ALTERNATIVES ANALYSIS (AA) REPORT

FORMER EDGEWOOD WAREHOUSE SITE
(NYSDEC No. E907032)
320 SOUTH ROBERTS ROAD
CITY OF DUNKIRK, CHAUTAUQUA COUNTY, NEW YORK 14048

Prepared for:

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TABLE OF CONTENTS

FIGURES

TABLES

APPENDIX

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1.0 INTRODUCTION

1.1 General Discussion

The Chautauqua County Department of Public Facilities (County) entered into a State Assistance Contract with the New York State Department of Environmental Conservation (NYSDEC) to complete a Remedial Investigation/Alternative Analysis (RI/AA) program at the former Edgewood Warehouse site. This site is located at located at 320 South Roberts Road, Dunkirk, New York (project site). The location and layout of the project site are shown on Figures 1 and 2, respectively. The RI/AA is being completed pursuant to the Environmental Restoration, or Brownfield, Program component of Title 5 of the Clean Water/Clean Air Bond Act of 1996, which is administered by the NYSDEC. The purpose of the RI/AA is to characterize the nature and extent of contamination occurring on, and emanating from, the project site, and to develop and evaluate remedial alternatives as appropriate. The Final RI Report was submitted to the NYSDEC in May 2009. TVGA Consultants (TVGA) has prepared this AA Report on behalf of the County to identify and evaluate potential remedial alternatives that address site contamination encountered during the RI.

1.2 Project History

Phase I and II Environmental Site Assessments (ESAs) were completed on the project site in 1997 and 1999, respectively. Contaminants of concern were identified in the soils, groundwater, and building components. Primary contaminants of concern included semi-volatile organic compounds (SVOCs) and metals in the soil; volatile organic compounds (VOCs) and metals in the groundwater; and VOCs, SVOCs, polychlorinated biphenyls (PCBs), metals, and asbestos in the building components. To further delineate contaminants of concern and to investigate areas and building components not previously characterized, a Remedial Investigation (RI) was completed at the project site in 2008.

TVGA prepared and issued a May 2009 Final Remedial Investigation Report that provided a detailed description of the scope and findings of the RI. In addition to summarizing and documenting the methods used to investigate the project site, the report described the physical characteristics of the project site; defined the nature and extent of contamination encountered; and assessed the contamination with respect to fate, transport and exposure.

The field observations and analytical data obtained during the RI were utilized to identify impacted media by comparing the analytical data for the contaminants of concern with the applicable regulatory standards and/or guidance values. Based on these data and an exposure assessment, remedial action objectives

(RAOs) were developed for the affected media. General response actions for each of the affected media were subsequently developed, combined into site-wide remedial alternatives, and comparatively analyzed. This AA Report concludes with a recommendation for remedy selection.

Upon confirmation of this recommendation by the NYSDEC, the proposed remedy will be described in a Proposed Remedial Action Plan (PRAP) for public review and comment. Following acceptance of the PRAP, the NYSDEC will issue a Record of Decision (ROD) for the project site.

1.3 Background Information

1.3.1 Site Description

The project site is located along the eastern side of South Roberts Road in the City of Dunkirk, New York and occupies approximately seven acres of an inactive industrial park. The project site contains an abandoned warehouse and a building that is believed to have been a former scale house associated with the adjoining railroad. Figure 2 shows the layout of the project site, including the on-site structures. The warehouse encompasses approximately 167,400 square feet and the scale house encompasses approximately 830 square feet. The remaining portions of the property generally consist of aged asphalt, concrete and gravel parking areas.

The former process equipment has been removed from the project site; however, various materials remain inside the buildings, including drums, wooden pallets, tires, tractor trailers, metal racks, an abandoned truck, wood and scrap metal. The external areas of the project site consist of a mixture of fill, soil, concrete, wood, brick, metal, and construction and demolition debris piles.

The project site is located in an area that is zoned for industrial use. Land use in the project site's vicinity is characterized by a mixture of commercial, industrial, and residential uses. The project site is bounded to the north by an active CSX rail yard; to the east by the Former Roblin Steel and Alumax Extrusions properties; to the south by an active office building; and to the west, beyond South Roberts Road, residential properties and a manufacturing facility.

1.3.2 Site History

The project site, formerly part of a larger complex, was owned and operated by the American Locomotive Company (ALCO), which first developed the site in 1910. ALCO manufactured locomotives at this complex until 1930, at which time operations were converted to manufacturing process equipment, primarily consisting of heat exchangers, feed water heaters, tunnel shields, pressure vessels and steel pipe, fittings and conduits. During and after World War II, manufacturing operations at the plant were expanded to include military equipment. This equipment included gun carriages, fragmentation bombs, thrust shafts and king posts for navel vessels, missile housings, nozzles, boosters and other components. Following the war, ALCO was contracted by the Atomic Energy Commission to manufacture nuclear reactor components and packaged reactor units. Work on nuclear reactors at the Dunkirk plant included the development, production, and testing of a skid-mounted, portable nuclear reactor, built to power a remote Army base on the Greenland icecap. In addition to nuclear reactors, ALCO manufactured components for the crawler for the Apollo/Saturn V space rocket. ALCO closed the Dunkirk plant in 1963 due to a combination of labor, union and management problems. From 1963 until 1966, the project site was owned by Progress Park, Inc., whose mission was to facilitate the re-occupation of the shuttered industrial complex containing the project site.

Following Progress Park Inc., the site was occupied by the Plymouth Tube Company, which began operations in the existing main building in 1967 but went out of business in 1982. The Plymouth Tube Company manufactured stainless steel feed water heater tubes for heat exchangers. During this time period, Cenedella Wood Products also occupied a four-story building that was formerly located on the project site but was demolished in 1988. Cenedella Wood Products manufactured wooden pallets, crates and boxes that were utilized by the Plymouth Tube Company to ship their final products.

The project site was owned by Edgewood Investments, Inc., which operated a warehouse within the existing main building from 1982 until recently. The warehouse was used for the storage of packaging supplies, operational supplies and equipment from the former Dunkirk Ice Cream and current Fieldbrook Farms Dairy facility. Since approximately 1997, the warehouse also accommodated a few small businesses: a limousine company utilized the southern annex portion of the building; a spray-on truck bed liner company utilized space in the south-central portion of the warehouse; and a home improvement company operated out of the eastern end of the warehouse. The buildings are currently vacant and owned by Chautauqua County.

In the past, the project site also contained another building that housed the facility power plant, a repair shop, a development area for experimental equipment, and the plant hospital. That building was demolished in 1988. An additional building, presently vacant, is located near the northeastern corner of the property, and appears to be a former scale house associated with the rail access to the industrial complex.

1.3.3 Remedial Investigation

The objective of the remedial investigation was to characterize the project site and determine the nature and extent of contamination occurring in the on-site soil/fill, groundwater, and building surfaces, components and materials. The scope of the remedial investigation was in general conformance with the Final RI/AA Work Plan developed for the project site and approved by the NYSDEC. Minor modifications to the scope of the field program were made during the course of the investigations, in consultation with NYSDEC, to account for conditions encountered. The primary tasks associated with the RI included:

- Site Topographic Survey
- Surface Soil Sampling
- Test Pit Excavations
- Soil Probe Advancement
- Subsurface Soil/Fill Sampling
- Test Boring Advancement
- Monitoring Well Installation
- Groundwater Elevation Monitoring
- Groundwater Sampling
- Sediment Sampling
- Interior Wood Block Flooring Sampling
- Pre-Demolition Asbestos Survey
- Container Inventory
- Data Validation

1.3.4 Physical Setting

The topography of the project site, as shown on Figure 1, is generally flat-lying with an average elevation of approximately 610 feet above mean sea level. The results of the Remedial Investigation indicate that soil/fill overlies native material and shale bedrock across the site. The overburden stratigraphy can be divided into four significant units, which are listed in descending order.

- Soil/Fill Material
- Reworked Native Material
- Lacustrine Native Material
- Shale Bedrock

Groundwater was present in both the soil/fill material as well as the native material. The depths to groundwater generally ranged from approximately 3 to 12 feet below the existing ground surface, and groundwater flows generally to the west and northwest.

1.3.5 Nature and Extent of Contamination

The following sections summarize and discuss the analytical results generated during the RI and Phase II ESA. Surface and subsurface soil/fill, groundwater, sediment, and building material samples were collected for chemical analysis to determine the magnitude and extent of potential contamination occurring in various media at the site. The following sections also discuss the probable fate and transport of contaminants in the different types of media at the project site. Additionally, remediation areas and volumes have been estimated based on the analytical results and field knowledge obtained during the RI. The areal extent of each of the contaminated media and the approximate volumes and weights developed from these areas are summarized below. The estimated weights for the surface and subsurface soil/fill listed in the following sections were determined by assuming that one cubic yard of soil/fill weighs 1.6 tons.

For discussion purposes, the analytical results are compared with the Standards Criteria and Guidance values (SCGs) applicable to each medium sampled, and include:

- Soil/Fill/Sediment/Wood Flooring: NYSDEC's 6NYCRR Part 375 Environmental Remediation Programs: Part 375-6.8: Residential, Commercial and Industrial Use Soil Cleanup Objectives (SCOs)
- Groundwater: NYSDEC's June 1998 Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations in the Technical and Operational Guidance Series (TOGS) 1.1.1
- Wood Flooring analyzed by TCLP: 40 CFR Part 261.24: Maximum Contaminant Levels for Toxicity Characteristics

1.3.5.1. Surface Soil/Fill

Contaminants of concern detected in the surface soil/fill primarily consist of SVOCs and metals. Figure 3 depicts the locations and contaminant concentrations of surface soil/fill samples exceeding the Commercial and Industrial Use SCOs. The SVOCs detected include PAHs, seven of which are known carcinogens (cPAHs). The SVOCs are characterized by low solubilities and high octanol-water partition coefficients, and, therefore, have a tendency to adsorb onto soil particles. In addition, the SVOCs have relatively low vapor pressures and are expected to remain in a solid or liquid state and undergo degradation via naturally occurring microbes. Due to the low solubility, SVOCs are not expected to impact groundwater quality or migrate substantially into the subsurface. This is supported by the lack of or low concentrations of these compounds in the on-site groundwater.

Arsenic was detected in seven surface soil/fill samples at concentrations above Industrial Use SCOs. Arsenic has a low solubility and does not readily degrade under natural conditions. Due to the low solubility, arsenic is not expected to impact groundwater quality or migrate substantially in the subsurface, which is supported by the absence of elevated concentrations of arsenic in the on-site groundwater.

The estimated area of impacted surface soil/fill is site-wide with the exception of areas occupied by structures and/or concrete. Based upon field observations and analytical results from the test pits and soil probes, the depth of the impacted surface soil/fill is assumed to extend to one foot below grade. With a thickness of one foot over 170,000 square feet, the approximate volume and weight of the impacted surface soil/fill is 6,300 cubic yards and 10,100 tons, respectively. Additionally, to address the surface soil/fill contamination to the north of the warehouse, clearing and grubbing will be required. The estimated area for clearing and grubbing is 0.5 acre.

1.3.5.2. Subsurface Soil/Fill

The analytical results indicate that the primary contaminants of concern in the subsurface soil/fill consist of SVOCs, primarily PAHs, and metals. Due to low solubility, SVOCs are not expected to impact groundwater quality or migrate substantially into the subsurface. This is supported by the lack of or low concentrations of these contaminants in the on-site groundwater. However, the subsurface soil/fill sample from TP-22 had the highest concentration of total SVOCs, and also demonstrated petroleum nuisance characteristics (i.e. odors) and elevated total organic vapors during the field screening.

Arsenic was detected in several subsurface soil/fill samples and mercury was detected in one subsurface soil/fill sample at concentrations above the Industrial Use SCOs. Due to the low solubility, arsenic is not expected to impact groundwater quality or migrate substantially in the subsurface, which is supported by the absence of elevated concentrations of arsenic in the on-site groundwater. However, arsenic was detected in TP-4 at a concentration more than six times the arsenic concentration in the next highest sample and at a concentration more than seven times the Industrial Use SCO. Mercury was detected in the subsurface soil/fill and groundwater at slightly elevated concentrations in only a localized area around PH-II-MW-6. Aluminum, calcium, magnesium, and iron were also detected in several subsurface soil/fill samples at concentrations above Industrial Use SCOs. These metals were also detected in groundwater samples at concentrations exceeding groundwater standards.

The estimated areal extent of subsurface soil/fill contamination exceeding Industrial Use SCOs, Commercial Use SCOs, and Residential Use SCOs are depicted on Figures 4, 5, and 6, respectively. Because the uppermost one foot of soil/fill exceeds the Industrial Use SCOs and is addressed as surface soil/fill in Section 1.3.5.1, the volume and weight estimates for subsurface soil do not include the surface material. The areas of contamination in the subsurface soil/fill have not been fully delineated and post-excavation sampling may be required to confirm that the contaminated material has been removed. The contaminants of concern and estimated volume of each area are summarized in Table 1.

Based on field observations and analytical results, the estimated volumes and weights of material exceeding the SCOs are:

- Industrial Use SCOs – 18,850 cubic yards and 30,125 tons
- Commercial Use SCOs – 23,700 cubic yards and 37,900 tons
- Residential Use SCOs – 35,200 cubic yards and 56,350 tons

In addition to these areas, the subsurface soil/fill with elevated SVOCs, arsenic and mercury in the vicinity of TP-22, TP-4 and PH-II-MW-6 respectively, will be addressed as part of the remedial alternatives discussed below. The estimated areal extent of subsurface soil/fill contamination in these three areas is depicted on Figure 7. The estimated depth of contaminated soil/fill in each of these areas is eight feet based on field observations and analytical results. Based on the areal extents depicted on Figure 7 and a depth of eight feet, the estimated volumes and weights of the soil/fill in these areas are:

- TP-22 Area – 2,291 cubic yards and 3,666 tons
- TP-4 Area – 1,331 cubic yards and 2,130 tons
- PH-II-MW-6 Area – 1,283 cubic yards and 2,052 tons

1.3.5.3. Groundwater

Groundwater at the project site was encountered at relatively shallow depths within the soil/fill material as well as native material. Concentrations of VOCs and/or metals exceeding the SCGs were detected in eight of the fourteen monitoring wells. The direction of the groundwater flow is generally to the west and northwest. In addition to historical operations on-site, the presence of VOCs in the groundwater may potentially be related to the flow of groundwater from adjoining sites. Figure 8 shows analytes that exceed the SCGs and an estimated areal extent of groundwater with elevated concentrations of VOCs, which is approximately 111,400 square feet.

1.3.5.4. Sediments

Contaminants of concern detected in the sediment collected from the on-site trenches, drains, pits and brick incinerator included SVOCs, metals and PCBs. Some of these structures appear to be isolated structures, and, therefore, contaminants within the structures are not anticipated to migrate off-site. However, some structures are full of sediment and debris so the system cannot be fully inspected.

Each of the sediment samples contained contaminant concentrations in excess of the Industrial Use SCOs. The sediment sample locations and estimated volume of contaminated sediments in each structure are shown in Table 2.

Based on the analytical results and field observations, with the exception of SED-7 and SED-8, this material would likely be disposed off-site as non-hazardous material. Sediment samples from SED-7 and SED-8 contained significantly elevated SVOC concentrations; therefore, sediment disposal profiling might indicate that this material should be disposed off-site as hazardous material. Figure 9 depicts the locations of the sediment samples.

1.3.5.5. Interior Wood Block Flooring

Contaminants of concern detected in the wood flooring include SVOCs and lead. The wood flooring is located between asphalt above and concrete flooring below and, therefore, the potential for contaminant migration is limited. However, due to the condition of the warehouse roof, the flooring is often exposed to precipitation and, as a result, the asphalt and wood flooring have buckled in a few locations. The high TCLP lead results and exposure to precipitation indicates the possibility for lead to leach from the wood flooring to other media.

Two areas of wood block flooring were identified in the warehouse. Disposal profiling of the two areas indicated that one area contains wood flooring that would be considered non-hazardous material, while the other area contains lead at characteristic hazardous waste concentrations. Therefore, each area is discussed separately below. The estimated aerial extent of each area is depicted on Figure 9.

a. Non-Hazardous Wood Block Flooring

The wood block flooring in the center portion of the warehouse contains elevated concentrations of SVOCs. Disposal profiling completed on the wood block flooring in this area indicated the material could be disposed off-site as non-hazardous material. This area occupies an estimated 38,875 square feet. Assuming that the material weighs 60 pounds per cubic foot and the depth of the wood flooring is 4.25 inches, the weight of the contaminated non-hazardous wood block flooring is 410 tons.

b. Hazardous Wood Block Flooring

Disposal profiling completed in several locations within the northeast portion of the building indicated that the wood block flooring would be considered hazardous waste based on significantly elevated concentrations of lead. This area occupies an estimated 4,060 square feet. Assuming that the material weighs 60 pounds per cubic foot and the depth of the wood flooring is 4.25 inches, the weight of the hazardous wood block flooring is 43 tons.

1.3.5.6. Asbestos

The pre-demolition asbestos survey report identified approximately 32,045 square feet and 90 linear feet of non-friable ACM and approximately 820 linear feet of friable asbestos containing materials (ACM) throughout the on-site structures.

1.3.5.7. Containers

The container inventory identified 91 total containers, as summarized in Appendix A, of which, 16 contained a suspect liquid that would require analytical testing prior to disposal. The total estimated quantity of suspect liquid in the 16 containers is 540 gallons. This inventory did not include various containers in a room in the northeast portion of the warehouse building due to safety concerns. However, the containers in this room are one- and five-gallon pails, and the total volume of liquids within these containers is estimated to be less than 100 gallons (two drums or less).

2.0 IDENTIFICATION AND DEVELOPMENT OF ALTERNATIVES

2.1 Remedial Action Objectives

The following subsections summarize the contaminants of concern, general locations of contaminants, and the Remedial Action Objectives (RAOs) identified for each of the identified media. These RAOs are based on the findings of the RI and the anticipated future use of the project site for commercial or industrial purposes.

2.1.1 Surface Soil/Fill

Contaminants of concern detected in the surface soil/fill consist of SVOCs and metals. The RAOs for this medium are to prevent exposure of human and environmental receptors to these contaminants via dermal contact, incidental ingestion, and inhalation of particulates, and to prevent the discharge of contaminated storm water runoff and eroded surface soil/fill to off-site locations or into adjacent storm sewers.

2.1.2 Subsurface Soil/Fill

Contaminants of concern detected in the subsurface soil/fill include SVOCs and metals. The RAOs for this medium are to prevent the exposure of humans and environmental receptors to contaminated subsurface soil/fill via dermal contact, and incidental ingestion or inhalation of particulates.

2.1.3 Groundwater

Contaminants of concern detected in the groundwater include VOCs and metals. The RAOs for this medium are to prevent the exposure of humans and environmental receptors to contaminated groundwater via dermal contact, ingestion of groundwater, and inhalation of vapors, and to prevent off-site migration.

2.1.4 Building Materials and Associated Components

2.1.4.1. Sediments

Contaminants of concern in this medium consist of SVOCs, PCBs and metals. The RAO for this medium is to prevent the exposure of humans and environmental receptors to contaminated sediment via dermal contact, and incidental ingestion or inhalation of particulates. Additionally, the RAOs include preventing the migration of contaminated sediments from the sumps and drains to interconnected drainage features, if any.

2.1.4.2. Interior Wood Block Flooring

Contaminants of concern in this medium consist of SVOCs and metals including hazardous levels of lead. The RAOs for this medium are to prevent the exposure of humans and environmental receptors to contaminated wood flooring via dermal contact and to prevent the leaching of contaminants from the wood block flooring.

2.1.4.3. Asbestos

Contaminants of concern in this medium consist of friable and non-friable ACMs. The RAO for this medium is to prevent the exposure of humans and environmental receptors to ACMs via incidental ingestion or inhalation of fibers.

2.1.4.4. Containers

Contaminants of concern likely include petroleum products as well as other, unknown materials. The RAOs for this medium are to prevent the exposure of humans and environmental receptors to suspect containers via dermal contact and/or incidental ingestion, and to prevent the release of materials from the containers.

2.2 General Response Actions

General response actions for each of the affected media at the project site have been identified and are described in the following subsections. Although these general response actions include no action as a remedial option, the “No Action” response action does not address the RAOs identified in the preceding section and is included for comparison purposes only. The general response actions are summarized in Table 3.

2.2.1 Surface Soil/Fill

General response actions available to satisfy the RAOs identified for surface soil/fill include:

- No action
- Institutional controls
- Containment
- Excavation and off-site disposal

2.2.2 Subsurface Soil/Fill

General response actions available to address the RAOs for subsurface soil/fill include:

- No action
- Institutional controls
- Containment
- Excavation and off-site disposal

2.2.3 Groundwater

General response actions available to address the RAO for groundwater include:

- No action
- Institutional controls
- Soil vapor mitigation
- Enhanced natural attenuation
- Long-term groundwater monitoring

2.2.4 Building Materials and Associated Components

2.2.4.1. Sediments

General response actions available to address the RAOs for sediment locations include:

- No action
- Removal of sediments from the most severely contaminated locations
- Removal of sediments from all drainage features

2.2.4.2. Interior Wood Block Flooring

General response actions available to address the RAO for the wood block flooring include:

- No action
- Removal of wood block flooring with hazardous concentrations of lead
- Removal and off-site disposal of all wood block flooring

2.2.4.3. Asbestos

General response actions available to address the RAO for the ACMs include:

- No action
- Removal and off-site disposal

2.2.4.4. Containers

General response actions available to address the RAOs for the containers include:

- No action
- Removal and off-site disposal

2.3 Development of Alternatives

The general response actions identified in Section 2.2 have been assembled into a series of site-wide remedial action alternatives. The alternatives range from least comprehensive to most comprehensive as summarized in Table 4 and outlined in the following subsections.

2.3.1 Alternative A – No Action

Under this alternative, the project site would remain in its current state, and maintenance of the current access controls would be performed in perpetuity.

This alternative does not satisfy the human health or environmental RAOs for the current use scenario, nor is it supportive of the redevelopment of the project site for manufacturing or light industrial use. However, it has been retained for detailed analysis to provide a point of comparison for the other alternatives.

2.3.2 Alternative B – Cover Installation and Limited Building Component Removal

This alternative would include placing either a six-inch asphalt or concrete paving system or twelve-inch cover soil and the removal of the more significantly contaminated building components. The cover system will be placed over the soil/fill across the property, and the existing floor will act as the cover for areas within the building footprint. The most contaminated sediments (SED-7 and SED-8) and the wood block flooring with hazardous levels of lead will be removed from the site. Asbestos-containing building materials and the containers will be removed and properly disposed.

This remedy will allow commercial or industrial redevelopment of the property, although a site management plan would be required to address any future invasive activities at the project site. To mitigate concerns regarding erosion of the cover system and exposure of the underlying soil/fill, long-term monitoring of the cover system would also be necessary.

The details of this alternative include:

- Clearing, grubbing, and removal of surface debris
- Asbestos abatement and off-site disposal
- Removal and off-site disposal of sediments within sumps SED-7 and SED-8 followed by in-place closure of drainage features
- Disposal profiling followed by off-site disposal of containers
- Removal and off-site disposal of wood block flooring with hazardous levels of lead
- Placement of a minimum of twelve inches of clean cover soil followed by seeding, or placement of an asphalt or concrete paving system at least six inches thick across the entire site outside the building footprint
- Placement of a deed restriction on the property that includes:
    - Development of a site management plan
    - Limitation on future development to commercial or industrial uses
    - Requirement for evaluation of the potential for soil vapor intrusion in the existing or any new structures, followed by the installation of a vapor barrier and/or venting system, if warranted
    - Prohibition on the use of groundwater as a source of potable or process water without necessary water quality treatment as determined by the Chautauqua County Department of Health
    - Requirement for annual certification of institutional and engineering controls
- Long-term groundwater monitoring

2.3.3 Alternative C – Cover Installation, Building Component Removal and Groundwater Treatment

This alternative includes placing either a six-inch asphalt or concrete paving system or twelve-inch soil cover over the entire site outside the building footprint. Additionally, this alternative includes the removal and off-site disposal of all sediments, wood block flooring, asbestos and containers; the in-place closure of all drainage features containing contaminated sediments; and the in-situ treatment of groundwater contamination.

This remedy will allow commercial or industrial redevelopment of the property, although a site management plan would be required to address any future invasive activities at the project site. To mitigate concerns regarding erosion of the cover system and exposure of the underlying soil/fill, long-term monitoring of the cover system would also be necessary.

The details of this alternative include:

- Clearing, grubbing, and removal of surface debris
- Asbestos abatement and off-site disposal
- Removal and off-site disposal of sediments within all sumps followed by in-place closure of drainage features
- Disposal profiling followed by off-site disposal of containers
- Removal and off-site disposal of all wood block flooring
- Placement of a minimum of twelve inches of clean cover soil followed by seeding, or placement of an asphalt or concrete paving system at least six inches thick across the entire site outside the building footprint
- Enhanced natural attenuation of groundwater (i.e., zero valent iron or similar)
- Performance of groundwater monitoring until concentrations decrease to acceptable levels
- Placement of a deed restriction on the property that includes:
    - Development of a site management plan
    - Limitation on future development to commercial or industrial uses
    - Requirement for evaluation of the potential for soil vapor intrusion in the existing or any new structures, followed by the installation of a vapor barrier and/or venting system, if warranted
    - Prohibition on the use of groundwater as a source of potable or process water without necessary water quality

treatment as determined by the Chautauqua County Department of Health
- o Requirement for annual certification of institutional and engineering controls

2.3.4 Alternative D – Limited Soil/Fill Removal, Cover Installation, Building Component Removal, Soil Vapor Mitigation and Groundwater Treatment

This alternative includes limited subsurface soil/fill removal from three areas that are potentially adversely affecting groundwater followed by placing either a six-inch asphalt or concrete paving system or twelve-inch soil cover over the entire site outside the building footprint. Additionally, this alternative includes the removal and off-site disposal of all sediments, wood block flooring, asbestos and containers; the in-place closure of all drainage features containing contaminated sediments; and the in-situ treatment of groundwater contamination. Also, soil vapor mitigation controls consisting of a subslab depressurization system or vapor barrier will be installed within the existing building as well as any new buildings to eliminate to potential for volatile organic vapor intrusion.

This remedy will allow commercial or industrial redevelopment of the property, although a site management plan would be required to address any future invasive activities at the project site. Long-term monitoring would focus on the cover system, site-wide groundwater quality, and air monitoring within the building after redevelopment.

The details of this alternative include:

- Clearing, grubbing, and removal of surface debris
- Excavation and off-site disposal of subsurface soil/fill in the vicinity of TP-22, TP-4 and PH-II-MW-6
- Asbestos abatement and off-site disposal
- Removal and off-site disposal of sediments within all sumps followed by in-place closure of drainage features
- Disposal profiling followed by off-site disposal of containers
- Removal and off-site disposal of all wood block flooring
- Installation of soil vapor mitigation controls
- Placement of a minimum of twelve inches of clean cover soil followed by seeding, or placement of an asphalt or concrete paving system at least six inches thick across the entire site outside the building footprint
- Enhanced natural attenuation of groundwater (i.e., zero valent iron or similar)

- Performance of groundwater monitoring until concentrations decrease to acceptable levels
- Placement of a deed restriction on the property that includes:
    - o Development of a site management plan
    - o Limitation on future development to commercial or industrial uses
    - o Requirement for evaluation of the potential for soil vapor intrusion in the existing or any new structures, followed by the installation of a vapor barrier and/or venting system, if warranted
    - o Prohibition on the use of groundwater as a source of potable or process water without necessary water quality treatment as determined by the Chautauqua County Department of Health
    - o Requirement for annual certification of institutional and engineering controls

For the purpose of estimating the potential costs of soil vapor mitigation controls, the costs associated with the design and installation of subslab depressurization system have been included with this alternative.

2.3.5 Alternative E – Soil/Fill and Building Component Removal, Soil Vapor Mitigation and Groundwater Treatment

This alternative includes removing the surface soil/fill and subsurface soil/fill with concentrations above Commercial Use SCOs from the site. Additionally, this alternative includes the removal and off-site disposal of all sediments, wood block flooring, asbestos and containers; the in-place closure of all drainage features containing contaminated sediments; and the in-situ treatment of groundwater contamination. Also, soil vapor mitigation controls consisting of a subslab depressurization system or vapor barrier will be installed within the existing building as well as any new buildings to eliminate to potential for volatile organic vapor intrusion.

Following implementation of the remedy, commercial or industrial redevelopment could occur on the property, although a site management plan would be required to address any future invasive activities at the project site. Long-term monitoring of the institutional controls would also be necessary.

The details of this alternative include:

- Clearing, grubbing, and removal of surface debris

- Excavation and off-site disposal of the uppermost one foot of surface soil/fill (excluding areas with existing asphalt or concrete surfaces)
- Excavation and off-site disposal of subsurface soil/fill that contains concentrations above the Commercial Use SCOs
- Backfilling excavations with clean material
- Asbestos abatement and off-site disposal
- Removal and off-site disposal of sediments within all sumps followed by in-place closure of drainage features
- Disposal profiling followed by off-site disposal of containers
- Removal and off-site disposal of all wood block flooring
- Enhanced natural attenuation of groundwater (i.e., zero valent iron or similar)
- Installation of soil vapor mitigation controls
- Performance of groundwater monitoring until contaminant concentrations decrease to acceptable levels
- Placement of a deed restriction on the property that includes:
    - Development of a site management plan
    - Limitation on future development to commercial or industrial uses
    - Requirement for evaluation of the potential for soil vapor intrusion in the existing or any new structures, followed by the installation of a vapor barrier and/or venting system, if warranted
    - Prohibition on the use of groundwater as a source of potable or process water without necessary water quality treatment as determined by the Chautauqua County Department of Health
    - Requirement for annual certification of institutional controls

For the purpose of estimating the potential costs of soil vapor mitigation controls, the costs associated with the design and installation of subslab depressurization system have been included with this alternative.

2.3.6 Alternative F – Residential Use Cleanup

This alternative is the most comprehensive, involving the removal and off-site disposal of all soil/fill that exceeds Residential Use SCOs from the site and the in-situ treatment of groundwater. Additionally, this alternative includes the removal and off-site disposal of all sediments, wood block flooring, asbestos and containers as well as the in-place closure of all drainage features containing contaminated sediments.

The details of this alternative include:

- Clearing, grubbing, and removal of surface debris
- Demolition of the warehouse and selective removal of floor slab to facilitate excavation of contaminated soil/fill under the slab
- Excavation and off-site disposal of the uppermost one foot of surface soil/fill (excluding areas with existing asphalt or concrete surfaces)
- Excavation and off-site disposal of subsurface soil/fill that contains concentrations above the Residential Use SCOs
- Backfilling excavations with clean material
- Asbestos abatement and off-site disposal
- Removal and off-site disposal of sediments within all sumps followed by in-place closure of drainage features
- Disposal profiling followed by off-site disposal of containers
- Removal and off-site disposal of all wood block flooring
- Enhanced natural attenuation of groundwater (i.e., zero valent iron or similar)
- Performance of groundwater monitoring until contaminant concentrations decrease to acceptable levels
- Placement of a deed restriction on the property that includes:
    - Development of a site management plan
    - Requirement for evaluation of the potential for soil vapor intrusion in the existing or any new structures, followed by the installation of a vapor barrier and/or venting system, if warranted
    - Prohibition on the use of groundwater as a source of potable or process water without necessary water quality treatment as determined by the Chautauqua County Department of Health
    - Requirement for annual certification of institutional controls

3.0 DETAILED ANALYSIS OF ALTERNATIVES

3.1 General Discussion

The remedial alternatives described in Section 2 were individually and comparatively evaluated with respect to the following six criteria as defined in 6 NYCRR 375:

- Overall Protection of Human Health and the Environment
- Compliance with Standards, Criteria, and Guidance

- Short-Term Effectiveness
- Long-Term Effectiveness
- Reduction of Toxicity, Mobility and Volume
- Feasibility

These criteria are discussed in greater detail below. A seventh criterion, community acceptance, will be evaluated by the NYSDEC at the conclusion of the public comment period.

3.1.1 Overall Protection of Human Health and the Environment

This threshold assessment addresses whether a remedy provides adequate protection, and describes how risks posed through each pathway are eliminated, reduced, or controlled. This evaluation allows for consideration of whether the alternative poses any unacceptable short-term or cross-media impacts.

3.1.2 Compliance with Standards, Criteria, and Guidance

A site's remedial program must be designed so as to conform to standards and criteria that are generally applicable, consistently applied, and officially promulgated, and are either directly applicable, or are not directly applicable but are relevant and appropriate, unless good cause exists why conformity should be dispensed with [6 NYCRR 375-1.10(c)(1)(i)].

3.1.3 Short-Term Effectiveness

The effectiveness of alternatives in protecting human health and the environment during construction and implementation of the remedial action is evaluated under this criterion. Short-term effectiveness is assessed in terms of protection of the community, protection of workers, environmental impacts, and time until protection is achieved.

3.1.4 Long-Term Effectiveness

The evaluation of this criterion focuses on the long-term protection of human health and the environment at the completion of the remedial action. Effectiveness is assessed with respect to the magnitude of residual risks; adequacy of controls, if any, in managing treatment residuals or untreated wastes that remain at the site; reliability of controls against possible failure; and potential to provide continued protection.

3.1.5 Reduction of Toxicity, Mobility and Volume

This evaluation criterion addresses the preference for selecting a remedial action alternative that permanently and significantly reduces the volume, toxicity, and/or mobility of the hazardous wastes and/or constituents. This preference is satisfied when the treatment is used to reduce the principal threats at a site through destruction of toxic contaminants, irreversible reduction in contaminant mobility, or reduction of total volume of contaminated media. The following is the hierarchy of remedial technologies ranked from most preferable to least preferable:

- Destruction
- Separation/treatment
- Solidification/chemical fixation
- Control and isolation

3.1.6 Feasibility

A feasible remedy is one that is appropriate for site conditions, is capable of being successfully carried out with available technology, and considers, at a minimum, implementability and cost-effectiveness.

3.2 Individual Analysis of Alternatives

The evaluations of the six criteria discussed above for each of the remedial alternatives are presented in the following subsections and summarized in Table 3.

3.2.1 Alternative A – No Action

3.2.1.1. Overall Protection of Human Health and the Environment

The No Action Alternative does not satisfy the RAOs because of its inability to eliminate the potential for the exposure of the public and future construction and site residents to on-site contaminants. Therefore, this alternative is not protective of human health with respect to the surrounding community because contamination would remain on-site and would not be effectively contained.

3.2.1.2. Compliance with Standards, Criteria, and Guidance

All contaminated media would remain on-site and therefore would not comply with SCGs.

3.2.1.3. Short-Term Effectiveness

Under this alternative, the project site would remain in its current state, in which media with elevated concentrations would remain on-site.

3.2.1.4. Long-Term Effectiveness

In the long-term, the proposed redevelopment of the project site for commercial or industrial use is not possible without remediation. Although natural attenuation will eventually address organic contamination, elevated concentrations of metals will remain in perpetuity.

3.2.1.5. Reduction of Toxicity, Mobility and Volume

This alternative would not reduce the toxicity, mobility or volume of contamination.

3.2.1.6. Feasibility

As this alternative requires no action at the project site, this alternative is considered to be implementable. There is no cost associated with this alternative. However, this alternative does not effectively protect human health and the environment.

3.2.2 Alternative B - Cover Installation and Limited Building Component Removal

3.2.2.1. Overall Protection of Human Health and the Environment

This alternative would achieve the RAOs for surface and subsurface soil/fill, asbestos, and containers but would not remove the soil/fill or groundwater contamination from the site. The most contaminated wood block flooring and sediments would be addressed, although some contaminated sediments and wood block flooring would remain on-site. Long-term operation, maintenance, and monitoring (OM&M) of the cover system and groundwater would be required.

3.2.2.2. Compliance with Standards, Criteria, and Guidance

A cover system would be placed over the contaminated soil/fill to limit the potential for contact with the contaminated material. Additionally, this alternative involves the removal and off-site disposal of most contaminated building components from the site including asbestos-containing materials, containers, and the most significantly contaminated sediment and wood block flooring. However, contaminated soil/fill, groundwater, sediments, and wood block flooring would remain at the project site.

3.2.2.3. Short-Term Effectiveness

Although short-term exposure risks to construction workers and the surrounding community could result from remediation activities at the site, these risks would be effectively minimized through the use of a site management plan and standard construction and health and safety precautions.

This remedial action could be implemented in less than a year.

3.2.2.4. Long-Term Effectiveness

This alternative would address exposure to site contaminants in the long-term, as the contaminated material will be covered. However, the cover must be maintained in perpetuity and adherence to a site management plan would be required for all future invasive activities at the project site. Long-term monitoring of groundwater and the cover system would be required.

3.2.2.5. Reduction of Toxicity, Mobility and Volume

This remedial action alternative would reduce the mobility of the contaminants in the surface soil/fill but not reduce the toxicity or volume of the contaminated surface and subsurface soil or the toxicity, mobility and volume of the subsurface soil/fill contaminants or contaminated groundwater. However, this alternative would remove contaminated building components from the site including asbestos and containers and would reduce but not eliminate the volume of contamination in the sediment and wood block flooring.

3.2.2.6. Feasibility

This remedial action alternative is appropriate for future site uses. Materials and equipment for completing remediation as described are readily available. As shown in Table 5, the estimated cost of this alternative is approximately $640,000, which makes this a cost-effective alternative.

3.2.3 Alternative C – Cover Installation, Building Component Removal, and Groundwater Treatment

3.2.3.1. Overall Protection of Human Health and the Environment

This alternative would achieve the RAOs for all media but would not remove the contaminated surface and subsurface soil/fill from the site. Although elevated concentrations of contaminants will remain in the soil/fill, the potential for contact with the contaminated material soil/fill will be limited via installation of a cover system. In situ treatment will remediate the contaminants in the groundwater over a period of years, during which time groundwater monitoring will be necessary. Long-term monitoring of the cover system will also be required.

3.2.3.2. Compliance with Standards, Criteria, and Guidance

All contaminated building components would be removed from the project site. Although soil/fill exceeding SCGs would remain on-site, a cover system would be placed over the site to limit the potential for contact with the contaminated material. In situ treatment will reduce contaminant concentrations in the groundwater.

3.2.3.3. Short-Term Effectiveness

Although short-term exposure risks to construction workers and the surrounding community could result from remediation activities at the site, these risks would be effectively minimized through the use of a site management plan and standard construction and health and safety precautions.

This remedial action could be implemented in less than a year, and the groundwater treatment will address the contaminants over several years.

3.2.3.4. Long-Term Effectiveness

This alternative would address exposure to site contaminants in the long-term, as all the contaminated building components will be removed from the project site and properly disposed. Additionally, a cover system will limit the potential for exposure to contaminants in the soil/fill. However, the cover must be maintained in perpetuity and adherence to a site management plan would be required for all future invasive activities at the project site. Long-term monitoring of the cover system would be required, and groundwater monitoring would be necessary until concentrations decrease to acceptable levels.

3.2.3.5. Reduction of Toxicity, Mobility and Volume

This remedial action alternative would remove the contaminants in the groundwater and building components. Although this alternative would not reduce the toxicity or volume of the contaminated soil/fill, the placement of a cover across the site will limit the mobility of the material.

3.2.3.6. Feasibility

This remedial action alternative is appropriate for current and future site uses. Materials and equipment for completing remediation as described are readily available. As shown in Table 6, the estimated cost of this alternative is approximately $870,000, which makes this alternative cost-effective when compared to the other remedies.

3.2.4 Alternative D – Limited Soil/Fill Removal, Cover Installation, Building Component Removal, Soil Vapor Mitigation and Groundwater Treatment

3.2.4.1. Overall Protection of Human Health and the Environment

This alternative would achieve the RAOs for all media but would not remove the contaminated surface and only remove a limited quantity of the contaminated subsurface soil/fill from the site. Although elevated concentrations of contaminants will remain in the soil/fill, the potential for contact with the contaminated material soil/fill will be limited via installation of a cover system. Additionally, soil vapor mitigation controls will be installed within the existing building as well as any new buildings to eliminate to potential for volatile organic vapor intrusion. Also, in situ treatment will remediate the contaminants in the groundwater over a period of years, during which time groundwater monitoring will be necessary. Long-term monitoring of the cover system will also be required.

3.2.4.2. Compliance with Standards, Criteria, and Guidance

All contaminated building components and a limited quantity of contaminated subsurface soil/fill would be removed from the project site. Although soil/fill exceeding SCGs would remain on-site, a cover system would be placed over the site to limit the potential for contact with the contaminated material. In situ treatment will reduce contaminant concentrations in the groundwater. Additionally, soil vapor mitigation controls will be installed within the existing building as well as any new buildings to eliminate to potential for volatile organic vapor intrusion.

3.2.4.3. Short-Term Effectiveness

Although short-term exposure risks to construction workers and the surrounding community could result from remediation activities at the site, these risks would be effectively minimized through the use of a site management plan and standard construction and health and safety precautions.

This remedial action could be implemented in less than a year, and the groundwater treatment will address the contaminants over several years.

3.2.4.4. Long-Term Effectiveness

This alternative would address exposure to site contaminants in the long-term, as all the contaminated building components will be removed from the project site and properly disposed. Additionally, a cover system will limit the potential for exposure to contaminants in the soil/fill. However, the cover must be maintained in perpetuity and adherence to a site management plan would be required for all future invasive activities at the project site. Long-term monitoring of the cover system would be required, and groundwater monitoring would be necessary until concentrations decrease to acceptable levels. Also, soil vapor mitigation controls will be installed within the existing building as well as any new buildings to eliminate to potential for volatile organic vapor intrusion.

3.2.4.5. Reduction of Toxicity, Mobility and Volume

This remedial action alternative would remove the contaminants in the groundwater and building components as well as a limited quantity of subsurface soil/fill. Although this alternative would not completely reduce the toxicity or volume of the contaminated soil/fill, the placement of a cover across the site will limit the mobility of the material. Also, soil vapor mitigation controls will be installed within the existing building as well as any new buildings to eliminate to potential for volatile organic vapor intrusion.

3.2.4.6. Feasibility

This remedial action alternative is appropriate for current and future site uses. Materials and equipment for completing remediation as described are readily available. As shown in Table 7, the estimated cost of this alternative is approximately $1,749,000, which makes this alternative somewhat cost-effective when compared to the other remedies.

3.2.5 Alternative E – Soil/Fill and Building Component Removal, Soil Vapor Mitigation and Groundwater Treatment

3.2.5.1. Overall Protection of Human Health and the Environment

This alternative would achieve the RAOs for all media but would not remove the subsurface soil/fill with concentrations above Residential Use SCOs from the site. In situ treatment will remediate the contaminants in the groundwater over a period of years, during which time groundwater monitoring will be necessary. Long-term monitoring of the cover system will also be required. Also, soil vapor mitigation controls will be installed within the existing building as well as any new buildings to eliminate to potential for volatile organic vapor intrusion.

3.2.5.2. Compliance with Standards, Criteria, and Guidance

All contaminated materials that exceed Commercial Use SCOs would be removed from the site and properly disposed. Additionally, groundwater treatment would reduce contaminant concentrations in the groundwater. While the underlying soil/fill may contain some metals at concentrations above the Residential Use SCOs, these concentrations would allow redevelopment of the property for commercial or industrial uses.

3.2.5.3. Short-Term Effectiveness

Although short-term exposure risks to construction workers and the surrounding community could result from remediation activities at the site, these risks would be effectively minimized through the use of a site management plan and standard construction and health and safety precautions.

This remedial action could be implemented in less than a year, and the groundwater treatment will address the contaminants over several years.

3.2.5.4. Long-Term Effectiveness

This alternative would address exposure to site contaminants in the long-term, as all the contaminated surface soil/fill, contaminated building components, and subsurface soil/fill exceeding Commercial Use SCOs will be removed from the project site and properly disposed. Groundwater monitoring would be necessary until concentrations decrease to acceptable levels. Also, soil vapor mitigation controls will be installed within the existing building as well as any new buildings to eliminate to potential for volatile organic vapor intrusion.

3.2.5.5. Reduction of Toxicity, Mobility and Volume

This remedial action alternative would effectively reduce the toxicity, mobility and volume of the contaminants through removal and proper off-site disposal of all surface soil/fill, contaminated building components, and subsurface soil/fill that exceeds Commercial Use SCOs. Additionally, on-site groundwater treatment would reduce contaminant concentrations in the groundwater. Although some subsurface soil/fill exceeding Residential Use SCOs will remain on-site, the mobility of the material will be low due to its subsurface location. Also, soil vapor mitigation controls will be installed within the existing building as well as any new buildings to eliminate to potential for volatile organic vapor intrusion.

3.2.5.6. Feasibility

This remedial action alternative is appropriate for current and future site conditions and uses. Materials and equipment for completing remediation as described are readily available. As shown in Table 8, the estimated cost of this alternative is approximately $4,795,100, which makes this alternative relatively expensive when compared to other alternatives.

3.2.6 Alternative F – Residential Use Cleanup

3.2.6.1. Overall Protection of Human Health and the Environment

This comprehensive alternative would achieve all of the RAOs and would render the site suitable for future residential, commercial, or industrial uses. In situ treatment will remediate the contaminants in the groundwater over a period of years, during which time groundwater monitoring will be necessary.

3.2.6.2. Compliance with Standards, Criteria, and Guidance

All contaminated materials that exceed Residential Use SCOs would be removed from the site and properly disposed. Additionally, groundwater treatment would reduce contaminant concentrations in the groundwater.

3.2.6.3. Short-Term Effectiveness

Although short-term exposure risks to construction workers and the surrounding community could result from remediation activities at the site, these risks would be effectively minimized through the use of a site management plan and standard construction and health and safety precautions.

This remedial action could be implemented in less than a year, and the groundwater treatment will address the contaminants over several years.

3.2.6.4. Long-Term Effectiveness

This alternative would address exposure to site contaminants in the long-term, as all the contaminated surface and subsurface soil/fill exceeding Residential Use SCOs and building components will be removed from the project site and properly disposed. Groundwater monitoring would be necessary until concentrations decrease to acceptable levels.

3.2.6.5. Reduction of Toxicity, Mobility and Volume

This remedial action alternative would effectively reduce the toxicity, mobility and volume of the contaminants through removal and proper off-site disposal of all surface soil/fill, contaminated building components, and subsurface soil/fill that exceeds Residential Use SCOs. Additionally, on-site groundwater treatment would reduce contaminants in the groundwater.

3.2.6.6. Feasibility

This remedial action alternative is appropriate for current and future site conditions and uses. Materials and equipment for completing remediation as described are readily available. As shown in Table 9, the estimated cost of this alternative is approximately $6,900,000, which makes this alternative the most expensive.

3.3 Comparative Analysis and Recommendation

Table 10 summarizes the comparative evaluation of the remedial alternatives, which includes ratings for each of the criteria mandated by 6 NYCRR Part 375. The comparison of the alternatives is based upon a qualitative system that utilizes relative ratings of *high*, *medium* and *low* to define each alternative's performance with respect to the 6 NYCRR Part 375 criteria. These ratings are then equated to a numerical scale to produce a relative numerical score for final comparison purposes. The ratings equate to the following conditions and numerical scores:

RATING	DESCRIPTION	NUMERICAL RATING
HIGH	SATISFIES CRITERIA TO A HIGH DEGREE	3
MEDIUM	SATISFIES CRITERIA TO A MODERATE DEGREE	2
LOW	MINIMALLY SATISFIES CRITERIA	1

The aggregate numerical score for each of the alternatives evaluated is shown near the bottom of Table 10. Higher relative scores represent a higher level of effectiveness with respect to the evaluation criteria.

As reflected by Table 10, Alternatives C through F have been identified as the most effective alternatives, as each would fully satisfy the RAOs developed for the project site; have high degrees of long-term effectiveness; result in the largest reductions of contaminated media; and would render the project site suitable for immediate redevelopment. However, Alternatives E and F are much more costly than other alternatives identified and Alternative C does not prevent the intrusion of soil vapor into on-site structures. As such, Alternative D is proposed for implementation based upon its high degree of overall protection of human health and the environment as well as its cost effectiveness. This alternative would render the site suitable for future intended use for commercial or industrial development.