INTERIM REMEDIAL MEASURE
PHASE II
WORK PLAN
revised

FOR

ROSE CLEANERS
500 Lexington Avenue
Mount Kisco, New York 10549
Site No.: 3-60-059
Index No.: W3-0978-03-12

PREPARED FOR

NEW YORK STATE DEPARTMENT OF
ENVIRONMENTAL CONSERVATION
625 BROADWAY
ALBANY, NEW YORK 12233-7016

PREPARED BY
BERNINGER ENVIRONMENTAL, INC.

Revised September 2012

DER-10 Section 1.5 (b) (1) PE Certification

I, John V. Soderberg, certify that I am currently a NYS registered Professional Engineer and that this revised phase II IRM Report 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).

John V. Soderberg, P.E. (049975)

Dated: March 30th 2012

Seal

TABLE OF CONTENTS

LIST OF FIGURES

APPENDICES

TABLES

1.0 INTRODUCTION

The subject property is listed on the NYSDEC DER Registry of Inactive Hazardous Waste Disposal Sites in New York State as Site Number 3-60-059 with a Classification of 2 pursuant to ECL 27-1305. The site is located at 500 Lexington Avenue, Mt. Kisco, New York 10549, fully described at Dist. 80.64, Section 01, Lot 14.(Figure-1) This document is a Revised Phase II Interim Remedial Measure Work Plan (IRM WP2), that is predicated upon the prior remedial investigation work and includes a scope of work for the implementation of a remedial measure to address contaminated soil areas delineated at the Rose Cleaners' property at the west, south and north sides of the building, specifically the "rear of the building", the "dumpster area" and excavation area (northern portion of the building). (Figure-2)

1.1 Status of Remedial Investigation

As requested by the NYSDEC, an Interim Remedial Measure (IRM) Work Plan was prepared to address immediate concerns relative to shallow soils impacted by dry-cleaning volatile organic chemicals (VOCs) (specifically tetrachloroethene (PCE) and daughter products) delineated during prior Remedial Investigation studies at the subject property. The IRM has been broken down into two phases of work for which Phase II focuses on the application of oxidation chemicals to source areas throughout the subject property. Future chemical treatment is intended to take place in the "the dumpster area", the "rear of the building" and the excavation area (northern portion of building / H-pattern area). The Phase I IRM was generally executed in accordance with the August 2008 IRM Work Plan (modification) and the September 2008 letter approving this modification. The Phase I work was documented in the Phase I IRM Construction Completion Report.(Phase I IRM CCR) The remainder of this work plan discusses the IRM Phase II activities to be performed.

1.2 IRM Phase II Remedial Objectives

The Phase II IRM is required to consist of the following:

- RegenOx™ treatment to unsaturated soils, saturated soils and the underlying aquifer in the, "dumpster area", "rear of building" and "northern portion of property"
- monitoring of wells to record: depth to groundwater (DTW), temp, pH, conductivity, D.O and ORP, before, during and after the injections
- pre/post application sampling of monitoring wells for chlorinated VOC's
- Development of a Phase II IRM Construction Completion Report (CCR) documenting the results of the remedial efforts

As both shallow unsaturated and saturated soil impacts have been identified, the Phase II IRM Work Plan includes a scope of work for the implementation of a proven in-situ remedial technology to address the aforementioned areas delineated at the west, south and north sides of the building.

2.0 SUMMARY OF SITE CONDITIONS

2.1 Site Conditions

The RI soil sampling performed was biased toward the north side of the building and included other potential suspect areas such as the "rear of the building", exterior to doors, exhaust fans and the historic "dumpster location." Primarily tetrachloroethene (PCE) has been the Volatile Organic Compound (VOC) present at the highest concentrations of concern, coupled with elevated detections of typical daughter (breakdown) VOCs such as 1,2-Dichloroethene(DCE) (total) and trichloroethene (TCE). No vinyl chloride has been reported above method detection limits.

Similar to soils, PCE is the primary constituent present at the highest concentrations in groundwater with the exception of one sampling location, (GW-1) at the northwest corner of the building where daughter products of PCE such as vinyl chloride predominated. The highest concentrations of PCE were present in the shallow groundwater samples collected at the west side of the building near the exhaust fan and the southwestern portion of the property near the old dumpster. Localized groundwater flow direction was previously confirmed to be northwest but recent groundwater studies show a northerly flow imitating the direction of the stream.

In summary, the Phase II IRM focuses on "the dumpster area"(southwest side), the "rear of the building" and the "northern portion of the property" (excavation area). Sampling results from the May 2005 investigation of the dumpster area and rear of the building have established the need for treatment in these areas. (See Figures -3 and 4) Investigation activities at the northern portion of the building indicate the need for additional treatment beyond the prior Phase I remedial efforts. PCE impacts to soil and groundwater in the excavation area that extend beyond the limit of the Phase I remedial activities were identified during the February 2008 investigation. (See Figure- 8)

2.2 Delineation of Phase II IRM Areas

Previous investigation activities conducted at the west, south and north sides of the subject property revealed PCE contaminated hot spots; the "rear of the building," near the dry cleaner exhaust fan,"the dumpster area," and the "excavation area". The investigation conducted in May of 2005 consisted of multiple borings in order to evaluate soil and groundwater conditions throughout the subject property. Sampling locations SB-3 and SB-10 located near the exhaust fan and the old dumpster area respectively, indicated elevated concentrations of PCE. Laboratory results for SB-3 detected concentrations of PCE at 34,000 ug/kg at a depth of 4-5 ft. and SB-10 detected concentrations of PCE at 15,000 ug/kg at a depth of 3-4 ft. Each of the samples collected from these locations exhibit concentrations of PCE that exceed NYSDEC soil cleanup objectives for protection of groundwater referenced in Technical Guidance Document Part 375 Soil Cleanup Objectives. (Figure-3 for Soil Data)

Groundwater sampling results indicated that PCE contamination was detected at elevated concentrations at multiple sampling depths. GW-3, which is also SB-3, detected PCE in groundwater at 1,500 ug/l from a depth of 5-7 ft. and also 150 ug/l from a depth of 15-17 ft. GW-10, which is also the same location as SB-10, was sampled at 5-7 ft. and 15-17 ft. and detected PCE at 380 ug/l and 120 ug/l respectively. Other sampling locations(GW-12 and GW-13) in the area of the old dumpster also possessed elevated concentrations of PCE above the TOGS groundwater cleanup objective of *5ug/L*. GW-12 and GW-13 were sampled at depths of 5-7' and 15-17' bgs. GW-12 showed concentrations of PCE at 5,800 ug/l for the 5-7' sample and 5,400 ug/l for the deeper 15-17' sample. GW-13 exhibited elevated concentrations of PCE at 3,500 ug/l for the 5-7' sample and 1,900 ug/l for the deeper 15-17' sample.(See Figure-4 for Groundwater Data)

Investigation data collected at the northern portion of the building indicated the presence of elevated PCE concentrations in saturated soils and groundwater. Figure-8 depicts the area of PCE impacted soil above and below the groundwater table. Elevated PID readings for soil samples collected during the February 2008 sampling event indicated significant impacts to saturated soils as deep as twelve (12) feet below the grade surface.

The overall goal for remediation in these three areas is to reduce soil and groundwater contamination to levels that comply with NYSDEC Part 375 Soil Cleanup Objectives for protection of groundwater and CP-51 cleanup goals, as well as, NYSDEC document TOGS for ambient water quality standards.

3.0 Project Schedule

Upon approval of the Phase II IRM Work Plan BEI will place an order for materials within one week from the approval date. Within this week BEI will also contact the USEPA and update all the necessary permits and documentation pertaining to the Underground Injection Control program. (UIC) After the materials are received and the permits are acquired and updated, BEI will begin to move forward with the injections three (3) weeks after the final approval of this work plan. Our client will be notified of the work to be performed and the NYSDEC will be contacted in order to confirm the official start date.

After completing the Phase II IRM work, BEI will compose a Phase II IRM Construction Completion Report (Phase II IRM CCR) in order to document the work performed and evaluate the results of our remedial efforts. Post injection monitoring will take place 24 hours, one week and two weeks after the chemical injections. Each of these three events will require the gauging of down gradient monitoring wells (MW-A-MW-H and HP-1 and HP-2) for: depth to water (DTW), pH, conductivity, ORP, D.O and temperature. Additional sampling for chlorinated VOC's will take place 6 weeks after the chemical injection event and three (3) months after the first round of sampling. After routine sampling procedures are completed, all monitoring wells will be sampled on a quarterly basis until the State Department determines it to be no longer necessary based on results. Sampling results will determine if additional injections are required (Appendix-A Monitoring Schedule)

4.0 Installation of IRM Monitoring Wells

In order to evaluate any immediate effects of the IRM and for future monitoring purposes ten (10) two-inch diameter groundwater monitoring wells have been installed using a Geoprobe direct push system. The wells are located along the northern property boundary and the creek at the western property boundary and are labeled as follows; MW-A, MW-B, MW-C, MW-D, MW-E, MW-F, MW-G and MW-H. Two monitoring wells were also installed within each of the H-pattern units for sampling purposes. Theses wells are labeled HP-1 and HP-2 and can be located on Figure-5.

As depth to groundwater is roughly 3 feet below grade in this area, the final depth of each of the monitoring wells is approximately 10 feet.(MW-A-MW-H) Well construction consists of 8 feet, of 2-inch diameter, schedule 40, .02 inch slotted well screen set approximately one (1) foot above the water table and seven (7) feet below the water table. Two feet of 2 inch diameter, schedule 40, flush joint threaded riser pipe finish the wells to grade. A bentonite seal has been installed just above the screened interval to prevent any surface runoff from entering into the well. A 5-inch cast iron manhole and cover has been cemented in place to complete the installation. Soil sampling was not conducted prior to the well installation, therefore, drill cuttings were not generated using the direct push probing method.

Well construction for HP-1 and HP-2 consists of five (5) foot of 2" inch diameter, schedule 40, .02" inch well screen set five feet into the ground. These wells were manually installed prior to the back filling of the excavation and are not secured with a permanent manhole cover**. A** manual 2.25" hand auger was used for installation. Upon completion of the final ground surface in the excavation area manhole covers will be installed flush to grade and cemented and sealed in place. (well logs Figures-6a-j)

Two (2) additional monitoring wells are proposed (MW-I and MW-J) to be installed along the northern property boundary in order to monitor the down gradient plume and evaluate the effectiveness of the Phase II IRM efforts. Well construction will consist of 10 feet, of 2-inch diameter, schedule 40, .02 inch slotted well screen set approximately five (5) feet into the water table from 10 - 20' feet bgs. Ten feet of 2 inch diameter, schedule 40, flush joint threaded riser pipe will finish the wells to grade making for a total well depth of 20' bgs with a 10' screened interval. A bentonite seal will be installed just above the screened interval to prevent any surface runoff from entering into the well. A 5-inch cast iron manhole and cover will be cemented in place to complete the installation**.** Please refer to monitoring well logs Figures-6 k and l.

One (1) additional up gradient monitoring well (MW-K) is proposed to be installed up-gradient from the known source area along the southern property boundary**.** Well construction will consist of 10 feet, of 2-inch diameter, schedule 40, 0.02 inch slotted well screen set approximately eight (8) feet into the water table from 2'-12' feet bgs. Two (2) feet of 2 inch diameter, schedule 40, flush joint threaded riser pipe will finish the well to grade making for a total well depth of 12' bgs with a 10' screened interval from 2-12'. Refer to Figure-6m for well construction details.

5.0 Selected ISCO Remedy - RegenOx™

Due to its ready availability, ease of use, mixing with water to reduce worker exposure, relatively low cost, effectiveness, and overall safety, the use of RegenOx™ is the selected remedy for this Phase II IRM.

RegenOx™ can be added to excavations, and soil piles using soil blending equipment or injected through permanent or temporary well screens. Once in contact with contaminated soil, RegenOx™ produces an effective oxidation reaction, comparable to that of Fenton's Reagent, without a violent exothermic hazard. The most aggressive approach using chemical oxidation is to maximize contact between RegenOx™ and the contaminated soil and groundwater.

RegenOx™ is a proprietary in-situ chemical oxidation process using a solid oxidant complex (sodium percarbonate/catalytic formulation) and an activator complex (a composition of ferrous salt embedded in a micro-scale catalyst gel). RegenOx™ with its catalytic system has very high activity, capable of treating a very broad range of soil and groundwater contaminants including both petroleum hydrocarbons and chlorinated solvents. Additionally, RegenOx™ has significant longevity in the subsurface allowing for both the initial contaminant degradation and the continued treatment of contaminants desorbing from the matrix. Most importantly, RegenOx™, when handled appropriately, is safe and easy to apply to the contaminated subsurface without the health and safety concerns and lingering environmental issues that have become associated with other chemical oxidation technologies.

For RegenOx™ parameters such as pH (optimum at 6-9); moisture content (optimum 70 to 95% field capacity); Particle-size distribution (optimum soil void volume >25%); Total Oxidant Demand (TOD) of 9g/kg is assumed when estimating oxidant loading. Total organic carbon (TOC) will be identified prior to implementation. If the initial values for pH, TOC, TOD, and moisture are not within the optimal criteria, the overall reactions will be slower or less effective. All of the above mentioned parameters as well as depth to groundwater, the intended treatment zone (in cubic feet), estimated total chlorinated VOC's from lab data and total porosity are taken into consideration by the experts at Regenesis to ensure that the unsaturated zone and the aquifer can absorb the total amount of

RegenOx™ intended for injection. Most of these calculations are derived from general site specific data pertaining to sites that share similar soil lithology and target contaminant concentrations. The amount of information provided by the vendor regarding the total oxidant dose is limited and in some cases reliant on assumptions. Complex formulas and equations are computer generated in order to configure the correct dosing amount for a particular site. Additional information regarding the formulation of the oxidant dose is discussed later in this document.

The following site specific data is required by Regenesis before calculating the oxidant dosage; the target constituents of concern (PCE and TCE), concentrations of those constituents, (ug/l or ug/kg), thickness of contaminated zone (10 feet), length and width of the plume (20 by 30 feet), and soil lithology in target zones (silty sands). Total Organic Carbon (TOC) will be analyzed by BEI before additional injection procedures commence in order to surmise the effectiveness of the treatment.

In the event of overflow, injection procedures should be discontinued for a few minutes or until the oxidant mixture settles back into the well. During this down time background temperature readings will be examined at down gradient monitoring wells for higher than normal temperature readings. When the injection process continues, the flow rate of the solution would be significantly reduced to avoid a reoccurrence.

6.0 IRM Phase II In-Situ Chemical Injection

6.1 Phase II IRM Treatment Areas

Phase II of the continuing IRM discusses three separate locations at the subject property known as the, “dumpster area”, the “rear of the building”(exterior to the door) and the excavation area (northern portion of property). Previous investigations have identified PCE in soil and groundwater at each of theses locations. At the rear of the building PCE contamination was discovered in the sub-surface soil and groundwater zones from 4 feet to 8 feet. PCE contamination was discovered at deeper depths (PCE detected 150 ug/l @ 15-17' (Figure-4) in this area but the concentrations were not nearly as significant when compared to the shallower depths. PCE was also found in the shallow sub-surface

near the old dumpster location and elevated concentrations of PCE were discovered from 4-8 feet. As for the excavation area, a large amount of source material was removed during Phase I IRM activities, but significant impacts in groundwater and residual soil contamination need to be addressed as part of the Phase II remedial work. The most significant impacts found in soil exceeding regulatory limits have been removed but shallow groundwater impacts are still present. The H-pattern units installed slightly above the fluctuating groundwater table in this area will provide sub-surface chemical treatment enhancing the degradation process.

The previously discussed data derived from prior investigations has been used to estimate the lateral extent of PCE contamination at the target areas. The length and width of the plumes in the dumpster area and the rear of the building have been overly anticipated in order to capture the entire contaminated parcel. The dumpster area and rear of building each contain areas of contamination that are approximately 450- 500 ft². The dumpster area measures approximately 30 feet long by 18 feet wide. The rear of the building measures approximately 24 feet long by 18 feet wide. Each area contains 4 injection wells for an overall total of 8 Phase II injection wells. The injection wells have been installed and well construction is discussed below. At the northern area of the property, H-pattern injection units have been installed in hot spot areas where soil excavation was performed as part of the Phase I IRM. (Refer to Phase I IRM CCR for more information) Please refer to Figure-5 for Phase II target areas.

6.2 IRM Injection Wells

A series of eight 8 injection wells and two (2) h-pattern units have been installed within the proposed areas for soil and groundwater treatment purposes. PCE contamination has been identified in the following areas:

- Dumpster area - 30 feet long by 18 feet wide (4 wells); and
- Rear of building - 24 feet long by 18 feet wide (4 wells);
- Northern Portion of Property - 30 feet long by 5 feet wide overall ; H-pattern units (2 units)

All injection wells (IW-1-8) consist of 8 feet of 2-inch diameter PVC 0.02 inch slotted screen set into the upper four feet of the groundwater via the Geoprobe direct push system. Depth to groundwater in the dumpster area and rear of the building is approximately 4 feet bgs. Based on the zone of contamination the total depth of each well is 8 feet bgs consisting of all screen. The wells were designed to have 4 feet of screen above and below the water table in order to treat the contaminated vadose and saturated zones where high PCE contamination exists from 4 - 8 feet bgs. A 5-inch cast iron manhole and cover was cemented in place to complete the installation. Drill cuttings were not generated using this method of well installation as soil sampling was not conducted prior to well installation. Please refer to Figure-5 for the injection well locations (IW-1-8) placed throughout the intended treatment zones and injection well logs Figure 7a-h.

BEI installed a series (two units) of two-inch diameter 2 mil slotted screens laterally throughout a majority of the excavation area (see Figures- 9 and 10). The screen lengths are manifold together via couplings to form an "H" and were brought to the land surface using two-inch solid schedule 40 PVC riser. The bi-lateral injection unit (h-pattern unit) closest to the Rose Cleaners' building lays 20 feet in overall length by a width of 5 feet. The second and smaller of the two units is 10 feet in length with a width of 5 feet. Each unit is equipped with an injection point at grade surface to allow for future injections of oxidation chemicals. Each H-pattern has a monitoring well (HP-1 and HP-2) installed within the confines of the "H" in order to collect chemical reaction data during injections. HP-1 and HP-2 will also serve as sampling wells in order to evaluate the effectiveness of the injections by analyzing for Volatile Organic Compounds. HP-1 and HP-2 consist of 6 feet of 2" diameter 2 mil slotted screen set approximately 1 foot into the water table. Each of these wells were installed manually post excavation activities. The monitoring wells are depicted in Figure-5 and 11.

The installation of each unit required trenching of the previously applied clean fill in order to place the H-pattern on a level plane within the intended treatment zone. The depth of each H-pattern unit is approximately 3.5 feet bgs which is just above the surface of the aquifer. The RegenOx is intended to be injected through the vertical injection piping allowing the chemical mixture to leach into the

water table through the horizontal screened piping. Having the screen set slightly above the water table will prevent back logging of the oxidant mixture enabling the intended amount of RegenOx to reach the aquifer surface and blend with groundwater.

The majority of PCE contamination in each area of concern is primarily located in the shallow sub-surface soil at 4-7 feet bgs. A good amount of contamination in the excavation area also exists in the groundwater from 7-12 feet bgs. which is expected to naturally attenuate as the source located in the shallower depths will be remediated via RegenOx. The dumpster area exhibits deeper groundwater impacts consisting of PCE in the 15-17 foot range, which is also expected to naturally attenuate as the source located in the shallower depths will be remediated. The injection well screening in the dumpster area and the rear of the building is set directly in the zones of contamination where PCE concentrations are highest. By setting the screened intervals at the same depths as the high PCE concentrations we are allowing the RegenOx to come into direct contact with the constituent as recommended to receive the best possible results.

6.3 RegenOx™ Application

The application of RegenOx™ will be pumped into multiple, strategically placed wells, in order to enhance the area of influence. It is anticipated that 840 pounds of RegenOx™ (420 pounds each of Part A oxidant and Part B activator) will be required for each treatment event in the dumpster and rear of the building areas. Calculations are based upon the fact that soil conditions in the dumpster area and the rear of the building are very similar, as well as, the overall cubic footage of the intended treatment zones. In the excavation area the overall cubic footage of the intended treatment zone is about half of what it is in the dumpster area and rear of the building, but, contaminant concentrations are far worse. It is anticipated that 640 pounds of RegenOx™ (400 pounds of oxidant and 240 pounds of activator) will be required for each treatment event in the excavation area. Data such as the cubic feet of the intended treatment zone and soil characteristics for this area are used to calculate the Total Pore Volume available in target areas. Additional information regarding technical parameter data is provided to Regenesis prior to the application of the oxidant mixture. Parameters such as Sorbed

Phase Oxygen Demand and Dissolved Phase Oxygen Demand are determined by the Regenesis staff based upon PCE contaminant concentrations. Soil boring logs and sub-surface soil characteristics recorded during field investigation activities are provided in order to determine total porosity and hydraulic conductivity (K value) values for the specified areas. (See boring logs provided to Regenesis attached as Appendix-B) Acceptable defaults for other parameters used in calculating the total oxidant dose are substituted wherever reliable data exists. Please refer to the attached Table-1 for RegenOx data calculations pertaining to the dumpster area and rear of the building and Table-3 for data calculations pertaining to the excavation area.

The RegenOx™ will be mixed with water in a 5.00 % solution which is standard for most well injections where soil lithology exhibits silty sands. In this case the aquifers' hydraulic characteristics dictate a 5% solution. The solution includes mixing 1 bucket of part B(activator) with 68 gallons of water. For example, each bucket (both Part A and Part B) weighs 30lbs, therefore, 420 total pounds of Part B would require about 950 gallons of water. If 420 pounds is equivalent to 14 buckets, with each bucket requiring 68 gallons of water, the end result is approximately 950 gallons of water in the dumpster and rear of the building treatment areas. This same mixture applies to the Part A solution(oxidizer). The percent solution of 5.00 % is generated by dividing the total volume (lbs) of the oxidant(A) or the activator(B) by the total amount of water required for each treatment area. The part A and part B solution percentages are calculated separately, as separate solutions, not together as one whole solution. The mixing ratios will remain consistent for each individual treatment area.

Only the total quantity of the RegenOx solution will differ in the excavation area as less volume and pore space is available.

The field procedure calls for the application of the Part B solution first followed by the injection of the Part A solution. This enables the Part B activator to reach the treatment zone and await the arrival of the Part A oxidant. When the two parts concatenate, the reaction begins within the intended treatment zone. This method of injection is recommended by Regenesis in order to prevent a reaction from occurring prior to plume contact.

6.4 Post Injection Monitoring

Before, during and post use of the RegenOx™, existing down gradient monitoring wells, MW-A-MW-H, MW-I, MW-J, HP-1 and HP-2, (Figure-11) will be monitored for changes in temperature, pH, conductivity, ORP, DO and depth to water (DTW) to make certain the RegenOx™ reaction with any residual saturated soil impacts do not occur too quickly and that the RegenOx™ solution does not migrate significantly beyond the intended treatment area. In order to monitor these conditions, the following activities will be conducted:

- Prior to use of the RegenOx™ solution, background pH, conductivity, ORP, D.O, temperature and DTW readings will be collected from the down gradient monitoring wells to establish a baseline for these readings. Wells will also be sampled pre-injection event in order to establish a VOC baseline.

- In order to ensure that the reaction rate is not too fast, background temperature readings will be collected from the monitoring wells. If temperature increases of 5°C or more are observed over the background conditions, the application and mixing will be discontinued until the temperature returns to background or near background conditions.

In order to perform follow-up evaluation of the RegenOx™ injections, the following activities are proposed:

- The initial post application evaluation of DTW, pH, conductivity, ORP, D.O and temperature of the on-site monitoring wells will take place 24-hours after treatment;

- The secondary evaluation of DTW, pH, conductivity, ORP, D.O and temperature of the on-site monitoring wells will take place one week after the RegenOx™ application; and

- The third evaluation of DTW, pH, conductivity, ORP, D.O and temperature of the on-site monitoring wells will take place two weeks after the RegenOx™ application.

The following sampling procedure will follow injections:

- Follow-up sampling of the on-site monitoring wells. Groundwater samples from the monitoring wells will be collected six (6) weeks after the application of the RegenOx™ solution and three (3) months following the initial post-use sample round. Quarterly sampling of all on-site monitoring wells will follow the three (3) month post injection sampling event for which conditions at the site will be re-evaluated including the need for additional

injections. Each sampling event will include analyzation of VOC's. A report of this evaluation will be submitted to the Department within 60 days of the receipt of validated data.

7.0 Health and Safety Plan, Handling and Permitting

The site specific Health and Safety Plan developed for the RI will be used for the IRM and is attached as Appendix-D. The plan will be adhered to by all personnel involved in the IRM. Incorporated into the plan is a section on community health and safety with measures to ensure the public living and working near the site, including facility employees or visitors, are protected from exposure to site contaminants during intrusive activities or on-site treatment actions.

7.1 Health and Safety

Upon combining RegenOx™ Part A and Part B, a mild exothermic reaction begins. This reaction results in minimal heat and pressure generation, allowing field application of RegenOx™ to be accomplished safely and without the use of highly specialized equipment or specialty contractors. Through the use of widely available, direct-push equipment and an assortment of pumps, RegenOx™ has been designed to be easy to install. As with all oxidants, proper health and safety procedures must be followed and include**:** Level D personal protective equipment. (Please also see Table-2 for additional Health and Safety Contingencies.)

7.2 Level D Personal Protective Equipment (PPE)

Personnel working with or in areas of potential contact with RegenOx™ should be required at a minimum to be fitted with modified Level D personal protective equipment:

- Eye Protection- Wear goggles or a face shield
- Head- Hard hat when required
- Respiratory- Use dust respirator approved by NIOSH/MSA
- Hands- Wear neoprene gloves
- Feet- Wear steel toe shoes with chemical resistant soles or neoprene boots
- Clothing- Wear long sleeve shirts and long pant legs. Consider using Tyvek body suit, Carhartt coverall or splash gear.

7.3 Permitting

Wells for injection of RegenOx™ in the area described as Mount Kisco, NY are considered Class V Injection Wells as per the Federal Underground Injection Control (UIC) Program which falls under the Federal Safe Drinking Water Act (SDWA) and are permitted by rule. Berninger Environmental Inc. is aware of the permit process with the USEPA and has obtained the necessary documentation permitting BEI to perform Underground Injections at the Rose Cleaners' site. Let it be noted that the EPA has to be contacted and a permit has to be filed for each individual injection. BEI will be applying for injection permits through the USEPA upon the approval of this Work Plan.

8.0 Community Air Monitoring Plan (CAMP)

Please refer to Appendix-C for CAMP.

FIGURES

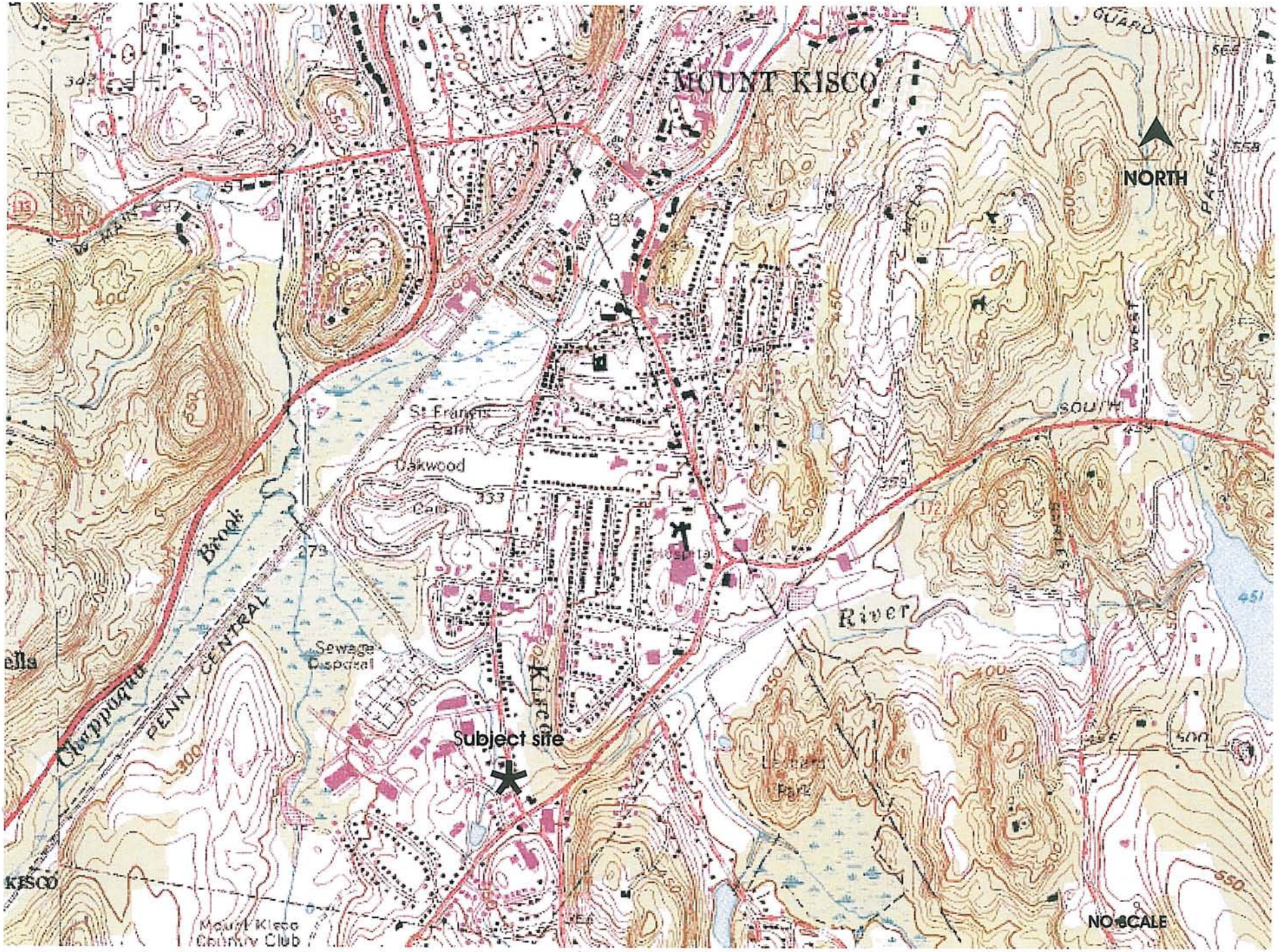
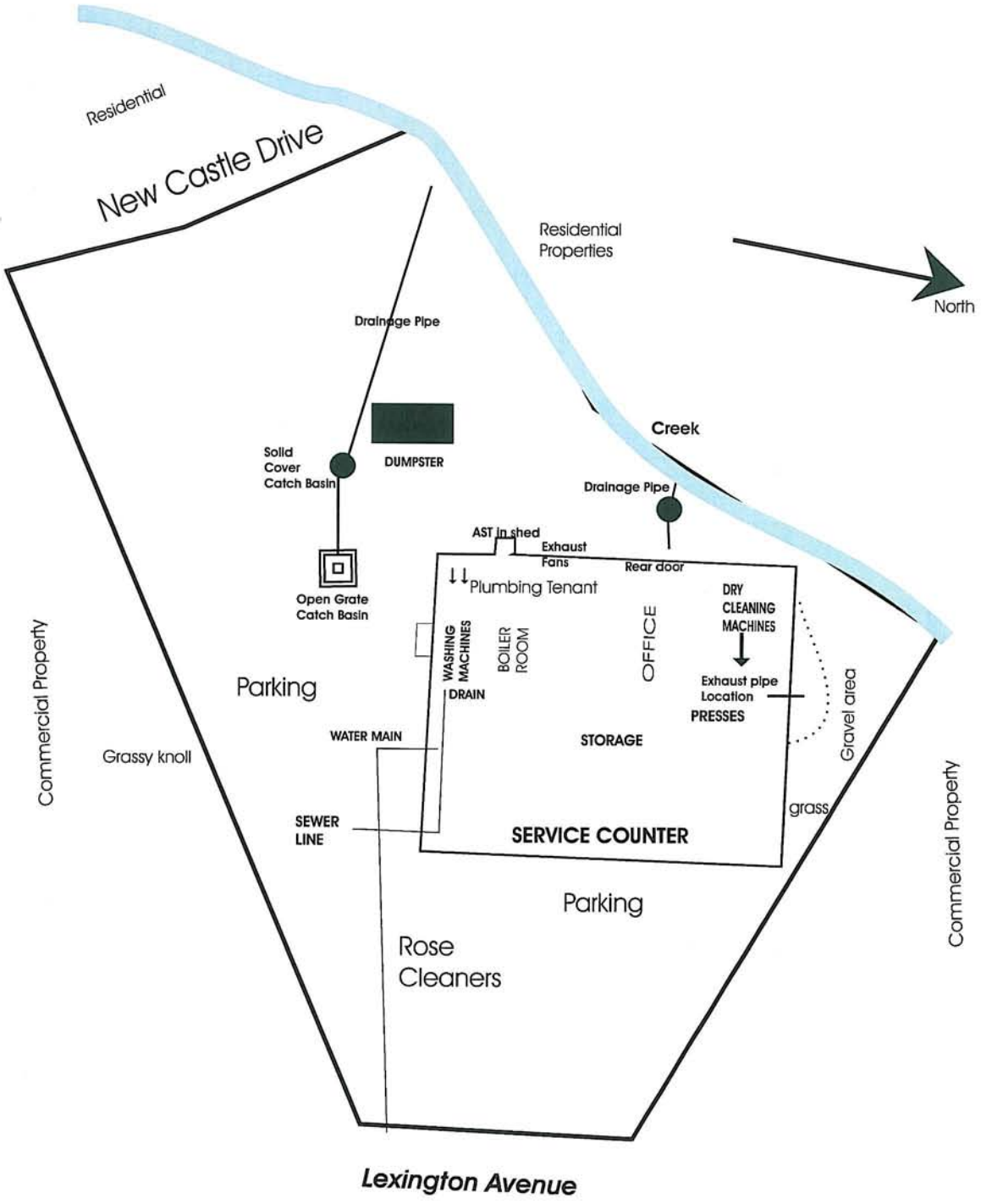


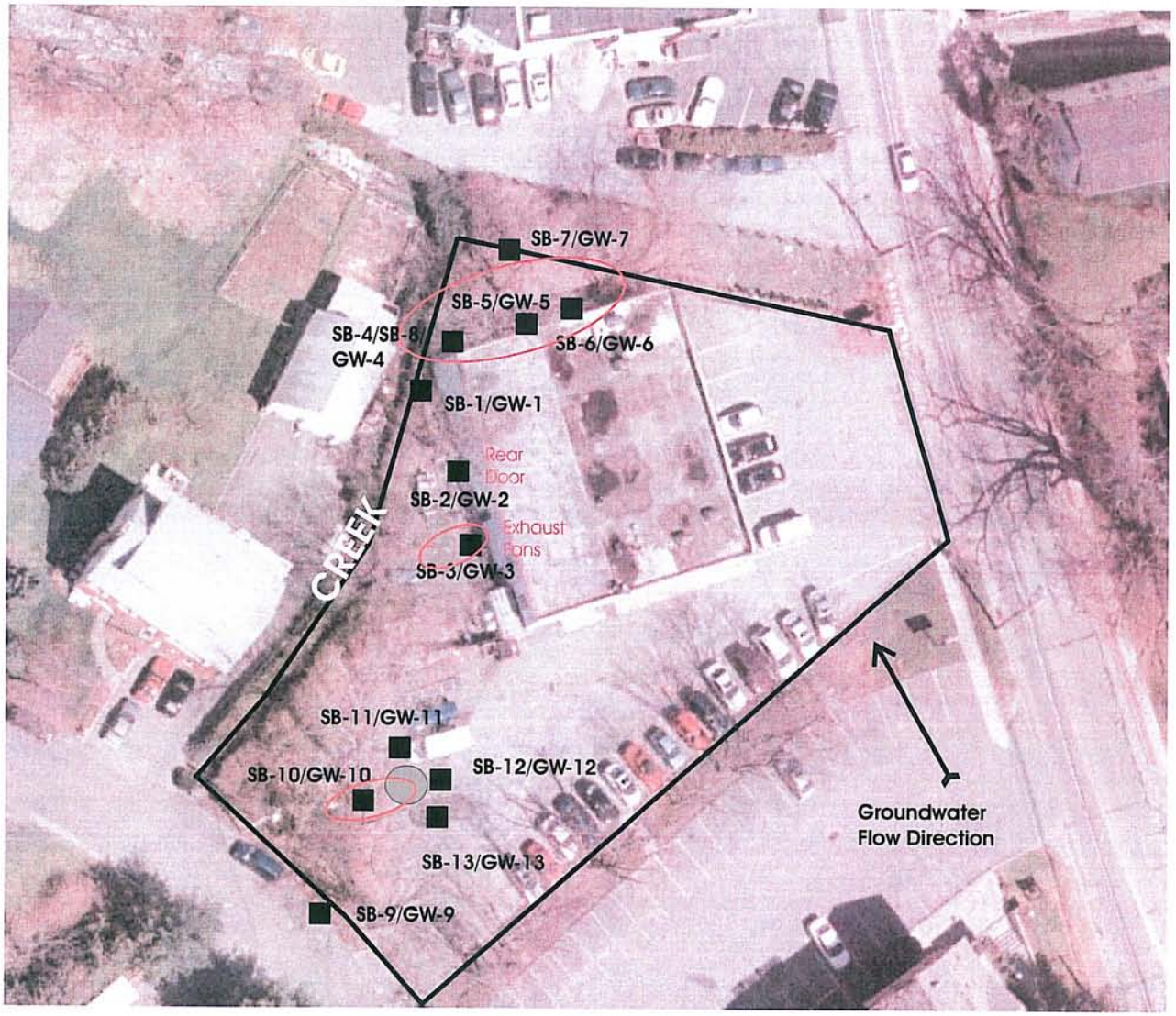
FIGURE 1 - SITE LOCATION AND TOPOGRAPHY



Based on plot plan

Approx. Scale 1" = 35 ft

FIGURE 2- Site Plan of Rose Cleaners with Details	**Rose Cleaners** **500 Lexington Avenue** **Mt. Kisco, New York**	**Berninger Environmental, Inc.** **90 Knickerbocker Avenue** **Bohemia, New York 11716** **(631) 589 - 6521**



Notes:

SB-9/GW-9
Soil & Groundwater Sampling Locations

Historic Dumpster Location

Areas of Soil Impacts Above NYSDEC RSCOs

Soil Boring#	Depth, bgs	PCE	TCE	1,2-DCE	VC	TVOCS
SB-1	3-4 ft	270	26	260	ND	628
SB-2	5-6 ft	110	11 J	170	ND	400
SB-3	4-5 ft	**34,000**	280	180	ND	34,460
SB-4	4-5 ft	**1,600,000**	**75,000**	**7,800 J**	ND	1,683,170
SB-5	3-4 ft	**51,000**	44 J	ND	ND	51,044
SB-6	3-4 ft	**15,000**	10 J	12 J	ND	15,022
SB-8	6"-8"	**4,300**	13	6 J	ND	4,319
SB-9	3-4 ft	ND	ND	ND	ND	ND
SB-10	3-4 ft	**15,000**	46	14	ND	15,060
SB-11	0.5 - 1 ft	ND	ND	ND	ND	ND
SB-12	3-4 ft	740	22	21	ND	783
SB-13	0-3 ft	ND	ND	ND	ND	ND

Scale
0 41 Feet

PCE - Tetrachloroethene; TCE - Trichloroethene; 1,2-DCE - Dichloroethene; VC- Vinyl Chloride; TVOCs - Total Volatile Organic Compounds. Bold # = Exceedance of NYSDEC RSCOs

Figure 3 -Soil Sampling Locations & Analytical Testing Results, *u*g/kg

Rose Cleaners
500 Lexington Avenue
Mt. Kisco, New York b

BEi Berninger Environmental, Inc.
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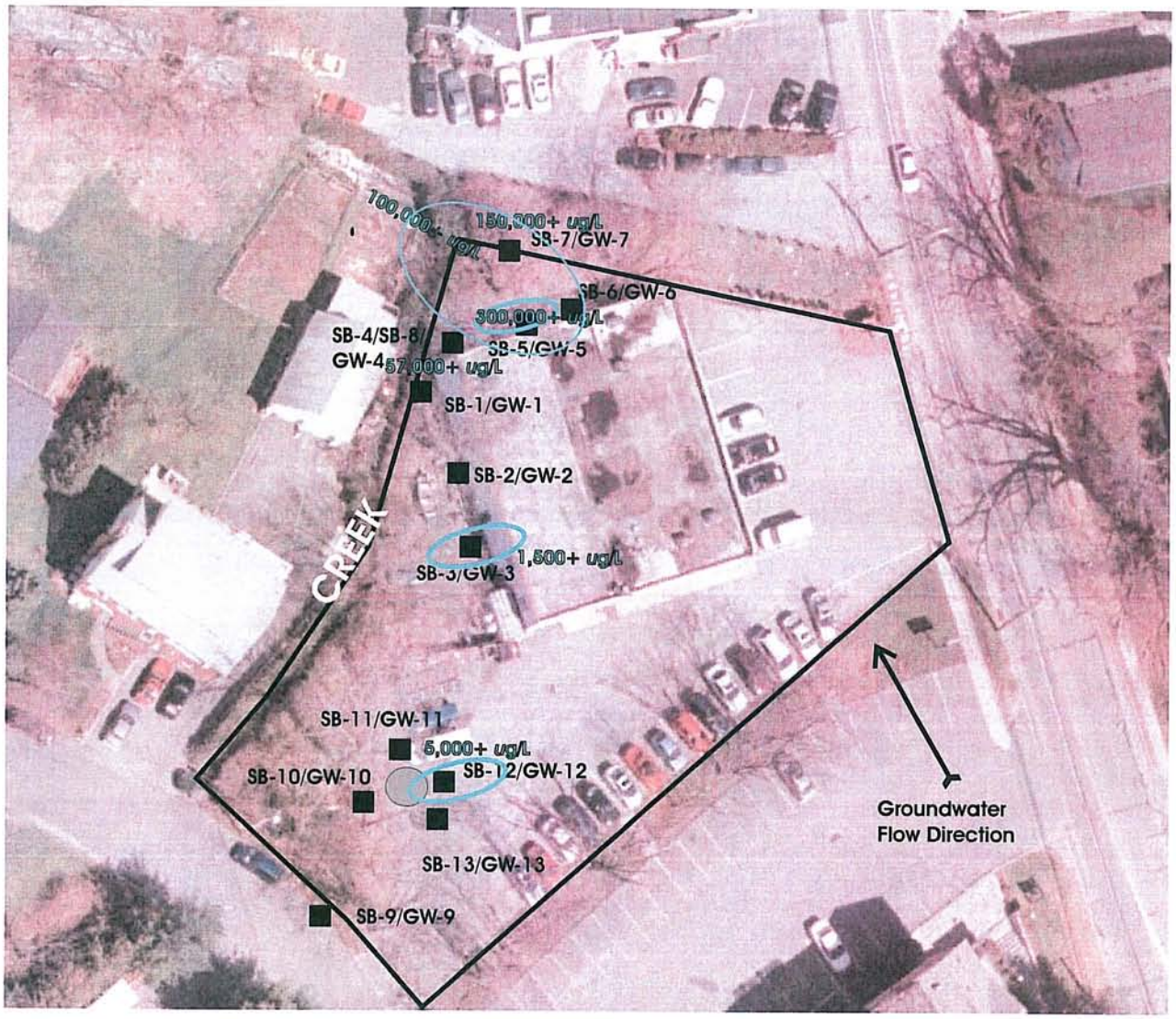
Phone:631-589-6521
90-B Knickerbocker Ave. Bohemia ,NY 11716



Notes:

SB-9/GW-9

Soil & Groundwater Sampling Locations

Historic Dumpster Location

Areas of Highest Groundwater Impacts

Groundwater Sample	Depth, bgs	PCE	TCE	1,2-DCE	VC	TVOCS
GW-1	4-6 ft	**14 J**	ND	**13,000**	**6,900**	19,936
	14-16 ft	**14,000**	ND	**110**	**42**	14,152
	24-26 ft	**2,300**	ND	**45**	**16 J**	2,361
GW-2	5-7 ft	**1,200**	**230**	**2,800**	**85**	4,315
	15-17 ft	**140**	**8**	**14**	ND	162
	25-27 ft	**220**	**8**	**32**	ND	268
GW-3	5-7 ft	**1,500**	**560**	**3,500**	**80 J**	5,640
	15-17 ft	**150**	**20**	**55**	ND	225
GW-4	5-7 ft	**55,000**	**10,000**	**11,000**	**400**	76,400
	15-17 ft	**57,000**	**590**	**480**	ND	58,070
	25-27 ft	**12,000**	**430**	**440**	ND	12,870
GW-5	5-7 ft	**240,000**	ND	ND	ND	240,000
	15-17 ft	**300,000**	**2,200**	**1,100 J**	ND	303,300
	25-27 ft	**300,000**	**1,800**	**660 J**	ND	302,460
GW-6	5-7 ft	**34,000**	**860**	**360**	**6 J**	35,226
	15-17 ft	**2,500**	**50 J**	**22 J**	ND	2,572
	25-27 ft	**1,400**	**48 J**	**34 J**	ND	1,482

Groundwater Sample	Depth, bgs	PCE	TCE	1,2-DCE	VC
GW-7	5-7 ft	**1,200**	**32 J**	**81 J**	ND
	15-17 ft	**150,000**	**480**	**360**	**26**
	25-27 ft	**140,000**	**420**	**160**	**8J**
GW-9	5-7 ft	2 J	ND	ND	ND
	15-17 ft	2 J	ND	ND	ND
GW-10	5-7 ft	**380**	**47 J**	**15**	ND
	15-17 ft	**120**	**17 J**	**7**	ND
GW-11	5-7 ft	**26**	4 J	2 J	ND
	15-17 ft	**17**	ND	3 J	ND
GW-12	5-7 ft	**5,800**	**1200 J**	**220**	ND
	15-17 ft	**5,400**	**910 J**	**120**	ND
GW-13	5-7 ft	**3,500**	**640 J**	**210**	ND
	15-17 ft	**1,900**	**560 J**	**330**	ND

PCE - Tetrachloroethene; TCE - Trichloroethene; 1,2-DCE - Dichloroethene; VC- Vinyl Chloride;
TVOCs - Total Volatile Organic Compounds. Bold # = Exceedance of NYSDEC Potable Groundwater SGVs or Surface Water SGVs

Scale
0 41 Feet

Figure 4 -Groundwater Analytical Testing Results for 15-17 feet bgs (*ug*/L)

Rose Cleaners
500 Lexington Avenue
Mt. Kisco, New York

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90 Knickerbocker Avenue
Bohemia, New York 11716
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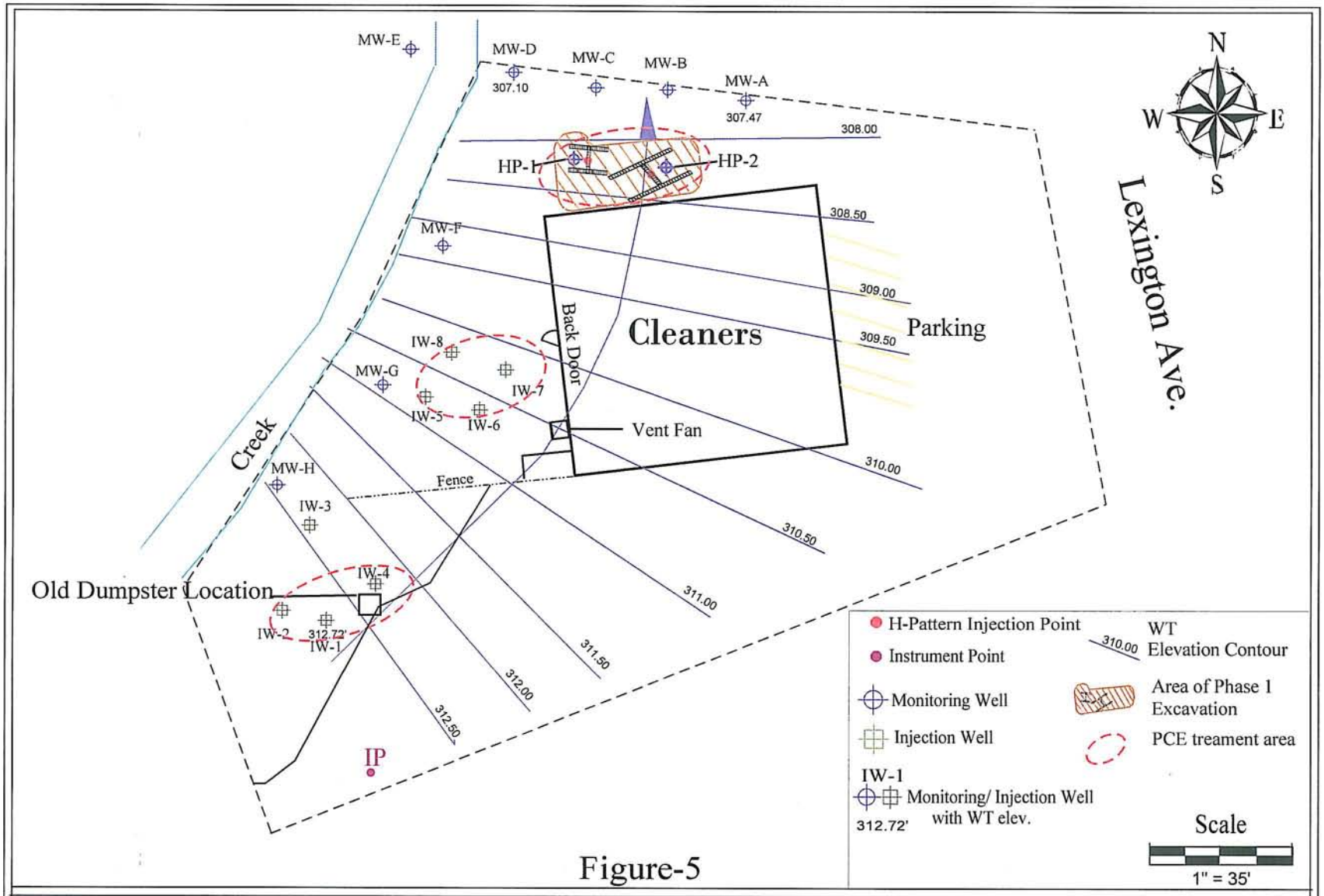

Figure-5

Groundwater Gradient Map	Rose Cleaners 500 Lexington Ave. Mt. Kisco, NY	**Berninger Environmental, Inc.** groundwater consultants and geologists Phone:631-589-6521 90-B Knickerbocker Ave. Bohemina ,NY 11716

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Drawn By: JGH

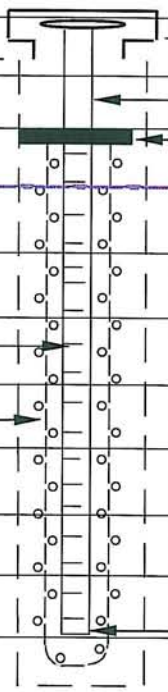
Figure 6a

Well Log

Project: Rose Cleaners
Client: Leonard Rose
Location: Mt. Kisco, NY
Well No: MW-A **Use:** Monitoring Well
Drilling Method: Geoprobe direct push
Casing Type: PVC **Casing Dia:** 2" **Casing Length:** 2'
Screen Type: PVC **Screen Dia:** 2" **Screen Length:** 8'
Screen Slot: .02 inch **Gravel Pack:** #2 Fil-pro
Casing Seal: Cement **Finish:** Cement flush

Date: 12/15/09
Be Job No:
Driller: Jon Jeffrey
Bore Hole Dia: 3.5"
Sample Method: N/A
Depth to Water: 3'
Total Depth: 10'
Security: 5" Manhole

Depth Below Grade	Sample Information	Well Design	Identification/Remarks
Grade Surface			
2'			
4'			
6'			
8'			
10'			



Hydraulic Cement Seal
5" manhole cover cemented in place
2' of 2" PVC riser
Bentonite Seal
8' of .02 inch slot screen
Fil-Pro Gravel Pack Material
10' Depth to Bottom

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Drawn By: JGH

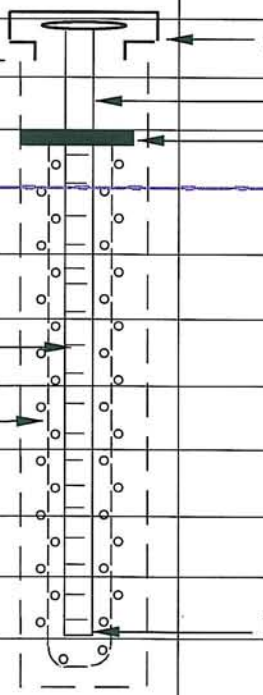
Figure 6b

Well Log

Project: Rose Cleaners
Client: Leonard Rose
Location: Mt. Kisco, NY
Well No: MW-B **Use:** Monitoring Well
Drilling Method: Geoprobe direct push
Casing Type: PVC **Casing Dia:** 2" **Casing Length:** 2'
Screen Type: PVC **Screen Dia:** 2" **Screen Length:** 8'
Screen Slot: .02 inch **Gravel Pack:** #2 Fil-pro
Casing Seal: Cement **Finish:** Cement flush

Date: 12/15/09
Be Job No:
Driller: Jon Jeffrey
Bore Hole Dia: 3.5"
Sample Method: N/A
Depth to Water: 3'
Total Depth: 10'
Security: 5" Manhole

Depth Below Grade	Sample Information	Well Design	Identification/Remarks
Grade Surface			
2'			
4'			
6'			
8'			
10'			



Hydraulic Cement Seal
5" manhole cover cemented in place
2' of 2" PVC riser
Bentonite Seal
8' of .02 inch slot screen
Fil-Pro Gravel Pack Material
10' Depth to Bottom

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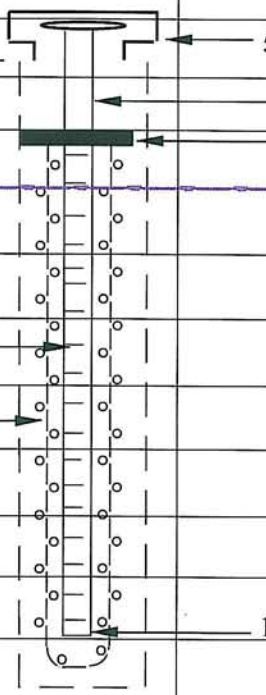
Figure 6c

Well Log

Project: Rose Cleaners
Client: Leonard Rose
Location: Mt. Kisco, NY
Well No: MW-C **Use:** Monitoring Well
Drilling Method: Geoprobe direct push
Casing Type: PVC **Casing Dia:** 2" **Casing Length:** 2'
Screen Type: PVC **Screen Dia:** 2" **Screen Length:** 8'
Screen Slot: .02 inch **Gravel Pack:** #2 Fil-pro
Casing Seal: Cement **Finish:** Cement flush

Date: 12/15/09
Be Job No:
Driller: Jon Jeffrey
Bore Hole Dia: 3.5"
Sample Method: N/A
Depth to Water: 3'
Total Depth: 10'
Security: 5" Manhole

Depth Below Grade	Sample Information	Well Design	Identification/Remarks
Grade Surface			
2'			
4'			
6'			
8'			
10'			



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Drawn By: JGH

Figure 6d

Well Log

Project: Rose Cleaners
Client: Leonard Rose
Location: Mt. Kisco, NY
Well No: MW-D **Use:** Monitoring Well
Drilling Method: Geoprobe direct push
Casing Type: PVC **Casing Dia:** 2" **Casing Length:** 2'
Screen Type: PVC **Screen Dia:** 2" **Screen Length:** 8'
Screen Slot: .02 inch **Gravel Pack:** #2 Fil-pro
Casing Seal: Cement **Finish:** Cement flush

Date: 12/15/09
Be Job No:
Driller: Jon Jeffrey
Bore Hole Dia: 3.5"
Sample Method: N/A
Depth to Water: 3'
Total Depth: 10'
Security: 5" Manhole

Depth Below Grade	Sample Information	Well Design	Identification/Remarks
Grade Surface			
Hydraulic Cement Seal			5" manhole cover cemented in place
2'			2' of 2" PVC riser
			Bentonite Seal
4'			
8' of .02 inch slot screen			
6'			
Fil-Pro Gravel Pack Material			
8'			
10'			10' Depth to Bottom

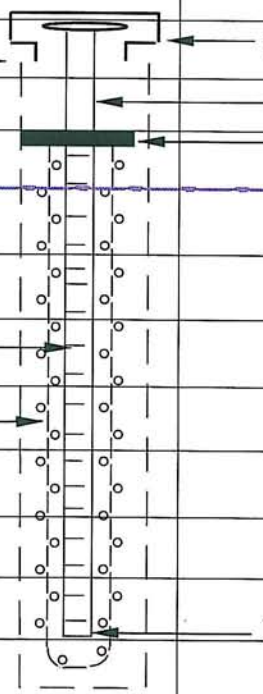

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Figure 6e — Well Log

Project: Rose Cleaners
Client: Leonard Rose
Location: Mt. Kisco, NY
Well No: MW-E **Use:** Monitoring Well
Drilling Method: Geoprobe direct push
Casing Type: PVC **Casing Dia:** 2" **Casing Length:** 2'
Screen Type: PVC **Screen Dia:** 2" **Screen Length:** 8'
Screen Slot: .02 inch **Gravel Pack:** #2 Fil-pro
Casing Seal: Cement **Finish:** Cement flush

Date: 12/15/09
Be Job No:
Driller: Jon Jeffrey
Bore Hole Dia: 3.5"
Sample Method: N/A
Depth to Water: 3'
Total Depth: 10'
Security: 5" Manhole

Depth Below Grade	Sample Information	Well Design	Identification/Remarks
Grade Surface			
2'			
4'			
6'			
8'			
10'			

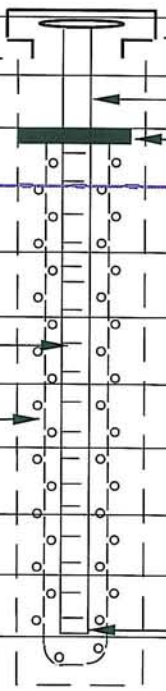

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Figure 6f

Well Log

Project: Rose Cleaners
Client: Leonard Rose
Location: Mt. Kisco, NY
Well No: MW-F **Use:** Monitoring Well
Drilling Method: Geoprobe direct push
Casing Type: PVC **Casing Dia:** 2" **Casing Length:** 2'
Screen Type: PVC **Screen Dia:** 2" **Screen Length:** 8'
Screen Slot: .02 inch **Gravel Pack:** #2 Fil-pro
Casing Seal: Cement **Finish:** Cement flush

Date: 12/15/09
Be Job No:
Driller: Jon Jeffrey
Bore Hole Dia: 3.5"
Sample Method: N/A
Depth to Water: 3'
Total Depth: 10'
Security: 5" Manhole

Depth Below Grade	Sample Information	Well Design	Identification/Remarks
Grade Surface			
Hydraulic Cement Seal			5" manhole cover cemented in place
2'			2' of 2" PVC riser
			Bentonite Seal
4'			
8' of .02 inch slot screen 6'			
Fil-Pro Gravel Pack Material			
8'			
10'			10' Depth to Bottom

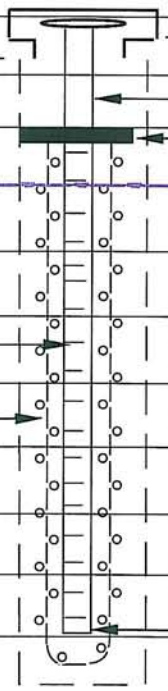

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Figure 6g

Well Log

Project: Rose Cleaners
Client: Leonard Rose
Location: Mt. Kisco, NY
Well No: MW-G **Use:** Monitoring Well
Drilling Method: Geoprobe direct push
Casing Type: PVC **Casing Dia:** 2" **Casing Length:** 2'
Screen Type: PVC **Screen Dia:** 2" **Screen Length:** 8'
Screen Slot: .02 inch **Gravel Pack:** #2 Fil-pro
Casing Seal: Cement **Finish:** Cement flush

Date: 12/15/09
Be Job No:
Driller: Jon Jeffrey
Bore Hole Dia: 3.5"
Sample Method: N/A
Depth to Water: 3'
Total Depth: 10'
Security: 5" Manhole

Depth Below Grade	Sample Information	Well Design	Identification/Remarks
Grade Surface			
Hydraulic Cement Seal			5" manhole cover cemented in place
2'			2' of 2" PVC riser
			Bentonite Seal
4'			
6'	8' of .02 inch slot screen		
Fil-Pro Gravel Pack Material			
8'			
10'			10' Depth to Bottom

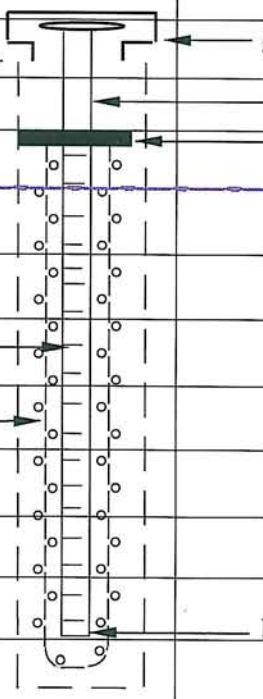

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Figure 6h

Well Log

Project: Rose Cleaners
Client: Leonard Rose
Location: Mt. Kisco, NY
Well No: MW-H **Use:** Monitoring Well
Drilling Method: Geoprobe direct push
Casing Type: PVC **Casing Dia:** 2" **Casing Length:** 2'
Screen Type: PVC **Screen Dia:** 2" **Screen Length:** 8'
Screen Slot: .02 inch **Gravel Pack:** #2 Fil-pro
Casing Seal: Cement **Finish:** Cement flush

Date: 12/15/09
Be Job No:
Driller: Jon Jeffrey
Bore Hole Dia: 3.5"
Sample Method: N/A
Depth to Water: 3'
Total Depth: 10'
Security: 5" Manhole

Depth Below Grade	Sample Information	Well Design	Identification/Remarks
Grade Surface			
2'			
4'			
6'			
8'			
10'			

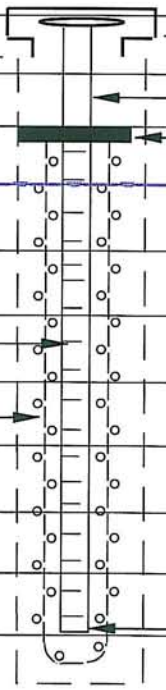

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Figure 6i

Well Log

Project: Rose Cleaners
Client: Leonard Rose
Location: Mt. Kisco, NY
Well No: HP-1 **Use:** Monitoring Well
Drilling Method: Geoprobe direct push
Casing Type: PVC **Casing Dia:** N/A **Casing Length:** N/A
Screen Type: PVC **Screen Dia:** 2" **Screen Length:** 5'
Screen Slot: .02 inch **Gravel Pack:** #2 Fil-pro
Casing Seal: N/A **Finish:** above grade

Date: 09/09
Be Job No:
Driller: Jon Jeffrey
Bore Hole Dia: 2.25"
Sample Method: N/A
Depth to Water: 3'
Total Depth: 5'
Security: N/A

Depth Below Grade	Sample Information	Well Design	Identification/Remarks
Grade Surface			2" J-Plug
2'			
4'			
5' of .02 inch slot screen			5' Depth to Bottom
Fil-Pro Gravel Pack Material			
6'			
8'			
10'			

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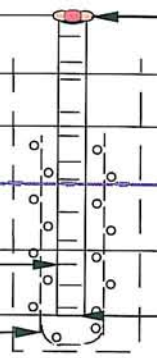
Figure 6j

Well Log

Project: Rose Cleaners
Client: Leonard Rose
Location: Mt. Kisco, NY
Well No: HP-2 **Use:** Monitoring Well
Drilling Method: Geoprobe direct push
Casing Type: PVC **Casing Dia:** N/A **Casing Length:** N/A
Screen Type: PVC **Screen Dia:** 2" **Screen Length:** 5'
Screen Slot: .02 inch **Gravel Pack:** #2 Fil-pro
Casing Seal: N/A **Finish:** above grade

Date: 09/09
Be Job No:
Driller: Jon Jeffrey
Bore Hole Dia: 2.25"
Sample Method: N/A
Depth to Water: 3'
Total Depth: 5'
Security: N/A

Depth Below Grade	Sample Information	Well Design	Identification/Remarks
Grade Surface			
2'			
4'			
6'			
8'			
10'			



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Drawn By: JGH

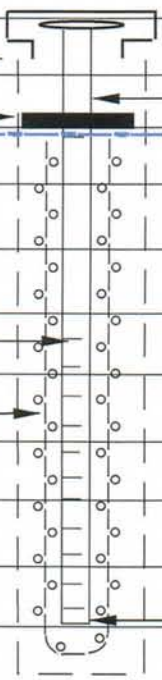
Figure 6k

Well Log

Project: Rose Cleaners
Client: Leonard Rose
Location: Mt. Kisco, NY
Well No: MW-I **Use:** Monitoring Well
Drilling Method: Geoprobe direct push
Casing Type: PVC **Casing Dia:** 2" **Casing Length:** 10'
Screen Type: PVC **Screen Dia:** 2" **Screen Length:** 10'
Screen Slot: .02 inch **Gravel Pack:** #2 Fil-pro
Casing Seal: Cement **Finish:** Cement flush

Date: TBA
Be Job No:
Driller: Joel/Eusi
Bore Hole Dia: 3.5"
Sample Method: N/A
Depth to Water: 4'
Total Depth: 20'
Security: 5" Manhole

Depth Below Grade	Sample Information	Well Design	Identification/Remarks
Grade Surface			
2'	Hydraulic Cement Seal		5" manhole cover cemented in place
4'	Bentonite Seal		10' of 2" PVC riser
			DTW
6'			
8'			
10'			
	10' of .02 inch slot screen		
	Fil-Pro Gravel Pack Material		
20'			20' Depth to Bottom



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Drawn By: JGH

Figure 6L

Well Log

Project: Rose Cleaners
Client: Leonard Rose
Location: Mt. Kisco, NY
Well No: MW-J **Use:** Monitoring Well
Drilling Method: Geoprobe direct push
Casing Type: PVC **Casing Dia:** 2" **Casing Length:** 10'
Screen Type: PVC **Screen Dia:** 2" **Screen Length:** 10'
Screen Slot: .02 inch **Gravel Pack:** #2 Fil-pro
Casing Seal: Cement **Finish:** Cement flush

Date: TBA
Be Job No:
Driller: Joel/Eusi
Bore Hole Dia: 3.5"
Sample Method: N/A
Depth to Water: 4'
Total Depth: 20'
Security: 5" Manhole

Depth Below Grade	Sample Information	Well Design	Identification/Remarks
Grade Surface			
2'	Hydraulic Cement Seal		5" manhole cover cemented in place
4'	Bentonite Seal		10' of 2" PVC riser; DTW
6'			
8'			
10'			
	10' of .02 inch slot screen		
	Fil-Pro Gravel Pack Material		
20'			20' Depth to Bottom

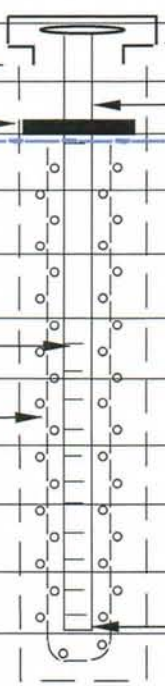

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Figure 6m

Well Log

Project: Rose Cleaners
Client: Leonard Rose
Location: Mt. Kisco, NY
Well No: MW-K **Use:** Monitoring Well
Drilling Method: Geoprobe direct push
Casing Type: PVC **Casing Dia:** 2" **Casing Length:** 2'
Screen Type: PVC **Screen Dia:** 2" **Screen Length:** 10'
Screen Slot: .02 inch **Gravel Pack:** #2 Fil-pro
Casing Seal: Cement **Finish:** Cement flush

Date: TBA
Be Job No:
Driller: Joel/Eusi
Bore Hole Dia: 3.5"
Sample Method: N/A
Depth to Water: 3'
Total Depth: 12'
Security: 5" Manhole

Depth Below Grade	Sample Information	Well Design	Identification/Remarks
Grade Surface			
2'			
DTW			
4'			
6'			
8'			
10'			
12'			

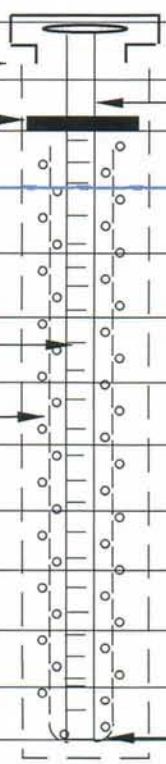

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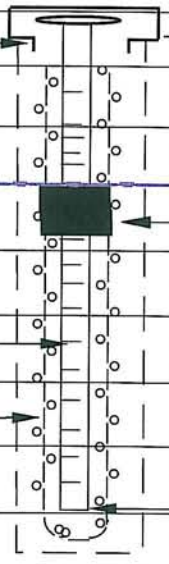
Figure 7a

Well Log

Project: Rose Cleaners
Client: Leonard Rose
Location: Mt. Kisco, NY
Well No: IW-1 **Use:** Injection Well
Drilling Method: Geoprobe direct push
Casing Type: PVC **Casing Dia:** N/A **Casing Length:** N/A
Screen Type: PVC **Screen Dia:** 2" **Screen Length:** 8'
Screen Slot: .02 inch **Gravel Pack:** #2 Fil-pro
Casing Seal: Cement **Finish:** Cement flush

Date: 12/15/09
Be Job No:
Driller: Jon Jeffrey
Bore Hole Dia: 3.5"
Sample Method: N/A
Depth to Water: 3'
Total Depth: 8'
Security: 5" Manhole

Depth Below Grade	Sample Information	Well Design	Identification/Remarks
Grade Surface			
Hydraulic Cement Seal			5" manhole cover cemented in place
2'			
4'			Bentonite Seal
.02 inch slot screen			
6'			
Fil-Pro Gravel Pack Material			
8'			Depth to Bottom 8'



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Drawn By: JGH

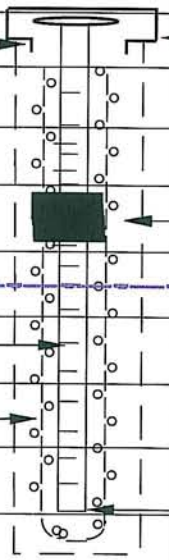
Figure 7b

Well Log

Project: Rose Cleaners
Client: Leonard Rose
Location: Mt. Kisco, NY
Well No: IW-2 **Use:** Injection Well
Drilling Method: Geoprobe direct push
Casing Type: PVC **Casing Dia:** N/A **Casing Length:** N/A
Screen Type: PVC **Screen Dia:** 2" **Screen Length:** 8'
Screen Slot: .02 inch **Gravel Pack:** #2 Fil-pro
Casing Seal: Cement **Finish:** Cement flush

Date: 12/15/09
Be Job No:
Driller: Jon Jeffrey
Bore Hole Dia: 3.5"
Sample Method: N/A
Depth to Water: 4.5'
Total Depth: 8'
Security: 5" Manhole

Depth Below Grade	Sample Information	Well Design	Identification/Remarks
Grade Surface			
Hydraulic Cement Seal			5" manhole cover cemented in place
2'			
4'			Bentonite Seal
6'	.02 inch slot screen		
Fil-Pro Gravel Pack Material			
8'			Depth to Bottom 8'



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groundwater consultants and geologists
Phone:631-589-6521
90-B Knickerbocker Ave. Bohemina ,NY 11716

Drawn By: JGH

Figure 7c

Well Log

Project: Rose Cleaners
Client: Leonard Rose
Location: Mt. Kisco, NY
Well No: IW-3 **Use:** Injection Well
Drilling Method: Geoprobe direct push
Casing Type: PVC **Casing Dia:** N/A **Casing Length:** N/A
Screen Type: PVC **Screen Dia:** 2" **Screen Length:** 8'
Screen Slot: .02 inch **Gravel Pack:** #2 Fil-pro
Casing Seal: Cement **Finish:** Cement flush

Date: 12/15/09
Be Job No:
Driller: Jon Jeffrey
Bore Hole Dia: 3.5"
Sample Method: N/A
Depth to Water: 4.5'
Total Depth: 8'
Security: 5" Manhole

Depth Below Grade	Sample Information	Well Design	Identification/Remarks
Grade Surface			
Hydraulic Cement Seal			5" manhole cover cemented in place
2'			
4'			Bentonite Seal
6'		.02 inch slot screen	
Fil-Pro Gravel Pack Material			
8'			Depth to Bottom 8'

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Drawn By: JGH

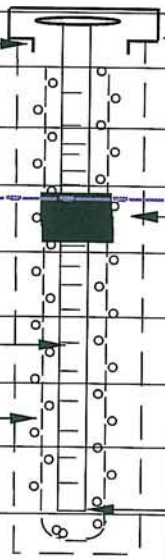
Figure 7d

Well Log

Project: Rose Cleaners
Client: Leonard Rose
Location: Mt. Kisco, NY
Well No: IW-4 **Use:** Injection Well
Drilling Method: Geoprobe direct push
Casing Type: PVC **Casing Dia:** N/A **Casing Length:** N/A
Screen Type: PVC **Screen Dia:** 2" **Screen Length:** 8'
Screen Slot: .02 inch **Gravel Pack:** #2 Fil-pro
Casing Seal: Cement **Finish:** Cement flush

Date: 12/15/09
Be Job No:
Driller: Jon Jeffrey
Bore Hole Dia: 3.5"
Sample Method: N/A
Depth to Water: 3.5'
Total Depth: 8'
Security: 5" Manhole

Depth Below Grade	Sample Information	Well Design	Identification/Remarks
Grade Surface			
Hydraulic Cement Seal			5" manhole cover cemented in place
2'			
4'			Bentonite Seal
6'	.02 inch slot screen		
Fil-Pro Gravel Pack Material			
8'			Depth to Bottom 8'



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groundwater consultants and geologists

Phone:631-589-6521

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Drawn By: JGH

Figure 7e

Well Log

Project: Rose Cleaners
Client: Leonard Rose
Location: Mt. Kisco, NY
Well No: IW-5 **Use:** Injection Well
Drilling Method: Geoprobe direct push
Casing Type: PVC **Casing Dia:** N/A **Casing Length:** N/A
Screen Type: PVC **Screen Dia:** 2" **Screen Length:** 8'
Screen Slot: .02 inch **Gravel Pack:** #2 Fil-pro
Casing Seal: Cement **Finish:** Cement flush

Date: 12/15/09
Be Job No:
Driller: Jon Jeffrey
Bore Hole Dia: 3.5"
Sample Method: N/A
Depth to Water: 3.5'
Total Depth: 8'
Security: 5" Manhole

Depth Below Grade	Sample Information	Well Design	Identification/Remarks
Grade Surface			
Hydraulic Cement Seal			5" manhole cover cemented in place
2'			
4'			Bentonite Seal
.02 inch slot screen			
6'			
Fil-Pro Gravel Pack Material			
8'			Depth to Bottom 8'

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Drawn By: JGH

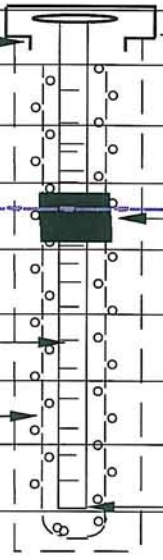
Figure 7f

Well Log

Project: Rose Cleaners
Client: Leonard Rose
Location: Mt. Kisco, NY
Well No: IW-6 **Use:** Injection Well
Drilling Method: Geoprobe direct push
Casing Type: PVC **Casing Dia:** N/A **Casing Length:** N/A
Screen Type: PVC **Screen Dia:** 2" **Screen Length:** 8'
Screen Slot: .02 inch **Gravel Pack:** #2 Fil-pro
Casing Seal: Cement **Finish:** Cement flush

Date: 12/15/09
Be Job No:
Driller: Jon Jeffrey
Bore Hole Dia: 3.5"
Sample Method: N/A
Depth to Water: 3.5'
Total Depth: 8'
Security: 5" Manhole

Depth Below Grade	Sample Information	Well Design	Identification/Remarks
Grade Surface			
Hydraulic Cement Seal			5" manhole cover cemented in place
2'			
4'			Bentonite Seal
6'	.02 inch slot screen		
Fil-Pro Gravel Pack Material			
8'			Depth to Bottom 8'



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Drawn By: JGH

Figure 7g

Well Log

Project: Rose Cleaners
Client: Leonard Rose
Location: Mt. Kisco, NY
Well No: IW-7 **Use:** Injection Well
Drilling Method: Geoprobe direct push
Casing Type: PVC **Casing Dia:** N/A **Casing Length:** N/A
Screen Type: PVC **Screen Dia:** 2" **Screen Length:** 8'
Screen Slot: .02 inch **Gravel Pack:** #2 Fil-pro
Casing Seal: Cement **Finish:** Cement flush

Date: 12/15/09
Be Job No:
Driller: Jon Jeffrey
Bore Hole Dia: 3.5"
Sample Method: N/A
Depth to Water: 3.5'
Total Depth: 8'
Security: 5" Manhole

Depth Below Grade	Sample Information	Well Design	Identification/Remarks
Grade Surface			
Hydraulic Cement Seal			5" manhole cover cemented in place
2'			
4'			Bentonite Seal
6'	.02 inch slot screen		
Fil-Pro Gravel Pack Material			
8'			Depth to Bottom 8'

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Drawn By: JGH

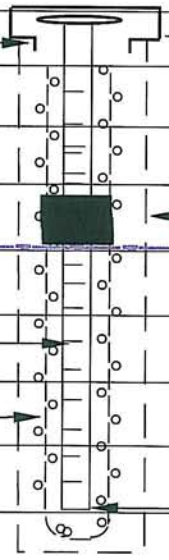
Figure 7h

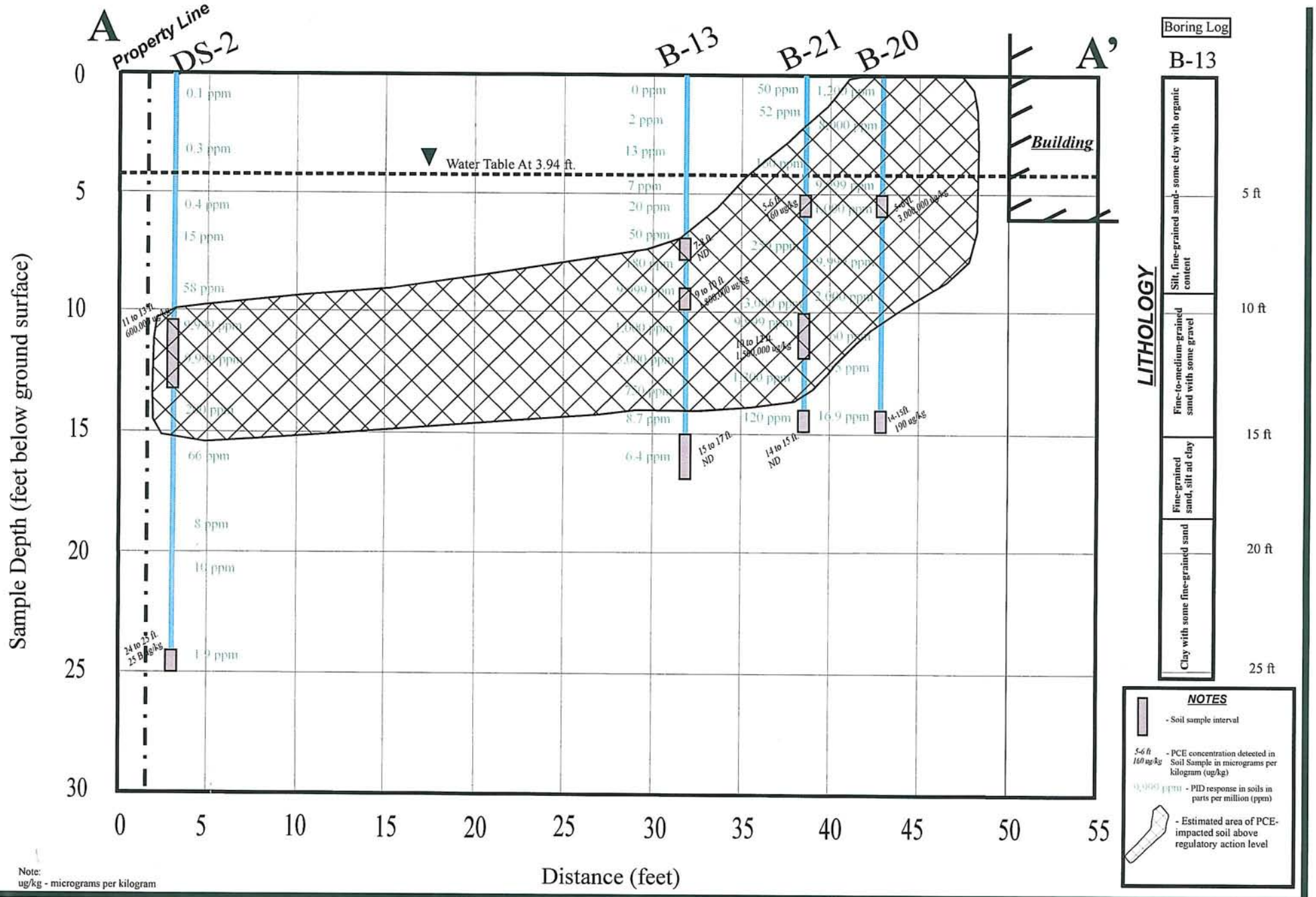
Well Log

Project: Rose Cleaners
Client: Leonard Rose
Location: Mt. Kisco, NY
Well No: IW-8 **Use:** Injection Well
Drilling Method: Geoprobe direct push
Casing Type: PVC **Casing Dia:** N/A **Casing Length:** N/A
Screen Type: PVC **Screen Dia:** 2" **Screen Length:** 8'
Screen Slot: .02 inch **Gravel Pack:** #2 Fil-pro
Casing Seal: Cement **Finish:** Cement flush

Date: 12/15/09
Be Job No:
Driller: Jon Jeffrey
Bore Hole Dia: 3.5"
Sample Method: N/A
Depth to Water: 4' bgs
Total Depth: 8'
Security: 5" Manhole

Depth Below Grade	Sample Information	Well Design	Identification/Remarks
Grade Surface			
Hydraulic Cement Seal			**5" manhole cover cemented in place**
2'			
4'			Bentonite Seal
.02 inch slot screen			
6'			
Fil-Pro Gravel Pack Material			
8'			Depth to Bottom 8'





Note:
ug/kg - micrograms per kilogram

Figure 8 - North -South cross-section A to A'
PCE concentrations (ug/kg) detected in samples

Rose Cleaners
500 Lexington Avenue
Mount Kisco, New York

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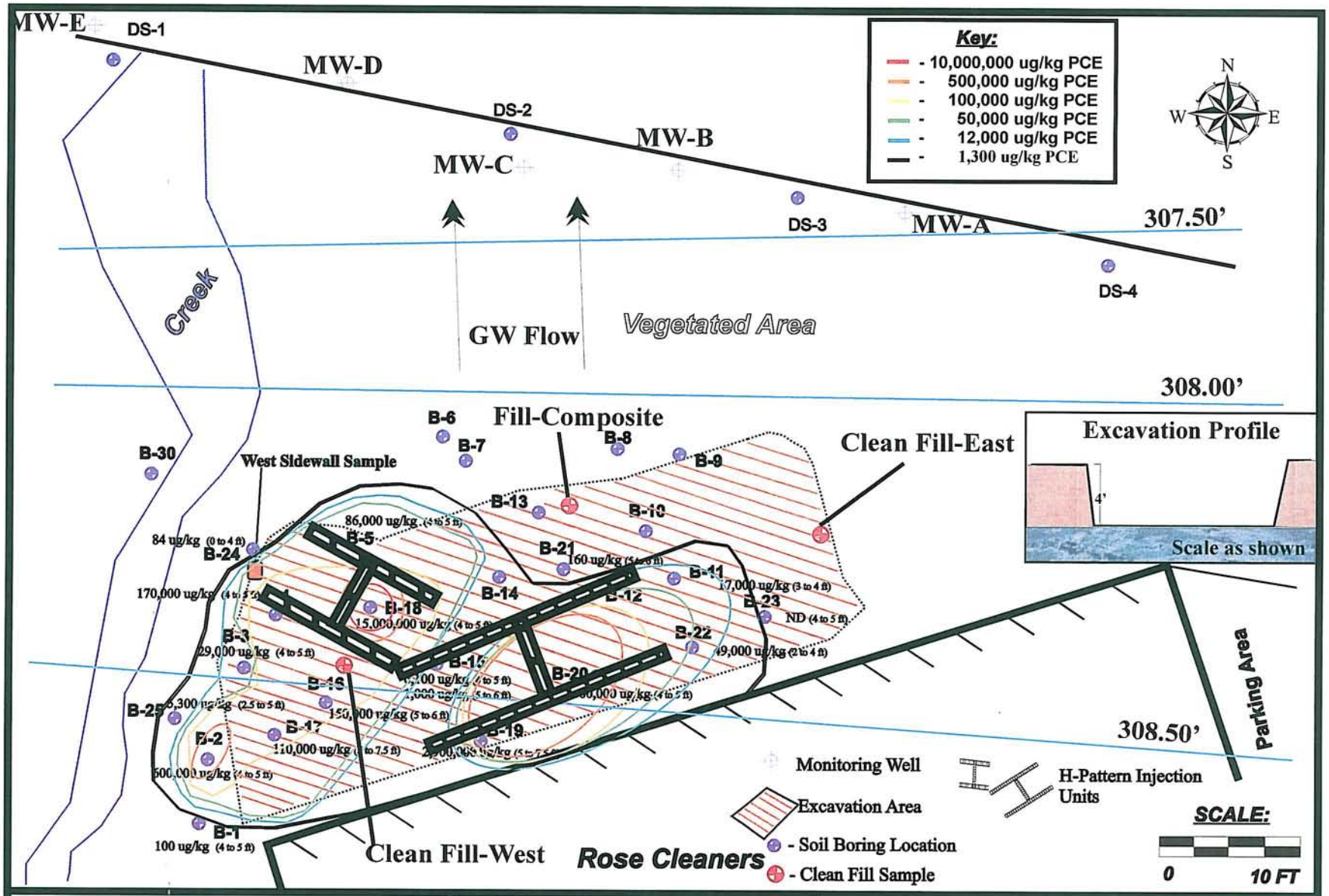

Site: Rose Cleaners
Address: 500 Lexington Ave.
Mt. Kisco, NY

Figure 9- Excavation Footprint with H-Pattern, Iso Overlay and Boring Overlay
February 2008

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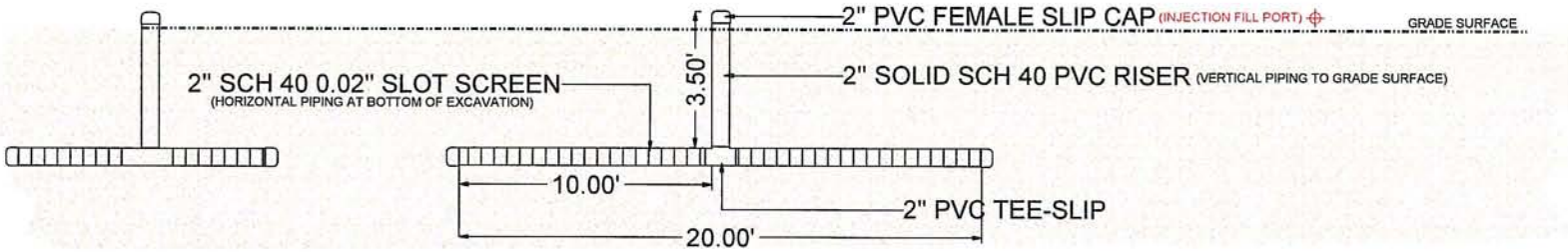
NOTES:

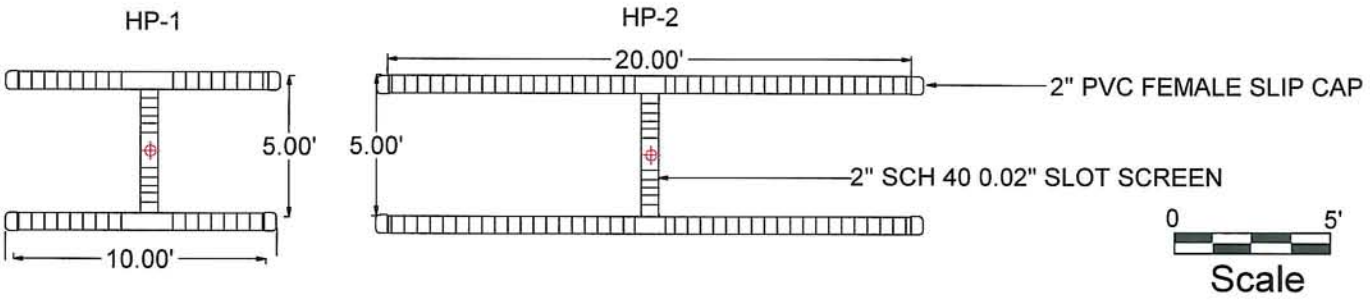
VIEW FROM TOP SHOWS H-PATTERN UNIT AS IT LAYS IN BOTTOM OF EXCAVATION.

CROSS HATCH WELL SYMBOL ⊕ INDICATES INJECTION PORT AT GRADE SURFACE

SIDE VIEW



TOP VIEW



P.E Certification

ROSE CLEANERS H-PATTERN AS BUILT DRAWING SCHEMATIC

Figure-10

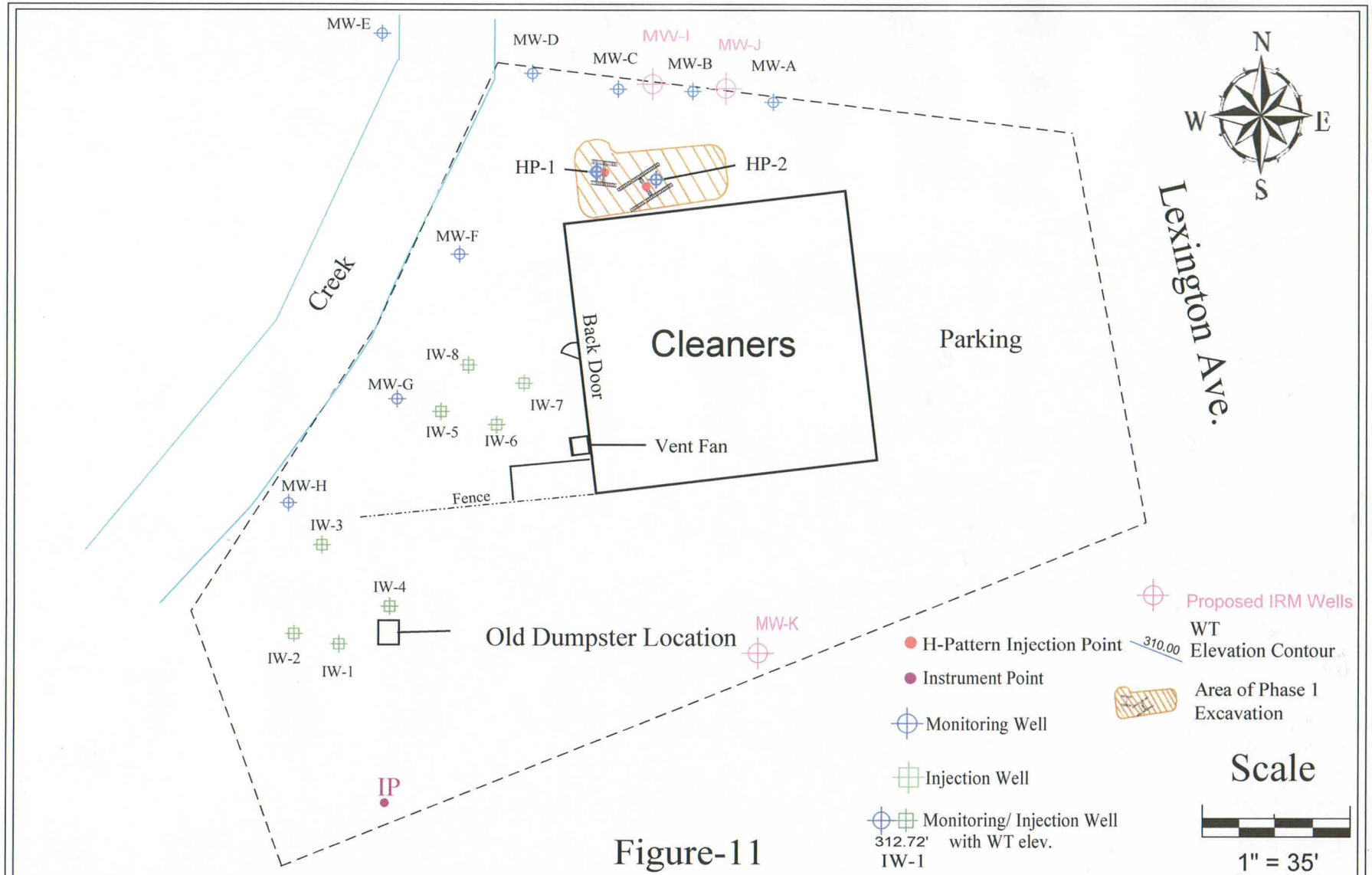


Figure-11

Monitoring Wells Map

Rose Cleaners
500 Lexington Ave.
Mt. Kisco, NY

JGH

Berninger Environmental, Inc.

groundwater consultants and geologists

Phone:631-589-6521

90-B Knickerbocker Ave. Bohemina ,NY 11716

Appendix-A

IRM Injection Monitoring Schedule

ISCO Application Data Appendix-A Rose Cleaners Mt. Kisco , New York

Groundwater Monitoring/Injection Data

Pre-Injection Data

Well	DTW	Temp. (F)	pH	Conductivity	D.O	ORP	TOC
MW-A							
MW-B							
MW-C							
MW-D							
MW-E							
MW-F							
MW-G							
MW-H							
MW-I							
MW-J							
MW-K							
MW-L							
HP-1							
HP-2							
Date:							

24 hours post injection

Well	DTW	Temp. (F)	pH	Conductivity	D.O	ORP
MW-A						
MW-B						
MW-C						
MW-D						
MW-E						
MW-F						
MW-G						
MW-H						
MW-I						
MW-J						
MW-K						
MW-L						
HP-1						
HP-2						
Date:						

One week post injection

Well	DTW	Temp. (F)	pH	Conductivity	D.O	ORP
MW-A						
MW-B						
MW-C						
MW-D						
MW-E						
MW-F						
MW-G						
MW-H						
MW-I						
MW-J						
MW-K						
MW-L						
HP-1						
HP-2						
Date:						

Two weeks post injection

Well	DTW	Temp. (F)	pH	Conductivity	D.O	ORP
MW-A						
MW-B						
MW-C						
MW-D						
MW-E						
MW-F						
MW-G						
MW-H						
MW-I						
MW-J						
MW-K						
MW-L						
HP-1						
HP-2						
Date:						

Groundwater Sampling Lab Data

Pre-Injection Lab Data *

Well	DTW	PCE	TCE	1, 2 DCE	trans 1, 2 DCE	1, 1, 1 TCE	1, 1 DCE	Vinyl Chloride
MW-A								
MW-B								
MW-C								
MW-D								
MW-E								
MW-F								
MW-G								
MW-H								
MW-I								
MW-J								
MW-K								
MW-L								
HP-1								
HP-2								
Date:								

6 week post injection

Well	DTW	PCE	TCE	1, 2 DCE	trans 1, 2 DCE	1, 1, 1 TCE	1, 1 DCE	Vinyl Chloride
MW-A								
MW-B								
MW-C								
MW-D								
MW-E								
MW-F								
MW-G								
MW-H								
MW-I								
MW-J								
MW-K								
MW-L								
HP-1								
HP-2								
Date:								

3 months post injection

Well	DTW	PCE	TCE	1, 2 DCE	trans 1, 2 DCE	1, 1, 1 TCE	1, 1 DCE	Vinyl Chloride	TOC
MW-A									
MW-B									
MW-C									
MW-D									
MW-E									
MW-F									
MW-G									
MW-H									
MW-I									
MW-J									
MW-K									
MW-L									
HP-1									
HP-2									
Date:									

*Test method EPA 8260 VOC's

Appendix-B

Regenesis Soil Boring Logs

Sampling Log

Rose Cleaners - 500 Lexington Avenue, Mt. Kisco, New York

Project: Rose Cleaners Mt Kisco, New York
Date: May - June 2005
Page:
Logged By: Jill Haimson, CGWP, PG Company: BEI
Drilling Started: Ended:
Driller: Butch/Pete
Type of Rig: Geoprobe

BORE HOLE DATE
Hole Diameter: Two Inch
Total Depth (2): Variable, see log

SAMPLER
Type: Geoprobe Macrocore/LB
Hammer: Hydraulic

REMARKS: See attached figures for sampling locations.

HNu Response Units,ppm	Sample				Sample Description	Sample
	No.	Rec. %	Depth (ft) bgs	Sample Depth		Lithology USC
0 -15+	SB-01	85	0 - 5 ft bgs	3-4 ft	Rear of the building, downgradient of interior dry cleaning machines. Upper 1.5 ft was organic fill, followed by crushed rock, and fine grained sand with silty clay. 3-4 ft bgs was dark black very fine sand with silty clay layer with PID of 15+ ppm response units.	ML
15+ to 100+	SB-01	95	5 - 9 ft bgs		5–6 ft interval was mixed organic fill with wood. At 6 ft a saturated med-coarse grained sand grey silt (PID 100+ ppm response units) layer was encountered. Same lithology to 8 ft bgs, below the water table interface. The 8-9 ft interval was a dark brown dryer layer. PID response (100+ppm response units). Vertical profiling of groundwater (GW-1) at 4-6 ft; 14-16 ft and 24-26 ft bgs. Also the same locations as MW-2. MW-2 was set with a ten foot screen from 2-10 ft bgs. Depth to water (DTW) was 4.02 ft bgs.	SM
15+ to 150+	SB-02	95	0 - 5 ft bgs	5-6 ft	Opposite rear door at back of the building. Upper one foot was an organic fill, followed by crushed rock, and fine grained sand with silty clay. 3-4 ft bgs was a sandy silty organic layer followed by silty plastic clay and fine sand. Elevated PID (150+ppm response units) at 5 ft bgs-water table interface.	SC
0	SB-02	85	5 - 9 ft bgs	--	5–9 ft interval was composed of saturated organic matter silty clay and sand layer. 7-9 ft interval was a silty clay layer. Vertical profiling of groundwater (GW-2) at 5-7 ft and 15-17 ft bgs.	ML
0-15+	SB-03	95	0 - 5 ft bgs	4-5 ft	Opposite exhaust fans at rear of the building. Upper 3 ft was organic fill with no PID response, followed by crushed rock, and fine grained sand with silty clay. 4-5 ft bgs was silty clay layer with elevated PID (15+ppm response units).Vertical profiling of groundwater (GW-3) at 5-7 ft and 15-17 ft bgs.	SC

1100+ to 9999	SB-04	100	0 - 5 ft bgs	4-5 ft	North side of the building. Upper 4 ft was fine grained sand with silty clay and organic matter. Elevated PID (100+- 9999+ppm response units) at entire interval. Saturated at 5 ft bgs. Vertical profiling of groundwater (GW-4) at 5-7 ft, 15-17 ft bgs and 25-27 ft bgs. Also the same relative location of SB-8.	SC
100-1500+	SB-05	95	0 - 5 ft bgs	3-4 ft	Opposite vent pipe from machine room. Upper 2.5 ft was debris, top soil and concrete chunks. 2.5 to 3 ft was concrete chips. 3-5 ft was a silty clay layer with an elevated PID (1500+ppm response units). Saturated at 5 ft bgs. Vertical profiling of groundwater (GW-5) at 5-7 ft, 15-17 ft bgs and 25-27 ft bgs.	SC
50+	SB-06	95	0 - 5 ft bgs	3-4 ft	West of the chiller pad. Upper 1 ft was loam and roots, followed by brown clay and fine sand with organe brown silt. Elevated PID (50+ppm response units). Saturated at 5 ft bgs. Vertical profiling of groundwater (GW-5) at 5-7 ft, 15-17 ft bgs and 25-27 ft bgs. Vertical profiling of groundwater (GW-6) at 5-7 ft, 15-17 ft bgs and 25-27 ft bgs.	SC
0	SB-07	90	0 - 5 ft bgs	--	Farthest north of the building. 0-5 ft was composed of sandy sitly clay and fine sandy clay. No PID response units. No soil sample collected for analysis. Vertical profiling of groundwater (GW-7) at 5-7 ft, 15-17 ft bgs and 25-27 ft bgs.	SC
100+	SB-08	100	0 - 0.5 ft bgs	6" - 8"	Adjacent to SB-04. Shallow soil sample (loam and gravel) collected as per NYSDOH requirements for exposure pathway assessment. Elevated PID (100+ppm response units). No groundwater collected for analysis -see GW-4.	SC
0	SB-09	100	0 - 5 ft bgs	3-4 ft	Background location (southern-most lateral extent). 0-5 ft sample consisted of fine-coarse sand with clay and silt, interbedded sandy silt and fine sand with clay. Vertical profiling of groundwater (GW-9) at 5-7 ft and 15-17 ft bgs.	SC
0	SB-10	100	0 - 5 ft bgs	3-4 ft	West side of dumpster at southeast corner of property. 0-5 ft was composed of grass, fine sandy silt and plastic clay. No PID response units. Vertical profiling of groundwater (GW-10) at 5-7 ft and 15-17 ft bgs. MW-3 was installed near this boring. Screened from 2-10 ft bgs. DTW was 3.14 ft bgs.	SC
15-70	SB-11	100	0 - 5 ft bgs	0.5 - ft	North side of dumpster at southeast corner of property. 0-5 ft was composed of grass, fine sand with silty clay. Elevated PID (15-70 ppm response units). Vertical profiling of groundwater (GW-11) at 5-7 ft and 15-17 ft bgs.	SC
0	SB-12	95	0 - 5 ft bgs	3-4 ft	East side of dumpster at southeast corner of property. 0-5 ft was composed of grass, fine sand with silty clay. Vertical profiling of groundwater (GW-12) at 5-7 ft and 15-17 ft bgs.	SC

Appendix-C

Community Air Monitoring Plan CAMP

Community Air Monitoring Plan for Work Activities

at

ROSE CLEANERS
500 Lexington Avenue
Mount Kisco, New York 10549
Site No.: 3-60-059
Index No.: W3-0978-03-12

PREPARED FOR

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
625 BROADWAY
ALBANY, NEW YORK

PREPARED BY

BERNINGER ENVIRONMENTAL, INC.

April 2012

Community Air Monitoring

The excavation part of the IRM is anticipated to pose the largest health and safety considerations relative to the surrounding community. Therefore, emphasis on the development of a Community Air Monitoring Plan (CAMP) has been placed on these primary activities versus the limited exposure to the community for injection of chemicals. Specifically, two types of air monitoring will be performed during the implementation of this IRM: 1) Perimeter for CAMP and 2) on-site monitoring inside the area of excavation for worker site safety as well as early warning relative to pending changes that will affect the property perimeters.

Perimeter Monitoring - CAMP

A Community Air Monitoring Plan (CAMP) provides for 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.

Continuous Monitoring

Continuous monitoring will be required for all ground intrusive activities and during the excavation and injection of chemicals. Ground intrusive activities include, but are not limited to, soil/waste excavation and handling, chemical injection and the installation of soil borings or monitoring wells.

Periodic Monitoring

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 bailing/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 active work area (i.e., the exclusion zone) on a **continuous** basis or as otherwise specified. Upwind concentrations will be measured at the start of each workday and periodically thereafter to establish background conditions. The monitoring work will be performed using equipment appropriate to measure the types of contaminants known or suspected to be present. The equipment will be calibrated at least daily for the contaminant(s) of concern or for an appropriate surrogate. The equipment will be capable of calculating 15-minute running average concentrations, which will be compared to the levels specified below.

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

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

- If the organic vapor level is above 25 ppm at the perimeter of the work area, activities must be shutdown. All 15-minute readings must be recorded and be available for State (DEC and DOH) personnel to review. Instantaneous readings, if any, used for decision purposes will also be recorded.

Particulate Monitoring, Response Levels and Actions

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

- If the downwind PM-10 particulate level is 100 micrograms per cubic meter (mcg/m^3) greater than background (upwind perimeter) for the 15-minute period or if airborne dust is observed leaving the work area, then dust suppression techniques must be employed. Work may continue with dust suppression techniques provided that downwind

PM-10 particulate levels do not exceed 150 mcg/m^3 above the upwind level and provided that no visible dust is migrating from the work area.

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

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

3.5 Soil Handling Issues

Hazardous and non-hazardous soil excavation with off-site transport and disposal is the main presumptive remedy for the northern area of soil contamination. This type of remedial action dictates specialized soil handling and typically requires significantly more attention to personal protection and safety, including provisions for worker protection (special clothing, decontamination techniques, etc.) and equipment decontamination. All workers occupying the work zones will be 40-hour OSHA trained for work at Class 2 sites and currently certified.

Excavation and off-site disposal primarily involves equipment that is widely used in the construction or non-hazardous solid waste disposal industries, such as excavators, backhoes, dump trucks, and containers of various shapes, sizes, and materials. When a site is remediated by excavation and off-site disposal, the contaminated material (typically a solid or semi-solid material such as soil or sludge) is excavated, then transported off-site for treatment and/or disposal. The techniques for soil handling in order to control cross-media transfer of

contaminants (such as air emission issues) during material handling (provided in Table 3-1) include the following:

1) Operation Controls - perform activities during cooler time periods (early am), maintain low speeds of equipment, control placement of stockpiles, containers, away from prevailing winds, use of larger equipment to minimize surface area/volume ratios, during dumping minimize soil drop height, during transport, cover or enclose trucks, etc.

2) Covers and Physical Barriers - physically isolate the contaminated media from the atmosphere (covers, mulch, foam coverings, wind screens, slurry cover sprays, etc.

3) Water Sprays or Suppressant Foams - reduce air emissions by adsorbing moisture from the air. Specialty VOC suppressant foams can be applied when instrumentation at strategic monitoring locations indicate that VOC concentrations exceed action levels. Within minutes of applying the foam, air-borne concentrations can be reduced from thousands of parts per million to background levels.

4) Enclosures - self-supported or air supported structures can be erected to provide a physical barrier between the air emission area and the atmosphere.

5) Soil Moisture Stabilization - As the soil column will be excavated down to the water table, moisture can be a large concern. As much of the soil excavated will be manifested as hazardous waste, a limitation on moisture **below 12% is** required in order to ensure that the loads are not rejected at the waste facility. Therefore, techniques such as the addition of lime or other specialty chemicals can be very effective. Because these materials typically chemically combine with water, they can be used very effectively to dry any type of wet soil. Heat from this reaction further dries wet soils. “Dry-up” of wet soil at construction sites is one of the widest uses of lime for soil treatment. Generally,

between 1 to 4 percent of lime by mass of dry soil will improve a wet site sufficiently to reduce moisture content and allow construction activities to proceed. However, strict control must be implemented to ensure that the pH does not exceed 12, rendering soils unacceptable to some facilities.

6) Site drainage control - Provisions will be made to capture on-site surface water runoff in the area of excavation or other work areas by diverting it to a controlled depression-area or plastic-lined beamed area. Covers, and if necessary, liners, will be used at all times when contaminated materials are being stored. Covers will be used on trucks that are moving materials around and from the site.

Appendix-D

Health and Safety Plan HASP

Site-Specific Health and Safety Plan for Work Activities

at

ROSE CLEANERS
500 Lexington Avenue
Mount Kisco, New York 10549
Site No.: 3-60-059
Index No.: W3-0978-03-12

PREPARED FOR

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
625 BROADWAY
ALBANY, NEW YORK

PREPARED BY

BEi

BERNINGER ENVIRONMENTAL, INC.

April 2012

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF APPENDIXES

FOREWORD

The Occupational Safety and Health Act (OSHA) implementing regulations of 29 CFR 1910.120 govern hazardous waste operations and emergency response. These regulations require that employers of employees involved in certain specific hazardous waste operations 1) develop and implement a written health and safety PROGRAM for employees involved in hazardous waste operations and 2) that the PROGRAM incorporate a site-specific health and safety plan.

Berninger Environmental, Inc. (BEI) has employees conducting activities which fall within the scope of these regulations, and thus, has in place a written health and safety PROGRAM as required. Its contents are contained in the BEI HAZWOPER Program Manual. Some activities conducted at the contaminated portion of the Rose Cleaners' facility may fall within the scope of these OSHA regulations. Thus, to assure regulatory compliance, this site-specific health and safety plan covering activities conducted at the contaminated portion of the Rose Cleaners' facility has been prepared. The Integrated Safety Management System (ISMS) and Environmental Safety, Health and Quality check lists will be used to define safe work procedures for work conducted in uncontaminated areas of the Rose Cleaners' facility.

The regulatory requirements for site-specific health and safety plans are found at 29 CFR 1910.120 (b)(4) and include ten specific elements which are designated with the letters A through J. Each of these elements is addressed in this health and safety plan for the Rose Cleaners' facility. Each element is listed below along with the section number where it is addressed in this health and safety plan.

	Health and safety plan ELEMENT	**SECTION NO. IN THIS PLAN**
A)	Health and safety risk hazard analysis	4.0
B)	Employee training assignments and requirements	6.1
C)	Personal protective equipment requirements	4.0, 5.4
D)	Medical surveillance requirements	6.2
E)	Frequency and types of monitoring required	4.0, 5.2
F)	Site control measures	5.3
G)	Decontamination procedures	4.0, 5.6
H)	Emergency response plan	5.7
I)	Confined space entry procedures	none (no confined space entry)
J)	Spill containment program	5.3

1.0 INTRODUCTION AND PROJECT DESCRIPTION

An Inactive Hazardous Waste Disposal Site (IHWDS) Investigation Work Plan (Work Plan) has been developed pursuant to the requirements of an executed Order of Consent (December 22, 2003) between the New York State Department of Environmental Conservation (NYSDEC), Division of Environmental Remediation (DER), and LRB Cleaners, Inc., the Respondent. The subject property is listed on the NYSDEC DER Registry of Inactive Hazardous Waste Disposal Sites in New York State as Site Number 3-60-059 with a Classification of "2" pursuant to ECL 27-1305. The site is located at 500 Lexington Avenue, Mt Kisco, New York, 10549, fully described as Dist. 80.64, Section 01, Lot 14. An IHWDS Investigation Work Plan was directed as part of the Order of Consent to determine the nature and extent of site contamination and off-site migration pathways in order to allow a decision by the NYSDEC DER regarding remedial action required to be undertaken at said site and/or off-site areas.

1.1 Purpose

The purpose of an IHWDS investigation is to:

- Determine the nature and delineate the areal and vertical extent of contamination in all media for each area of concern or emanating from the site;
- Delineate the surface and subsurface environmental media, including topography and depth to groundwater;
- Identify the source(s) of contamination, migration paths and actual or potential receptors of contamination on or through air, soil, sediment, groundwater, surface water, utilities and structures at the site without regard to property boundaries;
- Collect and evaluate all necessary data to evaluate the actual and potential impact to public health and the environment;
- Collect and evaluate information for a Fish and Wildlife Resource Impact Analysis (if necessary);
- Collect data to facilitate selection and design of remedial action alternatives; and
- Identify collected data needed for monitoring natural attenuation, potential feasible cleanup technologies and presumptive remedies.

This Site-Specific Health and Safety Plan (HASP) addresses the safety aspects of the spectrum of work activities to be conducted at the contaminated area(s). Activities at the contaminated area (but not the uncontaminated background area) fall under the scope of Code of Federal Regulations, 29 CFR 1910.120, *Hazardous Waste Operations and Emergency Response (HAZWOPER*). The purpose of this document is to establish overall site-specific health and safety guidelines to be followed by

all personnel conducting work at this site regardless of organizational affiliation. Work will be performed in accordance with requirements, as stipulated.

The levels of protection and procedures specified in this HASP are based on the best information available from historical data and recent evaluations of the area. Therefore, these recommendations represent the minimum health and safety requirements to be observed by all personnel engaged in work at the site. Unforeseeable site conditions, changes in scope of work or hazardous conditions not previously considered will warrant a reassessment of the protection levels and controls stated. Refer to Section 5.1 for requirements pertaining to field modifications and changes to the HASP.

2.0 SITE ORGANIZATION AND COORDINATION

Subsurface Investigation activities will be performed by BEI personnel. All work is performed under the direction of the Site Supervisor and support staff, all of whom are employed by BEI.

The following section describes the organizational structure for the subsurface investigation. Key personnel and their responsibilities are listed. Mr. Walter Berninger will be the Project Manager (PM), Mr. Justin Halpin will be the Site Supervisor (SS), Mr. Joel Meyers will serve as the Site Safety and Health Officer (SSHO) and Mr. Eusi Watkins will act as the Emergency Response Coordinator (ERC).

2.1 SITE SAFETY AND HEALTH OFFICER

The SSHO advises the Site Supervisor on health and safety issues and conducts briefings prior to initiation of site activities. The SSHO assesses the potential for worker exposures to hazardous agents, recommends appropriate hazard controls for protection of task site personnel and will require personnel to obtain immediate medical attention in the event of a work-related injury or illness. The SSHO ensures any necessary monitoring of potential chemical hazards is performed, reviews the effectiveness of monitoring and personal protective equipment and recommends upgrades or downgrades in protective health and safety measures. The SSHO ensures that appropriate fall protection measures are available and that needed work permits such as Radiological Work Permits (RWPs) are obtained. The SSHO notifies the Office of Radiation Protection when radiological support is required. The SSHO has stop work authority and advises emergency response personnel of an emergency. The SSHO authorizes the return to work following resolution of any health and safety hazards or other stop work issues. The SSHO ensures that this HASP is revised and approved if there are changes in site conditions or tasks. The SSHO will be available for consultation when required and will be aware of project-related work occurring on-site.

2.2 SITE SUPERVISOR

The Site Supervisor has primary responsibility for directing and managing all subsurface investigation field activities, including coordination with any support organizations. The Site Supervisor ensures that all on-site project personnel meet the required level of training, have reviewed the HASP and are instructed in safe work practices. The Site Supervisor also ensures that a qualified SSHO is designated, maintains a current copy of the HASP and documents field changes to the HASP in the project logbook. In addition, the Site Supervisor and staff perform oversight of field activities, maintain awareness of site operations and ensure that all project personnel adhere to ES&H requirements in order to prevent potential accidents from occurring.

The Site Supervisor is responsible for ensuring that the following five core functions of the Integrated Safety Management System (ISMS) are fulfilled appropriately:

- Define the work, roles and responsibilities. Allocate resources to ensure that research goals are balanced with safe work practices.

- Identify and analyze the hazards using the ESH&Q evaluation, consultation with subject

matter experts, material safety data sheet information, Work Smart Standards (WSS), lessons learned by other Principal Investigators (PIs) and staff and other resources.

- Develop and implement hazard controls tailored to the work being performed.

  - Resources include BEI staff, subject matter experts, the Hazardous Materials Inventory System, ESD Chemical Hygiene Plan, Division and project procedures, Training Needs Assessment process, Laboratory Operating Manuals, Laboratory Stewards and Lessons Learned and Alerts.
  - Examples of actions and tools include optimization of engineering controls and procedural approaches with training, HAZCOM job-specific training, job pre-briefings, compliance-based and project-specific training, ES&H permits (e.g., RWPs, Lockout/Tagout process) and protective equipment.

- Perform work within controls to ensure the work is done safely:

  - Communicate expectations to project staff.
  - Ensure that the controls identified in the ESH&Q evaluation and this HASP are carried out.
  - Ensure opportunity for procedure modification to respond to unanticipated situations.
  - Stop work if imminent danger exists.

- Provide feedback and continuous improvement:

  - Solicit feedback from project staff regarding ESH&Q issues and act on that input.
  - Communicate concerns to and seek help from supervisors and the ESH&Q group.
  - Reallocate resources to address issues that arise.
  - Ensure safety meetings and site briefings are performed.

2.3 PRINCIPAL INVESTIGATORS AND FIELD PROJECT PERSONNEL

PIs and field project personnel involved in on-site operations are responsible for understanding the intent of the principles of Integrated Safety Management and are to be knowledgeable of the processes in place to satisfy the intent of Integrated Safety Management.

Define the Scope of Work

- Understand the expectations they are to meet in their particular work assignment.
- Understand the responsibilities of the Site Supervisor and SSHO.
- Provide documentation of training to the Site Supervisor.

Identify and Analyze the Hazard

- Notify the SSHO of any special medical conditions (i.e., allergies, diabetes, etc.).
- Actively participate in identification of hazards prior to beginning work.
- Ensure that potential work hazards have been evaluated by subject matter experts and are accounted for in all work practices.

Develop and Implement Hazard Controls

- Seek the help of the SSHO and other subject matter experts, as appropriate, to analyze the hazards.
- Ensure that control strategies are developed and implemented, as appropriate, before work begins.
- Ensure safety measures are incorporated into activities (i.e., through HASP addendums or amendments, work aides or standard operating procedures).

Perform Work Within Controls

- Perform only those tasks that they believe they can do safely.
- Meet the responsibilities and safely perform the tasks that are delegated to them.
- Take all reasonable precautions to prevent injury to themselves and to their fellow employees; be alert to potentially harmful situations.
- Suspend work if unexpected concerns arise and modify plans to address concerns before resuming work.
- Comply with the work plan and HASP as well as postings and rules at the project site.

Provide Feedback and Continuous Improvement

- Keep the SSHO and Site Supervisor informed of any issues, problems or concerns regarding all aspects of their work.
- Notify appropriate Rose Cleaners' management personnel or the facility point of contact of

any unsafe condition, violation, noncompliance or environmental threat discovered in a facility.

- Report to the SSHO any changes in site conditions that may affect health and safety .
- Immediately notify the SSHO of symptoms or signs of exposure potentially related to any chemical, physical or biological hazards present at the site and immediately report any accidents, injuries and/or unsafe conditions to the SSHO.
- If unsafe conditions develop, task site personnel are authorized and expected to stop work and notify the SSHO and Site Supervisor of the unsafe condition.

3.0 INTEGRATED SAFETY MANAGEMENT SYSTEM (ISMS)

The ISMS process systematically integrates safety into management and work practices at all levels so missions are accomplished while protecting the public, the worker and the environment. Direct involvement of workers during the development and implementation of safety management systems is essential for success. DOE requires that the principles of ISMS be implemented for all ORNL activities. Therefore, all BEI personnel are expected to incorporate the following basic ISMS core functions during all work activities:

- Defining the scope of work;
- Identifying and analyzing hazards associated with the work;
- Developing and implementing hazard controls;
- Performing work activities within these controls; and
- Providing feedback on the adequacy of the controls to continue improving safety management.

4.0 TASK SPECIFIC HAZARD EVALUATION AND CONTROLS

The purpose of this Subsurface Investigation hazard evaluation is to identify and assess potential hazards that personnel might encounter and to prescribe methods of hazard control. Historical site data provided in Appendix A gives the results of chemical analyses in shallow soils and adjoining surface water (creek) at the Rose Cleaners' property. Material Safety Data Sheets (MSDS) for chemicals that are likely to be handled when conducting field work are included in Attachment B.

A description of sampling procedures and the activities to be conducted at the Rose Cleaners site is described below.

4.1 WATER LEVEL MEASUREMENTS

Task Description: Manual water level measurements will be collected from any monitoring wells installed in order to determine current depth to groundwater in the area. These measurements are taken by lowering an electronic water level sounder down the well. As the sounder is brought out of the well the tip of the sounder that has been submerged is rinsed with distilled water to rinse off the groundwater. The rinse water is allowed to drip back down into the well.

Equipment and Materials: Equipment includes water level sounder.

Task Hazards and Controls:

- **Chemical and Radiological Hazards**
  - Groundwater Contact: Based on previously obtained sample data (only available for soils or surface water; no known groundwater contamination is present), the risk of chemical or radiological exposure from short-term exposure to groundwater and surface water samples is minimal. However, direct contact with contaminated materials should be avoided; therefore, disposable latex or nitrile gloves and safety glasses will be worn when conducting groundwater monitoring and during the handling of sample tubes to prevent eye and skin contact.
  - Downhole equipment: Rinse downhole equipment with distilled water as it is brought out of the well.
- **Physical Hazards**
  - Tripping/Falling: Precautions should be taken to avoid trip, slip and fall accidents when climbing irregular or slippery surfaces. Before changing location visually survey the area for slippery surfaces and tripping hazards.
  - Heat/Cold Stress: Wear clothing appropriate for environmental and weather conditions. Temperature extremes may be a hazard for consideration depending on

the timing of the activity. Refer to Section 5.5 for discussion of recognition of symptoms and controls.

- **Biological/Vector Hazards**

  - Ticks/Snakes/Pathogens: Be cautious of snakes and vector carriers such as ticks. Check clothing and skin for ticks after walking in brush. Wash hands before eating and drinking.

- **Personal Protective Equipment Required to Address General Site Hazards**

  - Level of Protection: D
  - Protective Clothing: BEI-issued work clothes or disposable tyvek
  - Head Gear: Safety glasses
  - Gloves: Latex or nitrile (when conducting groundwater sampling or handling corrosive or oxidizing reagents)
  - Footwear: Sturdy work shoes

- **Monitoring Requirements**

  - See section 6.4 of Phase II IRM Work Plan

4.2 FIELD SAMPLING AND ANALYSIS OF GROUNDWATER/SURFACE WATER

Task Description: Procedures for field sampling and analysis of groundwater and surface water are described in the Rose Cleaners' IHWDS Investigation Work Plan. Groundwater will generally be sampled with a peristaltic pump. Slow purge techniques will be used in order to reduce the disturbance caused by removal of large volumes of water from the system. Field parameters will be monitored until stable groundwater chemistry (e.g. specific conductance, pH, Eh, temperature, dissolved oxygen) readings are obtained on the Myron 6P Ultrameter among others. The purge water will be collected in DOT approved 55-gallon drums, if deemed to be necessary or discharged in proximity to the wellhead with regulatory approval. Upon completion of the project, the drum contents (if any) will be sampled and analyzed for disposal at an approved facility. Surface water will be collected via disposable dedicated polyethylene bailers and rope.

Samples will be handled and transported according to regulatory requirements and procedures outlined in the Rose Cleaners' IHWDS Investigation Work Plan. Samples will be preserved and

stored as required by the analytical protocols (e.g. cooled, preservative added). Storage on site may occur for short periods of time in ice chests containing "blue ice" but will be quickly transferred to refrigerator storage in the field laboratory or at the fixed base laboratory at the appropriate temperatures. All storage of contaminated samples will follow procedures and relevant regulations.

Equipment and Materials: Sampling equipment includes sampling tubing which is dedicated for each sample collected; peristaltic pump; filters and sample containers (for collecting samples); HACH meter and test kits (see Appendix B for reagent MSDSs). Some samples may be preserved with a few drops of nitric, hydrochloric or sulfuric acid. Calibration standards including pH and conductivity are also used.

Task Hazards and Controls:

- **Chemical and Radiological Hazards**

  - Groundwater Contact: Based on previously obtained sample data (only available for soils or surface water), the risk of chemical exposure from short-term exposure to groundwater or surface water is minimal. However, direct contact with contaminated materials should be avoided, therefore, disposable latex or nitrile gloves and safety glasses will be worn when conducting groundwater and surface water sampling to prevent eye and skin contact.

  - Reagent Contact: Corrosive or oxidizing reagents pose a contact hazard. To prevent eye and skin contact when corrosive or oxidizing reagents are used disposable latex or nitrile gloves and safety glasses will be worn.

- **Physical Hazards**

  - Tripping/Falling: Precautions should be taken to avoid trip, slip and fall accidents when climbing irregular or slippery surfaces. Before changing location visually survey the area for slippery surfaces and tripping hazards.

  - Heat/Cold Stress: Wear clothing appropriate for environmental and weather conditions. Temperature extremes may be a hazard for consideration depending on the timing of the activity. Refer to Section 5.5 for discussion of recognition of symptoms and controls.

- **Explosion Hazards**

  - Gas cylinders: Pressurized gas cylinders (if any) will be transported and handled in accordance with applicable Department of Transportation guidance and regulations. Care will be taken to secure the cylinders upright during transport to ensure they are not damaged. Cylinders will also be secured at the site so they will not tip over during the injection process.

- **Biological/Vector Hazards**

  - Ticks/Snakes/Pathogens: Be cautious of snakes and vector carriers such as ticks. Check clothing and skin for ticks after walking in brush. Wash hands before eating and drinking.

- **Personal Protective Equipment Required to Address General Site Hazards**

  - Level of Protection: D
  - Protective Clothing: BEI-issued work clothes or disposable tyvek
  - Head Gear: Safety glasses
  - Gloves: Latex or nitrile (when conducting groundwater sampling or handling corrosive or oxidizing reagents)
  - Footwear: Sturdy work shoes

- **Monitoring Requirements**

  - Air Quality: Air monitoring with an organic vapor analyzer or other suitable instrument will be performed during all groundwater or surface water sampling activities. A VOC ambient air monitoring result of 3ppm will trigger a warning response. If a detection of 5ppm VOC in ambient air is detected, the SSHO will suspend work and instruct the workers to move to a safe zone until such time the work zone is tested safe.

4.3 FIELD SAMPLING AND ANALYSIS OF SOIL/SOIL GAS/SEDIMENT

Task Description: Procedures for field sampling and analysis of subsurface soils, soil gas, vapors and sediment are described in the Rose Cleaners' IHWDS Investigation Work Plan. Soil samples and soil gas samples will generally be obtained by a discrete sampler by hand, Geoprobe direct push sampling rig or Hollow Stem Auger Drilling Rig. This method ensures dedicated, undisturbed samples protected in a PVC liner or split spoon sampler. Sediment samples will be collected via decontaminated stainless steel sludge or dredge sampler. Field testing for total volatile organic compounds (VOCs) in the breathing zone (work zone), as well as the downwind perimeter will be monitored by an HNu or Minirae portable Photoionization Detector (PID). The air monitoring action levels using PID readings cited in Section 8.0 - Community Air Monitoring Plan will be used to safeguard workers and observers during the implementation of the field investigation program.

Any discarded soil or sediments will be collected in DOT approved 55-gallon drums. Upon completion of the project, the drum contents will be sampled and analyzed for disposal at an approved facility. It may also be possible to replace the discarded soil back in the bore hole and/or sediment in the creek if approved by the regulators.

Samples will be handled and transported according to regulatory requirements and procedures

outlined in the Rose Cleaners' IHWDS Investigation Work Plan. Samples will be preserved and stored as required by the analytical protocols (e.g. cooled, preservative added). Storage on site may occur for short periods of time in ice chests containing "blue ice" but will be quickly transferred to refrigerator storage in the field laboratory or at the fixed base laboratory at the appropriate temperatures. All storage of contaminated samples will follow procedures and relevant regulations.

Equipment and Materials: Sampling equipment includes a Geoprobe direct push sampling rig for exterior sample locations and a weighted slide hammer for interior sample collection. A PVC liner is dedicated for each soil sample collected. Soil gas samples will be collected directly into and containerized in dedicated stainless steel summa canisters. A stainless steel sludge or dredge sampler will be used to collect discrete sediment samples from select areas along the adjoining creek.

Task Hazards and Controls:

- **Chemical and Radiological Hazards**
  - Soil or Sediment Contact: Based on previously obtained sample data, the risk of chemical exposure from short-term exposure to soil samples is minimal (See Appendix A); no data is available for sediment. However, direct contact with contaminated materials should be avoided, therefore, disposable latex or nitrile gloves and safety glasses will be worn when conducting soil and sediment sampling to prevent eye and skin contact.
- **Physical Hazards**
  - Tripping/Falling: Precautions should be taken to avoid trip, slip and fall accidents when climbing irregular or slippery surfaces. Before changing location visually survey the area for slippery surfaces and tripping hazards.
  - Heat/Cold Stress: Wear clothing appropriate for environmental and weather conditions. Temperature extremes may be a hazard for consideration depending on the timing of the activity. Refer to Section 5.5 for discussion of recognition of symptoms and controls.
- **Biological/Vector Hazards**
  - Ticks/Snakes/Pathogens: Be cautious of snakes and vector carriers such as ticks. Check clothing and skin for ticks after walking in brush. Wash hands before eating and drinking.
- **Personal Protective Equipment Required to Address General Site Hazards**
  - Level of Protection: D
  - Protective Clothing: BEI-issued work clothes or disposable tyvek
  - Head Gear: Safety glasses

- Gloves: Latex or nitrile (when conducting groundwater sampling or handling corrosive or oxidizing reagents)
- Footwear: Sturdy work shoes

- **Monitoring Requirements**

  - Air Quality: Air monitoring with an organic vapor analyzer or other suitable instrument will be performed during all soil sampling activities. A VOC ambient air monitoring result of 3ppm will trigger a warning response. If a detection of 5ppm VOC in ambient air is detected, the SSHO will suspend work and instruct the workers to move to a safe zone until such time the work zone is tested safe.

4.4 GEOPROBE BORINGS AND MONITORING WELL INSTALLATION

Task Description: Probe rods are installed by using a Geoprobe direct push rig which hydraulically pushes or hammers steel drive pipe into the ground (please refer to the Rose Cleaners' IHWDS Investigation Work Plan for a more complete description). Sections of probe rods are added (threaded attachment) until the desired depth is reached. A sampling tool is opened to obtain the soil or groundwater which then is retrieved. If desired, a small diameter well can then be constructed inside the hollow pipe as it is withdrawn from the ground or in the uncased hole after the drive pipe is removed completely. The drive point is left in the ground. Sampling equipment and probe rods are cleaned and decontaminated by detergent wash and potable water rinse. Hollow-stem augers and other drilling methods may also be used to install groundwater monitoring wells and/or to collect soil samples. These methods produce drill cuttings that will be collected in DOT approved 55-gallon drums. Upon completion of the project, the drum contents will be sampled and analyzed for disposal at an approved facility. It may also be possible to replace the discarded soil back in the bore hole if approved by the regulators.

Equipment and Materials: Equipment includes Geoprobe rig, drill rigs and associated equipment and support vehicles such as air compressors, pressure washers, generators, probe rod and well construction materials.

Task Hazards and Controls:

- **Chemical and Radiological Hazards**

  - Groundwater Contact: Based on previously obtained sample data, the risk of chemical exposure from short-term exposure to groundwater samples is minimal. However, direct contact with contaminated materials should be avoided, therefore, disposable latex or nitrile gloves and safety glasses will be worn when conducting groundwater sampling to prevent eye and skin contact.

  - Soil/cuttings Contact: Workers could be exposed to contaminated soil remaining on the probe rods as it is raised out of the ground. This hazard will be minimized by screening the drive pipe as it is raised out of the hole. Prior to removal from the site, all drill pipe, drill cuttings and any core samples collected will be scanned for VOC contamination. An exclusion area will be set up around the drill rig to prevent entry by personnel that are not trained or wearing proper protection.

- **Physical Hazards**

  - Tripping/Falling: Precautions should be taken to avoid trip, slip and fall accidents when climbing irregular or slippery surfaces. Before changing location visually survey the area for slippery surfaces and tripping hazards. Operators will avoid accessing locations greater than six feet above ground. If it becomes necessary to perform work on the drill mast, the mast will be lowered prior to performing work.
  - Heat/Cold Stress: Wear clothing appropriate for environmental and weather conditions. Temperature extremes may be a hazard for consideration depending on the timing of the activity. Refer to Sect. 5.5 for discussion of recognition of symptoms and controls.
  - Abrasions, Scrapes and Sprains: Always use appropriate care when using tools and mechanical equipment. Maintain awareness of body and limb location and think ahead to probable body and object path before applying force to tools. Wear protective clothing as listed below. Drill rods, augers and tools will be properly stowed and restrained during transport. Support rails will have adequate strength to hold tools. Operators will avoid placing body parts at points of operation and/or pinch points.
  - Lifting: Use your legs to lift heavy objects, avoid awkward positions and twisting of the body and ask for assistance with awkward or heavy loads.
  - Mechanical Hazard: Working with drill rigs can result in injuries from equipment dislodging and striking unsuspecting personnel and from impacts due to flying objects or overturning vehicles. Therefore, follow these precautions:
    - ✓ Drill rig will be inspected visually before each use. If inspection reveals unsafe conditions, rig will be removed from service and repaired. Only qualified individuals shall make repairs to the drill rig.
    - ✓ Drill rig cabs will be kept free of all nonessential items and all loose items will be secured.
    - ✓ Drill rigs will be provided with necessary safety equipment.
    - ✓ Drill rig shall be properly maintained per manufacturer's recommendations. Only qualified individuals shall make repairs to the drill rig.
    - ✓ Parking brakes will be set before shutting off any heavy equipment or vehicle.
    - ✓ High pressure hoses will be secured to prevent "whipping" in the event of a failure.
    - ✓ Only competent individuals shall be allowed to operate the drill rig.
    - ✓ To minimize overhead hazards, wire cables will be inspected by the rig operator prior to use. Any frayed, kinked, marked or otherwise damaged cables will be taken out of service. Operator and other personnel in area during lifting of tools onto rig mast shall position themselves so that they are not under the load and/or between equipment.

  - Electrical Hazard: Of special concern to drilling operations is the possibility for conducting electricity through the drilling tower through either inadvertent contact with underground or overhead power lines or by lightning strikes. In addition, some of the equipment used is operated by electricity. Unless safe work practices are observed, serious injury or death can result. Therefore, observe the following precautions:

- ✓ Treat all electrical wires and circuits as 'live" unless certain they are not.
- ✓ Always maintain a firm work base to prevent a loss of balance and potential fall onto energized busses or parts (which should be covered with a good electrical insulator such as a rubber blanket).
- ✓ All tools should have insulated handles, be electrically grounded or double insulated.
- ✓ Do not drill within 10 ft of an overhead power line that is 50 kV (or within 50 ft for > 50 kV) unless power to the line is first turned off for the duration of the drilling.
- ✓ Ground fault circuit interrupters will be used for electrical extension cords in use between a fixed electrical system (permanent outlet) and a tool.
- ✓ Prior to drilling have site representatives delineate location of underground power lines and other utilities.
- ✓ Do not drill within 25 ft of any known underground power line.
- ✓ Maintain a watch for electrical storms. If electrical activity appears to be imminent, cease drilling operations and evacuate the area around the drill rig. If time permits do not leave auger or drill string in the borehole.

- Noise: Unprotected exposure of site workers to noise from drilling activities can result in noise induced hearing loss. Hearing protection must be worn where noise levels are greater than 85 dBA. The SSHO will ensure that either ear muffs or disposable foam earplugs are made available to all personnel and are used by the personnel in the immediate vicinity of the drill rig.

- **Biological/Vector Hazard**

  - Ticks/Snakes/Pathogens: Be cautious of snakes and vector carriers such as ticks. Check clothing and skin for ticks after walking in brush. Wash hands before eating and drinking.

- **Personal Protective Equipment Required to Address General Site Hazard**

  - Level of Protection: D
  - Protective Clothing: BEI-issued work clothes or disposable tyvek
  - Head Gear
    - Hard hat required for drill rig operations; not required for steam cleaning and washing
    - Safety glasses or goggles required during drilling and decon operations
    - Ear muffs or disposable foam earplugs required in the vicinity of drill rig
  - Gloves: Leather work gloves over nitrile or latex gloves during drilling or decon operations
  - Footwear: Steel-toed work shoes

- **Monitoring Requirements**

  - Air Quality: Air monitoring with a PID or other suitable instrument will be performed during all well installation activities. A VOC ambient air monitoring result of 3ppm will trigger a warning response. If a detection of 5 ppm VOC in ambient air is detected, the SSHO will suspend work and instruct the workers to move to a safe zone until such time the work zone is tested safe.

5.0 OTHER HEALTH AND SAFETY PLAN ELEMENTS

5.1 REVISIONS/ MODIFICATIONS TO THE HASP

The following actions will warrant revision and approval of this plan by the appropriate health and safety disciplines:

- Change in tasks (or previously unidentified tasks) that could impact employee health and safety.
- Changes in hazards (unknown or not previously addressed) which require a significant change in, or addition to, respiratory protection (as defined in exemptions to the plan modifications), physical/barrier protection features or other engineering controls.
- Occurrences as defined by DOE Order 232.1A.

5.1.1 Modifications allowed

The SSHO may upgrade PPE. These changes must be documented in the field logbook. The change and reason or evidence for the change must also be documented in the field logbook. For upgrades to include respiratory protection (including air-purifying and supplied air) for previously unidentified non-radiological issues or contaminants such as VOCs, the appropriate health and safety disciplines must be contacted. The SSHO will approve and document changes in PPE in the field logbook. Upgrades to include respiratory protection will require the SSHO to ensure workers have 40 Hour HAZWOPER Training and to assess any additional medical surveillance requirements.

5.2 MONITORING

Historical site data indicate that chemical exposure of site personnel is not a significant concern within the scope of this project. However as only limited site characterization has been performed, monitoring will be required for all field activities. Site monitoring requirements may change based on site conditions. All changes must be documented in the site logbook.

5.3 SITE AND SPILL CONTROL

Site access is available from public roads through the area and therefore will not be controlled to the general site. Based on the anticipated levels of contamination, formal barricaded work zones will not be established unless new monitoring data indicate the need for such barriers. An exclusion zone may be required for drilling operations and other field activities if required to reduce the accidental spread of hazardous substances from contaminated areas to clean areas. The SSHO will determine, as needed, the locations of the support zone, contamination reduction zone and the exclusion zone. Personnel accessing the zones must meet access requirements as stated in this plan.

5.4 PERSONAL PROTECTIVE EQUIPMENT

Level D protection is normally used when the potential for personnel contamination is low, as is the case with this project. Level D protection will include BEI-furnished clothing or disposable tyvek. Details and special requirements have been covered in the hazard control sections of the specific tasks in Sect. 4 above. Unexpected new hazards will require a reassessment of the specified PPE.

5.5 TEMPERATURE EXTREMES AND SITE CHARACTERISTICS

The effect of temperature extremes on personnel is a primary hazard associated with the activities conducted at the site. Symptoms and controls related to temperature extremes are considered in detail in this section.

Field activities conducted during the summer or winter pose a hazard because of temperature extremes. Since the project site is located in a relatively open area, workers shall dress appropriately for environmental conditions, wearing clothing that provides reasonable protection against winter cold and summer sun. Although extreme physical exertion will not be likely within the scope of this project, during hot weather workers are encouraged to be aware of their own symptoms of heat stress (headaches, dizziness, increased heart rate), to drink plenty of water and to take breaks as needed. Heat stress symptoms, remedies and monitoring are discussed in Section 5.5.1. Cold exposure effects are discussed in Section 5.5.2.

Workers are also encouraged to apply insect repellant and/or sunscreen as needed prior to field activities. Workers should exercise caution by visually inspecting their immediate area of activity for presence of poisonous/harmful plant, insect and animal species as well as any hazard resulting from previous human activity.

5.5.1 Effects and Prevention of Heat Stress

If the body's physiological processes fail to maintain a normal body temperature because of excessive heat, a number of physical reactions can occur. They can range from mild symptoms such as fatigue, irritability, anxiety, and decreased concentration, dexterity, or movement, to death.

Heat-related health concerns can include the following:

- **Heat rash:** Caused by continuous exposure to heat and humid air and aggravated by chafing clothes. Decreases ability to tolerate heat and is a nuisance.
- **Heat cramps:** Caused by profuse perspiration combined with inadequate fluid intake and chemical replacement, particularly salts. Signs include muscle spasm and pain in the extremities and abdomen.
- **Heat exhaustion:** Caused by increased stress on various organs to meet increased demands to cool the body. Signs include shortness of breath; increased pulse rate (120-200 beats per minute); pale, cool, moist skin; profuse sweating; dizziness; and lassitude.
- **Heat stroke:** Is the most severe form of heat stress. Body must be cooled immediately to

prevent severe injury and/or death. Signs include red, hot, dry skin; no perspiration; nausea; dizziness and confusion; strong, rapid pulse; and possibly coma. Medical help must be obtained immediately.

Medical attention must be obtained for the more serious symptoms of heat stress. One or more of the following methods are recommended to help reduce the potential for heat stress:

1. Provide plenty of liquids. To replace body fluids (water and electrolytes) lost due to sweating, use a 0.1 percent saltwater solution, more heavily salted foods, or commercial mixes. The commercial mixes may be preferable for those employees on a low-sodium diet.
2. Provide cooling devices to aid natural body ventilation. These devices, however, add weight, and their use should be balanced against worker efficiency.
3. Wear long cotton underwear, which acts as a wick to help absorb moisture and protect the skin from direct contact with heat-absorbing protective clothing.
4. Install mobile showers and/or hose-down facilities to reduce body temperature and cool protective clothing.
5. In extremely hot weather, conduct non-emergency response operations in the early morning or evening.
6. Ensure that adequate shelter is available to protect personnel against sun, heat, or other adverse weather conditions that decrease physical efficiency and increase the probability of accidents.
7. In hot weather, rotate workers wearing protective clothing.
8. Maintain good hygiene frequently changing clothing and showering daily. Clothing should be permitted to dry during rest periods. Workers who notice skin problems should immediately consult medical personnel.

5.5.2 Cold Exposure

Persons working outdoors in temperatures at or below freezing may suffer from cold exposure. During prolonged outdoor periods with inadequate clothing for protection, the effects of cold exposure may occur even at temperatures well above freezing. Cold exposure may cause severe injury due to freezing of exposed body surfaces (frostbite) or profound generalized cooling (hypothermia), possibly resulting in death. Areas of the body which have high surface area-to-volume ratios such as fingers, toes and ears are the most susceptible to frostbite.

Local injury resulting from cold is included in the generic term frostbite. There are several degrees of damage. Frostbite of the extremities can be categorized into:

- **Frost nip or incident frostbite:** characterized by sudden blanching or whitening of skin.
- **Superficial frostbite:** skin has a waxy or white appearance and is firm to the touch, but tissue beneath is resilient.
- **Deep frostbite:** tissues are cold, pale and solid; extremely serious injury.

Systemic hypothermia, or lowering of the core body temperature, is caused by exposure to freezing or rapidly dropping temperatures. Symptoms are usually exhibited in five stages: 1) shivering and loss of coordination; 2) apathy, listlessness, sleepiness and (sometimes) rapid cooling of the body to less than 95ºF (35ºC); 3) unconsciousness, glassy stare, slow pulse and slow respiratory rate; 4) freezing the extremities; and 5) death.

5.6 DECONTAMINATION

BEI will maintain on-site decontamination equipment such as a steam cleaner, potable water, alconox, pressure washer, water reservoir tank, and a wastewater transfer system and receiving tank. Groundwater, soil sampling and drilling equipment will be decontaminated between each boring, well installation, sampling event and prior to mobilization on or off site.

Decontamination of personnel shall be conducted only in the unexpected event that contamination is detected. At a minimum, personnel who have conducted work at the site will wash their hands prior to eating or drinking. BEI personnel shall supervise, assist and document incidents involving personnel contamination.

5.7 EMERGENCY PREPAREDNESS/RESPONSE

All emergency services can be reached by dialing 911 from any facility or mobile telephone. Access to phones and/or radios will be provided to on-site personnel. The Emergency Response Coordinator (ERC) will coordinate all emergency response operations.

Should evacuation from the site become necessary, the evacuation route to the hospital in the Village/Town of Mt. Kisco is shown in Figure 2. Emergency telephone numbers are given below.

Emergency Telephone Numbers

FIRE / POLICE 911

Town/Village of Mt. Kisco Fire Department
Union Hook & Ladder Co. No. 1
Town/Village of Mt. Kisco (914) 241-1100

Westchester County Police Department - (845)382-111
Town/Village of Mt. Kisco Water Department (914) 864-0020
Water & Sewer (914) 864-0021

Northern Westchester Hospital Center
400 East Main Street
Mount Kisco New York - (914) 666-1200

6.0 TRAINING/MEDICAL REQUIREMENTS

6.1 SITE-SPECIFIC HAZARD COMMUNICATION AND ACCESS BRIEFING

Since different training requirements may be needed based on the nature of different tasks to be performed, specific training requirements may be identified. However, generally applicable training requirements are presented here. Visitors not entering any exclusion zone or contamination reduction zone who have very limited potential for exposure to contaminants require:

- Site-specific hazard communication and access briefing.

All project personnel performing hands-on work that could potentially expose them to hazardous substances, safety, or health hazards will meet the following training requirements:

- General Employee Training (GET)
- 40 hour HAZWOPER (SARA/OSHA) training, or equivalent (Note: for certain types of low risk work, 24 hour training is acceptable)
- Current HAZWOPER 8-hour Annual Refresher (as applicable)
- Site-specific hazard communication and access briefing

In addition, the Site Safety and Health Officer requires:

- 8-hour HAZWOPER Supervisor training

Personnel involved in service or maintenance work on energized equipment require:

- Lockout/Tagout training

Prior to beginning work at the project site, all personnel will review this Health and Safety Plan and sign the training acknowledgment form (Appendix C). The site-specific hazard communication and access briefing is documented in the project logbook. If site conditions change, or other hazards are detected, the training and access requirements will be revised accordingly.

6.2 MEDICAL SURVEILLANCE

A medical surveillance program will be conducted in accordance with the requirements of 29 CFR 1910.120 for:

- All employees who are or may be exposed to hazardous substances or health hazards at or above the established permissible exposure limits or, if there is no permissible exposure limit, above the published exposure levels for these substances, without regard to the use of respirators, for 30 days or more a year.

- All employees who wear a respirator for 30 days or more a year or as required by 29 CFR 1910.134.
- All employees who are injured, become ill or develop signs or symptoms due to possible

overexposure involving hazardous substances or health hazards from an emergency response or hazardous waste operation.

- Members of HAZMAT teams.

All BEI employees receive periodic medical examinations. Because of the low potential for exposure to hazardous agents, it is not expected that additional medical surveillance will be required for BEI personnel at the Rose Cleaners' facility. Non-BEI personnel will be required to acknowledge coverage by a medical surveillance program sufficient to satisfy the requirements of 29 CFR 1910.120 (Appendix C).

FIGURES

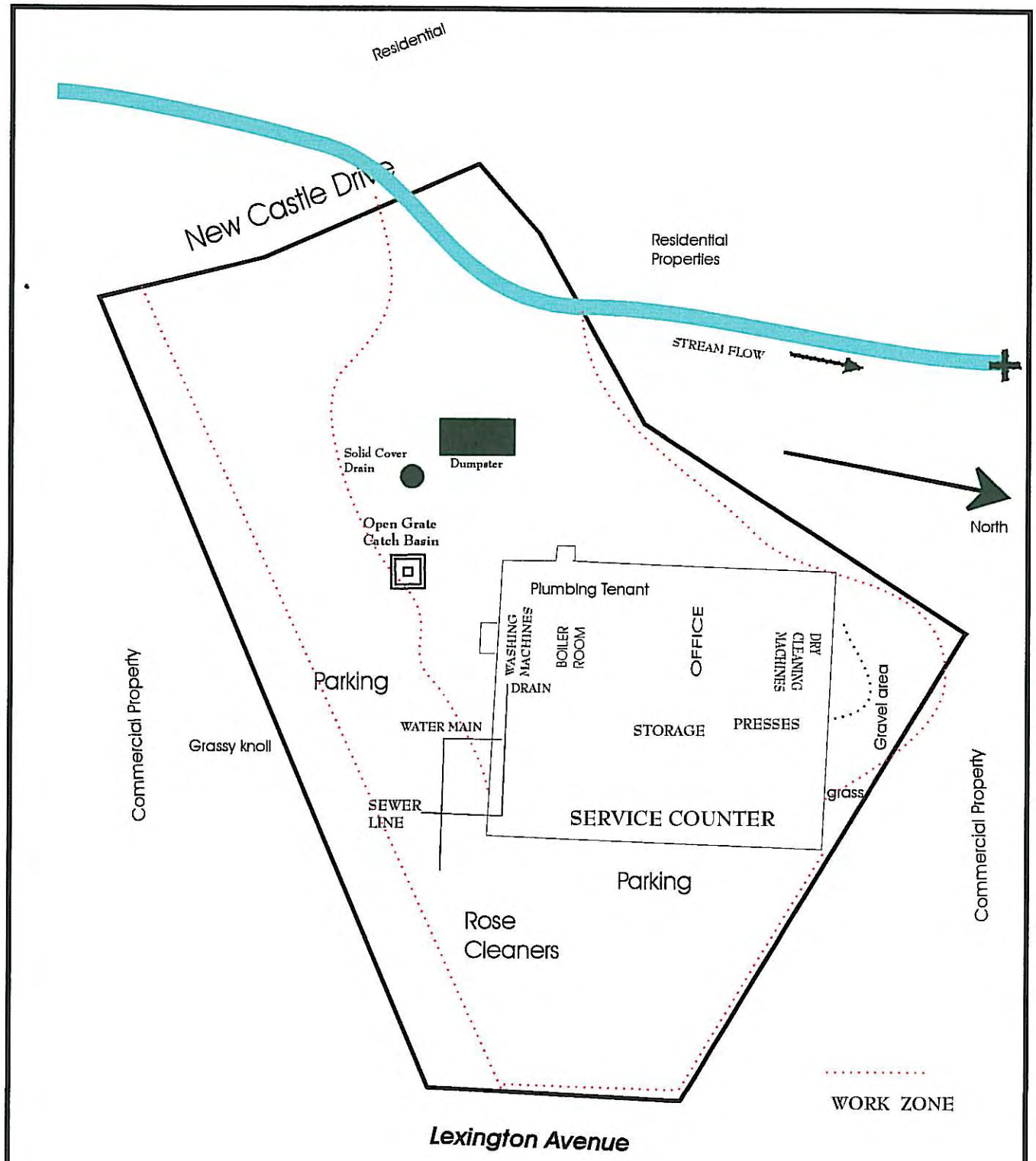


FIGURE 1 - HEALTH AND SAFETY WORK ZONES

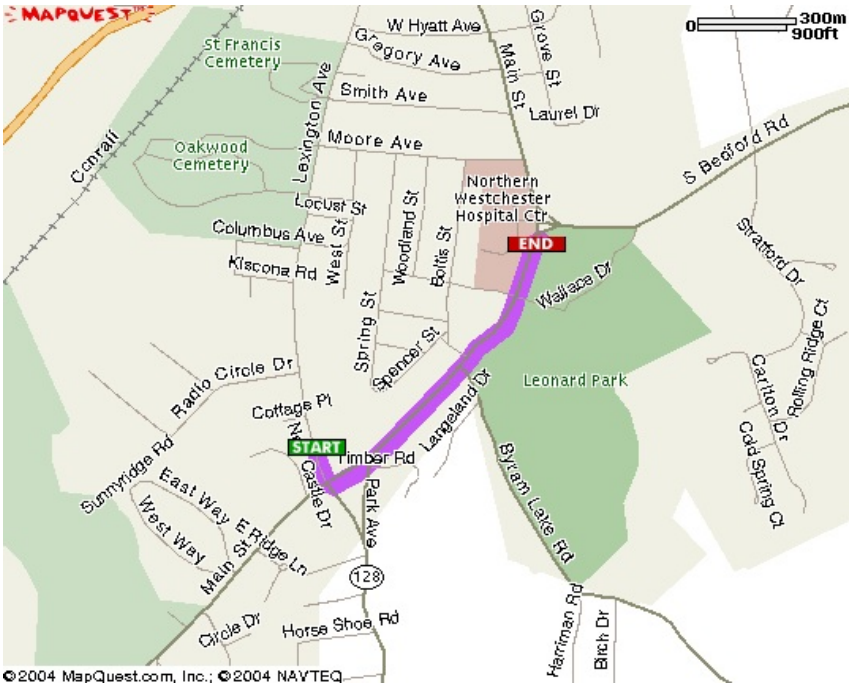


Figure 2 - EMERGENCY ROUTE TO NORTHERN WESTCHESTER HOSPITAL

1:	**: Start out going South on LEXINGTON AVE toward MAIN ST/NY-117/E MAIN ST.**	**<0.10 miles**
2:	**Turn LEFT onto MAIN ST/NY-117/E MAIN ST.**	**0.06 miles**
3:	**End at 400 E MAIN ST MOUNT KISCO NY**	
4:	**NY-32 becomes NY-32 Broadway.**	**0.30 miles**
5:	**Stay straight to go onto, Broadway.**	**0.5 miles**

TOTAL ESTIMATED TIME: 8 minutes

TOTAL DISTANCE: 2.4 miles

Appendix A

HISTORIC SITE DATA

SUMMARY OF PAST INVESTIGATIONS

Records available to Berninger Environmental, Inc. (BEI) indicate that on December 21, 2001, Tyree Brothers Environmental Services, Inc. (IBES) performed a limited subsurface investigation at the Rose Cleaners' facility. Two soil borings were manually drilled at the site with the locations chosen based on the presence of any exhaust piping and/or any location that would have the potential for chemical dumping.

Soil samples were collected at two locations; one directly adjacent to the stoop by the back door, at a depth of 2.5 to 3 feet, and one on the side of the building near the exhaust discharge piping at a depth of 3 to 4 feet. The increment with the highest photoionization detector reading was selected for laboratory analysis. PID readings ranged from 1.1 to 36.7 ppm PID response units. The samples were analyzed for volatile organic compounds via EPA method 8260.

The results of the laboratory analysis were compared to New York State Department of Environmental Conservation (NYSDEC) Determination of Soil Cleanup Objectives and Cleanup Levels, December 20, 2000.Laboratory results indicated that volatile organic compounds were detected in both of the soil samples. All concentrations in SB-I were within NYSDEC acceptable levels; tetrachloroethene was present at a concentration of 591 ug/kg. Sample SB-2 contained a concentration of one (1) compound (tetrachloroethene at 12,400 ug/kg) that exceeded NYSDEC soil guidelines of 1,400 ug/kg.

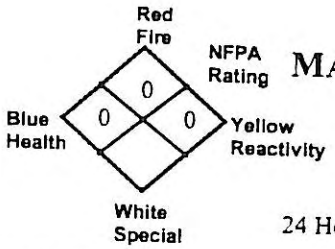
A surface water grab sample was also collected from a downstream location, between the dry cleaners and the adjacent commercial property, during the soil sampling program. This sample was hand delivered under chain of custody documentation to a New York State certified laboratory. The stream was located in back (west) of the dry cleaners. This sample was analyzed for volatile organic compounds via EPA method 8260. The results of the laboratory analysis were compared to the Division of Water Technical and Operational Guidance Series (TOGS) 1.1.1, Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations, April 2000,

Volatile organic compounds were also detected in the surface water sample taken from the stream. The stream sample contained concentrations of volatiles that exceeded NYSDEC surface water standards for two (2) compounds (cis-1,2- dichloroethene at 5.1 *u*g/L and tetrachloroethene at 9.3 *u*g/L). Due to the presence of concentrations of volatiles that exceeded NYSDEC standards for soil and surface water, Spill Number 01-09709 was assigned to this site.

Appendix B

MATERIAL SAFETY DATA SHEETS

Alconox ®



MATERIAL SAFETY DATA SHEET

Alconox, Inc.
30 Glenn Street
White Plains, NY 10603

24 Hour Emergency Number – Chem-Tel (800) 255-3924

I. IDENTIFICATION

Product Name (as appears on label)	ALCONOX
CAS Registry Number:	Not Applicable
Effective Date:	January 1, 2001
Chemical Family:	Anionic Powdered Detergent
Manufacturer Catalog Numbers for sizes	1104, 1125, 1150, 1101, 1103 and 1112

II. HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

There are no hazardous ingredients in ALCONOX as defined by the OSHA Standard and Hazardous Substance List 29 CFR 1910 Subpart Z.

III. PHYSICAL/CHEMICAL CHARACTERISTICS

Boiling Point (F):	Not Applicable
Vapor Pressure (mm Hg):	Not Applicable
Vapor Density (AIR=1):	Not Applicable
Specific Gravity (Water=1):	Not Applicable
Melting Point:	Not Applicable
Evaporation Rate (Butyl Acetate=1):	Not Applicable
Solubility in Water:	Appreciable-Soluble to 10% at ambient conditions
Appearance:	White powder interspersed with cream colored flakes.
pH:	9.5 (1%)

IV. FIRE AND EXPLOSION DATA

Flash Point (Method Used):	None
Flammable Limits:	LEL: No Data UEL: No Data
Extinguishing Media:	Water, dry chemical, CO_2, foam
Special Fire fighting Procedures:	Self-contained positive pressure breathing apparatus and protective clothing should be worn when fighting fires involving chemicals.
Unusual Fire and Explosion Hazards:	None

V. REACTIVITY DATA

Stability:	Stable
Hazardous Polymerization:	Will not occur
Incompatibility (Materials to Avoid):	None
Hazardous Decomposition or Byproducts:	May release CO_2 on burning

1,2-Dichloroethane, 99.8+% (GC) ACROS96087

**** SECTION 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION ****

MSDS Name: 1,2-Dichloroethane, 99.8+% (GC)
Catalog Numbers:
AC113360000, AC113360010, AC113360025, AC113360250, AC113361000
Synonyms:
Ethylene Dichloride; 1,2- Ethylene Dichloride; Glycol Dichloride; Ethane 1,2-Dichloro-.
Company Identification (Europe): Acros Organics N.V.
Janssen Pharmaceuticalaan 3a
2440 Geel, Belgium
Company Identification (USA): Acros Organics
One Reagent Lane
Fairlawn, NJ 07410
For information in North America, call: 800-ACROS-01
For information in Europe, call: 0032(0) 14575211
For emergencies in the US, call CHEMTREC: 800-424-9300
For emergencies in Europe, call: 0032(0) 14575299

**** SECTION 2 - COMPOSITION, INFORMATION ON INGREDIENTS ****

CAS#	Chemical Name	%	EINECS#
107-06-2	1,2-DICHLOROETHANE	>99.8	203-458-1

Hazard Symbols: T F
Risk Phrases: 11 22 36/37/38 45

**** SECTION 3 - HAZARDS IDENTIFICATION ****

EMERGENCY OVERVIEW

Appearance: colourless. Flash Point: 58 deg F.
Warning! Flammable liquid. Causes respiratory tract irritation. May cause digestive tract irritation. Irritant. May be harmful if swallowed. May cause central nervous system depression. May cause liver and kidney damage. Causes eye and skin irritation. May cause cancer based on animal studies. Potential cancer hazard.
Target Organs: Kidneys, central nervous system, liver.

Potential Health Effects

Eye:

Causes eye irritation. Vapors may cause eye irritation. May cause chemical conjunctivitis and corneal damage.

Skin:

Causes skin irritation. May be absorbed through the skin. May cause irritation and dermatitis. May cause cyanosis of the extremities.

Ingestion:

May cause central nervous system depression, kidney damage, and liver damage. May cause gastrointestinal irritation with nausea, vomiting and diarrhea. May cause liver and kidney damage. May cause effects similar to those for inhalation exposure. May be harmful if swallowed.

Inhalation:

Inhalation of high concentrations may cause central nervous system effects characterized by headache, dizziness, unconsciousness and coma. Causes respiratory tract irritation. May cause liver and kidney damage. Aspiration may lead to pulmonary edema. Vapors may cause

dizziness or suffocation. Can produce delayed pulmonary edema. May cause burning sensation in the chest.

Chronic:

Possible cancer hazard based on tests with laboratory animals. Prolonged or repeated skin contact may cause dermatitis. Prolonged or repeated eye contact may cause conjunctivitis. May cause liver and kidney damage. Effects may be delayed.

**** SECTION 4 - FIRST AID MEASURES ****

Eyes:

Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical aid.

Skin:

Get medical aid. Flush skin with plenty of soap and water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse.

Ingestion:

Never give anything by mouth to an unconscious person. Get medical aid. Do NOT induce vomiting. If conscious and alert, rinse mouth and drink 2-4 cupfuls of milk or water.

Inhalation:

Remove from exposure to fresh air immediately. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical aid. DO NOT use mouth-to-mouth respiration.

Notes to Physician:

Treat symptomatically and supportively.

**** SECTION 5 - FIRE FIGHTING MEASURES ****

General Information:

As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. Vapors may form an explosive mixture with air. Vapors can travel to a source of ignition and flash back. During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion. Will burn if involved in a fire. Use water spray to keep fire-exposed containers cool. Containers may explode in the heat of a fire. Flammable Liquid. Vapors may be heavier than air. They can spread along the ground and collect in low or confined areas. May polymerize explosively when involved in a fire.

Extinguishing Media:

For small fires, use dry chemical, carbon dioxide, water spray or alcohol-resistant foam. For large fires, use water spray, fog, or alcohol-resistant foam. Use water spray to cool fire-exposed containers. Water may be ineffective. Do NOT use straight streams of water.

**** SECTION 6 - ACCIDENTAL RELEASE MEASURES ****

General Information: Use proper personal protective equipment as indicated in Section 8.

Spills/Leaks:

Absorb spill with inert material, (e.g., dry sand or earth), then place into a chemical waste container. Avoid runoff into storm sewers and ditches which lead to waterways. Clean up spills immediately, observing precautions in the Protective Equipment section. Remove all sources of ignition. Use a spark-proof tool. Provide ventilation. A vapor suppressing foam may be used to reduce vapors.

**** SECTION 7 - HANDLING and STORAGE ****

Handling:

Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Ground and bond containers when transferring material. Use spark-proof tools and explosion proof equipment. Avoid contact with eyes, skin, and clothing. Empty containers retain product residue, (liquid and/or vapor), and can be dangerous. Keep

container tightly closed. Avoid contact with heat, sparks and flame. Avoid ingestion and inhalation. Use with adequate ventilation. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose empty containers to heat, sparks or open flames.

Storage:

Keep away from heat, sparks, and flame. Keep away from sources of ignition. Store in a tightly closed container. Keep from contact with oxidizing materials. Store in a cool, dry, well-ventilated area away from incompatible substances. Flammables-area.

**** SECTION 8 - EXPOSURE CONTROLS, PERSONAL PROTECTION ****

Engineering Controls:

Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use adequate general or local explosion-proof ventilation to keep airborne levels to acceptable levels.

Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
1,2-DICHLOROETHANE	10 ppm	1 ppm TWA; 4 mg/m3 TWA; NIOSH Potential Occupational Carcinogen - see Appendix A ; see Appendix C (Chloroethanes) for supplementary exposure limits Potential NIOSH carcinogen.	50 ppm TWA; C 100 ppm; C 100 ppm

OSHA Vacated PELs:

1,2-DICHLOROETHANE:

1 ppm TWA; 4 mg/m3 TWA

Personal Protective Equipment

Eyes:

Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

Skin:

Wear appropriate protective gloves to prevent skin exposure.

Clothing:

Wear appropriate protective clothing to prevent skin exposure.

Respirators:

A respiratory protection program that meets OSHA's 29 CFR §1910.134 and ANSI Z88.2 requirements or European Standard EN 149 must be followed whenever workplace conditions warrant a respirator's use.

**** SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES ****

Physical State:	Liquid
Appearance:	colourless
Odor:	chloroform-like
pH:	Not available.
Vapor Pressure:	66 mm Hg @ 20 C
Vapor Density:	3.5 (Air=1)
Evaporation Rate:	0.3 (Butyl acetate=1)
Viscosity:	Not available.
Boiling Point:	181 deg F

Freezing/Melting Point:	-31.9 deg F
Autoignition Temperature:	775 deg F (412.78 deg C)
Flash Point:	58 deg F (14.44 deg C)
NFPA Rating:	(est.) Health: 2; Flammability: 3; Reactivity: 0
Explosion Limits, Lower:	6.2
Upper:	15.9
Decomposition Temperature:	Not available.
Solubility:	Silghtly soluble in water
Specific Gravity/Density:	1.26 (Water=1)
Molecular Formula:	C2H4Cl2
Molecular Weight:	98.934

**** SECTION 10 - STABILITY AND REACTIVITY ****

Chemical Stability:
Stable at room temperature in closed containers under normal storage and handling conditions.
Conditions to Avoid:
Incompatible materials, ignition sources, excess heat, electrical sparks.
Incompatibilities with Other Materials:
Aluminum, bases, alkali metals, ketones, organic peroxides, nitric acid, strong oxidizing agents, strong reducing agents, liquid ammonia.
Hazardous Decomposition Products:
Hydrogen chloride, carbon monoxide, irritating and toxic fumes and gases, carbon dioxide.
Hazardous Polymerization: Has not been reported.

**** SECTION 11 - TOXICOLOGICAL INFORMATION ****

RTECS#:
CAS# 107-06-2: KI0525000
LD50/LC50:
CAS# 107-06-2: Inhalation, rat: LC50 =1000 ppm/7H; Oral, mouse: LD50 = 413 mg/kg; Oral, rabbit: LD50 = 860 mg/kg; Oral, rat: LD50 = 670 mg/kg; Skin, rabbit: LD50 = 2800 mg/kg.
Carcinogenicity:
1,2-DICHLOROETHANE -
ACGIH: A4 - Not Classifiable as a Human Carcinogen
California: carcinogen; initial date 10/1/87
NIOSH: occupational carcinogen
NTP: Suspect carcinogen
OSHA: Possible Select carcinogen
IARC: Group 2B carcinogen
Epidemiology:
IARC Group 2B: Proven animal carcinogenic substance of potential relevance to humans. IARC Group 2B: No data available on human carcinogenicity, however sufficient evidence of carcinogenicity in animals.
Teratogenicity:
May cause decreased fertility and other adverse effects in pregnant female rats and the progeny of the first generation, but not of the second, by giving them repeated 4-hr/day exposures to 57 mg/m3. Death, Ihl-rat, TCLo=20100 ug/m3/1H (female 7-14D post); Stunted fetus, Oral-rat, TDLo=1260 mg/kg (6-15D preg) Developmental abnormalities: Craniofacial, Ihl-mouse, TCLo=100 ppm/7H (female 6-15D post); Musculoskeletal, Oral-rat, TDLo=1260 mg/kg (6-15D preg)
Reproductive Effects:
No information found.
Neurotoxicity:
No information found.
Mutagenicity:
No information found.
Other Studies:
See actual entry in RTECS for complete information.

**** SECTION 12 - ECOLOGICAL INFORMATION ****

Ecotoxicity:

The following statement(s) is(are) made in order to comply with the California Safe Drinking Water Act:
WARNING: This product contains 1,2-DICHLOROETHANE, a chemical known to the state of California to cause cancer.
California No Significant Risk Level:
CAS# 107-06-2: no significant risk level = 10 ug/day

European/International Regulations

European Labeling in Accordance with EC Directives

Hazard Symbols: T F

Risk Phrases:

R 11 Highly flammable.
R 22 Harmful if swallowed.
R 36/37/38 Irritating to eyes, respiratory system and skin.
R 45 May cause cancer.

Safety Phrases:

S 53 Avoid exposure - obtain special instructions before use.
S 9 Keep container in a well-ventilated place.
S 16 Keep away from sources of ignition - No smoking.
S 33 Take precautionary measures against static discharges.
S 45 In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

WGK (Water Danger/Protection)
CAS# 107-06-2: 3

United Kingdom Occupational Exposure Limits

Canada

CAS# 107-06-2 is listed on Canada's DSL/NDSL List.
This product has a WHMIS classification of B2, D2B, D2A.
CAS# 107-06-2 is not listed on Canada's Ingredient Disclosure List.

Exposure Limits

CAS# 107-06-2: OEL-ARAB Republic of Egypt:TWA 5 ppm (2 mg/m3)
OEL-AUSTRALIA:TWA 10 ppm (40 mg/m3)
OEL-AUSTRIA:TWA 20 ppm (80 mg/m3)
OEL-BELGIUM:TWA 10 ppm (40 mg/m3)
OEL-DENMARK:TWA 1 ppm (4 mg/m3);Skin
OEL-FINLAND:TWA 10 ppm (40 mg/m3);STEL 20 ppm (80 mg/m3);CAR
OEL-FRANCE:TWA 10 ppm (40 mg/m3)
OEL-GERMANY;Carcinogen
OEL-HUNGARY:STEL 4 mg/m3;Carcinogen
OEL-JAPAN:TWA 10 ppm (40 mg/m3)
OEL-THE NETHERLANDS:TWA 50 ppm (200 mg/m3)
OEL-THE PHILIPPINES:TWA 50 ppm (200 mg/m3)
OEL-RUSSIA:TWA 10 ppm
OEL-SWEDEN:TWA 1 ppm (4 mg/m3);STEL 5 ppm (20 mg/m3);Skin;CAR
OEL-SWITZERLAND:TWA 10 ppm (40 mg/m3);STEL 20 ppm (80 mg/m3)
OEL-TURKEY:TWA 50 ppm (200 mg/m3)
OEL-UNITED KINGDOM:TWA 10 ppm (40 mg/m3);STEL 15 ppm (60 mg/m3)
OEL IN BULGARIA, COLOMBIA, JORDAN, KOREA check ACGIH TLV
OEL IN NEW ZEALAND, SINGAPORE, VIETNAM check ACGI TLV

**** SECTION 16 - ADDITIONAL INFORMATION ****

MSDS Creation Date: 9/02/1997 Revision #4 Date: 8/02/2000

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no way shall the company be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if the company has been advised of the possibility of such damages.

Seton Resource Center

Allow access to non-virtual folders: 0

Flammables-area.

**** SECTION 8 - EXPOSURE CONTROLS, PERSONAL PROTECTION ****

Engineering Controls:

Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use adequate ventilation to keep airborne concentrations low. Use adequate general or local explosion-proof ventilation to keep airborne levels to acceptable levels.

Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
1,1-Dichloroethane	100 ppm	100 ppm TWA; 400 mg/m3 TWA; see Appendix C (Chloroethanes) for supplementary exposure limits 3000 ppm IDLH	100 ppm TWA; 400 mg/m3 TWA

OSHA Vacated PELs:

1,1-Dichloroethane:
100 ppm TWA; 400 mg/m3 TWA

Personal Protective Equipment

Eyes:

Wear chemical goggles. Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

Skin:

Wear appropriate protective gloves to prevent skin exposure.

Clothing:

Wear appropriate protective clothing to prevent skin exposure.

Respirators:

A respiratory protection program that meets OSHA's 29 CFR §1910.134 and ANSI Z88.2 requirements or European Standard EN 149 must be followed whenever workplace conditions warrant a respirator's use.

**** SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES ****

Physical State:	Liquid
Appearance:	clear colorless to very faint yellow
Odor:	None reported.
pH:	Not available.
Vapor Pressure:	244 mbar @ 20 C
Vapor Density:	3.41
Evaporation Rate:	Not available.
Viscosity:	Not available.
Boiling Point:	57 deg C @ 760.00mm Hg
Freezing/Melting Point:	-97 deg C
Autoignition Temperature:	660 deg C (1,220.00 deg F)
Flash Point:	-10 deg C (14.00 deg F)
NFPA Rating:	(est.) Health: 2; Flammability: 3; Reactivity: 0
Explosion Limits, Lower:	.16 vol %
Upper:	.06 vol %
Decomposition Temperature:	
Solubility:	0.5g/100ml
Specific Gravity/Density:	1.1770g/cm3
Molecular Formula:	C2H4Cl2
Molecular Weight:	98.96

**** SECTION 10 - STABILITY AND REACTIVITY ****

Chemical Stability:
Stable under normal temperatures and pressures.
Conditions to Avoid:
Incompatible materials, ignition sources, excess heat, strong oxidants.
Incompatibilities with Other Materials:
Oxidizing agents.
Hazardous Decomposition Products:
Hydrogen chloride, phosgene, carbon monoxide, irritating and toxic fumes and gases, carbon dioxide.
Hazardous Polymerization: Has not been reported.

**** SECTION 11 - TOXICOLOGICAL INFORMATION ****

RTECS#:
CAS# 75-34-3: KI0175000
LD50/LC50:
CAS# 75-34-3: Inhalation, rat: LC50 =13000 ppm/4H; Oral, rat: LD50 = 725 mg/kg.
Carcinogenicity:
1,1-Dichloroethane -
ACGIH: A4 - Not Classifiable as a Human Carcinogen
California: carcinogen; initial date 1/1/90
Epidemiology:
No information available.
Teratogenicity:
No information available.
Reproductive Effects:
No information available.
Neurotoxicity:
No information available.
Mutagenicity:
No information available.
Other Studies:
See actual entry in RTECS for complete information.

**** SECTION 12 - ECOLOGICAL INFORMATION ****

**** SECTION 13 - DISPOSAL CONSIDERATIONS ****

Chemical waste generators must determine whether a discarded chemical is classif as a hazardous waste.
US EPA guidelines for the classification determination are listed in 40 CFR Part Additionally, waste generators must consult state and local hazardous waste regu ensure complete and accurate classification.
RCRA P-Series: None listed.
RCRA U-Series: CAS# 75-34-3: was a number U076.

**** SECTION 14 - TRANSPORT INFORMATION ****

US DOT
Shipping Name: 1,1-DICHLOROETHANE
Hazard Class: 3
UN Number: UN2362
Packing Group: II
Canadian TDG
Shipping Name: 1,1-DICHLOROETHANE
Hazard Class: 3
UN Number: UN2362
Other Information: FLASHPOINT -10 C

**** SECTION 15 - REGULATORY INFORMATION ****

US FEDERAL
TSCA

CAS# 75-34-3 is listed on the TSCA inventory.
Health & Safety Reporting List
CAS# 75-34-3: Effective Date: June 1, 1987; Sunset Date: June 1, 1997
Chemical Test Rules
None of the chemicals in this product are under a Chemical Test Rule.
Section 12b
CAS# 75-34-3: 4/12b
TSCA Significant New Use Rule
None of the chemicals in this material have a SNUR under TSCA.

SARA
Section 302 (RQ)
CAS# 75-34-3: final RQ = 1000 pounds (454 kg)
Section 302 (TPQ)
None of the chemicals in this product have a TPQ.
Section 313
This material contains 1,1-Dichloroethane (CAS# 75-34-3, 99%),which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR Part 372.

Clean Air Act:
CAS# 75-34-3 is listed as a hazardous air pollutant (HAP).
This material does not contain any Class 1 Ozone depletors.
This material does not contain any Class 2 Ozone depletors.

Clean Water Act:
None of the chemicals in this product are listed as Hazardous Substances under the CWA.
CAS# 75-34-3 is listed as a Priority Pollutant under the Clean Water Act.
None of the chemicals in this product are listed as Toxic Pollutants under the CWA.

OSHA:
None of the chemicals in this product are considered highly hazardous by OSHA.

STATE
1,1-Dichloroethane can be found on the following state right to know lists: California, New Jersey, Florida, Pennsylvania, Minnesota, Massachusetts.
The following statement(s) is(are) made in order to comply with the California Safe Drinking Water Act:
WARNING: This product contains 1,1-Dichloroethane, a chemical known to the state of California to cause cancer.
California No Significant Risk Level:
CAS# 75-34-3: no significant risk level = 100 ug/day

European/International Regulations
European Labeling in Accordance with EC Directives
Hazard Symbols: XN F
Risk Phrases:
R 11 Highly flammable.
R 22 Harmful if swallowed.
R 36/37 Irritating to eyes and respiratory system.
R 52/53 Harmful to aquatic organisms; may cause long-term adverse effects in the aquatic environment.
Safety Phrases:
S 9 Keep container in a well-ventilated place.
S 16 Keep away from sources of ignition - No smoking.
S 23 Do not inhale gas/fumes/vapour/spray.
S 28A After contact with skin, wash immediately with plenty of water.
S 33 Take precautionary measures against static discharges.
S 37 Wear suitable gloves.
S 45 In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).
S 61 Avoid release to the environment. Refer to special instructions/Safety data sheets.

WGK (Water Danger/Protection)
CAS# 75-34-3: 3
United Kingdom Occupational Exposure Limits
CAS# 75-34-3: OES-United Kingdom, TWA 200 ppm TWA; 823 mg/m3 TWA

CAS# 75-34-3: OES-United Kingdom, STEL 400 ppm STEL; 1650 mg/m3 STEL
Canada

CAS# 75-34-3 is listed on Canada's DSL/NDSL List.
This product has a WHMIS classification of B2, D2B.
CAS# 75-34-3 is not listed on Canada's Ingredient Disclosure List.
Exposure Limits

CAS# 75-34-3: OEL-ARAB Republic of Egypt
OEL-AUSTRALIA:TWA 200 ppm (810 mg/m3);STEL 250 pp (1010 mg/m3)
OEL-AUSTRIA:TWA 100 ppm (400 mg/m3)
OEL-BELGIUM:TWA 200 ppm (810 mg/m3);STEL 250 ppm (1010 mg/m3)
OEL-DENMARK:TWA 100 ppm (400 mg/m3)
OEL-FINLAND:TWA 100 ppm (400 mg/m3);STEL 250 ppm (1000 mg/m3)
OEL-FRANCE:TWA 200 ppm (810 mg/m3)
OEL-GERMANY:TWA 100 ppm (400 mg/m3)
OEL-JAPAN:TWA 100 ppm (400 mg/m3)
OEL-THE NETHERLANDS:TWA 200 ppm (820 mg/m3)
OEL-THE PHILIPPINES:TWA 100 ppm (400 mg/m3)
OEL-RUSSIA:TWA 100 ppm
OEL-SWITZERLAND:TWA 100 ppm (400 mg/m3);STEL 200 ppm (800 mg/m3)
OEL-THAILAND:TWA 50 ppm;STEL 100 ppm
OEL-TURKEY:TWA 100 ppm (400 mg/m3)
OEL-UNITED KINGDOM:TWA 200 ppm (810 mg/m3);STEL 400 ppm
OEL IN BULGARIA, COLOMBIA, JORDAN, KOREA check ACGIH TLV
OEL IN NEW ZEALAND, SINGAPORE, VIETNAM check ACGI TLV

**** SECTION 16 - ADDITIONAL INFORMATION ****

MSDS Creation Date: 9/02/1997 Revision #5 Date: 8/02/2000

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no way shall the company be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if the company has been advised of the possibility of such damages.

MSDS Material Safety Data Sheet

From: Mallinckrodt Baker, Inc.
222 Red School Lane
Phillipsburg, NJ 08865

Mallinckrodt CHEMICALS J.T.Baker

24 Hour Emergency Telephone: 908-859-2151
CHEMTREC: 1-800-424-9300

National Response in Canada
CANUTEC: 613-996-6666

Outside U.S. and Canada
Chemtrec: 703-527-3887

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

TRICHLOROETHYLENE

MSDS Number: T4940 — *Effective Date: 09/14/00*

1. Product Identification

Synonyms: Trichloroethene; TCE; acetylene trichloride; Ethinyl trichloride
CAS No.: 79-01-6
Molecular Weight: 131.39
Chemical Formula: C2HCl3
Product Codes:
J.T. Baker: 5376, 9454, 9458, 9464, 9473, 9474
Mallinckrodt: 8598, 8600, 8633

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Trichloroethylene	79-01-6	100%	Yes

3. Hazards Identification

Emergency Overview

WARNING! HARMFUL IF SWALLOWED OR INHALED. AFFECTS HEART, CENTRAL NERVOUS SYSTEM, LIVER AND KIDNEYS. CAUSES SEVERE SKIN

IRRITATION. CAUSES IRRITATION TO EYES AND RESPIRATORY TRACT. SUSPECT CANCER HAZARD. MAY CAUSE CANCER. Risk of cancer depends on level and duration of exposure.

J.T. Baker SAF-T-DATA(tm) Ratings (Provided here for your convenience)

Health Rating: 3 - Severe (Cancer Causing)
Flammability Rating: 1 - Slight
Reactivity Rating: 1 - Slight
Contact Rating: 2 - Moderate
Lab Protective Equip: GOGGLES & SHIELD; LAB COAT & APRON; VENT HOOD; PROPER GLOVES
Storage Color Code: Blue (Health)

Potential Health Effects

Inhalation:
Vapors can irritate the respiratory tract. Causes depression of the central nervous system with symptoms of visual disturbances and mental confusion, incoordination, headache, nausea, euphoria, and dizziness. Inhalation of high concentrations could cause unconsciousness, heart effects, liver effects, kidney effects, and death.

Ingestion:
Cases irritation to gastrointestinal tract. May also cause effects similar to inhalation. May cause coughing, abdominal pain, diarrhea, dizziness, pulmonary edema, unconsciousness. Kidney failure can result in severe cases. Estimated fatal dose is 3-5 ml/kg.

Skin Contact:
Cause irritation, redness and pain. Can cause blistering. Continued skin contact has a defatting action and can produce rough, dry, red skin resulting in secondary infection.

Eye Contact:
Vapors may cause severe irritation with redness and pain. Splashes may cause eye damage.

Chronic Exposure:
Chronic exposures may cause liver, kidney, central nervous system, and peripheral nervous system effects. Workers chronically exposed may exhibit central nervous system depression, intolerance to alcohol, and increased cardiac output. This material is linked to mutagenic effects in humans. This material is also a suspect carcinogen.

Aggravation of Pre-existing Conditions:
Persons with pre-existing skin disorders, cardiovascular disorders, impaired liver or kidney or respiratory function, or central or peripheral nervous system disorders may be more susceptible to the effects of the substance.

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4. First Aid Measures

Inhalation:
Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician.
Ingestion:
Induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person. Call a physician.
Skin Contact:
Immediately flush skin with plenty of soap and water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention. Wash clothing before reuse. Thoroughly clean shoes before reuse.
Eye Contact:
Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

Note to Physician:
Do not administer adrenaline or epinephrine to a victim of chlorinated solvent poisoning.

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5. Fire Fighting Measures

Fire:
Autoignition temperature: 420C (788F)
Flammable limits in air % by volume:
lel: 8; uel: 12.5
Explosion:
A strong ignition source, e. g., a welding torch, can produce ignition. Sealed containers may rupture when heated.
Fire Extinguishing Media:
Use water spray to keep fire exposed containers cool. If substance does ignite, use CO2, dry chemical or foam.
Special Information:
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode. Combustion by-products include phosgene and hydrogen chloride gases. Structural firefighters' clothing provides only limited protection to the combustion products of this material.

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6. Accidental Release Measures

Ventilate area of leak or spill. Remove all sources of ignition. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Use non-sparking tools and equipment. Collect liquid in an appropriate container or absorb with an inert material (e. g., vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer! US Regulations (CERCLA) require reporting

spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

7. Handling and Storage

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect against physical damage. Isolate from any source of heat or ignition. Isolate from incompatible substances. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product.

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
Trichloroethylene:
-OSHA Permissible Exposure Limit (PEL):
100 ppm (TWA), 200 ppm (Ceiling),
300 ppm/5min/2hr (Max)

-ACGIH Threshold Limit Value (TLV):
50 ppm (TWA) 100 ppm (STEL);
listed as A5, not suspected as a human carcinogen.

Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.

Personal Respirators (NIOSH Approved):
If the exposure limit is exceeded and engineering controls are not feasible, wear a supplied air, full-facepiece respirator, airlined hood, or full-facepiece self-contained breathing apparatus. Breathing air quality must meet the requirements of the OSHA respiratory protection standard (29CFR1910.134). This substance has poor warning properties. Where respirators are required, you must have a written program covering the basic requirements in the OSHA respirator standard. These include training, fit testing, medical approval, cleaning, maintenance, cartridge change schedules, etc. See 29CFR1910.134 for details.

Skin Protection:
Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact. Neoprene is a recommended material for personal protective equipment.

Eye Protection:
Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

9. Physical and Chemical Properties

Appearance:
Clear, colorless liquid.
Odor:
Chloroform-like odor.
Solubility:
Practically insoluble in water. Readily miscible in organic solvents.
Specific Gravity:
1.47 @ 20C/4C
pH:
No information found.
% Volatiles by volume @ 21C (70F):
100
Boiling Point:
87C (189F)
Melting Point:
-73C (-99F)
Vapor Density (Air=1):
4.5
Vapor Pressure (mm Hg):
57.8 @ 20C (68F)
Evaporation Rate (BuAc=1):
No information found.

---

10. Stability and Reactivity

Stability:
Stable under ordinary conditions of use and storage. Will slowly decompose to hydrochloric acid when exposed to light and moisture.
Hazardous Decomposition Products:
May produce carbon monoxide, carbon dioxide, hydrogen chloride and phosgene when heated to decomposition.
Hazardous Polymerization:
Will not occur.
Incompatibilities:
Strong caustics and alkalis, strong oxidizers, chemically active metals, such as barium, lithium, sodium, magnesium, titanium and beryllium, liquid oxygen.
Conditions to Avoid:
Heat, flame, ignition sources, light, moisture, incompatibles

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11. Toxicological Information

Toxicological Data:
Trichloroethylene: Oral rat LD50: 5650 mg/kg; investigated as a tumorigen, mutagen, reproductive effector.
Reproductive Toxicity:
This material has been linked to mutagenic effects in humans.

--------\Cancer Lists\----------

Ingredient	---NTP Carcinogen--- Known	Anticipated	IARC Category
Trichloroethylene (79-01-6)	No	Yes	2A

12. Ecological Information

Environmental Fate:
When released into the soil, this material may leach into groundwater. When released into the soil, this material is expected to quickly evaporate. When released to water, this material is expected to quickly evaporate. This material has an experimentally-determined bioconcentration factor (BCF) of less than 100. This material is not expected to significantly bioaccumulate. When released into the air, this material may be moderately degraded by reaction with photochemically produced hydroxyl radicals. When released into the air, this material is expected to have a half-life between 1 and 10 days.
Environmental Toxicity:
The LC50/96-hour values for fish are between 10 and 100 mg/l. This material is expected to be slightly toxic to aquatic life.

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be handled as hazardous waste and sent to a RCRA approved incinerator or disposed in a RCRA approved waste facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

14. Transport Information

Domestic (Land, D.O.T.)

Proper Shipping Name: TRICHLOROETHYLENE
Hazard Class: 6.1
UN/NA: UN1710

Packing Group: III
Information reported for product/size: 5GL

International (Water, I.M.O.)

Proper Shipping Name: TRICHLOROETHYLENE
Hazard Class: 6.1
UN/NA: UN1710
Packing Group: III
Information reported for product/size: 5GL

International (Air, I.C.A.O.)

Proper Shipping Name: TRICHLOROETHYLENE
Hazard Class: 6.1
UN/NA: UN1710
Packing Group: III
Information reported for product/size: 5GL

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15. Regulatory Information

--------\Chemical Inventory Status - Part 1\--------

Ingredient	TSCA	EC	Japan	Australia
Trichloroethylene (79-01-6)	Yes	Yes	Yes	Yes

--------\Chemical Inventory Status - Part 2\--------

Ingredient	Korea	--Canada-- DSL	NDSL	Phil.
Trichloroethylene (79-01-6)	Yes	Yes	No	Yes

--------\Federal, State & International Regulations - Part 1\--------

Ingredient	-SARA 302- RQ	TPQ	------SARA 313------ List	Chemical Catg.
Trichloroethylene (79-01-6)	No	No	Yes	No

--------\Federal, State & International Regulations - Part 2\--------

Ingredient	CERCLA	-RCRA- 261.33	-TSCA- 8(d)
Trichloroethylene (79-01-6)	100	U228	No

Chemical Weapons Convention: No TSCA 12(b): No CDTA: No
SARA 311/312: Acute: Yes Chronic: Yes Fire: No Pressure: No
Reactivity: No (Pure / Liquid)

WARNING:

THIS PRODUCT CONTAINS A CHEMICAL(S) KNOWN TO THE STATE OF CALIFORNIA TO CAUSE CANCER.

Australian Hazchem Code: No information found.
Poison Schedule: S6
WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

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16. Other Information

NFPA Ratings: Health: **2** Flammability: **1** Reactivity: **0**
Label Hazard Warning:
WARNING! HARMFUL IF SWALLOWED OR INHALED. AFFECTS HEART, CENTRAL NERVOUS SYSTEM, LIVER AND KIDNEYS. CAUSES SEVERE SKIN IRRITATION. CAUSES IRRITATION TO EYES AND RESPIRATORY TRACT. SUSPECT CANCER HAZARD. MAY CAUSE CANCER. Risk of cancer depends on level and duration of exposure.
Label Precautions:
Do not get in eyes, on skin, or on clothing.
Do not breathe vapor.
Keep container closed.
Use only with adequate ventilation.
Wash thoroughly after handling.
Keep away from heat and flame.
Label First Aid:
If swallowed, induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes. Remove contaminated clothing and shoes. Wash clothing before reuse. In all cases call a physician. Note to physician: Do not administer adrenaline or epinephrine to a victim of chlorinated solvent poisoning.
Product Use:
Laboratory Reagent.
Revision Information:
MSDS Section(s) changed since last revision of document include: 8, 11.
Disclaimer:
****

Mallinckrodt Baker, Inc. provides the information contained herein in good faith but makes no representation as to its comprehensiveness or accuracy. This document is intended only as a guide to the appropriate precautionary handling of the material by a properly trained person using this product. Individuals receiving the information must exercise their independent judgment in determining its appropriateness for a particular purpose. MALLINCKRODT BAKER, INC. MAKES NO REPRESENTATIONS OR WARRANTIES, EITHER EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION ANY WARRANTIES OF MERCHANTABILITY, FITNESS FOR A

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Prepared by: Strategic Services Division
Phone Number: (314) 539-1600 (U.S.A.)

MSDS Number: A2052 • • • • • *Effective Date: 02/18/03* • • • • • *Supercedes: 02/21/00*

MSDS Material Safety Data Sheet

From Mallinckrodt Baker, Inc.
222 Red School Lane
Phillipsburg, NJ 08865

J.T.Baker

24 Hour Emergency Telephone: 908-859-2151
CHEMTREC: 1-800-424-9300
National Response in Canada
CANUTEC: 613-996-6666
Outside U.S. And Canada
Chemtrec: 703-527-3887

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

ALCONOX®

1. Product Identification

Synonyms: Proprietary blend of sodium linear alkylaryl sulfonate, alcohol sulfate, phosphates, and carbonates.
CAS No.: Not applicable.
Molecular Weight: Not applicable to mixtures.
Chemical Formula: Not applicable to mixtures.
Product Codes: A461

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Alconox® proprietary detergent mixture	N/A	90 - 100%	Yes

3. Hazards Identification

Emergency Overview

CAUTION! MAY BE HARMFUL IF SWALLOWED OR INHALED. MAY CAUSE IRRITATION TO EYES AND RESPIRATORY TRACT.

J.T. Baker SAF-T-DATA(tm) Ratings (Provided here for your convenience)

Health Rating: 1 - Slight
Flammability Rating: 0 - None
Reactivity Rating: 1 - Slight
Contact Rating: 2 - Moderate
Lab Protective Equip: GOGGLES; LAB COAT
Storage Color Code: Orange (General Storage)

Potential Health Effects

Inhalation:
May cause irritation to the respiratory tract. Symptoms may include coughing and shortness of breath.
Ingestion:
May cause irritation to the gastrointestinal tract. Symptoms may include nausea, vomiting and diarrhea.
Skin Contact:
No adverse effects expected.
Eye Contact:
May cause irritation, redness and pain.
Chronic Exposure:
No information found.
Aggravation of Pre-existing Conditions:
No information found.

VI. HEALTH HAZARD DATA

Route(s) of Entry:	Inhalation? Yes Skin? No Ingestion? Yes
Health Hazards (Acute and Chronic):	Inhalation of powder may prove locally irritating to mucous membranes. Ingestion may cause discomfort and/or diarrhea. Eye contact may prove irritating.
Carcinogenicity:	NTP? No IARC Monographs? No OSHA Regulated? No
Signs and Symptoms of Exposure:	Exposure may irritate mucous membranes. May cause sneezing.
Medical Conditions Generally Aggravated by Exposure:	Not established. Unnecessary exposure to this product or any industrial chemical should be avoided. Respiratory conditions may be aggravated by powder.
Emergency and First Aid Procedures:	Eyes: Immediately flush eyes with water for at least 15 minutes. Call a physician. Skin: Flush with plenty of water. Ingestion: Drink large quantities of water or milk. Do not induce vomiting. If vomiting occurs administer fluids. See a physician for discomfort.

VII. PRECAUTIONS FOR SAFE HANDLING AND USE

Steps to be Taken if Material is Released or Spilled:	Material foams profusely. Recover as much as possible and flush remainder to sewer. Material is biodegradable.
Waste Disposal Method:	Small quantities may be disposed of in sewer. Large quantities should be disposed of in accordance with local ordinances for detergent products.
Precautions to be Taken in Storing and Handling:	Material should be stored in a dry area to prevent caking.
Other Precautions:	No special requirements other than the good industrial hygiene and safety practices employed with any industrial chemical.

VIII. CONTROL MEASURES

Respiratory Protection (Specify Type):	Dust mask - Recommended
Ventilation:	Local Exhaust-Normal Special-Not Required Mechanical-Not Required Other-Not Required
Protective Gloves:	Impervious gloves are useful but not required.
Eye Protection:	Goggles are recommended when handling solutions.
Other Protective Clothing or Equipment:	None
Work/Hygienic Practices:	No special practices required

VI. HEALTH HAZARD DATA

Route(s) of Entry:	Inhalation? Yes Skin? No Ingestion? Yes
Health Hazards (Acute and Chronic):	Inhalation of powder may prove locally irritating to mucous membranes. Ingestion may cause discomfort and/or diarrhea. Eye contact may prove irritating.
Carcinogenicity:	NTP? No IARC Monographs? No OSHA Regulated? No
Signs and Symptoms of Exposure:	Exposure may irritate mucous membranes. May cause sneezing.
Medical Conditions Generally Aggravated by Exposure:	Not established. Unnecessary exposure to this product or any industrial chemical should be avoided. Respiratory conditions may be aggravated by powder.
Emergency and First Aid Procedures:	Eyes: Immediately flush eyes with water for at least 15 minutes. Call a physician. Skin: Flush with plenty of water. Ingestion: Drink large quantities of water or milk. Do not induce vomiting. If vomiting occurs administer fluids. See a physician for discomfort.

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Other Precautions:	No special requirements other than the good industrial hygiene and safety practices employed with any industrial chemical.

VIII. CONTROL MEASURES

Respiratory Protection (Specify Type):	Dust mask - Recommended
Ventilation:	Local Exhaust-Normal Special-Not Required Mechanical-Not Required Other-Not Required
Protective Gloves:	Impervious gloves are useful but not required.
Eye Protection:	Goggles are recommended when handling solutions.
Other Protective Clothing or Equipment:	None
Work/Hygienic Practices:	No special practices required

Odor:
No information found.
Solubility:
Moderate (1-10%)
Specific Gravity:
No information found.
pH:
No information found.
% Volatiles by volume @ 21C (70F):
0
Boiling Point:
No information found.
Melting Point:
No information found.
Vapor Density (Air=1):
No information found.
Vapor Pressure (mm Hg):
No information found.
Evaporation Rate (BuAc=1):
No information found.

10. Stability and Reactivity

Stability:
Stable under ordinary conditions of use and storage.
Hazardous Decomposition Products:
Carbon dioxide and carbon monoxide may form when heated to decomposition.
Hazardous Polymerization:
Will not occur.
Incompatibilities:
No information found.
Conditions to Avoid:
No information found.

11. Toxicological Information

No LD50/LC50 information found relating to normal routes of occupational exposure.

--------\Cancer Lists\----------

Ingredient	---NTP Carcinogen--- Known	Anticipated	IARC Category
Alconox® proprietary detergent mixture	No	No	None

12. Ecological Information

Environmental Fate:
This product is biodegradable.
Environmental Toxicity:
No information found.

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be managed in an appropriate and approved waste disposal facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

14. Transport Information

Not regulated.

15. Regulatory Information

--------\Chemical Inventory Status - Part 1\--------

Ingredient	TSCA	EC	Japan	Australia
Alconox® proprietary detergent mixture	Yes	No	No	No

--------\Chemical Inventory Status - Part 2\--------

Ingredient	Korea	--Canada-- DSL	NDSL	Phil.
Alconox® proprietary detergent mixture	No	No	Yes	No

--------\Federal, State & International Regulations - Part 1\--------

Ingredient	-SARA 302- RQ	TPQ	------SARA 313------ List	Chemical Catg.
Alconox® proprietary detergent mixture	No	No	No	No

--------\Federal, State & International Regulations - Part 2\--------

Ingredient	CERCLA	-RCRA- 261.33	-TSCA- 8(d)
Alconox® proprietary detergent mixture	No	No	No

Chemical Weapons Convention: No TSCA 12(b): No CDTA: No
SARA 311/312: Acute: Yes Chronic: No Fire: No Pressure: No
Reactivity: No Pure / Solid

Australian Hazchem Code: None allocated.
Poison Schedule: None allocated.
WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

16. Other Information

NFPA Ratings: Health: **0** Flammability: **0** Reactivity: **0**
Label Hazard Warning:
CAUTION! MAY BE HARMFUL IF SWALLOWED OR INHALED. MAY CAUSE IRRITATION TO EYES AND RESPIRATORY TRACT.
Label Precautions:
Avoid contact with eyes.
Keep container closed.
Use with adequate ventilation.
Avoid breathing dust.
Wash thoroughly after handling.
Label First Aid:
If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of eye contact, immediately flush eyes with plenty of water for at least 15 minutes. In all cases, get medical attention.
Product Use:
Laboratory Reagent.
Revision Information:
MSDS Section(s) changed since last revision of document include: 8.
Disclaimer:
****
Mallinckrodt Baker, Inc. provides the information contained herein in good faith but makes no representation as to its comprehensiveness or accuracy. This document is intended only as a guide to the appropriate precautionary handling of the material by a properly trained person using this product. Individuals receiving the information must exercise their independent judgment in determining its appropriateness for a particular purpose. MALLINCKRODT BAKER, INC. MAKES NO REPRESENTATIONS OR WARRANTIES, EITHER EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION ANY WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE WITH RESPECT TO THE INFORMATION SET FORTH HEREIN OR THE PRODUCT TO WHICH THE INFORMATION REFERS. ACCORDINGLY, MALLINCKRODT BAKER, INC. WILL NOT BE RESPONSIBLE FOR DAMAGES RESULTING FROM USE OF OR RELIANCE UPON THIS INFORMATION.
****
Prepared by: Environmental Health & Safety
Phone Number: (314) 654-1600 (U.S.A.)

Appendix C

HEALTH AND SAFETY PLAN ACCEPTANCE
AND TRAINING ACKNOWLEDGMENT

Instructions: This form is to be completed by each person that works on the Rose Cleaners' IHWDS Investigation Work Plan site and returned to the Site Safety and Health Officer.

I have read and agree to abide by the contents of the SITE-SPECIFIC HEALTH AND SAFETY PLAN for work activities at the site. I have completed the training requirements specified in the plan. I am currently participating in a medical surveillance program that satisfies the requirements of CFR 1910.120.

Signature:	Date:
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

Return to:

Site Safety and Health Officer or

Berninger Environmental, Inc.

1615 Ninth Avenue Bohemia, New York 11716

TABLES

TABLE- 1

RegenOx Data Calculations

TABLE 1
Geologic and Chemical Data Needs

Data Needs For All ISCO Agents
Volatile Organic Compounds
Contaminant Mass Carbon Dioxide
Natural Organic Matter Oxygen
Chemical Oxygen Demand
pH of Soil and/or Groundwater
Hydraulic Conductivity
Soil Characterization
Groundwater Gradient
Vadose Zone Permeability
Oxidation Reduction Potential
Dissolved Oxygen in Groundwater Oxygen
Conductivity/Resistivity of Groundwater

Additional Data Needs For Permanganate
Soluble Manganese Concentration in Groundwater
Permanganate Impurities
Moisture Content of Vadose Zone

Additional Data Needs For Fenton's Reagent
Lower Explosive Limit

Iron content of soil and/or groundwater
Alkalinity of Soil and/or Groundwater

Additional Data Needs For Ozone

Lower Explosive Limit
Carbon Dioxide

Alkalinity of Soil and/or Groundwater

Chemical Oxygen Demand (COD). COD is an essential parameter to estimate chemical dosing for all oxidant technologies. COD value would incorporate the oxidation potential of media including oxidant demand imposed by NOM, iron, manganese, arsenic, carbon monoxide (CO), methane, and acetate and therefore is a useful indicator of oxidant demand.

pH of Soil and/or Groundwater. pH values are necessary to check suitability of an oxidant especially if the contaminated zone is altered by chemical addition to suit an oxidation technology. pH should be measured to establish baseline conditions.

Oxidation Reduction Potential (ORP) and Dissolved Oxygen (DO). ORP and DO of groundwater should be measured to assess applicability of an oxidant and to establish baseline conditions. This helps determine potential impacts on speciation and mobility of non-target metals (e.g., chromium).

RegenOx Design Software for Grid Applications

Aug 2006

is Technical Support: USA (949) 366-8000 www.regenesis.com

ea treatment

Consultant: Beringer

Number of RegenOx application (first, second, third, fourth . . .)	first			
Is NAPL present? (yes or no)	no			
Estimated Plume Requiring Treatment				
Width of plume (intersecting gw flow direction)	20	ft		
Length of plume (parallel to gw flow direction)	30	ft	600	ft²
Depth to contaminated zone	5	ft		
Thickness of contaminated zone	10	ft		
Nominal aquifer soil (gravel, sand, silty sand, silt, clay)	silty sand			
Total porosity	0.2	Effective porosity	0.2	
Hydraulic conductivity	10	ft/day	3.5E-03	cm/sec
Hydraulic gradient	0.005	ft/ft		
Seepage velocity	91.3	ft/yr	0.250	ft/day
Total Pore Volume	1,200	ft³	8,977	gallons

Dissolved Phase Oxygen Demand:	Contaminant Conc.	Contaminant Mass	Stoichiometry (wt/wt)	RegenOx Oxidant
Individual species that represent oxygen demand:	(mg/L)	(lb)	Oxidant/contaminant	Dose (lb)
Benzene	0.00	0.0	12.7	0
Toluene	0.00	0.0	11.9	0
Ethylbenzene	0.00	0.0	15.7	0
Xylenes	0.00	0.0	15.7	0
Tetrachloroethene (PCE)	20.00	1.5	1.3	3
Trichloroethene (TCE)	0.00	0.0	2.4	0
cis-1,2-dichloroethene (DCE)	0.00	0.0	4.3	0
Vinyl Chloride (VC)	0.00	0.0	8.4	0
tph	6.00	0.4	12.0	7
User added, add stoich. demand and Koc (see pull-down)	0.00	0.0	0.0	0

TPH-g

* stoichiometries listed for petroleum hydrocarbons assume partial oxidation to biodegradable intermediates

Measures of total oxygen demand				
Estimated total oxidant demand	10.00	g oxidant/kg soil	total oxidant demand =	6,592 lbs
Known total oxidant demand (from bench test)	9.00	g oxidant/kg soil	total oxidant demand =	5,933 lbs

Parameters for Sorbed Phase Oxygen Demand:				
Soil bulk density	1.76	g/cm³ =	110	lb/cf
Fraction of organic carbon (foc)	0.005	range: 0.0001 to 0.01		
(Estimated using sorbed phase = foc*Koc*Cgw)				
(Adjust Koc as necessary to provide realistic estimates)				

	Koc	Contaminant Conc.	Contaminant Mass	Stoichiometry (wt/wt)	RegenOx Oxidan
Individual species that represent oxygen demand:	(L/kg)	(mg/kg)	(lb)	Oxidant/contaminant	Dose (lb)
Benzene	123	0.00	0.0	12.7	0
Toluene	287	0.00	0.0	11.9	0
Ethylbenzene	327	0.00	0.0	15.7	0
Xylenes	288	0.00	0.0	15.7	0
Tetrachloroethene (PCE)	371	37.10	24.5	1.3	41
Trichloroethene (TCE)	122	0.00	0.0	2.4	0
cis-1,2-dichloroethene (DCE)	60	0.00	0.0	4.3	0
Vinyl Chloride (VC)	2.5	0.00	0.0	8.4	0
tph	373	11.19	7.4	12.0	115
User added, add stoich. demand and Koc (see pull-down)	0	0.00	0.0	0.0	0

Summary of Estimated RegenOx Requirements	Dissolved Phase Oxidant Dose (lbs)	Sorbed Phase Oxidant Dose (lbs)	RegenOx Safety Factor	Total RegenOx Oxidant Dose (lbs)	RegenOx Oxidan Cost
Stoichiometric Oxidant Dose	10	156	2.0	332	$657
Known Total Oxidant Demand	Percentage of TOD accounted for:		100%	5,933	$11,747
Oxidant material requirement	Percentage of TOD accounted for:		1%	391	$775 <-

Required RegenOx oxidant quantity (in 30 lb increments) ——————> 420 **lbs RegenOx oxidant**

Delivery Design for RegenOx

Spacing within rows (ft)	15.0	ft
# points per row	2	points/row
Spacing between rows (f	15.0	ft
# of rows	2	rows
Advective travel time bet. rows (days)	60	days
Number of points in grid	4	points
Oxidant application rate (lbs/ft)	10.5	
Total RegenOx oxidant required	420	lbs of RegenOx oxidant
Total RegenOx activator required	420	lbs of RegenOx activator

Mixing Volume for Injections

Volume of pore space (effective)	1200	ft³
Percent of pore space occupied by RegenOx solution	10%	
Amount of RegenOx activator required for injection	420	lbs
Amount of water required for injection	861	gallons
Percent oxidant in solution	5.23%	
Volume of water required per foot of injection	21.5	gallons
Amount of oxidant required per foot of injection	10.5	lbs
Amount of activator required per foot of injection	10.5	lbs
Total volume of solution injected per foot of injection	23.6	gallons
Radial influence (assuming 100% pore volume displacement)	2.2	feet
Estimated efficiency factor	0.75	
grams of oxidant per kg of soil	0.64	g/kg
oxidant concentration	5606	mg/L
price per cubic yard of soil treated	$9.26	

Project Summary		
Number of RegenOx delivery points (adjust as necessary for site)		4
RegenOx oxidant application rate in lbs/ft (adjust as necessary for site)		10.5 lbs/foot
RegenOx oxidant material requirement (lbs)		420 lbs
Number of 30 lb RegenOx oxidant buckets		14.0 buckets
RegenOx application rate in lbs/ft (adjust as necessary for site)		10.5 lbs/foot
RegenOx material requirement		420 lbs
Number of 30 lb RegenOx buckets		14.0 buckets
Bulk RegenOx material requirement for single injection		840 lbs
Unit cost of RegenOx (per pound)	$	2.45
Total RegenOx material cost for single injection	$	2,058
Shipping and Tax Estimates		
Sales Tax rate: 0.00%	$	-
Total Material Cost	$	2,058
Shipping (call for amount)	$	-
Total Regenesis Material Cost	$	2,058

RegenOx Injection Cost Estimate (responsibility of customer to contract work)		
Footage for each point = uncontaminated interval + RegenOx injection interval (ft)		15
Total length for direct push for project (ft)		60
Estimated daily installation rate (ft per day: 200 for push, 100 for drilling)		150
Estimated points per day (7 to 20 is typical for direct push)		10.0
Required number of days		1
Mob/demob cost for injection subcontractor	$	-
Daily rate for injection subcontractor	$	-
Total injection subcontrator cost for application	$	-
Total Install Cost (not including consultant, lab, etc.)	$	2,058

Other Project Cost Estimates		
Design	$	-
Permitting and reporting	$	-
Construction management	$	-
Groundwater monitoring and rpts	$	-
Other	$	-
Other	$	-
Other	$	-
Other	$	-
Total Project Cost	$	2,058

!egenOx Summary Page

egenesis Technical Support: USA (949) 366-8000

Site Name: Source Area treatment
Location: Rose Cleaner
Consultant: Bernnger

Application Design Input Parameters

Width of plume (intersecting gw flow direction)	20	ft
Length of plume (parallel to gw flow direction)	30	ft
Thickness of contaminated zone	10	ft
Soil type	silty sand	

Design Summary - INITIAL APPLICATION ONLY

Number of RegenOx injection points (initial app)	4	pts
egenOx dose rate (oxidant + activator) (initial app)	21.0	lbs/ft
otal amount of water required for initial application	861	gallons
Total volume of RegenOx solution applied per foot of injection (initial app)	23.6	gallons/ft

Estimated number of RegenOx applications required (enter 1 through 6)	2

Summary of Estimated RegenOx Totals

Application number	Part A RegenOx Oxidant (lbs)	Part B RegenOx Activator (lbs)	Total RegenOx Material Requirement (lbs)	Cumulative Amount of Oxidant (Part A) Applied (lbs)	Cumulative Amount of Activator (Part B) Applied (lbs)	Cumulative RegenOx Cost	Total RegenOx Material Cost Per Application
First	420	420	840	420	420	$2,058	$2,058.00
Second	420	420	840	840	840	$4,116	$2,058.00
Third	0	0	0	0	0	$0	$0.00
Fourth	0	0	0	0	0	$0	$0.00
Fifth	0	0	0	0	0	$0	$0.00
Sixth	0	0	0	0	0	$0	$0.00
TOTALS	840	840	1,680		Volume discount if purchased all together		$4,116.00

(not including shipping or applicable taxes)

TABLE- 2

Health and Safety Part A and Part B

RegenOx® – Part A (Oxidizer Complex)

Material Safety Data Sheet (MSDS)

Last Revised: June 24, 2010

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 Description:	A mixture of sodium percarbonate [$2Na_2CO_3 \cdot 3H_2O_2$], sodium carbonate [Na_2CO_3], sodium silicate and silica gel.
Chemical Family:	Inorganic Chemicals
Trade Name:	RegenOx® – Part A (Oxidizer Complex)
Product Use:	Used to remediate contaminated soil and groundwater (environmental applications)

Section 2 – Chemical Information/Other Designations

CAS No.	Chemical	Percentage
15630-89-4	Sodium Percarbonate	60 -100 %
5968-11-6	Sodium Carbonate Monohydrate	10 – 30 %
7699-11-6	Silicic Acid	< 1 %
63231-67-4	Silica Gel	< 1 %

Section 3 – Physical Data

Form:	Powder
Color:	White
Odor:	Odorless
Melting Point:	NA
Boiling Point:	NA

Section 3 – Physical Data (cont)

Flammability/Flash Point:	NA
Vapor Pressure:	NA
Bulk Density:	0.9 – 1.2 g/cm^3
Solubility:	Min 14.5g/100g water @ 20 ºC
Viscosity:	NA
pH (3% solution):	≈ 10.5
Decomposition Temperature:	Self-accelerating decomposition with oxygen release starts at 50 ºC.

Section 4 – Reactivity Data

Stability:	Stable under normal conditions
Conditions to Avoid/Incompatibility:	Acids, bases, salts of heavy metals, reducing agents, and flammable substances
Hazardous Decomposition Products:	Oxygen. Contamination with many substances will cause decomposition. The rate of decomposition increases with increasing temperature and may be very vigorous with rapid generation of oxygen and steam.

Section 5 – Regulations

TSCA Inventory Listed:	Yes
CERCLA Hazardous Substance (40 CFR Part 302)	
Listed Substance:	*No*
Unlisted Substance:	*Yes*
SARA, Title III, Sections 313 (40 CFR Part 372) – Toxic Chemical Release Reporting: Community Right-To-Know	
Extremely Hazardous Substance:	No
WHMIS Classification:	C, D2B
Canadian Domestic Substance List:	Appears

Section 6 – Protective Measures, Storage and Handling

Technical Protective Measures

Storage:

Oxidizer. Store in a cool, 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.

Do not swallow. Avoid breathing vapors, mists or dust. Do not eat, drink or smoke in the work area.

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

Wash hands thoroughly after handling.

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.

Respiratory Protection:

For many conditions, no respiratory protection is necessary; however, in dusty or unknown conditions or when exposures exceed limit values a NIOSH approved respirator should be used.

Hand Protection:

Wear chemical resistant gloves (neoprene, rubber, or PVC).

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.
Other:	Eye wash station.
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.

Section 7 – Hazards Identification

Potential Health Effects

Inhalation:	Causes irritation to the respiratory tract. Symptoms may include coughing, shortness of breath, and irritations to mucous membranes, nose and throat.
Eye Contact:	Causes irritation, redness and pain.
Skin Contact:	Causes slight irritation.
Ingestion:	May be harmful if swallowed (vomiting and diarrhea).

Section 8 – Measures in Case of Accidents and Fire

After Spillage/Leakage:	Eliminate all ignition sources. Evacuate unprotected personnel and never exceed any occupational exposure limit. Shovel or sweep spilt material into plastic bags or vented containers for disposal. Do not return spilled or contaminated material to the inventory.
Extinguishing Media:	Water

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:	If the individual is conscious and not convulsing, give two-four cups of water to dilute the chemical and seek medical attention immediately. **Do Not** induce vomiting.

Section 8 – Measures in Case of Accidents and Fire (cont)

Skin Contact:	Wash affected areas with soap and a mild detergent and large amounts of water.

Section 9 – Accidental Release Measures

Precautions:

Cleanup Methods:	Shovel or sweep spilt material into plastic bags or vented containers for disposal. Do not return spilled or contaminated material to the inventory.

Section 10 – Information on Toxicology

Toxicity Data

LD50 Oral (rat):	2,400 mg/kg
LD50 Dermal (rabbit):	Min 2,000 mg/kg
LD50 Inhalation (rat):	Min 4,580 mg/kg

Section 11 – Information on Ecology

Ecology Data

Ecotoxicological Information:	NA

Section 12 – Disposal Considerations

Waste Disposal Method

Waste Treatment:	Dispose of in an approved waste facility operated by an authorized contactor in compliance with local regulations.
Package (Pail) Treatment:	The empty and clean containers are to be recycled or disposed of in conformity with local regulations.

Section 13 – Shipping/Transport Information

D.O.T. Shipping Name:	Oxidizing Solid, N.O.S. [A mixture of sodium percarbonate [$2Na_2CO_3 \cdot 3H2O_2$], sodium carbonate [Na_2CO_3], sodium silicate and silica gel.]
UN Number:	1479
Hazard Class:	5.1
Labels:	5.1 (Oxidizer)
Packaging Group:	III

Section 14 – Other Information

HMIS® Rating	Health – 1 (slight)	Reactivity – 1 (slight)
	Flammability – 0 (none)	Lab PPE – goggles, gloves, and lab coat

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

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.

RegenOx® – Part B (Activator Complex)

Material Safety Data Sheet (MSDS)

Last Revised: June 4, 2010

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 Description:	A mixture of sodium silicate solution, silica gel and ferrous sulfate
Chemical Family:	Inorganic Chemicals
Trade Name:	RegenOx® – Part B (Activator Complex)
Product Use:	Used for environmental remediation of contaminated soils and groundwater

Section 2 – Chemical Information/Other Designations

CAS No.	Chemical
1344-09-8	Silicic Acid, Sodium Salt, Sodium Silicate
63231-67-4	Silica Gel
7720-78-7	Ferrous Sulfate
7732-18-5	Water

Section 3 – Physical Data

Form:	Liquid
Color:	Blue/Green
Odor:	Odorless
Melting Point:	NA
Boiling Point:	NA
Flammability/Flash Point:	NA
Vapor Pressure:	NA

Section 3 – Physical Data (cont)	
Specific Gravity	1.39 g/cm^3
Solubility:	Miscible
Viscosity:	NA
pH (3% solution):	11
Hazardous Decomposition Products:	Oxides of carbon and silicon may be formed when heated to decomposition.

Section 4 – Reactivity Data	
Stability:	Stable under normal conditions.
Conditions to Avoid:	None.
Incompatibility:	Avoid hydrogen fluoride, fluorine, oxygen difluoride, chlorine trifluoride, strong acids, strong bases, oxidizers, aluminum, fiberglass, copper, brass, zinc, and galvanized containers.

Section 5 – Regulations	
TSCA Inventory Listed:	Yes
CERCLA Hazardous Substance (40 CFR Part 302)	
Listed Substance:	*No*
Unlisted Substance:	*Yes*
SARA, Title III, Sections 302/303 (40 CFR Part 355) – Emergency Planning and Notification	
Extremely Hazardous Substance:	No
SARA, Title III, Sections 311/312 (40 CFR Part 370) – Hazardous Chemical Reporting: Community Right-To-Know	
Hazard Category:	Acute
SARA, Title III, Sections 313 (40 CFR Part 372) – Toxic Chemical Release Reporting: Community Right-To-Know	
Extremely Hazardous Substance:	No

Section 6 – Protective Measures, Storage and Handling

Technical Protective Measures

Storage:	Keep in a tightly closed container (steel or plastic) and store in a cool, well ventilated area away from all incompatible materials (acids, reactive metals, and ammonium salts). Store in a dry location away from heat above 60 degrees C and colder than 10 degrees C. Do not store in aluminum, fiberglass, copper, brass, zinc or galvanized containers.
Handling:	Avoid contact with eyes, skin and clothing. Avoid breathing spray mist. Use with adequate ventilation. Do not use product if it is brownish-yellow in color.

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. Safety shower and eyewash station should be within direct access.
Respiratory Protection:	Use NIOSH-approved dust and mist respirator where spray mist exists. Respirators should be used in accordance with 29 CFR 1910.134.
Hand Protection:	Wear chemical resistant gloves.
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. Gloves and protective clothing should be worn during use.
Other:	
Protection Against Fire & Explosion:	Product is non-explosive and non-combustible.

Section 7 – Hazards Identification

Potential Health Effects

Inhalation:	Causes irritation to the respiratory tract. Symptoms may include coughing, shortness of breath, and irritations to mucous membranes, nose and throat.
Eye Contact:	Causes irritation, redness and pain.
Skin Contact:	Causes irritation. Symptoms include redness, itching and pain.
Ingestion:	May cause irritation to mouth, esophagus, and stomach.

Section 8 – Measures in Case of Accidents and Fire

After Spillage/Leakage (small):	Mop up and neutralize liquid, then discharge to sewer in accordance with local, state and federal regulations.
After Spillage/Leakage (large):	Keep unnecessary personnel away; isolate hazard area and do not allow entrance into the affected area. Do not touch or walk through spilled material. Stop leak if possible without risking injury. Prevent runoff from entering into storm sewers and ditches that lead to natural waterways. Isolate the material if at all possible. Sand or earth may be used to contain the spill. If containment is not possible, neutralize the contaminated area and flush with large quantities of water.
Extinguishing Media:	Material is compatible with all extinguishing media.
Further Information:	

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. Give artificial respiration if individual is not breathing. If breathing is difficult, give oxygen. Seek medical attention if the effects persist.
Ingestion:	If the individual is conscious and not convulsing, give two-four cups of water to dilute the chemical and seek medical attention immediately. **DO NOT** induce vomiting.
Skin Contact:	Wash affected areas with soap and a mild detergent and large amounts of water. Remove contaminated clothing and shoes.

Section 9 – Accidental Release Measures

Precautions:

PPE:	Wear chemical goggles, body-covering protective clothing, chemical resistant gloves, and rubber boots (see Section 6).
Environmental Hazards:	Sinks and mixes with water. High pH of this material may be harmful to aquatic life. Only water will evaporate from a spill of this material.
Cleanup Methods:	Pick-up and place in an appropriate container for reclamation or disposal. US regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities.

Section 10 – Information on Toxicology

Toxicity Data

Sodium Silicate:	When tested for primary eye irritation potential according to OECD Guidelines, Section 405, a similar sodium silicate solution produced corneal, iridal and conjunctival irritation. Some eye irritation was still present 14 days after treatment, although the average primary irritation score has declined from 29.7 after 1 day to 4.0 after 14 days. When tested for primary skin irritation potential, a similar sodium silicate solution produced irritation with a primary irritation index of 3 to abraded skin and 0 to intact skin. Human experience confirms that irritation occurs when sodium silicates get on clothes at the collar, cuffs, or other areas where abrasion may exist. The acute oral toxicity of this product has not been tested.
Ferrous Sulfate:	LD50 Oral (rat): 319 mg/kg not a suspected carcinogen.

Section 11 – Information on Ecology

Ecology Data

Ecotoxicological Information:	Based on 100% solid sodium silicate, a 96 hour median tolerance for fish of 2,320 mg/l; a 96 hour median tolerance for water fleas of 247 mg/L; a 96 hour median tolerance for snail eggs of 632 mg/L; and a 96 hour median tolerance for Amphipoda of 160 mg/L.

Section 12 – Disposal Considerations

Waste Disposal Method

Waste Treatment:	Neutralize and landfill solids in an approved waste facility operated by an authorized contactor in compliance with local regulations.
Package (Pail) Treatment:	The empty and clean containers are to be recycled or disposed of in conformity with local regulations.

Section 13 – Shipping/Transport Information

D.O.T.	This product is not regulated as a hazardous material so there are no restrictions.

Section 14 – Other Information

HMIS® Rating	Health – 2 (moderate)	Reactivity – 0 (none)
	Flammability – 0 (none)	Lab PPE – goggles, gloves, and lab coat
	Contact – 1 (slight)	

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

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.

TABLE - 3

Data Calculations for Excavation Area

REGENESIS

RegenOx

Design Summary Output

Regenesis Technical Support: USA (949) 366-8000
www.regenesis.com

Date:	7/5/2012
Site Name:	Rose Cleaners
Treatment Area Location:	Vadose and Saturated Soils
Consultant/Contact:	BEI

RegenOx Grid-Based Design Specifications
Rose Cleaners
Vadose and Saturated Soils

Design Specifications	Quantity	Units
Number of Application Events	two to four	---
Application Frequency	2 weeks	---
Injection Point Spacing within row	10	ft on center
Injection Point Spacing between rows	10	ft on center
Number of Injection Points per Event	2	---
Total Injection Points (all applications)	8	---
Treatment Areal Extent	150	ft^2
Top of Treatment Interval	1	ft-bgs
Bottom of Treatment Interval	10	ft-bgs
Vertical Treatment Thickness	9	ft
Linear Footage to be Drilled	80	ft
Product Quantities	**Quantity**	**Units**
Total RegenOx (A&B all applications)	**640**	**lbs**
RegenOx Part A per Point	50	lbs
RegenOx Part A per Application	100	lbs
Total RegenOx Part A (all applications)	400	lbs
RegenOx Part B per Point	60	lbs
RegenOx Part B per Application	120	lbs
Total RegenOx Part B (all applications)	240	lbs
Total RegenOx Per Cubic Yard	11	lbs
Product Cost		
RegenOx Product Cost	**$1,600**	**not including tax/freight**
Field Mixing / Injection Ratios	**Value**	**Units**
% Solution	5%	% oxidant (Part A)
Mix Water Volume per Foot	13	gallons
Mix Water Volume per Point	114	gallons
Mix Water Volume per Application	228	gallons
Total Mix Water Volume (All Applications)	911	gallons
RegenOx Injection Volume (A+B+water) per Foot	12	gallons
RegenOx Injection Volume (A+B+water) per Point	105	gallons
Total RegenOx Injection Volume (A+B+water) (All Applications)	840	gallons

REGENESIS

RegenOx

Design Summary Output
Page 2 of 2

SITE DATA - INPUT PARAMETERS		
Hydraulic Parameters	**Value**	**Units**
Soil Type	silty sand	---
Fraction Organic Carbon (foc)	0.003	g/g
Porosity	0.33	cm^3/cm^3
Effective Porosity	0.2	cm^3/cm^3
Hydraulic Conductivity	10	ft/day
Hydraulic Gradient	0.005	ft/ft
Seepage Velocity	91.3	ft/yr