Remedial Action Work Plan

Carriage Cleaners — Penfield Site (C828131)
Penfield, New York

June 2016 0295-013-001

Prepared for:

Springs Land Company, LLC

BENCHMARK ENVIRONMENTAL ENGINEERING & SCIENCE, PLLC

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Prepared for:

SPRINGS LAND COMPANY, LLC

Prepared by:

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In Association With:

TURNKEY
ENVIRONMENTAL
RESTORATION, LLC

Certification

I, Thomas H. Forbes, certify that I am currently a NYS registered professional engineer and that this June 2016 Remedial Action Work Plan for the Carriage Cleaners Penfield Site (C828131) 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).

9-26-16

Date

REMEDIAL ACTION WORK PLAN

Carriage Cleaners - Penfield Site

1600 Penfield Road

Penfield, New York

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1.0 INTRODUCTION

Benchmark Environmental Engineering and Science, PLLC, in association with TurnKey Environmental Restoration, LLC, referred to herein jointly as Benchmark-TurnKey, have prepared this Remedial Action Work Plan (RAWP) on behalf of Springs Land Company, LLC (Springs Land Co.). Spring Lands Co. has elected to pursue cleanup and redevelopment of the Carriage Cleaners – Penfield Site (C828131), under the New York State Brownfield Cleanup Program (BCP) and executed a Brownfield Cleanup Agreement (BCA) with the New York State Department of Environmental Conservation (NYSDEC).

This document presents the scope of work and procedures for completion of remedial action in accordance with the Department's approved Decision Document (DD), dated October 2012.

1.1 Site Background

The Site is an approximate 0.6 acre parcel located at 1600 Penfield Road, Penfield, New York (Site; see Figures 1 and 2). The Site is currently vacant; the former building was demolished in 2009. The Site is currently secured by perimeter fencing to limit access to the Site. The Site is surrounded by commercial properties with residential properties beyond.

In the early 1960s, the former building was constructed and used as a dry cleaning facility until approximately 2005, though the timeframe of on-Site dry cleaning operation is unknown.

1.2 Previous Environmental History

A summary of the findings of the environmental investigations completed at the Site is provided below. Historic investigation and confirmation samples are shown on Figure 3.

1.2.1 August 2002 – Phase II Environmental Site Assessment

Labella Associates, P.C. (LaBella) completed a Phase II Environmental Site Assessment (ESA) in August 2002. The investigation identified chlorinated volatile organic compounds (cVOCs) in on-Site soil and groundwater.

1.2.2 August 2003 – Passive Soil Vapor Survey

LaBella completed a passive soil vapor survey in August 2003. The investigation identified VOCs in on-Site soil vapor.

1.2.3 October 2006 – Remedial Investigation (RI)

LaBella completed a RI at the Site during 2005 and 2006. The RI included the advancement of soil borings, soil vapor points, and groundwater monitoring wells, and collection of soil, groundwater and soil vapor samples across the Site. Based on the results of the RI, three (3) Areas of Concern (AOCs) were identified for the Site, including AOC 1 - Concrete Wastewater Holding Tank Area; AOC 2 - Former PCE Still Area; and, AOC 3 - Groundwater Contamination.

1.2.4 June 2007 – Interim Remedial Measures (IRMs)

IRMs were completed at the Site, related to AOC 1A (a subarea of AOC 1) in June 2007. AOC 1A included the excavation of the underground concrete waste water holding tank, associated contaminated soil and groundwater was removed and disposed and/or treated off-site at permitted facilities. Excavation activities were completed to practicable safe extents based on excavation wall stability issues and material handling concerns for saturated soils. Based on the confirmatory samples, additional remedial measures are required to address AOC 1.

1.3 Summary of Environmental Conditions

Based on the previous investigations, completed IRMs and the approved DD, the following environmental conditions exist at the Site:

Remaining Contamination

Soil/Fill

- cVOCs are present in subsurface soil/fill above SCGs for the Site. Specifically, tetrachloroethene (PCE) was detected as high as 130,000 mg/Kg, methylene chloride as high as 5,400 mg/Kg, trichloroethene (TCE) as high as 260 mg/Kg, and cis-1,2-dichloroethene (DCE) as high as 300 mg/Kg.

Groundwater

- cVOCs are the primary COCs in groundwater, with PCE and/or its breakdown products, TCE, DCE, and vinyl chloride (VC) detected above GWQS/GV on-Site. Specifically, PCE was detected as high as 142,000 ug/L, TCE as high as 5,300 ug/L, 1,2-DCE as high as 4,900 ug/L and VC as high as 50 ug/L.

Soil Vapor

- VOCs, including PCE, were detected in soil vapor samples collected along the western boundary of the Site.

1.4 Primary Constituents of Concern (COCs)

Based on the previous investigations and the NYSDEC approved DD, the site-specific Constituents of Concern (COCs) are comprised of chlorinated VOCs, specifically PCE and its chemical breakdown products TCE, DCE and VC, and methylene chloride.

1.5 Standards, Criteria, and Guidance (SCGs)

In accordance with the approved DD for the Site, the remedy must conform to promulgated standards, criteria and guidance (SCGs) that are directly applicable or that are relevant and appropriate for the Site.

The site-specific soil cleanup objectives (SCOs) relevant to the planned Track 4 Commercial Use cleanup criteria goals for the Site include:

- 6NYCRR Part 375 Protection of Groundwater Quality SCOs for tetrachloroethene (PCE), trichloroethene (TCE), cis- and trans-1,2-dichloroethene (DCE), 1,1-dichloroethene (1,1-DCE) and vinyl chloride (VC)
- 6NYCRR Part 375 Commercial Use SCOs for all other constituents
- CP-51 Soil Cleanup Guidance

Groundwater remediation cleanup criteria goals for the Site include:

- Class GA (Groundwater) per NYSDEC Division of Water Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations (TOGS 1.1.1)

1.6 Remedial Action Objectives

The remedial measures for the Carriage Cleaners Site (1600 Penfield) must satisfy Remedial Action Objectives (RAOs). Remedial Action Objectives are site-specific statements that convey the goals for minimizing substantial risks to public health and the environment. As stated in the approved DD, the RAOs for the Site have been defined as:

Groundwater:

RAO for Public Health Protection

- Prevent ingestion of groundwater with contaminant levels exceeding drinking water standards.
- Prevent contact with, or inhalation of volatiles, from contaminated groundwater.

RAO for Environmental Protection

- Restore ground water aquifer to pre-disposal/pre-release conditions, to the extent practicable.
- Prevent discharge of contaminants to surface water.
- Remove the source of ground or surface water contamination

Soil:

RAO for Public Health Protection

- Prevent ingestion/direct contact with contaminated soil.
- Prevent inhalation of or exposure from contaminants volatilizing from contaminants in soil.

RAO for Environmental Protection

- Prevent migration of contaminants that would result in groundwater contamination.
- Prevent impacts to biota from ingestion/direct contact with soil causing toxicity or impacts from bioaccumulation through the terrestrial food chain.

Soil Vapor:

RAO for Public Health Protection

- Mitigate impacts to public health resulting from existing, or the potential for, soil vapor intrusion into buildings at a site.

In general, remedial activities will include: completion of in-Situ chemical oxidation injection to degrade cVOCs in saturated soil/fill (AOC1) and groundwater (AOC3), and limited soil excavation (AOC2); engineering controls in the form of a site cover system; and, institutional controls in the form of an environmental easement and implementation of a Site Management Plan. Details of the planned remedial action are presented below.

1.7 Project Organization and Responsibilities

Springs Land Co. was accepted into the BCP as a non-responsible party (volunteer) per ECL§27-1405. Benchmark Environmental Engineering & Science, PLLC (Benchmark) in association with TurnKey Environmental Restoration, LLC (TurnKey) will manage the brownfield cleanup on behalf of the current owner Springs Land Co. The NYSDEC Division of Environmental Remediation (Region 8), in consultation with the New York State Department of Health (NYSDOH) shall monitor the remedial actions to verify that the work is performed in accordance with the BCA, the approved NYSDEC Decision Document, and NYSDEC DER-10 guidance.

Benchmark-TurnKey personnel, as well as subcontractors for this project have not been determined at this time. Once pricing is secured, subcontract agreements are in place, and a field schedule determined, resumes for the selected project team will be provided to the Department, if requested. Benchmark-TurnKey's résumé have been included in Appendix A.

2.0 PRE-REMEDIATION TASKS

2.1 Public Information and Outreach

A fact sheet containing information about the planned remedial work will be sent out via the NYSDEC regional listserv, and any subscribers that have requested mailed paper copies. Additionally, copies of the fact sheet will be delivered to the adjacent properties. Furthermore, a copy of this Work Plan will be made available for public review at the NYSDEC Region 8 office and the designated document repository, upon Departmental approval.

2.2 Underground Utilities Location

The remediation contractor will contact underground facilities protection organization (Dig Safely New York, UFPO) to locate utility lines within the work area.

After completion of the underground utility mark-out, completed by UFPO, a Site-wide inspection of the mark-out, as related to the planned remedial activities will be completed to evaluate potential pathways for off-site transport.

2.3 Health and Safety Plan Development

A Health and Safety Plan (HASP) will be prepared and enforced by the remediation contractor in accordance with the requirements of 29 CFR 1910.120. The HASP will cover all on-site remedial activities. Benchmark-TurnKey will be responsible for Site control and for the health and safety of its authorized site workers. Benchmark-TurnKey's HASP is provided for informational purposes in Appendix B. The remediation contractor will be required to develop a HASP as or more stringent than Benchmark-TurnKey's HASP.

2.4 Mobilization and Site Preparation

The remediation contractor's field operations at the Site will commence with mobilizing equipment and materials to the Site.

A site walk will be completed in the area planned for injection to inspect the surface cover (e.g., asphalt/concrete) to inspect for former boreholes which may allow injection reagent to migrate to the surface. Any identified former boreholes will be filled with asphalt patch and/or cement.

2.5 Temporary Facilities and Controls

The site is currently surrounded by chain-link fencing to restrict access. No temporary facilities (e.g., construction field trailer) are planned to be used during the remedial activities. Site controls may be employed for protection of site workers and the surrounding community during remediation and construction, including safety fencing, traffic cones, dust suppression, and erosion control as further described below.

2.5.1 Access Controls

The Site is currently surrounded by a chain-link fence. The fence will remain in place during remedial activities. Temporary safety construction fencing (i.e., orange plastic fence) may be utilized, based on the daily planned work activities, to identify active work areas and discourage trespassing.

Work areas will be determined daily based on the planned remedial activities, and may be changed throughout the work day to ensure safe operations. Access control will consider site worker and general public safety.

2.5.2 Material Storage

The remedial injections may require material storage. Planned reagents will be brought to the Site in plastic drums or plastic wrapped pallets, and will be scheduled to be delivered to the Site in quantities which can be used within 2-3 days. If the need arise, supplemental storage (i.e., secured mobile storage box/crate) may be discussed with the Department. Reagents will be shipped in DOT approved containers, as appropriate, to the Site by the manufacturer and/or chemical distributor.

2.5.3 Community Air Monitoring Program

A Community Air Monitoring Plan (CAMP), as more fully described in the HASP (see Appendix B), will be implemented during remedial activities. Volatile gas monitoring will be completed in the exclusion zone using a photoionization detector during the remedial activities.

Additional off-site air monitoring will be completed (with adjacent property owner permission) during remedial activities. Details of the off-site air monitoring are described below and in the CAMP-Community and Emergency Response Plan (CERP). During

injection activities a multi-gas LEL meter will be used to monitor field oxygen, hydrogen sulfide, and carbon monoxide gas within the exclusion zone.

2.5.4 Remediation Derived Wastes

Remediation-Derived Waste (RDW) will be placed in sealed NYSDOT-approved drums and labeled for subsequent characterization and disposal. All generated drums will be labeled alpha-numerically with regard to contents, origin, and date of generation using a paint stick marker on two sides and the top of each drum. Drums will be securely staged on-site pending characterization analyses. Field personnel will coordinate the on-site handling and temporary storage of drums, including transportation, characterization sampling, and offsite disposal arrangements, as necessary.

Discarded personal protective equipment (PPE) (i.e., latex gloves, Tyvek, paper towels, etc.) and disposable sampling equipment (i.e., bailers or stainless steel spoons) will be placed in sealed plastic garbage bags and disposed of as municipal solid waste.

Discarded chemical reagent packaging will be recycled by the chemical manufacture and/or distributor (reagent drums), or will be placed in sealed plastic garbage bags and disposed of as municipal solid waste (reagent paper bags and plastic wrap).

3.0 ISCO PILOT STUDY RESULTS

In-Situ chemical oxidation (ISCO) is an environmental remediation technique which utilizes a strong chemical oxidant to transform chemical contaminants into less harmful chemical species. Many different chemical oxidants have been shown to be effective reagents for environmental remediation. Hydrogen peroxide has been shown to be an effective oxidant for chlorinated ethenes, with fast reaction times (minute-hours to days), enhanced mass transfer rates related to the exothermic reaction and oxygen production, and reaction byproduct are typically water and oxygen. Regenesis PersulfOx ™ is a sodium persulfate based oxidant utilizing a patented catalyst to activate the reaction. The sulfate reagent is a more stable oxidant with slower reaction times (days to weeks) and does not interact as strongly with soil organic matter, whereby reducing application volumes.

Between April 8 and 10, 2015, a pilot study program was completed to evaluate potential ISCO reagents, including hydrogen peroxide (H_2O_2) and Regenesis PersulfOx. Findings aof the pilot study are provided below.

Prior to field injection activities a US Environmental Protection Agency (EPA) – Underground Injection Control application was submitted and approved. Copies of the UIC approval were provided to the Department prior to field activities. Additionally, a Monroe County hydrant permit was submitted and approved to use municipal water from nearby hydrant for make-up waters during the pilot study.

3.1 Pilot Study Injection Details

Existing groundwater monitoring wells MW-2 and MW-7 were used independently to evaluate the ISCO reagents, including MW-2 for hydrogen peroxide and MW-7 for PersulfOx. Multiple injection variables were evaluated during the pilot study, including, reagent concentrations, injection application rates, radius of influence, presence of reagents (peroxide and sulfate), and field parameters including DO, pH, temperature, ORP, specific conductance, and laboratory analysis for VOCs and dissolved iron.

Prior to injection activities, baseline water levels, and groundwater samples from MW-2 and MW-7 for analysis of VOCs, total and dissolved iron, and sulfate (MW-7) were collected. Table 1 summarizes the findings of the pilot study, including historic, baseline and post-injection VOCs, and attenuation and field parameters. Figure 4 identifies the pilot study injection locations.

3.1.1 MW-2 Field Activities – 10% Hydrogen Peroxide

Hydrogen peroxide is a strong oxidant capable of degrading the chlorinated VOCs present in on-Site groundwater. Based on EPA guidance and current scientific research, a 10% H_2O_2 solution was used for the pilot study. The reagent was delivered to the Site by chemical supplier in 55-gallon drums at the designated 10% concentration so no on-Site mixing or dilution was required.

In total, six (6) injection points (IPs) were advanced radially around MW-2 at varying off-sets, increasing from 3 ft to approximately 20 ft from MW-2 (see Figure 4). IPs were advanced to a target depth of approximately 22 fbgs and injected continuously to approximately 5-6 fbgs. Injection applications were evaluated for both "up-down" and "down-up" and reagent application volumes varied from 1 gallon/ft to 8 gallon/ft.

IP-1 was advanced 5-ft radially west from MW-2, and a total of 55-gallons reagent was injected from 6 to 22 fbgs. No field indication of injection was noted in MW-2 during IP-1. Based on the IP-1 results, IP-2 was moved in to approximately 3-ft radially west from MW-2 and injected a total of approximately 45 gallons from 22 to 8 fbgs. During IP-2, hydraulic connection between IP-2 and MW-2 was evident by observed rise in water level, increase in peroxide readings from non-detect (ND) to greater than 10 mg/L, temperature increase from 6.2 C to 8.9 C, and DO readings during injection from 3.2 ppm to greater than 22 ppm (field equipment max. value). IP-2 was stopped at 8 fbgs to minimize potential of daylighting reagent. IP-3 was completed approximately 5-ft east of MW-2 with the injection of approximately 60 gallons from 22 to 6 fbgs. IP-3 had clear field evidence of hydraulic connection during injections with increase in water level and field parameters. It should be noted that IP-3 is located approximately 10-ft radially from IP-1 and IP-2.

Based on the results for IP-1 through IP-3 (Day 1), it was determined in consultation with the Department to adjust injection spacing for the planned IP-4 and IP-5 (Day 2). Prior to Day 2 injections, water level within MW-2 had receded to initial condition (6 fbgs) approximately 12 hours after completion of injection activities on Day 1. Day 2 baseline DO readings were still elevated to greater than 22 ppm, with residual peroxide ranging from 2-5 ppm, from high of 25 ppm at completion of Day 1.

IP-4 was shifted approximately 8 ft radially southeast of MW-2. IP-4 injected approximately 25 gallons of reagent from 16 to 6 fbgs, (due to injection point failure). IP-4

showed field indication of hydraulic connection with increase in water level, residual peroxide and temperature.

IP-5 was shifted approximately 12 feet east of MW-2, and approximately 32 gallons were injected from 20 to 6 fbgs. IP-5 (12') showed hydraulic connection, however, application issues, with reagent daylighting around the injection rod and issues with injection hole compromising, IP-5 (12') was abandoned. IP-5 was attempted at 20-ft east of MW-2, with the injection of 11 gallons from 16 to 8 fbgs, however, IP-5 (20') had injection hole issues as described above, and was abandoned.

In consultation with the Department, an additional injection location (IP-6) was advanced approximately 15-ft north of MW-2. Approximately 15 gallons was injected from 16 to 6 fbgs, with hydraulic connection observed with water level rise.

It should be noted that during Day 1, MW-6M was monitored with no field indication of effect from the injection program. However, MW-6M was assessed for baseline readings at the start of Day 2, and elevated DO (10.44 ppm) and elevated residual peroxide (2-5 ppm) were detected, and field observation of hydraulic connection, including water level, DO and peroxide were detected during Day 2. MW-6M is located approximately 35 feet east of MW-2.

3.1.2 MW-7 Field Activities - Regenesis PersulfOx®

PersulfOx is a sodium persulfate based oxidant that is capable of destroying chlorinated contaminants at the Site. PersulfOx was supplied to the Site by the manufacturer in 50-lb bags, and mixed on-Site in accordance with the manufacturer's instructions with Monroe County municipal water. Baseline field and laboratory samples were collected from MW-7 prior to injections activities.

PersulfOx concentrations ranged from 10-20%, with application volumes ranging from 10 to 20 gallons/ft. Six (6) IPs were advanced radially around MW-7 (see Figure 4). MW-7 IP-1 and IP-2 were injected from 22 to 6 fbgs at an application rate of 20-gallon/ft. IP-3 and IP-4 were injected from 20-5 fbgs with an application rate of approximately 13 gallons/ft, and IP-5 and IP-6 were injected from 18-20 to 4-5 fbgs at an application rate of 10 gal/ft.

After completion of IP-3, visual evidence of cloudy milky appearance was evident within MW-7 and increasing sulfate readings were detected from 0.0 ppm (baseline) to greater than 77 ppm (maximum of equipment) after IP-3. Visual evidence and elevated

sulfate readings were detected during the start of Day 3 (IP-10 - IP-12). Field parameters did not fluctuate significantly during PersulfOx pilot study.

3.1.3 ISCO Pilot Study Groundwater Sampling

Pre and post-injection groundwater samples were collected and analyzed as follows:

- Hydrogen Peroxide (MW-2) – TCL VOCs, total and dissolved iron
- PersulfOx (MW-7) – TCL VOCs, sulfate, total and dissolved iron

It should be noted that the initial MW-2 H_2O_2 VOC sample was collected 2-days post injection. Based on the initial results, a second post-injection sample was collected 2-weeks later from MW-2. Both MW-2 VOC sample results are presented on Table 1.

Off-site well DP-10 was monitored for field parameter, peroxide and sulfate levels. No changes in field parameters, peroxide or sulfate were noted between the pre- and post-off-site monitoring.

3.2 ISCO Pilot Study Summary and Conclusions

The pilot study aimed to assess various reagents, injection spacing and dosage rates. Based on the field and analytical results, both hydrogen peroxide and PersulfOx are capable of treating on-Site groundwater (see Table 1). Analytical results indicate that hydrogen peroxide decreased total cVOC concentrations by 90%, and PersulfOx decreased cVOC concentrations by approximately 84%.

Based on the fact that hydrogen peroxide is capable of significant cVOC reduction (90% within 2 weeks), without additional material handling, lower application volumes to minimize potential injection to "push" contaminants off-site, hydrogen peroxide is the preferred reagent ofr AOC 3 remediation.

4.0 REMEDIAL APPROACH

The NYSDEC Decision Document (DD) identifies the cleanup approach for the Site. Specifically, the DD identifies three (3) Areas of Concern (AOC) that require remediation to achieve a Track 4 Commercial cleanup (see Figure 5). The major elements of the remediation include:

- In-Situ Chemical Oxidization (ISCO) to address residual cVOC contamination in the vadose zone soil-fill and groundwater
- Excavation and removal of cVOC-impacted soil/fill
- Installation and maintenance of a cover system. The cover system will include a demarcation layer, DER-10 acceptable backfill and/ or hardscape (asphalt/concrete) cover.
- Development and implementation of a Site Management Plan (SMP) for post-certificate of completion (COC) operation, maintenance and monitoring.

4.1 Supplemental Site Inspection

Prior to initiation of remedial activities, a supplemental site inspection is planned to assess current Site conditions.

The inspection will include evaluation of the existing groundwater monitoring network, inspection of the surface cover in relation to planned injections and cover system, collection of select groundwater and/or soil/fill samples, and collection of geospatial data.

If the existing groundwater monitoring network is found to be insufficient to perform groundwater monitoring during remedial injection and/or post-remedial monitoring, a revised plan will be discussed with the Department.

4.1.1 Groundwater Sample Collection

Prior to sample collection, static water levels will be measured and recorded from all on-Site monitoring wells to facilitate the preparation of a Site-wide isopotential map. Following water level measurement, field personnel will purge and sample monitoring wells using a submersible pump with dedicated pump tubing following low-flow/minimal drawdown purge and sample collection procedures. In the event of pump failure or the saturated unit does not permit the proper implementation of low-flow sampling, a dedicated polyethylene bailer will be used to purge and sample the well. Prior to sample collection via

low-flow methodology, groundwater will be evacuated from each well at a low-flow rate (typically less than 0.1 L/min) while maintaining a generally consistent water level. Field measurements for peroxide, sulfate, pH, temperature, turbidity, DO, ORP, specific conductance and water level, as well as visual and olfactory field observations will be periodically recorded and monitored for stabilization. Low-flow purging will be considered complete when pH, specific conductivity, DO, ORP, and temperature stabilize and when turbidity measurements fall below 50 Nephelometric Turbidity Units (NTU), or become stable above 50 NTU regardless of volume purged. Purging via disposable bailer, if necessary, will be considered complete following the removal of three well volumes and field parameter stabilization or to dryness, whichever occurs first. In general, stability is defined as variation between field measurements of 10 percent or less and no overall upward or downward trend in the measurements. Upon stabilization of field parameters, groundwater samples will be collected and analyzed as discussed below.

Sample collection methods include:

- **Submersible Pump with Dedicated Pump Tubing**

  All monitoring wells will be purged and sampled using a non-dedicated submersible pump and dedicated pump tubing following low-flow (minimal drawdown) purge and sample collection procedures, as described above. Non-dedicated pumps will require decontamination prior to use at each well location and the collection of an equipment blank.

- **Polyethylene Disposable Bailer**

  If low flow is not feasible (e.g., due to depth to groundwater), wells of any depth (up to 100 fbgs) may be purged and sampled using a polyethylene disposable bailer via direct grab. In general, a bottom filling dedicated polyethylene bailer is attached to a length of dedicated hollow-braid polypropylene rope and lowered into the well smoothly and slowly as not to agitate the groundwater or damage the well. Purging continues until a predetermined volume of water has been removed (typically three well volumes) or to dryness. Measurements for pH, temperature, specific conductance, dissolved oxygen and turbidity are recorded following removal of each well volume. The well is purged until the readings for indicator parameters stabilize or the well is purged to dryness.

Prior to, and immediately following collection of groundwater samples, field measurements for pH, specific conductance, temperature, dissolved oxygen, turbidity and water level, as well as visual and olfactory field observations will be recorded. All collected groundwater samples will be placed in pre-cleaned, pre-preserved laboratory provided sample bottles, cooled to 4°C in the field, and transported under chain-of-custody command to a NYSDOH-approved laboratory for analysis.

4.1.2 Groundwater Sample Analyses

Up to four (4) groundwater samples will be collected and analyzed for TCL VOCs, Total Suspended Solids (TSS) and Total Dissolved Solids (TDS), and dissolved iron in accordance with USEPA SW 846 methodology with equivalent NYSDEC Category B deliverables to allow for independent third-party data usability assessment. Final determination of groundwater sample locations will be based on the viability of the monitoring network, with an understanding that sample location preference will be given to wells located within the previously identified AOC3 area.

4.1.3 Soil/Fill Sample Collection

One (1) subsurface soil/fill sample is planned to be collected in the vicinity of IRM post-excavation sample location BS-1. The soil sample will be collected using a direct-push soil probe rig. Soil boing will be advanced to target depth of 16 feet below ground surface (fbgs) with target sample collection depth of 12 fbgs, corresponding to BS-1 sample depth. Final determination of sample interval will be based on field presence of water within the vadose zone and field PID reading.

Soil samples will be retrieved in 4-foot acetate sleeves and field screened for the presence of VOCs using a field photoionization detector (PID) equipped with a 10.6 eV lamp.

4.1.4 Soil/Fill Sample Collection and Analysis

Samples will be collected using dedicated stainless steel sampling tools. Representative soil samples will be placed in pre-cleaned laboratory provided sample bottles, cooled to 4ºC in the field, and transported under chain-of-custody command to a NYSDOH Environmental Laboratory Approval Program (ELAP)-certified analytical laboratory.

4.2 AOC 1 – Former Concrete Wastewater Tank Area

Residual cVOC impacts remain after completion of IRM activities completed in 2007. IRM excavation activities removed all feasibly accessible impacted soil/fill and the excavation was deemed complete at approximately 12-fbgs due to safety issues related to bank instability and undermining of the excavation walls. Based on the IRM post-excavation confirmatory sample results, residual contamination remains that requires remediation. Based on the extreme difficulty to complete excavations in this area, it is not deemed feasible, safe, or cost effective to address AOC 1 via excavation and off-site disposal. As such, a vadose zone ISCO injection using Regenesis Persulfox is planned.

Based on correspondence with Regenesis, a dilute PersolfOx (5-10%) will be effective in treating the residual cVOC impacted soil within the vadose zone. Details of the AOC 1 injection are provided below.

4.2.1 Regenesis PersulfOx®

PersulfOx is a sodium persulfate based oxidant that is capable of destroying chlorinated contaminants present on-Site. PersulfOx contains a built-in activation agent, so no additional catalyst will be added during the injection. Based on correspondence with Regenesis, a 5-10% PersulfOx solution will be injected at the manufacturer's suggested rate of approximately 20-gallons per foot across the 10-foot treatment thickness.

Regenesis PersulfOx information including product brochure, Material Safety Data Sheet (MSDS) and application instructions are included in Appendix XX. The reagent will be delivered in dry 55lbs bags as a DOT 5.1 Class Oxidizer and staged on-Site in accordance with the manufacturer's storage recommendations. The PersulfOx solution will be mixed on-Site in accordance with the manufacturer's instructions in a 275-gallon tote, or similar mixing vessel, using the municipally supplied potable water system (Monroe County Water Authority).

4.2.2 PersulfOx Injection Details

A total of 10 injection points are planned for AOC1, spaced across two (2) rows of five (5) points, with 10-foot spacing between each point (see Figure 6). A direct-push drilling probe capable of injecting the reagent will be utilized to deliver the reagent across a 10-ft treatment thickness. Injection points will be advanced to approximately 15 feet below ground surface (fbgs) and reagent will be applied continuously during retraction to

approximately 5 fbgs. Water levels in MW-6 will be monitored continuously during the injection. If "daylighting" of reagent occurs, the injection will be temporarily stopped and pressure relieved on injection rod.

After completion of each injection point, surface sealing/grouting will be completed.

4.2.3 Field Monitoring

Existing groundwater monitoring well MW-6 is present within the planned AOC-1 injection area (see Figure 6). Field measurements, including water level, temperature, sulfate, DO, turbidity and ORP will be collected pre-, during and post-injection. A groundwater sample will be collected for TCL VOCs as part of the pre-assessment, described above. Post-injection groundwater sampling is detailed below.

No sooner than 4 weeks post-AOC1 injections, a soil sample will be collected from the vicinity of BS-1 and compared to the pre-injection soil results, and determination of the potential need for supplemental remedial activities will be discussed with the Department, prior to AOC3 remediation. Copies of Field Documents are provided for reference in Appendix C.

4.3 AOC 2 – Former Still Area

Based on the Alternatives Analysis (AA) prepared by Labella, approximately 125 cubic yards of suspect soil/fill may require remedial action in the vicinity of the PCE Still Area located in the southern corner of the former building. In accordance with the approved IRM Work Plan (June 2006), and "Contained-In" determination, the planned excavation, sampling and handling of impacted soils is described below. Figure 7 shows the estimated extents of excavation and soil staging areas.

4.3.1 Concrete Removal

Currently, the former building concrete slab is in-place and will be removed to allow for excavation. Non-stained concrete will either be crushed on Site and used for backfill, or recycled off-site at a NYSDEC registered Construction and Demolition (C&D) recycling facility.

4.3.2 cVOC-Impacted Soil/Fill Removal

Excavation activities to remove unsaturated cVOC-impacted soil/fill exceeding the PGWSCOs are planned for AOC 2. A PID and visual/olfactory observations will be used

to screen soil/fill materials and assist in verifying removal of impacted soil/fill. All excavation work will be directed by an experienced Benchmark-TurnKey professional to remove impacted material. Lateral and vertical excavation will continue, as described above, until suspected source area soils and visually impacted soil/fill is removed, Part 375 PGWSCO are met, excavation has reached the property line, or NYSDEC agrees that no further excavation is required. Soil segregation is discussed below.

4.3.3 Excavation Confirmation Sampling

Post excavation confirmatory composite samples will be collected from the cVOC-impacted soil/fill excavation area. Sample locations from excavated areas will include sidewalls and bottom to confirm the excavation limits have achieve the PGWSCOs or to document the contaminant levels remaining in-place due to the limitations (presence of groundwater limiting excavation and/or structural concerns). A minimum of one (1) sample per 30 linear feet of sidewall and one sample for each 900 square feet of excavation bottom will be collected. Confirmation samples will be analyzed by a NYSDOH ELAP certified analytical laboratory for TCL VOCs via EPA Method 8260C. A Category B deliverable package to facilitate data evaluation by a third-party validation expert will be provided. Expedited turnaround times may be requested for the analytical results to minimize the time that the excavation remains open. The results of the confirmatory samples will be compared to the PGWSCOs.

4.3.4 Soil Segregation and Disposal Determination

In accordance with the previously approved IRM Work Plan (Oct 2006), excavated soil/fill will be segregated into separate categories for additional assessment, including:

- "Clean" – soils exhibiting no visual staining and PID readings are between 0.0 ppm and 50 ppm. Clean soil will be assessed for potential reuse on-Site
- "Lightly Impacted" – soils exhibiting PID readings greater than 50 ppm and less than 500 ppm
- "Moderately Impacted" – soils exhibiting PID readings of greater than 500 ppm and less than 2,000 ppm; and,
- 'Heavily Impacted" – Soils exhibiting PID readings of greater than 2,000 PID.

Once excavation is deemed complete, as described above, the segregated stockpiles will be sampled to assess soil reuse and/or waste disposal. Soil reuse samples will be collected in accordance with DER-10 and in consultation with the Department, waste characterization samples will be collected to allow for comparison to Contained In criteria and applicable disposal facility requirements (i.e., non-hazardous landfill, hazardous landfill, supplemental treatment and off-site disposal).

Based on the analytical results, soil handling and disposal will be discussed with the Department. Copies of all disposal facility records (application, approvals, transportation and disposal manifests) will be provided within the Final Engineering Report (FER).

4.3.5 Excavation Backfill

Following NYSDEC concurrence that the remedial excavation is complete, the excavation will be backfilled with approved backfill material. Prior to backfilling, a demarcation layer (e.g., orange plastic snow fencing) will be placed on top of the remaining in-place soil/fill and the clean approved backfill material.

The backfill material will be placed into the excavations and compacted with the excavator/backhoe bucket in 2-foot lifts to match the existing grade of the Site and minimize settling. Backfill material will comply with DER-10 guidance.

4.3.6 Groundwater Management

If necessary, water removed from excavations and surface water run-in to excavations during the impacted soil removal will be handled on-site prior to discharge to the municipal sewer. In general, water removed from excavations will be stored/settled in a portable storage tank(s), and if deemed necessary, will be pumped through a bag or cartridge filter prior to treatment using granular activated carbon (GAC). Following completion of excavation work, settled solids remaining in the tank and spent filter bags will be disposed of off-site.

If the accumulated waters required treatment, the spent GAC will be characterized and regenerated off-site, or disposed at a permitted disposal facility in accordance with applicable federal and state regulations. The storage tank will be decontaminated via pressure washing. Benchmark-TurnKey or the Site owner will coordinate with the municipality to obtain any necessary temporary sewer discharge permits.

4.4 AOC 3 - ISCO Groundwater Treatment

Based on the results of the pilot-study described above, hydrogen peroxide has been selected as the preferred oxidant for AOC3.

4.4.1 Hydrogen Peroxide

Hydrogen peroxide is a strong oxidant capable of degrading the chlorinated VOCs present in on-Site groundwater. A 10% hydrogen peroxide solution will be used, and no on-Site mixing or dilution is planned. Hydrogen peroxide will be delivered to the Site in 55-gallon drums or 275-gallon totes by commercial chemical distributor on a routine basis during the injection. Empty totes and drums will be returned to the chemical provider for reuse and/or recycling. Material Safety Data Sheet (MSDS) is included in Appendix D.

4.4.2 AOC 3 ISCO Injection Details

Based on the pilot-study results, a total of 38 injection points are planned for AOC 3 (see Figure 8). Injection points will be spaced approximately 20-ft apart on-center. A direct-push drilling probe capable of injecting the reagent will be utilized to deliver the reagent across a 15-ft treatment thickness. Injection points will be advanced to approximately 20 feet below ground surface (fbgs) and reagent will be applied continuously to approximately 5 fbgs. The target injection rate for AOC3 is 3 gallons 10% H_2O_2 /foot across the treatment thickness. Based on the pilot study results, no chelating or activation agents will be injected.

The injection will be completed systematically working from the outside to the center of the array to limit potential expansion of the plume and off-site migration.

If "daylighting" of reagent occurs, the injection will be temporarily stopped and pressure relieved on injection rod. After completion of each injection point, surface sealing/grouting will be completed.

4.4.3 Field Monitoring

The groundwater monitoring network will be used to monitor the injection. Adjacent wells will be field monitored continuously during injections. Field measurements, including water level, temperature, peroxide, DO, and ORP will be collected prior to and continuously during injection.

Pre- and post-injection groundwater monitoring will be completed. Details of the post-injection groundwater sampling is described below.

4.5 Groundwater Monitoring

A groundwater sampling program will be implemented to monitor the injection activities in the field during remedial injection, and post-injection to monitor the effectiveness of the in-situ groundwater treatment program. Pre-injection groundwater monitoring will be completed, as described above.

4.5.1 Remedial Groundwater Injection – Field Monitoring

In addition to standard field measured parameters, including pH, specific conductance, dissolved oxygen, redox potential, temperature and turbidity, groundwater samples will be collected and analyzed in the field for sulfate (AOC1) and residual peroxide (AOC3).

4.5.2 Post-Injection Groundwater Monitoring

Post-injection monitoring will be completed quarterly for up to one year (4-events), with semi-annual post-COC monitoring to be completed under an approved SMP.

In addition to standard field measured parameters, including pH, specific conductance, dissolved oxygen, redox potential, temperature and turbidity, groundwater samples will be collected and analyzed in the field for sulfate (AOC1) and residual peroxide (AOC3). Laboratory samples will be collected and submitted as follows:

- AOC 1 – (PersulfOx) – TCL VOCs, sulfate, total and dissolved iron (MW-6 only)
- AOC 3 – (Hydrogen Peroxide) – TCL VOCs, total and dissolved iron.

In addition to the on-Site groundwater monitoring wells, off-site downgradient well DP-10 will be included in the pre-assessment, post-injection, and during the second quarterly monitoring event. Details of the long-term post-COC groundwater monitoring program will be addressed in the Site Management Plan.

4.6 Cover System

The selected remedy for the Site includes construction of a cover system across the Site. The cover system will be comprised of:

- **Hardscape Areas:** These areas will be covered by hardscape (asphalt/concrete, building foundations).
- **Non-hardscape Areas:** A minimum of 12 inches of imported backfill or re-used on-site soil/fill, which is laboratory analyzed and determined to meet DER-10 Appendix 5 for Commercial reuse and not exhibit nuisance characteristics (visual and olfactory), will be placed. In vegetated and/or landscaped areas, the uppermost approximate three inches will be comprised of soil capable of sustaining vegetative growth. Any imported material to be used in the cover system will meet the DER-10 criteria.
- **Demarcation Layer:** A demarcation layer (e.g., snow fence, plastic mesh, etc.) will be placed beneath the soil cover system where hardscape (concrete/asphalt) will not be present.

Figure 9 present the planned cover system layout and details.

The planned cover system includes different cover types, including the existing asphalt and concrete, and vegetated areas. Where soil cover system transitions to hardscape, and at the limits of the BCP property, the cover will be keyed-in as necessary to achieve the minimum 12-inches of approved backfill material without tapering as shown on Figure 9.

4.7 Site Management Plan

For any BCP site not cleaned up to NYSDEC Part 375 Unrestricted Use SCOs, preparation of a Site Management Plan (SMP) that describes site-specific Institutional Controls and/or Engineering Controls (IC/EC) is a required component of the final remedy. Therefore, as part of the final remedy for the Site, a SMP will be prepared. Consistent with NYSDEC BCP requirements, the SMP will include the following components:

- **Engineering and Institutional Controls Plan**. Engineering controls include any physical barrier or method employed to actively or passively contain, stabilize, or monitor contaminants; restrict the movement of contaminants; or eliminate potential exposure pathways to contaminants. Institutional controls at the site will include groundwater use restrictions and use restrictions of the site to commercial or industrial purposes.
- **Operation and Maintenance Plan** that describes the measures necessary to operate, monitor, and maintain the cover system.

- **Excavation Work Plan** to assure that post-remediation intrusive activities and soil/fill handling at the Property related to redevelopment, operation, and maintenance are completed in a safe and environmentally responsible manner.
- **Site Monitoring Plan** that includes: provisions for a groundwater monitoring plan and a Property-wide inspection program to assure that the IC/ECs remain effective.
- **Environmental Easement** filed with Monroe County.

5.0 REMEDIAL ACTIVITIES SUPPORT DOCUMENTS

5.1 Health and Safety Protocols

Benchmark-TurnKey has prepared a Health and Safety Plan (HASP) for use by our employees in accordance with 40 CFR 300.150 of the NCP and 29 CFR 1910.120. The HASP, provided in Appendix A, includes the following site-specific information:

- A hazard assessment.
- Training requirements.
- Definition of exclusion, contaminant reduction, and other work zones.
- Monitoring procedures for Site operations.
- Safety procedures.
- Personal protective clothing and equipment requirements for various field operations.
- Disposal and decontamination procedures.

The HASP also includes a contingency plan that addresses potential site-specific emergencies, and a Community Air Monitoring Plan that describes required particulate monitoring to protect the neighboring community during intrusive site remediation activities.

Health and safety activities will be monitored throughout the remedial activities. A member of the field team will be designated to serve as the Site Safety and Health Officer (SSHO) throughout the field program. This person will report directly to the Project Manager and the Corporate Health and Safety Coordinator. The HASP will be subject to revision as necessary, based on new information that is discovered during the field activities.

A Community and Environmental Response Plan (CERP) has been included within the HASP. The CERP details the controls and monitoring to address potential short-term impacts to the surrounding community during remediation.

Based on the adjacent off-site receptors, including commercial retail building to the west and commercial day care facility to the north, a CERP was prepared to address off-site air monitoring and site controls.

5.1.1 Community Air Monitoring

Real-time community air monitoring will be performed during intrusive remedial activities at the Site. A CAMP is included with Benchmark-TurnKey's HASP. Particulate and VOC monitoring will be performed along the downwind perimeter of the work area during excavation, grading and soil/fill handling activities in accordance with this plan. Upwind concentrations will be field monitored at the start and periodically throughout the work day. Monitoring locations will be evaluated throughout the work day, as described in the CAMP. The CAMP is consistent with the requirements for community air monitoring at remediation sites as established by the New York State Department of Health (NYSDOH) and NYSDEC. Accordingly, it follows procedures and practices outlined under NYSDEC's DER-10 (May 2010) Appendix 1A (NYSDOH's Generic Community Air Monitoring Plan) and Appendix 1B (Fugitive Dust and Particulate Monitoring).

In addition to the generic CAMP, a Community and Environmental Response Plan (CERP) has been included within the HASP.

In general, the CERP includes additional off-site volatile organic and dust monitoring of the northern adjacent property during all intrusive activities, and additional CAMP monitoring of the western adjacent property during excavation activities.

Permission of the adjacent property owners will be sought, in conjunction with the Department, to allow access for air monitoring equipment placement.

Additional details of the CERP are included in the HASP (Appendix B).

5.2 Citizen Participation Activities

NYSDEC will coordinate and lead community relations throughout the course of the project with support from Benchmark-TurnKey as requested. The NYSDEC, with input from Benchmark-TurnKey and Springs Land Co., will issue project fact sheets to keep the public informed of remedial activities.

6.0 REPORTING

6.1 Remedial Activities Reporting

Benchmark-TurnKey will be on-Site full-time during the remedial actions to document remedial activities. Monitoring and documentation of the RA activities will include: construction stake-out; record drawings; daily reports of activities; community air monitoring results; post-injection sampling and analysis; and progress photographs and sketches.

6.1.1 Field Construction Monitoring

Standard daily reporting procedures will include preparation of an Inspector's Daily Report and, when appropriate, problem identification and corrective measures reports. Appendix C contains sample project documentation forms. Information that may be included on the daily report form includes:

- Weather and Site conditions.
- Processes and locations of construction under way.
- Equipment and personnel working in the area, including subcontractors.
- Number and type of truckloads of soil/fill removed from the site.
- Approximate sampling locations (sketches) or GPS (Trimble) coordinates and sample designations for pre-excavation characterization.
- Excavation locations and depths being excavated.

The completed reports will be available on-site and submitted to the NYSDEC as part of the Final Engineering Report. The NYSDEC will be promptly notified of problems requiring modifications to this Work Plan prior to proceeding or completion of the construction item.

Photographic documentation of the remedial activities will be prepared by a field representative throughout the duration of the project as necessary to convey typical work activities, changed conditions, and/or special circumstances.

6.2 Final Engineering Report

A Final Engineering Report (FER) will be prepared at the conclusion of remedial activities. The FER will include the following information and documentation, consistent with the NYSDEC's DER-10:

- Introduction and background.
- A Site or area planimetric map showing the parcel(s) remediated, including significant site features.
- A Site map showing the lateral limits of any excavations.
- Tabular summaries of unit quantities including: volume of soil excavated and disposition of excavated soil.
- Documentation on the disposition of impacted soil removed from the Site.
- Documentation of the cover system, including survey elevations and licensed professional engineer stamped record drawings.
- Copies of daily inspection reports and, if applicable, problem identification and corrective measure reports.
- Photo documentation of remedial activities.
- Text describing the remedial activities performed; a description of any deviations from the Work Plan and associated corrective measures taken; and other pertinent information necessary to document that the Site activities were carried out in accordance with this Work Plan.

In addition, Benchmark-TurnKey will subcontract for third-party data review of post-excavation verification data by a qualified, independent data validation expert. Specifically, a Data Usability Summary Report (DUSR) will be prepared, with appropriate data qualifiers added to the results. The DUSR format will follow the NYSDEC's September 1997 DUSR guidelines and draft DER-10 guidance. The DUSR and any necessary qualifications to the data will be appended to the FER.

6.3 Site Management Plan

As described in Section 3.9, a SMP will be submitted for the Site. The SMP will include an: Engineering and Institutional Control Plan; Operation and Maintenance Plan; Excavation Plan; a Site Monitoring Plan; and, an Environmental Easement.

7.0 PROJECT SCHEDULE

The anticipated project schedule for the major tasks to be performed during implementation of the Remedial Action are planned as follows:

- *June 2016 – NYSDEC Review of Remedial Action Work Plan*
- *August-September 2016 – Complete Pre-Assessment*
- *October-November 2016 – Complete AOC 1 activities*
- *Winter 2016/2017 – Complete AOC 2 activities*
- *Spring 2017 – Complete AOC 3 activities*
- *Summer 2017 – Complete Monitoring Plan*
- *Summer-Fall 2017 – Submit draft Site Management Plan and Final Engineering Report*
- *Fall 2017 – Submit final SMP and FER*
- *December 2017 – Receive Certifcate of Completion*

8.0 REFERENCES

1. Benchmark Environmental Engineering and Science, PLLC, in association with TurnKey Environmental Restoration, LLC. *In-Situ Chemical Oxidation Pilot Study Work Plan, Carriage Cleaners – Penfield Site (C828131)*. Revised January 2015.

2. LaBella Associates, P.C. (LaBella). Phase *II Environmental Site Assessment Report*, Carriage Cleantown, 1600 Penfield Road, Town of Penfield, Monroe County, New York. June 2002.

3. LaBella. *Remedial Investigation Report*, Carriage Cleantown, 1600 Penfield Road, Town of Penfield, Monroe County, New York. June 2009, Revised February 2011.

4. LaBella. *Interim Remedial Measures*, Carriage Cleantown, 1600 Penfield Road, Town of Penfield, Monroe County, New York. July 2009, revised February 2011.

5. LaBella. *Remedial Alternatives Analysis Report*, 1600 Penfield Road, Penfield, New York. July 2009.

6. MACTEC. *Remedial Investigation Report – Off-Site Carriage Cleaners RI*, April 2012

7. New York State Department of Environmental Conservation. *DER-10; Technical Guidance for Site Investigation and Remediation.* May 2010.

TABLE

TABLE 1

SUMMARY OF PRE- AND POST- ISCO PILOT STUDY GROUNDWATER ANALYTICAL RESULTS

1600 PENFIELD ROAD SITE

PENFIELD, NEW YORK

Parameter	GWQS	Sample Location								
		MW-2 (Hydrogen Peroxide)						MW-7 (PersulfOx)		
		Historic	Historic	Post IRM	Pre-ISCO	Post-ISCO		Historic	Pre-ISCO	Post-ISCO
		11/2/2005[2]	11/21/2005	3/3/2008	4/8/2015	4/10/2015	4/29/2015	4/5/2005	4/8/2015	4/29/2015
Volatile Organic Compounds (VOCs) - ug/L										
Chloroform	**7**	--	--	<50	ND<0.34	ND<6.8	ND<0.68	--	ND<0.34	0.79 J
Chloromethane (Methyl chloride)	**--**	--	--	<50	ND<0.35	ND<7.0	ND<0.70	--	ND<0.35	23
1,1-Dichloroethene	**5**	3.6	2.7	<50	1.7	1.7	ND<0.58	1.7	2.7	ND<0.58
cis-1,2-Dichloroethene	**5**	2,100	1400 D	810	840	120	76	800 D	950	130
trans-1,2-Dichloroethene	**5**	16	10	<50	6.2	7.3	ND<1.8	10	9.3	22
Tetrachloroethene	**5**	2,500	1900 D	1,400	850	1000 D	97 D	<1.0	5.7	4.4
Trichloroethene	**5**	1,200	900 D	260	310	460	28	<1.8	21	9.5
Vinyl chloride	**2**	25	21	31 J	58	56	12	130	78	7.1
Total cVOCs	**--**	5,845	4,234	2,501	2,066	1,645	213	942	1,067	173
Attentuation and Field Parameteters										
Iron-Total (ug/L)		--	--	--	11.4	11.8	--	--	16.3	38
Iron- Dissolved (ug/L)		--	--	--	ND<0.05	ND<0.05	--	--	ND<0.05	ND<0.05
Sulfate (ug/L)		--	--	--	--	--	--	--	150	135
pH (units)		--	--	--	6.83	6.62	7.01	--	6.93	6.42
Temperature (°C)		--	--	--	9.2	10.4	11.4	--	7.9	13.1
Specific Conductance (uS)		--	--	--	1782	1497	4851	--	664	985
Turbidity		--	--	--	97.9	358	39	--	641	275
ORP (mV)		--	--	--	95	149	-14	--	114	182
DO (ppm)		--	--	--	5.29	12.5	3.09	--	5.87	2.73

Notes:

1. Only those parameters detected above their reporting limit at a minimum of one sample location are presented in this table.
2. Laboratory analyized the 11/2/2005 samples outside of of their holding times, therefore the wells were resampled on 11/21/2005

Definitions:

ND = Parameter not detected above laboratory detection limit.

D = Identifies all compunds identified in an alalysis at the secondary dilution factor

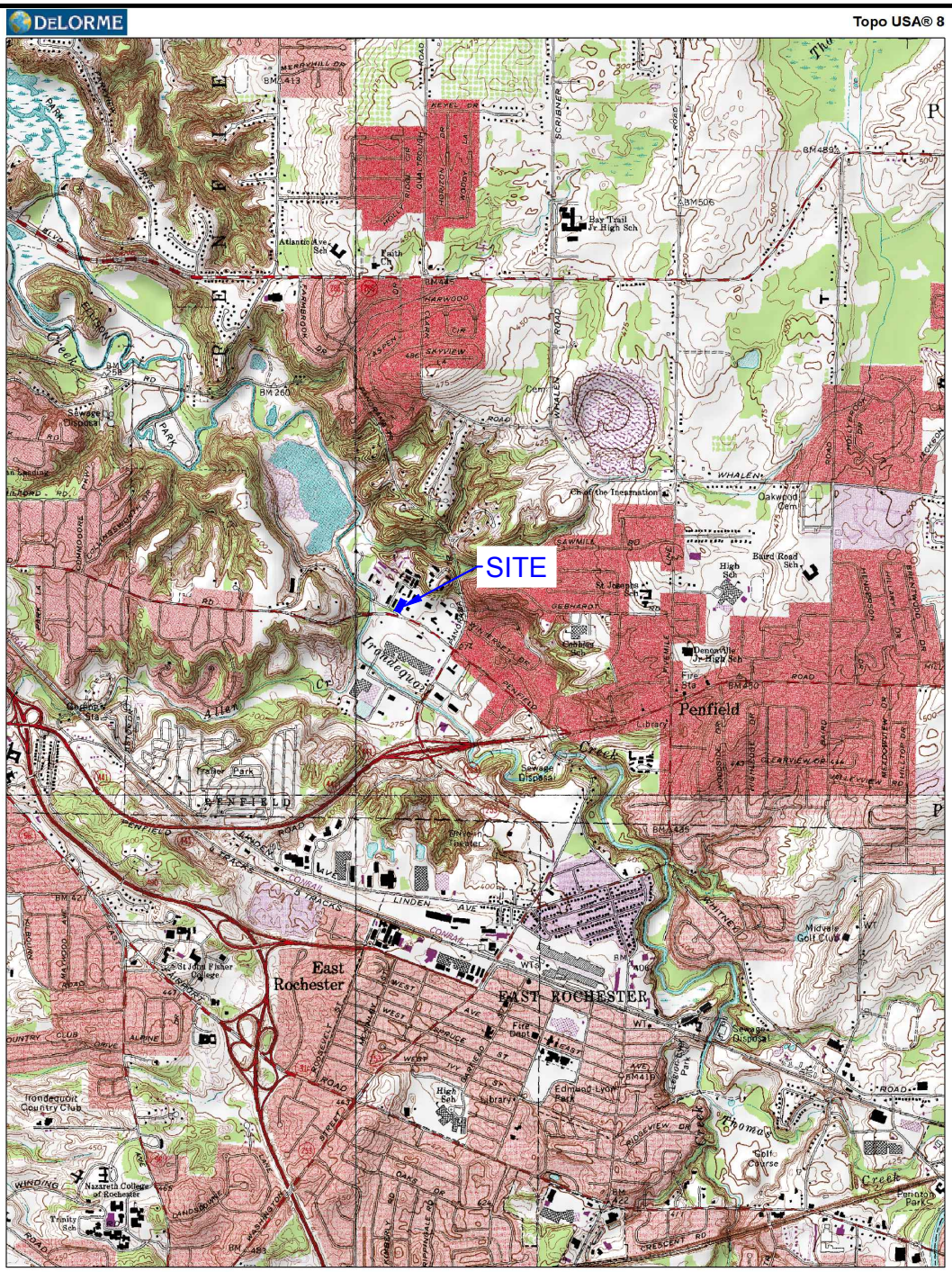
J = Denotes an estimate value that is less than the reported method detection limit, but greater than zero

"--" = No groundwater quality standard available; Not analyzed for.

FIGURES

F:\CAD\TurnKey\Spring Land Company\1600 Penfield Rd\RAWP\Figure 1; Site Location and Vicinity Map.dwg

FIGURE 1



BENCHMARK ENVIRONMENTAL ENGINEERING & SCIENCE, PLLC

TURNKEY ENVIRONMENTAL RESTORATION, LLC

2558 HAMBURG TURNPIKE, SUITE 300, BUFFALO, NY 14218, (716) 856-0599

PROJECT NO.: 0295-016-001

DATE: JUNE 2016

DRAFTED BY: KRR

SITE LOCATION AND VICINTY MAP

REMEDIAL ACTION WORK PLAN

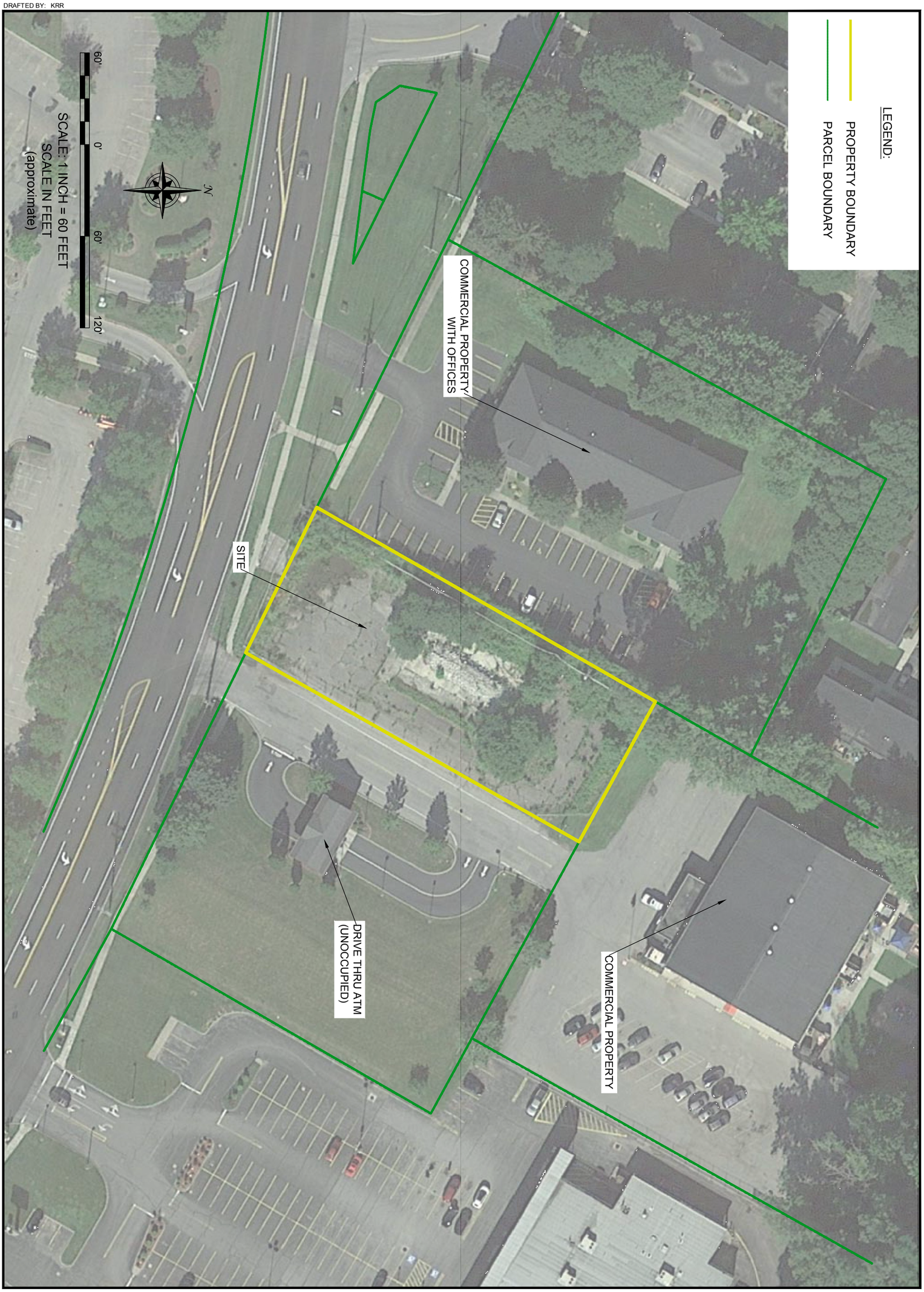
CARRIAGE CLEANERS - PENFIELD SITE
1600 PENFIELD ROAD SITE
PENFIELD, NEW YORK

PREPARED FOR

SPRINGS LAND COMPANY, LLC

F:\CAD\TurnKey\Spring Land Company\1600 Penfield Rd\RAWP\Figure 2; Site Plan (Aerial).dwg

DATE: JUNE 2016
DRAFTED BY: KRR



SITE PLAN (AERIAL)

REMEDIAL ACTION WORK PLAN

CARRIAGE CLEANERS - PENFIELD SITE
1600 PENFIELD ROAD SITE
PENFIELD, NEW YORK

PREPARED FOR

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FIGURE 2

BENCHMARK ENVIRONMENTAL ENGINEERING & SCIENCE, PLLC
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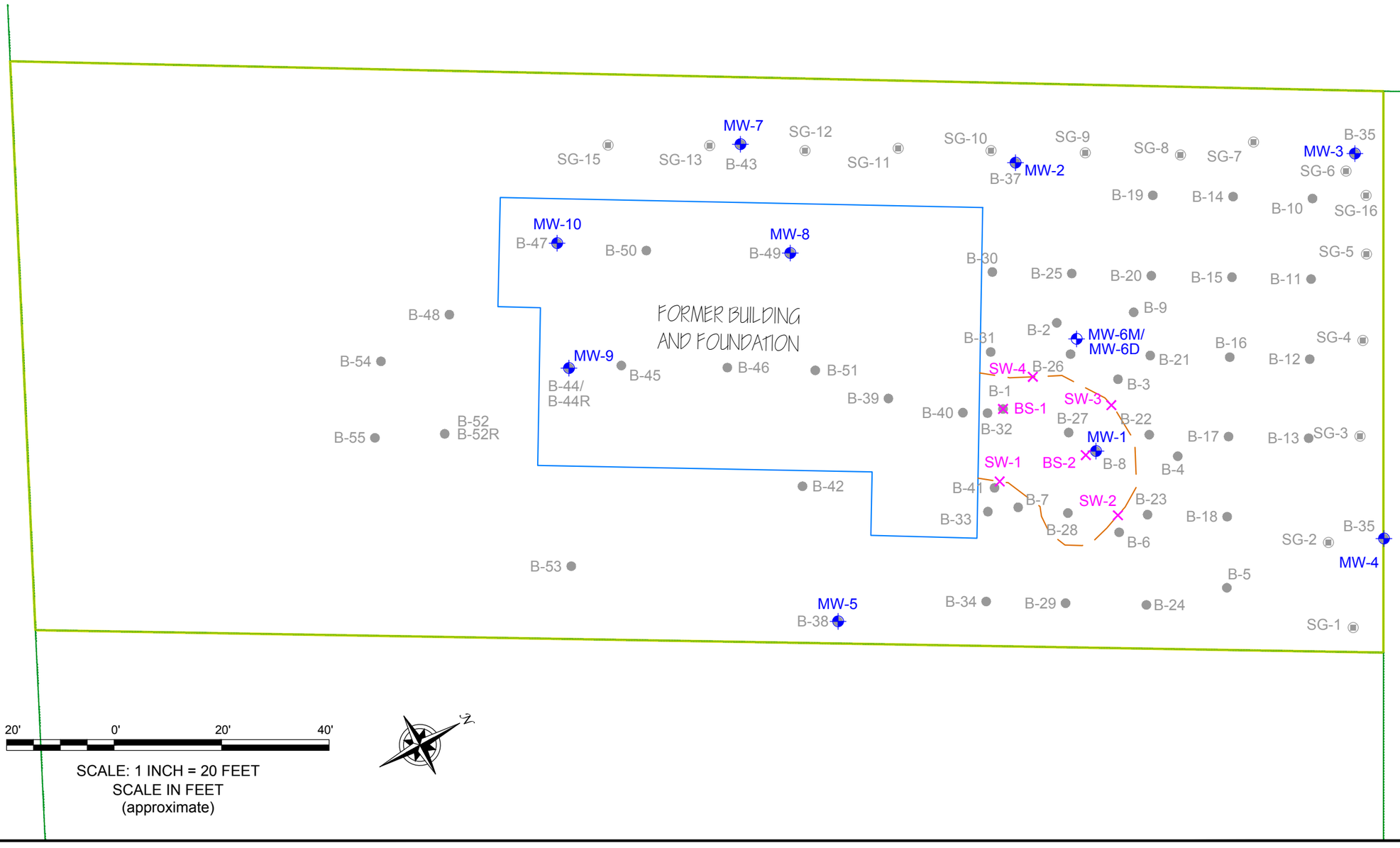
JOB NO.: 0295-016-001

F:\CAD\TurnKey\Spring Land Company\1600 Penfield Rd\RAWP\Figure 3; Historic Sample Locations and Building Foundations.dwg

LEGEND:

- PROPERTY BOUNDARY
- PARCEL BOUNDARY
- LOCATION OF IRM EXCAVATION 2007
- B-40 SOIL BORING LOCATIONS
- SG-15 SOIL GAS LOCATIONS
- BS-2 IRM SAMPLE LOCATIONS
- MW-1 MONITORING WELL LOCATIONS



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JOB NO.: 0295-016-001

HISTORIC INVESTIGATION AND CONFIRMATORY SAMPLE LOCATIONS

REMEDIAL ACTION WORK PLAN

CARRIAGE CLEANERS - PENFIELD SITE
1600 PENFIELD ROAD SITE
PENFIELD, NEW YORK

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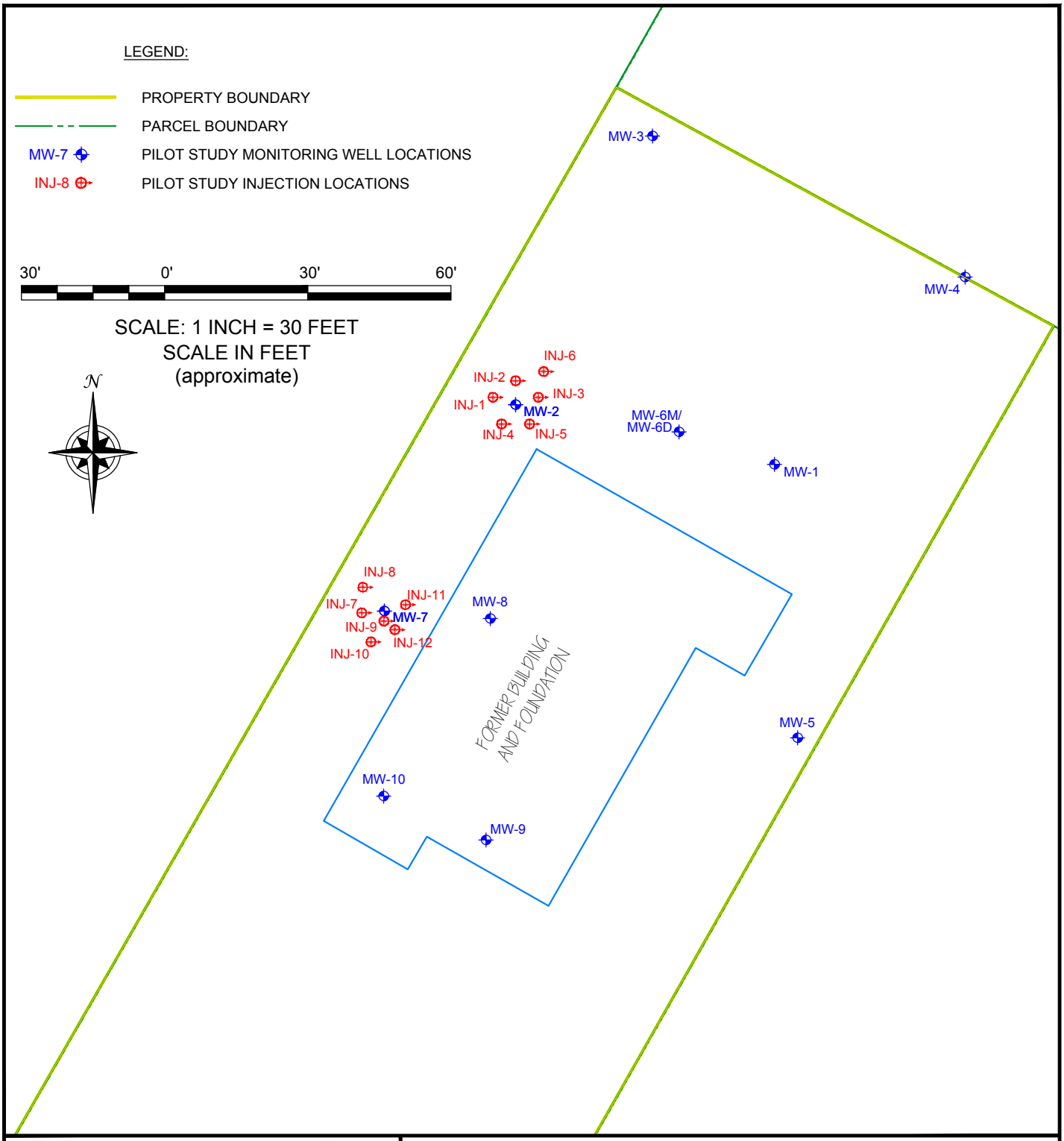
FIGURE 3

F:\CAD\TurnKey\Spring Land Company\1600 Penfield Rd\RAWP\Figure 4; Pilot Study Locations.dwg

FIGURE 4



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PILOT STUDY INVESTIGATION LOCATIONS

REMEDIAL ACTION WORK PLAN

CARRIAGE CLEANERS - PENFIELD SITE
1600 PENFIELD ROAD SITE
PENFIELD, NEW YORK

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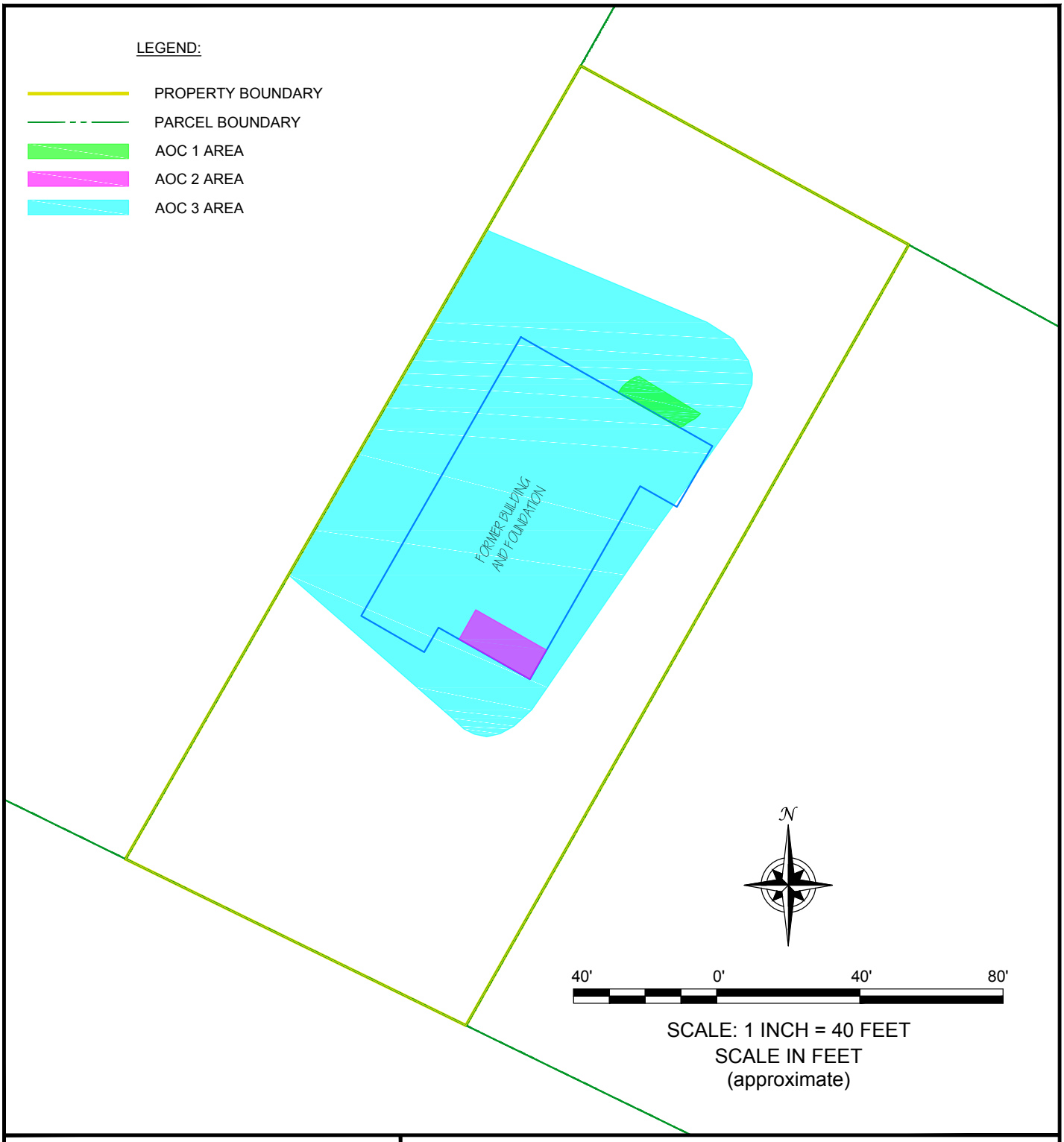
F:\CAD\TurnKey\Spring Land Company\1600 Penfield Rd\RAWP\Figure 5; IRM Excavation Areas.dwg

FIGURE 5



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AOC AREAS

REMEDIAL ACTION WORK PLAN

CARRIAGE CLEANERS - PENFIELD SITE
1600 PENFIELD ROAD SITE
PENFIELD, NEW YORK

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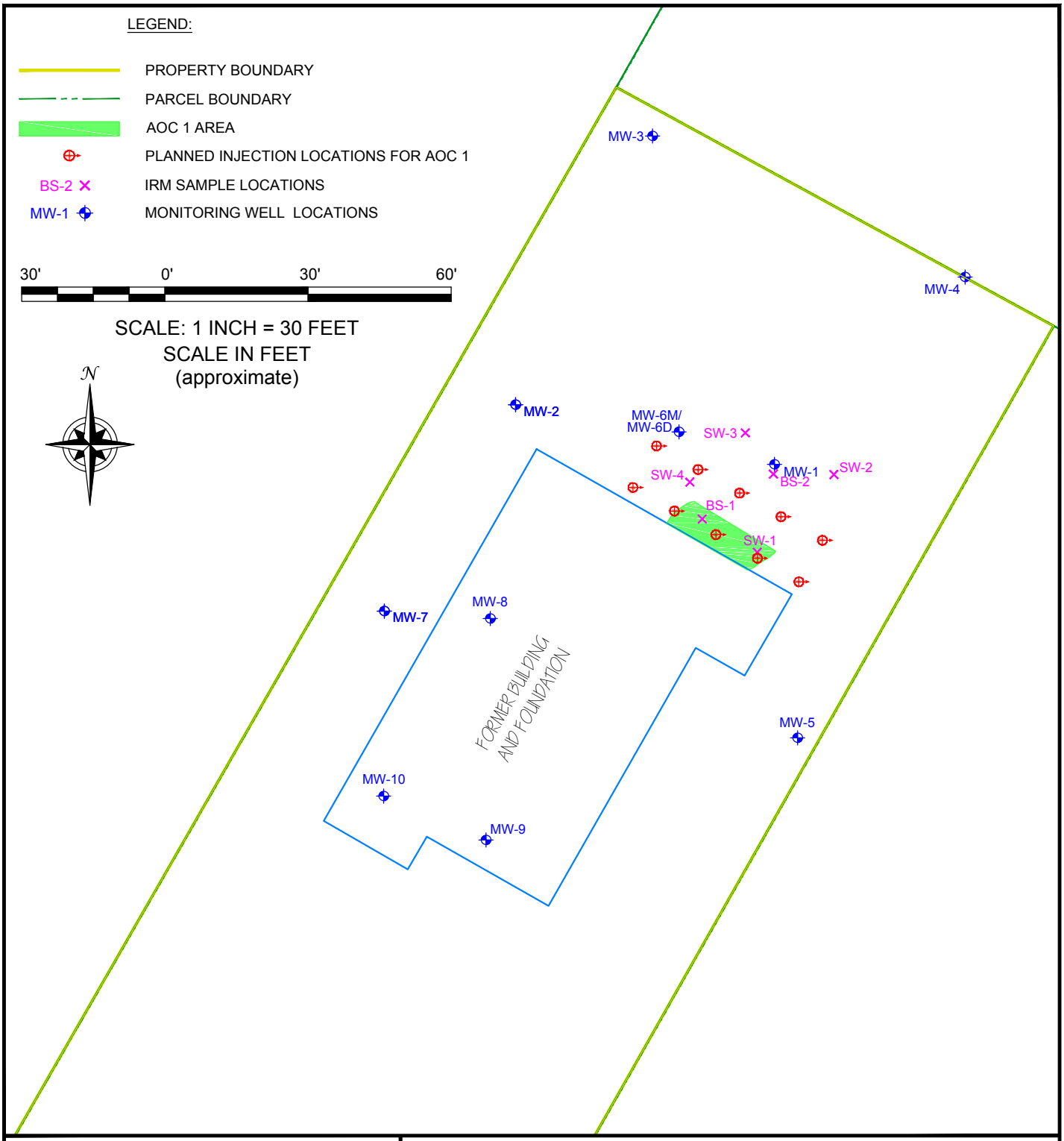
F:\CAD\TurnKey\Spring Land Company\1600 Penfield Rd\RAWP\Figure 6; ISCO Chemical Oxidation (AOC 1).dwg

FIGURE 6



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PROJECT NO.: 0295-016-001

DATE: JUNE 2016

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AOC 1 ISCO INJECTION PLAN

REMEDIAL ACTION WORK PLAN

CARRIAGE CLEANERS - PENFIELD SITE
1600 PENFIELD ROAD SITE
PENFIELD, NEW YORK

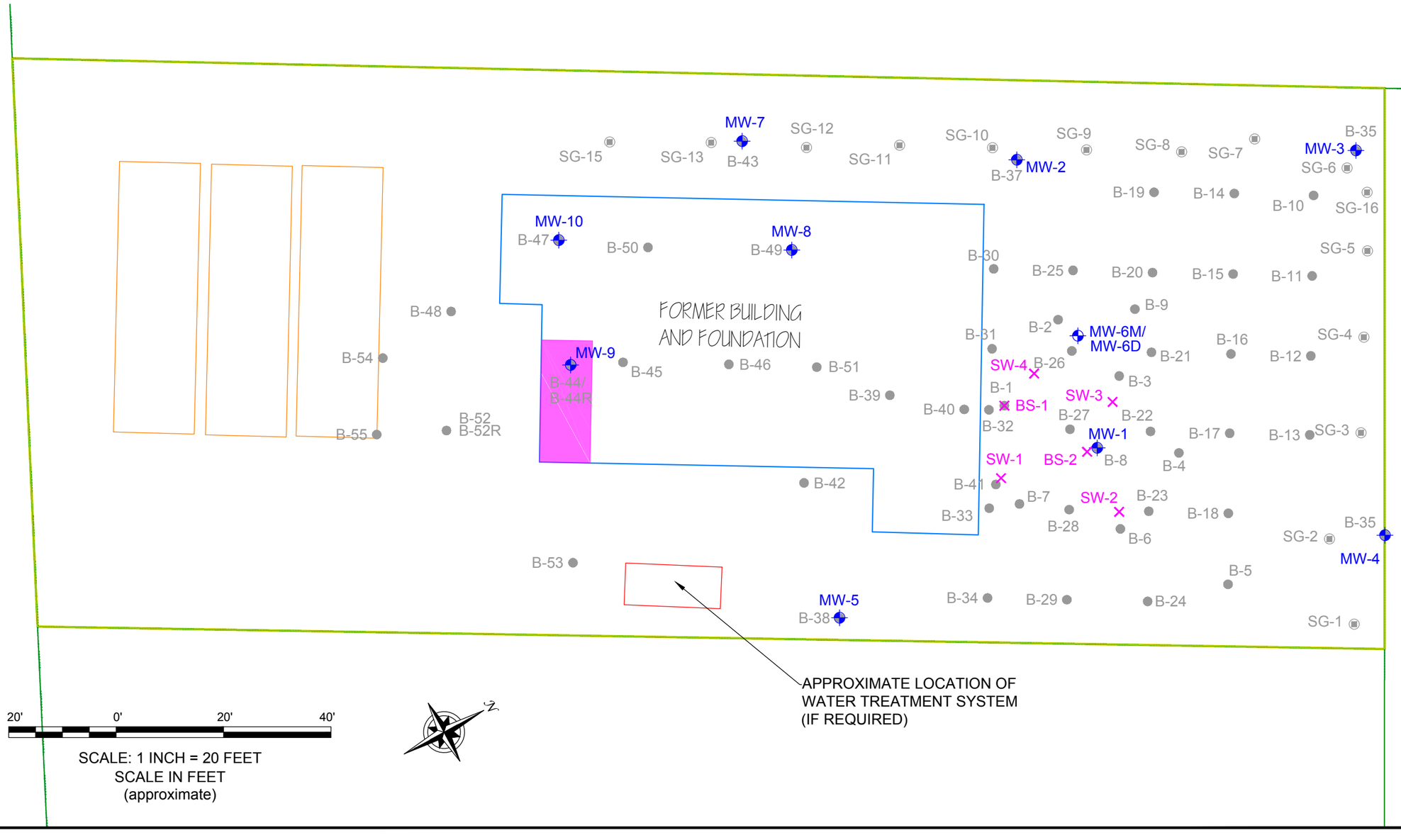
PREPARED FOR

SPRINGS LAND COMPANY, LLC

F:\CAD\TurnKey\Spring Land Company\1600 Penfield Rd\RAWP\Figure 7; AOC Area 2 Excavation and Soil Staging .dwg

LEGEND:

- PROPERTY BOUNDARY
- PARCEL BOUNDARY
- AOC 2 AREA
- APPROXIMATE LOCATION OF SOIL STAGING AREA
- B-40 SOIL BORING LOCATIONS
- SG-15 SOIL GAS LOCATIONS
- BS-2 CONFIRMATORY SAMPLE LOCATIONS
- MW-1 MONITORING WELL LOCATIONS



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JOB NO.: 0295-016-001

AOC 2 AREA EXCAVATION AND SOIL STAGING AREA

REMEDIAL ACTION WORK PLAN

CARRIAGE CLEANERS - PENFIELD SITE
1600 PENFIELD ROAD SITE
PENFIELD, NEW YORK

PREPARED FOR

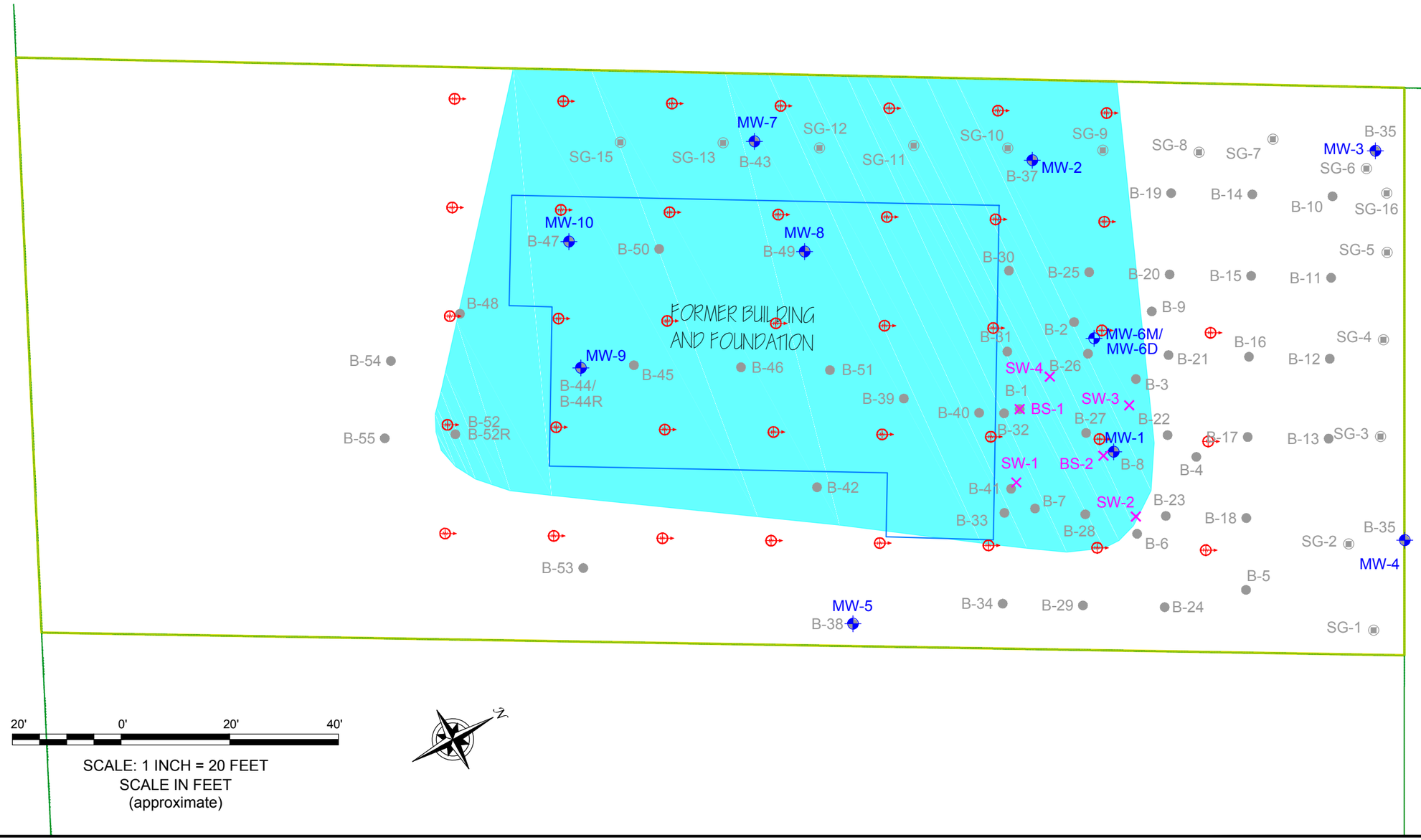
SPRINGS LAND COMPANY, LLC

FIGURE 7

F:\CAD\TurnKey\Spring Land Company\1600 Penfield Rd\RAWP\Figure 8; ISCO Chemical Oxidation (AOC 3).dwg

LEGEND:

- PROPERTY BOUNDARY
- PARCEL BOUNDARY
- AOC 3 AREA
- PLANNED INJECTION LOCATIONS
- B-40 SOIL BORING LOCATIONS
- SG-15 SOIL GAS LOCATIONS
- BS-2 IRM SAMPLE LOCATIONS
- MW-1 MONITORING WELL LOCATIONS



20' 0' 20' 40'

SCALE: 1 INCH = 20 FEET
SCALE IN FEET
(approximate)

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DATE: JINE 2016
DRAFTED BY: KRR

BENCHMARK ENVIRONMENTAL ENGINEERING & SCIENCE, PLLC

2558 HAMBURG TURNPIKE, SUITE 300, BUFFALO, NY 14218, (716) 856-0599

TURNKEY ENVIRONMENTAL RESTORATION, LLC

JOB NO.: 0295-016-001

AOC 3 ISCO INJECTION PLAN

REMEDIAL ACTION WORK PLAN
CARRIAGE CLEANERS - PENFIELD SITE
1600 PENFIELD ROAD SITE
PENFIELD, NEW YORK
PREPARED FOR
SPRINGS LAND COMPANY, LLC

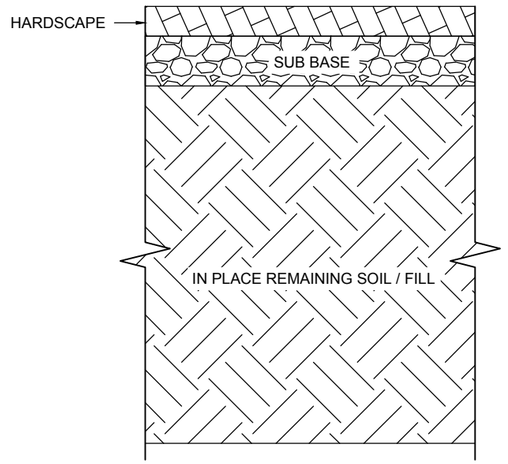
FIGURE 8

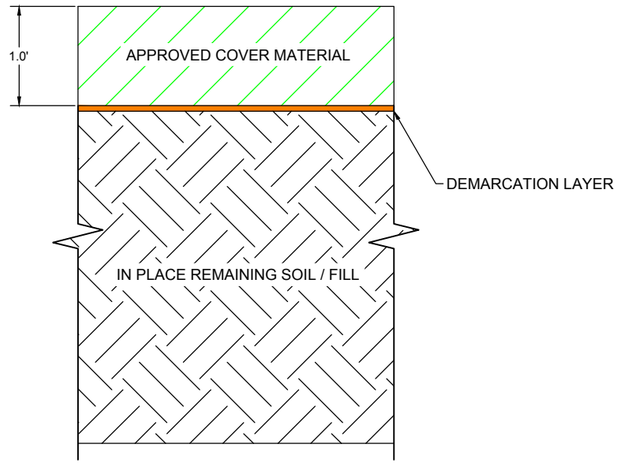
F:\CAD\TurnKey\Spring Land Company\1600 Penfield Rd\RAWP\Figure 9; Cover System and Detail.dwg

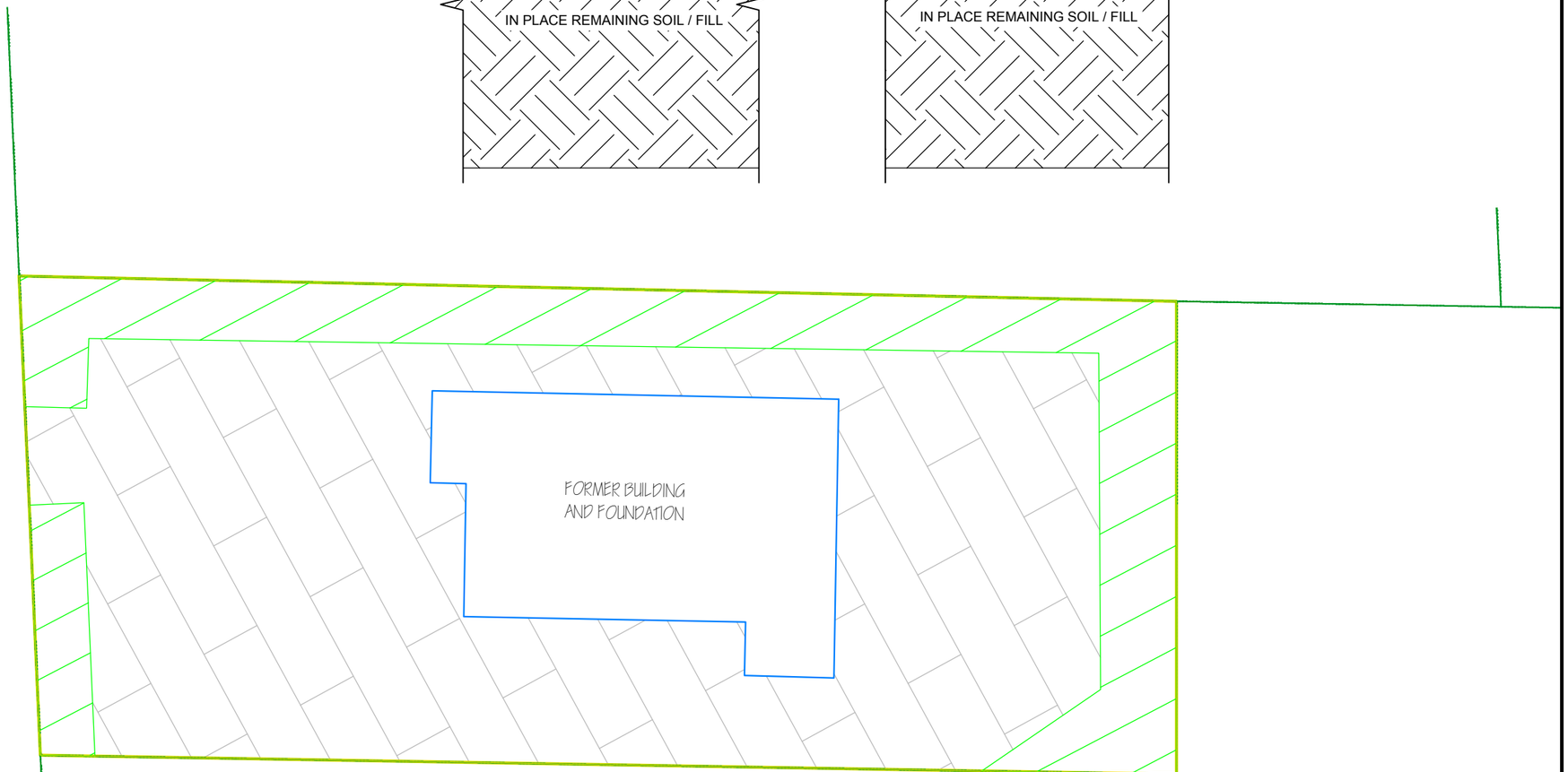
COVER SYSTEM DETAILS

LEGEND:

- PROPERTY BOUNDARY
- PARCEL BOUNDARY
- SOIL COVER SYSTEM
- HARDSCAPE (ASPHALT)







20' 0' 20' 40'

SCALE: 1 INCH = 20 FEET
SCALE IN FEET
(approximate)

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TURNKEY ENVIRONMENTAL RESTORATION, LLC

2558 HAMBURG TURNPIKE, SUITE 300, BUFFALO, NY 14218, (716) 856-0599

JOB NO.: 0295-016-001

COVER SYSTEM LOCATION AND DETAIL

REMEDIAL ACTION WORK PLAN

CARRIAGE CLEANERS - PENFIELD SITE
1600 PENFIELD ROAD SITE
PENFIELD, NEW YORK

PREPARED FOR

SPRINGS LAND COMPANY, LLC

FIGURE 9

APPENDIX A

RESUMES

THOMAS H. FORBES, P.E.
PRINCIPAL ENGINEER

EDUCATION

BS (Chemical Engineering) 1988; State University of New York at Buffalo
Graduate of State University of New York at Buffalo School of Management Center for Entrepreneurial Leadership; 2002
Graduate-level courses in Biological Principles of Engineering and Hazardous Waste Management through the State University of New York at Buffalo Department of Environmental Engineering

REGISTRATION AND AFFILIATIONS

Professional Engineer, New York
Professional Engineer, Ohio
ISO 14000 Certified Lead Auditor - April 1998
Member - American Institute of Chemical Engineers
Member – New York Water Environment Association, Inc.

SUMMARY OF EXPERIENCE

Mr. Forbes has over 26 years of environmental engineering experience, with a particular focus on brownfield and hazardous waste site investigation and remediation; petroleum-impacted site remediation; due diligence for environmentally-impaired properties; groundwater and industrial wastewater treatment; and environmental regulatory compliance. Investigations and cleanups Mr. Forbes has directed have included well over 100 sites contaminated with a wide range of materials, including chlorinated solvents, PCBs, dioxins, heavy metals, cyanide, radioactive isotopes, and petroleum contamination. He has evaluated and successfully implemented on a conventional and design-build basis cost-saving and innovative treatment technologies (e.g. in-situ and ex-situ physical-chemical, thermal, and biological treatment) as well as removal and containment methods for remediation.

REPRESENTATIVE PROJECT EXPERIENCE

June 1998 to Present: **Benchmark Environmental Engineering & Science, PLLC**

- Served as project manager for the investigation and hydrogeological assessment of the 2001 Webster Block site on behalf of the City of Buffalo. Work included a Phase II Site investigation, underground storage tank removal, groundwater pump test, and utility capacity evaluation performed under USEPA Pilot grant.

- Currently serving as Project Officer for NYSDEC Brownfield Cleanup Program (BCP) investigation and remediation of the former Millard Fillmore Gates Circle hospital complex in Buffalo, NY.

- Project officer for NYSDEC BCP investigation and cleanup of 154 South Ogden Street in concert with construction of the South Buffalo Charter School.

- Serving as project manager for remedial investigation, alternatives analysis, and remedial construction to facilitate redevelopment of over 450-acres of former steel manufacturing site property encompassing 33 separate BCP sub-parcel sites in Lackawanna, New York. Contaminants of concern primarily include petroleum organics/solvents and heavy metals.

- Project manager for RI/FS, remedial design and remedial construction at the Sycamore Village Site, a 4-acre NY State Environmental Restoration Program (ERP) site in Buffalo, NY. Responsible for all technical and administrative aspects of the project, involving removal of over 18,000 cubic yards of soil from an impacted residential neighborhood and site restoration.

- Assisted western NY client's legal counsel prepare legal defense related to a multi-PRP suit by Orange County Water District, Fullerton, CA for primary drinking water aquifer contamination by chlorinated solvents and emergent organic contaminants. Served as technical consultant during mediation and settlement discussions; prepared expert report and lead technical arguments on behalf of defendant to support bankruptcy claim dismissal.

- Served as project manager and supervising contractor for design-build remedial activities at the Markhams National Priority List (NPL) site in Dayton, NY. Successfully implemented remedial measures leading to USEPA-designated Preliminary Site Closeout status in October 2008 and delisting in 2009.

- Served as project manager representing multiple potential responsible party (PRP)-led remedial construction activities to address heavy metal and chlorinated solvent impacts at the Peter Cooper Landfill NPL site. Responsible for oversight and coordination of RI/FS planning and implementation activities, lead technical contact with USEPA, and remedial measures design and construction. Achieved site closeout in 2011.

- Served as project manager for design-build cleanup of the Urbana Landfill Site, a Class 2 Hazardous Waste Landfill Site. Designed and successfully implemented a Soil Vapor Extraction system to address source area chlorinated organics in soils, achieving soil cleanup goals with 12 months, Also responsible for design, startup and continued operation of a downgradient perimeter groundwater extraction well system and groundwater remediation utilizing advanced oxidation treatment.

- Assisted in the development of a voluntary cleanup plan for remediation of a 120-acre former steel manufacturing site in Buffalo, NY which was contaminated with volatile organic compounds, heavy metals, poly-nuclear aromatic hydrocarbons. Specific assistance involved design of a soil vapor extraction (SVE) system to address VOC and SVOC source area impacts proximate to a residential neighborhood and development and implementation of a Community Air Monitoring Plan involving quantitative monitoring (Summa Canister and respirable particulate analysis) and qualitative monitoring (field instruments).

- Served as Project Manager for RI/FS and cleanup activities related to solvent releases from a former paint and specialty coatings manufacturing facility in Buffalo, NY. The work, carried out under NY State Superfund program, included insitu treatment of soils and groundwater impacted by chlorinated and non-chlorinated volatile organics and heavy metals.

- Assisted confidential client's legal counsel negotiate a consent decree with New Mexico Environment Department related to cleanup of chlorinated solvent releases to the fractured bedrock aquifer from a former manufacturing operation in Albuquerque, NM. Presently managing insitu groundwater cleanup and monitoring work.

- Currently serving as Project Manager for NY State Voluntary Cleanup efforts for chlorinated solvent cleanup at a former degreasing and electroplating facility in Rochester, NY. Designed and implemented interim remedial measures involving low-profile air stripping and insitu hydrogen infusion.

- Served as Project Manager for multiple EPA Pilot-Grant funded investigations for City of Buffalo Department of Strategic Planning.

- Project manager for remedial investigation, alternatives analysis, and remedial construction to facilitate redevelopment of over 450-acres of former steel manufacturing site property in Lackawanna, New York. Contaminants of concern primarily include petroleum organics and heavy metals.

- Managed design-build cleanup of former New 7th Street Brownfield Cleanup Program Site in Buffalo, New York. The project involved design-build removal of several hundred tons of petroleum-impacted soil and fill material and preparation of related engineering reports resulting in Certificate of Completion issuance.

- Led remedial efforts for petroleum releases at a Western New York refinery and major oil storage facility, achieving site inactivation within 3 months of the release.

- Managed spill site investigation and cleanup work including underground storage tank removal work at numerous petroleum and chemical spill sites in Western New York.

- Led design-build construction of a 5 MGD capacity cooling water pH adjustment system for PVS Chemical Corporation. The project included design of feed forward pH control system, adjustment tank and mixer construction, process and chemical feed piping modifications to neutralize sulfuric acid discharges. Successfully implemented startup and demonstration testing.

- Designed a 75 gpm groundwater treatment system and served as quality assurance officer for remedial efforts at the Steelfields site (former LTV Steel/Hanna Furnace Site), Buffalo, NY. The treatment system removes petroleum-based volatile organic and semi-volatile organic compounds prior to discharge to the Buffalo Sewer Authority.

June 1988 to June 1998 **Malcolm Pirnie, Inc.**

- Assisted the City of Buffalo Department of Community Development in implementing an emergency PCB-contaminated soil removal effort from a residential neighborhood in Buffalo, NY. Responsibilities included coordination of hazmat excavation contractor and secure landfill, preparation of an emergency excavation and confirmatory sampling plan, and oversight of community air monitoring during the removal work.

- Designed and successfully implemented an innovative groundwater treatment system for the Mercury Aircraft, Inc. Class 2 hazardous waste site in Dresden, New York. Responsibilities included preparation of design plans and specifications for an advanced oxidation process and low profile air stripper, construction oversight and treatment system start-up.

- Performed a Feasibility Study and prepared an Engineering Design Report for remediation of PCB-contaminated soils and sediments at the Columbus McKinnon Corporation, Tonawanda, New York. Responsibilities included detailed evaluation of several remedial processes, completion of design calculations and remedial cost estimates, and preparation of a final report for submission to NYSDEC.

- Assisted in performance of a Feasibility Study for the West Valley Nuclear Demonstration Site. The Feasibility Study evaluated alternatives for remediation of groundwater contaminated with radioactive isotopes from a former containment area release.

- Assisted in the design and performed start-up of a groundwater remediation system for Moog, Inc., an aerospace parts manufacturer. The project, performed on a design-build basis, involved preparation of design plans, securing contractor bids for construction, and start-up of the remediation system, which incorporates filtration and air stripping to remove chlorinated volatile organic contaminants from groundwater.

- Designed and implemented groundwater monitoring well decommissioning procedures for the Love Canal site, Niagara Falls NY. The project was performed on behalf of NYSDEC and included abandoning of monitoring wells no longer used in the Love Canal landfill or in adjoining neighborhoods.

- Prepared an environmental monitoring plan for remediation of PCB-contaminated sediments in the St. Lawrence River along the General Motors, Inc. Powertrain Division facility in Massena, New York.

- Assisted in the performance of a Feasibility Study for remediation of volatile organic, PCB and heavy metal-contaminated soils and ground water at the Rochester Fire Academy, Rochester, New York.

PUBLICATIONS/PRESENTATIONS

Forbes, Thomas H. and Frappa, Richard H. "Innovative Remedial Measures for the Mercury Aircraft Site" Proceedings of the Purdue University 50th Annual Industrial Waste Conference, May 1995.

Frappa, Richard H., Forbes, Thomas H. and McManus, Anne Marie "A Blast to Remediate" Industrial Wastewater, July/August 1996.

Forbes, Thomas H. and McManus, Anne Marie "Advanced Oxidation Technology and Application" Proceedings of the University at Buffalo 28th Mid-Atlantic Industrial and Hazardous Waste Conference, July 1996.

Forbes, Thomas H. et al - "Pay to Throw in Buffalo" Proceedings of 1997 Solid Waste Association of North America annual conference.

Forbes, T.H. & Werthman, P.H. "Development of Site-Specific Cleanup Levels for Commercial Redevelopment of a Large Former Steel Works," presented at the Brownfields 2000 Conference, Atlantic City NJ, October 2000.

Forbes, Thomas H. and Frappa, Richard H. "Innovative Remedial Measures Almost 10 Years Later at the Former Mercury Aircraft Site" Proceedings of the National Groundwater Association Northeast Conference, October 2002.

Forbes, Thomas H. "Ins and Outs of the New York State Brownfield Cleanup Program" Air & Waste Management Association, Niagara Frontier Section, Annual Environmental Seminar (presentation), April 2006.

Forbes, Thomas H. "Brownfield Redevelopment" Proceedings of Half Moon Seminar's "New York Environmental Compliance for Design Professionals" conference, September 2008.

Forbes, Thomas H. "New York State Brownfield Cleanup Program Update" Air & Waste Management Association Annual Environmental Seminar (presentation), April 2009.

MICHAEL LESAKOWSKI
SR. PROJECT MANAGER

EDUCATION

Master of Science (Environmental Engineering Science), University of Buffalo, 2008
Bachelor of Science (Biology), State University of New York at Fredonia, 1994

REGISTRATION

40-Hour OSHA Health and Safety Training
Annual 8 Hour OSHA Refreshers
ASTM Training for Commercial Property Transaction Due Diligence

SUMMARY OF EXPERIENCE

Mr. Lesakowski has over 15 years experience in the environmental consulting field at numerous industrial, commercial and hazardous waste sites throughout the northeast United States. A summary of projects Mr. Lesakowski has been involved with include all aspects of New York Brownfield Cleanup Program projects, New York State Superfund Program projects, New York Petroleum Spills Department projects, over 1,000 Phase I Environmental Site Assessments and more than 200 Phase II Site Investigations associated with property acquisition and divestiture and numerous remediation projects ranging from simple underground storage tank (UST) removals to complex groundwater remediation programs. Mr. Lesakowski is proficient in vapor intrusion modeling of chlorinated solvent and petroleum volatile organic compound (VOC) impacted sites. Mr. Lesakowski also has project management and technical consulting experience on several multi-site portfolio environmental due diligence assignments, working with purchasers and lenders to facilitate multi-million dollar real estate transactions. Prior to joining Benchmark, Mr. Lesakowski was a principal in an environmental consulting firm with offices in New York, Pennsylvania, Ohio and Maryland. Mr. Lesakowski is currently managing ten New York Brownfield Cleanup Program sites and several New York Spill Sites. He has managed assessments, investigations and remediation projects on properties with a multitude of historic uses (e.g., petroleum storage terminals, gas stations, automobile dealerships, rail yards, foundries, drycleaners, steel manufacturing, metallurgical plants, metal plating operations, junk yards), media types (surface and subsurface soil, groundwater, sediments, soil vapor, indoor air, building materials) and contaminants (e.g, VOCs, semi-volatile organic compounds (SVOCs), polychlorinated biphenyls (PCBs), heavy metals).

NEW YORK BROWNFIELD CLEANUP PROGRAM EXPERIENCE

348 Langner Road Site, West Seneca, New York

- Recently completed a Remedial Investigation and Interim Remedial Measures (IRM) for a property that was formerly developed as a retail gasoline station since the 1940s. Contaminants of concern include petroleum VOCs in soil and groundwater. The IRM included removal of over 8,000-tons of petroleum-impacted soil and removal of eight underground storage tanks (USTs) and related infrastructure and piping. During the remedial work, certain soil that was not impacted was field-screened on-Site, characterized via analytical testing to show that it was not impacted with contaminants of concern, and transported off-Site to an approved destination site with permission from NYSDEC. This screening of on-site materials saved our client over 4,000 cubic yards of material that would have otherwise been sent to a landfill at significant additional cost.

285-295 Niagara Street Site, Buffalo, New York

- Recently completed a Remedial Work for a property that was formerly developed as a bicycle factory from the 1800s, and a car wash and gasoline station since the 1950s. Contaminants of concern include petroleum VOCs in soil and groundwater. The remedial work included removal of approximately 4,500-tons of petroleum-impacted soil and removal of two underground storage tanks (USTs) that were encountered during excavation. During the remedial work, certain soil that was not impacted was field-screened on-Site, characterized via analytical testing to show that it was not impacted with contaminants of concern, and re-used on-Site with permission from NYSDEC. This screening of on-site materials saved our client from disposing of clean material that would have otherwise been sent to a landfill at significant additional cost.

125 Main Street Site, Buffalo, New York

- Recently completed a Remedial Investigation for a property known as the Former Donovan building, located in the City of Buffalo, NY, which was formerly industrial and commercial site, which as filled with miscellaneous historic fill materials. Contaminants of concern include petroleum VOCs, SVOCs and metals in soil. The remedial work was started in 2012 and is expected to be completed in 2013.

301 Franklin Street Site, Olean, New York

- Recently received a certificate of completion (COC) for a NY Brownfield Program Site. As part of the project, Mr. Lesakowski managed a Remedial Investigation and Interim Remedial Measures for a property located within the ExxonMobil Legacy Site (EMSL) area, which was formerly developed as a petroleum refinery. Contaminants of concern include petroleum VOCs, SVOCs and metals in soil and VOCs and SVOCs and non-aqueous phase liquid (NAPL) in groundwater. The IRM included removal of approximately 3,000-tons of metals- and petroleum-impacted soil and removal of 5,800 linear feet of abandoned subsurface piping. Remedial work included soil excavation and disposal; removal of abandoned subsurface piping and infrastructure; installation of a soil vapor extraction system; installation of an active subslab depressurization (ASD) system in the building; and, construction of a soil cover system.

Homer Street Redevelopment Site, Olean, New York

- Recently completed Interim Remedial Measures that included removal of approximately 11,000 linear feet of abandoned subsurface piping and 48 drums of residual piping contents. A Remedial Investigation was previously completed for this property, which is located within the ExxonMobil Legacy Site (EMSL) Works #3 area, which was formerly developed as a petroleum refinery. Contaminants of concern include grossly contaminated soils impacted with tar-like material, petroleum VOCs, SVOCs and metals in soil and VOCs, SVOCS and light non-aqueous phase liquid (LNAPL) in groundwater. Remedial Investigation work completed 2011-2012 included test pit excavations, soil borings/monitoring wells, surface soil, subsurface soil, sediment, surface water and groundwater sampling and delineation of surficial petroleum contamination.

NOCO S-41 Site, Buffalo, NY and Niagara Street and Pennsylvania Avenue Site, Buffalo, NY

- Recently completed a Remedial Investigation (RI), Interim Remedial Measures (IRM) and Remedial Alternatives Analysis under the NYSDEC Brownfield Cleanup Program for two former gasoline station and automotive repair facilities with significant soil and groundwater petroleum VOC impact. The remediation approach for both sites involves removal of abandoned underground storage tanks, product dispensers and piping, removal of in-ground hydraulic lifts,

soil excavation, and extraction and treatment of impacted groundwater. Final Engineering Reports and Site Management Plans were approved by the NYSDEC in December 2009 and Certificates of Completion were also issued in December 2009.

3807 Highland Avenue Site, Niagara Falls, New York

- Completed a Remedial Investigation (RI), Interim Remedial Measures (IRM) and Remedial Alternatives Analysis under the NYSDEC Brownfield Cleanup Program sites at a historic metallurgical facility and steel factory in Niagara Falls, NY. The Remedial Investigation involved collecting over 100 surface and subsurface soil and sediment samples and installing and sampling groundwater monitoring wells on an approximate 25-acre parcel slated for future mixed used commercial and industrial development. IRMs include excavation of chromium-impacted, arsenic-impacted and SVOC-impacted soil in several areas of the Site, drum and tank removal, catch basin and sump cleaning, smoke stack deposits remediation, and chemical waste removal. A Certificate of Completion was issued in June 2010.

1501 College Avenue Site, Niagara Falls, New York

- A Certificate of Completion was issued in December 2012 for this BCP site. Mr. Lesakowski managed a Remedial Investigation (RI), Interim Remedial Measures (IRM) and Remedial Alternatives Analysis under the NYSDEC Brownfield Cleanup Program sites at a historic heavy industrial facility in Niagara Falls, NY. The Remedial Investigation involved collecting surface and subsurface soil and sediment samples and installing and sampling groundwater monitoring wells on an approximate 15-acre parcel. IRMs include excavation of petroleum-impacted, PCB-impacted and SVOC-impacted soil in several areas of the Site, removal of galbestos PCB-impacted building materials, abandoned/damaged drum removal, chemical waste removal and a soil cover system.

275 Franklin Street Site

- Currently managing a NYSDEC Brownfield Cleanup Program site formerly used as drycleaner in western New York with significant soil and groundwater chlorinated VOC impact. Soil was successfully remediated using soil vapor extraction (SVE) to unrestricted soil cleanup objectives (SCOs) and groundwater remediation involves in-situ treatment of impacted groundwater. An active sub-slab depressurization system design and installation is planned in the new building during construction.

330 Maple Road Site, Amherst, New York

- Managed a Remedial Investigation (RI) and Remedial Alternatives Analysis under the NYSDEC Brownfield Cleanup Program for a small-arms shooting range with significant lead and semi-volatile organic compound (SVOC) impact. The RI involved collecting over 1,000 soil samples on 26-acre parcel slated for future mixed-use commercial and residential development. Bench-scale testing was completed to select a substrate to treat the characteristic hazardous soil to below toxicity characteristic leaching procedure (TCLP) thresholds. A Remedial Action Work Plan, which called for in-situ stabilization of characteristic hazardous soil and off-site disposal was prepared and approved by the NYSDEC. The remediation, which achieved a Residential Cleanup, was completed from the summer of 2011 through winter 2012. A certificate of completion was issued in spring 2012.

Seneca Market I, LLC Site, Watkins Glen, New York

- Managed Site Remediation at a former drycleaner, bus garage and asphalt plant under the NYSDEC Brownfield Cleanup Program with significant chlorinated volatile organic compound (cVOC) impact. The remediation approach involved underground tank removal, in-ground hydraulic lift removal, hazardous soil excavation and enhanced biodegradation of groundwater. The Site received its certificate of completion in December 2008. The Property is currently developed with an up-scale hotel. The project is highlighted on NYSDEC website as a Brownfield Success Story.

GLR Holdings Site, Niagara Falls, New York

- Managed a Remedial Investigation (RI), Interim Remedial Measure (IRM) and Remedial Alternatives Analysis under the NYSDEC Brownfield Cleanup Program for a former automotive repair facility with significant soil and groundwater chlorinated VOC impact. The remediation approach involved negotiated soil and groundwater cleanup objectives, limited soil excavation and enhanced biodegradation of groundwater. The Site received its certificate of completion in February 2008.

2250 Factory Outlet Boulevard Site, Niagara Falls, New York

- Managed Remedial Investigation (RI), Interim Remedial Measure (IRM) and Remedial Alternatives Analysis under the NYSDEC Brownfield Cleanup Program at a former lumber yard with chromium impact in Niagara Falls, NY. The remediation approach involved excavation and off-Site disposal of hazardous and non-hazardous soil. The Site received its certificate of completion in December 2007.

New Seventh Street Site, Buffalo, New York

- Managed the investigation of a former gasoline station and adjacent manufactured gas plant (MGP) as part of one of the largest Brownfield redevelopment projects in western New York. The project involves site redevelopment from a historic MGP site and adjacent gasoline station to a multi-million dollar commercial office complex. Acting on behalf of the developer (Duke Realty) and future tenant (HealthNow New York); preliminary investigations were completed to evaluate the nature and location of contaminants. Subsequent site investigation and remediation was completed via a Remedial Investigation (RI) and Interim Remedial Measures (IRM) under the New York State Brownfield Cleanup Program, saving months and significant cost. As a concurrent assignment, acted as a technical consultant to the developer and future tenant on negotiations and advisement on development of an environmental liability transfer arrangement between the purchaser/tenant (client), seller and a national remediation contractor.

OTHER PERTINENT EXPERIENCE

- Managed a site assessment and site investigations for a portfolio of retail gasoline stations in western New York. Project tasks include a historical review to determine sites' histories, review of previous technical reports, soil and groundwater investigations and remediation cost estimating for site cleanups. This project also involves forensic analyses of soil and groundwater samples to estimate the relative time of historic spills to determine the liability and responsibility for remediation of historic petroleum spills on-site.

- Managed a Phase I/Phase II site investigations for the Buffalo Urban Development Corporation for two parcels in the City of Buffalo encompassing approximately 100-acres. The project

involved Phase I ESAs to assess potential historic concerns in a historic heavy industrial area and subsequent soil and groundwater investigations to investigate subsurface environmental conditions. A portion of the property was subsequently developed with an industrial facility.

- Managed environmental due diligence, including Phase I/Phase II investigations of five active service stations in central and eastern upstate New York for a potential purchaser. Phase I ESAs indicated a history of gasoline stations on-site. In conjunction with the purchaser and seller, it was negotiated that a baseline assessment of soil and groundwater impact would be completed to establish responsibility for addressing contamination going forward. The purchaser was able to purchase the sites with no liability for historic petroleum spills on-site.

- Managed investigation and remediation of a former automobile dealership in Rochester, New York. Site investigations, competed with oversight of NYSDEC Spills division, indicated soil impact as a result of leaking gasoline, diesel and waste oil USTs and floor drain discharges. Remedial tasks included a removal of four USTs and associated pump dispensers, closing/sealing interior floor drains and excavation and off-site disposal of 1,500 cubic yards of impacted soil.

- Performed fieldwork at a 50-acre industrial park in western New York. Task included a soil boring and monitoring well installation program, development and sampling of monitoring wells and a hydraulic conductivity assessment. Subsequent remedial tasks included removal of six underground storage tanks and petroleum-impacted soil and a long-term groundwater monitoring plan.

- Performed fieldwork and reporting for RI/FS of NYSDEC superfund site in Long Island, NY. Investigation activities at this former metal plating facility included soil investigation, monitoring well installation and groundwater sampling, hydraulic conductivity testing, and floor drain/cess pool investigation. IRM activities included closure of interior floor drains and removal of heavy metals impacted soil.

ENVIRONMENTAL LIABILITY TRANSFER EXPERIENCE

- Starting in 2010 through present, took the lead role in developing a liability transfer arrangement of a former refinery in New York State. Major tasks included technical review of historic Remedial Investigation data, remedial alternative selection and cost estimating, preparation of technical and liability transfer program proposal and negotiation with Fortune 100 company technical and business representatives. The deal involves a multi-million dollar remedial cleanup that is planned to be completed under the New York Brownfield Cleanup Program.

- Managed environmental consulting and due diligence activities for a purchaser of 182 gasoline service stations in Maryland, Virginia and Washington, DC. Tasks included Phase I ESAs, remediation cost estimating for sites with known impacts and/or on-going remediation and interfacing with the client's lenders to facilitate a $110 million dollar real estate transaction. An Environmental Liability Transfer arrangement funded by the seller facilitated the additional environmental investigation and remediation of impacted sites.

- Played a key role in developing a liability transfer agreement for the transfer of a 48-site portfolio of gasoline stations with known petroleum impacts. Tasks included Phase I/Phase scoping, technical report review, oversight of remediation cost estimates and interfacing with the attorneys, insurance brokers, client and property sellers to develop and present the liability transfer arrangement.

- Provided technical consulting on behalf of HealthNow New York and Duke Realty for developing a liability transfer agreement for the transfer of a former manufactured gas plant site and gasoline station with significant soil, groundwater and soil vapor petroleum impacts. Tasks included technical report review, remediation cost estimating and interfacing with the attorneys, insurance brokers, client and property sellers to develop the liability transfer arrangement. Benchmark/TurnKey completed the remediation of the former gasoline station portion of the Site.

NATHAN T. MUNLEY
PROJECT MANAGER / SENIOR PROJECT SCIENTIST

EDUCATION

Masters of Science (Biology) 2004; State University of New York, Binghamton University

Bachelors of Science (Health Science) 1995; State University of New York, College at Cortland

Masters of Science (Engineering Science) (Currently Enrolled); State University of New York, University at Buffalo - Department of Environmental Engineering and Science.

Graduate coursework in: Stream Bank Restoration and Design, Biological Treatment Systems, Physiochemical Unit Processes, Aquatic Chemistry, Hazardous Waste Management, Hydrologic Engineering, Geographic Information Systems (GIS), and Computer Aided Design (CAD)

REGISTRATION AND AFFILIATIONS

Certified OSHA 40-Hour Hazardous Waste Site Training
Annual 8-Hour OSHA Refresher
Member – Society of Wetland Scientists

SUMMARY OF EXPERIENCE

Mr. Munley has over 10 years of experience in the environmental field ranging from conducting environmental research to consulting on environmental science and engineering projects. Environmental consulting projects that Mr. Munley has completed include a wide range of environmental site assessment, investigation, and remediation assignments including: Phase I & II Environmental Site Assessments (ESAs); Brownfield Cleanup Program investigation and cleanup; soil and groundwater treatment design projects, wetland mitigation permitting and design; and hazardous waste site remediation projects. Prior to joining TurnKey, Mr. Munley was a researcher conducting laboratory and field based experiments investigated lake acidification and non-point source pollution degradation of wetlands. Mr. Munley has particular interests into the environmental site assessment, investigation, remedial design, and redevelopment of former industrial sites (Brownfields).

REPRESENTATIVE EXPERIENCE

June 2005 to Present: TurnKey Environmental Restoration, LLC

- Completed a large 10-acre multi-parcel Phase I ESA for a wind turbine project located within a highly contaminated urban Site listed on the NYS Inactive Hazardous Waste Site list. Project tasks included a review of historic technical reports, and soil and groundwater investigation documents to determine potential impacts of the known contamination related to the proposed wind farm redevelopment. Coordination with multiple regulatory agencies, owner/operators and legal representatives were imperative for the successful outcome of the project. In addition to the Phase I ESA, a wetland assessment was completed to determine potential wetland issues related to the project.

- Recently completed site assessment and remediation of gasoline service station and car wash establishment. Completed Phase I and II Environmental Site Assessment (ESAs); preparation of application and approved admittance to the NYSDEC Brownfield Cleanup Program (BCP), preparation and completion of BCP required investigation and remedial work plans, and preparation of BCP required Final Engineering Report and Site Management Plan, for successful issuance of the Certificate of Completion (COC) for the owner.

- Currently conducting a Phase I/Phase II site investigation at a former gasoline service station and oil change facility located in Kenmore, NY. The project involves the completion of a Phase I ESA to assess potential historic concerns based on the former use of the property, and subsequent Phase II site investigation to further define the recognized environmental conditions identified in the Phase I ESA.

- Currently managing an US Army Corps of Engineers (USACE) and NYSDEC Joint Application Permit and Wetland Mitigation project located in Hammondsport, NY. The not-for-profit museum requires additional educational display space. The museum expansion project will infringe upon a USACE jurisdictional wetland. The 0.5-acre wetland disturbance will be off-set by a 1.6-acre mitigation wetland. Significant coordination and management between the museum, regulatory agencies, land owners, and local government was required during the application process. Construction is scheduled to begin Spring 2011.

- Recently served as Project Scientist for a 22-acre Brownfield Cleanup Program Site cleanup encompassing 10 adjoining parcels in Niagara Falls, NY. The BCP project included preparation of the BCP Application, as well as the Remedial Investigation (RI), Interim Remedial Measures (IRM), and Alternatives Analysis (AAR) Work Plan. The RI involved collecting over 100 surface, subsurface soil and sediment samples; installing and sampling groundwater monitoring wells. IRMs include excavation of chromium-impacted, arsenic-impacted and SVOC-impacted soil in several areas of the Site, drum and tank removal, catch basin and sump cleaning, smoke stack deposits remediation, and hazardous and non-hazardous chemical waste removal. The Certificate of completion was received in 2010.

- Responsible for all aspects of Phase I Environmental Site Assessment completion for over 100 properties in New York State.

PUBLICATIONS/PRESENTATIONS

- Presenter – Technical Papers
  Munley, Nathan T., Titus, John H., and Zhu, Weixing. "Nutrient Retention in Vegetated Buffer Strips: Testing the Effects of Different Species Assemblages." International Society of Wetland Scientist, The 25th Annual Conference, Seattle, WA. July 2004.

APPENDIX B

HEALTH AND SAFETY PLAN

HEALTH AND SAFETY PLAN
for
REMEDIAL ACTION WORK PLAN

CARRIAGE CLEANERS SITE
BCP SITE NO. C828131
1600 PENFIELD ROAD
PENFIELD NEW YORK

June 2016 0295-013-001

Prepared for:

Springs Land Company, LLC

Prepared By:

TurnKey Environmental Restoration, LLC

In Association With

Benchmark Environmental Engineering & Science, PLLC

HEALTH AND SAFETY PLAN FOR REMEDIAL ACTIVITIES

Carriage Cleaners Site
BCP Site No. C828131

Acknowledgement Page

Plan Reviewed by (initial):

Corporate Health and Safety Director: _____

Project Manager: _____

Designated Site Safety and Health Officer: _____

Acknowledgement:

I acknowledge that I have reviewed the information contained in this site-specific Health and Safety Plan, and understand the hazards associated with performance of the field activities described herein. I agree to comply with the requirements of this plan.

NAME (PRINT)	SIGNATURE	DATE

HEALTH AND SAFETY PLAN FOR REMEDIAL INVESTIGATION ACTIVITIES

Carriage Cleaners Site
BCP Site No. C828131

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1.0 INTRODUCTION

1.1 General

In accordance with OSHA requirements contained in 29 CFR 1910.120 and USEPA Standard Operating Safety Guidelines, this Health and Safety Plan (HASP) describes the specific health and safety practices and procedures to be employed by TurnKey Environmental Restoration, LLC and Benchmark Environmental Engineering & Science, PLLC employees (referred to jointly hereafter as TurnKey). This HASP has been prepared to cover all activities during the remedial activities at the Carriage Cleaners site (Site) addressed at 1600 Penfield Road located in the Town of Penfield, Monroe County, New York (S.B.L# 123.20-2-47) (see Figure 1 of the Remedial Action Work Plan).

This HASP presents information and procedures for TurnKey employees who will be involved with field activities, including the assignment of responsibilities, personnel protection requirements, work practices and emergency response procedures. It is not intended to cover the activities of other contractors or subcontractors on the Site; these firms will be required to develop and enforce their own HASPs as discussed below. In order to ensure that proper coordination on such key issues as emergency notification and decontamination exists between TurnKey and other contractors or subcontractors, TurnKey will review all HASPs and coordinate procedures where appropriate.

This HASP presents information on known Site health and safety hazards using available historical information for previously investigated areas of the Site, and identify the equipment, materials, and procedures that will be used to eliminate or control these hazards. Environmental monitoring will be performed during the course of field activities to provide real-time data for on-going assessment of potential hazards. This HASP will be updated as new site data becomes available.

All TurnKey personnel involved with the field activities associated with the Remedial Action will be required to comply with this HASP and any field modifications as directed by the Site Safety and Health Officer.

1.2 Site Background

The Site is an approximate 0.6 acre parcel located at 1600 Penfield Road, Penfield, New York (Site; see Figures 1 and 2). The Site is currently vacant, with the former building being demolished in 2009. The site is currently secured by perimeter fencing to limit access to the Site. The Site is surrounded by commercial and residential beyond.

In the early 1960s, the former building was constructed and used as a dry cleaning facility until approximately 2005, though the timeframe of on-Site dry cleaning operation is unknown.

1.3 Previous Investigations

A summary of the findings of the environmental investigations completed at the Site is provided below.

1.3.1 August 2002 – Phase II Environmental Site Assessment

Labella Associates, P.C. (LaBella) completed a Phase II Environmental Site Assessment (ESA) in August 2002. The investigation identified chlorinated volatile organic compounds (cVOCs) in on-Site soil and groundwater.

1.3.2 August 2003 – Passive Soil Vapor Survey

LaBella completed a Phase II Environmental Site Assessment (ESA) in August 2002. The investigation identified chlorinated volatile organic compounds (cVOCs) in on-Site soil vapor.

1.3.3 October 2006 – Remedial Investigation (RI)

LaBella completed a RI at the Site during 2005 and 2006. The RI included the advancement of soil borings, soil vapor points, and groundwater monitoring wells, and collection of soil, groundwater and soil vapor samples across the Site. Based on the results of the RI, three (3) Areas of Concern (AOCs) were identified for the Site, including AOC#1- Concrete Wastewater Holding Tank Area; AOC#2- Former PCE Still Area; and, AOC#3- Groundwater Contamination.

1.3.4 June 2007 – Interim Remedial Measures (IRMs)

IRMs were completed at the Site, related to AOC #1A (a subarea of AOC #1) in June 2007. AOC#1A included the excavation of the underground concrete waste water holding tank,

associated contaminated soil and groundwater was removed and disposed and/or treated off-site at permitted facilities. Based on the confirmatory samples, additional remedial action may be necessary to address AOC#1.

2.0 ORGANIZATIONAL STRUCTURE

This chapter of the HASP describes the lines of authority, responsibility, and communication as they pertain to health and safety functions at the Site. The purpose of this chapter is to identify the personnel who will impact the development and implementation of the HASP and to describe their roles and responsibilities. This chapter also identifies other contractors and subcontractors involved in work operations and it establishes the lines of communication among them for health and safety matters. The organizational structure described in this chapter is consistent with the requirements of 29 CFR 1910.120(b)(2). This section will be reviewed by the Project Manager and updated as necessary to reflect the current organizational structure at this Site.

2.1 Roles and Responsibilities

All TurnKey personnel on the Site must comply with the minimum requirements of this HASP. The specific responsibilities and authority of management, safety and health, and other personnel on this Site are detailed in the following paragraphs.

2.1.1 Corporate Health and Safety Director

The Corporate Health and Safety Director is **Mr. Thomas H. Forbes, P.E**. The Corporate Health and Safety Director is responsible for developing and implementing the Health and Safety program and policies for Benchmark Environmental Engineering & Science, PLLC and TurnKey Environmental Restoration, LLC, and consulting with corporate management to ensure adequate resources are available to properly implement these programs and policies. The Corporate Health and Safety Director coordinates TurnKey's Health and Safety training and medical monitoring programs, and assists project management and field staff in developing site-specific health and safety plans.

2.1.2 Project Manager

The Project Manager for this Site is **Mr. Michael Lesakowski/Mr. Nathan Munley**. The Project Manager has the responsibility and authority to direct all TurnKey work operations at the Site. The Project Manager coordinates safety and health functions with the Site Safety and Health Officer, and bears ultimate responsibility for proper implementation of this HASP. He may delegate authority to expedite and facilitate any

application of the program, including modifications to the overall project approach as necessary to circumvent unsafe work conditions. Specific duties of the Project Manager include:

- Preparing and coordinating the Remedial Action Work Plan.
- Providing TurnKey workers with work assignments and overseeing their performance.
- Coordinating health and safety efforts with the Site Safety and Health Officer (SSHO).
- Reviewing the Emergency Response Plan to assure its effectiveness.
- Serving as the primary liaison with Site contractors and the property owner.

2.1.3 Site Safety and Health Officer

The Site Safety and Health Officer (SSHO) for this Site is **Mr. Bryan H. Hann**. The qualified alternate SSHO is **Mr. Richard L. Dubisz**. The SSHO reports to the Project Manager. The SSHO is on-site or readily accessible to the Site during all work operations and has the authority to halt work if unsafe conditions are detected. The specific responsibilities of the SSHO are:

- Managing the safety and health functions for TurnKey personnel on the Site.
- Serving as the point of contact for safety and health matters.
- Ensuring that TurnKey field personnel working on the Site have received proper training (per 29 CFR Part 1910.120(e)), that they have obtained medical clearance to wear respiratory protection (per 29 CFR Part 1910.134), and that they are properly trained in the selection, use and maintenance of personal protective equipment, including qualitative respirator fit testing.
- Performing or overseeing Site monitoring as required by the HASP.
- Assisting in the preparation and review of the HASP.
- Maintaining site-specific safety and health records as described in this HASP.

- Coordinating with the Project Manager, Site Workers, and Contractor's SSHO as necessary for safety and health efforts.

2.1.4 Site Workers

Site workers are responsible for: complying with this HASP or a more stringent HASP, if appropriate (i.e., Contractor and Subcontractor's HASP); using proper personal protective equipment (PPE); reporting unsafe acts and conditions to the SSHO; and following the safety and health instructions of the Project Manager and SSHO.

2.1.5 Other Site Personnel

Other Site personnel with health and safety responsibilities in the work zone, including subcontractors and governmental agencies performing Site inspection work (i.e., NYSDEC and/or its designated oversight contractor) who will be responsible for developing, implementing, and enforcing a Health and Safety Plan equally stringent or more stringent than TurnKey's HASP. TurnKey assumes no responsibility for the health and safety of anyone outside its direct employ. During activities involving subcontractors, the subcontractor's HASP shall cover all non-TurnKey Site personnel. The subcontractor(s) shall assign a SSHO who will coordinate with TurnKey's SSHO as necessary to ensure effective lines of communication and consistency between health and safety plans.

3.0 HAZARD EVALUATION

The possibility exists that workers will be exposed to hazardous substances during the remedial activities listed in Section 1.5. The principal points of exposure would be through direct contact with impacted media or vapors during intrusive activities. In addition, the use of large equipment will also present conditions for potential physical injury to workers. Adherence to the medical evaluations, worker training relative to chemical hazards, safe work practices, proper personal protection, environmental monitoring, establishment work zones and site control, appropriate decontamination procedures and contingency planning outlined herein will reduce the potential for chemical exposures and physical injuries.

3.1 Chemical Hazards

Table 1 identifies known constituents of potential concern (COPCs) and ranges of concentrations, by media, observed during previous investigations. Based on this work, the COPCs include specific cVOCs and, to a lesser extent, petroleum VOCs. Table 2 lists toxicity and exposure data for these constituents of potential concern. As additional data is obtained, Tables 1 and 2 will be updated accordingly. Brief descriptions of the toxicology of these materials and related health and safety guidance and criteria are provided below.

- **Tetrachloroethene (PCE)** was formally widely used in dry cleaning operations as a solvent. It is harmful by ingestion inhalation and skin absorption. Exposure can cause dermatitis, dizziness, nausea, liver and kidney damage. This compound is a suspected carcinogen.

- **Trichloroethene** (**TCE)** was formally widely used in dry cleaning operations. It is toxic by inhalation and skin absorption. It is an irritant to the skin, eyes and mucous membranes. Symptoms of exposure may include headache, dizziness and nausea. Exposure may cause liver and kidney damage. TCE is a suspected human carcinogen.

- **cis-1,2-Dichloroethene (cis-1,2-DCE) & trans-1,2-Dichloroethene (trans-1,2-DCE)** are breakdown products of PCE. Direct exposure is mostly by inhalation resulting in heart and liver damage.

- **Vinyl Chloride** is an intermediate in the production of chlorinated compounds. It is a biodegradation product of TCE and PCE. Inhalation exposure may result in damage to the liver, kidneys, lungs and other organs. In addition to liver cancer,

exposure has also been linked to an increased risk of lung, brain, hematopoietic, and digestive tract cancers.

With respect to the anticipated activities defined in Section 1.4, possible routes of exposure to the above-mentioned contaminants are presented in Table 3. The use of proper respiratory equipment, as outlined in Section 7.0 and on Table 4, will minimize the potential for exposure to airborne contamination. Further, exposure to contaminants through dermal and other routes will also be minimized through the use of protective clothing (Section 7.0), safe work practices (Section 6.0), and proper decontamination procedures (Section 12.0).

3.2 Physical Hazards

Remedial activities at the Site may present the following physical hazards:

- The potential for physical injury during heavy equipment use, such as drill rigs.
- The potential for slip and fall injuries due to slippery terrain.

These hazards represent only some of the possible means of injury that may be present during investigation and sampling activities at the Site. Since it is impossible to list all potential sources of injury, it shall be the responsibility of each individual to exercise proper care and caution during all phases of the work. A few common hazards are presented in the following sections; project specific hazards should always be discussed with the Project Manager prior to beginning any field project.

3.2.1 Earthmoving Equipment

- Only authorized personnel are permitted to operate earthmoving equipment.
- Maintain safe distance from operating equipment and stay alert of equipment movement. Avoid positioning between fixed objects and operating equipment and equipment pinch points, remain outside of the equipment swing and turning radius. Pay attention to backup alarms, but not rely on them for protection. Never turn your back on operating equipment.
- Approach operating equipment only after receiving the operator's attention. The operator shall acknowledge your presence and stop movement of the equipment. Caution shall be used when standing next to idle equipment; when equipment is

placed in gear it can lurch forward or backward. Never approach operating equipment from the side or rear where the operator's vision is compromised.

- When required to work in proximity to operating equipment, wear high-visibility vests to increase visibility to equipment operators. For work performed after daylight hours, vests shall be made of reflective material or include a reflective stripe or panel.

- Do not ride on earthmoving equipment unless it is specifically designed to accommodate passengers. Only ride in seats that are provided for transportation and that are equipped with seat belts.

- Stay as clear as possible of all hoisting operations. Loads shall not be hoisted overhead of personnel.

- Earthmoving equipment shall not be used to lift or lower personnel.

- If equipment becomes electrically energized, personnel shall be instructed not to touch any part of the equipment or attempt to touch any person who may be in contact with the electrical current. The utility company or appropriate party shall be contacted to have line de-energized prior to approaching the equipment.

3.2.2 Excavation

- Do not enter the excavations unless completely necessary, and only after the competent person has completed the daily inspection and has authorized entry.

- Follow all excavation entry requirements established by the competent person.

- Do not enter excavations where protective systems are damaged or unstable.

- Do not enter excavations where objects or structures above the work location may become unstable and fall into the excavation.

- Do not enter excavations with the potential for a hazardous atmosphere until the air has been tested and found to be at safe levels.

- Do not enter excavations with accumulated water unless precautions have been taken to prevent excavation cave-in.

3.2.3 Exposure to Public Vehicular Traffic

The following precautions must be taken when working around traffic, and in or near an area where traffic controls have been established by a contractor.

- Exercise caution when exiting traveled way or parking along street – avoid sudden stops, use flashers, etc.
- Park in a manner that will allow for safe exit from vehicle, and where practicable, park vehicle so that it can serve as a barrier.
- All staff working adjacent to traveled way or within work area must wear reflective/high-visibility safety vests.
- Eye protection should be worn to protect from flying debris.
- Remain aware of factors that influence traffic related hazards and required controls – sun glare, rain, wind, flash flooding, limited sight-distance, hills, curves, guardrails, width of shoulder (i.e., breakdown lane), etc.
- Always remain aware of an escape route -- behind an established barrier, parked vehicle, guardrail, etc.
- Always pay attention to moving traffic – never assume drivers are looking out for you.
- Work as far from traveled way as possible to avoid creating confusion for drivers.
- When workers must face away from traffic, a "buddy system" should be used, where one worker is looking towards traffic.
- Review traffic control devices to ensure that they are adequate to protect your work area. Traffic control devices should: 1) convey a clear meaning, 2) command respect of road users, and 3) give adequate time for proper traffic response. The adequacy of these devices are dependent on limited sight distance, proximity to ramps or intersections, restrictive width, duration of job, and traffic volume, speed, and proximity.

- Either a barrier or shadow vehicle should be positioned a considerable distance ahead of the work area. The vehicle should be equipped with a flashing arrow sign and truck-mounted crash cushion. All vehicles within 40 feet of traffic should have an orange flashing hazard light atop the vehicle.

- Except on highways, flaggers should be used when 1) two-way traffic is reduced to using one common lane, 2) driver visibility is impaired or limited, 3) project vehicles enter or exit traffic in an unexpected manner, or 4) the use of a flagger enhances established traffic warning systems.

- Lookouts should be used when physical barriers are not available or practical. The lookout continually watches approaching traffic for signs of erratic driver behavior and warns workers. Vehicles should be parked at least 40 feet away from the work zone and traffic. Minimize the amount of time that you will have your back to oncoming traffic.

3.3 In-Situ Injection Oxidants

The in-situ injection oxidants used during remedial activities at the Site will be hydrogen peroxide (H_2O_2) and PersulfOx™ developed by Regenesis Corp. PersulfOx ™ is a sodium persulfate based oxidant utilizing a patented catalyst to activate the reaction. PersulfOx™ is a white solid, free flowing powder. Field personnel should take precautions while handling and applying the material and use appropriate PPE (Level D) including eye protection. Gloves should be used as appropriate based on the exposure duration and field conditions. Product application information and a Material Safety Data Sheet (MSDS) are provided in Appendix A-4.

4.0 TRAINING

4.1 Site Workers

All personnel performing remedial activities (such as, but not limited to, equipment operators and general laborers) who may be exposed to hazardous substances, health hazards, or safety hazards and their supervisors/managers responsible for the Site shall receive training in accordance with 29 CFR 1910.120(e) before they are permitted to engage in operations in the exclusion zone or contaminant reduction zone. This training includes an initial 40-hour Hazardous Waste Site Worker Protection Course, an 8-hour Annual Refresher Course subsequent to the initial 40-hour training, and 3 days of actual field experience under the direct supervision of a trained, experienced supervisor. Additional site-specific training shall also be provided by the SSHO prior to the start of field activities. A description of topics to be covered by this training is provided below.

4.1.1 Initial and Refresher Training

Initial and refresher training is conducted by a qualified instructor as specified under OSHA 29 CFR 1910.120(e)(5), and is specifically designed to meet the requirements of OSHA 29 CFR 1910.120(e)(3) and 1910.120(e)(8). The training covers, as a minimum, the following topics:

- OSHA HAZWOPER regulations.
- Site safety and hazard recognition, including chemical and physical hazards.
- Medical monitoring requirements.
- Air monitoring, permissible exposure limits, and respiratory protection level classifications.
- Appropriate use of personal protective equipment (PPE), including chemical compatibility and respiratory equipment selection and use.
- Work practices to minimize risk.
- Work zones and Site control.

- Safe use of engineering controls and equipment.
- Decontamination procedures.
- Emergency response and escape.
- Confined space entry procedures.
- Heat and cold stress monitoring.
- Elements of a Health and Safety Plan.
- Spill containment.

Initial training also incorporates workshops for PPE and respiratory equipment use (Levels A, B and C), and respirator fit testing. Records and certification received from the course instructor documenting each employee's successful completion of the training identified above are maintained on file at TurnKey's Buffalo, NY office. Contractors and Subcontractors are required to provide similar documentation of training for all their personnel who will be involved in on-site work activities.

Any employee who has not been certified as having received health and safety training in conformance with 29 CFR 1910.120(e) is prohibited from working in the exclusion and contamination reduction zones, or to engage in any on-site work activities that may involve exposure to hazardous substances or wastes.

4.1.2 Site Training

Site workers are given a copy of the HASP and provided a site-specific briefing prior to the commencement of work to ensure that employees are familiar with the HASP and the information and requirements it contains. The Site briefing shall be provided by the SSHO prior to initiating field activities and shall include:

- Names of personnel and alternates responsible for Site safety and health.
- Safety, health and other hazards present on the Site.
- The Site lay-out including work zones and places of refuge.

- The emergency communications system and emergency evacuation procedures.
- Use of PPE.
- Work practices by which the employee can minimize risks from hazards.
- Safe use of engineering controls and equipment on the Site.
- Medical surveillance, including recognition of symptoms and signs of over-exposure (see Section 5).
- Decontamination procedures (see Section 12).
- The Emergency Response Plan (see HASP Appendix A-1).
- Confined space entry procedures, if required (see Section 13).
- The spill containment program (see Section 9).
- Site control (see Section 11).

Supplemental health and safety briefings will also be conducted by the SSHO on an as-needed basis during the course of the work. Supplemental briefings are provided as necessary to notify employees of any changes to this HASP as a result of information gathered during on-going Site characterization and analysis. Conditions for which the SSHO may schedule additional briefings include, but are not limited to: a change in Site conditions (i.e., based on monitoring results); changes in the work schedule/plan; newly discovered hazards; and safety incidents occurring during Site work.

4.2 Supervisor Training

On-site safety and health personnel who are directly responsible for or who supervise the safety and health of workers engaged in hazardous waste operations (i.e., SSHO) shall receive, in addition to the appropriate level of worker training described in Section 4.1, above, 8 additional hours of specialized supervisory training, in compliance with 29 CFR 1910.120(e)(4).

4.3 Emergency Response Training

Emergency response training is discussed in the Emergency Response Plan (Appendix A-1 of this HASP).

4.4 Site Visitors

TurnKey's SSHO will provide a site-specific briefing to all Site visitors and other non-TurnKey personnel who enter the Site beyond the Site entry point. The site-specific briefing will provide information about Site hazards, the Site lay-out including work zones and places of refuge, the emergency communications system and emergency evacuation procedures, and other pertinent safety and health requirements as appropriate.

Site visitors will not be permitted to enter the exclusion zone or contaminant reduction zones unless they have received the level of training required for Site workers as described in Section 4.1.

5.0 MEDICAL MONITORING

Medical monitoring examinations are provided to TurnKey employees as stipulated under 29 CFR Part 1910.120(f). These exams include initial employment and termination physicals for all TurnKey employees involved in hazardous waste Site field operations. Annual exams are provided for those employees who are engaged in hazardous waste site field operations for more than 30 days per year, or who meet other specific criteria listed in 29 CFR 1910.120(f). Post-exposure examinations are also provided for employees who may have been injured, received a health impairment, or developed signs or symptoms of over-exposure to hazardous substances or were accidentally exposed to substances at concentrations above the permissible exposure limits without necessary personal protective equipment. Such exams are performed as soon as possible following development of symptoms or the known exposure event.

Medical evaluations are performed by an occupational health care provider under contract with Benchmark-TurnKey. Health Works WNY, Seneca Square Plaza, 1900 Ridge Road, West Seneca, New York 14224. The facility can be reached at (716) 823-5050.

Medical evaluations are conducted according to the Benchmark-TurnKey Medical Monitoring Program and include an evaluation of the workers' ability to use respiratory protective equipment. The examinations include:

- Occupational/medical history review.
- Physical exam, including vital sign measurement.
- Spirometry testing.
- Eyesight testing.
- Audio testing (minimum baseline and exit, annual for employees routinely exposed to greater than 85db).
- EKG (for employees >40 yrs age or as medical conditions dictate).
- Chest X-ray (baseline and exit, and every 5 years).
- Blood biochemistry (including blood count, white cell differential count, serum multiplastic screening).

- Medical certification of physical requirements (i.e., sight, musculoskeletal, cardiovascular) for safe job performance and to wear respiratory protection equipment.

The purpose of the medical evaluation is to determine an employee's fitness for duty on hazardous waste sites, and to establish baseline medical data.

In conformance with OSHA regulations, TurnKey will maintain and preserve medical records for a period of 30 years following termination of employment. Employees are provided a copy of the physician's post-exam report, and have access to their medical records and analyses.

6.0 SAFE WORK PRACTICES

All TurnKey employees shall conform to the following safe work practices during all on-site work activities conducted within the exclusion and contamination reduction zones:

- Eating, drinking, chewing gum or tobacco, smoking, or any practice that increases the probability of hand-to-mouth contact is strictly prohibited.
- The hands and face must be thoroughly washed upon leaving the work area and prior to engaging in any activity indicated above.
- Respiratory protective equipment and clothing must be worn by all personnel entering the Site as required by the HASP or as modified by the Site Safety Officer. Excessive facial hair (i.e., beards, long mustaches or sideburns) that interferes with the satisfactory respirator-to-face seal is prohibited.
- Contact with surfaces/materials either suspected or known to be contaminated will be avoided to minimize the potential for transfer to personnel, cross contamination and need for decontamination.
- Due to possible contraindications, use of prescribed drugs should be reviewed with the TurnKey occupational physician.
- Alcoholic beverage and illegal drug intake are strictly forbidden during the work day.
- All personnel shall be familiar with standard operating safety procedures and additional instructions contained in this Health and Safety Plan.
- On-site personnel shall use the "buddy" system. No one may work alone (i.e., out of earshot or visual contact with other workers) in the exclusion zone.
- Personnel and equipment in the contaminated area shall be minimized, consistent with effective Site operations.
- All employees have the obligation to immediately report and if possible, correct unsafe work conditions.
- Use of contact lenses on-site will not be permitted. Spectacle kits for insertion into full-face respirators will be provided for TurnKey employees, as requested and required.

The recommended specific safety practices for working around the subcontractor's equipment (e.g., drill rig, site truck.) are as follows:

- Although the subcontractors are responsible for their equipment and safe operation of the Site, TurnKey personnel are also responsible for their own safety.
- Subsurface work will not be initiated without first clearing underground utility services.
- Heavy equipment should not be operated within 20 feet of overhead wires. This distance may be increased if windy conditions are anticipated or if lines carry high voltage. The Site should also be sufficiently clear to ensure the project staff can move around the heavy machinery safely.
- Care should be taken to avoid overhead wires when moving heavy-equipment from location to location.
- Hard hats, safety boots and safety glasses should be worn at all times in the vicinity of heavy equipment. Hearing protection is also recommended.
- The work Site should be kept neat. This will prevent personnel from tripping and will allow for fast emergency exit from the Site.
- Proper lighting must be provided when working at night.
- Investigation activities should be discontinued during an electrical storm or severe weather conditions.
- The presence of combustible gases should be checked before igniting any open flame.
- Personnel shall stand upwind of any investigation activity when not immediately involved in sampling/logging/observing activities.
- Personnel will not approach the edge of an unsecured trench/excavation closer than two feet.

7.0 PERSONAL PROTECTIVE EQUIPMENT

7.1 Equipment Selection

Personal protective equipment (PPE) will be donned when work activities may result in exposure to physical or chemical hazards beyond acceptable limits, and when such exposure can be mitigated through appropriate PPE. The selection of PPE will be based on an evaluation of the performance characteristics of the PPE relative to the requirements and limitations of the Site, the task-specific conditions and duration, and the hazards and potential hazards identified at the Site. Table 4 listed the required PPE for each remedial investigation activity.

Equipment designed to protect the body against contact with known or suspect chemical hazards are grouped into four categories according to the degree of protection afforded. The following categories are consistent with United States Environmental Protection Agency (USEPA) Level of Protection designation:

- **Level A:** Should be selected when the highest level of respiratory, skin and eye protection is needed.
- **Level B:** Should be selected when the highest level of respiratory protection is needed, but a lesser level of skin protection is required. Level B (or Level A) is also necessary for oxygen-deficient atmospheres.
- **Level C:** Should be selected when the types of airborne substances are known, the concentrations have been measured and the criteria for using air-purifying respirators are met. In atmospheres where no airborne contaminants are present, Level C provides dermal protection only.
- **Level D:** Should not be worn on any site with elevated respiratory or skin hazards. This is generally a work uniform providing minimal protection.

OSHA requires the use of certain PPE under conditions where an immediate danger to life and health (IDLH) may be present. Specifically, OSHA 29 CFR 1910.120(g)(3)(iii) requires use of a positive pressure self-contained breathing apparatus, or positive pressure air-line respirator equipped with an escape air supply when chemical exposure levels present a substantial possibility of immediate serious injury, illness or death, or impair the ability to

escape. Similarly, OSHA 29 CFR 1910.120(g)(3)(iv) requires donning totally encapsulating chemical protective suits (with a protection level equivalent to Level A protection) in conditions where skin absorption of a hazardous substance may result in a substantial possibility of immediate serious illness, injury or death, or impair the ability to escape.

In situations where the types of chemicals, concentrations, and possibilities of contact are unknown, the appropriate level of protection must be selected based on professional experience and judgment until the hazards can be further characterized. The individual components of clothing and equipment must be assembled into a full protective ensemble to protect the worker from site-specific hazards, while at the same time minimizing hazards and drawbacks of the personal protective gear itself. Ensemble components are detailed below for levels A/B, C, and D protection.

7.2 Protection Ensembles

7.2.1 Level A/B Protection Ensemble

Level A/B ensembles include similar respiratory protection; however, Level A provides a higher degree of dermal protection than Level B. Use of Level A over Level B is determined by: comparing the concentrations of identified substances in the air with skin toxicity data, and assessing the effect of the substance (by its measured air concentrations or splash potential) on the small area of the head and neck unprotected by Level B clothing.

The recommended PPE for level A/B is:

- Pressure-demand, full-face piece self-contained breathing apparatus (MSHA/-NIOSH approved) or pressure-demand supplied-air respirator with escape self-contained breathing apparatus (SCBA).
- Chemical-resistant clothing. For Level A, clothing consists of totally encapsulating chemical resistant suit. Level B incorporates hooded one-or two-piece chemical splash suit.
- Inner and outer chemical resistant gloves.
- Chemical-resistant safety boots/shoes.
- Hardhat.

7.2.2 Level C Protection Ensemble

Level C protection is distinguished from Level B by the equipment used to protect the respiratory system, assuming the same type of chemical-resistant clothing is used. The main selection criterion for Level C is that conditions permit wearing an air-purifying device. The device (when required) must be an air purifying respirator (MSHA/NIOSH approved) equipped with filter cartridges. Cartridges must be able to remove the substances encountered. Respiratory protection will be used only with proper fitting, training and the approval of a qualified individual. In addition, an air-purifying respirator can be used only if: oxygen content of the atmosphere is at least 19.5% in volume; substances are identified and concentrations measured; substances have adequate warning properties; the individual passes a qualitative fit-test for the mask; and an appropriate cartridge/canister is used, and its service limit concentration is not exceeded.

Recommended PPE for Level C conditions includes:

- Full-face piece, air-purifying respirator equipped with MSHA and NIOSH approved organic vapor/acid gas/dust/mist combination cartridges or as designated by the SSHO.
- Chemical-resistant clothing (hooded, one or two-piece chemical splash suit or disposable chemical-resistant one-piece suit).
- Inner and outer chemical-resistant gloves.
- Chemical-resistant safety boots/shoes.
- Hardhat.

An air monitoring program is part of all response operations when atmospheric contamination is known or suspected. It is particularly important that the air be monitored thoroughly when personnel are wearing air-purifying respirators. Continual surveillance using direct-reading instruments is needed to detect any changes in air quality necessitating a higher level of respiratory protection.

7.2.3 Level D Protection Ensemble

As indicated above, Level D protection is primarily a work uniform. It can be worn in areas where only boots can be contaminated, where there are no inhalable toxic substances and where the atmospheric contains at least 19.5% oxygen.

Recommended PPE for Level D includes:

- Coveralls.
- Safety boots/shoes.
- Safety glasses or chemical splash goggles.
- Hardhat.
- Optional gloves; escape mask; face shield.

7.2.4 Recommended Level of Protection for Site Tasks

Based on current information regarding both the contaminants suspected to be present at the Site and the various tasks that are included in the remedial activities, the minimum required Levels of Protection for these tasks are as identified in Table 4.

8.0 EXPOSURE MONITORING

8.1 General

Based on the results of historic sample analysis and the nature of the proposed work activities at the Site, the possibility exists that organic vapors and/or particulates may be released to the air during intrusive construction activities. Ambient breathing zone concentrations may at times, exceed the permissible exposure limits (PELs) established by OSHA for the individual compounds (see Table 1), in which case respiratory protection will be required. Respiratory and dermal protection may be modified (upgraded or downgraded) by the SSHO based upon real-time field monitoring data.

During injection operations, real-time monitoring will also be conducted to maintain safe working conditions on-Site.

8.1.1 On-Site Work Zone Monitoring

TurnKey-Benchmark personnel will conduct routine, real-time air monitoring upwind and downwind of work areas during all intrusive construction phases such as excavation, backfilling, drilling, etc. The work area will be monitored at regular intervals using a photo-ionization detector (PID). Observed values will be recorded and maintained as part of the permanent field record.

While wearing appropriate PPE, on-Site monitoring will be conducted in the AOC-1 injection area. The following field parameters will be taken in real time during the injection process; water level, temperature, sulfate, DO, turbidity and ORP. Observed values will be recorded and maintained as part of the permanent field record.

8.1.2 Off-Site Community Air Monitoring

In addition to on-site monitoring within the work zone(s), upwind and downwind of the Site, monitoring will also be conducted off-Site in front of the Day Care located northeast of the site during all intrusive activities. During excavation activities on-Site, four (4) air monitoring units will be employed; upwind and downwind of the Site, one (1) in front of the Day Care northeast of the site, and one (1) off-Site in front of the commercial building northwest of the site. This will provide a real-time method for determination of

vapor and/or particulate releases to the surrounding community as a result of ground intrusive investigation work.

Ground intrusive activities are defined by NYSDOH Generic Community Air Monitoring Plan, which is attached in HASP Appendix A-2. Ground intrusive activities include soil/waste excavation and handling, test pitting or trenching, and the installation of soil borings or monitoring wells. Non-intrusive activities include the collection of soil and sediment samples or the collection of groundwater samples from existing wells. Continuous monitoring is required for ground intrusive activities and periodic monitoring is required for non-intrusive activities. Periodic monitoring consists of taking a reading upon arrival at a sample location, monitoring while opening a well cap or overturning soil, monitoring while bailing a well, and taking a reading prior to leaving a sampling location. This may be upgraded to continuous if the sampling location is in close proximity to individuals not involved in the Site activity (i.e., on a curb of a busy street). The action levels below will be used during periodic monitoring.

8.2 Monitoring Action Levels

8.2.1 On-Site Work Zone Action Levels

The PID, or other appropriate instrument(s), will be used by TurnKey-Benchmark personnel to monitor organic vapor concentrations as specified in this HASP. In addition, fugitive dust/particulate concentrations will be monitored during major soil intrusion (viz., well/boring installation) using a real-time particulate monitor as specified in this plan. In the absence of such monitoring, appropriate respiratory protection for particulates shall be donned. Sustained readings obtained in the breathing zone may be interpreted (with regard to other Site conditions) as follows for TurnKey-Benchmark personnel:

- Total atmospheric concentrations of unidentified vapors or gases ranging from 0 to 1 ppm above background on the PID) - Continue operations under Level D.

- Total atmospheric concentrations of unidentified vapors or gases yielding sustained readings from >1 ppm to 5 ppm above background on the PID (vapors not suspected of containing high levels of chemicals toxic to the skin) - Continue operations under Level C.

- Total atmospheric concentrations of unidentified vapors or gases yielding sustained readings of >5 ppm to 50 ppm above background on the PID - Continue operations under Level B, re-evaluate and alter (if possible) construction methods to achieve lower vapor concentrations.

- Total atmospheric concentrations of unidentified vapors or gases above 50 ppm on the PID - Discontinue operations and exit the work zone immediately.

An explosimeter may be used to monitor levels of both combustible gases and oxygen during the remedial activities. Action levels based on the instrument readings shall be as follows:

- Less than 10% LEL - Continue engineering operations with caution.

- 10-25% LEL - Continuous monitoring with extreme caution, determine source/cause of elevated reading.

- Greater than 25% LEL - Explosion hazard, evaluate source and leave the Work Zone.

- 19.5% - 21% oxygen - proceed with extreme caution; attempt to determine potential source of oxygen displacement.

- Less than 19.5% oxygen - leave work zone immediately.

- 21-25% oxygen - Continue engineering operations with caution.

- Greater than 25% oxygen - Fire hazard potential, leave Work Zone immediately.

The particulate monitor will be used to monitor respirable dust concentrations during all intrusive activities and during handling of Site soil/fill. Action levels based on the instrument readings shall be as follows:

- Less than 50 mg/m^3 - Continue field operations.

- 50-150 mg/m^3 - Don dust/particulate mask or equivalent

- Greater than 150 mg/m^3 - Don dust/particulate mask or equivalent. Initiate engineering controls to reduce respirable dust concentration (viz., wetting of

excavated soils or tools at discretion of Site Health and Safety Officer).

Readings with the organic vapor analyzer, combustible gas meter, and particulate monitor will be recorded and documented on the appropriate Project Field Forms. All instruments will be calibrated before use on a daily basis and the procedure will be documented on the appropriate Project Field Forms.

8.2.2 Community Air Monitoring Action Levels

In addition to the action levels prescribed in Section 8.2.1 for TurnKey-Benchmark personnel on-site, the following criteria shall also be adhered to for the protection of downwind receptors consistent with NYSDOH requirements (HASP Appendix A-2):

- **ORGANIC VAPOR PERIMETER MONITORING:**
  - If the sustained ambient air concentration of organic vapors at the downwind perimeter of the exclusion zone exceeds 5 ppm above background for the 15-minute average, work activities will be temporarily halted and monitoring continued. If the sustained organic vapor decreases below 5 ppm over background, work activities can resume but more frequent intervals of monitoring, as directed by the Site Health and Safety Officer, must be conducted.

  - If the sustained ambient air concentration of organic vapors at the downwind perimeter of the exclusion zone are greater than 5 ppm over background but less than 25 ppm for the 15-minute average, activities can resume provided that: the organic vapor level 200 feet downwind of the working site or half the distance to the nearest off-site residential or commercial structure, whichever is less, is below 5 ppm over background; and more frequent intervals of monitoring, as directed by the Site Health and Safety Officer, are conducted.

  - If the sustained organic vapor level is above 25 ppm at the perimeter of the exclusion zone for the 15-minute average, the Site Health and Safety Officer must be notified and work activities shut down. The Site Health and Safety Officer will determine when re-entry of the exclusion zone is possible and will implement downwind air monitoring to ensure vapor emissions do not impact the nearest off-site residential or commercial structure at levels exceeding those specified in the ***Organic Vapor Contingency Monitoring Plan*** below. All readings will be recorded and will be available for New York State

Department of Environmental Conservation (DEC) and Department of Health (DOH) personnel to review.

- **ORGANIC VAPOR CONTINGENCY MONITORING PLAN:**
  - If the sustained organic vapor level is greater than 5 ppm over background 200 feet downwind from the work area or half the distance to the nearest off-site residential or commercial property, whichever is less, all work activities must be halted.
  - If, following the cessation of the work activities or as the result of an emergency, sustained organic levels persist above 5 ppm above background 200 feet downwind or half the distance to the nearest off-site residential or commercial property from the work area, then the air quality must be monitored within 20 feet of the perimeter of the nearest off-site residential or commercial structure (20-foot zone).
  - If efforts to abate the emission source are unsuccessful and if sustained organic vapor levels approach or exceed 5 ppm above background within the 20-foot zone for more than 30 minutes, or are sustained at levels greater than 10 ppm above background for longer than one minute, then the ***Major Vapor Emission Response Plan*** (see below) will automatically be placed into effect.

- **MAJOR VAPOR EMISSION RESPONSE PLAN:**

  Upon activation, the following activities will be undertaken:

  1. All Emergency Response Contacts as listed in this Health and Safety Plan and the Emergency Response Plan (Appendix A-1) will be advised.
  2. The local police authorities will immediately be contacted by the Site Health and Safety Officer and advised of the situation.
  3. Frequent air monitoring will be conducted at 30-minute intervals within the 20-foot zone. If two sustained successive readings below action levels are measured, air monitoring may be halted or modified by the Site Health and Safety Officer.

  The following personnel are to be notified in the listed sequence in the event that a Major Vapor Emission Plan is activated:

Responsible Person	Contact	Phone Number
SSHO	Police	911
SSHO	State Emergency Response Hotline	(800) 457-7362

Additional emergency numbers are listed in the Emergency Response Plan included as Appendix A-1.

- **EXPLOSIVE VAPORS:**
  - Sustained atmospheric concentrations of greater than 10% LEL in the work area - Initiate combustible gas monitoring at the downwind portion of the Site perimeter.
  - Sustained atmospheric concentrations of greater than 10% LEL at the downwind Site perimeter – Halt work and contact local Fire Department.

- **AIRBORNE PARTICULATE COMMUNITY AIR MONITORING**

Respirable (PM-10) particulate monitoring will be performed on a continuous basis at the upwind and downwind perimeter of the exclusion zone. In addition to upwind and downwind monitoring, one (1) monitor will be placed off-Site in front of the Day Care located to the northeast of the site during all intrusive activities on-Site. During excavation activities, one (1) monitor in addition to the three (3) monitors already employed will be set up off-Site in front of the commercial building located northwest of the Site. The monitoring will be performed using real-time monitoring equipment capable of measuring PM-10 and integrating over a period of 15-minutes for comparison to the airborne particulate action levels. 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. All readings will be recorded and will be available for NYSDEC and NYSDOH review. Readings will be interpreted as follows:

- If the downwind PM-10 particulate level is 100 micrograms per cubic meter (ug/m^3) greater than the background (upwind perimeter) reading for the 15-minute period or if airborne dust is observed leaving the work area, then dust suppression techniques must be employed. Work may continue with dust suppression provided that the downwind PM-10 particulate levels do not

exceed 150 ug/m^3 above the upwind level and that visible dust is not migrating from the work area.

- If, after implementation of dust suppression techniques downwind PM-10 levels are greater than 150 ug/m^3 above the upwind level, work activities must be stopped and dust suppression controls re-evaluated. Work can resume provided that supplemental dust suppression measures and/or other controls are successful in reducing the downwind PM-10 particulate concentration to within 150 ug/m^3 of the upwind level and in preventing visible dust migration.

Pertinent emergency response information including the telephone number of the Fire Department is included in the Emergency Response Plan (Appendix A-1).

9.0 SPILL RELEASE/RESPONSE

This chapter of the HASP describes the potential for and procedures related to spills or releases of known or suspected petroleum and/or hazardous substances on the Site. The purpose of this Section of the HASP is to plan appropriate response, control, counter-measures and reporting, consistent with OSHA requirements in 29 CFR 1910.120(b)(4)(ii)(J) and (j)(1)(viii). The spill containment program addresses the following elements:

- Potential hazardous material spills and available controls.
- Initial notification and evaluation.
- Spill response.
- Post-spill evaluation.

9.1 Potential Spills and Available Controls

An evaluation was conducted to determine the potential for hazardous material and oil/petroleum spills at this Site. For the purpose of this evaluation, hazardous materials posing a significant spill potential are considered to be:

- CERCLA Hazardous Substances as identified in 40 CFR Part 302, where such materials pose the potential for release in excess of their corresponding Reportable Quantity (RQ).

- Extremely Hazardous Substances as identified in 40 CFR Part 355, Attachment 1, where such materials pose the potential for release in excess of their corresponding Reportable Quantity (RQ).

- Hazardous Chemicals as defined under Section 311(e) of the Emergency Planning and Community Right-To-Know Act of 1986, where such chemicals are present or will be stored in excess of 10,000 lbs.

- Toxic Chemicals as defined in 40 CFR Part 372, where such chemicals are present or will be stored in excess of 10,000 lbs.

- Chemicals regulated under 6NYCRR Part 597, where such materials pose the potential for release in excess of their corresponding Reportable Quantity (RQ).

Oil/petroleum products are considered to pose a significant spill potential whenever the following situations occur:

- The potential for a "harmful quantity" of oil (including petroleum and non-petroleum-based fuels and lubricants) to reach navigable waters of the U.S. exists (40 CFR Part 112.4). Harmful quantities are considered by USEPA to be volumes of 1,000 gallons or more, or lesser quantities that either form a visible sheen on the water or violate applicable water quality standards.

- The potential for any amount of petroleum to reach any waters of NY State, including groundwater, exists. Petroleum, as defined by NY State in 6NYCRR Part 612, is a petroleum-based heat source, energy source, or engine lubricant/maintenance fluid.

- The potential for any release, to soil or water, of petroleum from a bulk storage facility regulated under 6NYCRR Part 612. A regulated petroleum storage facility is defined by NY State as a Site having stationary tank(s) and intra-facility piping, fixtures and related equipment with an aggregate storage volume of 1100 gallons or greater.

The evaluation indicates that, based on Site history and the scope of work, a hazardous material spill is not likely to occur during investigation efforts. However, the procedures identified below will be followed in the event of an unanticipated release.

9.2 Initial Spill Notification and Evaluation

Any worker who discovers a hazardous substance or oil/petroleum spill will immediately notify the Project Manager and SSHO. The worker will, to the best of his/her ability, report the material involved, the location of the spill, the estimated quantity of material spilled, the direction/flow of the spill material, related fire/explosion incidents, if any, and any associated injuries. The Emergency Response Plan presented in Appendix A-1 of this HASP will immediately be implemented if an emergency release has occurred.

Following initial report of a spill, the Project Manager will make an evaluation as to whether the release exceeds RQ levels. If an RQ level is exceeded, the Project Manager will notify the Site owner who will in turn notify NYSDEC at 1-800-457-7362 within 2 hours of spill discovery. The Project Manager will also determine what additional agencies are to be contacted regarding the release, and will follow-up with written reports as required by the applicable regulations.

9.3 Spill Response

For all spill situations, the following general response guidelines will apply:

- Only those personnel involved in overseeing or performing containment operations will be allowed within the spill area. If necessary, the area will be roped, ribboned or otherwise blocked off to prevent unauthorized access.
- Appropriate PPE, as specified by the SSHO, will be donned before entering the spill area.
- Ignition points will be extinguished/removed if fire or explosion hazards exist.
- Surrounding reactive materials will be removed.
- Drains or drainage in the spill area will be blocked to prevent inflow of spilled materials or applied materials.

For minor spills, TurnKey will maintain a Spill Control and Containment Kit in the Field Office or other readily accessible storage location. The kit will consist of, at a minimum, a 50 lb. bag of "speedy dry" granular absorbent material, absorbent pads, shovels, empty 5-gallon pails, and an empty open-top 55-gallon drum. Spilled materials will be absorbed, and shoveled into a 55-gallon drum for proper disposal (USEPA approval will be secured for on-site treatment of the impacted soils/absorbent materials, if applicable). Impacted soils will be hand-excavated to the point that no visible signs of contamination remains, and will be drummed with the absorbent.

In the event of a major release or a release that threatens surface water, a spill response contractor will be called to the Site. The response contractor may use heavy equipment (e.g., excavator, backhoe, etc.) to berm the soils surrounding the spill site or create diversion trenching to mitigate overland migration or release to navigable waters. Where feasible, pumps will be used to transfer free liquid to storage containers. Spill control/cleanup contractors in the Western New York area that may be contacted for assistance (in order of preference) include:

- NYTECH, Inc.: (585) 436-5660 or (1-800-807-7455)
- The Environmental Service Group of NY, Inc.: (716) 695-6720

9.4 Post-Spill Evaluation

If a reportable quantity of hazardous material or oil/petroleum is spilled as determined by the Project Manager, a written report will be prepared as indicated in Section 9.2. The report will identify the root cause of the spill, type and amount of material released, date/time of release, response actions, agencies notified and/or involved in cleanup, and procedures to be implemented to avoid repeat incidents. In addition, all re-useable spill cleanup and containment materials will be decontaminated, and spill kit supplies/disposable items will be replenished.

10.0 HEAT/COLD STRESS MONITORING

Although it is anticipated that work activities at the Site will be completed during the winter months, measures to be taken to minimize heat stress to TurnKey employees have also been included in the event that work activities extend to the spring months. The SSHO and/or his or her designee will be responsible for monitoring TurnKey field personnel for symptoms of heat/cold stress.

10.1 Heat Stress Monitoring

Personal protective equipment may place an employee at risk of developing heat stress, a common and potentially serious illnesses often encountered at construction, landfill, waste disposal, industrial or other unsheltered sites. The potential for heat stress is dependent on a number of factors, including environmental conditions, clothing, workload, physical conditioning and age. Personal protective equipment may severely reduce the body's normal ability to maintain temperature equilibrium (via evaporation and convection), and require increased energy expenditure due to its bulk and weight.

Proper training and preventive measures will mitigate the potential for serious illness. Heat stress prevention is particularly important because once a person suffers from heat stroke or heat exhaustion, that person may be predisposed to additional heat related illness. To avoid heat stress, the following steps should be taken:

- Adjust work schedules.
- Modify work/rest schedules according to monitoring requirements.
- Mandate work slowdowns as needed.
- Perform work during cooler hours of the day if possible or at night if adequate lighting can be provided.
- Provide shelter (air-conditioned, if possible) or shaded areas to protect personnel during rest periods.
- Maintain worker's body fluids at normal levels. This is necessary to ensure that the cardiovascular system functions adequately. Daily fluid intake must approximately equal the amount of water lost in sweat (i.e., eight fluid ounces must be ingested for approximately every 1 lb of weight lost). The normal thirst mechanism is not sensitive enough to ensure that enough water will be consumed

to replace lost perspiration. When heavy sweating occurs, workers should be encouraged to drink more.

- Train workers to recognize the symptoms of heat related illness.

Heat-Related Illness - Symptoms:

- Heat rash may result from continuous exposure to heat or humid air.
- Heat cramps are caused by heavy sweating with inadequate electrolyte replacement. Signs and symptoms include: muscle spasms; pain in the hands, feet and abdomen.
- Heat exhaustion occurs from increased stress on various body organs including inadequate blood circulation due to cardiovascular insufficiency or dehydration. Signs and symptoms include: pale, cool, moist skin; heavy sweating; dizziness; nausea; fainting.
- Heat stroke is the most serious form of heat stress. Temperature regulation fails and the body temperature rises to critical levels. Immediate action must be taken to cool the body before serious injury and death occur. Competent medical help must be obtained. Signs and symptoms are: red, hot, usually dry skin; lack of or reduced perspiration; nausea; dizziness and confusion; strong, rapid pulse; coma.

The monitoring of personnel wearing protective clothing should commence when the ambient temperature is 70 degrees Fahrenheit or above. For monitoring the body's recuperative ability to excess heat, one or more of the following techniques should be used as a screening mechanism.

- Heart rate may be measured by the radial pulse for 30 seconds as early as possible in the resting period. The rate at the beginning of the rest period should not exceed 100 beats per minute. If the rate is higher, the next work period should be shortened by 10 minutes (or 33%), while the length of the rest periods stay the same. If the pulse rate is 100 beats per minute at the beginning of the nest rest period, the following work cycle should be further shortened by 33%.
- Body temperature may be measured orally with a clinical thermometer as early as possible in the resting period. Oral temperature at the beginning of the rest period should not exceed 99.6 degrees Fahrenheit. If it does, the next work period should be shortened by 10 minutes (or 33%), while the length of the rest period

remains the same. However, if the oral temperature exceeds 99.6 degrees Fahrenheit at the beginning of the next period, the work cycle may be further shortened by 33%. Oral temperature should be measured at the end of the rest period to make sure that it has dropped below 99.6 degrees Fahrenheit. No TurnKey employee will be permitted to continue wearing semi-permeable or impermeable garments when his/her oral temperature exceeds 100.6 degrees Fahrenheit.

10.2 Cold Stress Monitoring

Exposure to cold conditions may result in frostbite or hypothermia, each of which progresses in stages as shown below.

- **Frostbite** occurs when body tissue (usually on the extremities) begins to freeze. The three states of frostbite are:

  1) **Frostnip** - This is the first stage of the freezing process. It is characterized by a whitened area of skin, along with a slight burning or painful sensation. Treatment consists of removing the victim from the cold conditions, removal of boots and gloves, soaking the injured part in warm water (102 to 108 degrees Fahrenheit) and drinking a warm beverage. Do not rub skin to generate friction/ heat.

  2) **Superficial Frostbite** - This is the second stage of the freezing process. It is characterized by a whitish gray area of tissue which will be firm to the touch but will yield little pain. The treatment is identical for Frostnip.

  3) **Deep Frostbite** - In this final stage of the freezing process the affected tissue will be cold, numb and hard and will yield little to no pain. Treatment is identical to that for Frostnip.

- **Hypothermia** is a serious cold stress condition occurring when the body loses heat at a rate faster than it is produced. If untreated, hypothermia may be fatal. The stages of hypothermia may not be clearly defined or visible at first, but generally include:

  1) Shivering

  2) Apathy (i.e., a change to an indifferent or uncaring mood)

  3) Unconsciousness

4) Bodily freezing

Employees exhibiting signs of hypothermia should be treated by medical professionals. Steps that can be taken while awaiting help include:

1) Remove the victim from the cold environment and remove wet or frozen clothing. (Do this carefully as frostbite may have started.)

2) Perform active re-warming with hot liquids for drinking (Note: do not give the victim any liquid containing alcohol or caffeine) and a warm water bath (102 to 108 degrees Fahrenheit).

3) Perform passive re-warming with a blanket or jacket wrapped around the victim.

In any potential cold stress situation, it is the responsibility of the SSHO to encourage the following:

- Education of workers to recognize the symptoms of frostbite and hypothermia.
- Workers should dress warmly, with more layers of thin clothing as opposed to one thick layer.
- Personnel should remain active and keep moving.
- Personnel should be allowed to take shelter in heated areas, as necessary.
- Personnel should drink warm liquids (no caffeine or alcohol if hypothermia has set in).
- For monitoring the body's recuperation from excess cold, oral temperature recordings should occur:
  - At the Site Safety Technicians discretion when suspicion is based on changes in a worker's performance or mental status.
  - At a workers request.
  - As a screening measure, two times per shift, under unusually hazardous conditions (e.g., wind chill less than 20 degrees Fahrenheit or wind chill less than 30 degrees Fahrenheit with precipitation).

- As a screening measure whenever anyone worker on Site develops hypothermia.

Any person developing moderate hypothermia (a core body temperature of 92 degrees Fahrenheit) will not be allowed to return to work for 48 hours without the recommendation of a qualified medical doctor.

11.0 SITE CONTROL

The purpose of site control is to minimize potential contamination of workers, protect the public from site hazards, and prevent vandalism. The degree of site control necessary depends on the site characteristics, site size, and the surrounding community.

Controlled work areas will be established at each work location, and if required, will be established directly prior to the work being conducted. Diagrams designating specific controlled work areas will be drawn on site maps posted in the support vehicle or trailer (if applicable) and discussed during daily tailgate safety meetings. If the site layout changes, the new areas and their potential hazards will be discussed immediately after the changes are made. General examples of zone layouts have been developed for drilling and earth moving activities (e.g., excavating, trenching, etc.) and are attached to this section.

11.1 Controlled Work Zones

Controlled work zones around the areas designated for investigation activities will be established by TurnKey on a daily basis and communicated to all employees and other Site users by the SSHO. It shall be the SSHO's responsibility to ensure that all Site workers are aware of the work zone boundaries and to enforce proper procedures in each area. The zones will include an Exclusion Zone (or contaminated work area), a Contaminant Reduction Zone (or decontamination zone), and a Support Zone (uncontaminated or "clean area" where personnel should not be exposed to hazardous conditions). Each zone will be periodically monitored in accordance with the air monitoring requirements established in this HASP. The Exclusion Zone and the Contamination Reduction Zone are considered work areas. The Support Zone is accessible to the public (e.g., vendors, inspectors). The following sections describe these zones in more detail.

11.2 Exclusion Zone

The Exclusion Zone (or "Hot Zone") is the area where contaminated materials may be exposed, excavated or handled and all areas where contaminated equipment or personnel may travel. The zone will be clearly delineated by hazard flagging tape, barricades or cones, or enclosed by fences or ropes, as necessary. All personnel entering the Exclusion Zone must wear the prescribed level of personal protective equipment identified in Section 7.

The extent of each area will be sufficient to ensure that personnel located at/beyond its boundaries will not be affected in any substantial way by hazards associated with sample

collection activities. To meet this requirement, the following minimum distances will be used:

- **Direct Push Drilling Activities**. A distance of 20 feet in all directions will be cleared from the rig.

- **HSA Drilling**. Determine the mast height of the drill rig. This height will be cleared, if practical, in all directions from the bore-hole location and designated as the exclusion zone. The cleared area will be sufficient to accommodate movement of necessary equipment and the stockpiling of spoils piles.

- **Test Pitting Activities**. A distance of 25 feet will be cleared in all directions from the backhoe and the location where the excavated soil is deposited.

- **Slab Cutting**. A distance of 10 feet in all directions from the cutting location will be cleared when using manual methods (i.e., chisel or equivalent) and 20 feet when using a concrete saw.

- **Hand Augering**. A distance of 10 feet will be cleared in all directions from the sampling location in order to accommodate additional sampling equipment.

All personnel should be alert to prevent unauthorized, accidental entrance into controlled-access areas (the Exclusion Zone and CRZ). If such an entry should occur, the trespasser should be immediately escorted outside the area, or all HAZWOPER-related work must cease. All personnel, equipment, and supplies that enter controlled-access areas must be decontaminated or containerized as waste prior to leaving (through the CRZ only).

11.3 Contamination Reduction Zone (CRZ)

The Contamination Reduction Zone (CRZ) is the transition area between the contaminated area and the clean area. Decontamination is the main focus in this area. The decontamination of workers and equipment limits the physical transfer of hazardous substances into the clean area. This area must also be clearly marked with hazard tape and access limited to personnel involved in decontamination, as necessary.

11.4 Support Zone

The Support Zone is an uncontaminated zone where administrative and other support functions, such as first aid, equipment supply, emergency information, etc., are

located. The Support Zone shall have minimal potential for significant exposure to contaminants (i.e., background levels). Employees will establish a Support Zone (if necessary) at the site before the commencement of site activities. The Support Zone would also serve as the entry point for controlling site access. Support equipment will be located in this zone, and personnel may wear normal work clothes within this zone.

11.5 Boundaries

In the absence of other task-specific work zone boundaries established by the SSHO, the following boundaries will apply to all investigation activities involving disruption or handling of Site soils, sediment, or groundwater:

- Exclusion Zone: 50 foot radius from the outer limit of the sampling activity.
- Contaminant Reduction Zone: 100 foot radius from the outer limit of the sampling activity.
- Support Zone: Areas outside the Contaminant Reduction Zone.

11.6 Site Access Documentation

Access of non-essential personnel to the Exclusion and Contaminant Reduction Zones will be strictly controlled by TurnKey. Only personnel who are essential to the completion of the task will be allowed access to these areas with the prescribed level of protection. Entrance of all personnel must be approved by the SSHO. If implemented by the PM, all personnel entering the site shall complete a "Site Entry/Exit Log" located at the site trailer or primary site support vehicle.

The Contractor will maintain a Health and Safety Logbook containing the names of workers and their level of protection. The zone boundaries may be changed by the SSHO as environmental conditions warrant, and to respond to the necessary changes in work locations on-site.

11.7 Visitor Access

Visitors to any HAZWOPER controlled-work area must comply with the health and safety requirements of this HASP, and demonstrate an acceptable need for entry into the work area. All visitors desiring to enter any controlled work area must observe the following procedures:

1. A written confirmation must be received by TurnKey documenting that each of the visitors has received the proper training and medical monitoring required by this HASP. Verbal confirmation can be considered acceptable provided such confirmation is made by an officer or other authorized representative of the visitor's organization.

2. Each visitor will be briefed on the hazards associated with the site activities being performed and acknowledge receipt of this briefing by signing the appropriate tailgate safety briefing form.

3. All visitors must be escorted by an TurnKey employee.

If the site visitor requires entry to any Exclusion Zone, but does not comply with the above requirements, all work activities within the Exclusion Zone must be suspended. Until these requirements have been met, entry will not be permitted.

11.8 Site Security

Site security is necessary to:

- Prevent the exposure of unauthorized, unprotected people to site hazards.
- Avoid the increased hazards from vandals or persons seeking to abandon other wastes on the site.
- Prevent theft.
- Avoid interference with safe working procedures.

To maintain site security during working hours:

1. Maintain security in the Support Zone and at access control points.

2. Establish an identification system to identify authorized persons and limitations to their approved activities.

3. Assign responsibility for enforcing authority for entry and exit requirements.

4. When feasible, install fencing or other physical barrier around the site.

5. If the site is not fenced, post signs around the perimeter and whenever possible, use guards to patrol the perimeter. Guards must be fully apprised of the hazards involved and trained in emergency procedures.

6. Have the PM approve all visitors to the site. Make sure they have valid purpose for entering the site. Have trained site personnel accompany visitors at all times and provide them with the appropriate protective equipment.

To maintain site security during off-duty hours:

1. If possible, assign trained, in-house technicians for site surveillance. They will be familiar with the site, the nature of the work, the site's hazards, and respiratory protection techniques.

2. If necessary, use security guards to patrol the site boundary. Such personnel may be less expensive than trained technicians, but will be more difficult to train in safety procedures and will be less confident in reacting to problems around hazardous substances.

3. Enlist public enforcement agencies, such as the local police department, if the site presents a significant risk to local health and safety.

4. Secure the equipment.

12.0 DECONTAMINATION

12.1 Decontamination for TurnKey Employees

The degree of decontamination required is a function of a particular task and the environment within which it occurs. The following decontamination procedure will remain flexible, thereby allowing the decontamination crew to respond appropriately to the changing environmental conditions which may arise at the Site. All TurnKey personnel on-site shall follow the procedure below.

Station 1 - Equipment Drop: Deposit visibly contaminated (if any) re-useable equipment used in the contamination reduction and exclusion zones (tools, containers, monitoring instruments, radios, clipboards, etc.) on plastic sheeting.

Station 2 - Boots and Gloves Wash and Rinse: Scrub outer boots and outer gloves.

Station 3 - Tape, Outer Boot and Glove Removal: Remove tape, outer boots and gloves. Deposit tape and gloves in waste disposal container.

Station 4 - Canister or Mask Change: If worker leaves exclusive zone to change canister (or mask), this is the last step in the decontamination procedure. Worker's canister is exchanged, new outer gloves and boot cover donned, and worker returns to duty.

Station 5 - Outer Garment/Face Piece Removal: Protective suit removed and deposited in separate container provided by Contractor. Face piece or goggles are removed if used. Avoid touching face with fingers. Face piece and/or goggles deposited on plastic sheet. Hard hat removed and placed on plastic sheet.

Station 6 - Inner Glove Removal: Inner gloves are the last personal protective equipment to be removed. Avoid touching the outside of the gloves with bare fingers. Dispose of these gloves in waste disposal container.

Following PPE removal, personnel shall wash hands, face and forearms with absorbent wipes. If field activities proceed for duration of 6 consecutive months or longer, shower facilities will be provided for worker use in accordance with OSHA 29 CFR 1910.120(n).

12.2 Decontamination for Medical Emergencies

In the event of a minor, non-life threatening injury, personnel should follow the decontamination procedures as defined, and then administer first-aid.

In the event of a major injury or other serious medical concern (e.g., heat stroke), immediate first-aid is to be administered and the victim transported to the hospital in lieu of further decontamination efforts unless exposure to a Site contaminant would be considered "Immediately Dangerous to Life or Health."

12.3 Decontamination of Field Equipment

Decontamination of heavy equipment will be conducted by the subcontractor in accordance with his approved HASP in the Contamination Reduction Zone. As a minimum, this will include manually removing heavy soil clods, followed by high pressure water and detergent or steam cleaning.

Decontamination of all tools used for sample collection purposes will be conducted by TurnKey personnel. It is expected that all tools will be constructed of nonporous, nonabsorbent materials (i.e., metal) that will aid in the decontamination effort. Any tool or part of a tool made of porous, absorbent material (i.e., wood) will be placed into suitable containers and prepared for disposal.

13.0 CONFINED SPACE ENTRY

OSHA 29 CFR 1910.146 identifies a confined space as a space that is large enough and so configured that an employee can physically enter and do assigned work, has limited or restricted means for entry and exit, and is not intended for continuous employee occupancy. Confined spaces include, but are not limited to, trenches, storage tanks, process vessels, pits, sewers, tunnels, underground utility vaults, pipelines, sumps, wells, and excavations.

Confined space entry by TurnKey employees is not anticipated to be necessary to complete the remedial activities identified in Section 1.4. In the event that the scope of work changes or confined space entry appears necessary, the Project Manager will be consulted to determine if feasible engineering alternatives to confined space entry can be implemented. If confined space entry by TurnKey employees cannot be avoided through reasonable engineering measures, task-specific confined space entry procedures will be developed and a confined-space entry permit will be issued through TurnKey's corporate Health and Safety Director. TurnKey employees shall not enter a confined space without these procedures, permits in place, and proper training.

14.0 FIRE PREVENTION AND PROTECTION

14.1 General Approach

Recommended practices and standards of the National Fire Protection Association (NFPA) and other applicable regulations will be followed in the development and application of Project Fire Protection Programs. When required by regulatory authorities, the project management will prepare and submit a Fire Protection Plan for the approval of the contracting officers, authorized representative or other designated official. Essential considerations for the Fire Protection Plan will include:

- Proper Site preparation and safe storage of combustible and flammable materials.
- Availability of coordination with private and public fire authorities.
- Adequate job-site fire protection and inspections for fire prevention.
- Adequate indoctrination and training of employees.

14.2 Equipment and Requirements

Fire extinguishers will be provided by TurnKey and are required to be provided by the subcontractor on all heavy equipment brought on-site. Fire extinguishers will be inspected, serviced, and maintained in accordance with the manufacturer's instructions. As a minimum, all extinguishers shall be checked monthly and weighed semi-annually, and recharged if necessary. Recharge or replacement shall be mandatory immediately after each use.

14.3 Flammable and Combustible Substances

All storage, handling or use of flammable and combustible substances will be under the supervision of qualified persons. All tanks, containers, and pumping equipment (portable or stationary) that are used for the storage and handling of flammable and combustible liquids, will meet the recommendations of the National Fire Protection Association.

14.4 Hot Work

If the scope of work necessitates welding or blow torch operation, the hot work permit presented in Appendix A-3 will be completed by the SSHO and reviewed/issued by the Project Manager.

15.0 EMERGENCY INFORMATION

In accordance with OSHA 29 CFR Part 1910, an Emergency Response Plan is included as Appendix A-1 of this HASP.

16.0 REFERENCES

1. Labella Associates, P.C., *Remedial Investigation Report*, Carriage Cleantown, 1600 Penfield Road, Penfield, NY, June 2009.

2. Labella Associates, P.C., *Remedial Alternatives Analysis*, 1600 Penfield Road, Penfield, NY, July 2009.

3. Labella Associates, P.C., *Interim Remedial Measures*, Carriage Cleantown, 1600 Penfield Road, Penfield, NY, July 2009.

TABLES

TABLE 1

COPCs & OBSERVED CONCENTRATIONS BY MEDIA

Health and Safety Plan for Remedial Action Activities
Carriage Cleaners Site
Penfield, New York
BCP Site No. C828131

Parameter	Soil (mg/Kg)	Groundwater (ug/L)
Volatile Organic Compounds		
Tetrachloroethene	130,000	58,000 D
Trichloroethene	0.098 J	2,900 D
cis-1,2-Dichloroethene	0.25 J	1,500 D,J
trans-1,2-Dichloroethene	ND	32
Vinyl Chloride	ND	44

Notes:

J = Estimated concentration.
D = Compounds identified in an analysis at the secondary dilution factor.
B = Compound detected in the associated trip blank as well as the sample.
ND = Not detected.
NA = Not analyzed.

TABLE 2

TOXICITY AND EXPOSURE DATA FOR CONSTITUENTS OF POTENTIAL CONCERN

Health and Safety Plan for Remedial Action Activities
Carriage Cleaners Site
Penfield, New York
BCP Site No. C828131

Constituents of Potential Concern	Inhalation Hazard		IDLH
	PEL	TLV	
Volatile Organic Compounds (ppm):			
Tetrachloroethene	100	25	150; Ca
Trichloroethene	100	10	1,000; Ca
cis-1,2-Dichloroethene	200	200	1,000
trans-1,2-Dichloroethene	200	200	1,000
Vinyl Chloride	1	1	ND; Ca

Notes:

PEL - Permissible Exposure Limit, established by OSHA, equals the max. exposure concentration allowable for 8 hours per day @ 40 hrs. per week.
TLV - Threshold Limit Value, established by ACGIH, equals the maximum exposure concentration allowable for 8 hours per day @ 40 hrs. per week.
IDLH - Immediately Dangerous to Life or Health
Ca - NIOSH considers constituent to be a potential carcinogen.
ND - IDLH has not yet been established.
NA - Not Available. Exposure should be minimized to the extent feasible through appropriate engineering controls & PPE.

TABLE 3

POTENTIAL ROUTES OF EXPOSURE TO CONSTITUENTS OF POTENTIAL CONCERN

Health and Safety Plan for Remedial Action Activities
Carriage Cleaners Site
Penfield, New York
BCP Site No. C828131

Activity	Direct Contact with Surface and Subsurface Soils	Direct Contact with Groundwater	Inhalation of Vapors or Dust
Monitoring Wells Installation		X	
Sampling of Monitoring Wells		X	
Injection Point Work	X	X	X

TABLE 4

REQUIRED LEVELS OF PROTECTION FOR RA TASKS

Health and Safety Plan for Remedial Action Activities
Carriage Cleaners Site
Penfield, New York
BCP Site No. C828131

Activity	Respiratory Protection 1	Clothing	Gloves 2	Boots 2, 3	Other Required PPE/Modifications 2, 4
Remedial Action Activities					
1. Monitoring Well Sampling	Level D (upgrade to Level C if necessary)	Work Uniform or Tyvek	L/N	outer: L inner: STSS	HH SGSS
2. Injection Point Work	Level D (upgrade to Level C if necessary)	Work Uniform or Tyvek	L/N	outer: L inner: STSS	SGSS

Notes:

1. Respiratory equipment shall conform to guidelines presented in Section 7.0 of this HASP. The Level C requirement is an air-purifying respirator equiped with organic compound/acid gas/dust cartridge.
2. HH = hardhat; L= Latex; L/N = latex inner glove, nitrile outer glove; N = Nitrile; S = Saranex; SG = safety glasses; SGSS = safety glasses with sideshields; STSS = steel toe safety shoes.
3. Latex outer boot (or approved overboot) required whenever contact with contaminated materials may occur. SSHO may downgrade to STSS (steel-toed safety shoes) if contact will be limited to cover/replacement soils.
4. Dust masks shall be donned as directed by the SSHO (site safety and health officer) or site safety technician whenever potentially contaminated airborne particulates (i.e., dust) are present in significant amounts in the breathing zone. Goggles may be substituted with safety glasses w/side-shields whenever contact with contaminated liquids is not anticipated.

APPENDIX A-1

EMERGENCY RESPONSE PLAN

HASP
APPENDIX A-1

EMERGENCY RESPONSE PLAN
for
REMEDIAL ACTION WORK PLAN
ACTIVITIES

CARRIAGE CLEANERS SITE
1600 PENFIELD ROAD
PENFIELD, NEW YORK
BCP SITE NO. C828131

Revised June 2016 0295-013-001

Prepared for:

Springs Land Company, LLC

Prepared By:

TurnKey Environmental Restoration, LLC

In Association With

Benchmark Environmental Engineering & Science, PLLC

APPENDIX A-1: EMERGENCY RESPONSE PLAN
HEALTH AND SAFETY PLAN FOR
REMEDIAL ACTION WORK PLAN ACTIVITIES

Carriage Cleaners Site
BCP Site No. C828131

Table of Contents

LIST OF FIGURES

1.0 GENERAL

This report presents the site-specific Emergency Response Plan (ERP) referenced in the Health and Safety Plan (HASP) prepared for the Remedial Action (RA) activities at the Carriage Cleaners site (Site) addressed at 1600 Penfield Road located in the Town of Penfield, Monroe County, New York. This appendix of the HASP describes potential emergencies that may occur at the Site; procedures for responding to those emergencies; roles and responsibilities during emergency response; and training all workers must receive in order to follow emergency procedures. This ERP also describes the provisions this Site has made to coordinate its emergency response planning with other contractors on-site and with off-site emergency response organizations.

This ERP is consistent with the requirements of 29 CFR 1910.120(l) and provides the following site-specific information:

- Pre-emergency planning.
- Personnel roles, lines of authority, and communication.
- Emergency recognition and prevention.
- Safe distances and places of refuge.
- Evacuation routes and procedures.
- Decontamination procedures.
- Emergency medical treatment and first aid.
- Emergency alerting and response procedures.
- Critique of response and follow-up.
- Emergency personal protective equipment (PPE) and equipment.

2.0 PRE-EMERGENCY PLANNING

This Site has been evaluated for potential emergency occurrences, based on Site hazards, the required work tasks, the Site topography, and prevailing weather conditions. The results of that evaluation indicate the potential for the following site emergencies to occur at the locations indicated.

Type of Emergency:

1. Medical, due to physical injury
2. Fire, due to use of gasoline on-site by vehicles

Source of Emergency:

1. Slip/trip/fall
2. Fire

Location of Source:

1. Non-specific

3.0 ON-SITE EMERGENCY RESPONSE EQUIPMENT

Emergency procedures may require specialized equipment to facilitate worker rescue, contamination control and reduction, or post-emergency clean up. Emergency response equipment available on the Site is listed below. The equipment inventory and storage locations are based on the potential emergencies described above. This equipment inventory is designed to meet on-site emergency response needs and any specialized equipment needs that off-site responders might require because of the hazards at this Site but not ordinarily stocked.

Any additional PPE required and stocked for emergency response is also listed below. During an emergency, the Emergency Response Coordinator (ERC) is responsible for specifying the level of PPE required for emergency response. At a minimum, PPE used by emergency responders will comply with Section 7.0, Personal Protective Equipment, of this HASP. Emergency response equipment is inspected at regular intervals and maintained in good working order. The equipment inventory is replenished as necessary to maintain response capabilities.

Emergency Equipment	Quantity	Location
First Aid Kit	1	Site Vehicle
Chemical Fire Extinguisher	2 (minimum)	All heavy equipment and Site Vehicle

Emergency PPE	Quantity	Location
Full-face respirator	1 for each worker	Site Vehicle
Chemical-resistant suits	4 (minimum)	Site Vehicle

4.0 EMERGENCY PLANNING MAPS

An area-specific map of the Site will be developed on a daily basis during performance of field activities. The map will be marked to identify critical on-site emergency planning information including: emergency evacuation routes, a place of refuge, an assembly point, and the locations of key Site emergency equipment. Site zone boundaries will be shown to alert responders to known areas of contamination. There are no major topographical features, however the direction of prevailing winds/weather conditions that could affect emergency response planning are also marked on the map. The map will be posted at site-designated place of refuge and inside the TurnKey personnel field vehicle.

5.0 EMERGENCY CONTACTS

The following identifies the emergency contacts for this ERP.

Emergency Telephone Numbers:

Project Manager: ***Michael Lesakowski***
Work: (716) 856-0599
Mobile: (716) 818-3954

Corporate Health and Safety Director: ***Thomas H. Forbes***
Work: (716) 856-0599
Mobile: (716) 864-1730

Site Safety and Health Officer (SSHO): ***Bryan C. Hann***
Work: (716) 856-0635
Mobile: (716) 870-1165

Alternate SSHO: ***Richard L. Dubisz***
Work: (716) 856-0635
Mobile: (716) 998-4334

STRONG MEMORIAL HOSPITAL (ER):	(585) 275-4551
FIRE:	911
AMBULANCE:	911
POLICE:	911
STATE EMERGENCY RESPONSE HOTLINE:	(800) 457-7362
NATIONAL RESPONSE HOTLINE:	(800) 424-8802
NYSDOH (ROCHESTER OFFICE):	(585) 423-8041
NYSDEC:	(585) 226-2466
NYSDEC 24-HOUR SPILL HOTLINE:	(800) 457-7252
NYSDEC Project Manager: Charlotte B. Theobold	(585) 226-5354
NYSDOH Project Manager: Melissa Doroski	(518) 402-7860
Monroe County Health Department Project Manager: John Frazer	(585) 753-5476

The Site location is:
Carriage Cleaners Site
1600 Penfield Road
Penfield, New York 14625
Site Phone Number: (Insert Cell Phone or Field Trailer): _____

6.0 EMERGENCY ALERTING & EVACUATION

Internal emergency communication systems are used to alert workers to danger, convey safety information, and maintain site control. Any effective system can be employed. Two-way radio headsets or field telephones are often used when work teams are far from the command post. Hand signals and air-horn blasts are also commonly used. Every system must have a backup. It shall be the responsibility of each contractor's SSHO to ensure an adequate method of internal communication is understood by all personnel entering the Site. Unless all personnel are otherwise informed, the following signals shall be used.

1) Emergency signals by portable air horn, siren, or whistle: two short blasts, personal injury; continuous blast, emergency requiring site excavation.

2) Visual signals: hand gripping throat, out of air/cannot breathe; hands on top of head, need assistance; thumbs up, affirmative/ everything is OK; thumbs down, no/negative; grip partner's wrist or waist, leave area immediately.

If evacuation notice is given, site workers leave the worksite with their respective buddies, if possible, by way of the nearest exit. Emergency decontamination procedures detailed in Section 12.0 of the HASP are followed to the extent practical without compromising the safety and health of site personnel. The evacuation routes and assembly area will be determined by conditions at the time of the evacuation based on wind direction, the location of the hazard source, and other factors as determined by rehearsals and inputs from emergency response organizations. Wind direction indicators are located so that workers can determine a safe up wind or cross wind evacuation route and assembly area if not informed by the emergency response coordinator at the time the evacuation alarm sounds. Since work conditions and work zones within the site may be changing on daily basis, it shall be the responsibility of the construction SSHO to review evacuation routes and procedures as necessary and to inform all TurnKey-Benchmark workers of any changes.

Personnel exiting the site will gather at a designated assembly point. To determine that everyone has successfully exited the site, personnel will be accounted for at the assembly site. If any worker cannot be accounted for, notification is given to the SSHO so that appropriate action can be initiated. Contractors and subcontractors on this Site have coordinated their emergency response plans to ensure that these plans are compatible and that source(s) of potential emergencies are recognized, alarm systems are clearly understood, and evacuation routes are accessible to all personnel relying on them.

7.0 EXTREME WEATHER CONDITIONS

In the event of adverse weather conditions, the SSHO in conjunction with the Contractor's SSHO will determine if engineering operations can continue without sacrificing the health and safety of Site personnel. Items to be considered prior to determining if work should continue include but are not limited to:

- Potential for heat/cold stress.
- Weather-related construction hazards (e.g., flooding or wet conditions producing undermining of structures or sheeting, high wind threats, etc).
- Limited visibility.
- Potential for electrical storms.
- Limited site access/egress (e.g., due to heavy snow)

8.0 EMERGENCY MEDICAL TREATMENT & FIRST AID

Personnel Exposure:

The following general guidelines will be employed in instances where health impacts threaten to occur acute exposure is realized:

- Skin Contact: Use copious amounts of soap and water. Wash/rinse affected area for at least 15 minutes. Decontaminate and provide medical attention. Eyewash stations will be provided on site. If necessary, transport to Strong Memorial Hospital.

- Inhalation: Move to fresh air and, if necessary, transport to Strong Memorial Hospital.

- Ingestion: Decontaminate and transport to Strong Memorial Hospital.

Personal Injury:

Minor first-aid will be applied on-site as deemed necessary. In the event of a life threatening injury, the individual should be transported to Strong Memorial Hospital via ambulance. The SSHO will supply available chemical specific information to appropriate medical personnel as requested.

First aid kits will conform to Red Cross and other applicable good health standards, and shall consist of a weatherproof container with individually sealed packages for each type of item. First aid kits will be fully equipped before being sent out on each job and will be checked weekly by the SSHO to ensure that the expended items are replaced.

Directions to Strong Memorial Hospital (see Figure A-1):

The following directions describe the best route from the Site to Strong Memorial Hospital in Rochester, New York (approximately 8 miles):

- Travel west on Penfield Road toward Old Penfield Road
- Slight right to merge onto I-490 W
- Take Exit 17 for Goodman Street
- Turn Left onto S Goodman Street
- Turn Right onto Elmwood Avenue
- Make a U-Turn at Kendrick Road (to remain on Elmwood Avenue)
- The hospital is on the right at 601 Elmwood Ave.
- Follow signs to the ER

9.0 EMERGENCY RESPONSE CRITIQUE & RECORD KEEPING

Following an emergency, the SSHO and Project Manager shall review the effectiveness of this Emergency Response Plan (ERP) in addressing notification, control and evacuation requirements. Updates and modifications to this ERP shall be made accordingly. It shall be the responsibility of each contractor to establish and assure adequate records of the following:

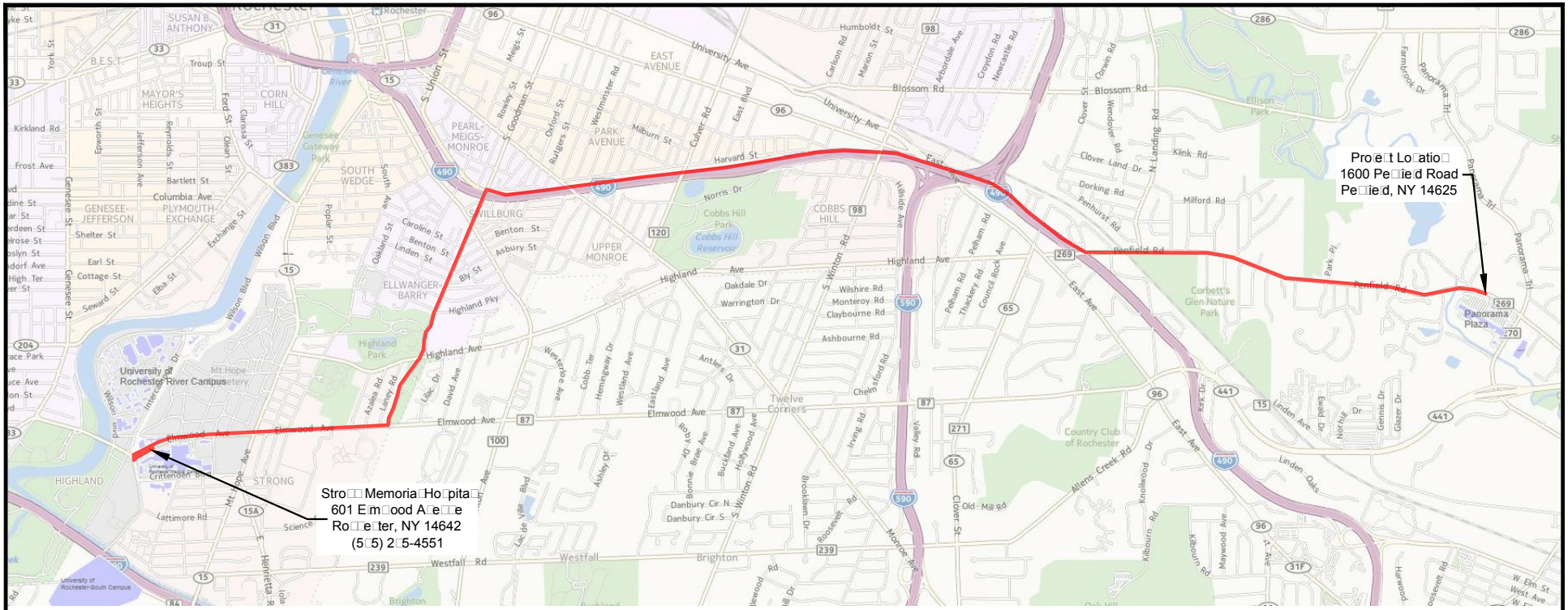
- Occupational injuries and illnesses.
- Accident investigations.
- Reports to insurance carrier or State compensation agencies.
- Reports required by the client.
- Records and reports required by local, state, federal and/or international agencies.
- Property or equipment damage.
- Third party injury or damage claims.
- Environmental testing logs.
- Explosive and hazardous substances inventories and records.
- Records of inspections and citations.
- Safety training.

10.0 EMERGENCY RESPONSE TRAINING

All persons who enter the worksite, including visitors, shall receive a site-specific briefing from the SSHO regarding anticipated emergency situations and emergency procedures. Where this Site relies on off-site organizations for emergency response, the training of personnel in those off-site organizations has been evaluated and is deemed adequate for response to this Site.

FIGURES

F:\CAD\TurnKey\Spring Land Company\1600 Penfield Rd\Figure A-1; Hospital Route Map (HASP).dwg



DIRECTIONS

- Travel west on Penfield Road toward Old Penfield Road
- Slight right to merge onto I-490 W
- Take Exit 17 for Goodman Street
- Turn Left onto S Goodman Street
- Turn Right onto Elmwood Avenue
- Make a U-Turn at Kendrick Road (to remain on Elmwood Avenue)
- The hospital is on the right at 601 Elmwood Ave.
- Follow signs to the ER

NOTES

1.) The map is adapted from yahoo.com.
2.) The map is NOT TO SCALE.

N

TURNKEY ENVIRONMENTAL RESTORATION, LLC
2558 HAMBURG TURNPIKE
SUITE 300
BUFFALO, NY 14218
(716) 856-0635

PROJECT NO.: 0295-01□-001
DATE: APRIL 2014
DRAFTED BY: JCT

HOSPITAL ROUTE MAP

HEALTH AND SAFETY PLAN

CARRIAGE CLEANERS SITE
PENFIELD, NEW YORK
BCP SITE NO. C□2□1□1

PREPARED FOR
SPRINGS LAND COMPANY, LLC

FIGURE A-1

APPENDIX A-2

NYSDOH GENERIC COMMUNITY AIR MONITORING PLAN (CAMP)

Appendix C1
New York State Department of Health
Generic Community Air Monitoring Plan

Overview

A Community Air Monitoring Plan (CAMP) requires real-time monitoring for volatile organic compounds (VOCs) and particulates (i.e., dust) at the downwind perimeter of each designated work area when certain activities are in progress at contaminated sites. The CAMP is not intended for use in establishing action levels for worker respiratory protection. Rather, its intent is to provide a measure of protection for the downwind community (i.e., off-site receptors including residences and businesses and on-site workers not directly involved with the subject work activities) from potential airborne contaminant releases as a direct result of investigative and remedial work activities. The action levels specified herein require increased monitoring, corrective actions to abate emissions, and/or work shutdown. Additionally, the CAMP helps to confirm that work activities did not spread contamination off-site through the air.

The generic CAMP presented below will be sufficient to cover many, if not most, sites. Specific requirements should be reviewed for each situation in consultation with NYSDOH to ensure proper applicability. In some cases, a separate site-specific CAMP or supplement may be required. Depending upon the nature of contamination, chemical- specific monitoring with appropriately-sensitive methods may be required. Depending upon the proximity of potentially exposed individuals, more stringent monitoring or response levels than those presented below may be required. Special requirements will be necessary for work within 20 feet of potentially exposed individuals or structures and for indoor work with co-located residences or facilities. These requirements should be determined in consultation with NYSDOH.

Reliance on the CAMP should not preclude simple, common-sense measures to keep VOCs, dust, and odors at a minimum around the work areas.

Community Air Monitoring Plan

Depending upon the nature of known or potential contaminants at each site, real-time air monitoring for VOCs and/or particulate levels at the perimeter of the exclusion zone or work area will be necessary. Most sites will involve VOC and particulate monitoring; sites known to be contaminated with heavy metals alone may only require particulate monitoring. If radiological contamination is a concern, additional monitoring requirements may be necessary per consultation with appropriate DEC/NYSDOH staff.

Continuous monitoring will be required for all ground intrusive activities and during the demolition of contaminated or potentially contaminated structures. Ground intrusive activities include, but are not limited to, soil/waste excavation and handling, test pitting or trenching, and the installation of soil borings or monitoring wells.

Periodic monitoring for VOCs will be required during non-intrusive activities such as the collection of soil and sediment samples or the collection of groundwater samples from existing monitoring wells. “Periodic” monitoring during sample collection might reasonably consist of taking a reading upon arrival at a sample location, monitoring while opening a well cap or

overturning soil, monitoring during well baling/purging, and taking a reading prior to leaving a sample location. In some instances, depending upon the proximity of potentially exposed individuals, continuous monitoring may be required during sampling activities. Examples of such situations include groundwater sampling at wells on the curb of a busy urban street, in the midst of a public park, or adjacent to a school or residence.

VOC Monitoring, Response Levels, and Actions

Volatile organic compounds (VOCs) must be monitored at the downwind perimeter of the immediate work area (i.e., the exclusion zone) on a continuous basis or as otherwise specified. Upwind concentrations should be measured at the start of each workday and periodically thereafter to establish background conditions, particularly if wind direction changes. The monitoring work should be performed using equipment appropriate to measure the types of contaminants known or suspected to be present. The equipment should be calibrated at least daily for the contaminant(s) of concern or for an appropriate surrogate. The equipment should be capable of calculating 15-minute running average concentrations, which will be compared to the levels specified below.

1. If the ambient air concentration of total organic vapors at the downwind perimeter of the work area or exclusion zone exceeds 5 parts per million (ppm) above background for the 15-minute average, work activities must be temporarily halted and monitoring continued. If the total organic vapor level readily decreases (per instantaneous readings) below 5 ppm over background, work activities can resume with continued monitoring.

2. If total organic vapor levels at the downwind perimeter of the work area or exclusion zone persist at levels in excess of 5 ppm over background but less than 25 ppm, work activities must be halted, the source of vapors identified, corrective actions taken to abate emissions, and monitoring continued. After these steps, work activities can resume provided that the total organic vapor level 200 feet downwind of the exclusion zone or half the distance to the nearest potential receptor or residential/commercial structure, whichever is less - but in no case less than 20 feet, is below 5 ppm over background for the 15-minute average.

3. If the organic vapor level is above 25 ppm at the perimeter of the work area, activities must be shutdown.

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

Particulate Monitoring, Response Levels, and Actions

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

1. If the downwind PM-10 particulate level is 100 micrograms per cubic meter (mcg/m^3) greater than background (upwind perimeter) for the 15-minute period or if airborne dust is observed leaving the work area, then dust suppression techniques must be employed. Work may continue with dust suppression techniques provided that downwind PM-10 particulate levels do not exceed 150 mcg/m^3 above the upwind level and provided that no visible dust is migrating from the work area.

2. If, after implementation of dust suppression techniques, downwind PM-10 particulate levels are greater than 150 mcg/m^3 above the upwind level, work must be stopped and a re-evaluation of activities initiated. Work can resume provided that dust suppression measures and other controls are successful in reducing the downwind PM-10 particulate concentration to within 150 mcg/m^3 of the upwind level and in preventing visible dust migration.

3. All readings must be recorded and be available for State (DEC and NYSDOH) and County Health personnel to review.

December 2009

Appendix C2
Fugitive Dust and Particulate Monitoring

A program for suppressing fugitive dust and particulate matter monitoring at hazardous waste sites is a responsibility on the remedial party performing the work. These procedures must be incorporated into appropriate intrusive work plans. The following fugitive dust suppression and particulate monitoring program should be employed at sites during construction and other intrusive activities which warrant its use:

1. Reasonable fugitive dust suppression techniques must be employed during all site activities which may generate fugitive dust.

2. Particulate monitoring must be employed during the handling of waste or contaminated soil or when activities on site may generate fugitive dust from exposed waste or contaminated soil. Remedial activities may also include the excavation, grading, or placement of clean fill. These control measures should not be considered necessary for these activities.

3. Particulate monitoring must be performed using real-time particulate monitors and shall monitor particulate matter less than ten microns (PM10) with the following minimum performance standards:

(a) Objects to be measured: Dust, mists or aerosols;
(b) Measurement Ranges: 0.001 to 400 mg/m3 (1 to 400,000 :ug/m3);
(c) Precision (2-sigma) at constant temperature: +/- 10 :g/m3 for one second averaging; and +/- 1.5 g/m3 for sixty second averaging;
(d) Accuracy: +/- 5% of reading +/- precision (Referred to gravimetric calibration with SAE fine test dust (mmd= 2 to 3 :m, g= 2.5, as aerosolized);
(e) Resolution: 0.1% of reading or 1g/m3, whichever is larger;
(f) Particle Size Range of Maximum Response: 0.1-10;
(g) Total Number of Data Points in Memory: 10,000;
(h) Logged Data: Each data point with average concentration, time/date and data point number
(i) Run Summary: overall average, maximum concentrations, time/date of maximum, total number of logged points, start time/date, total elapsed time (run duration), STEL concentration and time/date occurrence, averaging (logging) period, calibration factor, and tag number;
(j) Alarm Averaging Time (user selectable): real-time (1-60 seconds) or STEL (15 minutes), alarms required;
(k) Operating Time: 48 hours (fully charged NiCd battery); continuously with charger;
(l) Operating Temperature: -10 to 50^{o} C (14 to 122^{o} F);
(m) Particulate levels will be monitored upwind and immediately downwind at the working site and integrated over a period not to exceed 15 minutes.

4. In order to ensure the validity of the fugitive dust measurements performed, there must be appropriate Quality Assurance/Quality Control (QA/QC). It is the responsibility of the remedial party to adequately supplement QA/QC Plans to include the following critical features: periodic instrument calibration, operator training, daily instrument performance (span) checks, and a record keeping plan.

5. The action level will be established at 150 ug/m3 (15 minutes average). While conservative,

this short-term interval will provide a real-time assessment of on-site air quality to assure both health and safety. If particulate levels are detected in excess of 150 ug/m3, the upwind background level must be confirmed immediately. If the working site particulate measurement is greater than 100 ug/m3 above the background level, additional dust suppression techniques must be implemented to reduce the generation of fugitive dust and corrective action taken to protect site personnel and reduce the potential for contaminant migration. Corrective measures may include increasing the level of personal protection for on-site personnel and implementing additional dust suppression techniques (see paragraph 7). Should the action level of 150 ug/m3 continue to be exceeded work must stop and DER must be notified as provided in the site design or remedial work plan. The notification shall include a description of the control measures implemented to prevent further exceedances.

6. It must be recognized that the generation of dust from waste or contaminated soil that migrates off-site, has the potential for transporting contaminants off-site. There may be situations when dust is being generated and leaving the site and the monitoring equipment does not measure PM10 at or above the action level. Since this situation has the potential to allow for the migration of contaminants off-site, it is unacceptable. While it is not practical to quantify total suspended particulates on a real-time basis, it is appropriate to rely on visual observation. If dust is observed leaving the working site, additional dust suppression techniques must be employed. Activities that have a high dusting potential--such as solidification and treatment involving materials like kiln dust and lime--will require the need for special measures to be considered.

7. The following techniques have been shown to be effective for the controlling of the generation and migration of dust during construction activities:

(a) Applying water on haul roads;
(b) Wetting equipment and excavation faces;
(c) Spraying water on buckets during excavation and dumping;
(d) Hauling materials in properly tarped or watertight containers;
(e) Restricting vehicle speeds to 10 mph;
(f) Covering excavated areas and material after excavation activity ceases; and
(g) Reducing the excavation size and/or number of excavations.

Experience has shown that the chance of exceeding the 150ug/m3 action level is remote when the above-mentioned techniques are used. When techniques involving water application are used, care must be taken not to use excess water, which can result in unacceptably wet conditions. Using atomizing sprays will prevent overly wet conditions, conserve water, and provide an effective means of suppressing the fugitive dust.

8. The evaluation of weather conditions is necessary for proper fugitive dust control. When extreme wind conditions make dust control ineffective, as a last resort remedial actions may need to be suspended. There may be situations that require fugitive dust suppression and particulate monitoring requirements with action levels more stringent than those provided above. Under some circumstances, the contaminant concentration and/or toxicity may require additional monitoring to protect site personnel and the public. Additional integrated sampling and chemical analysis of the dust may also be in order. This must be evaluated when a health and safety plan is developed and when appropriate suppression and monitoring requirements are established for protection of health and the environment.

APPENDIX A-3

HOT WORK PERMIT

HOT WORK PERMIT

PART 1 - INFORMATION

Issue Date:	
Date Work to be Performed: Start:	Finish (permit terminated):
Performed By:	
Work Area:	
Object to be Worked On:	

PART 2 - APPROVAL

(for 1, 2 or 3: mark Yes, No or NA)*

Will working be on or in:	Finish (permit terminated):	
1. Metal partition, wall, ceiling covered by combustible material?	yes	no
2. Pipes, in contact with combustible material?	yes	no
3. Explosive area?	yes	no

* = If any of these conditions exist (marked "yes"), a permit will not be issued without being reviewed and approved by Thomas H. Forbes (Corporate Health and Safety Director). Required Signature below.

PART 3 - REQUIRED CONDITIONS**

(Check all conditions that must be met)

	PROTECTIVE ACTION		PROTECTIVE EQUIPMENT
	Specific Risk Assessment Required		Goggles/visor/welding screen
	Fire or spark barrier		Apron/fireproof clothing
	Cover hot surfaces		Welding gloves/gauntlets/other:
	Move movable fire hazards, specifically		Wellintons/Knee pads
	Erect screen on barrier		Ear protection: Ear muffs/Ear plugs
	Restrict Access		B.A.: SCBA/Long Breather
	Wet the ground		Respirator: Type:
	Ensure adequate ventilation		Cartridge:
	Provide adequate supports		Local Exhaust Ventilation
	Cover exposed drain/floor or wall cracks		Extinguisher/Fire blanket
	Fire watch (must remain on duty during duration of permit)		Personal flammable gas monitor
	Issue additional permit(s):		

Other precautions:

** Permit will not be issued until these conditions are met.

SIGNATURES

Orginating Employee:	Date:
Project Manager:	Date:
Part 2 Approval:	Date:

Prepared By: _____

APPENDIX A-4

REAGENT INFORMATION

COLUMBUS CHEMICAL INDUSTRIES INC.

Safety Data Sheet

Hydrogen Peroxide, 10% (w/w)

1. PRODUCT AND COMPANY IDENTIFICATION

Product Name: Hydrogen Peroxide, 10% (w/w)

Synonyms/Generic Names: Peroxide

Product Number: 8836

Product Use: Industrial, Manufacturing or Laboratory use

Manufacturer: Columbus Chemical Industries, Inc.
N4335 Temkin Rd.
Columbus, WI. 53925

For More Information Call: 820-623-2140 (Monday-Friday 8:00-4:30)

In Case of Emergency Call: CHEMTREC - 800-424-9300 or 703-527-3887 (24 Hours/Day, 7 Days/Week)

2. HAZARDS INDENTIFICATION

OSHA Hazards: Oxidizer, Target organ effect, Toxic by ingestion, Corrosive, Carcinogen

Target Organs: Eyes, Skin, Respiratory system

Signal Words: Danger

Pictograms:

GHS Classification

Oxidizing liquids	Category 1
Acute toxicity, Dermal	Category 4
Acute toxicity, Oral	Category 4
Skin corrosion	Category 1
Eye irritation	Category 1
Respiratory sensitizer	Category 1B

GHS Label Elements, including precautionary statements:

Hazard Statements:

H271	May cause fire or explosion; strong oxidizer
H302	Harmful if swallowed
H314	Causes severe skin burns and eye damage
H333	May be harmful if inhaled
H402	Harmful to aquatic life

Precautionary Statements:

P220	Keep/store away from clothing/combustible materials.
P280	Wear protective gloves/protective clothing/eye protection/face protection
P305+P351+P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses if present and easy to do so. Continue rinsing.
P310	Immediately call a POISON CENTER or doctor/physician.

Potential Health Effects

Eyes	May cause serious damage.
Inhalation	Irritating to the respiratory system. Causes irritation to the respiratory tract.
Skin	Irritating to skin. Contact causes redness, burns, itching and pain. Prolonged or repeated skin exposure may cause dermatitis.
Ingestion	Causes irritation and pain.

NFPA Ratings

Health	3
Flammability	0
Reactivity	1
Specific hazard	OX

HMIS Ratings

Health	3
Fire	0
Reactivity	1
Personal	D

3. COMPOSITION/INFORMATION ON INGREDIENTS

Component	Weight %	CAS #	EINECS# / ELINCS#	Formula	Molecular Weight
Hydrogen Peroxide	10	7722-84-1	231-765-0	H_2O_2	34.01 g/mol
Water	Balance	7732-18-5	231-791-2	H_2O	18.00 g/mol

4. FIRST-AID MEASURES

Eyes	In case of eye contact, rinse with plenty of water and seek medical attention immediately.
Inhalation	Move casualty to fresh air and keep at rest. If breathing is difficult, give oxygen. If not breathing, give artificial respiration. Get medical attention.
Skin	Immediately flush with plenty of water for at least 15 minutes while removing contaminated clothing and wash using soap. Get medical attention immediately.
Ingestion	**Do Not Induce Vomiting!** Never give anything by mouth to an unconscious person. If conscious, wash out mouth with water. Get medical attention immediately.

5. FIREFIGHTING MEASURES

Suitable (and unsuitable) extinguishing media	Product is not flammable. Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide. Use flooding quantities of water to cool containers.
Special protective equipment and precautions for firefighters	Wear self-contained, approved breathing apparatus and full protective clothing, including eye protection and boots.
Specific hazards arising from the chemical	Product components will burn producing oxygen. (See also Stability and Reactivity section).

6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures	See section 8 for recommendations on the use of personal protective equipment.
Environmental precautions	Prevent spillage from entering drains. Any release to the environment may be subject to federal/national or local reporting requirements.
Methods and materials for containment and cleaning up	Neutralize spill with sodium bicarbonate or lime. Absorb spill with noncombustible absorbent material, then place in a suitable container for disposal. Clean surfaces thoroughly with water to remove residual contamination. Dispose of all waste and cleanup materials in accordance with regulations.

7. HANDLING AND STORAGE

Precautions for safe handling
See section 8 for recommendations on the use of personal protective equipment. Use with adequate ventilation. Wash thoroughly after using. Keep container closed when not in use.

Conditions for safe storage, including any incompatibilities
Store in cool, dry well ventilated area. Isolate from combustible material. Store in the dark. Keep away from incompatible materials (see section 10 for incompatibilities).

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Occupational exposure controls:

Component	Exposure Limits	Basis	Entity
Hydrogen Peroxide	1 ppm 1.4 mg/m^3	TLV	ACGIH
	1 ppm 1.4 mg/m^3	PEL	OSHA
	1 ppm 1.4 mg/m^3	REL	NIOSH

TWA: Time Weighted Average over 8 hours of work.
TLV: Threshold Limit Value over 8 hours of work.
REL: Recommended Exposure Limit
PEL: Permissible Exposure Limit
STEL: Short Term Exposure Limit during x minutes.
IDLH: Immediately Dangerous to Life or Health
WEEL: Workplace Environmental Exposure Levels
CEIL: Ceiling

Personal Protection

Eyes	Wear chemical safety glasses with a face shield for splash protection.
Inhalation	Provide local exhaust, preferably mechanical. If exposure levels are excessive, use an approved respirator.
Skin	Wear neoprene or nitrile gloves, apron and other protective clothing appropriate to the risk of exposure.
Other	Not Available

Other Recommendations
Provide eyewash stations, quick-drench showers and washing facilities accessible to areas of use and handling. Have supplies and equipment for neutralization and running water available.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance (physical state, color, etc.)	Clear, colorless liquid
Odor	No Odor
Odor threshold	Not Applicable
pH	Not Available
Melting point/freezing point	Not Available
Initial boiling point and boiling range	Not Available
Flash point	Not Flammable
Evaporation rate	Not Available
Flammability (solid, gas)	Not Flammable
Upper/lower flammability or explosive limit	Not Explosive
Vapor pressure	Not Available
Vapor density	Not Available
Relative density	Not Available
Solubility (ies)	Completely soluble in water
Partition coefficient: n-octanol/water	Not Available
Auto-ignition temperature	Not Applicable
Decomposition temperature	Not Available

10. STABILITY AND REACTIVITY

Chemical Stability	Stable
Possibility of Hazardous Reactions	Will not occur.
Conditions to Avoid	Store out of direct light
Incompatible Materials	Brass, Copper, Powdered metals, Iron, Iron and iron salts, combustible materials
Hazardous Decomposition Products	Not Available

11. TOXICOLOGICAL INFORMATION

Acute Toxicity

Skin	LD50 Dermal – rat – 4060 mg/kg
Eyes	Not Available
Respiratory	LC50 Vapor – rat – 2000 mg/m – 4 hours
Ingestion	LD50 Oral – mouse – 2000 mg/kg

Carcinogenicity

IARC	3-Group 3: Not classifiable as to its carcinogenicity to humans.
ACGIH	A3: Confirmed animal carcinogen with unknown relevance to humans.
NTP	No components of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.
OSHA	No components of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Signs & Symptoms of Exposure

Skin	Redness, burning, itching and pain.
Eyes	Eye burns, pain, watering eyes.
Respiratory	Coughing, shortness of breath, burning, choking, coughing, wheezing, laryngitis, headache or nausea.
Ingestion	Causes irritation and pain.

Chronic Toxicity	Not Available
Teratogenicity	Not Available
Mutagenicity	Not Available
Embryotoxicity	Not Available
Specific Target Organ Toxicity	Not Available

12. ECOLOGICAL INFORMATION

Ecotoxicity

Aquatic Vertebrate	Not Available
Aquatic Invertebrate	Not Available
Terrestrial	Not Available

Persistence and Degradability	Not Available
Bioaccumulative Potential	Not Available
Mobility in Soil	Not Available
PBT and vPvB Assessment	Not Available
Other Adverse Effects	Not Available

13. DISPOSAL CONSIDERATIONS

Waste Residues	Users should review their operations in terms of the applicable federal/national or local regulations and consult with appropriate regulatory agencies if necessary before disposing of waste product container.
Product Containers	Users should review their operations in terms of the applicable federal/national or local regulations and consult with appropriate regulatory agencies if necessary before disposing of waste product container.

The information offered in section 13 is for the product as shipped. Use and/or alterations to the product may significantly change the characteristics of the material and alter the waste classification and proper disposal methods.

14. TRANSPORTATION INFORMATION

US DOT	UN2984, Hydrogen peroxide, aqueous solutions 5.1, (8), pg III
TDG	UN2984, HYDROGEN PEROXIDE, AQUEOUS SOLUTIONS 5.1, (8), PG III
IMDG	UN2984, HYDROGEN PEROXIDE, AQUEOUS SOLUTIONS 5.1, (8), PG III
Marine Pollutant	No
IATA/ICAO	UN2984, Hydrogen peroxide, aqueous solutions 5.1, (8), pg III

15. REGULATORY INFORMATION

TSCA Inventory Status	All ingredients are listed on the TSCA inventory.
DSCL (EEC)	All ingredients are listed on the DSCL inventory.
California Proposition 65	Not Listed

SARA 302	Listed: Hydrogen Peroxide
SARA 304	Listed: Hydrogen Peroxide
SARA 311	Hydrogen Peroxide
SARA 312	Hydrogen Peroxide
SARA 313	Listed: Hydrogen Peroxide
WHMIS Canada	Class C: Oxidizing Material Class D-2B: Toxic Material Causing Other Toxic Effects

16. OTHER INFORMATION

Revision	Date
Revision 1	12/03/2012

PersulfOx™
CATALYZED PERSULFATE

APPLICATION INSTRUCTIONS

Subsurface application of PersulfOx™ via pressure injection is commonly performed using either direct-push technology (DPT) or wells. PersulfOx is a single-part, sodium persulfate – based *in situ* chemical oxidant with built-in activation. It is a dry white powder that ships as a **DOT 5.1 Class Oxidizer** and should be handled according to regulations governing oxidizers. An MSDS is provided with each shipment.

Pre-Application procedures - Prior to PersulfOx application, Regenesis recommends pre-application test injection using clear water. This procedure is useful in determining if the target zone has hydraulic limitations that would reduce the anticipated volume applied or cause application pressures to exceed the commonly accepted application range. For *in situ* injection projects, Regenesis recommends the injection test volume range 15-20% greater than the single-point design volume.

Solution making procedures - Before application the PersulfOx is mixed with water to create an injection solution. PersulfOx can be mixed into solutions that range from 5% to 20% weight/weight (w/w). For most applications Regenesis suggests a 10-15% w/w solution. The PersulfOx+water solution should be mixed in appropriately sized tanks that match the projects requirements. Upon creation the PersulfOx solution is alkaline and so tanks and related mixing equipment should be configured with chemically resistant materials. When working in areas with cold water temps (temperatures <16^{o}C/ 65^{o}F) users should be aware of lessened overall chemical solubility resulting in relatively longer mix time requirements; in all cases it is recommended that periodic mixing be part of the application process. We recommend slow addition of dry PersulfOx powder to water and mixing during and after PersulfOx addition using appropriately sized power mixing equipment such as drum or tank-type vortex/cyclone mixers. Alternatively, lower volume batch mixing may also be used. Low volume mixing alternatives would include power drills equipped with paint-mixer attachments or chemically resistant centrifugal pumps set up in a recirculation configuration. PersulfOx mixes readily into water when batched at the recommended solution ranges. Once mixed PersulfOx will dissolve and remain in solution but as with all chemical mixtures we recommend that the PersulfOx solution be checked periodically throughout the workday. The PersulfOx solution will be typically have a cloudy white appearance that is associated with the formation of a small amount of flocculent (<1%). This flocculent is associated with minerals present in most mix waters. When adding the PersulfOx to the mix water, follow proper handling and dust precautions (see H&S sheet and MSDS).

PersulfOx™
CATALYZED PERSULFATE

APPLICATION INSTRUCTIONS (cont'd)

The following table is a guideline for solution mixing % per bag of PersulfOx in water:

No. of Bags	Weight of Material (lbs.)	Desired Solution (%)	Volume of Water (gallons)	Final PersulfOx volume (gallons)
1	55	5	125	128
1	55	10	59	62
1	55	15	37	40
1	55	20	26	29

Volume of mix water (gallons/vertical foot of injection) can be calculated from the following equation:

$$\frac{\text{PersulfOx lbs/ foot}}{(8.34\ \text{lbs/gal water})(\%\ \text{PersulfOx solids})}\left[1-(\%\ \text{PersulfOx solids})\right]$$

Direct Push (DPT) Applications - It is imperative that the DPT injection holes be properly grouted/sealed upon completion of the injection activities. The purpose of this effort is to seal off any potential pathways to the surface which may allow "day lighting" of injection materials. Whenever possible, the application should be performed by systematically working from the outside to the center of the injection array. This methodology of application will limit the potential for expansion of the plume (also applies to wells).

Well-Applications - Regenesis recommends that injection wells be generally be constructed using ≥2-inch diameter Schedule 80 PVC with a screen slot size ≥0.02-inch. When possible the well seal should consist of a minimum of ≈6-12 inches of fine silica sand placed directly over the well filter pack. This will minimize bentonite infiltration into the well screen/filter pack interval. This should be overlain by ≥3 feet of hydrated and "cured" bentonite seal. The well should be sealed to the surface with cement or cement + bentonite grout (bentonite<10%). Prior to injection of any remedial reagent, Regenesis recommends that the injection wells be "surged and purged" of fine grained particles present in the well bore to the extent practicable.

After each PersulfOx injection event, each injection well should be flushed with clear-water. This clear-water "chaser" should be equivalent to approximately 2-3 borehole volumes. When wells are used for PersulfOx injection, the PersulfOx injection wells and nearby groundwater monitoring wells should be either tightly capped or alternatively equipped with a pressure gauge & relief valve. This will reduce potential for short circuiting to the surface.

Surfacing - From time to time application related surfacing of oxidants or other high volume remedial reagents may occur. Regenesis has co-authored a document that addresses the specifics reagent surfacing before it occurs as well as proper management when it does occur. This document is entitled "Guidelines for Subsurface Injection of In Situ Remedial Reagents within the LARWQCB Region" (ISRR). This document can be found on the LARWQCB Website or on the Regenesis website www.regenesis.com

PersulfOx

Material Safety Data Sheet (MSDS)

Last Revised: February 8, 2013

Section 1 – Supplier Information and Material Identification

Supplier:

REGENESIS
1011 Calle Sombra
San Clemente, CA 92673
Telephone: 949.366.8000
Fax: 949.366.8090
E-mail: info@regenesis.com

Chemical Synonyms:	A mixture of Sodium Persulfate [$Na_2S_2O_8$] and Sodium Silicate [Na_2SiO_3].
Chemical Family:	Inorganic Chemicals
Trade Name:	PersulfOx™
Product Use:	Used to remediate contaminated soil and groundwater (environmental remediation applications)

Section 2 – Chemical Information/Other Designations

CAS No.	Chemical	Percentage
7775-27-1	Sodium Persulfate	90%
1344-09-8	Sodium Silicate	10%

Section 3 – Physical Data	
Form:	Solid, free-flowing powder
Color:	White
Odor:	Odorless
Melting Point:	NA
Boiling Point:	NA
Flammability/Flash Point:	Non-combustible
Vapor Pressure:	NA
Bulk Density:	NA
Viscosity:	NA
pH (10% solution):	≈ 7.0 – 11.5 @ 25 °C
Decomposition Temperature:	Decomposition will occur upon heating.

Section 4 – Reactivity Data	
Stability:	Stable under normal conditions. Stability decreases in the presence of heat, moisture and/or contamination.
Conditions to Avoid/Incompatibility:	Acids, alkalis, halides (fluorides, chlorides, bromides and iodides), Combustible materials, most metals and heavy metals, oxidizable materials, other oxidizers, reducing agents, cleaners, and organic or carbon containing compounds, moisture, heat, flame. Contact with incompatible materials can result in a material decomposition or other uncontrolled reactions.
Hazardous Decomposition Products:	Oxygen that supports combustion and oxides of sulfur.
Polymerization	Will not occur

Section 5 – Regulations

UNITED STATES

SARA TITLE III (SUPERFUND ADMENDMENTS AND REAUTHORIZATION ACT)

Section 302 Extremely Hazardous Substances (40 CFR 335, Appendix A):	N/A
Section 311 Hazard Categories (40 CFR 370):	Fire Hazard, Immediate (Acute) Health Hazard
Section 312 Threshold Planning Quantity (40 CFR 370):	The Threshold Planning Quantity (TPQ) for this product, if treated as a mixture, is 10,000 lbs; however, this product contains the following ingredients with a TPQ of less than 10,000 lbs.: None
Section 313 Reportable Ingredients (40 CFR 372):	Not Listed

CERCLA (COMPREHENSIVE ENVIRONMENTAL RESPONSE COMPENSATION AND LIABILITY ACT)

CERCLA Designation & Reportable Quantities (RQ) (40 CFR 302.4):	Unlisted, RQ = 100 lbs., Ignitability

Section 6 – Protective Measures, Storage and Handling

Technical Protective Measures

Storage:

Oxidizer. Store in a cool, clean, and well ventilated area away from all sources of ignition and out of the direct sunlight. Store in a dry location away from heat and in temperatures less than 40 °C.

Keep away from incompatible materials and keep lids tightly closed. Do not store in improperly labeled containers.

Protect from moisture. Do not store near combustible materials. Keep containers well sealed.

Store separately from reducing materials. Avoid contamination which may lead to decomposition.

Handling:

Avoid contact with eyes, skin and clothing. Use with adequate ventilation. Wear respiratory protection if ventilation is inadequate or not available. Use eye and skin protection. Use clean plastic or stainless steel scoops only.

Do not swallow. Avoid breathing vapors, mists or dust. Do not eat, drink or smoke in the work area. Wash hands thoroughly after handling.

Label containers and keep them tightly closed when not in use.

Personal Protective Equipment (PPE)

Engineering Controls:

General room ventilation is required if used indoors. Local exhaust ventilation, process enclosures or other engineering controls may be needed to maintain airborne levels below recommended exposure limits. Avoid creating dust or mists. Maintain adequate ventilation at all times. Do not use in confined areas. Keep levels below recommended exposure limits. To determine actual exposure limits, monitoring should be performed on a routine basis. General use of persulfates will generate thermal and pressure regimes which need to mitigated during application as a precautionary measure.

Respiratory Protection:

Use NIOSH(P100) approved respirator when airborne dust is expected.

Exposure Limit

0.1 mg/m^3 (TWA) - ACGIH

Hand Protection:

Wear chemical resistant gloves (neoprene, rubber, or PVC). Thoroughly wash the outside of gloves with soap and water prior to removal.

Section 6 – Protective Measures, Storage and Handling (cont)

Eye Protection:	Wear chemical safety goggles. A full face shield may be worn in lieu of safety goggles.
Skin Protection:	Try to avoid skin contact with this product. Chemical resistant gloves (neoprene, PVC or rubber) and protective clothing should be worn during use.
Protection Against Fire & Explosion:	Product is non-explosive. In case of fire, evacuate all non-essential personnel, wear protective clothing and a self-contained breathing apparatus, stay upwind of fire, and use water to spray cool fire-exposed containers. Presence of water accelerates decomposition.

Section 7 – Hazards Identification

Potential Health Effects

Inhalation:	May be harmful and irritating.
Eye Contact:	Non-irritating (rabbit)
Skin Contact:	Non-irritating (rabbit)
Ingestion:	May be harmful if swallowed (vomiting and diarrhea).
Target Organs:	Eyes, skin, respiratory passages

Section 8 – Measures in Case of Accidents and Fire

After Spillage/Leakage:	Spilled material should be collected and put in approved DOT container and isolated for disposal. Isolated material should be monitored for signs of decomposition (fuming/smoking). If spilled material is wet, dissolve with large quantity of water and dispose as a hazardous waste. All disposals should be carried out according to regulatory agencies procedures.
Extinguishing Media:	Water; Do not use carbon dioxide or other gas filled fire extinguishers; they will have no effect on decomposing persulfates. Wear full protective clothing and self contained breathing apparatus.

First Aid

Eye Contact:	Flush eyes with running water for at least 15 minutes with eyelids held open. Seek a specialist.
Inhalation:	Remove affected person to fresh air. Seek medical attention if the effects persist.
Ingestion:	Rinse mouth with water, give two-four cups of water to dilute the chemical and seek medical attention immediately. Never give anything by mouth to an unconscious person. **Do Not** induce vomiting.
Skin Contact:	Wash affected areas with soap and a mild detergent and large amounts of water. Seek medical attention if irritation occurs or persists.

Notes to Medical Doctor: This product has low oral toxicity and is not irritating to the eyes and skin. Flooding of exposed areas with water is suggested, but gastric lavage or emesis induction for ingestions must consider possible aggravation of esophageal injury and the expected absence of system effects. Treatment is controlled removal of exposure followed by symptomatic and supportive care.

Section 9 – Accidental Release Measures

Precautions:

Cleanup Methods: Spilled material should be collected and put in approved DOT container and isolated for disposal. Isolated material should be monitored for signs of decomposition (fuming/smoking). If spilled material is wet, dissolve with large quantity of water and dispose as a hazardous waste. All disposals should be carried out according to local regulatory agencies procedures.

Section 10 – Information on Toxicology

Toxicity Data

Oral LD_{50} (rat):	895 mg/kg
Dermal LD_{50} (rabbit):	> 10 g/kg
Inhalation LD_{50} (rat):	5.1 mg/kg

Section 11 – Information on Ecology

Ecotoxicological Information

Bluegill sunfish, 96-hour LC_{50} = 771 mg/L

Rainbow trout, 96-hour LC_{50} = 163 mg/L

Daphnia, 48-hour LC_{50} = 133 mg/L

Grass shrimp, 96-hour LC_{50} = 519 mg/L

Biotic Degradation: N/A.

Section 12 – Disposal Considerations

Waste Disposal Method: Dispose of in an approved waste facility operated by an authorized contactor in compliance with local, state and federal regulations.

Section 13 – Shipping/Transport Information

D.O.T. Shipping Name:	Oxidizing Solid, n.o.s. (a mixture of Sodium persulfate, sodium metasilicate and silicon dioxide)
UN Number:	UN 1479
Hazard Class:	5.1 (Oxidizer)
Labels:	5.1 (Oxidizer)
Packaging Group:	III

Section 14 – Other Information

HMIS® Rating	Health – 1 (Slight)	Physical Hazard – 1 (Slight)
	Flammability – 0 (None)	Lab PPE – goggles, gloves, apron, dust respirator

HMIS® is a registered trademark of the National Painting and Coating Association.

NFPA	Health – 1 (Slight)	Reactivity – 1 (Slight)
	Flammability – 0 (None)	Special - Oxidizer

Section 15 – Further Information

The information contained in this document is the best available to the supplier at the time of writing, but is provided without warranty of any kind. Some possible hazards have been determined by analogy to similar classes of material. The items in this document are subject to change and clarification as more information become available. This document is intended only as a guide to the appropriate precautionary handling of the material by a properly trained person. Individuals receiving this information must exercise their independent judgment in determining its appropriateness for a particular purpose.

APPENDIX A-5

REMEDIAL ACTION MONITORING PLAN

HASP
APPENDIX A-5

REMEDIAL ACTION MONITORING PLAN
for
REMEDIAL ACTION WORK PLAN ACTIVITIES

CARRIAGE CLEANERS - PENFIELD SITE
1600 PENFIELD ROAD
PENFIELD, NEW YORK
BCP SITE NO. C828131

June 2016 0295-013-001

Prepared for:

Springs Land Company, LLC

Prepared By:

BENCHMARK
ENVIRONMENTAL
ENGINEERING &
SCIENCE, PLLC

In Association With

TURNKEY
ENVIRONMENTAL
RESTORATION, LLC

APPENDIX A-5: REMEDIAL ACTION MONITORING PLAN
HEALTH AND SAFETY PLAN FOR
REMEDIAL ACTION WORK PLAN ACTIVITIES

Carriage Cleaners - Penfield Site
BCP Site No. C828131

Table of Contents

1.0 GENERAL

This Remedial Action Monitoring Plan (RAMP) has been prepared to add additional details on the controls, monitoring and work practices that will be implemented during the remediation of the Site. The purpose of the RAMP is to provide members of the local community with additional information on the programs and procedures that will be put in place to protect public health and minimize the disturbance caused by the remedial activity.

The RAMP has been developed in accordance with the Brownfield Cleanup Program (BCP) between Springs Land Company, LLC and the New York State Department of Environmental Conservation (NYSDEC).

The site is an approximate 0.6 acre parcel located at 1600 Penfield Road, Penfield, New York (Site; see Figures 1 and 2 of the Remedial Action Work Plan). The Site is currently vacant, with the former building being demolished in 2009. The Site is currently secured by perimeter fencing to limit access to the Site. The Site is surrounded by commercial and residential beyond.

In the early 1960s, the former building was constructed and used as a dry cleaning facility until approximately 2005, though the timeframe of on-Site dry cleaning operation is unknown.

1.1 RAMP Organization

This RAMP has been organized in general accordance with Section 5.1 (e) of NYSDEC DER-10 as follows:

- Section 1 – Introduction, describes the Site, Site History and purpose of the RAMP;
- Section 2 – Sampling and Monitoring Plan
- Section 3 – Quality Assurance/Quality Control Plan
- Section 4 – Remedial Action Monitoring Reporting Plan

2.0 SAMPLING AND MONITORING PLAN

On and Off-Site monitoring will be carried out during all intrusive activities on-Site. CAMP stations will be utilized to monitor organic vapors and/or particulates that may be released to the air during remedial action activities occurring on-Site. Real-time monitoring of subsurface conditions will also be completed during the injection of hydrogen peroxide and Regenesis PersulfOx® at the Site.

2.1 Community Air Monitoring Plan

Benchmark-TurnKey personnel will conduct routine, real-time monitoring during all intrusive construction phases such as excavation, backfilling, drilling, etc. Ambient breathing zone concentrations may at times, exceed the permissible exposure limits (PELs) established by OSHA for the individual compounds, in which case respiratory protection will be required. The work area will also be monitored at regular intervals using a photo-ionization detector (PID). Observed values will be recorded and maintained as part of the permanent field record.

In addition to on-site monitoring upwind and downwind of the work zone(s), monitoring will also be conducted directly adjacent to the site in-front of the nearest human receptors. During all intrusive activities an off-Site CAMP station will be positioned northeast of the site in front of the Day Care (with property owner permission). During excavation activities, in addition to the monitoring locations previously mentioned, an additional CAMP station will be positioned off-Site northwest of the site in front of the adjacent commercial building (with property owner permission).

In addition to the volatile gas and particulates monitoring, a multi-gas LEL meter will be used to monitor field oxygen, hydrogen sulfide, and carbon monoxide gas within the exclusion zone during injection activities.

2.2 Subsurface Injection Monitoring Plan

Benchmark-TurnKey personnel will measure standard field measured parameters; including pH, specific conductance, dissolved oxygen, redox potential, temperature and turbidity, continuously during ISCO activities.

Existing groundwater monitoring well MW-6 is present within the planned AOC-1 injection area. Field measurements, including water level, temperature, sulfate, DO, turbidity and ORP will be collected pre-, during, and post-injection. A groundwater sample will be collected for TCL VOCs as part of the pre-assessment.

A post-injection soil sample will be collected from the vicinity of BS-1 and compared to the pre-injection soil results, and determination of the potential need for supplemental remedial activities will be discussed with the Department, prior to AOC3 remediation.

3.0 QUALITY ASSURANCE/QUALITY CONTROL PLAN

A Community Air Monitoring Plan (CAMP) will be implemented during the Remedial Action activities taking place on-Site. Volatile gas monitoring will be monitored throughout the day using a photoionization detector (PID).

During remedial injections, a multi-gas LEL meter will be used to monitor field oxygen, hydrogen sulfide, and carbon monoxide gas within the exclusion zone.

A groundwater sampling program will be implemented to monitor the injection activities in the field during remedial injection, and post-injection to monitor the effectiveness of the in-situ groundwater treatment program.

Groundwater sampling will meet the following guidelines; USEPA's Requirements for Quality Assurance Project Plans for Environmental Data Operations; the EPA Region II CERCLA Quality Assurance Manual, and NYSDEC's DER-10 Technical Guidance for Site Investigation and Remediation (May 2010).

3.1 Air Monitoring

Each day the respective air monitoring instruments; photoionization detectors (PIDs), dust monitors, and the multi-gas LEL meter will be calibrated and zeroed at that start of each work day. A calibration log will be kept throughout the remedial action activities.

3.2 Groundwater Sample Collection

During groundwater injections field monitoring will occur in real-time to ensure public and worker safety; standard field measured parameters include pH, specific conductance, dissolved oxygen, redox potential, temperature and turbidity. In addition, groundwater samples will be collected and analyzed in the field for sulfate (AOC1) and residual peroxide (AOC3). Laboratory samples will be collected and submitted as follows:

- AOC 1 – (PersulfOx) – TCL VOCs, sulfate, total and dissolved iron (MW-6 only)
- AOC 3 – (Hydrogen Peroxide) – TCL VOCs, total and dissolved iron.

Post-injection groundwater monitoring will be completed quarterly for up to one year (4-events), with semi-annual post-COC monitoring to be completed under an approved SMP.

At the time of post-injection sampling, standard field parameters will be measured, including pH, specific conductance, dissolved oxygen, redox potential, temperature and turbidity. In addition,

groundwater samples will be collected and analyzed in the field for sulfate (AOC1) and residual peroxide (AOC3). Laboratory samples will be collected and submitted as follows:

- AOC 1 – (PersulfOx) – TCL VOCs, sulfate, total and dissolved iron (MW-6 only)
- AOC 3 – (Hydrogen Peroxide) – TCL VOCs, total and dissolved iron.

In addition to the on-Site groundwater monitoring wells, off-site downgradient well MW-11 will be included in the quarterly field parameters, and sampled during the pre-assessment and during the second quarterly monitoring event.

4.0 REMEDIAL ACTION MONITORING REPORTING PLAN

Benchmark-Turnkey will be on-Site full-time during the remedial actions to document remedial activities. Monitoring and documentation of the RA activities will include: construction stake-out; record drawings; daily reports of activities; community air monitoring results; post-injection sampling and analysis; and progress photographs and sketches.

4.1 Field Monitoring

Standard daily reporting procedures will include preparation of an Inspector's Daily Report and, when appropriate, problem identification and corrective measures reports. Appendix C of the Remedial Action Work Plan contains sample project documentation forms. Information that may be included on the daily report form includes:

- Weather and Site conditions.
- Processes and locations of construction under way.
- Equipment and personnel working in the area, including subcontractors.
- Number and type of truckloads of soil/fill removed from the site.
- Approximate sampling locations (sketches) or GPS (Trimble) coordinates and sample designations for pre-excavation characterization.
- Excavation locations and depths being excavated.

The completed reports will be available on-site and submitted to the NYSDEC as part of the Final Engineering Report. The NYSDEC will be promptly notified of problems requiring modifications to this Work Plan prior to proceeding or completion of the construction item.

Photographic documentation of the remedial activities will be prepared by a field representative throughout the duration of the project as necessary to convey typical work activities, changed conditions, and/or special circumstanc.

APPENDIX A-6

COMMUNITY & ENVIRONMENTAL RESPONSE PLAN

HASP
APPENDIX A-6

COMMUNITY & ENVIRONMENTAL RESPONSE PLAN
for
REMEDIAL ACTION WORK PLAN ACTIVITIES

CARRIAGE CLEANERS - PENFIELD SITE
1600 PENFIELD ROAD
PENFIELD, NEW YORK
BCP SITE NO. C828131

June 2016 0295-013-001

Prepared for:

Springs Land Company, LLC

Prepared By:

BENCHMARK ENVIRONMENTAL ENGINEERING & SCIENCE, PLLC

In Association With

TURNKEY ENVIRONMENTAL RESTORATION, LLC

APPENDIX A-6: COMMUNITY & ENVIRONMENTAL RESPONSE PLAN
HEALTH AND SAFETY PLAN FOR REMEDIAL ACTION WORK PLAN ACTIVITIES

Carriage Cleaners - Penfield Site
BCP Site No. C828131

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1.0 GENERAL

This Community and Environmental Response Plan (CERP) has been prepared to summarize the controls, monitoring and work practices that will be implemented during the remediation of the Site. The purpose of the CERP is to provide members of the local community with information on the programs and procedures that will be put in place to protect public health and minimize the disturbance caused by the remedial activity.

The CERP has been developed in accordance with the Brownfield Cleanup Program (BCP) between Springs Land Company, LLC and the New York State Department of Environmental Conservation (NYSDEC).

The site is an approximate 0.6 acre parcel located at 1600 Penfield Road, Penfield, New York (Site; see Figures 1 and 2 of the Remedial Action Work Plan). The Site is currently vacant, with the former building being demolished in 2009. The Site is currently secured by perimeter fencing to limit access to the Site. The Site is surrounded by commercial and residential beyond.

In the early 1960s, the former building was constructed and used as a dry cleaning facility until approximately 2005, though the timeframe of on-Site dry cleaning operation is unknown.

1.1 CERP ORGANIZATION

This CERP has been organized in general accordance with Section 5.1 (f) of NYSDEC DER-10 as follows:

- Section 1 – Introduction, describes the Site, Site History and purpose of the CERP;
- Section 2- Public Protection Measures;
- Section 3 – Community Air Monitoring Plan (CAMP);
- Section 4 – Noise and Vibration Mitigation;
- Section 5 – Site Security;
- Section 6 – Erosion and Sediment Control;
- Section 7 – Waste Management;
- Section 8 – Traffic Control and Site Assessment;
- Section 9 – Off-Site Trucking Routes and Emergency Procedures

1.2 SITE & REGULATORY AGENCY CONTACT INFORMATION

Project-related Questions:

NYSDEC	NYSDOH	Environmental Consultant
Charlotte Theobald	Melissa Doroski	Nathan Munley
charlotte.theobald@dec.ny.gov	melissa.doroski@health.ny.gov	nmunley@benchmarkturnkey.com
585-226-5354	518-402-7860	716-856-0635

1.3 DOCUMENT REPOSITORY

Penfield Public Library
Attn: Pat Gough
1985 Baird Road
Penfield, NY 14526
Phone: 585-340-8720

2.0 PUBLIC PROTECTION MEASURES

Benchmark-TurnKey on behalf of Springs Land Company, LLC, will implement a number of safety measures to protect the public during remediation work. Signs will be replaced at the gates indicating that the site is an active construction site and public access is not permitted.

Chain-link fence will remain in place around the perimeter of the site during remedial activities to restrict access. Additional site controls may be used; safety fencing, traffic cones, dust suppression, and erosion control, to provide additional protection to the public.

Community Air Monitoring, described in section 3.0, will provide additional protection to the public by monitoring airborne releases during all construction and intrusive remedial action activities on-Site.

3.0 COMMUNITY AIR MONITORING PLAN

A Community Air Monitoring Plan (CAMP) will be implemented during the Remedial Action activities taking place on-Site. Stations will be set up around the site to ensure public safety. The work area will also be monitored for Volatile gases at regular intervals using a photoionization detector (PID). Observed values will be recorded and maintained as part of the permanent field record. The measures included in the CAMP will provide a level of protection for the occupants of the neighborhood schools and residences, as well as the downwind community, from potential airborne releases.

3.1 Community Air Monitoring Information

During all intrusive activities on-Site, a minimum of three (3) air monitoring stations will be set-up to monitor airborne releases in the vicinity of the work area. One (1) station will be positioned upwind and another downwind of the work zone(s) on-Site with the remaining third station positioned off-Site in front of the Day Care (with property owner permission).

During excavation activities on-Site, specifically from the cVOC-impacted soil/fill excavation area, four (4) air monitoring stations will be utilized to ensure public safety. Three (3) monitoring stations will be set-up in the same locations as were described for intrusive activity monitoring. The fourth station will be set-up off-Site northwest of the site in front of the adjacent commercial building (with adjacent property owner permission).

During injection activities a multi-gas LEL meter will be used to monitor field oxygen, hydrogen sulfide, and carbon monoxide gas within the exclusion zone.

4.0 NOISE AND VIBRATION MITIGATION

In accordance with the Town of Penfield, construction equipment will only be operated during the hours of 7:00 a.m. and 8:00 p.m. on weekdays. The majority of the work will be completed between 7:00 a.m. and 5:00 p.m.

5.0 SITE SECURITY

Site Security will include chain-link fence around the perimeter of the property to prevent vandalism and/or destruction of construction equipment and to prevent site access, thus minimizing health and safety concerns for the surrounding neighborhood. Temporary safety construction fencing may be utilized, based on the daily planned activities, to identify active work areas and discourage trespassing.

Work areas will be determined daily based on the planned remedial activities, and may be changed throughout the work day to ensure safe operations. Access control will consider site worker and general public safety.

5.1 Site Fencing

The site is currently surrounded by chain-link fencing to restrict access. At the end of each day the chain-link fence will be secured. No temporary facilities (e.g., construction field trailer) are planned to be used during the remedial activities. Site controls may be employed for protection of site workers and the surrounding community during remediation and construction, including safety fencing, traffic cones, dust suppression, and erosion control.

6.0 EROSION & SEDIMENT CONTROL MEASURES

The Erosion and Sediment Control Plan describes the means and methods to minimize soil and sediment erosion and to control stormwater on the Site.

6.1 Erosion and Sediment Control Plan

Prior to excavation or other intrusive activities on-Site, sediment barriers will be installed along Penfield road to minimize sediment runoff from the site. The site is less than 1 acre in area therefore a Stormwater Pollution Prevention Plan (SWPPP) is not required. All steps will be taken to minimize runoff from the site and the roads clean directly adjacent to the site.

7.0 WASTE MANAGEMENT MEASURES

The waste management measures include procedures for managing, treating and disposal of waste materials generated as a result of the Site remediation.

7.1 Excavation and Materials Management Plan

The Excavation and Materials Management Plan (EMMP) includes the following:

1) A waste matrix for all waste streams to be managed;
2) An approach and procedures for excavation, hauling, and disposal, site grading, and coordination with other on-site activities;
3) Testing procedures for determining which excavated materials are non-hazardous industrial waste; petroleum contaminated waste; or hazardous waste;
4) Approved waste transporter and disposal facilities;
5) Proposed material suppliers for and sources for environmentally clean backfill and demarcation barrier.

7.2 Waste Management Plan

In accordance with the previously approved IRM Work Plan (Oct 2006), excavated soil/fill will be segregated into separate categories for additional assessment, including:

- "Clean" – soils exhibiting no visual staining and PID readings are between 0.0 ppm and 50 ppm. Clean soil will be assessed for potential reuse on-Site
- "Lightly Impacted" – soils exhibiting PID readings greater than 50 ppm and less than 500 ppm
- "Moderately Impacted" – soils exhibiting PID readings of greater than 500 ppm and less than 2,000 ppm; and,
- 'Heavily Impacted" – Soils exhibiting PID readings of greater than 2,000 PID.

Once excavation is deemed complete, as described above, the segregated stockpiles will be sampled to assess soil reuse and/or waste disposal. Soil reuse samples will be collected in accordance with DER-10 and in consultation with the Department, waste characterization samples will be collected to allow for comparison to Contained In criteria and applicable disposal facility

requirements (i.e., non-hazardous landfill, hazardous landfill, supplemental treatment and off-site disposal).

Based on the analytical results, soil handling and disposal will be discussed with the Department. Copies of all disposal facility records (application, approvals, transportation and disposal manifests) will be provided within the Final Engineering Report (FER).

The remedial injections may require material storage on-Site as well. Planned reagents will be brought to the Site in plastic drums or plastic wrapped pallets, and will be scheduled to be delivered to the Site in quantities which can be used within 2-3 days. If the need arise, supplemental storage (i.e., secured mobile storage box/crate) may be discussed with the Department. Reagents will be shipped in DOT approved containers, as appropriate, to the Site by the manufacturer and/or chemical distributor.

Material management and handling of the anticipated waste streams will be performed as indicated in the table below.

7.3 Groundwater Management Plan

If necessary, water removed from excavations and surface water run-in to excavations during the impacted soil removal will be handled on-site prior to discharge to the municipal sewer. In general, water removed from excavations will be stored/settled in a portable storage tank(s), and if deemed necessary, will be pumped through a bag or cartridge filter prior to treatment using granular activated carbon (GAC). Following completion of excavation work, settled solids remaining in the tank and spent filter bags will be disposed of off-site.

If the accumulated waters required treatment, the spent GAC will be characterized and regenerated off-site, or disposed at a permitted disposal facility in accordance with applicable federal and state regulations. The storage tank will be decontaminated via pressure washing. Benchmark-TurnKey or the Site owner will coordinate with the municipality to obtain any necessary temporary sewer discharge permits.

7.4 Spill Containment and Cleanup Program Plan

An evaluation was conducted to determine the potential for hazardous material and oil/petroleum spills at this Site. The evaluation, more fully described in the HASP, indicates that, based on Site history and the scope of work, a hazardous material spill is not likely to occur during investigation efforts. However, the procedures identified below will be followed in the event of an unanticipated release.

7.4.1 Initial Spill Notification and Evaluation

Any worker who discovers a hazardous substance or oil/petroleum spill will immediately notify the Project Manager and SSHO. The worker will, to the best of his/her ability, report the material involved, the location of the spill, the estimated quantity of material spilled, the direction/flow of the spill material, related fire/explosion incidents, if any, and any associated injuries. The Emergency Response Plan presented in Appendix A-1 of this HASP will immediately be implemented if an emergency release has occurred.

Following initial report of a spill, the Project Manager will make an evaluation as to whether the release exceeds RQ levels. If an RQ level is exceeded, the Project Manager will notify the Site owner who will in turn notify NYSDEC spill hotline at 1-800-457-7362 within 2 hours of spill discovery. The Project Manager will also determine what additional agencies are to be contacted regarding the release, and will follow-up with written reports as required by the applicable regulations.

7.4.2 Spill Response

For all spill situations, the following general response guidelines will apply:

- Only those personnel involved in overseeing or performing containment operations will be allowed within the spill area. If necessary, the area will be roped, ribboned or otherwise blocked off to prevent unauthorized access.
- Appropriate PPE, as specified by the SSHO, will be donned before entering the spill area.
- Ignition points will be extinguished/removed if fire or explosion hazards exist.
- Surrounding reactive materials will be removed.
- Drains or drainage in the spill area will be blocked to prevent inflow of spilled materials or applied materials.

For minor spills, Benchmark-TurnKey will obtain Spill Control and Containment Kit materials. Materials that may be used for small spills include a 50 lb. bag of "speedy dry" granular absorbent material, absorbent pads, shovels, empty 5-gallon pails, and an empty open-top 55-gallon drum. Spilled materials will be absorbed, and shoveled into a 55-gallon drum for proper disposal (USEPA approval will be secured for on-site treatment of the impacted soils/absorbent materials, if

applicable). Impacted soils will be hand-excavated to the point that no visible signs of contamination remains, and will be drummed with the absorbent.

In the event of a major release or a release that threatens surface water, a spill response contractor will be called to the Site. The response contractor may use heavy equipment (e.g., excavator, backhoe, etc.) to berm the soils surrounding the spill site or create diversion trenching to mitigate overland migration or release to navigable waters. Where feasible, pumps will be used to transfer free liquid to storage containers.

7.4.3 Post-Spill Evaluation

If a reportable quantity of hazardous material or oil/petroleum is spilled as determined by the Project Manager, a written report will be prepared. The report will identify the root cause of the spill, type and amount of material released, date/time of release, response actions, agencies notified and/or involved in cleanup, and procedures to be implemented to avoid repeat incidents.

8.0 TRAFFIC CONTROL AND SITE ACCESS

The objectives of the site-specific Transportation and Traffic Safety Plan for the remedial construction at the Carriage Cleaners Site are based on the following work objectives:

- Pre-plan all work, including delivery of materials, or loading and removal of materials, to have the least intrusive impact upon the neighboring community;
- Perform delivery and removal of materials so as not to impede public vehicular traffic, or pedestrian bike or foot traffic;
- Schedule deliveries at times of low traffic volumes when practical;
- Schedule deliveries to occur such that the number of transport vehicles on-site at any specific time is minimized;
- Employ environmental controls to prevent fugitive dust during loading of impacted soil/fill; and
- Perform the majority of on-site activities Monday through Friday, 7:00 am – 5:00 pm.

8.1 Transportation and Traffic Safety Plan

All regular truck drivers and delivery personnel will be given a safety briefing regarding the traffic safety plan. Trained traffic control personnel (flaggers) will be used to assist the truckers when entering and exiting the Site. They will stop traffic (bicycles, pedestrians, or vehicles) in a controlled manner to ensure the trucks can enter or exit in a safe manner. Trucks scheduled to pick up or deliver soil will be spaced out so as not to have multiple vehicles at any one time on the Site or in the surrounding areas.

8.2 Decontamination of Trucks and Equipment Leaving the Site

Decontamination of heavy equipment and trucks will be conducted by the subcontractor in accordance with their approved HASP in the Contamination Reduction Zone, more fully described in the HASP. As a minimum, this will include manually removing heavy soil clods, followed by high pressure water and detergent or steam cleaning.

9.0 OFF-SITE TRUCKING ROUTES AND EMERGENCY PROCEDURES

9.1 Transporter Contingency Plan

The designated transporter of contaminated soil to the disposal facility will be responsible for the training of their drivers. Specifically the training of transporting contaminated materials and passing a safe driver course. All vehicles will have the required permits and will be inspected and maintained prior to use.

In the event of a spill/discharge or other emergency during delivery, transportation or pickup, the driver will immediately and safely take appropriate action to protect human health and the environment including:

a. Secure the area to unauthorized access by people or other vehicles.
b. Keep all sources of ignition (pipes, cigarettes, flares, etc.) away from the scene.
c. Set up warning signals around the scene to prevent further accidents. Flame producing signals, such as flares, should not be used during incidents involving combustible or flammable materials.
d. Attempt to contain the spill and stop or reduce the flow of the leak.
e. Obtain help in the immediate area to assist in securing the site.

The driver will contact the TurnKey Site representative or the transporter's manager with details about the spill; how much, where the spill occurred, and what was spilled. The driver is then to continue to monitor the scene while an appropriate course of action is determined.

APPENDIX C

PROJECT DOCUMENTATION FORMS

INSPECTOR'S DAILY REPORT

CONTRACTOR			
CLIENT		DATE:	

LOCATION				DAY		JOB NO.	
WEATHER		TEMP	° F	START		END	

WORK PERFORMED:

CONTRACTOR ACTIVITIES:

[PUT CONTRACTOR ACTIVITIES HERE, BE SPECIFIC. TYPE OF EQUIPMENT, ACTIVITIES PERFORMED, BY WHOM, LOCATION OF LANDFILL ETC.]

TURNKEY ACTIVITIES:

[PUT ENGINEER ACTIVITIES HERE, BE SPECIFIC. TYPE OF EQUIPMENT, ACTIVITIES AND TESTING PERFORMED, SAMPLES COLLECTED, BY WHOM, LOCATION OF LANDFILL ETC.]

TEST PERFORMED		*QA PERSONNEL* SIGNATURE			
PICTURES TAKEN	none	REPORT NO.			
VISITORS	none	SHEET	1	OF	

INSPECTOR'S DAILY REPORT

CONTRACTOR			
CLIENT		DATE:	

LOCATION				DAY		JOB NO.	
WEATHER		TEMP	° F	START		END	

INSPECTOR'S DAILY REPORT

MEETINGS HELD & RESULTS:

CONTRACTOR'S WORK FORCE AND EQUIPMENT

DESCRIPTION	*H*	#	*DESCRIPTION*	*H*	#	*DESCRIPTION*	*H*	#	*DESCRIPTION*	*H*	#
Field Engineer						Equipment			Front Loader Ton		
Superintendent			Ironworker			Generators			Bulldozer		
						Welding Equip.			DJ Dump truck		
Laborer-Foreman			Carpenter						Water Truck		
Laborer									Backhoe		
Operating Engineer			Concrete Finisher						Excavator		
						Roller			Pad foot roller		
Carpenter						Paving Equipment					
						Air Compressor					

REMARKS:

REFERENCES TO OTHER FORMS:

SAMPLES COLLECTED:					
SAMPLE NUMBER					
APPROX. LOCATION OF STOCKPILE					
NO. OF STOCKPILE					
DATE OF COLLECTION					
CLIMATOLOGIC CONDITIONS					
FIELD OBSERVATION		SHEET		OF	

DAILY LOG	DATE			
	REPORT NO.			
	PAGE		OF	

CORRECTIVE MEASURES REPORT

Date:

Project:

Job No:

Location:

CQA Monitor(s):

Client:

Contractor:

Contractor's Supervisor:

WEATHER CONDITIONS:

Ambient Air Temp. - A.M.:

Ambient Air Temp. - P.M.:

Wind Direction:

Wind Speed:

Precipitation:

Corrective Measures Undertaken (reference Problem Identification Report No.)

Retesing Location:

Suggested Method of Minimizing Re-Occurrence:

Approvals (initial):

CQA Engineer:

Project Manager:

Signed:

CQA Representative

APPENDIX D

ISCO REAGENT INFORMATION

COLUMBUS CHEMICAL INDUSTRIES INC.

Safety Data Sheet

Hydrogen Peroxide, 10% (w/w)

1. PRODUCT AND COMPANY IDENTIFICATION

Product Name: Hydrogen Peroxide, 10% (w/w)

Synonyms/Generic Names: Peroxide

Product Number: 8836

Product Use: Industrial, Manufacturing or Laboratory use

Manufacturer: Columbus Chemical Industries, Inc.
N4335 Temkin Rd.
Columbus, WI. 53925

For More Information Call: 820-623-2140 (Monday-Friday 8:00-4:30)

In Case of Emergency Call: CHEMTREC - 800-424-9300 or 703-527-3887 (24 Hours/Day, 7 Days/Week)

2. HAZARDS INDENTIFICATION

OSHA Hazards: Oxidizer, Target organ effect, Toxic by ingestion, Corrosive, Carcinogen

Target Organs: Eyes, Skin, Respiratory system

Signal Words: Danger

Pictograms:

GHS Classification

Oxidizing liquids	Category 1
Acute toxicity, Dermal	Category 4
Acute toxicity, Oral	Category 4
Skin corrosion	Category 1
Eye irritation	Category 1
Respiratory sensitizer	Category 1B

GHS Label Elements, including precautionary statements:

Hazard Statements:

H271	May cause fire or explosion; strong oxidizer
H302	Harmful if swallowed
H314	Causes severe skin burns and eye damage
H333	May be harmful if inhaled
H402	Harmful to aquatic life

Precautionary Statements:

P220	Keep/store away from clothing/combustible materials.
P280	Wear protective gloves/protective clothing/eye protection/face protection
P305+P351+P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses if present and easy to do so. Continue rinsing.
P310	Immediately call a POISON CENTER or doctor/physician.

Potential Health Effects

Eyes	May cause serious damage.
Inhalation	Irritating to the respiratory system. Causes irritation to the respiratory tract.
Skin	Irritating to skin. Contact causes redness, burns, itching and pain. Prolonged or repeated skin exposure may cause dermatitis.
Ingestion	Causes irritation and pain.

NFPA Ratings

Health	3
Flammability	0
Reactivity	1
Specific hazard	OX

HMIS Ratings

Health	3
Fire	0
Reactivity	1
Personal	D

3. COMPOSITION/INFORMATION ON INGREDIENTS

Component	Weight %	CAS #	EINECS# / ELINCS#	Formula	Molecular Weight
Hydrogen Peroxide	10	7722-84-1	231-765-0	H_2O_2	34.01 g/mol
Water	Balance	7732-18-5	231-791-2	H_2O	18.00 g/mol

4. FIRST-AID MEASURES

Eyes	In case of eye contact, rinse with plenty of water and seek medical attention immediately.
Inhalation	Move casualty to fresh air and keep at rest. If breathing is difficult, give oxygen. If not breathing, give artificial respiration. Get medical attention.
Skin	Immediately flush with plenty of water for at least 15 minutes while removing contaminated clothing and wash using soap. Get medical attention immediately.
Ingestion	**Do Not Induce Vomiting!** Never give anything by mouth to an unconscious person. If conscious, wash out mouth with water. Get medical attention immediately.

5. FIREFIGHTING MEASURES

Suitable (and unsuitable) extinguishing media	Product is not flammable. Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide. Use flooding quantities of water to cool containers.
Special protective equipment and precautions for firefighters	Wear self-contained, approved breathing apparatus and full protective clothing, including eye protection and boots.
Specific hazards arising from the chemical	Product components will burn producing oxygen. (See also Stability and Reactivity section).

6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures	See section 8 for recommendations on the use of personal protective equipment.
Environmental precautions	Prevent spillage from entering drains. Any release to the environment may be subject to federal/national or local reporting requirements.
Methods and materials for containment and cleaning up	Neutralize spill with sodium bicarbonate or lime. Absorb spill with noncombustible absorbent material, then place in a suitable container for disposal. Clean surfaces thoroughly with water to remove residual contamination. Dispose of all waste and cleanup materials in accordance with regulations.

7. HANDLING AND STORAGE

Precautions for safe handling
See section 8 for recommendations on the use of personal protective equipment. Use with adequate ventilation. Wash thoroughly after using. Keep container closed when not in use.

Conditions for safe storage, including any incompatibilities
Store in cool, dry well ventilated area. Isolate from combustible material. Store in the dark. Keep away from incompatible materials (see section 10 for incompatibilities).

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Occupational exposure controls:

Component	Exposure Limits	Basis	Entity
Hydrogen Peroxide	1 ppm 1.4 mg/m^3	TLV	ACGIH
	1 ppm 1.4 mg/m^3	PEL	OSHA
	1 ppm 1.4 mg/m^3	REL	NIOSH

TWA: Time Weighted Average over 8 hours of work.
TLV: Threshold Limit Value over 8 hours of work.
REL: Recommended Exposure Limit
PEL: Permissible Exposure Limit
STEL: Short Term Exposure Limit during x minutes.
IDLH: Immediately Dangerous to Life or Health
WEEL: Workplace Environmental Exposure Levels
CEIL: Ceiling

Personal Protection

Eyes	Wear chemical safety glasses with a face shield for splash protection.
Inhalation	Provide local exhaust, preferably mechanical. If exposure levels are excessive, use an approved respirator.
Skin	Wear neoprene or nitrile gloves, apron and other protective clothing appropriate to the risk of exposure.
Other	Not Available

Other Recommendations
Provide eyewash stations, quick-drench showers and washing facilities accessible to areas of use and handling. Have supplies and equipment for neutralization and running water available.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance (physical state, color, etc.)	Clear, colorless liquid
Odor	No Odor
Odor threshold	Not Applicable
pH	Not Available
Melting point/freezing point	Not Available
Initial boiling point and boiling range	Not Available
Flash point	Not Flammable
Evaporation rate	Not Available
Flammability (solid, gas)	Not Flammable
Upper/lower flammability or explosive limit	Not Explosive
Vapor pressure	Not Available
Vapor density	Not Available
Relative density	Not Available
Solubility (ies)	Completely soluble in water
Partition coefficient: n-octanol/water	Not Available
Auto-ignition temperature	Not Applicable
Decomposition temperature	Not Available

10. STABILITY AND REACTIVITY

Chemical Stability	Stable
Possibility of Hazardous Reactions	Will not occur.
Conditions to Avoid	Store out of direct light
Incompatible Materials	Brass, Copper, Powdered metals, Iron, Iron and iron salts, combustible materials
Hazardous Decomposition Products	Not Available

11. TOXICOLOGICAL INFORMATION

Acute Toxicity

Skin	LD50 Dermal – rat – 4060 mg/kg
Eyes	Not Available
Respiratory	LC50 Vapor – rat – 2000 mg/m – 4 hours
Ingestion	LD50 Oral – mouse – 2000 mg/kg

Carcinogenicity

IARC	3-Group 3: Not classifiable as to its carcinogenicity to humans.
ACGIH	A3: Confirmed animal carcinogen with unknown relevance to humans.
NTP	No components of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.
OSHA	No components of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Signs & Symptoms of Exposure

Skin	Redness, burning, itching and pain.
Eyes	Eye burns, pain, watering eyes.
Respiratory	Coughing, shortness of breath, burning, choking, coughing, wheezing, laryngitis, headache or nausea.
Ingestion	Causes irritation and pain.

Chronic Toxicity	Not Available
Teratogenicity	Not Available
Mutagenicity	Not Available
Embryotoxicity	Not Available
Specific Target Organ Toxicity	Not Available

12. ECOLOGICAL INFORMATION

Ecotoxicity

Aquatic Vertebrate	Not Available
Aquatic Invertebrate	Not Available
Terrestrial	Not Available

Persistence and Degradability	Not Available
Bioaccumulative Potential	Not Available
Mobility in Soil	Not Available
PBT and vPvB Assessment	Not Available
Other Adverse Effects	Not Available

13. DISPOSAL CONSIDERATIONS

Waste Residues	Users should review their operations in terms of the applicable federal/national or local regulations and consult with appropriate regulatory agencies if necessary before disposing of waste product container.
Product Containers	Users should review their operations in terms of the applicable federal/national or local regulations and consult with appropriate regulatory agencies if necessary before disposing of waste product container.

The information offered in section 13 is for the product as shipped. Use and/or alterations to the product may significantly change the characteristics of the material and alter the waste classification and proper disposal methods.

14. TRANSPORTATION INFORMATION

US DOT	UN2984, Hydrogen peroxide, aqueous solutions 5.1, (8), pg III
TDG	UN2984, HYDROGEN PEROXIDE, AQUEOUS SOLUTIONS 5.1, (8), PG III
IMDG	UN2984, HYDROGEN PEROXIDE, AQUEOUS SOLUTIONS 5.1, (8), PG III
Marine Pollutant	No
IATA/ICAO	UN2984, Hydrogen peroxide, aqueous solutions 5.1, (8), pg III

15. REGULATORY INFORMATION

TSCA Inventory Status	All ingredients are listed on the TSCA inventory.
DSCL (EEC)	All ingredients are listed on the DSCL inventory.
California Proposition 65	Not Listed

SARA 302	Listed: Hydrogen Peroxide
SARA 304	Listed: Hydrogen Peroxide
SARA 311	Hydrogen Peroxide
SARA 312	Hydrogen Peroxide
SARA 313	Listed: Hydrogen Peroxide
WHMIS Canada	Class C: Oxidizing Material Class D-2B: Toxic Material Causing Other Toxic Effects

16. OTHER INFORMATION

Revision	Date
Revision 1	12/03/2012

PersulfOx™
CATALYZED PERSULFATE

APPLICATION INSTRUCTIONS

Subsurface application of PersulfOx via pressure injection is commonly performed using either direct-push technology (DPT) or wells. PersulfOx is a dry white powder. It ships as a **DOT 5.1 Class Oxidizer** and should be handled according to regulations governing oxidizers. An MSDS is provided with each shipment.

Installation procedures. Prior to PersulfOx injection, Regenesis recommends test injection using clear water. This procedure is useful in determining if the target zone has hydraulic limitations that would limit the anticipated volume to be applied or exceed the anticipated application pressures to be used. For *in situ* oxidation projects, Regenesis recommends the test injection volume range up to 15% greater than the design volume for a single-point injection event.

Before application PersulfOx is mixed with water to create an injection solution. The common solution range for a PersulfOx injection fluid is 5% to 22.5% w/w; Regenesis suggests use of a 15% w/w solution. The solution should be made in appropriately sized tanks to match the project requirements. The solution is alkaline so use a plastic poly tank or other semi-resistant tank materials. When working in areas with cooler make-up water temperatures (<16°C or 65°F) be aware of lower chemical solubility; in all cases it is recommended that mechanical mixing be a regular part of the mixing process. We recommend slow addition of the dry PersulfOx powder to water then mixing during and after addition using power equipment such as drum-type vortex/cyclone mixers attached to the tank. Alternatives are power drills with paint-mixer attachments or trash pumps with a recirculating hose configuration. PersulfOx mixes easily in water within the common solution ranges. Once mixed PersulfOx will stay in solution for a few hours before some settling. It is always recommended that the solution be checked and re-mixed 4 to 5 times during a workday. When adding the PersulfOx to the mix water, follow proper handling and dust precautions (see H & S sheet and MSDS). The following table is a guideline for solution mixing % per bag of PersulfOx in water:

No. of Bags	Weight of Material (lbs.)	Desired Solution (%)	Volume of Water (gallons)	Final PersulfOx volume (gallons)
1	55	5	125	128
1	55	10	59	62
1	55	15	37	40
1	55	20	26	29
1	55	22.5	23	26

Volume of mix water (gallons/vertical foot of injection) can be calculated from the following equation:

$$\frac{\text{Persulfox lbs/ foot}}{(8.34\,\text{lbs/gal water})(\%\,\text{Persulfox solids})}\left[1-(\%\,\text{Persulfox solids})\right]$$

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Direct Push (DPT) applications. It is imperative that the DPT injection holes be properly grouted/sealed upon completion of the injection activities. The purpose of this effort is to seal off any potential pathways to the surface which may allow "day lighting" of injection materials. Whenever possible, the application should be performed by systematically working from the outside to the center of the injection array. This methodology of application will limit expansion of the plume (also applies to wells).

Well-applications. Regenesis recommends that wells should generally be constructed using at least 2-inch diameter Schedule 80 PVC with a screen slot size >0.2-inch. When possible use the required bentonite seal above the filter pack and then a cement grout (bentonite <10%) to the surface. Injection wells should be flushed with a clean-water chaser after application of PersulfOx. When wells are used for PersulfOx injection, the PersulfOx injection wells and all nearby groundwater monitoring wells should be tightly capped (or be equipped with pressure gauges) to reduce potential for short circuiting to the surface.

Surfacing. From time to time application related surfacing of oxidants or other high volume remedial reagents may occur. Regenesis has co-authored a document that addresses the specifics reagent surfacing before it occurs as well as proper management when it does occur. This document is entitled "Guidelines for Subsurface Injection of In Situ Remedial Reagents within the LARWQCB Region" (ISRR). This document can be found on the LARWQCB Website or on the Regenesis website www.regenesis.com

PersulfOx™

Material Safety Data Sheet (MSDS)

Last Revised: April 20, 2012

Section 1 – Supplier Information and Material Identification

Supplier:

1011 Calle Sombra
San Clemente, CA 92673
Telephone: 949.366.8000
Fax: 949.366.8090
E-mail: info@regenesis.com

Chemical Synonyms:	A mixture of Sodium Persulfate [$Na_2S_2O_8$], Sodium Metasilicate [Na_2SiO_3] and Amorphous Silicon Dioxide[SiO_2].
Chemical Family:	Inorganic Chemicals
Trade Name:	PersulfOx™
Product Use:	Used to remediate contaminated soil and groundwater (environmental remediation applications)

Section 2 – Chemical Information/Other Designations

CAS No.	**Chemical**
7775-27-1	Sodium Persulfate
6834-92-0	Sodium Metasilicate, Anhydrous
7631-86-9	Silicon Dioxide, Amorphous

Section 3 – Physical Data

Form:	Solid, free-flowing powder
Color:	White
Odor:	Odorless
Melting Point:	NA
Boiling Point:	NA
Flammability/Flash Point:	Non-combustible
Vapor Pressure:	NA
Bulk Density:	NA
Viscosity:	NA
pH (10% solution):	≈ 8.5 – 9.9 @ 25 °C
Decomposition Temperature:	Decomposition will occur upon heating.

Section 4 – Reactivity Data

Stability:	Stable under normal conditions. Stability decreases in the presence of heat, moisture and/or contamination.
Conditions to Avoid/Incompatibility:	Acids, alkalis, halides (fluorides, chlorides, bromides and iodides), Combustible materials, most metals and heavy metals, oxidizable materials, other oxidizers, reducing agents, cleaners, and organic or carbon containing compounds, moisture, heat, flame. Contact with incompatible materials can result in a material decomposition or other uncontrolled reactions.
Hazardous Decomposition Products:	Oxygen that supports combustion and oxides of sulfur.
Polymerization	Will not occur

Section 5 – Regulations

UNITED STATES

SARA TITLE III (SUPERFUND ADMENDMENTS AND REAUTHORIZATION ACT)

Section 302 Extremely Hazardous Substances (40 CFR 335, Appendix A):	N/A
Section 311 Hazard Categories (40 CFR 370):	Fire Hazard, Immediate (Acute) Health Hazard
Section 312 Threshold Planning Quantity (40 CFR 370):	The Threshold Planning Quantity (TPQ) for this product, if treated as a mixture, is 10,000 lbs; however, this product contains the following ingredients with a TPQ of less than 10,000 lbs.: None
Section 313 Reportable Ingredients (40 CFR 372):	Not Listed

CERCLA (COMPREHENSIVE ENVIRONMENTAL RESPONSE COMPENSATION AND LIABILITY ACT)

CERCLA Designation & Reportable Quantities (RQ) (40 CFR 302.4):	Unlisted, RQ = 100 lbs., Ignitability

Section 6 – Protective Measures, Storage and Handling

Technical Protective Measures

Storage:

Oxidizer. Store in a cool, clean, and well ventilated area away from all sources of ignition and out of the direct sunlight. Store in a dry location away from heat and in temperatures less than 40 °C.

Keep away from incompatible materials and keep lids tightly closed. Do not store in improperly labeled containers.

Protect from moisture. Do not store near combustible materials. Keep containers well sealed.

Store separately from reducing materials. Avoid contamination which may lead to decomposition.

Handling:

Avoid contact with eyes, skin and clothing. Use with adequate ventilation. Wear respiratory protection if ventilation is inadequate or not available. Use eye and skin protection. Use clean plastic or stainless steel scoops only.

Do not swallow. Avoid breathing vapors, mists or dust. Do not eat, drink or smoke in the work area. Wash hands thoroughly after handling.

Label containers and keep them tightly closed when not in use.

Personal Protective Equipment (PPE)

Engineering Controls:

General room ventilation is required if used indoors. Local exhaust ventilation, process enclosures or other engineering controls may be needed to maintain airborne levels below recommended exposure limits. Avoid creating dust or mists. Maintain adequate ventilation at all times. Do not use in confined areas. Keep levels below recommended exposure limits. To determine actual exposure limits, monitoring should be performed on a routine basis. General use of persulfates will generate thermal and pressure regimes which need to mitigated during application as a precautionary measure.

Respiratory Protection:

Use NIOSH(P100) approved respirator when airborne dust is expected.

Exposure Limit

0.1 mg/m^3 (TWA) - ACGIH

Hand Protection:

Wear chemical resistant gloves (neoprene, rubber, or PVC). Thoroughly wash the outside of gloves with soap and water prior to removal.

Section 6 – Protective Measures, Storage and Handling (cont)

Eye Protection:	Wear chemical safety goggles. A full face shield may be worn in lieu of safety goggles.
Skin Protection:	Try to avoid skin contact with this product. Chemical resistant gloves (neoprene, PVC or rubber) and protective clothing should be worn during use.
Protection Against Fire & Explosion:	Product is non-explosive. In case of fire, evacuate all non-essential personnel, wear protective clothing and a self-contained breathing apparatus, stay upwind of fire, and use water to spray cool fire-exposed containers. Presence of water accelerates decomposition.

Section 7 – Hazards Identification

Potential Health Effects

Inhalation:	May be harmful and irritating.
Eye Contact:	Non-irritating (rabbit)
Skin Contact:	Non-irritating (rabbit)
Ingestion:	May be harmful if swallowed (vomiting and diarrhea).
Target Organs:	Eyes, skin, respiratory passages

Section 8 – Measures in Case of Accidents and Fire

After Spillage/Leakage:	Spilled material should be collected and put in approved DOT container and isolated for disposal. Isolated material should be monitored for signs of decomposition (fuming/smoking). If spilled material is wet, dissolve with large quantity of water and dispose as a hazardous waste. All disposals should be carried out according to regulatory agencies procedures.
Extinguishing Media:	Water; Do not use carbon dioxide or other gas filled fire extinguishers; they will have no effect on decomposing persulfates. Wear full protective clothing and self contained breathing apparatus.

First Aid

Eye Contact:	Flush eyes with running water for at least 15 minutes with eyelids held open. Seek a specialist.
Inhalation:	Remove affected person to fresh air. Seek medical attention if the effects persist.
Ingestion:	Rinse mouth with water, give two-four cups of water to dilute the chemical and seek medical attention immediately. Never give anything by mouth to an unconscious person. **Do Not** induce vomiting.
Skin Contact:	Wash affected areas with soap and a mild detergent and large amounts of water. Seek medical attention if irritation occurs or persists.

Notes to Medical Doctor: This product has low oral toxicity and is not irritating to the eyes and skin. Flooding of exposed areas with water is suggested, but gastric lavage or emesis induction for ingestions must consider possible aggravation of esophageal injury and the expected absence of system effects. Treatment is controlled removal of exposure followed by symptomatic and supportive care.

Section 9 – Accidental Release Measures

Precautions:

Cleanup Methods: Spilled material should be collected and put in approved DOT container and isolated for disposal. Isolated material should be monitored for signs of decomposition (fuming/smoking). If spilled material is wet, dissolve with large quantity of water and dispose as a hazardous waste. All disposals should be carried out according to local regulatory agencies procedures.

Section 10 – Information on Toxicology

Toxicity Data

Oral LD_{50} (rat):	895 mg/kg
Dermal LD_{50} (rabbit):	> 10 g/kg
Inhalation LD_{50} (rat):	5.1 mg/kg

Section 11 – Information on Ecology

Ecotoxicological Information

Bluegill sunfish, 96-hour LC_{50} = 771 mg/L

Rainbow trout, 96-hour LC_{50} = 163 mg/L

Daphnia, 48-hour LC_{50} = 133 mg/L

Grass shrimp, 96-hour LC_{50} = 519 mg/L

Biotic Degradation: N/A.

Section 12 – Disposal Considerations

Waste Disposal Method: Dispose of in an approved waste facility operated by an authorized contactor in compliance with local, state and federal regulations.

Section 13 – Shipping/Transport Information

D.O.T. Shipping Name:	Oxidizing Solid, n.o.s. (a mixture of Sodium persulfate, sodium metasilicate and silicon dioxide)
UN Number:	UN 1479
Hazard Class:	5.1 (Oxidizer)
Labels:	5.1 (Oxidizer)
Packaging Group:	III

Section 14 – Other Information

HMIS® Rating	Health – 1 (Slight)	Physical Hazard – 1 (Slight)
	Flammability – 0 (None)	Lab PPE – goggles, gloves, apron, dust respirator

HMIS® is a registered trademark of the National Painting and Coating Association.

NFPA	Health – 1 (Slight)	Reactivity – 1 (Slight)
	Flammability – 0 (None)	Special - Oxidizer

Section 15 – Further Information

The information contained in this document is the best available to the supplier at the time of writing, but is provided without warranty of any kind. Some possible hazards have been determined by analogy to similar classes of material. The items in this document are subject to change and clarification as more information become available. This document is intended only as a guide to the appropriate precautionary handling of the material by a properly trained person. Individuals receiving this information must exercise their independent judgment in determining its appropriateness for a particular purpose.

PersulfOx™
CATALYZED PERSULFATE

Packaging, Storage, Health and Safety

PersulfOx® is a chemical oxidation technology developed by REGENESIS for the remediation of organic contaminants in soil and groundwater which employs a patented "catalyzed persulfate" technology. PersulfOx is mixed with water and applied to the contaminated matrix via mixing equipment or subsurface injection techniques. When adding the fine dry PersulfOx powder to the mix water, proper handling and dust precautions should be followed as listed under Health and Safety below (also review MSDS).

Packaging and Storage:

PersulfOx is a dry, white, and free flowing powder delivered in 30 lb. pails or 55.1 lb (25 kg) bags. It ships as a DOT 5.1 Class Oxidizer and should be handled according to rules and regulations governing oxidizers. Persulfox should be stored in a cool (<40^{o} C), clean, dry, and well-ventilated area and away from heat and moisture. It should not be stored with combustible or reducing materials.

Health and Safety:

PersulfOx is engineered for ease of handling in the field and is safely mixed without the risks and potential hazards associated with most other chemical oxidants such as alkaline activated sodium persulfate. However, PersulfOx is an oxidizer/catalyst powder mixture, therefore Level C proper protective equipment (PPE) is recommended for all personnel working with or in areas of potential contact with PersulfOx. In addition, PersulfOx is an alkaline product when in solution; if left to stand for a long periods, persulfate based products can become acidic. Under either alkaline or acidic conditions PersulfOx can be caustic and corrosive and degrade equipment surfaces.

Personal Protective Equipment (PPE)

- Eye protection – Wear well sealed goggles or a face shield (face shield recommended for full face protection)
- Head – Hard hat when required
- Respiratory – Use NIOSH(P100) approved respirator when airborne dust is expected
- Hands – Wear chemical resistant gloves (neoprene, rubber, PVC)
- Feet – Wear steel toe shoes with chemical resistant soles or neoprene boots
- Clothing – Wear long sleeve shirts and long pant legs. Consider using a Tyvek® body suit, Carhartt® coverall or splash gear
- Engineering Controls-ventilation is required if used indoors. Controls should be maintained to avoid creation of dusts and mists.

PersulfOx™
CATALYZED PERSULFATE

A Sodium Persulfate - Based *In Situ* Chemical Oxidant with Built-In Activation

DESCRIPTION

PersulfOx™ is an *in situ* chemical oxidation reagent that destroys organic contaminants found in groundwater and soil through powerful yet controlled chemical reactions. PersulfOx is a sodium persulfate ($Na_2S_2O_8$) - based technology which employs a uniquely patented catalyst to enhance oxidative destruction of both hydrocarbon and chlorinated contaminants in the subsurface.

Traditionally, sodium persulfate is activated with the addition of heat, chelated metals, hydrogen peroxide, or base in order to generate sulfate radicals. These activation processes are inherently complex, costly and can pose additional health and safety risks. In comparison, PersulfOx is a relatively safe and easy-to-use ISCO agent.

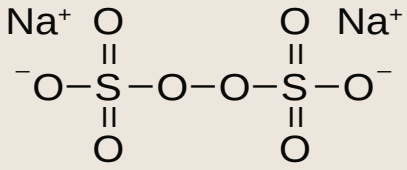

FIGURE 1:
SODIUM PERSULFATE CHEMICAL STRUCTURE

In short, PersulfOx contains a built-in catalyst which activates the persulfate component and generates contaminant destroying free radicals without the need for the addition of a separate activator.

FEATURES & BENEFITS

- Promotes rapid and sustained *in situ* oxidation of a wide-range of organic contaminants
- Provides a unique catalytic surface on which oxidants and contaminants react in a process known as "surface mediated oxidation."
- Contains built-in activation: eliminates complex and potentially hazardous chemical addition required to achieve traditional persulfate activation
- Fewer health and safety concerns than with use of traditional activation methods such as heat, chelated metals, hydrogen peroxide or base
- Single component product results in simplified logistics and application. No additional containers and/or multi-step mixing ratios required prior to application
- Contaminant oxidation performance equivalent to best alternative persulfate activation methods

FUNCTION

PersulfOx is an all-in-one product that provides powerful and highly efficient chemical oxidation performance. It is easily mixed with water and applied into the contaminated matrix using subsurface injection techniques or soil mixing tools.

The PersulfOx catalyst is a silica based, microscopic surface on which oxidants and contaminants can come together and react in a distinct process known as "surface mediated oxidation." During this process, oxidation reactions occur repeatedly on the surface of the catalyst serving several contaminant-reducing functions:

- The generation of sulfate radical and other oxidizing species
- Accelerated oxidation through the adsorption of contaminant molecules and other oxidizing species
- Catalyzes direct and free-radical-mediated oxidation by sodium persulfate

The equation below shows the net complete oxidation of toluene, a constituent of gasoline, by PersulfOx:

For a Free Consultation and Application Design for the use of PersulfOx visit www.regenesis.com

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PUMP SELECTION AND EQUIPMENT CLEANING

Subsurface application of PersulfOx via pressure injection is commonly performed using either direct-push technology (DPT) or wells. The PersulfOx material is a white, powdery material that ships as a **DOT 5.1 Class Oxidizer** and should be handled according to regulations governing oxidizers. In addition, when prepared onsite as an injectable solution, the equipment selected should be appropriate given the chemical nature of persulfate. Proper cleaning should be performed to minimize equipment degradation.

TYPICAL INSTALLATION EQUIPMENT

- Direct push technology (DPT) rig with injection assembly or properly constructed injection wells
- Injection Pumps-see list/discussion below
- Injection hosing, manifolds, and a pressure relief valve with a bypass
- Clear, reinforced PVC hosing between mixing tank/drum and pump
- Pressure gauges or transducers for existing wells
- Drum-type vortex/cyclone mixers attached to the tank, or;
- Power drill paint stirrer (3-inch diameter or smaller propeller tip), or;
- Trash pumps with a re-circulating hose configuration
- 5-amp sump pump (such as Little Giant) and hose
- Plastic poly tanks and other semi-resistant materials to hold an alkaline solution or three to four 55-gallon poly drums or similarly sized mixing tanks for PersulfOx mixing
- Sand, bentonite chips, granular bentonite, cement, hydraulic cement, and quick-set concrete for closing and sealing temporary injection holes
- Access to water. (Note: cooler water temperatures [<16^{o}C or 65^{o}F] lower chemical solubility and/or solubility rate
- Access to electricity

Pump Information - Regenesis has evaluated a number of pumps that are capable of delivering oxidants to the subsurface at a sufficient pressure and volumetric rate. Although a number of pumps may be capable of delivering the PersulfOx to the subsurface at adequate pressures and volume, each pump has a set of practical issues that must be considered to manage a specific field setting. In general, Regenesis recommends using a pump with a minimum pressure rating of 100 pounds per square inch (psi) in sandy formations or 800 psi in silt, clay or weathered bedrock formations, and a minimum delivery rate of 5 gallons per minute (gpm). Note that operating pressures (i.e., pressure required to deliver reagent to the formation) are typically substantially less than the pump capacity pressures. A variety of pumps may be used for oxidant injection including:

1) Double diaphragm (air-driven) pumps: Yamada-NDP-25E, Wilden- P-200 Advanced and T-2
2) Positive displacement: Hydracell D-10
3) Gasoline-engine driven: Geoprobe Systems DP-800
4) Progressive cavity: Moyno 500 Series-333

Pump features should include housing and internal parts that have reasonable chemical resistance for both caustic and corrosive fluids. Pumps with lower gpm ratings can be used; however, they are not recommended due to the amount of time required to inject the volume of liquids typically associated with a PersulfOx injection (i.e. 1,000 lbs of PersulfOx requires roughly 675 gallons of water to make a 15% solution). Prior to PersulfOx injection, a test injection using clear water is a useful procedure to determine the formation acceptance rate under a pressure-injection. For *in situ* oxidation projects, Regenesis recommends testing volumes up to 15% greater than the design volume for a single-point injection.

Equipment Cleaning - It is important to clean all equipment during and especially at the end of each work day. Thorough flushing of pumps, tanks, and hoses with clean water is a necessary standard procedure for both health and safety of personnel as well as equipment care and longevity. Persulfox is an alkaline product when in solution; if left to stand for a long period of time persulfate based products can become acidic and degrade equipment surfaces. For best results, use a hot water pressure washer (150 - 170 °F or 66 - 77 °C) to clean equipment and rods periodically throughout the day. Internal pump mechanisms and hoses can be cleaned by circulating hot water (and, as needed, mixed with a biodegradable cleaner such as Simple Green®) through the pump and delivery hose. Further cleaning and decontamination (if necessary due to subsurface conditions) should be performed according to the equipment supplier's standard procedures and local regulatory requirements.