FINAL
AREA C&E IN-SITU TREATMENT
PRE-DESIGN INVESTIGATION WORK PLAN

BUFFALO COLOR AREA ABCE
BUFFALO, NEW YORK

Prepared for:

SOUTH BUFFALO DEVELOPMENT, LLC
Buffalo, New York

Prepared by:

MACTEC Engineering and Consulting, Inc.
MACTEC Project Number: 3410-09-0701

DECEMBER 2009

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Ryan T. Belcher
Project Engineer

Stuart C. Pearson
Principal Engineer

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LIST OF ACRONYMS AND ABBREVIATIONS

AAR	Alternatives Analysis Report
BOD	biochemical oxygen demand
COC	contaminants of concern
COD	chemical oxygen demand
DIC	dissolved inorganic compound
DO	dissolved oxygen
ERFS	Environmental Remediation and Financial Services
GHR	GHR Consulting Services
MACTEC	MACTEC Engineering and Consulting, Inc.
mg/L	milligrams per liter
NYS	New York State
ORC-A®	Oxygen Release Compound Advanced
ORP	oxidation-reduction potential
PDI	Pre-Design Investigation
PLFA	phospholipid fatty acids
qPHE	phenol hydroxylase
qTOD	toluene dioxygenase
RAO	
SBD	South Buffalo Development, LLC
SIP	stable isotope probing
Site	Buffalo Color Corporation Area ABCE Site
SOD	soil oxidant demand
USEPA	United States Environmental Protection Agency
VOC	volatile organic compounds

LIST OF FIGURES

Figure

1.0 INTRODUCTION

On behalf of South Buffalo Development, LLC (SBD), MACTEC Engineering and Consulting, Inc. (MACTEC) has prepared this Work Plan for in-situ treatment pre-design work at the Buffalo Color Corporation Area ABCE Site (Site) in Buffalo, New York. SBD is in the process of redeveloping the Site. This work includes implementing the recommendations of the New York State Department of Environmental Conservation approved Final Alternatives Analysis Report (AAR), prepared by MACTEC and issued on February 11, 2009 (MACTEC, 2009).

The AAR identified in-situ enhanced bioremediation (Alternative GW-C&E-2) of the limited chlorobenzene plumes at Areas C&E as the preferred remedy for Areas C&E groundwater. The AAR:

- recommended a pre-design investigation, including a treatability study, be conducted to collect site-specific data related to geochemical and biological processes at the Site in order to determine the appropriate amendments for enhanced bioremediation;
- recommended a pilot-scale test would be conducted on-Site based upon the results of the treatability study to determine the injection point locations, spacing, and effectiveness;
- indicated full-scale implementation would be based upon the results of the treatability and pilot-scale tests; and
- suggested that at Area E, it may be advantageous to directly apply the bio-enhancement additive to the subsurface during the proposed soil "hot spot" removal action.

This Work Plan identifies the objectives and proposed scope of work for pre-design investigations to support the design and implementation of in-situ treatment for Areas C&E groundwater. The scope of work presented herein is a component of the overall Pre-design Investigation (PDI) that will be conducted to support the design and implementation of the preferred remedies for the Site.

This Work Plan has been prepared consistent with the remedial action objectives for groundwater identified in the AAR (MACTEC, 2009). Groundwater is not used or planned for use at the Site or in the vicinity of the Site for drinking purposes. Therefore, no existing or reasonably anticipated future exposure pathway is complete for potable use of groundwater in the shallow aquifer. The

AAR Conceptual Site Model identified direct-contact exposure to contaminated groundwater via inhalation of vapors or dermal contact as a potentially complete exposure pathway for construction workers (inhalation and dermal contact) and Site workers, trespassers and terrestrial biota (inhalation only) at the Site. Furthermore, the Conceptual Site Model identified direct-contact exposure to surface water (i.e., site stormwater) as a potentially complete exposure pathway for construction workers and terrestrial and aquatic biota. Therefore, the following RAOs were identified for the Site groundwater:

1. Protect construction workers, Site workers, visitors and terrestrial biota from inhalation of vapors associated with contaminants in the shallow aquifer exceeding the New York State (NYS) Class GA standards for groundwater.
2. Protect construction workers, Site workers, and visitors from dermal contact with contaminants in the shallow aquifer exceeding the NYS Class GA standards.
3. Protect construction workers, Site workers, visitors, and terrestrial and aquatic biota from direct contact with groundwater from the shallow aquifer discharging to the Buffalo River at concentrations that exceed the applicable water quality based standards of the receiving water.

The AAR identified the criteria for determining success of the remedy for Area C&E groundwater as confirmation, through groundwater monitoring, that concentrations of COCs in the plume have been reduced and that the plume is not migrating beyond the Site.

The AAR (MACTEC, 2009) identified the estimated extent of groundwater within the shallow aquifer that exceeded NYS Class GA standards based upon the results of a remedial investigation, and defined the extent of groundwater contamination within Areas C&E to be addressed through in-situ treatment as:

1. The northwestern corner of Area C (at well RFI-20 and extending downgradient toward well RFI-31), where up to 7.7 milligrams per liter (mg/L) of chlorobenzene were identified during the Remedial Investigation; and
2. The southwestern portion of Area E in the vicinity of the large Aboveground Storage Tank farm and well RFI-32, where up to 33 mg/L of chlorobenzene, as well as elevated levels of other organic compounds, were identified in the shallow aquifer.

The nature and extent of groundwater contamination in Areas C&E has been further characterized through the implementation of a groundwater profiling program as part of the PDI. The scope of work for groundwater profiling at Areas C&E is presented in Pre-Design Work Plan, Buffalo Color Site A, B, C, & E, dated August 6, 2009 (MACTEC, 2009b). Results of the groundwater profiling program are depicted in Figures 1 and 2, and have been incorporated into the scope of work presented herein.

Subsequent to the Area C&E groundwater plume delineation investigation described above, MACTEC installed and sampled three additional 2-inch diameter monitoring wells within the Area C&E chlorobenzene groundwater plumes (six total) in accordance with the Pre-Design Work Plan (MACTEC, 2009b). Analytical results for groundwater samples collected from the six new wells will not be available until mid-December.

2.0 SCOPE OF WORK

The objectives of the pre-design investigation activities described herein are to:

1. Collect site-specific data related to geochemical and biological processes at the Site through laboratory and/or bench-scale testing in order to determine the appropriate amendments for enhanced bioremediation or a combined bioremediation and chemical oxidation approach; and
2. Evaluate the injection of such amendments into the contaminated aquifer through implementation of a pilot-scale test (Field Pilot-Study Test).

MACTEC established a treatability study plan that addresses these objectives and will produce data to support full-scale design. In addition to the bioremediation approach discussed in the AAR, MACTEC has included some testing of in-situ chemical oxidation since full-scale implementation of the bioremediation approach may benefit from isolated chemical oxidation of the areas with the highest chlorobenzene concentrations. The field test will focus on reagent injectability and radius of influence and not long-term concentration reduction. The scope of work described in the following subsections will be conducted by MACTEC subcontractors, GHR Consulting Services (GHR) (Area E) and Environmental Remediation and Financial Services (ERFS) (Area C) (or their respective subcontractors), under field oversight by MACTEC. Where applicable, work components to be conducted by MACTEC are identified.

2.1 LABORATORY AND BENCH-SCALE TREATABILITY TESTING

Bench-scale treatability testing will consist of three primary components as follows:

1. Biodegradation Rate Testing and Screening Analysis;
2. In-situ Chemical Oxidation Bench Testing; and
3. Microbial Sampling and Analysis.

These components are described in the following subsections.

2.1.1 Bioremediation Rate Testing and Screening Analysis

To evaluate the bioremediation technology, GHR will conduct a bioremediation rate test and screening analysis.

The bioremediation rate test will utilize groundwater samples from two sources (either individual groundwater monitoring wells or a composite from several) to be collected by GHR during the field pilot-study as described in Subsection 2.2.1. The objective of the bioremediation rate test is to evaluate the effect of nutrients (phosphorus, nitrogen, and trace elements including boron, copper, iron, magnesium, manganese, molybdenum, sulfur and zinc) and inoculants (consortium of microbes – proprietary culture) on aerobic biodegradation of chlorobenzene in site groundwater. The two groundwater samples will be used to setup four 1-liter reactors (killed control, unamended, nutrient amended, and nutrient and inoculant amended) per sample (eight reactors total). Oxygen consumption within each reactor will be monitored continuously over a period of two to four weeks, until the rate decreases to a minimal level, at which time degradation will be interpreted to be complete.

The screening analysis will consist of initial samples to determine biochemical oxygen demand (BOD), chemical oxygen demand (COD), plate counts (total and chlorobenzene degraders) and ferrous iron, nitrate and phosphate, with an additional four samples from the respirometry reactors analyzed for BOD and COD at the completion of the bioremediation rate testing. The samples will typically include the killed control and the reactor with the highest oxygen consumption.

GHR will prepare a report that summarizes the results of the testing and screening analysis and provides recommendations for field implementation of the iSOC® technology.

Further details of the Bioremediation Rate Testing and Screening Analysis are presented in GHR's Treatability Study Work Plan in Appendix A.

2.1.2 In-situ Chemical Oxidation Bench Testing

To further evaluate the chemical oxidation technology, ERFS will conduct a chemical oxidation bench-scale test.

The chemical oxidation bench-scale test will utilize groundwater and soil samples collected during installation of the infiltration trench and monitoring wells associated with the chemical oxidation pilot-test (refer to Subsection 2.2) which will be prepared into five soil-groundwater mixtures (includes an unamended control) to evaluate the ability of two different catalyzed chemical oxidation reagents (catalyzed hydrogen peroxide and initiated persulfate),, at two different reagent concentrations (both reagent types at both ten and twenty times the stoichiometric concentration),, to degrade chlorobenzene under site-specific conditions. Each amended test setup will receive 4 doses of reagents separated by several hours to allow for completed reactions. Parameters such as residual oxidant, pH, dissolved oxygen (DO), and oxidation-reduction potential (ORP) will be measured just prior to each of the four dosings. Laboratory analysis for volatile organic compounds (VOCs) (method 8260), including chlorobenzene, will be run at baseline, following the second reagent dose, and following the fourth (final) reagent dose.

ERFS will prepare a report that summarizes the results of the testing and analysis and provides recommendations for full-scale field implementation.

Further details of the Chemical Oxidation Bench-Scale Test are presented in ERFS' Treatability Study Work Plan in Appendix B.

2.1.3 Microbial Sampling and Analysis

To evaluate the amended and unamended biodegradation of chlorobenze in-situ within site groundwater, two bio-trap® passive samplers will be installed by MACTEC within the screened interval of monitoring well MW-C2, which is generally representative of chlorobenzene plume conditions outside of the defined hot-spots. One bio-trap® will be baited with Oxygen Release Compound Advanced (ORC-A®), the other will be unbaited; both will also be baited with a specially synthesized form of chlorobenzene containing ^{13}C labeled carbon, a sampling procedure known as stable isotope probing (SIP). Since ^{13}C is rare, carbon originating from the labeled chlorobenzene is readily distinguished from carbon (predominantly ^{12}C) from other sources (www.microbe.com). The samplers will be assembled, installed in the monitoring well MW-C2, and allowed to incubate in the well for 30 days prior to retrieval in accordance with the vendor instructions provide in Appendix C. After incubation, MACTEC will retrieve the bio-traps and

send them to Microbial Insights for analysis. The analysis will include both the SIP analysis and CENSUS® analysis.

The SIP analysis includes the following three approaches to demonstrate biodegradation of chlorobenzene:

1. The loss of the labeled compound provides an estimate of the degradation rate.
2. Quantification of ^{13}C enriched phospholipid fatty acids (PLFA) indicates incorporation into microbial biomass.
3. Quantification of ^{13}C enriched dissolved inorganic carbon (DIC) indicates contaminant mineralization.

The CENSUS® analysis will provide data to evaluate key microbial communities and functional genes associated with aerobic biodegradation of chlorobenzene through quantification of phenol hydroxylase (qPHE) and toluene dioxygenase (qTOD) genes for the microbes present in both the baited and unbaited bio-trap samplers.

2.2 FIELD PILOT-STUDY TESTING

The field pilot-study testing will consist of two primary components as follows:

1. Bioremediation Field Pilot-Study at Area E; and
2. Chemical Oxidation Field Pilot-Study at Area C.

The selection of which technology to pilot test at each area was based on implementation logistics. The soil and contaminants at each area are relatively similar and the intent is to test different remediation delivery techniques simultaneously. MACTEC anticipates applying pilot test data from one area to both areas during full-scale design.

2.2.1 Bioremediation Field Pilot-Study – Area E

A field test will be conducted at Area E to evaluate the radius of influence of the iSOC® technology under site-specific conditions for the purpose of determining appropriate spacing

requirements for full-scale implementation. The Area E field pilot-study will include the following activities:

- Installation of a 2-inch diameter infusion well (IW-E01) to be screened from 4 to approximately 11 feet below ground surface, approximately 3 feet upgradient of existing monitoring well RFI-32.
- Collection of a composite soil sample during installation of IW-E01 for soil oxidant demand (SOD), BOD, and COD analysis.
- Collection of a groundwater sample from RFI-32 and IW-E01 for analysis of contaminants of concern (COCs), BOD, COD, nitrate, phosphate and ferrous iron.
- Collection of eight liters of groundwater from two existing monitoring locations in Area E to conduct bioremediation rate testing and screening analysis described in Subsection 2.1.1.
- A two to five day field pilot-test involving monitoring the infusion of oxygen at a rate of 40 grams per day at IW-E01 by measuring DO at IW-E01 and RFI-32. Each monitoring event will last approximately 15 minutes. During day one, DO will be measured using an YSI 600XL multi-parameter water quality monitor and low-flow cell, and recorded in the field log book every hour. On subsequent days, the frequency of monitoring may be decreased. Monitoring will continue until equilibrium is achieved, as defined by achieving DO levels in RFI-32 that do not exhibit a further measurable increase and/or the concentration in RFI-32 reaching that present in IW-E01.

Further details of the Area E field pilot-test study are presented in GHR's Treatability Study Work Plan in Appendix A.

2.2.2 Chemical Oxidation Field Pilot-Study – Area C

A field test will be conducted at Area C to evaluate the ability to apply chemical oxidants to the contaminated aquifer and the resulting lateral distribution under site-specific conditions using both an infiltration trench and two direct push injection locations. These tests will help determine the appropriate approach and installation spacing requirements for full-scale implementation. The Area C field pilot-study will include the following activities:

- Installation of a 20-ft long injection trench, approximately 3 feet deep by 3 feet wide at the location shown on Figure 3;
- Installation of 10 temporary well points around the injection trench to collect lateral distribution data as shown on Figure 3;
- Collection of samples of soil and groundwater for the Area C Chemical Oxidation Bench-Scale Test, described in Subsection 2.1.2, while installing the pilot test trench and temporary monitoring points;
- Injection of between 1,000 and 2,000 gallons of nearly equal volumes of 3% to 6% hydrogen peroxide and 3% to 6% ferrous sulfate via the infiltration trench;
- Injection of 750 gallons per injection point (1,500 gallons total) of nearly equal volumes of 3% to 6% hydrogen peroxide and 3% to 6% ferrous sulfate at each of two direct push points, as shown on Figure 3, to test for distribution and resurfacing potential;
- Collection of field parameter data from the temporary well points to evaluate distribution and effectiveness of reagents delivered via the injection trench;
- SiteVision™ survey at baseline and multiple times during treatment to track reagent migration in the subsurface;
- Preparation and submittal of daily logs that will be provided in a final letter report of results and recommendations.

Further details of the Area C field pilot-test study are presented in ERFS' Treatability Study Work Plan in Appendix B.

2.2.3 Injection Permit for Field Pilot-Study Tests

MACTEC has prepared and submitted an application for an Underground Injection Control Permit by Rule to the United States Environmental Protection Agency (USEPA), Region 2, Groundwater Compliance Section. The USEPA has indicated to MACTEC that completion and submittal of an USEPA Office of Ground Water and Drinking Water Inventory of Injection Wells and "Additional Information" as identified on USEPA Region 2 Supplemental Instruction for Completing Inventory of Injection Wells shall be considered authorization to complete the injection activities described in the following subsections. A copy of the application is included as Appendix D.

2.2.4 Post-injection Groundwater Monitoring

MACTEC will conduct groundwater sampling at both two weeks and four weeks following completion of the field activities to evaluate the effects of the field pilot-test study. Groundwater samples will be collected for VOCs (method 8260B) and metals (6010B and mercury) analysis from monitoring wells PS-05, MW-C3, and RFI-32.

2.3 HEALTH AND SAFETY

MACTEC personnel will perform work associated with the field activities in accordance with the approved MACTEC Site Health and Safety Plan and the December 2009 Health and Safety Addendum which addresses oversight of the Field Pilot-Study Tests. Subcontractors working at the Site will perform their work in accordance with their respective companies' health and safety procedures and plans. MACTEC will conduct health and safety meetings with the subcontractors or field crews at the beginning of each day.

Information on the reagents, amendments, and equipment to be used during the field pilot-study tests are included in the subcontractor's Treatability Study Work Plans provided in Appendices A and B.

2.4 SCHEDULE

The anticipated investigation, testing, and reporting schedule is summarized below.

- Area C&E Field Pilot-scale Testing – December 14, 2009 through December 18, 2009
- In-well incubation of Bio-traps – December 14, 2009 through January 13, 2010
- Analysis of Bio-traps – 45 days starting January 13, 2010 (estimated completion on February 27, 2010)
- Bioremediation Bench-Scale Testing – 2 to 4 weeks beginning December 14, 2009 (estimated completion by January 13, 2010)
- Chemical Oxidation Bench-Scale Testing – 6 to 8 weeks beginning December 14, 2009 (estimated completion by January 25, 2010)

3.0 REPORTING

An "In-Situ Treatability Study Investigation and Data Report" will be prepared as part of the Design Basis-30% Design. The report will consist of a description of the work performed, analyses conducted and results, the results of the field pilot-scale tests conducted, and parameters for design of full-scale implementation.

4.0 REFERENCES

MACTEC Engineering and Consulting (MACTEC), 2009b, "Pre-Design Work Plan, Buffalo Color Site A, B, C, & E", Buffalo, New York (Erie County) dated August 6, 2009

MACTEC Engineering and Consulting (MACTEC), 2009, "Final Alternatives Analysis Report, Former Buffalo Color Corporation Site", Buffalo, New York dated February 11, 2009

FIGURES

LEGEND:

- MONITORING WELL
- MONITORING WELL (PZ)
- PDI-C20 — PDI Boring Locations
- Chlorobenzene 1600 — Groundwater Concentration Text Boxes (µg/l)
- Groundwater Plume Boundary >1mg/l
- Groundwater Plume Boundary >10 mg/l
- MW-C01 — Proposed Additional Well Locations

VT3

RFI-21D

RFI-20

RFI-31

PS-05

PS-04

1 mg/l

10 mg/l

PDI-C01
Chlorobenzene 970
1,2,4-Trichlorobenzene 190
1,2-Dichlorobenzene 160
1,3-Dichlorobenzene 290
1,4-Dichlorobenzene 530

PDI-C02
Chlorobenzene 4.6

PDI-C03
Chlorobenzene ND

PDI-C04
Chlorobenzene 23
1,2,4-Trichlorobenzene 79
1,2-Dichlorobenzene 6.9
1,3-Dichlorobenzene .57
1,4-Dichlorobenzene 2.2
Benzene 1.6

PDI-C05
Chlorobenzene 6.5
1,2,4-Trichlorobenzene 2
1,2-Dichlorobenzene 1.1
1,4-Dichlorobenzene .54
Benzene 9.6

PDI-C06
Chlorobenzene 280
1,2,4-Trichlorobenzene 12000
1,2-Dichlorobenzene 2300
1,3-Dichlorobenzene 1000
1,4-Dichlorobenzene 820
Benzene 38

PDI-C07
Chlorobenzene ND
1,2,4-Trichlorobenzene 3.1

PDI-C08
Chlorobenzene 5.8
1,2,4-Trichlorobenzene 98
1,2-Dichlorobenzene 10
1,3-Dichlorobenzene .51
1,4-Dichlorobenzene 2.6
Benzene 3.5

PDI-C09
Chlorobenzene 19

PDI-C10
Chlorobenzene ND

PDI-C11
Chlorobenzene ND

PDI-C12
Chlorobenzene ND

PDI-C13
Chlorobenzene ND

PDI-C14
Chlorobenzene 93
Benzene 2.9

PDI-C15
Chlorobenzene 7.6
1,2,4-Trichlorobenzene 0.9

PDI-C16
Chlorobenzene 99
1,2,4-Trichlorobenzene .66
1,2-Dichlorobenzene 68
1,3-Dichlorobenzene 1.8
1,4-Dichlorobenzene 9.4
Benzene 13

PDI-C17
Chlorobenzene 220
1,2-Dichlorobenzene 90
Naphthalene 2600

PDI-C18
Chlorobenzene 520
1,2,4-Trichlorobenzene 2.2
1,2-Dichlorobenzene 16
1,3-Dichlorobenzene 22
1,4-Dichlorobenzene 36
Benzene 2.6

PDI-C19
Chlorobenzene ND

PDI-C20
Chlorobenzene 0.51

PDI-C21
Chlorobenzene ND

PDI-C22
Chlorobenzene 0.63
1,2,4-Trichlorobenzene 0.75
1,2-Dichlorobenzene 1.7
Benzene 2.1

PDI-C23
Chlorobenzene 2300
1,2,4-Trichlorobenzene 150
1,2-Dichlorobenzene 1500
1,3-Dichlorobenzene 29
1,4-Dichlorobenzene 420
Benzene 84

PDI-C24
Chlorobenzene 78
1,2,4-Trichlorobenzene 19
1,2-Dichlorobenzene 110
1,4-Dichlorobenzene 15
Benzene 14

PDI-C25
Chlorobenzene 130000
1,2,4-Trichlorobenzene 10000
1,2-Dichlorobenzene 42000
1,3-Dichlorobenzene 460
1,4-Dichlorobenzene 7700
Benzene 480
Aniline 1600
Nitrobenzene 4900

PDI-C26
Chlorobenzene 1600
1,2,4-Trichlorobenzene 7.9
1,2-Dichlorobenzene 9.4
1,3-Dichlorobenzene 30
1,4-Dichlorobenzene 29
Benzene 76

PDI-C27
Chlorobenzene 1.6

PDI-C28
Chlorobenzene ND
Benzene .87

PDI-C29
Chlorobenzene 540
1,3-Dichlorobenzene 65
1,4-Dichlorobenzene 59

PDI-C30
Chlorobenzene 8100
1,2,4-Trichlorobenzene 3200
1,2-Dichlorobenzene 3100
1,3-Dichlorobenzene 2000
1,4-Dichlorobenzene 1000
Benzene 65

MW-C01
MW-C02
MW-C03

50 0 50
SCALE: 1"=50'

Prepared/Date: NEL 10/21/2009
Checked/Date: CEH 10/26/2009

SOUTH BUFFALO DEVELOPMENT LLC
BUFFALO, NEW YORK

MACTEC

AREA C GROUDWATER PLUME
WITH GW CONC. TEXT BOXES
Project 3410090701
Figure 1

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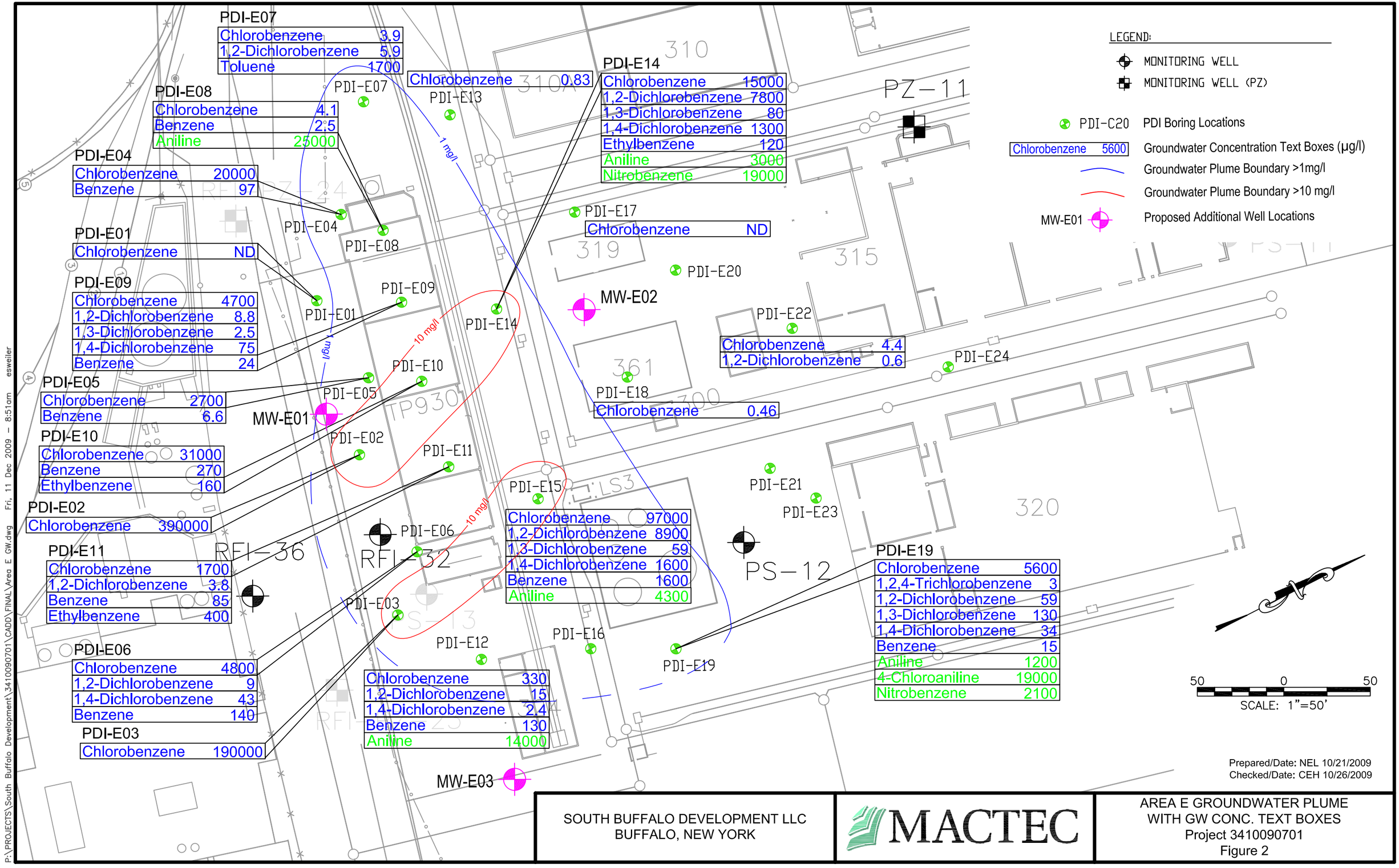
PDI-E07
Chlorobenzene 3.9
1,2-Dichlorobenzene 5.9
Toluene 1700
PDI-E08
Chlorobenzene 4.1
Benzene 2.5
Aniline 25000
PDI-E04
Chlorobenzene 20000
Benzene 97
PDI-E01
Chlorobenzene ND
PDI-E09
Chlorobenzene 4700
1,2-Dichlorobenzene 8.8
1,3-Dichlorobenzene 2.5
1,4-Dichlorobenzene 75
Benzene 24
PDI-E05
Chlorobenzene 2700
Benzene 6.6
PDI-E10
Chlorobenzene 31000
Benzene 270
Ethylbenzene 160
PDI-E02
Chlorobenzene 390000
PDI-E11
Chlorobenzene 1700
1,2-Dichlorobenzene 3.8
Benzene 85
Ethylbenzene 400
PDI-E06
Chlorobenzene 4800
1,2-Dichlorobenzene 9
1,4-Dichlorobenzene 43
Benzene 140
PDI-E03
Chlorobenzene 190000
Chlorobenzene 0.83
PDI-E13
PDI-E14
Chlorobenzene 15000
1,2-Dichlorobenzene 7800
1,3-Dichlorobenzene 80
1,4-Dichlorobenzene 1300
Ethylbenzene 120
Aniline 3000
Nitrobenzene 19000
PDI-E17
Chlorobenzene ND
PDI-E20
MW-E02
PDI-E22
Chlorobenzene 4.4
1,2-Dichlorobenzene 0.6
PDI-E24
PDI-E18
Chlorobenzene 0.46
PDI-E21
PDI-E23
PDI-E15
Chlorobenzene 97000
1,2-Dichlorobenzene 8900
1,3-Dichlorobenzene 59
1,4-Dichlorobenzene 1600
Benzene 1600
Aniline 4300
PDI-E16
PDI-E19
PDI-E12
Chlorobenzene 330
1,2-Dichlorobenzene 15
1,4-Dichlorobenzene 2.4
Benzene 130
Aniline 14000
MW-E03
PDI-E19
Chlorobenzene 5600
1,2,4-Trichlorobenzene 3
1,2-Dichlorobenzene 59
1,3-Dichlorobenzene 130
1,4-Dichlorobenzene 34
Benzene 15
Aniline 1200
4-Chloroaniline 19000
Nitrobenzene 2100
MW-E01
PDI-E02
PDI-E11
PDI-E06
PDI-E03
1 mg/l
10 mg/l
RFI-36
RFI-32
RFI-24
RFI-23
PS-11
PS-12
PS-13
PZ-11
TP930
310
310A
319
315
361
320
LS3
LEGEND:
MONITORING WELL
MONITORING WELL (PZ)
PDI-C20 PDI Boring Locations
Chlorobenzene 5600 Groundwater Concentration Text Boxes (µg/l)
Groundwater Plume Boundary >1mg/l
Groundwater Plume Boundary >10 mg/l
MW-E01 Proposed Additional Well Locations
50 0 50
SCALE: 1"=50'
Prepared/Date: NEL 10/21/2009
Checked/Date: CEH 10/26/2009
SOUTH BUFFALO DEVELOPMENT LLC
BUFFALO, NEW YORK
MACTEC
AREA E GROUNDWATER PLUME
WITH GW CONC. TEXT BOXES
Project 3410090701
Figure 2
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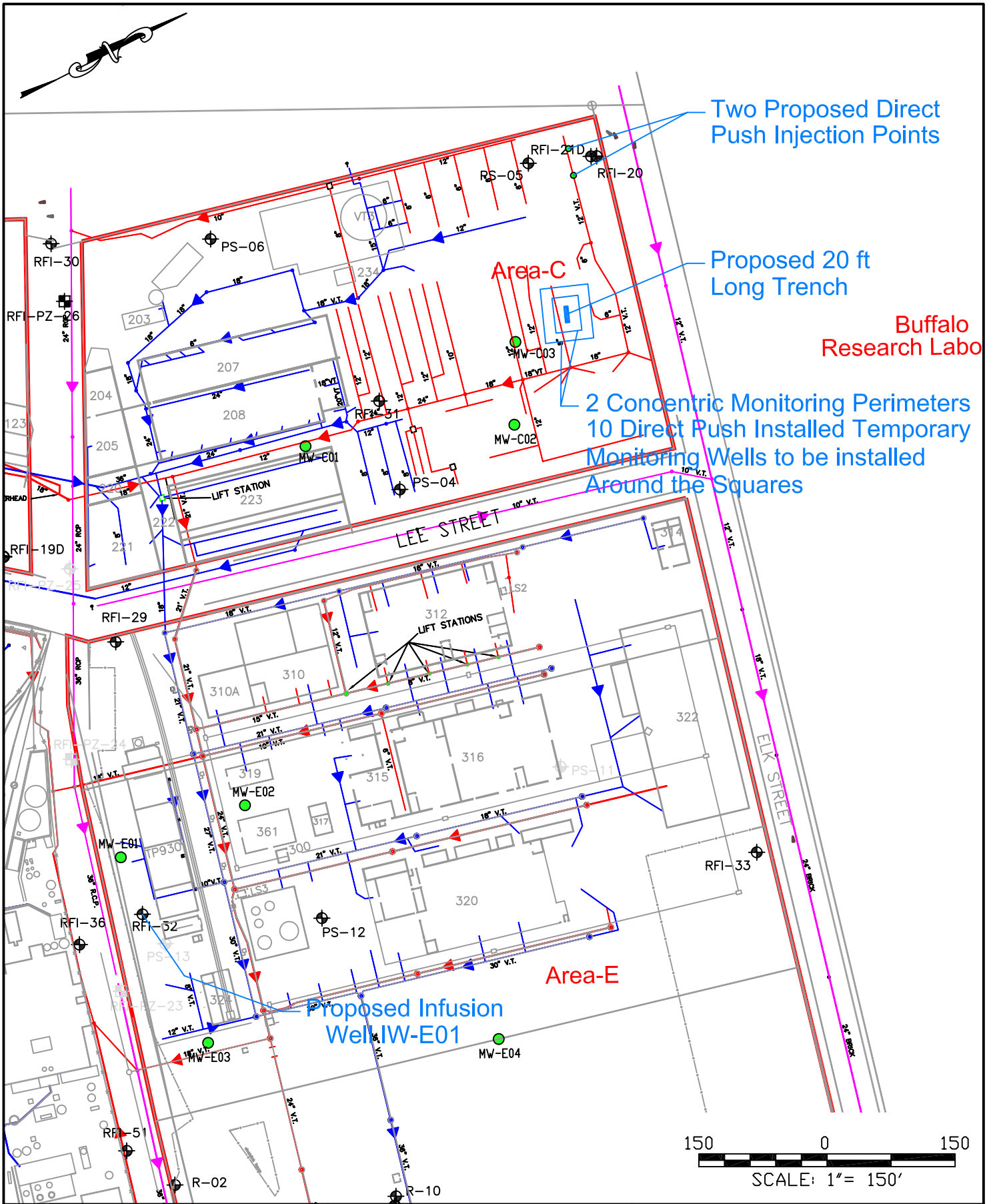

SOUTH BUFFALO DEVELOPMENT LLC
BUFFALO, NEW YORK
Project No.: 3410090701

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SITE PLAN
WITH PILOT STUDY ACTIVITIES
BUFFALO COLOR AREAS ABCE
FIGURE: 3

3

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APPENDIX A

GHR BIOREMEDIATION TREATABILITY STUDY WORK PLAN

UPDATED WORKPLAN

BUFFALO COLOR AREA
BUFFALO, NEW YORK

IN-SITU REMEDIAL TECHNOLOGY – AREA E

BENCH-SCALE/LABORATORY ANALYTICAL TESTING
AND
FIELD PILOT TESTING

Prepared for:

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Ambler, PA 19002

Revised December 8, 2009

A short term field test will be conducted in Area E to determine spacing requirements for the in situ enhanced bioremediation oxygen delivery system (iSOC). A newly installed test infusion well will be installed: 2" in diameter, and screened from 4' to approximately 11' below ground surface. An infusion well will be installed 3' upgradient of an existing performance (monitoring) well RFI-32. The infusion well will be identified as IW-E01. The infusion well will be constructed similarly to a monitoring well and will be available for groundwater sampling subsequent to the pilot test.

Prior to installing the new well, a sample of the soil will be taken near the soil/groundwater interface; the sample will be analyzed for soil oxygen demand (SOD). The soil sample will also be analyzed for biochemical oxygen demand (BOD) and chemical oxygen demand (COD).

An iSOC will be installed in IW-E01 and will be connected to an oxygen cylinder via a two-stage pressure regulator. The iSOC is equipped with an internal flow control valve to limit oxygen delivered to 35-40 grams of oxygen per day. The performance well (RFI-32) will be monitored for dissolved oxygen (DO) to establish its radius of influence and the time required for the oxygen to reach a steady state condition. Initially, dissolved chlorobenzene will be measured in both the performance well and IW-E01. Oxygen will be continuously infused into IW-E01 and DO will be monitored in both the performance and infusion well over a two to five day period. This data will be helpful to determine ideal placement of infusion wells necessary to address the more heavily contaminated areas in the full scale implementation phase.

A field sampling log will be established to record DO in both the performance and infusion wells as a function of time. Typically an infusion well will reach saturated conditions (approximately 40 mg/l DO) within 15-25 hours. The rate of DO increase in the performance well is variable depending on dissolved contamination (which exhibits an oxygen demand), as well as the other chemical and biochemical demands in the groundwater, and the oxygen demand of the soil in contact with groundwater.

Prior to initiating the pilot study, groundwater samples will be obtained from RFI-32 and the newly installed infusion well IW-E01. Groundwater samples will be analyzed for COCs, BOD, COD, nitrate, phosphate and ferrous iron. The groundwater sample from RFI-32 will be obtained using a low flow purge technique, and will be field tested for pH, ORP, temperature and DO. The groundwater sample from IW-E01 will be obtained by Geoprobe, and will be similarly analyzed. Data will be logged during the sampling procedure.

Additionally, GHR will obtain groundwater samples from two other existing monitoring locations in Area E. Each sample may be from a single well or sampling point or may be a composite from several wells or sampling points, depending on yield. GHR proposes to use the B1-200 Electrolytic respirometer with eight 1 L reactors to evaluate the effect of nutrients and inoculant on the groundwater. All reactors will have 800-1000 mL of groundwater. The reactors will be set up as follows:

Reactor #	GW Source	Nutrients/Additives
1	Area E, sample 1	Killed control
2	Area E, sample 1	Unamended groundwater
3	Area E, sample 1	N+P+trace
4	Area E, sample 1	N+P+trace+inoculant
5	Area E, sample 2	Killed control
6	Area E, sample 2	Unamended groundwater
7	Area E, sample 2	N+P+trace
8	Area E, sample 2	N+P+trace+inoculant

If insufficient oxygen uptake is occurring, a chlorobenzene spike of 5 mg/l may be used to increase oxygen consumption. Nutrient consisting of urea will be added to provide 2 mg/L ammonium-N (N), potassium phosphate to provide 5 mg/l of phosphate-P (P) and one mL of a 0.1% solution of commercial product ("MOST", JR Peters, Inc., Allentown, PA) containing trace elements (trace) will be added where indicated in the table. The trace element product contains boron, copper, iron, magnesium, manganese, molybdenum, sulfur and zinc. All reactors will be incubated at 15°C.

Oxygen consumption will be monitored continuously in all reactors. When the oxygen consumption rate decreases to a minimal level, degradation will be assumed complete. GHR estimates that this will occur in 2 to 4 weeks. At completion, samples will be removed from each reactor and the samples will be submitted to an outside laboratory for final chlorobenzene analysis.

GHR will conduct a screening test on the initial samples to determine BOD, COD, plate counts (total and chlorobenzene degraders) and ferrous iron, nitrate and phosphate. Additionally, four samples from the respirometry reactors will be analyzed for BOD and COD. GHR will consult with MACTEC to determine which four of the eight reactor samples will be selected for BOD and COD analysis.

Upon receiving the final test results, Bioscience will prepare a written report consisting of the oxygen consumption data in graphical and tabular form and the analytical results for each reactor. Screen test data and the effect of added nutrient and/or inoculants will be addressed and recommendations for field addition will be made.

STANDARD OPERATING PROCEDURES

BUFFALO COLOR AREA
BUFFALO, NEW YORK

IN-SITU REMEDIAL TECHNOLOGY – AREA E

FIELD PILOT TESTING

Prepared for:

MACTEC Engineering and Consulting, Inc.
Portland, Maine 04101

Prepared by:

GHR Consulting Services, Inc./O_2 Technologies, Inc.
224B S. Maple Street
Ambler, PA 19002

Revised December 8, 2009

STANDARD OPERATING PROCEDURES

BUFFALO COLOR AREA
BUFFALO, NEW YORK

IN-SITU REMEDIAL TECHNOLOGY – AREA E

FIELD PILOT TESTING

This standard operating procedure (SOP) includes field work to be performed by GHR Consulting Services, Inc. (GHR) at the Buffalo Color Area E in Buffalo, NY. Subcontracted to GHR will be SJB Drilling Services, Inc. (SJB), a drilling contractor. The work is to be performed on or around the week of December 14, 2009.

INITIAL SOIL AND GROUNDWATER SAMPLING

A single soil sample will be obtained from the location for the new infusion well, IW-E01. The soil sample will be obtained by SJB and GHR using a truck-mounted Geoprobe model 5410, or equivalent. The rig will use direct-push technology to advance dual-tube macrocores to obtain and extract five foot soil cores. The cores will be encapsulated in acetate liners and brought to the surface for analysis and sampling. The acetate liners will be cut open, and the soil core will be logged in a field log book. Visual observations of the soils will be logged. A photoionization detector (PID) will be used to field screen the soil cores for volatile organic vapors. The PID will be a MiniRAE 2000 or equivalent. PID readings will be recorded in the log book.

Soil cores will be advanced to about 10 feet below ground surface (bgs). A single composite soil sample will be obtained from IW-E01. The composite sample will be comprised of two soil locations: one at or near the groundwater interface, and one location from between the groundwater interface and the glaciolacustrine clay layer, expected to be encountered near 11' bgs. The location and description of the composite soil sample will be logged. Unsampled soils will be stored on-site in drums. Acetate liners will be disposed of as non-hazardous waste.

A single groundwater sample will be obtained from IW-E01. The groundwater sample will be obtained by SJB and GHR using a truck-mounted Geoprobe 5410, or equivalent. The rig will use direct-push technology to advance hollow-stem rods to 11' bgs. A stainless steel screen will be deployed from 8' bgs to 11' bgs. New small diameter tubing with a stainless steel check valve will be deployed inside the hollow rods down to 11' bgs to obtain a single groundwater sample. No purging of the groundwater is required. The tubing will be disposed of as non-hazardous waste.

Another single groundwater sample will be obtained from an existing monitoring well, RFI-32. The well will be purged using the low-flow method. The sampling protocol includes an initial gauging and recording of the static monitoring well groundwater level. The well will be purged using electric submersible pump (Fultz Pump). The discharge of the pump will be connected to a YSI 600XL multi-parameter water quality monitor and low-flow cell to measure and record dissolved oxygen (DO), temperature, conductivity, oxygen reduction potential (ORP) and pH. In addition, a LaMotte 2020 portable turbidity meter will be used to measure turbidity during the purging process. GHR will record groundwater level drawdown, purge rate and the above referenced parameters at five minute intervals.

After the process parameters stabilize within acceptable tolerances, the groundwater sample will be collected directly from the discharge tubing.

The YSI 600XL multi-parameter water quality monitor and the turbidity meter will be calibrated on-site prior to the commencement of work. Calibration records and all field logs will be provided to MACTEC as part of daily report submittals and a final submittal. Soil and groundwater sampling are scheduled for 12/14/2009, and are expected to take one-half day.

INSTALLATION OF INFUSION WELL

Compressed oxygen cylinders and equipment are to be transported to and handled at the workplace in compliance with OSHA 29CFR 1910.104.

A single infusion well will be installed in Area E. The well is to be designated IW-E01, and will be constructed of 2" PVC with a protective outer casing (see well installation instructions for detailed well construction, page 6). The well will be installed by SJB and GHR using a Geoprobe model 7700 or equivalent. The rig will advance 8" diameter augers to 20' bgs. The 2" well will be installed from 20' bgs to 1' above ground surface, and will be screened from 4' bgs to 11' bgs.

Concrete will be used to encase the well from 20' bgs to 11' bgs, as well as from 3' bgs to the surface. Filter pack material will be used to encase the screened area of the well. The concrete will be mixed onsite from 80 lb bags. SJB will provide the concrete mix and the necessary water.

Soil cuttings from the well installation process will be containerized in 55 gallon drums. The drums will remain onsite for disposal by others. SJB will supply the drums and the drum lids. No further site restoration activities are planned for this event.

GHR will install one iSOC oxygen infusion device in IW-E01. The iSOC will be suspended within the well near 19' bgs. The iSOC will be connected to a small oxygen cylinder (30" long) by small diameter plastic tubing. The iSOC will be suspended using twine or wire from the top of the well casing. The oxygen cylinder and associated pressure regulator will be contained within a small plastic storage container, approximate dimensions are 3'x2'x2'. The container will be set adjacent to IW-E01 and will be protected by several traffic cones.

Well installation activities are scheduled for 12/14/2009, and are expected to take one-half day.

FIELD TEST MONITORING

For two to five days during the week of 12/14/2009, GHR will perform field testing on the new infusion well IW-E01 and a nearby performance well. Field testing includes the deployment of dissolved oxygen (DO) measuring equipment down well. IW-E01 and the nearby performance well will be monitored in the field test. Each monitoring event will last approximately 15 minutes. During day one, DO will be recorded in the field log book every hour. On subsequent days, the frequency of monitoring may be decreased. Monitoring events will not be held at night.

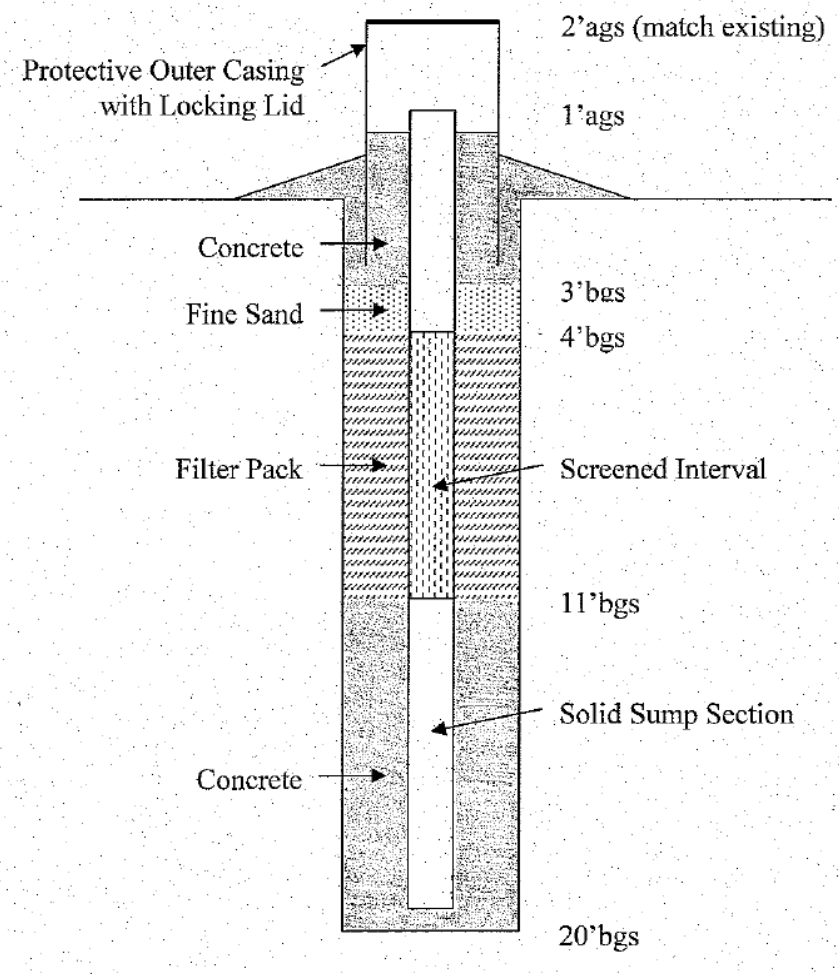
At the conclusion of the field test, the iSOC, oxygen cylinder and associated equipment will be removed from the site and IW-E01 will be closed and locked. Field test monitoring activities are scheduled for 12/15/2009, and are expected to take two to five days. Field work will be completed by the end of the day on December 18, 2009.

Soil Sample

Location:	5 feet due north of PS-13
Equipment:	Direct push macrocore (dual tube)
Boring:	Surface to 16'bgs
Sample:	Composite of 12" section centered at top of water table and 12" section centered at 8'bgs

Infusion Well

Location:	5 feet due north of PS-13
Construction:	2" schedule 40 PVC in 8" borehole
Outer casing:	Match protective outer casing to the existing monitoring wells on site (none, 4"steel, 6" PVC, etc.)
Top case:	From 1' above ground surface to 4' below ground surface (bgs)
Screening:	4'bgs to clay layer (approximately 11'bgs). Center screening in borehole.
Solid sump:	From bottom of screening to 20'bgs



APPENDIX B

ERFS CHEMICAL OXIDATION TREATABILITY STUDY WORK PLAN

SUMMARY WORK PLAN

IN SITU CHEMICAL OXIDATION PILOT TEST
TREATMENT AREA C
Buffalo Color Area ABCE Site
Buffalo, New York

Prepared For:

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December 2009

1.0 INTRODUCTION

Environmental Remediation and Financial Services, LLC (ERFS) prepared this work plan for MACTEC Engineering and Consulting, Inc. (MACTEC) to implement an in situ chemical oxidation (ISCO) pilot test at Treatment Area C, Buffalo Color Area ABCE Site in Buffalo, New York. The pilot test objectives are to collect soil and groundwater samples for bench testing and to confirm the expected lateral distribution of treatment reagents using both laterals and direct push points.

This Draft Work Plan includes sections regarding health and safety and spill control; treatment technology evaluation and selection; bench, pilot, and testing implementation; monitoring; and, schedule. The results obtained by implementing this work plan would then be used to adjust and confirm the full scale remediation approach.

2.0 HEALTH & SAFETY, and SPILL CONTROL

2.1 Health and Safety –ERFS has prepared a site specific Health and Safety Plan (HASP) for review by MACTEC. ERFS and subcontractors will participate in kick off safety meeting(s) and orientation and will hold daily pre-work safety meetings;

2.2 Spill Control – ERFS will prepare a Spill Prevention, Control, and Countermeasures Plan that will address materials containment, handling, mixing, and storage procedures and requirements. Adequate countermeasure materials (absorbents, neutralizers, dilution water) will be maintained on site during the work and all ERFS personnel and subcontractors will understand their actions to control or mitigate a reagent spill, including notifications.

3.0 TREATMENT TECHNOLOGY EVALUATION AND SELECTION

Multiple proven technologies are available for in situ treatment of chlorinated aromatic compounds. However, many of these techniques may not be compatible or appropriate for this site given the soil types and groundwater conditions. In situ biological treatment is sensitive to groundwater redox conditions, groundwater pH, groundwater dissolved oxygen (DO) content, and the concentrations of macro and micro nutrients at the site. Further, bio-stimulation approaches depend on the starting microbial populations – both type and number. In situ chemical oxidation techniques can be sensitive to the soil oxidant demand within treatment area soils and dependent on the soil permeability at the treatment areas.

In order to meet the very tight project schedule while still verifying remediation technique selection, ERFS recommends evaluating biological stimulation (addition of nutrients and oxygen enhancement), bioaugmentation (same as stimulation with the addition of exogenous microbes), and chemical oxidation all on parallel schedules. ERFS recommends that bench testing and pilot testing be conducted concurrently so that results will be available by December 2009. Biological treatment may be limited due to highly

variable geochemical conditions where pH is found outside the ideal range of 6 to 8 s.u. In situ chemical oxidation may be limited by soil permeability and soil oxidant demand.

None of these remedial options requires significant dilution water and injected volumes are expected to fall within roughly 5% to 15% of the treatment area pore volume during any one injection event; therefore, dilution of contaminant concentrations is not expected due to the relatively low injected volume. ERFS will also avoid long periods of increased hydrostatic head at injection areas to eliminate potential contaminant migration from the treatment area. Reaction byproducts of the selected remedies do not form listed contaminants or hazardous residuals.

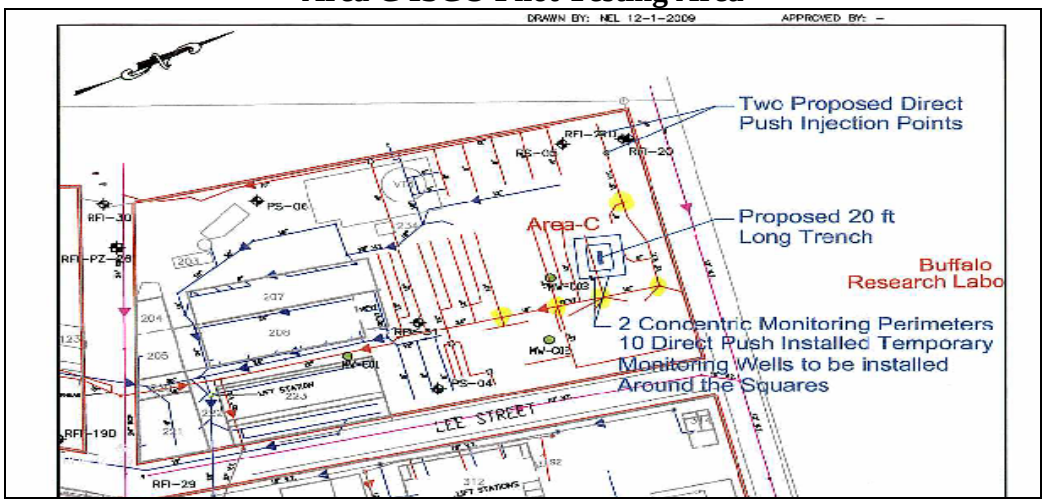
4.0 PILOT TEST IMPLEMENTATION

4.1 Site Setting Description

The site setting is described in the RFP documents, figures, and tables. Previous investigations relied on monitoring well data to determine the location and size of chlorobenzene (CB), trichlorobenzene (TCB), and dichlorobenzene (DCB) impacted areas. The understanding of chlorobenzene hot spots was widened and better defined through MACTEC's recent geoprobe soil and groundwater investigation where larger impacted areas were found to be better represented as multiple smaller source areas. ERFS will conduct field pilot testing at Area C.

Only the upper, unconfined aquifer is targeted for in situ treatment. This interval is generally described as moderate to low permeability soil composed of fine sand, silt, and fill material. Depth to water ranges from 3 to 8 ft bgs. The galciolacustrine clay unit is generally noted at about 10 ft bgs and defines the lower limit of the upper unconfined aquifer. At Area C, the most highly impacted location appears to be around boring PDI-C25 where CB was detected at 130,000 ug/L in groundwater.

Area C ISCO Pilot Testing Area

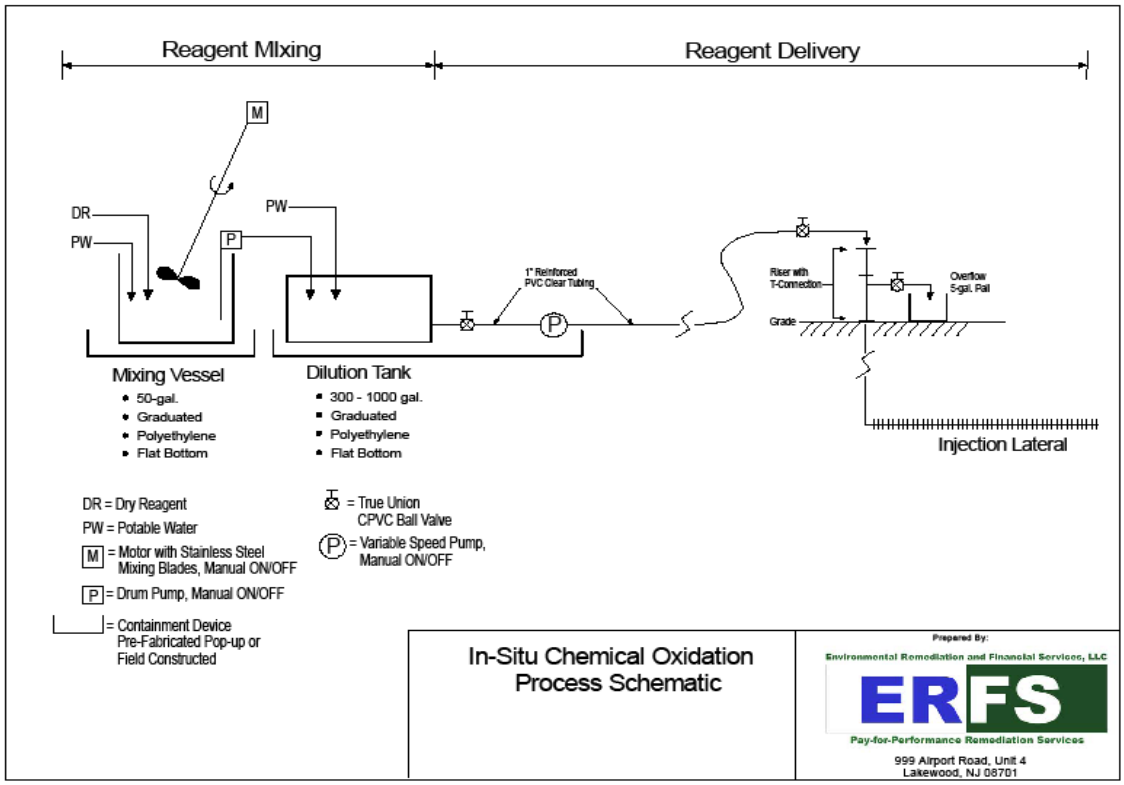


4.2 Field Pilot Test Implementation

ERFS will use in situ chemical oxidation (ISCO) for pilot testing so that reagent distribution results can be obtained quickly and inexpensively. Further, chemical oxidation is the recommended approach at the higher contaminated source areas since that approach can rapidly reduce very high contaminant concentrations in groundwater very quickly.

The choice of injection methods workable at the site will be limited due to the shallow nature of the targeted interval (3 to 10 ft bgs). Under these conditions, use of vertical injection wells is problematic since the shallow depth to groundwater often leads to well overflow or short circuiting of reagents easily to the surface. Direct push injection may not be workable at this site since a minimum of about 10 ft of overburden is needed to avoid short circuiting while conducting direct injection under pressure. Injecting at 10 ft bgs at the site would not be beneficial since reagent mixing over a six or seven foot vertical interval is unlikely.

Based on the above analysis, ERFS recommends using lateral trenches to apply reagents near PDI-C25 and DP injection near RFI-20. Laterals will allow application of larger volumes of reagents that can then percolate into the target area and react with contaminants. This approach allows a very high "volume injected" per "man-hour on site" ratio, resulting in more treatment at lower cost. ERFS will also test direct injection at two locations adjacent to RFI-20.



Both hydrogen peroxide and sodium persulfate will effectively oxidize CB, TCB, and DCB in situ. Hydrogen peroxide, at the proper formulation at low concentrations is an effective reagent for oxidation and it will yield changes in easy to measure field parameters which will provide quick results regarding distribution. Sodium persulfate is also an effective reagent, however it is more costly, is highly corrosive to equipment, and can only be measured using colorimetric test kits which can give false positive results in many cases. Based on these reasons, ERFS recommends using a dilute (1% to 6%) hydrogen peroxide solution with a dilute ferrous sulfate (2% to 5%) catalyst applied in strategic sequences during the pilot testing.

Example of ERFS Reagent Addition

Based on the above analysis and discussion of delivery methods and reagent selection, ERFS proposes to conduct pilot testing at Area C using a slotted lateral in a trench near PDI-C25 and two DP injectors at RFI-20, then applying diluted, catalyzed hydrogen peroxide (CHP) for treatment. The lateral distribution will be measured at temporary points to be installed at key locations and distances (10 to 30 ft away) around the lateral and at RFI-20 for the DP points.

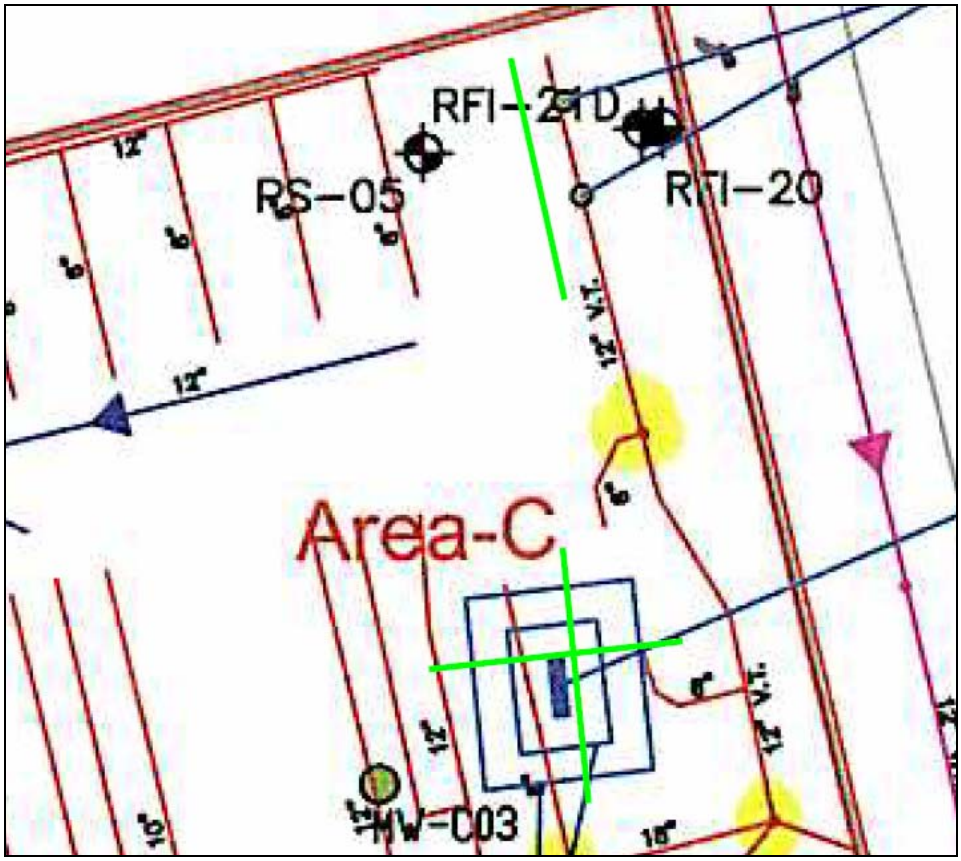
Specifically,

- Area C – Target PDI-C25 area using a lateral injection trench and target RFI-20 using two DP points;
- Testing to consist of:
  - Install a 20-ft long trench, approximately 3 ft deep by 3 ft wide;
  - Install two direct injection points near RFI-20 to test for distribution and re-surfacing potential;
  - Install 10 temporary well points to collect lateral distribution data
  - Collect field parameter data – oxygen, carbon dioxide, LEL, and PID readings in well point headspace and DTW, ORP, DO, pH, specific conductivity, temperature, iron, and peroxide in well point groundwater. Data to be collected at baseline and periodically throughout each injection day;
  - SiteVision uses high resolution electrical resistivity equipment and imaging software to “map” shallow (i.e., typically less than 50 meters) geological and man-made features as well as real-time hydrogeological conditions. When used in

conjunction with On-Contact Remediation Process®, SiteVision can be used to monitor the distribution of chemical reagents as they are injected into a targeted Treatment Area. The resistivity data that are collected are used to create two- or three-dimensional images of the subsurface. By collecting data over successive time intervals, changes in subsurface conditions (i.e., resistivity domains) can be used to document successful infusion of reagents or to identify gaps where treatment reagents may not be contacting the contaminant-impacted media. By calculating and comparing apparent resistivity values at multiple subsurface locations, SiteVision is able to model subsurface features

Electrical resistivity is a commonly used geophysical surveying technique founded on the principal that the resistance of electrical current flow in the subsurface is dependent on the conductivity of the subsurface material, the water content in the material and the chemical composition of the groundwater. The basic equipment array to obtain a single resistivity measurement includes a source for an electrical current with appropriate meters to measure current and voltage, two current electrodes to induce a high-voltage\low-amperage current into the ground and two voltage electrodes to measure the voltage drop at a measured distance from the current source. Using the known spacing of all four electrodes or "nodes" along the surface, an apparent resistivity measurement is calculated at a corresponding depth beneath the surface array. SiteVision uses a state-of-the-art automatic resistivity switch, capable of using up to 48-nodes, to quickly obtain multiple measurements (i.e., data points) at pre-determined depth levels along the desired survey line.

The figure below depicts a portion of Treatment Area C consisting of a 20-foot long lateral injection trench and two (2) shallow direct push injection points. The location of the SiteVision-survey lines proposed by ERFS to collect resistivity data are shown in green. Resistivity measurements would be collected along two survey lines intersecting at 90 degrees. The survey lines would be oriented parallel and perpendicular to the proposed lateral injection trench. A third optional survey line is also shown adjacent to the proposed direct-push injection points. The resistivity array to be selected for the pilot testing will provide adequate subsurface data points good sensitivity in both horizontal and vertical directions with an investigation depth of approximately 12 feet below ground surface.



Treatment Area 'C' injection trench and proposed SiteVision survey lines (in green).

From the measured apparent resistivity data points collected for each survey, an iterative series of contoured apparent resistivity profiles, or psuedosections, are generated using specialized modeling software. In the final iteration of the modeling process, psuedosections are converted into least-squares inversion models (also referred to as Inverse Model Resistivity Sections or "Sections"). The Sections are false-color contour, cross-sectional representations of the resistivity data in units of ohm-meters. In general, darker colors represent areas of lower relative resistivity while the progressively brighter colors are areas of higher relative resistivity. [Note: For unconsolidated sediments such as those occurring at the Site, resistivity values are dependent upon several factors including the type of sediments, porosity of the materials, the degree of saturation, and the concentration of dissolved salts in the groundwater.] The Sections may then be interpreted in the context of other subsurface information derived from soil borings, groundwater monitoring wells, etc., as well as data related to the chemical injections. By adjusting the contour range and interval of the Sections, resolution of the data can be optimized within the area of interest. Once the contour parameters are fixed, Sections can easily be compared and evaluated for changes over distance and/or time.

- Apply 750 to 1,500 gallons of reagents to trench each day. Volume dependent on reagent concentration and soil permeability in the test area;

- Apply 500-1,000 gallons to each direct push point to verify distribution and potential re-surfacing using this method;
- ERFS will provide daily logs, photographs, and will provide a final letter report of results and recommendations.

4.3 Bench Scale Testing

ERFS will subcontract the ISCO bench testing to our laboratory studies partner, the Environmental Health Sciences and Environmental Science & Policy Department of Biology at Clarkson University in Potsdam, New York. Laboratory analysis will be conducted by Northeast Analytical Labs (NEAL). ERFS will collect and ship soil and groundwater samples to Clarkson during field work for the pilot test, Clarkson will be responsible for completing the testing; shipping samples for analysis; and, for submitting a draft report of activities and results to ERFS. ERFS and MACTEC will provide comments and questions to Clarkson either in writing or via telephone conference calls after which Clarkson will issue a final report.

Specifically:

- ERFS will collect samples of soil and groundwater from Area C while installing the pilot test trench and monitoring points. Once received by Clarkson, aliquots of soil and groundwater will be removed for baseline laboratory analysis of VOCs, including chlorobenzene, and shipped to NEAL for VOC and COD analysis.
- Remaining sample to be prepared into soil-groundwater mixtures in test containers (typically 40-ml vials) for five experiments, each run in duplicate:
  - Catalyzed peroxide
    - 10 x stoichiometric amount + iron
    - 20 x stoichiometric amount + iron
  - Initiated Persulfate
    - 10 x stoichiometric amount + iron
    - 20 x stoichiometric amount + iron
  - Control – no treatment
- Each experimental run will receive 4 doses of reagents separated by several hours to allow for completed reactions. Parameters such as residual oxidant, pH, DO, and ORP will be measured just prior to each of the 4 doses. Laboratory analysis for VOCs, including chlorobenzene, will be run at baseline, following the second reagent dose, and following the fourth (final) reagent dose.
- Schedule – ERFS estimates that six to eight weeks will be required to run baseline analysis, complete the bench testing, receive and review analytical results, and submit the draft report. Review, comment, and draft revision will likely require two weeks. All analytical services will be done on standard turnaround time of 10 business days from receipt of samples.

5.0 Schedule

Assuming a December 10, 2009 contracting date and notice to proceed, ERFS proposes the following schedule:

- Dec 14 – Mobilize to site. ERFS to ship samples to Clarkson for analysis and bench testing;
- Dec 15 and 16 – Install trenches at one or both areas;
- Dec 15 and 16 – Install temporary well points around trenches;
- Dec 17 – receive chemicals, collect baseline data, conduct baseline SiteVision survey
- Dec 18 through 23 (if needed) – apply reagents to trenches and measure field parameters (multiple times daily), record data via data loggers, and SiteVision surveys (every two days and final day);
- Jan 25, 2010 - Receive bench results;
- Feb 1, 2010 – Submit draft report
- Feb 14, 2010 receive MACTEC comments;
- Feb 21, 2010 submit final report to MACTEC.

Some Concrete mixed throughout

Two DP injection points

LEGEND:

- MONITORING WELL
- MONITORING WELL (PZ)
- PDI-C20 — PDI Boring Locations
- Chlorobenzene 1600 — Groundwater Concentration Text Boxes (µg/l)
- Groundwater Plume Boundary >1mg/l
- Groundwater Plume Boundary >10 mg/l
- MW-C01 — Proposed Additional Well Locations

= Concrete Very Likely

20 ft long trench

Two 'concentric' monitoring perimeters. 10 DP installed TMWs to be installed around the squares

PDI-C13: Chlorobenzene ND
PDI-C19: Chlorobenzene ND
RFI-21D
RFI-20
PS-05
PDI-C12: Chlorobenzene ND
1 mg/l
PDI-C18: Chlorobenzene 520; 1,2,4-Trichlorobenzene 2.2; 1,2-Dichlorobenzene 16; 1,3-Dichlorobenzene 22; 1,4-Dichlorobenzene 36; Benzene 2.6
PDI-C27: Chlorobenzene 1.6
PDI-C26: Chlorobenzene 1600; 1,2,4-Trichlorobenzene 7.9; 1,2-Dichlorobenzene 9.4; 1,3-Dichlorobenzene 30; 1,4-Dichlorobenzene 29; Benzene 76
PDI-C03: Chlorobenzene ND
PDI-C11: Chlorobenzene ND
PDI-C10: Chlorobenzene ND
VT3
PDI-C08: Chlorobenzene 5.8; 1,2,4-Trichlorobenzene .98; 1,2-Dichlorobenzene 10; 1,3-Dichlorobenzene .51; 1,4-Dichlorobenzene 2.6; Benzene 3.5
PDI-C02: Chlorobenzene 4.6
PDI-C09: Chlorobenzene 19
PDI-C17: Chlorobenzene 220; 1,2-Dichlorobenzene 90; Naphthalene 2600
1 mg/l
PDI-C25: Chlorobenzene 130000; 1,2,4-Trichlorobenzene 10000; 1,2-Dichlorobenzene 42000; 1,3-Dichlorobenzene 460; 1,4-Dichlorobenzene 7700; Benzene 480; Aniline 1600; Nitrobenzene 4900
MW-C03
PDI-C01: Chlorobenzene 970; 1,2,4-Trichlorobenzene 190; 1,2-Dichlorobenzene 160; 1,3-Dichlorobenzene 290; 1,4-Dichlorobenzene 530
PDI-C08
10 mg/l
PDI-C24
PDI-C30: Chlorobenzene 8100; 1,2,4-Trichlorobenzene 3200; 1,2-Dichlorobenzene 3100; 1,3-Dichlorobenzene 2000; 1,4-Dichlorobenzene 1000; Benzene 65
PDI-C06: Chlorobenzene 280; 1,2,4-Trichlorobenzene 12000; 1,2-Dichlorobenzene 2300; 1,3-Dichlorobenzene 1000; 1,4-Dichlorobenzene 820; Benzene 38
PDI-C07: Chlorobenzene ND; 1,2,4-Trichlorobenzene 3.1
PDI-C16
1 mg/l
PDI-C23
PDI-C24: Chlorobenzene 78; 1,2,4-Trichlorobenzene 19; 1,2-Dichlorobenzene 110; 1,4-Dichlorobenzene 15; Benzene 14
PDI-C23: Chlorobenzene 2300; 1,2,4-Trichlorobenzene 150; 1,2-Dichlorobenzene 1500; 1,3-Dichlorobenzene 29; 1,4-Dichlorobenzene 420; Benzene 84
PDI-C05: Chlorobenzene 6.5; 1,2,4-Trichlorobenzene 2; 1,2-Dichlorobenzene 1.1; 1,4-Dichlorobenzene .54; Benzene 9.6
PDI-C06
PDI-C22: Chlorobenzene 0.63; 1,2,4-Trichlorobenzene 0.75; 1,2-Dichlorobenzene 1.7; Benzene 2.1
PDI-C16: Chlorobenzene 99; 1,2,4-Trichlorobenzene .66; 1,2-Dichlorobenzene 68; 1,3-Dichlorobenzene 1.8; 1,4-Dichlorobenzene 9.4; Benzene 13
PDI-C29: Chlorobenzene 540; 1,3-Dichlorobenzene 65; 1,4-Dichlorobenzene 59
1 mg/l
RFI-31
PDI-C05
MW-C02
PDI-C21: Chlorobenzene ND
MW-C01
PDI-C04
PDI-C15: Chlorobenzene 7.6; 1,2,4-Trichlorobenzene 0.9
PDI-C04: Chlorobenzene 2.3; 1,2,4-Trichlorobenzene 79; 1,2-Dichlorobenzene 6.9; 1,3-Dichlorobenzene .57; 1,4-Dichlorobenzene 2.2; Benzene 1.6
PDI-C20: Chlorobenzene 0.51
PS-04
PDI-C14: Chlorobenzene 93; Benzene 2.9
PDI-C28: Chlorobenzene ND; Benzene .87

50 0 50
SCALE: 1"=50'

Prepared/Date: NEL 10/21/2009
Checked/Date: CEH 10/26/2009

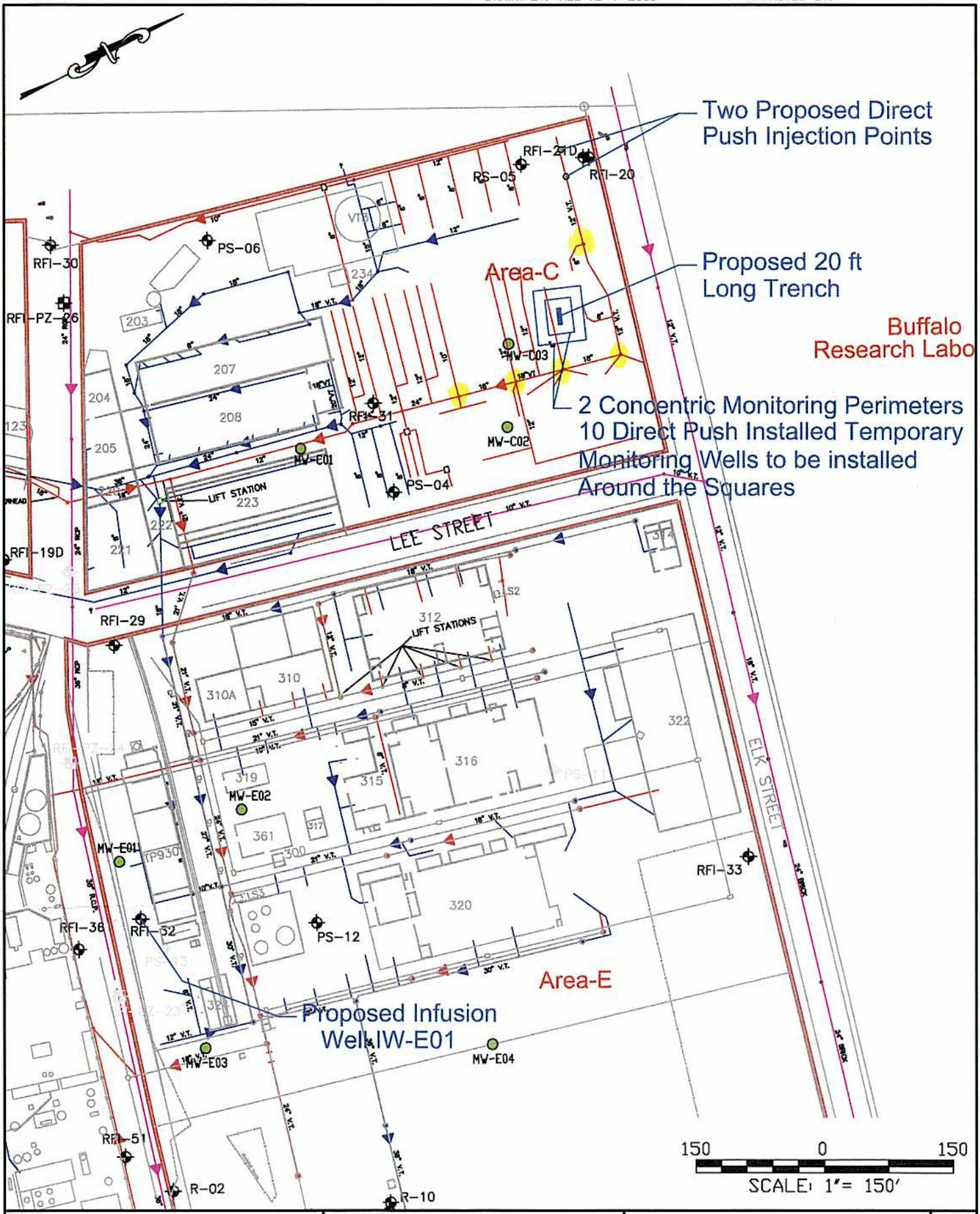
SOUTH BUFFALO DEVELOPMENT LLC
BUFFALO, NEW YORK

MACTEC

AREA C GROUDWATER PLUME
WITH GW CONC. TEXT BOXES
Project 3410090701
Figure X.X

P:\PROJECTS\South Buffalo Development\3410090701\CADD\FINAL\Area C GW.dwg Fri, 13 Nov 2009 - 9:46am esweiler

DRAWN BY: NEL 12-1-2009 APPROVED BY: -



SOUTH BUFFALO DEVELOPMENT LLC BUFFALO, NEW YORK Project No.: 3410090701	MACTEC Engineering & Consulting Inc. 800 North Bell Avenue, Suite 200 Pittsburgh, PA 15106	SITE PLAN WITH PILOT STUDY ACTIVITIES BUFFALO COLOR AREAS ABCE FIGURE: X

X

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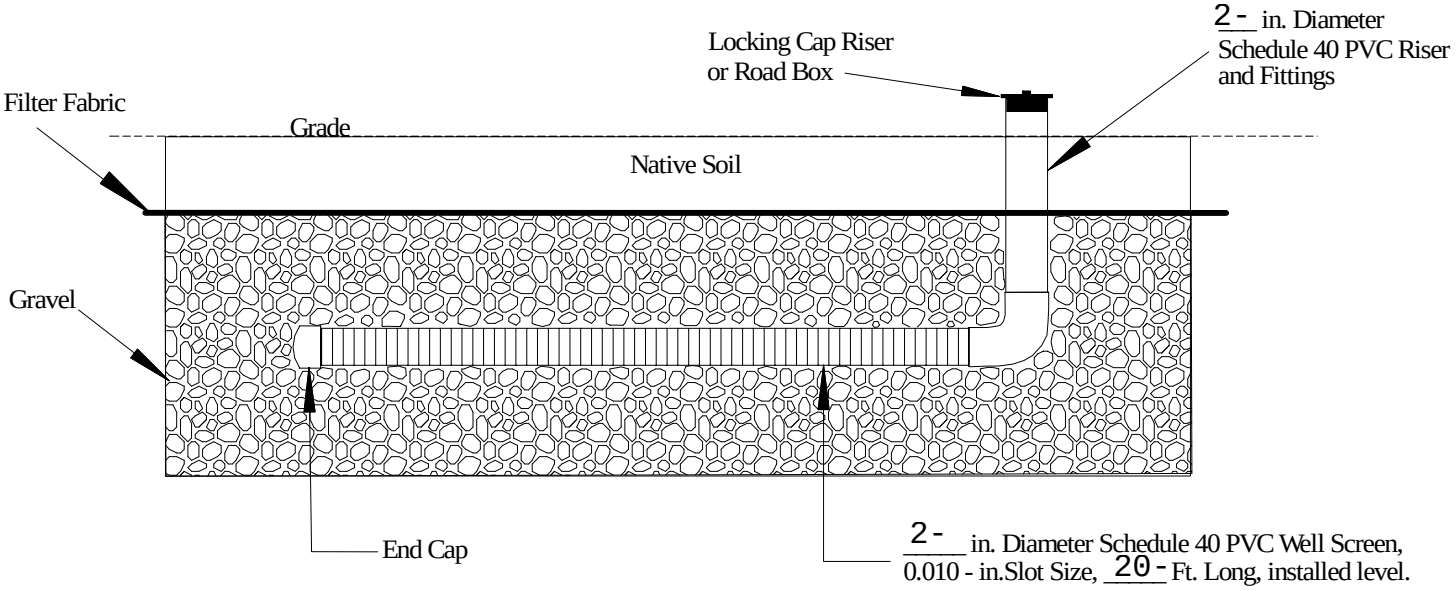
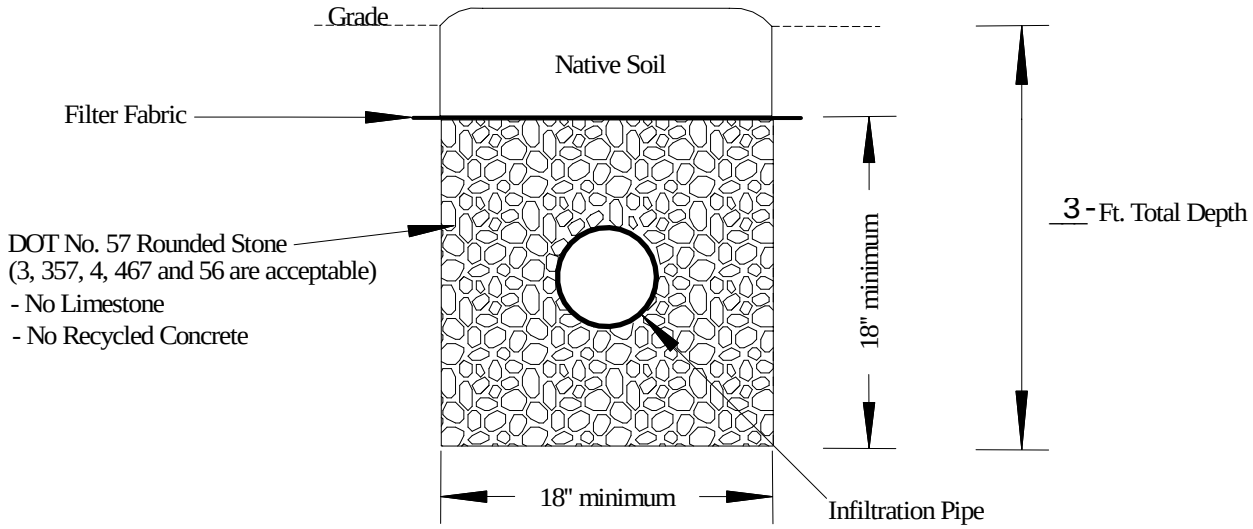
Cross Sectional Lateral View



Cross Sectional End View



Standard On-Contact Design Injection Trench

Buffalo Color Site, Area C Pilot Test

Prepared By:

Environmental Remediation and Financial Services, LLC

ERFS

Pay-for-Performance Remediation Services

2150 Highway 35, Suite 250
Sea Girt, NJ 08750

Date:	Scale:	Draftsperson:
03/16/07	Not to Scale	BCG

Geoprobe® Accessories

>> Tools Menu

View Product Video

Pressure Activated Injection Probe

The Pressure-Activated Injection Probe allows for either top-down or bottom-up injection of remediation materials when using any Geoprobe® grout or injection machine. The probe allows materials to be injected laterally into the subsurface. Unlike conventional injection methods, this probe ensures accurate placement of the material into the intended injection interval. A key feature of this probe is that it acts as a backflow preventer, keeping injection material IN the ground and not ON the ground! The probe is available for use with 1.5 in. probe rods (21479) and with 1.25 in. probe rods (18735).

Pressure Activated Injection Probe

For use with:

- Geoprobe® Grout & Injection Machines

APPENDIX C

BIO-TRAP INSTALLATION INSTRUCTIONS

Supply List - Deployment

Following is a table detailing the supplies that were sent for deployment of the bio-trap units and the colors used for the amendment suppliers.

No.	Item	Image
2	Unit Housing	
1	Weight	
2	GEO Sampler*	
2	MICRO Sampler (13C – Chlorobenzene)	
1	ORC Amendment Supplier	
1	Gray PVC Spacer	

* Extra vials provided incase of breakage during shipping

2340 Stock Creek Blvd.
Rockford, TN 37853-3044
Phone: 865.573.8188
Fax: 865.573.8133
www.microbe.com

Terminology

Samplers are placed in each 15" slotted PVC housing unit. Housing units (e.g. Control, BioStim-HRC, BioAug-DHC, etc.) are linked to form an Assembly. An entire Assembly (consisting of 2 or more units) is deployed in each well. **See Figure 1.**

Assembly: An assembly is a collection of two or more units (15" PVC housings) for deployment in a particular monitoring well.

Unit: A unit is a 1.25" x 15" slotted PVC housing to hold samplers. Units have baffled end caps to separate different zones within the monitoring well. Typically each unit will correspond to a treatment (labeled "Control-MNA", "BioStim-HRC", "BioAug-DHC"). The metal nameplate is on the bottom of the Unit.

Samplers: ALL units will contain three samplers – One geochemical fingerprint sampler (GEO), one contaminant of concern sampler (COC), and one microbial population sampler (MICRO).

- The **GEO** sampler is a 20 mL amber VOA vial with a blue screw cap.
- The **COC** sampler is a 40 mL amber VOA vial with a red screw cap.
- The **MICRO** sampler is a ~ 1" x 3 ½" slotted PVC pipe containing Bio-Sep beads.

Amendment Supplier: BioStim and/or BioAug units will include an "Amendment Supplier" which provides an electron donor (e.g. HRC, EOS), or an electron acceptor (e.g. ORC, PermeOx, nitrate, sulfate), or a nutrient source intended to stimulate microbial activity. Depending on the type of amendment, the amendment supplier will be one of the following:

- a sponge, or
- a nylon pouch, or
- a clear VOA vial

A sponge placed in the bottom of the unit is typically used as the amendment supplier for viscous amendments such as HRC or EOS. For powdered or granular amendments, a nylon pouch is often used as the amendment supplier. A clear VOA vial is used for dissolved amendment solutions. The Control-MNA units have a solid gray PVC spacer as a substitute for the amendment supplier.

Helpful Hints

- **Please wear gloves when handling all Bio-Trap components.**
- **Do NOT discard the foam vial transport holders. These will be needed when you return the unit for analysis.**
- **Remove and discard the clear end cap covers from all vials.**
- **Amber vials are samplers**
- **Clear vials and sponges are suppliers**
- **Color dictates type of sampler or supplier**
- **Prepare one unit at a time.**
- **Once Bio-Traps are assembled, keep in an upright position.**
- **Upon retrieval, ALWAYS replace caps with same color.**
- **Do NOT remove the units from the well during the incubation period.**

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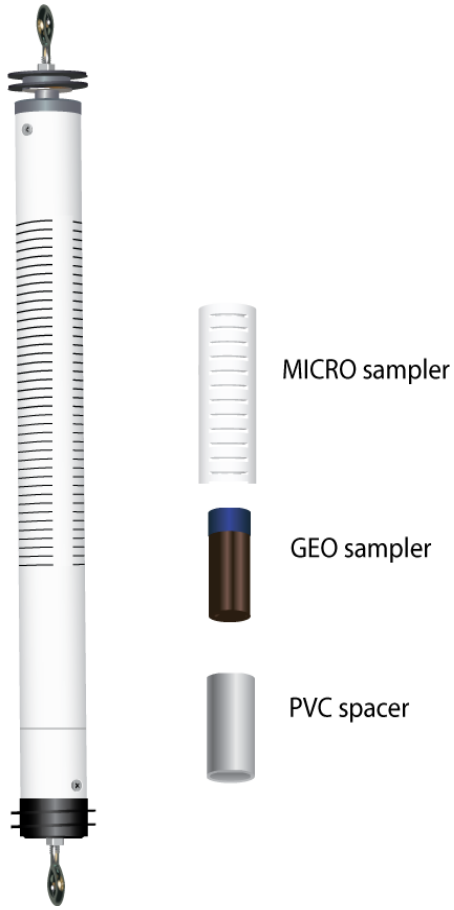
Pre-deployment Instructions

- Remove the **clear end cap covers** from all glass VOA vials. Colored screw caps should NOT be removed.
- The BOTTOM of the unit has the metal nameplate (e.g. Control-MNA, LACTATE, DHC, etc.)

Control – MNA unit assembly

- Twist off the bottom of unit labeled MNA, to fill with samplers.
- First, insert the MICRO sampler. It does not matter which end goes in first. Be sure to wear gloves.
- Next, place the 20 mL amber VOA vial with the blue screw cap (GEO Sampler) into the housing so that the cap is facing the MICRO sampler and the top of the unit.
- Please insert (only one) gray PVC spacer as a substitute for an amendment supplier.
- Hand-tighten the threaded cap back onto unit until it is secure. Remember to store the unit in an upright position.



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BioStim – ORC-A unit assembly

- Twist off the bottom of unit labeled ORC-A, to fill with samplers.
- First, insert the MICRO sampler. It does not matter which end goes in first. Be sure to wear gloves.
- Next, place the 20 mL amber VOA vial with the blue screw cap (GEO Sampler) into the housing so that the cap is facing the MICRO sampler and the top of the unit.
- **After inserting the GEO sampler,** place ORC-A amendment supplier baggie in the threaded cap of the unit.
- Hand-tighten the threaded cap back onto unit until it is secure. Remember to store the unit in an upright position.

MICRO sampler

GEO sampler

ORC - Nutrient supplier

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Bio-Trap Assembly and Deployment

Once all 15" PVC units contain the required samplers, the units can be connected to form an assembly for in well deployment.

- **Control-MNA Unit –** The control unit is usually placed at the top of the assembly (shallowest position in the well). Be sure to securely attach a nylon rope or cable to the top of this unit to suspend the assembly in the well. BioStim units will be attached with metal fasteners to the bottom of this unit.
- **BioStim-Treatment A Unit –** Using the metal fasteners, attach the top of this unit to the bottom end of the Control-MNA unit.
- **BioStim-Treatment B Or BioAug-DHC Unit –** Using the metal fasteners, attach the top of this unit to the bottom of the unit above.
- Repeat as necessary.

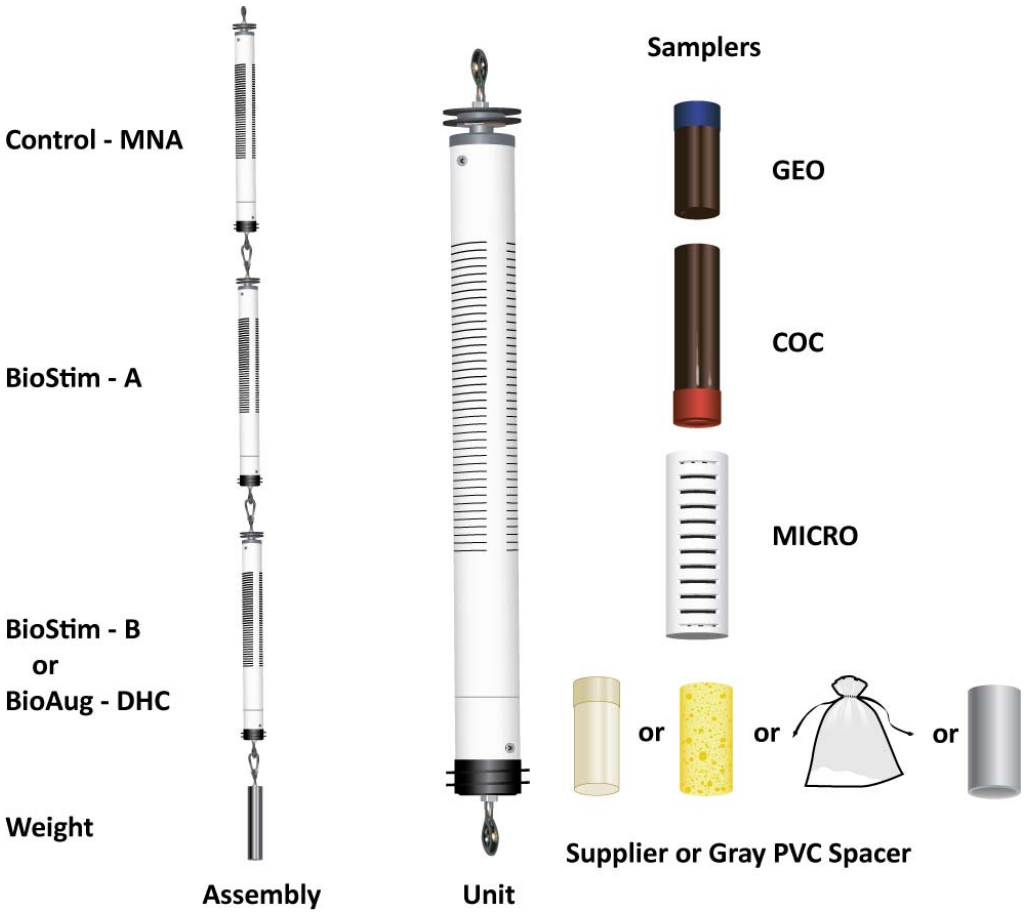

Figure 1. Illustration of Bio-Trap Assembly, Unit, and Samplers. Actual configuration may vary depending on the number of samplers and units per well.

When the Bio-Trap Assembly is complete, attach the weight to the bottom of the deepest unit. The Assembly is now ready to be deployed.

Please note: Microbial Insights will be send a second shipment later with the retrieval instructions and supplies.

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Supply List – Return Kit

Following is a list of the supplies that are being shipped separately (from the deployment supplies) for retrieval of the Bio-Trap Units and their return to Microbial Insights for analysis.

Item	Image
GEO Sampler Blue return Caps	
Labels for GEO and MICRO samplers	-
Bubble Bags for VOA vials	-
Small Zippered Bag labeled for MICRO samplers	-
Large Zippered Bags for Unit Samplers (GEO and MICRO)	-
Return Box for units, weights, PVC spacers	-
MI Chain of Custody Form	-

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Bio-Trap Assembly Retrieval

- After the desired incubation period, carefully retrieve the assembly and remove the nylon line and the weights. **Units contain glass vials that can be broken so please handle with care.**
- Separate the Bio-Trap Units from each other and keep in an upright position.
- Open one Unit at a time and carefully remove all contents. DO NOT DISCARD THE PVC UNIT HOUSING.
- **Label and Package all contents from one unit before opening another unit.**
- Label the vials with the provided preprinted labels. Please include the well and unit type (Control, BioStim, BioAug, etc.)
- Place the MICRO sampler (1" x 3 ½" slotted PVC containing bio-sep beads) into a small zippered bag (provided) and label appropriately.
- The screw caps that were on the VOA vials during deployment need to be replaced with the same color screw caps that have a Teflon septum.
- Remove the **blue screw cap** from the 20 mL VOA vial and replace with the extra blue screw cap provided. Please note that it is okay for the GEO sampler to be exposed to air. The original membrane will be removed with the cap.
- **If** a clear 20 mL VOA vial was used as the amendment supplier, remove the white screw cap and replace with the extra white screw cap provided. The original membrane will be removed with the cap.
- Sponge and nylon pouch amendment suppliers can be discarded as investigation derived waste.
- Once all screw caps have been replaced, tightly wrap each vial in a bubble wrap bag.
- Place all of the vials and MICRO sampler from one unit into a large zippered bag so that all samplers from a unit are in one bag.
- Place large bag containing the MICRO sampler and all vials within a cooler packed with ice as quickly as possible after retrieval and for shipping.
- Complete the MI chain of custody form.
- Ship the Bio-Trap housing units, weights, PVC spacers, MICRO samplers in the bag, and all VOA vials along with the chain of custody form to Microbial Insights. See shipping instructions below:

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Phone: 865.573.8188
Fax: 865.573.8133
www.microbe.com

Shipping Instructions

MICRO samplers and all VOA vials need to be shipped on ice (or blue ice) for next day delivery (please call to arrange Saturday delivery). If regular ice is used, the ice should be double bagged. **The Bio-Trap housing units, PVC spacers and weights must be returned to Microbial Insights but should be shipped separately without ice.**

Samples should be shipped to:

Sample Custodian
Microbial Insights, Inc.
2340 Stock Creek Blvd.
Rockford, TN 37853-3044
(865) 573-8188

Saturday Delivery:

Due to the short hold time associated with this study, it is not recommended to send samples for Saturday Delivery.

2340 Stock Creek Blvd.
Rockford, TN 37853-3044
Phone: 865.573.8188
Fax: 865.573.8133
www.microbe.com

APPENDIX D

UNDERGROUND INJECTION CONTROL PERMIT AUTHORIZATION BY RULE APPLICATION

MACTEC

engineering and constructing a better tomorrow

December 9, 2009

Nicole Kraft
US EPA Region 2
290 Broadway
New York, NY 10007-1866

Subject: **Application – Underground Injection Control Permit Authorization by Rule**

Permittee: MACTEC Engineering and Consulting, Inc., 511 Congress Street, 2nd floor, Portland, Maine 04101
Property Owner Name and Address: South Buffalo Development, LLC, 333 Ganson Street, Buffalo, New York 14203
Site Name and Address: Former Buffalo Color Corporation Site, 100 Lee Street, Buffalo, New York

MACTEC Engineering and Consulting, Inc. (MACTEC) is submitting this letter and the attached Inventory of Injection Wells to request an Underground Injection Control Permit Authorization by Rule for the above referenced site, on behalf of the property owner, South Buffalo Development, LLC.

The Former Buffalo Color Corporation Site is zoned industrial and is approximately 40 acres in size, consisting of multiple parcels. The property was formerly the location of Buffalo Color Corporation, and is currently undergoing demolition and remediation under the NY Brownfield Cleanup Program so that the site can be redeveloped for commercial/light industrial use.

MACTEC has subcontracted the execution of an on-site field pilot-test for in-situ treatment of groundwater contamination at Area C and Area E of the former Buffalo Color Corporation site. The field pilot-test is scheduled for the week of December 14, 2009. The proposed injection locations, quantities, and monitoring are described in the following paragraphs.

Former Buffalo Color Corporation Site Area C: At Area C of the Former Buffalo Color Corporation Site, which is located at 229 Elk Street (refer to attached Figure 1), injection work is planned to occur over a two day period starting December 14, 2009 with approximately:

- 1,000 to 2,000 gallons total of 3% to 6% hydrogen peroxide and 3% to 6% ferrous sulfate solutions introduced via an infiltration trench (refer to Figure 1 attached). Hydrogen peroxide and ferrous sulfate solutions will be introduced in approximately equal volumes (500 to 1,000 gallons each); and
- Up to 1,500 gallons total of 3% to 6% hydrogen peroxide and 3% to 6% ferrous sulfate solutions injected at two direct push points (750 gallons per point) (refer to Figure 1 attached). Hydrogen peroxide and ferrous sulfate solutions will be introduced in approximately equal volumes.

Monitoring of the injection work at Area C will include:

- Collection of field parameter data from the temporary well points (refer to attached Figure 1) to evaluate distribution and effectiveness of reagents delivered via the injection trench; and
- A SiteVision™ survey (a soil resistivity survey method used to track reagent migration in the subsurface by plotting changes in soil resistivity profiles caused by electrolytic reagents) at baseline and multiple times during treatment to track reagent migration in the subsurface.

Former Buffalo Color Corporation Site Area E: At Area E of the Former Buffalo Color Corporation Site, which is located at 85 Lee Street (refer to attached Figure 1), injection work is planned over a two to five day period starting December 14, 2009 with approximately 40 grams of oxygen per day added to a single infusion well to be screened from 4 feet to 11 feet below ground surface. The oxygen will be added to the groundwater using 30-inch oxygen cylinders connected by tubing to an in-situ submerged oxygen curtain® (iSOC®) infusion device installed within the infusion well. The proposed infusion well (IW-E01) will be located approximately 3 feet from existing groundwater monitoring well RFI-32 as shown on Figure 1 attached. Monitoring of the injection work at Area E will include measuring dissolved oxygen at IW-E01 and RFI-32. Each monitoring event will last approximately 15 minutes. During day one, dissolved oxygen will be recorded every hour. On subsequent days, the frequency of monitoring may be decreased as appropriate.

Please send any return correspondence and direct any questions or comments regarding this application to:

Ryan Belcher
MACTEC Engineering and Consulting, Inc.
511 Congress Street, 2nd Floor
Portland, Maine 04101

Office: (207) 775-5401
Direct: (207 828-3530
Email: RTBelcher@MACTEC.com

Sincerely,

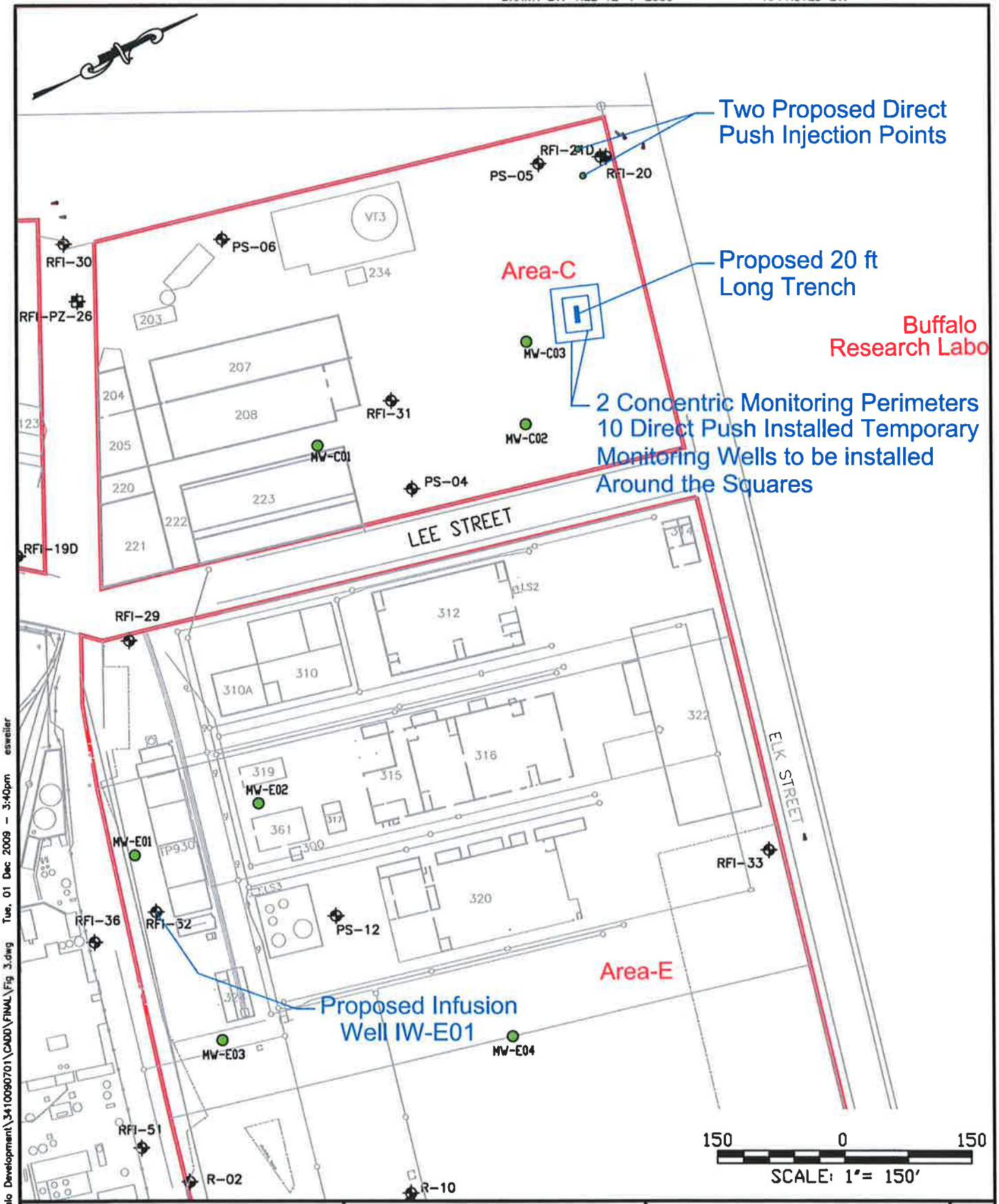
Ryan Belcher
Project Engineer

Sur John Scrabis with permission
Principal Engineer

Enclosures:
Figure 1 – Site Plan with Pilot Study Activities

cc: electronic copy
John Scrabis — MACTEC Engineering and Consulting, Inc.
Jon Williams — South Buffalo Development, LLC
Gene Melnyk — NY State Department of Environmental Conservation

DRAWN BY: NEL 12-1-2009 APPROVED BY: –



P:\PROJECTS\South Buffalo Development\3410090701\CADD\FINAL\Fig 3.dwg Tue, 01 Dec 2009 - 3:40pm eswelter

SOUTH BUFFALO DEVELOPMENT LLC BUFFALO, NEW YORK Project No.: 3410090701	MACTEC Engineering & Consulting Inc. 800 North Bell Avenue, Suite 200 Pittsburgh, PA 15106	SITE PLAN WITH PILOT STUDY ACTIVITIES BUFFALO COLOR AREAS ABCE FIGURE: 1	X

Type or print all information. See reverse for instructions.

OMB No. 2040-0042 Approval Expires 12/31/2011

INVENTORY OF INJECTION WELLS

EPA

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF GROUND WATER AND DRINKING WATER

(This information is collected under the authority of the Safe Drinking Water Act)

1. DATE PREPARED *(Year, Month, Day)*: 09-12-08

2. FACILITY ID NUMBER:

PAPERWORK REDUCTION ACT NOTICE

The public reporting burden for this collection of information is estimated at about 0.5 hour per response, including time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding the burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, Director, Collection Strategies Division (2822), U.S. Environmental Protection Agency, 1200 Pennsylvania Avenue, NW, Washington, DC 20460, and to the Office of Management and Budget, Paperwork Reduction Project, Washington, DC20503.

3. TRANSACTION TYPE *(Please mark one of the following)*

- [ ] Deletion
- [x] First Time Entry
- [ ] Entry Change
- [ ] Replacement

4. FACILITY NAME AND LOCATION

A. NAME *(last, first, and middle initial)*: Former Buffalo Color Corporation Site

B. STREET ADDRESS/ROUTE NUMBER: 100 Lee Street

C. LATITUDE: DEG 42 | MIN 51 | SEC 56.3034

D. LONGITUDE: DEG -78 | MIN 50 | SEC 32.1714

E. TOWNSHIP/RANGE

TOWNSHIP	RANGE	SECT	1/4 SECT

F. CITY/TOWN: Buffalo

G. STATE: New York

H. ZIP CODE: 14210

I. NUMERIC COUNTY CODE: ERIE

J. INDIAN LAND *(mark "x")*: [ ] Yes [x] No

5. LEGAL CONTACT

A. TYPE *(mark "x")*: [x] Owner [ ] Operator

B. NAME *(last, first, and middle initial)*: Jon Williams

C. PHONE *(area code and number)*: (716) 856-3333

D. ORGANIZATION: South Buffalo Development, LLC

E. STREET/P.O. BOX: 333 Ganson Street

F. CITY/TOWN: Buffalo

G. STATE: New York

H. ZIP CODE: 14203

I. OWNERSHIP *(mark "x")*

- [x] PRIVATE
- [ ] PUBLIC
- [ ] SPECIFY OTHER
- [ ] STATE
- [ ] FEDERAL

6. WELL INFORMATION

A. CLASS AND TYPE	B. NUMBER OF WELLS: COMM	B. NUMBER OF WELLS: NON-COMM	C. TOTAL NUMBER OF WELLS	D. WELL OPERATION STATUS: UC	AC	TA	PA	AN
V 5X26		2	2	2				
V 5X26		1	1	1				
			0					
			0					
			0					
			0					
			0					

COMMENTS *(Optional)*:

Injection wells to include two temporary Class V, Type 5X26, injection points and one permanent Class V, Type 5X26 injection well. Additionally, reagents to be added to the groundwater via a shallow infiltration trench constructed above the water table. Further details of the proposed activities are provided in attached letter.

KEY:

DEG = Degree
MIN = Minute
SEC = Second
SECT = Section
1/4 SECT = Quarter Section

COMM = Commercial
NON-COMM = Non-Commercial
AC = Active
UC = Under Construction
TA = Temporarily Abandoned
PA = Permanently Abandoned and Approved by State
AN = Permanently Abandoned and not Approved by State