Work Plan

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Remedial Action Work Plan
Hanna Furnace Site: Subparcel 2
Buffalo, New York

New York State Department of
Environmental Conservation
ReBuild Now - New York

November 2002

O'BRIEN & GERE
ENGINEERS, INC.

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Vice President

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Executive summary

The Hanna Furnace property is a vacant industrial property currently owned by the City of Buffalo. The Hanna Furnace property surrounds the eastern portion of the Union Ship Canal, and encompasses approximately 113 acres, including the Former Manufacturing Area. The Former Manufacturing Area occupies approximately 32 acres of the Hanna Furnace property at the southern edge of the City of Buffalo in Erie County.

The Hanna Furnace property has been characterized during several previous investigations. Based on the findings of the investigations, the size of the property, the property's historic use, and the City's contemplated use of the property, the Hanna Furnace property has been subdivided into four subparcels for future developmental considerations. This Remedial Action Work Plan (RAWP) has been prepared to support a voluntary cleanup of the Former Manufacturing Area (Subparcel 2; the Site), which will allow future redevelopment of the Former Manufacturing Area for office and light industrial uses.

Constituents of potential concern

The environmental investigations found that while impacts to surface soil, subsurface soil, and ground water have been detected, the magnitude of the impacts are considered to be minimal and consistent with the historic industrial use and type of fill that is present on the Site. Of the constituents detected in soil and ground water, semi-volatile organic compounds (SVOCs), specifically polycyclic aromatic hydrocarbons (PAHs), and metals were most prevalent. Volatile organic compounds (VOCs) and polychlorinated biphenyls (PCBs) were sporadically detected, and when encountered, were detected at concentrations significantly below site-specific action levels (SSALs) and regulatory soil and ground water standards and guidance. The results of the investigation have indicated that the constituents of potential concern are:

- PAHs, which were found to be present in soil across the Site. However, the concentrations are well below SSALs with the exception of one localized location. Ground water sampled contained fewer PAHs at lower concentrations. This is to be expected as the mobility of PAHs in the environment is relatively low.
- Metals were detected at concentrations that exceed SSALs at several locations on the Site. Constituents that exceeded the SSALs in one or more soil samples were arsenic, barium, chromium, lead, and mercury. The distribution is generally considered to be sporadic and

likely fill-related. Metals were also detected sporadically in ground water at concentrations that exceeded ground water standards. This suggests that they may be related to fill present at individual locations and not migrating with the ground water.

- Petroleum-related non-aqueous phase liquid (NAPL) was found to be present within shallow soils in two general areas: north of the 2-story brick building and north and east of the former Oil Shack.
- Elevated pH was detected in ground water in three monitoring wells on the Site. The source of the elevated pH is suspected to be the pig iron building located on Subparcel 1.

The cleanup plan

In order to reduce potential exposure risks associated with direct contact with soil/fill material the entire Site will be covered as part of redevelopment activities. In addition, NAPL-impact soils will be removed and either treated on-site or disposed at a permitted off-site disposal facility. The cover system will be placed directly on top of the regraded soil/fill material and will include clean soil for vegetated areas, asphalt for roads and parking lots, or concrete for sidewalks, buildings and heavy use areas. Surface coverage over the entire redeveloped subparcel or portion thereof will be required as a pre-condition of occupancy. An Operation, Monitoring & Maintenance Work Plan to evaluate the performance of the cover system is included as Appendix A and will be implemented following remediation of the Site. Deed restrictions will also be placed on the Site to limit activities to office and light industrial uses.

Protection of on-site workers and the off-site community, including surrounding residents and businesses as well as potential future commercial and public users of the Site during the redevelopment activities, are addressed through Chapter 7 of this RAWP, which includes health and safety requirements and a Community Air Monitoring Plan. Soil/fill management procedures are provided in Chapter 6 of this RAWP, which describes procedures for handling soil/fill material during redevelopment activities and for placement of the cover system.

Remedy evaluation

The proposed cover system is intended to be protective of human health and the environment. The primary exposure pathway at the Site (metals and PAHs in soil and high pH in ground water) is via direct contact. The proposed plan of covering the on-site fill material with clean soil, pavement or buildings as part of the site redevelopment will minimize the potential for direct contact with soil and is therefore protective of human health and the environment. Results of ground water sampling indicated that constituents present in the soil/fill material have not significantly impacted ground water quality with the exception of elevated pH. Ground water is not used at the Site and therefore no direct

contact with elevated pH ground water is anticipated except during invasive construction activities.

The RAWP includes provisions for routine monitoring and maintenance of the cover, and procedures for the proper analyses and management of soil/fill that may be excavated or disturbed in the future. In addition, a set of SSALs have been established reflecting the previously characterized level of contamination at the Site. As part of the remedial action, soil/fill that is excavated or otherwise moved during the development of the Site will be analyzed. If concentrations are below action levels the soil/fill may be used on-site, and properly covered. A detailed discussion of the protectiveness and effectiveness of the remedial action is provided in Chapter 5 of this RAWP.

1. Introduction and purpose

1.1. Overview and objectives

The Hanna Furnace property is a vacant industrial property currently owned by the City of Buffalo. The Hanna Furnace property surrounds the eastern portion of the Union Ship Canal, and encompasses approximately 113 acres, including the Former Manufacturing Area. The location of the Hanna Furnace property is shown on Figure 1-1. The Hanna Furnace property has been characterized during several previous investigations. Based on the findings of those investigations together with the size of the Hanna Furnace property, its historic use, and the City's current developmental needs and plans, the Hanna Furnace property has been subdivided into four subparcels for future developmental considerations. The Former Railroad Yard has been designated Subparcel 1. Subparcel 2 comprises the Former Manufacturing Area. Subparcel 3 consists of an area surrounding the Union Ship Canal 200-feet wide on each side. Subparcel 4 includes the Former Filter Cake/Flue Ash Disposal Area located to the north of the Union Ship Canal. These subparcels are shown on Figure 1-2. These subparcels will be considered separately during future environmental investigatory and remedial activities, as well as during redevelopment activities at the Hanna Furnace property. This Remedial Action Work Plan (RAWP) has been created specifically for the Former Manufacturing Area (Subparcel 2; the Site).

The objective of this RAWP is to set guidelines for management of soil material prior to and during redevelopment activities. This RAWP addresses environmental concerns related to soil management and remediation of localized areas. This plan is not intended to serve as a design document for construction activities related to redevelopment activities. It is the developer's responsibility to prepare a design that incorporates the requirements for cover and soil management as set forth in this RAWP. . The developer will prepare a construction completion report to document compliance with the RAWP.

For the convenience of the developer, and to provide consistency between Subparcels 1 and 2, sections of the February 2002 Remedial Action Work Plan for the Former Railroad Yard Area (Subparcel 1) by Malcolm Pirnie, Inc. have been restated, where appropriate. In other areas the Malcolm Pirnie document is referenced for more detail, if needed. The developer should note, however, that this document does contain specific information pertaining solely to Subparcel 2. Specifically, management of NAPL-impacted soils is necessary on Subparcel 2 only and therefore not discussed in the February 2002 Remedial Action Work Plan for Subparcel 1.

1.2. Site history

The Site consists of a 32-acre portion of the Hanna Furnace property located at the southern edge of the City of Buffalo in Erie County (Figure 1-1). This portion of the property was once the main manufacturing area. Structures formerly located on the Site included several production buildings, four blast furnaces, and various support structures. The Hanna Furnace property is bordered to the west by New York State Route 5, to the south by the Lackawanna Commerce Park, to the east by railroad tracks, and to the north by wetland areas, and the former Shenango Steel property.

The Buffalo Union Steel Corporation purchased the manufacturing area in 1900. The Union Ship Canal was constructed near the northern edge of the Buffalo Union Steel property in 1910 to service the facility. Pig iron manufacturing commenced during the period of 1900 to 1915 with the construction of blast furnaces. Following the construction of the blast furnaces, the Hanna Furnace Company acquired the property from Buffalo Union Steel. The National Steel Company subsequently purchased the property in 1929, and the corporate entity became know as the Hanna Furnace Corporation.

Iron ore, lime, coke and other raw materials were received via the canal, and were stockpiled along the northern and southern edges of the canal. Additionally, the pig iron manufactured at the Site was transported to customers via the network of railroads at and near the Hanna Furnace property.

The Hanna Furnace Corporation ceased all operations in 1982 due to foreign competition and to the closure of the Shenango Furnace Company, a primary recipient of pig iron from the Hanna Furnace Corporation.

The Jordan Foster Scrap Corporation purchased the Hanna Furnace property in 1983 and subsequently dismantled many of the buildings. The Jordan Foster Scrap Corporation filed for bankruptcy during 1986, and leased the Hanna Furnace property briefly to the Equity Scrap Processing Company. In 1998, the City of Buffalo gained title to the Hanna Furnace property due to nonpayment of taxes. The Hanna Furnace property has been essentially unoccupied and unsecured since 1986.

Demolition of structures at the Site is being completed in two phases. Phase I was completed in late April 2002 and involved the demolition of the on-site structures with the exception of the blast furnaces. Some of the brick and concrete from the building demolition was used to fill below-grade foundations. The bulk of this material was crushed and recycled for off-site uses. The second phase of the program will include demolition of the blast furnaces and removal of any foundations that

extend above grade. Following removal of the structures, hydroseeding will be used to vegetate the area, or the Site will be completely graded, covered, and vegetated.

2. Previous investigations

2.1. Chronology

Several environmental investigations have been performed at the Hanna Furnace property over the last 20 years by various agencies, none of which concluded that remedial action was necessary. However, the areas investigated at the Hanna Furnace property have varied between investigations; therefore, it is important to keep in mind the area of investigation when evaluating and comparing data results and recommendations. The following is a chronological summary of the significant investigations performed at the Hanna Furnace property and the results or recommendations of each:

- In 1979 Rupley, Bahler, and Blake, Consulting Engineers prepared a Solid Waste Management Facility Report for the Hanna Furnace Corporation. This report includes an evaluation of surface water quality in the Union Ship Canal and an on-property pond located on Subparcel 4. The water samples contained phenols and soluble iron at concentrations above New York State Class GA (drinking water) ground water standards. It should be noted that groundwater is not used as a drinking water supply in the area of the Hanna Furnace property.

- In April 1982, after the cessation of pig iron manufacturing at the Site, the Erie County Department of Environmental Protection inspected the Hanna Furnace property and prepared a report entitled *Inactive Site Profile Report*. The report recommended that the New York State Department of Environmental Conservation (NYSDEC) downgrade the classification of the Hanna Furnace property to a "class F" which pertains to a site where no further action is warranted and little to no environmental hazard potential exists.

- In 1983, the NYSDEC, after inspection of the Hanna Furnace property, prepared an *Inactive Hazardous Waste Disposal Site Report,* also known as the "Registry". The on-property inactive landfill was assigned a site number (# 915029). The Hanna Furnace property was initially assigned a classification of 2A, which indicates a potential hazardous waste site with insufficient data to properly characterize potential site issues.

- Also in 1983, the United States Geological Survey (USGS) drilled and sampled seven test borings on the north side of the Union Ship Canal. Samples from these borings were analyzed for a short list of heavy metals. In their report entitled *Draft Report of Preliminary*

Evaluation of Chemical Migration to the Niagara River from Hazardous Waste Disposal Sites in Erie and Niagara Counties, the USGS concluded that there was potential for lateral migration of contaminants at and away from the Hanna Furnace property. No samples were collected in the Former Manufacturing Area during this investigation.

- In 1985, a site inspection and Phase I investigation was performed for the NYSDEC by Engineering-Science and Dames & Moore. The Phase I investigation was limited to areas north of the Union Ship Canal and included a records search and scoring the Hanna Furnace property using the Hazard Ranking Scoring (HRS) system. The study area was assigned a score of 8.73 out of 100 in the Phase I report. Sites with scores greater than 28.5 are generally considered to pose an immediate threat to human health and the environment and are recommended for placement on the National Priorities List. Additional data needs were identified by the Phase I investigation and a Phase II investigation was recommended and outlined.

- In 1988, Recra Environmental, Inc. (Recra) performed a *Site Characterization and Environmental Assessment* for the New York State Department of Transportation. The characterization and assessment included the entire 113-acre Hanna Furnace property. The work involved the collection of samples of surface and subsurface soil/fill, surface water, sediment and ground water, performance of a risk assessment, and an evaluation of remedial alternatives. The investigation included the collection and analysis of eight surface soil samples, six subsurface soil samples, and two ground water samples in the Former Manufacturing Area. The soil and ground water samples were analyzed for arsenic, chromium, copper, lead, total cyanide, oil and grease, ammonia, and polychlorinated biphenyls (PCBs). Analytical results indicated elevated levels of metals and low (less than 1 part per million) concentrations of PCBs in the soil samples. Ground water samples from the monitoring wells contained arsenic, chromium, lead, and cyanide at concentrations above the class GA standards. The pH of the ground water was also above the range of the class GA standard. The HRS score of the Hanna Furnace property was recalculated using the data collected from the site characterization. The revised HRS, as scored by Recra, remained low at 12.28 out of 100, and Recra concluded that the Hanna Furnace property does not pose an immediate threat to human health and the environment.

- In 1990, the NYSDEC collected two surface soil samples (one composite and one discrete) from the Former Manufacturing Area for analysis of PCBs. The composite sample was collected from three locations in the vicinity of the oil shack building where it was identified that transformer salvaging apparently had been conducted. The discrete sample was collected from oil-stained soil in the vicinity of a suspected transformer pen in the southwest corner of the Site, near the former office building. PCBs were not detected in either sample.

- In 1994, the NYSDEC collected 36 surface soil samples from the Hanna Furnace property, of which 13 were collected in the Former Manufacturing Area. The 13 samples were analyzed for PCBs using immunoassay techniques, and were analyzed for metals (arsenic, barium, cadmium, chromium, copper, lead, mercury, nickel, and selenium) using standard laboratory methodologies. PCBs were not detected in the samples, and detected metals, except for silver, were at concentrations exceeding the current NYSDEC soil cleanup guidelines in at least one sample.

- In 1995, ABB Environmental Services performed a Preliminary Site Assessment (PSA) for the NYSDEC at the Hanna Furnace property. The PSA included not only the 113-acre Hanna Furnace property but also the adjacent Shenango Steel Site. The purpose of the PSA was to more thoroughly characterize the Hanna Furnace property, recalculate the site score using the HRS system, and reclassify the Hanna Furnace property. Of the sampling conducted during the PSA, five surface soils, two subsurface soils, and two ground water samples were collected from the Former Manufacturing Area. In addition water and sediment samples were collected from eight sumps or trenches. The samples were analyzed for Target Compound List (TCL) volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), pesticides/PCBs, and Target Analyte List (TAL) metals plus total cyanide. The surface soil samples were also analyzed for EPToxicity metals. One sample of the sump water and each of the sump sediment samples were also analyzed for EPToxicity metals, corrosivity, reactivity, and ignitability.

  Analytical results for the surface soil samples indicated that SVOCs, primarily polynuclear aromatic hydrocarbons (PAHs), and a number of metals were detected at concentrations exceeding the NYS TAGM 4046 soil cleanup guidelines. Metals were detected in the EPToxicity analysis at concentrations below levels for characteristic hazardous waste. The analytical results for the two subsurface samples indicated that no VOCs, SVOCs, pesticides, or PCBs were detected, and a number of metals were detected at concentrations exceeding the soil cleanup guidelines.

  Analysis of the ground water samples indicated that only iron, magnesium, manganese, and sodium were detected at concentrations exceeding the New York State Glass GA Groundwater Quality Standards. VOCs, SVOCs, and pesticides/PCBs were not detected in the ground water samples.

  Analysis of the sump samples revealed the presence of SVOCs and a number of inorganic constituents. Several sump sediment samples also contained detectable concentrations of pesticides. The pH of the sump water sample was 12.3.

No disposal of listed or characteristic hazardous waste was documented at the Hanna Furnace property. Therefore, the NYSDEC removed the Hanna Furnace property from its Registry of Inactive Hazardous Waste Disposal Sites.

- In 1997, Ecology and Environment, Inc. (E&E) performed an Environmental Site Assessment for the Buffalo Urban Renewal Agency. The objective of the assessment was to summarize available and pertinent environmental information, to identify variations in current site conditions relative to those defined in earlier investigations, and to identify potential areas of concern. The assessment involved a review of records as well as the performance of three site inspections. The assessment report presented the findings in order of environmental concern by area. Within the Former Manufacturing Area, the following concerns were identified:
  - potential contamination in the machine shop (2 story brick building)
  - discolored firebrick at blast furnace No. 3
  - an area containing brown black material with lack of vegetation
  - sediment contamination within sumps and trenches
  - oil and lubricant staining in Oil Shack
  - potential releases from an AST in the former coal bin
  - drums
  - elevated pH in monitoring wells MW-104, MW-105 and MW-106.

- In May 2000, Malcolm Pirnie, Inc. developed a Qualitative Human Health and Ecological Risk Assessments for the Hanna Furnace property Former Railroad Yard. The purpose of the risk assessment was to identify relevant environmental media and chemicals of potential concern that may present a health risk to the populations in and around the vicinity of the Former Railroad Yard. The risk assessments concluded that, given the redevelopment plans for the Hanna Furnace property, exposures to future on-site workers and trespassers and wildlife would be effectively precluded by covering the Former Railroad Yard with 12 inches of vegetated soil, asphalt, or concrete.

- On February 13, 2001, Malcolm Pirnie, Inc. reported that a petroleum product was observed in split spoon samples collected from a boring completed near the large, two-story brick building at the Subparcel 2. The observations were made during the implementation of a geotechnical sampling program being conduced by Barron & Associates, P.C. for the Ciminelli Development Company. Observations in the boring indicated that the sheen was visible in the split spoon collected from the interval of 4 to 6 feet below grade level (bgl). The three subsequent split spoons (6 to 8

feet, 8 to 10 feet, and 10 to 12 feet bgl) also contained petroleum product. The product was described as a light brown to brown viscous fluid with a petroleum odor. The advancement of the boring was halted at 18 feet bgl so that the underlying lacustrine clay would not be penetrated.

- In July/August 2001 Environmental Resources Management (ERM) performed a site investigation at Subparcel 2 of the Hanna Furnace property on behalf of the NYSDEC. ERM conducted the investigation in accordance with the Work Assignment prepared by O'Brien and Gere Engineers, Inc. and the NYSDEC. The investigation consisted of installation of soil borings, installation of new ground water monitoring wells, and excavation of test pits. Samples from soil borings were analyzed for VOCs, SVOCs, PCBs, and target analyte list (TAL) metals. Ground water samples were analyzed for VOCs, SVOCs, PCBs, and TAL metals. Fourteen test pits were completed in Subparcel 2 to evaluate the nature and extent of NAPL that was discovered during the 2001 Malcolm Pirnie investigation. Soil and ground water samples were collected from two test pits and analyzed for SVOCs, PCBs, and TAL metals. Results of this investigation are summarized in Section 2.2 below.

2.2. Nature and extent of contamination

Based on data obtained from the July/August 2001 investigation performed by ERM, and data collected from the Site during previously investigations, a Site Investigation Report was developed by O'Brien & Gere Engineers, Inc. Conclusions from the Site Investigation Report are summarized below.

PAHs were found in soil across the Site. However, the concentrations are well below the SSALs (Table 5-1) with the exception of one location, which is considered to be localized. The ground water samples contained fewer PAH compounds at lower concentrations. This is to be expected, as the mobility of PAHs in the environment is relatively low due to relatively low water solubilities and relatively low organic carbon partition coefficients.

In the case of metals, constituents that were detected at concentrations that exceeded the SSALs at eight surface soil and five subsurface soil sample locations. Figures 2-1 and 2-2 depict exceedances in surface soil and subsurface soil, respectively.

Each of the ground water samples collected from the monitoring wells and test pits contained TAL metals above Class GA ground water standards. Iron and sodium concentrations were above the Class GA standards in most of the wells. In addition the following inorganics were detected at concentrations exceeding Class GA ground water standards in at least one of the monitoring wells: arsenic (1 sample), cyanide (2 samples), lead (2 samples), and manganese (1 sample). Most of these

exceedances were less than twice the ground water standards with the exception of manganese in MW-003 and cyanide in MW-004 which were more than twice the Class GA standard. Although the latter two concentrations are elevated, they are localized to these two wells and are likely due to constituents in the soil/fill material in those areas.

Ground water samples from two test pits were analyzed for TAL metals. Each of the ground water samples collected from test pits contained TAL metals above Class GA ground water standards. TAL metals in the ground water samples collected from the test pits that exceeded Class GA ground water standards included arsenic (1 sample), cadmium (1 sample), chromium (1 sample), copper (2 samples), iron (2 samples), lead (2 samples), manganese (2 samples), mercury (2 samples), selenium (1 sample), and sodium (2 samples). The ground water samples collected from the test pits were more turbid than the samples collected from the monitoring wells, which likely accounts for the greater concentration of metal constituents detected in the test pit ground water samples. By definition, ground water samples that have high turbidity contain suspended aquifer materials, which in turn contain metal constituents. As required by the analytical procedures, ground water samples are preserved with nitric acid. In ground water samples with elevated turbidity, the preservation causes metal constituents from the aquifer materials to solubilize into the water. Ground water samples for metals analyses that have high turbidity are not considered representative of those metal constituents that migrate with the ground water system.

During the purging and sampling of the monitoring wells during the most 2001 ERM investigation of the Site, pH measurements were recorded for ground water. The data indicated elevated pH above the Class GA ground water standards (6.5 – 8.5 SU) in three monitoring wells in the western portion of Subparcel 2 that ranged from 10.99 to 11.79. Two monitoring wells in the western portion of Subparcel 1 also had elevated pH that ranged from 9.5 to 11.3. The pH in monitoring wells outside of the elevated pH area ranged between 6.95 to 7.69. The area of elevated pH is shown on Figure 2-3.

Borings, wells, and test pits were completed during the field program to assess the nature and extent of the NAPL. The analytical results did not reveal the presence of elevated concentrations of petroleum-related constituents. However, staining and odors were noted in the soil and a sheen was observed on the water table in the areas shown on Figure 2-3. A fingerprint analysis of the soil sample from test pit TP-07 was performed by Zymax Forensics. The fingerprint analysis indicated that the NAPL is likely asphalt or a mixture of diesel and asphalt. It should be noted that no measurable free product was observed in the monitoring wells or within the open test pits. As shown on Figure 2-3, the NAPL area north of the 2-story brick building appears to be contiguous extending from beneath the eastern end of the foundation northward. The thickness of impacted soil is greatest in the area beneath the building, extending to as much as 8 feet below grade. The areal extent of these soils is approximately 2,225 square feet. The outermost edges of the staining appear to be limited to the 2-foot interval surrounding the

water table. The area of the NAPL-impacted soils in this outer area is approximately 3,025 square feet. Using these dimensions, the total estimated volume of petroleum-impacted soil is 23, 850 cubic feet (883 cubic yards).

Two separate areas with petroleum-impacted soil have been identified in the vicinity of the former oil shack. Area A is the larger of the two areas and extends northwest from under the eastern edge of the building. The depth of the impacted soil column is greatest, 8 feet, at SB-53, which is located on the southeastern corner of the building. In SB-59, impacted soils were observed between 1 to 4 feet below grade. At TP-13, a sheen was noted on the water table, which was located at approximately 5 feet below grade. The extent of this area is approximately 1, 700 square feet. Using an average thickness of 4 feet, the volume of impacted soil is estimated to be approximately 6, 800 cubic feet (250 cubic yards).

Area B is located east of the former oil shack foundation footprint. This area was identified by one boring, SB-60. The depth of impacted soil extends from the surface to approximately 5.5 feet below grade. This distribution and isolated occurrence suggests that the impacted soils in Area B are the result of a surface spill. An estimated volume of 6.911 cubic feet (255 cubic yards) of impacted soil was calculated using a radius of approximately 20 feet around the boring and a thickness of 5.5 feet below grade.

fg 10 - Mn & Cyanide 'Localized' Contamination
Pg-11 - "No Significant Impacts to Groundwater"

The 2001 ERM investigation, as well as previous investigations, indicate that of the existing contaminants detected in soil and ground water within the Site, SVOCs (PAHs in particular), and metals were the most prevalent. VOCs and PCBs were sporadically detected and when encountered, were detected at concentrations below SSALs, as discussed in Section 5.2.1, and regulatory soil and ground water standards or guidance. As described above, an area of elevated pH in ground water and areas of NAPL-impacted soils were also encountered.

After completion of this Remedial Action Work Plan, the site would be remediated to a level that is protective of public health and the environment for the Contemplated Use of the property (i.e. restricted industrial/commercial uses excluding day care, child care, and medical care). The following factors establish the basis behind this conclusion.

A. The data obtained from the Site show no significant impacts to groundwater. No connection was observed between the conditions present in the soil and the quality of groundwater. The sole exception to this statement is the site-wide pH issue that will be monitored both in groundwater and in the Union Ship Canal.

B. The proposed cover system will break any human health exposure pathway under the Contemplated Use. Any area not included as a parking lot or building will be included in the proposed covered area.

C. The soil impacted with petroleum and NAPL will be excavated and either removed from the Site for treatment and disposal or treated on-site.

Based on the above information and understanding of the Site, the environmental conditions for the Former Railroad Yard are similar to the Former Manufacturing Area (with the exception of the areas of NAPL-impacted soil). Furthermore, the two subparcels are located adjacent to each other, therefore conclusions presented in the May 2000 Qualitative Human Health and Ecological Risk Assessments (Malcolm Pirnie, 2000) for the Former Railroad Yard Area are appropriate for the Former Manufacturing Area.

3. Contemplated use

Development Downtown, Inc. (DDI)has been tasked with the redevelopment program for this property as part of the South Buffalo Redevelopment project. The Hanna Furnace property constitutes the Union Ship Canal District of the South Buffalo Redevelopment project. As part of the planning process a final draft of the Union Ship Canal Zoning Plan dated February 2001 was developed. As part of the redevelopment project, Subparcel 2 of the Hanna Furnace property has been identified for office and light industrial uses. Specific uses for this zoning category are as follow:

- Research offices and laboratories
- Offices
- Manufacturing

The zoning specifically prohibits residential uses.

As documented in the Union Ship Canal Zoning Plan, Subparcel 1 of the Hanna Furnace property, which is adjacent to the south side of Subparcel 2, has been designated with similar uses. Subparcel 3, which borders the northern side of Subparcel 2, has been identified as open-space. This area is intended to be used for parks and playgrounds, marinas/boat launch, concession areas, and other outdoor recreation uses. The contemplated uses of these subparcels are depicted on the attached Exhibit 3-1 – Union Ship Canal Development Conceptual Parcelization and Land Use developed by BERC.

An application for the voluntary cleanup of the Former Manufacturing Area (Subparcel 2; the Site) will be submitted to the NYSDEC. The voluntary cleanup will allow for the future redevelopment of the Former Manufacturing Area for commercial and industrial purposes. The current proposed transitional development plan for the Site includes lower profile, flex-type buildings in closest proximity to the canal and high-bay distributors/light manufacturing buildings on the outer perimeter of the Site. The estimated average land coverage is 25 percent.

4. Summary of remedy

Based on the Site characterization results and the Qualitative Risk Assessment (Malcolm Pirnie, 2000), soil/fill material and ground water are the media of concern for the Site. The constituents of potential concern (COPCs) for soil consist primarily of metals and PAHs. Results of ground water sampling indicate that constituents in the soil/fill material have not significantly impacted ground water quality with the possible exception of elevated pH. Although metals were detected in ground water, it is likely that detected concentrations are localized and reflect constituents present in the soil/fill in those areas. Furthermore, future use of groundwater at the site is unlikely due to its limited quantity and poor quality. In addition, public water will be available for the site from the Erie County Water Authority.

The identification of the remedial action objectives (RAOs) for the Site is based primarily on the human health and environmental risks posed by the Site as identified in the Qualitative Risk Assessment (Malcolm Pirnie, 2000). Based on the commercial/industrial contemplated use of the property, the RAO for the Site is to minimize potential exposure to on-site surface soil, subsurface soil, and ground water and to prevent releases from the petroleum-impacted soils.

To achieve the RAOs for the Site, the entire Former Manufacturing Area, Subparcel 2 of the Hanna Furnace property, will be covered as part of site redevelopment. The cover system will be placed directly on top of the regraded on-site soil/fill material and will consist of:

- clean soil for outdoor vegetated areas
- asphalt for roads and parking lots
- or, concrete for sidewalks, buildings, and heavy use areas.

Furthermore, surface coverage over the entire redeveloped subparcel or portion thereof will be required by the site owner or developer as a pre-condition of occupancy. In addition, petroleum-impacted soils must be removed prior to development.

The remedy consists of the following components:

- Site preparation
- Cover system
- Removal and management of soil containing petroleum non-aqueous phase liquid (NAPL)
- Soil/fill management
- Construction water management
- Institutional controls

- Maintenance

The proposed cover system has been designed to be protective of human health and the environment. The primary exposure pathway for contaminants at the Site (metals and PAHs in soil and high pH in ground water) is via direct contact. The proposed plan of covering the on-site soil/fill material will minimize the potential for direct contact with soil/fill and is therefore protective of human health and the environment. Results of ground water sampling indicated that constituents present in the soil/fill material have not significantly impacted ground water quality with the possible exception of elevated pH. Ground water is not used at the Site and therefore no direct contact with elevated pH ground water is anticipated except during invasive construction activities.

Given the redevelopment plans, as outlined in Chapter 3, exposure to the soil/fill and surface soil would be precluded for future on-site workers and trespassers. There do not appear to be significant fish and wildlife resources at the Former Manufacturing Area and impacts from future development are expected to be minimal. The intended future redevelopment activities will also inhibit significant use of the Site by wildlife.

4.1. Site preparation

The Site will require grading prior to cover placement activities. The fill material and debris piles will be graded to the surface required for redevelopment, and to preclude the formation of standing water. Site preparation is discussed in detail in Section 6.1.

4.2. Cover system

The proposed cover system will consist of one of the following:

- Soil: 12 inches of vegetated soil cover in areas that will not receive significant equipment or vehicular use.

  An alternative source of cover system material may be residuals that are presently stored at the Erie County Water Authority's (ECWA) Sturgeon Point Water Treatment Plant (WTP) in the Town of Evans, Erie County, New York.

- Asphalt: a minimum of 2-inches of asphalt over a 4-inch gravel subbase in areas that will become roads, sidewalks, and parking lots. The actual thickness of the asphalt and subbase material will be determined by the developer based on the intended use of the area.

- Concrete: a minimum of 2-inches of concrete over a 4-inch gravel subbase in areas that will become slab-on-grade structures, utilities,

footings, foundations, signs, or for roads, sidewalks, and parking lots in lieu of asphalt. In areas that will become slab-on-grade structures, an 8-mil polyethylene vapor barrier will be placed under the concrete. The actual type and thickness of concrete and subbase material will be determined by the developer based on the intended use of the area.

The cover system is discussed in detail in Section 6.5.

4.3. NAPL area

Petroleum-related NAPL was found to be present within the shallow soils in two general areas: north of the 2-story brick building and north and east of the former Oil Shack. In the vicinity of the Oil Shack, information suggests that there may be two separate areas containing NAPL-impacted soils. The estimated volume of impacted soil is as follows:

North of 2-Story brick	883 cu yds
Oil Shack-Area A	250 cu yds
Oil Shack-Area B	255 cu yds
Total estimated volume	1,388 cu yds

NAPL-impacted soil is to be removed prior to development, and will be removed no later than December 31, 2003.

NYSDEC's STARS Memo #1, *Petroleum Contaminated Soil Guidance Policy,* provides three options for the management of petroleum-impacted soils:

1) Process under a specific NYSDEC Beneficial Used Determination (BUD) such as an approved hot-mix asphalt or cold-mix asphalt plant,
2) Dispose at a permitted off-site disposal facility,
3) Treated on-site in accordance with NYSDEC's STARS Memo #2, *Biocell and Biopile Designs for Small-Scale Petroleum-Contaminated Soil Projects.*

Other treatment alternatives may be proposed by the developer and approved by NYSDEC.

Management of NAPL-impacted soils is discussed in detail in Section 6.6.

4.4. Soil/fill management

During construction activities at the Site, the excavation of soil/fill material may be necessary for the construction of utility corridors. Excavation may also be necessary during the construction of footings for structures and for other activities.

Soil/fill that is excavated as part of redevelopment will be sampled and analyzed for comparison to SSALs, which are described in Section 5.2. Excavated soil/fill that is found to exceed SSALs will be further characterized prior to transportation off-site for disposal at a permitted facility. Excavated soil/fill that meets SSALs may be used on-site as fill.

Management of soil/fill excavated as part of redevelopment activities is discussed in detail in Sections 6.2 and 6.3.

4.5. Construction water management

Pumping of water (i.e., ground water and/or storm water that has accumulated in an excavation) from excavations, if necessary, will be done in such a manner as to prevent the migration of particulates, soil/fill, or unsolidified concrete materials, and to prevent damage to the existing subgrade. Water pumped from excavations will be managed properly in accordance with all applicable regulations so as to prevent endangerment of public health, property, or any portion of the construction. Construction water management is discussed in detail in Section 6.9.

4.6. Access controls

Access to soil/fill on subdivided parcels adjacent to occupied on- or off-site parcels must be controlled until final cover is placed to prevent direct contact with subgrade materials. To better control site access, obvious access points will be gated. All City-and DDI-owned gates will be posted with "No Trespassing" signs. The entire site will be completely covered with clean fill or vegetated via hydroseeding to limit dust generation.

4.7. Institutional controls

The industrial/commercial contemplated use of the Site will be controlled through City zoning, land use and design guidelines, and deed restrictions. Deed restrictions will be implemented that will prevent the use of ground water and disturbance of the final cover system. Deed restrictions are described in detail in the VCA.

4.8. Maintenance

Maintenance of the remedy will be the responsibility of the property owner. Erosion of the soil cover system will be reduced by maintaining a vegetative cover. In order to reduce the disturbance of the soil cover material, berms or mounds composed of clean soil will be constructed in areas in which trees and shrubs will be planted. Cover materials, fencing, signs, and gates will be inspected annually and repaired as needed.

The main features of the OM&M Plan are:

- Inspection procedures
- Evaluation of the final cover system (i.e., vegetative cover, roads, buildings, parking lots, etc.) for sloughing, cracks, settlement, erosion, distressed vegetation, damaged fencing, gates or signs
- Inspection reporting.

5. Engineering evaluation of the remedy

The following sections present an engineering evaluation of the remedy with respect to the evaluation criteria presented in 6 NYCRR Part 375-1.10 and the RAO as presented in Section 4.

5.1. Protection of human health and the environment

The analysis of the remedy with respect to overall protection of human health and the environment provides an evaluation of whether the remedy would achieve and maintain adequate protection of public health and the environment under the contemplated use of the site and a description of how protection would be achieved through treatment, engineering, and institutional controls.

Based on the site-specific Qualitative Risk Assessment (Malcolm Pirnie, 2000), the placement of asphalt, concrete, and clean soil cover would provide adequate protection of human health and the environment and would achieve the RAO for the Site. The cover material, with routine maintenance, would effectively reduce the potential for direct contact with contaminated soil/fill and ground water with elevated pH.

5.2. Compliance with standards, criteria, and guidelines

There are three categories of standards, criteria, and guidelines (SCGs) that must be considered during the evaluation of the remedy: chemical-specific, location-specific, and action-specific. Chemical-specific SCGs are health-based or risk-based numerical values or methodologies which, when applied to site-specific conditions, establish the acceptable amount or concentration of a chemical that may be found in, or discharged to, the ambient environment. Location-specific SCGs set restrictions on activities based on the characteristics of the site or immediate environs. Action-specific SCGs set controls or restrictions on particular types of remedial actions once the remedial actions have been identified as part of a remedy. Potentially applicable or relevant and appropriate SCGs are summarized in Table 5-2. Selected SCGs are also discussed below.

5.2.1. Chemical-specific SCGs

Chemical-specific SCGs for soil/fill excavations or disturbances consist of SSALs that define levels for the Site contaminants of concern, above which off-site disposal will be required. SSALs were developed based on a review of NYSDEC TAGM No. 4046, the site conditions, and the

Contemplated Use. The SSALs, presented in Table 5-1, have been approved by the NYSDEC and NYSDOH.

The potentially applicable chemical-specific SCG for construction water is 6 NYCRR Part 703.5 – Surface water and Ground Water Quality Standards.

5.2.2. Location-specific SCGs

Redevelopment of Subparcel 2 is part of the overall redevelopment of the Hanna Furnace Site as a commercial/light industrial park. Review of the New York State Coastal Management Program (19 NYCRR Part 600/601) will be performed as part of the Generic Environmental Impact Statement (GEIS) for the Hanna Furnace Site. The redevelopment will comply with both State and local coastal zone policies, and will be compatible with the Local Waterfront Revitalization Plan.

The Union Ship Canal is designated as a Class C fresh surface water. According to 6 NYCRR Part 701.8, the best usage of Class C waters is fishing. Class C waters are defined as suitable for fish propagation and survival, and suitable for primary and secondary contact recreation, although other factors may limit the use for these purposes. During redevelopment, any construction water that is discharged to the ground surface will meet the criteria of 6 NYCRR Part 701.8.

The Hanna Furnace Site (Subparcel 4) is located near wetland areas; however, site activities on Subparcel 2 will not impact these areas.

5.2.3. Action-specific SCGs

During site clearing, grading, excavating, and stockpiling of excavated soil, dust suppression and air monitoring will be conducted in accordance with NYSDEC TAGM HWR-89-4031, Fugitive Dust Suppression and Particulate Monitoring Program at Inactive Hazardous Waste Sites. The program to be implemented at the Site is described in Section 6.8.

Erosion control measures will be implemented for soil/fill stockpiles and unvegetated soil surfaces during redevelopment activities to prevent migration of contaminated soil/fill to the Union Ship Canal. These measures will be in accordance with the NYSDEC General Permit for storm water discharges associated with construction activities.

Excavated soil/fill material generated during redevelopment activities containing analytes above the SSALs will be further classified for disposal purposes with respect to hazardous characteristics, as outlined in 6 NYCRR Part 371, Identification and Listing of Hazardous Wastes. Soil/fill material determined to be a hazardous waste will be handled in accordance with the requirements of: 6 NYCRR Part 372, Hazardous Waste Manifest System and Related Standards for Generators, Transporters, and Facilities; and 49 CFR 107-171, DOT Rules for Hazardous Materials Transport.

Use of residuals from the ECWAs Sturgeon Point WTP as an alternative source of cover system material is being considered. A BUD application addendum will be prepared in accordance with 6 NYCRR Part 360-1.15, Beneficial Use.

Subsurface soil exhibiting visual evidence of the presence of petroleum product may be managed in accordance with STARS Memo #2 – Biocell and Biopile Designs for Small-scale Petroleum-Contaminated Soil Projects. The STARS #2 Memo is included as Exhibit 6-3.

If excavated soil/fill is identified as hazardous material, it will be transported for off-site disposal in accordance with 6 NYCRR Part 364 – Waste Transporter Permits; 49 CFR 172 – 174 and 177 – 179 – Department of Transportation Regulations; 40 CFR 262.20 through 40 CFR 262.23 – Standards Applicable to Generators of Hazardous Waste; and 6 NYCRR Part 372 – Hazardous Waste Manifest System and Related Standards for Generators, Transporters, and Facilities.

Remedial construction activities will be performed in accordance with 29 CFR Part 1910 – Occupational Safety and Health Standards and 29 CFR Part 1926 – Safety and Health Regulations for Construction.

5.3. Short-term effectiveness

The short-term effectiveness criterion addresses the protection of workers and the community during construction and implementation of the remedy, environmental effects resulting from implementation of the remedy, and the time required to achieve the remedial action objectives.

Initially, the restriction of access to the Site in its present condition will reduce the risks posed by the Site to the general public. The ultimate construction of a cover system composed of soil, asphalt, and concrete will effectively reduce the risk to public health and the environment in the short-term by covering the soil/fill material. The anticipated long term implementation schedule may also reduce short term effects. However, the site will be stabilized prior to initiation of development activities, as described in Section 6.1.The material used for the cover system will limit the potential for exposure of the public to on-site soil/fill material.

During site redevelopment activities and construction of the cover system, workers engaged in subsurface construction or maintenance activities will be required to implement a site-specific, activity-specific health and safety plan. Recommended health and safety procedures are presented in Chapter 7. Additionally, Section 6.8 includes a description of methods of dust suppression to be implemented during site redevelopment activities, thereby reducing potential exposure to contaminated dust.

5.4. Long-term effectiveness

For the evaluation of long-term effectiveness, the magnitude of residual risk remaining from untreated material remaining at the Site and the adequacy and reliability of controls used to manage untreated materials were assessed for the remedy.

The remedial action alternative will effectively reduce the long-term risk to public health and the environment by eliminating the potential exposure risk of direct contact with site soil/fill material through the placement of a cover system over the Site. The cover system will be maintained so that the site soil/fill material will remain completely covered with either 12 inches of vegetated material, asphalt, or concrete. Maintenance to the asphalt cover system may include repair of cracks or damage caused by weathering or vehicular use. Maintenance of the soil cover system may include replanting of grass to achieve a vegetative cover that will eliminate the potential for soil erosion.

The soil/fill contaminants are generally immobile and, with the exception of high pH, have not significantly impacted site ground water, and therefore, do not pose a threat to adjacent properties via ground water flow.

In addition, the industrial/commercial use of the Site will be controlled through City zoning, land use and design guidelines, and deed restrictions. Therefore, with proper maintenance, the cover system will provide long-term effectiveness in achieving the RAO for the Site.

5.5. Reduction of toxicity, mobility, or volume

The evaluation of reduction of toxicity, mobility, or volume through treatment addressed the expected performance of treatment technology employed in the remedy.

The proposed remedial action alternative will effectively reduce the mobility of the contaminants through control, isolation, and limited removal and treatment of the on-site soil/fill material. The contaminants present at the Site are generally immobile. Placement of a properly maintained cover system will minimize contaminant mobility due to soil erosion. The removal and treatment of soil that contains NAPL will also reduce mobility of contaminants. The proposed remedy is sufficient to be protective of public health and the environment. Therefore, other remedial action treatment alternatives (e.g., destruction, and solidification/ chemical fixation) are unwarranted.

If concentrations of contaminants detected in on-site soils excavated during site redevelopment are higher than the SSALs, the impacted soil/fill material will be removed from the Site and properly disposed, thereby decreasing the toxicity and volume of contamination at the Site.

5.6. Implementability

The analysis of implementability involved the assessment of the following: the ability to construct and operate the technology, the reliability of the technology, the ease of undertaking additional remedial action, the ability to monitor the effectiveness of the remedy, the ability to obtain necessary approvals from other agencies, and the availability of services, capacities, equipment, materials and specialists.

The proposed remedy for the Site is suitable to current and future site conditions and uses. Materials and equipment for site clearing, grading, and placing and maintaining the cover system are readily available. The cover system will be easily implemented since all structures, debris, and vegetation will be removed off-site; the Site will be graded to a regular topographic surface for redevelopment; and access to the Site is good.

6. Remedy implementation

The purpose of this section is to provide environmental guidelines for construction of the remedy.

6.1. Site preparation

The Site will require grading prior to cover placement activities. The fill material and debris piles will be graded to the surface required for redevelopment, and to preclude the formation of standing water. Trees, shrubs, roots, brush, masonry, rubbish, scrap, debris, pavement, curbs, fences, and selected miscellaneous structures will be removed and properly disposed off-site or stockpiled north of the Union Ship Canal on Subparcel 4 in accordance with applicable solid waste regulations. Only exempt materials as defined in 6 NYCRR Part 360-7.1(b)(1) are allowed for stockpiling. Prior to cover system placement, protruding material will be removed from the ground surface. Burning will not be allowed on-site. Much of the clearing and grubbing work proposed in this section has been performed as part of the recent demolition program.

As redevelopment activities may be take place over a period of time, the Site will be stabilized at the start of the project. This will be accomplished by establishing a site-wide vegetative cover. The vegetative cover may be achieved in one of two ways:

1) Placement of cover material may occur as portions of the Site are developed. Under this scenario, the Site surface will be completely vegetated to minimize erosion caused by wind and stormwater and will minimize exposure to on-site soil/fill material prior to the initiation of site development

2) The Site may be completely graded, covered, and vegetated.

Under both scenarios, obvious access points will be gated to limit potential for illegal dumping and the vegetation will be maintained during development. In addition, petroleum-impacted soils must be removed prior to development activities and no later than December 31, 2003. Further, details pertaining to the NAPL removal methods to be used are provided in Section 6.6.

6.2. Excavation and grading

No excavation, grading or disturbance of the final vegetated soil cover or existing subgrade soil/fill shall be initiated prior to a minimum of three working days notification to the NYSDEC Region 9, Division of Environmental Remediation. A NYSDEC Region 9 Contact List is included as Exhibit 6-1. A Professional Engineer's representative with construction/remediation experience, representing the subject property owner or developer will monitor soil/fill excavations or disturbances.

During excavation performed to support redevelopment activities, the soil/fill will be inspected for staining and will be field screened for the presence of VOCs with a PID.

6.2.1. Visibly impacted soil/fill or soil/fill that exhibits elevated PID readings

Stained soil is soil that is observed to be discolored, tinted, dyed, unnaturally mottled, or has a sheen. Soil/fill screening and sampling is described in Section 6.3. Excavated soil/fill that is visibly stained or produces elevated PID readings (i.e., sustained 10 ppm or greater) will be considered potentially contaminated and stockpiled on the Hanna Furnace property for further assessment. The potentially contaminated soil/fill will be stockpiled (maximum 50 cubic yard piles) on polyethylene sheeting and then sampled for reuse, treatment, or disposal. The stockpiled potentially contaminated soil/fill will also be completely covered using polyethylene sheeting to reduce the infiltration of precipitation and the entrainment of dust. Sampling and analysis will be completed in accordance with the protocols delineated in Section 6.3. Soil/fill containing one or more constituents in excess of the SSALs shown in Table 5-1 will be transported off-site to a permitted waste management facility.

6.2.2. Soil/fill with elevated pH

As shown on Table 5-1, the SSAL for pH is 12.5. Any excavated soil/fill with a pH higher than 12.5 is considered hazardous and therefore must be properly disposed off-site. Additionally, any soil/fill with a pH greater than 9.0 but less than 12.5 may be reused on-site but only to fill in areas below grade. This soil/fill may not be used as backfill in utility trenches or to create berms or other above grade mounds. This soil/fill must also be covered with clean material in accordance with Section 6.5.

6.2.3. Buried drums or underground storage tanks

If buried drums or underground storage tanks are encountered during soil excavation activities, excavation will cease and the NYSDEC will be immediately notified. All drums and/or underground storage tanks encountered will be evaluated and the contractor will submit a removal plan for NYSDEC approval. Appropriately trained personnel will excavate all of the drums and/or underground storage tanks while

following all applicable federal, state, and local regulations. Removed drums and underground storage tanks will be properly characterized and disposed off-site. The soil/fill surrounding the buried drums or underground storage tanks will be considered as potentially contaminated and will be stockpiled and characterized.

6.2.4. Other soil/fill

Other excavated soils (i.e., soils that do not exhibit an elevated PID reading, visually unimpacted soil, or soil that does not have an elevated pH) will be stockpiled for characterization per Section 6.3. These soils will be stockpiled in piles up to 2000 cy.

6.2.5. Excavation requirements

Excavations for structures and utilities will be open excavations in accordance with applicable local, state, and federal regulations. All excavations must be backfilled as soon as the work allows. If excavations are left open, they will be barricaded and warning lights will be posted, if necessary. Backfilled excavations must be covered with suitable cover material within ten working days of backfilling or as otherwise approved by the NYSDEC. All disturbed soils must be revegetated as per Section 6.5. The cover system is discussed in Section 6.5.

Excavated backfill may be used as subgrade or excavation subgrade backfill, if appropriate, following characterization performed in accordance with Section 6.3.

6.2.6. Grading requirements

The Site will require grading prior to cover placement activities. The fill material and debris piles will be graded to the surface required for redevelopment, and to preclude the formation of standing water. Trees, shrubs, roots, brush, masonry, rubbish, scrap, debris, pavement, curbs, fences, and miscellaneous structures will be removed and properly disposed off-site or temporarily stockpiled north of the Union Ship Canal on Subparcel 4 in accordance with applicable solid waste regulations. Only exempt materials as defined in 6 NYCRR Part 360-7.1(b)(1) are allowed for stockpiling. Prior to cover system placement, protruding material will be removed from the ground surface. Burning will not be allowed on-site.

6.3. Soil/fill characterization

A soil characterization flowchart is provided on Figure 6-1.

6.3.1. Excavated and stockpiled soil/fill

Excavated and stockpiled soil/fill will be sampled and classified for reuse or disposal. For excavated soil/fill with visual evidence of contamination (i.e., staining or elevated PID measurements), one composite sample and a duplicate sample will be collected for each 100 cubic yards of stockpiled soil/fill. For excavated soil/fill that does not exhibit visual evidence of contamination, one composite sample and a duplicate sample will be collected for 2000 cubic yards of stockpiled soil, and a minimum of 1 sample will be collected for volumes less than 2000 cubic yards.

The composite sample will be collected from five locations within each stockpile. A duplicate composite sample will also be collected. PID measurements will be recorded for each of the five individual locations. One grab sample will be collected from the individual location with the highest PID measurement. If none of the five individual sample locations exhibit PID readings, one location will be selected at random. The composite sample will be analyzed by a NYSDOH ELAP-certified laboratory for pH (EPA Method 9045C), TCL SVOCs, pesticides, and PCBs, and TAL metals, and cyanide. The grab sample will be analyzed for TCL VOCs.

Soil samples will be composited by placing equal portions of fill/soil from each of the five composite sample locations into a pre-cleaned, stainless steel (or Pyrex glass) mixing bowl. The soil/fill will be thoroughly homogenized using a stainless steel scope or trowel and transferred to pre-cleaned jars provided by the laboratory. Sample jars will then be labeled and a chain-of-custody form will be prepared.

6.3.2. Soil/fill disposal or reuse

Soil/fill that has been characterized and found to meet the SSALs, may be reused as subgrade or excavation subgrade backfill, if appropriate. Soil/fill may not be reused as backfill in landscaping berms to be used for the planting of trees and shrubs. If the analysis of the soil/fill samples reveals unacceptably high levels of any analytes (i.e., greater than one or more SSAL), the soil may not be used as backfill on-site and additional analyses will be necessary to further classify the material for disposal purposes. The developer will be responsible for classifying any material that is found to contain one or more constituents in excess of the SSALs. At a minimum, the duplicate sample will be analyzed for the toxicity characteristic using the Toxicity Characteristic Leaching Procedure (TCLP) for the particular analytes that were detected at concentrations exceeding the SSALs. The duplicate sample may also be analyzed for the other RCRA Characteristics including reactivity, corrosivity, and ignitability. If the analytical results indicate that

concentrations exceed the standards for RCRA characteristics, the material will be considered a hazardous waste and must be properly disposed off-site at a permitted disposal facility within 90 days of excavation. Additional characterization sampling for off-site disposal may be required by the disposal facility. To potentially reduce off-site disposal requirements/costs, the owner or site developer may also choose to characterize each stockpile individually. If the analytical results indicate that the soil is not a hazardous waste, the material will be properly disposed off-site at a non-hazardous waste facility. Stockpiled soil cannot be transported on or off-site until the analytical results are received.

6.4. Subgrade material

Subgrade material used to backfill excavations or placed to increase site grades or elevation shall meet the following criteria. These criteria are also summarized in Figure 6-2.

- Excavated on-site soil/fill shall be sampled and analyzed. Analytical results shall indicate that the contaminants, if any, are present at concentrations below the SSALs.

- Off-site borrow soils will be documented as having originated from locations having no evidence of disposal or release of hazardous, toxic or radioactive substances, wastes or petroleum products.

- Off-site soils intended for use as site backfill cannot otherwise be defined as a solid waste in accordance with 6 NYCRR Part 360-1.2(a).

- If the contractor designates a source as "virgin" soil, it shall be further documented in writing to be native soil material from areas not having supported any known prior industrial or commercial development or agricultural use.

- Virgin soils should be subject to collection of one representative composite sample per source. The sample should be analyzed for TCL VOCs, SVOCs, pesticides, PCBs, arsenic, barium, cadmium, chromium, lead, mercury, selenium, silver, and cyanide. The soil will be acceptable for use as backfill provided that all parameters meet the SSALs.

- Non-virgin soils will be tested via collection of one composite sample per 500 cubic yards of material from each source area. If more than 1,000 cubic yards of soil are borrowed from a given off-site non-virgin soil source area and both samples of the first 1,000 cubic yards meet SSALs, the sample collection frequency will be reduced to one composite for every 2,500 cubic yards of additional

soils from the same source, up to 5,000 cubic yards. For borrow sources greater than 5,000 cubic yards, sampling frequency may be reduced to one sample per 5,000 cubic yards, provided all earlier samples met the SSALs.

6.5. Cover system

Surface coverage over the entire redeveloped subparcels will be required by the developer or owner as a pre-condition of occupancy. The purpose of the surface cover is to eliminate the potential for human contact with fill material. The proposed cover system will consist of one of the following types of clean material:

- Soil: 12 inches of vegetated soil cover in areas that will not receive significant equipment or vehicular use.

  To reduce the disturbance of the surface cover material, clean soil berms will be constructed in areas where trees and shrubs will be planted. The berms will be of sufficient thickness to allow the excavation of only clean fill deep enough to plant the tree or shrub root ball. The berm material will contain sufficient organic material to allow tree and/or shrub growth, and will be of sufficient strength to support trees and/or shrubs at their maximum height.

- Asphalt: a minimum of 2-inches of asphalt over a 4-inch gravel subbase in areas that will become roads, sidewalks, and parking lots. Actual cross sections will be determined based on the intended use of the area.

- Concrete: a minimum of 2-inches of concrete layer over a 4-inch gravel subbase, in areas that will become slab-on-grade structures or for roads, sidewalks, and parking lots in lieu of asphalt. For slab-on-grade structures, an 8-mil polyethylene vapor barrier will be placed beneath the concrete. Actual cross sections will be determined based on the intended use of the area.

6.5.1. Soil

The cover soil material shall meet the following criteria. These criteria are also summarized on Figure 6-3.

- Excavated on-site soil/fill shall not be used as cover material.

- Off-site borrow soils will be documented as having originated from locations having no evidence of disposal or release of hazardous, toxic or radioactive substances, wastes or petroleum products.

- Off-site soils intended for use as site cover cannot otherwise be defined as a solid waste in accordance with 6NYCRR Part 360-1.2(a).

- If the contractor designates a source as "virgin" soil, it shall be further documented in writing to be native soil material from areas not having supported any known prior industrial or commercial development or agricultural use.

- Virgin soils should be subject to collection of one representative composite sample per source. The sample should be analyzed for TCL VOCs, SVOCs, pesticides, PCBs, and TAL metals plus cyanide. The soil will be acceptable for use as cover material provided that all parameters meet the NYSDEC recommended soil cleanup objectives included in TAGM 4046.

- Non-virgin soils will be tested via collection of one composite sample per 500 cubic yards of material from each source area. If more than 1,000 cubic yards of soil are borrowed from a given off-site non-virgin soil source area and both samples of the first 1,000 cubic yards meet the TAGM 4046 criteria, the sample collection frequency will be reduced to one composite for every 2,500 cubic yards of additional soils from the same source, up to 5,000 cubic yards. For borrow sources greater than 5,000 cubic yards, sampling frequency may be reduced to one sample per 5,000 cubic yards, provided all earlier samples met the TAGM 4046 criteria.

- An alternative source of cover system material may be residuals that are presently stored at the ECWAs Sturgeon Point WTP in the Town of Evans, Erie County, and New York. A BUD application has been prepared for use of those residuals as a component of the proposed cover system for Subparcel 1. A BUD application addendum will be prepared for Subparcel 2. This material will consist of a mixture of water treatment plant residuals and clean fill obtained from off-site sources. If the BUD is approved by the NYSDEC, the materials would be handled/placed in accordance with the NYSDEC-approved BUD.

- As stated in the February 2002 RAWP for Subparcel 1 by Malcolm Pirnie, the topsoil used for the final cover shall be fertile, friable, natural loam surface soil, capable of sustaining plant growth, and free of clods or hard earth, plants or roots, sticks or other extraneous material harmful to plant growth. The topsoil shall be well-graded with the following approximate analysis:

a.

Sieve Size	Percent Passing by Weight
3-inch	100
No. 4	> 75
No. 200	>30
0.002 mm	<20

Source: Malcolm Pirnie, Inc.

b. pH 5.5 to pH 7.6
c. Minimum organic content of 2.5 percent as determined by ignition loss
d. Soluble salt content not greater than 500 ppm.

- Grassed areas will be seeded with a sustainable perennial mixture. The grass seed mixture will be fresh, clean, new-crop seed complying with the tolerance for purity and germination established by the Official Seed Analysts of North America. Ground surface disturbed by construction operations will be seeded with 100 lb/acre of seed. As stated in the February 2002 RAWP for Subparcel 1 by Malcolm Pirnie, seed will conform to the following:

a.

Name of Grass	Application Rate (lbs/acre)	Purity (%)	Germination
Perennial Ryegrass	10	95	85
Kentucky Bluegrass	20	85	75
Strong Creeping Red Fescue	20	95	80
Chewings Fescue	20	95	80
Hard Fescue	20	95	80
White Clover	10	98	75

Source: Malcolm Pirnie, Inc.

b. Germination and purity percentages should equal or exceed the minimum seed standards listed. If necessary to use seed with a germination percentage less than the minimum recommended above, the seeding rate will be increased accordingly to compensate for the lower germinations.
c. Weed seed content will be less than 0.25 percent and free on noxious weeds.
d. All seed shall be rejected if the label lists any of the following grasses:
   1) Sheep Fescue
   2) Meadow Fescue
   3) Canada Blue
   4) Alta Fescue

5) Kentucky 31 Fescue
6) Bent Grass

e. In addition, one bushel per acre of oats or rye seed will be sowed over disturbed areas to provide a quick shade cover and to prevent erosion during turf establishment.

- To reduce the disturbance of the surface cover material, clean soil berms will be constructed in areas where trees and shrubs will be planted. The berms will be of sufficient thickness to allow the excavation of only clean fill deep enough to plant the tree or shrub root ball. The berm material will contain sufficient organic material to allow three and/or shrub growth, and will be of sufficient strength to support threes and/or shrubs at their maximum height.

6.5.2. Asphalt

It is expected that asphalt will be used for the development in areas that will become roads, sidewalks, and parking lots. As asphalt will represent a cover in terms of remedial action, a minimum cross-sectional thickness of 6 inches of material (asphalt and clean subbase material) is required for protection from exposure to the underlying soil/fill material. The actual cross section of the asphalt cover (i.e., thickness of the asphalt and subbase material) will be determined based on the intended use of the area.

6.5.3. Concrete

It is expected that concrete may be used in areas that will become slab-on-grade structures, utilities, footings, foundations, or signs. Concrete may also be used instead of asphalt for roads, sidewalks, and parking lots. As concrete will represent a cover in terms of remedial action, a minimum cross-sectional thickness of 6 inches of material (concrete and clean subbase material) is required for protection from exposure to the underlying soil/fill material. A vapor barrier consisting of polyethylene sheeting with a minimum thickness of 8-mils will be installed under all structures. Type and thickness of concrete and subbase material will be determined based on intended use of the area.

6.6. Removal/treatment of NAPL area

Approximately 1,388 cy of soil exhibiting visual evidence of the presence of petroleum product may be excavated. The extent of soil removal will be established in the field based on visual evidence of NAPL. As such, an NYSDEC representative will be required to approve the extent of excavation.

NYSDEC's STARS Memo #1, *Petroleum Contaminated Soil Guidance Policy*, provides three options for the management of petroleum-impacted soils:

1) Process under a specific NYSDEC BUD such as an approved hot-mix asphalt or cold-mix asphalt plant
2) Dispose at a permitted off-site disposal facility
3) Treat on-site in accordance with NYSDEC's STARS Memo #2, *Biocell and Biopile Designs for Small-Scale Petroleum-Contaminated Soil Projects*.

NYSDEC's STARS Memo #1 and STARS Memo #2 are included as Exhibits 6-2 and 6-3, respectively.

If onsite treatment is selected, biopiles may be constructed as described in the following sections, and in accordance with NYSDEC's STARS Memo #2. A plan describing the soil disposition and implementation methods selected by the developer shall be provided to NYSDEC for approval prior to excavation.

The following subsections provide information pertaining to the construction of biopiles. This information has been excerpted from STARS Memo #2. More detailed information can be found in the document (Exhibit 6-3).

6.6.1. Construction equipment

It is anticipated that the following equipment may be needed for constructing biopiles:

- Excavator
- Front end loader equipped with grinder bucket (or other mixing equipment) for mixing and transferring materials.
- Dozer
- Dump truck
- Water tank
- Backhoe

6.6.2. Biopile base construction

A layer of sand approximately 3 inches thick should be used as a base for each biopile. The sand base should be sloped approximately 1% across the width of the pile to promote drainage. The sand should be hauled from a local borrow source and spread with a dozer. The sand base should be surrounded by an earthen berm approximately 2 feet high. A liner should be placed over the sand and berm. The liner should consist of a continuous double layer of 8-mil reinforced polyethylene. The edges of the liner should be anchored with sandbags.

6.6.3. Soil amendment

Prior to transferring material to the biopile, 19:3:3 (nitrogen: phosphorous: potassium) granular fertilizer should be mixed with the soil. If soil pH exceeds 8.5, the soil pile may be seeded with uncontaminated soil as a source of viable microbes. A loader equipped with a grinder bucket (or other mixing equipment) should be used to thoroughly mix the fertilizer and soil. Water should be applied until soils are wet, but not saturated.

6.6.4. Biopile construction

The biopile should be constructed by placing amended material over the liner. Areas where equipment has traveled and compacted the placed material should be manually or mechanically tilled to re-establish porosity.

While constructing the pile, a ventilation system (including a network of 4-inch, slotted PVC piping, shut-off valves, explosion-proof blower, particle filter, moisture trap, and muffler) should be installed in accordance with the attached STARS Memo #2.

After the amended material has been placed, the pile should be covered with non-woven geotextile specifically designed for compost and biopiles. The geotextile should be air permeable, but have a minimal water permeability. The structure of the fabric should encourage water to flow along the horizontal slope and minimize vertical flow. The covers placed on the side slopes should be keyed into the biopile a minimum of 12 inches. Seams in cover sections should be overlapped a minimum of 2 feet. The cover should be anchored using sandbags. Tires or hay bales should be placed on top of the pile to provide air space between the soil and the cover to allow air circulation beneath the cover.

6.6.5. Biopile operations/inspections

The system should be inspected at a frequency approved by NYSDEC and adjustments should be made if necessary.

When soil temperature is below 40 F, the end-of-season sampling procedures should be followed in accordance with STARS Memo #2 and the Site should be secured.

6.6.6. Process monitoring

Process monitoring should include, but may not be limited to, pH, temperature, moisture, nutrients, and aeration. These process specifications should be monitored in accordance with the STARS Memo #2 , which is attached as Exhibit 6-3.

The bioremediation process should be performed under the guidance of NYSDEC until the soil/fill reaches guidance values listed in STARS Memo #1 or until deemed appropriate by NYSDEC. Closure samples

should also be performed as described in STARS Memo #1. STARS Memo #1 is included as Exhibit 6-2.

Following bioremediation, the treated soil/fill material should be managed in accordance with STARS Memo #1.

6.7. Erosion control

When the remedial actions at the Hanna Furnace Site require the disturbance of more than 5 acres of land, federal and state laws require that the project obtain coverage under the NYSDEC SPDES General Permit for Storm Water Discharges from Construction Activities that are classified as "Associated with Industrial Activity", Permit #GP-93-06 (Construction Storm Water General Permit). It should be noted that after December 9, 2002, federal and state laws will require that the project obtain coverage under the NYSDEC SPDES General Permit for Storm Water Discharges from Construction Activities for certain activities disturbing between 1 and 5 acres of land. Requirements for coverage under the Construction Storm Water General Permit include the submittal of a Notice of Intent 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 "Chapter Four: the Storm Water Management and Erosion Control Plan" in Reducing Impacts of Storm Water Runoff from New Development, NYSDEC, 1992. This Storm Water Management and Erosion Control Plan, in accordance with permit requirements, will 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. The SWPP will also include a contingency plan to be implemented in the event that heavy rain events are determined to be impacting water quality in the Union Ship Canal due to redevelopment activities. 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.

Proven soil conservation practices will be incorporated in the construction and development plans to mitigate soil erosion, off-site sediment migration, and water pollution from erosion. These practices combine vegetative and structural measures. Many of these measures will be permanent in nature and become part of the completed construction project (design features such as drainage channels and grading). Other measures will be temporary and serve only during the construction stage. The contractor will remove temporary measures at the completion of construction. The selection of erosion and sediment control measures will be based on several general principles, including:

- The minimization of erosion through project design (maximum slopes, phased construction, etc.).
- The incorporation of temporary and permanent erosion control measures.
- The removal of sediment from sediment-laden storm water before it leaves the Site.

The use of appropriate temporary erosion control measures such as silt fencing and/or hay bales will be required around all soil/fill stockpiles and unvegetated soil surfaces during redevelopment activities. These methods are described below. Stockpiles shall be graded and compacted as necessary for positive surface water runoff and dust control. Stockpiles of soil/fill will be placed a minimum of 50 feet from the subparcel boundaries.

Temporary erosion control measures.
Temporary erosion and sedimentation control measures and facilities will be employed during active construction stages. Prior to any construction activity, temporary erosion and sediment control measures shall be installed and maintained until such time that permanent erosion control measures are installed and effective. Additional sediment control measures may also be necessary. Structural measures, as described below, will be designed and installed to provide the required sediment and erosion control. The following temporary measures will be incorporated into construction activities:

- Silt fencing.
- Straw bales.
- Temporary vegetation/mulching.

Regrading and cover activities may result in sheet flow to various areas of the Site; therefore, silt fencing will be used as the primary sediment control measure. Prior to extensive clearing, grading, excavation, and placement of cover soils, silt fences will be installed along all construction perimeter areas to prevent sedimentation in low areas and drainage areas. The location and orientation of silt fencing to be used during redevelopment operations will be field determined. There may be

breaks and overlaps in the silt fencing to allow construction vehicles access to the construction areas.

Intermediate silt fencing will be used upslope of perimeter areas where phased construction activities are occurring. This measure will effectively lower sheet flow velocities and reduce sediment loads to perimeter fencing. In addition, silt fencing around soil stockpiles will be employed.

As sediment collects along the silt fences, they will be cleaned to maintain desired removal performance and prevent structural failure of the fence. Accumulated sediment will be removed when 60% of the storage capacity of the silt fence is full. Removed sediment will be stockpiled and characterized in accordance with Section 6.3. The perimeter silt fences will remain in place until construction activities in the area are completed and vegetative cover or other erosion control measures are adequately established. Silt fences will be provided and installed in accordance with the New York Guidelines for Urban Erosion and Sediment Control.

Straw bales will be used to intercept sediment-laden runoff from storm water channels as needed during various phases of construction. Additional straw bale dikes may be necessary in some areas during some phases of construction.

Use of straw bales will be limited to swales and/or diversion ditches where the anticipated flow velocity will not be greater than 5 feet per second (fps). Where flows may eventually exceed 5 fps along a swale or diversion ditch, an intermediate straw bale barrier will be installed upgradient of the final bale barrier. The intermediate bale barrier will effectively reduce flow velocities and sediment load to the final barrier.

As with the silt fencing, sediment will be removed to maintain performance and prevent overtopping or failure of the straw bale barrier when 60% of the storage capacity of the straw bale barrier is full. Removed sediment will be stockpiled and characterized in accordance with Section 6.3. Sediment laden straw bales that have lost their structural integrity and/or effectiveness will be disposed of off-site as a solid waste. Straw bale barriers will remain in place until construction activities contributing sediment to the barrier are complete and vegetative cover or other erosion control measures are adequately established. Straw bales will be provided and installed in accordance with the New York Guidelines for Urban Erosion and Sediment Control.

As a result of phased construction and split construction schedule, portions of the Site may be left in intermediate/incomplete conditions. Intermediate areas may include rough graded areas awaiting finer grading or areas awaiting topsoil placement. Intermediate areas where activities will not resume for a period in excess of 2 weeks shall be seeded with a quick germinating variety of grass or covered with a layer of straw mulch.

The temporary cover will act to stabilize the soil and reduce erosion. As construction progresses, areas containing temporary vegetation or straw mulch can be covered without removal of the temporary vegetation or mulch.

Permanent erosion control measures.
Permanent erosion control measures and facilities will be incorporated during cover construction and during site redevelopment for long-term erosion protection. Permanent measures and facilities will be installed as early as possible during construction phases. Parking and building systems associated with redevelopment shall not include dry wells or other subsurface injections/disposal piping or facilities.

The remedial construction activities will involve the installation of a cover system including asphalt, concrete, or topsoil over the entire site. Permanent erosion control measures incorporate a combination of design features to limit overall erosion and sediment problems to practical design limits, and the placement of permanent facilities during site restoration for long term erosion protection. The soil cover system will be designed based on the following criteria:

- Maximum slope of 33% (3H: 1 V) to limit erosion.
- Minimize the potential contact with, and migration of, waste fill.
- Provide a medium for the growth of vegetation to control erosion.

Design features incorporated into the construction plans to control erosion will include limiting steep slopes, routing runoff to surface water collection channels, limiting flow velocities in the collection channels to the extent practical, and lining collection channels, where appropriate. In areas where flow will be concentrated (i.e.; collection channels) the channel slopes and configuration will be designed to maintain channel stability.

Any final slopes greater than 33 percent will be reinforced or have a demarcation layer under the clean cover to indicate if erosion has extended into the subgrade. Following the placement of final cover soils over regraded areas, a revegetation program will be implemented to establish permanent vegetation. Vegetation serves to reduce erosion, enhance evapotranspiration, and improve runoff water quality. The areas to be grassed will be seeded in stages as construction is completed with 100 lbs./acre of seed conforming to the mix included in Section 6.5. In addition to the above seed mixture, mulch, mulch blankets, or synthetic fabric will be placed to prevent erosion during turf establishment. Mulch will be placed on all slopes less than 15% and a mulch blanket on all slopes greater than 15%. Synthetic erosion control fabric will be placed in drainage ditches and swales. As an aid to turf establishment, seeded areas will be fertilized with a starter fertilizer.

6.8. Dust control

The surface of unvegetated or disturbed soil/fill areas will be wetted with water or other dust suppressive agents to control dust during construction. Any subgrade material left exposed during extended interim periods (greater than 90 days) prior to placement of final cover shall be covered with a temporary cover system (i.e., tarps, spray type cover system, etc.) or planted with vegetation to control fugitive dust to the extent practicable. Particulate monitoring will be performed along the downwind occupied perimeter of the subparcel during subgrade excavation, grading, and handling activities in accordance with the Community Air Monitoring Plan further detailed in Section 7.2 and in accordance with NYSDEC TAGM 4031 (Fugitive Dust Suppression and Particulate Monitoring Program at Inactive Hazardous Waste Sites), which is included in Exhibit 6-4.

Dust suppression techniques will be employed at the Site in accordance with NYSDEC TAGM 4031. This TAGM describes guidance for dust monitoring, and includes a list of effective dust suppression techniques. As per TAGM 4031, dust suppression techniques that may be used at the Site include applying water on roadways, wetting equipment, spraying water on buckets during excavation and dumping, hauling materials in properly covered or watertight containers, covering excavated areas and material after excavation activity ceases, establishing vegetative cover immediately after placement of cover soil, and reducing the excavation size and/or number of excavations. If the BUD for the reuse of water treatment residuals is acceptable to the NYSDEC, dust suppression techniques will also be constantly employed during soil blending. The use of atomizing sprays is recommended so that excessively wet areas will not be created but fugitive dust will be suppressed.

6.9. Construction water management

Pumping of water (i.e., ground water and/or storm water that has accumulated in an excavation) from excavations, if necessary, will be done in such a manner as to prevent the migration of particulates, soil/fill, or unsolidified concrete materials, and to prevent damage to the existing subgrade. Water pumped from excavations will be managed properly in accordance with all applicable regulations so as to prevent endangerment of public health, property, or any portion of the construction.

In areas where ground water potentially has a high pH, the pH of the ground water in excavations will be measured using a field pH meter. Water in the excavations will not be discharged to the ground surface if:

- staining or PID measurements above background are observed in the excavation
- a sheen is present on the water surface
- or, if pH is less than 6.5 or greater than 8.5.

If any of these conditions exist, the water pumped from the excavations will be containerized and analyzed in accordance with the Surface Water and Ground Water Quality Standards set forth in 6 NYCRR Part 703.5 and the Buffalo Sewer Authority discharge permit. If the water meets the surface water and ground water quality standards, it may be discharged to the ground surface. If the water does not meet the surface water and ground water quality standards, it may be discharged to the Buffalo Sewer Authority under a discharge permit. If the water quality is such that the Buffalo Sewer Authority discharge permit requirements will be exceeded, it will be transported off-site for proper disposal or treated on-site via a treatment system that has been approved by NYSDEC.

Runoff from surface discharges shall be controlled. No discharges shall enter a surface water body (i.e., Union Ship Canal) without proper permits.

6.10. Access controls

Access to soil/fill on subdivided parcels adjacent to occupied on- or off-site parcels must be controlled until final cover is placed to prevent direct contact with subgrade materials. To better control Site access, obvious access points will be gated. All City- and DDI-owned gates will be posted with "No Trespassing" signs. The entire site will be completely covered with clean fill or vegetated via hydroseeding to limit dust generation.

6.11. Institutional controls

The use of the property will be restricted through verbiage in the Voluntary Cleanup Agreement, to which this Remedial Action Work Plan will be attached. Deed restrictions will be implemented that will prevent the use of ground water and disturbance of the final cover system. Deed restrictions are described in detail in the VCA.

7. Health and safety

Invasive work performed at the Former Manufacturing Area will be performed in accordance with all applicable local, state, and federal regulations to protect worker health and safety.

All contractors performing redevelopment or maintenance activities involving intrusive work at the Former Manufacturing Area will be required to prepare a site-specific, activity-specific Health and Safety Plan (HASP). The HASP should also include provisions for protection of the community. In order to facilitate the creation of an appropriate HASP by the contractor(s) performing work, the ranges of concentrations of contaminants detected in soil and ground water samples collected during previous site investigations are shown in Table 7-1. Additionally, copies of the reports detailing the procedures and findings of these site investigations are available at the Albany and Buffalo offices of the NYSDEC.

7.1. Construction personnel protection

Contractors engaged in subsurface construction or maintenance activities (e.g., foundation and utility workers) will be required to implement appropriate health and safety procedures. These procedures will involve, at a minimum, donning adequate personal protective equipment, performing appropriate air monitoring, and implementing other engineering controls as necessary to mitigate potential ingestion, inhalation and contact with residual constituents in the soils. Recommended health and safety procedures include, but may not be limited to, the following:

- While conducting invasive work at the Site, the Contractor shall provide safe and healthful working conditions. The Contractor shall comply with all New York State Department of Labor regulations and published recommendations and regulations promulgated under the Federal Occupational Safety and Health Act of 1970 and the Construction Safety Act of 1969, as amended, and with laws, rules, and regulations of other authorities having jurisdiction. Compliance with governmental requirements is mandated by law and considered only a minimum level of safety performance. The Contractor shall insure that all work is performed in accordance with recognized safe work practices.

- The Contractor shall be responsible for the safety of the Contractor's employees and the public. The Contractor shall be solely responsible for the adequacy and safety of all construction methods, materials, equipment and the safe prosecution of the work.

- The Contractor is responsible to ensure that all project personnel have been trained in accordance with 29 CFR 1910.120.

- The Contractor shall have a written HASP prepared, signed and sealed by a safety professional; a safety professional and/or a trained safety representative(s) active on the job whenever the work is in progress; an effective and documented safety training program; and a safety work method check list system.

- The Contractor shall stop work whenever a work procedure or a condition at a work site is deemed unsafe by the safety professional or his trained safety representative(s).

- The Contractor shall employ a properly qualified safety professional whose duties shall be to initiate, review and implement measures for the protection of health and prevention of accidents. The Contractor shall also employ safety representative(s) whose duties, working under the direct supervision of the safety professional, shall include the implementation the safety program for the work at the Site.

- Recognition as a safety professional shall be based on a minimum of certification by the Board of Certified Safety Professionals as a Certified Safety Professional and 5 years of professional safety management experience in the types of construction and conditions expected to be encountered on the Site.

- Safety representative(s) who work under the direction of the safety professional will have appropriate qualifications. The required qualifications shall include a minimum of: 5 years of relevant construction experience, two years of which were exclusively in construction safety management; successful completion of a 30-hour OSHA Construction Safety and Health training course; 40-hour training as per 29 CFR 1926.65, Hazardous Waste Operations and Emergency Response; and, if confined space entry is required, training as per 29 CFR 1910.146, Permit-Required Confined Spaces.

- The safety professional shall visit and audit all work areas as often as necessary but at least once each week and shall be available for consultation whenever necessary.

- The safety representative(s) must be at the job site full time whenever work is in progress. When multiple shift work is in progress more than one safety representative may be required.

- The safety professional and his safety representative(s) shall be responsible for ensuring Contractor compliance with governing laws, rules and regulations as well as of good safety practice.

- The safety staff shall maintain and keep available safety records, up-to-date copies of all pertinent safety rules and regulations, Material Safety Data Sheets, and the Contractors' site specific HASPs and the site emergency response plan with emergency and telephone contacts for supportive actions.

- The responsible safety professional shall sign and seal the Contractor's written site-specific HASP and the HASP shall be available to workers on site. The Contractor shall provide copies of the HASP to the Contractors' insurer, if required.

- The HASP shall be written in accordance with 29 CFR 1926.65 and it will identify and define the following: the hazards anticipated for each major invasive task; the engineering, administrative and/or personal protective equipment control measures that will be implemented; the surveillance methods, and schedules of both walk through surveys and in-depth safety audits to be performed on site; medical monitoring and screening methods; the Contractors' pre-start-up and continuous safety- training program; emergency response equipment, notification, training and procedures; and include copies of safety inspection check-off sheets, specific to the work methods and crews performing work at the various job locations, to be used on a regular basis in evaluating the Site and work methods.

- The safety professional and/or his trained safety representative(s) shall as a minimum:

    - Schedule and conduct safety meetings and safety training programs as required by law, the health and safety plan, and good safety practice. A specific schedule of dates of these meetings and an outline of materials to be covered shall be provided with the health and safety plan. All employees shall be instructed on the recognition of hazards, observance of precautions, of the contents of the health and safety plan and the use of protective and emergency equipment.

    - Determine that operators of specific equipment are qualified by training and/or experience before they are allowed to operate such equipment.

    - Develop and implement emergency response procedures. Post the name, address and hours of the nearest medical doctor, name and address of nearby clinics and hospitals, and the telephone numbers of the appropriate ambulance service, fire, and the police department.

- Post all appropriate notices regarding safety and health regulations at locations that afford maximum exposure to all personnel at the job site.

- Post appropriate instructions and warning signs in regard to all hazardous areas or conditions that cannot be eliminated. Identification of these areas shall be based on experience, on site surveillance, and severity of hazard. Such signs shall not be used in place of appropriate workplace controls.

- Ascertain by personal inspection that all safety rules and regulations are enforced. Make inspections at least once a shift to ensure that all machines, tools and equipment are in a safe operating condition; and that all work areas are free of hazards. Take necessary and timely corrective actions to eliminate all unsafe acts and/or conditions, and submit to the Engineer each day a copy of his findings on the inspection check list report forms established in the health and safety plan.

- Provide safety training and orientation to authorized visitors to ensure their safety while occupying the job site.

- Perform all related tasks necessary to achieve the highest degree of safety that the nature of the work permits.

- The Contractor shall have proper safety and rescue equipment, adequately maintained and readily available, for foreseeable contingencies. This equipment may include such applicable items as: proper fire extinguishers, first aid supplies, safety ropes and harnesses, stretchers, water safety devices, oxygen breathing apparatus, resuscitators, gas detectors, oxygen deficiency indicators, combustible gas detectors, etc. This equipment should be kept in protected areas and checked at scheduled intervals. A log shall be maintained indicating who checked the equipment, when it was checked, and that it was acceptable. This equipment log shall be updated monthly and be submitted with the monthly report. Equipment that requires calibration shall have copies of dated calibration certificates on site. Substitute safety and rescue equipment must be provided while primary equipment is being serviced or calibrated.

- All personnel employed by the Contractor or his subcontractors or any visitors whenever entering the job site, shall be required to wear appropriate personal protection equipment required for that area. The Contractor may remove from the Site any person who fails to comply with this or any other safety requirement.

- Because water with elevated pH may act as a skin irritant, care must be taken to inhibit dermal contact when handling any ground water at the site. Actions to inhibit contact with ground water may include the use of latex or other waterproof gloves by on-site workers.

- The Contractor will follow the minimum requirements for health and safety, as included in the February 2002 RAWP for Subparcel 1 by Malcolm Pirnie, which are included in this report as Exhibit 7-1.

7.2. Community air monitoring program

Air monitoring will be performed during redevelopment activities in accordance with the New York State Department of Health (NYSDOH) *Generic Community Air Monitoring Plan*, which is included in Exhibit 7-2. Prior to implementation of redevelopment activities, the developer will prepare and submit a Perimeter Air Monitoring and Dust Control Plan for NYSDEC approval. Ambient air monitoring will be conducted by the Professional Engineer's representative monitoring the work on a real-time basis during all subsurface construction activities. All air monitoring readings will be recorded in a logbook and will be available for review by the NYSDEC and NYSDOH.

Actions levels for dust generation shall be developed based upon the constituents identified in the surface soils. These data are provided in Table 7-1.

7.2.1. Vapor emission response plan

If the downwind area perimeter air concentrations of organic vapors exceed the upwind work area perimeter concentration by 5 ppm but less than 25 ppm, the following actions will be taken:

- Monitoring of the perimeter work area location every 30 minutes.

- Monitoring of the organic vapor concentration 200 feet downwind of the work area perimeter or half the distance to the nearest receptor, whichever is less, every 30 minutes. If this reading exceeds the perimeter work area upwind organic vapor concentration by 5 ppm, all work must halt and monitoring increased to every 15 minutes. If, at any time, this reading exceeds the perimeter work area upwind concentration by 10 ppm, the Major Vapor Emissions Response Plan will be initiated.

- If organic vapor levels 200 feet downwind of the perimeter work area or half the distance to the nearest downwind receptor, whichever is less, exceeds by 5 ppm the work area perimeter upwind concentration persistently, then air quality monitoring must be performed within 20 feet of the nearest downwind receptor (20-foot zone). If the readings in the 20-foot zone exceed the perimeter work area upwind concentration by 5 ppm for more than 30 minutes, then the Major Vapor Emissions Response Plan will be implemented.

- Work activities can resume only after the downwind 200 foot reading and the 20-foot zone reading are less than 5 ppm above the perimeter work area upwind concentration. In addition, the downwind perimeter work area concentration must be less than 25 ppm above the perimeter work area upwind concentration.

7.2.2. Major vapor emission response plan

If the downwind work area perimeter organic vapor concentration exceeds the upwind work area perimeter concentration by more than 25 ppm, then the Major Vapor Emission Response Plan will be activated. Upon activation, the following activities will be undertaken:

1. All work will halt.
2. All Emergency Response Contacts as listed in the Health and Safety Plan will be contacted.
3. The NYSDEC, NYSDOH, and the Erie County Health Department will be notified and advised of the situation.
4. The local police and fire department authorities will immediately be contacted by the Safety Officer and advised of the situation.
5. Frequent air monitoring will be conducted at 30-minute intervals within the 20-Foot Zone. If two successive readings below action levels are measured, air monitoring may be halted or modified by the Safety Officer and work may resume.

7.2.3. Particulate monitoring and response levels

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

If the downwind PM-10 particulate level is 100 micrograms per cubic meter (mcg/m3) 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, as described in Section 6.8, provided that downwind PM-10 particulate levels do not exceed 150 mcg/m3 above the upwind level and provided that no visible dust is migrating from the work area.

If, after implementation of dust suppression techniques, downwind PM-10 particulate levels are greater than 150 mcg/m3 above the upwind level, work must be stopped and a re-evaluation of activities initiated. Work can resume provided that dust suppression measures and other controls are successful in reducing the downwind PM-10 particulate concentration to within 150 mcg/m3 of the upwind level and in preventing visible dust migration.

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

8. Quality assurance/quality control

8.1. Analytical Data

All characterization samples collected during site redevelopment activities will be analyzed using the most recent NYSDEC Analytical Services Protocol (ASP). Analytical data will be submitted in complete ASP Category B data packs including documentation of laboratory QA/QC procedures that will provide legally defensible data in a court of law. If requested, the Category B data packs will be submitted to the NYSDEC.

The laboratory proposed to perform the analyses will be certified through the New York State Department of Health Environmental Laboratory Approval Program (ELAP) to perform Contract Laboratory Program (CLP) analysis and Solid Waste and Hazardous Waste Analytical testing on all media to be sampled during this investigation. The laboratory will maintain this certification for the duration of the project.

The detection limit for compounds listed as SSALs in Table 5-1 shall be equal to or less than the noted action level.

Sampling and decontamination procedures are presented in Appendix 8-1. Procedures for chain of custody, laboratory instrumentation calibration, laboratory analyses, reporting of data, internal quality control, and corrective actions shall be followed as per NYSDEC ASP and as per the laboratory's Quality Assurance Plan. Where appropriate, trip blanks, field blanks, field duplicates, and matrix spike, matrix spike duplicate shall be performed at a rate of 5% (1 per up to 20 samples) and will be used to assess the quality of the data. The laboratory's in-house QA/QC limits will be utilized whenever they are more stringent than those suggested by the EPA methods.

After receipt of analytical results, the data package will be sent to a qualified, third party, data validation specialist for evaluation. A Data Usability Summary Report (DUSR) will be prepared. The DUSR will provide a determination of whether or not the data meets the project specific criteria for data quality and data use. DUSR guidelines are included as Exhibit 8-1.

8.2. Construction quality assurance

This Section has been prepared as a means of providing guidelines and procedures for Construction Quality Assurance (CQA) during implementation of the remedy. It is the responsibility of the site developer to prepare and implement a CQA Plan.

The CQA Plan should, at a minimum, contain the following:

- Responsibilities of each entity associated with the project. This should include a delineation of the appropriate lines of communication between, the contractor, developer, and inspection and design personnel associated with the construction activities.

- Qualifications, level of experience, and training required for the contractor, crew and inspectors in sufficient detail to determine personnel permitted to be involved with the project.

- A description of construction quality assurance/construction quality control (CQA/CQC) protocols to be used for documenting construction activities and compliance with remedial objectives set forth in this RAWP. Detailed information including the frequency of inspections, field testing methods, sampling requirements for laboratory testing, testing procedures and equipment to be utilized, criteria for acceptance/failure, and a description of the corrective actions to be initiated upon test failure should be presented.

- Outline testing parameters, procedures, and criteria of construction procedures to be utilized during the redevelopment activities. These will include, but may not be limited to, areas of excavation, soil management, backfill source and quality, cover thickness and composition, vegetation matrix, asphalt, and concrete.

9. Operation, monitoring & maintenance work plan

An Operation, Monitoring & Maintenance (OM&M) Work Plan has been prepared for the former Hanna Furnace Site – the Former Manufacturing Area (Subparcel 2; the Site) and is included as Appendix 9-1 of this RAWP. As part of the VCA, the institutional and physical components that comprise the completed voluntary cleanup must be maintained. This OM&M Work Plan describes the conditions and procedures for maintaining the physical components of the completed voluntary cleanup, and as an appendix to this RAWP, it shall be an enforceable part of the VCA.

The Owner of the Site (or any portion thereof) should evaluate the criteria presented in this plan and should recommend changes to the NYSDEC, as appropriate, based on the actual post-closure site conditions. At a minimum, this plan should be reviewed annually during the post-closure period and updated as necessary.

10. Notification and reporting

The following minimum notification and reporting requirements shall be followed by the property owner prior to and following site development, as appropriate:

- Prior to initiation of the remedial action, the developer will submit a SWPPP for NYSDEC approval.
- The NYSDEC will be notified that subgrade activities are being initiated a minimum of three working days in advance of construction.
- If buried drums or underground storage tanks are encountered during soil excavation activities, excavation will cease and the NYSDEC will be immediately notified.
- A construction certification report stamped by a New York State licensed Professional Engineer, will be prepared and submitted to the NYSDEC and NYSDOH within 90 days after development of each subparcel. At a minimum, the report will include:
  - An area map showing the subparcel that was developed and the property's tax map number.
  - A topographic map of the developed property showing actual building locations and dimensions, roads, parking areas, utility locations, berms, fences, property lines, sidewalks, green areas, contours and other pertinent improvements and features. The topographic map will be stamped by a New York State licensed surveyor.
  - Plans showing areas and depth of fill removal.
  - Copies of daily inspection reports for soil-related issues.
  - Description of erosion control measures.
  - A text narrative describing the excavation activities performed, health and safety monitoring performed (both site specified and Community Air Monitoring), quantities and locations of soil/fill excavated, disposal locations for the soil/fill, soil sampling locations and results, a description of any problems encountered, location and acceptability test results for backfill sources, and other pertinent information necessary to document that the site activities were carried out properly.

- Plans showing before and after survey elevations on a 100-foot grid system to document the thickness of the clean soil cover system.

- A certification that all work was performed in conformance with the Remedial Action Work Plan.

- Excavation, grading or disturbance of the final vegetated soil cover or existing subgrade soil/fill. A minimum of three working days notice will be provided to NYSDEC.

Applications must be submitted to the appropriate parties prior to the following activities:

- If construction water is to be discharged to the on-site sanitary sewer, a Buffalo Sewer Authority discharge permit will be obtained.

- If an alternative source of cover system material is used (i.e., residuals that are presently stored at the ECWA Sturgeon Point WTP) a BUD application addendum to the BUD application for Subparcel 1 will be prepared for Subparcel 2.

Notification contacts are as follows:

Mr. David Locey/Mr. Martin Doster, P.E.
Project Engineer
Division of Environmental Remediation
NYSDEC – Region 9
270 Michigan Avenue
Buffalo, New York 14203
(716) 851-7220

Mr. Jamie Malcolm, P.E.
Environmental Engineer
NYSDEC
625 Broadway
Albany, New York 12233

Mr. Mathew J. Forcucci
NY State Dept. of Health
584 Delaware Ave.
Buffalo, New York 14202
(716) 847-4501

11. Citizen participation

In accordance with NYSDEC's guidance for Voluntary Cleanup Agreements, a Citizen Participation Plan has been included in the Remedial Action Work Plan as Appendix 11-1.

References

ABB Environmental Services. *Preliminary Site Assessment.* November 1995.

Ecology and Environment, Inc. *Environmental Site Assessment.* May 1997.

Engineering Science. *Phase I Investigation.* January 1986.

Erie County Department of Environmental Protection. *Inactive Site Profile Report.* April 1982.

Malcolm Pirnie, Inc. *Characterization of the Former Railroad Yard.* October 1999.

Malcolm Pirnie, Inc. *Supplemental Investigation Report.* May 2000.

Malcolm Pirnie. *Hanna Furnace Site – Former Railroad Yard Qualitative Human Health and Ecological Risk Assessment.* May 2000.

Malcolm Pirnie. *Remedial Action Work Plan, Hanna Furnace Site – Former Railyard Area (Subparcel 1).* February 2002.

NYSDEC. *Inactive Hazardous Waste Disposal Site Report.* 1983.

NYSDEC. STARS Memo #1. *Petroleum-Contaminated Soil Guidance Policy.* August 1992.

NYSDEC. STARS Memo #2. *Biocell and Biopile Designs for Small-Scale Petroleum-Contaminated Soil Projects.* May 1996.

O'Brien & Gere. *Site Investigation Report, Hanna Furnace – Parcel 2 Buffalo New York.* November 2002.

Recra Environmental. *Site Characterization and Environmental Assessment.* August 1988.

Rupley, Bahler and Burke. *Solid Waste Management Facility Report.* 1979.

United States Geological Survey. *Draft Report of Preliminary Evaluation of Chemical Migration to the Niagara River from Hazardous Disposal Sites in Erie and Niagara Counties.* 1983.

Union Ship Canal Zoning Plan. February 2001.

Table 5-1

Hanna Furnace - SubParcel 2
Buffalo, NY

Site Specific Action Levels

Parameter	Highest Value At Parcel 2 Surface Soil	Highest Value At Parcel 2 Subsurf Soil	Soil Cleanup Guidelines	Eastern U.S. Background Range	Site Specific Action Levels
Total VOCs (ppm)					
Total VOCs	0.278 (3)	0.777 (5)	NA		**10**
SVOC (ppm)					
Total SVOCs	**2,772**	63.92	500		**500**
Pesticides/PCBs (ppm)					
Total Pesticides	No Data	No Data			**10**
Total PCBs (surface to 1 ft)	0.443		1		**1**
Total PCBs (greater than 1 ft)		0.031	10		**10**
Metals (ppm)					
Aluminum	33500	66500	SB	33000	
Antimony	51.5	48.2	SB	NA	
Arsenic	29.3	59.8	7.5 or SB		**50**
Barium	381	722	300 or SB		**500**
Beryllium	6.7	12.5	0.16 or SB	0-1.75	
Cadmium	10.8	7.5	(10)		**20**
Calcium	205000	266000	SB	130-35000	
Chromium	416	88.8	(50)		**200**
Cobalt	10.2	9.9	30 or SB	2.5-60	
Copper	4310	1530	25 or SB	1-50	
Iron	163000	189000	2000 or SB	2000-550000	
Lead	1480	1890	(1000)		**1000**
Magnesium	44100	37500	SB	100-5000	
Manganese	6670	4560	SB	50-5000	
Mercury	4.4	0.54	0.1		**1**
Nickel	56.6	21.5	13 or SB	0.5-25	
Potassium	3380	5280	SB	8500-43000	
Selenium	12.4	41.9	2 or SB		**50**
Silver	5.3	2.7	SB		**1000**
Sodium	1300	1400	SB	6000-8000	
Thallium	10.9	12.2	SB	NA	
Vanadium	67.5	98.5	150 or SB	1-300	
Zinc	1460	982	20 or SB	9-50	
Cyanide	1.5	32.3	NA	NA	**50**

NOTES:

Bold - Site-specific action levles (SSALs)
NC - No Criteria Established
NA - Not Available
NO - Naturally occurring compound.
SB - Site Background

Soil cleanup guidelines and Eastern U.S. background ranges were obtained from NYSDEC TAGM #4046 (1/24/94). Value in parentheses are NYSDEC revised values for non-residential sites but have not yet been incorporated into TAGM #4046.

Table 5-2. *Potential SCGs*

POTENTIAL CHEMICAL-SPECIFIC SCGs			
MEDIUM	CITATION	REQUIREMENTS	COMMENT
Soil	TAGM No. HWR-94-4046, December 2000.	Provides recommended soil cleanup objectives.	Potentially applicable to site soil.
Surface Water Ground Water	6 NYCRR Parts 700 – 706 Water Quality Regulations for Surface Waters and Ground Water	Provides surface water quality standards for Class C waters	Potentially applicable to storm water and ground water discharges to the ground surface.
Surface Water Ground Water	T.O.G.S 1.1.1 Ambient Water Quality Standards and Guidance Values	Provides surface water quality guidance values and effluent limitations.	Potentially applicable to storm water and ground water discharges to the ground surface.
POTENTIAL LOCATION-SPECIFIC SCGs			
LOCATION	CITATION	REQUIREMENTS	COMMENTS
New York State Coastline	19 NYCRR Part 600/601 – New York State Coastal Management Program	Presents New York State policies regarding its coastline, including policies regarding development.	Potentially applicable. Will be addressed as part of the Generic Environmental Impact Statement for the Hanna Furnace Site.
Class C Surface Water	6 NYCRR Part 701.8 - Ambient Water Quality Standards and Guidance Values	States that the best usage of Class C surface water is for fish propagation and survival, ad primary and secondary contact recreation.	Potentially applicable. Construction water may be discharged to the ground surface.
Stream or River	Fish and Wildlife Coordination Act	Action to protect fish or wildlife during diversion, channeling or other activity that modifies a stream or river.	Not applicable. No stream or river diversion.
Wetlands	6 NYCRR Part 663 – Freshwater Wetlands Permit Requirements	Actions occurring in a designated freshwater wetland (within 100 ft) must be approved by NYSDEC or its designee. Activities occurring adjacent to freshwater wetlands must: • be compatible with preservation, protection, and conservation of wetland and benefits • result in no more than insubstantial degradation to, or loss of, any part of the wetland • be compatible with public health/welfare.	Not applicable. No wetland areas within 100 feet of Subparcel 2.
Wetlands	Clean Water Act Section 404 and 33 CFR Part 330 – Nationwide Permit Program	Permit required for discharge of fill material in wetland. Nationwide permit exists for hazardous and toxic waste cleanup.	Not applicable. No fill material will be placed in wetland.
Wetlands	Executive Order 11990 – Protection of Wetlands	Requires consideration of factors relevant to project's effects on survival and quality of wetlands.	Not applicable. Wetlands are not anticipated to be impacted by the redevelopment.
Wetlands	401 Water Quality Certification (33 U.S.C. 1314)	Requires, as a condition of federal permit approvals, state certification that the federal permit issued under Section 404 meets state water quality standards. Includes all wetlands that may be affected by a federally permitted activity.	Not applicable. Wetlands are not anticipated to be impacted by redevelopment.

Table 5-2. *Potential SCGs*

POTENTIAL ACTION-SPECIFIC SCGs			
ACTION	CITATION	REQUIREMENTS	COMMENTS
Excavation, grading and soil cover	40 CFR Part 50 – National Air Quality Standards	Site air quality during earth moving activities must meet the National Ambient Air Quality Standard (NAAQS) for particulate matter (150 $\mu g/m^3$ 24-hour average concentration).	Potentially applicable federal air quality standard.
Excavation, grading, and soil cover	NYSDEC TAGM HWR-89-4031 – Fugitive Dust Suppression and Particulate Monitoring Program at Inactive Hazardous Waste Sites	Provides guidance regarding dust monitoring, suppression, and action levels during earth moving activities.	Potentially applicable during redevelopment activities.
Soil/Fill Characterization	6 NYCRR Part 371 – Identification and Listing of Hazardous Wastes	Provides requirements for characterization of hazardous waste.	Potentially applicable for soil/fill material excavated during redevelopment activities.
Cover material	6 NYCRR Part 360 – 1.15, Beneficial Use	Presents requirements for beneficial use of relocated soils.	Potentially applicable for use of residuals from the ECWAs Sturgeon Point WTP as a cover material.
Remediation of NAPL area	STARS Memo #1 – Petroleum-Contaminated Soil Guidance Policy	Provides direction on the handling, disposal and/or reuse of non-hazardous petroleum-contaminated soils.	Potentially applicable for NAPL-contaminated soils at Subparcel 2.
Remediation of NAPL area	STARS Memo #2 – Biocell and Biopile Designs for Small-Scale Petroleum-Contaminated Soil Projects	Provides a generic design approach for small-scale petroleum-contaminated soil projects.	Potentially applicable for NAPL-contaminated soil at Subparcel 2.
Landfill Disposal	6 NYCRR Part 376 – Land Disposal Restrictions	Hazardous waste must meet land disposal treatment requirements prior to disposal.	Potentially applicable for soil/fill material excavated during redevelopment activities.
Transportation	6 NYCRR Part 364 – Waste Transporter Permits	Hazardous waste transport must be conducted by a hauler permitted under 6 NYCRR Part 364.	Potentially applicable for transport of soil/fill material.
Transportation	49 CFR 172 – 174 and 177 – 179 – Department of Transportation Regulations	Hazardous waste transport to off-site disposal facilities must be conducted in accordance with applicable DOT requirements.	Potentially applicable for transport of soil/fill material.
Transportation of Hazardous Waste	40 CFR Part 262 – Standards Applicable to Generators of Hazardous Waste	If a hazardous waste is transported for off-site treatment, storage, or disposal, a manifest shall be prepared and distributed in accordance with 40 CFR 262.20 through 262.23.	Potentially applicable for soil/fill material excavated during redevelopment activities.
Construction	29 CFR Part 1910 – Occupational Safety and Health Standards and 29 CFR Part 1926 – Safety and Health Regulations for Construction	All construction activities must be conducted in accordance with applicable OSHA requirements.	Potentially applicable for during redevelopment activities.
Transportation and Off-Site Disposal	6 NYCRR Part 372 – Hazardous Waste Manifest System and Related Standards for Generators, Transporters, and Facilities	Hazardous waste generator and transportation requirements must be met when hazardous waste is generated for disposal. Generator requirements include obtaining an EPA Identification number and manifesting hazardous waste for disposal.	Potentially applicable for soil/fill material excavated during redevelopment activities.

Table 5-2. *Potential SCGs*

POTENTIAL ACTION-SPECIFIC SCGs			
ACTION	CITATION	REQUIREMENTS	COMMENTS
Construction storm water management	NYSDEC General permit for storm water discharges associated with industrial activity from construction activities. Pursuant to Article 17 Titles 7 and 8 and Article 70 of Environmental Conservation Law.	The regulation prohibits discharge of materials other than storm water and all discharges which contain a hazardous substance in excess of reportable quantities established by 40 CFR 117.3 of 40 CFR 302.4, unless a separate NPDES permit has been issued to regulate those discharges. A permit must be acquired if activities involve the disturbance of 5 acres or more. If the project is covered under the general permit, the following are required: • development and implementation of a storm water pollution prevention plan • development and implementation of a monitoring program • all records must be retained for a period of at least 3 years after construction is complete.	Potentially applicable for redevelopment activities.
Post-construction storm water discharge	6 NYCRR Part 750 through 758– State Pollutant Discharge Elimination Systems	These regulations provide requirements for the discharge of water to surface water bodies.	Potentially applicable for cover runoff following construction.

O'BRIEN & GERE ENGINEERS, INC.

Table 7-1

Union Ship Canal Parcel #2
Surface Soil Samples
Maximum and Minimum Detected Concentrations

Parameter	NYSDEC TAGM Values	Average Eastern U.S. Background Concentrations	# of Samples/ # of Detects	Minimum Detected Concentration	Maximum Detected Concentration
INORGANICS (mg/Kg)					
Aluminum	SB	33000	35/35	2010	33500
Antimony	SB	NC	35/15	1.1	51.5
Arsenic	7.5	5	35/32	1.3	29.3
Barium	300	290	35/35	20.9	381
Beryllium	0.16	0.6	35/35	0.077	6.7
Cadmium	10*	0.2	35/25	0.14	10.8
Calcium	SB	3400	35/35	1130	205000
Chromium	50*	33	35/35	1.9	416
Cobalt	30	5.9	35/35	0.46	10.2
Copper	25	13	35/35	1.9	4310
Cyanide	NC	NC	1/1	1.5	1.5
Iron	2000	14000	35/35	1800	163000
Lead	1000*	14	35/35	2.5	1480
Magnesium	SB	2300	35/35	647	44100
Manganese	SB	285	35/35	33.5	6670
Mercury	0.1	0.81	35/27	0.055	4.4
Nickel	13	12	35/35	1.1	56.6
Potassium	SB	12000	35/35	281	3380
Selenium	2	0.3	35/8	1.6	12.4
Silver	SB	NC	35/13	1.1	5.3
Sodium	SB	2500	35/35	113	1300
Thallium	SB	NC	35/8	1.5	10.9
Vanadium	150	43	35/18	0.3	67.5
Zinc	20	40	35/34	28.9	1460
POLYCHLORINATED BIPHENYLS (mg/Kg)					
Aroclor 1242	NC	NC	6/1	0.0995	0.0995
Aroclor 1254	NC	NC	6/3	0.0597	0.153
Aroclor 1260	NC	NC	6/6	0.0173	0.29
SEMIVOLATILE ORGANIC COMPOUNDS (mg/Kg)					
1,1'-Biphenyl	NC	NC	34/6	0.04	1.1
2-Methylnaphthalene	36.4	NC	34/24	0.04	5
4-Methylphenol	0.9	NC	34/1	0.045	0.045
Acenaphthene	50	NC	34/15	0.034	7.5
Acenaphthylene	41	NC	34/19	0.051	17
Acetophenone	NC	NC	34/11	0.034	1.5
Anthracene	50	NC	34/23	0.044	34
Benzo(a)anthracene	0.224**	NC	34/32	0.052	270
Benzaldehyde	NC	NC	34/1	0.048	0.048
Benzo(a)pyrene	0.061**	NC	34/33	0.034	240
Benzo(b)fluoranthene	0.224**	NC	34/34	0.055	270
Benzo(ghi)perylene	50	NC	34/29	0.039	75
Benzo(k)fluoranthene	0.224**	NC	34/34	0.039	330
Bis(2-ethylhexyl)phthalate	50	NC	34/21	0.048	2.9
Butyl benzyl phthalate	50	NC	34/1	0.14	0.14
Caprolactam	NC	NC	34/1	0.19	0.19
Carbazole	NC	NC	34/18	0.036	6.6
Chrysene	0.4**	NC	34/33	0.053	270
Di-n-butyl phthalate	8.1	NC	34/2	0.06	0.2
Dibenzo(a,h)anthracene	0.014**	NC	34/17	0.047	37
Dibenzofuran	6.2	NC	34/19	0.033	9.2
Fluoranthene	50	NC	34/33	0.084	460
Fluorene	50	NC	34/14	0.043	7.9
Indeno(1,2,3-cd)pyrene	3.2**	NC	34/32	0.036	110
N-Nitrosodiphenylamine	NC	NC	34/1	0.35	0.35
Naphthalene	13	NC	34/22	0.041	8.1
Phenanthrene	50	NC	34/33	0.034	170
Phenol	0.03	NC	34/4	0.085	1.2
Pyrene	50	NC	34/33	0.065	460

NOTES: * - 1 mg/Kg for surface soil, 10 mg/Kg for subsurface soil.
** - Indicates carcinogenic PAHs.
SB - site background.
NC - no criteria.

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Table 7-1

Union Ship Canal Parcel #2
Surface Soil Samples
Maximum and Minimum Detected Concentrations

Parameter	NYSDEC TAGM Values	Average Eastern U.S. Background Concentrations	# of Samples/ # of Detects	Minimum Detected Concentration	Maximum Detected Concentration
VOLATILE ORGANIC COMPOUNDS (mg/Kg)					
2-Butanone (MEK)	0.3	NC	3/2	0.027	0.04
Acetone	0.2	NC	3/3	0.04	0.14
Carbon disulfide	2.7	NC	3/3	0.002	0.016
Ethylbenzene	5.5	NC	3/1	0.009	0.009
Toluene	1.5	NC	3/2	0.001	0.024
Xylene (total)	1.2	NC	3/1	0.049	0.049

NOTES: * - 1 mg/Kg for surface soil, 10 mg/Kg for subsurface soil.
** - Indicates carcinogenic PAHs.
SB - site background.
NC - no criteria.

O'BRIEN & GERE ENGINEERS, INC.

Table 7-1

Union Ship Canal Parcel #2
Subsurface Soil Samples
Maximum and Minimum Detected Concentrations

Parameter	NYSDEC TAGM Values	Average Eastern U.S. Background Concentrations	# of Samples/ # of Detects	Minimum Detected Concentration	Maximum Detected Concentration
INORGANICS (mg/Kg)					
Aluminum	SB	33000	37/37	5030	66500
Antimony	SB	NC	37/10	0.96	123
Arsenic	7.5	5	37/31	2.3	59.8
Barium	300	290	37/37	45	722
Beryllium	0.16	0.6	37/37	0.3	12.5
Cadmium	10*	0.2	37/24	0.075	7.5
Calcium	SB	3400	37/37	22700	266000
Chromium	50*	33	37/37	2.6	88.8
Cobalt	30	5.9	37/37	0.8	15.7
Copper	25	13	37/29	3.9	2070
Cyanide	NC	NC	37/35	0.28	32.3
Iron	2000	14000	37/37	2810	280000
Lead	1000*	14	37/36	3.6	1890
Magnesium	SB	2300	37/37	3320	37500
Manganese	SB	285	37/37	324	4560
Mercury	0.1	0.81	37/15	0.023	1
Nickel	13	12	37/30	0.52	25.6
Potassium	SB	12000	37/37	703	5280
Selenium	2	0.3	37/19	2.1	41.9
Silver	SB	NC	37/8	0.11	2.7
Sodium	SB	2500	37/37	115	1400
Thallium	SB	NC	37/6	1.8	12.2
Vanadium	150	43	37/25	0.38	98.5
Zinc	20	40	37/29	25.3	1160
POLYCHLORINATED BIPHENYLS (mg/Kg)					
Aroclor 1260	NC	NC	5/2	0.0156	0.0306
SEMIVOLATILE ORGANIC COMPOUNDS (mg/Kg)					
1,1'-Biphenyl	NC	NC	16/1	0.57	0.57
2-Methylnaphthalene	36.4	NC	16/7	0.027	5.2
Acenaphthene	50	NC	16/2	0.015	0.9
Acenaphthylene	41	NC	16/3	0.067	3.3
Acetophenone	NC	NC	16/5	0.045	0.12
Anthracene	50	NC	16/4	0.04	1.9
Benzo(a)anthracene	0.224**	NC	16/11	0.015	7.3
Benzo(a)pyrene	0.061**	NC	16/9	0.015	6.6
Benzo(b)fluoranthene	0.224**	NC	16/11	0.015	7.2
Benzo(ghi)perylene	50	NC	16/8	0.01	1.6
Benzo(k)fluoranthene	0.224**	NC	16/9	0.015	5.3
Bis(2-ethylhexyl)phthalate	50	NC	16/12	0.017	2.6
Carbazole	NC	NC	16/2	0.014	0.52
Chrysene	0.4**	NC	16/13	0.017	7.3
Di-n-octyl phthalate	50	NC	16/7	0.017	2.8
Dibenzo(a,h)anthracene	0.014**	NC	16/3	0.026	0.97
Dibenzofuran	6.2	NC	16/4	0.014	0.75
Fluoranthene	50	NC	16/15	0.018	14
Fluorene	50	NC	16/2	0.019	1.3
Indeno(1,2,3-cd)pyrene	3.2**	NC	16/7	0.026	2.4
N-Nitrosodiphenylamine	NC	NC	16/1	0.026	0.026
Naphthalene	13	NC	16/6	0.017	0.98
Phenanthrene	50	NC	16/12	0.035	4.5
Pyrene	50	NC	16/14	0.029	5.3
VOLATILE ORGANIC COMPOUNDS (mg/Kg)					
1,1,2-Trichloroethane	NC	NC	5/1	0.002	0.002
4-Methyl-2-pentanone (MIBK)	1	NC	5/1	0.004	0.004
Acetone	0.2	NC	5/5	0.033	0.079
Benzene	0.06	NC	5/1	0.002	0.002
Bromoform	NC	NC	5/1	0.001	0.001
Carbon disulfide	2.7	NC	5/3	0.003	0.031
Ethylbenzene	5.5	NC	5/1	0.017	0.017

NOTES: * - 1 mg/Kg for surface soil, 10 mg/Kg for subsurface soil.
** - Indicates carcinogenic PAHs.
SB - site background.
NC - no criteria.

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Table 7-1

Union Ship Canal Parcel #2
Subsurface Soil Samples
Maximum and Minimum Detected Concentrations

Parameter	NYSDEC TAGM Values	Average Eastern U.S. Background Concentrations	# of Samples/ # of Detects	Minimum Detected Concentration	Maximum Detected Concentration
Methylcyclohexane	NC	NC	5/2	0.006	0.18
Tetrachloroethene	1.4	NC	5/1	0.42	0.42
Toluene	1.5	NC	5/3	0.002	0.005
Trichloroethene	0.7	NC	5/1	0.004	0.004
Xylene (total)	1.2	NC	5/2	0.003	0.081

NOTES: * - 1 mg/Kg for surface soil, 10 mg/Kg for subsurface soil.
** - Indicates carcinogenic PAHs.
SB - site background.
NC - no criteria.

O'BRIEN & GERE ENGINEERS, INC.

Table 7-1

Union Ship Canal Parcel #2
Ground Water Samples
Maximum and Minimum Detected Concentrations

Parameter	NY State Class GA Standards	Average Eastern U.S. Background Concentrations	# of Samples/ # of Detects	Minimum Detected Concentration	Maximum Detected Concentration
INORGANICS (ug/L)					
Aluminum	NC	NC	9/7	310	77100
Arsenic	25	NC	9/9	6.8	44.4
Barium	1000	NC	9/9	10.1	508
Beryllium	NC	NC	9/2	2.2	12.3
Cadmium	5	NC	9/2	4	15
Calcium	NC	NC	9/9	79900	473000
Chromium	50	NC	9/2	18.4	60.2
Cobalt	NC	NC	9/8	0.53	15.6
Copper	200	NC	9/3	63	2670
Cyanide	200	NC	7/7	6.6	628
Iron	300	NC	9/8	404	79600
Lead	25	NC	9/6	3.3	1080
Magnesium	NC	NC	9/7	1520	43800
Manganese	300	NC	9/8	5.4	5950
Mercury	0.7	NC	9/2	1.9	5.3
Nickel	100	NC	9/5	5.3	89.7
Potassium	NC	NC	9/9	12300	70300
Selenium	10	NC	9/4	7	10.8
Silver	50	NC	9/9	0.89	3.9
Sodium	20000	NC	9/9	17400	86100
Vanadium	NC	NC	9/4	1	3.7
Zinc	NC	NC	9/3	843	2300
SEMIVOLATILE ORGANIC COMPOUNDS (ug/L)					
1,1'-Biphenyl	5	NC	9/1	2	2
2-Methylnaphthalene	NC	NC	9/2	2	360
Benzo(a)anthracene	NC**	NC	9/1	1	1
Benzo(a)pyrene	NC**	NC	9/1	1	1
Benzo(b)fluoranthene	NC**	NC	9/1	1	1
Benzo(k)fluoranthene	NC**	NC	9/1	1	1
Bis(2-ethylhexyl)phthalate	5	NC	9/1	1	1
Chrysene	NC**	NC	9/1	3	3
Fluorene	NC	NC	9/1	38	38
Naphthalene	NC	NC	9/1	1	1
Phenanthrene	NC	NC	9/1	150	150
Pyrene	NC	NC	9/1	15	15

NOTES: ** - Indicates carcinogenic PAHs.
NC - no criteria.

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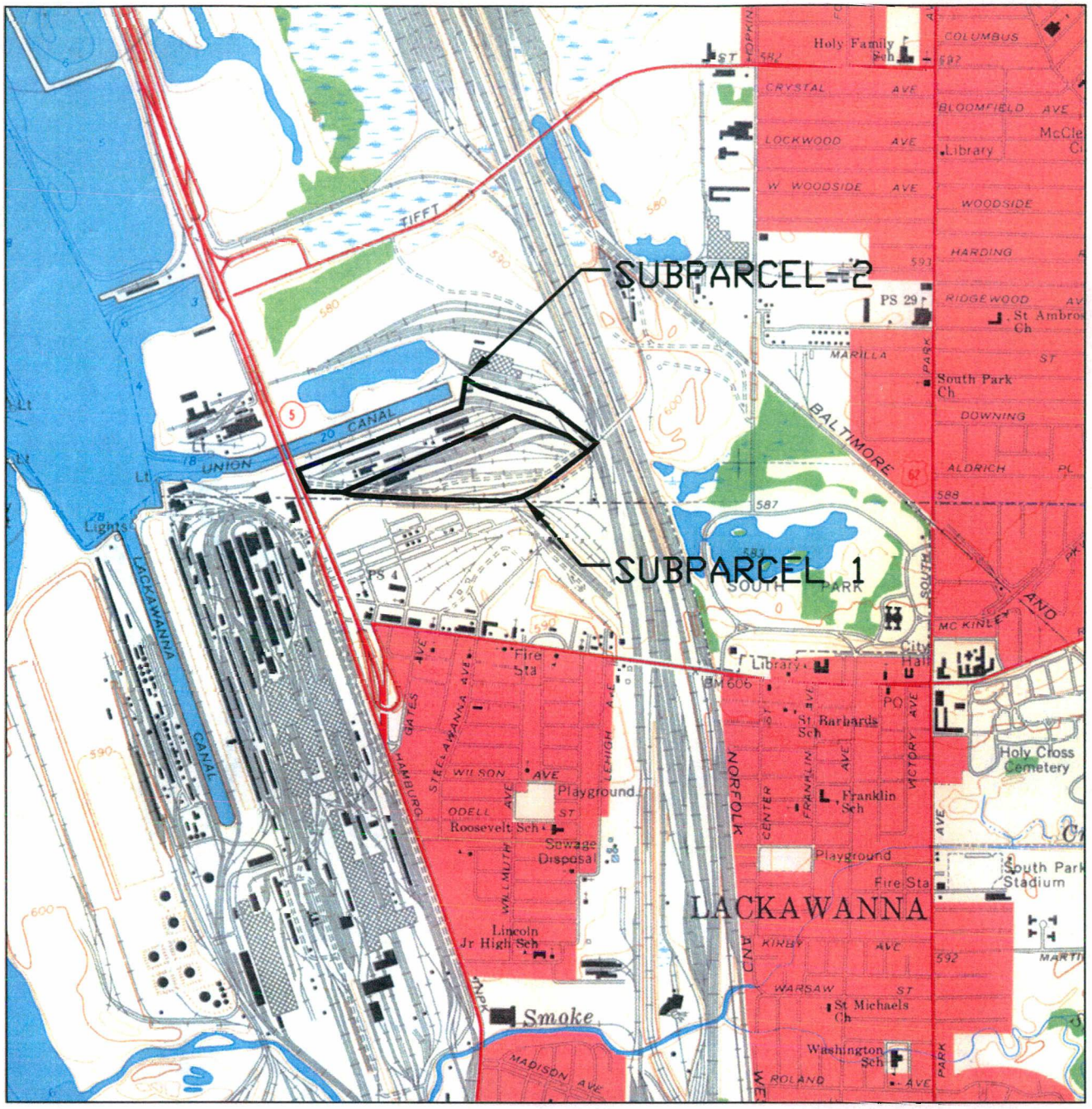
FIGURE 1–1



ADAPTED FROM: BUFFALO SE, NY USGS QUADRANGLE

HANNA FURNACE SITE–SUBPARCEL 2
REBUILD NOW–NEW YORK
EMPIRE STATE DEVELOPMENT

SITE LOCATION MAP

QUADRANGLE LOCATION

1 0 1/2 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 0 5 1 KILOMETER

FILE NO. 10569.25466
AUGUST 2002

APPROXIMATE SCALE: 1:24000

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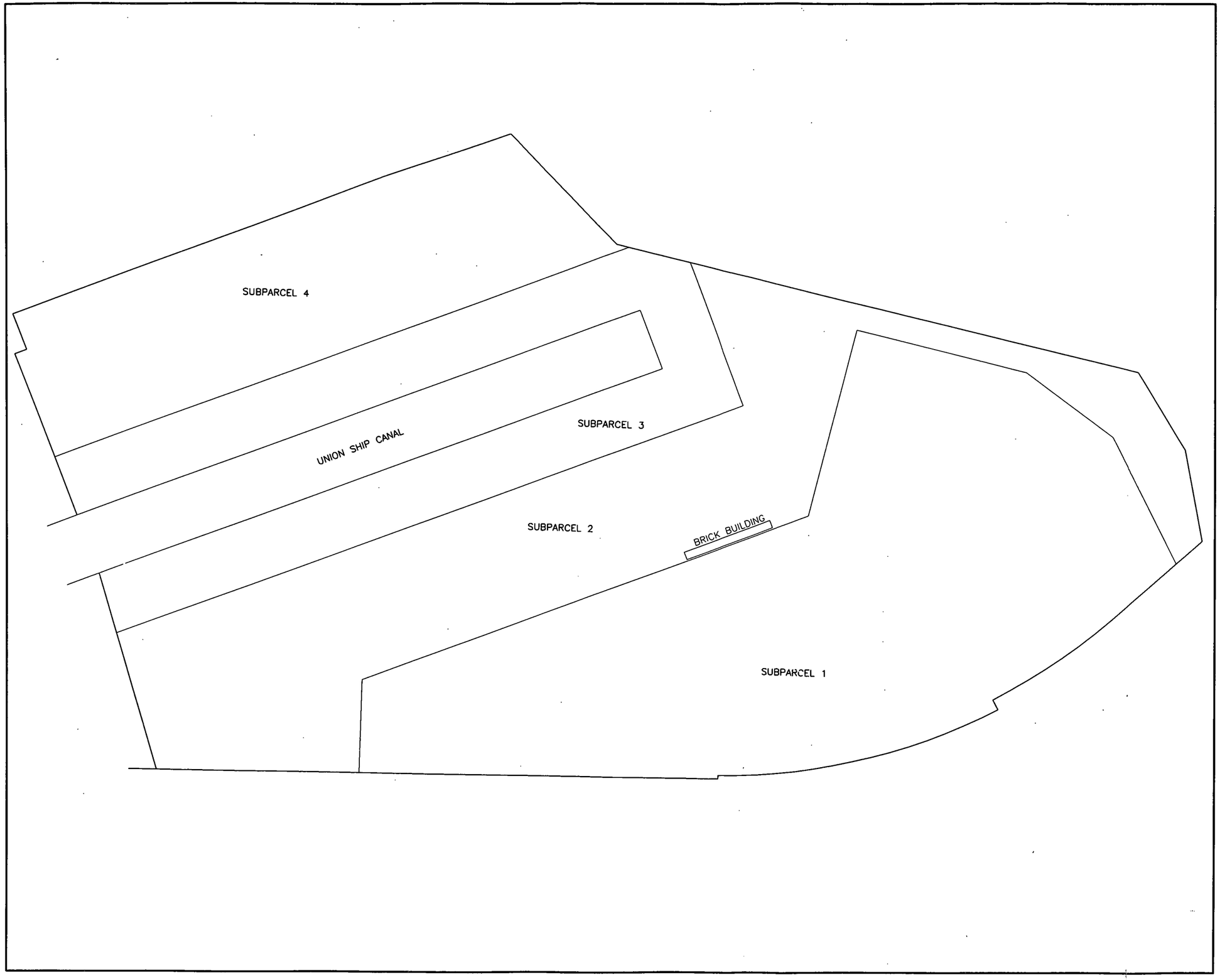
DWG PATH: I:\DIV23\PROJECTS\10569\25466\PHASE II\DWGS\C11.DWG

PLOT DATE: 8/8/02

FIGURE 1-2



HANNA FURNACE-SUBPARCEL
REBUILD NOW-NEW YORK
EMPIRE STATE DEVELOPMENT

SITE MAP

1"=300' 300 0 300

FILE NO. 10569.25466.012
AUGUST 2002

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PLOT DATE: 8/8/02

SS_EXCEED_P1SL.MXD

FIGURE 2-1

PARCEL 2

CONCRETE FOUNDATION WALL

SB-19

SB-16

SB-20

SB-18

SB-12

SB-17

SB-14

SB-10

1 STORY STEEL BUILDING

2 STORY BRICK BUILDING

1 STORY BRICK BUILDING (OIL SHACK)

1 STORY STEEL BUILDING

PARCEL 1

2 STORY BRICK BUILDING

LEGEND

ACTION LEVEL EXCEEDANCES

LEAD

CHROMIUM

MERCURY

HANNA FURNACE - PARCEL 2
REBUILD NOW - N.Y.
EMPIRE STATE DEVELOPMENT

N

W E

S

EXCEEDANCES IN SURFACE SOIL SAMPLES

JUNE 2002
10569.25466.001

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SB_EXCEED2PTSL.MXD

FIGURE 2-2

PARCEL 2

CONCRETE FOUNDATION WALL

SB-15

SB-70

SB-12

2 STORY BRICK BUILDING

1 STORY BRICK BUILDING (OIL SHACK)

1 STORY STEEL BUILDING

1 STORY STEEL BUILDING

PARCEL 1

2 STORY BRICK BUILDING

SB-03

SB-06

Legend

ACTION LEVEL EXCEEDANCES

BARIUM LEAD ARSENIC

HANNA FURNACE - PARCEL 2
REBUILD NOW - N.Y.
EMPIRE STATE DEVELOPMENT

N
W E
S

EXCEEDANCES IN SUBSURFACE SOIL SAMPLES

JUNE 2002
10569.25466.001

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SAMPLE_LOC_2-3.MXD

FIGURE 2-3

PARCEL 4

UNION SHIP CANAL

PARCEL 3

PARCEL 2

PARCEL 1

1 STORY STEEL BUILDING

CONCRETE FOUNDATION WALL

1 STORY BRICK BUILDING (OIL SHACK)

2 STORY BRICK BUILDING

SB-01 SB-02 SB-03 SB-04 SB-05 SB-06 SB-07 SB-08 SB-09 SB-10 SB-11 SB-12 SB-13 SB-14 SB-15 SB-16 SB-17 SB-18 SB-19 SB-20 SB-21 SB-22 SB-23 SB-24 SB-25 SB-26 SB-27 SB-28 SB-29 SB-30 SB-31 SB-32 SB-33 SB-34 SB-35 SB-36 SB-37 SB-38 SB-39 SB-40 SB-41 SB-42 SB-43 SB-44 SB-45 SB-46 SB-47 SB-48 SB-49 SB-50 SB-51 SB-52 SB-53 SB-54 SB-55 SB-56 SB-57 SB-58 SB-59 SB-60 SB-61 SB-62 SB-63 SB-64 SB-65 SB-66 SB-67 SB-68 SB-69 SB-70 SB-71

MW-003 MW-004 MW-005 MW-006 MW-007 MW-104 MW-105 MW-106 MW-107

TP-1 TP-2 TP-3 TP-4 TP-5 TP-6 TP-7 TP-8 TP-9 TP-10 TP-11 TP-12 TP-13 TP-14

Area A

Area B

Feet

0 25 50 100 150

Legend

TEST PIT

SAMPLE TYPE

MONITORING WELL

SOIL BORING

ELEVATED pH IN GROUNDWATER

APPROXIMATE LOCATION OF NAPL

HANNA FURNACE - SUB PARCEL 2
REBUILD NOW - N.Y.
EMPIRE STATE DEVELOPMENT

0 100 200 400 600 800 1,000

Feet

N W E S

AREAS OF CONCERN EXTENT OF NAPL AND ELEVATED pH IN GROUND WATER

AUGUST 2002
10569.25466.001

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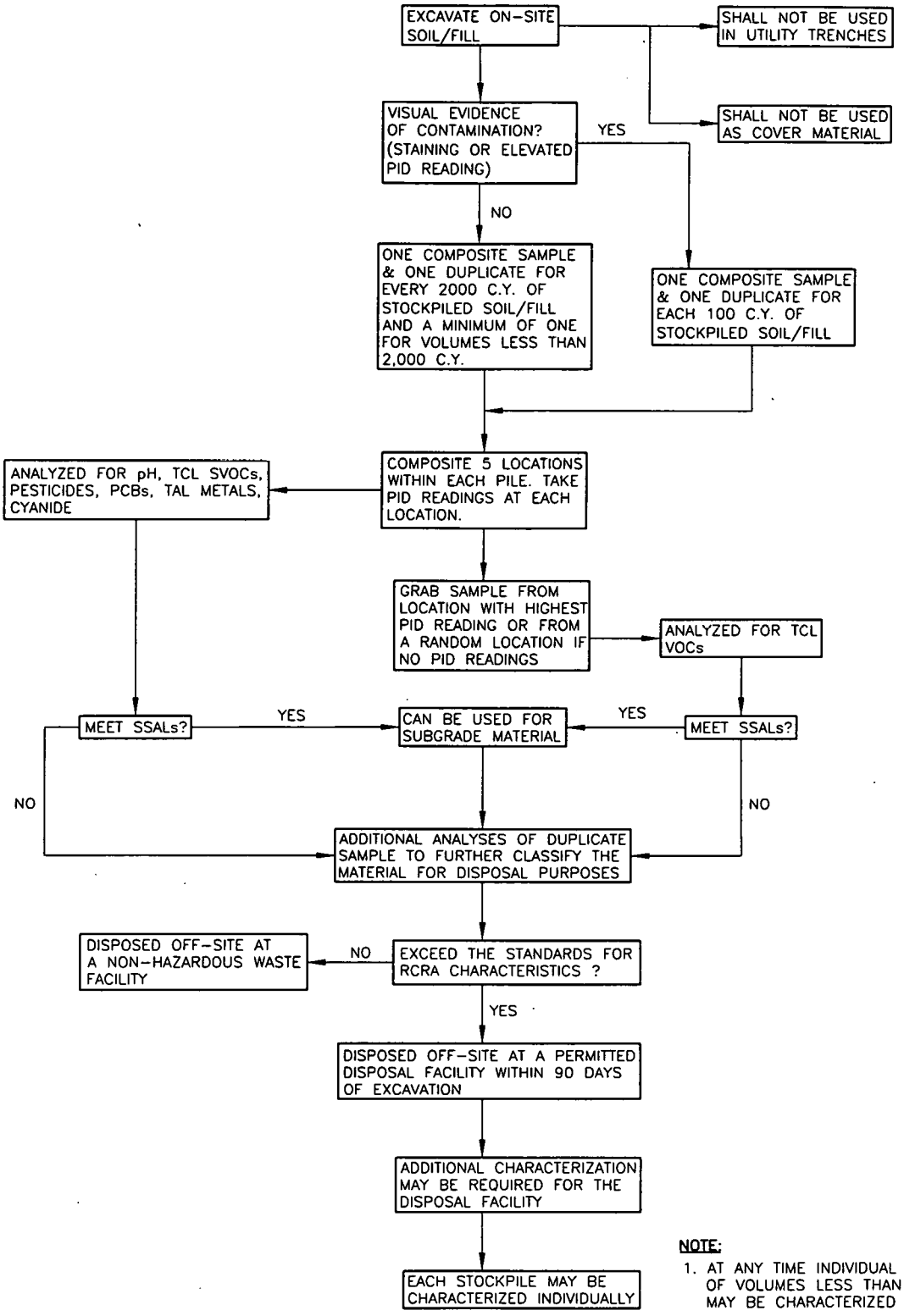
FIGURE 6-1



NOTE:

1. AT ANY TIME INDIVIDUAL STOCKPILES OF VOLUMES LESS THAN THOSE STATED MAY BE CHARACTERIZED INDIVIDUALLY.

HANNA FURNACE-SUBPARCEL 2
REBUILD NOW-NEW YORK
EMPIRE STATE DEVELOPMENT

SOIL CHARACTERIZATION FLOW CHART

10569.25466.008
AUGUST 2002

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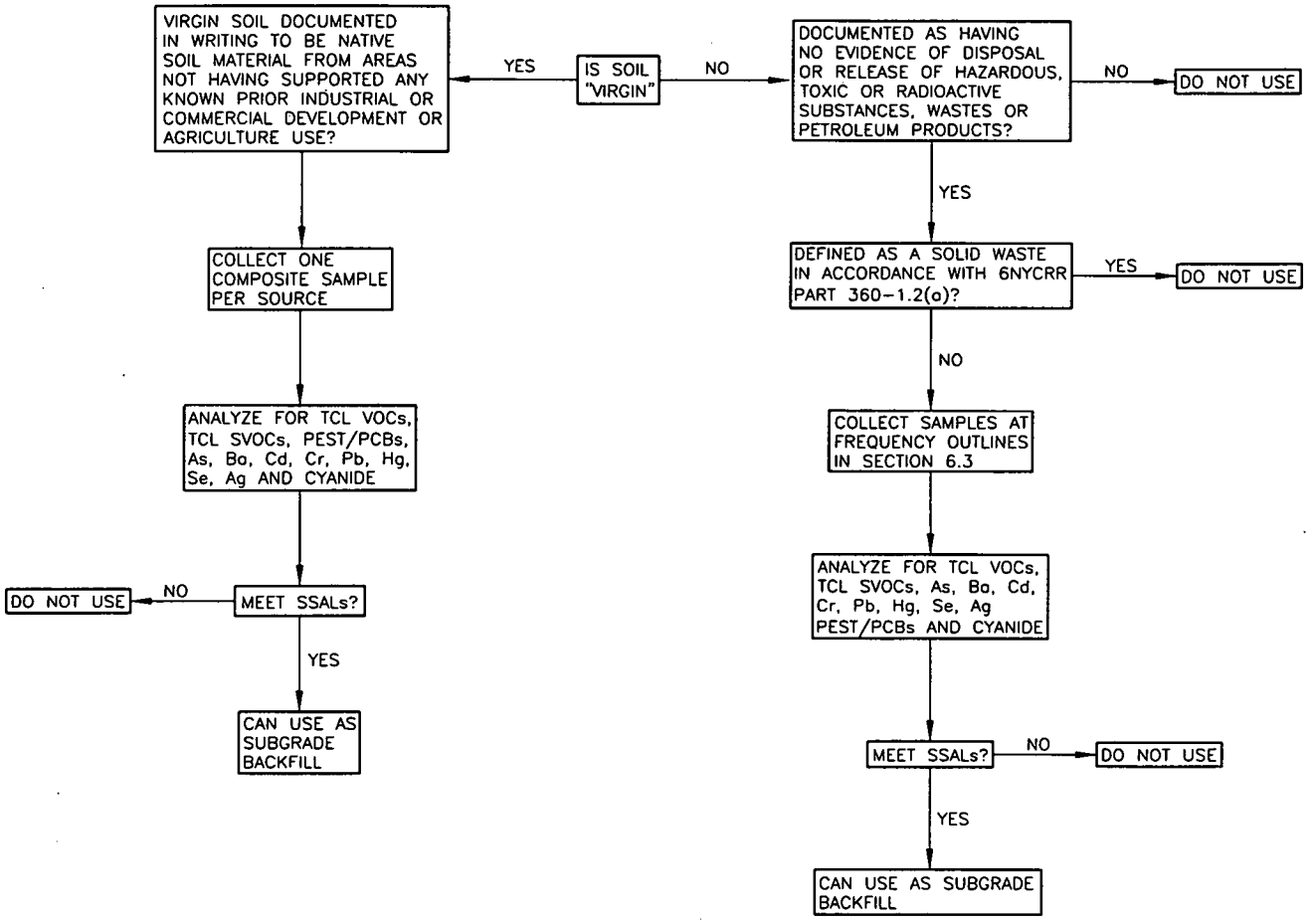
PLOT DATE: 8/6/02

FIGURE 6-2



NOTE:

1. AT ANY TIME INDIVIDUAL STOCKPILES OF VOLUMES LESS THAN THOSE STATED MAY BE CHARACTERIZED INDIVIDUALLY.

HANNA FURNACE-SUBPARCEL 2
REBUILD NOW-NEW YORK
EMPIRE STATE DEVELOPMENT

FLOW CHART FOR SUBGRADE BACKFILL USING OFFSITE SOURCES

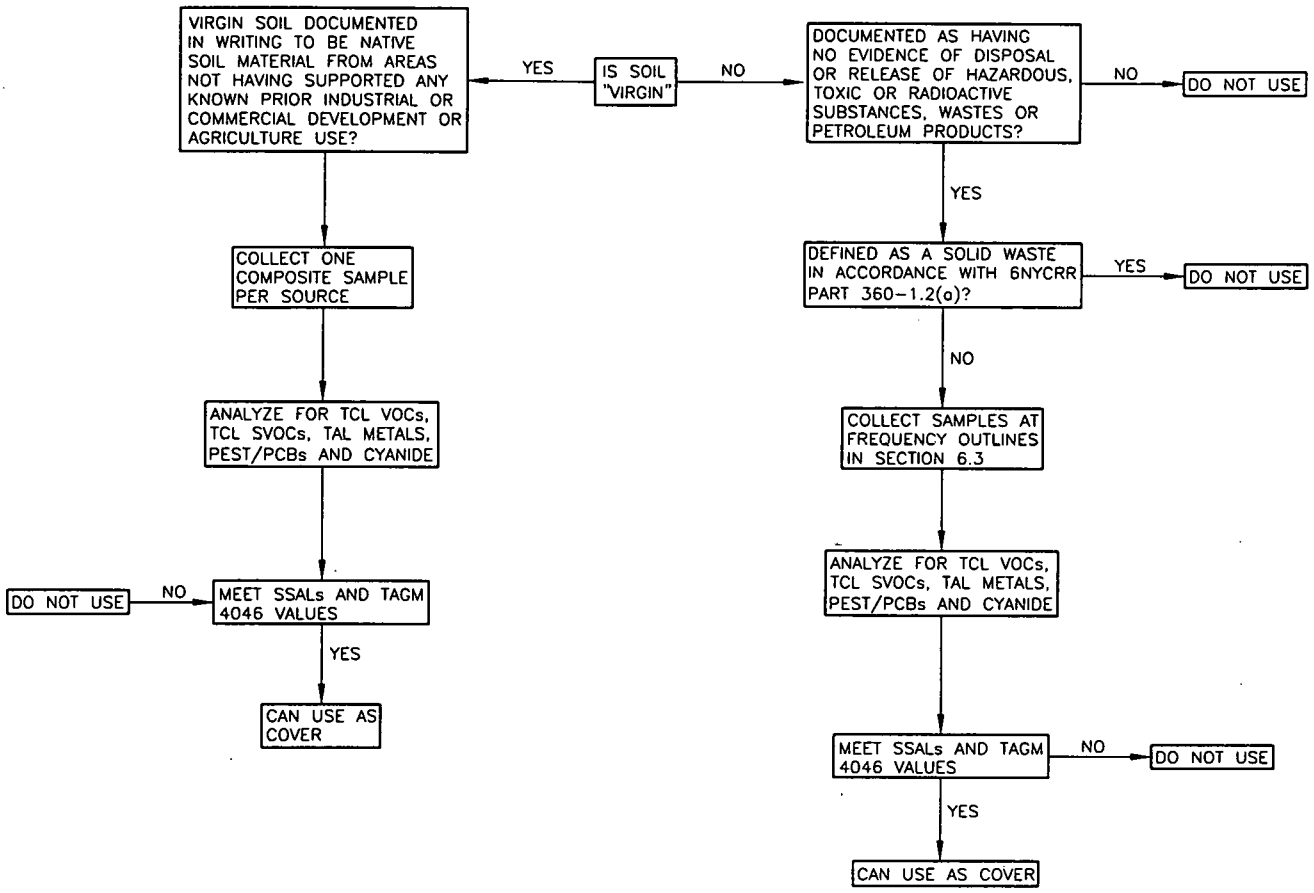
10569.25466.009
AUGUST 2002

O'BRIEN & GERE ENGINEERS INC.

DWG PATH: I:\DIV71\PROJECTS\10569\25466\DWGS\PHASE II\008.DWG

PLOT DATE: 8/6/02

FIGURE 6-3



NOTE:

1. AT ANY TIME INDIVIDUAL STOCKPILES OF VOLUMES LESS THAN THOSE STATED MAY BE CHARACTERIZED INDIVIDUALLY.

HANNA FURNACE-SUBPARCEL 2
REBUILD NOW-NEW YORK
EMPIRE STATE DEVELOPMENT

FLOW CHART FOR COVER SOIL USING OFFSITE SOURCES

10569.25466.010
AUGUST 2002

O'BRIEN & GERE ENGINEERS INC.

DWG PATH: I:\DIV82\PROJECTS\10569\25466\PHASE II\DWGS\008.DWG

PLOT DATE: 10/23/02

APPENDIX 8-1

Sampling and decontamination procedures

Sampling Procedure and Equipment Decontamination Procedures

Soil excavated at the site will generally be staged in piles ranging in size from 20 to 2000 cubic yard (cy). Samples will be collected and analyzed to characterize the soils to determine whether or not they can be reused at the site or need to be properly disposed at an off-site location.

The sampling methods employed will be one of the following: a hand auger; a standard 2-foot long, 2-inch outside diameter split-barrel sampler; lexan tubing; or similar equipment capable of reaching at least 3 ft below the surface of the pile. Once recovered, soil will be removed from the sampling device for examination and placement into a container for inspection and analysis.

Samples will be collected from five locations within one or multiple soil piles totaling the volume specified in the RAWP. The sampling interval should be at leAst 2 ft below the surface of the pile. A portion of one of the five individual samples will be submitted as a grab sample for VOC analysis. The five samples will be composited into one sample and submitted for the remaining analyses.

Soil sampling procedures

1. Identify the soil pile(s) designation and record the location information in the field log book or other record book.

2. Put on a new pair of disposable gloves.

3. At the designated sample location attempt to hand auger or drive a split barrel sampling, 2 to 3 ft below the surface of the pile. If an obstruction is encountered prior to reaching a depth of 2 ft, backfill the hole, move over several feet and attempt another hole. The sample should be collected from the interval no less than 2 ft below the surface of the pile and a 1-ft sample interval should be obtained from each location. For large piles consideration should be given to collecting samples from deeper intervals to obtain soil samples representative of the entire pile or piles for analysis.

4. Measure the length of soil sample retrieved, if applicable, and record result on the soil boring log.

5. Place one portion of the sample (grab sample) into a precleaned 4 oz. laboratory sample container for VOC analysis (as applicable), and a second portion into a glass container and cover with aluminum foil, or place into a Ziploc® bag and seal for PID headspace screening. The headspace sample will be allowed to attain ambient temperatures prior to screening with the PID equipped with a minimum 10.2 eV lamp. Results of the PID screening will be recorded with the location information.

6. Place the equal portions of the five soil samples into a stainless steel bowl, glass container or equivalent container. After the five grab samples have been added to the container, mix the soil together and place a portion in the appropriate laboratory sample jars for analyses as specified in the section entitled **Analysis and Laboratory Requirements** or the RAWP.

7. After the last sample has been collected, record the date and time. Place sample bottles to be analyzed by the laboratory in a cooler with ice.

8. Begin the chain-of-custody documentation. Ship the cooler to the laboratory for analysis within 48 hours of sample collection or as specified in the QAPP.

Decontamination of Sampling Equipment

Non-disposable sampling equipment that contacts the soil sample will be decontaminated between sample intervals. Decontamination procedures are designed to remove particles and compounds which could affect the integrity of samples and, thus, the interpretation of resulting analytical data.

Decontamination methods and materials are selected based upon the type of contamination and the decontamination method's ability to remove the contaminants. The following are the basic elements of the decontamination procedure:

- Equipment which has the potential to contact the environmental medium to be sampled should be washed with a detergent solution and rinsed with control water before it is used. Control water is clean water from a supply with a known chemical composition. Control water can be bottled distilled water or potable water.

- Whenever possible, field sampling should be initiated in that area of the site with the lowest known contamination and proceed to the area of highest known or suspected contamination.

The following is a step-by-step procedure for field equipment decontamination:

1. Using laboratory grade detergent (Alconox® or equivalent) and control water, remove visible particles and residuals by scrubbing with a brush. This step may be preceded, if needed, by a steam or high-pressure wash in order to facilitate residual removal.

2. Rinse the equipment thoroughly with control water to remove the detergents.

3. If warranted, wrap the sampling equipment with a clean inert material such as oil-free aluminum foil for transport to the sample collection area.

The decontamination process should be documented in the field log book or other sampling record.

Disposition of investigation-derived wastes (IDW)

Water generated during decontamination will be allowed to infiltrate the ground surface in the vicinity of the soil pile. Care should be taken to minimize the potential for the liquid to flow from the area.

Analysis and Laboratory Requirements

A NYSDOH ELAP certified laboratory shall be used to analyzed the soil samples. The required analyses are:

- Target compound List (TCL) Volatile organic Compounds (VOCs) by New York State Department of Environmental Conservation (NYSDEC) Analytical Services Protocol (ASP) 95-1

- TCL Semivolatile Organic Compounds (SVOCs) by NYSDEC ASP 95-2
- TCL Pesticides and polychlorinated benzenes (PCBs) by NYSDEC ASP 95-3
- Target Analyte List (TAL) metals and cyanide by NYSDEC ASP
- pH by SW-846 Method 9045

If contaminants are present at concentrations above the SSALs, additional analysis will be required by the disposal facility and will likely include:

- Toxicity Leaching Characteristic Procedure (TCLP)
- RCRA Characteristics (Ignitability, Corrosivity, and Reactivity)
- Additional analyses as required by the disposal facility.

Pile Sampling Requirements

Requirements for sampling piles based upon size and potential contamination are provided in the following table:

Frequency	*Samples*	*Duplicate samples*	*Minimum Total Samples*
Contaminated Soil (based on PID/visual)			
100 cy	1 composite* 1 grab	1 composite 1 grab	2 composite 2 grab
Non-contaminated Soil (based on PID/visual)			
<2000 cy	1 composite* 1 grab	1 composite 1 grab	2 composite 2 grab
>2000 cy	1 composite* 1 grab	1 composite 1 grab	2 composite 2 grab

Notes: Additional composite and grab sample (duplicates) will only be analyzed in the event that the results of the initial analyses indicate that offsite disposal is needed.
* - composite samples consist of five grab samples homogenized together

APPENDIX 9-1

Operation, Monitoring & Maintenance Work Plan

Work Plan

Operation, Monitoring & Maintenance Work Plan Hanna Furnace Site: Subparcel 2 Buffalo, New York

New York State Department of Environmental Conservation
ReBuild Now - New York

November 2002

O'BRIEN & GERE
ENGINEERS, INC.

Contents

1. Operation and maintenance plan work plan

Prior to initiation of OM&M activities, the Owner shall prepare and submit appropriate organizational documents to the NYSDEC for review and approval. The organizational documents shall include:

- An organizational chart outlining the responsible party's personnel (with qualifications) who will be responsible for implementing the post-closure operation, maintenance and monitoring program.
- A health and safety plan.
- Example inspection report forms.
- A schedule for the annual inspections and reporting.

1.1. Inspection procedures

The physical components of the cover system shall be inspected annually by a representative of the Owner (or its delegated agent) qualified to carry out such inspections. The inspection will be coordinated with facility personnel at least one week prior to ensure that most, if not all, of the paved areas will be accessible for inspection. Indoors, in office spaces with floor coverings, the inspection should at minimum make note of areas with settled or uneven surfaces, seepage or flooding. Arrangements to repair those areas that the inspector requires to be maintained, if any, will be initiated as may be required by the inspector.

The annual inspection shall include, but not be limited to, inspection of: security and access; cover condition; evidence of sloughing, erosion, ponding, or settlement; unintended traffic/rutting; and distressed vegetation; cracks in soil or pavement; erosion of stormwater swales; and site photographs. These inspection reports, which shall include a map that shows areas of damage or required maintenance, shall be kept on file by the Owner. If the inspections reveal that maintenance is necessary, then the Owner shall notify the NYSDEC, and arrange to complete the repairs. The NYSDEC shall be informed by Owner when repairs are complete.

1.2. Final cover system condition

The final cover system shall be observed by traversing the cover on foot and making appropriate observations, notes and photographic records as necessary, for inclusion with the report. It is anticipated that some maintenance activities will be necessary during the closure period. The following characteristics shall be noted during the observation of the cover system, fencing and signs, and erosion control features:

- Sloughing
- Cracks
- Settlement (depression and puddles)
- Erosion features
- Distressed vegetation/turf
- Damaged fencing, gates and signs.

The following sections describe actions that should be taken to address the conditions described above. Maintenance and repairs that are typically necessary during the closure period are also described.

1.2.1. Sloughing

Sloughing of the soil cover may occur. Areas where sloughing has occurred shall be repaired. Cover soil shall be placed in accordance with the requirements of the Section 6.4.

1.2.2. Cracks

The locations of any cracks in the soil, asphalt or concrete cover should be noted on an inspection log and site map, including width, length and depth of the crack. The inspector will assess the appropriate maintenance procedure. Small willow cracks in the soil cover can be repaired by minor re-grading of the cracked area and re-seeding the area. Larger cracks that appear to extend into the fill material shall be filled with soil similar to that used for construction of the cover soil layer prior to re-seeding, in accordance with Section 6.4. Repairs to the asphalt and/or concrete will be completed when and in the fashion deemed necessary by the inspector.

1.2.3. Settlement

Settlement features such as depressions or areas of ponding water shall be re-graded by placing additional soil cover so that surface water drains in the appropriate direction. Previous investigations approximately defined a portion of the Site where the pH of the groundwater was found to be elevated, as depicted on Figure 2-3. Ponded water within this approximate area shall be examined for elevated pH prior to any regrading activity and if necessary, contained and disposed in accordance with the RAWP.

1.2.4. Erosion features

Erosion features shall be repaired by backfilling to the original grade with soil and re-seeding. Torn or displaced synthetic erosion control fabric in storm water channels shall be repaired or replaced as directed by the inspector.

1.2.5. Distressed vegetation

Areas of distressed vegetation shall be re-seeded and a starter fertilizer applied. Large-root growth may also compromise the integrity of the soil cover and shall be discouraged with regular mowing. Reasonable efforts shall be taken to avoid damage to the vegetation from traffic and other unintended uses.

1.2.6. Fencing and access control

To the best of owner's ability, physical discontinuities in fence material shall be repaired; fence posts and foundations that show evidence of structural weakness shall be repaired or replaced as necessary; gates and locks shall be maintained to deter unauthorized entry; warning signs shall be kept secured in place; and trees shall be trimmed to ensure the signs are visible.

1.3. Inspection reporting

The Owner shall submit annual inspection reports to the NYSDEC. If the inspection indicates that corrective action is required, a follow up inspection will be performed after the repairs have been completed. If the inspector determines that correction action is required, a Corrective Action Form will be included with the inspection report, confirming that the repairs were completed, and in accordance with the Remedial Action Work Plan.

Any analytical data that may be gathered during the course of the inspection or corrective action shall also be included with the inspection report and submitted to the NYSDEC, within 21 days of the inspection. The inspection reports will be submitted by the Site Owner with an attached Annual Certification form, signed and notarized by the Site Owner, certifying that the specified engineering and institutional controls are in place and functioning.

APPENDIX 11-1

Citizen Participation Plan

Report

Citizen Participation Plan
Hanna Furnace Site: Subparcel 2
Buffalo, New York

New York State Department of
Environmental Conservation
ReBuild Now - New York

November 2002

O'BRIEN & GERE
ENGINEERS, INC.

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1. Introduction

This document is a site-specific Citizen Participation Plan (CPP) for voluntary cleanup activities at the Former Manufacturing Area (Subparcel 2; the Site) of the Hanna Furnace Site located in Buffalo, New York (Figure 1-1). The Site is identified as a Class 2A site on the New York State Registry of Inactive Hazardous Waste Disposal Sites. A Class 2A designation means that the Site was a potential hazardous waste site but that insufficient data were available to properly characterize potential issues at the Site.

New York State Department of Environmental Conservation (NYSDEC) is committed to a citizen participation program as a part of its responsibilities for the inactive hazardous waste site remedial program. Citizen participation promotes public understanding of NYSDEC's responsibilities, planning activities, and remedial activities at inactive hazardous waste disposal sites. It provides an opportunity for NYSDEC to learn from the public, information that will enable NYSDEC to develop a comprehensive remedial program that is protective of both public health and the environment.

2. Site background

2.1. Site setting

The Hanna Furnace property is a vacant industrial property currently owned by the City of Buffalo and located at the southern edge of the City of Buffalo in Erie County (Figure 1-1). The Hanna Furnace property surrounds the eastern portion of the Union Ship Canal, and encompasses approximately 113 acres, including the Former Manufacturing Area. The location of the Hanna Furnace property is shown on Figure 1-1. The Hanna Furnace property has been characterized during several previous investigations. Based on the findings of those investigations together with the size of the property, its historic use, and the City's current developmental needs and plans, the Hanna Furnace property has been subdivided into four subparcels for future developmental considerations. The Former Railroad Yard has been designated Subparcel 1. Subparcel 2 comprises the Former Manufacturing Area. Subparcel 3 consists of an area surrounding the Union Ship Canal 200-feet wide on each side. Subparcel 4 includes the Former Filter Cake/Flue Ash Disposal Area located to the north of the Union Ship Canal. These subparcels are shown on Figure 1-2. These subparcels will be considered separately during future environmental investigatory and remedial activities, as well as during redevelopment activities at the property. This CPP has been created specifically for the 32-acre Former Manufacturing Area (Subparcel 2; the Site).

An application for the voluntary cleanup of the Former Manufacturing Area will be submitted to NYSDEC. The voluntary cleanup will allow for the future redevelopment of the Former Manufacturing Area for commercial and industrial purposes. The current proposed transitional development plan for the Site includes lower profile, flex-type product in closest proximity to the canal and high-bay distributors/light manufacturing buildings on the outer perimeter of the Site. The estimated average land coverage is 25 percent.

2.2. Site history

Subparcel 2 consists of a 32-acre portion of the Hanna Furnace property located at the southern edge of the City of Buffalo in Erie County (Figure 1-1). This portion of the property was once the main manufacturing area. Structures formerly located on this subparcel included several production buildings, four blast furnaces, and various support structures. The Hanna

Furnace property is bordered to the west by New York State Route 5, to the south by the Lackawanna Commerce Park, to the east by railroad tracks, and to the north by wetland areas, and the former Shenango Steel property.

The Buffalo Union Steel Corporation purchased the manufacturing area in 1900. The Union Ship Canal was constructed near the northern edge of the Buffalo Union Steel property in 1910 to service the facility. Pig iron manufacturing commenced during the period of 1900 to 1915 with the construction of blast furnaces. Following the construction of the blast furnaces, the Hanna Furnace Company acquired the property from Buffalo Union Steel. The National Steel Company subsequently purchased the property in 1929, and the corporate entity became know as the Hanna Furnace Corporation.

Iron ore, lime, coke and other raw materials were received vie the canal, and were stockpiled along the northern and southern edges of the canal. Additionally, the pig iron manufactured at the site was transported to customers via the network of railroads at and near the Hanna Furnace property.

The Hanna Furnace Corporation ceased all operations in 1982 due to foreign competition and to the closure of the Shenango Furnace Company, a primary recipient of pig iron from the Hanna Furnace Corporation.

The Jordan Foster Scrap Corporation purchased the Hanna Furnace property in 1983 and subsequently dismantled many of the buildings. The Jordan Foster Scrap Corporation filed for bankruptcy during 1986, and leased the Hanna Furnace property briefly to the Equity Scrap Processing Company. In 1998, the City of Buffalo gained title to the Hanna Furnace property due to nonpayment of taxes. The Hanna Furnace property has been essentially unoccupied and unsecured since 1986.

Demolition of structures at the Site is being completed in two phases. Phase I was completed in late April 2002 and involved the demolition of the on-site structures with the exception of the blast furnaces. Some of the brick and concrete from the building demolition was used to fill below-grade foundations. The bulk of this material was crushed and recycled for off-site uses. The second phase of the program will include demolition of the blast furnaces and removal of any foundations that extend above grade. Following removal of the structures, hydroseeding will be used to vegetate the area.

2.3. Environmental issues identified at the site

Based on data obtained from the July/August 2001 investigation performed by ERM, and data collected from the Site during previously investigations, a Site Investigation Report was developed by O'Brien &

Gere Engineers, Inc. Conclusions from the Site Investigation Report are summarized below.

PAHs were found in soil across the Site. However, the concentrations are well below the SSALs (Table 5-1) with the exception of one location, which is considered to be localized. The ground water samples contained fewer PAH compounds at lower concentrations. This is to be expected, as the mobility of PAHs in the environment is relatively low due to relatively low water solubilities and relatively low organic carbon partition coefficients.

In the case of metals, constituents that were detected at concentrations that exceeded the SSALs at eight surface soil and five subsurface soil sample locations. Figures 2-1 and 2-2 depict exceedances in surface soil and subsurface soil, respectively.

Each of the ground water samples collected from the monitoring wells and test pits contained TAL metals above Class GA ground water standards. Iron and sodium concentrations were above the Class GA standards in most of the wells. In addition the following inorganics were detected at concentrations exceeding Class GA ground water standards in at least one of the monitoring wells: arsenic (1 sample), cyanide (2 samples), lead (2 samples), and manganese (1 sample). Most of these exceedances were less than twice the ground water standards with the exception of manganese in MW-003 and cyanide in MW-004 which were more than twice the Class GA standard. Although the latter two concentrations are elevated, they are localized to these two wells and are likely due to constituents in the soil/fill material in those areas.

Ground water samples from two test pits were analyzed for TAL metals. Each of the ground water samples collected from test pits contained TAL metals above Class GA ground water standards. TAL metals in the ground water samples collected from the test pits that exceeded Class GA ground water standards included arsenic (1 sample), cadmium (1 sample), chromium (1 sample), copper (2 samples), iron (2 samples), lead (2 samples), manganese (2 samples), mercury (2 samples), selenium (1 sample), and sodium (2 samples). The ground water samples collected from the test pits were more turbid than the samples collected from the monitoring wells, which likely accounts for the greater concentration of metal constituents detected in the test pit ground water samples. By definition, ground water samples that have high turbidity contain suspended aquifer materials, which in turn contain metal constituents. As required by the analytical procedures, ground water samples are preserved with nitric acid. In ground water samples with elevated turbidity, the preservation causes metal constituents from the aquifer materials to solubilize into the water. Ground water samples for metals analyses that have high turbidity are not considered representative of those metal constituents that migrate with the ground water system.

During the purging and sampling of the monitoring wells during the most 2001 ERM investigation of the Site, pH measurements were recorded for ground water. The data indicated elevated pH above the Class GA

ground water standards (6.5 – 8.5 SU) in three monitoring wells in the western portion of Subparcel 2 that ranged from 10.99 to 11.79. Two monitoring wells in the western portion of Subparcel 1 also had elevated pH that ranged from 9.5 to 11.3. The pH in monitoring wells outside of the elevated pH area ranged between 6.95 to 7.69. The area of elevated pH is shown on Figure 2-3.

Borings, wells, and test pits were completed during the field program to assess the nature and extent of the NAPL. The analytical results did not reveal the presence of elevated concentrations of petroleum-related constituents. However, staining and odors were noted in the soil and a sheen was observed on the water table in the areas shown on Figure 2-3. A fingerprint analysis of the soil sample from test pit TP-07 was performed by Zymax Forensics. The fingerprint analysis indicated that the NAPL is likely asphalt or a mixture of diesel and asphalt. It should be noted that no measurable free product was observed in the monitoring wells or within the open test pits. As shown on Figure 2-3, the NAPL area north of the 2-story brick building appears to be contiguous extending from beneath the eastern end of the foundation northward. The thickness of impacted soil is greatest in the area beneath the building, extending to as much as 8 feet below grade. The areal extent of these soils is approximately 2,225 square feet. The outermost edges of the staining appear to be limited to the 2-foot interval surrounding the water table. The area of the NAPL-impacted soils in this outer area is approximately 3,025 square feet. Using these dimensions, the total estimated volume of petroleum-impacted soil is 23, 850 cubic feet (883 cubic yards).

Two separate areas with petroleum-impacted soil have been identified in the vicinity of the former oil shack. Area A is the larger of the two areas and extends northwest from under the eastern edge of the building. The depth of the impacted soil column is greatest, 8 feet, at SB-53, which is located on the southeastern corner of the building. In SB-59, impacted soils were observed between 1 to 4 feet below grade. At TP-13, a sheen was noted on the water table, which was located at approximately 5 feet below grade. The extent of this area is approximately 1, 700 square feet. Using an average thickness of 4 feet, the volume of impacted soil is estimated to be approximately 6, 800 cubic feet (250 cubic yards).

Area B is located east of the former oil shack foundation footprint. This area was identified by one boring, SB-60. The depth of impacted soil extends from the surface to approximately 5.5 feet below grade. This distribution and isolated occurrence suggests that the impacted soils in Area B are the result of a surface spill. An estimated volume of 6.911 cubic feet (255 cubic yards) of impacted soil was calculated using a radius of approximately 20 feet around the boring and a thickness of 5.5 feet below grade.

The 2001 ERM investigation, as well as previous investigations, indicate that of the existing contaminants detected in soil and ground water within the Site, SVOCs (PAHs in particular), and metals were the most prevalent. VOCs and PCBs were sporadically detected and when

encountered, were detected at concentrations below SSALs, as discussed in Section 5.2.1, and regulatory soil and ground water standards or guidance. As described above, an area of elevated pH in ground water and areas of NAPL-impacted soils were also encountered.

After completion of this Remedial Action Work Plan, the site would be remediated to a level that is protective of public health and the environment for the Contemplated Use of the property (i.e. restricted industrial/commercial uses excluding day care, child care, and medical care). The following factors establish the basis behind this conclusion.

A. The data obtained from the Site show no significant impacts to groundwater. No connection was observed between the conditions present in the soil and the quality of groundwater. The sole exception to this statement is the site-wide pH issue that will be monitored both in groundwater and in the Union Ship Canal.

B. The proposed cover system will break any human health exposure pathway under the Contemplated Use. Any area not included as a parking lot or building will be included in the proposed covered area.

C. The soil impacted with petroleum and NAPL will be excavated and either removed from the Site for treatment and disposal or treated on-site.

Based on the above information and understanding of the Site, the environmental conditions for the Former Railroad Yard are similar to the Former Manufacturing Area (with the exception of the areas of NAPL-impacted soil). Furthermore, the two subparcels are located adjacent to each other, therefore conclusions presented in the May 2000 Qualitative Human Health and Ecological Risk Assessments (Malcolm Pirnie, 2000) for the Former Railroad Yard Area are appropriate for the Former Manufacturing Area.

3. Project description

3.1. Voluntary cleanup objective

The future use of the Hanna Furnace property - Former Manufacturing Area is presented in Chapter 3 of the Voluntary Cleanup Program Remedial Action Work Plan. The proposed cleanup has been designed to be protective of human health and the environment by covering the soil and fill material at the Site with asphalt, concrete, or clean soil. Because VOCs were not detected in the samples collected in the Former Manufacturing Area, the primary exposure pathway for contaminants at the Site (metals and PAHs) is via direct contact. The proposed plan of covering the on-site fill material will eliminate the potential for direct contact with soil and is therefore protective of human health and the environment.

3.2. Voluntary cleanup activities

In order to eliminate potential exposure risks associated with direct contact with site fill material, the entire Former Manufacturing Area will be covered as part of Site redevelopment. The cover system will be placed directly on top of the regraded on-site fill material and will include clean soil for outdoor, vegetated areas, asphalt for roads and parking lots, or concrete for sidewalks, buildings and heavy use areas. Surface coverage over the entire redeveloped subparcel will be required by the Site owner or developer as a pre-condition of occupancy. NAPL-impacted soil will also be removed prior to development and will be removed no later than December 31, 2002. The Site cover system will be maintained in accordance with the Operation, Maintenance, and Monitoring (OM&M) Work Plan and the Voluntary Cleanup Agreement.

During invasive redevelopment activities such as the construction of buried utilities, fill material will be excavated in accordance with Chapter 6 of the Remedial Action Work Plan. It is expected that the material excavated will contain concentrations of contaminants similar to those encountered during investigations previously conducted at the Site. However, due to the nature of subsurface investigations, it is possible that localized zones of more significant contamination may be encountered. To define areas of soil/fill that will require additional cleanup, SSALs have been established for soil/fill at the Site. The SSALs are specific concentration limits for the parameters of concern that, when

exceeded, trigger the need for remediation. The list of SSALs for the Site is presented in Table 3-1.

During excavation activities at the Site, the soil/fill will be inspected for staining and will be field screened for the presence of VOCs with a photoionization detector (PID). Excavated soil/fill that is visibly stained or produces elevated PID readings (i.e., sustained 10 ppm or greater) will be considered potentially contaminated and stockpiled on the Hanna Furnace property for further assessment. The potentially contaminated soil will be stockpiled on polyethylene sheeting and then sampled for reuse, treatment or disposal. The stockpiled potentially contaminated soil will also be completely covered using polyethylene sheeting to reduce the infiltration of precipitation and the entrainment of dust. Soil/fill containing one or more constituents in excess of the SSALs will be transported off-site to a permitted waste management facility. Any analytes that do not have a corresponding SSAL and are detected at concentrations above the soil cleanup guidelines (TAGM 4046) will be transported off-site to a permitted waste disposal facility unless otherwise agreed by the NYSDEC. Soil/fill awaiting analytical results or awaiting transportation will be stored on-site under polyethylene sheeting.

Excavated or disturbed soil/fill, which exhibits no staining or elevated PID readings, and has been analyzed and found to meet SSALs, may be used as subgrade or excavation subgrade backfill. All excavations or disturbances must be backfilled as soon as the work allows.

Protection of the off-site community, which includes surrounding residents and businesses as well as potential future commercial and public users of the Site during the redevelopment period, will be addressed through a Community Air Monitoring Program (included as Section 7.2 of the Remedial Action Work Plan) and a Remedy Implementation plan (included as Chapter 6 of the Remedial Action Work Plan). The Community Air Monitoring Program establishes specific requirements for air monitoring and procedures to mitigate off-site migration of airborne particulates and vapors during the remediation and redevelopment periods. The Remedy Implementation Plan provides requirements for handling of soils/fill excavated during redevelopment (i.e., for foundation and subsurface utilities) and for placement of final, clean vegetated cover material or paving over exposed soil/fill in all redeveloped areas of the Site.

3.3. Project schedule

Due to the nature of commercial and industrial Site development, the specific schedule for the Site redevelopment activities, including the remedial actions, is not known. However, it is anticipated that the former manufacturing area will be completely redeveloped within 10 years of the execution of the Voluntary Cleanup Agreement.

4. Project contacts

For more information about this project, please contact the following persons:

Environmental Concerns

Mr. David Locey/Mr. Martin Doster, P.E.
Project Engineer
Division of Environmental Remediation
NYSDEC – Region 9
270 Michigan Avenue
Buffalo, New York 14203
(716) 851-7220

Mr. Jamie Malcolm, P.E.
Environmental Engineer
NYSDEC
625 Broadway
Albany, New York 12233

Health Related Concerns

Mr. Mathew J. Forcucci
NY State Dept. of Health
584 Delaware Ave.
Buffalo, New York 14202
(716) 847-4501

Citizen Participation

Mr. Michael Podd
NYSDEC
270 Michigan Avenue
Buffalo, NY 14203
(716) 851-7220

5. Public mailing list

The mailing list is used to provide information to area residents, elected officials, media and other interested parties who want to be kept informed about the Hanna Furnace – Former Manufacturing Area Site. A copy of the list is presented in Appendix A. If you would like to request your name to be added to the list, please contact Michael Podd, Citizen Participation Specialist in the NYSDEC Region 9 office at (716) 851-7220.

6. Identification of document repositories

Documents related to the Hanna Furnace property Former Manufacturing Area Voluntary Cleanup will be available for public review at the locations listed below. As additional documents are created during the remediation process, they will be added to the repositories.

Buffalo & Erie County Public Library
JP Dudley Branch
2010 So. Park Avenue
Buffalo, New York 14220
(716) 823-1854

Hours of Operation:	M/F/Sat:	10am – 6pm
	T/Th:	12pm – 8pm
	W:	Closed
	Sun:	1pm-5pm

NYSDEC
Region 9 Offices
270 Michigan Avenue
Buffalo, New York 14203
(716)851-7220
Contact: Mr. Martin Doster, P.E. Project Engineer

Hours of Operation:	Mon-F,	8:30am-4:45pm
	(by appointment only)	

7. Description of specific citizen participation activities

NYSDEC and NYSDOH are committed to keeping the public informed and involved throughout the process of investigating and remediating this Site. At a minimum, the Citizen Participation Activities will include:

At least 30 days prior to NYSDEC approval of the voluntary cleanup Agreement, A Voluntary Cleanup Agreement Application Fact Sheet will be sent to addressees of the Mailing List.

After construction is completed, an End of Construction Subparcel 2 Fact Sheet will be sent to addressees of the Mailing List.

At any time, the mailing may be updated.

At any time, the public is encouraged to contact the officials listed in Chapter 4 of the CPP to express any concerns or questions they may have regarding this project.

8. Glossary of key terms and major program elements

This glossary defines terms associated with New York's hazardous waste site citizen participation program, and important elements of the hazardous waste site remedial program. Words in **bold** in the definitions are defined elsewhere in the glossary. A list of acronyms often used in the remedial program is presented at the end of this section.

Administrative Record
Part of a site's **Record of Decision** that lists and defines documents used in the development of NYSDEC's decision about selection of a remedial action.

Availability Session
A scheduled gathering of program staff and members of the public in a casual setting, without a formal presentation or agenda but usually focusing on a specific aspect of a site's remedial process

Citizen Participation
A program of planning and activities to encourage communication among people affected by or interested in hazardous waste sites and the government agencies responsible for investigating and remediating them.

Citizen Participation (CP) Record
A document prepared at a major remedial stage that describes the citizen participation activities required at that stage. A CP Record also directs a scoping process to determine if additional citizen participation activities are appropriate and feasible.

Citizen Participation Specialist
A staff member from a NYSDEC central office or regional office who has specialized training and experience to assist a **project manager** and other staff to plan, conduct and evaluate a site-specific citizen participation program.

Classification
A process to place a hazardous waste site within a category which defines its hazardous waste status and its threat or potential threat to public health and the environment. Sites are listed along with their classification in the **Registry of Inactive Hazardous Waste Disposal Sites**.

- **Class 1** – causing or representing an imminent danger of causing irreversible or irreparable damage to public health or environment – immediate action required.

- **Class 2** – significant threat to public health or environment – action required.
- **Class 2a** – temporary classification assigned to a site for which there is inadequate or insufficient data for inclusions in any other classification.
- **Class 3** – does not present a significant threat to public health or environment – action may be deferred.
- **Class 4** – site properly closed – requires continued management.
- **Class 5** – site properly closed – no further action required.
- **Delisted** – site no longer considered an inactive hazardous waste disposal site.

Comment Period
A time period for the public to review and comment about various documents and **Division of Environmental Remediation (DER)** actions. For example, a 30-day comment period is provided when DER issues a **Proposed Remedial Action Plan (PRAP)**, and when DER proposes to **delist** a site from the **Registry of Inactive Hazardous Waste Disposal Sites.**

Consent Order
A legal and enforceable agreement negotiated between NYSDEC and a **responsible party**. The order sets forth agreed upon terms by which a responsible party will undertake site investigation and/or cleanup, or pay for the costs of those activities. The order includes a description of the remedial actions to be taken by the responsible party with NYSDEC oversight, and a schedule for implementation.

Contact List
Names, addresses and/or telephone numbers of individuals, groups, organizations, government officials and media affected by or interested in a particular hazardous waste site. The size of a contact list and the categories included are influenced by population density, degree of interest in a site, the stage of the remedial process and other factors. It is an important tool needed to conduct outreach activities.

Delist
Action by which DER removes a hazardous waste site from the **Registry of Inactive Hazardous Waste Disposal Sites** upon determination that: the site contains inconsequential amounts of hazardous wastes; or that a remediated site no longer requires **Operation and Maintenance.** A proposal to delist a site triggers a public notification and **comment period** process.

Division of Environmental Enforcement (DEE)
A unit within NYSDEC that works with the **Division of Environmental Remediation** and others to negotiate with **responsible parties** to achieve agreements for the investigation and remediation of hazardous waste sites. A negotiated agreement is contained in a **consent order**.

Division of Environmental Remediation (DER)
Formerly the **Division of Hazardous Waste Remediation**, a major program unit within NYSDEC created to manage the hazardous waste site remedial program from site discovery through **Operation and Maintenance** activities. Staff include: engineers, geologists, chemists, attorneys, citizen participation specialists, environmental program specialists and support staff.

Division of Hazardous Waste Remediation
(See **Division of Environmental Remediation**.)

Document Repository
A file of documents pertaining to a site's remedial and citizen participation programs which is made available for public review. The file generally is maintained in a public building near the hazardous waste site to provide access at times and a location convenient to the public.

Enforcement
NYSDEC's effort, through legal action if necessary, to compel a **responsible party** to perform or pay for site remedial activities. NYSDEC may perform this effort by itself or in concert with other agencies.

Environmental Quality Bond Act (EQBA)
The 1986 Environmental Quality Bond Act which gives New York State bonding authority of up to $1.2 billion to fund the State's share of the total cost of remediating hazardous waste sites in New York State.

Fact Sheet
A written discussion about part or all of a site's remedial process, prepared and provided by DER to the public. A fact sheet may focus on: a particular element of the site's remedial program; opportunities for public involvement; availability of a report or other information, or announcement of a **public meeting** or **comment period**. A fact sheet may be mailed to all or part of a site's **contact list**, distributed at meetings, placed in a **document repository** and/or sent on an "as requested" basis.

Interim Remedial Measure (IRM)
A discrete action which can be conducted at a site relatively quickly to reduce the risk to people's health and the environment from a well-defined hazardous waste problem. Examples of IRMs include removing contaminated soil and drums, providing alternative water supplies or securing a site to prevent access.

National Priorities List
The U.S. Environmental Protection Agency's list of the most serious uncontrolled or abandoned hazardous waste sites identified for possible long-term remedial response using money from a special trust fund.

New York State Department of Health
Agency within the executive branch of New York State government which: performs health-related inspections at suspected hazardous waste sites; conducts health assessments to determine potential risk from environmental exposure; reviews Risk Assessments prepared during the **Remedial Investigation and Feasibility Study**; conducts health-related community outreach around sites; and review remedial actions to assure that public health concerns are adequately addressed.

New York State Department of Law
Agency within the executive branch of New York State government that takes the lead on hazardous waste sites requiring civil enforcement through court action. Litigation can involve negotiations and court action with **responsible parties** to clean up sites; natural resource damage claims, and recovery of remedial costs.

New York State Registry of Inactive Hazardous Waste Disposal Sites
The "Registry." A document that NYSDEC is directed by law to maintain and that lists and provides information about every hazardous waste site in New York State that meets criteria established through a definition of hazardous waste and **classification** system.

Operable Unit
A discrete part of an entire site that produces a release, threat of release, or pathway of exposure. An Operable Unit can receive specific investigation, and a particular remedy may be proposed. A **Record of Decision** is prepared for each Operable Unit.

Operation and Maintenance
A period in which remedial action may be conducted following construction at a site (for example, operation of a "pump and treat" system), or which is performed after a remedial action to assure its continued effectiveness and protection of people's health and the environment. Activities can include site inspections, well monitoring and other sampling.

Preliminary Site Assessment (PSA)
A PSA is DER's first investigation of a site. A PSA is performed to determine if a site meets New York State's definition of an inactive hazardous waste disposal site by confirming the presence of hazardous waste and determining if the site poses a significant threat to public health or the environment.

Project Manager
An NYSDEC staff member within the DER (usually an engineer, geologist or hydrogeologist) responsible for the day-to-day administration of remedial activities at, and ultimate disposition of, a hazardous waste site. The Project Manager works with legal, health, **citizen participation** and other staff to accomplish site-related goals and objectives.

Proposed Remedial Action Plan (PRAP)
An analysis by DER of each alternative considered for the remediation of a hazardous waste site and a rationale for selection of the alternative it recommends. The PRAP is created based on information developed during the site's **Remedial Investigation and Feasibility Study**. The PRAP is reviewed by the public and other state agencies.

Public Meeting
A scheduled gathering of DER staff with the affected/interested public to give and receive information, ask questions and discuss concerns about a site's remedial program. Staff from other NYSDEC divisions, legal and health staff, and staff from consultants and a responsible party often also attend. A public meeting, unlike an **availability session**, generally features a formal presentation and a detailed agenda.

Reclassification
A process by which DER redefines the threat posed by a hazardous waste site to public health and the environment by developing and assessing site information and, based on findings and conclusions, assigning a new **classification** code.

Record of Decision (ROD)
A document that provides definitive record of the cleanup alternative that will be used to remediate a hazardous waste site. The ROD is based on information and analyses developed during the **Remedial Investigation/Feasibility Study** and the public comment.

Remedial Alternatives Report (RAR)
A report that contains an evaluation of options for the remediation of any contamination in, on, or under, or emanating from, a property that includes an analysis of data and other information concerning the nature and extent of that property's contamination and is generally performed concurrently, and in an interactive fashion, with the site investigation.

Remedial Construction
The physical development, assembly and implementation of the remedial alternative selected to remediate a site. Construction follows the **Remedial Design** stage of a site's remedial program.

Remedial Design
The process following finalization of a **Record of Decision** in which plans and specifications are developed for the **Remedial Construction** of the alternative selected to remediate a site.

Remedial Investigation/Feasibility Study (RI/FS)
The RI fully defines and characterizes the type and extent of hazardous waste contamination at the site. The FS, which may be conducted during or after the RI, uses information developed during the RI to develop alternative remedial actions to eliminate or reduce the threat of hazardous waste contamination to public health and the environment.

Responsible Party
An individual or business who: currently owns or operates a hazardous waste site; or historically owned or operated a site when hazardous waste was disposed; or generated hazardous waste at a site; or transported hazardous waste to a site.

Responsiveness Summary
A written summary of major oral and written comments received by DER during a **comment period** about key elements of a site's remedial program, such as a **Proposed Remedial Action Plan**, and DER's response to those comments.

Site Investigation (SI)
A process undertaken to determine the nature and extent of contamination in, on, and under, and emanating from a property. The **SI** includes the gathering of sufficient information to determine the necessity for, and the selection of the appropriate method of, remediation of contamination in, on, or under, or emanating from a property.

Site Issues And Community Profile Scoping Sheet
A document prepared to support each **Citizen Participation Record**. Each Scoping Sheet identifies issues and information important to DER and the community and information that needs to be exchanged at a particular remedial stage. The Scoping Sheet also summarizes information about the surrounding community, including demographics, special needs, etc.

Superfund
The common name for the Federal program established by the Comprehensive Environmental Response, Compensation and Liability Act of 1980, as amended in 1986. The Superfund law authorizes the U.S. Environmental Protection Agency to investigate and clean up sites nominated to the **National Priorities List**.

Title 3 Project
Remediation of a municipally owned site through the State Superfund Title 3 Program whereby New York State pays 75 percent of eligible costs for remediation and the municipality pays 25 percent.

Toll-Free "800" Number
An information line (800) 367-4448 maintained by the DER to provide convenient access for people who have questions, concerns or information about hazardous waste sites and their remedial programs.

Acronyms

AG	New York State Attorney General's Office
ARAR	Applicable or Relevant and Appropriate Requirement
C&D	Construction and Debris
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act of 1980
CO	Consent Order

CP	Citizen Participation
CPP	Citizen Participation Plan
CPS	Citizen Participation Specialist
CQC/CQA	Construction Quality Control/Construction Quality Assurance
DEE	Division of Environmental Enforcement
DER	Division of Environmental Remediation, formerly the Division of Hazardous Waste Remediation
DHWR	Division of Hazardous Waste Remediation, now the Division of Environmental Remediation
DOD	Department of Defense
DOL	Department of Law
DOW	Division of Water
ENB	Environmental Notice Bulletin
EQBA	1986 Environmental Quality Bond Act
EPA	Environmental Protection Agency
F&W	Division of Fish and Wildlife
FDA	Food and Drug Administration
FSF	Federal Superfund
FOIL	Freedom of Information Law
FS	Feasibility Study
FY	Fiscal Year
GPM	Gallons Per Minute
HeLP	Health Liaison Program
IRM	Interim Remedial Measure
mg/kg	milligrams per kilogram
NPL	National Priorities List
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
O&M	Operation and Maintenance
OSHA	Occupational Safety and Health Administration
OU	Operable Unit
PAH	Polynuclear Aromatic Hydrocarbon
PCB	Polychlorinated Biphenyl
PM	Project Manager
ppm/ppb/ppt	parts per million/parts per billion/parts per trillion
PRAP	Proposed Remedial Action Plan
PRP	Potentially Responsible Party
PRS	Priority Ranking System
PSA	Preliminary Site Assessment
QA/QC	Quality Assurance/Quality Control
RA	Remedial Action
RCRA	Resource Conservation and Recovery Act
RD	Remedial Design
RFP	Request for Proposals
RHWRE	Regional Hazardous Waste Remediation Engineer
RI	Remedial Investigation
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
RP	Responsible Party
SSF	State Superfund

SVOC	Semi-Volatile Organic Compound
TAGM	Technical and Administrative Guidance Memorandum
TCLP	Toxicity Characteristic Leading Procedure
TSDF	Treatment, Storage and Disposal Facility
ug/l	micrograms per liter
USGS	U.S. Geological Service
VCP	Voluntary Cleanup Program
VOC	Volatile Organic Compound

Table 3-1

Hanna Furnace - SubParcel 2
Buffalo, NY

Site Specific Action Levels

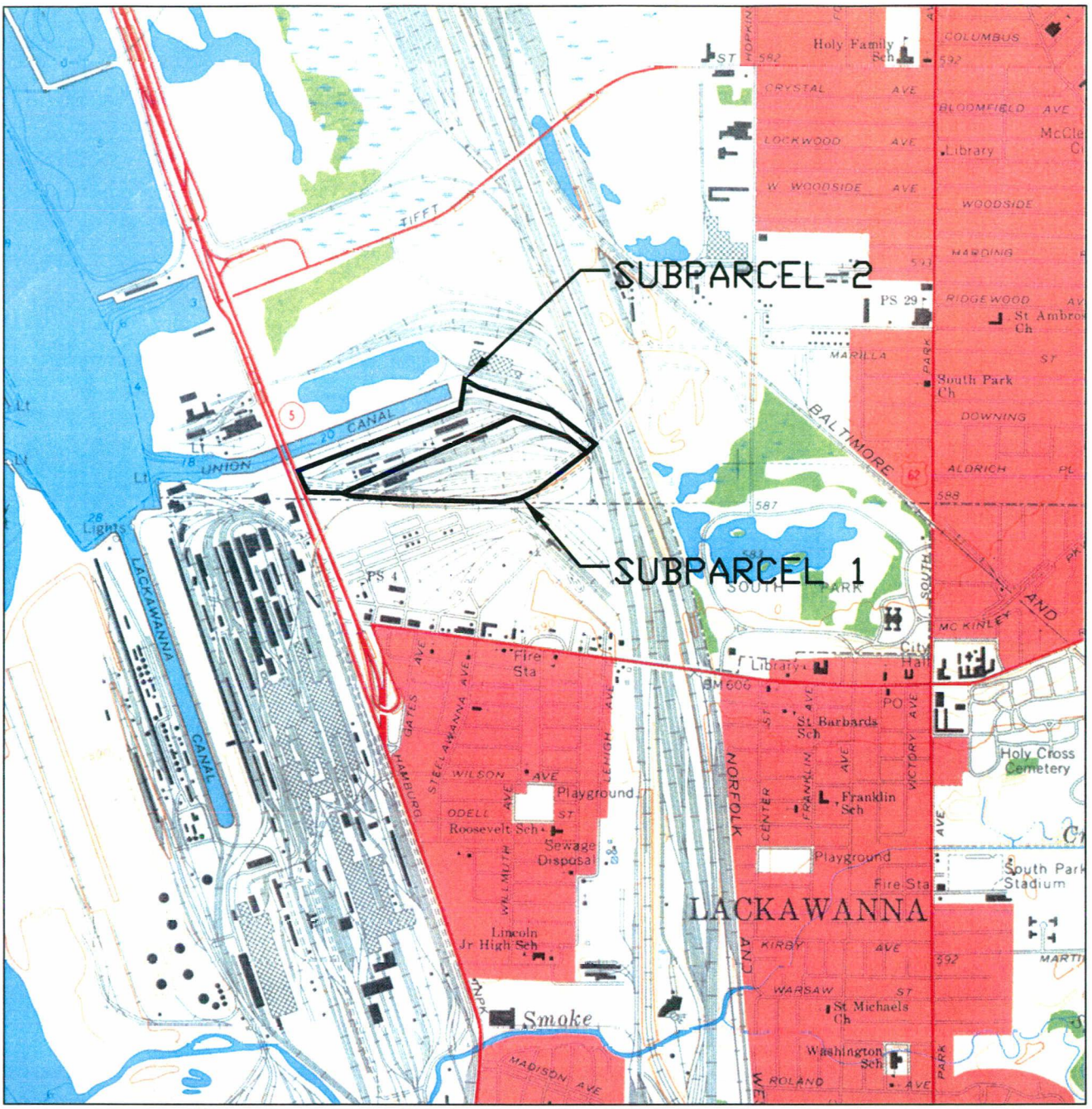
Parameter	Highest Value At Parcel 2 Surface Soil	Highest Value At Parcel 2 Subsurf Soil	Soil Cleanup Guidelines	Eastern U.S. Background Range	Site Specific Action Levels
Total VOCs (ppm)					
Total VOCs	0.278 (3)	0.777 (5)	NA		**10**
SVOC (ppm)					
Total SVOCs	**2,772**	63.92	500		**500**
Pesticides/PCBs (ppm)					
Total Pesticides	No Data	No Data			**10**
Total PCBs (surface to 1 ft)	0.443		1		**1**
Total PCBs (greater than 1 ft)		0.031	10		**10**
Metals (ppm)					
Aluminum	33500	66500	SB	33000	
Antimony	51.5	48.2	SB	NA	
Arsenic	29.3	59.8	7.5 or SB		**50**
Barium	381	722	300 or SB		**500**
Beryllium	6.7	12.5	0.16 or SB	0-1.75	
Cadmium	10.8	7.5	(10)		**20**
Calcium	205000	266000	SB	130-35000	
Chromium	416	88.8	(50)		**200**
Cobalt	10.2	9.9	30 or SB	2.5-60	
Copper	4310	1530	25 or SB	1-50	
Iron	163000	189000	2000 or SB	2000-550000	
Lead	1480	1890	(1000)		**1000**
Magnesium	44100	37500	SB	100-5000	
Manganese	6670	4560	SB	50-5000	
Mercury	4.4	0.54	0.1		**1**
Nickel	56.6	21.5	13 or SB	0.5-25	
Potassium	3380	5280	SB	8500-43000	
Selenium	12.4	41.9	2 or SB		**50**
Silver	5.3	2.7	SB		**1000**
Sodium	1300	1400	SB	6000-8000	
Thallium	10.9	12.2	SB	NA	
Vanadium	67.5	98.5	150 or SB	1-300	
Zinc	1460	982	20 or SB	9-50	
Cyanide	1.5	32.3	NA	NA	**50**

NOTES:

Bold - Site-specific action levles (SSALs)
NC - No Criteria Established
NA - Not Available
NO - Naturally occurring compound.
SB - Site Background

Soil cleanup guidelines and Eastern U.S. background ranges were obtained from NYSDEC TAGM #4046 (1/24/94). Value in parentheses are NYSDEC revised values for non-residential sites but have not yet been incorporated into TAGM #4046.

FIGURE 1–1



ADAPTED FROM: BUFFALO SE, NY USGS QUADRANGLE

HANNA FURNACE SITE–SUBPARCEL 2
REBUILD NOW–NEW YORK
EMPIRE STATE DEVELOPMENT

SITE LOCATION MAP

QUADRANGLE LOCATION

1 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 5 0 1 KILOMETER

FILE NO. 10569.25466
AUGUST 2002

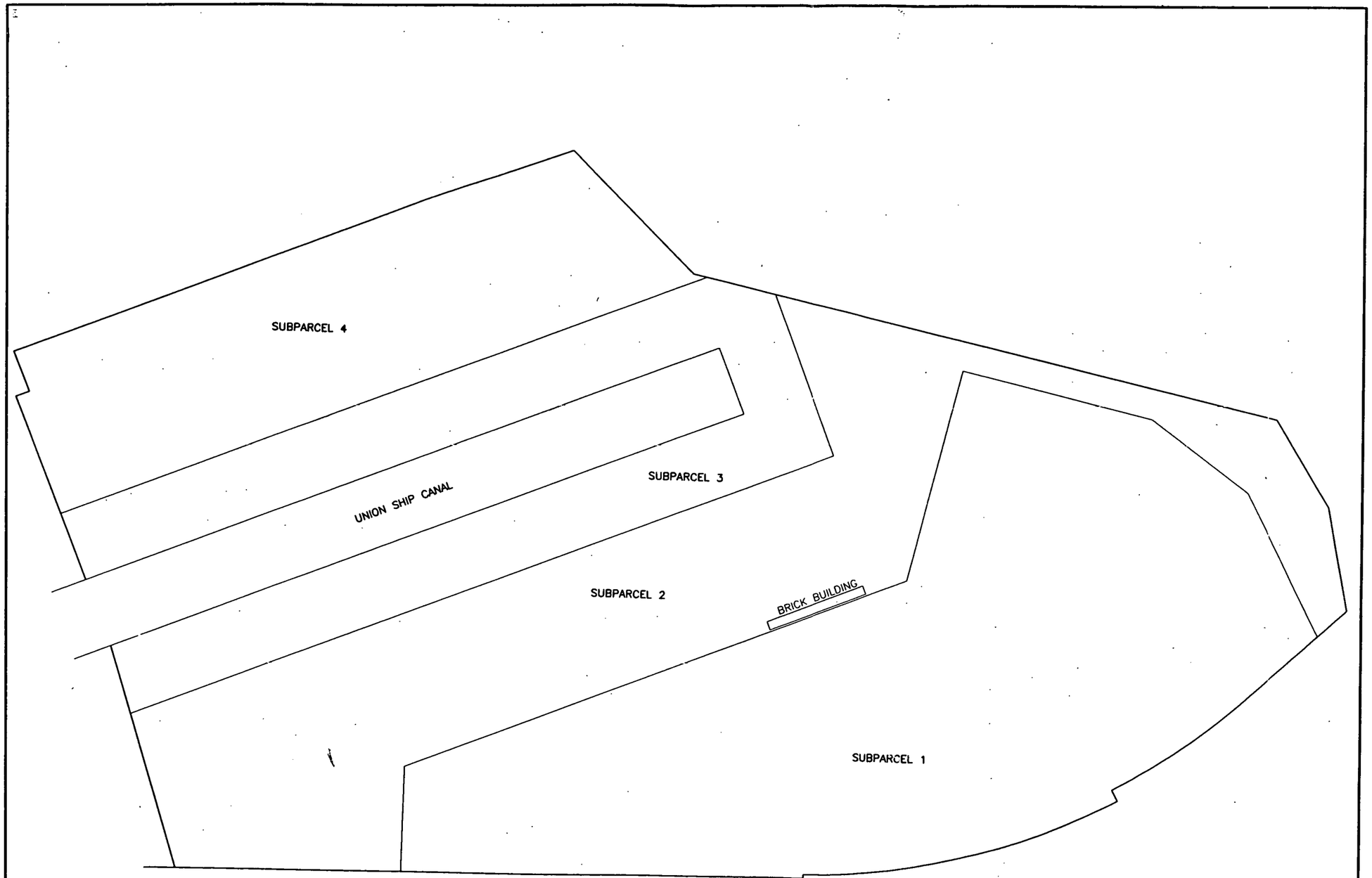
APPROXIMATE SCALE: 1:24000

O'BRIEN & GERE ENGINEERS INC.

DWG PATH: I:\CIV83\PROJECTS\10569\25466\PHASE II\DWGS\011.DWG

PLOT DATE: 8/8/02

FIGURE 1–2



HANNA FURNACE–SUBPARCEL
REBUILD NOW–NEW YORK
EMPIRE STATE DEVELOPMENT

SITE MAP

1"=300' 300 0 300

FILE NO. 10569.25466.012
AUGUST 2002

O'BRIEN & GERE
ENGINEERS INC.

DWG PATH: I:\DIV83\PROJECTS\10569\25466\PHASE II\DWGS\012.DWG

PLOT DATE: 8/8/02

Contact List of Interested/Affected Public

APPENDIX A – MAILING LIST

ADJACENT PROPERTY OWNERS

List To Be Announced

If you would like your name to be added to the list, please contact Mr. Michael Podd at the NYSDEC Region 9 Office at 716-851-7220.

CITIZENS GROUPS

Mr. Ausar Afrika
Harambee Books, Environmental
108 Sycamore St.
Buffalo, NY 14204

Mr. Alex Cukan, Director
Interfaith Center for Environment
1260 Delaware Ave.
Buffalo, NY 14209

Mr. William Hilps, Sr.
Environmental Council
5115 Baer Road
Sanborn, NY 14132

Mr. Don Kill
Erie County Sportsmen's Fed.
55 Winstead Road
Lackawana, NY 14218

Mr. Alfred Price
State Univ. of New York at Buffalo
Planning Dept.
3435 Main Street
Buffalo, NY 14214

Mr. Blake Reeves
State Univ. of New York at Buffalo
4 Cloister Court
Buffalo, NY 14226

Ms. Judy Robinson
Citizen Environmental Co.
425 Elmwood Ave.
Buffalo, NY 14202

Ms. Dawn Sanders
Citizen Action of New York
433 Franklin St.
Buffalo, NY 14202-1301

LOCAL OFFICIALS/GOVERNMENT REPRESENTATIVES

Councilmember James Pitts
Buffalo Common Council, President
1408 City Hall
Buffalo, NY 14202

Councilmember Mary Martino
Buffalo Common Council, South
1410 City Hall
Buffalo, NY 14202

Mr. James Smith
Buffalo Environmental Office
916 City Hall
Buffalo, NY 14202

Mayor Anthony Masiello
Buffalo Mayor's Office, Room 201
City Hall
Buffalo, NY 14202

Sandra Nasca, Esq.
Buffalo Economic Renaissance Corp.
617 Main Street
Buffalo, NY 14203

NYSDEC/NYSDOH/USEPA REPRESENTATIVES

Gerald Mikol, Director
NYSDEC, Region 9
270 Michigan Ave.
Buffalo, NY 14203

Mr. Martin Doster
NYSDEC, Region 9
270 Michigan Ave.
Buffalo, NY 14203

Mr. David Locey
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Mr. Peter Buechi
NYSDEC, Region 9
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Buffalo, NY 14203

Mr. Michael Podd
NYSDEC, Region 9
270 Michigan Ave.
Buffalo, NY 14203

Mr. Joseph Ryan
NYSDEC, Region 9
270 Michigan Ave.
Buffalo, NY 14203

Mr. Lawrence Ennist
NYSDEC, Room 260A
50 Wolf Road
Albany, NY 12233-7010

Mr. Sam Thernstrom
NYSDEC, Room 602
50 Wolf Road
Albany, NY 12233-7010

Community Outreach File
NYSDEC, Region 9
270 Michigan Ave.
Buffalo, NY 14203

Mr. Cameron O' Connor
NYSDOH
584 Delaware Ave.
Buffalo, NY 14202

Mr. Mark Van Deusen
NYSDOH, Outreach Unit
547 River St.
Troy, NY 12180

Mr. Mark Van Valkenburg
NYSDOH, Room 205
547 River St.
Troy, NY 12180

Mr. Timothy Doolittle
NY State Dept. of State
65 Court St.
Buffalo, NY 14202-3471

Mr. Michael Basile
USEPA
Public Info. Office
Niagara Falls, NY 14303

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Buffalo, NY 14205

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2703 South Park
Lackawanna, NY 14218

Tracey Drury
Business First
472 Delaware Avenue
Buffalo, NY 14202

James Schrader
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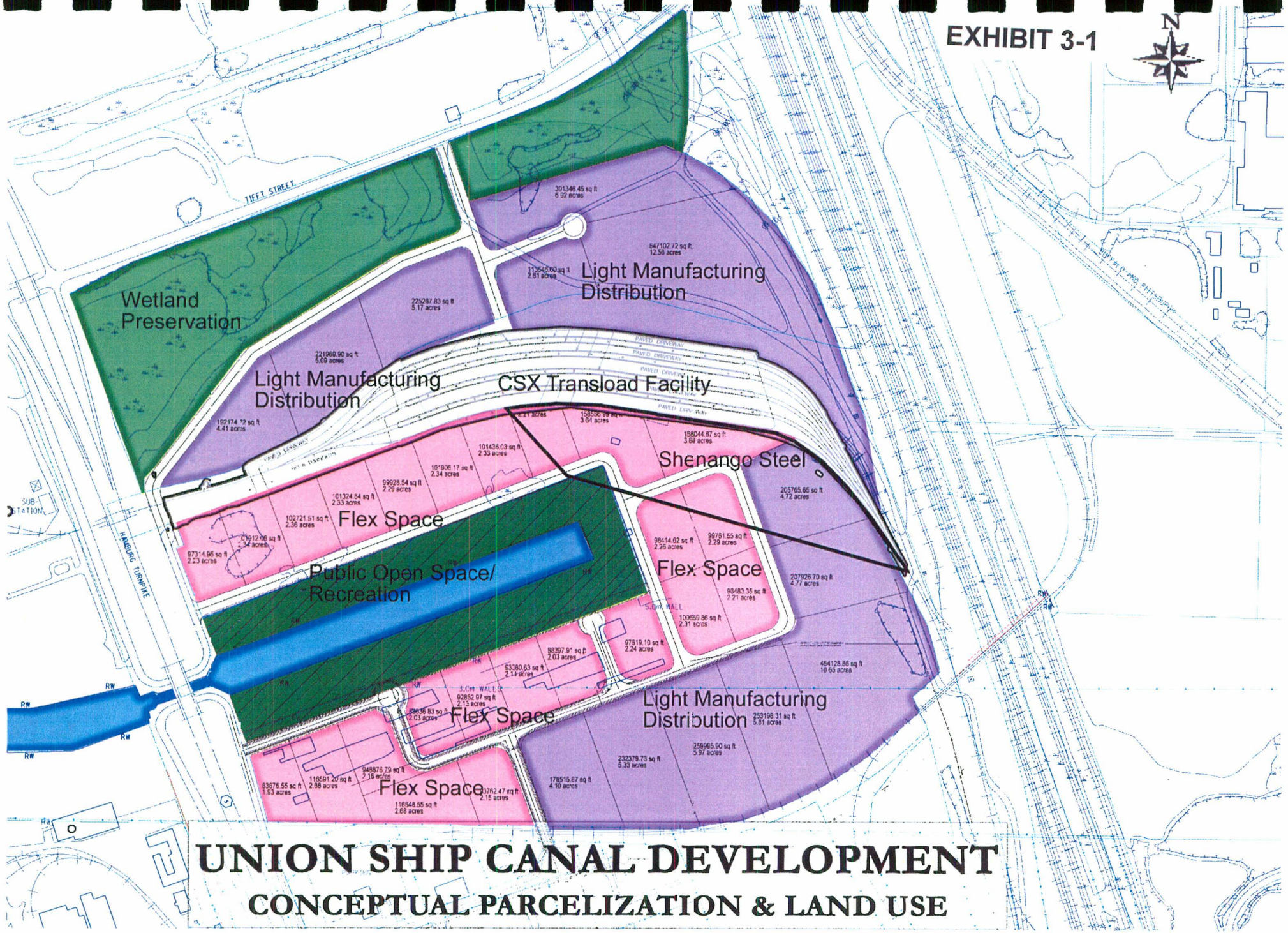
Exhibit 3-1

Union Ship Canal Development Conceptual Parcelization & Land Use

EXHIBIT 3-1



UNION SHIP CANAL DEVELOPMENT

CONCEPTUAL PARCELIZATION & LAND USE

Source: BERC

Exhibit 6-1

NYSDEC Region 9 Contact List

NYSDEC Region 9 Contacts

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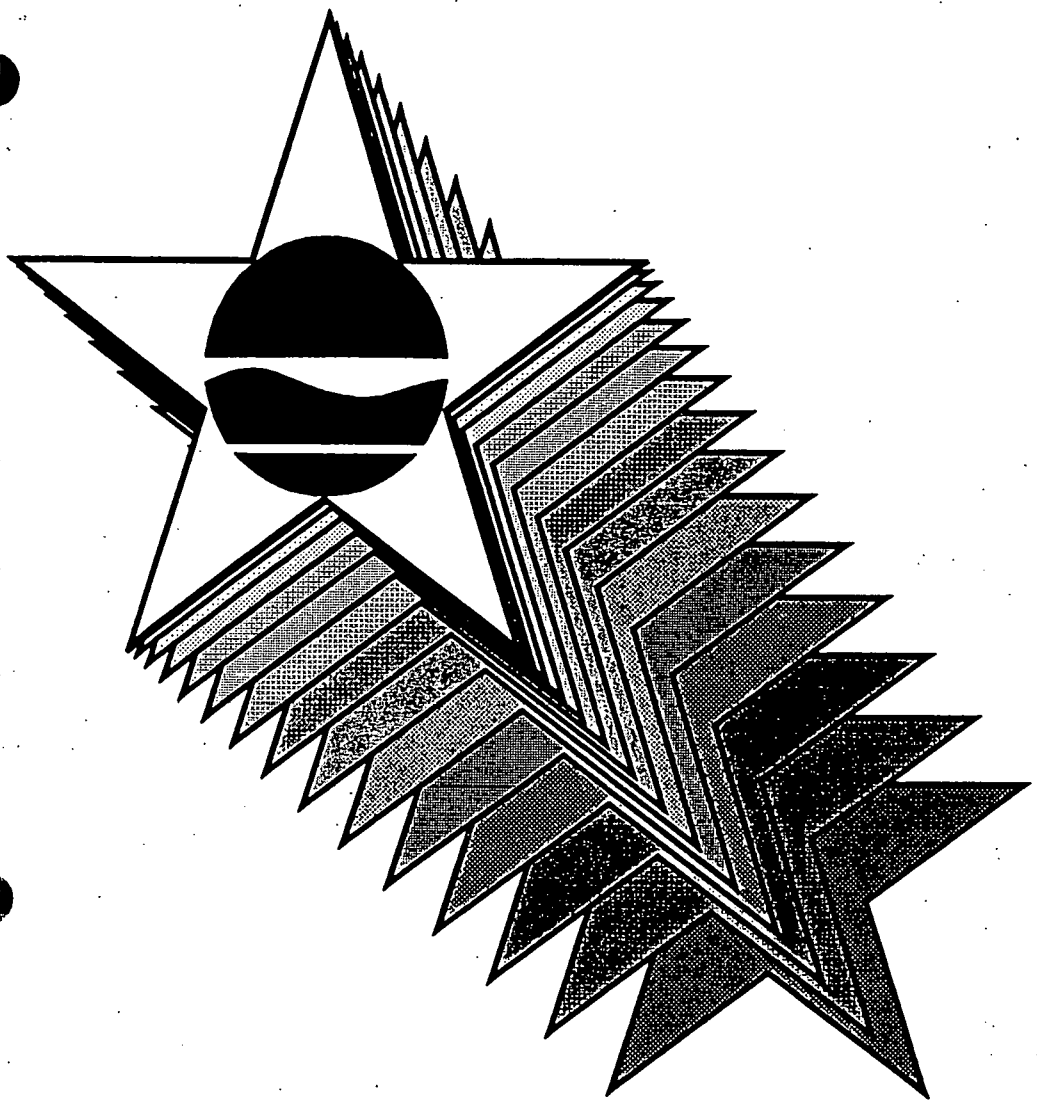
Exhibit 6-2

STARS Memo #1 – Petroleum-Contaminated Soil Guidance Policy



Spill
Technology
And
Remediation
Series

STARS Memo #1
Petroleum-Contaminated Soil Guidance Policy

Prepared by:
New York State Department of Environmental Conservation
Division of Construction Management
Bureau of Spill Prevention and Response
August 1992

NEW YORK STATE PETROLEUM-CONTAMINATED SOIL GUIDANCE

Table of Contents

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SECTION I
PURPOSE AND APPLICABILITY

The goal at each petroleum spill site is to remove the spilled petroleum product from the soil in the most efficient and safe manner in order that the soil may be returned to a reusable product. When complete removal is not possible, practical, or cost effective, the objective is to remediate the contaminated media to concentration levels which will protect groundwater, human health and the environment.

The Petroleum-Contaminated Soil Guidance Policy is intended to provide direction on the handling, disposal and/or reuse of non-hazardous petroleum-contaminated soils. The reuse or disposal options for excavated soils vary depending on the level of treatment provided consistent with protecting the public health and the environment. While this document does not establish standards, it is intended as guidance in determining whether soils have been contaminated to levels which require investigation and remediation.

This document also constitutes a determination of beneficial use by the Department, as defined in Solid Waste Regulation NYCRR Part 360. Petroleum-contaminated soil, if determined to satisfy the criteria herein, can be reused or disposed of as directed in this guidance. Therefore, soils which meet beneficial use conditions are no longer a solid waste in accordance with NYCRR Part 360-1.2(a)(4).

This guidance is intended for Regional Spill Investigators, Regional Solid Waste staff and responsible parties to assist them in determining the acceptability of remedial activities at a petroleum spill site or in determining the acceptability of a site assessment. It may be applied to both excavated and non-excavated material. The evaluation method and guidance values included in this guidance may be used to determine the limits of contamination, such as defining the extent of contamination in an excavation which contains contaminated material. Situations may exist where results of sampling analysis will require interpretations or subjective judgement, as with certain nuisance characteristics such as odors. These interpretations and judgements will be made solely by the DEC representative on site. There may be instances where the DEC will opt to digress from this guidance to establish cleanup goals reflecting site-specific circumstances at a particular petroleum spill site.

The guidance may also be used by responsible parties to develop corrective action plans which will achieve the criteria set forth in this document.

Robert G. Hampston
Director
Division of Construction Management

Norman H. Nosenchuck
Director
Division of Solid Waste

SECTION II

HAZARDOUS WASTE DETERMINATION

An initial determination[1] must be made on all excavated petroleum-contaminated soil as to whether or not it is a hazardous waste. The hazardous waste determination typically involves laboratory analysis to quantify contaminant concentrations in the waste material. The DEC and EPA regulations, however, allow the generator of the waste to use knowledge of the waste and/or laboratory analysis to make a hazardous waste determination. Petroleum-contaminated soils are generally stored on site while laboratory analysis results are obtained and evaluated. As long as the material is segregated from the environment by impervious material, such as polyethylene sheeting, the petroleum-contaminated soil may remain on site until appropriate laboratory results are available and interpreted.

A petroleum-contaminated soil is considered a characteristic hazardous waste when it exhibits any of the following characteristics: ignitability, corrosivity, reactivity, or toxicity, as defined in 6NYCRR Part 371, Section 371.3, or 40 CFR Section 261. Knowledge of soils contaminated with virgin petroleum products indicates that those waste materials do not demonstrate ignitability, corrosivity, or reactivity characteristics. Therefore, the only characteristic of concern for virgin petroleum-contaminated soil is toxicity. The Toxicity Characteristic (TC) Rule identifies benzene and lead as compounds which may cause petroleum-contaminated waste to be hazardous. Analysis of additional parameters may be necessary for petroleum-contaminated soil located at sites where other contaminants may be present. Refer to Appendix A for more specific information regarding the procedures for hazardous waste determination, and the TC Rule regulatory levels.

If the contaminated soil has been excavated and if the hazardous waste criteria apply, then the contaminated soil is classified as a hazardous waste. Excavated soil which is hazardous due to any non-petroleum component will be referred to the Division of Hazardous Waste Remediation, and the Division of Hazardous Substances Regulation to determine appropriate remedial actions.

If in-situ soil is contaminated by a petroleum product, and if the above hazardous waste criteria are met, the site will be remediated under the direction of the Bureau of Spill Prevention and Response to provide for protection of human health and environmental quality. In-situ soil, which violates any of the hazardous waste criteria due to any non-petroleum component, will be referred to the Division of Hazardous Waste Remediation, and the Division of Hazardous Substances Regulation to determine appropriate remedial actions.

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[1] In-situ or excavated soils which could contain contaminants other than petroleum products, by virtue of laboratory analysis, e history, visual observations, etc., will be sampled and analyzed by either the responsible party or by the Bureau of Spill vention and Response (BSPR). The Division of Hazardous Substances Regulation (DHSR) will provide assistance to BSPR staff (for state-funded projects) and responsible parties in making hazardous waste determinations for their generated waste.

SECTION III

SOIL CLEANUP GUIDELINES

There are four essential guidelines which must be satisfied in order for soil to be considered acceptably remediated or not sufficiently contaminated. These are: A) protection of the groundwater; B) protection of human health; C) protection of fish and wildlife and the environment in which they live; and D) protection against objectionable nuisance characteristics. Compliance with these guidelines is satisfied by analysis of soil samples for contaminant concentrations and leachability, and subsequent comparison of the sampling results to guidance values, values which have been determined to be acceptable by DEC.

Contaminant concentrations are determined using EPA standard Methods 8021 or 8270. Leachability is determined using a procedure known as the Toxicity Characteristic Leaching Procedure (TCLP). Satisfactory protection of groundwater is indicated by TCLP Extraction Guidance Values or by TCLP Alternative Guidance Values. Satisfactory protection of human health is indicated by Human Health Guidance Values. Satisfactory protection of water body sediment is indicated by Sediment Guidance Values. Finally, satisfactory protection against objectionable nuisance characteristics is indicated by the lack of odor and by each contaminant concentration being less than 10,000 ppb. Tables 1 and 2 in Section VIII list the contaminants of concern and their corresponding guidance values for acceptable soil concentrations for components of gasoline and fuel oil, respectively. Analysis of additional parameters may be necessary for petroleum-contaminated soil located at sites where other contaminants may be present.

The procedures used when evaluating soil samples to satisfy these guidelines are discussed further in this section.

A. Protection of Groundwater

The presence of a contaminant in the soil does not determine its potential for groundwater contamination. Soil particles can adsorb contaminants which will not be released through infiltration and groundwater recharge mechanisms. Therefore, it is the leachability of the soil which must be measured. To be protective of groundwater quality, the soil must not leach contaminants to the groundwater at concentrations which violate groundwater standards. The **Toxicity Characteristic Leaching Procedure (TCLP)** has been accepted by the Department[2] as a method of determining leachability of petroleum-contaminated soil.

The Toxicity Characteristic Leaching Procedure (TCLP) is an extraction process designed to address the leaching potential of organic and inorganic contaminants. It is used to simulate the actual site-specific leaching potential of individual contaminants present in the soil. In the extraction process, the soil sample is mixed with an acid solution and shaken for

[2] Accepted by NYSDEC Cleanup Standards Task Force.

approximately eighteen hours. For non-volatile organic and inorganic compounds, the soil/acid solution is filtered to produce an extract liquid. For volatile organic compounds, the soil/acid solution is held in a Zero Headspace Extractor (ZHE), preventing the escape of volatile organics, and a liquid extract is squeezed out of the soil/acid solution. The extracted liquid is then analyzed to determine the concentration of the petroleum compounds in question. If the concentrations in the extract are less than or equal to the groundwater standards, then the soil may be considered environmentally acceptable for groundwater protection. Tables 1 and 2 in Appendix B identify the TCLP Extraction Guidance Values for the primary components of gasoline and fuel oil. The tabulated TCLP Extraction Guidance Values are equal to the NYSDEC groundwater standards or the NYSDOH drinking water standards, whichever is more stringent.

An alternative approach to the actual extraction process of the TCLP laboratory procedure which may be a cost-saving shortcut is to evaluate the concentration of the contaminant in the soil and mathematically determine if it will satisfy the leachate criteria. The TCLP laboratory procedure requires the soil sample to be diluted by a ratio of 20:1 when preparing the sample for the acidic extraction, and subsequent leachate analysis. Assuming that the entire mass of the contaminants present in the soil will leach out during the extraction process, the dilution factor of 20 can be applied to the actual soil contaminant concentration to give a maximum possible contaminant concentration obtainable in the leachate.

If a contaminant concentration in the soil is known, then the maximum possible contaminant concentration in the TCLP extract can be determined by the following equation:

Contaminant Concentration in Soil (ug/kg or ppb)	÷ 20 =	Maximum Possible Contaminant Concentration in Extract Liquid (ug/l or ppb)

If the maximum possible contaminant concentration in the extract liquid, as determined by the above equation, is less than or equal to the contaminant's TCLP Extraction Guidance Value, then the contaminant satisfies the groundwater quality protection criterion. If the calculated maximum possible contaminant concentration in the extract liquid is greater than the TCLP Extraction Guidance Value, then no conclusion can be drawn and groundwater quality protection must be confirmed by actually performing the TCLP extraction for that contaminant.

Example:

If the total concentration of Toluene in the soil as determined by

Method 8021 is 100 ug/kg or 100 ppb for Sample A and 140 ug/kg or 140 ppb for Sample B, and the groundwater standard is 5 ppb then:

Sample A is: 100 ug/kg ÷ 20 = 5 ug/l = 5 ppb
Sample B is: 140 ug/kg ÷ 20 = 7 ug/l > 5 ppb

Sample A is considered to have satisfied groundwater protection by the TCLP extraction test for Toluene at 5 ppb. In Sample B, the calculated extract value is greater than 5 ug/l, therefore, no conclusion can be drawn from the calculation, and an actual TCLP extraction test must be performed.

To simplify this alternative approach, TCLP Alternative Guidance Values, which are equal to 20 times the TCLP Extraction Guidance Values, have been included in Tables 1 and 2. Therefore, if a contaminant's soil concentration is known, it can simply be compared to the TCLP Alternative Guidance Values.

The above methodology can also be used to make the hazardous waste determination, with the soil or sediment concentration compared to the respective hazardous waste limit for the leachate. A considerable decrease in analytical costs may be realized if the above equation is used to evaluate contaminant concentration acceptability.

In summary, if the contaminant concentrations in the soil are less than or equal to the TCLP Alternative Guidance Values, or if the contaminant concentrations in the soil extract are less than or equal to the TCLP Extraction Guidance Values, then the soil is considered environmentally acceptable for groundwater quality protection.

B. Protection of Human Health

Protection of human health is an essential requirement of both treatment and reuse of petroleum-contaminated soil. EPA has published health-based standards for many contaminants in soil. The standards are contained in the Health Effects Assessment Summary Table (HEAST REPORT). These standards were derived from methodologies based on soil ingestion values for carcinogens and systemic toxicants.

The appropriate health-based soil Guidance Values are listed in Tables 1 and 2 for the primary components of gasoline and fuel oil.

If the contaminant concentrations in the soil are less than or equal to the Human Health Guidance Values, then the soil is considered safe for human health concerns.

C. Protection of Fish and Wildlife

Protection of fish and wildlife must be satisfied when dealing with contaminated sediment. Some Sediment Guidance Values for protection of aquatic life and animals which consume aquatic life, have been developed and are noted in Tables 1 and 2. Where sediments are contaminated, these Guidance Values should be used. The appropriate natural resource division (eg. Marine, Fish & Wildlife, etc.) should be contacted for situations involving sediment contaminants which do not have tabulated Sediment Guidance Values. If a spill has occurred at a location that may be sensitive to wildlife (eg. wetlands), the Division of Fish and Wildlife should be consulted to determine whether the soil cleanup levels are adequate for natural resource protection.

If the contaminant concentrations in the sediment are less than or equal to the tabulated Sediment Guidance Values, then the sediment is considered environmentally acceptable for fish and wildlife concerns.

D. Protection Against Objectionable Nuisance Characteristics

Petroleum-contaminated soil must not exhibit objectionable nuisance characteristics to be eligible for some reuse options described later in this guidance and listed in Table 3.

1) Petroleum-Type Odors

The soil must not exhibit any discernible petroleum-type odors in order to be considered for the reuse options identified later in this guidance. Odor determinations for state-funded spill projects will be made by the Regional Spill Investigator. Odor determinations for responsible party (RP) sites are the responsibility of the RP. The Regional Spill Investigator may or may not be available to assess the odor criteria at all sites. When the Regional Spill Investigator is on-site, he/she may override the decision of the RP if, in the investigator's opinion, sufficient odors still persist. Determinations by DEC Spill Investigators do not relinquish a responsible party's responsibilities or liabilities under the law.

2) Contaminant Concentrations

The soil shall not contain any contaminant at a concentration above **10,000 ug/kg (10,000 ppb).** This maximum individual contaminant concentration should support the above odor determination, since some petroleum constituents will not leach at high concentrations but may exhibit odors.

If the soil does not exhibit petroleum-type odors and does not contain any individual contaminant at greater than 10,000 ppb, then the soil is considered acceptable for nuisance characteristics.

SECTION IV

GUIDANCE VALUES

A. Gasoline-Contaminated Soils

Table 1 lists the primary gasoline components of concern. The table identifies the compound names, the preferred EPA laboratory methods for determining contaminant concentration, the detection limits for a liquid matrix (water), the detection limits for a solid matrix (soil), the TCLP Extraction Guidance Values (C_w), the TCLP Alternative Guidance Values (C_a), the Human Health Guidance Values (C_h), and the Sediment Guidance Values (C_s).

Although EPA Method 8021 is preferred, other laboratory methods may be used with prior approval from the DEC Regional Spill Investigator. Other proposed methods should be evaluated on their ability to quantify the compounds of concern at acceptable detection levels.

The tabulated detection limits are the practical quantitation limits (PQLs). The PQL is the lowest level that can be measured within specified limits of precision during routine laboratory operations on most matrices. Efforts should be made to obtain the best detection possible when selecting a laboratory.

To demonstrate groundwater quality protection via the TCLP Extraction Method, the concentration of the hydrocarbon compound in the TCLP extract, as determined by EPA Method 8021 for a liquid matrix, must be less than or equal to the TCLP Extraction Guidance Value, C_w.

-or-

To demonstrate groundwater quality protection via the TCLP Alternative Method, the concentration of the hydrocarbon compound in the soil, as determined by EPA Method 8021 for a solid matrix, must be less than or equal to the TCLP Alternative Guidance Value, C_a.

To demonstrate human health protection, the concentration of the hydrocarbon compound in the soil, as determined by EPA Method 8021 for a solid matrix, must be less than or equal to the Human Health Guidance Value, C_h.

To demonstrate fish and wildlife protection, the concentration of the hydrocarbon compound in the soil, as determined by EPA Method 8021 for a solid matrix, must be less than or equal to the Sediment Guidance Value C_s. Meeting this requirement is only necessary when dealing with contaminated sediment.

To demonstrate nuisance protection, the soil must not exhibit petroleum-type odors, and must not contain any contaminant at greater than 10,000 ppb, as determined by EPA Method 8021 for a solid matrix.

When the Guidance Value or standard is below the detection limit, achieving the detection limit will be considered acceptable for meeting the Guidance Value or standard, as long as the reported laboratory detection limits are reasonably close to the listed PQLs.

B. Fuel Oil-Contaminated Soil

Table 2 lists the primary fuel oil components of concern. As with Table 1, Table 2 identifies compound names, preferred EPA laboratory methods, detection limits, and Guidance Values.

Although EPA Methods 8021 and 8270 are preferred for identifying compounds of concern for gasoline and fuel oil, other laboratory methods may be used with prior approval from the DEC Regional Spill Investigator. Other proposed methods should be evaluated on their ability to quantify the compounds of interest at acceptable detection levels.

Since there is no single laboratory method which will analyze for all of the volatile and semi-volatile compounds of concern, it is generally necessary to use more than one laboratory method for fuel oil analysis. Both volatile and semi-volatile compounds must be addressed initially, but a reduced list of analytes may be acceptable for subsequent sampling depending upon the initial results.

As with Table 1, the detection limits in Table 2 are PQLs. Efforts should be made to obtain the best detection possible when selecting a laboratory.

Experience has shown that soil containing some of the insoluble semi-volatile compounds at high concentrations can exhibit a distinct odor even though the substances will not leach from the soil. Therefore, the maximum individual contaminant concentration of 10,000 ppb is instituted to help address this problem. In addition, anytime a soil exhibits discernible petroleum odors, even if it has met the numerical criteria, it shall not be considered clean enough for some reuse options under 6NYCRR Part 360, as described later in this document.

Odor determination is subjective. Since there is no recognized odor measuring device, some discrepancies may arise between responsible parties and the DEC on this subject. In order to document odor determinations and to address the need for remediation due to odors, the following approaches may be considered: (1) direct the laboratory to identify and quantify all pollutants present in the soil and/or leachate samples instead of just the

method's target compounds; and (2) establish site-specific conditions based on an evaluation of the characteristics of the site. The determination and evaluation of odors remains a subject requiring further research and policy development.

Some of the semi-volatiles are carcinogens, and subsequently have groundwater quality Guidance Values of 0.002 ppb. The TCLP Extraction Guidance Values are 0.002 ppb, and the TCLP Alternative Guidance Values are 0.04 ppb. The solid matrix detection limit does not approach this low value. Therefore, when these compounds are determined to be present, the TCLP Extraction Method and the Alternative Guidance Values must be satisfied to demonstrate groundwater quality protection for these particular contaminants. The following compounds listed in Table 2 are affected by this limitation: benzo(a)anthracene; benzo(b)fluoranthene; benzo(k)fluoranthene; benzo(a)pyrene; chrysene; benzo(ghi)perylene; and indeno(1,2,3-cd)pyrene.

Particular attention should be paid to the Human Health Guidance Values for fuel oil-contaminated soil. While the majority of the semi-volatiles have health Guidance Values considerably higher than the contaminant concentration generally encountered at spill sites, there are seven compounds listed in Table 2 which have Human Health Guidance Values lower than the detection limits. When any of these compounds (benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene and dibenz(a,h)anthracene) are present, the Human Health Guidance Value most likely will be the limiting factor for achieving acceptable cleanup levels.

To demonstrate groundwater quality protection via the TCLP Extraction Method, the concentrations of the hydrocarbon compounds in the TCLP extract, as determined by EPA Methods 8021 and 8270 Base/Neutral for a liquid matrix, must be less than or equal to the TCLP Extraction Guidance Value, C_w;

-or-

To demonstrate groundwater quality protection via the TCLP Alternative Method, the concentrations of the hydrocarbon compounds in the soil, as determined by EPA Methods 8021 and 8270 Base/Neutral for a solid matrix, must be less than or equal to the TCLP Alternative Guidance Value, C_a. As described above, the TCLP Alternative Method is not a sufficient demonstration of groundwater protection for some contaminants.

To demonstrate human health protection, the concentrations of the hydrocarbon compounds in the soil, as determined by EPA Methods 8021 and 8270 Base/Neutral for a solid matrix, must be less than or equal to the Human Health Guidance Value, C_h.

To demonstrate fish and wildlife protection, the concentrations of the hydrocarbon compounds in the soil, as determined by EPA Methods 8021

and 8270 Base/Neutral for a solid matrix, must be less than or equal to the Sediment Guidance Value, C_s. Meeting this requirement is only necessary when dealing with contaminated sediment.

To demonstrate nuisance protection, the soil must not exhibit petroleum-type odors, and must not contain any contaminant at greater than 10,000 ppb, as determined by EPA Methods 8021 and 8270 Base/Neutral for a solid matrix.

When the Guidance Value or standard is below the detection limit, achieving the detection limit will be considered acceptable for meeting the Guidance Value or standard, as long as the reported laboratory detection limits are reasonably close to the listed PQLs.

SECTION V

LABORATORY ANALYSIS

There are a variety of laboratory methods, established by the USEPA and the NYS Department of Health (DOH), which can be used to analyze petroleum-contaminated soils. The selection of appropriate laboratory methods depends on the compounds of concern, the detection limits for each compound, the nature of the samples to be analyzed, the capabilities of the laboratory, and the regulatory limits or Guidance Values to be achieved. The methods recommended and most often used for petroleum-contaminated soils are EPA Standard Methods 8021, 8270 (Base/Neutrals) and the TCLP extraction process. In every case, the NYSDEC will evaluate laboratory results from NYSDOH-approved laboratories only.

Each laboratory method identifies compounds which can be quantified with an acceptable degree of precision and accuracy. Many laboratory methods have petroleum compounds as target compounds, along with non-petroleum compounds. Method 8270, for example, identifies acid extractable hydrocarbons and base/neutral extractable hydrocarbons. The semi-volatile constituents of petroleum products are a sub-set of the base/neutral extractable compounds under Method 8270. Therefore, when requesting this analysis, base/neutrals only should be specified.

Some laboratories may be able to quantify non-target compounds of concern with particular methods. For example, there is no laboratory method which lists MTBE (methyl t-butyl ether) as a target compound; however, laboratories can include MTBE in their analysis using Method 8021. Therefore, when requesting this analysis, Method 8021 plus MTBE should be specified.

Each laboratory method establishes minimum concentrations of the target compounds which can be detected under ideal conditions using that particular procedure. These Method Detection Limits (MDLs) are rarely achievable under actual conditions in an analytical laboratory. Laboratories report their actual detection limits as Practical Quantitation Limits (PQLs). The PQLs for analysis on a liquid matrix are generally four times the MDLs. With a solid matrix, the PQLs will be affected by the quantity of contamination present, categorized as low, medium or high concentrations. Lower PQLs are generally possible with low level soil contamination. Laboratories must identify their PQLs when reporting analytical results.

Laboratories and methods to be utilized should be selected according to the best detection possible for the compounds of interest, and the regulatory or guidance levels needed to be achieved. For example, Table 2 indicates that naphthalene is a target compound for Method 8021 and Method 8270. Both of these methods can provide detection levels in a liquid matrix below the TCLP Extraction Guidance Value of 10 ppb. Therefore, either method could be used for analysis of a liquid matrix of naphthalene. However, for a solid matrix, Method 8021 is capable of providing much better detection of naphthalene than Method 8270. If the soil concentrations for naphthalene will be compared to the TCLP Alternative Guidance Value of 200 ppb, then Method 8021 should be used instead of Method

8270. If the soil concentrations for naphthalene will be compared only with the nuisance protection level of 10,000 ppb, or the Human Health Guidance Value of 300,000 ppb, then both Method 8021 and Method 8270 are capable of providing satisfactory detection levels for naphthalene.

Initial laboratory analysis should address the full range of compounds which may be present, considering the petroleum products involved. In consideration of prior laboratory results, potential contaminants may be eliminated from subsequent sampling analysis lists. As the contaminants are identified or eliminated, it may be appropriate to change laboratory methods during a project, to avoid unnecessary laboratory expenses. In addition, it may be appropriate to discuss analytical work with the laboratory in terms of the actual compounds of interest rather than method numbers and their defined target compounds. The final laboratory results for a project, however, should address the same full range of compounds as the initial sampling results, to confirm that the interim results did not overlook the appearance of other compounds. For example, gasoline-contaminated soil which is undergoing on-site bioremediation should be analyzed initially using Method 8021 plus MTBE. If only benzene, toluene, ethyl benzene and xylenes are detected, then Method 8020 could be used for interim sampling events. Upon completion of the bioremediation project, the soil should be analyzed using Method 8021 plus MTBE, to demonstrate the satisfaction of the Guidance Values applicable to the selected reuse option.

A detailed description of analytical protocols and procedures is available in the DEC Sampling Guidelines and Protocols manual.

SECTION VI

SAMPLING

Samples should be collected in such a manner so as to best characterize the extent of contamination of the soil in question. There is no specific number or type of samples which will apply to all situations and best engineering judgement will have to be used. The type of sample, grab or composite, will vary depending upon the constituent being identified. While grab samples come from one location, composites come from several locations and are joined to form one sample. When volatiles are in question, care must be taken when collecting composite samples to minimize the loss of volatiles during handling. In order to minimize handling of volatiles, several grab samples are preferred, with confirmatory composite samples. When sampling for semi-volatiles, several composite samples are preferred, with confirmatory grab samples.

The treatment process (if any) will also have a bearing as to how well a soil may be characterized. Low temperature thermal treatment units (e.g. rotary kiln dryers) process soil resulting in a more homogeneous mixture than would be obtained from a stationary pile. The following guidance is offered to assist the Regional Spill Investigator in determining the number and types of samples which should be requested for various treatment scenarios. More comprehensive samples may be required depending on the reuse or disposal alternative to be used.

The responsible party and the Regional Spill Investigator should agree on a sampling plan and review procedure before the samples are collected. All sample results submitted for regulatory compliance must be analyzed by New York State Department of Health approved laboratories.

A detailed description of soil sampling protocols and procedures is available in the DEC Sampling Guidelines and Protocols manual.

A. Tank Pit

If there is a question as to the extent of residual contamination, or if comprehensive documentation is necessary, a tank pit may be sampled for laboratory analysis.

A total of five samples should be taken from the excavation. One composite sample from each of the side walls at a distance approximately one third up from the bottom of the pit. Several samples should also be collected to form one composite sample from the bottom of the pit. Any remaining samples should be grab samples from areas with greater potential for contamination such as stained soils, adjacent to a corrosion hole, opposite a manway, or opposite a tank opening. All samples shall be taken no less than six inches below the exposed surface being sampled. Samples for compositing should be taken from random locations on the floor and walls of the tank pit.

B. Soil Pile

The number of samples required for an excavated pile will be related to the quantity of soil stockpiled. The table below can be used as a guide in determining the appropriate number of samples. If, in the opinion of the Regional Spill Investigator, additional samples are warranted, they should be requested.

Recommended Number of Soil Pile Samples

CONTAMINANT	SEMI-VOLATILES		VOLATILES	
SAMPLE TYPE	Grab	Composite	Grab	Composite
SOIL QUANTITY (yd^3)				
0-50	1	1	1	1
50-100	1	2	2	1
100-200	1	3	3	1
200-300	1	4	4	1
300-400	2	4	4	2
400-500	2	5	5	2
500-800	2	6	6	2
800-1000	2	7	7	2
>1000 - Proposed Sampling plan shall be submitted for approval on site specific basis				

Best engineering judgement is needed to determine the most appropriate sampling locations. The objective of the sampling is to characterize the extent of contamination of the pile. Consideration should be given to how the soil was stockpiled. Is the most contaminated soil toward the top? Are areas visibly contaminated? How high and how long is the pile? It may be preferable to divide the pile into manageable segments. Samples should be taken from within the pile. Surface soil should not be used as sampling material. Samples shall be collected in accordance with proper sample collection techniques. All samples must be collected in glass containers with air-tight sealable tops.

Using the above sampling table, considering the factors mentioned above, and applying best engineering judgement, an acceptable evaluation of the contaminant concentrations in the soil can be made.

C. Processed Soil

Processed soil is soil which undergoes physical handling during a treatment process. Examples of treatment processes are rotary kiln dryers (low temperature thermal treatment units) or soil washing units. Soil under these conditions are more homogeneously mixed; therefore, individual

samples are more likely to characterize the entire lot. Since these processes are continuous in nature, the samples should be collected over a period of time similar to that described below:

1) A sample may be collected every twenty minutes for a period of two hours. The samples are then mixed to form one composite sample. This frequency will continue until all soils are processed. The twenty minute composite interval is a guideline which can be adjusted based on the amount of soil processed and the processing period. Testing protocols are specifically defined in the treatment unit's operating permit.

2) At least one grab sample should be taken for every two sets of composites.

3) A minimum of two samples (1 grab, 1 composite) should be taken for any treated soil batch.

D. Aboveground (Ex-Situ) Treatment

Typical aboveground treatment technologies are bioremediation and soil vapor extraction. Soil remediated under these conditions will be mixed (tilled) and spread evenly over a wide area. The soil will be spread to a uniform thickness, usually no higher than two feet, although depths may be higher for soil vapor extraction treatment. The shallow depth makes sample collection an easy process. The number of required samples can be based on the quantity of soil being treated (see above table). Depth of the sample can be anywhere from six inches to the bottom of the treatment layer. Care must be taken not to penetrate the liner material. The sampling locations and depths must be randomized.

E. Non-Excavated (In-Situ) Treatment

Treatment of non-excavated soil is similar to aboveground treatment in that the contamination is spread over a wide area. It differs, however, in that the depths of the contaminated zone are varied and usually extend much deeper. Once the volume of contaminated material is determined, the above table can be used to determine the number of required samples. The sampling locations and depths must be randomized.

SECTION VII

MANAGEMENT OF EXCAVATED (EX-SITU) CONTAMINATED SOILS

Once non-hazardous petroleum-contaminated soil is moved from its original state, it is by definition a solid industrial waste and must be managed in accordance with Part 360 and transported in accordance with Part 364 regulations. There are several alternatives available to properly handle this contaminated soil.

A. Soils Which Do Not Meet Guidance Values

Soils which do not meet the guidance values can be processed under a specific DEC Beneficial Use Determination (BUD), such as at an approved hot-mix asphalt batching plant or at a cold-mix asphalt plant, disposed of at a DEC authorized landfill, or treated on site.

1) Reuse Under Specific Beneficial Use Determinations

The DEC Division of Solid Waste has made Beneficial Use Determinations (BUD's) under 6 NYCRR Part 360, identifying recycling or re-use activities which are not subject to Part 360 regulations. The use of petroleum-contaminated soil in a manufacturing process to produce a marketable product may be eligible for BUD issuance. Each manufacturing process operator must maintain compliance with the specific requirements of the issued BUD. Hot-mix and cold-mix asphalt manufacturing are two examples of processes which have received BUD's, and other processes may be approved by the Division of Solid Waste in the future.

a. Reuse at an Approved Asphalt Batching Plant

Several asphalt plants have been authorized to accept non-hazardous contaminated soil, for use as aggregate, provided the plant is in compliance with any other DEC regulations which may apply to the facility. For example, the use of petroleum-contaminated soil may require a modification of the facility's air emission permit.

b. Production of Cold-Mix Asphalt

A Beneficial Use Determination (BUD) has been issued to the process which combines liquid asphalt emulsion with the contaminated soil to produce a cold-mix asphalt. Approval to process petroleum-contaminated soil to produce a cold-mix asphalt is issued by the Spill Response Program. The applicant must satisfy specific testing requirements prior to receiving approval to process. Each BUD identifies allowable uses for

the manufactured cold-mix asphalt and any qualifying conditions and post-treatment testing protocols.

These asphalt products, if being stockpiled or transported for disposal rather than reuse, no longer meet the requirements for these BUDs and are subject to all applicable regulatory provisions of 6NYCRR Parts 360 and 364.

PCS containing asphalt products, which are left in a stockpile and are not being beneficially used, remain a solid waste until such use is accomplished. These materials shall be removed from the stockpile for beneficial use in accordance with their beneficial use approval requirements, or disposal if necessary, as rapidly as possible.

2) Disposal at an Authorized Landfill

A DEC-authorized landfill is one which either has an operating permit or is under a consent order. While this is not the preferred method of dealing with contaminated soil, it may be the most economical or, due to site constraints, the only alternative. Additional restrictions may be required by the landfill operators prior to accepting materials at their facilities.

3) Treatment On Site

Non-hazardous petroleum-contaminated soil may be treated on the site of generation without a DEC Part 360 Permit. Depending on the treatment technologies being utilized, other DEC permits may be required for air emissions and water discharges.The soil treatment processes may involve excavation of soils, securely stockpiling the soils until treatment is initiated, aboveground treatment of the soils, and/or placement of soils back into an excavation for treatment. The Regional Spill Investigator should require a remedial plan, signed by the responsible party, prior to the placement of contaminated soils into an excavation for treatment.

If the soil is to be placed back in an excavation for treatment, and if the excavation is determined to be uncontaminated, the excavation must be prepared and lined in such a manner to protect it against contamination from the soil which will be treated. However, if the excavation is contaminated it shall be the decision of the Regional Spill Investigator as to whether a liner is necessary.

All excavated soil shall be placed on an impervious material (eg: polyethylene sheeting) with the sides banked so as to control and contain run-off. During periods when no treatment is on-going, the surface of the pile(s) must also be covered with an impervious material.

The site may have to be evaluated for its impact to the ambient air. Cross media contamination shall be minimized and aesthetic or nuisance issues shall be addressed. If space on the site is limited, or if the protection of the public health is in jeopardy, then on-site treatment will not be allowed and soil must be removed to a permitted location for treatment or disposal.

There are several methods of on-site soil treatment. Typical among these are soil venting, bioremediation, soil washing and low temperature thermal treatment. All treatment should be evaluated based on its ability to achieve the desired result in the most economical and efficient manner.

B. Soils Which Meet Guidance Values

The reuse options available for de-contaminated soil depends upon which particular Guidance Values are satisfied by the soil. Table 3 identifies the reuse options and the Guidance Values which must be met to use each reuse option.

As described earlier, the DEC Division of Solid Waste (DSW) has issued a Generic Beneficial Use Determination (BUD) which exempts petroleum-contaminated soils, which have been successfully incorporated into an asphalt product by a Bureau of Spill Prevention and Response (BSPR) approved producer and which will be utilized in a bonified paving project.

In addition, the DSW has determined that soils which satisfy the appropriate Guidance Values and which will be reused as highway sub-base material, fill for the original excavation, fill elsewhere on the site of generation, or fill off-site at pre-approved locations, are being beneficially used and are exempt from the provisions of 6NYCRR Part 360. These soils are also exempt from 6NYCRR Part 364 since they no longer meet the Part 364 definition of "solid waste".

The reuse options are not listed as a hierarchy; however, off-site reuse is generally less desirable. The Regional Spill Supervisor or his/her designee will review all appropriate soil sampling data to determine if the criteria has been met for the requested reuse option. Upon request from the responsible party, the evaluation of the submitted data shall be documented with a statement from the Regional Spill Supervisor that the soil does or does not meet the criteria for the desired reuse option. **The DEC and its designee assume no liability when evaluating data for a responsible party with regard to the reuse or disposal of the soil in question.** The generator of the soil has the ultimate responsibility for the accurate and precise characterization, and the safe and proper reuse or disposal of the material. In addition, soil which is being reused off site shall not be allowed to be transported prior to the receipt of the laboratory reports confirming that the

soil has satisfied the appropriate Guidance Values of this guidance document. **The responsible party shall maintain all field data, laboratory results, and final disposition records for three years.**

The possible reuse options are presented below. Additional uses of decontaminated petroleum-contaminated soil may be identified in a Part 360 Permit or BUD for a specific facility.

1) Reuse as a Construction Material

Soil which satisfies the Guidance Values for groundwater protection, human health protection and nuisance characteristics can be reused as construction material. Construction material can include hot asphalt, cold-mix asphalt, concrete, roadway sub-base, etc. Final destination of the soil shall be identified prior to removal from the site.

2) Returned to the Original Excavation

Soil which satisfies the Guidance Values for groundwater protection, human health protection, and nuisance characteristics, can be placed back in the hole from which it was excavated.

3) Placed Elsewhere on Site

Soil which satisfies the Guidance Values for groundwater protection, human health protection, and nuisance characteristics, can be placed anywhere within the confines of the contiguously-owned property from which it originated.

4) Reuse Off-Site at a Pre-Approved Location

The Regional Spill Engineer and Regional Solid Waste Engineer may approve a request for an off-site reuse location for remediated soil which satisfies the Guidance Values for groundwater protection, human health protection, and nuisance characteristics. Sites which may be considered for this option are industrial sites, authorized construction and demolition debris landfills, petroleum storage facilities, authorized landfills, or other locations where public access is limited. Written approval must be received from the property owner(s) prior to exercising this reuse option. The responsible party may submit such a request to the Regional Spill Engineer who will coordinate with the Regional Solid Waste Engineer to approve or disapprove the request.

C. Rock Debris

Rock debris, for purposes of this policy, is defined as those rocks which are four (4) inches or greater in diameter. They shall be cleaned of any packed-on petroleum-contaminated soil. These rocks are not treated as a solid waste and can be disposed of as construction and demolition debris.

If rock debris cannot be separated from the petroleum-contaminated soil, it shall be handled as a solid waste in accordance with NYCRR Part 360 and/or Part 364 requirements.

SECTION VIII

MANAGEMENT OF NON-EXCAVATED (IN-SITU) CONTAMINATED SOIL

In-situ contaminated soil may pose a threat to the groundwater, human health and the environment. These sites must be evaluated to determine the extent of contamination and the appropriate investigative or remedial actions necessary. The soil may be treated in-situ and evaluated by the same guidelines as excavated soil, while taking into account site-specific considerations and conditions.

Additional guidance will be developed to establish procedures for evaluating the potential impacts of non-excavated (in-situ) contaminated soils. Issues which should be considered when evaluating in-situ contaminated soil are environmental sensitivity of the site, level of residual contamination, soil characteristics, depth to groundwater, present and potential land use. A proper sampling plan will be necessary to determine the number, quantity and depth of samples to properly characterize the site.

SECTION IX

REFERENCES

NYS Department of Environmental Conservation, Cleanup Standards Task Force, DRAFT Cleanup Policy and Guidelines, October 1991.

NYS Department of Environmental Conservation, Division of Hazardous Substances Regulation, 6NYCRR Part 364, Waste Transporter Permits, January 12, 1990.

NYS Department of Environmental Conservation, Division of Hazardous Substances Regulation, 6NYCRR Part 371 Identification and Listing of Hazardous Wastes, December 25, 1988.

NYS Department of Environmental Conservation, Division of Solid Waste, 6NYCRR Part 360 Solid Waste Management Facilities, May 28, 1991.

NYS Department of Environmental Conservation, Division of Water, Sampling Guidelines and Protocols, March 1991.

NYS Department of Environmental Conservation, Division of Water, Spill Response Guidance Manual, January 1990.

NYS Department of Environmental Conservation, Division of Water, Technical and Operation Guidance Series (1.1.1), Ambient Water Quality Standards and Guidance Values, November 15, 1991.

US Environmental Protection Agency, 40 CFR Part 261 Identification and Listing of Hazardous Wastes, June 29, 1990.

US Environmental Protection Agency, Health Effects Assessment Summary Table, April 4, 1991.

APPENDIX A

HAZARDOUS WASTE DETERMINATION AND REGULATORY LEVELS

In accordance with DEC and EPA regulations, the generator of a waste material must determine if the material is a hazardous waste or a non-hazardous waste. The generator can make this determination using knowledge of the waste and/or laboratory analyses.

A waste material can be a hazardous waste due to its origin, its listed waste content, or its characteristics.

Soil contaminated with virgin petroleum products is a hazardous waste if it exhibits a characteristic of a hazardous waste, namely, ignitability, corrosivity, reactivity, and toxicity. The hazardous waste characteristics, defined in 6NYCRR Part 371, Section 371.3, and 40 CFR Section 261, are described below.

A. **Ignitability**:

A solid waste exhibits the characteristic of ignitability if a representative sample of the waste has any of the following properties:

1) Is not a liquid and is capable under standard temperature and pressure, of causing fire through friction, absorption of moisture or spontaneous chemical changes and, when ignited, burns so vigorously and persistently that it creates a hazard.

2) It is a liquid, other than an aqueous solution containing less than 24 percent ethyl alcohol by volume, and has a flash point less than 60°C (140°F).

3) It is an ignitable compressed gas.

4) It is an oxidizer.

In accordance with guidance from the DEC Division of Hazardous Substances Regulation and based on knowledge of the waste, soils contaminated with virgin petroleum products do not exhibit the above properties and do not have to be tested for the ignitability characteristic.

B. **Corrosivity**:

A solid waste exhibits the characteristic of corrosivity if a representative sample of the waste has either of the following properties:

1) It is aqueous and has pH less than or equal to 2 or greater than or equal to 12.5.

2) It is a liquid and corrodes steel at a rate greater than 6.35 mm (0.250 inch) per year at a test temperature of 55°C (130°F).

Based on knowledge of the waste, soils contaminated with virgin petroleum products do not exhibit the above properties, and do not have to be tested for the corrosivity characteristic.

C. Reactivity:

A solid waste exhibits the characteristic of reactivity if a representative sample of the waste has any of the following properties:

1) It is normally unstable and readily undergoes violent change without detonating.

2) It reacts violently with water.

3) It forms potentially explosive mixtures with water.

4) When mixed with water, it generates toxic gases, vapors or fumes in a quantity sufficient to present a danger to human health or the environment.

5) It is a cyanide or sulfide bearing waste which, when exposed to pH conditions between 2 and 12.5, can generate toxic gases, vapors or fumes in quantity sufficient to present a danger to human health or the environment.

6) It is capable of detonation or explosive reaction if it is subjected to a strong initiating source or if heated under confinement.

7) It is readily capable of detonation or explosive decomposition or reaction at standard temperature and pressure.

8) It is a forbidden explosive, a Class A explosive or a Class B explosive.

Based on knowledge of the waste, soils contaminated with virgin petroleum products do not exhibit the above properties, and do not have to be tested for the reactivity characteristic.

D. Toxicity:

If the Toxicity Characteristic Leaching Procedure (TCLP) extract from a representative sample of the waste contain any of the contaminants identified in the attached listing of Hazardous Waste Regulatory levels at concentrations equal to or greater than the values listed, it is a hazardous waste.

With respect to petroleum-contaminated soil, the primary compound of concern is benzene. If the benzene concentration in a TCLP extract is equal

to or greater than 500 ppb, the contaminated material is a characteristic hazardous waste. For gasoline contaminated soil, toxicity for lead must also be evaluated.

The regulatory level of benzene in the soil is determined by analyzing the soil using the TCLP extraction method and determining the concentration in the extract.

A second method of determination is to identify the total concentration of the contaminant in the soil. If the total concentration is less than the regulatory level, then the leachate level could not possibly exceed the standard. This approach would save laboratory costs because the TCLP would not have to be run. If the total concentration in the soil exceeds the regulatory level required in the extract, no conclusion can be drawn from these results and a complete TCLP must be run.

Additional Information on Toxicity Characteristics

On March 29, 1990, the U.S. Environmental Protection Agency established the Toxicity Characteristic (TC) Rule. The TC Rule expands the list of contaminants by which a waste can be classified as hazardous due to toxicity, and it replaces the Extraction Procedure Toxicity (EP Tox) with the Toxicity Characteristic Leaching Procedure (TCLP). The TC Rule's specified contaminant list includes the same 14 metals and pesticides as the original toxicity list, plus 25 additional organic chemicals. Each of the 39 listed contaminants has the potential for rendering a particular material a characteristic hazardous waste due to toxicity. Since benzene is one of the 25 organic compounds added to the toxicity list, and since benzene is commonly found in petroleum products, it is possible that petroleum-contaminated soil may classify as a hazardous waste. Limited relief from these hazardous waste regulations is currently available because the TC Rule has specifically deferred petroleum-contaminated soil, groundwater, and debris generated from underground storage tank (UST) releases, until the impact of the regulation is further evaluated.

UST sites are essentially those sites which have underground storage tanks containing transportation fuels, such as gasoline, jet fuel, aviation gas, and diesel fuel. (See 40 CFR Section 280.12 for a more complete definition). The TC Rule does not apply to petroleum-contaminated media produced by a leak from an UST, including associated underground piping. However, DEC regulations state that the materials contaminated by transportation fuels can be hazardous wastes if they exhibit other hazardous waste characteristics, such as toxicity due to lead.

The TC Rule, as published on March 29, 1990, became effective on September 25, 1990, for large-quantity generators, and March 29, 1991, for small quantity generators. Large quantity generators are defined as those parties who generate 2,200 pounds or more of hazardous waste in any month. Small quantity generators are those parties who generate between 220 and 2,200 pounds of hazardous waste in any month. Until the DEC adopts the TC Rule, waste generators must comply with both the EPA and DEC waste regulations. Refer to the specific regulations of interest for more information.

HAZARDOUS WASTE REGULATORY LEVELS FOR TOXICITY CHARACTERISTIC

CONSTITUENT	REGULATORY LEVEL (mg/L)
Arsenic	5.0
Barium	100.0
Benzene	0.5*
Cadmium	1.0
Carbon tetrachloride	0.5*
Chlordane	0.03*
Chlorobenzene	100.0*
Chloroform	6.0*
Chromium	5.0
o-Cresol	200.0*
m-Cresol	200.0*
Cresol (TOTAL)	200.0*
2,4-D	10.0
1,4-Dichlorobenzene	7.5*
1,2-Dichloroethane	0.5*
1,1-Dichloroethylene	0.7*
2,4-Dinitrotoluene	0.13*
Endrin	0.02
Heptachlor (and its epoxide)	0.008*
Hexachlorobenzene	0.13*
Hexachloro-1,3butadiene	0.5*
Hexachloroethane	3.0*
Lead	5.0
Lindane	0.4
Mercury	0.2

HAZARDOUS WASTE REGULATORY LEVELS FOR TOXICITY CHARACTERISTIC (Cont'd)

CONSTITUENT	REGULATORY LEVEL (mg/L)
Methoxychlor	10.0
Methyl ethyl ketone	200.0*
Nitrobenzene	2.0*
Pentachlorophenol	100.0*
Pyridine	5.0*
Selenium	1.0
Silver	5.0
Tetrachloroethylene	0.7*
Toxaphene	0.5
Trichloroethylene	0.5*
2,4,5-Trichlorophenol	400.0*
2,4,6-Trichlorophenol	2.0*
2,4,5-TP (Silvex)	1.0
Vinyl chloride	0.2*

* New Toxicity Characteristics Effective 9/25/90

APPENDIX B

GUIDANCE VALUES AND REUSE OPTIONS

TABLE 1
Guidance Values For Gasoline Contaminated Soil*

Compound	EPA Method	Detection Limit[1] (ppb)		TCLP Extraction Guidance Value[2] C_w (ppb)	TCLP Alternative Guidance Value C_a (ppb)	Human Health Guidance Value C_h (ppb)	Sediment Guidance Value C_s (ppb)
		Liquid	Solid				
Benzene	8021 (8020)	1	2	0.7	14	2.4×10^4	
Ethylbenzene	8021 (8020)	1	2	5	100	8.0×10^6	
Toluene	8021 (8020)	1	2	5	100	2.0×10^7	
o-Xylene	8021 (8020)	2	2	5	100	2.0×10^8	
m-Xylene	8021 (8020)	2	2	5	100	2.0×10^8	
p-Xylene	8021 (8020)	2	2	5	100	***	
Mixed Xylenes	8021 (8020)	2	2	5	100	2.0×10^8	
Isopropylbenzene	8021	1	1	5	100	***	
n-Propylbenzene	8021	1	1	5	100	***	
p-Isopropyltoluene	8021	1	1	5	100	***	
1,2,4-Trimethylbenzene	8021	1	1	5	100	***	
1,3,5-Trimethylbenzene	8021	1	1	5	100	***	
n-Butylbenzene	8021	1	1	5	100	***	
sec-Butylbenzene	8021	1	1	5	100	***	
Naphthalene	8021	1	1	10	200	3.0×10^5	
Methyl t-butyl ether (MTBE)[3]	8021 (8020)	1	1	50	1,000	***	

***Nuisance Characteristics Guidance:**

No petroleum-type odors.

No individual contaminant in soil at greater than 10,000 ppb.

(1) The listed Detection Limits are Practical Quantitation Limits (PQLs). The Method Detection Limit (MDL) is the best possible detection. Laboratories report the Practical Quantitation Limit (PQL), which is generally 4 times the MDL. Efforts should be made to obtain the best detection possible when selecting a laboratory. When the Guidance Value or standard is below the detection limit, achieving the detection limit will be considered acceptable for meeting the Guidance Value or standard.

(2) The TCLP Extraction Guidance Values are equal to the NYSDEC groundwater quality standards or Guidance Values, or the NYSDOH drinking water quality standards or Guidance Values, whichever is more stringent.

(3) Methyl t-butyl ether (MTBE) is not a target compound of Methods 8021 and 8020, but MTBE may be determined using these methods with appropriate quality assurance and quality control measures.

*** No Guidance Value identified in EPA HEAST Report.

TABLE 2
Guidance Values for Fuel Oil Contaminated Soil*

Compound	EPA Method	Detection Limit[1] (ppb)		TCLP Extraction Guidance Value[2] C_w (ppb)	TCLP Alternative Guidance Value C_a (ppb)	Human Health Guidance Value C_h (ppb)	Sediment Guidance Value C_s (ppb)	
		Liquid	Solid				Fresh	Marine
Benzene	8021 (8020)	1	2	0.7	14	2.4×10^4		
Ethylbenzene	8021 (8020)	1	2	5	100	8.0×10^6		
Toluene	8021 (8020)	1	2	5	100	2.0×10^7		
o-Xylene	8021 (8020)	2	2	5	100	2.0×10^8		
m-Xylene	8021 (8020)	2	2	5	100	2.0×10^8		
p-Xylene	8021 (8020)	2	2	5	100	•••		
Mixed Xylenes	8021 (8020)	2	2	5	100	2.0×10^8		
Isopropylbenzene	8021	1	1	5	100	•••		
n-Propylbenzene	8021	1	1	5	100	•••		
p-Isopropyltoluene	8021	1	1	5	100	•••		
1,2,4-Trimethylbenzene	8021	1	1	5	100	•••		
1,3,5-Trimethylbenzene	8021	1	1	5	100	•••		
n-Butylbenzene	8021	1	1	5	100	•••		
sec-Butylbenzene	8021	1	1	5	100	•••		
t-Butyl benzene	8021	1	1	5	100	•••		
Naphthalene[3]	8021 (8270)	1 (6)	1 (330)	10	200	3.0×10^5		
Anthracene	8270	8	330	50	1,000	2.0×10^7		
Fluorene	8270	8	330	50	1,000	3.0×10^6		
Phenanthrene	8270	22	330	50	1,000	•••		
Pyrene	8270	8	330	50	1,000	2.0×10^6		
Acenaphthene	8270	8	330	20	400	5.0×10^6		
Benzo(a)anthracene	8270	31	330	.002	.04[4]	220	33	18
Fluoranthene	8270	9	330	50	1,000	3.0×10^6		

(CONTINUED ON THE NEXT PAGE)

TABLE 2 (Cont'd)
Guidance Values for Fuel Oil Contaminated Soil*

Compound	EPA Method	Detection Limit (ppb)		TCLP Extraction Guidance Value[3] C_w (ppb)	TCLP Alternative Guidance Value C_a (ppb)	Human Health Guidance Value C_h (ppb)	Sediment Guidance Value C_s (ppb)	
		Liquid	Solid				Fresh	Marine
Benzo(b)fluoranthene	8270	19	330	.002	.04[4]	220	33	18
Benzo(k)fluoranthene	8270	10	330	.002	.04[4]	220	33	18
Chrysene	8270	10	330	.002	.04[4]	***	33	18
Benzo(a)pyrene	8270	10	330	.002	.04[4]	61	33	18
Benzo(g,h,i)perylene	8270	10	330	.002	.04[4]	***		
Indeno(1,2,3-cd)pyrene	8270	10	330	.002	.04[4]	***		
Dibenz(a,h)anthracene	8270	10	330	50	1,000	14		

* **Nuisance Characteristics Guidance:**
No Petroleum-type odors.
No individual contaminant in soil at greater than 10,000 ppb.

[1] The listed Detection Limits are Practical Quantitation Limits (PQL's). The Method Detection Limit (MDL) is the best possible detection. Laboratories report the Practical Quantitation Limit (PQL), which is generally 4 times the MDL. Efforts should be made to obtain the best detection possible when selecting a laboratory. When the Guidance Value or standard is below the detection limit, achieving the detection limit will be considered acceptable for meeting the Guidance Value or standard.

[2] The TCLP Extraction Guidance Values are equal to the NYSDEC groundwater quality standards or Guidance Values, or the NYSDOH drinking water quality standards or Guidance Values, whichever is more stringent.

[3] For naphthalene analysis in a liquid matrix, both Method 8021 and Method 8270 can provide satisfactory levels for comparison to the C_w of 10 ppb.

For naphthalene analysis in a solid matrix, Method 8021 is preferred over Method 8270 for comparison to the C_a of 200 ppb. If the C_a Guidance Value is not being used in the soil evaluation, then both Method 8021 and 8270 can provide satisfactory detection levels for comparison to the C_h of 3.0×10^5, and nuisance characteristic of 10,000 ppb.

[4] Due to the high detection limit for a solid matrix, the TCLP Extraction Method must be used to demonstrate groundwater quality protection for these compounds.

*** No Guidance Value identified in EPA HEAST Report.

TABLE 3
Soil Reuse Options

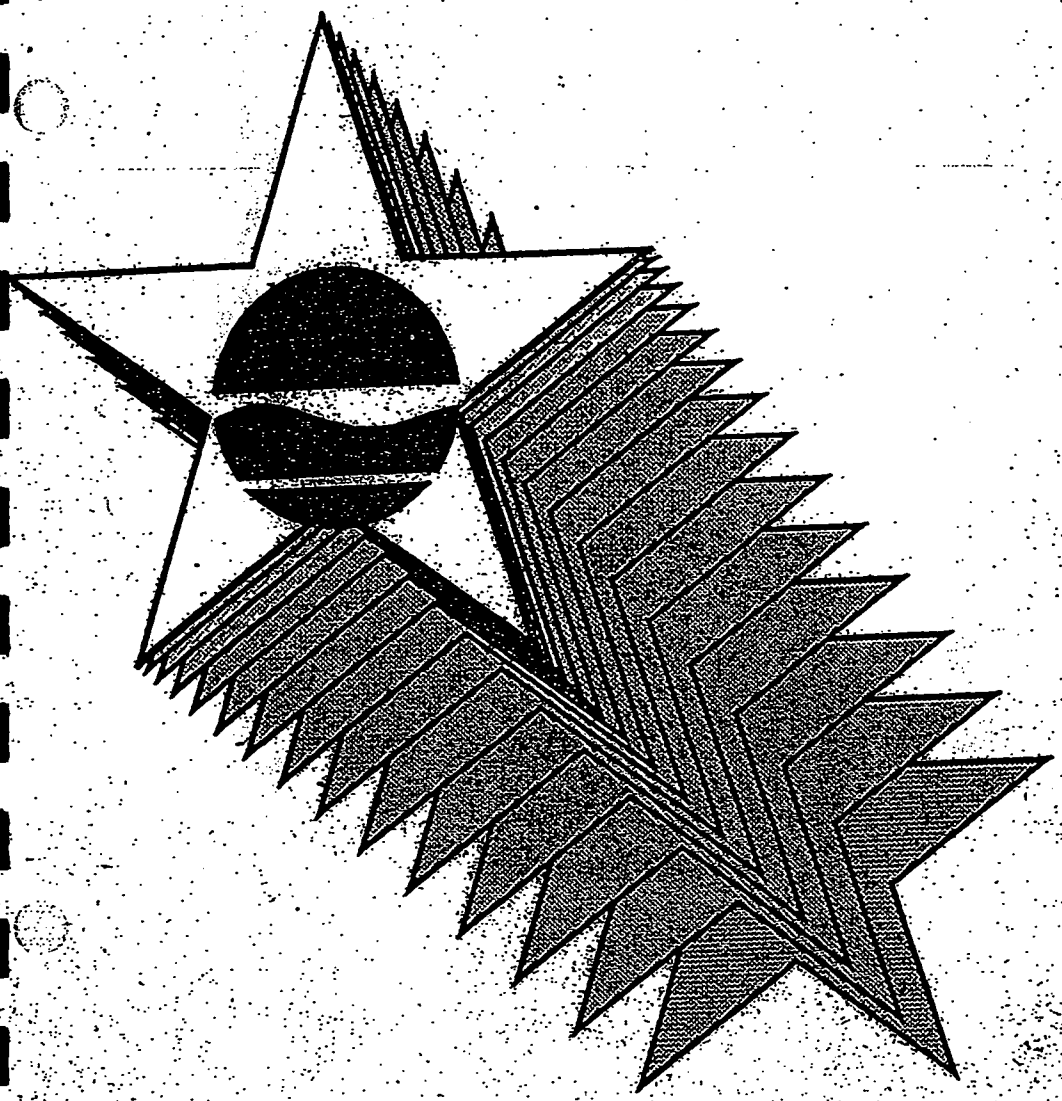
Reuse Option	Minimum Criteria To Be Met[1]		
	Protection of Groundwater	Protection of Human Health	Protection Against Nuisance Characteristics
Asphalt[2] or Concrete Manufacturing			
Cold-Mix Asphalt[2]			
Construction Material	X	X	X
Fill for Original Excavation	X	X	X
Fill Elsewhere On-Site	X	X	X
Off-Site at Pre-Approved Location	X	X	X

[1] In addition, the criteria for protection of fish and wildlife must be met when sediments are the waste materials being handled, and when these soils or sediments are being disposed in surface waters, marine waters, or wetland areas.

[2] The soils must satisfy the criteria established under the particular BUD issuance.

Exhibit 6-3

STARS Memo #2 – Biocell and Biopile Designs for Small-Scale Petroleum-Contaminated Soil Projects



Spill
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Series

STARS Memo #2

Biocell and Biopile Designs for Small-Scale Petroleum-Contaminated Soil Projects

Prepared by:
New York State Department of Environmental Conservation
Division of Spills Management

May 1996

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BACKGROUND AND APPLICABILITY

As the number of petroleum-contaminated sites requiring cleanup in New York State increases, so does the desire for better, faster and more cost-effective ways to investigate and remediate these sites. This situation becomes more significant as the option of landfilling petroleum-contaminated soils decreases as more landfills close. As a result, landfilling becomes more costly for the few which remain in operation. Landfilling also brings with it the liability of stored petroleum-contaminated soil as well as the transfer of contaminated material from one location to another.

The New York State Department of Environmental Conservation (NYSDEC) Division of Spill Management (DSM) is concerned that the Responsible Parties (RPs) get their money's worth so they will continue to be responsible and cooperative in remediating petroleum releases to the environment. In addition, DSM wants to control expenditures from the New York State Spill Fund, which is a revolving fund of State and federal money used to investigate and remediate spills when an RP is unidentifiable, or is unwilling or unable to perform the work deemed necessary by DSM. The New York State Department of Environmental Conservation (NYS DEC) has been investigating and encouraging reuse and recycling alternatives to landfilling, which are efficient, cost-effective, and environmentally-protective. 6 NYCRR Part 611 refers to guidance that encourages recycling or on-site treatment versus disposal.

DEC has also been seeking alternatives which lend themselves to the development of a generic design approach for small-scale projects. Generic approaches are desirable because they could reduce the time lag and the overall costs of a spill cleanup for small-scale projects, by providing the preliminary design work for an (RP) or contractor to adapt to similar projects and by minimizing (or virtually eliminating) the engineering design phase. Generic approaches could also help educate RPs and contractors who do not have knowledge and experience in innovative remedial technologies.

Ex-situ (aboveground) bioremediation has been developed as a generic design approach for small-scale projects. This was possible because aboveground soil bioremediation technology can be adjusted to address soil type, contaminant type, soil quantity, and concentration.

Bioremediation creates and maintains a favorable environment to stimulate microorganisms to use contaminants (hydrocarbons) in soil as a food source. Under proper conditions, microorganisms, can break down contaminants into non-hazardous inorganic substances. Small-scale bioremediation lends itself to a generic design approach because the design criteria, which include moisture content, temperature and pH of the soil, can be simply measured and adjusted to optimum conditions for the process. The additional design criteria, nutrient and oxygen requirements, can be estimated based on contaminant concentrations in the soil. It is understood that generic parameters established by a standardized method may not provide the same remedial efficiencies as those based on a site-specific feasibility study; however, it is anticipated that the results will be adequate for small-scale projects.

The advantages of bioremediation include the following:

- it can be conducted on site,
- the waste is permanently eliminated,
- capital costs for these small-scale applications are cheaper than other processes,
- there is positive public acceptance because it provides for recycling,
- the long-term liability risks associated with leaving contamination on site are eliminated,
- there is minimum site disruption,
- transportation costs and liability of landfilling are eliminated, and
- it can be coupled with other treatment techniques.

Disadvantages of bioremediation include the following:

- the design criteria for highly efficient remediation are site-specific, and
- extensive monitoring may be necessary.

This design approach uses indigenous microorganisms applied to petroleum-contaminated soils of approximately 30 - 100 yd^3, typical of the removal of an underground storage tank. This volume of soil was chosen because it should reduce costs for many RPs who do not have the resources to hire professionals with experience in bioremediation. In addition, it would reduce project duration time compared to less active approaches, and it would be a manageable quantity of soil for application of a

generic design approach. The same principles can be used for smaller or larger quantities. A less elaborate design would be appropriate for smaller quantities, and an experienced professional consultant is recommended for larger quantities.

The generic biocell and biopile designs are intended to provide an overview and direction to spillers on the use of ex-situ bioremediation of small-scale (approx. 30 - 100 yd^3) petroleum-contaminated soil. While this document does not establish standards, it is intended as guidance to regional spill investigators and RPs for designing bioremediation cells and piles.

BIOREMEDIATION TECHNOLOGY

Bioremediation consists of creating and maintaining a favorable environment for microorganisms, either indigenous (naturally existing) or non-indigenous (brought in from another site), to use contaminants in soil as a carbon food source. The basic requirements for bioremediation to occur include a food source (hydrocarbons), oxygen, and nutrients (phosphorous and nitrogen), in a compatible environment (proper pH, temperature and moisture.) Other nutrients such as potassium, calcium, iron, manganese, cobalt, copper, and zinc, are generally present in adequate concentrations in most soil and aquifer systems, and usually need no further attention in the design of a bioremediation process.

Two commonly used designs for ex-situ bioremediation are the biocell and the biopile. In a biocell, the contaminated soil is spread in 1 to 2-foot layers. In a biopile, the contaminated soil is mounded in 3 to 4-foot piles.

pH

Petroleum-consuming microorganisms grow best at pH near 7. Where high concentrations of volatile compounds are present and where soils have low alkalinity (acidic conditions, i.e., pH<7), liming may be necessary. Adding enough lime to attain a pH of 7.2 to 7.5 should be sufficient to maintain appropriate pH throughout the life of the project without having to monitor the pH. The lime added should be in the form of ground agricultural limestone ($CaCO_3$), similar to pelletized limestone sold in garden stores. Ground limestone is recommended because it is less expensive than other forms and applying excessive amounts will not affect treatment. Soil samples can be collected and taken to a local garden store for pH measurement and liming requirements to achieve pH near 7.

The pH of alkaline soil (pH>7) should be reduced by the acidic by-products generated from the biological activity in the soil. As biological activity and resulting pH reduction continue, monitoring may be necessary to determine if acidic conditions occur and subsequent liming is necessary. For a project of this size and duration, pH monitoring may not be necessary after measuring and adjusting at the start of the project. As a conservative approach, pH could be measured once per season.

Note: Some studies have reported that lime may be harmful to hydrocarbon-degrading bacteria and magnesium sulfate may be used as a substitute. Since magnesium sulfate is apparently difficult to obtain, and since DSM has limited data discouraging the use of lime, DSM will continue recommending its use. Further investigation of the use of lime for pH control is recommended in a project where pH control is a concern.

Temperature

The microorganisms will operate best at ambient temperatures between 40° and 100°F. The heat generated by covering the soil, and from the biodegradation reactions should allow operation of a bioremediation process in most of New York State for approximately 9 months per year. Efficiency will improve as temperature rises and petroleum hydrocarbon degradation does not generate enough heat to be concerned with excessively high temperatures.

Covering piles will help to sustain heat. Black polyethylene covers are generally more durable than standard polyethylene, and will absorb heat to keep the pile warm. Clear polyethylene degrades more rapidly due to exposure to weather and sunlight. Therefore, to prolong the life of bioremediation processes in the Northeast, the use of black polyethylene covers is recommended.

Moisture

Moisture content should be maintained at 50-60 percent field moisture capacity, which means that the soil should be wet but not puddly. (Values of field moisture capacity for various soil textures are tabulated in the appendices of the original design paper.) If desired, moisture can be measured regularly using a lysimeter, monitored visually, and added as necessary. However, for this simple approach, moisture can be added using a spray applicator, and distributed in the cells by the weekly tilling process, or by natural dispersion through the piles. If spraying is not expected to provide enough moisture throughout a pile, then moisture could be added through a system of slotted pipes woven through the pile, to ensure even distribution.

Dechlorinated water must be used for bioremediation because chlorine can kill the microorganisms. In addition, the water must be potable quality water to avoid propagation of pathogenic bacteria during the bioremediation process.

If too much moisture is present in the soil, leachate may collect in the sump areas of the cells or piles. This leachate must be disposed of properly in accordance with local State and federal regulations. Depending on the level of contamination, disposal options may include discharging to a municipal sewer system with prior approval from the sewage treatment plant owner/operator, or to a regulated disposal facility. An acceptable alternative is to re-use the leachate for moistening the cells or piles. If there is more leachate than is needed, the excess must be properly disposed of, as described above.

Nutrient Requirements

Microorganisms degrade hydrocarbons through chemical reactions between microbial enzymes and the hydrocarbons. Nutrient requirements for these biodegradation reactions include nitrogen, phosphorous and oxygen. These requirements were calculated based on the average composition of

gasoline and fuel oil contaminants in the soil and the amount of soil to be treated, by solving the chemical reaction equations for biodegradation. The derivation of the reaction equations and calculation of the nutrient requirements are found in the appendices of the DSM design paper, "Generic Biocell and Biopile Designs for Small-Scale Petroleum-Contaminated Soil Projects.

Oxygen can be added to a biocell by tilling at least once per week, and to a pile through a system of slotted pipes to ensure even distribution of oxygen. Oxygen rates need to be greater than or equal to the calculated requirements. An excess oxygen supply is desirable to ensure adequate distribution of oxygen throughout a pile. Conversely, too much air can dry out the soil, decrease the biological activity, and volatilize the contaminants.

Based on the amount of oxygen required (found in the appendices of the DSM design paper), a 1-hp blower can be operated at a low flow rate while monitoring moisture content. If the soil is drying out, then the pump flow rate should be decreased or water should be added.

Nitrogen and phosphorous requirements can be satisfied by applying the appropriate fertilizer or a custom fertilizer blend based on the calculated requirements. Ammonia is the preferred source of nitrogen for hydrocarbons. Nitrogen and phosphorous can be added in the form of "off-the-shelf" fertilizer. If it is assumed that nitrogen and phosphorous initially in the soil is negligible, then a 6:1, nitrogen: phosphorous ratio is desirable. Therefore, a lawn fertilizer of 19:3:3 (nitrogen:phosphorous:potassium) ratio can be used.

The amount of fertilizer required has been tabulated in Table 1 based on the amount of soil to be treated and total petroleum hydrocarbons (TPH) found in the soil. All the fertilizer can be applied at the start of the project. The bacteria will consume the nutrients as they need them. Fertilizer can be added all at once, in dry pelletized form. Liquid fertilizer and periodic fertilizer application might also be viable options.

Table 1 lists the amount of fertilizer required to treat fuel oil or gasoline-contaminated soil for a range of contamination and quantities of soil to be treated.[1] The nitrogen:phosphorous ratio in the fertilizer should be 6:1, such as 19:3:3 (N:P:K) lawn feed which can be found in garden stores.

Monitoring Requirements

Regular sampling and analysis of contamination levels and microbial counts are necessary to monitor the progress of the biodegradation. Contaminant sampling and analysis should be conducted in accordance with the DEC Division of Spill Management's Sampling Guidelines and Protocols, and STARS Memo #1: Petroleum-Contaminated Soil Guidance Policy, under guidance of a DEC Regional Project Manager.

Microbe counts are conducted using Colony-Forming Units (CFU) analysis, a numerical tally of the total microbial population present, and Colony-Utilizing Population (CUP) analysis, the percentage of the microbe population capable of consuming the petroleum products. Low microbial counts and high contamination levels can indicate that the environmental conditions are not ideal for microbial growth. High microbial counts and lower contamination levels probably indicate that biodegradation is working well. Low microbial counts and low contamination levels can indicate that biodegradation was successful and that the microbes are dying off because the contamination (food source) is decreasing.

Table 2 is an example of an aggressive sampling and analysis procedure that may be used on a fast-track small-scale bioremediation project. Small-scale projects, including the sampling and analysis procedures, should be conducted under the guidance of a DEC Regional Project Manager. Each sampling plan can be developed on a site-by-site basis. Critical factors which indicate successful bioremediation include pH, contaminant concentration, and microbe count.

Table 1: Amount of Fertilizer Required to Treat Fuel Oil or Gasoline-Contaminated Soil (lbs.) (N:P=6:1)

Total Petroleum Hydrocarbons (TPH) (ppm)	Volume of Soil ($yd.^3$)							
	30	40	50	60	70	80	90	100
1000	59	79	99	118	138	158	177	197
2000	118	158	197	236	276	315	355	394
3000	177	236	296	355	414	473	532	591
4000	236	315	394	473	552	631	709	788
5000	296	394	493	591	690	788	887	985
6000	355	473	591	709	828	946	1064	1182
7000	414	552	690	828	966	1104	1242	1379
8000	473	631	788	946	1104	1261	1419	1577
9000	532	709	887	1064	1242	1419	1596	177
10000	591	788	985	1182	1379	1577	1774	1971
12500	739	985	1232	1478	1724	1971	2217	2463
15000	887	1182	1478	1774	2069	2365	2660	2956
17500	1035	1379	1724	2069	2414	2759	3104	3449
20000	1182	1577	1971	2365	2759	3153	3547	3941

1 Fertilizer requirements were calculated for the average composition of fuel oil and for gasoline. Amounts for gasoline and fuel oil were within 10% of each other; therefore, the same table will be used for both substances.

Table 2. Small-Scale Bioremediation Sampling Plan

Pretreatment Sampling:	TPH[1], total soil concentration[2], microbes[3], and soil sieve analysis (grain size distribution)[4], and pH[5]
Sampling During Treatment:	
every 4 - 6 weeks:	TPH and microbes
every 8 - 12 weeks:	TPH, indicator compounds[6], microbes and pH
End of Season:	TPH, total soil concentration, and microbes
Next Season Start-up:	TPH, total soil concentration, microbes, and pH
Project Closeout:	Total soil concentration, TCLP[2], and microbes

1 TPH analysis is performed using EPA Method 418.1.

2 Total soil concentration analysis and TCLP extract analysis will be performed using EPA Method 8021 plus MTBE for gasoline and EPA Methods 8021 and 8270 (base neutrals) for fuel oil, in accordance with STARS Memo #1.

3 Microbe counts can be measured by colony-forming units (CFU) and colony-utilizing population (CUP). According to literature, 10^6 - 10^8 CFU/gram is the recommended level of microbes sufficient to support contaminant degradation.

4 Soil sieve analysis (grain size distribution) is conducted to classify soil type and to determine whether or not composting would be recommended to promote better aeration, such as in clays. Composting is beyond the scope of this guidance paper.

5 pH measurements can be done at a local garden store.

6 Indicator compounds to be analyzed for gasoline include BTEX using EPA Method 8020. Indicator compounds to be analyzed for fuel oil will be determined based on the total soil concentration analysis results.

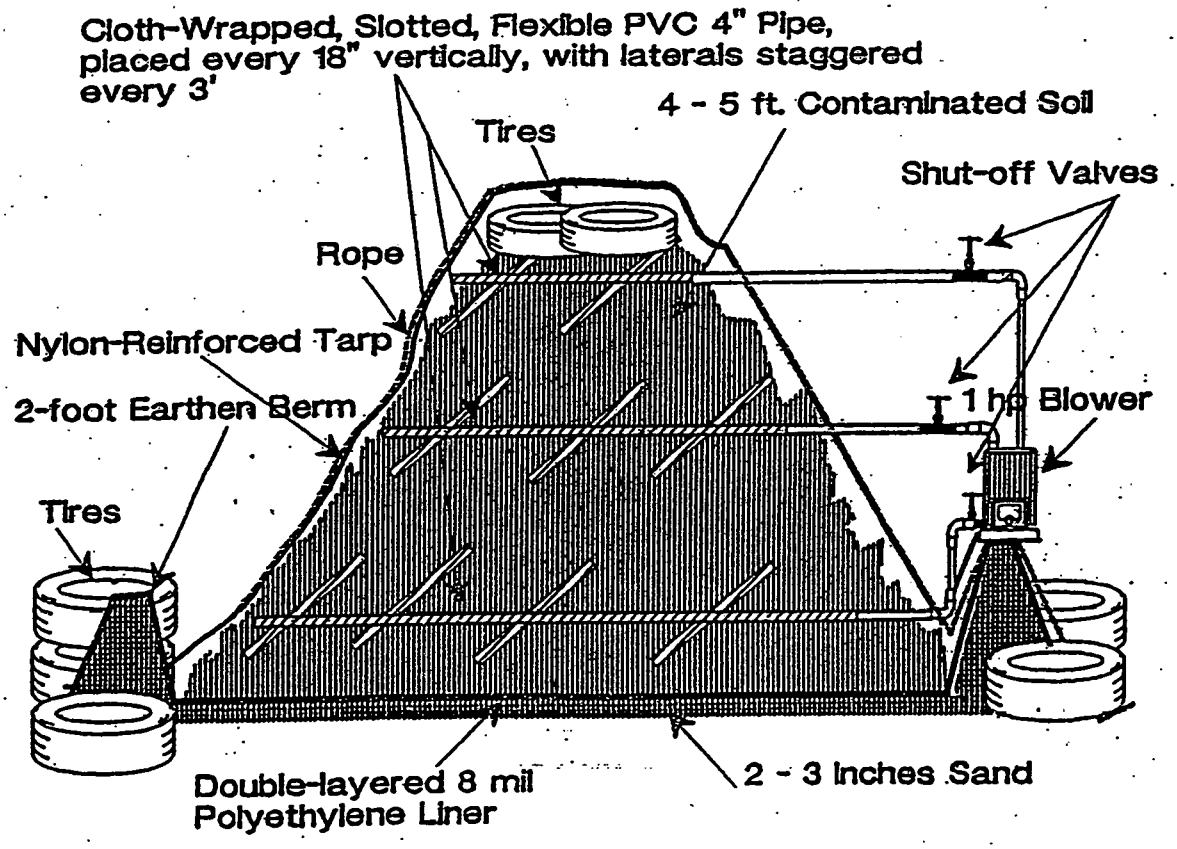
BIOREMEDIATION APPROACHES

The engineering technologies for bioremediation can be characterized as physical controls, pump and treat, excavate and treat (ex-situ), and in-place (in-situ) technology. Physical controls consist of impermeable barriers designed to prevent contaminant migration and to allow natural biodegradation to occur. Pump and treat, and excavate and treat methods bring contaminated groundwater or soil to the surface where it is treated by biological reactors, possibly coupled with physical and chemical processes. In-situ technologies process the contaminated groundwater or soil in place in the subsurface. This paper addresses excavating and treating soil in a pile, also known as a biopile, or in a layer, also known as a biocell.

Biopile

Figure 1

Design Specifications for Biopile



Design Specifications and Operating Conditions for a Biopile

Setup

A biopile is set up according to the following design specifications and accompanying sketch. (See Figure 1.)

1. Clear and grade an area for construction. The foundation should be sloped to allow drainage and collection of rainwater.
2. Build a two-foot earthen berm around the pile to prevent run-on of surface waters and run-off of leachate. If this curb is constructed of soil, it should also be covered with the polyethylene liner to protect the curb from erosion.
3. Lay a double-layered 8 mil polyethylene liner on top of a 2 - 3 inch layer of sand and 2-foot berms. The liner should be durable enough so that soil-moving equipment will not tear it, and it is impermeable to leachate in the soil.
4. Pile the soil into a 4 - 5 foot flat-top pile on the liner, by adding soil in 1 to 2-foot lifts, installing air distribution piping and lime, fertilizer, and water with each lift.
5. While constructing the pile, install a ventilation system (a network of 4", slotted PVC piping woven throughout the pile, shut-off valves, explosion-proof blower, particle filter, moisture trap, and muffler) according to manufacturers' recommended practices. The piping system includes shut-off valves at each elevation of piping to allow varying air flow depending on moisture and contaminant levels. Slotted PVC pipes should be wrapped in a geotextile cloth to prevent soil from clogging the screens.
6. Add lime and fertilizer, and spray each soil layer with dechlorinated water until soil is wet but not puddly. (See the Operation section of this design for details on adding lime and fertilizer.)
7. Place tires or hay bales on top of the pile to provide air space between the soil and the cover, allowing air circulation under the cover.

8. Cover the pile with a black nylon-reinforced tarp, or at least a double layer of 8 mil polyethylene, or a greenhouse-type structure, to protect the soil from rain and to keep it warm. This cover should be durable enough to withstand wind and weathering.

9. Anchor the cover using tires or hay bales around the perimeter of the cover, and ropes run over the top of the cover and tied to the tires or bales.

10. Secure the entire area with a safety fence to deter vandalism.

Operation

The process specifications include proper pH, temperature, moisture, nutrients and aeration:

pH

1. Determine the amount of soil to be treated.
2. Take one composite soil sample to a local garden store to be tested for pH. Refer to a liming chart for amount of lime ($CaCO_3$) to be added to obtain pH 7.
3. Add lime and mix with soil and fertilizer as the pile is constructed.
4. Check pH once per season.

Temperature

1. Operate at soil temperature above 40° F.
2. When soil temperature is below 40° F, follow end-of-season sampling procedures and secure site.

Moisture

1. Check soil weekly for dryness.
2. When the soil appears dry, remove cover, spray soil with potable, dechlorinated water until it is wet but not puddly. (Dehydration can be somewhat controlled by varying flow rate of vacuum pump. Water can be dechlorinated with tablets purchased at a local aquarium store.)
3. Adjust schedule or pump flow rate based on results.

Nutrients

1. Determine the amount of soil to be treated and the TPH of the soil. TPH analysis should be conducted using EPA Method 418.1, Modified Method 8015, or similar method. Refer to nutrient addition table in this guidance document.
2. Add fertilizer and mix with the soil and lime (if needed) as the pile is constructed.

Aeration

1. Supply air through a system of slotted pipes to ensure even distribution of oxygen. The design for the piping needs to be such that it avoids short-circuiting of air. Short-circuiting occurs due to varying resistance to air flow such as soil settling or clogging of pipe perforations. This results in air preferentially flowing through the path of least resistance. One way to avoid short-circuiting is to cover the perforated piping with a geotextile material to prevent clogging of the perforations. This geotextile material can be purchased in a plumbing or building supply store. Notes: A manifold of piping with valves at the manifold may be a better design than a helical piping structure. It may improve air distribution by allowing control of the direction and flow rate of air passing through the piping. Air could be directed to the most contaminated parts of the pile to promote contaminant biodegradation. Air flows could also be directed to dry out the very wet areas or away from areas which may be drying out from too much air.

   The smallest available diameter pipe is desired to allow maximum surface area of soil to be in contact with the air.

Small diameter piping also facilitates easier sampling which may contribute to solving the aeration problem. Sampling challenges could be encountered when the piping is struck by the auger and subsequent auguring locations are necessary to avoid the piping obstruction. These sampling problems could also cause the geotextile material on the piping to be torn up. The purpose of this geotextile is to prevent soil from entering the perforations in the piping and contribute to poor air distribution in the pile.

An excess oxygen supply is desirable to ensure adequate distribution of oxygen throughout the pile. However, too much air can dry out the soil and volatilize the contaminants.

Based on the oxygen requirements found in the appendices of the original design paper, and the operating capabilities of a 1 hp pump, a 1 hp pump can be operated at a low flow rate to meet oxygen requirements. If the soil is drying out, then the pump flow rate should be decreased or water should be added.

Monitoring

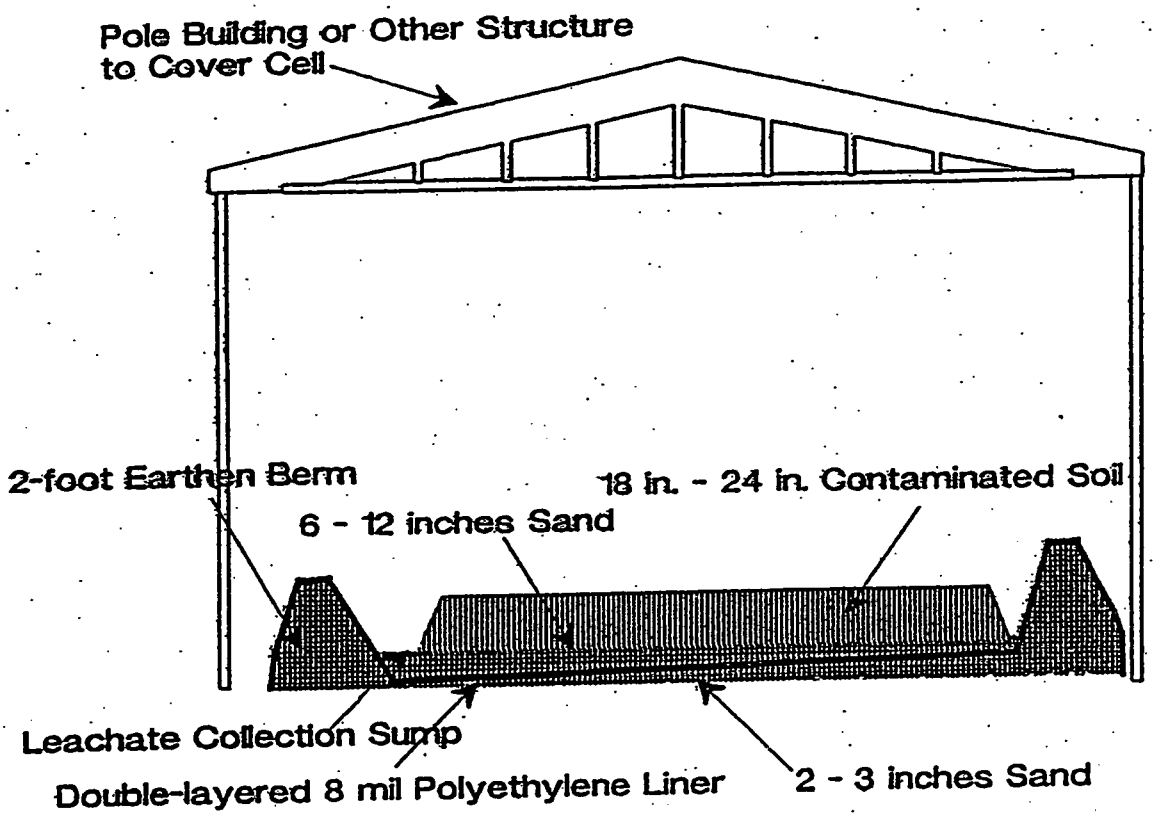
1. Perform types, numbers, and frequency of sampling as outlined in the Monitoring Requirements section of this guidance document.

Project Close-out

1. Conduct process under the guidance of NYS DEC until the soil reaches the guidance values listed in STARS Memo #1 or until determined appropriate by NYS DEC. Perform closure samples as described in STARS #1.

Figure 2

Design Specifications for Biocell



Design Specifications and Operating Conditions for a Biocell

Setup

A biocell is set up according to the following design specifications and accompanying sketch. (See Figure 2.)

1. Clear and grade a sloped area for construction. The foundation should be sloped towards a sump to collect leachate.

2. Lay a double-layered 8 mil polyethylene liner on top of a 2 - 3 inch layer of sand with 6 - 12-inch berms. The liner should be durable enough so that soil-moving equipment will not tear it, and it is impermeable to leachate in the soil.
   Build a 6 - 12-inch earthen berm around the pile to prevent run-on of surface waters and run-off of leachate. If this curb is constructed of soil, it should also be covered with the polyethylene liner to protect the curb from erosion.
   Cover the liner with a 2-foot layer of sand or gravel to protect against tilling equipment.

3. Spread the soil into a 18 - 24 inch layer on the sand.

4. While constructing the cell, add lime and fertilizer, and spray with dechlorinated water until soil is wet but not puddly. (See the Operation section of this design for details on adding lime and fertilizer.)

5. Cover the cell with a durable peaked or sloped-roof cover to prevent puddling on top of the cover and to protect against rainfall and the resulting leachate.
   A peaked or sloped roof is required so that water will not collect on it. The cell cover also should be designed to allow soil tilling operations to occur without disturbing the cover, or to be easily removed and replaced to allow for soil tilling as needed.

   Tents constructed of reinforced-nylon tarps can be used. However, this approach allows puddling of rain water on the covers and into the cells which makes it difficult to remove the cover for tilling.

Other alternatives which should be investigated are portable garages or surplus army tents or any other viable structure. These structures should be cheaper than a pole barn, stronger than the tarpaulin tents, and tall enough that they will not have to be removed for tilling. An alternative is to leave the cell uncovered until rain becomes a problem, or the project could be active during the "dry" season only and shut-down when conditions are too wet and cold to support bioremediation.

6. Secure the entire area with a safety fence to deter vandalism.

Operation

The process specifications include proper pH, temperature, moisture, nutrients and aeration:

pH

1. Determine the amount of soil to be treated.
2. Take one composite soil sample to a local garden store to be tested for pH. Refer to a liming chart for amount of lime ($CaCO_3$) to be added to obtain pH 7.
3. Add lime and mix with soil and fertilizer as the soil layer is constructed.
4. Check pH once per season.

Temperature

1. Operate at soil temperature above 40° F.
2. When soil temperature is below 40° F, follow end-of-season sampling procedures and secure site.

Moisture

1. Check soil weekly for dryness.

2. When the soil appears dry, spray soil with potable, dechlorinated water until it is wet but not puddly. (Water can be dechlorinated with tablets purchased at a local aquarium store.)
3. Distribute by tilling once per week.
4. Adjust schedule based on results.

Nutrients

1. Determine the amount of soil to be treated and the TPH of the soil. TPH analysis should be conducted using EPA Method 418.1, Modified Method 8015, or similar method. Refer to nutrient addition table in this guidance document.
2. Add fertilizer and mix with the soil and lime as the cell is constructed.

Aeration

1. Till at least once per week or supply air through a system of slotted pipes (see biopile design specifications).

   Tilling is a very difficult, labor-intensive process in saturated soil, clayey soil, and soil deeper than 10 inches. Based on the difficulty of tilling the soil with a garden tiller, it is recommended that a farm tiller should be used, or that the cells should be constructed with thinner layers of soil. If thinner layers are used (10 inches or less of soil), a suitable rototiller could be rented at a garden store or a rental center, to efficiently turn the soil layer over in the cell.

   An alternative for both the tilling problem in the cells and the aeration of clayey soils may be the use of oxygen-containing nutrient blends being marketed by various vendors in the industry. These blends, containing nutrients and oxygen in a solid form, are mixed into the soil and solubilize when moisture is added.

Monitoring

1. Perform types, numbers, and frequency of sampling as outlined in the Monitoring Requirements section of this guidance document.

Project Close-out

1. Conduct process under the guidance of NYS DEC until the soil reaches the guidance values listed in STARS Memo #1 or until determined appropriate by NYS DEC. Perform closure samples as described in STARS #1.

COST ESTIMATES

Based on limited experience with this type of project in NYS, it is estimated that the cost of conducting this type of project can range from less than $100 per ton to several hundred dollars per ton. Costs can vary greatly based on soil quantity, soil type, amount and type of contamination, access to and choice of materials and labor, and the monitoring plan.

ACKNOWLEDGEMENTS

This Document, prepared by the NYSDEC DSM, presents guidelines and recommended practices for bioremediation of small-scale amounts of petroleum-contaminated soil.

The information contained herein is based on reference documents and a research project completed with the dedicated and cooperative effort of Stewart's Ice Cream Shops, Inc., Lebanon Valley Landscaping, Inc., American Spill Abatement, Inc., and Waste Stream Technology, the USEPA and the NYSDEC.

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New York State Department of Environmental Conservation, Division of Water, Bureau of Spill Prevention and Response, Albany, New York, "Sampling Guidelines & Protocols: Technical Background and Quality Control/Quality Assurance For NYS DEC Spill Response Program," March 1991.

Exhibit 6-4

NYSDEC TAGM 4031 – Fugitive Dust Suppression and Particulate Monitoring Program at Inactive Hazardous Waste Sites

TECHNICAL AND ADMINISTRATIVE GUIDANCE MEMORANDUM #4031

FUGITIVE DUST SUPPRESSION AND PARTICULATE MONITORING PROGRAM AT INACTIVE HAZARDOUS WASTE SITES

TO: Regional Hazardous Waste Remediation Engrs., Bur. Directors & Section Chiefs

FROM: Michael J. O'Toole, Jr., Director, Division of Hazardous Waste Remediation

SUBJECT: DIVISION TECHNICAL AND ADMINISTRATIVE GUIDANCE MEMORANDUM -- FUGITIVE DUST SUPRESSION AND PARTICULATE MONITORING PROGRAM AT INACTIVE HAZARDOUS WASTE SITES

DATE: Oct 27, 1989

Michael J. O'Toole, Jr. (signed)

1. Introduction

Fugitive dust suppression, particulate monitoring, and subsequent action levels for such must be used and applied consistently during remedial activities at hazardous waste sites. This guidance provides a basis for developing and implementing a fugitive dust suppression and particulate monitoring program as an element of a hazardous waste site's health and safety program.

2. Background

Fugitive dust is particulate matter--a generic term for a broad class of chemically and physically diverse substances that exist as discrete particles, liquid droplets or solids, over a wide range of sizes--which becomes airborne and contributes to air quality as a nuisance and threat to human health and the environment.

On July 1, 1987, the United States Environmental Protection Agency (USEPA) revised the ambient air quality standard for particulates so as to reflect direct impact on human health by setting the standard for particulate matter less than ten microns in diameter (PM_{10}); this involves fugitive dust whether contaminated or not. Based upon an examination of air quality composition, respiratory tract deposition, and health effects, PM_{10} is considered conservative for the primary standard--that requisite to protect public health with an adequate margin of safety. The primary standards are 150 ug/m^3 over a 24-hour averaging time and 50 ug/m^3 over an annual averaging time. Both of these standards are to be averaged arithmetically.

There exists real-time monitoring equipment available to measure PM_{10} and capable of integrating over a period of six seconds to ten hours. Combined with an adequate fugitive dust suppression program, such equipment will aid in preventing the off-site migration of contaminated soil. It will also protect both on-site personnel from exposure to high levels of dust and the public around the site from any exposure to any dust. While specifically intended for the protection of on-site personnel as well as the public, this program is not meant to replace long-term monitoring which may be required given the contaminants inherent to the site and its air quality.

3. Guidance

A program for suppressing fugitive dust and monitoring particulate matter at hazardous waste sites can be developed without placing an undue burden on remedial activities while still being protective of health and environment. Since the responsibility for implementing this program ultimately will fall on the party performing the work, these procedures must be incorporated into appropriate work plans. The following fugitive dust suppression and particulate monitoring program will be employed at hazardous waste sites during construction and other activities which warrant its use:

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 waste or contaminated soil or when activities on site may generate fugitive dust from exposed waste or contaminated soil. Such activities shall also include the excavation, grading, or placement of clean fill, and control measures therefore should be considered.

3. Particulate monitoring must be performed using real-time particulate monitors and shall monitor particulate matter less than ten microns (PM_{10}) with the following minimum performance standards:

   Object to be measured: Dust, Mists, Aerosols
   Size range: <0.1 to 10 microns
   Sensitivity: 0.001 mg/m^3
   Range: 0.001 to 10 mg/m^3
   Overall Accuracy: ±10% as compared to gravimetric analysis of stearic acid or reference dust

   Operating Conditions:
   Temperature: 0 to 40°C
   Humidity: 10 to 99% Relative Humidity

   Power: Battery operated with a minimum capacity of eight hours continuous operation

   Automatic alarms are suggested.

   Particulate levels will be monitored immediately downwind at the working site and integrated over a period not to exceed 15 minutes. Consequently, instrumentation

shall require necessary averaging hardware to accomplish this task; the P-5 Digital Dust Indicator as manufactured by MDA Scientific, Inc. or similar is appropriate.

4. In order to ensure the validity of the fugitive dust measurements performed, there must be appropriate Quality Assurance/Quality Control (QA/QC). It is thc responsibility of the entity operating the equipment to adequately supplement QA/QC Plans to include 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 ug/m^3 over the integrated period not to exceed 15 minutes. 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 ug/m^3, the upwind background level must be measured immediately using the same portable monitor. If the working site particulate measurement is greater than 100 ug/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 (see Paragraph 7). Should the action level of 150 ug/m^3 be exceeded, the Division of Air Resources must be notified in writing within five working days; the notification shall include a description of the control measures implemented to prevent further exceedences.

6. It must be recognized that the generation of dust from waste or contaminated soil that migrates off-site, has the potential for transporting contaminants off-site. There may be situations when dust is being generated and leaving the site and the monitoring equipment does not measure PM_{10} at or above the action level. Since this situation has the potential to migrate contaminants off-site, it is unacceptable. While it is not practical to quantify total suspended particulates on a real-time basis, it is appropriate to rely on visual observation. If dust is observed leaving the working site, additional dust suppression techniques must be employed. Activities that have a high dusting potential--such as solidification and treatment involving materials like kiln dust and lime--will require the need for special measures to be considered.

7. The following techniques have been shown to be effective for the controlling of the generation and migration of dust during construction activities:

    1. Applying water on haul roads.
    2. Wetting equipment and excavation faces.
    3. Spraying water on buckets during excavation and dumping.
    4. Hauling materials in properly tarped or watertight containers.
    5. Restricting vehicle speeds to 10 mph.
    6. Covering excavated areas and material after excavation activity ceases.
    7. Reducing the excavation size and/or number of excavations.

    Experience has shown that utilizing the above-mentioned dust suppression techniques, within reason as not to create excess water which would result in unacceptable wet

conditions, the chance of exceeding the 150 ug/m^3 action level at hazardous waste site remediations is remote. Using atomizing sprays will prevent overly wet conditions, conserve water, and provide an effective means of suppressing the fugitive dust.

8. If the dust suppression techniques being utilized at the site do not lower particulates to an acceptable level (that is, below 150 ug/m^3 and no visible dust), work must be suspended until appropriate corrective measures are approved to remedy the situation. Also, the evaluation of weather conditions will be necessary for proper fugitive dust control--when extreme wind conditions make dust control ineffective, as a last resort remedial actions may need 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 appropriate toxics 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.

Exhibit 7-1

Minimum requirements for Health and Safety (Malcolm Pirnie, 2002)

MINIMUM REQUIREMENTS FOR HEALTH AND SAFETY

1.0 Description

The Contractor is responsible and liable for the health and safety of all on-site personnel and off-site community impacted by the site redevelopment activities.

This section describes the minimum health and safety requirements for this project including the requirements for the development of a written Health and Safety Plan (HASP). All on-site workers must comply with the requirements of the HASP. The Contractor's HASP must comply with all applicable federal and state regulations protecting human health and the environment from the hazards posed by activities during this site remediation.

2.0 References

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

AMERICAN CONFERENCE OF GOVERNMENTAL INDUSTRIAL HYGIENISTS

ACGIH TLVs	Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices (Latest Edition)

CODES OF FEDERAL REGULATIONS (CFR)

29 CFR 1910	Occupational Safety and Health Standards (Latest Edition)
29CFR 1926	Safety and Health Regulations for Construction (Latest Edition)
40 CFR 262	Standards Applicable to Generators of Hazardous Waste (Latest Edition)
49 CFR 178	Shipping Container Specification (Latest Edition)

U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)

EPA 9285.1-30	1992 or latest edition: Standard Operating Safety Guides (Office of Emergency and Remedial Response)
EPA-450	1987 or latest edition: Ambient Monitoring Guidelines for Prevention of Significant Deterioration (PSD)

NATIONAL INSTITUTES FOR SAFETY AND HEALTH (NIOSH)

NIOSH 85-115	1985 or latest edition: Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities (NIOSH, OSHA, USCG, and EPA)
NIOSH 89-127	1989 or latest edition: Manual of Analytical Methods

N.Y.S. DEPARTMENT OF ENVIRONMENTAL CONSERVATION (NYSDEC)

TAGM 4031	1989 Division Technical and Administrative Guidance Memorandum -- Fugitive Dust Suppression and Particulate Monitoring Program at Inactive Hazardous Waste Sites

N.Y.S. DEPARTMENT OF LABOR

NYSDOL 28.876	1980 Article 28 Section 876 NYS Labor Law (Right-to-Know Law)

3.0 Basis

The Occupational Safety and Health Administration (OSHA) Standards and Regulations contained in Title 29, Code of Federal Regulations, Parts 1910 and 1926 (20 CFR 1910 and 1926) and subsequent additions and/or modifications, the New York State Labor Law Section 876 (Right-to-Know Law), the Standard Operating Safety Guidelines by the United States Environmental Protection Agency (EPA), Office of Emergency and Remedial Response and the Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities (NIOSH, OSHA, USCG, and EPA) provide the basis for the safety and health program. Additional specifications within this section are in addition to OSHA regulations and reflect the positions of both the EPA and the National Institute for Occupation Safety and Health (NIOSH) regarding procedures required to ensure safe operations at abandoned hazardous waste disposal sites.

The safety and health of the public and project personnel and the protection of the environment will take precedence over cost and schedule considerations for all project work. The Contractor will notify the NYSDEC and NYSDOH of conditions which may adversely affect the safety and health of project personnel and the community. The NYSDEC or the NYSDOH may stop work for health and safety reasons. If work is suspended for health and/or safety reasons, it shall not resume until approval is obtained from the NYSDEC or the NYSDOH. The cost of work stoppage due to health and safety is the responsibility of the Contractor.

4.0 Health and Safety Definitions

The following definitions shall apply to the work of the redevelopment of the site:

A. Project Personnel: Project personnel include the Contractor, subcontractor, and Federal, and State, and local Representatives, working or having official business at the Project Site.

B. Authorized Visitor: The Safety Officer has primary responsibility for determining who is qualified and may enter the site. The Site Safety Officer will only allow authorized visitors with written proof that they have been medically certified and trained in accordance with 29 CFR 1910.120 to enter the contamination reduction zone and/or exclusion area.

C. Health and Safety Coordinator (HSC): The HSC shall be a Certified Industrial Hygienist (CIH) or Certified Safety Professional (CSP) retained by the Contractor. The HSC will be responsible for the development and implementation of the HASP.

D. Safety Officer (SO): The SO will be the Contractor's on-site person who will be responsible for the day-to-day implementation and enforcement of the HASP.

E. Health and Safety Technicians (HST): The HST(s) will be the Contractor's on-site personnel who will assist the SO in the implementations of the HASP, in particular, with air monitoring in active work areas and maintenance of safety equipment.

F. Medical Consultant (MC): The MC is a physician retained by the Contractor who will be responsible for conducting physical exams as specified under the Medical Monitoring Programs in this section.

G. Project Site: The area of the Hanna Furnace Site that is undergoing redevelopment, which includes the Contractor Work Area.

H. Contractor Work Area: An area of the project site including the Support Zone, access road, staging area, and Exclusion Zone.

I. Contractor Support Zone: An area of the Contractor Work Area outside the Exclusion Zone, accessible for deliveries and visitors. No persons, vehicles, or equipment may enter these areas from the Exclusion Zone without having gone through specified decontamination procedures in the adjacent Contamination Reduction Zone.

J. Staging Areas: Areas within the Exclusion Zone for the segregated temporary staging of uncontaminated and contaminated soil and debris.

K. Exclusion Zone: The innermost area within the Contractor Work Area that encloses the area of contamination. Protective clothing and breathing apparatus as specified in the health and safety requirements and in the Contractor's approved HASP must be worn.

L. Contamination Reduction Zone: An area at the Exit Point of the Exclusion Zone through which all personnel, vehicles, and equipment must enter and exit. All decontamination of vehicles and equipment and removal of personal protective clothing and breathing apparatus must take place at the boundary between the Exclusion Zone and the Contamination Reduction Zone.

M. Work: Work includes all labor, materials, and other items that are part of site redevelopment activities.

N. Monitoring: The use of direct reading field instrumentation to provide information regarding the levels of gases and/or vapor, which are present during remedial action. Monitoring shall be conducted to evaluate employee exposures to toxic materials and hazardous conditions.

5.0 Responsibilities

The Contractor shall:

A. Employ an SO who shall be assigned full-time responsibility for all tasks herein described under this HASP. In the event the SO cannot meet his responsibilities, the Contractor shall be responsible for obtaining the services of an "alternate" SO meeting the minimum requirements and qualifications contained herein. No work will proceed on this project in the absence of an approved SO.

B. Ensure that all project personnel have obtained the required physical examination prior to and at the termination of work covered by the contract.

C. Be responsible for the pre-job indoctrination of all project personnel with regard to the HASP and other safety requirements to be observed during work, including but not limited to (a) potential hazards, (b) personal hygiene principles, (c) personal protection equipment, (d) respiratory protection equipment usage and fit testing, and (e) emergency procedures dealing with fire and medical situations.

D. Be responsible for the implementation of this HASP, and the Emergency Contingency and Response Plan.

E. Provide and ensure that all project personnel are properly clothed and equipped and that all equipment is kept clean and properly maintained in accordance with the manufacturer's recommendations or replaced as necessary.

F. Will perform all site redevelopment work in a safe and environmentally acceptable manner. The Contractor will provide for the safety of all project personnel and the community for the duration of the redevelopment activities.

G. Have sole and complete responsibility for safety conditions for the project, including safety of all persons (including employees).

H. Be responsible for protecting the project personnel and the general public from hazards due to the exposure, handling, and transport of contaminated materials. Barricades, warning lights if needed, roped-off areas, and proper signs shall be furnished in sufficient amounts and locations to safeguard the project personnel and public at all times.

I. Ensure all OSHA health and safety requirements are met.

J. Maintain a chronological log of all persons entering the project site. It will include organization, date, and time of entry and exit. Each person must sign in and out.

6.0 Submittals

Health and Safety Plan (HASP)

The HASP is a deliverable product of this project. The Contractor will submit the HASP to the NYSDEC and NYSDOH a minimum of two weeks prior to initiation of redevelopment activities. Agreed upon responses to all comments will be incorporated into the final copy of the HASP. The HASP shall govern all work performed for this contract. The HASP shall address, at a minimum, the following items in accordance with 29 CFR 1910.120(I)(2):

A. Health and Safety Organization.
B. Site Description and Hazard Assessment.
C. Training.
D. Medical Surveillance.
E. Work Areas.
F. Standard Operating Safety Procedures and Engineering Controls.
G. Personal Protective Equipment (PPE).
H. Personnel Hygiene and Decontamination.
I. Equipment Decontamination.
J. Air Monitoring.

K. Emergency Equipment/First Aid Requirements.
L. Emergency Response and Contingency Plan.
M Spill Containment Plan.
N. Heat & Cold Stress.
O. Record Keeping.
P. Community Protection Plan.

The following sections will describe the requirements of each of the above-listed elements of the HASP.

7.0 Health and Safety Organization

The Contractor shall list in the HASP a safety organization with specific names, qualifications, and responsibilities. At a minimum, the Contractor shall provide the services of a Health and Safety Coordinator, SO, and a Medical Consultant.

Health and Safety Coordinator: The Contractor must retain the services of a Health and Safety Coordinator (HSC). The HSC must be an American Board of Industrial Hygiene (ABIH) Certified Industrial Hygienist (CIH) or a Certified Safety Professional (CSP). The HSC must have a minimum of two years experience in hazardous waste site remediations or related industries and have a working knowledge of federal and state occupational health and safety regulations. The HSC must be familiar with air monitoring techniques and the development of health and safety programs for personnel working in potentially toxic atmospheres.

In addition to meeting the above requirements, the HSC will have the following responsibilities:

A. Responsibility for the overall development and implementation of the HASP.

B. Responsibility for the initial training of on-site workers with respect to the contents of the HASP.

C. Availability during normal business hours for consultation by the Safety Officer.

D. Availability to assist the Safety Officer in follow-up training and if changes in site conditions occur.

Safety Officer: The designated SO must have, at a minimum, two years of experience in the remediation of hazardous waste sites or related field experience. The SO must have formal training in health and safety and be conversant with federal and state regulations governing occupational health and safety. The SO must be certified in CPR and first aid and have experience and training in the implementation of personal protection and air monitoring programs. The SO must have "hands-on"

experience with the operation and maintenance of real-time air monitoring equipment. The SO must be thoroughly knowledgeable of the operation and maintenance of air-purifying respirators (APR) and supplied-air respirators (SAR) including SCBA and airline respirators.

In addition to meeting the above qualifications, the SO will be responsible for the following minimum requirements:

A. Responsibility for the implementation, enforcement, and monitoring of the health and safety plan.

B. Responsibility for the pre-construction indoctrination and periodic training of all on-site personnel with regard to this safety plan and other safety requirements to be observed during construction, including:

(1) Potential hazards.
(2) Personal hygiene principles.
(3) PPE.
(4) Respiratory protection equipment usage and fit testing.
(5) Emergency procedures dealing with fire and medical situations.
(6) Conduct daily update meetings in regard to health and safety.

C. Responsibility for alerting any State or Federal on-site representative prior to the Contractor starting any particular hazardous work.

D. Responsibility for informing project personnel of the New York State Labor Law Section 876 (Right-to-Know Law).

E. Responsibility for the maintenance of separation of Exclusion Zone (Dirty) from the Support Zone (Clean) areas as described hereafter.

Health and Safety Technicians: The Health and Safety Technician (HST) must have one year of hazardous waste site or related experience and be knowledgeable of applicable occupational health and safety regulations. The HST must be certified in CPR and first aid. The HST will be under direct supervision of the SO during on-site work. The HST must be familiar with the operations, maintenance and calibration of monitoring equipment used in this remediation. A HST will be assigned to each work crew or task in potentially hazardous areas.

Medical Consultant: The Contractor is required to retain a Medical Consultant (MC) who is a physician, certified in occupational medicine. The physician shall have experience in the occupational health area and shall be familiar with potential site hazards of remedial action projects. The MC will also be available to provide annual physicals and to provide additional medical evaluations of personnel when necessary.

8.0 Site Description and Hazard Assessment

The Contractor shall perform a hazard assessment to provide information to assist in selection of PPE and establish air monitoring guidelines to protect on-site personnel, the environment, and the public. The Contractor shall provide a general description of the site, its location, past history, previous environmental sampling results, and general background on the conditions present at the site.

A. Chemical Hazards: A qualitative evaluation of chemical hazards shall be based on the following:

- ∃ Nature of potential contaminants;
- ∃ Location of potential contaminants at the project site;
- ∃ Potential for exposure during site activities; and
- ∃ Effects of potential contaminants on human health.

B. Biological Hazards: A qualitative evaluation of biological hazards consisting of the elements listed for chemical hazards.

C. Physical Hazards: The Contractor shall assess the potential for physical hazards affecting personnel during the performance of on-site work.

The Contractor shall develop a hazard assessment for each site task and operation established in the HASP.

9.0 Training

OSHA Training

The Contractor is responsible to ensure that all project personnel have been trained in accordance with OSHA 1910.120 regulations.

The Contractor shall ensure that all employees are informed of the potential hazards of toxic chemicals to the unborn child and of the risks associated with working at the project site.

The Contractor shall be responsible for, and guarantee that, personnel not successfully completing the required training are not permitted to enter the project site to perform work.

Safety Meetings

At a minimum, the SO will conduct daily safety meetings that will be mandatory for all project personnel. The meetings will provide refresher courses for existing equipment and protocols, and will examine new site conditions as they are encountered.

Additional safety meetings will be held on an as-required basis.

Should any unforeseen or site-peculiar safety-related factor, hazard, or condition become evident during the performance of work at this site, the Contractor will bring such to the attention of the SO in writing as quickly as possible for resolution. In the interim, the Contractor will take prudent action to establish and maintain safe working conditions and to safeguard employees, the public, and the environment.

10.0 Medical Surveillance

The Contractor shall utilize the services of a Physician to provide, at a minimum, the medical examinations and surveillance specified herein. The name of the Physician and evidence of examination of all Contractor and subcontractor on-site personnel shall be kept by the SO.

Contractor and subcontractor project personnel involved in this project shall be provided with medical surveillance prior to onset of work. At any time there is suspected excessive exposure to substances that would be medically detectable, all project personnel will be medically monitored. The costs for these medical exams are to be borne by the Contractor.

Physical examinations are required for:

A. Any and all personnel entering hazardous or transition zones or performing work that required respiratory protection.

B. All Contractor personnel on site who are dedicated or may be used for emergency response purposes in the Exclusion Zone.

C. Contractor supervisors entering hazardous or transition zones, or on site for more than 16 hours during the length of the project.

Physical examinations are not required for people making periodic deliveries provided they do not enter hazardous or transition zones.

In accordance with good medical practice, the examining Physician or other appropriate representative of the Physician shall discuss the results of such medical

examination with the individual examined. Such discussion shall include an explanation of any medical condition that the Physician believes required further evaluation or treatment and any medical condition which the Physician believes would be adversely affected by such individual's employment at the project site. A written report of such examination shall be transmitted to the individual's private physician upon written request by the individual.

The examining Physician or Physician group shall notify the SO in writing that the individual has received a medical examination and shall advise the SO as to any specific limitations upon such individual's ability to work at the project site that were identified as a result of the examination. Appropriate action shall be taken in light of the advice given pursuant to this subparagraph.

The physical examination shall also include but not be limited to the following minimum requirements:

A. Complete blood profile;

B. Blood chemistry to include: chloride, CO_2, potassium, sodium, BUN, glucose, globulin, total protein, albumin, calcium, cholesterol, alkaline phosphates, triglycerides, uric acid, creatinine, total bilirubin, phosphorous, lactic dehydrogenase, SGPT, SGOT;

C. Urine analysis;

D. "Hands on" physical examination to include a complete evaluation of all organ systems including any follow-up appointments deemed necessary in the clinical judgement of the examining physician to monitor any chronic conditions or abnormalities;

E. Electrocardiogram;

F. Chest X-ray (if recommended by examining physician in accordance with good medical practice);

G. Pulmonary function;

H. Audiometry - To be performed by a certified technician, audiologist, or physician. The range of 500 to 8,000 hertz should be assessed.

I. Vision screening - Use a battery (TITMUS) instrument to screen the individual's ability to see test targets well at 13 to 16 inches and at 20 feet. Tests should include an assessment of muscle balance, eye coordination, depth perception, peripheral vision, color discrimination, and tonometry.

J. Tetanus booster shot (if no inoculation has been received within the last five years); and

K. Complete medical history.

11.0 Site Control

Security

Security shall be provided and maintained by the Contractor.

Vehicular access to the site, other than to designated parking areas, shall be restricted to authorized vehicles only. Use of on-site designated parking areas shall be restricted to vehicles of the State or Federal on-site representative, Contractor, subcontractor, and service personnel assigned to the site and actually on duty but may also be used on short-term basis for authorized visitors.

The Contractor shall be responsible for maintaining a log of security incidents and visitor access granted.

The Contractor shall require all personnel having access to the project site to sign-in and sign-out, and shall keep a record of all site access.

All approved visitors to the site shall be briefed by the SO on safety and security, provided with temporary identification and safety equipment, and escorted throughout their visit.

Site visitors shall not be permitted to enter the hazardous work zone unless approved by the SO with appropriate site access agreement.

Project sites shall be posted, "Warning Hazardous Work Area, Do Not Enter Unless Authorized," and access restricted by the use of a snow fence or equal at a minimum. Warning signs shall be posted at a minimum of every 500 feet.

Site Control

The Contractor shall provide the following site control procedures as a minimum:

- A site map;
- A map showing site work zones;
- The use of a "buddy system"; and
- Standard operating procedures or safe work practices.

Work Areas

The Contractor will clearly lay out and identify work areas in the field and will limit equipment, operations and personnel in the areas as defined below:

A. Exclusion Zone (EZ) - This will include all areas where potential environmental monitoring has shown or it is suspected that a potential hazard may exist to workers. The level of PPE required in these areas will be determined by the SO after air monitoring and on-site inspection has been conducted. The area will be clearly delineated from the decontamination area. As work within the hazardous zone proceeds, the delineating boundary will be relocated as necessary to prevent the accidental contamination of nearby people and equipment. The Exclusion Zone will be delineated by fencing (e.g., chain link, snow fencing, or orange plastic fencing).

B. Contamination Reduction Zone - This zone will occur at the interface of "Hazardous" and "Clean" areas and will provide for the transfer of equipment and materials from the Support Zone to the Exclusion Zone, the decontamination of personnel and clothing prior to entering the "Clean" area, and for the physical segregation of the "Clean" and "Hazardous" areas. This area will contain all required emergency equipment, etc. This area will be clearly delineated by fencing (e.g., chain link, snow fencing, or orange plastic fencing). It shall also delineate an area that although not contaminated at a particular time may become so at a later date.

C. Support Zone - This area is the remainder of the work site and project site. The Support Zone will be clearly delineated and procedures implemented to prevent active or passive contamination from the work site. The function of the Support Zone includes:

(1) An entry area for personnel, material and equipment to the Exclusion Zone of site operations through the Contamination Reduction Zone;

(2) An exit for decontamination personnel, materials and equipment from the "Decontamination" area of site operations;

(3) The housing of site special services; and

(4) A storage area for clean, safety, and work equipment.

12.0 Standard Operating Safety Procedures (SOP), Engineering Controls

General SOP

A. The Contractor will ensure that all safety equipment and protective clothing is kept clean and well maintained.

B. All prescription eyeglasses in use on this project will be safety glasses and will be compatible with respirators. No contact lenses shall be allowed on site.

C. All disposable or reusable gloves worn on the site will be approved by the SO.

D. During periods of prolonged respirator usage in contaminated areas, respirator filters will be changed upon breakthrough. Respirator filters will always be changed daily.

E. Footwear used on site will be covered by rubber overboots or booties when entering or working in the Exclusion Zone area or Contamination Reduction Zone. Boots or booties will be washed with water and detergents to remove dirt and contaminated sediment before leaving the Exclusion Zone or Contamination Reduction Zone.

F. All PPE used in the Exclusion Zone or Contamination Reduction Zone will be decontaminated or disposed of at the end of the workday. The SO will be responsible for ensuring decontamination of PPE before reuse.

G. All respirators will be individually assigned and not interchanged between workers without cleaning and sanitizing.

H. Contractor, subcontractor and service personnel unable to pass a fit test as a result of facial hair or facial configuration shall not enter or work in an area that requires respiratory protection.

I. The Contractor will ensure that all project personnel shall have vision or corrected vision to at least 20/40 in one eye.

J. On-site personnel found to be disregarding any provision of this plan will, at the request of the SO, be barred from the project.

K. Used disposable outerwear such as coveralls, gloves, and boots shall not be reused. Used disposable outerwear will be removed upon leaving the hazardous work zone and will be placed inside disposable containers provided for that purpose. These containers will be stored at the site at the designated staging area and the Contractor will be responsible for proper disposal of these materials at the completion of the project.

L. Protective coveralls that become torn or badly soiled will be replaced immediately.

M. Eating, drinking, chewing gum or tobacco, smoking, etc., will be prohibited in the hazardous work zones and neutral zones.

N. All personnel will thoroughly cleanse their hands, face, and forearms and other exposed areas prior to eating, smoking or drinking.

O. Workers who have worked in a hazardous work zone will shower at the completion of the workday.

P. All personnel will wash their hands, face, and forearms before using toilet facilities.

Q. No alcohol, firearms or drugs (without prescriptions) will be allowed on site at any time.

R. All personnel who are on medication should report it to the SO who will make a determination whether or not the individual will be allowed to work and in what capacity. The SO may require a letter from the individual's personal physician stating what limitations (if any) the medication may impose on the individual.

Engineering Controls - Dust and Air Emissions

The Contractor shall provide all equipment and personnel necessary to monitor and control dust and air emissions.

13.0 Personal Protective Equipment

General

The Contractor shall provide all project personnel with the necessary safety equipment and protective clothing, taking into consideration the chemical wastes at the site. At a minimum, the Contractor may supply project personnel with the following:

A. Sufficient disposable coveralls;

B. One pair splash goggles;

C. Chemical-resistant outer and inner gloves;

D. Rubber overshoes (to be washed daily);

E. Hard hat;

F. One full-face mask with appropriate canisters for work requiring Level C protection; and

G. For all project personnel involved with Level B protection, a positive-pressure SCBA or a positive-pressure in-line air respirator. A 5-minute escape bottle must be included with the in-line air apparatus.

Levels of Protection

The following sections described the requirements of each level of protection.

A. Level A Protection

(1) PPE:

a. Supplied-air respirator approved by the Mine Safety and Health Administration (MSHA) and NIOSH. Respirators may be:

∃ Positive-pressure SCBA; or

∃ Positive-pressure airline respirator (with escape bottle for Immediately Dangerous to Life and Health [IDLH] or potential for IDLH atmosphere).

b. Fully encapsulating chemical-resistant suit.

c. Coveralls.

d. Cotton long underwear.*

e. Gloves (inner), chemical-resistant.

f. Boots, chemical-resistant, steel toe and shank. (Depending on suit construction, worn over or under suit boot.)

g. Hard hat (under suit).*

h. Disposal gloves and boot covers (worn over fully encapsulating suit).

I. Cooling unit.*

j. Two-way radio communications (inherently safe).*

* Optional

(2) Criteria for Selection:

Meeting any of these criteria warrants use of Level A protection:

a. The chemical substance has been identified and requires the highest level of protection for skin, eyes, and the respiratory system based on:

- ∃ Measures (or potential for) high concentration of atmospheric vapors, gases, or particulates, or
- ∃ Site operations and work functions involves high potential for splash, immersion, or exposure to unexpected vapors, gases, or particulates of materials highly toxic to the skin.

b. Substances with a high degree of hazard to the skin are known or suspected to be present, and skin contact is possible.

c. Operations must be conducted in confined, poorly ventilated areas until the absence of substances requiring Level A protection is determined.

d. Direct readings on field Flame Ionization Detectors (FID) or Photoionization Detectors (PID) and similar instruments indicate high levels of unidentified vapors and gases in the air.

(3) Guidance on Selection:

a. Fully encapsulating suits are primarily designed to provide a gas- or vapor-tight barrier between the wearer and atmospheric contaminants. Therefore, Level A is generally worn when high concentrations of airborne substances could severely effect the skin. Since Level A requires the use of SCBA, the eyes and respiratory system are also more protected.

Until air surveillance data become available to assist in the selection of the appropriate level of protection, the use of Level A may have to be based on indirect evidence of the potential for atmospheric contamination or other means of skin contact with severe skin affecting substances.

Conditions that may require Level A protection include:

- Confined spaces: Enclosed, confined, or poorly ventilated areas are conducive to the buildup of toxic vapors, gases, or particulates. (Explosive or oxygen-deficient atmospheres are also more probable in confined spaces). Confined-space entry does not automatically warrant wearing Level A protection, but should serve as a cue to carefully consider and to justify a lower level of protection.

- Suspected/known highly toxic substances: Various substances that are highly toxic, especially skin absorption, for example, fuming corrosives, cyanide compounds, concentrated pesticides, Department of Transportation Poison "A" materials, suspected carcinogens, and infectious substances may be known or suspected to be involved. Field instruments may not be available to detect or quantify air concentrations of these materials. Until these substances are identified and concentrations measured, maximum protection may be necessary.

- Visible emissions: Visible air emissions from leaking containers or railroad/vehicular tank cars, as well as smoke from chemical fires and others, indicate high potential for concentrations of substances that could be extreme respiratory or skin hazards.

- Job Functions: Initial site entries are generally walk-throughs, in which instruments and visual observations are used to make a preliminary evaluation of the hazards.

In initial site entries, Level A should be worn when:

- There is a probability for exposure to high concentrations of vapors, gases, or particulates; and

- Substances are known or suspected of being extremely toxic directly to the skin or by being absorbed.

Subsequent entries are to conduct the many activities needed to reduce the environmental impact of the incident. Levels of protection for later operations are based not only on data obtained from the initial and subsequent environmental

monitoring, but also on the probability of contamination and ease of decontamination.

Examples of situations where Level A has been worn are:

- Excavating of soil to sample buried drums suspected of containing high concentrations of dioxin;
- Entering a cloud of chlorine to repair a valve broken in a railroad accident;
- Handling and moving drums known to contain oleum; and
- Responding to accidents involving cyanide, arsenic, and undiluted pesticides.

b. The fully encapsulating suit provides the highest degree of protection to skin, eyes, and respiratory system if the suit material resists chemicals during the time the suit is worn. While Level A provides maximum protection, all suit material may be rapidly permeated and degraded by certain chemicals from extremely high air concentrations, splashes, or immersion of boots or gloves in concentrated liquids or sludges. These limitations should be recognized when specifying the type of fully encapsulating suit. Whenever possible, the suit material should be matched with the substance it is used to protect against.

B. Level B Protection

(1) PPE:

a Positive-pressure SCBA (MSHA/NIOSH approved); or

b. Positive-pressure air line respirator (with escape bottle for IDLH or potential for IDLH atmosphere) MSHA/NIOSH approved;

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

d. Cotton long underwear;*

e. Coveralls;

f. Gloves (outer), chemical-resistant;

g. Gloves (inner), chemical-resistant;

h. Boots (inner), leather work shoe with steel toe and shank;

I. Boots (outer), chemical-resistant, (disposable);

j. Hard hat (face shield*);

k. 2-way radio communication;* and

l. Taping between suit and gloves, and suit and boots.

*Optional

(2) Criteria for Sclection:

Any one of the following conditions warrants use of Level B Protection:

a. The type and atmospheric concentration of toxic substances have been identified and require a high level of respiratory protection, but less skin protection than Level A. These atmospheres would:

- ∃ Have IDLH concentrations; or
- ∃ Exceed limits of protection afforded by an air-purifying mask; or
- ∃ Contain substances for which air-purifying canisters do not exist or have low removal efficiency; or
- ∃ Contain substances requiring air-supplied equipment, but substances and/or concentrations do not represent a serious skin hazard.

b. The atmosphere contains less than 19.5% oxygen

c. Site operations make it highly unlikely that the work being done will generate high concentrations of vapors, gases or particulates, or splashes of material that will affect the skin of personal wearing Level B protection.

d. Working in confined spaces.

e. Total atmospheric concentrations, sustained in the breathing zone, of unidentified vapors or gases range from 5 ppm above background to 500 ppm above background as measured by direct reading instruments such as the FID or PID or similar instruments, but vapors and gases are not suspected of containing high levels of chemicals toxic to skin.

(3) Guidance on Selection Criteria:

Level B equipment provides a reasonable degree of protection against splashes and to lower air contaminant concentrations, but a somewhat lower level of protection to skin than Level A. The chemical-resistant clothing required in Level B is available in a wide variety of styles, materials, construction detail, permeability, etc. Taping joints between the gloves, boots and suit, and between hood and respirator reduces the possibility for splash and vapor or gas penetration. These factors all affect the degree of protection afforded. Therefore, the SO should select the most effective chemical-resistant clothing based on the known or anticipated hazards and/or job function.

Level B does provide a high level of protection to the respiratory tract. Generally, if SCBA is required, Level B clothing rather than a fully encapsulating suit (Level A) is selected based on needing less protection against known or anticipated substances affecting the skin. Level B skin protection is selected by:

a. Comparing the concentrations of known or identified substances in air with skin toxicity data;

b. Determining the presence of substances that are destructive to or readily absorbed through the skin by liquid splashes, unexpected high levels of gases, vapor or particulates, or other means of direct contact; and

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

For initial site entry at an open site, Level B protection should protect site personnel, providing the conditions described in selecting Level A are known or judged to be absent.

C. Level C Protection

(1) PPE

a. Full-face, air-purifying, cartridge- or canister-equipped respirator (MSHA/NIOSH approved) with cartridges appropriate for the respiratory hazards;

b. Chemical-resistant clothing (coveralls, hooded, one-piece or two-piece chemical splash suit; chemical-resistant hood and apron; disposable chemical-resistant coveralls);

c. Coveralls;

d. Cotton long underwear;*

e. Gloves (outer), chemical-resistant;

f. Gloves (inner), chemical-resistant;

g. Boots (inner), leather work shoes with steel toe and shank;

h. Boots (outer), chemical-resistant (disposable);*

I. Hard hat (face shield);*

j. Escape SCBA of at least 5-minute duration;

k. 2-way radio communications (inherently safe);* and

(2) Taping between suit and boots, and suit and gloves.

* Optional

(3) Criteria for Selection

Meeting all of these criteria permits use of Level C protection:

a. Measured air concentrations of identified substances will be reduced by the respirator to, at or below, the substance's Threshold Limit Value (TLV) or appropriate occupational exposure limit and the concentration is within the service limit of the canister.

b. Atmospheric contaminant concentrations do not exceed IDLH levels.

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

d. Job functions do not require SCBA.

e. Total readings register between background and 5 ppm above background as measured by instruments such as the FID or PID.

f. Oxygen concentrations are not less than 19.5% by volume.

g. Air will be monitored continuously.

(4) Guidance on Sclcction Criteria

Level C protection is distinguished from Level B by the equipment used to protect the respiratory system, assuming the same type of chemical-resistant clothing is used. The main selection criterion for Level C is that conditions permit wearing air-purifying devices. The air-purifying device must be a full-face mask (MSHA/NIOSH approved) equipped with a cartridge suspended from the chin or on a harness. Cartridges must be able to remove the substances encountered.

A full-face, air-purifying mask can be used only if:

a. Oxygen content of the atmosphere is at least 19.5% by volume;

b. Substance(s) is identified and its concentrations(s) measured;

c. Substance(s) has adequate warning properties;

d. Individual passes a qualitative fit-test for the mask; and

e. Appropriate cartridge is used, and its service limits concentration is not exceeded.

An air monitoring program is part of all response operations when atmospheric contamination is known or suspected. It is particularly important that the air be monitored thoroughly when personnel are

wearing air-purifying respirators (Level C). Continual surveillance using direct-reading instruments and air sampling is needed to detect any changes in air quality necessitating a higher level of respiratory protection. Total unidentified vapor/gas concentrations exceeding 5 ppm above background require Level B.

D. Level D Protection

(1) PPE:

a. Coveralls, chemical resistant;

b. Gloves (outer), chemical resistant;

c. Gloves (inner), chemical resistant;*

d. Boots (inner), leather work shoes with steel toe and shank;

e. Boots (outer), chemical resistant (disposable);*

f. Hard hat;

g. Face shield;*

h. Safety glasses with side shields or chemical splash goggles;* and

i. Taping between suit and boots, and suit and gloves.

* Optional

(2) Criteria for Selection:

a. No atmospheric contaminant is present.

b. Direct reading instruments do not indicate any readings above background.

c. Job functions have been determined not to require respirator protection.

(3) Guidance on Selection Criteria:

Level D protection is distinguished from Level C protection in the requirement for respiratory protection. Level D is used for non-intrusive activities or intrusive activities with continuous air

monitoring. It can be worn only in areas where there is no possibility of contact with contamination.

E. Anticipated Levels of Protection

It is anticipated that most of the work shall be performed in Level D. A respirator shall be immediately available in the event that air monitoring indicates an upgrade to Level C is required. The determination of the proper level of protection for each task shall be the responsibility of the Contractor. The task specific levels of protection shall be stated in the Contractor's HASP.

Disposable Coveralls

The Contractor shall provide, as necessary, protective coveralls for all project personnel each day with extra sets provided for authorized visitors. The coveralls shall be of the disposable type made of Tyvek or equivalent material, and shall be manufactured/supplied by Durafab, Koppler, or other appropriate manufacturers. To protect project personnel from exposure to liquids, splash-resistant suits (Saranex suits, from appropriate manufacturers) shall be provided. Ripped suits will be immediately replaced after all necessary decontamination has been completed to the satisfaction of the SO.

Hard Hat

The Contractor shall provide and maintain one hard hat per person on site (authorized visitors included). The hard hats shall comply with OSHA Health and Safety Standards (29 CFR 1910.135).

Face Shields

The Contractor shall provide and maintain one face shield per person on site, if necessary. The face shields shall be of the full face type meeting OSHA Health and Safety Standards (29 CFR 1910.133) and shall have brackets for mounting on hard hats. Hard hats and face shields shall be from the same manufacturer to ensure proper fit and shall be manufactured/supplied by Bullard, Norton, or other appropriate manufacturers.

Full Face Organic Vapor Respirator

The Contractor shall provide and maintain a dedicated air-purifying organic vapor respirator per person working in hazardous work and neutral work zones. The respirator shall be of the full-face canister type with cartridges appropriate for the respiratory hazards. Respirators and cartridges shall be MSHA/NIOSH approved, manufactured/supplied by MSA, Scott, or other appropriate manufacturers. The Contractor shall inspect and maintain respirators and canisters in accordance with OSHA regulations (29 CFR 1910.134) and in accordance with manufacturer's instructions. The Contractor shall ensure that proper fit testing training and medical surveillance of respirator users is in accordance with OSHA regulations (29 CFR 1910.134).

Gloves (outer)

The Contractor shall supply a minimum of one pair of gloves per workman in areas where skin contact with hazardous material is possible. Work gloves shall consist of nitrile (NCR) or Neoprene material. Other gloves may be selected if required based on the potential chemical present. Cotton liners will be provided by the Contractor during cold weather.

Gloves (inner)

The Contractor shall supply Latex or equivalent surgical gloves to be worn inside the outer gloves.

Boots (inner)

The Contractor shall supply one pair of safety shoes or boots per workman and shall be of the safety-toe type meeting the requirements of 29 CFR 1910.136.

Boots (outer)

The Contractor shall provide and maintain one pair of overshoes for each on-site person entering a hazardous work area. The overshoes shall be constructed of rubber and shall be 12 inches high minimum.

14.0 Decontamination

Portable "Boot Wash" Decontamination Equipment

The Contractor shall provide a portable decontamination station, commonly referred to as a "Boot Wash" facility for each hazardous work zone requiring decontamination for project personnel. These facilities shall be constructed to contain spent wash water, contain a reservoir of clean wash water, a power supply to operate a pump for

the wash water, a separate entrance and exit to the decontamination platform, with the equipment being mobile, allowing easy transport from one hazardous work zone to the next. An appropriate detergent such as alconox shall be used.

Personnel Decontamination

The Contractor shall provide full decontamination facilities at all hazardous zones. Decontamination facilities must be described in detail in the HASP.

Disposal of Spent Clothing and Material

Contaminated clothing, used respirator cartridges and other disposable items will be put into drums/containers for transport and proper disposal as hazardous waste in accordance with RCRA requirements.

Containers/55-gallon capacity drums shall conform to the requirements of 40 CFR Part 178 for Transportation of Hazardous Materials. The containers containing hazardous material shall be transported by the Contractor to the staging area.

The Contractor is responsible for the proper container packaging, labeling, transporting, and disposal.

15.0 Equipment Decontamination

General

Thoroughly decontaminate all equipment and material used in this project in accordance with established federal and state procedures before it is removed from the project site. With the exception of the excavated materials, all contaminated materials and clothing that cannot be decontaminated shall be disposed of using a method permitted by appropriate regulatory agencies. All vehicles and equipment used will be decontaminated to the satisfaction of the SO in the decontamination area on site prior to leaving the project.

Decontamination shall take place within the designated equipment and materials decontamination area. The decontamination shall consist of degreasing (if required), followed by high-pressure, water cleaning, supplemented by detergents as appropriate. Wash units shall be portable, high-pressure with a self-contained water storage tank and pressurizing system (as required). Each unit shall be capable of providing a nozzle pressure of 150 psi.

If the Contractor cannot or does not satisfactorily decontaminate his tools or equipment at the completion of the project, the Contractor will dispose of any equipment which cannot be decontaminated satisfactorily. At the completion of the

project the Contractor shall completely decontaminate and clean the decontamination area.

Decontamination Pad

The Contractor shall construct a decontamination station located on-site. The decontamination station shall be located in the Contamination Reduction Zone and shall be used to clean all vehicles leaving the Exclusion Zone prior to entering the Support Zone or leaving the site. The Contractor shall install at a minimum a 40 mil polyethylene sealed liner decontamination pad in such a manner that is capable of collecting all decontamination waters with a minimum of six foot corrugated splash walls or curtains to prevent overspray. The decontamination pad shall be able to support vehicles without cracking or becoming damaged. The area is to be properly graded and have no deleterious materials. All decontamination water shall be collected and stored in a holding tank. The Contractor shall clean and dismantle the decontamination pad and properly transport and dispose of the materials at the conclusion of the construction.

16.0 Air Monitoring Program

General

The Contractor shall develop, as part of the HASP, an air monitoring program (AMP). The purpose of the AMP is to determine that the proper level of personnel protective equipment is used, to document that the level of worker protection is adequate, and to assess the migration of contaminants to off-site receptors as a result of site work.

The Contractor shall supply all personnel, equipment, facilities, and supplies to develop and implement the air monitoring program described in this section. Equipment shall include at a minimum: an organic vapor analyzer and real-time aerosol monitors, depending on work activities and environmental conditions.

The Contractor's AMP shall include both real-time and documentation air monitoring (personal and area sampling as needed). The purpose of real-time monitoring will be to determine if an upgrade (or downgrade) of PPE is required while performing on-site work and to implement engineering controls, protocols, or emergency procedures if site action levels are encountered.

The Contractor shall also use documentation monitoring to ensure that adequate PPE is being used and to determine if engineering controls are mitigating the migration of contamination to off-site receptors. Documentation monitoring shall include the collection and analysis of samples for total nuisance dust.

To protect the public in the neighboring residential neighborhood, the Contractor must include in the AMP provisions for suspending work and implementing engineering controls based upon detectable odors, as well as upon instrument monitoring results.

During the progress of active remedial work, the Contractor will monitor the quality of the air in and around each active hazardous operation with real-time instrumentation prior to personnel entering these areas. Sampling at the hazardous work site will be conducted on a continuous basis. Any departures from general background will be reported to the SO prior to entering the area. The SO will determine when and if operations should be shut down.

Air monitoring (both real time and documentation monitoring) shall be conducted by a minimum of one dedicated person with communication to the foreman whenever intrusive activities (such as excavation) are performed in an exclusion zone. After completion of intrusive activities involving contaminated materials and removal of the exclusion zone, air monitoring may be discontinued.

Air monitoring equipment will be operated by personnel trained in the use of the specific equipment provided and will be under the control of the SO. A log of the location, time, type and value of each reading and/or sampling will be maintained. The NYSDEC of NYSDOH on-site representative may request copies of daily log sheets.

Real-Time Monitoring

Real-time particulate monitoring shall be conducted using the following equipment:

Photoionization Detectors (PIDs) shall be MiniRAE Plus (PG-76) Professional PIDs as manufactured by RAE Systems Inc., or equal. The Contractor shall provide one PID for each and every hazardous work zone operation, and one site backup PID. Total particulates shall be measured using a real-time aerosol monitor. The instrument shall be calibrated daily according to the procedure in the users manual. The meter shall be capable of measuring concentrations in the size range of less than 0.1 to 10 microns with a sensitivity down to 0.001 mg/m^3. The monitor shall be Miniram model MIEPDM-3, or equal.

Real-time particulate monitoring will be conducted during any excavation, transportation, or other handling of contaminated soil, scarification, and during the relocation of debris.

Action Levels

The following action levels will be established for work area and perimeter monitoring of particulates, organic vapors, and odors. If the following levels are attained at half the distance between the work zone and the property line, then work will cease until engineering controls bring levels down to acceptable limits. These levels are general and shall be used as minimum action levels. The Contractor shall

develop site-specific perimeter monitoring action levels based on contaminants found in the work areas.

Monitor the air, using the same equipment, for 10-15 minutes upwind of the work site to establish background level. The background level shall be established before the start of each shift every day. Particulate levels should be integrated over a period not to exceed 15 minutes. In the event that downwind particulates are detected at levels in excess of 150 ug/m^3 or 2.5 times the established background level, whichever is less, at the work site, immediately re-measure the background concentrations upwind of the work zone also using the same equipment. If the measured particulate level at the work zone(s) is 100 ug/m^3 above the background level, monitor the downwind site perimeter and implement additional dust controls in the work zone(s). Continue to take hourly measurements of the upwind background concentrations, and compare such concentrations with the particulate level at the work zone(s), until the downwind level at the work zone is less than 100 ug/m^3 above the upwind level.

If at any time the measured particulate level at the work zone(s) is more than 150 ug/m^3, the Contractor shall immediately suspend work at the remediation site, promptly notify the Safety Officer, and implement suitable corrective action or engineering controls before work resumes. Notify the NYSDEC Division of Air resources in writing within 5 working days including a description of the control measures implemented to prevent further exceedances.

If work activities generate any visible dust in off-site areas, the Contractor shall immediately suspend work, promptly notify the Safety Officer, and implement suitable corrective action or engineering controls before work resumes. This "no visible dust" requirement in off-site areas is in addition to the 100/150 ug/m^3 actions levels given above.

The action level for total organic vapors shall be five parts per million above background as measured on the FID or PID. The action level for odors shall be noticeable odors.

Real-time monitoring will also be conducted at half the distance to the site perimeter including an upwind (background) and a downwind location. A background reading will be established daily at the beginning of the work shift. If the wind direction changes during the course of the day, a new background reading will be made. Downwind readings at half the distance to the site perimeter will be made when site action levels have been exceeded at the work zone, if odors are evident, if complaints are received, during periods of higher activity, or at a minimum of twice per work shift.

If site action levels are exceeded at half the distance to the site perimeter location for fugitive dust, organic vapors, or noticeable odors, work must be suspended and

engineering controls must be implemented to bring concentrations back down to acceptable levels.

Ensure the validity of real-time monitoring through appropriate QA/QC procedures. Include periodic instrument calibration, operator training, daily instrument performance checks, and details of the record keeping plan in QA/QC plans.

Documentation Monitoring

Documentation monitoring will be conducted at the site perimeter at four locations (north, south, east and west site perimeter) for total dust. Documentation monitoring will be conducted only during the handling of soil that is potentially contaminated (as per the Remedial Work Plan) or known to be contaminated including excavation, staging, grading, or decontamination activities. Documentation Monitoring will include the following:

A. Total nuisance dust will be collected using a PVC collection filter and personnel sampling pump and analyzed gravimetrically according to NIOSH Method 0500.

B. The perimeter locations will be established and marked with high visibility paint or flagging at approximately equidistant points around the site. Samples will be collected at a height of 6 feet above ground surface.

C. Documentation samples will be collected continuously during excavation, staging, grading, and decontamination activities, during the normal work hours when activities are occurring on site. At the end of the week real-time monitoring data will be reviewed and the four samples from one day will be selected by the Contractor and will be analyzed for lead. A maximum of seven days turnaround time is required for all documentation samples.

D. In addition to perimeter monitoring, particulate documentation samples will be collected on site once a week. On-site samples will be collected by choosing "high risk" workers to wear appropriate collection media for metals and particulates. "High risk" workers are those workers most likely to encounter contamination on a particular task. At a minimum, two high risk workers will be chosen to wear collection media for a particular day each week and the media will be analyzed with the documentation air monitoring samples.

Install a meteorological station on site that will be capable of recording, at a minimum, outside temperature, wind velocity, and wind direction.

The documentation sampling submitted shall also identify the "high risk" workers chosen to wear appropriate collection media for contaminants; date media was worn; task involved; analytical results and applicable standards.

Community Air Monitoring (Refer also to: Section 24.0 - Community Protection Plan)

Real-time air monitoring, for particulate levels at the perimeter of the work area is necessary:

A. Particulates should be continuously monitored upwind, downwind and within the work area at temporary particulate monitoring stations. This requires a minimum of one monitor per station or work zone. If the downwind particulate level is 2.5 times background or 100 ug/m^3 greater than the upwind particulate level, then dust suppression techniques must be employed to reduce the particulates to below these levels. All readings must be recorded and be available for review by NYSDEC and NYSDOH representatives.

As discussed above, the Contractor shall install a meteorological station on site that will be capable of recording, at a minimum, wind velocity, temperature, and direction.

17.0 Emergency Equipment and First Aid Requirements

Communications

The Contractor shall provide telephone communication at the site field office. Emergency numbers, such as police, sheriff, fire, ambulance, hospital, NYSDEC, EPA, NYSDOH, and utilities, applicable to this site shall be prominently posted near the telephone.

The Contractor shall establish a signaling system for emergency purposes.

Emergency Shower and Emergency Eye Wash

The Contractor shall supply and maintain one portable eyewash/body wash facility per active hazardous work zone. The facility shall have a minimum water capacity of 10 gallons and shall conform to OSHA regulations 29 CFR 1910.151. The portable eyewash/body wash facility shall be manufactured/ supplied by Direct Safety Company, Lab Safety Supply Company, or other appropriate suppliers.

Fire Extinguishers

The Contractor shall supply and maintain at least one fire extinguisher in the Contractor's office and one at each hazardous work zone. The fire extinguisher shall be a 20-pound Class ABC dry fire extinguisher with UL-approval per OSHA Safety and Health Training Standards 29 CFR 1910.157. The fire extinguisher shall be

manufactured/supplied by Direct Safety Company, Lab Safety Supply Company, or other appropriate suppliers.

First Aid Kit

The Contractor shall supply and locate in his project office and at each and every hazardous work zone one 24-unit (minimum size) "industrial" or "Contractor" first aid kit, required by OSHA requirements 29 CFR 1910.151. The first aid kit shall be manufactured/supplied by Norton, Scott, or other appropriate suppliers.

Emergency Inventory

In addition to those items specified elsewhere, the SO will maintain the following inventory of equipment and protective clothing for use at the site in the event of emergencies.

A. Washable coveralls;

B. Gloves (outer);

C. Gloves (inner);

D. Face shields;

E. Safety glasses;

F. Respirators and appropriate cartridges;

G. Disposable coveralls;

H. Chemical-resistant boots and latex boot covers;

I. Hard hats; and

J. Rain suits.

18.0 Emergency Responses/Contingency Plan and Procedures

Daily Work

During the progress of work, the Contractor will monitor the quality of the air in and around each active hazardous operation prior to personnel entering these areas. Sampling shall be conducted on a continuous basis. Based on the air monitoring data, the proper level of protection will be chosen by the SO.

Emergency Vehicle Access

In the event that emergency services vehicles (police, fire, ambulance) need access to a location which is blocked by the working crew operations, those operations (equipment, materials, etc.) will be immediately moved to allow those vehicles access. Emergency crews will be briefed as to site conditions and hazards by the SO. All vehicles and personnel will be decontaminated prior to leaving the site.

The Contractor shall schedule a site briefing with the local Fire Department at the completion of mobilization to familiarize emergency response personnel with his/her operations and site layout.

Personal Injury Response Plan

In cases of personal injuries, the injured person or the crew personnel in charge will notify the SO. The SO will assess the seriousness of the injury, give first aid treatment if advisable, consult by telephone with a physician if necessary, and arrange for hospitalization if required. The SO will arrange for an ambulance if required.

If soiled clothing cannot be removed, the injured person will be wrapped in blankets for transportation to the hospital.

Personnel, including unauthorized personnel, having skin contact with chemically contaminated liquids or soils shall be flushed with water after any wet or soiled clothing has been removed. These personnel should be observed by the SO to ascertain whether there are any symptoms resulting from the exposure. If there is any visible manifestation of exposure such as skin irritation, the project personnel will refer to a consulting physician to determine whether the symptoms were the result of a delayed or acute exposure, a secondary response to exposure such as skin infection, or occupational dermatitis. All episodes of obvious chemical contamination will be reviewed by the SO in order to determine whether changes are needed in work procedures.

Route to the Hospital

The Contractor shall post in conspicuous places in the Support Zone a map with written directions to the nearest hospital or emergency medical treatment facility.

Fire Service

The Contractor will make arrangements to take immediate fire fighting and fire protection measures with the local Fire Chief. If there is a fire, the crewmen or their person in charge will immediately call the SO. The SO will immediately call the fire personnel.

The air downwind from any fire or explosion will be monitored immediately in order to protect workers and the nearby community. If personal injuries result from any fire or explosion, the procedures outlined in the Personal Injury Response Plan are to be followed.

Master Telephone List

The attached master telephone list will be completed and prominently posted at the field office. The list will have telephone numbers of all project personnel, emergency services including hospital, fire, police, and utilities. In addition, two copies with telephone numbers are to be given to the NYSDEC and NSYDOH for emergency reference purposes.

Emergency Service	Telephone Number
Fire Department (Sloan Fire Dept.)	911
Police Department (Buffalo Police Dept.)	911
Ambulance (Rural Metro)	911
Hospital/Emergency Care Facility (Mercy Hospital)	911/(716) 826-7000
Poison Control Center	(716) 878-7654
Chemical Emergency Advice (CHEMTREC)	(800) 424-9300
Erie County Department of Health	(716) 858-7690 (business hours) (716) 898-4225 (after 5 pm)
NYSDEC Region 9 office (Buffalo)	(716) 851-7220
NYSDEC Division of Environmental Remediation, Albany, NY	(518) 457-9285 (800) 342-9296 (leave a message for next work day response)
NYSDOH Western Regional Office	(716) 847-4385
NYSDOH Headquarters (Albany)	(800)-458-1158
Contractor	

19.0 Confined Space Work

The Contractor will evaluate the work areas and determine if there are any permit-required confined spaces. If the Contractor determines that personnel will not need to enter a permit-required confined space, appropriate measures to prevent personnel from entering such shall be taken. If the Contractor determines that personnel will need to enter a permit-required confined space, develop and implement a written permit-required confined space program.

The written program shall comply with 29 CFR 1910.146 and shall include the following:

A. Implement methods to prevent unauthorized entry;
B. Identify and evaluate the hazards of permit-required confined spaces before personnel entry;
C. Develop and implement procedures for safe permit-required confined space entry;
D. Provide the appropriate equipment to evaluate permit-required confined spaces;
E. Evaluate permit-required confined spaces when entry operations are conducted;
F. Provide at least one attendant outside the permit-required confined space which will be entered;
G. Designate the personnel who will have active roles in entry operations;
H. Develop and implement procedures for obtaining rescue and emergency services;
I. Develop and implement a system for the preparation, issuance, use and collection of entry permits;
J. Develop and implement procedures to coordinate entry operations when personnel from more than one employer are working;
K. Develop and implement procedures for concluding the entry;
L. Review and revise entry operations if measures may not protect personnel; and
M. Review the permit-required confined space program to ensure personnel are protected from the hazards present.

Copies of the permit-required confined space program and employee training certificates shall be included with the HASP.

20.0 On-Site Spill Containment Plan

The Contractor will provide a written on-site spill containment program that includes the following minimum requirements:

A. Procedures to help prevent spills from occurring;
B. Spill reporting procedure;
C. Spill containment equipment list;
D. Hazard assessment for known or unknown spilled materials;
E. Containment techniques;
F. Air monitoring and sampling requirements;
G. Personal protective equipment requirements;
H. Employee training requirements;
I. Decontamination procedures;
J. Cleanup and disposal methods; and
K. Emergency evacuation procedures.

21.0 Heat Stress Monitoring

Site personnel who wear protective clothing allow body heat to be accumulated with an elevation of the body temperature. Heat cramps, heat exhaustion, and heat stroke can be experienced, which, if not remedied, can threaten life or health. Therefore, an American Red Cross Standard First Aid book or equivalent will be maintained on site at all times so that the SO and site personnel will be able to recognize symptoms of heat emergencies and be capable of controlling the problem.

When protective clothing is worn, especially Levels A and B, the suggested guidelines for ambient temperature and maximum wearing time per excursion are:

Ambient Temperature (EF)	**Maximum Wearing Time Per Excursion (Minutes)**
Above 90	15
85 to 90	30
80 to 85	60
70 to 80	90
60 to 70	120
50 to 60	180

One method of measuring the effectiveness of employees' rest-recovery regime is by monitoring the heart rate. The "Brouha guideline" is one such method:

- During a 3-minute period, count the pulse rate for the **last** 30 seconds of the first minute, the **last** 30 seconds of the second minute, and the **last** 30 seconds of the third minute.

- Double each count.

If the recovery pulse rate during the last 30 seconds of the first minute is at 110 beats/minute or less and the deceleration between the first, second, and third minutes is **at least** 10 beats/minute, the work-recovery regime is acceptable. If the employee's rate is above that specified, a longer rest period is required, accompanied by an increased intake of fluids.

In the case of heat cramps or heat exhaustion, "Gatorade" or its equivalent is suggested as part of the treatment regime. The reason for this type of liquid refreshment is that such beverages will return much-needed electrolytes to the

system. Without these electrolytes, body systems cannot function properly, thereby increasing the represented health hazard.

This liquid refreshment will be stored in a cooler at the edge of the decontamination zone in plastic squeeze bottles. The plastic bottles will be marked with individual's names. Disposable cups with lids and straws may be used in place of the squeeze bottles. Prior to drinking within the decontamination zone, the project personnel shall follow the following decontamination procedures:

A. Personnel shall wash and rinse their outer gloves and remove them.

B. Personnel shall remove their hard hats and respirators and place on table.

C. Personnel shall remove their inner gloves and place them on table.

D. Personnel shall wash and rinse their face and hands.

E. Personnel shall carefully remove their personal bottle or cup from the cooler to ensure that their outer clothes do not touch any bottles, cups, etc.

F. The used bottle or cups will not be returned to the cooler, but will be placed in a receptacle or container to be cleaned or disposed of.

G. Personnel shall replace their respirators, hard hats, gloves and tape gloves prior to re-entering the hazardous zone.

When personnel are working in situations where the ambient temperatures and humidity are high--and especially in situations where protection Levels A, B, and C are required-the SO must:

- ∃ Assure that all employees drink plenty of fluids ("Gatorade" or its equivalent);
- ∃ Assure that frequent breaks are scheduled so overheating does not occur; and
- ∃ Revise work schedules, when necessary, to take advantage of the cooler parts of the day (i.e., 5:00 a.m. to 1:00 p.m., and 6:00 p.m. to nightfall).

Cold Stress

Whole-body protection shall be provided to all site personnel that have prolonged exposure to cold air. The right kind of protective clothing shall be provided to site

personnel to prevent cold stress. The following dry clothing shall be provided by the Contractor as deemed necessary by the SO:

- Appropriate underclothing (wool or other);
- Outer coats that repel wind and moisture;
- Face, head, and ear coverings;
- Extra pair of socks;
- Insulated safety boots; and
- Glove liners (wool) or wind- and water-repellant gloves.

The SO will use the equivalent chill temperature when determining the combined cooling effect of wind and low temperatures on exposed skin or when determining clothing insulation requirements.

Site personnel working continuously in the cold are required to warm themselves on a regular basis in the on-site hygiene facility. Warm, sweet drinks will also be provided to site personnel to prevent dehydration. The SO shall follow the work practices and recommendations for cold stress threshold limit values as stated by the 1991-1992 Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices by the American Conference of Governmental Industrial Hygienists or equivalent cold stress prevention methods.

22.0 Logs, Reports and Record Keeping

Security Log

A daily log of security incidents and visitors granted access to the site will be maintained, as well as a log of all personnel entering and exiting the site.

All approved visitors to the site will be briefed by the SO on safety and security, provided with temporary identification and safety equipment, and escorted throughout their visit. Site visitors will not be permitted to enter a hazardous work zone.

Project site shall be posted, "Warning: Hazardous Work Area, Do Not Enter Unless Authorized," and access restricted by the use of a snow fence.

Safety Log

The Contractor's SO will maintain a bound safety logbook. The log will include all health and safety matters on site and include, but not be limited to, the following information:

- Date and weather conditions on site;
- A description of the proposed work for the day;
- Times when site personnel arrive and depart;
- Air monitoring data;
- Heat and/or cold stress monitoring;
- Decontamination procedures;
- Type and calibration of air sampling/monitoring equipment used;
- Safety meeting summaries; and
- Accidents.

Emergency Or Accident Report

Any emergency or accident will be reported immediately to the SO. The NYSDEC and NYSDOH will also be notified. The Contractor will submit a written report immediately to the NYSDEC and the NYSDOH, but no later than 24 hours of its concurrence. The report will include, but not be limited to, the nature of the problem, time, location, areas affected, manner and methods used to control the emergency, sampling and/or monitoring data, impact, if any, to the surrounding community, and corrective actions the Contractor will institute to minimize future occurrences. All spills will be treated as emergencies.

Daily Work Report

The Contractor shall maintain a daily work report that summarizes the following:

- Work performed,
- Level of protection,
- Air monitoring results,
- Safety-related problems, and
- Corrective actions implemented.

23.0 Posting Regulations

The Contractor will post signs at the perimeter of the Exclusion Zone that state "Warning, Hazardous Work Area, Do Not Enter Unless Authorized." In addition, a notice directing visitors to sign in will be posted at the project site. Also, the Contractor will post a sign stating that any questions about the site should be directed to the New York State Department of Environmental Conservation.

Safety regulations and safety reminders will be posted at conspicuous locations throughout the project area. The following safety regulations and safety reminders are at a minimum to be posted around the job site.

SAFETY REGULATIONS

(To be Posted for Project Personnel)

The main safety emphasis is on preventing personal **contact** with gases, soils, sludge and water. Towards that end, the following rules have been established.

Regulations

A. Eating on the site is PROHIBITED except in specifically designated areas.

B. All project personnel on the site must wear clean or new gloves daily.

C. If you get wet to the skin, you must wash the affected area with soap and water immediately. If clothes in touch with the skin are wet, these must be changed.

D. You must wash your hands and face before eating, drinking or smoking.

E. Observe regulations on washing and removing boots before entering the dressing room or a clean area and showering before going home.

Recommendations

A. Do not smoke with dirty hands.

B. Check for any personal habit which could introduce soil or water into the body.

Examples: eating food off fingers, wiping face or nose with a dirty hand or running a dirty hand through hair.

C. Check that any regularly worn clothing is clean. Examples include dirty watchbands, neck chains and a dirty liner on your safety helmet.

SAFETY REMINDER FOR TOXIC CHEMICALS

(Post for Project Personnel)

Chemicals can't cause problems unless you breathe them, eat them, or put them on your skin.

Chemicals in Gases, Soils, Sludge, and Water

Don't let chemicals enter mouth, nose, or stay on skin.

Use common personal hygiene.

A. Don't eat or drink on the site.

B. No smoking in the area of work.

C. Wear protective clothing.

D. Glove liners must be **clean**.

E. Wash your hands whenever practical. Wash before eating, drinking, or smoking.

F. Don't carry chemicals home to your family. (For example, on clothing, mud in the car, dirty hands.)

G. Follow strictly the HASP.

24.0 Community Protection Plan

A. Community Protection Plan

The Contractor shall develop, as part of this HASP, a Community Protection Plan (CPP). The CPP shall outline those steps to be implemented to protect the health and safety of surrounding human population and the environment.

B. Air Monitoring

As part of the Air Monitoring Program, use real-time monitoring and documentation sampling as described in the Subpart AAir Monitoring Program≅ of this section to determine if off-site emissions, as a result of the site work, poses a threat to the surrounding community.

Provide real-time air monitoring for particulate levels at the perimeter of the work area. Including the following:

1. Particulates shall be continuously monitored at the 4 documentation sampling stations for a total of 4 dust monitors. If the downwind particulate level is 150 ug/m^3 greater than the upwind particulate level, dust suppressing techniques shall be employed. All readings shall be recorded and be available for State (NYSDEC and NYSDOH) personnel to review.

Coordinate with local officials to arrange for notification and evacuation of the surrounding community in the event that off-site emissions pose a threat.

2. Off-Site Spill Response

Produce as part of the HASP a Spill Response Plan, also coordinated with local officials, in case of an off-site spill of either liquid or solid wastes. The plan shall include transportation routes and times, as well as the minimum requirements set forth in the Subpart titled AOn-site Spill Containment Plan.≅ The driver shall be supplied with Material Safety Data Sheets (MSDs), a 24-hour emergency phone number, and instructions for reporting emergencies to local agencies and the project site.

Exhibit 7-2

New York State Department of Health Generic Community Air Monitoring Plan

New York State Department of Health
Generic Community Air Monitoring Plan

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

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

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

Community Air Monitoring Plan

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

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

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

sampling at wells on the curb of a busy urban street, in the midst of a public park, or adjacent to a school or residence.

VOC Monitoring, Response Levels, and Actions

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

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

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

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

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

Particulate Monitoring, Response Levels, and Actions

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

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

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

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

Exhibit 8-1

Minimum Requirements for QA/QC

Appendix B: Minimum Requirements for QA/QC

Guidance for the Development of Quality Assurance Plans and Data Usability Summary Reports (DUSR)

I. General Discussion

A. Data Quality Assurance/Quality Control: A separate Quality Assurance Project Plan (QAPjP) is not required when the following quality assurance points are included in the Work Plan:

1. Project description and project goals - Include the site environmental history and project goals.

2. Project organization - Include designation of the Project Manager, Quality Assurance Officer and Field Analyst, if field analysis is planned. These resumes must be included as a Work Plan Appendix.

3. Sampling procedure and equipment decontamination procedures - Include a sampling chart that specifies the sample matrix, number of samples, analysis methods and data reporting level. EPA or Department Analytical Services Protocol (ASP) methods are acceptable. Also include a site map that shows proposed sampling sites and previous sampling locations and results.

4. Proposed laboratory - The proposed laboratory must be identified in the Work Plan and it must be NYSDOH ELAP-certified for the planned laboratory analyses. Ten (10) percent of field screening analyses are to be confirmed by an ELAP certified laboratory. In most cases, the investigation and cleanup confirmation sample analysis reporting level will be DEC ASP Category B deliverables in order to fully evaluate and document the project. This reporting level gives the necessary documentation that will be reviewed to evaluate the usability of the data. It also gives calibration data needed to verify "not-detected" analytes that are possible compounds of concern, as indicated by site history or previous screening level data. Detection limits must be low enough to be compared to applicable standards.

   When Category B deliverables are required, the laboratory must be NYSDOH ELAP CLP-certified, since the CLP certification program evaluates the proficiency of the laboratory in the quality control parameters required by the analytical methods and the reporting format for the Category B deliverables package. For sites where the Department already has valid and usable investigative data verified by Category B deliverables, intermediate samples (SPDES, interim remedial measures, construction, and operation and maintenance samples) usually only require a standard, one page analysis report done by an ELAP- certified laboratory.

5. Standard Operating Procedures (SOPs) - Include SOPs for well construction, sample collection, decontamination procedures, field instruments and field screening methods.

6. Data validation - While not required, the data should be evaluated according to the Division of Environmental Remediation (DER) Data Usability Summary Report (DUSR) guidelines.

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II. Data Usability Summary Reports

A. **Background:** The Data Usability Summary Report (DUSR) provides a thorough evaluation of analytical data without the costly and time consuming process of third party data validation. The primary objective of a DUSR is to determine whether or not the data, as presented, meets the site/project specific criteria for data quality and data use.
The development of the DUSR must be carried out by an experienced environmental scientist, such as the project Quality Assurance Officer, who is fully capable of conducting a full data validation. Furthermore, the DUSR is developed from a full New York State Department of Environmental Conservation Analytical Services Protocol (NYSDEC ASP) Category B or a United States Environmental Protection Agency Contract Laboratory Protocol (USEPA CLP) deliverables package.

B. **Review:** If the DUSR and the data deliverables package indicates significant problems with some or all of the data in the package, the data should be either rejected or validated to determine if it can be used. This decision will be based upon several factors and should be made with advice from a qualified person in the Department's Quality Assurance Unit. In some cases, the data may be usable for screening purposes only.

C. **Personnel Requirements:** The Environmental Scientist preparing the DUSR must hold a Bachelors Degree in a relevant natural or physical science or field of engineering and must submit a resume to the Division's Quality Assurance Unit documenting experience in environmental sampling, analysis and data review.

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D. **Preparation of a DUSR:** The DUSR is developed by reviewing and evaluating the analytical data package. During the course of this review the following questions must be asked and answered:

1. Is the data package complete as defined under the requirements for the NYSDEC ASP Category B or USEPA CLP deliverables?
2. Have all holding times been met?
3. Do all the QC data (i.e., blanks, instrument tunings, calibration standards, calibration verifications, surrogate recoveries, spike recoveries, replicate analyses, laboratory controls and sample data) fall within the protocol required limits and specifications?
4. Have all of the data been generated using established and agreed upon analytical protocols?
5. Does an evaluation of the raw data confirm the results provided in the data summary sheets and quality control verification forms?
6. Have the correct data qualifiers been used?

Once the data package has been reviewed and the questions given above have been answered, the DUSR proceeds to describe the samples and the analytical parameters. Data deficiencies, analytical protocol deviations, and quality control problems are identified and their effect on the data is discussed. The DUSR shall also include recommendations on resampling and/or reanalysis. All data qualifications must be documented following the latest NYSDEC ASP guidelines.

E. **Questions:** Contact the Department's Division of Environmental Remediation Quality Assurance Group with any questions on the preparation of a DUSR.

III. Quality Assurance Officer Guidelines

A. QAO Description and Requirements

1. The Quality Assurance Officer (QAO) is an employee of the same consulting firm generating the work plan and acts in conjunction with the project manager to develop a site-specific quality assurance plan. The QAO must not have another position on the project, such as a project or task manager, that involves project productivity or profitability as a job performance criteria.

2. The project QAO must have a minimum of a bachelors degree in chemistry or natural science with a minimum of 20 hours in chemistry.

3. The QAO must be proficient in analytical methodology, data interpretation and validation, the development of sampling plans, quality control procedures, and auditing techniques.

4. The QAO will assist the project manager in the development of the sampling and analytical portion of the Quality Assurance Project Plan. The QAO or his/her designee shall conduct periodic field and sampling audits, interface with the analytical laboratory to make requests and resolve problems, interface with the data validator, and develop a project specific data usability report. Because on site work may be necessary, verification of completion of the 40-hour OSHA safety training course and 8-hour refresher is required.

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