthma.	(FP) NA (VP) 0 mm (IP) NA (UEL) NA (LEL) NA	Odorless, silver-gray to black solid
Copper (dust/mists/metal) CAS-7440-50-8	Copper (dust/mists/metal) CAS-7440-50-8	232	TLV: 1 mg/m3 (dust & mist) TLV: 0.2 mg/m3 (fume) PEL: 1 mg/m3 STEL: NE IDLH: 100 mg/m3	Inhalation Ingestion Skin contact Eye contact	ACUTE: Irritation to eyes, nose and pharynx, metallic taste and nasal perforation. CHRONIC: Skin sensitization, increased risk with Wilson's disease.	(FP) NA (VP) NA (IP) NA (UEL) NA (LEL) NA	Red powder, turns green on exposure to moist air.
Cumene CAS-98-82-8	Cumol Isopropyl benzene 2-Phenyl propane	45	TLV: 50 ppm PEL: 50 ppm STEL: NE IDLH: 900 ppm	Inhalation Absorption Ingestion Skin/eye contact	ACUTE: Irritation of the eyes, skin, mucus membrane; dermatitis; headache CHRONIC: Narcosis; coma	(FP)96 F (VP) 8 mm (IP) 8.75 eV (UEL) 6.5% (LEL) 0.9%	Colorless liquid with a sharp, penetrating aromatic odor
Cyclohexane CAS-110-82-7	Benzene hexahydride Hexahydrobenzene Hexamethylene Hexanaphthene CAS-110-82-7	5	TLV: 100 ppm STEL: NE PEL: 300 ppm IDLH: 1,300 ppm	Inhalation Ingestion Skin/eye contact	ACUTE: Irritation of the eyes and upper respiratory system; drowsiness; dermatitis CHRONIC: Narcosis; coma	(FP) 0 F (VP) 78 mm (IP) 9.88 eV (UEL) 8% (LEL) 1.3%	Colorless liquid with a sweet, chloroform- like odor

Table B2.1

Properties of Potential Site Contaminants
Frontier Chemical Site

Chemical Name	Chemical Name (Synonyms)	Maximum Concentration in Site Soils mg/kg	Exposure Limits	Routes Of Entry	Symptoms/Health Effects	Chemical Properties	Physical Characteristics
Dieldrin CAS-60-57-1	Dieldrin HEOD CAS-60-57-1	230	TLV: 0.1 mg/m3 (IFV) PEL: 0.25 mg/m3 [skin] STEL: NE IDLH: 50 mg/m3	Inhalation Skin absorption Ingestion Skin contact Eye contact	ACUTE: Headache, dizziness; nausea, vomiting, malaise (vague feeling of discomfort), sweating; myoclonic limb jerks; clonic, tonic convulsions. CHRONIC: coma; [potential occupational carcinogen]; in animals: liver, kidney damage.	(FP) NE (VP) 77°F (IP) NE (UEL) NE (LEL) NE	Colorless to light-tan crystals with a mild, chemical odor. [insecticide].
Ethylbenzene CAS-100-41-4	Ethylbenzene Ethylbenzol EB CAS-100-41-4	19	TLV: 20 ppm PEL: 100 ppm STEL: NE IDLH: 800 ppm	Inhalation Ingestion Skin contact Eye contact	ACUTE: Causes irritation of the eyes, skin, mucous membranes, and respiratory tract. Effects on CNS. CHRONIC: Defatting of the skin, narcosis, and coma.	(FP) 55°F (VP) 7 mm (IP) 8.76 eV (UEL) 6.7% (LEL) 0.8%	Colorless liquid with an aromatic odor.
Fluoranthene (PAH)	Fluoranthene (PAH)	4.3	TLV: 0.2 mg/m3 PEL: 0.2 mg/m3 STEL: NE IDLH: NE	Absorption Inhalation Ingestion	ACUTE: Dermatitis and bronchitis CHRONIC: Cancer of lungs, skin, bladder and kidneys. Skin carcinogen.	(FP) NE (VP) NE (IP) NE (UEL) NE (LEL) NE	Colored needles, light yellow, fine crystals.
Iron CAS-1309-37-1	Iron Iron Oxide CAS-1309-37-1	33,600	TLV: 5 mg/m3 (R) PEL: 5 mg/m3 [R] 15 mg/m3 (total) STEL: NE IDLH: NE	Absorption Inhalation Ingestion	ACUTE: Dust irritates eyes and respiratory tract CHRONIC:	(FP) NE (VP) NE (IP) NE (UEL) NE (LEL) NE	Grey crystalline powder
Lead (metal) CAS-7439-92-1	Lead (metal) CAS-7439-92-1	1160	TLV: 0.05 mg/m3 PEL: 0.05 mg/m3 STEL: NE IDLH: 100 mg/m3	Inhalation Ingestion Skin contact Eye contact	ACUTE: Lead is a cummulative poison, however, it may cause eye and skin irritation. CHRONIC: Effects blood, bone marrow, CNS, PNS and kidneys resulting in anemia, convulsions, peripheral nerve disease and kidney impairment. Toxicity to human reproduction or development.	(FP) NA (VP) NA (IP) NA (UEL) NA (LEL) NA	A heavy, ductile, soft, gray solid. Turns tarnished on exposure to air.

Table B2.1

Properties of Potential Site Contaminants
Frontier Chemical Site

Chemical Name	Chemical Name (Synonyms)	Maximum Concentration in Site Soils mg/kg	Exposure Limits	Routes Of Entry	Symptoms/Health Effects	Chemical Properties	Physical Characteristics
Mercury - Elemental and inorganic forms CAS-7439-97-6	Mercury (metal) Quicksilver Liquid silver CAS-7439-97-6	2.9	TLV: 0.025 mg/m3 PEL: 0.1 mg/m3 STEL: 0.03 mg/m3 IDLH: 10 mg/m3	Inhalation Absorption (skin) Ingestion	ACUTE: Irritation to skin. Vapor inhalation may cause pneumonitis. May effect CNS and kidneys. CHRONIC: May effect CNS and kidneys, resulting in irritability, tremors, speech disorders, mental/memory disturbances. Inflammation/discoloration of gums. Danger of cumulative effects.	(FP) NA (VP) 0.0012 mm (IP) NE (UEL) NA (LEL) NA	Odorless, heavy and mobile silvery-white liquid metal
Methyl Acetate	No Information	20	PEL: 200 ppm	Inhalation Ingestion	No Information	No Information	No Information
Methyl Chloride CAS-74-87-3	Chloromethane Methyl Chloride Artic CAS-74-87-3	17	TLV: 50 ppm [skin] PEL: 100 ppm C 200 ppm STEL: 100 ppm [skin] IDLH: 2000 ppm	Absorption Inhalation Ingestion	ACUTE: The liquid may cause frostbite, dizziness, nausea, vomiting, slurred speech, convolutions, and coma. CHRONIC: The substance may have effects on the central nervous system. May cause teratogenic effects and toxic effects upon human reproduction.	(FP) NA (gas) (VP) 3796 mm (IP) 11.28 eV (UEL) 17.4 (LEL) 8.1	Colorless gas with a faint, sweet odor, which is not noticeable at dangerous concentrations.
Monochlorotoluene	Monochlorotoluene CAS-025168-05-2 or CAS-95-49-8	7884	TLV: 50 ppm	Inhalation Ingestion Skin contact Eye contact	ACUTE: Mild irritation/redness of eyes. Redness, dryness and irritation of skin with prolonged or repeated exposure. CNS depression, headache, dizziness, nausea, loss of balance, and drowsiness. Burns to GI tract.	(FP) 96 F (VP) 4 mm (IP) 8.83 eV (UEL)/(LEL) NI	Colorless liquid with an odor characteristic of aromatics.
Naphthalene CAS-91-20-3	Naphthalene Naphthalin Coal tar White tar CAS-91-20-3	10	TLV: 10 ppm PEL: 10 ppm STEL: 15 ppm IDLH: 250 ppm	Inhalation Ingestion Skin contact Absorption Eye contact	ACUTE: Levels above 10 ppm may cause: Inhalation - Headache, nausea, excessive sweating and vomiting; Skin - May cause irritation and if hypersensitive to naphthalene then severe irritation may occur; Eyes - Irritation. Direct contact may cause blurring vision and damage to the cornea; Ingestion - Nausea, vomiting, abdominal pain, bladder irritation, and brown or black coloration of urine. CHRONIC: Clouding of the eyes. Chronic skin problems in cases of hypersensitivity. Liver and kidney damage.	(FP) 174°F (VP) 0.08 mm (IP) 8.12 eV (UEL) 5.9% (LEL) 0.9%	Colorless to brown solid with an odor of mothballs. Sometimes found as a crystalline white solid. Shipped as a molten solid.

Table B2.1

Properties of Potential Site Contaminants
Frontier Chemical Site

Chemical Name	Chemical Name (Synonyms)	Maximum Concentration in Site Soils mg/kg	Exposure Limits	Routes Of Entry	Symptoms/Health Effects	Chemical Properties	Physical Characteristics
Nickel (metal) CAS-7440-02-0	Nickel (metal) CAS-7440-02-0	60.6	TLV: 1.5 mg/m3 (I) PEL: 1 mg/m3 STEL: NE IDLH: 10 mg/m3	Inhalation Ingestion Skin contact Eye contact	ACUTE: May cause mechanical irritation, pneumonitis (fume inhalation). CHRONIC: Sensitization, asthma, damage to lungs. Possible human carcinogen.	(FP) NA (VP) 0 mm (IP) NA (UEL) NA (LEL) NA	Lustrous, silvery, odorless, solid.
PAHs CAS-65996-93-2	Polyaromatic Hydrocarbons PAHs Coal Tar Pitch Volatiles CAS-65996-93-2	Varies	TLV: 0.2 mg/m3 PEL: 0.2 mg/m3 STEL: NE IDLH: 80 mg/m3	Inhalation Ingestion	ACUTE: Bronchitis. CHRONIC: Dermatitis, may cause damage to bladder, kidneys and lungs. Potential occupational carcinogen.	(FP) Varies (VP) NA (IP) Varies (UEL) NA (LEL) NA	Black or dark brown amorphous residue. Properties vary depending upon specific compound.
Phenol CAS-108-95-2	Phenol Hydroxybenzene Carbolic acid CAS-108-95-2	8.7	TLV: 5 ppm [skin] PEL: 5 ppm [skin] STEL: NE IDLH: 250 ppm	Inhalation Absorption Ingestion	ACUTE: CORROSIVE to eyes, skin and respiratory tract. May cause lung edema, affects CNS, heart, and kidneys, resulting in convulsions, coma, cardiac disorders and respiratory failure. CHRONIC: Dermatitis. May damage liver and kidneys.	(FP) 175°F (VP) 0.4 mm (IP) 8.50 eV (UEL) 8.6% (LEL) 1.8%	Colorless to yellow or light pink, crystalline solid with a sweet, acrid odor.
Selenium CAS-7782-49-2	Selenium CAS-7782-49-2	1.7	TLV: 0.2 mg/m3 PEL: 0.2 mg/m3 STEL: NE IDLH: 1 mg/m3	Inhalation Ingestion Skin Contact Eye Contact	ACUTE: Irritation eyes, skin, nose, throat; visual disturbance; headache; chills, fever, dyspnea (breathing difficulty). Metallic taste, garlic breath. CHRONIC: Bronchitis, , eye, skin burns; gastrointestinal disturbance, dermatitis.	(FP) NA (VP) 0 mm (IP) NA (UEL) NA (LEL) NA	Amorphous or crystalline, red to gray solid. Occurs as an impurity in most sulfide ores
Silver (metal) CAS-7440-22-4	Silver (metal) CAS-7440-22-4	1.8	TLV: 0.1 mg/m3 PEL: 0.01 mg/m3 STEL: NE IDLH: 10 mg/m3	Inhalation Ingestion Skin contact Eye contact	ACUTE: Inhalation of large amounts of vapors may cause lung damage, pulmonary edema. CHRONIC: Grey-blue discoloration of eyes, nose, throat and skin (argyria/argyrosis)	(FP) NA (VP) NA (IP) NA (UEL) NA (LEL) NA	White, lustrous solid.

Table B2.1

Properties of Potential Site Contaminants
Frontier Chemical Site

Chemical Name	Chemical Name (Synonyms)	Maximum Concentration in Site Soils mg/kg	Exposure Limits	Routes Of Entry	Symptoms/Health Effects	Chemical Properties	Physical Characteristics
Tetrachloroethene CAS-127-18-4	Tetrachloroethene PCE Perchloroethylene Tetrachloroethylene CAS-127-18-4	2,700	TLV: 25 ppm PEL: 100 ppm STEL: 100 ppm IDLH: 150 ppm	Inhalation Ingestion Absorption	ACUTE: Irritation to skin, eyes and respiratory tract. Ingestion may cause chemical pneumonitis. Affects CNS. Unconsciousness at high level exposures. CHRONIC: Dermatitis. May cause liver and kidney damage. Probable human carcinogen.	(FP) NA (VP) 14 mm (IP) 9.32 eV (UEL) NA (LEL) NA	Colorless liquid with a mild, chloroform-like odor.
Thallium (metal) CAS-7440-28-0	Thallium (metal) CAS-7440-28-0	7.1	TLV: 0.02 mg/m3 [skin] PEL: 0.1 mg/m3 [skin] STEL: NE IDLH: 15 mg/m3	Inhalation Ingestion Skin contact Absorption Eye contact	ACUTE: May affect gastrointestinal tract, nervous system, kidneys and cardiovascular system. May cause hair loss and atrophy of nails. Ingestion may cause death. Effects may be delayed. CHRONIC: May affect nervous system, cardiovascular system and may cause hair loss.	(FP) NA (VP) NA (IP) NA (UEL) NA (LEL) NA	Bluish-white, very soft metal. Turns grey on exposure to air.
Toluene CAS-108-88-3	Toluene Methylbenzene Toluol CAS-108-88-3	600	TLV: 20 ppm PEL: 200 ppm STEL: NE IDLH: 500 ppm	Inhalation Ingestion Absorption	ACUTE: Irritation to eyes and respiratory tract. Ingestion may cause chemical pneumonitis. Affects CNS. Unconsciousness and cardiac dysrhythmia at high level exposures. CHRONIC: Defatting of the skin. Affects CNS. Enhanced hearing damage.	(FP) 40°F (VP) 21 mm (IP) 8.82 eV (UEL) 7.1% (LEL) 1.1%	Colorless liquid with a sweet, pungent, benzene-like odor.
Trichloroethene CAS-79-01-6	Trichloroethene TCE Trichloroethylene Ethylene trichloride CAS-79-01-6	150	TLV: 10 ppm PEL: 100 ppm STEL: 25 ppm IDLH: 1,000 ppm	Inhalation Ingestion Absorption	ACUTE: Irritation to eyes and skin. Ingestion may cause chemical pneumonitis. Affects CNS. Unconsciousness due to exposure. CHRONIC: Dermatitis. Affects CNS, loss of memory. May damage liver and kidneys. Probable human carcinogen.	(FP) NE (VP) 58 mm (IP) 9.45 eV (UEL) 10.5% @ 77°F (LEL) 8.0% @ 77°F	Colorless liquid with a chloroform-like odor. Sometimes dyed blue.
Vanadium (oxide) dust CAS-1314-62-1	Vanadium (oxide) dust CAS-1314-62-1	25.2	TLV: 0.05 mg/m3 PEL: C 0.5 mg V2O5/m3 (resp) STEL: NE IDLH: 35 mg/m3	Inhalation Ingestion Skin Contact Eye Contact	ACUTE: Irritation eyes, throat; green tongue, metallic taste, cough, fine rales, wheezing CHRONIC: Bronchitis, dyspnea (breathing difficulty); eczema	(FP) NA (VP) 0 mm (IP) NA (UEL) NA (LEL) NA	Yellow-orange powder or dark-grey, odorless flakes dispersed in air

Table B2.1

Properties of Potential Site Contaminants
Frontier Chemical Site

Chemical Name	Chemical Name (Synonyms)	Maximum Concentration in Site Soils mg/kg	Exposure Limits	Routes Of Entry	Symptoms/Health Effects	Chemical Properties	Physical Characteristics
Vinyl Chloride CAS-75-01-4	Vinyl Chloride Chloroethene VCM Chloroethylene CAS-75-01-4	4	TLV: 1 ppm PEL: 1 ppm STEL: NE IDLH: NE	Inhalation Skin contact Eye contact	ACUTE: Irritation to eyes. Affects CNS. May cause unconsciousness. CHRONIC: Affects liver, spleen, blood and peripheral blood vessels, tissue and bones in fingers. Human carcinogen.	(FP) NA (gas) (VP) 3.3 atm (IP) 9.99 eV (UEL) 33.0% (LEL) 3.6%	Colorless gas or liquid (<7°F) with a pleasant odor at high concentrations.
Xylene (o;m;p isomers) CAS-106-42-3	Xylene (o;m;p isomers) CAS-106-42-3	40	TLV: 100 ppm PEL: 100 ppm STEL: 150 ppm IDLH: 900 ppm	Inhalation Absorption Ingestion	ACUTE: Irritation to eyes and respiratory tract. Ingestion may cause chemical pneumonitis. Affects CNS. CHRONIC: Defatting of the skin, lung damage resulting in chronic bronchitis. Affects CNS and blood.	(FP) 90/82/81°F (IP) 7/9/9 mm (IP) 8.56eV (UEL) 6.7% (LEL) 0.9%	Colorless liquid with an aromatic odor. (p-isomer solid <56°F).
Zinc (metal) CAS-7440-66-6	Zinc (metal) Zinc Oxide CAS-7440-66-6	312	TLV: 2 mg/m3 [respirable] PEL: 5 mg/m3 [respirable] STEL: 10 mg/m3 [respirable] IDLH: 500 mg/m3	Inhalation	ACUTE: Metal fume fever; muscle aches, nausea, fever, dry throat, weakness, and lassitude; metallic taste; headache; blurred vision; low back pain. Effects may be delayed. CHRONIC: Decreased pulmonary function. Tightness in chest.	(FP) NA (VP) NA (IP) NA (UEL) NA (LEL) NA	White, odorless solid. Slowly decomposed by water.
Methyl Cyclohexane	Methyl Cyclohexane	17	Not Established	No Information	No Information	No Information	No Information
Trifluorotrichloroethane	Trifluorotrichloroethane	2	Not Established	No Information	No Information	No Information	No Information

TABLE B.8.1

ON-SITE AIR MONITORING PROGRAM ACTION LEVELS
HEALTH AND SAFETY PLAN
FRONTIER CHEMICAL SITE
NIAGARA FALLS, NEW YORK

Monitoring Device	*Action Level*	*Action*
Combustible Gas Indicator	>10 Percent LEL	Cease operations and move to a safe place. Notify CSHO. Do not continue working until conditions are constantly below 10 percent LEL.
Oxygen Meter	<19.5 Percent or >23.5 Percent	Cease operations and move to a safe place. Notify CSHO. Do not continue working until oxygen levels are between 19.5 and 23.5 percent. Note: When oxygen levels are outside this range, percent LEL readings are not reliable.
Photoionization Detector (PID) - Check correction factors (CF) from the manufacturer to convert PID reading to actual gas concentration		
11.7 or greater eV lamp	< 1.0 ppm or Background	Full-Face Respirator Available
	≥ 1 ppm and ≤ 25 ppm	Full-face air purifying respirator Level C PPE
	>25 ppm and < 500 ppm	Supplied air respirator Level B PPE. Implement additional engineering controls.
	≥ 500 ppm	Shut down activities. Notify CSHO. Implement additional engineering controls.
Dust / Particulate - (Impacted	< 1.0 mg/m^3 or Background	Full-Face Respirator Available
	≥ 1.0 mg/m^3 and < 50 mg/m^3	Wear Full-Face Respirator - Level C PPE
	> 50 mg/m^3	Wear Supplied Air Respirator - Level B PPE, Implement Additional Engineering Controls
Carbon Monoxide	>35 ppm	Shut down activities. Notify CSHO. Implement additional engineering controls

Notes:

CSHO Safety and Health Officer (Contractor)
LEL Lower Explosive Limit.
PPE Personal Protection Equipment.
ppm Parts Per Million.

ATTACHMENT A

JOB SAFETY ANALYSIS FORMS

Job Safety Analysis (JSA)

____

Field staff must review job-specific work plan and coordinate with project manager to verify that all up-front logistics are completed prior to starting work including, but not limited to, permitting, access agreements and notification to required contacts (e.g., site managers, inspectors, clients, subcontractors, etc.). Additionally, a tailgate safety meeting must be performed and documented at the beginning of each workday. **Stop, Think, Act, Review (STAR)** must be used prior to any activity. All personnel must possess the appropriate training prior to initiating scheduled tasks. Also consider weather conditions. All project personnel have the authority and responsibility to use **Stop Work Authority.**

Date Issued/Revised	November 2011	**JSA Type:**	
Work Type	Construction	**Client:**	The Frontier Chemical PRP Group
Work Activity			
Work Site	Former Frontier Chemical Site Niagara Falls, New York		
Key Equipment			
Task-specific Training			

MINIMUM REQUIRED PERSONAL PROTECTIVE EQUIPMENT (SEE JOB STEPS FOR TASK-SPECIFIC REQUIREMENTS)			
☐ REFLECTIVE VEST*	☐ GOGGLES	☐ APR: ________________*	☐ GLOVES*
☒ HARD HAT	☐ FACE SHIELD*	☐ SUPPLIED AIR RESPIRATOR*	☐ COVERALLS*
☐ LIFELINE / HARNESS*	☐ HEARING PROTECTION*	☐ PPE CLOTHING*	☐ OTHER*
☒ SAFETY GLASSES	☒ STEEL TOED BOOTS	☐ OTHER* ____________________	☐ OTHER*
ADDITIONAL PPE: * Provide specific type(s) or descriptions of this item below			

Reviewed By	Position/Title	Date	Reviewed By	Position/Title	Date

Job Safety Analysis (JSA)

____

JOB STEPS [1]	TASK ACTIVITY	POTENTIAL HAZARD(S) [2]	CORRECTIVE MEASURE(S)[3]	Person Responsible
1	Perform the STAR Process (Stop Think Act Review) and discuss Stop Work Authority (SWA) -	• Slips, trips, falls; • Situational risks - use STAR;	• Verify personnel training is sufficient for scheduled task(s). Is Job Instruction (hands-on) Training necessary?	
2		•	•	
3		•	•	
4		•	•	
5		•	•	
6		•	•	

[1] Each Job or Task consists of a set of steps. Be sure to list all the steps in the sequence that they are performed. Specify the equipment or other details to set the basis for the potential (associated) hazards.

[2] A hazard is a potential danger. What can go wrong? How can someone get hurt? Consider, but do not limit, the analysis to: **Contact** - victim is struck by or strikes an object; **Caught** - victim is caught on, caught in or caught between objects; **Fall** - victim falls to ground or lower level (includes slips and trips); **Exertion** - excessive strain or stress / ergonomics / lifting techniques; **Exposure** - inhalation/skin hazards. Specify the hazards and do not limit the description to a single word such as "Caught"

[3] Aligning with the Job Steps, Task Activity Description, and Potential Hazard columns, describe what actions or procedures are necessary to eliminate or minimize the hazards. Be clear, concise and specific. Use objective, observable and quantified terms. Avoid subjective general statements such as, "be careful" or "use as appropriate".

Job Safety Analysis (JSA)
DEMOLITION ACTIVITIES

Field staff must review job-specific work plan and coordinate with project manager to verify that all up-front logistics are completed prior to starting work including, but not limited to, permitting, access agreements, and notification to required contacts (e.g., site managers, inspectors, clients, subcontractors, etc.). Additionally, a tailgate safety meeting must be performed and documented at the beginning of each workday. **Stop, Think, Act, Review (STAR)** must be used prior to any activity. All personnel must possess the appropriate training prior to initiating scheduled tasks. Also consider weather conditions. All project personnel have the authority and responsibility to use **Stop Work Authority (SWA).**

Date Issued/Revised:	November 2011	**JSA Type:**	Demolition Activities
Work Type:	Construction	**Client:**	The Frontier Chemical PRP Group
Work Activity:	Oversight of building demolition		
Work Site:	Frontier Chemical Site Niagara Falls, New York		
Key Equipment:	Heavy Equipment and PPE		
Task-specific Training:	40-Hour Training, Fall Protection, CRA Annual Safety Training, Construction Hazards, Remember Charlie Video, HAZCOM/WHMIS, Lockout, Heavy/Mobile Equipment Safety, PPE, Excavation Safety		

MINIMUM REQUIRED PERSONAL PROTECTIVE EQUIPMENT (see job steps for task-specific requirements)						
☒ Reflective Vest	☐ Goggles	☒ Gloves*	**Supplied Air**	**APR**		
☒ Hard Hat	☐ Face Shield*	☐ Coveralls*	☐ SCBA	☐ Full Face APR	☐ Particulate	☐ Organic Vapor
☒ Lifeline/Harness*	☒ Hearing Protection*	☐ PPE Clothing*	☐ Airline Respirator (attach description)	☐ Half Mask APR	☐ Particulate/Organic Vapor Combined	
☒ Safety Glasses	☒ Safety-toed Boots				☐ Acid Gas	
☒ Other*	Flashlight		☐ Other*	☐ Other*		
ADDITIONAL PPE (*provide specific type(s) or descriptions of this item below)						
Assess possible inhalation hazards prior to work and determine appropriate level of respiratory protection if deemed necessary.						

Reviewed By	**Position/Title**	**Date**	**Reviewed By**	**Position/Title**	**Date**

Job Safety Analysis (JSA)
DEMOLITION ACTIVITIES

Job Steps[1]	Task Activity	Potential Hazard(s)[2]	Corrective Measure(s)[3]	Person Responsible
1	Review STAR and SWA	Personnel not aware of STAR and SWA	• Reminder of importance/documentation of procedures for SWA; use SWA to stop any unsafe or illegal work practices • Discuss inspection activities with construction site supervisor and appropriate subcontractors • Sign in with general contractor • Review contractor's site-specific HASP/orientation	Demolition Crew
2	Demolition Activities	Slip/trip/fall hazards Injury from heat/cold stress or inclement weather Noise Lifting heavy objects Falling/flying objects Particulate inhalation Exposure to vehicular traffic and heavy and mobile equipment Struck by falling debris Exposure to dust and contaminated particulate Sharp objects, pinch point and impaling hazards	• Walk area first, especially when view of ground surface is covered • Keep area free of excess materials and debris • Remove all travel path hazards by keeping materials/objects organized and out of walkways • Note and communicate areas of slick or uneven ground • Take breaks as needed by monitoring the daily heat index, as outlined in the HASP • Consume adequate food/beverages; personnel should consume at least 8 ounces (250 mL) of cool water or electrolyte replacement drinks every 20-30 minutes • Observe work-rest schedule to manage heat/cold stresses • When warranted, stay alert for rain, lightning and high wind hazards; perform work in such hazards as outlined in the HASP • Hearing protection required when working within 20 feet (6 m) of operating equipment or units, if levels are suspected to be >85 dBA, or for personal comfort • Check for contact hazards such as other boxes/objects in the vicinity as well as other people/equipment in the area • Check there is ample room to squat, lift, turn, or maneuver without twisting the back or other muscle joints • Check travel path for, and remove slip hazards such as tools, puddles, and debris • Demarcate demolition area, ensuring a safe distance from work to avoid any accidental injury from airborne debris/dust as well as demolition equipment • Wear appropriate PPE • Do not allow distractions; if attention is to be diverted from work (phone call/conversation/etc.) move away from work zone • Do not enter structure once integrity has been compromised; collapse can result in serious injury and/or death • Prior to demolition works, assess building to determine if possible hazards exist from airborne particulate matter such as asbestos-containing materials (ACM), fiberglass, silica, or known Contaminants of Concern (COCs) from site history • Determine and don appropriate PPE (including respiratory protection) as required • Avoid airborne particulate whenever possible; PPE is your last line of defense • Maintain eye contact with equipment operators and do not walk into their path unless the operator motions for you to move • Stay outside of swing radius of articulating equipment	Demolition Crew

Job Safety Analysis (JSA)
DEMOLITION ACTIVITIES

Job Steps[1]	Task Activity	Potential Hazard(s)[2]	Corrective Measure(s)[3]	Person Responsible
3	Clean-up and disposal of debris	Exposure to hazardous materials	• Ensure that all materials are assessed prior to demolition to determine presence of possibly hazardous materials such as ACM, fiberglass, silica or known COCs from site history • Ensure that proper protocols are followed for disposing of waste as per governmental procedures; If no procedure(s) are available, follow best practices • Ensure proper PPE (including respiratory protection) as applicable is worn until all hazardous materials (including particulate matter) has been removed and exposure to the area is deemed safe	Demolition Crew

(1) Each Job or Task consists of a set of steps. Be sure to list all the steps in the sequence that they are performed. Specify the equipment or other details to set the basis for the potential (associated) hazards.

(2) A hazard is a potential danger. What can go wrong? How can someone get hurt? Consider, but do not limit, the analysis to: **Contact** - victim is struck by or strikes an object; **Caught** - victim is caught on, caught in or caught between objects; **Fall** - victim falls to ground or lower level (includes slips and trips); **Exertion** - excessive strain or stress/ergonomics/lifting techniques; **Exposure** - inhalation/skin hazards. Specify the hazards and do not limit the description to a single word such as "Caught".

(3) Aligning with the Job Steps, Task Activity Description, and Potential Hazard columns, describe what actions or procedures are necessary to eliminate or minimize the hazards. Be clear, concise and specific. Use objective, observable, and quantified terms. Avoid subjective general statements such as "be careful" or "use as appropriate".

Job Safety Analysis (JSA)
EQUIPMENT FUELING

Field staff must review job-specific work plan and coordinate with project manager to verify that all up-front logistics are completed prior to starting work including, but not limited to, permitting, access agreements and notification to required contacts (e.g., site managers, inspectors, clients, subcontractors, etc.). Additionally, a tailgate safety meeting must be performed and documented at the beginning of each workday. **Stop, Think, Act, Review (STAR)** must be used prior to any activity. All personnel must possess the appropriate training prior to initiating scheduled tasks. Also consider weather conditions. All project personnel have the authority and responsibility to use **Stop Work Authority.**

Date Issued/Revised	November 2011	**JSA Type:**	Excavation
Work Type	Construction	**Client:**	The Frontier Chemical PRP Group
Work Activity	Pumping fuel into equipment		
Work Site	Former Frontier Chemical Site Niagara Falls, New York		
Key Equipment	Pickup Truck w/ Fuel Tank and Temporary fuel storage tank w/ secondary containment		
Task-specific Training	HAZCOM, PPE, Mobile Equipment Operations		

MINIMUM REQUIRED PERSONAL PROTECTIVE EQUIPMENT (SEE JOB STEPS FOR TASK-SPECIFIC REQUIREMENTS)			
☒ REFLECTIVE VEST*	☐ GOGGLES	☐ APR: ________________*	☒ GLOVES*
☒ HARD HAT	☐ FACE SHIELD*	☐ SUPPLIED AIR RESPIRATOR*	☐ COVERALLS*
☐ LIFELINE / HARNESS*	☐ HEARING PROTECTION*	☐ PPE CLOTHING*	☐ OTHER*
☒ SAFETY GLASSES	☒ STEEL TOED BOOTS	☐ OTHER* ________________	☐ OTHER*
ADDITIONAL PPE: * Provide specific type(s) or descriptions of this item below			
Reflective Vest - Class II			

Reviewed By	**Position/Title**	**Date**	**Reviewed By**	**Position/Title**	**Date**

Job Safety Analysis (JSA)
EQUIPMENT FUELING

JOB STEPS [1]	TASK ACTIVITY	POTENTIAL HAZARD(S) [2]	CORRECTIVE MEASURE(S)[3]	Person Responsible
1	Perform the STAR Process (Stop Think Act Review) and discuss Stop Work Authority (SWA) -	• Slips, trips, falls; • Situational risks - use STAR;	• Verify personnel training is sufficient for scheduled task(s). Is Job Instruction (hands-on) Training necessary?	Fueling Technician
2	Refer to the equipment manufacturer's operating manual before using any machinery. Place Nozzle in tank	• Property damage and personal injury from fire; • Fire potential from static/ contact spark	• No cell phones allowed on site. No cell phones in fueling areas. No smoking. No fueling during storm events. Determine appropriate area for fueling. Have two 20lb fire extinguishers within 25 feet of the fueling area.	Fueling Technician
3	Turn on pump and dispense fuel into equipment	• Property damage and personal injury from fire; • Fire potential from static/ contact spark; • Personal injury due to skin /eye contact with fuel due to splash/ spills of fuel	• No cell phones allowed on site. No cell phones in fueling areas. No smoking. No fueling during storm events. Determine appropriate area for fueling. Have two 20lb fire extinguishers within 25 feet of the fueling area. Ensure the end of the nozzle is secured in the tank before turning on the pump and dispensing fuel. Wear the proper PPE. Stay upwind when fueling equipment. Remain in attendance of the nozzle at all times during fueling. Avoid overfilling of the equipment.	Fueling Technician
4	Turn off pump and return nozzle to the fuel tank	• Property damage and personal injury from fire; • Fire potential from static/ contact spark; • Slips/ trips/ falls; pinch points	• No cell phones allowed on site. No cell phones in fueling areas. No smoking. No fueling during storm events. Determine appropriate area for fueling. Have two 20lb fire extinguishers within 25 feet of the fueling area. Ensure the end of the nozzle is secured in the tank before turning on the pump and dispensing fuel. Wear the proper PPE. Stay upwind when fueling equipment. Remain in attendance of the nozzle at all times during fueling. Avoid overfilling of the equipment. Pay Attention to surroundings. Pick up tools, equipment, and trash in the fueling area. Pay attention to the surroundings. Wear gloves. Do not rush.	Fueling Technician

[1] Each Job or Task consists of a set of steps. Be sure to list all the steps in the sequence that they are performed. Specify the equipment or other details to set the basis for the potential (associated) hazards.

[2] A hazard is a potential danger. What can go wrong? How can someone get hurt? Consider, but do not limit, the analysis to: **Contact** - victim is struck by or strikes an object; **Caught** - victim is caught on, caught in or caught between objects; **Fall** - victim falls to ground or lower level (includes slips and trips); **Exertion** - excessive strain or stress / ergonomics / lifting techniques; **Exposure** - inhalation/skin hazards. Specify the hazards and do not limit the description to a single word such as "Caught"

[3] Aligning with the Job Steps, Task Activity Description, and Potential Hazard columns, describe what actions or procedures are necessary to eliminate or minimize the hazards. Be clear, concise and specific. Use objective, observable and quantified terms. Avoid subjective general statements such as, "be careful" or "use as appropriate".

Job Safety Analysis (JSA)
EXCAVATION AND TRENCHING

Field staff must review job-specific work plan and coordinate with project manager to verify that all up-front logistics are completed prior to starting work including, but not limited to, permitting, access agreements and notification to required contacts (e.g., site managers, inspectors, clients, subcontractors, etc.). Additionally, a tailgate safety meeting must be performed and documented at the beginning of each workday. **Stop, Think, Act, Review (STAR)** must be used prior to any activity. All personnel must possess the appropriate training prior to initiating scheduled tasks. Also consider weather conditions. All project personnel have the authority and responsibility to use **Stop Work Authority.**

Date Issued/Revised	November 2011	**JSA Type:**	Excavation and Trenching
Work Type	Construction	**Client:**	The Frontier Chemical PRP Group
Work Activity	Excavation and Trenching		
Work Site	Former Frontier Chemical Site Niagara Falls, New York		
Key Equipment	Excavator; air monitoring equipment (PID and 4-gas); Excavation Safety Checklist		
Task-specific Training	40 HR and 8 HR HAZWOPER, PPE, Mobile Equipment Operations, Excavation Safety Training; Excavation Competent Person (for supervisors); Heavy Equipment Safety		

MINIMUM REQUIRED PERSONAL PROTECTIVE EQUIPMENT (SEE JOB STEPS FOR TASK-SPECIFIC REQUIREMENTS)			
☒ REFLECTIVE VEST*	☐ GOGGLES	☒ APR: Full-Facepiece*	☒ GLOVES*
☒ HARD HAT	☐ FACE SHIELD*	☐ SUPPLIED AIR RESPIRATOR*	☐ COVERALLS*
☐ LIFELINE / HARNESS*	☐ HEARING PROTECTION*	☐ PPE CLOTHING*	☐ OTHER*
☒ SAFETY GLASSES	☒ STEEL TOED BOOTS	☐ OTHER* ______	☐ OTHER* ______
ADDITIONAL PPE: * Provide specific type(s) or descriptions of this item below			
Reflective Vest- Class II Gloves - Leather			
APR –Full-Facepiece equipped with organic vapor and particulate cartridges			

Reviewed By	Position/Title	Date	Reviewed By	Position/Title	Date

Job Safety Analysis (JSA)
EXCAVATION AND TRENCHING

JOB STEPS [1]	TASK ACTIVITY	POTENTIAL HAZARD(S) [2]	CORRECTIVE MEASURE(S)[3]	Person Responsible
1	Perform the STAR Process (Stop Think Act Review) and discuss Stop Work Authority (SWA) -	• Slips, trips, falls; • situational risks - use STAR;	• Verify personnel training is sufficient for scheduled task(s). Is Job Instruction (hands-on) Training necessary?	All Affected Personnel
2	Verify Utility Clearance procedures completed (overhead and underground); verify excavation trench layout	• Underground utility strike • Overhead utilities	• Clear all underground utilities • Utility Locate Ticket number on file within 10 days of excavation startup? • Mark work area and safe distances for overhead lines • use spotter as necessary	Site Supervisor Project Manager
3	Setup necessary work area and traffic controls	• Fall-in • Caught-between and struck-by hazards	• Demarcate site and work areas to ensure that personnel and truck/equipment traffic is maintained safely and smoothly • Stockpile and laydown area are setup properly	Site Supervisor Laborers
4	Hand digging and pot holing activities conducted (where/if necessary based on utility locates)	• Underground utility strike	• Use preventive techniques • Maintain proper utility clearances with heavy equipment and use hand digging/pot holing when necessary	Site Supervisor Laborers Operator
5	Heavy equipment operations to excavate and handle soils and spoils	• Caught-between and struck-by hazards • Underground/overhead utilities	• Stay out of swing radius • Use spotters to verify clear route of travel and work area; maintain eye contact with operator and/or signal operator; keep soil 2 feet from edges • Inspect heavy equipment – document inspection • Ensure above utility clearances and safe work protocols are followed	All Affected Personnel
6	Trenching activities	• Soil cave-in; noise • Struck-by/against • Encountering impacted soils	• Keep proper distances from edge of excavation • Limit equipment operations in trench area • Keep work area free of trip hazards • Perform necessary soil classification • Use hearing protection as necessary • Follow air monitoring protocols • Contact site supervisor if odors and/or discolored soils are encountered	Operator Radiation Contractor Laborers Site Supervisor
7	Trench or Excavation Entry	• Soil cave-in • Struck-by/against • Encountering slag • Hazardous atmospheres • Slip/trip/fall hazards • Emergency egress	• Keep proper distances from edge of excavation • Limit equipment operations in trench area • Keep work area free of trip hazards • Perform necessary soil classification • Use daily inspection form to document/meet competent person inspection requirements • Inspect trench after any change in conditions (rain, equipment vibrations, etc.) • Utilize trench box properly; ensure that tabulated data sheet is on site (as required) • Use 4-gas monitor and PID to screen excavation air prior to and during entry • Ladder safety and proper slope of ladder • If necessary based on air monitoring and/or other site conditions use harness and lifeline when entering trenches over 5 feet deep	Site Supervisor Operators Laborers

Job Safety Analysis (JSA)
EXCAVATION AND TRENCHING

[1] Each Job or Task consists of a set of steps. Be sure to list all the steps in the sequence that they are performed. Specify the equipment or other details to set the basis for the potential (associated) hazards.

[2] A hazard is a potential danger. What can go wrong? How can someone get hurt? Consider, but do not limit, the analysis to: **Contact** - victim is struck by or strikes an object; **Caught** - victim is caught on, caught in or caught between objects; **Fall** - victim falls to ground or lower level (includes slips and trips); **Exertion** - excessive strain or stress / ergonomics / lifting techniques; **Exposure** - inhalation/skin hazards. Specify the hazards and do not limit the description to a single word such as "Caught"

[3] Aligning with the Job Steps, Task Activity Description, and Potential Hazard columns, describe what actions or procedures are necessary to eliminate or minimize the hazards. Be clear, concise and specific. Use objective, observable and quantified terms. Avoid subjective general statements such as, "be careful" or "use as appropriate".

Job Safety Analysis (JSA)
EXCAVATOR OPERATION

Field staff must review job-specific work plan and coordinate with project manager to verify that all up-front logistics are completed prior to starting work including, but not limited to, permitting, access agreements and notification to required contacts (e.g., site managers, inspectors, clients, subcontractors, etc.). Additionally, a tailgate safety meeting must be performed and documented at the beginning of each workday. **Stop, Think, Act, Review (STAR)** must be used prior to any activity. All personnel must possess the appropriate training prior to initiating scheduled tasks. Also consider weather conditions. All project personnel have the authority and responsibility to use **Stop Work Authority.**

Date Issued/Revised	November 2011	**JSA Type**	Loading Soil and/or Waste Material
Work Type	Construction	**Client**	The Frontier Chemical PRP Group
Work Activity	Excavator Operation		
Work Site	Former Frontier Chemical Site Niagara Falls, New York		
Key Equipment	Excavator		
Task-specific Training	40 HR and 8 HR HAZWOPER, PPE, Mobile Equipment Operations, Excavation Safety Training; Heavy Equipment Safety		

MINIMUM REQUIRED PERSONAL PROTECTIVE EQUIPMENT (SEE JOB STEPS FOR TASK-SPECIFIC REQUIREMENTS)			
☒ REFLECTIVE VEST*	☐ GOGGLES	☐ APR: Full Facepiece*	☒ GLOVES*
☒ HARD HAT	☒ FACE SHIELD*	☐ SUPPLIED AIR RESPIRATOR*	☐ COVERALLS*
☐ LIFELINE / HARNESS*	☒ HEARING PROTECTION*	☐ PPE CLOTHING*	☐ OTHER*
☒ SAFETY GLASSES	☒ STEEL TOED BOOTS	☐ OTHER* ____________	☐ OTHER* ____________
ADDITIONAL PPE: * Provide specific type(s) or descriptions of this item below			
Reflective Vest - Class II Gloves - Leather			
APR –Full-Facepiece equipped with organic vapor and particulate cartridges			

Reviewed By	**Position/Title**	**Date**	**Reviewed By**	**Position/Title**	**Date**

Job Safety Analysis (JSA)
EXCAVATOR OPERATION

JOB STEPS [1]	TASK ACTIVITY	POTENTIAL HAZARD(S) [2]	CORRECTIVE MEASURE(S)[3]	Person Responsible
1	Perform the STAR Process (Stop Think Act Review) and discuss Stop Work Authority (SWA) -	• Slips, trips, falls; • Situational risks - use STAR;	• Verify personnel training is sufficient for scheduled task(s). Is Job Instruction (hands-on) Training necessary?	Site Supervisor on all
2	Inspect equipment	• Equipment malfunction or damage • Hydraulic fluid, fuel, oil leaks/spills • Loss of steering, loss of brakes, etc.; accidents, decreased visibility • Fire • Slip/trip/fall hazards • Unexpected operation of equipment • Swing radius signage missing	• Follow Equipment Inspection Form/Tag Out if malfunction found • Grease moving parts • Check all fluids • Ensure that fluids are not too low or too full • Walk around equipment and look for leaking fluids • Ensure that tracks are acceptable (no unacceptable wear and no objects present) • Ensure that windows and mirrors are clean. Adjust mirrors! • Remove trash or other debris from cab • Ensure that back up alarm and horn are operational • Correct any problems immediately and inform supervisor • If equipment appears as though it has been tampered with or vandalized, do not start it • Ensure that fire extinguisher is in place and functioning • Inspect the fire extinguisher monthly • Use three point mount/dismount at all times • Be cautious of where you step and be aware of your surroundings • Ensure that ignition key is in your pocket, equipment is in neutral and parking brake is engaged • Use interlock safety mechanism any time equipment is not conducting a productive and/or controlled activity	Site Supervisor and Operator
3	Entering equipment	• Reduced visibility • Uncomfortable seating - back strain • Debris on floor getting stuck under pedals • Unexpected movement of excavator	• Adjust seat and mirrors so that you are able to see where traveling • Adjust controls and seat to your comfort and safety • Ensure that all materials inside cab are secured • Be cautious of where you step and be aware of your surroundings • Ensure steps are clear of water, mud, and other debris • Ensure parking brake is engaged and gear is in neutral • Use interlock safety mechanism any time equipment is not conducting a productive and/or controlled activity	Site Supervisor and Operator
4	Configure controls and seating	• Ergonomics/unnecessary physical stress/ back injury • Incapable of reaching controls • Visual blocks	• Upon sitting, adjust seat fully to accommodate reach and comfort zone • Fasten seat belt • Make certain all controls are set in neutral positions • Adjust mirrors	Site Supervisor and Operator
5	Starting and warming up	• Unanticipated rolling or movement, engine fire, or mechanical/electrical faults	• Review operator’s manual if new to this particular machine • Start engine and check controls to ensure all are in working conditions • Allow a minimum of 2 minutes to warm up	Site Supervisor and Operator

Job Safety Analysis (JSA)
EXCAVATOR OPERATION

JOB STEPS [1]	TASK ACTIVITY	POTENTIAL HAZARD(S) [2]	CORRECTIVE MEASURE(S)[3]	Person Responsible
6	Moving equipment work area	• Other equipment, personnel, or objects in work area • Uneven terrain	• Perform STAR – be aware of surroundings • Know the daily task and other people and equipment in the area • Make eye contact with other operators and site personnel in the immediate vicinity • Inspect pathway prior to moving equipment to ensure clear pathway	Site Supervisor and Operator
7	Performing tasks	• Other equipment (collision) • Slopes, ground conditions possible injuries to personnel and equipment, buried obstacles, underground and overhead utilities • Dust	• Perform STAR • Know where utilities are located – know where your bucket is in relation to any underground utilities at all times • Be aware of the scope of work to be performed • Use a spotter • Know the paths of other equipment or persons entering and leaving your work area • Communicate with supervisors and other operators throughout the day with any questions • Stop work immediately and contact a supervisor if you are uncertain of your task, experience equipment failure, or personal injury or near loss • Wear dust mask if conditions warrant	Site Supervisor and Operator
8	Stopping at end of day	• Slip/trip/fall hazards • Overnight parking of equipment	• Be cautious of where you step and be aware of your surroundings • Park in designated area • Set brake/control locks • Idle for 2 minutes if engine is hot • Lower bucket to ground – zero energy state • Turn equipment off; remove keys • Use three-point dismount • Secure inside equipment (i.e., fire extinguisher)	Site Supervisor and Operator

[1] Each Job or Task consists of a set of steps. Be sure to list all the steps in the sequence that they are performed. Specify the equipment or other details to set the basis for the potential (associated) hazards.

[2] A hazard is a potential danger. What can go wrong? How can someone get hurt? Consider, but do not limit, the analysis to: **Contact** - victim is struck by or strikes an object; **Caught** - victim is caught on, caught in or caught between objects; **Fall** - victim falls to ground or lower level (includes slips and trips); **Exertion** - excessive strain or stress / ergonomics / lifting techniques; **Exposure** - inhalation/skin hazards. Specify the hazards and do not limit the description to a single word such as "Caught"

[3] Aligning with the Job Steps, Task Activity Description, and Potential Hazard columns, describe what actions or procedures are necessary to eliminate or minimize the hazards. Be clear, concise and specific. Use objective, observable and quantified terms. Avoid subjective general statements such as, "be careful" or "use as appropriate".

Job Safety Analysis (JSA)
GROUNDWATER SAMPLING ACTIVITIES

Field staff must review job-specific work plan and coordinate with project manager to verify that all up-front logistics are completed prior to starting work including, but not limited to, permitting, access agreements, and notification to required contacts (e.g., site managers, inspectors, clients, subcontractors, etc.). Additionally, a tailgate safety meeting must be performed and documented at the beginning of each workday. **Stop, Think, Act, Review (STAR)** must be used prior to any activity. All personnel must possess the appropriate training prior to initiating scheduled tasks. Also consider weather conditions. All project personnel have the authority and responsibility to use **Stop Work Authority (SWA).**

Date Issued/Revised:	November 2011	**JSA Type:**	Groundwater Sampling
Work Type:	Environmental	**Client:**	The Frontier Chemical PRP Group
Work Activity:	Groundwater sampling		
Work Site:	Frontier Chemical Site Niagara Falls, New York		
Key Equipment:	Bailer or pump (select one or both – address in task activity and hazards); photoionization detector; safety cones/barricades		
Task-specific Training:	40 HR & 8 HR HAZWOPER, Electrical Safety, PPE, HAZCOM and Power and Hand Tool Safety		

MINIMUM REQUIRED PERSONAL PROTECTIVE EQUIPMENT (see job steps for task-specific requirements)					
☐ Reflective Vest	☐ Goggles	☒ Gloves*	**Supplied Air**	**APR**	
☐ Hard Hat	☐ Face Shield*	☐ Coveralls*	☐ SCBA	☒ Full Face APR	☐ Particulate ☐ Organic Vapor
☐ Lifeline/Harness*	☐ Hearing Protection*	☒ PPE Clothing*	☐ Airline Respirator (attach description)	☐ Half Mask APR	☐ Particulate/Organic Vapor Combined
☒ Safety Glasses	☒ Safety-toed Boots				☐ Acid Gas
☒ Other*			☐ Other*	☐ Other*	
ADDITIONAL PPE (*provide specific type(s) or descriptions of this item below)					
Gloves - Use inner nitrile gloves when handling wet sampling containers; use leather gloves for other tasks.					
Other - Sunscreen and Insect Repellant PPE Clothing – Polycoated Tyvek® APR – wear cartridges for organic vapors when organic vapors are present					

Reviewed By	Position/Title	Date	Reviewed By	Position/Title	Date

Job Safety Analysis (JSA)
GROUNDWATER SAMPLING ACTIVITIES

Job Steps[1]	Task Activity	Potential Hazard(s)[2]	Corrective Measure(s)[3]	Person Responsible
1	Discuss STAR (Stop Think Act & Review) and Stop Work Authority (SWA)	• Near Loss, Injury, and even Death	• Identify any hazards. Modify the JSA accordingly. Discuss the task and expectations of the task to all personnel. Have all applicable personnel sign off on this JSA prior to starting work. • Project team (CRA) discusses importance of and documentation procedures for SWA during pre-job safety meeting. Use SWA to stop any work that is unsafe.	Sampling Team
2	Inspect/calibrate sampling equipment	• Loss due to malfunctioning equipment	• Check all equipment to ensure it is in proper working order and has been calibrated to CRA and manufacturer's standards, and document	Sampling Team
3	Establish work zone at monitoring well location, including traffic control	• Traffic • Pinch points • Back strain	• Maintain awareness of on-site traffic patterns and walking paths; setup barricades • Use work gloves when setting up barricades and be aware of hand placement • Use buddy system and proper lifting techniques • Develop a temporary traffic control plan when necessary	Sampling Team
4	Open monitoring well cover(s)	• Pinch points • Hand injury • Biological hazards	• Avoid placing hands in pinch points • Wear proper PPE (gloves) for task and use the proper tool(s) when opening well covers (open face wrench/socket wrench) • Inspect for other hazards that may affect the hands (hypodermic needles, etc.) • Heightened awareness of wasps, ants, bees, spiders, and poison plants	Sampling Team
5	Measure water levels	• Contaminant exposure • Cross contamination	• Wear proper PPE (Ndex nitrile gloves) • use PID to monitor air quality • Decon probe and measuring tape following gauging of well	Sampling Team
6	Develop/purge monitoring well location (select one or both – peristaltic pump or bailer – hazards will be contingent upon method)	• Slip/trip/fall hazards • Cuts • Pinch points • Electrical (AC or DC) • Back and shoulder strain	• Maintain housekeeping; be aware of ground conditions • Use PPE and proper tools • Keep hands away from pinch points • Inspect wiring, clamps, cables, etc.; avoid arcing • Stretch affected muscles (triceps, back, neck, and shoulder) prior to/during/after activity • Avoid repetitive motions and overhead lifts; use proper lifting techniques and neutral postures and take breaks	Sampling Team
7	Collect groundwater sample utilizing bailer or sampling pump	• Chemical exposure • Cuts from container breaking • Sample misidentification	• Wear proper PPE • Inspect bottles for signs of breakage/damage; do not use suspect containers • Close glass bottles carefully – avoid cross threading lid and bottle • Ensure sample id numbers match sample location/site plan • Check sample labels for accuracy prior to placing in container	Sampling Team
8	Close monitoring well cover	• Traffic • Hand injury • Pinch points	• Maintain awareness of on-site traffic patterns; verify barricades are still in place • Wear appropriate gloves and use proper tool(s) • Avoid placing hands in pinch points	Sampling Team
9	Pack samples in container (i.e., cooler)	• Bottle breakage • Chemical exposure • Back strain • Lost time due to sampling error	• Pack glass containers in bubble wrap or equivalent protection • Wear appropriate PPE (Ndex nitrile gloves) • Use proper lifting techniques and buddy lifts (if necessary) • Ensure samples are packed/labeled/shipped correctly – double check	Sampling Team

Job Safety Analysis (JSA)
GROUNDWATER SAMPLING ACTIVITIES

Job Steps[(1)]	Task Activity	Potential Hazard(s)[(2)]	Corrective Measure(s)[(3)]	Person Responsible
10	Manage any investigative derived waste (IDW)	• Chemical exposure • Pinch points • Slip/trip/fall hazards • Heavy lifting • Mislabeling waste	• Wear appropriate PPE (Ndex gloves) and work gloves • Avoid pinch points • Use proper PPE • Inspect for proper housekeeping; clean up work area • Use proper lifting techniques; stretch affected muscles; do not lift more than 50 pounds unassisted – use lifting devices and a buddy to assist • Label IDW appropriately (generator, contact number, identification of contents, and site location); specify type of contents; arrange for disposal	Sampling Team and Project Manager

(1) Each Job or Task consists of a set of steps. Be sure to list all the steps in the sequence that they are performed. Specify the equipment or other details to set the basis for the potential (associated) hazards.

(2) A hazard is a potential danger. What can go wrong? How can someone get hurt? Consider, but do not limit, the analysis to: **Contact** - victim is struck by or strikes an object; **Caught** - victim is caught on, caught in or caught between objects; **Fall** - victim falls to ground or lower level (includes slips and trips); **Exertion** - excessive strain or stress/ergonomics/lifting techniques; **Exposure** - inhalation/skin hazards. Specify the hazards and do not limit the description to a single word such as "Caught".

(3) Aligning with the Job Steps, Task Activity Description, and Potential Hazard columns, describe what actions or procedures are necessary to eliminate or minimize the hazards. Be clear, concise and specific. Use objective, observable, and quantified terms. Avoid subjective general statements such as "be careful" or "use as appropriate".

Job Safety Analysis (JSA)
SOIL SAMPLING ACTIVITIES

Field staff must review job-specific work plan and coordinate with project manager to verify that all up-front logistics are completed prior to starting work including, but not limited to, permitting, access agreements, and notification to required contacts (e.g., site managers, inspectors, clients, subcontractors, etc.). Additionally, a tailgate safety meeting must be performed and documented at the beginning of each workday. **Stop, Think, Act, Review (STAR)** must be used prior to any activity. All personnel must possess the appropriate training prior to initiating scheduled tasks. Also consider weather conditions. All project personnel have the authority and responsibility to use **Stop Work Authority (SWA).**

Date Issued/Revised:	November, 2011	**JSA Type:**	Soil Sampling Activities
Work Type:	Environmental	**Client:**	The Frontier Chemical PRP Group
Work Activity:	Soil Sampling Activities		
Work Site:	Frontier Chemical Site Niagara Falls, New York		
Key Equipment:	Air monitoring equipment, PPE		
Task-specific Training:	40-hr HAZWOPER and 8-hr refresher, HAZCOM, PPE, Power and Hand Tool Safety and CRA Field Method Training (Soil Sampling Procedures)		

MINIMUM REQUIRED PERSONAL PROTECTIVE EQUIPMENT (see job steps for task-specific requirements)						
☐ Reflective Vest	☐ Goggles	☒ Gloves*	**Supplied Air**	**APR**		
☒ Hard Hat	☐ Face Shield*	☐ Coveralls*	☐ SCBA	☐ Full Face APR	☐ Particulate	☐ Organic Vapor
☐ Lifeline/Harness*	☐ Hearing Protection*	☒ PPE Clothing*	☐ Airline Respirator (attach description)	☐ Half Mask APR	☐ Particulate/Organic Vapor Combined	
☒ Safety Glasses	☒ Safety-toed Boots				☐ Acid Gas	
☐ Other*			☐ Other*	☐ Other*		
ADDITIONAL PPE (*provide specific type(s) or descriptions of this item below)						
PPE Clothing -Tyvek®; Gloves inner nitrile for sampling, leather for moving supplies, Ansell Crusader Flex Delux Hot Mill Glove or a Wells Lamont Extra Heavy Weight Terry Glove when contacting hot objects						

Reviewed By	Position/Title	Date	Reviewed By	Position/Title	Date

Job Safety Analysis (JSA)
SOIL SAMPLING ACTIVITIES

Job Steps[(1)]	Task Activity	Potential Hazard(s)[(2)]	Corrective Measure(s)[(3)]	Person Responsible
1	Project Coordination	• Miscommunication • Possible Injury	• Inform Site Operator of planned activities at Site.	Sampling Technician
2	Perform the STAR Process and discuss Stop Work Authority (SWA). Refer to the specific snow thrower's equipment manufacturer's operating manual before using the equipment.	• Slips, Trips, Falls • Situational risks	• Verify personnel's training is sufficient for the scheduled task(s). • Is job instruction training (hands-on) training necessary? • Employees should remove finger rings, necklaces, or jewelry, which may be hazardous in equipment operation.	Sampling Technician
3	Inspect and calibrate sampling and monitoring equipment	• Lost time from improperly functioning equipment • Incorrect sampling procedures/collection due to malfunctioning equipment	• Ensure all equipment is functioning properly • Complete Quality Control documents	Sampling Technician
4	Prepare to collect soil samples	• Back strain • Pinch points • Cuts • Punctures • Sample misidentification	• Use proper lifting techniques and buddy system if needed • Avoid placing hands/fingers in pinch point locations • Use proper tools when opening container packaging • Do not use fixed open blade knives when opening boxes or containers • Ensure the sample id label matches sample location with site plan/CRA site supervisor/subcontractor	Sampling Technician
5	Opening the sample sleeve (if applicable)	• Cuts due to sharp edges of sample sleeve • Contaminant exposure	• Use sleeve cutter for opening the sample sleeves • Keep hands clear of the sleeve when cutting • Wear nitrile gloves • Maintain awareness of sharp edges of sample sleeve	Sampling Technician
6	Sample collection	• Contaminant exposure • Cuts from container breakage • Sample misidentification • Contact with soils that are very hot (400F+)	• Wear nitrile gloves and replace between soil samples Note: wear Ansell Crusader Flex Delux Hot Mill Glove or a Wells Lamont Extra Heavy Weight Terry Glove when contacting hot objects • Inspect glass bottles for breaks/cracks • Do not attempt to use any suspect containers • Close glass sample containers carefully to avoid breakage • Check sample labels for accuracy prior to placing in cooler	Sampling Technician
7	Headspace screening of samples	• Contaminant exposure • Incorrect headspace readings	• Wear nitrile gloves • Ensure proper calibration of equipment	Sampling Technician
8	Sample selection	• Bottle breakage • Contaminant exposure • Pinch points • Lost time due to incorrect sample selection	• Wear nitrile gloves when handling sample containers • Confirm selected samples are correct based on work plan selection criteria, PID readings, and soil boring logs • Avoid placing hands/fingers in pinch point locations (e.g., between cooler and lid)	Sampling Technician

Job Safety Analysis (JSA)
SOIL SAMPLING ACTIVITIES

Job Steps(1)	Task Activity	Potential Hazard(s)(2)	Corrective Measure(s)(3)	Person Responsible
9	Packing samples in cooler(s)	• Bottle breakage • Contaminant exposure • Cuts • Pinch points • Back strain • Lost time due to incorrect sample packaging or hold time exceedances	• Wear nitrile gloves when handling sample containers • Pack glass containers in bubble wrap • Check COC against sample labels and SSOW for accuracy before shipping • Avoid placing hands/fingers in pinch point locations (e.g., between cooler and lid) • Use proper lifting techniques and buddy system if needed • Ensure equipment and supplies are loaded correctly and do not shift during transport	Sampling Technician
10	Investigation derived waste (IDW) management	• Contaminant exposure • Heavy lifting • Pinch points • Slips/trips/fall hazards • Mislabeled waste	• Wear nitrile gloves when handling IDW • Use proper lifting techniques to transport/dispose of IDW into drums and use buddy system if needed • Avoid placing hands/fingers in pinch point locations • Maintain awareness of walking surfaces • Label IDW with generator, a contact number, identification of contents, and site location • Specify IDW as either hazardous or non-hazardous material	Sampling Technician

(1) Each Job or Task consists of a set of steps. Be sure to list all the steps in the sequence that they are performed. Specify the equipment or other details to set the basis for the potential (associated) hazards.

(2) A hazard is a potential danger. What can go wrong? How can someone get hurt? Consider, but do not limit, the analysis to: **Contact** - victim is struck by or strikes an object; **Caught** - victim is caught on, caught in or caught between objects; **Fall** - victim falls to ground or lower level (includes slips and trips); **Exertion** - excessive strain or stress/ergonomics/lifting techniques; **Exposure** - inhalation/skin hazards. Specify the hazards and do not limit the description to a single word such as "Caught".

(3) Aligning with the Job Steps, Task Activity Description, and Potential Hazard columns, describe what actions or procedures are necessary to eliminate or minimize the hazards. Be clear, concise and specific. Use objective, observable, and quantified terms. Avoid subjective general statements such as "be careful" or "use as appropriate".

Job Safety Analysis (JSA)
HEAVY EQUIPMENT OPERATION DOZER/LOADER

Field staff must review job-specific work plan and coordinate with project manager to verify that all up-front logistics are completed prior to starting work including, but not limited to, permitting, access agreements and notification to required contacts (e.g., site managers, inspectors, clients, subcontractors, etc.). Additionally, a tailgate safety meeting must be performed and documented at the beginning of each workday. **Stop, Think, Act, Review (STAR)** must be used prior to any activity. All personnel must possess the appropriate training prior to initiating scheduled tasks. Also consider weather conditions. All project personnel have the authority and responsibility to use **Stop Work Authority.**

Date Issued/Revised	November 2011	**JSA Type**	Construction
Work Type	Construction	**Client**	The Frontier Chemical PRP Group
Work Activity	Heavy Equipment Operation: Dozer / Loader		
Work Site	Former Frontier Chemical Site Niagara Falls, New York		
Key Equipment	Dozer and or Loader		
Task-specific Training	40 HR and 8 HR HAZWOPER, Heavy equipment operation; Mobile Equipment Operations, HAZCOM, PPE		

MINIMUM REQUIRED PERSONAL PROTECTIVE EQUIPMENT (SEE JOB STEPS FOR TASK-SPECIFIC REQUIREMENTS)			
☒ REFLECTIVE VEST*	☐ GOGGLES	☒ APR: Full-Facepiece*	☒ GLOVES*
☒ HARD HAT	☐ FACE SHIELD*	☐ SUPPLIED AIR RESPIRATOR*	☐ COVERALLS*
☐ LIFELINE / HARNESS*	☒ HEARING PROTECTION*	☐ PPE CLOTHING*	☒ OTHER* Fire Extinguisher
☒ SAFETY GLASSES	☒ STEEL TOED BOOTS	☐ OTHER*	☐ OTHER* ____________________
ADDITIONAL PPE: * Provide specific type(s) or descriptions of this item below			
Gloves - Leather Hearing Protection - NNR 20 Reflective Vest - Class 2			
APR –Full-Facepiece equipped with organic vapor and particulate cartridges			

Reviewed By	**Position/Title**	**Date**	**Reviewed By**	**Position/Title**	**Date**

Job Safety Analysis (JSA)
HEAVY EQUIPMENT OPERATION DOZER/LOADER

JOB STEPS [1]	TASK ACTIVITY	POTENTIAL HAZARD(S) [2]	CORRECTIVE MEASURE(S) [3]	Person Responsible
1	Perform the STAR Process and discuss Stop Work Authority (SWA) Perform Review "General Site Activities" JSA.	• Failing to identify hazardous conditions resulting in losses or near losses.	• Perform the STAR Process STAR. • Assess the risks. • Determine the hazards of performing the task and survey the work area. • Consider weather conditions such as fog that could reduce visibility. • Always consider the worst case scenario. • Analyze the hazards determined. • Decide a plan of action to eliminate or reduce the hazards and act on it.	Construction Superintendent and Operator
2	Inspect Equipment	• Equipment malfunction or damage. • Hydraulic fluid, fuel, oil leaks/spills • Loss of steering, loss of brakes, etc. – accidents decreased visibility. • Fire. • Slips, trips, falls. • Unexpected operation of equipment.	• Follow equipment inspection form/tag out if malfunction found. • Grease moving parts. • Check all fluids. • Ensure that fluids are not too low or too full. • Walk around equipment and look for leaking fluids. • Ensure that dozer tracks are acceptable (no unacceptable wear and no objects present). Check loader tires • Ensure that windows and mirrors are clean. • Remove trash or other debris from cab. • Ensure that back up alarm and horn are operational. • Correct any problems immediately and inform supervisor. • If equipment appears as though it has been tampered with or vandalized, do not start it • Ensure that fire extinguisher is in place and functioning. • Inspect the fire extinguisher monthly. • Use three point mount/dismount at all times. • Be cautious of where you step and be aware of your surroundings. • Ensure that ignition key is in your pocket, equipment is in neutral and parking brake is engaged.	Construction Superintendent and Operator
3	Entering Equipment	• Reduced visibility, uncomfortable seating-back strain. • Debris on floor getting stuck under pedals. • Unexpected movement of truck. • Unexpected movement of truck.	• Adjust seat and mirrors so that you are able to see where traveling. • Adjust controls and seat to your comfort and safety. • Ensure that all materials inside cab are secured. • Be cautious of where you step and be aware of your surroundings. • Ensure steps are clear of water, mud and other debris • Ensure parking brake is engaged and gear is in neutral.	Construction Superintendent and Operator
4	Configure controls and seating.	• Ergonomics / unnecessary physical stress. • Incapable of reaching controls. • Visual blocks.	• Upon sitting, adjust seat fully to accommodate reach and comfort zone. • Fasten seat belt • Make certain all controls are set in neutral positions. • Adjust mirrors.	Construction Superintendent and Operator

Job Safety Analysis (JSA)
HEAVY EQUIPMENT OPERATION DOZER/LOADER

JOB STEPS [1]	TASK ACTIVITY	POTENTIAL HAZARD(S) [2]	CORRECTIVE MEASURE(S)[3]	Person Responsible
5	Starting and warming up.	• Unanticipated rolling or movement, • engine fire, or mechanical/electrical faults	• Review operator's manual if new to this particular machine. • Start engine and check controls to ensure all are in working conditions. • Allow a minimum of two minutes to warm up.	Construction Superintendent and Operator
6	Moving equipment work area.	• Other equipment, personnel, or objects in work area. • Uneven terrain.	• Perform the STAR Process. • Know the daily task and other people and equipment in the area. • Make eye contact with other operators and site personnel in the immediate vicinity. • Inspect pathway prior to moving equipment to ensure clear pathway.	Construction Superintendent and Operator
7	Performing tasks.	• Other equipment (collision), • slopes, ground conditions • possible injuries to personnel and equipment, • buried obstacles, underground and overhead utilities. • Organic Vapors/Dust.	• Perform the STAR Process • Know where utilities are located. Be aware of the scope of work to be performed. • Know the paths of other equipment or persons entering and leaving your work area. • Communicate with supervisors and other operators throughout the day with any questions. • Stop work immediately and contact a supervisor if you are uncertain of your task, experience equipment failure, or personal injury or near loss. • Wear respirator if conditions warrant.	Construction Superintendent and Operator
8	Stopping at end of day.	• Slips, trips and falls. • Overnight parking of equipment.	• Be cautious of where you step and be aware of your surroundings. • Park in designated area. • Set brake/control locks. • Idle for two minutes if engine is hot. • Lower blade or bucket to ground. • Turn equipment off. • Use 3-point dismount. • Secure inside instruments (i.e., fire extinguisher).	Construction Superintendent and Operator

1 Each Job or Task consists of a set of steps. Be sure to list all the steps in the sequence that they are performed. Specify the equipment or other details to set the basis for the potential (associated) hazards.

2 A hazard is a potential danger. What can go wrong? How can someone get hurt? Consider, but do not limit, the analysis to: **Contact** - victim is struck by or strikes an object; **Caught** - victim is caught on, caught in or caught between objects; **Fall** - victim falls to ground or lower level (includes slips and trips); **Exertion** - excessive strain or stress / ergonomics / lifting techniques; **Exposure** - inhalation/skin hazards. Specify the hazards and do not limit the description to a single word such as "Caught"

3 Aligning with the Job Steps, Task Activity Description, and Potential Hazard columns, describe what actions or procedures are necessary to eliminate or minimize the hazards. Be clear, concise and specific. Use objective, observable and quantified terms. Avoid subjective general statements such as, "be careful" or "use as appropriate".

JOB SAFETY ANALYSIS (JSA)

Equipment Fueling

Field staff must review job-specific work plan and coordinate with project manager to verify that all up-front logistics are completed prior to starting work including, but not limited to, permitting, access agreements, and notification to required contacts (e.g., site managers, inspectors, clients, subcontractors, etc.). Additionally, a tailgate safety meeting must be performed and documented at the beginning of each workday. **Stop, Think, Act, Review (STAR)** must be used prior to any activity. All personnel must possess the appropriate training prior to initiating scheduled tasks. Also consider weather conditions. CRA personnel have the authority and responsibility to use **Stop Work Authority (SWA).**

Date Issued/Revised	November 2011	**JSA Type:**	Excavation
Work Type	Construction	**Client:**	The Frontier Chemical PRP Group
Work Activity	Pumping fuel into equipment		
Work Site	Former Frontier Chemical Site Niagara Falls, New York		
Key Equipment	Pickup Truck w/ Fuel Tank and Temporary fuel storage tank w/ secondary containment		
Task-specific Training	HAZCOM, PPE, Mobile Equipment Operations		

MINIMUM REQUIRED PERSONAL PROTECTIVE EQUIPMENT (SEE JOB STEPS FOR TASK-SPECIFIC REQUIREMENTS)			
☒ Reflective Vest*	☐ Goggles	☐ APR: ________________*	☒ Gloves*
☒ Hard Hat	☐ Face Shield*	☐ Supplied Air Respirator*	☐ Coveralls*
☐ Lifeline / Harness*	☐ Hearing Protection*	☐ PPE Clothing*	☐ Other*
☒ Safety Glasses	☒ Steel Toed Boots	☐ Other* _____________________________	☐ Other*
ADDITIONAL PPE: * Provide specific type(s) or descriptions of this item below			
Reflective Vest - Class II			

Reviewed By	**Position/Title**	**Date**	**Reviewed By**	**Position/Title**	**Date**

JOB SAFETY ANALYSIS (JSA)

Equipment Fueling

Job Steps[(1)]	TASK ACTIVITY	Potential Hazard(s)[(2)]	corrective measure(s)[(3)]	Person Responsible
1	Perform the STAR Process (Stop Think Act Review) and discuss Stop Work Authority (SWA) -	• Slips, trips, falls; • Situational risks - use STAR;	• Verify personnel training is sufficient for scheduled task(s). Is Job Instruction (hands-on) Training necessary?	Fueling Technician
2	Refer to the equipment manufacturer's operating manual before using any machinery. Place Nozzle in tank	• Property damage and personal injury from fire; • Fire potential from static/ contact spark	• No cell phones allowed on site. No cell phones in fueling areas. No smoking. No fueling during storm events. Determine appropriate area for fueling. Have two 20lb fire extinguishers within 25 feet of the fueling area.	Fueling Technician
3	Turn on pump and dispense fuel into equipment	• Property damage and personal injury from fire; • Fire potential from static/ contact spark; • Personal injury due to skin /eye contact with fuel due to splash/ spills of fuel	• No cell phones allowed on site. No cell phones in fueling areas. No smoking. No fueling during storm events. Determine appropriate area for fueling. Have two 20lb fire extinguishers within 25 feet of the fueling area. Ensure the end of the nozzle is secured in the tank before turning on the pump and dispensing fuel. Wear the proper PPE. Stay upwind when fueling equipment. Remain in attendance of the nozzle at all times during fueling. Avoid overfilling of the equipment.	Fueling Technician
4	Turn off pump and return nozzle to the fuel tank	• Property damage and personal injury from fire; • Fire potential from static/ contact spark; • Slips/ trips/ falls; pinch points	• No cell phones allowed on site. No cell phones in fueling areas. No smoking. No fueling during storm events. Determine appropriate area for fueling. Have two 20lb fire extinguishers within 25 feet of the fueling area. Ensure the end of the nozzle is secured in the tank before turning on the pump and dispensing fuel. Wear the proper PPE. Stay upwind when fueling equipment. Remain in attendance of the nozzle at all times during fueling. Avoid overfilling of the equipment. Pay Attention to surroundings. Pick up tools, equipment, and trash in the fueling area. Pay attention to the surroundings. Wear gloves. Do not rush.	Fueling Technician

(1) Each Job or Task consists of a set of steps. Be sure to list all the steps in the sequence that they are performed. Specify the equipment or other details to set the basis for the potential (associated) hazards.

(2) A hazard is a potential danger. What can go wrong? How can someone get hurt? Consider, but do not limit, the analysis to: **Contact** - victim is struck by or strikes an object; **Caught** - victim is caught on, caught in or caught between objects; **Fall** - victim falls to ground or lower level (includes slips and trips); **Exertion** - excessive strain or stress / ergonomics / lifting techniques; **Exposure** - inhalation/skin hazards. Specify the hazards and do not limit the description to a single word such as "Caught"

(3) Aligning with the Job Steps, Task Activity Description, and Potential Hazard columns, describe what actions or procedures are necessary to eliminate or minimize the hazards. Be clear, concise and specific. Use objective, observable and quantified terms. Avoid subjective general statements such as, "be careful" or "use as appropriate".

Job Safety Analysis (JSA)
MATERIAL HANDLING ACTIVITIES – RIGGING AND PLACEMENT OF MATERIALS

Field staff must review job-specific work plan and coordinate with project manager to verify that all up-front logistics are completed prior to starting work including, but not limited to, permitting, access agreements and notification to required contacts (e.g., site managers, inspectors, clients, subcontractors, etc.). Additionally, a tailgate safety meeting must be performed and documented at the beginning of each workday. **Stop, Think, Act, Review (STAR)** must be used prior to any activity. All personnel must possess the appropriate training prior to initiating scheduled tasks. Also consider weather conditions. All project personnel have the authority and responsibility to use **Stop Work Authority.**

Date Issued/Revised	November 2011	**JSA Type**	Material Handling Activities
Work Type	Construction	**Client**	The Frontier Chemical PRP Group
Work Activity	Rigging and Placement of Materials		
Work Site	The Former Frontier Chemical Site Niagara Falls, New York		
Key Equipment	Excavator, Backhoe, or Crane		
Task-specific Training	Rigging; lifting signals; heavy equipment safety; use of taglines; proper use of load charts; 40 HR and 8 HR HAZWOPER, HAZCOM, PPE, Mobile Equipment Operations		

MINIMUM REQUIRED PERSONAL PROTECTIVE EQUIPMENT (SEE JOB STEPS FOR TASK-SPECIFIC REQUIREMENTS)			
☒ REFLECTIVE VEST*	☐ GOGGLES	☐ APR: ________________*	☒ GLOVES*
☒ HARD HAT	☐ FACE SHIELD*	☐ SUPPLIED AIR RESPIRATOR*	☐ COVERALLS*
☐ LIFELINE / HARNESS*	☐ HEARING PROTECTION*	☐ PPE CLOTHING*	☐ OTHER* ____________________________
☒ SAFETY GLASSES	☒ STEEL TOED BOOTS	☐ OTHER* ______________________________	☐ OTHER* ____________________________
ADDITIONAL PPE: * Provide specific type(s) or descriptions of this item below			
Reflective Vest - Class II			
Gloves - Leather			

Reviewed By	**Position/Title**	**Date**	**Reviewed By**	**Position/Title**	**Date**

Job Safety Analysis (JSA)
MATERIAL HANDLING ACTIVITIES – RIGGING AND PLACEMENT OF MATERIALS

JOB STEPS [1]	TASK ACTIVITY	POTENTIAL HAZARD(S) [2]	CORRECTIVE MEASURE(S)[3]	Person Responsible
1	Perform the STAR Process and discuss Stop Work Authority (SWA) Equipment Inspection	• Hydraulic failure	• Inspect equipment lines and fluid reservoirs	Operator
2	Rigging components – Inspection of load and rigging	• Attachment point failure	• Inspect attachment hook/ring for fractures, dents or abuse. • Certify load capability of attachment point.	Operator, Qualified Rigger and all field personnel involved in the operation
3	Rigging components – Continue inspection of load, rigging, and material to be lifted	• Rigging assembly failure	• Inspect rigging chains, wire rope, cables, hooks, slings, d-rings, splitters, spreaders and all other components for unusual shape, fractures, fraying, dents, abuse or abnormalities. • Insure components used have annual certification, proper load rating and are implemented as recommended by training and the manufacturer.	Operator, Labor and all field personnel involved in operation.
4	Rigging components	• Improper component attachment, lifting point usage, incorrect balance or component orientation	• Use the manufacturer's recommended lifting attachment points, slots or cable points to secure load to be rigged. • Use proper rigging components to assure load is evenly distributed, proper balance is achieved and place hoisting equipment and rigged components in proper orientation to assure placement logistics are correct.	Operator, Labor and all field personnel involved in operation.
5	Tag lines – Proper placement of taglines to ensure control of load. No one is to work under a suspended load	• Lift control failure	• Use of tag lines, as a lifting control measure is mandatory as appropriate for correct placement of rigged component. • Personnel assisting rigging or lift should never physically be in contact with rigged or lifted components as a measure of component control.	Operator, Labor and all field personnel involved in operation.
6	Pre-plan the lift and prepare the landing zone	• Objects/personnel in swing radius path; • Lifting outside of equipment's load safe load radius	• Pre-plan the lift to ensure swing radius does not impact other operations. • Ensure that load and load path stays within load radius of lifting equipment.	Rigger, And Operator
7	Component placement – Pick the load and place the item in the correct position.	• Improper preparation of location receiving rigged or lifted component resulting in need for multiple lifts.	• Preparation of the area receiving the rigged or lifted component to avoid and necessary re-lift or multiple lifts.	Operator, Labor and all field personnel involved in operation.
8	Maintain Control of Area	• Unauthorized personnel or equipment in rigging or lifting exclusion zone	• Area marking and clearance of all personnel and equipment to prevent interference during rigging or lifting activities. • Spotter action to terminate rigging or lifting if situational changes occur putting personnel or equipment at risk.	Operator, Labor and all field personnel involved in operation.
9	Control of communication between task personnel	• Multiple signals interfering with operator	• During lifting or rigging activities, a communication order must be established previous to any attempt to hoist load. • Spotters communicate to one load controller; load controller communicates to operator. • Operator must maintain visual contact with load controller at all times. • All operations are controlled by ground controller.	Operator, Labor and all field personnel involved in operation.
10	Trench entry in order to place materials and piping – see JSA for Excavation Activities	• Excavation Hazards (review of that JSA)	• Follow JSA for Excavation.	All Affected Personnel

Job Safety Analysis (JSA)

MATERIAL HANDLING ACTIVITIES – RIGGING AND PLACEMENT OF MATERIALS

[1] Each Job or Task consists of a set of steps. Be sure to list all the steps in the sequence that they are performed. Specify the equipment or other details to set the basis for the potential (associated) hazards.

[2] A hazard is a potential danger. What can go wrong? How can someone get hurt? Consider, but do not limit, the analysis to: **Contact** - victim is struck by or strikes an object; **Caught** - victim is caught on, caught in or caught between objects; **Fall** - victim falls to ground or lower level (includes slips and trips); **Exertion** - excessive strain or stress / ergonomics / lifting techniques; **Exposure** - inhalation/skin hazards. Specify the hazards and do not limit the description to a single word such as "Caught"

[3] Aligning with the Job Steps, Task Activity Description, and Potential Hazard columns, describe what actions or procedures are necessary to eliminate or minimize the hazards. Be clear, concise and specific. Use objective, observable and quantified terms. Avoid subjective general statements such as, "be careful" or "use as appropriate".

Job Safety Analysis (JSA)
MOBILE EQUIPMENT OPERATION

Safety Means Awareness Responsibility Teamwork

Field staff must review job-specific work plan and coordinate with project manager to verify that all up-front logistics are completed prior to starting work including, but not limited to, permitting, access agreements and notification to required contacts (e.g., site managers, inspectors, clients, subcontractors, etc.). Additionally, a tailgate safety meeting must be performed and documented at the beginning of each workday. **Stop, Think, Act, Review (STAR)** must be used prior to any activity. All personnel must possess the appropriate training prior to initiating scheduled tasks. Also consider weather conditions. All project personnel have the authority and responsibility to use **Stop Work Authority.**

Date Issued/Revised	November 2011	**JSA Type:**	Construction
Work Type	Construction	**Client:**	The Frontier Chemical PRP Group
Work Activity	Mobile Equipment Operation		
Work Site	The Former Frontier Chemical Site Niagara Falls, New York		
Key Equipment	Excavator; Dozer, Loader, Skidsteer, Compactor, Grader, Off-road Dump Truck, Pickup Trucks		
Task-specific Training	40 HR and 8 HR HAZWOPER, PPE, Mobile Equipment Operations, Excavation Safety Training; Excavation Competent Person (for supervisors); Heavy Equipment Safety		

MINIMUM REQUIRED PERSONAL PROTECTIVE EQUIPMENT (SEE JOB STEPS FOR TASK-SPECIFIC REQUIREMENTS)			
☒ REFLECTIVE VEST*	☐ GOGGLES	☐ APR: _______________*	☒ GLOVES*
☒ HARD HAT	☐ FACE SHIELD*	☐ SUPPLIED AIR RESPIRATOR*	☐ COVERALLS*
☒ LIFELINE / HARNESS*	☐ HEARING PROTECTION*	☐ PPE CLOTHING*	☐ OTHER*
☒ SAFETY GLASSES	☒ STEEL TOED BOOTS	☐ OTHER* ____________	☐ OTHER* ____________
ADDITIONAL PPE: * Provide specific type(s) or descriptions of this item below			
Lifeline / Harness will be used in deep excavations; Reflective Vest- Class II Gloves - Leather			

Reviewed By	Position/Title	Date	Reviewed By	Position/Title	Date

Job Safety Analysis (JSA)
MOBILE EQUIPMENT OPERATION

JOB STEPS [1]	TASK ACTIVITY	POTENTIAL HAZARD(S) [2]	CORRECTIVE MEASURE(S)[3]	Person Responsible
1	Perform the STAR Process (Stop Think Act Review) and discuss Stop Work Authority (SWA) -	• Slips, trips, falls; • Situational risks	• Verify personnel training is sufficient for scheduled task(s). Is Job Instruction (hands-on) Training necessary?	Operator
2	Perform daily (pre-shift) equipment inspection include area around the equipment and PPE and perform a complete walk around inspection	• Equipment failure • PPE failure	• Don all necessary PPE • Provide training to personnel on inspection procedures • Document daily inspection • Defects must be corrected before operating unit	Operator
3	Mount/dismount the equipment	• Slip/trip/fall hazards • Sprains/Strains • Potential injury	• Use three points of contact • Never jump from the machine • Clear tracks and personnel access points of debris and mud as necessary • Only a trained operator will be allowed on equipment • Never carry riders unless unit is so designed	Operator
4	Starting heavy/mobile equipment	• Struck-by • Caught between • Equipment failure	• Perform inspection (see Task 2) • Check to be certain all workers and equipment are a safe distance from unit • All operators manuals should be available for each piece of equipment and used in employee training • Allow proper warm-up and wait for gauges to register properly • Raise the blade, cable and chokers, boom, grapple, or other attachments before moving the unit	Operator
5	Operation of heavy/mobile equipment	• Struck-by/Caught In • Overhead/underground utilities • Flying debris • Rollover • Fire • Winch failure	• Appropriate guarding (according to machine type and use) shall be in place at all times unit is in operation • Backup alarms shall be functional • Seat belts shall be provided and their use enforced • Fire extinguishers and first aid kits shall be provided on each unit • Fire extinguishers shall be inspected for functionality on a daily basis • Do not operate equipment unless you have been trained to safely operate the equipment	Operator
6	Perform equipment maintenance	• Equipment failure/loss • Sharp objects • Pinch points	• Use STAR process • Follow equipment manufacturer's preventive maintenance procedures and instructions • Only qualified individuals should perform maintenance activities on equipment	Operator
7	Cleaning and housekeeping of equipment	• Fire • Slip/trip/fall hazards • Equipment failure	• Remove loose items and all trash from the operator's compartment • Clean equipment as necessary to prevent buildup of debris, wood chips, etc. that may cause fire	Operator

[1] Each Job or Task consists of a set of steps. Be sure to list all the steps in the sequence that they are performed. Specify the equipment or other details to set the basis for the potential (associated) hazards.

[2] A hazard is a potential danger. What can go wrong? How can someone get hurt? Consider, but do not limit, the analysis to: **Contact** - victim is struck by or strikes an object; **Caught** - victim is caught on, caught in or caught between objects; **Fall** - victim falls to ground or lower level (includes slips and trips); **Exertion** - excessive strain or stress / ergonomics / lifting techniques; **Exposure** - inhalation/skin hazards. Specify the hazards and do not limit the description to a single word such as "Caught"

[3] Aligning with the Job Steps, Task Activity Description, and Potential Hazard columns, describe what actions or procedures are necessary to eliminate or minimize the hazards. Be clear, concise and specific. Use objective, observable and quantified terms. Avoid subjective general statements such as, "be careful" or "use as appropriate".

Job Safety Analysis (JSA)
MOBILIZATION AND DEMOBILIZATION ACTIVITIES

Field staff must review job-specific work plan and coordinate with project manager to verify that all up-front logistics are completed prior to starting work including, but not limited to, permitting, access agreements and notification to required contacts (e.g., site managers, inspectors, clients, subcontractors, etc.). Additionally, a tailgate safety meeting must be performed and documented at the beginning of each workday. **Stop, Think, Act, Review (STAR)** must be used prior to any activity. All personnel must possess the appropriate training prior to initiating scheduled tasks. Also consider weather conditions. All project personnel have the authority and responsibility to use **Stop Work Authority.**

Date Issued/Revised	November 2011	**JSA Type**	Mobilization and Demobilization Activities
Work Type	Construction	**Client**	The Frontier Chemical PRP Group
Work Activity	Mobilization of Equipment and Supplies to and from the job site		
Work Site	The Former Frontier Chemical Site Niagara Falls, New York		
Key Equipment	Pickup trucks and trailers		
Task-specific Training	PPE, HAZCOM, Motor Vehicle Safety, Mobile Equipment Operations		

MINIMUM REQUIRED PERSONAL PROTECTIVE EQUIPMENT (SEE JOB STEPS FOR TASK-SPECIFIC REQUIREMENTS)			
☒ REFLECTIVE VEST*	☐ GOGGLES	☐ APR: ________________*	☒ GLOVES*
☒ HARD HAT	☐ FACE SHIELD*	☐ SUPPLIED AIR RESPIRATOR*	☐ COVERALLS*
☐ LIFELINE / HARNESS*	☐ HEARING PROTECTION*	☐ PPE CLOTHING*	☐ OTHER* ____________________________
☒ SAFETY GLASSES	☒ STEEL TOED BOOTS	☐ OTHER* ____________________________	☐ OTHER* ____________________________

ADDITIONAL PPE: * Provide specific type(s) or descriptions of this item below
Reflective Vest - Class II
Gloves - Leather

Reviewed By	**Position/Title**	**Date**	**Reviewed By**	**Position/Title**	**Date**

Job Safety Analysis (JSA)
MOBILIZATION AND DEMOBILIZATION ACTIVITIES

JOB STEPS (1)	TASK ACTIVITY	POTENTIAL HAZARD(S) (2)	CORRECTIVE MEASURE(S)(3)	Person Responsible
1	Discuss STAR (Stop Think Assess & Review) and Stop Work Authority (SWA)	• Site personnel not aware of STAR & SWA	• Project team discusses importance of and documentation procedures for SWA during pre-job safety meeting. Use SWA to stop any work that is unsafe.	Personnel Taking Part in this Activity
2	Check weather	• Unexpected storm; Fog; Rain; Snow; Lightening/Thunder; • Heat/Cold stress	• Check local weather forecast. • Discuss weather issues and precautions to take while driving and on-site during the pre-job safety meeting. If weather conditions (e.g., fog, rain, snow, etc.) impair the ability/vision of the driver, exit at nearest safe location and assess the situation. • While on-site, at first sign of lightening/thunder utilize SWA and assess weather conditions. In extreme temperatures, ensure all personnel have proper clothing, hydration, and heat/cold protection (e.g., canopy, fan, and glove warmers).	Personnel Taking Part in this Activity
3	Load equipment into vehicle	• Back strain; • Cuts; • Pinch points; • Hand/Foot injury; • Forgotten equipment; • Damaged equipment	• Use proper lifting techniques and buddy system if needed. • Wear leather/cotton gloves and avoid placing hands/fingers in pinch point locations. Wear steel toe boots. • Verify requested equipment against warehouse form. • Load equipment in an organized manner to prevent shifting during transport or use cargo netting.	Personnel Taking Part in this Activity
4	Complete CRA Daily Operator Vehicle Checklist	• Damaged vehicle lights, tires, windows, mirrors, horn; Inadequate vehicle documents and/or safety items	• Check for fluid leaks under vehicle. • Test operation of headlights, front/rear turn signals, backup lights, brake lights, and emergency flashers. Visually check the pressure/wear of tires. Ensure the vehicle has a spare tire. Assure windshield and window glass is clean and free from obstructions. Test the windshield wipers and horn. Verify vehicle registration, insurance card, and inspection sticker is present and valid. • Ensure the vehicle contains a first aid kit, fire extinguisher, and road hazard kit.	Personnel Taking Part in this Activity
5	Check and adjust seat, steering wheel, headrest, and mirrors	• Back/body strain; • Blind spots; Impaired vision.	• Adjust seat, headrest, and steering wheel height so body is fully supported/comfortable and pedals are within easy reach. Ensure mirrors are properly adjusted.	Personnel Taking Part in this Activity
6	Fasten seat belt(s) and ensure passenger(s) seat belts are fastened	• Serious injury, ejection, or death from collision and/or traffic citation	• Verify driver and passenger(s) seat belts are in good condition and properly latched.	Personnel Taking Part in this Activity
7	Ensure vehicle doors are locked	• Serious injury, ejection, or death from collision; • Unwanted intrusion; Lost equipment	• Manually lock all doors to vehicle.	Personnel Taking Part in this Activity
8	Start engine and check gauges and warning lights	• Vehicle breakdown	• Verify sufficient fuel and other hazard lamps (e.g., battery, oil, and temperature) are not lit.	Personnel Taking Part in this Activity

Job Safety Analysis (JSA)
MOBILIZATION AND DEMOBILIZATION ACTIVITIES

JOB STEPS [(1)]	TASK ACTIVITY	POTENTIAL HAZARD(S) [(2)]	CORRECTIVE MEASURE(S)[(3)]	Person Responsible
9	Mobilize to site	• Arriving late; • Collision; • Injury or Death to occupants or other parties	• Do not use cell phones or perform other distracting activities while vehicle is in motion. • Constantly scan intersections, move eyes, check mirrors, and assess traffic lights (fresh vs. stale). • Maintain safety cushion around vehicle (front, sides, and rear) and 4 second following distance. • Utilize all driving defensive techniques.	Personnel Taking Part in this Activity
10	Arrive at site	• Pedestrian injury; • Collision	• Maintain awareness of pedestrian/vehicular traffic when entering site and traveling to work zone.	Personnel Taking Part in this Activity
11	Park vehicle	• Pedestrian injury; • Collision; • Property damage	• Maintain awareness of pedestrian/vehicular traffic. • Park vehicle in pull-through parking space or facing the exit. • Use caution and mirrors/spotter when backing vehicle.	Personnel Taking Part in this Activity
12	Demobilization	• Collision; • Injury or Death to occupants or other parties	• Perform perimeter vehicle check. • Maintain awareness of pedestrian/vehicular traffic when exiting site. • Utilize defensive driving techniques. • Complete post-departure checklist and report vehicle problems to company vehicle maintenance manager or rental car agency.	Personnel Taking Part in this Activity

1 Each Job or Task consists of a set of steps. Be sure to list all the steps in the sequence that they are performed. Specify the equipment or other details to set the basis for the potential (associated) hazards.

2 A hazard is a potential danger. What can go wrong? How can someone get hurt? Consider, but do not limit, the analysis to: **Contact** - victim is struck by or strikes an object; **Caught** - victim is caught on, caught in or caught between objects; **Fall** - victim falls to ground or lower level (includes slips and trips); **Exertion** - excessive strain or stress / ergonomics / lifting techniques; **Exposure** - inhalation/skin hazards. Specify the hazards and do not limit the description to a single word such as "Caught"

3 Aligning with the Job Steps, Task Activity Description, and Potential Hazard columns, describe what actions or procedures are necessary to eliminate or minimize the hazards. Be clear, concise and specific. Use objective, observable and quantified terms. Avoid subjective general statements such as, "be careful" or "use as appropriate".

Job Safety Analysis (JSA)
ROUTINE O&M ACTIVITIES FOR THE THERMAL TREATMENT UNIT

Field staff must review job-specific work plan and coordinate with project manager to verify that all up-front logistics are completed prior to starting work including, but not limited to, permitting, access agreements, and notification to required contacts (e.g., site managers, inspectors, clients, subcontractors, etc.). Additionally, a tailgate safety meeting must be performed and documented at the beginning of each workday. **Stop, Think, Act, Review (STAR)** must be used prior to any activity. All personnel must possess the appropriate training prior to initiating scheduled tasks. Also consider weather conditions. All project personnel have the authority and responsibility to use **Stop Work Authority (SWA).**

Date Issued/Revised:	November 2011	**JSA Type:**	O&M - Routine O&M Activities for the Thermal Treatment Unit
Work Type:	Remediation	**Client:**	The Frontier Chemical PRP Group
Work Activity:	Routine O&M activities for the Thermal Treatment Unit		
Work Site:	Frontier Chemical Site Niagara Falls, New York		
Key Equipment:	Thermal Treatment Unit		
Task-specific Training:	40-hour HAZWOPER or 8-hour Refresher, HAZCOM, Lockout/Tagout, Fall Protection, Power and Hand Tool Safety and PPE		

MINIMUM REQUIRED PERSONAL PROTECTIVE EQUIPMENT (see job steps for task-specific requirements)						
☒ Reflective Vest	☐ Goggles	☒ Gloves*	**Supplied Air**	**APR**		
☒ Hard Hat	☐ Face Shield*	☐ Coveralls*	☐ SCBA	☐ Full Face APR	☐ Particulate	☐ Organic Vapor
☐ Lifeline/Harness*	☐ Hearing Protection*	☐ PPE Clothing*	☐ Airline Respirator (attach description)	☐ Half Mask APR	☐ Particulate/Organic Vapor Combined	
☒ Safety Glasses	☒ Safety-toed Boots				☐ Acid Gas	
☐ Other*			☐ Other*	☐ Other*		
ADDITIONAL PPE (*provide specific type(s) or descriptions of this item below)						
Reflective Vest is to be worn when working near moving heavy equipment						
Gloves – inner nitrile for sample collection; leather for moving supplies and equipment. Ansell Crusader Flex Delux Hot Mill Glove or a Wells Lamont Extra Heavy Weight Terry Glove when contacting hot objects						

Reviewed By	**Position/Title**	**Date**	**Reviewed By**	**Position/Title**	**Date**

Job Safety Analysis (JSA)
ROUTINE O&M ACTIVITIES FOR THE THERMAL TREATMENT UNIT

Job Steps[1]	Task Activity	Potential Hazard(s)[2]	Corrective Measure(s)[3]	Person Responsible
1	Tailgate safety meeting	• Not identifying all hazards while performing tasks • Injury • Property damage	• Discuss work to be performed and associated hazards with CRA personnel and subcontractors • Include discussion on hospital route, evacuation procedures, and emergency contacts; complete daily tailgate forms • Discuss site-specific requirements for working on facility • Refer to task-specific JSAs for other O&M activities	Site Operator or Maintenance Technician
2	Discuss STAR (Stop Think Act & Review) and Stop Work Authority (SWA)	• Near Loss, Injury, and even Death	• Identify any hazards. Modify the JSA accordingly. Discuss the task and expectations of the task to all personnel. Have all applicable personnel sign off on this JSA prior to starting work. • Project team (CRA) discusses importance of and documentation procedures for SWA during pre-job safety meeting. Use SWA to stop any work that is unsafe.	Site Operator or Maintenance Technician
3	Routine O&M activities	• Slip/trip/fall hazards • Heat and cold stress • Biological hazards • Fire/explosion • Hazardous Energy (e.g., electrical) • Fire/Explosion • Equipment containing impact, high temperature, or pressurized liquids and gases (pneumatic pumps, compressors, piping, etc.) • Contact with Hot Objects hazardous substances and exposure to organic vapors • High noise levels during carbon change-outs • Moving equipment. Heavy materials/pumps/electric motor handling • Potential back injuries • Potential personal injuries (e.g., cuts)	• Keep work areas and walkways free of excess materials and debris to reduce trip hazards • Keep all work surfaces dry when possible • Stay away from moving heavy equipment that may be blending and mixing soils. • Take breaks if you feel tired or start to sweat excessively • Consume adequate food/beverage – keep hydrated • Inspect work area upon arrival to identify biological hazards (snakes, insects, poisonous plants, etc) • Open enclosures slowly and cautiously while looking for the possible presence of biological hazards • Do not smoke in work area • Ensure that there are two 20-pound fully charged fire extinguishers in the work areas and perform monthly inspection of each unit • Ensure that a fire watch is implemented for activities that involve hot work and ensure that the fire watch procedure meets the requirements of the facility • Perform Lock Out/Tag Out (LOTO) procedures • Drain and relieve pressure from lines before opening or loosening fittings • Wear appropriate PPE require for task at hand Note: Wear Ansell Crusader Flex Delux Hot Mill Glove or a Wells Lamont Extra Heavy Weight Terry Glove when contacting hot objects. Wear a reflective vest in areas where heavy equipment is working • Inspect tools prior to use, if faulty, do not use • Avoid potential hot surfaces and ensure that potential hot surfaces are labeled • Hearing protection must be worn during carbon change-outs • Keep hands and loose clothing away from moving equipment • Use power lift truck, dolly, winch devise cart, or other mechanical means to move heavy equipment or drums • Electrical cords must be grounded and inserted into a GFCI outlet	Site Operator or Maintenance Technician

(1) Each Job or Task consists of a set of steps. Be sure to list all the steps in the sequence that they are performed. Specify the equipment or other details to set the basis for the potential (associated) hazards.

(2) A hazard is a potential danger. What can go wrong? How can someone get hurt? Consider, but do not limit, the analysis to: **Contact** - victim is struck by or strikes an object; **Caught** - victim is caught on, caught in or caught between objects; **Fall** - victim falls to ground or lower level (includes slips and trips); **Exertion** - excessive strain or stress/ergonomics/lifting techniques; **Exposure** - inhalation/skin hazards. Specify the hazards and do not limit the description to a single word such as "Caught".

Job Safety Analysis (JSA)
ROUTINE O&M ACTIVITIES FOR THE THERMAL TREATMENT UNIT

(3) Aligning with the Job Steps, Task Activity Description, and Potential Hazard columns, describe what actions or procedures are necessary to eliminate or minimize the hazards. Be clear, concise and specific. Use objective, observable, and quantified terms. Avoid subjective general statements such as "be careful" or "use as appropriate".

Job Safety Analysis (JSA)
SILT FENCE INSTALLATION

Field staff must review job-specific work plan and coordinate with project manager to verify that all up-front logistics are completed prior to starting work including, but not limited to, permitting, access agreements and notification to required contacts (e.g., site managers, inspectors, clients, subcontractors, etc.). Additionally, a tailgate safety meeting must be performed and documented at the beginning of each workday. **Stop, Think, Act, Review (STAR)** must be used prior to any activity. All personnel must possess the appropriate training prior to initiating scheduled tasks. Also consider weather conditions. All project personnel have the authority and responsibility to use **Stop Work Authority.**

Date Issued/Revised	November 2011	JSA Type	Construction
Work Type	Construction	Client	The Frontier Chemical PRP Group
Work Activity	Silt Fence Installation		
Work Site	The Former Frontier Chemical Site Niagara Falls, New York		
Key Equipment	Skidsteer, Sledge Hammer, Shovel		
Task-specific Training	Mobile Equipment Operations, PPE, Hand and Power Tool Safety		

MINIMUM REQUIRED PERSONAL PROTECTIVE EQUIPMENT (SEE JOB STEPS FOR TASK-SPECIFIC REQUIREMENTS)			
☒ REFLECTIVE VEST*	☐ GOGGLES	☐ APR*	☒ GLOVES*
☒ HARD HAT	☐ FACE SHIELD*	☐ SUPPLIED AIR RESPIRATOR*	☐ COVERALLS*
☐ LIFELINE / HARNESS*	☐ HEARING PROTECTION*	☐ PPE CLOTHING*	☐ OTHER* ____________
☒ SAFETY GLASSES	☒ STEEL TOED BOOTS	☐ OTHER* ____________	☐ OTHER* ____________
ADDITIONAL PPE: * Provide specific type(s) or descriptions of this item below			
Reflective Vest - Class II Gloves - Leather			

Reviewed By	Position/Title	Date	Reviewed By	Position/Title	Date

Job Safety Analysis (JSA)
SILT FENCE INSTALLATION

CRA SMART PROGRAM

Safety Means Awareness Responsibility Teamwork

JOB STEPS [1]	TASK ACTIVITY	POTENTIAL HAZARD(S) [2]	CORRECTIVE MEASURE(S) [3]	Person Responsible
1	Perform the STAR Process and discuss Stop Work Authority (SWA) Equipment Inspection	• Hydraulic failure • Instrument/monitor failure	• Inspect equipment lines and fluid reservoirs – document inspection. • Calibrate instrument prior to use – document calibration.	Personnel involved in this activity
2	Underground Utilities	• Impact, breach or rupture of underground utilities	• Inspect area. • Call underground utility locator and monitor locator during locating activities. • Verify all markings, locations and procedures prior to installation work.	Personnel involved in this activity
3	Installation zone inspection	• Underground Insects, nests and hives; • Poisonous plants; • Stinging/biting insects • Chemical hazards	• Visually inspect area of fence installation for any activity regarding hornets, yellow jackets, bees, fire ants or termites. A slow walk or drive along the fence path prior to excavation to inspect for insects flying in and out or ground, ant humps or mounds and trails.	Personnel involved in this activity
4	Silt fence trough (pathway) excavation	• Struck-by/against; • Utilities; • Chemical hazards; • Cross-contamination	• Setup safe work area. Use a spotter when moving equipment. • Use a spotter when digging to assist with observing for underground installations. Spotter will be used when working near overhead lines to assist equipment operator and keep machine away/out of lines. • Control areas where excavator will travel. Attempt to keep excavator tires out of impacted spoils and areas. Employees are to setup work area access to minimize spread of contamination.	Personnel involved in this activity
5	Hand tool use	• Improper hammer/tool selection; • Improper stapler use • Potential cuts/abrasions • Chemical hazards	• Use only a hammer of a weight and handle length appropriate to individual laborers' capability. Inspect every post and hammer for signs of metal fatigue/fractures. Inspect stapler for correct staple installation. Inspect stapler and test operation for gauging correct drive pressure. Use staples of a length needed for the job. Safety glasses and awareness of installer hand location during use of a hammer or staple gun. • Ensure that all hand tools (fence post driver, shovel, etc.) are in good working condition. • Wear proper PPE such as stout leather gloves to prevent trauma to hands. • Use work practices that do not generate visible dust levels.	Personnel involved in this activity
6	Fence layout activities	• Back or muscle strain	• Use the 'buddy system' during fence installation. 100' fence rolls require a coordinated two-man effort to place fence correctly and according to Mfg. requirements.	Personnel involved in this activity

[1] Each Job or Task consists of a set of steps. Be sure to list all the steps in the sequence that they are performed. Specify the equipment or other details to set the basis for the potential (associated) hazards.

[2] A hazard is a potential danger. What can go wrong? How can someone get hurt? Consider, but do not limit, the analysis to: **Contact** - victim is struck by or strikes an object; **Caught** - victim is caught on, caught in or caught between objects; **Fall** - victim falls to ground or lower level (includes slips and trips); **Exertion** - excessive strain or stress / ergonomics / lifting techniques; **Exposure** - inhalation/skin hazards. Specify the hazards and do not limit the description to a single word such as "Caught"

[3] Aligning with the Job Steps, Task Activity Description, and Potential Hazard columns, describe what actions or procedures are necessary to eliminate or minimize the hazards. Be clear, concise and specific. Use objective, observable and quantified terms. Avoid subjective general statements such as, "be careful" or "use as appropriate".

Job Safety Analysis (JSA)
SURVEYING ACTIVITIES

Field staff must review job-specific work plan and coordinate with project manager to verify that all up-front logistics are completed prior to starting work including, but not limited to, permitting, access agreements and notification to required contacts (e.g., site managers, inspectors, clients, subcontractors, etc.). Additionally, a tailgate safety meeting must be performed and documented at the beginning of each workday. **Stop, Think, Act, Review (STAR)** must be used prior to any activity. All personnel must possess the appropriate training prior to initiating scheduled tasks. Also consider weather conditions. All project personnel have the authority and responsibility to use **Stop Work Authority.**

Date Issued/Revised	November 2011	**JSA Type**	Surveying Activities
Work Type	Construction	**Client**	The Frontier Chemical PRP Group
Work Activity	Surveying Activities		
Work Site	The Former Frontier Chemical Site Niagara Falls, New York		
Key Equipment	Topcon GPS, grade rod, stakes, hammer, wood lathe, ribbon		
Task-specific Training	Flagger safety; Traffic control devices; PPE, Mobile Equipment Operations		

MINIMUM REQUIRED PERSONAL PROTECTIVE EQUIPMENT (SEE JOB STEPS FOR TASK-SPECIFIC REQUIREMENTS)			
☒ REFLECTIVE VEST*	☐ GOGGLES	☐ APR: ________________*	☒ GLOVES* Leather
☒ HARD HAT	☐ FACE SHIELD*	☐ SUPPLIED AIR RESPIRATOR*	☐ COVERALLS*
☐ LIFELINE / HARNESS*	☐ HEARING PROTECTION*	☐ PPE CLOTHING*	☐ OTHER*
☒ SAFETY GLASSES	☒ STEEL TOED BOOTS	☐ OTHER* ____________________	☐ OTHER* ____________________
ADDITIONAL PPE: * Provide specific type(s) or descriptions of this item below			
Reflective Vest – Class II			
Gloves - Leather gloves for mobilization and demobilization equipment			

Reviewed By	**Position/Title**	**Date**	**Reviewed By**	**Position/Title**	**Date**

Job Safety Analysis (JSA)
SURVEYING ACTIVITIES

JOB STEPS [1]	TASK ACTIVITY	POTENTIAL HAZARD(S) [2]	CORRECTIVE MEASURE(S)[3]	Person Responsible
1	Perform the STAR Process and discuss Stop Work Authority (SWA) Perform Review "General Site Activities" JSA.	• Failing to identify hazardous conditions resulting in losses or near losses.	• Perform the STAR Process STAR. • Assess the risks. • Determine the hazards of performing the task and survey the work area. • Consider weather conditions such as fog that could reduce visibility. • Always consider the worst case scenario. • Analyze the hazards determined. • Decide a plan of action to eliminate or reduce the hazards and act on it.	Survey Team
2	Mob equipment to surveying area	• Potential back Injuries loading equipment; • Pinch points; • Moving or flying projectiles inside vehicle while transporting equipment; • Slip/trip/fall; • Biological hazards.	• Follow proper lifting procedure identified in the HASP; • Wear leather gloves when moving equipment around; • Review JSA and HASP; • Practice STAR; • Properly secure all equipment inside the vehicle. • Contact the owner of any public roadway (State or City) to determine requirements for surveying on or along their roadway. • Develop a Temporary Traffic Control Plan (TTCP) if surveying activities will be taking place on or along the shoulder of a public highway. • Set up a Temporary Traffic Control Zone (TTCZ) if surveying activities will be taking place on or along the shoulder of a public highway. The TTCP will describe the set up of the TTCZ.	Survey Team
3	Setup in work zone	• Struck by oncoming traffic/heavy equipment; • Slip/trip/fall; • Biological hazards; • Potential back injuries from moving equipment; • Heat/Cold Stress;	• Communication with other personnel/heavy equipment operators to notify them of survey team presence; • Position a company truck with flashers on for added protection and to aid in the protection of the survey crew as they set up the TTCZ; • Follow hot/cold stress procedures presented in the HASP. Ensure fluid intake and clothing/PPE is appropriate for conditions.	Survey Team

Job Safety Analysis (JSA)
SURVEYING ACTIVITIES

JOB STEPS [1]	TASK ACTIVITY	POTENTIAL HAZARD(S) [2]	CORRECTIVE MEASURE(S)[3]	Person Responsible
4	Conduct survey activities	• Struck by oncoming traffic; • Slip/trip/fall; • Potential injuries from misuse of tools or use of tools in disrepair; • Splinters, eye injuries from broken stakes; • Utility strikes; • Biological hazards; • Weather.	• Wear hi-visibility safety vest, steel-toed boots, safety glasses, and hard hat; • Do not use old or faded PPE; • Make sure that proper PPE is being worn; • Notify nearby equipment of changes in you activities/movement through work area; • Inspect tools; • Repair/replace tools as necessary; • Visually inspect stakes prior to driving into ground. Do not use stakes that are cracked, split, have large knots, etc; • Perform utility clearance to with clients representative to verify presence of underground utilities to avoid driving grade stakes through any underground obstructions; • Watch for snakes, insects, animals, etc; avoid walking though tall grass and shrubs as much as possible; • Check weather prior to entering work area; • Should conditions be windy, wear spoggles (safety glass goggles) to prevent dirt and debris from getting into the eyes; • Wear sunscreen, as required; • If thunder is heard o lightning seen, leave work area immediately and take shelter; do not re-enter work area until 30 minutes after last lightning strike is seen	Survey Team
5	Exit work zone	• Struck by oncoming traffic; • Slip/trip/fall; • Biological hazards; • Weather.	• Walk through clear paths, especially when carrying equipment; watch for and avoid rough terrain as much as possible; • Note traffic patterns, make sure path to vehicle is clear and notify nearby equipment you are moving through their path; • Watch for snakes, insects, animals, etc; avoid walking though tall grass and shrubs as much as possible; • Check weather prior to entering work area; • Should conditions be windy, wear spoggles (safety glass goggles) to prevent dirt and debris from getting into the eyes; • Wear sunscreen, as required; • If thunder is heard o lightning seen, leave work area immediately and take shelter; do not re-enter work area until 30 minutes after last lightning strike is seen.	Survey Team

[1] Each Job or Task consists of a set of steps. Be sure to list all the steps in the sequence that they are performed. Specify the equipment or other details to set the basis for the potential (associated) hazards.

[2] A hazard is a potential danger. What can go wrong? How can someone get hurt? Consider, but do not limit, the analysis to: **Contact** - victim is struck by or strikes an object; **Caught** - victim is caught on, caught in or caught between objects; **Fall** - victim falls to ground or lower level (includes slips and trips); **Exertion** - excessive strain or stress / ergonomics / lifting techniques; **Exposure** - inhalation/skin hazards. Specify the hazards and do not limit the description to a single word such as "Caught"

[3] Aligning with the Job Steps, Task Activity Description, and Potential Hazard columns, describe what actions or procedures are necessary to eliminate or minimize the hazards. Be clear, concise and specific. Use objective, observable and quantified terms. Avoid subjective general statements such as, "be careful" or "use as appropriate".

Job Safety Analysis (JSA)
TRASH PUMP SETUP AND OPERATION

Safety Means Awareness Responsibility Teamwork

Field staff must review job-specific work plan and coordinate with project manager to verify that all up-front logistics are completed prior to starting work including, but not limited to, permitting, access agreements and notification to required contacts (e.g., site managers, inspectors, clients, subcontractors, etc.). Additionally, a tailgate safety meeting must be performed and documented at the beginning of each workday. **Stop, Think, Act, Review (STAR)** must be used prior to any activity. All personnel must possess the appropriate training prior to initiating scheduled tasks. Also consider weather conditions. All project personnel have the authority and responsibility to use **Stop Work Authority.**

Date Issued/Revised	November 2011	JSA Type	Construction
Work Type	Construction	Client	The Frontier Chemical PRP Group
Work Activity	Setup and operation of 2” and 3” trash pumps		
Work Site	The Former Frontier Chemical Site Niagara Falls, New York		
Key Equipment	Trash pump; fittings; hose sections; safety fuel can;		
Task-specific Training	40 HR and 8 HR HAZWOPER, HAZCOM, PPE Hand and Power Tool Safety		

MINIMUM REQUIRED PERSONAL PROTECTIVE EQUIPMENT (SEE JOB STEPS FOR TASK-SPECIFIC REQUIREMENTS)			
☒ REFLECTIVE VEST*	☒ GOGGLES – as necessary	☐ APR: ________________*	☒ GLOVES* see below
☒ HARD HAT	☐ FACE SHIELD*	☐ SUPPLIED AIR RESPIRATOR*	☐ COVERALLS*
☐ LIFELINE / HARNESS*	☒ HEARING PROTECTION*	☐ PPE CLOTHING*	☐ OTHER* ____________
☒ SAFETY GLASSES	☒ STEEL TOED BOOTS	☐ OTHER* ____________	☐ OTHER* ____________

ADDITIONAL PPE: * Provide specific type(s) or descriptions of this item below

Reflective Vest - Class II Gloves - Leather

Hearing Protection - NRR 20

Reviewed By	Position/Title	Date	Reviewed By	Position/Title	Date

Job Safety Analysis (JSA)
TRASH PUMP SETUP AND OPERATION

Safety Means Awareness Responsibility Teamwork

JOB STEPS [1]	TASK ACTIVITY	POTENTIAL HAZARD(S) [2]	CORRECTIVE MEASURE(S)[3]	Person Responsible
1	Perform the STAR Process and discuss Stop Work Authority (SWA)	• Slips, Trips, Falls • Situational risks	• Verify personnel's training is sufficient for the scheduled task(s). • Is job instruction training (hands-on) training necessary? • Employees should remove finger rings, necklaces, or jewelry, which may be hazardous in equipment operation.	All Affected Personnel
2	Equipment Safety Checklist	• Faulty hose connections; • Damaged hoses and fittings	• Replace worn or damaged hoses and fittings. • Replace hose connections with operational connections. • Perform an overall inspection of the equipment for any defects or signs of damage. • Refer to the specific pump's equipment manufacturer's operating manual before using the equipment.	All Affected Personnel
3	Pump and hose set-up	• Slip, Trip, Fall; • Uneven terrain; • Wet, icy, and muddy conditions; • Material Handling – Back sprains and strains; • Struck-by and Line of Fire; • Pinch-points.	• Be aware of your surrounding conditions (footing, weather conditions, etc.) • Use proper lifting techniques; "straight back-bent knee" lifting approach. Have a "buddy" assist with the lift. • Use gloves to ensure a secure grip. • Grab the equipment only at designated handles or if none are available, at locations where the hands and fingers will not get caught in the equipment or smashed. • Test the weight of the equipment before lifting. • Straighten out hoses before connection and keep them out of high traffic areas. • Be aware of "stored energy" hazards presented by hoses.	All Affected Personnel
4	Equipment Fueling/Refueling	• Fires; Explosions; • Chemical hazard	• Turn off equipment before fueling and let it first cool down prior to refueling. • No smoking while fueling. • Do not use cell phones while fueling. • Store fuel in proper safety containers only. • If transferring fuel from large vessels into portable cans, use proper grounding or bonding techniques. • Do not fuel the equipment when it is hot. • Wear gloves and wash hands after fueling.	All Affected Personnel
5	Starting the pump	• Back Strains; • Slippery Conditions	• Make sure the starting cord is free pulling. Test the cord before pulling. • Be aware of your surrounding conditions. Make sure Slip/Trip/Fall/ hazards were properly identified and corrected.	Assigned Laborer
6	Pump Operation	• Splash Hazards; • Hot Surfaces; • Noise	• Remove worn or damaged hoses until they can be repaired or replaced. • Keep hands away from the exhaust or hot components of the equipment. • Be aware of any unguarded moving parts on the equipment.	Assigned Laborer

1 Each Job or Task consists of a set of steps. Be sure to list all the steps in the sequence that they are performed. Specify the equipment or other details to set the basis for the potential (associated) hazards.

2 A hazard is a potential danger. What can go wrong? How can someone get hurt? Consider, but do not limit, the analysis to: **Contact** - victim is struck by or strikes an object; **Caught** - victim is caught on, caught in or caught between objects; **Fall** - victim falls to ground or lower level (includes slips and trips); **Exertion** - excessive strain or stress / ergonomics / lifting techniques; **Exposure** - inhalation/skin hazards. Specify the hazards and do not limit the description to a single word such as "Caught"

3 Aligning with the Job Steps, Task Activity Description, and Potential Hazard columns, describe what actions or procedures are necessary to eliminate or minimize the hazards. Be clear, concise and specific. Use objective, observable and quantified terms. Avoid subjective general statements such as, "be careful" or "use as appropriate".

ATTACHMENT B

PROJECT SAFETY FORMS

TRAINING ACKNOWLEDGEMENT FORM
DAILY SAFETY (TAILGATE) MEETING FORM
ENERGY CONTROL PROGRAM (LOCKOUT/TAGOUT) FORMS
INCIDENT REPORTING FORM
HOT WORK PERMIT AND CHECKLIST

TRAINING ACKNOWLEDGEMENT FORM

I have read or received instruction in the Site Health and Safety Plan and I understand the contents of the Site Health and Safety Plan. I have been informed whom to contact if I have any questions and I know where to report any additional health and safety hazards. I understand that I have "stop work" authority. I agree to work to the safety plan guidelines and understand that failure to do so could result in removal from the Site. **I will Stop Think Act Review prior to initiating a task.**

Date	*Printed Name*	*Signature*	*Company*

DAILY SAFETY MEETING FORM

PROJECT: **The Frontier Chemical Site**

LOCATION: **Niagara Falls, New York**

DATE/TIME: ____________________________

1. Safety Issues or Topics Discussed:
2. Work Summary and Physical/Chemical Hazards of Concern:
Planned Activities:
Physical hazards:
Biological hazards:
Chemicals onsite:
3. Protective Equipment/Procedures:
4. Emergency Procedure:
MUSTERING POINT: Northwest corner of Intersection at Royal Avenue and 47th Street
In event of an emergency gather/proceed to mustering point(s). Review Contingency Plan
Emergency Procedures for Area(s) of activity.

5. Signatures of Attendees (Handwriting must be legible):	

Hazardous Energy Control Program
(Lockout/Tagout)

Project Name:	Project Number: **047392**
Name of Facility:	Maintenance or Repair Activity:
Equipment Name:	Equipment Serial Number:

Energy Sources Present:

☐Electrical; ☐Chemical; ☐Mechanical; ☐Pneumatic; ☐Hydraulic; ☐Thermal;

☐ Other:____

SHUT DOWN

	Energy Source	Isolating Device	Location	Action	Verification Step
1					
2					

Note: Photos may be attached to facilitate LOTO procedure detailed above.

START UP

	Energy Source	Isolating Device	Location	Action	Verification Step
2					
1					

Note: Photos may be attached to facilitate LOTO procedure detailed above.

Lockout/Tagout Procedure Written By:

____

Name Date Signature

Procedure Verification

The procedure listed above was field tested/verified by __________________ of ___________ on the _____ day of __________________, 200__.

If the energy sources affecting this equipment are modified in anyway, the overall procedure should be reevaluated.

ACCIDENT REPORTING FORM

Report all accidents immediately to the Safety and Health Officer

Instructions: For Personal Injuries, Property Damage, and Near Miss Reports, Complete Sections 1 and 2.
For Vehicle Accidents, Complete Sections 1, 2, and 4. Form must be completed within 24 hours.

SECTION 1

A. Employee Identification ( ) Employee ( ) Temporary Employee ( ) Subcontractor

Employee No.	Last Name	First Name	Middle Name/Initial	M or F

Area Code ( )	Telephone Number	Address (Street, City, State, Province, Zip Code)

Date of Hire / /	Position/Title	Supervisor	Employee's Company/Office Location

B. General Information

Where did the accident occur? ( ) Office ( ) Project Site	Type of Occurrence ( ) Near Miss ( ) Employee Injury ( ) Vehicle Accident ( ) Property Damage Only

Date and Hour of Accident		Date and Hour Reported to Employer		Date and Hour Last Worked		Time Employee Began Work
Month Day Year	a.m. p.m.	Month Day Year	a.m. p.m.	Month Day Year	a.m. p.m.	a.m. p.m.

Normal Work Hours on Last Day Worked		Witnesses?	Witness Name and Telephone Number
From: To:	a.m. p.m.	( ) Yes ( ) No	

C. Project Information (Project Related Accidents/Near Misses Only)

Project #	Project Name	Project Manager	Site Telephone Number ( )	Employee Cell Number ( )

Was the Client Advised of the Accident? ( ) Yes ( ) No Name:	Project Address (Street, City, State, Province, Zip Code) Specific Location of Accident

SECTION 2

A. Details of the Accident/Near Miss

1. What job/task was being performed when the accident occurred?
2. Describe the employee's specific activities at the time of the accident. Include details of equipment/materials being used, including the size and weights of objects being handled.
3. For injuries, identify the part of body injured, and specify left or right side.
4. Identify the object or substance that directly injured employee and how.
5. Identify Property Damaged (include owner of property, nature and source of damage, model and serial number, if appropriate).

B. Health Care/Medical Treatment

Employee received health care? ( ) Yes ( ) No	Identify the type of health care provided and where it was performed. (Check all that apply). ( ) First Aid ( ) Medical treatment other than first aid (sutures, etc.) ( ) Hospitalized ( ) Clinic ( ) Hospital emergency room ( ) On location by self or co-worker) ( ) On site by EMT

Name of Health Care Provider, Physician's Name, Address (Street, City, Province/State, and Postal/Zip Code)

Section 2 (Continued)

<table>
<tr><th colspan="3">C. Accident Investigation</th></tr>
<tr><td>H&S plan prepared and on site?
( ) Yes ( ) Not applicable</td><td colspan="2">Did the safety plan identify and provide safety procedures for the specific tasks the employee was conducting when injured?
( ) Yes ( ) No If no, why not? (Explain).</td></tr>
<tr><td colspan="3">Did the employee have the proper safety training to conduct these tasks or use the equipment? ( ) Yes ( ) No If not, why not?</td></tr>
<tr><td colspan="3">Identify all of the potential contributing factors and how they led to the occurrence of the accident. (Lack of attention, wrong use of equipment, lack of training, etc.)</td></tr>
<tr><td colspan="3">What contributing factor above was the underlying root cause of the accident.</td></tr>
<tr><td colspan="3">Is any training or retraining recommended? If yes, describe.</td></tr>
<tr><td colspan="3">What actions have been or will be taken to correct this accident from reoccurring?</td></tr>
<tr><td colspan="3">Additional information: Attach photos, accident diagrams, as applicable.</td></tr>
<tr><td>Report Date
Month Day Year</td><td>Report Prepared by: (please print)</td><td>Report Prepared by: (signature)</td></tr>
</table>

VEHICLE ACCIDENT SECTION

(Complete this Section for all Vehicle Accidents)

SECTION 4

A. Vehicle

License Plate No.	State	Police Department	City	State
Vehicle Year/Make/Model	Odometer Reading at Time of Accident	Police Report Number	Weather Conditions	

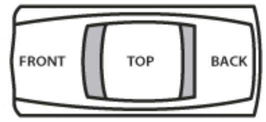
Name of Person Operating Vehicle

Address

City State/Province Zip Code

Telephone: Area Code ( )

"X" IN AREA OF VEHICLE DAMAGE



CIRCLE
0 No Damage
1 Light
2 Moderate
3 Heavy
4 Rolled
5 Burned

Vehicle Type: ( ) Personal ( ) Rental ( ) CRA-Own

Description of Vehicle Damage:

B. Other Vehicles Involved

Name of Owner	Address	City/State/Zip	Area Code and Telephone Number ( )
Operator's Name (if different from above)	Address	City/State/Zip	Area Code and Telephone Number ( )

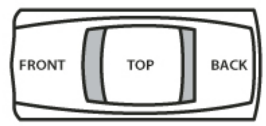
Year/Make/Model

Insurance Co. Name & Telephone

License Plate No./State/Province

Description of Property Damage:

"x" IN AREA OF VEHICLE DAMAGE



CIRCLE
0 No Damage
1 Light
2 Moderate
3 Heavy
4 Rolled
5 Burned

C. Injured Persons

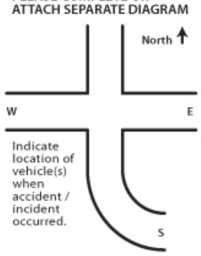
Name	Address Street, City, State/Zip Code	Phone Number	Nature of Injury	Indicate if Injured was a Vehicle Driver/ Passenger, Employee, Other, or Pedestrian
1.				
2.				
3.				

D. Witnesses

Name	Address Street, City, State/Prov./Zip Code	Area Code and Telephone Number
1.		( )
2.		( )

E. Description of Accident

PLEASE COMPLETE OR ATTACH SEPARATE DIAGRAM



Was Ticket Issued:
Other Operator ☐
Company Operator ☐

Reason: ____________________

Report Date Month Day Year	Report Prepared by: (please print)	Report Prepared by: (signature)

Note: If Additional Space is Required to Complete this Report, Use Separate Sheet of Paper and Attach.

HOT WORK PERMIT AND HOT WORK CHECKLIST

Location (facility, well name, rig, etc.):

Description of Hot Work:

I have reviewed the proposed work, agree that hot work is necessary and may proceed without unreasonable risk.

Initial authorization: **Date:** **Expiration time:**

The following precautions must be taken to complete the work safely (attach details of specific procedures or checklist if appropriate).

Check	Yes	NA	Check	Yes	NA	Check	Yes	NA
All lines depressurized?			Area/space gas free?			Standby man/fire watch?		
All liquids drained?			Combustibles removed?			Pre-job safety meeting complete?		
Space cleaned and purged?			Continuous atmosphere monitoring?			Emergency procedure established?		
Space properly ventilated?			Fire extinguisher/water available?			Special PPE required?		
Lockout/tagout complete?			Respiratory protection required?					

Positive Isolation ☐ NA
☐ Blind ☐ Double Block and Bleed
☐ Disconnect ☐ Full thickness Skillet

Electric lighting and equipment properly rated for hazardous area location
☐ Yes ☐ No ☐ NA

Communication Method ☐ NA
☐ Hand signal ☐ Voice
☐ Radio ☐ Horn

PPE	Rescue Equipment	Emergency Phone Numbers
Head: ☐ Hardhat ☐ Other: ______ **Eye/Face**: ☐ Safety glasses w/side shields ☐ Face shield ☐ Goggles ☐ Other: ______ **Arms/ Hands:** ☐ Leather gloves ☐ Leather gloves w/long sleeves ☐ Other: ______ **Footwear:** ☐ Leather Boots **Clothing:** ☐ Flame-resistant clothing	Emergency Response Plan? ☐ Yes ☐ No ☐ NA If no, notify outside rescue services GPS Coordinates: ______ ☐ Full body harness ☐ Lifeline ☐ Personnel basket ☐ Rigid stretcher ☐ Mechanical lift for >5 degrees vertical	Ambulance/EMS: Rescue Services: Air Rescue: Fire Department: Other:

Atmospheric Testing Acceptable Conditions	**Time →**	**Results : AM/PM**	**Results : AM/PM**	**Results : AM/PM**	**Results : AM/PM**	**Results : AM/PM**
Oxygen	19.5% to 23.5%					
Flammability	<10% LEL					
H_2S	<10 ppm					
Norm	<50 Micrograms					
Vessel Temperature	<100ºF (43ºC)					
Tester Signature: X		Initials	Initials	Initials	Initials	Initials
Direct Reading Monitor		Model and Unit Number:			Calibration Date: / /	

This permit is approved for ____ hours on this date ____/______/___
Signature of On-site Supervisor:
X Start Time: :

Only the On-site Supervisor may extend the permit time (Max. 12 hours)
Time was extended to: ________ hours.
Rep. Initials: ______________ Time: :
Permit start time shall be the same as the initial test time.

Cancellation of Permit
Signature of On-site Supervisor: Date: ____/______/___
X

Permit Retention: 1 year or until audited

Signature of person(s) performing Hot Work:
X

X

X

X

Signature of Fire Watch:
X

Signature of Contract Supervisor:
X

Distribution: Original - Client Representative and Work Site Copy - Initial Authorization

HOT WORK CHECKLIST

Signature	
	All welding machines **shall** be located in an unclassified area while in use (for offshore welding, machines must be 3 m or 10 feet away from a well-bay or production area and 0.5 m or 18 inches or away from deck drains – refer to Electrical Area Classification drawing).
	Welding machines with AC power convenience receptacles **shall** be labeled as AC power and **shall** be used with ground fault circuit interrupter (GFCI) adapters. The adapters should be placed as close to the welding machine as possible.
	Welding machines with DC power convenience receptacles **shall** be removed or otherwise disabled and must not be used.
	Welding machines used offshore **shall** be equipped with drip pans, shut down devices, and spark arresters.
	All welding leads **shall** be grounded as close as possible to the work area.
	All welding leads and extension cords **shall** be completely insulated, UL rated, and in good working condition.
	Welding rods **shall not** be left in the electrode holder when laid down on steel decks. The stud ends **shall** be put into a container – not on the floor or deck.
	Oxygen and acetylene bottles **shall** be separated by a 5-foot high metal barrier, secured in a rack. Acetylene bottles shall be kept in an upright position.
	Regulators **shall** be equipped with properly operating gauges.
	Oxygen and acetylene hoses **shall** be leak-free and routed to prevent mechanical damage.
	Oxygen and acetylene hoses **shall not** be hung on cylinders when in use.
	Oxygen and acetylene **shall** be turned off at the cylinder valve and hoses bled anytime the equipment is not in use. Regulators **shall** be removed and protective cylinder caps put in place anytime cylinders are to be moved.
	Acetylene pressure downstream of the regulator **shall** be kept at or below 15 psi.
	Check valves/flame arresters **shall** be installed on the torch and the regulator.
	Only friction spark devices **shall** be used for ignition of cutting torches. Due to a potential ignition source, friction sparkers shall **not** be permitted to be carried throughout the facility.
	When lighting the cutting torch, the fuel gas valve shall be opened before opening the oxygen valve.
	Equipment containing hydrocarbons or other flammable substances has been relocated at least 35 feet horizontally from the hot work site. Similar equipment located at a lower elevation where slag, sparks, or other burning material could fall has been relocated at least 35 feet from the point of impact. When relocation is impractical, the equipment has been either shielded or the contents rendered inert.
	Fire resistant blankets (if used) **shall** be of a good quality and should be installed in a manner that does not create pockets or folds.
	Instrument gas systems and devices isolated or shielded.

On-Site Supervisor: ______________________ Date: ______________

Welder: ______________________ Date: ______________

Hazardous Energy Control Program
(Lockout/Tagout)

LOCKOUT/TAGOUT PERIODIC INSPECTION	
Project Name: Former Frontier Chemical Site	Project Number: **047392**
Name of Facility:	Maintenance or Repair Activity:
Equipment Name:	Equipment Serial Number:
Energy Sources Present: ☐Electrical; ☐Chemical; ☐Mechanical; ☐Pneumatic; ☐Hydraulic; ☐Thermal; ☐ Other:____	

Are changes to the procedure required? ☐YES ☐NO

If YES, identify below: ____

____

____

Employees included in the inspection: ____________________________________

____

____

____

Supervisor (Print Name) Signature

__________________________ ____________________________________

Date of Inspection: __________________________

SAFETY INSPECTION CHECKLIST FOR EXCAVATIONS
REFERENCED BY OSHA STANDARDS

This checklist is to be completed by the competent person at the start of work and as needed throughout the shift (i.e., after rain events, etc.). ***(A competent person has been trained in the current OSHA excavation standard, is knowledgeable about soil analysis and protective systems, and has the authority to shut down the job.)***

Site Location:		Project #:		
Date:	Time:	Competent Person:		
Were visual soil tests made? If Yes, what type?		YES	NO ☐	Type:
Were manual soil tests made? If yes, what type?		YES ☐	NO ☐	Type:
Soil Type:		Signature:		
Soil Classification:				
Excavation Depth:		Excavation Width:		
Protective System Used:				

In the following table, please place an Y for Yes, N for No, or N/A for Not Applicable in the right hand column for each item. If No, place the date of correction.

	Subject	Y, N, or NA	Date Corrected
GENERAL INSPECTION OF THE JOB SITE			
1.	Does the competent person have the authority to remove employees from the excavation immediately?	**Y**	
2.	**ARE SURFACE OBSTRUCTIONS REMOVED OR SUPPORTED?**	**Y**	
3.	Are employees protected from loose rock or soil that could pose a hazard by falling or rolling into the excavation?	**Y**	
4.	Are hard hats worn by all employees?	**Y**	
5.	Are excavated soil, materials, and equipment placed at least 2 feet from the edge of the excavation?	**Y**	
6.	Are walkways and bridges over excavations 4 feet or more in depth equipped with standard guardrails and toe-boards?	**N/A**	
7.	Are warning vests or other highly visible clothing provided and worn by all employees exposed to public vehicular traffic?	**Y**	
8.	Are employees required to stand away from vehicles being loaded or unloaded?	**Y**	
9.	Is a warning system established and used when mobile equipment operates near the edge of the excavation?	**N/A**	
10.	Are employees prohibited from going beneath suspended loads?	**N/A**	
11.	Are employees prohibited from working on the faces of sloped or benched excavations above other employees?	**N/A**	
UTILITIES			
12.	Were utility companies contacted and/or utilities located?	**N/A**	
13.	Are the exact locations of the utilities marked?	**N/A**	
14.	Are underground installations protected, supported, or removed when excavation is opened?	**N/A**	
MEANS OF ENTERING AND EXITING THE TRENCH			
15.	Is the distance along the trench to an exit no greater than 25 feet in excavations 4 feet or more in depth?	N/A	
16.	**IS A SUPPORT SYSTEM, SUCH AS UNDERPINNING, BEING USED?**	N/A	
17.	Are ladders used in excavations secured and extended 3 feet above edge of the trench?	N/A	
18.	Are structural ramps used by employees designed by a competent person?	N/A	
19.	Are structural ramps used for equipment designed by a registered professional engineer?	N/A	
20.	Are employees protected from cave-ins when entering or exiting the excavation?	N/A	

	Subject	Y, N, or NA	Date Corrected
WET CONDITIONS			
21.	Is water removal equipment monitored by a competent person?	Y	
22.	Is surface water or run-off diverted or controlled to prevent accumulation in the excavation?	Y	
23.	Are inspections made after every rainstorm or other hazard-increasing occurrence?	Y	
HAZARDOUS ATMOSPHERE			
24.	Is the atmosphere within the excavation tested where there is a reasonable possibility of an oxygen deficiency, combustible, or other harmful contaminant exposing employees to a hazard?	N/A	
25.	Are adequate precautions taken to protect employees from exposure to an atmosphere containing less than 19.5% oxygen and/or other hazardous atmospheres?	N/A	
26.	Is ventilation provided to prevent employee exposure to an atmosphere containing flammable gas 10% above the lower explosive limit of a gas?	N/A	
27.	Is testing conducted often to ensure that the atmosphere remains safe?	N/A	
28.	Is emergency equipment, such as breathing apparatus, safety harness and lifeline, and/or basket stretcher readily available where hazardous atmospheres could or do exist?	N/A	
SUPPORT SYSTEMS			
29.	Are materials and/or equipment for support systems selected based on soil analysis, trench depth, and expected loads?	N/A	
30.	Are materials and equipment used for protective systems inspected and in good condition?	N/A	
31.	Are protective systems installed without exposing employees to the hazards of cave-ins (including end walls), collapses, or threat of being struck by materials or equipment?	N/A	
32.	Are excavations below the level of the base, or footing supported, approved by a registered professional engineer?	N/A	
33.	Does the removal of support systems progress from the bottom and members are released slowly? Note any indication of possible failure.	N/A	
34.	Is the excavation of material a level no greater than 2 feet below the bottom of the support system and only if the system is designed to support the loads calculated for the full depth?	N/A	
35.	Is there a shield system placed to prevent lateral movement?	N/A	

ATTACHMENT C

COMMUNITY AIR MONITORING PLAN

TABLE OF CONTENTS

1.0 <u>OVERVIEW</u>

A Community Air Monitoring Plan (CAMP) requires real-time monitoring at the downwind perimeter of each designated work area when certain activities are in progress at contaminated sites. In the case of the Frontier Site, the monitoring will be performed for volatile organic compounds (VOCs) and particulates (i.e., dust) during the soil remediation program. The CAMP is not intended for use in establishing action levels for worker respiratory protection. Rather, its intent is to provide a measure of protection for the downwind community (i.e., off-Site receptors including residences and businesses and on-Site workers not directly involved with the subject work activities) from potential airborne contaminant releases as a direct result of remedial work activities. The CAMP helps to confirm that work activities do not spread contamination off-Site through the air.

Continuous monitoring will be required for all ground intrusive activities. Ground intrusive activities include, but are not limited to, soil excavation and handling and the installation of soil borings or monitoring wells. It is noted that monitoring under the CAMP is not required when the handling of contaminated soil is being performed within an enclosed structure.

In some cases, **periodic monitoring** for VOCs may be required during <u>non-intrusive</u> activities if such monitoring is deemed appropriate. For example, the first time that groundwater samples are collected from a particular well, it would be appropriate to monitor for VOCs; particularly if the groundwater sampling is being performed on a public street or adjacent to schools or residences. Subsequent sampling events conducted at these wells will be able to rely upon the past experience in determining whether monitoring is required.

2.0 VOC MONITORING, RESPONSE LEVELS, AND ACTIONS

VOCs will be monitored at the Site property boundary immediately downwind of the work area on a continuous basis during ground intrusive activities. Upwind concentrations will be measured at the start of each workday and periodically thereafter to confirm background conditions, particularly if the wind direction changes. The monitoring will be performed using equipment appropriate to measure the types of contaminants known or suspected to be present. Photoionization Detector Units (PIDs) will be used for the VOC monitoring at this Site. The equipment will be calibrated at least daily for the contaminants of concern listed in Table B.2.1 of the HASP. The equipment will be capable of calculating 15-minute running average concentrations, which will be compared to the levels specified below.

1. If the ambient air concentration of total VOC vapors at the property boundary immediately downwind of the work area exceeds 5 parts per million (ppm) above background for the 15-minute average, work activities must be temporarily halted and monitoring continued. If the VOC vapor level readily decreases (per instantaneous readings) below 5 ppm over background, work activities can resume with continued monitoring.
2. If VOC vapor levels at the property boundary immediately downwind of the work area persist at levels in excess of 5 ppm over background but less than 25 ppm, work activities must be halted, the source of vapors identified, corrective actions taken to abate emissions, and monitoring continued. After these steps, work activities can resume provided that the VOC vapor level 200 feet downwind of the property boundary or half the distance to the nearest potential receptor or residential/commercial structure, whichever is less, is below 5 ppm over background for the 15-minute average.
3. If the VOC vapor level is above 25 ppm at the property boundary downwind of the work area, activities must be shutdown. It will be necessary to implement corrective actions to abate emissions. In the event that the excavation limit coincides closely with the property boundary, a determination will be made in conjunction with the NYSDEC, and taking into consideration the Site's neighboring conditions, as to possible alternative criteria requirements.

All 15-minute readings must be recorded and be available for State (New York State Department of Environmental Conservation and New York State Department of Health) and County health personnel to review. Instantaneous readings, if any, used for decision purposes should also be recorded.

3.0 PARTICULATE MONITORING, RESPONSE LEVELS, AND ACTIONS

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

1. If the downwind PM-10 particulate level is 100 micrograms per cubic meter ($\mu g/m^3$) greater than background (upwind perimeter) for the 15-minute period or if airborne dust is observed leaving the work area, then dust suppression techniques must be employed. Work may continue with dust suppression techniques provided that downwind PM-10 particulate levels do not exceed 150 $\mu g/m^3$ above the upwind level and provided that no visible dust is migrating from the work area.
2. If, after implementation of dust suppression techniques, downwind PM-10 particulate levels are greater than 150 $\mu g/m^3$ above the upwind level, work must be stopped and a re-evaluation of activities initiated. Work can resume provided that dust suppression measures and other controls are successful in reducing the downwind PM-10 particulate concentration to within 150 $\mu g/m^3$ of the upwind level and in preventing visible dust migration.

   All readings must be recorded and be available for State (NYSDEC and NYSDOH) and County health personnel to review.

The following fugitive dust suppression and particulate monitoring program will be employed during excavation and other soil-intrusive activities:

1. Reasonable fugitive dust suppression techniques must be employed during all Site activities, which may generate fugitive dust.
2. Particulate monitoring must be employed during the handling of contaminated soil or when activities on Site may generate fugitive dust from contaminated soil. It is noted that monitoring under the CAMP is not required when the handling of contaminated soil is being performed within an enclosed structure. Monitoring and control measures are also not required under the CAMP for the excavation,

grading, or placement of clean fill. They may still be needed as an appropriate part of the general Remedial Design Report Health and Safety Plan.

3. Particulate monitoring must be performed using real-time particulate monitors and shall monitor particulate matter less than ten microns (PM10) with the following minimum performance standards:

   (a) Objects to be measured: Dust, mists, or aerosols

   (b) Measurement Ranges: 0.001 to 400 milligrams per cubic meter (mg/m^3) (1 to 400,000 $\mu g/m^3$)

   (c) Precision (2-sigma) at constant temperature: ±10 $\mu g/m^3$ for 1-second averaging; and ±1.5 gram per cubic meter (g/m^3) for 60-second averaging

   (d) Accuracy: ±5 percent of reading ± precision referred to gravimetric calibration with SAE fine test dust (mass median diameter = 2 to 3 μm, g = 2.5, as aerosolized)

   (e) Resolution: 0.1 percent of reading or 1 g/m^3, whichever is larger

   (f) Particle Size Range of Maximum Response: 0.1 to 10

   (g) Total Number of Data Points in Memory: 10,000

   (h) Logged Data: Each data point with average concentration, time/date and data point number

   (i) Run Summary: Overall average, maximum concentrations, time/date of maximum, total number of logged points, start time/date, total elapsed time (run duration), STEL concentration and time/date occurrence, averaging (logging) period, calibration factor, and tag number

   (j) Alarm Averaging Time (user selectable): Real-time (1 to 60 seconds) or STEL (15 minutes) alarms required

   (k) Operating Time: 48 hours (fully charged NiCd battery); continuously with charger

   (l) Operating Temperature: -10 to 50°C (14 to 122°F)

   (m) Particulate levels will be monitored upwind and immediately downwind at the working Site and integrated over a period not to exceed 15 minutes

4. In order to ensure the validity of the fugitive dust measurements performed, there must be appropriate Quality Assurance/Quality Control. Consequently, the Construction Quality Assurance Plan that will be implemented during the remediation of the Site soil includes the following critical features: periodic instrument calibration, operator training, daily instrument performance (span) checks, and a record keeping plan.

5. The action level will be established at 150 μg/m^3 (15 minutes average). While conservative, this short-term interval will provide a real-time assessment of on-Site air quality to assure both health and safety. If particulate levels are detected in excess of 150 μg/m^3, the upwind background level must be confirmed immediately. If the working Site particulate measurement is greater than 100 μg/m^3 above the background level, additional dust suppression techniques must be implemented to reduce the generation of fugitive dust and corrective action taken to protect Site personnel and reduce the potential for contaminant migration. Corrective measures may include increasing the level of personal protection for on-Site personnel and implementing additional dust suppression techniques. Should the action level of 150 μg/m^3 continue to be exceeded, work must stop and NYSDEC must be notified as provided in the Remedial Design Report HASP. The notification shall include a description of the control measures implemented to prevent further exceedances.

6. If dust is observed leaving the working Site, additional dust suppression techniques must be employed. The following techniques have been shown to be effective for controlling the generation and migration of dust during construction activities and will be considered for use at this Site:

   (a) Applying water on haul roads

   (b) Wetting equipment and excavation faces

   (c) Spraying water on buckets during excavation and dumping

   (d) Hauling materials in properly tarped or watertight containers;

   (e) Restricting vehicle speeds to 10 mph

   (f) Covering excavated areas and material after excavation activity ceases

   (g) Reducing the excavation size and/or number of excavations

   Experience has shown that the chance of exceeding the 150 μg/m^3 action level is low when the above-mentioned techniques are used. When techniques involving water application are used, care must be taken not to use excess water, which can result in unacceptably wet conditions. Using atomizing sprays will prevent overly wet conditions, conserve water, and provide an effective means of suppressing the fugitive dust.

7. The evaluation of weather conditions is necessary for proper fugitive dust control. When extreme wind conditions make dust control ineffective, work may have to be suspended. There may be situations that require fugitive dust suppression and particulate monitoring requirements with action levels more stringent than those provided above. Under some circumstances, the contaminant concentration and/or toxicity may require additional monitoring to

protect Site personnel and the public. Additional integrated sampling and chemical analysis of the dust may also be in order. This must be evaluated when a health and safety plan is developed and when appropriate suppression and monitoring requirements are established for protection of health and the environment.

APPENDIX C

CONSTRUCTION QUALITY ASSURANCE PLAN

APPENDIX C

CONSTRUCTION QUALITY ASSURANCE PLAN

FRONTIER CHEMICAL SITE
NIAGARA FALLS, NEW YORK
NYSDEC INDEX #89-0571-00-01

Prepared For:
Frontier Chemical Site Potentially Responsible Parties Group

DECEMBER 2011
REF. NO. 047392 (9)
This report is printed on recycled paper.

TABLE OF CONTENTS

LIST OF FIGURES
(Following Text)

LIST OF TABLES
(Following Text)

1.0 INTRODUCTION

CRA Infrastructure & Engineering, Inc, (CRA) has prepared this Construction Quality Assurance Plan (CQAP) on behalf of the Frontier Chemical Site Potentially Responsible Parties Group (Frontier Group) for submittal to the New York State Department of Environmental Conservation (NYSDEC) for the Frontier Chemical Site (NYSDEC Index # 89-0571-00-01) (Site). This CQAP forms part of the Remedial Design (RD) for the soil remediation project for the Site.

1.1 PURPOSE AND ORGANIZATION OF REPORT

This CQAP presents the quality assurance program to be followed during implementation of the Remedial Action (RA) at the Site to ensure that the RA construction activities meet or exceed all design criteria, plans, and specifications. This QCAP is organized as follows:

- Section 1.0 presents the background information, purpose and organization of the report
- Section 2.0 provides a description of the Frontier Chemical Site project
- Section 3.0 outlines the project organization and responsibilities
- Section 4.0 presents the personnel qualification requirements
- Section 5.0 presents the project meeting requirements
- Section 6.0 describes the inspection, testing, and verification sampling activities required to ensure that the construction and materials comply with all design specifications and plans
- Section 7.0 describes the documentation requirements of CQA activities
- Section 8.0 describes the final report documenting the RA work and certification of the work

2.0 PROJECT DESCRIPTION

The Remedial Design Report addresses the design and implementation of the remaining components of the RA including:

- Implementation of the Site-specific Health and Safety Plan (HASP)
- Provision of Site security
- Mobilization of construction facilities, material, equipment, and personnel necessary to perform the work
- Implementation of environmental controls
- Provision and maintenance of construction facilities and temporary controls
- Site preparation including:
  - Work zone identification
  - Provision of utilities
  - Construction of decontamination facilities
  - Construction of staging and treatment facilities
  - Demolition of buildings and tank farms within the footprint of the excavation area
  - Clearing
  - Abandonment of specific existing wells
  - Access roads
  - Deactivation, abandonment, and relocation of utilities (e.g., storm sewers) as required
- Testing of the thermal desorption treatment unit
- Excavation, handling and backfilling of soil/sediment including:
  - Layout of excavation limits
  - Removal and crushing sections of concrete foundations and slabs and on-Site placement of the crushed concrete
  - Excavation and stockpiling of source area and non-source area soil in accordance with the RD
  - Preparation of source area soil for treatment
  - Treatment of prepared soil
  - Collection of treated soil confirmation samples
  - Placement of treated soil and non-source area soil into excavation
  - Surface water and groundwater management

- Completion of RA closeout activities including:
  - Construction of the Site cover
  - Removal and off-Site disposal of miscellaneous debris at appropriate off-Site facilities (as required)
  - Decontamination of Site equipment and facilities
- Demobilization of construction facilities and equipment from the Site

Construction Quality Control (CQC) activities will be implemented by the selected Remedial Action Contractor (RA Contractor) to measure and control the characteristics of the materials, installations, and operations used in the RA construction activities and demonstrate that the materials, installations, and operations meet the requirements of the project specifications. A brief description of the RA construction activities including physical controls, institutional controls, groundwater remedies, site conditions, excavation and treatment of source area soil, construction of the Site cap, and long-term operation, maintenance, and monitoring are provided in Sections 2.1 through 2.7.

2.1 PHYSICAL CONTROLS

Fences, gates, and warning signs will be used to restrict access to the facility to deter vandalism and control public (trespasser) exposure. Upon completion of the soil remediation component, those areas of the Site that have been disturbed by the soil excavation will be capped with 1 foot (ft) of clean material. All existing soil-exposed surfaces across the Site will be similarly capped with 1 ft of clean material. The remainder of the Site is covered with concrete or asphalt and will remain covered with these hard surface covers.

2.2 INSTITUTIONAL CONTROLS

Institutional controls will be emplaced to reduce the potential for exposure to the residual contaminants of concern (COCs). The Site will remain as an industrial zoned property and deed restrictions/title notices will be put in place by the property owner to document appropriate precautions for any residual constituents that will remain, appropriately covered, on the Site following the planned RA. The NYSDEC regulates the installation of new groundwater extraction projects in New York State and therefore, in conjunction with the institutional controls, is in a position to confirm that groundwater beneath the Site is not inappropriately extracted or diverted from its current flow path without proper precautions being taken. The institutional controls ensure that future Site buildings incorporate appropriate vapor control measures to protect indoor air quality. The owners of the property will allow and monitor all appropriate institutional controls placed upon the Site.

2.3 GROUNDWATER REMEDIES

The overburden and shallow bedrock groundwater beneath the Site is hydraulically controlled by the bedrock sewer tunnels along 47th Street and Royal Avenue. These tunnels draw all of the shallow groundwater in the area (including from beneath the Frontier Site) toward them. The groundwater, once having infiltrated the tunnels, flows to the City of Niagara Falls wastewater treatment plant where it is treated. A Significant Industrial User (SIU) Permit has been issued to the Frontier Group by the Niagara Falls Water Board to allow this infiltration and treatment of Site groundwater to occur under proper authorization.

The deep bedrock groundwater was investigated during the remedial pre-design and determined to be protected from the chemicals on the Site by upward hydraulic gradients that prevent any aqueous phase chemical from reaching the deep bedrock groundwater flow regime. While there are some chemicals detected in the deep bedrock groundwater, their concentrations are low and they do not pose a significant environmental risk. A monitored natural attenuation remedy has been selected for the deep bedrock groundwater.

2.4 SITE CONDITIONS

Most of the Site buildings/structures were demolished in 1999 or shortly thereafter. A few buildings and structures remain and will be demolished in the near future. The Site is currently vacant, but plans are being prepared to use the Site in the near future as a vehicle storage area. This use would be in compliance with the industrial zoning for the Site.

2.5 SOIL EXCAVATION AND TREATMENT

The preferred remedy for the Site soil consists of excavation and on-Site thermal treatment of source area soil. The NYSDEC and Frontier Group have established the horizontal and vertical delineation of the source area soil to constitute the remediation area identified through the NYSDEC–approved remedial pre-design investigation. This delineation is consistent with the remedial objectives of the 2006 ROD. The volume of the source area soil is approximately 15,000 cubic yards.

The Remedial Design Report includes a set of figures depicting the source area soil (see Figures 2.2 through 2.9 of the RD Report). Each successive figure presents a 2 ft interval of the soil horizon, starting with the interval at the ground surface and descending to the bottom interval overlying the top of bedrock which is located at a depth of approximately 16 ft below ground surface. As can be seen on the figures, there are considerable discontinuities in the adjoining and overlying/underlying areas that are considered source area soil.

Since the source area soil is interspersed throughout the soil horizon and surrounded by soil that does not require remediation, considerable additional soil will have to be excavated in order to access the source area soil. Based on the available information, it is expected that on the order of 32,000 cubic yards of soil will have to be excavated in order to access the 15,000 cubic yards of source area soil. Only the source area soil will be thermally treated prior to placement back into the excavation.

The excavated soil will be placed into non-source area and source area stockpiles. The source area stockpiles will be located within an enclosed structure which will be under negative pressure to control vapor emissions. A mobile thermal desorption treatment unit is planned to be used to treat the source area soil. The source area soil will be treated and then placed into treated soil stockpiles. The treated soil will be tested to confirm successful treatment to less than 100 ppm Total Volatile Organic Compounds (VOCs) prior to being used as backfill. Backfilling of the excavation will start when an excavation area has reached its final depth. The excavation will be filled in the following sequence:

i) Lower excavation with non-source area soil
ii) Upper excavation to 1 foot below final grade with treated soil

A filter fabric will be placed between the non-source and treated soil and the sidewalls of the excavation.

The desorbed VOCs in the air stream are treated using a system which may contain, in sequence:

i) Removal or destruction of the VOCs
ii) Cooling and removal of fine particulates

iii) A scrubber to remove any hydrochloric acid (HCl) generated by the chlorinated compounds

Prior to full-time operation of the thermal treatment unit, Proof of Performance test trial burns will be performed to determine the envelope of the operational parameters of the thermal treatment unit. Additional details of the trial burns are provided in Section 5.11 of the Remedial Design Report.

2.6 SITE CAP

Most of the current surface area on the Site is hard surface cover consisting of asphalt or concrete. This surface prevents contact with Site contaminants. Smaller areas of the Site have soil cover and the proposed soil remediation (excavation and on-Site treatment of source area soil) will create additional soil cover areas. Upon completion of the soil remedy, the soil cover areas will be capped with one foot of clean material. Based on the expectation that the Site will be used as a vehicle storage area in the near future, the most practical material to use as the cover material is quarried stone or crushed concrete/demolition debris. This material will be capable of supporting truck traffic that would be traversing the Site in its future use as a vehicle storage area.

2.7 LONG-TERM OPERATION, MAINTENANCE, AND MONITORING

Once the source area soil is treated, there will be no need for ongoing operation, maintenance, and monitoring (OM&M) activities associated with the remaining soil. However, it is noted that the groundwater remedies will require some OM&M activities; primarily groundwater sampling. The only other physical remedial component at the Site will be the continued securing of the Site boundary with a fence (at least along some boundaries depending upon planned usage) and appropriate signage. All other long term remedial components will be institutional in nature. This includes restrictions and guidelines associated with potential future use or activity at the Site. These restrictions and guidelines will be defined by the institutional controls established for the Site and are provided in the Site Management Plan which is included as Appendix A to this RD.

3.0 PROJECT ORGANIZATION AND RESPONSIBILITIES

3.1 GENERAL

The RA construction and operation activities will be managed by the Engineer on behalf of the Frontier Group. As construction manager, the Engineer will be responsible for ensuring that the RA is implemented in accordance with the project specifications. The Engineer will provide oversight of the selected RA Contractor, and will report directly to both the Frontier Group and the NYSDEC. Additional subcontractors for specific construction activities and specific quality assurance (QA) testing activities will also be overseen by the Engineer.

The primary role of the selected RA Contractor is to implement each of the respective components of the RA in accordance with the project specifications.

Brief descriptions of the duties of the key personnel and organizations are presented in Sections 3.2 through 3.8. A project organization chart is presented on Figure C3.1.

3.2 CHAIRMAN OF THE TECHNICAL COMMITTEE, FRONTIER GROUP

The duties of the Chairman of the Technical Committee for the Frontier Group are as follows:

i) Provide overall project direction
ii) Participate in discussions with the NYSDEC
iii) Provide final certificates that the RA has been completed in full satisfaction of the requirements of the RD

3.3 ENGINEER PROJECT MANAGER

The duties of the Engineer Project Manager are as follows:

i) Provide overall project management
ii) Provide managerial and technical guidance to Engineer's Site Manager and technical resources group

iii) Ensure professional services provided by Engineer are cost effective and of the highest quality

iv) Ensure appropriate resources of Engineer are available on an as-required basis

v) Participate in discussions with the NYSDEC

vi) Provide final certification that the RA has been completed in full satisfaction of the requirements of the RD.

3.4 SITE CONSTRUCTION MANAGER

The Site Construction Manager will be a representative of the Engineer Project Manager. The duties of the Site Construction Manager are as follows:

i) Report to Engineer Project Manager

ii) Provide management of CQA Support Personnel, as required

iii) Accept/reject testing firms selected to perform CQA field/laboratory tests

iv) Provide supervision of on-Site project construction and operational activities, as necessary

v) Provide technical representation at meetings, as appropriate

vi) Serve as Construction Quality Assurance Officer (QAO)

vii) Conduct CQA inspections as indicated in the CQAP, and/or ensure that CQA inspections are conducted by appropriate CQA Support Personnel

viii) Inform CQA Support Personnel on CQA requirements and procedures

ix) Ensure that CQA Support Personnel perform the appropriate field testing

x) Ensure that regular calibration of testing equipment is conducted and recorded

xi) Ensure that all Site activities are recorded daily and maintained

xii) Ensure that CQA inspections and test results are accurately recorded

xiii) Identify work that should be accepted, rejected, or uncovered for inspection, or that may require special testing, inspection, or approval

xiv) Reject defective work and verify that corrective measures are implemented

xv) Supervise and interact with the RA Contractor, as necessary

xvi) Prepare and review reports

xvii) Serve as the Site contact should Agency personnel require clarification on issues related to the project schedule, CQA activities, or health and safety

3.5 CQA SUPPORT PERSONNEL

The duties of the CQA Support Personnel are as follows:

i) Report directly to and provide support to the Site Construction Manager
ii) Conduct CQA tests as indicated in the CQAP
iii) Accurately record test results and inspections
iv) Calibrate testing equipment as required
v) Maintain testing equipment in good working order
vi) Promptly notify the Site Construction Manager whether or not test results comply with this CQAP and the project specifications

3.6 CQA SUBCONTRACTORS

The duties of the CQA subcontractors are to provide CQA testing of materials used in the RA, as requested by the Site Construction Manager, and to provide the data necessary to confirm RA activities have been implemented according to the project specifications.

3.7 REMEDIAL ACTION (RA) CONTRACTOR

The duties of the selected RA Contractor, as they relate to QA and quality control (QC) are as follows:

i) Provide quality materials and workmanship to ensure that materials, operations, and procedures meet specified requirements
ii) Submit manufacturers' material properties data and quality control certificates, and global positioning system (GPS)/topographic survey data to the Site Construction Manager
iii) Retain qualified testing firms (e.g., laboratory, geotechnical) for testing of materials and workmanship to ensure that materials meet specified requirements
iv) Submit samples and/or materials for testing to determine if samples/materials meet specified requirements, and submits results directly to the CQA Officer
v) Record daily CQA activities in the Contractor's Site log book and submit a "Daily Construction Quality Control Report" (see Section 7.2) to the CQA Officer

vi) Prepare and submit to the Site Construction Manager CQC reports, production reports, and field installation reports

vii) Oversee and is responsible for the work activities completed by subcontractors of the RA Contractor

viii) Complete construction activities according to the related project specifications

ix) Develop and implement Site-specific HASP

3.8 NYSDEC

The NYSDEC will have an on-Site Representative to monitor RA activities. Communications between the NYSDEC and the Steering Committee relating to RA activities will be handled through the Engineer Project Manager and / or the Chairman of the Technical Committee for the Frontier Group.

4.0 PERSONNEL QUALIFICATIONS

4.1 SITE CONSTRUCTION MANAGER

The Site Construction Manager will have the following qualifications:

i) Graduate of a recognized college or university in a technically related field, or equivalent; and a minimum of 5 years experience in hazardous waste remedial construction

ii) Minimum 5 years experience in the oversight and implementation of hazardous waste remedial construction and CQA activities

iii) Good management and communication skills

iv) 40-hour hazardous waste operations and emergency response (HAZWOPER) training in accordance with Occupational Safety and Health Association (OSHA) regulations at 29 CFR 1910.120, including annual 8-hour refresher courses and supervisor training

4.2 CQA SUPPORT PERSONNEL

The CQA Support Personnel will have the following minimum qualifications:

i) Graduate of a recognized college or university in engineering technology, or equivalent; or a minimum of 3 years experience in hazardous waste remedial construction and CQA inspection/testing procedures

ii) Working knowledge of relevant codes and regulations concerning material and equipment installation, observation and testing procedures, testing equipment, documentation procedures, and Site safety

iii) 40-hour HAZWOPER training, plus annual 8-hour refresher courses, in accordance with 29 CFR 1910.120

4.3 REMEDIAL ACTION (RA) CONTRACTOR

The RA Contractor will assign experienced personnel to supervise the implementation of each component of the remediation activities specified in the project specifications.

Experienced personnel will have a thorough knowledge of construction and remediation procedures, equipment operation procedures, monitoring procedures, and documentation procedures as appropriate and as required for implementation of the RA activities.

RA Contractor will be responsible for the work activities completed by subcontractors of the RA Contractor.

RA Contractor personnel and subcontractor personnel involved in Site activities that result in a potential for exposure to Site-related COCs will be required to have completed 40-hour HAZWOPER training, plus annual 8-hour refresher courses, in accordance with 29 CFR 1910.120.

Selected RA contractor will designate an on-Site Project Manager and Health and Safety Officer empowered to act on behalf of the contractor in all matters pertaining to the remedial construction activities.

5.0 PROJECT MEETINGS

5.1 GENERAL

Project meetings as detailed herein will be held during the RA construction activities to ensure that all tasks are accomplished according to schedule and that they are completed in accordance with the project specifications. These progress meetings will be attended by the Site Construction Manager, CQA Support Personnel, and RA Contractor representatives, as detailed below. In addition, the Frontier Group and NYSDEC will be notified of the scheduled meetings.

Meeting minutes will be recorded by the Site Construction Manager or their designate, as required, for all meetings held on-Site during the RA activities. Copies of the minutes will be forwarded to the Frontier Group, NYSDEC, and all organizations present at the meetings.

5.2 PRE-CONSTRUCTION MEETING

Purpose: To review the general project scope, levels of responsibility, reporting, and health and safety requirements for the RA Contractor.

Schedule: The time and date of the pre-construction meeting will be scheduled following NYSDEC written approval of the Final 100 percent Design Report.

Attendees: Engineer Project Manager, Site Construction Manager, CQA Support Personnel, NYSDEC representative(s), RA Contractor Project Manager, and Health and Safety Officer.

Agenda:

i) Introduce each organization and Site personnel

ii) Review of general project scope and requirements specified in the Design Report and the project specifications

iii) Review of this CQAP, Site HASP, RA Contractor's Site-specific HASPs, and any potential modifications to ensure that Site-specific considerations are addressed

iv) Review of the methods for documenting and reporting inspection data

v) Review of the project schedule

vi) Establish a schedule of meetings and briefings during remediation

vii) Review of the roles and responsibilities of each organization and Site personnel

viii) Review lines of authority and communication

ix) Review procedures for processing field decisions, submittals, substitutions, applications for payment, proposal requests, field orders, work change directives, change orders, and close out procedures

x) Review temporary facilities and controls, field offices, security, and housekeeping procedures

xi) Review of the methods for distributing and storing documents and reports

xii) Discussion of all key issues, concerns, and project goals

xiii) Identify procedures to resolve disputes or misunderstandings during remediation

xiv) Review of endpoint activities and procedures for project completion

xv) Conduct a Site walk-around to verify that the project specifications and drawings are understood, and to review construction areas, and material and equipment storage locations

5.3 PROGRESS MEETINGS

Purpose: To provide an update of work, review the progress of the work, identify schedule changes, and, if behind, efforts required to get back onto schedule.

Schedule: Progress meetings will be conducted periodically throughout the RA, typically on a weekly basis, on days to be determined by the Site Construction Manager and the RA Contractor's Project Manager.

Attendees: Site Construction Manager, CQA Support Personnel (as needed), Engineer Project Manager (as appropriate), NYSDEC representative(s), RA Contractor Project Manager, and Health and Safety Officer.

Agenda:

i) Review work activities for the previous week

ii) Comparison of actual progress to scheduled work activities, noting of schedule slippages, and actions to be implemented to rectify schedule slippages

iii) Review work activities for the next week

iv) Review RA Contractor's personnel and equipment assignments for the upcoming week

v) Review potential construction and/or coordination problems and develop proposed solutions

vi) Review potential health and safety issues including air monitoring results

vii) Review submittals schedule and status of submittals

5.4 PROBLEM OR WORK DEFICIENCY MEETINGS

Purpose: To resolve any problem or deficiency that is present or is likely to occur.

Schedule: As required.

Attendees: Site Construction Manager, CQA Support Personnel (as needed), NYSDEC representative(s), RA Contractor Project Manager (optional if problem is not directly related to the RA Contractor's component of the work).

Agenda:

i) Define and discuss problem or deficiency

ii) Review alternative solutions

iii) Develop and implement a plan to resolve the problem or deficiency

Meeting minutes will be recorded by the Site Construction Manager or RA Contractor Project Manager, as required, for all meetings held on Site during the RA activities. Copies of the minutes will be forwarded to NYSDEC and all organizations present at the meetings.

5.5 PRE-FINAL CONSTRUCTION COMPLETION MEETING

Purpose: To identify outstanding issues or deficiencies related to the construction of the remedy.

Schedule: The Pre-Final Construction Completion Meeting will be conducted following 90 percent completion of the construction activities.

Attendees: Site Construction Manager, CQA Support Personnel, RA Contractor Project Manager, and NYSDEC representative(s)

Agenda:

i) Site walk through and general project update
ii) Define and discuss issues or deficiencies (punch list items)
iii) Review alternative solutions
iv) Develop and implement a plan and schedule to resolve the issues or deficiencies

5.6 FINAL CONSTRUCTION COMPLETION MEETING

Purpose: To conduct a final inspection of the constructed remedy and verify resolution of issues or deficiencies identified in the Pre-Final Construction Completion Meeting.

Schedule: The Final Construction Completion Meeting will be conducted following substantial completion of the construction activities.

Attendees: Site Construction Manager, CQA Support Personnel, RA Contractor Project Manager, and NYSDEC representative(s).

Agenda:

i) Site walk through and general project update
ii) Resolution of punch list items
iii) Discuss conversion to operation, maintenance, and monitoring phase of work

6.0 INSPECTION AND TESTING ACTIVITIES

6.1 GENERAL

Throughout the implementation of the RA construction activities there will be numerous inspections and testing requirements for specific work tasks. The inspection and testing requirements will ensure compliance with the Remedial Design Report and the project specifications, as well as ensure completion of the work tasks to a high level of quality.

Inspections and testing will provide a means of monitoring the quality and progress of work performed.

6.2 INSPECTIONS

Throughout the period of RA activities, the quality of work completed and material used for each of the work tasks will be maintained at a high level through regular inspections of the work. Inspections will be completed throughout the construction by the Site Construction Manager and/or CQA Support Personnel.

In general, inspections to be conducted by the Site Construction Manager and/or CQA Support Personnel include the following:

i) Inspections of the work progress, as necessary.

ii) Inspections of work areas and operations including those associated with soil excavation, storage, processing, treatment, testing, and backfill.

iii) Inspections of material and equipment as they are delivered to the Site to check for damage during delivery.

iv) Comparison of the material and equipment delivered to the Site to the project specifications to ensure that the proper material and equipment has been delivered to the Site.

v) Inspection of materials and equipment after they have been installed to ensure that they have not been damaged during installation.

vi) A pre-construction/operation inspection will be performed prior to beginning work on any work task. A pre-construction/operation inspection will include the following:

- A review of contract requirements to ensure that all materials and/or equipment have been tested and/or inspected according to applicable standards and specifications.

- Ensure that provisions have been made to provide required QC testing by the remedial contractors.
- Examination of the work areas to confirm that all applicable preliminary work tasks have been completed.

vii) General inspections will be performed periodically as the amount of work completed warrants such an inspection. A general inspection will include the following:

- Examination of the quality of workmanship.
- Testing of materials for compliance with the project specifications.
- Identification of omissions.
- General progress of work performed.

The results of all inspections will be recorded in the Site log book as described in Section 7.2.

The components of each work task to be inspected, the types of inspections required, and frequency of the inspections are summarized in Table C6.1.

6.3 TESTING

In addition to the regular CQA inspections of materials and equipment during the progress of the remediation, CQA testing of materials and operational procedures, as well as associated compliance monitoring activities, will be performed as required. CQA testing will be performed to ensure compliance with material, operational and compliance specifications, and design criteria as presented in the Remedial Design Report and project specifications.

Specifically, soil will be tested as it is excavated so that it can be properly characterized and stockpiled as source area soil or non-source area soil. The source area soil will also be tested following thermal treatment to confirm that the treatment achieves the remedial objectives prior to being reused as backfill.

A series of tests will also be performed on an ongoing basis in conjunction with the operation of the thermal treatment unit. However, until a thermal treatment contractor has been retained by the Frontier Group, it will not be possible to identify the specific testing that will be performed during operation of the thermal treatment unit. Upon selection of the thermal treatment contractor, the specific Proof of Performance and

Permit information regarding the proposed treatment unit will be provided to the NYSDEC for approval. The final details of the testing program will be fine-tuned during the test trial burns.

The CQA testing requirements, methods of testing, testing frequency, and acceptance criteria for each of the RA components are summarized in Table C6.2.

CQC material testing of the soil will be performed by the CQA Support Staff. All other material testing will be performed by the RA Contractor to measure and control the characteristics of the materials, installations, and operational procedures used in the RA in order to demonstrate that the materials, installations, and operational procedures meet the requirements of the Remedial Design Report.

7.0 CQA DOCUMENTATION

7.1 GENERAL

This section details the documentation requirements for the CQAP. The proper, thorough, and accurate documentation of all CQA activities is important in ensuring the quality of the RA implementation. CQA testing will be documented as testing occurs.

7.2 SITE CONSTRUCTION MANAGER SITE LOG BOOK

The Site Construction Manager or CQA Support Personnel will record field and CQA activities in the Site Log Book, as required. The log book will include the following information:

i) Date and weather conditions
ii) Personnel on-Site
iii) Description of Site activities
iv) Decisions made regarding approval of units of material, equipment, or of work, and/or corrective actions to be taken in cases of substandard quality
v) Submittals made by suppliers verifying material quality
vi) Construction delays and causes
vii) Areas affected by delays
viii) Construction problems and corrective actions
ix) Present phase of construction
x) Material and/or equipment delivered (including equipment demobilization)
xi) Inspections made
xii) Health and safety considerations
xiii) Quality control tests performed
xiv) Instructions given by the Site Construction Manager
xv) Changed conditions/conflicts encountered
xvi) Remarks

Each entry into the log will be signed by the Site Construction Manager or CQA Support Personnel as verification to its correctness.

7.3 CQA INSTRUMENT CALIBRATION

The CQA Support Personnel will record calibrations of test equipment in an Instrument Calibration Log Book, maintained on-Site by the Site Construction Manager. Actions taken as a result of recalibration will be recorded in the Inspection Log Book, as described in the next section.

7.4 CQA INSPECTION AND TEST LOG BOOK

Results of all CQA equipment calibrations, inspections, and field tests will be recorded by the Site Construction Manager or CQA Support Personnel into a separate CQA Inspection and Test Log Book (or Site Log Book, if appropriate). The log book may be in the form of an electronic data base. Separate log books may be kept for the various RA components. These books will be kept on Site and maintained by the Site Construction Manager. Results of CQA inspections and associated field tests will be added to the CQA Inspection and Test Log Book within 48 hours of completion. Results of CQA tests performed by CQA test laboratories will be added to the CQA Inspection and Test Log Book within 48 hours of receipt of results from the laboratory by the Site Construction Manager or CQA Support Personnel. The CQA Inspection and Test Log Book will be made available to NYSDEC for review. The CQA Inspection and Test Log Book will include the following information:

i) Date, time, and weather conditions

ii) Description or title of the inspection or test activity

iii) Location of inspection, test activity, or location from which the sample increment was obtained

iv) Type of inspection or test activity and procedure used (reference to standard method when appropriate)

v) Recorded observations or test data, with all necessary calculations

vi) Results of the inspection or test activity and comparison with specification requirements

vii) Personnel involved in the inspection or test activity

viii) Signature of the appropriate CQA Support Personnel

Items above will be formulated into checklists so that details are not overlooked.

7.5 PROBLEM/CORRECTIVE ACTION REPORTS

A problem is defined as material, equipment, operations, or workmanship that does not meet the requirements of the project specifications. Problem/Corrective Action Reports should be cross-referenced to specific inspection entries in the CQA Inspection and Test Log Book where the problem was identified. Problem/Corrective Action Reports will include the following information:

i) Unique identifying sheet number for cross-referencing and document control
ii) Detailed description of the problem
iii) Location of the problem
iv) Probable cause
v) How and when the problem was identified (reference to CQA Inspection and Test Log Book)
vi) Estimation of how long problem has existed
vii) Suggested corrective action
viii) Documentation of correction (reference to CQA Inspection and Test Log Book)
ix) Final results
x) Suggested methods to prevent similar problems
xi) Signature of the appropriate CQA Support Personnel and concurrence by the Site Construction Manager

In some cases, not all of the above information will be available or obtainable. However, when available, such efforts to document problems could help to avoid similar problems in the future.

7.6 STORAGE OF RECORDS

During RA construction activities, the Site Construction Manager will maintain a copy of the following CQA related documents in the Site office:

i) Remedial Design Report and related specifications
ii) All submittals from the RA contractor, as required by the CQAP and the project specifications
iii) Site Construction Manager's Site Log Book

iv) CQA Inspection and Test Log Book

v) Problem/Corrective Action Reports

Some or all of these records may be in an electronic format. Once the RA construction activities are complete, all CQA documents will be included in Final Construction Inspection Reports which will be prepared by the Engineer and retained by the NYSDEC.

7.7 DOCUMENTATION OF OPERATIONS OF THERMAL TREATMENT UNIT

Daily records will be kept of the operation of the thermal treatment unit throughout the entire period for which soil is being treated. The daily records will provide documentation on the following aspects of its operation:

i) Date

ii) Waste feed rate and hours of operation

iii) Temperature of soil entering thermal treatment unit

iv) Temperature of soil exiting thermal treatment unit

v) Exit air temperature from the desorption chamber and cat/ox unit (if applicable)

vi) Afterburner temperature

vii) Stack gas velocity (if applicable)

viii) Baghouse pressure drop, venture pressure drop, or drop in liquid/gas ratio

ix) Flow rate and pH of acid gas scrubber liquid

x) Particulate matter emissions

xi) Gas emissions (oxygen, carbon monoxide, total hydrocarbons, carbon dioxide, as applicable)

xii) Fuel consumption

8.0 FINAL REPORT AND CERTIFICATION

Within 45 days of the final construction completion certification inspection/meeting, a final report will be submitted to the NYSDEC documenting the RA work. This report will include a narrative description of the various components of the remedy, corresponding milestone dates, Problem/Corrective Action Reports, deviations from design and material specifications (with justifying documentation), and as-constructed drawings. A sufficient number of photographs representative of the various components of the remedy will be included. In the report, a registered professional engineer and the Frontier Group's Chairman of the Technical Committee shall state that the RA has been completed in full satisfaction of the requirements of the RD. The written report shall include as-built drawings signed and stamped by a professional engineer licensed in the State of New York. The report shall contain the following statement, signed by the Chairman of the Technical Committee of the Frontier Group:

> *To the best of my knowledge, after thorough investigation, I certify that the information contained in or accompanying this submission is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.*

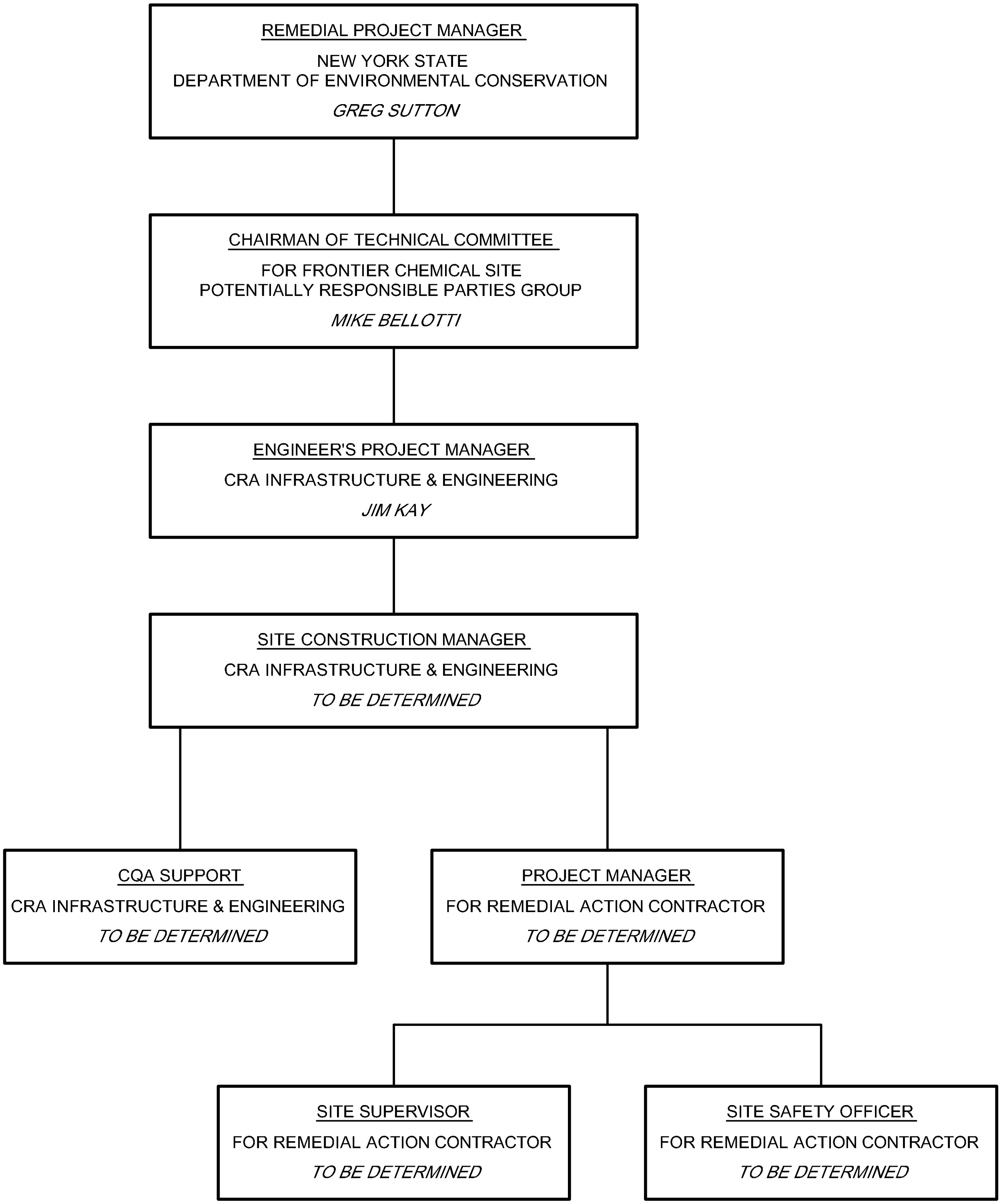


figure C.3.1

PROJECT MANAGEMENT ORGANIZATION FOR REMEDIAL ACTION
FRONTIER CHEMICAL SITE
Niagara Falls, New York

TABLE C6.1

SUMMARY OF CONSTRUCTION QUALITY ASSURANCE INSPECTIONS
REMEDIAL ACTION
FRONTIER CHEMICAL SITE, NIAGARA FALLS, NY

Work Task Component to be Inspected	*Items to be Checked During Inspection*	*Type of Inspection*	*Frequency of Inspection*	*Submittals to Site Engineer*	*Rejection Criteria*
A. Construction Facilities and Temporary Controls					
• Site Operations	• are barriers in place to prevent unauthorized Site entry and to protect adjacent properties and facilities	• visual	• daily as required	• none	• barriers not correctly located/installed
	• is fencing in place to delineate work areas and do workers observe and respect limits marked	• visual	• daily as required	• none	• fencing not installed/located correctly
	• are stockpiled materials covered with an impermeable liner during periods of work stoppage, including at the end of each working day	• visual	• daily as required	• none	• stockpiles not covered correctly
	• is surface water runoff prevented from leaving work areas	• visual	• daily as required	• none	• surface water controls not implemented
	• is surface water runoff from non-contaminated areas prevented from contacting potentially contaminated areas	• visual	• daily as required	• none	• surface water controls not implemented
	• are appropriate erosion control measures in place around cuts, fills, stockpiles, staging areas, and other work areas	• visual	• daily as required	• none	• erosion control measures not implemented
	• are appropriate dust control measures being followed to prevent dust release from the Site exceeding specified levels	• instrument reading	• per specifications	• instrument readings	• dust control measures not implemented • specified levels exceeded
	• are appropriate Site access roads and parking areas being maintained	• visual	• daily as required	• none	• roads, parking areas not maintained
	• are appropriate equipment decontamination procedures followed	• visual	• as required	• none	• decontamination procedures not followed
• Clearing	• are limits of clearing clearly marked and is clearing proceeding only within these limits	• visual	• daily as required	• none	• failure to perform as stated
	• are above ground portions of trees, shrubs and other cleared vegetation appropriately handled separately	• visual	• daily as required	• none	• failure to perform as stated
• Building Demolition	• is ACM from demolished buildings being handled appropriately	• visual	• per occurrence	• none	• does not meet Specification

TABLE C6.1

SUMMARY OF CONSTRUCTION QUALITY ASSURANCE INSPECTIONS
REMEDIAL ACTION
FRONTIER CHEMICAL SITE, NIAGARA FALLS, NY

Work Task Component to be Inspected	*Items to be Checked During Inspection*	*Type of Inspection*	*Frequency of Inspection*	*Submittals to Site Engineer*	*Rejection Criteria*
B. Excavation Activities					
• Excavation	• has specified depth and areal extent of excavation been reached	• visual • PID readings • survey	• prior to backfilling	• PID readings • survey information	• visual impact evident • PID reading >100 ppm
• Stockpiling	• are sideslopes stable/safe	• visual	• daily	• none	• OSHA requirement
	• are stockpiles of different materials adequately separated to prevent intermingling	• visual	• each stockpile daily	• none	• material not adequately separated
	• are adequate sediment and erosion controls in place	• visual	• during stockpile area preparation and following each rainfall event	• none	• sediment and erosion controls inadequate
• Backfilling	• does backfill material contain unsuitable material	• visual • check against Specifications	• each source of backfill material	• none	• unsuitable material present
	• is backfill placed in proper lifts	• visual (grade stakes)	• prior to compaction	• none	• does not meet Specification
	• has backfilled material been compacted to Specification	• visual	• in accordance with Specifications	• none	• does not meet Specification
	• horizontal and vertical control	• survey	• during and on completion of backfilling	• survey information	• outside vertical tolerance of ±2 inches (2) and horizontal tolerance of 1± feet
• Filter Fabric Installation	• does filter fabric comply with Specifications	• check manufacturer and supplier certifications • visual	• upon arrival at site	• suppliers and manufacturer's certification • delivery tickets	• material does not meet Specifications
	• has material arrived at Site undamaged	• visual	• upon delivery to Site	• none	• damaged materials
	• is material properly stored to prevent accidental damage	• visual	• upon delivery to Site	• none	• improperly stored materials
	• has Contractor submitted required submittals	• check against Specifications	• prior to commencing material placement	• Contractor's submittals	• required submittals not submitted or deficient
	• is base preparation free of ruts or harmful objects	• visual	• prior to placement	• none	• presence of ruts or sharp objects
	• have materials been installed as specified	• visual	• continuous	• suppliers/installer approval letter	• material not installed as specified in Specification

TABLE C6.1

SUMMARY OF CONSTRUCTION QUALITY ASSURANCE INSPECTIONS
REMEDIAL ACTION
FRONTIER CHEMICAL SITE, NIAGARA FALLS, NY

Work Task Component to be Inspected	*Items to be Checked During Inspection*	*Type of Inspection*	*Frequency of Inspection*	*Submittals to Site Engineer*	*Rejection Criteria*
B. Excavation Activities (cont'd)					
• Soil Vapor and Dust Management	• is excavation smallest size possible	• visual	• continuous	• none	• failure to perform as stated
	• is excavation backfilled as soon as practicable	• visual	• continuous	• none	• failure to perform as stated
	• are exposed odorous excavation areas covered at end of each working day	• visual	• daily	• none	• failure to perform as stated
	• are non-source area stockpiles covered at the end of each working day	• visual	• daily	• none	• failure to perform as stated
	• is source area soil enclosure under negative pressure	• visual	• during use of enclosure	• pressure reading result	• pressure readings positive
	• has breakthrough occurred from lead carbon bed	• analytical	• in accordance with Design Report	• analytical results	• concentrations indicate breakthrough has occurred
	• are adequate dust control measures in place	• instrument reading	• ongoing	• instrument readings	• specified levels exceeded
C. Cap Construction					
• Final Cover Construction	• has backfill reached pregrade elevation	• visual • survey	• on completion of placing fill materials	• none	• outside tolerance of ±2 inches (2)
	• has material been placed to design thickness and in proper lifts	• visual (grade stakes)	• continuous	• survey information	• outside tolerance of ±2 inches (2)

TABLE C6.1

SUMMARY OF CONSTRUCTION QUALITY ASSURANCE INSPECTIONS
REMEDIAL ACTION
FRONTIER CHEMICAL SITE, NIAGARA FALLS, NY

Work Task Component to be Inspected	*Items to be Checked During Inspection*	*Type of Inspection*	*Frequency of Inspection*	*Submittals to Site Engineer*	*Rejection Criteria*
D. Source Area Soil Treatment					
• Soil Preparation	• to be determined	• to be determined	• prior to treatment	• to be determined	• material does not meet Specifications
E. Thermal Treatment Unit					
• Installation	• to be determined	• check manufacturer and supplier Specifications • visual • check against Specifications	• during installation	• supplier's and manufacturer's certification	• does not meet Specification
	• Location and layout	• survey	• prior to installation	• survey information	• does not meet Specifications
	• check structures for physical damage	• visual	• during installation and operation	• none	• physical damage
	• confirm fit and sealing of joints, covers and accessories	• visual	• during installation and operation	• none	• failure to perform as stated
• Proof of Performance Testing	• collection samples • temperature	• laboratory analysis • thermometer	• once per 100 cy • ongoing	• laboratory data • temperature data	• concentration exceeds 100 ppm TVOC
• Air Discharge	• Air discharge criteria achieved	• analytical	• to be determined	• analytical results	• concentration exceeds 100 ppm TVOC
F. Monitoring Well Abandonment					
• Grout	• does grout meet Specifications	• check supplier's Specifications	• upon delivery to Site	• certifications	• does not meet Specification
• Well Abandonment	• ensure proper backfill is installed	• visual	• prior to installation	• well abandonment log	• does not meet Specification
	• ensure proper casing cutoff depth and backfill material	• visual	• following backfill	• well abandonment log	• does not meet Specification

TABLE C6.1

SUMMARY OF CONSTRUCTION QUALITY ASSURANCE INSPECTIONS
REMEDIAL ACTION
FRONTIER CHEMICAL SITE, NIAGARA FALLS, NY

Work Task Component to be Inspected	*Items to be Checked During Inspection*	*Type of Inspection*	*Frequency of Inspection*	*Submittals to Site Engineer*	*Rejection Criteria*
G. Miscellaneous					
• Fencing and Gates	• is salvaged fence properly stored to prevent damage	• visual	• after removal	• none	• material not stored properly
	• does material meet Specifications	• visual	• upon delivery to Site	• supplier's certification • delivery tickets	• does not meet Specification
	• is alignment correct	• survey and visual	• continuous during installation	• none	• alignment incorrect
	• does installation conform to Specifications	• visual	• continuous during installation	• none	• does not meet Specification
• Access Roads	• does material meet Specifications	• check supplier Specifications	• upon delivery to Site	• supplier's certification • delivery tickets	• does not meet Specification
	• is alignment correct	• survey and visual	• continuous during installation	• none	• alignment incorrect. Tolerance of ±6 inches
	• does installation conform to Specifications	• visual	• continuous during installation	• none	• does not meet Specification
• Pre-Engineered Structure	• does material meet Specifications	• check supplier's Specifications	• upon delivery to Site	• supplier's certification • delivery tickets	• does not meet Specification
	• is alignment correct	• survey and visual	• continuous during installation	• none	• alignment incorrect. Tolerance of ±2 inches
	• does installation conform to Specifications	• visual	• continuous during installation	• none	• does not meet Specification
• Concrete Foundations	• does material meet Specifications	• check supplier's Specifications	• upon delivery to Site	• supplier's certification	• material does not meet Specifications
	• is alignment correct	• survey and visual	• continuous during installation	• none	• alignment incorrect. Tolerance of ±2 inches
	• does installation conform to Specifications	• visual	• continuous during installation	• none	• installation does not conform to Specifications and Drawings
	• has reinforcement been properly installed	• visual	• continuous during installation	• none	• installation does not conform to Specifications

TABLE C6.2

SUMMARY OF QUALITY ASSURANCE TESTING PROCEDURES
REMEDIAL ACTION
FRONTIER CHEMICAL SITE, NIAGARA FALLS, NY

Work Task to be Inspected	*Type of Testing*	*Method of Testing*	*Frequency*	*Acceptance/Rejection Criteria*
A. Soil Treatment				
• Confirmatory Sampling Treated Soil	• Chemical Characterization	• VOCs + MCT	• 1 per 100 CY	• TVOC Concentrations exceeded 100 ppm
• Air Discharge Sampling	• Chemical Characterization	• per Specification	• per Specification	• concentrations outside of operational envelope
• Feedstock	• visual	• visual	• continuous	
B. Cap Construction				
• Crushed Concrete				
a) Material	• Particle Size	• Visual	• continuous	• particle size >2-inch
b) Placement	• Elevation	• Survey	• before and after placement	• tolerance of plus or minus 2-inch as from design
• Filter Fabric				
a) Materials	• material Specification	• per Specification	• upon arrival	• meets Specification
b) Installation	• overlapping joint	• visual	• continuous	• 1 foot overlap

TABLE C6.2

SUMMARY OF QUALITY ASSURANCE TESTING PROCEDURES
REMEDIAL ACTION
FRONTIER CHEMICAL SITE, NIAGARA FALLS, NY

Work Task to be Inspected	*Type of Testing*	*Method of Testing*	*Frequency*	*Acceptance/Rejection Criteria*
C. Thermal Treatment Unit				
• Proof of Performance Testing	• to be determined	• to be determined	• to be determined	• to be determined
• Operating	• to be determined	• to be determined	• to be determined	• Total VOC Concentration 100 ppm
D. Miscellaneous				
• Pre-Engineered Structure				
a) Concrete Slab	• Cement	• ASTM C150	• 1 per supplier	• per Specification
	• Aggregates	• ASTM C33	• 1 per supplier	• per Specification
	• Air Entrainment Admixture	• ASTM 260	• 1 per supplier	• per Specification
	• Water Reducing Admixture	• ASTM C494	• 1 per supplier	• per Specification
	• Concrete Mixing & Delivery	• ASTM C94 Option C	• 1 per supplier	• per Specification

APPENDIX D

CITIZEN PARTICIPATION PLAN

APPENDIX D
CITIZEN PARTICIPATION PLAN

FRONTIER CHEMICAL SITE
NIAGARA FALLS, NEW YORK
NYSDEC INDEX #89-0571-00-01

Prepared For:
Frontier Chemical Site Potentially Responsible Parties Group

DECEMBER 2011
REF. NO. 047392 (9)
This report is printed on recycled paper.

TABLE OF CONTENTS

LIST OF FIGURES
(Following Text)

LIST OF ATTACHMENTS

Note: The information presented in this Citizen Participation Plan was current as of the date of its approval by the New York State Department of Environmental Conservation. Portions of this Citizen Participation Plan may be revised during the site's remedial process.

1.0 WHAT IS NEW YORK'S STATE SUPERFUND PROGRAM?

The New York State's State Superfund Program or Inactive Hazardous Waste Disposal Site (IHWDS) Program is the State's program for identifying, investigating and cleaning up sites where consequential amounts of hazardous waste may exist. These sites go through a process of investigation, evaluation, cleanup, and monitoring that has several distinct stages. For an explanation of the different stages of the investigation and cleanup process, please refer to the New York State Department of Environmental Conservation (NYSDEC) Division of Environmental Remediation's (DER's) fact sheets on stages of the investigation and cleanup process at: http://www.dec.ny.gov/chemical/8661.html.

DER is made aware of potential hazardous waste sites in a variety of ways, including notification by the responsible party and citizen complaints.

An environmental investigation called a Site Characterization (SC) is performed when DER is made aware that hazardous waste has or may have been disposed of at a site. The goal of the SC is to determine whether a site meets the state's definition of an inactive hazardous waste disposal site by confirming the presence of hazardous waste and determining the threat posed by the site to public health or the environment. DER or the potentially responsible party performs the SC. For more information, you can read DER's fact sheet on SCs at: http://www.dec.ny.gov/chemical/8660.html.

Once the presence of a consequential amount of hazardous waste is confirmed at a site, the site is added to the State's official list of sites and is given a classification code. Sites that receive a classification of 2 (representing a significant threat to public health and/or the environment and requiring action) usually undergo a detailed environmental investigation, called a remedial investigation. When the parties responsible for the contamination are known, the responsible parties often pay for and perform the investigation and evaluation of cleanup options. At sites where responsible parties cannot be found or are unable or unwilling to fund an investigation, the State pays for the investigation using money from the 1986 Environmental Quality Bond Act, also known as the "State Superfund." The State may try to recover costs from a responsible party after the investigation and cleanup is complete.

Each Class 2 site is assigned a project manager. Regional IHWDS Program staff serve as project managers for many inactive hazardous waste disposal sites in their respective regions. Staff in NYSDEC's Albany office serve as project managers for the remaining sites. For sites where state money pays for an investigation, the project manager oversees the investigation and evaluation of cleanup options directly, or he/she may supervise a consultant hired to do the work. When a responsible party performs an investigation, the project manager reviews and approves investigation work plans and reports and ensures the responsible party performs a thorough and proper investigation. The project manager also works closely with New York State Department of Health staff who ensure that public health concerns are addressed.

The project manager writes the Proposed Remedial Action Plan (PRAP) that outlines the State's preferred method to address the site. The project manager presents the proposed plan at a public meeting and responds to public comments. After a final plan is selected and the Record of Decision (ROD) is approved, DER staff may remain involved with the design and implementation of the cleanup.

DER staff also perform inspections of sites that have been remediated but continue to have cleanup systems or other controls in place. For more information about the State Superfund, go online at: http://www.dec.ny.gov/chemical/8439.html.

2.0 CITIZEN PARTICIPATION PLAN OVERVIEW

A Citizen Participation (CP) Plan provides members of the affected and interested public with information about how NYSDEC will inform and involve them during the investigation and remediation (cleanup) of a site under the Superfund Program.

This CP Plan has been developed for the Frontier Chemical – Royal Avenue Site (hereafter referred to as "the Site") under the State Superfund Program. A Site location map is provided in Figure 1.1. NYSDEC is committed to informing and involving the public concerning the investigation and remediation (cleanup) of the Site. This CP Plan describes the public information and involvement program that will be carried out with assistance from The Frontier Chemical Site Potentially Responsible Parties Group (hereafter referred to as "the Frontier Group").

Attachment A of this CP Plan identifies NYSDEC project contacts to whom the public may address questions or request information about the Site's remedial program. The locations of the Site's document repositories also are identified in Attachment A. The document repositories provide convenient access to important project documents for public review and comment.

A site contact list was previously developed for this Site. This list was developed to keep the community informed about, and involved in, the Site's investigation and remediation process. A site contact list typically includes, at a minimum:

- Chief executive officer and zoning board of each county, city, town and village in which the Site is located
- Residents on and/or adjacent to the Site
- The public water supplier which services the area in which the Site is located
- Any person who has requested to be placed on the Site contact list
- The administrator of any school or day care facility located on and/or adjacent to the Site for purposes of posting and/or dissemination at the facility
- Document repositories and their contacts

In 2011, the NYSDEC instituted a paperless initiative for citizen participation activities in an on-going effort to incorporate sustainability into its daily operations. The NYSDEC began using email county listservs to distribute pertinent information to the public about remedial activities being performed in the State's remedial programs. Postcards were mailed to the contact list directing interested parties on how to sign up to continue to receive information about the Site.

To receive information about this Site and citizen participation activities for the Site, you must sign up at the appropriate DER county (Niagara County) email listserv at: www.dec.ny.gov/chemical/61092.html.

If "paperless" is not an option for you, or if you have questions, write to DER at the following address:

New York State Department of Environmental Conservation
Division of Environmental Remediation
625 Broadway
Albany, New York 12233-7012

Or email: derweb@gw.dec.state.ny.us. Please include in your correspondence the Site name Frontier Chemical – Royal Avenue Site (Site No. 932110).

Attachment B identifies the CP activities that have been and will be conducted during the Site's remedial program.

The CP activities are designed to achieve the following objectives:

- Help the interested and affected public to understand contamination issues related to a superfund site, and the nature and progress of a PRP's efforts, under State oversight, to investigate and, if appropriate, remediate (clean up) a superfund site
- Ensure open communication between the public and project staff throughout the site's remedial process
- Create opportunities for the public to contribute information, opinions, and perspectives that have potential to influence decisions about a site's investigation and remediation (cleanup)

This CP Plan may be revised due to changes in major issues of public concern or in the nature and scope of remedial activities. Modifications may include updates to major issues of concern to the public, and changes in planned citizen participation activities. The public is encouraged to discuss its ideas and suggestions about the citizen participation program with the project contact(s) listed in Attachment A.

3.0 SITE DESCRIPTION AND HISTORY

The Site is a 9-acre parcel located in an industrialized area of the City of Niagara Falls, County of Niagara, New York and is identified as Block 1 and Lot 6 on the Niagara County Tax Map (160.09). The Site location is shown on Figure 1.1.

The Site is bordered to the north by property identified as owned by the Niagara Junction Railway Company, to the northwest by property identified as owned by the Niagara County Industrial Development Agency, to the south by Elkem Metal Company and to the southwest by Frank's Vacuum Truck Service (both along Royal Avenue), and to the east by 47th Street, beyond which is an industrial site (Strator). A Site map is provided as Figure 1.2.

The Site was originally developed in 1906 by ISCO Chemical Company (ISCO) as a caustic-chlorine plant. During World War II, the International Minerals and Chemicals Corporation bought the Site and operated the facility as a caustic soda/potash and chlorine plant. In 1974, the Frontier Chemical Company, which provided hazardous and non-hazardous chemical treatment, moved their operations to the Site from Pendleton, New York. Frontier Chemical expanded its on-Site operations, which included wastewater treatment, fuels blending, and bulking chemicals for off-Site disposal.

In 1985, Frontier Chemical and a sister company, BLT Services, Inc., became wholly owned subsidiaries of Environmental Services Associates, Inc. (ESA). In February 1990, ROE Consolidated Holdings assumed operational control of ESA, which had operational control of the Site. The current Site owner is 5335 River Road, Inc.

The facility ceased operations in December 1992. In 1995, the NYSDEC listed the Site as a Class 2 Site in the Registry of Inactive Hazardous Waste Disposal Sites in New York State. A Class 2 Site is a site where hazardous waste presents a significant threat to the public health or the environment and action is required. Beginning in 1999, most of the Site's buildings were demolished and some rubble remains on Site. The Site is vacant but secured with a perimeter fence.

Contaminants of concern at the Site include various volatile organic compounds (such as trichlorobenzene, dichlorobenzene, chlorobenzene, tetrachloroethene (PCE), trichloroethene (TCE), acetone, benzene, toluene, etc.), and various semivolatile organics (such as chlorotoluene, phenol, dichlorophenol, etc.). Impacted media include soil, overburden groundwater, and bedrock groundwater. Overburden and upper bedrock groundwater contaminant migration has been limited by the presence of the unlined bedrock tunnels on the east (the 47th Street Tunnel) and south sides (the Falls Street Tunnel under Royal Avenue) of the Site. Preparations are underway to perform a remedy of the Site soil.

4.0 REMEDIAL PROCESS

The Frontier Group entered into an Order on Consent and Administrative Settlement (Index #89-0571-00-01) with the New York State Department of Environmental Conservation (NYSDEC) on August 15, 2008 to perform additional Site characterization and testing.

The Site characterization phase of the process is complete with the next steps being Remedial Design and Remedial Action. The Frontier Group has implemented the Remedial Action for the overburden and shallow groundwater at the Site. The Site characterization for the deep bedrock groundwater has also been completed by the Frontier Group and a Remedial Action consisting of monitored natural attenuation has been identified as the appropriate remedy for the deep bedrock groundwater. The Frontier Group is now preparing the Remedial Design for the source area soil component of the remedy.

Approval of the Remedial Design Report by NYSDEC would allow the Frontier Group to construct the selected remedy to remediate (clean up) the Site's source area soil. Notification will be sent out to the concerned public before the start of Site remediation. When the Frontier Group completes the Remedial Action for the source area soil, it will prepare a Final Engineering Report that certifies that all of the remediation (cleanup) activities have been achieved or will be achieved within a specific time frame. NYSDEC will review the report to be certain that the remediation is protective of public health and the environment for the intended use for the Site. A notification announcing the completion of remedial activities and the review of the Final Engineering Report will be issued through the NYSDEC listserv system.

NYSDEC would then issue the Frontier Group a Certificate of Completion. This Certificate states that remediation (cleanup) goals have been achieved and allows the redevelopment of the Site to begin. If institutional controls or engineering controls are used to achieve remedial objectives, information discussing such controls will be issued through the NYSDEC listserv system.

An institutional control is a non-physical means of enforcing a restriction on the use of real property that limits human or environmental exposure, restricts the use of groundwater, provides notice to potential owners, operators, or members of the public, or prevents actions that would interfere with the effectiveness of a remedial program or with the effectiveness and/or integrity of Site management at or pertaining to a superfund site. An example of an institutional control is a deed restriction.

An engineering control is a physical barrier or method employed to actively or passively contain, stabilize, or monitor contamination, restrict the movement of contamination to ensure the long-term effectiveness of a remedial program, or eliminate potential exposure pathways to contamination. Examples include caps and vapor barriers.

Site management will be conducted by the Frontier Group as required with appropriate NYSDEC oversight.

Activities required to be conducted to inform and involve the public during the Site's remedial process are introduced in Section 5 and identified in the chart in Attachment B.

5.0 CITIZEN PARTICIPATION ACTIVITIES

CP activities that have already occurred and are planned during the remediation of the Site are included in Attachment B. NYSDEC will ensure that these CP activities are conducted, with appropriate assistance from the Frontier Group.

All CP activities seek to provide the public with significant information about Site findings and planned remedial activities, and some activities announce comment periods and request public input about important draft documents such as the Final Design Report.

The CP Plan for the Site may be revised based on changes in the Site's remedial program or major issues of public concern.

All written materials developed for the public will be reviewed and approved by NYSDEC for clarity and accuracy before they are distributed.

6.0 MAJOR ISSUE OF PUBLIC CONCERN

This section of the CP Plan identifies major issues of public concern as they relate to the Site. Additional major issues of public concern may be identified during the Site's remedial process.

No major issues of public concern have been presented to the NYSDEC or the Frontier Group to date.

ATTACHMENT A

PROJECT CONTACTS AND DOCUMENT REPOSITORIES

Project Contacts

For information about the site's remedial program, the public may contact the following NYSDEC project contacts:

Gregory Sutton
Project Manager
NYSDEC Region 9
Division of Environmental Remediation
270 Michigan Avenue
Buffalo, New York 14203-2999
(716) 851-7200
Email: region9@gw.dec.state.ny.us

Matt Forcucci
NYSDOH
584 Delaware Avenue
Buffalo, New York 14202
Phone: (716) 847-4501
Email: mjf13@health.state.ny.us

Document Repositories

The document repositories identified below have been established to provide the public with convenient access to important project documents:

Earl Brydges Memorial Library
1425 Main Street
Niagara Falls, New York 14206
(716) 823-5626

NYSDEC Region 9 Office
270 Michigan Avenue
Buffalo, New York 12403-2999
(716) 851-7200 (Call for Appointment)

ATTACHMENT B

IDENTIFICATION OF CITIZEN PARTICIPATION ACTIVITIES REQUIRED UNDER THE STATE SUPERFUND PROGRAM

Site Listing and Reclassification:

- Mail notice to Site contact list about final decisions concerning an initial Site listing, classification, or reclassification. If contact list not developed:
  - Publish notice in local newspaper, and
  - Mail notice to adjacent property owners and others

Before Start of Remedial Investigation (RI):

- Prepare Site contact list
- Establish document repository
- Prepare Citizen Participation Plan
- Send notice through NYSDEC listserv system about availability of RI Work Plan and upcoming RI field work

This phase of the work is already completed

When DER Approves Remedial Investigation (RI) Report:

- Send notice through NYSDEC listserv system about RI results

This phase of the work is already completed

When DER Releases Proposed Remedial Action Plan (PRAP):

- Send notice through NYSDEC listserv system about PRAP, 30-day public comment period, and public meeting
- Conduct 30-day public comment period about PRAP
- Hold public meeting during PRAP comment period

This phase of the work is already completed

When DER Issues Record of Decision (ROD):

- Send notice through NYSDEC listserv system about availability of ROD. ROD includes responsiveness summary of significant comments about PRAP

This phase of the work is already completed

Before Start of Remedial Action (RA):

- Send notice through NYSDEC listserv system about upcoming RA

When DER Issues Certificate of Completion (COC) or Other Similar Site Closure Document:

- Send notice through NYSDEC listserv system about issuance of COC or other similar Site closure document

Proposed Site Delisting:

- Publish notice in Environmental Notice Bulletin (ENB) announcing proposal to delist and 30 day public comment period.
- Publish ENB notice content in local newspaper.
- Send notice through NYSDEC listserv system about proposal to delist and 30-day public comment period. Provide notice to adjacent property owners, chief executive officer of the municipality, and public water supplier, if applicable.
- Conduct 30-day public comment period about proposed delist.
- Prepare responsiveness summary and make publicly available.

NOTES:

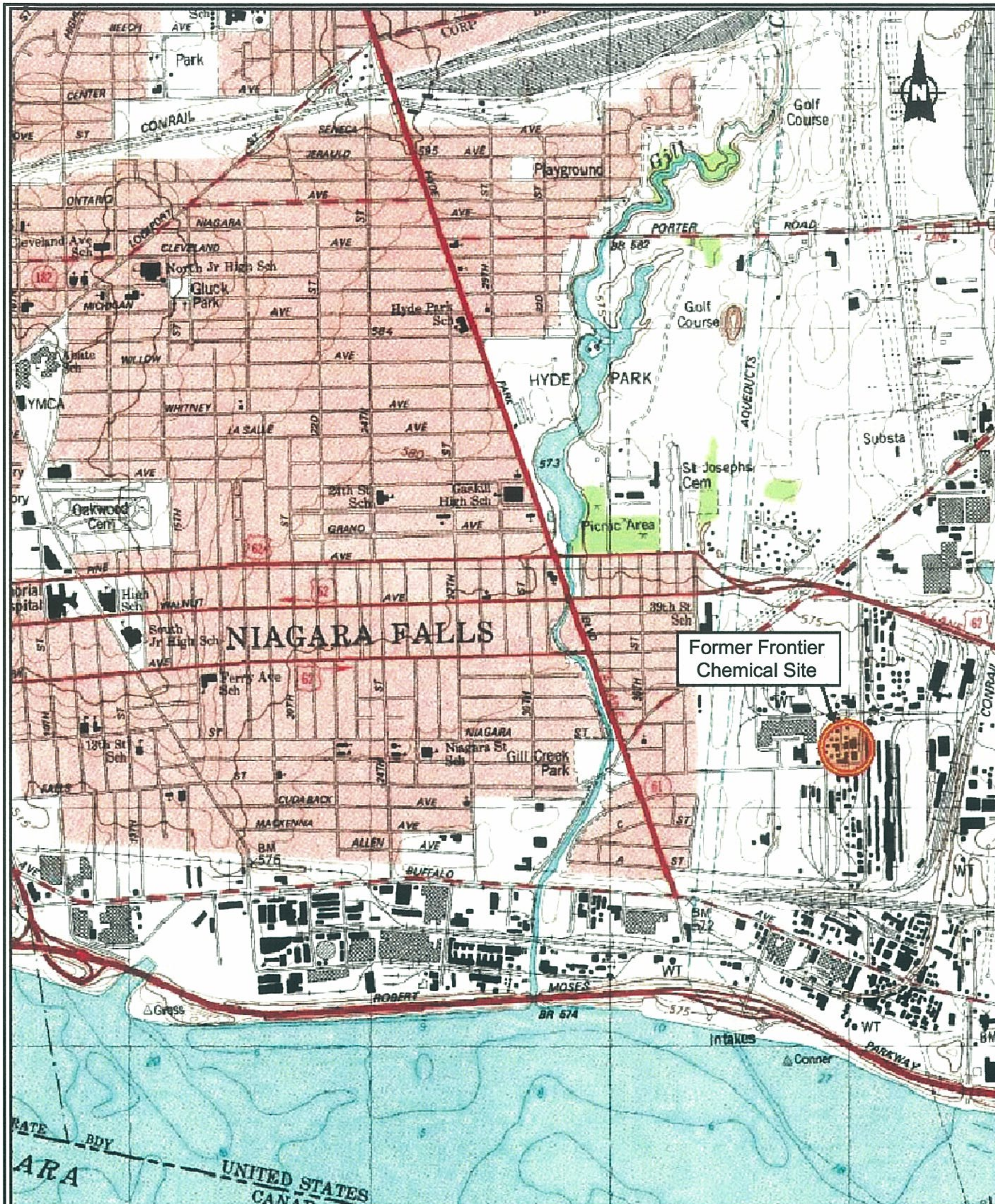
Technical Assistance Grants (TAGs):

- Available for Class 1 and 2 sites

Interim Remedial Measure (IRM):

If IRM represents all or significant part of remedy:

- Send notice through NYSDEC listserv system IRM Work Plan
- Conduct 30-day public comment period about IRM Work Plan
- Hold public meeting during public comment period



SOURCE: E & E, 2002

figure D1.1

SITE LOCATION MAP

Frontier Chemical Site - Niagara Falls, New York

47392-00(009)GN-WA004 DEC 14/2011

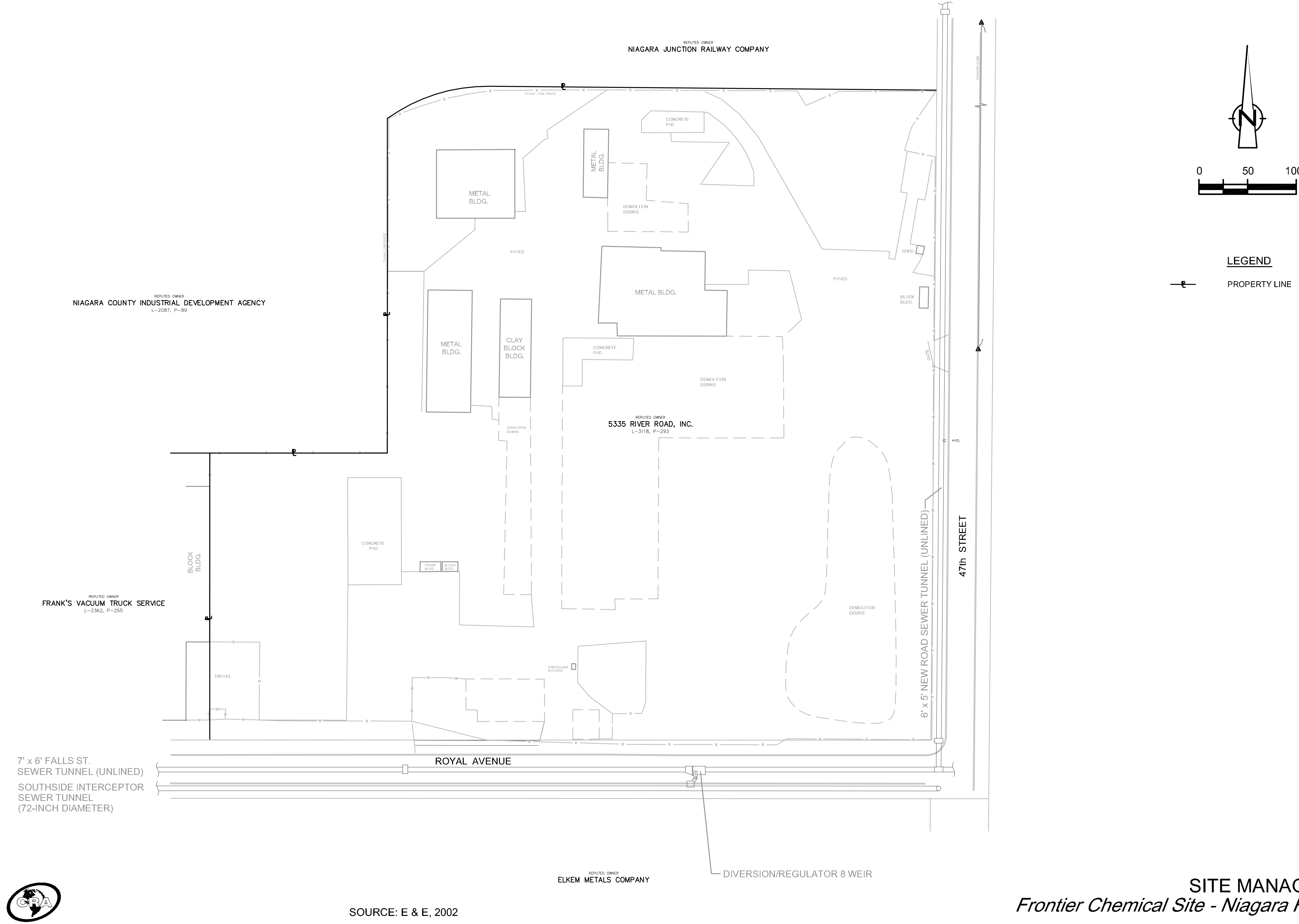


figure D1.2

SITE MAP
SITE MANAGEMENT PLAN
Frontier Chemical Site - Niagara Falls, New York

47392-00(009)GN-BU003 DEC 14/2011