Groundwater Remediation Work Plan

Former Elka Chemical Corporation Site

NYSDEC Site Number: 152239

Prepared for:

The New York State Department of Environmental Conservation,
Division of Environmental Remediation

Prepared by:

Eastern Environmental Solutions, Inc.
Manorville, New York
and
Dermody Consulting
Center Moriches, NY

June, 2025

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ACRONYMS

AWQS Ambient Water Quality Standards

CAMP Community Air Monitoring Plan

HASP Health and Safety Plan

LIRR Long Island Rail Road

NYSDEC New York State Department of Environmental Conservation

SCDHS Suffolk County Department of Health Services

VOCs Volatile Organic Compounds

CERTIFICATION

I, Ravi Korlipara, certify that I am currently a NYS registered professional engineer and that this Groundwater Remediation Work Plan was prepared in accordance with all applicable statutes and regulations and in substantial conformance with the DER Technical Guidance for Site Investigation and Remediation (DER-10).

Dr. Ravi Korlipara, P.E. Date

SECTION 1.0
INTRODUCTION

1.1 Purpose

This Groundwater Remediation Work Plan has been prepared by Eastern Environmental Solutions, Inc. and Dermody Consulting (jointly referred to as EES) for the property at 340 West Hoffman Avenue, Lindenhurst, New York (the "Site"). The Suffolk County Tax Map Number for the Site is District 103, Section 9, Block 1, and Lot 81.5. The Site is listed on the New York State Department of Environmental Conservation (NYSDEC) Registry of Inactive Hazardous Waste Disposal Sites (Class 2) as Site No. 152239. A survey showing the Site boundaries is provided in Appendix A. A segment of the US Geological Survey Map for the Site is provided in Appendix B.

Previous Site investigations performed by others from 2001 to 2015 demonstrated that the former Elka Chemical Corp. (Elka) discharged volatile organic compounds (VOCs) at the Site that resulted in the presence of a now-degraded and dense, sludge-like smear zone at and near the water table. In addition, VOC groundwater plume was present at the Site, as well as in the groundwater downgradient of the Site.

The EES Site investigation work performed from 2017 to present included the collection of on-Site and off-Site groundwater sampling, on-Site soil sampling, and on-Site sub-slab soil vapor and indoor/outdoor air samples.

The purpose of this report is to provide a work plan for the remediation of groundwater contamination at and downgradient of the Site. A Health and Safety Plan (HASP) and Community Air Monitoring Plan (CAMP) is provided in Appendix C. Appendix D contains the Safety Data Sheet for the compound that will be injected during the remediation project.

1.2 Site Background

The Site is located in a commercial/industrial area at the northwest corner of the intersection of West Hoffman and New York Avenues. The Site is approximately 0.5 acres in size and consists of a paved parking lot on its east end, a 4000-square-foot commercial/industrial building on its central portion, and an unpaved area on its west end. West Hoffman Avenue is a divided road with the Long Island Rail Road (LIRR) elevated tracks present in its median. The Site location and properties boundaries are presented in Figure 1. The Site and the downgradient area are shown in Figure 2.

The building at the Site was previously occupied by Elka Chemical Corporation (Elka) from the 1920s until approximately 1985. Elka was involved in the business of repackaging xylene and other VOCs and it has been determined that the releases at the Site were attributable to operations at Elka. From approximately 1985 to 2013, the Site was occupied by Roy's Auto Repair and a Volvo dealership that was known as Verness Motoring Co. In 2013, the Site was used as a gymnasium, and since 2014 until 2024, the Site building and east parking lot was occupied by the New Born Church. At present, the building is unoccupied. The unpaved western portion of the Site is currently occupied by a landscaping company and is used to store landscaping vehicles, wood, and piles of mulch and soil.

SECTION 2.0
SITE SETTING AND ENVIRONMENTAL HISTORY

2.1 Geology and Hydrogeology

The regional geology of the Site area consists of a base of Precambrian crystalline bedrock predominantly composed of schist and gneiss overlain by the Lloyd Sand Member of the Cretaceous Raritan Formation. The clay member of the Raritan Formation overlies the Lloyd Sand Member, and acts as a confining unit. Overlying the Raritan Formation is the Cretaceous Magothy Formation which, in the Site area, is overlain by the Pleistocene Upper Glacial Formation that is composed of stratified medium to coarse-grained sand and gravel. The Upper Glacial deposits are estimated to be approximately 75 feet thick in the Site area.

The soils at and in the area of the Site are classified by the US Department of Agriculture as consisting primarily of urban land soils, which generally contain a mix of sand, gravel, silt, clay, and fill material.

Site-specific geology was recorded during a previous subsurface investigation at the Site. Based on the Site Characterization Report prepared by HRP Associates (2015), the geology was evaluated to a depth of 70 feet below grade. The boring logs from that report indicate that the Site geology generally consists of tan, medium-to-coarse-grained sand with some gravel and pebbles to a depth of at least 70 feet below grade. No clay or other potentially confining layers were identified.

Based on the US Geological Survey topographic quadrangle map, the elevation at the Site is approximately 20 feet above mean sea level and the topography is generally flat. Groundwater beneath the Site occurs at approximately 5 feet below grade. The groundwater flow direction is to the south-southeast.

2.2 Environmental History

Several environmental investigations were performed at and in the vicinity of the Site between2001 to 2015. The investigations showed the presence of, primarily, non- chlorinated VOCs, primarily in the shallow groundwater at and downgradient of the Site.

Starting in 2017, EES performed investigations of the groundwater, soil, and soil vapor/indoor and outdoor air at the Site plus groundwater investigations in the areas upgradient and downgradient of the Site.

2.3 Summary of Prior Site Conditions

Based on the previous investigations, there was gray, highly-weathered, dense material with a sludge-like consistency that is present throughout most areas of the Site where sampling occurred. The sludge layer/smear zone is present at and below the water table is an indication that floating product was likely to have been present on the surface of the water table in the past.

Elka is reported to have occupied the Site from the 1920s to 1985. Therefore, the sludge layer/smear zone is between 40 to 100 years old.

In the area downgradient of the Site, Geoprobe groundwater sampling was performed on at least three occasions between 2001 to 2012. The groundwater contamination, which consists primarily of VOCs, was generally confined to the area between 11th and 12th Streets and, therefore, the groundwater flow direction appears to be generally south-southeast and parallel to 11th and 12th Streets. This groundwater flow direction is consistent with groundwater flow directions obtained from the 2006, 2010, 2013, and 2016 synoptic measurements US Geological Survey maps and the 2002 Suffolk County Department of Health Services (SCDHS) groundwater elevation map for the Site area.

The data showed that the contamination was mostly confined to the shallow groundwater. As the plume travels southward to Kent Avenue, it was detected at deeper depths of up to 30 feet below grade (due to plume descent) . Kent Avenue is the southernmost location where groundwater sampling had been performed prior to the EES investigation. Elevated concentrations of xylene and trimethylbenzenes, as well as other VOCs, had been detected along Kent Avenue, which is approximately 650 feet downgradient of the Site.

2.4 Summary of Current Groundwater Conditions

The most recent groundwater sampling was performed in July, 2024. The sampling locations and concentrations of VOCs that exceed the NYSDEC Ambient Water Quality Standards (AWQS) are provided in Figure 2 for the on-Site groundwater samples and Figure 3 for the off-Site groundwater samples. Only wells or well depths with exceedances of the AWQS during the previous sampling were included in the 2024 sampling.

The results show that for the on-Site groundwater, samples were obtained primarily at the south end of the Site along the hydraulically downgradient portion of the Site. The depth to the groundwater is approximately five feet throughout the Site. The shallow wells are screened from 5 to 10 feet below grade (which is approximately 0 to 5 feet below the water table). The shallow wells are identified by an “S” after the well number. The deeper wells are screened from 15 to 20

feet below grade (10 to 15 feet below the water table) and identified as the wells with a "D" following the well number.

The results showed that elevated concentrations of VOCs appear to be present throughout most of the Site in shallow groundwater. The deeper groundwater contains fewer areas where the concentrations of VOCs exceed the AWQS, and the concentrations in the deeper groundwater are generally much lower than in the shallow groundwater.

The highest detection of any VOC was for total xylenes at well GP-15S (on the east side of the Site) at 3,710 micrograms per liter (ug/l) which is a reduction compared to the 2018 sampling total xylenes concentration at this location of 5,800 ug/l. The second highest detection of any VOC was total xylenes at GP-7S (on the west side of the Site) at 1,380 ug/l. Other elevated detections of VOCs include 1,2,4-trimethylbenzene (detected at concentrations as high as 534 ug/l), 1,3,5-trimethylbenzene (detected at concentrations as high as 481 ug/l), and ethylbenzene (detected at concentrations as high as 802 ug/l).

Elevated concentrations of VOCs were detected generally along most of the Site's southern border and the sample near the northern border on the west side of the Site (GP-12S). Previous sampling also showed relatively minor exceedances of the AWQS for naphthalene across the Site and one minor exceedance for Di-n-butyl phthalate on the east side of the Site.

For the off-Site groundwater, no VOC exceedances of the AWQS were detected in the upgradient groundwater. For the three wells downgradient GW-3, GW-4, and GW-5, along the south side of West Hoffman Ave., relatively minor exceedances of the AWQS were detected at GW-3S. GW-4S was damaged and not sampled, but previous sampling showed no exceedances of the AWQS were present at this location. For GP-5S, there were no exceedances of the AWQS.

For the off-Site groundwater on Kent Ave., there were exceedances of the AWQS for GW-7 (7-12'). For the groundwater at West Gates Avenue, there were no exceedances of the AWQS at GW-12 (20-25').

Based on the groundwater sampling, shallow groundwater at the Site contains VOCs at concentrations in exceedance of the AWQS throughout most of the Site. For the deeper on-Site groundwater (15-20' below grade), exceedances of the AWQS were found at GP-10D, GP-12D, and GP-14D, all on the eastern portion of the Site. All five locations of on-Site SVOC exceedances of the AWQS were found in the shallow groundwater and were co-located with VOC exceedances.

For the downgradient groundwater, there are exceedances of the AWQS on the western portion of the area along the south border of West Hoffman Avenue and at Kent Street at one location (GW-7).

2.5 Proposed Groundwater Remedy

Based on the presence of hydrocarbon VOCs in the groundwater on and off-Site, and the area of their presence, enhanced chemical bioremediation is proposed to address the groundwater contamination. This will be implemented with Regenesis PetroFix.

The injection of PetroFix acts by using a micron-scale activated carbon solution to adsorb hydrocarbons and then adds electron acceptors to stimulate hydrocarbon biodegradation. Therefore, the carbon will adsorb the hydrocarbons, and the electron acceptors will biodegrade the hydrocarbons.

The PetroFix concentrated solution is diluted in a mixing tank with water, mixed, and then electron acceptor material is added to the tank and mixed again.

2.6 Pilot Testing

Prior to performing full-scale chemical injection across the Site, a pilot test will be conducted to determine the radius of influence of influence (ROI) of the injected liquids. Based on the geology at the Site, it is expected that the ROI will be 3 to 6.5 feet from the injection point.

PetroFix, when injected into the groundwater, stains the soil a dark black color that can be compared to the color of the soil obtained from below the water table prior to the injection. The injection point is shown in Figure 4.

Prior to commencing on-Site activities, the US Environmental Protection Agency will be contacted to obtain an Underground Injection Control Permit.

Up to 41 gallons (which is 400 pounds) of PetroFix, properly prepared, mixed, and diluted will be injected into the aquifer. The dilution rates are 9.8 pounds of PetroFix (which has a volume of one gallon) to 98 gallons of water. It is expected that 300 to 400 gallons of PetroFix/water mixture will be used per well.

The steps associated with the pilot are as follows:

1. Perform a One-Call markout and perform an on-Site utility markout no more than 10 days prior to the start of the work.

2. Inspect the Site to assure that the markouts have been performed. In addition, an on-Site utility markout will be performed.

3. Set up a storage area and a work area.

4. Set up a mixing tank in the area of the injection well and provide a water supply hose

and sprayer.

5. Perform a Geoprobe boring to a depth of 25 feet (20 feet below the water table) with a retractable 2-foot screen. Inject PetroFix solution at a pressure of 20 to 30 psi at 20 to 25 feet, 13 to 18 feet, 7 to 12 feet, and 5 to 7 feet.
6. After each boring or injection well is no longer needed, they will be sealed with a cement/bentonite grout to prevent the creation of preferential pathways.
7. After the injection is complete, a Geoprobe continuous boring will be performed at a distance of 4 feet from the injection point to a depth of 27 feet to determine the pattern of horizontal and vertical coverage (based on visual observations of the color change in the soil cores. A second boring will be performed at 6.5 feet from the injection well using the same procedures. Additional borings may be performed to obtain accurate measurements of the vertical and horizontal distribution of PetroFix at this location.

Based on the results of the pilot test, the radius of influence and vertical injection intervals will be determined. This information will be used to create a grid map with the injection locations marked. The grid map will be submitted to the NYSDEC for approval prior to commencing full-scale injection. In addition, a round of on-Site and off-Site groundwater sampling will be performed prior to full-scale chemical injections. This will provide the current information regarding the areas that require remediation and at what depths.

In addition, six months after the initial injection, a round of Site groundwater sampling will be performed to determine post-injection concentrations in the groundwater monitoring wells. The sampling results will be included in a report that provides the sampling results and an evaluation to determine if a second injection will be required.

2.7 Remedial Action Objectives

Based on the investigation performed at the Site and the area downgradient of the Site, it has been determined that primarily hydrocarbon-related contamination has impacted the on and off-Site groundwater. In addition, trichloroethylene is present in soil vapor beneath the Site building.

The Remedial Action Objectives (RAOs) for the Site and downgradient area are as follows:

Groundwater

RAOs for Public Health Protection:

- Prevent ingestion of groundwater with contaminant levels exceeding the New York State drinking water standards.

- Prevent contact with, or inhalation of, volatile organic compounds from contaminated groundwater.

RAOs for Environmental Protection:

- Restore groundwater to pre-disposal/pre-release conditions to the extent practicable.
- Remove the source of groundwater contamination to the extent practicable.

Soil

RAOs for Protection of Public Health:

- Prevent ingestion/direct contact with contaminated soil.
- Prevent inhalation or other exposure from contaminants volatizing from the soil.

RAOs for Environmental Protection:

- Prevent the migration of contaminants that would result in groundwater or surface water contamination.

Soil Vapor

RAOs for Public Health Protection:

- Mitigate impacts to public health resulting from existing or potential soil vapor intrusion at the Site building.

A Quality Assurance Project Plan (QAPP) is included as Appendix E.

SCALE: 1" = 40'

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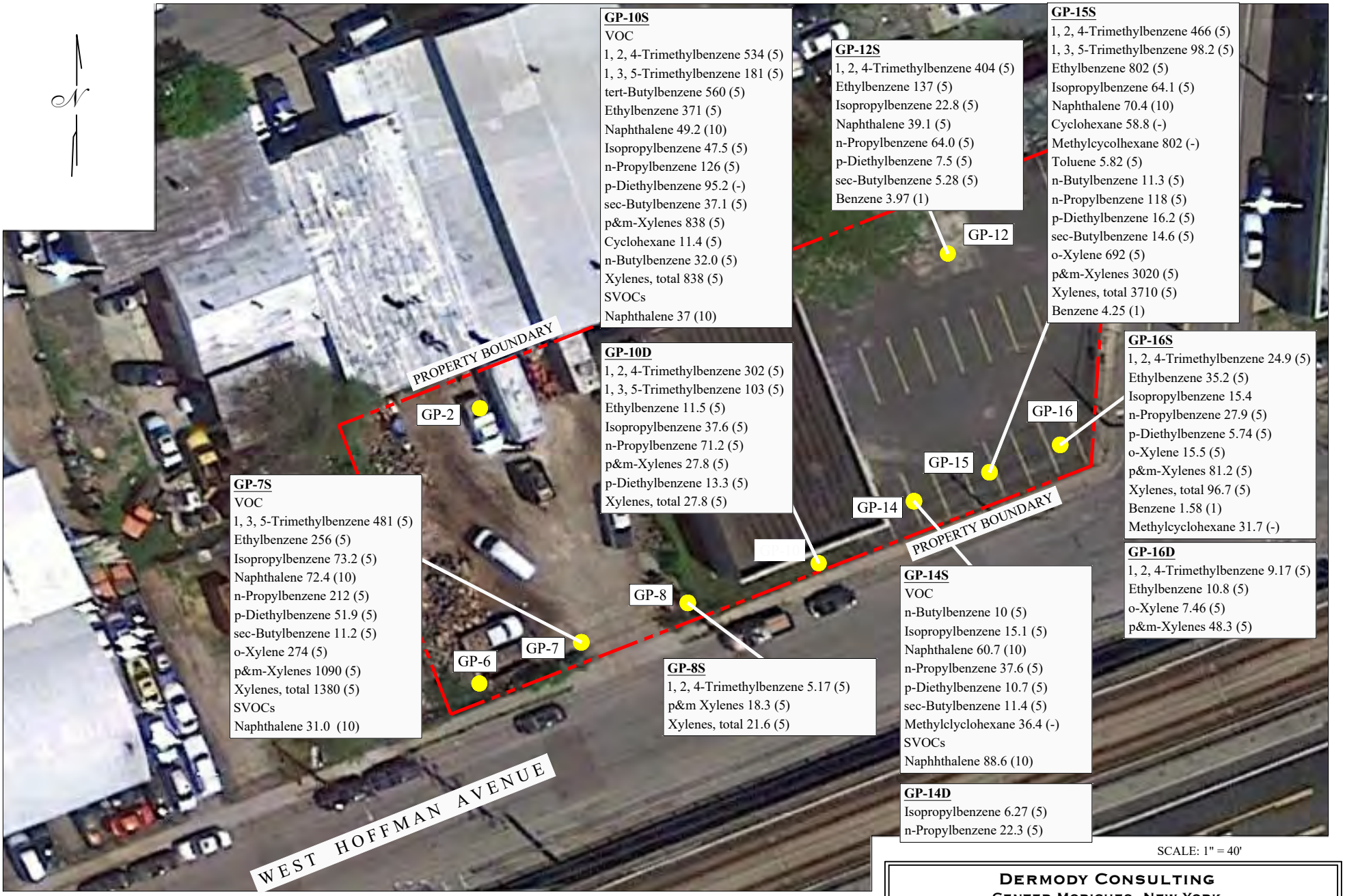
CENTER MORICHES, NEW YORK

FIGURE 1
GENERAL SITE LAYOUT

340 WEST HOFFMAN AVENUE
LINDENHURST, NEW YORK



SCALE: 1" = 40'

LEGEND

GP-8S
1, 2, 4-Trimethylbenzene 5.17 (5)
p&m Xylenes 18.3 (5)
Xylenes, total 21.6 (5)

ON-SITE GROUNDWATER SAMPLING LOCATION AND VOCs EXCEEDANCES OF AWQS. AWQS VALUES ARE SHOWN IN PARENTHESES.
ALL VALUES SHOWN ARE IN ug/l.

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FIGURE 2
2024 ON-SITE GROUNDWATER EXCEEDANCES
OF THE AMBIENT WATER QUALITY STANDARDS
340 WEST HOFFMAN AVENUE
LINDENHURST, NEW YORK

SCALE: 1" = 280'

LEGEND

GW-12 (20-25')
NO EXC.

OFF-SITE GROUNDWATER SAMPLING LOCATION AND VOC EXCEEDANCES OF AWQS. AWQS VALUES ARE SHOWN IN PARENTHESES.
ALL VALUES SHOWN ARE IN ug/l.

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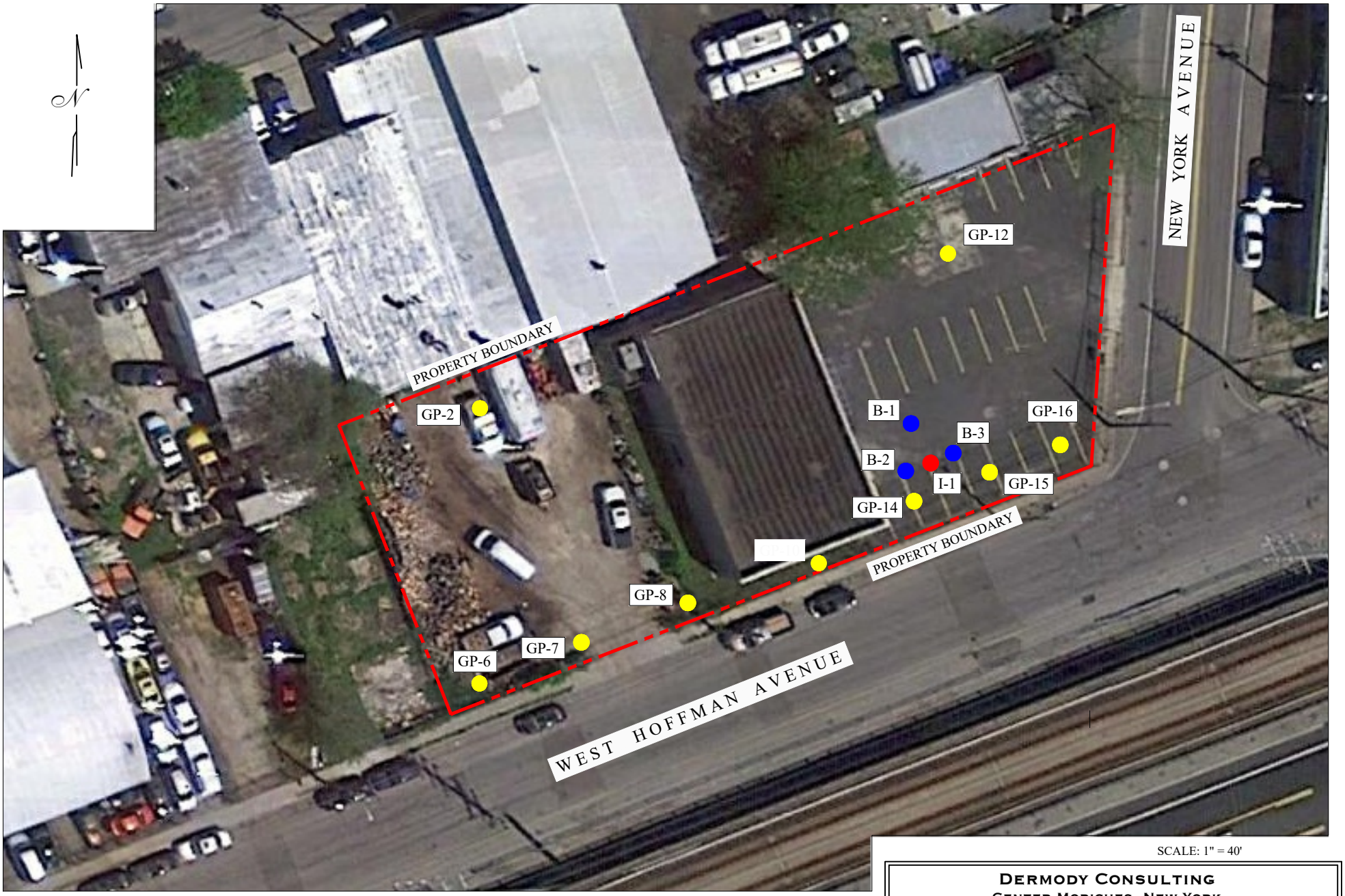
CENTER MORICHES, NEW YORK

FIGURE 3

2024 OFF-SITE GROUNDWATER VOC EXCEEDANCES OF THE AMBIENT WATER QUALITY STANDARDS

340 WEST HOFFMAN AVENUE
LINDENHURST, NEW YORK



LEGEND

- GROUNDWATER SAMPLING LOCATION
- B-1 PROPOSED PILOT TEST WELL LOCATION
- I-1 PROPOSED INJECTION WELL LOCATION

SCALE: 1" = 40'

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FIGURE 4

PROPOSED PILOT TEST BORINGS AND INJECTION WELL LOCATIONS

340 WEST HOFFMAN AVENUE
LINDENHURST, NEW YORK

Appendix A

UNAUTHORIZED ALTERATION OR ADDITION TO THIS SURVEY IS A VIOLATION OF SECTION 7209 OF THE NEW YORK STATE EDUCATION LAW.

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GUARANTEES INDICATED HEREON SHALL RUN ONLY TO THE PERSON FOR WHOM THE SURVEY IS PREPARED, AND ON HIS BEHALF TO THE TITLE COMPANY, GOVERNMENTAL AGENCY AND LENDING INSTITUTION LISTED HEREON, AND TO THE ASSIGNEES OF THE LENDING INSTITUTION. GUARANTEES ARE NOT TRANSFERABLE.

Note: ALL SUBSURFACE STRUCTURES: WATER SUPPLY, SANITARY SYSTEMS, DRAINAGE, DRYWELLS AND UTILITIES. SHOWN ARE FROM FIELD OBSERVATIONS AND OR DATA OBTAINED FROM OTHERS.

THE EXISTENCE OF RIGHTS OF WAY AND/OR EASEMENTS OF RECORD IF ANY, NOT SHOWN ARE NOT GUARANTEED.

AREA = 23,261 S.F.

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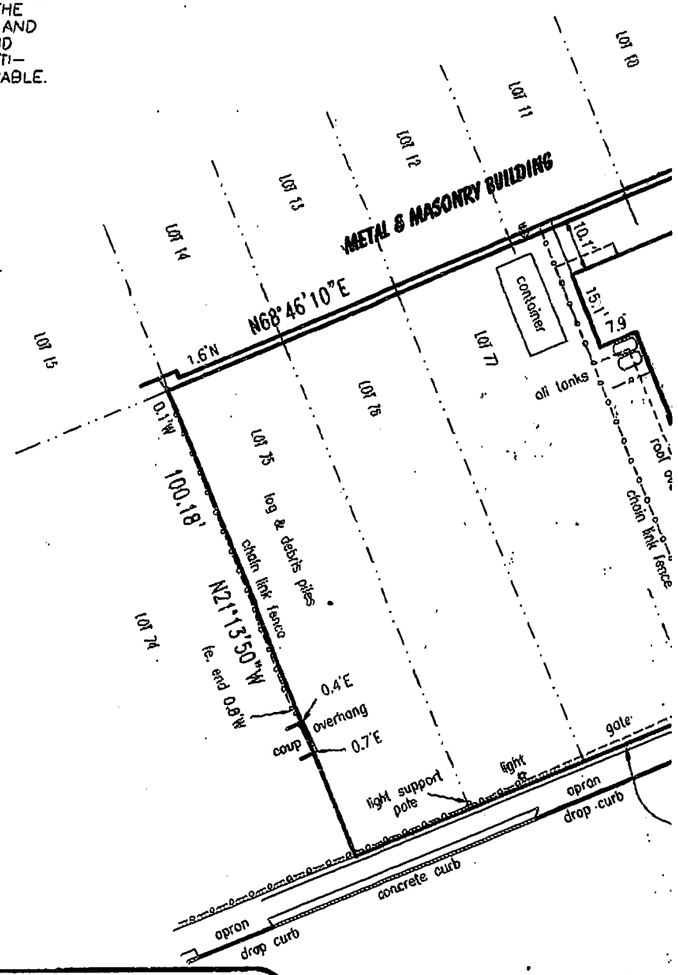

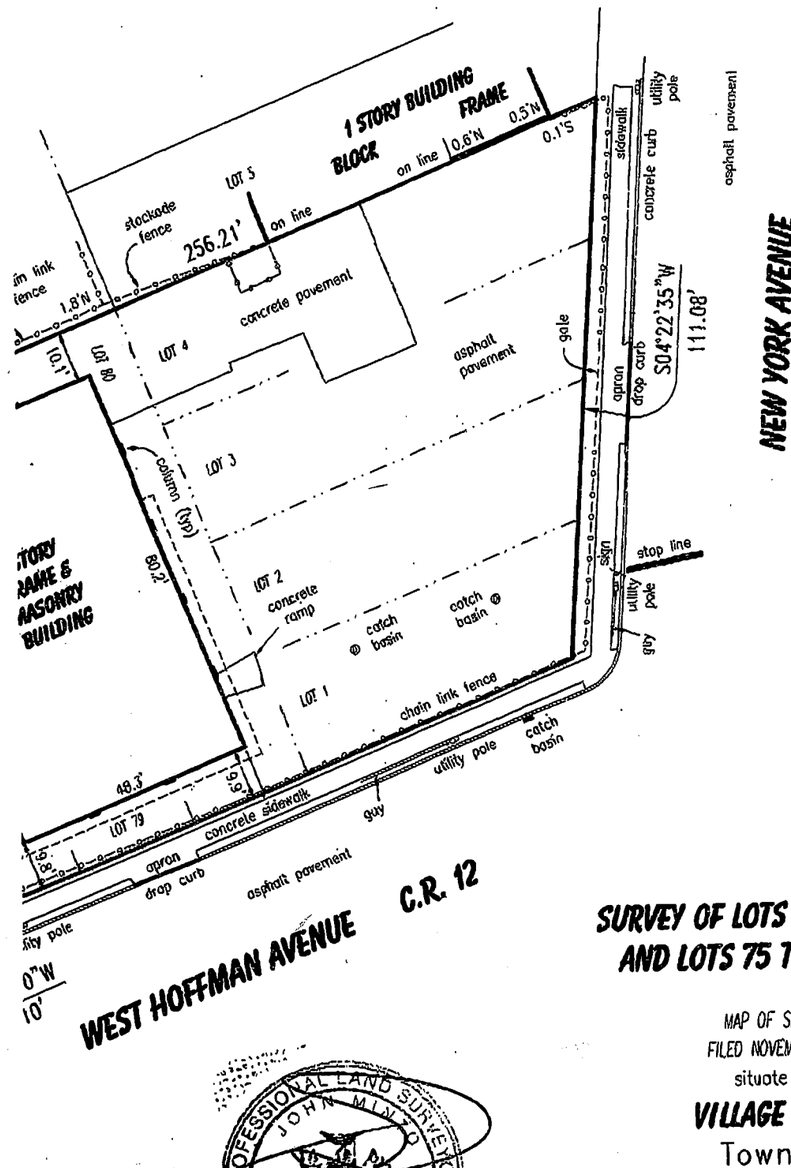

JM LAND SURVEYING

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93 SMITHTOWN BOULEVARD SMITHTOWN, N.Y. 11787

Certified to:
340 WEST HOFFMAN CORPORATI

Premises known as:
#340 West Hoffman Avenue,
rst, N.Y. 11757

PROFESSIONAL LAND SURVEYOR
JOHN MINTO
No. 49866
STATE OF NEW YORK

SURVEY OF LOTS 1 THROUGH 4 INCLUSIVE AND LOTS 75 THROUGH 80 INCLUSIVE

Block 5
MAP OF SHEET 1, CITY OF BRESLAU
FILED NOVEMBER 20, 1879 FILE NO 155
situate in the Incorporated

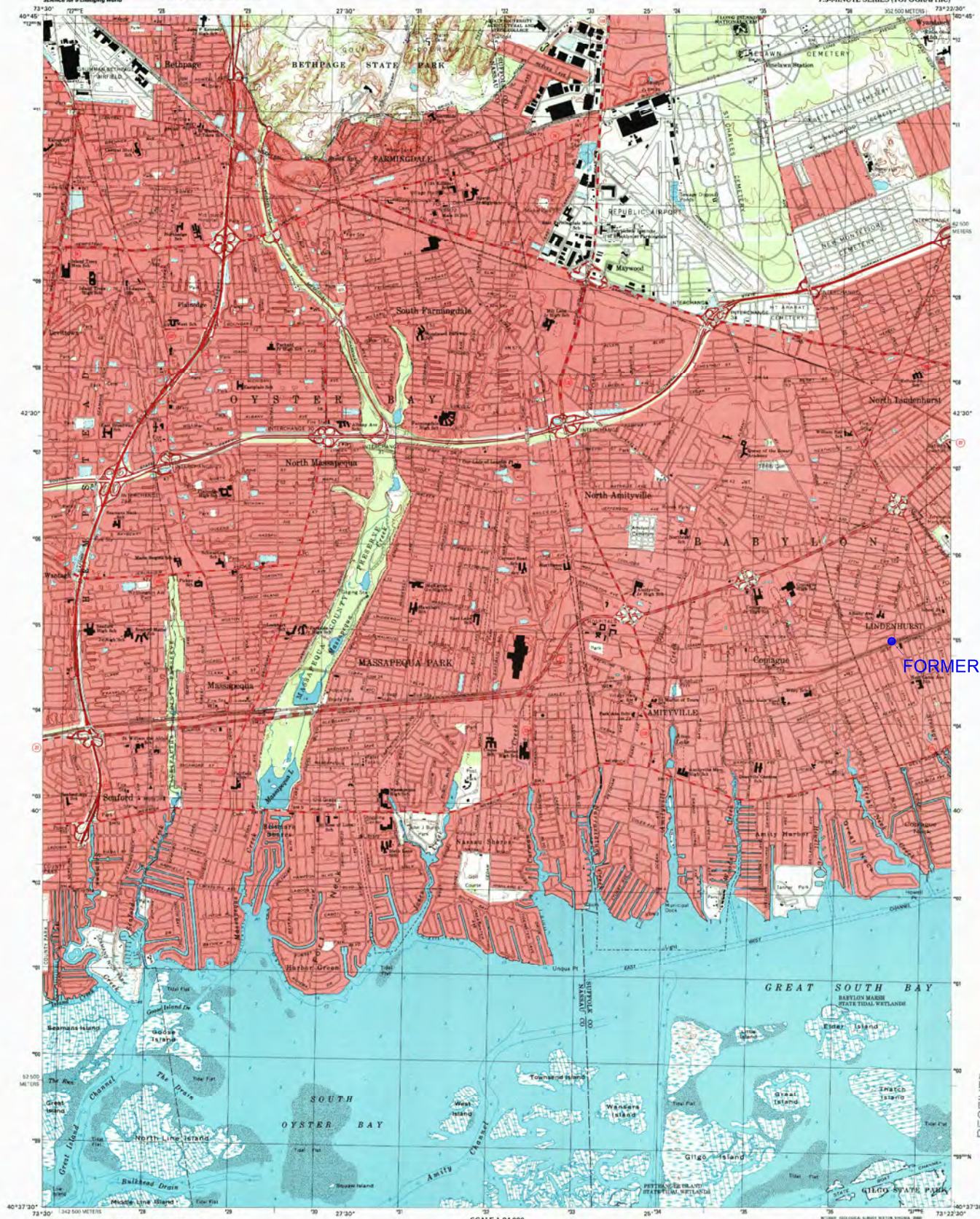
VILLAGE OF LINDENHURST

Town of Babylon
Suffolk County, New York
Tax Map #103-009-01-81.005
Scale 1"= 30' September26, 2012

GRAPHIC SCALE

30 0 15 30 60
(IN FEET)
1 inch = 30 ft.

Appendix B


USGS
science for a changing world
U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY
AMITYVILLE QUADRANGLE
NEW YORK
7.5-MINUTE SERIES (TOPOGRAPHIC)
Bethpage
BETHPAGE STATE PARK
FARMINGDALE
Pinelawn Station
PINELAWN CEMETERY
REPUBLIC AIRPORT
Massapequa
South Farmingdale
OYSTER BAY
North Massapequa
North Amityville
BABYLON
North Lindenhurst
LINDENHURST
FORMER ELKA SITE
MASSAPEQUA PARK
Amityville
Copiague
AMITYVILLE
Seaford
Harbor Green
GREAT SOUTH BAY
BABYLON MARSH STATE TIDAL WETLANDS
Seamans Island
Goose Island
Townsend Island
Elder Island
Great Island
Gilgo Island
SOUTH OYSTER BAY
North Line Island
Middle Line Island
Bulkhead Drain
Amity Channel
GILGO STATE PARK
PETTIT'S ISLAND STATE TIDAL WETLANDS
Produced by the United States Geological Survey
SCALE 1:24 000
CONTOUR INTERVAL 5 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929
ROAD CLASSIFICATION
AMITYVILLE, NY
1994
RECEIVED
AUG 31 2000

Appendix C

Health and Safety Plan
(with Community Air Monitoring Plan)
for
The Former Elka Chemical Corporation Site
340 West Hoffman Avenue
Lindenhurst, New York

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SECTION 1.0
INTRODUCTION

This Health and Safety Plan (HASP) has been written for compliance with "OSHA Hazardous Waste Operations Standards (29 CFR 1910.120)", the guidance documents, "Standard Operating Safety Guidelines (Office of Solid Waste and Emergency Response, 1988)" and the "Occupational Safety and Health Guidance Manual for Hazardous Waste Activities" (U.S. Department of Health and Human Services, 1985).

1.1 Scope and Applicability of the HASP

This HASP is designed to be applicable to locations where soil and groundwater may be encountered at the Former Elka Chemical Corporation property (the Site) located at 340 West Hoffman Avenue, Lindenhurst, New York by all parties that either perform or witness the activities on Site. This HASP may also be modified or amended to meet specific needs of the work proposed. This HASP will detail the Site safety procedures, Site background, and safety monitoring. Contractors will be required to adopt this HASP in full.

The Health and Safety Officer (HSO) will be present at the Site to inspect the implementation of the HASP, however, it is the sole responsibility of the contractor(s) to comply with the HASP.

The HASP has been formulated as a guide to complement professional judgment and experience. The appropriateness of the information presented should always be evaluated with respect to unforeseen Site conditions which may arise.

1.2 Site Work Zone and Visitors

The Site work zone (a.k.a. exclusion zone) during well installations will be a 30-foot radius about the work location. This work zone may be extended if, in the judgment of the HSO, Site conditions warrant a larger work zone.

No visitors will be permitted within the work zone without the consent of the HSO. All visitors will be required to be familiar with, and comply with the HASP. The HSO will deny access to those whose presence within the work zone is unnecessary or those who are deemed by the HSO to be in non-compliance with the HASP.

All Site workers, including the contractors, will be required to have 40-hour hazardous material training (eight-hour refresher courses annually) and respirator fit test certification as stated in 29 CFR 1910.120. Copies of documentation certifying the above-listed requirements will be kept at the Site in the possession of the HSO.

The HSO will also give an on-Site health and safety discussion to all Site personnel, including the contractors, prior to initiating the Site work. Workers not in attendance during the health and safety talk will be required to have the discussion with the HSO prior to entering the work zone.

Emergency telephone numbers and directions to the nearest hospital are found in Attachment A.

SECTION 2.0
KEY PERSONNEL

The co-project managers for this project are Peter Dermody, C.P.G. and James Mulvey. Mr. Mulvey will also act as HSO.

SECTION 3.0
SITE BACKGROUND

3.1 Site History and Known Chemical Constituents at the Site

The Site is located at 340 West Hoffman Avenue, Lindenhurst. The Site is developed with a an industrial/commercial building. Topography at the Site is essentially flat. The primary chemicals known to be present at the Site are non-chlorinated VOCs, primarily BTEX and other petroleum constituents.

TABLE 3.1.1
PRIMARY CHEMICALS DETECTED AT THE SITE WITH THRESHOLD LIMIT VALUES

CONTAMINANT	SHORT TERM EXPOSURE LIMIT (STEL) 15 MINUTES	TIME-WEIGHTED AVERAGE 8 HOUR EXPOSURE LIMIT
Xylene	150 ppm	100 ppm
1,2,4- trim	125 ppm	100 ppm
Trimethylbenzenes (mixed isomers)	Not listed	25 ppm

ppm: parts per million

SECTION 4.0
TASK/OPERATION HEALTH AND SAFETY ANALYSIS

This section will present health and safety analyses.

4.1 Safety Analysis

The tasks will include the injection of Petrofix liquid into the groundwater. In general, one to two consultants will be present at the Site along with environmental drilling personnel. No other site operations will be conducted by contractors without the presence of the HSO or assistant HSO on-Site.

Based on the Site history, it has been determined that known potential chemical concerns consist of petroleum-related VOCs in the soil, soil vapor, and groundwater at the Site.

Organic vapor concentrations will be monitored in the work zone by utilizing a MiniRae photoionization detector (PID) or similar. The PID will be calibrated according to its manufacturer's instructions. Background organic vapor concentrations will then be established in the work zone prior to drilling and recorded in the HSO field book. Upon commencement of drilling or trenching, PID readings will be obtained in the workers' breathing zone. A PID reading will also be obtained approximately 15 minute intervals during drilling or boring, including readings immediately following breakthrough to the subsurface. At the discretion of the HSO, PID readings may be obtained more frequently. All readings and observations will be recorded in the HSO field book.

Steady-state PID readings greater than five ppm in the worker's breathing zone will require upgrading to Level C personal protective equipment. Steady-state readings, for this purpose, will be defined as readings exceeding five ppm above background for a minimum of ten seconds. Readings will be obtained at points approximately three foot above the borehole. These points will define the worker's breathing zone.

Upon encountering PID levels greater than five ppm above background in the worker's breathing zone, all personnel will be evacuated from the work zone in the upwind direction (if discernable).

Specific evacuation routes will be discussed prior to commencement of work at each location based on work location and wind direction. In addition, an evacuation meeting place will be determined. Level C personal protection will be implemented including full-face air-purifying respirators with dust and organic vapor cartridges (personal protective equipment will be described in greater detail in Section 7.0). All personnel and contractors must be properly trained and fit tested prior to donning respirators. If, at any time, PID readings exceed steady-state levels greater than 25 ppm above background, or any conditions exist which the HSO determines will require Level B personal protective equipment, all work at the Site will cease immediately and all personnel will evacuate the work zone. Evacuation will occur in the upwind direction if discernable. Level B conditions are not anticipated to be encountered; however, if level B conditions arise, no further Site work will be performed, and a complete evaluation of the operation will be performed and this HASP will be modified.

All drilling personnel will be required to wear chemical-resistant gloves (such as butyl or nitrile) when the potential for dermal contact with soil is possible. Dermal contact with soils removed from the ground will be avoided.

4.2 Other Safety Considerations

4.2.1 Noise

During any operation which may generate potentially harmful levels of noise, the HSO may monitor noise levels with a Realistic^{tm} (or similar) hand-held sound level meter. Noise levels will be monitored in decibels (dBs) in the A-weighted, slow-response mode. Noise level readings which exceed the 29 CFR 1910.95 permissible noise exposure limits will require hearing protection (see Table 4.2.1.1 for permissible noise exposures).

TABLE 4.2.1.1
PERMISSIBLE NOISE EXPOSURES*

Duration Per Day Hours	Sound Level dBA Slow Response
8	90
6	92
4	95
3	97
2	100
12	102
1	105
2	110
3 or less	115

NOTES: When the daily noise exposure is composed of two or more periods of noise exposure of different levels, their combined effect should be considered, rather than the individual effect of each. If the sum of the following fractions: $C_1/T_1+C_2/T_2$ C_6/T_6 exceed unity, then, the mixed exposure should be considered to exceed the limit value. Cn indicates the total time of exposure at a specified noise level, and Tn indicates the total time of exposure permitted at that level.

Exposure to impulsive or impact noise should not exceed 140 dB peak sound pressure level.

* Standards derived from 29 CFR 1910.95

Hearing protection will be available to all Site workers. The hearing protection will consist of foam, expansion-fit earplugs (or other approvable hearing protection) with an Environmental Protection Agency noise reduction rating of at least 29 dB. Hearing protection must alleviate worker exposure to noise to an eight-hour time-weighted average of 85 dB or below. In the event that the hearing protection is inadequate, work will cease until a higher level of hearing protection can be incorporated.

4.2.2 Slip/Trip/Fall Preventative Measures

To reduce the potential for slipping, tripping, or falling, the work zone will be kept clear of unnecessary equipment. All Site workers will be required to wear work boots with adequate tread to reduce the potential for slipping (work boots must be leather or chemical-resistant and contain steel toes and steel shanks).

4.2.3 Heat/Cold Stress

Heat stress may become a concern especially if protective clothing is donned which will decrease natural ventilation. To assist in reducing heat stress the following measures will be taken:

- An adequate supply of water or other liquids will be brought on Site. To prevent dehydration, personnel will be encouraged to drink generous amounts of water even if not thirsty.
- A shady rest area will be designated to provide shelter during sunny days.
- In hot weather, workers wearing protective clothing may be rotated.

When the temperature is over 70 degrees Fahrenheit and personnel are wearing protective clothing, heat stress monitoring may be implemented as follows:

- Heart rate may be measured by counting the radial pulse for 30 seconds at the beginning of the rest period. The heart rate should not exceed 110 beats per minute. If the rate is higher, the next work period will be shortened by ten minutes (or 33%). If the pulse rate is 100 beats per minute at the beginning of the next rest period, the following work cycle will be shortened by 33%. The HSO will decide on the length of work periods and rest periods based on Site conditions.

- Body temperature may be measured, if deemed necessary, at the beginning of the rest period. Oral temperature should not exceed 99 degrees Fahrenheit. If it does, the next work period will be shortened by ten minutes (or 33%). However, if the oral temperature exceeds 99.7 degrees Fahrenheit at the beginning of the next period, the following work cycle will be further shortened by 33%. Work will not re-commence until the worker's body temperature has dropped below 99 degrees Fahrenheit.

Indications of heat stress range from mild (fatigue, irritability, anxiety, decreased concentration, dexterity or movement) to fatal. Medical help will be obtained for serious conditions.

Heat-related problems are caused by:

Prolonged Exposure: continuous exposure to heat and humid air, which can be aggravated by chafing clothes. Decreases ability to tolerate heat as well as being a nuisance.

Heat cramps: caused by profuse perspiration with inadequate fluid intake and chemical replacement (especially salts). Signs of heat cramps include muscle spasm and pain in the extremities and abdomen.

Heat exhaustion: caused by increased stress on various organs to meet increased demands to cool the body. Signs of heat exhaustion include shallow breathing; pale, cool, moist skin; profuse sweating; dizziness, and lassitude.

Heat stroke: the most severe form of heat stress, which can be fatal. Medical help must be obtained immediately. Body must be cooled immediately to prevent severe injury and/or death. Signs of heat stroke include red, hot, dry skin; no perspiration; nausea; dizziness and confusion; strong, rapid pulse; coma.

Cold stress is a concern if work is conducted during cold weather or marginally cold weather during precipitation periods or moderate to high wind velocity periods. To assist in reducing cold exposure the following measures will be taken:

- All personnel will be required to wear adequate and appropriate clothing. This will include head gear to prevent the high percentage loss of heat that occurs in this area (thermal liners for hard hats if hard hats are required).
- Provide a readily available warm shelter near each work zone.
- Carefully schedule work and rest periods to account for the current temperature and wind velocity conditions.
- Monitor work patterns and physical condition of workers and rotate personnel, as necessary.

Indications of cold exposure range from shivering, dizziness, numbness, confusion, weakness, impaired judgment, impaired vision to drowsiness. Medical help will be obtained for serious conditions if they occur.

Cold exposure related problems are:

Frost bite: Ice crystal formation in body tissues. The restricted blood flow to the injured part results in local tissue destruction.

Hypothermia: Severe exposure to cold temperature resulting in the body losing heat at a rate faster than the body can generate heat. The stages of hypothermia are shivering, apathy, loss of consciousness, decreasing pulse rate and breathing rate, and death.

Signs and symptoms of heat and cold stress are listed in Table 4.2.3.

4.2.4 Potential Electrical Hazards

Potential electric hazards consist mainly of underground power lines. Underground potential electrical hazards will be minimized by having a utility mark-out performed for the Site. In addition, available as-built Site blueprints will be used to avoid contact with subsurface utility lines or structures. As a final precaution, prior to drilling at any location, post-hole digging or hand augering will be performed by the drillers to a depth of three to four feet to check for the existence of subsurface utility lines or structures.

TABLE 4.2.3
SIGNS AND SYMPTOMS OF HEAT AND COLD STRESS

Type of Heat Stress	Signs and Symptoms
Heat Exhaustion	Clammy skin Confusion Dizziness Fainting Fatigue Heat rash Light-headedness Nausea Profuse sweating Slurred speech Weak pulse
Heat Stroke (may be fatal)	Confusion Convulsions Hot skin, high temperature (yet may feel chilled) Incoherent speech Staggering gait Sweating stops (yet residual sweat may be present) Unconsciousness
Type of Cold Stress	**Signs and Symptoms**
Frost bite	Pain or prickling progressing to numbness Pale, hard, cold skin with waxy appearance Flushing of skin subsequent to re-warming Burning sensation and swelling that may persist for weeks Blisters
Hypothermia (may be fatal)	Shivering Apathy Loss of consciousness Decreasing pulse rate and breathing rate

4.2.5 The Buddy System

All activities in contaminated or potentially contaminated areas will be conducted by pairing off the Site workers in groups of two (or three if necessary). Each person (buddy) will be able to:

- Provide his or her partner with assistance.
- Observe his or her partner for signs of chemical or heat or cold exposure.
- Periodically check the integrity of his or her partner's protective clothing.
- Notify the HSO or others if emergency help is needed.

The buddy system will be instituted at the beginning of each work day. If new workers arrive on Site, a buddy will be chosen prior to the new worker entering the work zone.

4.2.6 Site Communications

Two sets of communication systems will be established at the Site: internal communication among personnel on-Site, and external communication between on-Site and off-Site personnel.

Internal communication will be used to:

- Alert team members to emergencies.
- Pass along safety information such as heat stress check, protective clothing check, etc.
- Communicate changes in the work to be accomplished.
- Maintain Site control.

Due to ambient noise, verbal communications may be difficult at times. If necessary, the HSO will carry a whistle (or compressed air horn if respirators are donned) to signal Site workers. A single whistle blast will be the signal to immediately evacuate the work zone through the access control point. This signal will be discussed with all Site workers prior to commencement of work.

An external communication system between on-Site and off-Site personnel will be established to:

- Coordinate emergency response.
- Report to the Project Manager.
- Maintain contact with essential off-Site personnel.

4.2.7 General Safe Work Practices

Standing orders which will be applicable during Site operations are as follows:

- No smoking, eating, drinking, or application of cosmetics in the work zone.
- No matches or lighters in the work zone.
- All Site workers will enter/exit the work zone through the Site access point.
- Any signs of contamination, radioactivity, explosivity, or unusual condition such as dead animals will require evacuating the Site immediately and reporting the information to the HSO.
- Loose fitting clothing or loose long hair will be prohibited in the work zone during drilling operations.
- A signal person will direct the backing of work vehicles.
- Equipment operators will be instructed to check equipment for abnormalities such as oozing liquids, frayed cables, unusual odors, etc.

SECTION 5.0
PERSONNEL TRAINING REQUIREMENTS

All Dermody Consulting personnel and contractor personnel will receive adequate training prior to entering the Site. Site personnel will, at a minimum, have completed OSHA-approved, 40-hour hazardous materials Site safety training and OSHA-approved, eight-hour safety refresher course within one year prior to commencing field work. In addition, each worker must have a minimum of three days field experience under the direct supervision of a trained, experienced supervisor.

Prior to Site field work, the HSO will conduct an in-house review of the project with respect to health and safety with all Dermody Consulting personnel who will be involved with field work at the Site. The review will include discussions of signs and symptoms of chemical exposure and heat stress that indicate potential medical emergencies presented in Table 5.1. In addition, if necessary, review of personal protective equipment will be conducted to include the proper use of air-purifying respirators.

TABLE 5.1
SIGNS AND SYMPTOMS OF EXPOSURE TO CHEMICALS

Type of Hazard	Signs and Symptoms
~~Chemical Hazard~~	~~Behavioral changes~~
	Breathing difficulties
	~~Changes in complexion of skin color~~
	Confusion
	Coordination difficulties
	Coughing
	Depression
	Dermatitis
	Dilated Pupils
	Dizziness
	Euphoria
	Fatigue and/or weakness
	Flushed face and/or neck
	Insomnia
	Irregular heartbeat
	Irritability
	Irritation of eyes, nose, respiratory tract, skin or throat
	Headache
	Lacrimation
	Light-Headedness
	Muscle Fatigue
	Nausea
	Nervousness
	Numbness in limbs
	Paresthesia
	Sleepiness
	Tingling
	Tremors
	Vertigo
	Visual disturbance
	Vomiting

SECTION 6.0
PERSONAL PROTECTIVE EQUIPMENT

6.1 General Considerations

The two basic objectives of the personal protective equipment (PPE) are to protect the wearer from safety and health hazards, and to prevent the wearer from incorrect use and/or malfunction of the PPE.

All work is expected to be performed during daylight hours and workdays, and in general, are expected to be eight to ten hours in duration. Any work performed beyond daylight hours will require the permission of the HSO. This decision will be based on the adequacy of artificial illumination and the type and necessity of the task being performed.

Personal protection levels for the Site activities, based on past investigations, are anticipated to be Level D with the possibility of upgrading to Level C. The equipment included for each level of protection is provided as follows:

Level C Protection

Personnel protective equipment:

- Air-purifying respirator, full-face.
- Chemical-resistant clothing includes: Tyvek^{tm} (spun bonded olefin fibers) for particulate and limited splash protection or Saranex^{tm} (plastic film-laminated Tyvek) for permeation resistance to solvents.
- Coveralls*, or
- Long cotton underwear.*
- Gloves (outer), chemical-resistant.
- Gloves (inner), chemical-resistant.
- Boots (outer), leather or chemical-resistant, steel toe and shank.

- Boot covers (outer), chemical-resistant (disposable).*
- Hard hat (face shield).*
- Escape mask.*
- 2-way radio communications (inherently safe).*

(*) optional

Criteria for Selection of Level C Protection

Meeting all of these criteria permits use of Level C Protection:

- Oxygen concentrations are not less than 19.5% by volume.
- Measured air concentrations of identified substances will be reduced by the respirator to concentrations below the substance's threshold limit value (TLV).
- Atmospheric contaminants, liquid splashes, or other direct contact will not adversely affect any body area left unprotected by chemical-resistant clothing.
- Job functions do not require self-contained breathing apparatus.
- Direct readings are below 50 ppm on the PID.

Level D Protection

Personnel protective equipment:

- Coveralls.
- Gloves.*
- Boots/shoes, leather or chemical-resistant, steel toe and shank.
- Safety glasses or chemical splash goggles.*
- Hard hat (face shield*).
- Escape mask.*

(*) optional

Criteria for Selection of Level D Protection

Meeting any of these criteria allows use of Level D Protection:

- No contaminant levels above 5 ppm organic vapors or dusty conditions are present.

- Work functions preclude splashes, immersion, or the reasonable potential for unexpected inhalation of any chemicals above the TLV.

Additional Considerations for Selecting Levels of Protection

Another factor which will be considered in selecting the appropriate level of protection is heat and physical stress. The use of protective clothing and respirators increases physical stress, in particular, heat stress on the wearer. Chemical protective clothing greatly reduces natural ventilation and diminishes the body's ability to regulate its temperature. Even in moderate ambient temperatures, the diminished capacity of the body to dissipate heat can result in one or more heat-related problems.

All chemical protective garments can be a contributing factor to heat stress. Greater susceptibility to heat stress occurs when protective clothing requires the use of a tightly fitted hood against the respirator face piece, or when gloves or boots are taped to the suit. As more body area is covered, less cooling takes place, increasing the probability of heat stress.

Wearing protective equipment also increases the risk of accidents. It is heavy, cumbersome, decreases dexterity, agility, interferes with vision, and is fatiguing to wear. These factors all increase physical stress and the potential for accidents. In particular, the necessity of selecting a level of protection will be balanced against the increased probability of heat stress and accidents.

6.2 Donning and Doffing Ensembles

Donning an Ensemble

A routine will be established and practiced periodically for donning a Level C ensemble. Assistance may be provided for donning and doffing since these operations are difficult to perform alone.

Table 6.2.1 lists sample procedures for donning a Level C ensemble. These procedures should be modified depending on the particular type of suit and/or when extra gloves and/or boots are used.

TABLE 6.2.1
SAMPLE DONNING PROCEDURES

---

1. Inspect the clothing and respiratory equipment before donning (see Inspection in subsection 7.4).

2. Adjust hard hat or headpiece if worn, to fit user's head.

3. Standing or sitting, step into the legs of the suit; ensure proper placement of the feet within the suit; then gather the suit around the waist.

4. Put on chemical-resistant safety boots over the feet of the suit. Tape the leg cuff over the tops of the boots.

5. Don the respirator and adjust it to be secure, but comfortable.

6. Perform negative and positive respirator facepiece seal test procedures.

   - To conduct a negative-pressure test, close the inlet part with the palm of the hand or squeeze the breathing tube so it does not pass air, and gently inhale for about 10 seconds. Any inward rushing of air indicates a poor fit. Note that a leaking facepiece may be drawn tightly to the face to form a good seal, giving a false indication of adequate fit.

   - To conduct a positive-pressure test, gently exhale while covering the exhalation valve to ensure that a positive pressure can be built up. Failure to build a positive pressure indicates a poor fit.

7. Depending on type of suit:

   - Put on inner gloves (surgical gloves).

   - Additional over gloves, worn over attached suit gloves, may be donned later.

8. Put on hard hat

9. Have assistant observe the wearer for a period of time to ensure that the wearer is comfortable, psychologically stable, and that the equipment is functioning properly

Doffing an Ensemble

Exact procedures for removing Level C ensembles must be established and followed to prevent contaminant migration from the work area and transfer of contaminants to the wearer's body, the doffing assistant, and others.

Doffing procedures are provided in Table 6.2.2. These procedures should be performed only after decontamination of the suited worker. They require a suitably attired assistant. Throughout the procedures, both worker and assistant should avoid any direct contact with the outside surface of the suit.

6.3 Respirator Fit Testing

The fit or integrity of the facepiece-to-face seal of a respirator affects its performance. Most facepieces fit only a certain percentage of the population; thus each facepiece must be tested on the potential wearer in order to ensure a tight seal. Facial features such as scars, hollow temples, very prominent cheekbones, deep skin creases, dentures or missing teeth, and the chewing of gum and tobacco may interfere with the respirator-to-face seal. A respirator shall not be worn when such conditions prevent a good seal. The worker's diligence in observing these factors shall be evaluated by periodic checks. Fit testing will comply with 29 CFR 1910.1025 regulations.

6.4 Inspection

The PPE inspection program will entail five different inspections:

- Inspection and operational testing of equipment received from the factory or distributor.
- Inspection of equipment as it is issued to workers.
- Inspection after use.
- Periodic inspection of stored equipment.
- Periodic inspection when a question arises concerning the appropriateness of the selected equipment, or when problems with similar equipment arise.

TABLE 6.2.2
DOFFING PROCEDURES

---

1. Remove any extraneous or disposable clothing, boot covers, outer gloves, and tape.

2. Remove respirator by loosening straps and pulling straps over the top of the head and move mask away from head. Do not pull mask over the top of the head.

3. Remove arms, one at a time, from suit, avoiding any contact between the outside surface of the suit and wearer's body and lay the suit out flat behind the wearer. Leave internal gloves on, if any.

4. Sitting, if possible, remove both legs from the suit.

5. After suit is removed, remove internal gloves by rolling them off the hand, inside out.

The inspection checklist is provided in Table 6.4.1. Records will be kept of all inspection procedures. Individual identification numbers will be assigned to all reusable pieces of equipment and records should be maintained by that number. At a minimum, each inspection should record the ID number, date, inspector, and any unusual conditions or findings. Periodic review of these records may indicate an item or type of item with excessive maintenance costs or a particularly high level of down-time.

6.5 Storage

Clothing and respirators will be stored properly to prevent damage or malfunction due to exposure to dust, moisture, sunlight, damaging chemicals, extreme temperatures, and impact. Storage procedures are as follows:

Clothing:

- Potentially contaminated clothing will be stored in an area separate from street clothing.
- Potentially contaminated clothing will be stored in a well-ventilated area, with good air flow around each item, if possible.
- Different types and material of clothing and gloves will be stored separately to prevent issuing the wrong material by mistake.
- Protective clothing will be folded or hung in accordance with manufacturer's recommendations.

Respirators:

- Air-purifying respirators should be dismantled, washed, and placed in sealed plastic bags.

6.6 Maintenance

Specialized maintenance will be performed only by the factory or an authorized repair person. Routine maintenance, such as cleaning, will be performed by the personnel to whom the equipment is

TABLE 6.4.1
PPE INSPECTION CHECKLIST

CLOTHING

Before use:

! Determine that the clothing material is correct for the specified task at hand.

! Visually inspect for:

! imperfect seams
! non-uniform coatings
! tears
! malfunctioning closures

! Hold up to light and check for pinholes.

! Flex product:

! Observe for cracks
! Observe for other signs of shelf deterioration

! If the product has been used previously, inspect inside and out for signs of chemical attack:

! discoloration
! swelling
! stiffness

During the work task, periodically inspect for:

! Evidence of chemical attack such as discoloration, swelling, stiffening, and softening. Keep in mind, however, that chemical permeation can occur without any visible effects.

! Closure failure

! Tears

! Punctures

! Seam discontinuities

TABLE 6.4.1 - *CONTINUED*
PPE INSPECTION CHECKLIST

GLOVES

Before use:

Pressurize glove to check for pinholes. Blow into the glove then roll gauntlet toward fingers, or inflate glove and hold under water. In either case, no air should escape.

AIR-PURIFYING RESPIRATORS

Inspect air-purifying respirators:

before each use to be sure they have been adequately cleaned

Check material conditions for:

signs of pliability
signs of deterioration
signs of distortion

Examine cartridges to ensure that:

they are the proper type for the intended use
the expiration date has not been passed
they have not been opened or used previously

Check faceshields and lenses for:

cracks
fogginess

Air purifying respirators will be stored individually in resealable plastic bags.

assigned. Respirators will be cleaned at the end of each day with alcohol pads or, preferably, by washing with warm soapy water.

6.7 Decontamination Methods

All personnel, clothing, equipment, and samples leaving the contaminated (work zone) area of the Site must be decontaminated to remove any harmful chemicals or infectious organisms that may have adhered to them. Decontamination methods either (1) physically remove contaminants, (2) inactivate contaminants by chemical detoxification or disinfection/sterilization, or (3) remove contaminants by a combination of both physical and chemical means. In many cases, gross contamination can be removed by physical means involving dislodging/displacement, rinsing, wiping off, and evaporation. Contaminants that can be removed by physical means include dust, vapors, and volatile liquids. All reusable equipment will be decontaminated by rinsing in a bath of detergent and water (respirators, gloves to be reused). Monitoring equipment will be decontaminated by wiping with paper towels and water.

All used PPE to be discarded will be placed in a 55-gallon drum and stored in a secure place at the Site while awaiting final disposition.

The effectiveness of the decontamination will be evaluated near the beginning of Site activities and will be modified if determined to be ineffective. Visual observation will be used for this purpose. The HSO will inspect decontaminated materials for discoloration, stains, corrosive effects, visible dirt, or other signs of possible residual contamination.

SECTION 7.0
CALIBRATION PROCEDURES, FREQUENCIES, AND MAINTENANCE

This section will present the calibration procedures, frequencies, and maintenance for the health and safety field monitoring instruments.

The use of the monitoring equipment is presented as follows (the manufacturer's owner's manuals for all equipment used will be present at the Site):

1. MiniRae PID - this instrument is a photoionization detector that measures the concentration of airborne ionizable gases and vapors. The MiniRae does not distinguish between individual compounds and will not read methane. The calibration will be performed with a cylinder of "zero gas" (hydrocarbon free air) to "zero" the instrument and a 100 ppm cylinder of isobutylene to calibrate the span.

The calibration procedures and frequencies for each instrument are presented as follows:

MiniRae PID

Isobutylene at 100 ppm in air will be used as Span Gas. A commercial zero grade gas will be used as the zero gas. Calibrate the instrument as follows:

1. Connect the supplied regulator to the Span Gas cylinder. Hand tighten the fittings.
2. Open the valve on the gas bag by turning the valve stem fully counter clockwise.
3. Attach the gas bag adapter nut to the regulator. Hand tighten the fittings.
4. Turn the regulator knob counter clockwise about half turn to start the flow of gas.
5. Fill the gas bag about half full and then close the regulator fully clockwise to turn off the flow of gas.
6. Disconnect the bag from the adapter and empty it. Flush the bag a few times with the Span Gas and then fill it.
7. Close the gas bag by turning the valve clockwise.

8. Hold down the power and N/- button to get to the password screen.

9. Press the select button for Zero Calibration.

10. Apply the “zero” gas and allow the MiniRae to calibrate for 30 seconds.

11. Press the select button for Span Gas Calibration.

12. Apply the span gas and allow the MiniRae to calibrate for 30 seconds.

The instrument will be calibrated prior to the commencement of each day's work. The instrument will be charged overnight prior to each day's work.

SECTION 8.0
EMERGENCY RESPONSE PLAN

This section will present the Emergency Response Plan (ERP) for the Site. Pre-emergency planning will consist of reviewing the ERP with all workers at the Site prior to initiation of work.

Personnel Roles

Should an emergency situation arise at the Site, the HSO will assume control and decision-making. The HSO will also resolve all dispute concerning health and safety requirements and precautions. The HSO will also:

- Be authorized to seek and purchase supplies as necessary.
- Have control over activities of everyone entering the Site.

The HSO will communicate, by field telephone or other, with off-Site personnel to include the Project Manager to evaluate data and assist in the decision-making process. Phone numbers for the fire department, police, ambulance, poison control center, New York State Department of Health, and NYS Department of Environmental Conservation Spill Response Department are listed on the next-to-last page of this document. The hospital which will be utilized during an emergency will be Brookdale University Hospital and Medical Center. The directions to the hospital, along with the hospital's emergency room phone number are presented on the last page of this document.

Copies of the last page of this document will be available at the Site and will be placed in all vehicles of personnel involved in activities at the Site.

Internal communications will consist of a single whistle (or compressed air horn if Level C is donned) blast. This blast will signal all workers to evacuate the work zone by the nearest exit.

Response Follow-Up

Following an emergency, or incident, a detailed report will be generated by the HSO. All equipment will be restored to pre-emergency conditions. The HASP will be reviewed following an

emergency to determine if it provides adequate information to assist in dealing with the emergency. The HASP may be revised to incorporate additional information as needed.

Emergency Recognition and Prevention

Before daily work assignments begin, each day a brief on-Site meeting will be held by the HSO which will address health and safety issues related to the day's work. Prior to initiation of work, a detailed on-Site health and safety meeting will be held to review all potential hazards, contingencies, and safety measures.

Safe Distances and Places of Refuge

The main potential cause of work zone evacuation is a significant vapor release. Vapor release evacuation will be discussed prior to work at each location and in general will be in the upwind direction. Wind direction will be monitored at each work location and all workers will be notified of the direction of evacuation prior to commencement of work. Safe distances will be discussed at each location and determined by the HSO. The PID will be used to determine if workers have evacuated a sufficient distance.

At all times, vehicles which may be utilized in an emergency for transport to the hospital (or other destination) will have clear access to leave the Site. The HSO will assure that an emergency vehicle does not become blocked-in by other vehicles.

Site Security and Control

The HSO will control entry of personnel into the work zone. No unnecessary person shall be permitted in the work zone.

Decontamination Procedures During Emergencies

In the event of a medical emergency, decontamination will be performed if it does not interfere with essential treatment. Decontamination will be performed by washing, rinsing, and/or cutting off protective clothing and equipment.

If decontamination cannot be performed, the victim will be wrapped in plastic to reduce contamination to other personnel. Emergency and off-Site medical personnel will be alerted to the potential contamination.

Emergency Medical Treatment and First Aid

Medical emergencies will be treated, in general, by medical experts by transporting the victim to the nearby hospital.

A first aid kit will be present on-Site for minor medical treatment.

SECTION 9.0
COMMUNITY AIR MONITORING PLAN

This section includes procedures to address potential community health and safety issues associated with investigation and remediation at the Site.

Air Monitoring

A Community Air Monitoring Plan (CAMP) will be implemented at the Site during investigation and remediation activities including the Pilot Test and the Full-Scale Injection activities. Under the CAMP, organic vapor concentrations will be monitored at the downwind edge of the immediate work area at the Site. Daily Field Reports will include CAMP readings at 15-minute intervals, a figure showing the work areas and locations of CAMP monitors and wind direction. CAMP exceedances and corrective measures taken will be reported to the NYSDEC and NYSDOH project managers within one business day. . It will be the responsibility of the HSO to implement the plan and to ensure that proper action is taken in the event that any of the established action levels are exceeded.

To monitor organic vapors, a PID will be used. Calibration of the PID will be performed according to manufacturer's instructions. Background levels of organic vapors will be measured at the Site prior to beginning work and upwind of the work area periodically using a PID.

PID readings will be recorded in the field logbook for both background and work area perimeter. Logbook recordings will include the time, location, and PID readings.

Periodic monitoring for VOCs will be performed during non-intrusive activities such as the collection of soil samples. Periodic monitoring during sample collection will generally consist of taking a reading upon arrival at a sample location, monitoring while overturning soil, and taking a reading prior to leaving a sample location.

VOC Monitoring, Response Levels, and Actions

VOCs will be monitored at the downward perimeter of the immediate work area on a continuous

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 will be temporarily halted and monitoring continued. If the total organic vapor level readily decreases (per instantaneous readings) below 5 ppm over background, work activities will 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 will be halted, the source of vapors identified, corrective actions taken to abate emissions, and monitoring continued. After these steps, work activities will 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 shut down.

All 15-minute readings must be recorded and be available for State regulatory personnel to review. Instantaneous readings, if any, used for decision purposes should also be recorded.

Particulate Monitoring, Response Levels, and Actions

If activities are performed that have the potential to generate significant particulate concentrations, the air will be monitored at the upwind and downwind perimeters of the exclusion zone

at temporary particulate monitoring stations. The particulate monitoring will be performed using real-time monitoring equipment capable of measuring particulate matter less than 10 micrometers in size (PM-10) and capable of integrating over a period of 15 minutes (or less) for comparison to the airborne particulate action level. The equipment will be equipped with an audible alarm to indicate exceedance of the action level. In addition, fugitive dust migration will 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 will be employed. Work will 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 will 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 will be recorded and be available for State regulatory personnel to review.

Noise Monitoring

Due to the use of heavy equipment at the Site during the investigation and remediation, there is the potential for noise to impact the Site workers and the surrounding community.

Since the facility is occasionally occupied, there is a potential that Site employees will be impacted by noise. In addition, work will be performed only during daytime hours. If appropriate, the HSO may periodically monitor noise levels at the work zone boundary and the closest property

boundary with a Realistic[tm] hand-held sound level meter (or similar). Noise levels will be monitored in dBs in the A-weighted, slow-response mode. If noise level readings exceed an eight-hour time-weighted average of 85 dB at the closest property boundary or noise complaints are received, the HSO will take appropriate measures to reduce noise exposure beyond these boundaries.

ATTACHMENT A

EMERGENCY TELEPHONE NUMBERS, CONTACT PERSONNEL, AND DIRECTIONS FROM THE SITE TO THE HOSPITAL

TABLE A.1

Emergency Telephone Numbers

Suffolk County Police Department	911
Ambulance	911
Poison Control Center Hotline	1-800-222-1222
New York State Department of Health	1-800-458-1158
N.Y.S. Department of Environmental Conservation Spill Hotline	1-800-457-7362

Contact Personnel

James Mulvey (cell) 631 745-7581
Peter Dermody (cell) 631 905-4868
Eastern Environmental Solutions, Inc. 631 727-2700

Directions to Brunswick Hospital

Brunswick Hospital is located at 81 Louden Avenue, Amityville (at the northwest corner of Route 110 and Louden Ave. The phone number is 631-789-7421.

Appendix D

SAFETY DATA SHEET

1. Identification

Product identifier **PetroFix**

Other means of identification None.

Recommended use Remediation of contaminants in soil and groundwater.

Recommended restrictions None known.

Manufacturer/Importer/Supplier/Distributor information

Company Name Regenesis

Address 1011 Calle Sombra
San Clemente, CA 92673 USA

General information 949-366-8000

E-mail CustomerService@regenesis.com

Emergency phone number For Hazardous Materials Incidents ONLY (spill, leak, fire, exposure or accident), call CHEMTREC 24/7 at:

USA, Canada, Mexico 1-800-424-9300

International 1-703-527-3887

2. Hazard(s) identification

Physical hazards Not classified.

Health hazards Not classified.

OSHA defined hazards Not classified.

Label elements

Hazard symbol None.

Signal word None.

Hazard statement The mixture does not meet the criteria for classification.

Precautionary statement

Prevention Observe good industrial hygiene practices.

Response Wash hands after handling.

Storage Store away from incompatible materials.

Disposal Dispose of waste and residues in accordance with local authority requirements.

Hazard(s) not otherwise classified (HNOC) None known.

Supplemental information None.

3. Composition/information on ingredients

Mixtures

Chemical name	CAS number	%
Activated carbon <10 µm	7440-44-0	>25
Calcium sulfate dihydrate	10101-41-4	<10
Additive	-	<2

Composition comments All concentrations are in percent by weight unless otherwise indicated.
Components not listed are either non-hazardous or are below reportable limits.
Chemical ingredient identity and/or concentration information withheld for some or all components present is confidential business information (trade secret), and is being withheld as permitted by 29 CFR 1910.1200(i).

4. First-aid measures

Inhalation	Move to fresh air. Call a physician if symptoms develop or persist.
Skin contact	Wash off with soap and water. Get medical attention if irritation develops and persists.
Eye contact	Rinse with water. Get medical attention if irritation develops and persists.
Ingestion	Rinse mouth. Get medical attention if symptoms occur.
Most important symptoms/effects, acute and delayed	Direct contact with eyes may cause temporary irritation.
Indication of immediate medical attention and special treatment needed	Treat symptomatically.
General information	Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves.

5. Fire-fighting measures

Suitable extinguishing media	Water fog. Foam. Dry chemical powder. Carbon dioxide (CO2).
Unsuitable extinguishing media	None known.
Specific hazards arising from the chemical	During fire, gases hazardous to health may be formed. Combustion products may include: carbon oxides, nitrogen oxides, sulfur oxides, calcium oxide.
Special protective equipment and precautions for firefighters	Self-contained breathing apparatus and full protective clothing must be worn in case of fire.
Fire fighting equipment/instructions	Move containers from fire area if you can do so without risk.
Specific methods	Use standard firefighting procedures and consider the hazards of other involved materials.
General fire hazards	This material will not burn until the water has evaporated. Residue can burn. When dry may form combustible dust concentrations in air.

6. Accidental release measures

Personal precautions, protective equipment and emergency procedures	Keep unnecessary personnel away. For personal protection, see section 8 of the SDS.
Methods and materials for containment and cleaning up	Large Spills: Stop the flow of material, if this is without risk. Dike the spilled material, where this is possible. Absorb in vermiculite, dry sand or earth and place into containers. Following product recovery, flush area with water. Small Spills: Wipe up with absorbent material (e.g. cloth, fleece). Clean surface thoroughly to remove residual contamination. Never return spills to original containers for re-use. For waste disposal, see section 13 of the SDS.
Environmental precautions	Avoid discharge into drains, water courses or onto the ground.

7. Handling and storage

Precautions for safe handling	Avoid prolonged exposure. Observe good industrial hygiene practices.
Conditions for safe storage, including any incompatibilities	Store in original tightly closed container. Store away from incompatible materials (see Section 10 of the SDS).

8. Exposure controls/personal protection

Occupational exposure limits

US. OSHA Table Z-3 (29 CFR 1910.1000)

Components	Type	Value	Form
Activated carbon <10 µm (CAS 7440-44-0)	TWA	5 mg/m3	Respirable fraction.
		15 mg/m3	Total dust.

US. ACGIH Threshold Limit Values

Components	Type	Value	Form
Activated carbon <10 µm (CAS 7440-44-0)	TWA	2 mg/m3	Respirable fraction.

US. ACGIH Threshold Limit Values

Components	Type	Value	Form
Calcium sulfate dihydrate (CAS 10101-41-4)	TWA	10 mg/m3	Inhalable fraction.

Biological limit values No biological exposure limits noted for the ingredient(s).

Appropriate engineering controls Good general ventilation (typically 10 air changes per hour) should be used. Ventilation rates should be matched to conditions. If applicable, use process enclosures, local exhaust ventilation, or other engineering controls to maintain airborne levels below recommended exposure limits. If exposure limits have not been established, maintain airborne levels to an acceptable level.

Individual protection measures, such as personal protective equipment

Eye/face protection Wear safety glasses with side shields (or goggles).

Skin protection

Hand protection Wear appropriate chemical resistant gloves. Suitable gloves can be recommended by the glove supplier.

Skin protection

Other Wear suitable protective clothing.

Respiratory protection In case of insufficient ventilation, wear suitable respiratory equipment.

Thermal hazards Wear appropriate thermal protective clothing, when necessary.

General hygiene considerations Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants.

9. Physical and chemical properties

Appearance

Physical state Liquid.

Form Aqueous suspension.

Color Not available.

Odor Not available.

Odor threshold Not available.

pH 8 - 10

Melting point/freezing point Not available.

Initial boiling point and boiling range 212 °F (100 °C)

Flash point Not available.

Evaporation rate Not available.

Flammability (solid, gas) Not applicable.

Upper/lower flammability or explosive limits

Flammability limit - lower (%) Not available.

Flammability limit - upper (%) Not available.

Vapor pressure Not available.

Vapor density Not available.

Relative density Not available.

Solubility(ies)

Solubility (water) Not available.

Partition coefficient (n-octanol/water) Not available.

Auto-ignition temperature Not available.

Decomposition temperature Not available.

Viscosity Not available.

Other information

Explosive properties Not explosive.

Oxidizing properties	Not oxidizing.

10. Stability and reactivity

Reactivity	The product is stable and non-reactive under normal conditions of use, storage and transport.
Chemical stability	Material is stable under normal conditions.
Possibility of hazardous reactions	No dangerous reaction known under conditions of normal use.
Conditions to avoid	Contact with incompatible materials. Avoid drying out product. May generate combustible dust if material dries.
Incompatible materials	Strong oxidizing agents. Acids.
Hazardous decomposition products	No hazardous decomposition products are known.

11. Toxicological information

Information on likely routes of exposure

Inhalation	Spray mist may irritate the respiratory system. For dry material: Dust may irritate respiratory system.
Skin contact	Prolonged or repeated exposure may cause minor irritation.
Eye contact	Direct contact with eyes may cause temporary irritation.
Ingestion	May cause discomfort if swallowed.
Symptoms related to the physical, chemical and toxicological characteristics	Direct contact with eyes may cause temporary irritation.

Information on toxicological effects

Acute toxicity Not expected to be acutely toxic.

Components	Species	Test Results
Activated carbon <10 µm (CAS 7440-44-0)		
Acute		
Oral		
LD50	Rat	> 10000 mg/kg

Skin corrosion/irritation	Prolonged skin contact may cause temporary irritation.
Serious eye damage/eye irritation	Direct contact with eyes may cause temporary irritation.

Respiratory or skin sensitization

Respiratory sensitization	Not a respiratory sensitizer.
Skin sensitization	This product is not expected to cause skin sensitization.
Germ cell mutagenicity	No data available to indicate product or any components present at greater than 0.1% are mutagenic or genotoxic.
Carcinogenicity	Not classifiable as to carcinogenicity to humans.

IARC Monographs. Overall Evaluation of Carcinogenicity

Not listed.

NTP Report on Carcinogens

Not listed.

OSHA Specifically Regulated Substances (29 CFR 1910.1001-1053)

Not regulated.

Reproductive toxicity	This product is not expected to cause reproductive or developmental effects.
Specific target organ toxicity - single exposure	Not classified.
Specific target organ toxicity - repeated exposure	Not classified.
Aspiration hazard	Not an aspiration hazard.

12. Ecological information

Ecotoxicity	The product is not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Persistence and degradability	No data is available on the degradability of this product.
Bioaccumulative potential	No data available.
Mobility in soil	No data available.
Other adverse effects	None known.

13. Disposal considerations

Disposal instructions	Collect and reclaim or dispose in sealed containers at licensed waste disposal site.
Local disposal regulations	Dispose in accordance with all applicable regulations.
Hazardous waste code	The waste code should be assigned in discussion between the user, the producer and the waste disposal company.
Waste from residues / unused products	Dispose of in accordance with local regulations. Empty containers or liners may retain some product residues. This material and its container must be disposed of in a safe manner (see: Disposal instructions).
Contaminated packaging	Since emptied containers may retain product residue, follow label warnings even after container is emptied. Empty containers should be taken to an approved waste handling site for recycling or disposal.

14. Transport information

DOT

Not regulated as dangerous goods.

IATA

Not regulated as dangerous goods.

IMDG

Not regulated as dangerous goods.

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code	Not established.

15. Regulatory information

US federal regulations	This product is not known to be a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.

TSCA Section 12(b) Export Notification (40 CFR 707, Subpt. D)

Not regulated.

CERCLA Hazardous Substance List (40 CFR 302.4)

Not listed.

SARA 304 Emergency release notification

Not regulated.

OSHA Specifically Regulated Substances (29 CFR 1910.1001-1053)

Not regulated.

Superfund Amendments and Reauthorization Act of 1986 (SARA)

SARA 302 Extremely hazardous substance

Not listed.

SARA 311/312 Hazardous chemical	No

SARA 313 (TRI reporting)

Not regulated.

Other federal regulations

Clean Air Act (CAA) Section 112 Hazardous Air Pollutants (HAPs) List

Not regulated.

Clean Air Act (CAA) Section 112(r) Accidental Release Prevention (40 CFR 68.130)

Not regulated.

Safe Drinking Water Act (SDWA)	Not regulated.

US state regulations

US. Massachusetts RTK - Substance List

Calcium sulfate dihydrate (CAS 10101-41-4)

US. New Jersey Worker and Community Right-to-Know Act

Not listed.

US. Pennsylvania Worker and Community Right-to-Know Law

Not listed.

US. Rhode Island RTK

Activated carbon <10 µm (CAS 7440-44-0)
Calcium sulfate dihydrate (CAS 10101-41-4)

California Proposition 65

California Safe Drinking Water and Toxic Enforcement Act of 2016 (Proposition 65): This material is not known to contain any chemicals currently listed as carcinogens or reproductive toxins. For more information go to www.P65Warnings.ca.gov.

International Inventories

Country(s) or region	Inventory name	On inventory (yes/no)*
Australia	Australian Inventory of Chemical Substances (AICS)	Yes
Canada	Domestic Substances List (DSL)	No
Canada	Non-Domestic Substances List (NDSL)	No
China	Inventory of Existing Chemical Substances in China (IECSC)	Yes
Europe	European Inventory of Existing Commercial Chemical Substances (EINECS)	No
Europe	European List of Notified Chemical Substances (ELINCS)	No
Japan	Inventory of Existing and New Chemical Substances (ENCS)	No
Korea	Existing Chemicals List (ECL)	Yes
New Zealand	New Zealand Inventory	Yes
Philippines	Philippine Inventory of Chemicals and Chemical Substances (PICCS)	Yes
Taiwan	Taiwan Chemical Substance Inventory (TCSI)	Yes
United States & Puerto Rico	Toxic Substances Control Act (TSCA) Inventory	Yes

*A "Yes" indicates this product complies with the inventory requirements administered by the governing country(s).
A "No" indicates that one or more components of the product are not listed or exempt from listing on the inventory administered by the governing country(s).

16. Other information, including date of preparation or last revision

Issue date 15-February-2018

Revision date -

Version # 01

HMIS® ratings Health: 1
Flammability: 1
Physical hazard: 0

NFPA ratings

Disclaimer Regenesis cannot anticipate all conditions under which this information and its product, or the products of other manufacturers in combination with its product, may be used. It is the user's responsibility to ensure safe conditions for handling, storage and disposal of the product, and to assume liability for loss, injury, damage or expense due to improper use. The information in the sheet was written based on the best knowledge and experience currently available.

Appendix E

TABLE OF CONTENTS

QUALITY ASSURANCE PROJECT PLAN

1.0 PROJECT SCOPE AND GOALS

This Quality Assurance Project Plan (QAPP) has been prepared in accordance with DER-10 to provide procedures to be followed during the course of the sampling and analytical portions of the project related to the former Elka Chemical Corp. located at 340 West Hoffman Ave., Lindenhurst, New York.

The remediation at the Site will commence with the remediation of soil on the western portion of the site and the installation of a Sub-Slab Depressurization System (SSDS) in the building at the site.

The project goals are remove surface oil from four area on the western portion of the site and to operate the SSDS until the concentrations of subsurface soil vapors decrease to concentrations that the NYSDEC determines that no further post-remediation is required.

1.1 Project Organization

The project manager and Quality Assurance Officer (QAO) is Peter Dermody, CPG, who will be working under the supervision of Ravi Korlipara, PE, PhD.

1.2 Indoor Air Monitoring Procedures

Indoor air monitoring will be performed following the installation of the SSDS. One indoor and one outdoor air sample will be obtained from the on-site building (the former church).

1.3 SSDS Effluent Air

For each of the four SSDS units, laboratory-provided clean 6-liter Summa Canisters will be connected to dedicated food-grade polyethylene tubing. The tubing will be placed in the sampling port on the effluent side of the exhaust fan and a vapor sample will be obtained over a period of approximately one minute. The Summa Canister valve will then be closed and all canisters will be submitted to the laboratory for analysis of VOCs by USEPA Method TO-15 with Category B deliverables by an ELAP-certified laboratory. The canisters will be transferred to the custody of the laboratory within 48 hours (although the holding time for Summa Canisters is 30 days).

The following table provides the analytical methods/ Quality Assurance Summary Table:

Location	Matrix	Laboratory Analysis	Sample Containers	Sample Holding Time	Number of Samples
SSDS Effluent	Sub-Slab Soil Vapor	TO-15	6-Liter Summa Canister	48 hours	6

2.0 QUALITY ASSURANCE PROJECT PLAN OBJECTIVES

2.1 Overview

Overall project goals are defined through the development of Data Quality Objectives (DQOs), which are qualitative and quantitative Statements that specify the quality of the data required to support decisions; DQOs, as described in this section, are based on the end uses of the data as described in the work plan.

In this plan, Quality Assurance and Quality Control are defined as follows:

- Quality Assurance - The overall integrated program for assuring reliability of monitoring and measurement data.

- Quality Control - The routine application of procedures for obtaining prescribed standards of performance in the monitoring and measurement process.

2.2 QA/QC Requirements for Analytical Laboratory

Samples will be analyzed by a New York State Department of Health (NYSDOH) certified laboratory. Data generated from the laboratory will be used to evaluate volatile organic compounds (VOCs). The QA requirements for all subcontracted analytical laboratory work performed on this project are described below. QA elements to be evaluated include accuracy, precision, representativeness, and completeness. The data generated by the analytical laboratory for this project are required to achieve detection levels low enough to meet required quantification limits as specified in NYSDEC Analytical Services Protocol (ASP). The analytical results meeting the required quantification limits will provide data that meets the data quality objectives of this remedial program as described in the work plan. The QC elements that are important to this project are completeness of field data, sample custody, sample holding times, sample preservation, sample storage, instrument calibration and blank contamination.

2.3 Instrument Calibration

Calibration curves will be developed for each of the compounds to be analyzed. Standard concentrations and a blank will be used to produce the initial curves. The development of calibration curves and initial calibration response factors must be consistent with method requirements presented in the most recent version of NYSDEC ASP 07/2005).

2.3.1 Continuing Instrument Calibration

The initial calibration curve will be verified every 12 hours by analyzing one calibration standard. The standard concentration will be the midpoint concentration of the initial calibration curve. The calibration check compound must come within 25% relative percent difference (RPD) of the average response factor obtained during initial calibration. If the RPD is greater than 25%, then corrective action must be taken as provided in the specific methodology.

2.4 Accuracy

Accuracy is defined as the nearness of a real or the mean (x) of a set of results to the true value. Accuracy is assessed by means of reference samples and percent recoveries. Accuracy includes both precision and recovery and is expressed as percent recovery (% REC). The MS sample is used to determine the percent recovery. The matrix spike percent recovery (% REC) is calculated by the following equation:

$$\%REC = \frac{SSR - SR}{SA} \times 100$$

Where:
SSR = spike sample results
SR = sample results
SA = spike added from spiking mix

2.5 Precision

Precision is defined as the measurement of agreement of a set of replicate results among themselves without a Precision is defined as the measurement of agreement of a set of replicate results among themselves without assumption of any prior information as to the true result. Precision is assessed by means of duplicate/replicate sample analyses.

Analytical precision is expressed in terms of RPD. The RPD is calculated using the following formula:

$$RPD = \frac{D^1 - D^2}{(D^1 - D^2)/2} \times 100$$

Where:
RPD = relative percent difference
D^1 = first sample value
D^2 = second sample value (duplicate)

2.6 Sensitivity

The sensitivity objectives for this plan require that data generated by the analytical laboratory achieve quantification levels low enough to meet the required detection limits specified by NYSDEC ASP and to meet all site-specific standards, criteria and guidance values (SGCs) established for this project.

2.7 Representativeness

Representativeness is a measure of the relationship of an individual sample taken from a particular site to the remainder of that site and the relationship of a small aliquot of the sample (i.e., the one used in the actual analysis) to the sample remaining on site. The representativeness of samples is assured by adherence to sampling procedures described in the Remedial Investigation Work Plan.

2.8 Completeness

Completeness is a measure of the quantity of data obtained from a measurement system as compared to the amount of data expected from the measurement system. Completeness is defined as the percentage of all results that are not affected by failing QC qualifiers and should be between 70 and 100% of all analyses performed. The objective of completeness in laboratory reporting is to provide a thorough data support package. The laboratory data package provides documentation of sample analysis and results in the form of summaries, QC data, and raw analytical data. The laboratory will be required to submit data packages that follow NYSDEC ASP reporting format which, at a minimum, will include the following components:

1. All sample chain-of-custody forms.
2. The case narrative(s) presenting a discussion of any problems and/or procedural changes required during analyses. Also presented in the case narrative are sample summary forms.
3. Documentation demonstrating the laboratory's ability to attain the contract specified detection limits for all target analytes in all required matrices.
4. Tabulated target compound results and tentatively identified compounds.
5. Surrogate spike analysis results (organics).
6. Matrix spike/matrix spike duplicate/matrix spike blank results.
7. QC check sample and standard recovery results
8. Blank results (field, trip, and method).
9. Internal standard area and RT summary.

2.9 Laboratory Custody Procedures

The following elements are important for maintaining the field custody of samples:

- Sample identification
- Sample labels
- Chain-of-Custody records

Sample tags will be attached to all Summa Canister and each tag will contain an identifying sample number. The number, type of sample, and sample identification will be entered into the field logbook. A chain-of-custody form, initiated at the analytical laboratory will accompany the Summa Canisters from the laboratory into the field. Upon receipt of the Summa Canisters, the sampler will sign and date the first received blank space. After each sample is collected and appropriately identified, entries will be made on the chain-of-custody form that will include:

- Site name and address
- Samplers' names and signatures

3.0 ANALYTICAL PROCEDURES

3.1 Laboratory Analysis

Samples will be analyzed by the NYSDOH ELAP laboratory for one or more of the following parameters: VOCs in air by USEPA Method TO15.

If any modifications or additions to the standard procedures are anticipated. and if any nonstandard sample preparation or analytical protocol is to be used, the modifications and the nonstandard protocol will be explicitly defined and documented.

4.0 DATA REDUCTION, REVIEW, AND REPORTING

4.1 Overview

The process of data reduction, review, and reporting ensures the assessments or a conclusion based on the final data accurately reflects actual site conditions. This plan presents the specific procedures, methods, and format that will be employed for data reduction, review and reporting of each measurement parameter determined in the laboratory and field. Also described in this section is the process by which all data, reports, and work plans are proofed and checked for technical and numerical errors prior to final submission.

4.2 Data Reduction

Standard methods and references will be used as guidelines for data handling, reduction, validation, and reporting. All data for the project will be compiled and summarized with an independent verification at each step in the process to prevent transcription/typographical errors. Any computerized entry of data will also undergo verification review.

Sample analysis will be provided by a New York State certified environmental laboratory. Laboratory reports will include ASP category B deliverables for use in the preparation of a data usability summary

report (DUSR). All results will be provided in accordance with the NYSDEC Environmental Information Management System (EIMS) electronic data deliverable (EDD) format. Analytical results shall be presented on standard NYSDEC ASP-B forms or equivalents, and include the dates the samples were received and analyzed, and the actual methodology used. Note that if waste characterization samples are analyzed they will be in results only format and will not be evaluated in the DUSR.

Laboratory QA/QC information required by the method protocols will be compiled, including the application of data QA/QC qualifiers as appropriate. In addition, laboratory worksheets, laboratory notebooks, chains-of-custody, instrument logs, standards records, calibration records, and maintenance records, as applicable, will be provided in the laboratory data packages to determine the validity of data. Specifics on internal laboratory data reduction protocols are identified in the laboratory's SOPs.

Following receipt of the laboratory analytical results by EBC, the data results will be compiled and presented in an appropriate tabular form. Where appropriate, the impacts of QA/QC qualifiers resulting from laboratory or external validation reviews will be assessed in terms of data usability.

4.3 Laboratory Data Reporting

All sample data packages submitted by the analytical laboratory will be required to be reported in conformance to the NYSDEC ASP, Category B data deliverable requirements as applicable to the method utilized. All results will be provided in accordance with the NYSDEC Environmental Information Management System (EIMS) electronic data deliverable (EDD) format.

4.4 Data Usability Summary Report

A Data Usability Summary Report (DUSR) will be prepared that will present the results of data validation, including a summary assessment of laboratory data packages, sample preservation and chain of custody procedures, and a summary assessment of precision, accuracy, representativeness, comparability, and completeness for each analytical method.

5.0 CORRECTIVE ACTION

Review and implementation of systems and procedures may result in recommendations for corrective action. Any deviations from the specified procedures within approved project plans due to unexpected site-specific conditions shall warrant corrective action.

Procedures have been established to ensure that conditions adverse to data quality are promptly investigated, evaluated and corrected. These procedures for review and implementation of a change are as follows:

- Define the problem.
- Investigate the cause of the problem.
- Develop a corrective action to eliminate the problem, in consultation with the personnel who defined the problem and who will implement the change.
- Complete the required form describing the change and its rationale (see below for form requirements).
- Obtain all required written approvals.

- Implement the corrective action.
- Verify that the change has eliminated the problem.

During the field investigation, all changes to the sampling program will be documented in field logs/sheets and the EBC PM advised.

If any problems occur with the laboratory or analyses, the laboratory must immediately notify the PM, who will consult with other project staff. All approved corrective actions shall be controlled and documented.

All corrective action documentation shall include an explanation of the problem and a proposed solution which will be maintained in the project file or associated logs. Each report must be approved by the necessary personnel (e.g., the PM) before implementation of the change occurs. The PM shall be responsible for controlling, tracking, implementing and distributing identified changes.