



NORTHEASTERN
ENVIRONMENTAL
TECHNOLOGIES CORP.

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November 7, 2007

Mr. Keith Goertz, PE
NYSDEC Region 4 Spill Unit
1130 North Westcott Rd.
Schenectady, New York 12306

**RE: PILOT SCALE CHEMICAL OXIDATION WORK PLAN - FAIRVIEW PLAZA HUDSON, NY
(SPILL CASE # 0204750)**

Dear Keith:

This work plan has been prepared to address the groundwater quality impacts known to exist at the subject Fairview Plaza located at 160 Fairview Ave. Hudson, NY (see **Figure 1**) as required by the NYS Department of Environmental Conservation (DEC) Order on Consent R4-2007-0924-124. The proposed pilot scale test work is intended to evaluate the feasibility of using *in situ* chemical oxidation to reduce the mass of the dry cleaning chemical release (i.e., Tetrachloroethene and its chlorinated volatile organic compound break down compounds) that has been documented east of the Wash Rite tenant space.

In situ chemical oxidation is being considered as a means to accelerate the rate of mass reduction based on the natural attenuation rates thus far documented in the chlorinated VOC plume and the position of the dry cleaning chemical impacts with respect to existing underground utilities. The pilot scale test application work will involve the use of the commercially available Regenesis product RegenOx™. A more specific accounting of the methods proposed for the pilot scale chemical oxidation test are included as follows.

BACKGROUND ON REGENOX™ TO ACCELERATE CONTAMINANT DEGRADATION

RegenOx™ is a proprietary (patent-applied-for by Regenesis) *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. 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.

DATA AND ASSUMPTIONS USED TO DESIGN THIS REGENOX™ APPLICATION

The proposed pilot test work is intended to evaluate and predict the rate that the chemical oxidant reduces the mass of the chlorinated VOC impacts. The proposed treatment zone will incorporate an area 30 feet x 30 feet surrounding existing monitoring well MW-4-06. The injection sites will be arranged in a rectangular grid array that consists of 3 rows of 3 points (See **Figure 2**). RegenOx™ will be installed using high pressure (i.e., 2000 psi) positive displacement pump and direct push drilling equipment. The vertical treatment zone will be between 10 and 20 feet below grade.

Based on the most recent chlorinated VOC groundwater concentrations at monitoring well MW-4-06 (i.e., 2,200 ug/L PERC; 2,130ug/L TCE, 4,120ug/L DCE, 715ug/L VC), a total of 120lbs (60lbs of Part A & 60lbs of Part B) will be installed (injected as a solution) at each injection site (i.e., 12 gallons per vertical foot*).

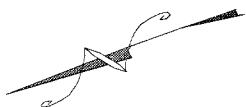
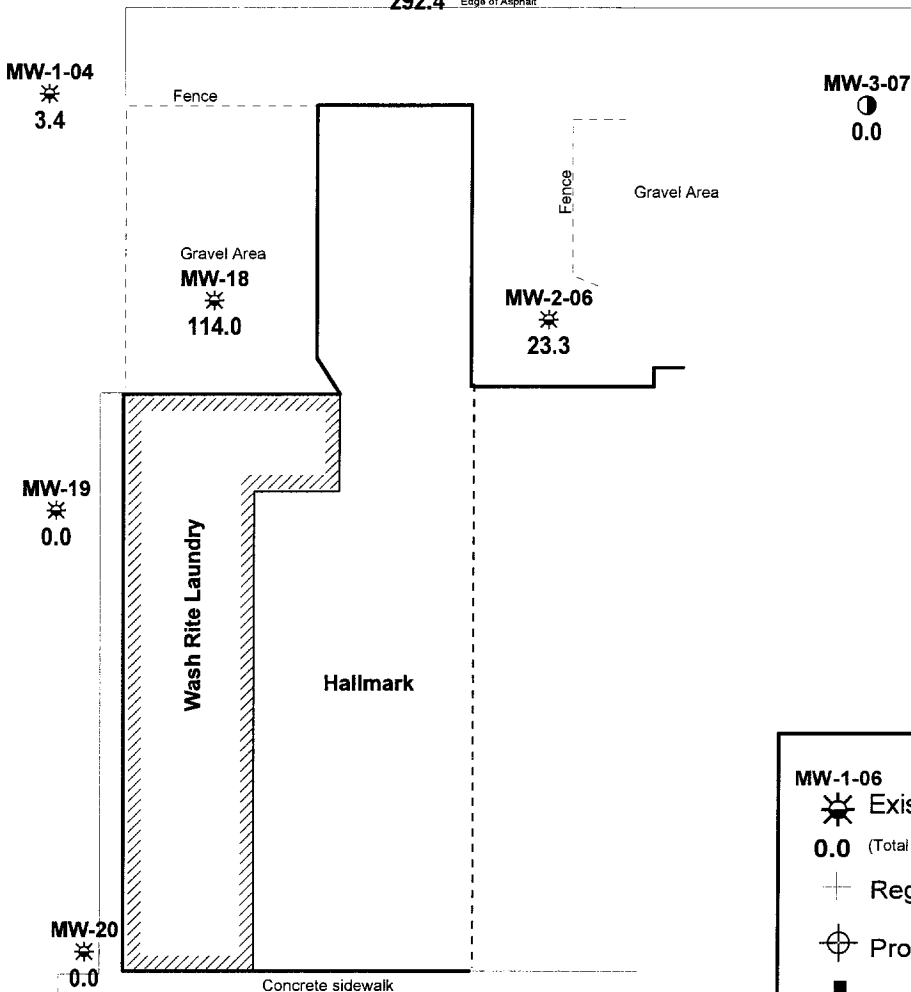
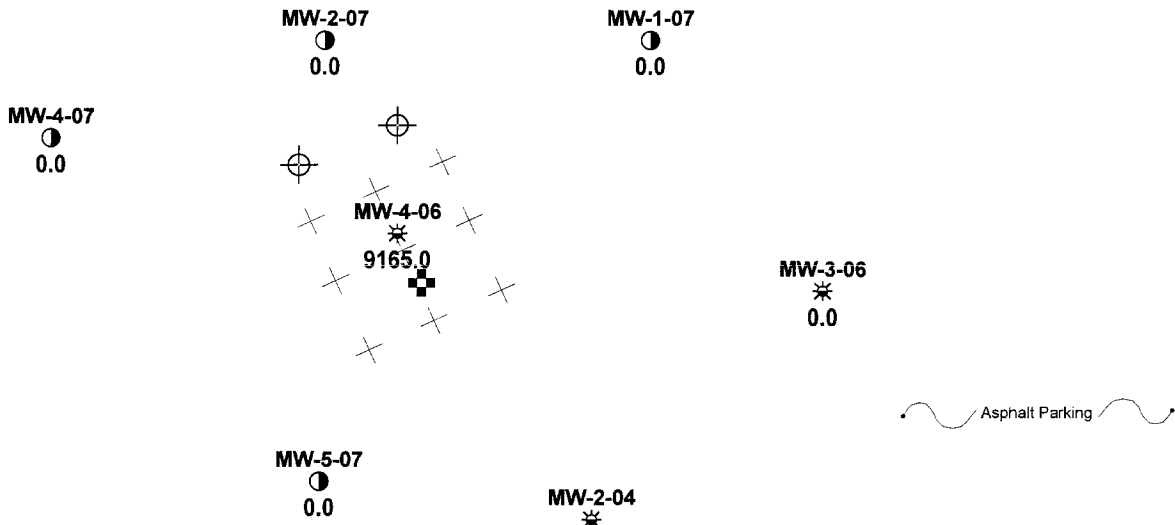
There is evidence of natural biodegradation, based on the presence of DCE and VC which suggests bioremediation may also be considered at a later time, if deemed beneficial. A second RegenOx™ application and / or the use of an *in situ* bioremediation treatment product will be evaluated after the initial RegenOx™ pilot test to further address any remaining contamination.

PILOT SCALE TEST MONITORING PROGRAM

In order to validate and track the effectiveness of the chemical oxidant, we propose using the existing network of monitoring wells. Two additional monitoring wells to be installed 15 feet east (down gradient) of monitoring well MW-4-06 will assist with the monitoring program. Baseline water quality information will be obtained from the network of wells to identify groundwater quality and physiochemical conditions prior to the injection of the chemical oxidant. Unless otherwise directed the following parameters, methods and monitoring frequencies will be used to document the progress of this pilot scale test.

ANALYTE	METHOD	BASELINE	7 DAYS	14 DAYS	30 DAYS
pH, DO, ORP, Temperature, Conductivity	Low Flow Cell & Horiba Field Meter Readings	X	X	X	X
Chemical Oxidant	Field Test for Hydrogen Peroxide	X	X	X	X
Chlorinated VOCs	Lab Services (8260)	X		X	X
Chemical Oxygen Demand	Lab Services (COD)	X			X
Dissolved Iron & Manganese	Lab Services Fe & Mg	X			X

*Note: RegenOX application rates based on existing water quality data and application recommendations received from Regenesis.



LEGEND

- MW-1-06 Existing Monitoring Well
- 0.0 (Total VOC Concentrations)
- RegenOX Injection Point
- Proposed Monitoring Well
- Proposed Soil Boring

Asphalt Parking

MW-1-06
*
0.0

NOTES:
 Site features are based on a site plan prepared by Hersberg and Hershberg Map No. 000277 Dated 09/27/00.
 Monitoring well locations are based on field measurements.
 Concrete, fence and edge of asphalt are approximated.
 Groundwater elevations are measured in feet. Total VOC Concentrations recorded on May 17, 2007.

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FIGURE 2: RegenOX Pilot Test Work Zone
PROJECT: 160 Fairview Avenue
Town of Greenport, Hudson, New York

Project # 02.05244	Scale: 1" = 40.0 ft.	Date: 11/05/07
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During the 30 day monitoring period groundwater samples will be collected from monitoring well MW-4-06 to assess the extent to which RegenOx™ affects the shallow aquifer conditions and the dissolved phase chlorinated VOC concentrations. Similarly, background water quality information will be obtained using groundwater samples collected from monitoring well MW-3-07. The groundwater data from MW-3-07 will facilitate a comparison of conditions induced by the addition of RegenOx™ with background natural attenuation conditions outside the plume. Potential contaminant and competing electron acceptor flux entering the treatment zone will be evaluated using groundwater samples collected at monitoring wells MW-2-04 and MW-5-07. Down gradient groundwater quality data will be obtained using a combination of the (2) new monitoring wells and MW-2-07.

One composite soil sample for contaminant analysis at baseline (i.e., when RegenOx™ is applied) will be performed to establish a baseline soil concentration for future oxidant applications and to consider the likelihood for chemical rebounds effects related to impacted soil that may remain after the oxidant application. It is expected that the soil sample will be obtained from the upper surface of the groundwater table from a soil boring advanced west of MW-4-06. A specific accounting of the soil boring / monitoring well installation work and water sampling methods are included in **Attachment A**.

INTERIOR AIR & VAPOR SAMPLING SERVICES

Sub slab vapor probe implants located in the Wash Rite Laundry and Hallmark tenant spaces will be re-sampled to establish a "heating season conditions" baseline for the structure since the installation of the sub slab vapor mitigation system. The sampling event will occur 30 days after the installation of the RegenOx™ to consider vapor intrusion conditions related to the *in situ* treatment program.

Prior to collecting the soil vapor samples, three vapor volumes will be purged from each implant using a SKC air sample pump. After purging, a vapor sample will be collected in a pre-cleaned 125 ml glass sampling bulb. The vapor samples will be prescreened using a hand held photoionization meter (i.e., PhotoVac Model 2020). Sub slab vapor samples will be collected using a negatively pressurized 6L Summa® canister equipped with a time specific regulator. Each regulator will be calibrated by EMSL Analytical, Inc. (EMSL) for the desired 8 hour sampling interval. A simultaneous indoor air sample will be collected from each of the areas. A simultaneous outdoor air sample will be collected at an upwind location (free of obstructions) adjacent to the Fairview Plaza. Each indoor and outdoor air sample will be obtained from a 3 foot elevated platform via 6L Summa® canisters equipped with an 8 hour sample regulator.

All Summa® canisters will be certified as clean by EMSL. A sampling log will be maintained for the sampling event which documents sample IDs, date and time of the sample collection, sample height, the names of NETC staff, pertinent weather conditions, sampling methods and devices used, volume of air sampled, applicable pre and post sample vacuum and ambient air temperature data, and chain of custody information. All samples will be shipped under chain of custody documentation for chemical analysis. All samples will be analyzed via EPA Method TO-15. All data sets will be reported in micrograms per cubic meter ($\mu\text{g}/\text{m}^3$) with minimum sample reporting limits of $1 \mu\text{g}/\text{m}^3$. Concurrent with the vapor sampling, a DOH indoor air quality questionnaire and building inventory will be conducted by a representative of NETC.

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REPORTING SERVICES

At the conclusion of the proposed 30 day monitoring period, a status report will be prepared and submitted to the DEC for formal consideration. Data collected using the methodologies described in this transmittal will be utilized to develop a site wide *in situ* treatment and monitoring program to address areas of the site which remain affected by the chlorinated VOC release and / or discuss if a second RegenOx™ application and / or the use of an *in situ* bioremediation treatment product would benefit the development of a site wide treatment program.

The report will document all investigatory activities, discuss the rationale and methods of the investigation, and provide recommendations for additional site characterization and / or remedial action work, if appropriate. The final report will include all data, data analysis, methodology, laboratory results, chain-of-custody documentation, as well as any pertinent field notes developed during the pilot test program.

The report will also evaluate and discuss the impact (if any) the *in situ* treatment measures have on the ongoing indoor air, sub slab vapor and vapor intrusion mitigation measures underway at the Wash Rite and Hall Mark tenant spaces. All information will be presented in a clear and concise manner and substantiate the conclusions and recommendations reached.

Thank you in advance for your ongoing assistance with this site. The NETC organization and I remain available to assist you and the DEC with this important matter, as necessary.

Sincerely,
NORTHEASTERN ENVIRONMENTAL TECHNOLOGIES CORPORATION



Jeffrey T. Wink, President
JTW/epa

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c.c. Mr. Tony Fabiano

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ATTACHMENT A

METHODOLOGIES

SOIL BORING PROGRAM

Three exterior soil borings will be advanced down gradient of the Wash Rite retail space. Each soil boring will be advanced to a depth of 20.0 feet. The soil borings will be installed using a combination of direct push and rotary drilling methods. Each soil boring will be completed in a manner to provide a geological log of the subsurface conditions and provide necessary data on the site's down gradient groundwater and soil quality.

SOIL SAMPLING SERVICES

Continuous soil sampling services will be performed at each soil boring location. The objective of the soil sampling program is to further qualify the areal and vertical extent of the PERC release. All soil samples will be logged on site as they are extracted, labeled and retained for additional field volatile organic compound (VOC) analysis. All soil samples collected will be examined and described using the Burmister and Unified Classification Systems. In compliance with ASTM methods, the samples will be labeled with the following information: boring number, sample number and depth of sample penetration.

SOIL GAS ANALYSIS

Head space VOC soil gas measurements will be recorded on each soil sample using a properly calibrated photoionization detector (PID). The results of the testing work will be used to determine a baseline for the sorbed phase VOC chemical impacts. The field PID soil screening data will be used to short list a minimum of (1) soil sample from each soil boring for confirmatory laboratory analysis, as deemed necessary. A minimum of (1) soil sample will be submitted for chemical analysis via EPA Method 8260.

MONITORING WELL INSTALLATIONS

Each soil boring will be converted to 2.0 inch monitoring wells and given the designation of "MW". The monitoring wells will each be composed of two basic components; a PVC well screen and riser or blank. The well screen is the intake portion of the well. The basic purpose of the riser is to provide storage and a connection to the surface from the well screen. The annular space around the well screen and two feet above will be filled with sand pack (0.010 grade). A bentonite seal will be installed above the sand pack, and the remainder of the borehole filled with cement. NETC personnel will perform all aspects of the drilling and monitoring well installation program, and be responsible for detailed logging of all samples. The relative location and elevation for each of the wells will be established by NETC staff following the well installation program. Each of the wells will be developed to facilitate the groundwater monitoring services underway at the site. Well development services are necessary for the following reasons:

- To remove residual mud and formational silt and clay, thereby preventing turbidity during sampling that could potentially interfere with chemical analysis; and,
- To increase the hydraulic conductivity immediately around the well, which in turn reduces the potential of the well yielding an insufficient volume of water during the sampling procedure.

METHODOLOGIES (CONT.)

Dedicated bailers will be used at each monitoring well as a surge-block device for loosening the fine-grained material from the well annulus, and as a mechanism to remove the water and sediment from the well. The surging will be assisted by rapidly raising and lowering the bailer within the screen section. Bailing will be continued until the water sufficiently clears or five well volumes of water had been removed. All groundwater generated during the well development activities will be staged on site in 55 gallon, 17H salvage drums.

GROUNDWATER SAMPLING SERVICES

Groundwater samples will be collected from the existing and proposed network of monitoring wells. All locations will be sampled using a low flow and flow cell sampling techniques. All samples will be collected in such a manner as to minimize agitation and other disturbing conditions, which may cause physiochemical changes and bring about losses due to volatilization, adsorption, redox changes or physiochemical degradation. The samples will be transferred to a set of laboratory prepared bottles for chemical analysis as outlined in the pilot test work plan.

Observations have been recorded regarding weather and surrounding air/water/soil conditions, non-aqueous components of water (e.g. "floaters," surface sheens) and other pertinent field conditions. Chain of custody documentation was maintained throughout the transfer and shipment of samples to the laboratory.

DECONTAMINATION PROTOCOL

All equipment used during the pilot test study work that is to come in contact with soil, as well as drill tools, pumps and hoses will undergo an initial cleaning procedure. While working at the site, the drilling equipment will be decontaminated between soil borings and injection points to prevent cross contamination. The cleaning process will involve the use of an Alconox wash and a high pressure water rinse. All soil and water resultant from the drilling and decontamination procedures will be staged on site in 55 gallon, 17H salvage drums.