

INTERIM REMEDIAL MEASURE DESIGN DOCUMENT

Bridge Cleaners Site

Prepared for
Zhong Chuang Properties LLC
39-26 30th Street
Long Island City, NY 11101-2806

Prepared by
The logo for Integral Engineering P.C. features the word "integral" in a blue, lowercase, sans-serif font. A stylized, curved line in a light brown or tan color starts from the bottom of the letter 'i' and sweeps upwards and to the right, ending under the letter 'l'. Below the word "integral", the words "engineering p.c." are written in a smaller, blue, lowercase, sans-serif font.
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CONTENTS

LIST OF FIGURES	IV
LIST OF TABLES	V
ACRONYMS AND ABBREVIATIONS.....	VI
CERTIFICATION	VIII
1 INTRODUCTION	1-1
1.1 SITE DESCRIPTION	1-2
1.2 SITE HISTORY	1-2
1.3 PURPOSE.....	1-3
2 BACKGROUND	2-1
2.1 PHYSICAL SETTING.....	2-1
2.1.1 Geologic Setting.....	2-1
2.1.2 Hydrogeologic Setting.....	2-2
3 CONCEPTUAL SITE MODEL	3-1
4 PILOT TEST	4-1
4.1 TESTING OBJECTIVES	4-1
4.2 OVERVIEW OF TESTS AND EQUIPMENT	4-1
4.3 SLUG TEST AND MODIFIED (BETWEEN WELL) SLUG TEST	4-3
4.3.1 Slug Test.....	4-3
4.3.2 Modified Slug Tests.....	4-5
4.4 SVE STEADY STATE TESTS.....	4-7
4.4.1 Intrinsic Permeability.....	4-7
4.4.2 Modeled SVE Pressure Distribution from Recovery Well.....	4-9
4.5 AIR SPARGE AND AIR SPARGE WITH SVE TESTS.....	4-11
4.6 VAPOR LABORATORY ANALYTICAL TESTS.....	4-15
5 REMEDIATION SYSTEM DESIGN	5-1
5.1 SVE LAYOUT AND EQUIPMENT.....	5-1
5.2 SVE SYSTEM CURVE	5-2
5.3 SSDS DESIGN CRITERION	5-3

6	SCHEDULE.....	6-1
7	KEY PROJECT CONTACT LIST.....	7-1
8	BIBLIOGRAPHY	8-1
	Appendix A. Pilot Testing: Slug Test Calculations	
	Appendix B. Pilot Testing: Air Sparge Calculations	
	Appendix C. Soil Vapor Laboratory Report	
	Appendix D. SVE Design Plans & Elevations	

LIST OF FIGURES

- Figure 1. Site Location Map
- Figure 2. Site Plan
- Figure 3. Site Layout
- Figure 4. Slug Test Bouwer & Rice Analysis
- Figure 5. Slug Test Image Well Locations
- Figure 6. SVE Pilot Test Radius of Influence
- Figure 7. SVE Pilot Test Differential Pressure vs. Distance
- Figure 8. Calculated Air Spread During Air Sparge
- Figure 9. GW-3 Elevation During Air Sparge
- Figure 10. Dissolved Oxygen in GW-3 During Air Sparge
- Figure 11. System and Blower Curves

LIST OF TABLES

Table 1.	Hydraulic Conductivity from Slug Tests
Table 2.	Hydraulic Conductivity from Modified Slug Tests
Table 3.	SVE Pilot Test Radius of Influence
Table 4.	SVE Pilot Test Measured Pressure Differentials
Table 5.	SVE Pilot Test Soil Vapor Sample Results
Table 6.	Schedule
Table 7.	Key Contact List

ACRONYMS AND ABBREVIATIONS

atm	atmosphere (atmospheric pressure)
BCP	brownfield cleanup program
CFM	cubic feet per minute
CSM	conceptual site model
DAR	division of air resources
DER	division of environmental remediation
DGW	depth to groundwater
DO	dissolved oxygen
ft bgs	feet below ground surface
GPD	gallons per day
Integral	Integral Engineering, P.C.
IRM	interim remedial measure
iwc	inches of water column
NYCRR	New York Code of Rules and Regulations
NYSDEC	New York State Department of Environmental Conservation
PCE	tetrachloroethylene
PFD	process flow diagram
PID	photoionization detector
psig	pounds per square inch (gage)
PVC	polyvinyl chloride
RIR	remedial investigation report
Sch	schedule
SCO	soil cleanup objectives
SF	square foot or square feet
Site	39-26 30 th Street, Long Island City, New York
SSDS	sub-slab depressurization system
SVE	soil vapor extraction
TCE	trichloroethylene

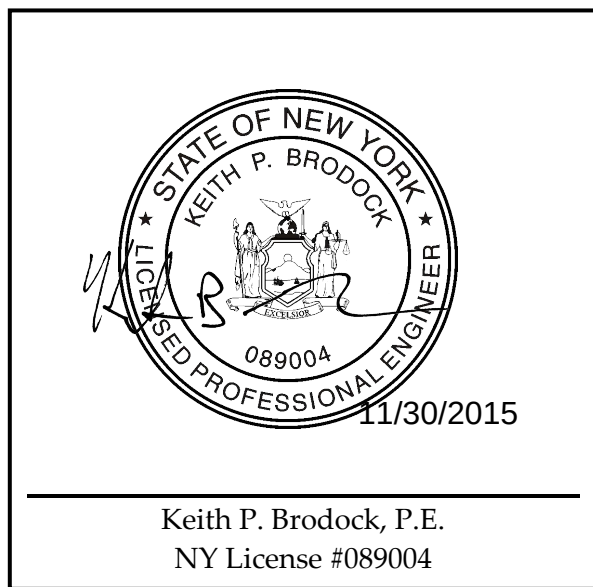
TechSolutions	TechSolutions Engineering, P.C.
USEPA	United States Environmental Protection Agency
USGS	U.S. Geological Survey
VMP	vacuum monitoring point
VOC	volatile organic compound
Volunteer	Zhong Chuang Properties LLC
Zhong Chuang	Zhong Chuang Properties LLC

CERTIFICATION

I, Keith P. Brodock, P.E., certify that I am currently a New York State registered professional engineer as defined in 6 NYCRR part 375 and that this Interim Remedial Measure (IRM) Design Document was prepared in accordance with all applicable statutes and regulations and in substantial conformance with the DER Technical Guidance for Site Investigation and Remediation (DER-10).

It is a violation of Article 145 of New York State Education Law for any person to alter this document in any way without the express written verification of adoption by a New York State licensed engineer in accordance with Section 7209(2), Article 145, New York State Education Law.

Date signed and sealed:



1 INTRODUCTION

Integral Engineering, P.C. (Integral) has prepared this Interim Remedial Measure (IRM) Design Document on behalf of Zhong Chuang Properties LLC (Zhong Chuang or Volunteer) for the property located at 39-26 30th Street, Long Island City, NY (Site). The Site is currently enrolled in the New York State Brownfield Cleanup Program (BCP) and listed as Site No. C241127.

Remediation pilot tests were performed at the Site to evaluate the efficacy of air sparge and soil vapor extraction (SVE); to identify the design parameters for the remediation system; and, to evaluate the appropriateness of SVE for mitigation of soil vapor intrusion. The subsurface pilot tests included installation of one SVE recovery well, application of negative pressure (vacuum) to the recovery well, and measurement of subsurface pressures at various distances from the recovery well. Two of the pilot tests included injection of air into the saturated subsurface to evaluate the utility and efficacy of air sparging as a potential component of the remediation.

The subsurface pilot test included the installation of an SVE recovery well (RW-01), air injection well (AI-01R)¹, and several vacuum monitoring points (VM-01 through VM-08) placed strategically through out the site. Previously installed groundwater monitoring wells (GW-1 through GW-5), sub-slab soil probes (SP-2 through 8), and the newly installed wells were utilized for the measurement of subsurface pressures at various distances from the recovery well (RW-01) during the application of negative pressure (vacuum). Two additional air injection pilot tests included the application of pressurized air into AI-01R. The results of the air injection tests were used to evaluate the effectiveness of air sparging as a potential component of the remediation.

The pilot test evaluation and proposed remediation design is presented in this Design Document. In summary, based upon the pilot test data, we propose to install one blower to extract contaminated vapors from the subsurface at two locations within the building. The one system will act as both an SVE² and as a sub-slab depressurization system (SSDS) to mitigate soil vapor intrusion. The system installation would be performed as an interim remedial measure (IRM).

¹ The initial air injection well, AI-01, was compromised. A replacement well, AI-01R, with similar characteristics to AI-01 was installed nearby for the pilot test.

² No air sparge is proposed for this remediation system, as discussed further in Section 4.

1.1 SITE DESCRIPTION

The approximately 7,500 square foot (SF) Site is known as the former Bridge Cleaners and is designated as Block 399, Lot 31. A Site location map is provided as Figure 1. A map showing the Site property boundaries is included as Figure 2.

The Site is currently improved with a one-story building (without a basement) that covers the entire lot. The building is currently used for the storage and cutting of fabrics. The Site is currently zoned as M1-3/R7X, which is a Special Long Island City Mixed Use District for mixed residential and commercial use.

1.2 SITE HISTORY

A number of investigations and assessments have been performed at the Site between 2011 and 2014. These investigations consisted of limited subsurface assessments conducted by various consultants on behalf of the Site owner or the New York State Department of Environmental Conservation (NYSDEC). Integral has been provided the following investigation reports:

- Limited Sub-Surface Site Investigation, Long Island Laboratories, Inc., dated September 2011
- Site Characterization Report, Ecology and Environmental Engineering, P.C., May 2012
- Remedial Investigation Report, TechSolutions Engineering, P.C., June 2014 (most recent version)

According to the June 2014 Remedial Investigation Report (RIR) prepared by TechSolutions Engineering, P.C. (TechSolutions)³, the Site was used as a dry cleaner from 1997 until about 2011. Other historical uses included warehousing and distribution.

The RIR summarized soil, groundwater, and soil vapor results from investigations performed at the Site between September 2011 and February 2014. Elevated tetrachloroethylene (PCE) and trichloroethylene (TCE) concentrations were found in groundwater and soil vapor samples collected within and nearby the Site. PCE and TCE were identified in soil samples at the Site, but did not exceed NYSDEC Unrestricted Soil Cleanup Objectives (SCOs).

A soil investigation conducted by Integral in December 2014, identified concentrations of PCE above the Unrestricted SCO, but below the Industrial SCO, in four soil samples collected from beneath the northern corner of the building. Pursuant to an NYSDEC-approved Remedial Investigation Proposal dated November 11, 2014, a total of five soil samples, inclusive of one

³ This RIR was rejected by the NYSDEC in a letter dated September 10, 2014, though it has been utilized in this Work Plan for reference.

duplicate, were collected during the installation of two soil borings (SB-6 and SB-7). Samples collected from SB-06 were defined as SB-06(11.5'-12') and SB-06(17.5-18.5'); samples collected from SB-07 were defined as SB-07(0-4') and SB-07(15-17.5'); a duplicate collected from SB-07(0-4') designated DUPLICATE (12-30-14). In samples SB-06(11.5'-12'), SB-07(0-4'), DUPLICATE (12-30-14), and SB-07(15-17.5'), PCE was the only analyte detected, and was identified above the Unrestricted SCO and the Protection of Groundwater SCO (to the extent the Protection of Groundwater SCO is applicable to this Site), both 1.3 mg/kg, but below the Industrial SCO of 300 mg/kg. DUPLICATE (12-30-14) contained the maximum observed concentration of PCE at 9.6 mg/kg.

1.3 PURPOSE

The purpose of this IRM Design Document is to accomplish the following:

- Provide an evaluation of the pilot test data and resulting conclusions; and,
- Present the remediation system design for the focused remediation of chlorinated volatile organic compounds (VOCs) and for mitigation of soil vapor intrusion.

2 BACKGROUND

2.1 PHYSICAL SETTING

The Site incorporates approximately 0.17 acres of fairly level land situated in Long Island City, Queens, New York. The Site is mapped on the Central Park, NY-NJ and Brooklyn Quadrant 7.5 Minute Topographic Map, published by the U.S. Geological Survey (USGS). Review of the topographic map indicates that the Site is located approximately 40 ft above sea level (National Geodetic Vertical Datum 1988).

2.1.1 Geologic Setting

Previous reports have characterized the soil beneath the Site as medium or fine sand with trace silt. Bedrock geology in the vicinity of the Site is characterized from the RIR as:

At the regional level, the subsurface geological units of Queens County consist of sequences of unconsolidated sediments of Late Cretaceous and Pleistocene pre-Sangamon and Sangamon ages. The unconsolidated sediments are underlain by crystalline bedrock of Precambrian age and overlain mostly by glacial upper Pleistocene deposits of Wisconsinian age but also to a lesser extent by Holocene deposits (Soren, USGS, 1978). From grade to bedrock, the primary geologic units in the region are artificial fill / surficial deposits, upper Pleistocene deposits, Gardiners Clay (where present), Jameco Gravel (not be present in the vicinity of the Site), Monmouth Group and Magothy Formation, and the Raritan Formation.

Natural surficial glacial deposits in Queens County consist mostly of ground moraine in the northern part of Queens County near the [Site] and outwash in the southern portions of the county. However, artificial fill has been used in many places to extend and reinforce shorelines and to fill swampy areas in preparation for development. The surficial deposits are underlain by the upper Pleistocene deposits which range in thickness from 0 to 300 feet and are primarily composed of glacial drift material such as till, lacustrine deposits and outwash sand and gravel (Soren, USGS, 1978). Regionally, the upper Pleistocene deposits are unconformably underlain by the Gardiners Clay which is located in primarily the central and southern parts of Queens County. The Gardiners Clay consists of mostly grayish green and less commonly dark gray clay intercalated with sand and gravelly beds. The thickness of the Gardiners Clay varies widely and is absent in some sections of Queens County (i.e., Glendale, Woodhaven, Ozone Park areas) but generally ranges to a maximum of 150 feet thick. Importantly, the Gardiners Clay serves to confine water in the underlying

Jameco Gravel regionally where present and Magothy-Matawan Formation (Soren, USGS, 1978) in much of the region.

The Jameco Gravel is believed to have been deposited by streams in Queens County and unconformable underlies the Gardiners Clay where present. The Jameco deposits are mostly coarse sand and granule to cobble gravel with boulders having been reported by some drillers. The thickness of the Jameco Gravel ranges from 0 to 250 feet regionally; however, it is generally absent in the vicinity of the [Site] which is located north of the most-widely accepted extent of the Jameco Gravel...

Underlying the Jameco Gravel (where present) is the Monmouth Group and the Magothy- Matawan Formation which ranges from 0 to 450 feet thick in Queens County. Magothy- Matawan strata may be missing in northern and northwestern Queens County and is typically present between 0 and 200 feet in thickness near the [Site]. The Raritan Formation underlies the Magothy-Matawan formation where present and consists of a clay and sand member. Bedrock is typically not encountered to a depth of between 100 and 200 feet in the vicinity of the [Site]. (TechSolutions 2014)

2.1.2 Hydrogeologic Setting

Groundwater has been measured at approximately twenty ft bgs at the Site. According to the RIR:

The regional aquifer system in the general vicinity of the Site includes the following system from shallow to deep: the upper glacial aquifer which is underlain by the Magothy Aquifer. The Raritan clay unit then separates the Magothy Aquifer from the underlying Lloyd Aquifer which overlies bedrock. (TechSolutions 2014)

3 CONCEPTUAL SITE MODEL

The conceptual site model (CSM) reflects that there are residual chlorinated hydrocarbons in the unsaturated subsurface near the northern corner of the building potentially causing secondary impacts to groundwater. This residual material may have discharged from a boiler drain in the northern corner of the building, and while there is a small concrete patch in this area, there is no evidence that a drain existed in the building. The CSM also must consider the possibility that a release occurred off-Site and is contributing to the observed conditions. The magnitude of the release, whether on-Site or off-Site (or both), is unknown, though the chlorinated hydrocarbon concentrations identified in the unsaturated on-Site soil lead to the conclusion that any on-Site release was minor.

Below is additional supporting information to the CSM:

- The groundwater at the Site, based on previous reports, generally flows from north to south. PCE concentrations in groundwater ranged from 176 to 340 µg/L, and were within the same order of magnitude across the Site, although slightly higher to the south.
- Soil vapor concentrations of PCE ranged from 21,400 to 668,000 µg/m³ across the Site. The larger concentrations were found in the northern portion of the building, indicating potential residual source material nearby (in unsaturated soil).
- A boiler room was historically present in the northern corner of the building. In the past, it was not uncommon for buildings to construct a drain (dry well) for boiler condensate blow-down. No evidence of a drain or dry well has been observed or provided, although there appears to be a small concrete patch in this area.
- PCE was identified in soil samples collected from the northern corner of the Site building with a maximum concentration of 9.6 mg/kg, which is below the Industrial SCO of 300 mg/kg, but above the Unrestricted Use and Protection of Groundwater SCOs of 1.3 mg/kg, to the extent the Protection of Groundwater SCO is applicable to this Site. (Integral, 2015)

4 PILOT TEST

This section presents the results of the pilot test that was performed to inform the design of an SVE remediation system and vapor intrusion mitigation system at the Site.

4.1 TESTING OBJECTIVES

The overall objective of the testing program is to provide for the design of a remediation and protective system in light of the concentrations of PCE and other VOCs in the soil, groundwater, or soil vapors beneath the slab of the building.

Aquifer testing [slug and modified (between well) slug tests] were done to:

- Evaluate hydraulic conductivities for the purpose of controlling groundwater if necessary and/or evaluating intrinsic permeability which can be derived from hydraulic conductivities,
- Assess the ability of air sparging techniques to enhance the remediation and protective systems to be designed, and,
- Evaluate the effects of underground structures on the capture of contaminated soil vapors.

The steady-state SVE tests were done to provide necessary data for the design of soil vapor extraction from beneath the building slab. The major purpose for such a system is to create a negative pressure differential from above to below the slab, and thereby prevent vapors from moving from sub-slab into the above-slab confines of the building. Additionally, the SVE system will reduce concentrations of contaminants in soil vapor beneath the slab.

The air sparging tests were conducted to evaluate the efficacy of air sparging to enhance the remediation by removing contaminants from the groundwater so that they could be captured by the SVE system.

Lastly, laboratory analytical testing results of soil vapors from the recovery well (RW-01) and vacuum monitoring point (VMP) VM-02 were used to evaluate the need for air treatment on the discharge of the SVE system.

4.2 OVERVIEW OF TESTS AND EQUIPMENT

Groundwater pressure responses in the five monitoring wells (GW-1 through GW-5) and one air sparging well (AI-01R) were recorded throughout the tests using pressure transducers recording at one minute intervals (Figure 3 shows the site layout). Pressure transducers were In-

Situ data loggers (Aqua TROLL 200), and a barometric pressure logger (Schlumberger Baro-Diver) for a calibration to barometric pressure if necessary.

Transducer records were calibrated by depth to groundwater measurements made both before and after the recording periods. Depth to groundwater (DGW) measurements were obtained at the time of deployment of the pressure transducer or when the transducer was removed from the well. Survey and depth to groundwater data provided by Donald R. Stedje, P.L.S., were used to calculate groundwater elevations, and distances to wells containing transducers.

Dissolved oxygen levels, temperature, and other parameters were measured using meters (YSI Model 550) installed in the groundwater monitoring wells.

Differential pressures were periodically measured via digital manometers, and pressure gauges in the groundwater monitoring wells, VMPs, and select soil boring locations where tubes remain to allow access to the subsurface.

Slug tests and modified (between wells) slug tests were conducted using AI-01R as the pressurized well. Pressure changes (slugs) were created by pressurizing AI-01R then suddenly releasing the pressure to create the slug. Responses were measured using pressure transducers in the slug well and the four remaining monitoring wells within the building.

Steady state SVE tests were conducted using RW-01 as the extraction well. Extraction was done using three different negative pressures (vacuum) and volumetric flows at RW-01. Responses to these three extraction rates were measured in the groundwater monitoring wells, vacuum monitoring probes, and a select number of soil (vapor) probe locations where tubes to the subsurface remained.

Air sparging tests were conducted by pressurizing AI-01R sufficiently to create a flow of air into the well and out into the formation. Responses to the flow of air into the formation were measured in the groundwater monitoring wells; specifically, dissolved oxygen levels and changes to groundwater elevations were measured.

After an initial period of air sparging, SVE was added at RW-01 as before. This allowed for the field testing of vapors in the discharge from RW-01 using a photoionization detector (PID).

Contaminant concentrations in extracted and potentially extracted vapors were evaluated using PID measurements of the extracted air from RW-01, and via laboratory-analyzed air samples collected from RW-01 and VMP VM-02 (results discussed in Section 4.6).

Analysis methods for the pilot test data were based on theoretical equations developed initially by Theis and modified by others to accommodate a particular aquifer test.

4.3 SLUG TEST AND MODIFIED (BETWEEN WELL) SLUG TEST

Two slug tests were done in AI-01R, one following the other. AI-01R is a two inch well screened between 34 and 35 feet below ground. At the time of the test, groundwater was 20 feet below ground surface providing a water column in the well of approximately 14 feet.

The aquifer was stressed by pressurizing the slug test well to approximately 30 pounds per square inch (psig) until a stable condition had been reached. The pressure was rapidly released and the well's recovery tracked by pressure transducers recording on one minute intervals.

The modified slug tests were done at the same time as the slug tests. The water pressure differential created by the slug test was recorded in other nearby wells as a pressure wave propagated through the aquifer.

4.3.1 Slug Test

The slug tests in AI-01R were analyzed using the Bouwer and Rice method. The governing equation is

$$K = \frac{r_c^2 \cdot \ln(R_e/r_w)}{2L_e} \cdot \frac{1}{t} \cdot \ln\left(\frac{y_0}{y_t}\right) \text{ where}$$

K = Hydraulic conductivity

L_e = Length of screened portion of well

r_c = Radius of the casing

R_e = Effective radial distance over which y is dissipated

r_w = Radial distance to undisturbed portion of aquifer from center line

t = Time

y = Difference between water level in well and water level outside well

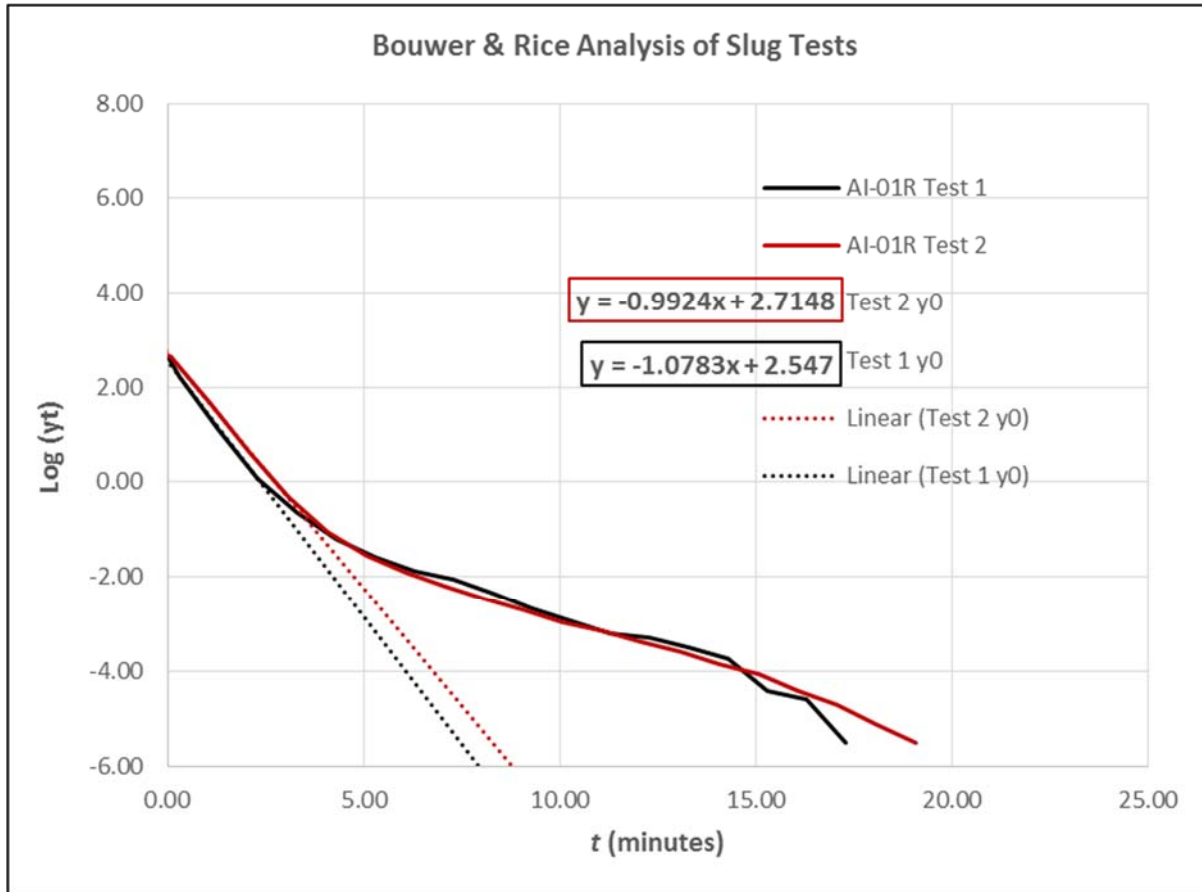
y₀ = y at time zero

y_t = y at time t.

The method involves calculating the most representative slopes of the water recovery curve in the plot of the slug recovery (feet) and time (minutes). Because of the shortness of the screen (one foot) and the bentonite sealing of the annular space between the well casing and the outer portions of the disturbed area (the dimensions of the drill hole) for the entire length of the well

above the screen, the most representative portion of the recovery curve occurred in the first five minutes. These slopes are shown in Figure 4 below.

Figure 4 Slug Test Bouwer & Rice Analysis



Detailed calculations are provided in Appendix A. Results are as follows:

Table 1 Hydraulic Conductivity

K	Test 1	Test 2
ft/min	0.0037	0.0034
GPD/ft ²	40.2	37.0

4.3.2 Modified Slug Tests

Modified slug tests involve the detection of pressure signals from the slug test well in other wells in the formation. Analysis is in accordance with basic propagation theory as developed by Theis from heat transfer theory, using the one parameter solution for heat propagation

$$s(x, t) = 1/\sqrt{4\pi T t} \cdot e^{(-x^2/4K T t)} \text{ where}$$

$s(x, t)$ is the amplitude of the pressure signal,

T is transmissivity,

x is distance between the slug test well and the observation well, and,

t is time.

K can be estimated from T by

$$K = \frac{T}{b \cdot S_s} \text{ where}$$

b = Aquifer depth, and,

S_s = Specific Storage or Elastic Storage.

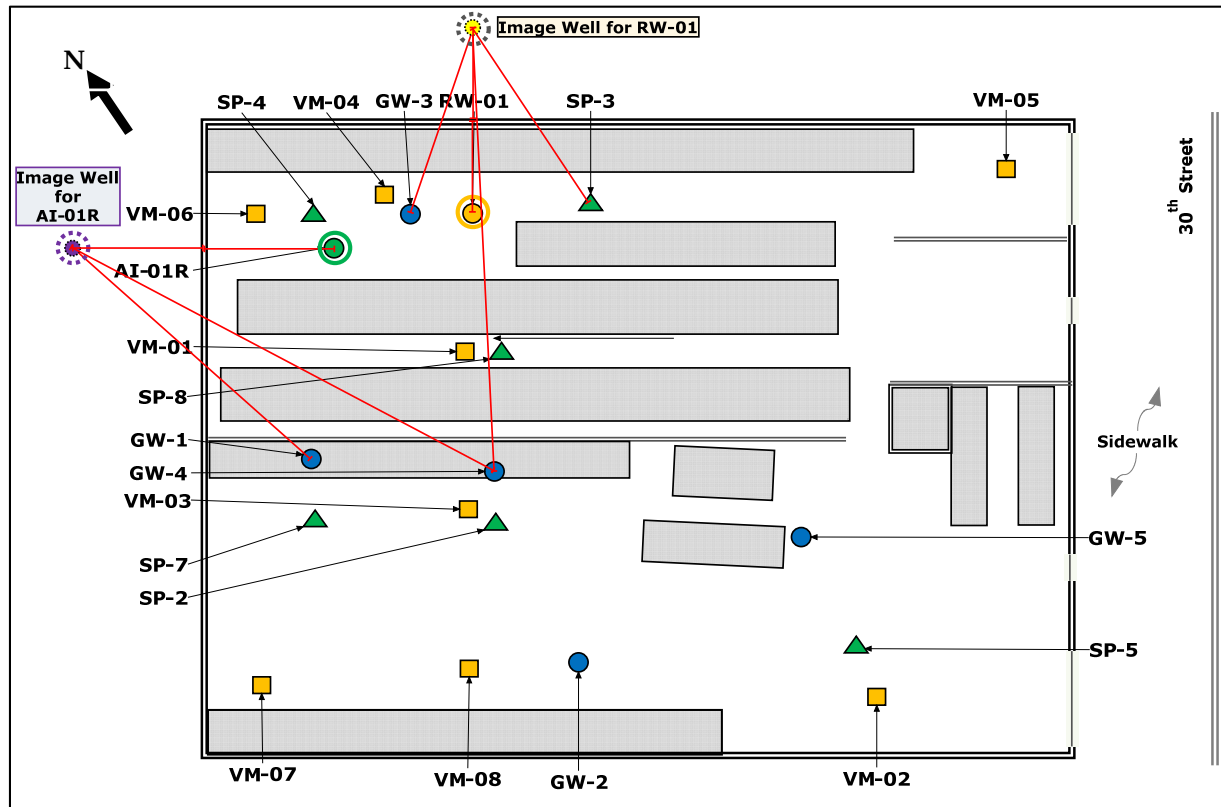
As the remote wells respond to a pressure wave from the slug well, and there is little actual movement of groundwater in the remote wells, the Specific Storage, S_s , is reflecting the elasticity component of Storativity, as opposed to the water drainage component. Therefore, the parameter is appropriate even for unconfined conditions. This assumption may not be true for the responses in GW-3, however, as some water movement is apparent.

For the modified slug test, the amplitude, period and arrival times of the pressure waves at a remote wells were identified. Hydraulic conductivities were determined by calculating the best fit K and S values across all tests using least squares regression techniques.

The above calculations are also used to look for inconsistencies in the data that indicate hydraulic barriers. The principle of superimposition is used to estimate the location of the boundaries indicated by the calculations. Further, K values are adjusted to account for the effects of these boundaries. An image well (shown on Figure 5 below) was used to take into

account a partial boundary apparent at about the location of the building's northwestern foundation.

Figure 5 Slug Test Image Well Locations



The K values were calculated from the modified slug tests:

Table 2 Hydraulic Conductivity from Modified Slug Tests

Test Number	Well Designation	r ft	K ft/min	K GPD/ft ²
1	GW-3	9.7	0.0031	34
1	GW-1	24.4	0.0041	
1	GW-1 Image	40.0	0.0041	
1	GW-1 Combined	24.4	0.0041	44
1	GW-4	31.8	0.0036	39
	Test 1 Averages		0.0036	39
2	GW-3	9.7	0.0046	50
2	GW-1	24.4	0.0038	

Test Number	Well Designation	<i>r</i> ft	K ft/min	K GPD/ft ²
2	GW-1 Image	40.0	0.0038	
2	GW-1 Combined	24.4	0.0038	41
2	GW-4	31.8	0.0021	
2	GW-4 Image	50.0	0.0021	
2	GW-4 Combined	31.8	0.0021	22
Test 2 Averages			0.0035	38

The slug and modified slug tests result in similar hydraulic conductivities ranging from 0.0034 to 0.0037 ft/min (37 to 40 GPD/ft²). The modified slug test also provides information on hydraulic barriers that can be used to evaluate the radius of influence of SVE capture and the negative pressures (suction) required to be placed on recovery wells.

4.4 SVE STEADY STATE TESTS

4.4.1 Intrinsic Permeability

Intrinsic permeability was calculated using the Cooper-Jacob Approximation

$$k_i = \frac{Q_v \mu}{\pi b P_s \cdot (1 - P_{atm}/P_{r_2})} \ln \left(\frac{r_s}{r_2} \right) \quad \text{where}$$

- b* = Aquifer thickness
- P*_{atm} = Atmospheric pressure
- P*_{r2} = Pressure at *r*₂
- P*_s = Pressure at the screen
- Q*_v = Volumetric Flow rate
- r*₂ = Distance from center line of well to *P*_{r2}
- r*_s = Radius of screen
- μ* = Dynamic Viscosity

The radius of influence (ROI) is calculated as the distance from the well where the absolute pressure equals atmospheric pressure. Figure 6, below, shows graphically this calculation for Tests 1 and 3 in the radial direction to the southeast toward the furthest, remote corner of the building (Table 3, below, provides the tabulated data). The resulting ROI values can be confirmed by comparing to the measured values in the well nearest the calculated ROI, GW-5.

Net pressure increases due to the extraction is greater in GW-5 than 0.01 iwc defined to calculate the ROI, confirming the calculated extent of the ROI.

Figure 6 SVE Pilot Test Radius of Influence

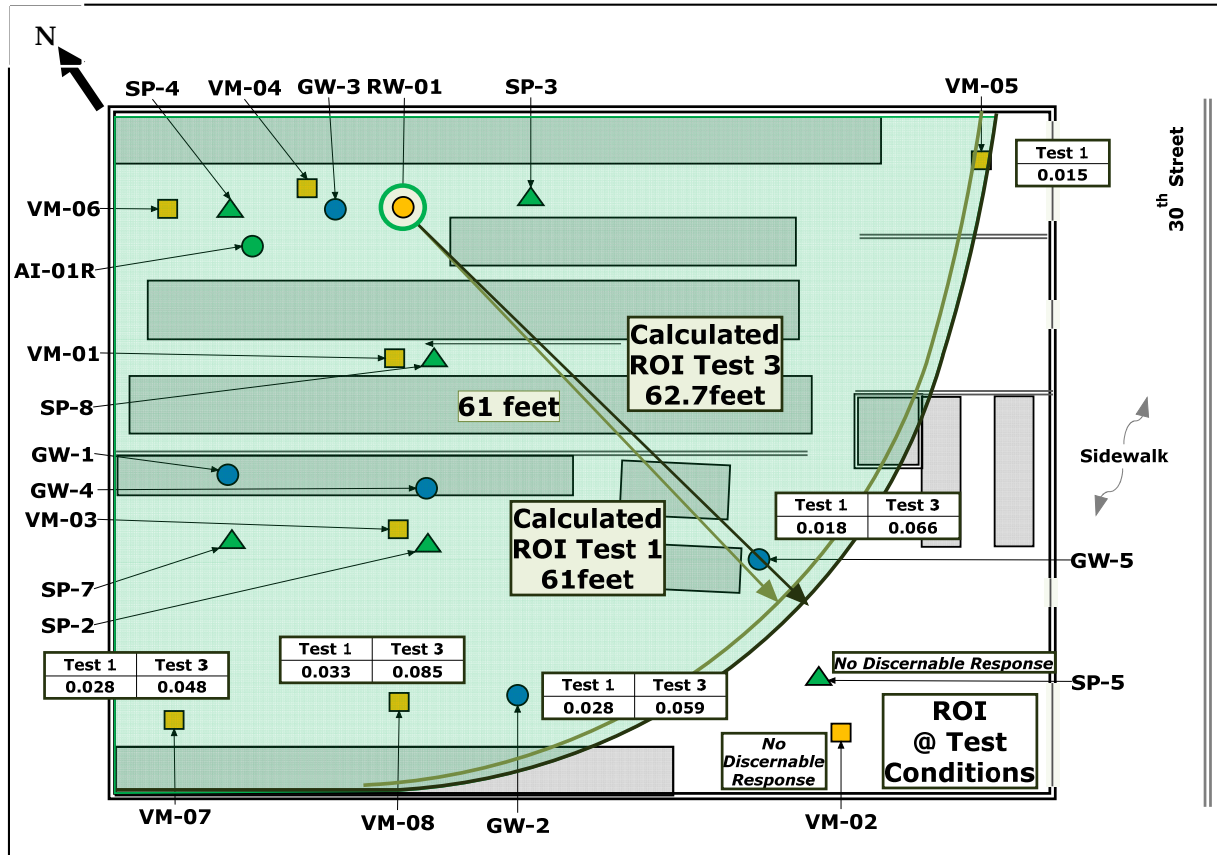


Table 3 SVE Pilot Test Radius of Influence

Test Number	Radial Direction	ROI ΔP iwc	ROI ft	k_i cm ²	K ft/min	ΔP in GW-2 53 ft South	ΔP in GW-5 52.8 ft Southeast
Test 1	Southeast	0.010	61.0	2.3E-06	0.436	0.028	0.018
Test 3	Southeast	0.010	62.7	2.1E-06	0.399	0.059	0.066

Also shown is Test 3 to the south toward GW-2. The boundary along the northwestern foundation affects the calculations to the south (and southwest). Radial directions affected by the foundation walls have relatively higher pressures due to the boundary effects, resulting in lower ROI values and higher k_i values than would be calculated in the absence of the boundary. However, in all three SVE tests, the measured pressure increase in GW-2 is above 0.01 iwc. This is true of all wells at the perimeter of the measurements, confirming that the system influenced

all areas under the slab with the exception of the area to the southeast, as shown in Figure 6 and listed below in Table 4.

Table 4 SVE Pilot Test Measured Pressure Differentials

Measured Location	Distance from RW-1 feet	ΔP Test 1 iwc	ΔP Test 2 iwc	ΔP Test 3 iwc
VM-7 ΔP	59.49	0.028	0.034	0.048
VM-8 ΔP	52.37	0.033	0.057	0.085
GW-2 ΔP	53.08	0.028	0.066	0.059
GW-5 ΔP	52.83	0.018	0.060	0.066
VM-5 ΔP	61.12	0.015	0.011	--

4.4.2 Modeled SVE Pressure Distribution from Recovery Well

Rearranging the Cooper-Jacob Approximation used above allows us to model directly the pressure gradients extending from the recovery well. The rearranged equation is

$$P_{r_x}^2 = P_{r_w}^2 - [Q_v \cdot P_s \cdot \mu / (\pi \cdot b \cdot k_i)] \cdot \ln(r_w/r_x) \quad \text{where}$$

k_i = Intrinsic permeability,

r_w = Effective radius of the screen,

r_x = Radius of differential pressure,

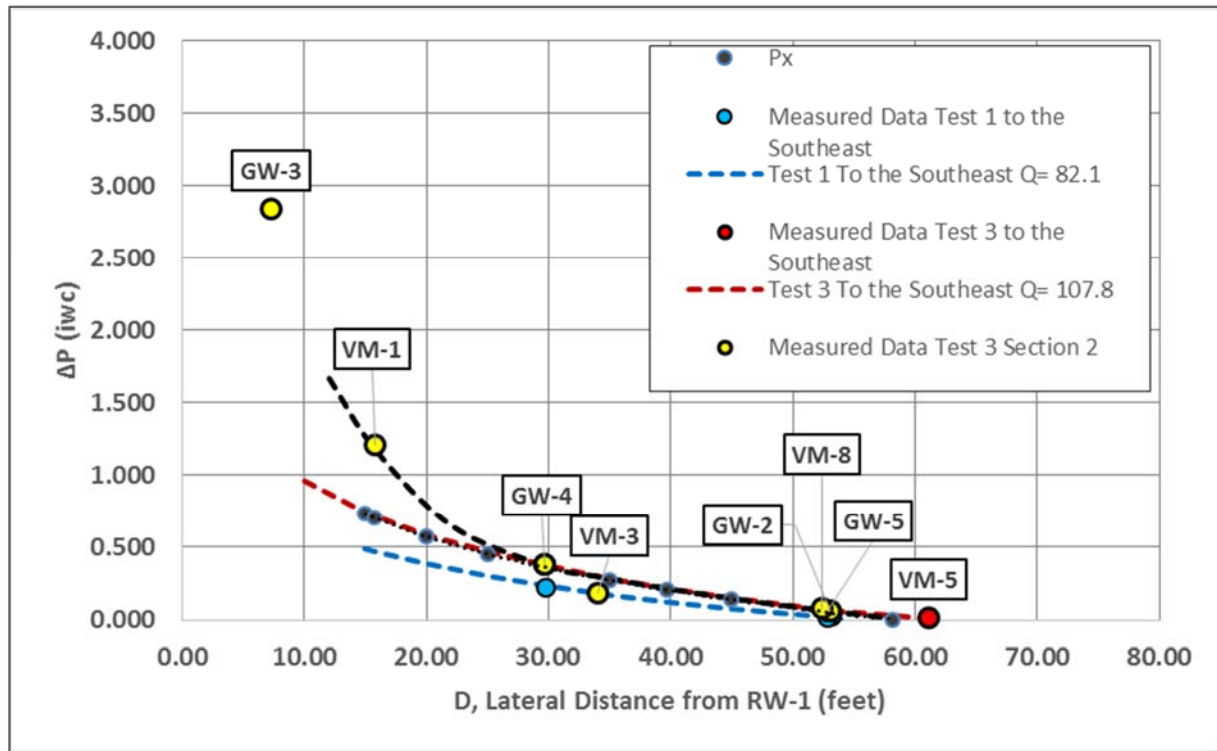
P_s, P_{r_x} = differential pressures at screen and at r_x , respectively,

Q_v = Volumetric flow rate, and,

b = thickness of zone available for air flow.

Calculations using this form of the equation allows us to better fit the measured data, and thereby fine tune the influence extraction will have on the subsurface vapors. It also allows us to evaluate the directionality of the extraction influence (Figure 7, below).

Figure 7 SVE Pilot Test Differential Pressure vs. Distance



The calculations to the south and southwest include the same super-imposition principle applied to the modified slug tests, resulting in the distribution of suction pressure over a greater distance.

Evaluating the data in this fashion still allowed us to evaluate the effects of the air leakage identified in RW-01. The leakage caused a loss of suction between the wellhead and the screen. Based on these calculations, the suction pressure on the screen could have been as low as 20% of the suction pressure at the wellhead. We believe the leak is between the concrete plug and the PVC casing near the surface of the ground. This can be remedied when SVE piping is permanently hooked to the recovery well. For design purposes, we will be looking at the lower screen suction pressures as well as the anticipated pressures that would be achieved with a repair of the leaking recovery well. Equipment will be specified to cover conditions in between.

4.5 AIR SPARGE AND AIR SPARGE WITH SVE TESTS

The aquifer was stressed by pressurizing the air sparging well (AI-01R) until the applied pressure is stabilized at approximately 30 psig. AI-01R is a two-inch well screened between 34 and 35 feet below ground. During the test, groundwater levels and dissolved oxygen concentrations were measured in the groundwater monitoring wells. After approximately 30 minutes, the SVE testing system was activated and PID readings in its discharge were added to the data collection.

Given the relatively low hydraulic conductivity values measured, the thinness of the groundwater zone to be treated, and the silty / fine sand nature of the soils, Site conditions are conducive to air sparging. Silty sand and fine sand with low hydraulic conductivities generally have relatively low porosity and, in turn, relatively high capillary pressures. As air sparging must displace water in the formation, it must overcome the groundwater's capillary pressures resisting the displacement. Once air is displaced in the immediate vicinity of the well from the well screen to the surface, the pressure applied to the screen is relieved by vertical flow of air, limiting the lateral spread of air.

Calculations (provided in Appendix B) quantify the above concepts. The screen is pressurized (P_s) and a flow out the screen is created (Q_{air}). Groundwater is displaced both laterally and vertically; however, as the head differential is much larger in the vertical direction, the displacement of water is greater vertically until the air reaches the unsaturated zone. The applied pressure, P_s , is dissipated immediately outside the screen as air flows vertically. Thereafter, of course, air will flow preferentially through the column of soil from which water has been displaced to the surface. It will not spread as the surrounding groundwater's hydraulic and capillary pressures will prevent the air from entering the water filled pores surrounding the column of air filled pores. This is the steady state condition that is set up almost immediately, after the air has displaced the water in the vertical direction.

At steady state, the screen pressure is relieved by the vertical flow of air. The resulting air pressure at any point in the air column next to the sparge well is equal to the groundwater's pressure preventing lateral flow. The size of the column of air filled pores can be estimated by calculating the area needed to pass the flow, Q_{air} . This is readily done using Darcy's Equation modified for air as the fluid

$$Q_{air} = A \cdot \frac{k_i \rho \cdot g}{\mu} \cdot \frac{\Delta h}{\Delta L} \quad \text{where}$$

A = Area at depth $\Delta L = \pi r^2 - \pi r_w^2$, r = radius of air column, r_w = radius of drill hole,

k_i = Intrinsic permeability (cm²),

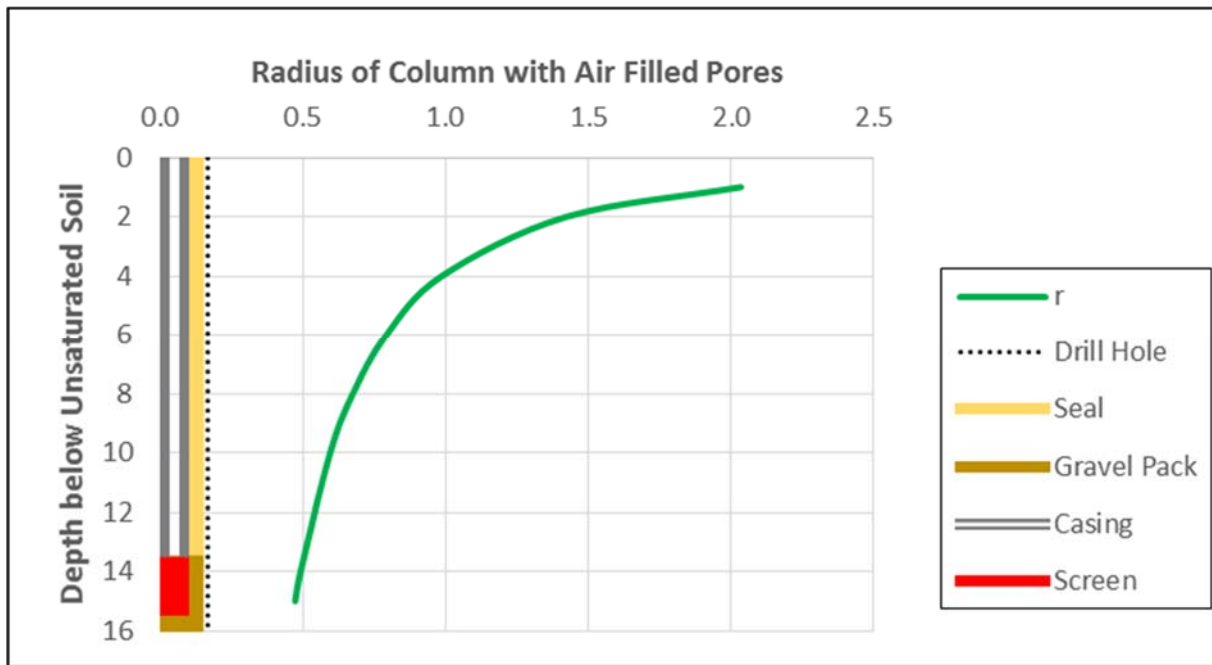
ρ = Density of air (varies with pressure),

Δh = Head difference between depth of ΔL and the unsaturated zone,

μ = Dynamic viscosity, and,
 ΔL = Depth below unsaturated zone.

Assuming a flow of 107 cfm, applying the intrinsic permeability values from above, and using the lower values of capillary pressure, we calculate that air sparging would drive air less than a ½ foot around the screen, and up to a maximum of 2.0 feet once the unsaturated zone is reached:

Figure 8 Calculated Air Spread During Air Sparge



Air sparging must displace water in a zone around the air sparging well at a sufficient distance to be effective. Against the high capillary pressures in the fine sand, low hydraulic conductivities, and thinness of the zone to be sparged, sufficient air pressures and flows cannot be imparted to the air sparging well to drive the air a reasonable distance from the well.

Figure 9, below, shows the pressure transducer response in monitoring well GW-3 during the course of the air sparging tests⁴. At the beginning of the test, as AI-01R is pressurized, the recorded groundwater level in GW-03 increases until an approximately steady level is reached at hour 16.5. Therefore, between its static level and the level reached during the air sparging, GW-03 was raised approximately 1.8 feet. (The jog in this rise at approximately 16.35 hours is due to an increase in the pressurization of AI-01R done to re-stabilize the pressure at 30 psig.)

⁴ GW-3 had a base elevation of 9.47ft to which it returned at the end of the air sparging tests. Figure 9 shows the well not quite recovered from prior testing.

After this initial rise in groundwater elevation, the elevation in GW-03 slowly declined until the end of the sparging test when it rapidly returned back to its static level.

Figure 9 GW-3 Elevation During Air Sparge

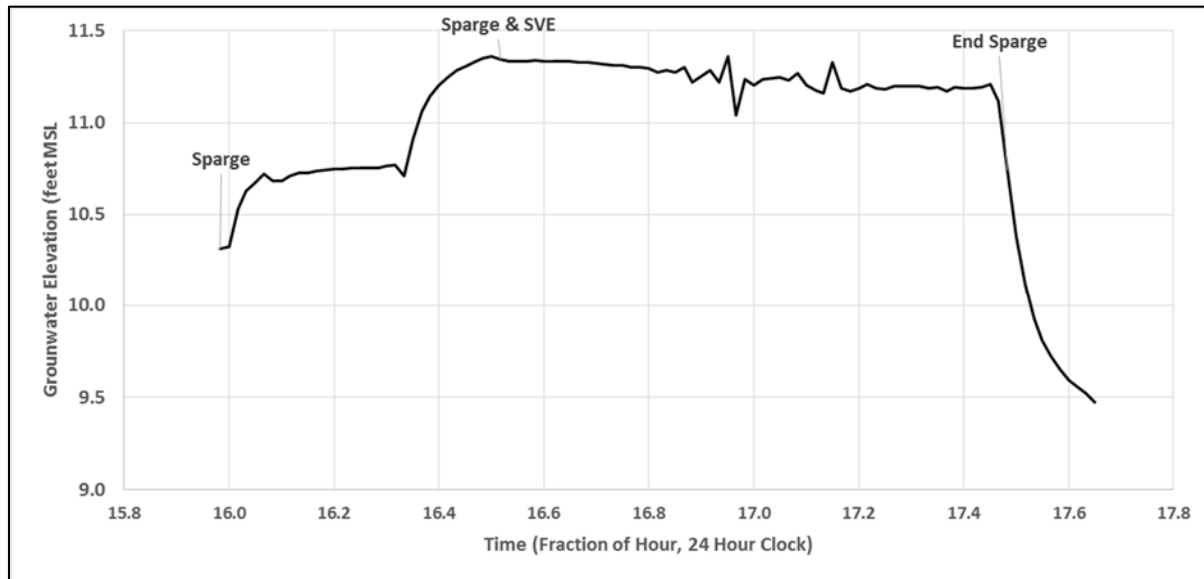
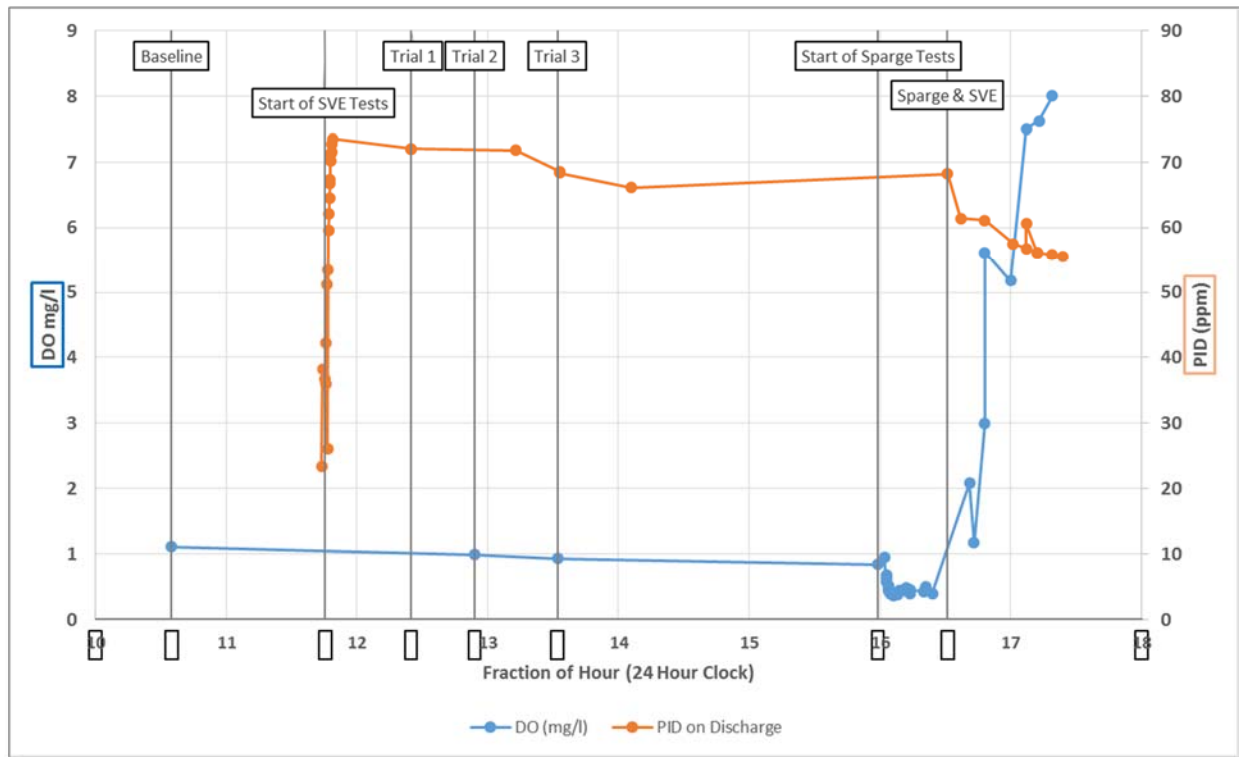


Figure 10, below, shows the levels of dissolved oxygen (DO) in GW-3 and the PID readings in the discharge of the SVE system. The figure covers the entire period of testing. The PID readings

are represented by the upper orange line. The dissolved oxygen readings are represented by the lower blue line.

Figure 10 Dissolved Oxygen in GW-3 During Air Sparge



A little before noon, the SVE test system was started. The PID level increases rapidly due to the SVE beginning to pull vapors from the undisturbed area around RW-01. Thereafter, the PID readings begin a slow decline, likely due to cleaner air being pulled in from farther away.

Turning on the air sparging system may have increased the vapor concentrations as the sample at about 4:30PM (16.50 hrs) is slightly increased. Thereafter, however, the PID returns to its decay pattern until the end of the test. This observation is consistent with the above calculations that tell us that only a small column of water was affected by the injection of the air, resulting in an equivalently-small release of contaminants picked up by the PID in the SVE discharge.

The DO in GW-3 initially drops when the air sparging test begins, probably due to the air sparging causing a small groundwater gradient and, in turn, an addition of groundwater from the undisturbed area around the well that has a lower DO concentration. After the initial drop, the DO dramatically increases in GW-3.

The substantial rise in groundwater elevation in GW-3 would only occur if, by the act of injecting air at the location of AI-01R, water was pushed to GW-3 at a rate faster than would

occur with Darcian flow in the saturated zone. Rather, injecting air into AI-01R apparently pushed groundwater into the unsaturated zone, where it could travel to GW-3 much faster than in the saturated zone. This resulted in the rapid 1.83 foot increase in the groundwater level in GW-3. In turn, as this water was oxygenated by the air injection, it resulted in a rapid increase of the DO concentration in GW-3.

In summary, the nature of the soils and thinness of the groundwater zone is not conducive to the application of air sparging. The pilot testing confirmed this as the zone of groundwater affected by the injection of air was small and, in turn, the removal of contaminants by the air sparging was shown to be impracticable. Therefore, we conclude that air sparging is impracticable for this Site.

4.6 VAPOR LABORATORY ANALYTICAL TESTS

Two vapor samples were collected and analyzed, and, based on an analysis of the results and relevant regulations, Integral has concluded that no vapor treatment is necessary. Integral collected one vapor sample from RW-01 during the SVE pilot test and one vapor sample from VM-2, assuming that future vapor extraction may occur near VM-2. Below are the results (the laboratory report is included as Appendix C).

Table 5 SVE Pilot Test Soil Vapor Sample Results

Constituent	RW-1 µg/m ³	VM-2 µg/m ³
cis-1,2-Dichloroethylene	384	ND
Isopropanol	ND	398,000
Tetrachloroethylene	226,000	55,400
Trichloroethylene	1,100	ND

ND – Not Detected

Conservatively using the maximum concentrations above and applying the entire estimated flow of 115 CFM, the discharge would be 0.27 lbs/hr.

Vapor emissions treatment is not necessary for this discharge. According to NYSDEC DAR-1 *Guidelines for the Control of Toxic Ambient Air Contaminants*, emissions treatment is necessary for sources emitting greater than 3.5 lbs/hr of VOCs (the design discharge for the proposed SVE is 0.25 lbs/hr, an order of magnitude lower). Further, according to 6 NYCRR 201-3.3(c)(29), the proposed SVE system is defined as a "trivial activity" for which no treatment is necessary as the system is a soil vent operated under an agreement (the Brownfield Cleanup Agreement) with, and under the supervision of, NYSDEC. We, therefore, conclude that no emissions treatment is necessary for the proposed system.

5 REMEDIATION SYSTEM DESIGN

Based on the results of the pilot test, we have designed the SVE remediation system with one blower that will extract soil vapor from two locations in opposite corners of the building. An SVE system uses one or more blowers to induce airflow through the subsurface (unsaturated zones) to volatilize contaminants for exhaust to the atmosphere. For this Site, the SVE system will also serve to create negative differential pressure beneath the Site building's slab relative to the pressure above the building's slab, thereby mitigating the infiltration of sub-slab vapors into the building. No air sparging is contemplated for this Site based on the pilot test evaluation; the existing air injection well will be sealed with an expanding well cap. The SVE process flow diagram (PFD), layouts, and elevations are provided in Appendix D.

5.1 SVE LAYOUT AND EQUIPMENT

The SVE blower will extract vapors from the existing RW-1 and from proposed RW-2, to be located in the southern corner of the building (the PFD is located in Appendix D). The connection piping from RW-1 to the wall will be trenched beneath the floor to avoid permanent disruption to the building operations (layouts are provided in Appendix D). The RW-1 riser will bend at the ceiling and run along the exterior walls until it joins the RW-2 riser. The combined risers will penetrate the roof and connect to the roof-mounted SVE skid.

RW-2 will be installed consistent with RW-1: four-inch PVC Sch 40, 0.020-inch slot from 1.5-18 ft bgs⁵. The annular space around the well will be filled with sand from the end of the boring to six inches above the top of the screen. Above the sand, the annulus will be filled with concrete to grade. The seal between the riser and the concrete will be enhanced with the application of a chemically-resistant sealant such as bituthene liquid membrane. The borehole will be completed with a well cover.

The SVE system will contain various equipment to refine and direct the pressure/flow. Pressure indicators/transmitters and pitot tubes will be installed to assess the pressure and flow conditions within the system. (The vacuum monitoring points (already installed) will be used to monitor subsurface pressure field extension.) Butterfly valves and a variable frequency drive (VFD) will be installed to control the pressure/flow within the system (see Appendix D for equipment locations).

Some of the SVE monitoring and control equipment will be located in an electrical panel located on the first floor. We intend to transmit the pressure/flow readings from the roof-mounted SVE skid to the first floor control panel to limit the need for roof access (there is no access at the

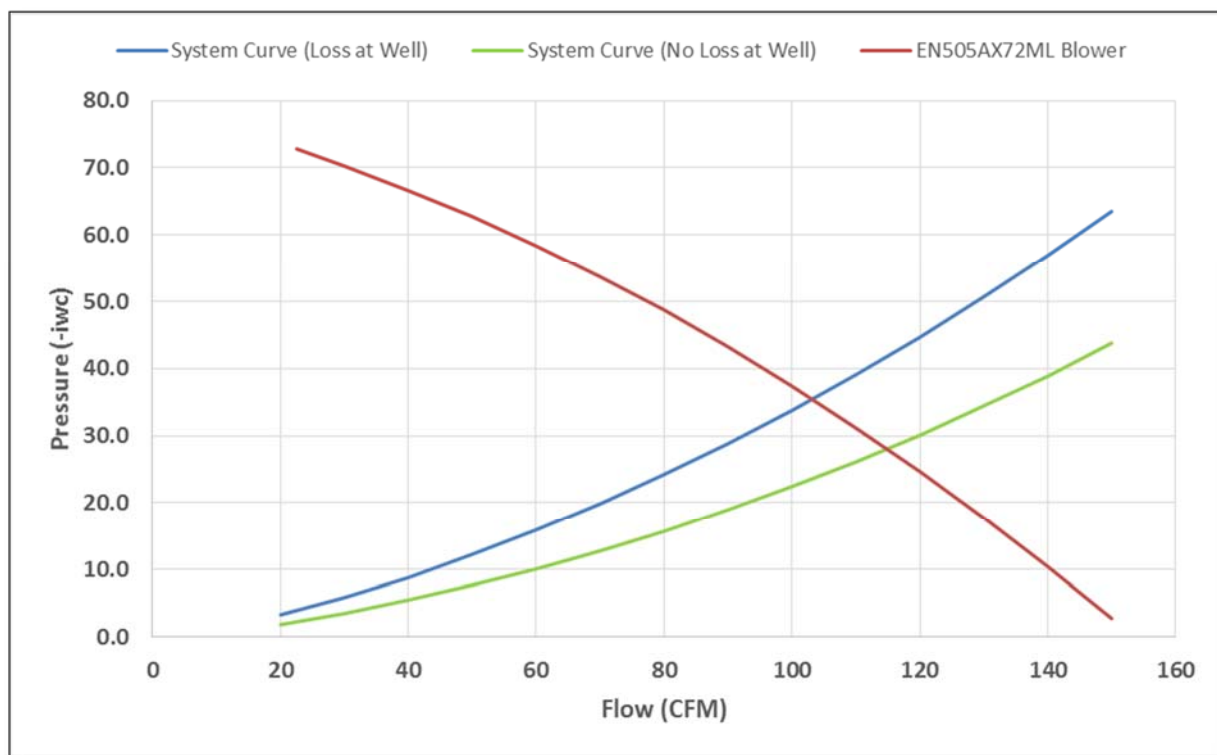
⁵ RW-2 will be screened above and below the silty clay layer expected to be present 6.0-9.5 ft bgs to maintain the functionality of this well.

moment). The VFD will also be located in the control panel so the SVE system can be balanced using the VFD and butterfly valves, all located on the first floor.

5.2 SVE SYSTEM CURVE

Accounting for pressure losses in the system layout and equipment, the system curve was generated for SVE blower selection. The pressure/flow data generated during the pilot test (representing the subsurface conditions) was combined with the designed above-grade pressure/flow conditions⁶ to generate a system curve. The system curve represents the total system correlation between pressure and flow. We developed two system curves: one including the loss at the well due to the observed leak (blue), and one excluding that loss (green), assuming the leak is repaired during system construction. Both systems curves are shown below on Figure 11.

Figure 11 System and Blower Curves



The blower curve for a Rotron EN505AX72ML, the selected blower, is also plotted on the above figure in red. Where the blower curve meets the system curve (assumed to be the green curve

⁶ At present, we've assumed a 50/50 flow split between the two branches of the designed SVE system, and we will continue to refine the split.

[with the leak repaired]) is the operating point (28iwc, 115CFM) at which the SVE system will operate, given the Site conditions.

5.3 SSDS DESIGN CRITERION

A design criterion of 0.010 iwc was utilized for the SSDS portion of the design; meaning, the SSDS is designed to provide a minimum of 0.010 iwc of differential pressure across the slab (vacuum, defined as a lower pressure beneath the slab than above the slab). United States Environmental Protection Agency (USEPA) Radon Mitigation Standards recommend at least 0.004 iwc of pressure differential across the building slab. We have designed to a higher pressure differential to add a factor of safety to the design and to take into account that a radon type fan operates at lower pressures; however, differential pressure of 0.004 iwc across the slab is acceptable, according to USEPA. The SVE system will achieve 0.010 iwc pressure differential across the slab in the VMPs.

6 SCHEDULE

Below is a schedule for the installation of the remediation system. This is the same schedule as presented in our letter dated October 22, 2015, with the addition of a Comfort Letter from NYSDEC. The Comfort Letter is intended to provide the Volunteer with NYSDEC's agreement on the remediation approach and system design. Having NYSDEC's agreement in principle will allow the Volunteer to spend money on the remediation prior to the end of the public notice period with a reasonable assurance that its implementation as proposed will be approved by NYSDEC, thereby permitting a shortening of the schedule. We assume that the public notice period will start on December 1, 2015 and end on January 15, 2015.

Table 6. Schedule

Task	Task Duration	Date Completed / Scheduled
NYSDEC/NYSDOH Approval of IRM WP	--	5/29/2015
Install SVE Recovery Well, Monitoring Points, and Air Injection Well	--	8/8/2015
Conduct SVE Pilot Test & Air Injection Pilot Test (Attempted)	--	10/3/2015
Reinstall Air Injection Well	--	10/16/2015
Conduct SVE Pilot Test & Air Injection Pilot Test	--	11/2/2015
Design SVE (with Air Injection) System	--	11/23/2015
Prepare Design Document	--	11/30/2015
<i>Submit Results of Pilot Test and Final IRM Design</i>	--	<i>11/30/2015</i>
<i>Receive a Comfort Letter from NYSDEC re: Design Agreement</i>	--	<i>12/15/2015</i>
Public Notice of IRM Design	45 Days	1/15/2016
Contracting / Procurement	4 Weeks ⁷	2/12/2016
System Installation	1 Week ⁸	2/19/2016
System Start-up & Balancing	1 Week	2/26/2016
Prepare Site Management Plan	2 Weeks	3/11/2016

We will notify NYSDEC at least one week prior to installing the system.

⁷ We may be able to reduce the contracting and procurement time, depending upon the availability of the contractor and of the system components, and upon the receipt of the Comfort Letter.

⁸ Weather permitting

7 KEY PROJECT CONTACT LIST

Table 7. Key Contact List

Name	Title	Phone Number	E-mail
Ruth Curley	NYSDEC Project Manager	(518) 402-9480	ruth.curley@dec.ny.gov
Christopher Doroski	NYSDOH Project Manager	(518) 402-7870	christopher.doroski@health.ny.gov
Keith Brodock, P.E.	Integral Project Manager	(212) 440-6702	kbrodock@integral-corp.com
Zhong Chuang Properties LLC	Volunteer		
James J. Periconi, Esq.	Attorney for Volunteer	(212) 213-5500	jpericoni@periconi.com

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FIGURES

N:\GIS\Projects\E075 Bridge\Cleaners Alerat\Production MXDs\Figure1 site location.mxd 10/10/2014 2:15:21 PM

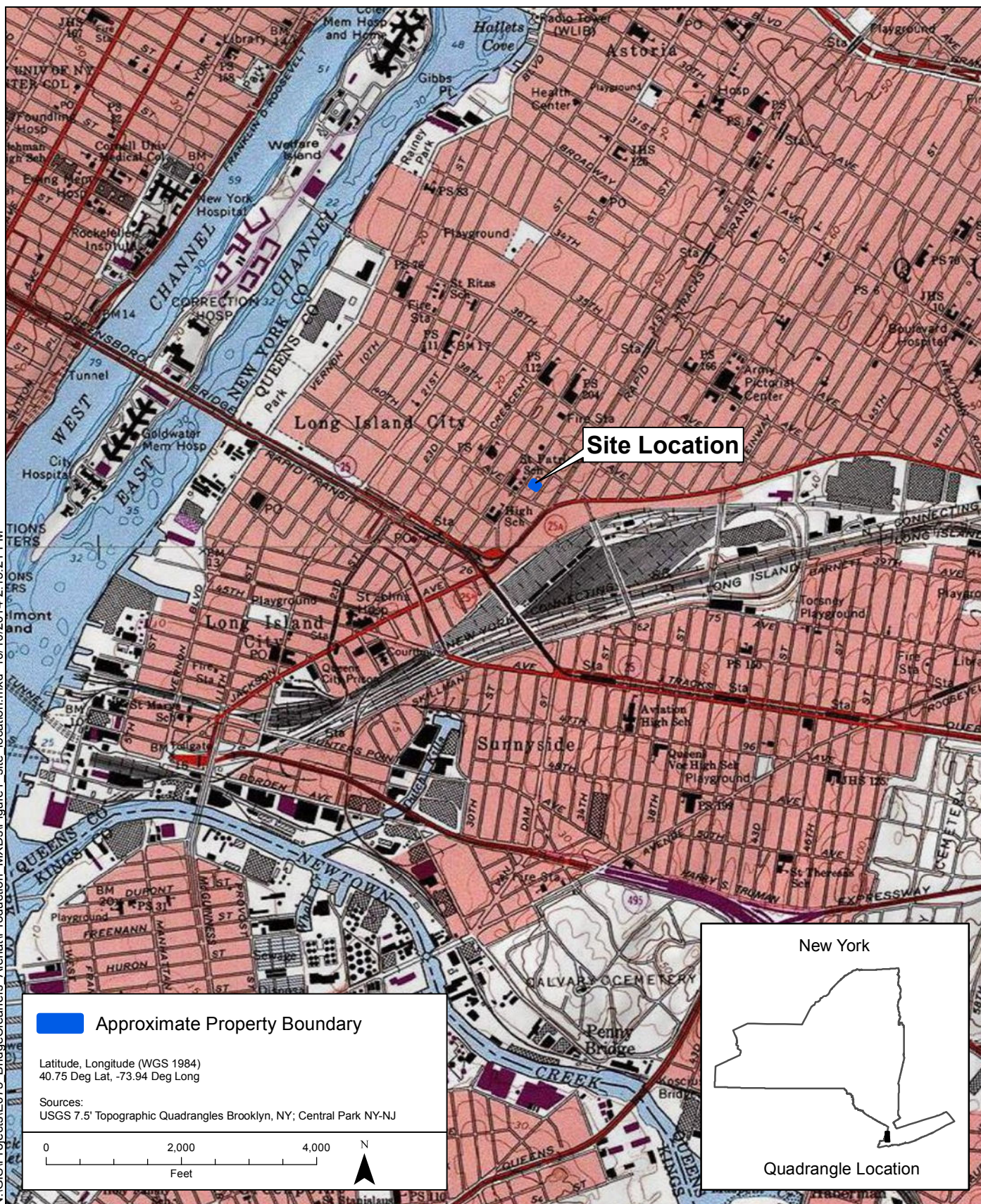


Figure 1.
Site Location Map
39-26 30th St.
Long Island City, NY

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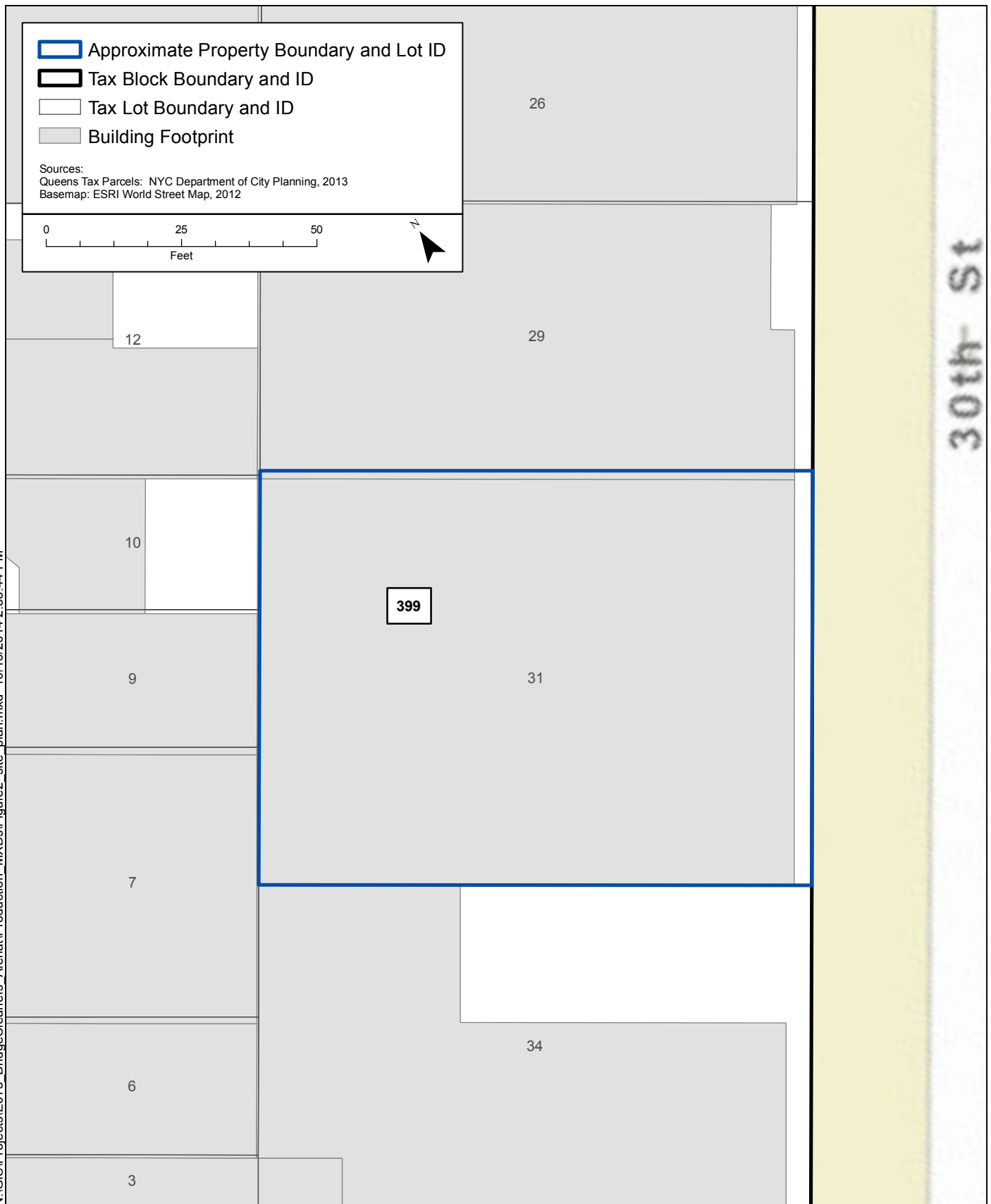
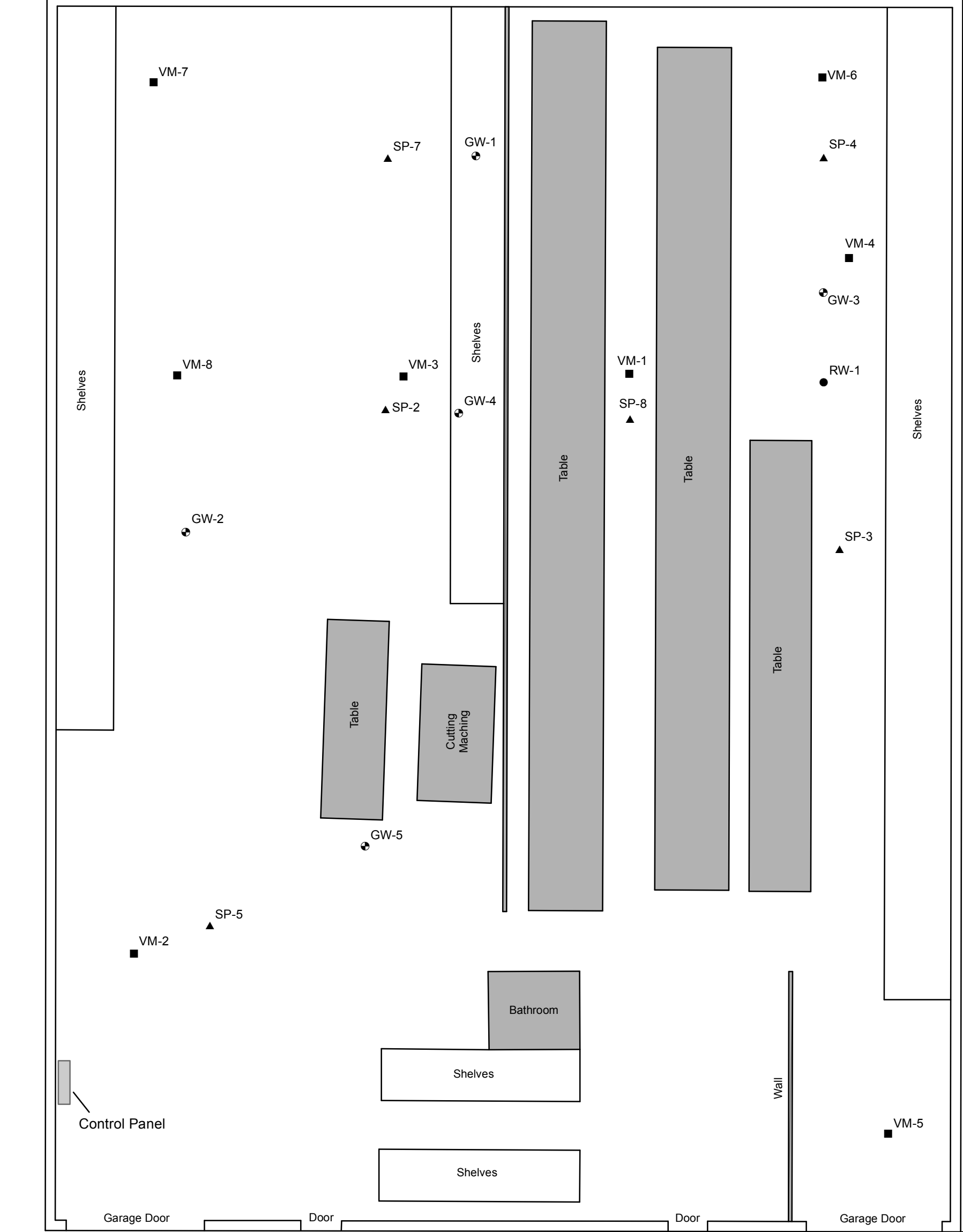


Figure 2.
Site Plan
39-26 30th St
Long Island City, NY

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- Vapor Extraction Well
- ⊕ Groundwater Monitoring Well
- Vacuum Monitoring Point
- ▲ Soil Vapor Point

0

5

10

Feet

Figure 3.
Site Layout
39-26 30th St
Long Island City, NY

APPENDIX A

PILOT TESTING: SLUG TEST CALCULATIONS

Bouwer & Rice Slug Test Method

$$K = \frac{r_c^2 \cdot \ln(R_e/r_w)}{2L_e} \cdot \frac{1}{t} \cdot \ln\left(\frac{y_0}{y_t}\right)$$

L_e = 1 Length of screened portion of well

Aquifer Thickness

$b = H =$ 40

Static Water Level = 40.0

Transducer Static = 9.94

DTW = 20.2

DTB = 30.0

L_w = 9.8

L_w = Water column length in well

K = Hydraulic Conductivity

r_c^2 = Radius of the casing (squared)

R_e = Effective radial distance over which y is dissipated

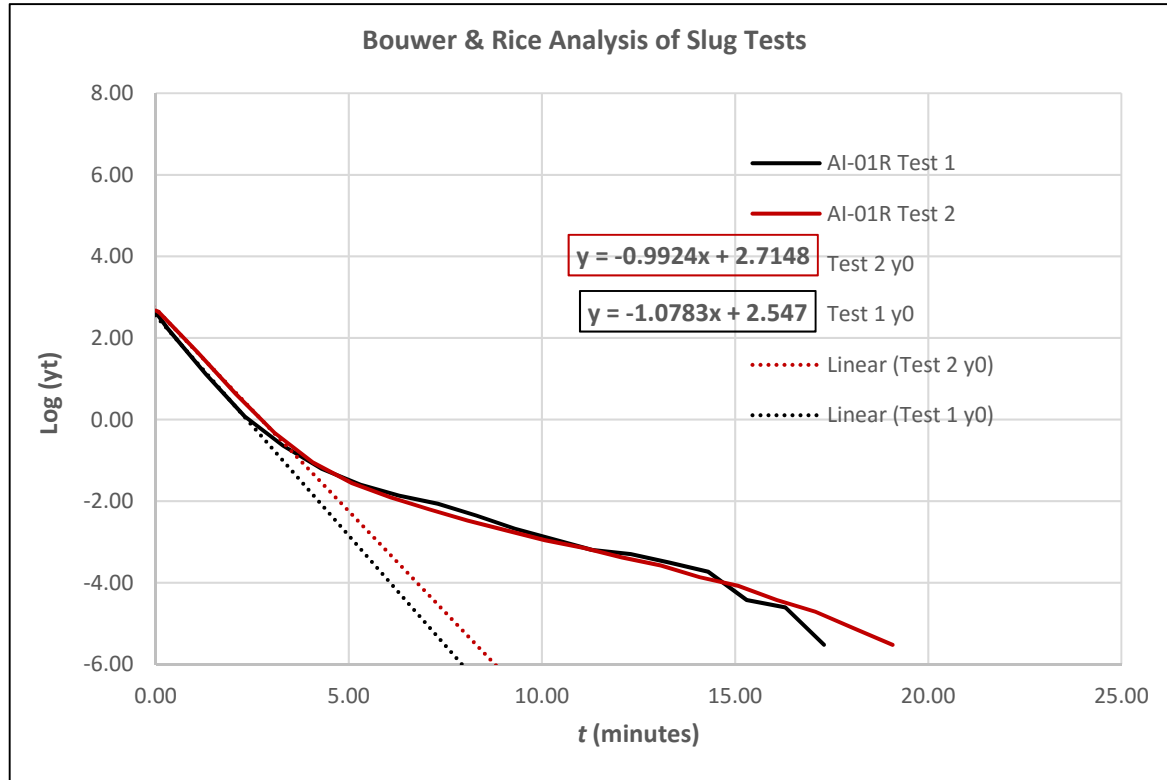
r_w = Radial distance to undisturbed portion of aquifer from center line

y_0 = y at time zero

y_t = y at time t = difference between level in well versus static water level outside well

Zero Adjust Factor	Elapse Time (minutes)		Transducer Data		y_t		Test 1 y_0	Test 2 y_0
	0.70	0.923					$\ln(y_t)$	
	AI-1 Test 1	AI-1 Test 2	AI-01R Test 1	AI-1 Test 2	AI-1 Test 1	AI-1 Test 2	AI-1 Test 1	AI-01R Test 2
	0.00	0.00	23.92	24.44	13.978	14.499	2.64	2.67
	0.30	0.08	19.33	23.94	9.394	14.001	2.24	2.64
	1.30	1.08	12.98	15.19	3.041	5.253	1.11	1.66
	2.30	2.08	11.03	11.81	1.087	1.868	0.08	0.62
	3.30	3.08	10.47	10.66	0.527	0.723	-0.64	-0.32
	4.30	4.08	10.24	10.29	0.299	0.349	-1.21	-1.05
	5.30	5.08	10.14	10.15	0.203	0.211	-1.59	-1.56
	6.30	6.08	10.10	10.09	0.155	0.149	-1.86	-1.90
	7.30	7.08	10.07	10.05	0.127	0.111	-2.06	-2.20
	8.30	8.08	10.04	10.02	0.095	0.084	-2.35	-2.48
	9.30	9.08	10.01	10.01	0.069	0.066	-2.67	-2.72
	10.30	10.08	9.99	9.99	0.053	0.052	-2.94	-2.96
	11.30	11.08	9.98	9.98	0.041	0.043	-3.19	-3.15
	12.30	12.08	9.98	9.97	0.037	0.034	-3.30	-3.38
	13.30	13.08	9.97	9.97	0.030	0.028	-3.51	-3.58
	14.30	14.08	9.96	9.96	0.024	0.021	-3.73	-3.86
	15.30	15.08	9.95	9.96	0.012	0.017	-4.42	-4.07
	16.30	16.08	9.95	9.95	0.010	0.012	-4.61	-4.42
	17.30	17.08	9.94	9.95	0.004	0.009	-5.52	-4.71
		18.08		9.95		0.006		-5.12
		19.08		9.94		0.004		-5.52

Bouwer & Rice Slug Test Method



	AI-1 Test 1	AI-1 Test 2		
$\ln(y_t)$ at $t=0$	2.547	1.533	Intercept from Graph	Note: $\ln(y_0/t_0)$ cannot be calculated from the slope of the semi-log curve. Convert to the same scale and then calculate the slope.
y_0	12.769	4.632	(b in equation)	
y_t	0.171		At point on straight line	
t	4.0		Interval between y_0 & y_t	
$\ln(y_0/y_t)/t$	1.078		Slope by calculating above	
$\ln(y_0/y_t)/t$	1.078	0.992	Slope from Graph equation (Note sign is reversed)	
$H =$	40	feet	Aquifer Depth	
$L_w =$	9.8	feet	Vertical distance of water in well	
$L_e =$	1.0	feet	Screen Length	
ID	2.067	inches	Nom. 2" PVC ID	
OD	2.375	inches	Nom. 2" PVC OD	
Drill Hole OD	4.0	inches	0.333 feet	
$r_w =$	2.0	inches	0.167 feet	
$r_c =$	1.034	inches	0.086 feet	
$L_w/r_w =$	59			
$L_e/r_w =$	6.0	See		
$A =$	1.0	Bouwer		
$B =$	0.5	Table &		
$\ln(R_e/r_w) =$	0.933	Equations		
K	0.0037	0.0034	ft/min	
	40.2	37.0	GPD/ft²	

$$K = \frac{r_c^2 \cdot \ln(R_e/r_w)}{2L_e} \cdot \frac{1}{t} \cdot \ln\left(\frac{y_0}{y_t}\right)$$

APPENDIX B

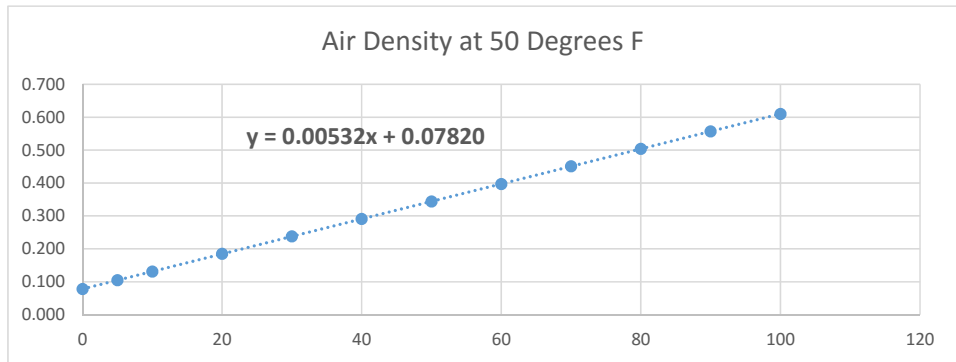
PILOT TESTING: AIR SPARGE CALCULATIONS

Evaluation of Air Sparging									
Constants, Conversions and Definitions									
Dynamic Viscosity	μ	3.90E-07 lb-sec/ft ²	2.71E-09 lb-sec/in ²						
Convert to ->	psi	Pascal	Bar	Technical Atmosphere	Atmosphere	Torr	Manometer Readings		
Convert from	lb./in ²	kg/(m•sec ²)	(bar)	kg/cm ²	kg/m ²	(atm)	1 mm hg	in. H ₂ O, iwc	in. hg
1 psi	1	6.89E+03	6.89E-02	7.03E-02	7.03E+02	6.80E-02	5.17E+01	2.77E+01	2.04E+00
Pascal	1.5E-04	1	1.00E-05	1.02E-05	1.02E-01	9.87E-06	7.50E-03	4.0E-03	2.96E-04
Bar	1.45E+01	1.00E+05	1	1.02E+00	1.02E+04	9.87E-01	7.50E+02	4.02E+02	2.95E+01
kg/cm ²	1.42E+01	9.81E+04	9.81E-01	1	1.00E+04	9.68E-01	7.36E+02	3.94E+02	2.90E+01
kg/m ²	1.42E-03	9.81E+00	9.81E-05	1.00E-04	1	9.68E-05	7.36E-02	3.94E-02	2.90E-03
1 atm	1.47E+01	1.01E+05	1.01E+00	1.03E+00	1.03E+04	1	7.60E+02	4.07E+02	2.99E+01
Torr	1.93E-02	1.33E+02	1.33E-03	1.36E-03	1.36E+01	1.32E-03	1	5.36E-01	3.94E-02
in. H ₂ O, iwc	3.61E-02	2.49E+02	2.49E-03	2.54E-03	2.54E+01	2.46E-03	1.87E+00	1	7.36E-02
in. hg	4.91E-01	3.38E+03	3.38E-02	3.45E-02	3.45E+02	3.34E-02	2.54E+01	1.36E+01	1

Length	1	meter	3.28	feet	39.37	inches			
Density	1.00	lb/ft ³	0.00058	lb/in ³	0.0316	lb-sec ² /ft ⁴	16.08	kg/m ³	
Hydraulic Conductivity & Intrinsic Permeability	$K = \frac{k_i \cdot \rho \cdot g}{\mu}$		K	cm/s	ρ	g/cm ³			
			k_i	Darcy	g	Acceleration due to gravity cm/s ²			
			μ	cPoise	g/s•cm	Poise	g/s•m		
Dynamic Viscosity air	μ	3.90E-07	lb-sec/ft ²	2.71E-09	lb-sec/in ²	1.87E-05	N•s/m ² or kg/s•m	1.87E-02	cPoise
Conversions	1	atm	=	14.696	psi	29.92	in. hg	406.8	iwc
Intrinsic Permeability	k_i	1	cm ²	=	1.01E+08	Darcy			
To Hydraulic Conductivity	1	cm ²	=	3,220	ft/sec	193,200	ft/min	1.85E+09	GPD/ft ²

Air Density at 50 Degrees F

Gauge Pressure	Air Density
psi	lb/ft ³
0	0.078
5	0.105
10	0.131
20	0.185
30	0.238
40	0.291
50	0.344
60	0.397
70	0.451
80	0.504
90	0.557
100	0.610
<i>a</i>	<i>b</i>
0.00532	0.07820



$$\text{Air Density} = a \cdot \text{Gauge Pressure} + b$$

	OD	Thickness	ID	OD Area	ID Area	
Screen ID, 2 inch nominal, Sch. 40	2.375	0.154	2.067	4.43	3.36	in/in ²
	OD	Thickness	ID	OD Area	ID Area	
	0.060	0.004	0.053	0.0029	0.0022	m/m ²
Drill Hole	4.0	inches	0.102	m		

Effective Pore Size & Capillary Pressures

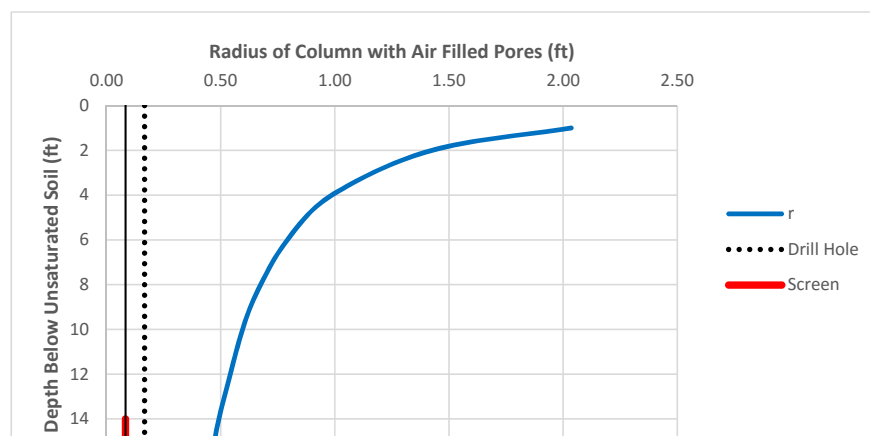
Material	Effective <i>n</i>	Capillary Pressure		
		cm Hg	iwc	psi
Silty Sand, average	20%	6.0	0.021	0.042
Fine sand, maximum	28%	4.0	0.014	0.028

Total Pressures Resisting Lateral Flow of Air					Intrinsic Permeability and Hydraulic Conductivity		
Capillary Pressure	0.04	0.03	psi				
	1.2	0.8	iwc				
Hydraulic Pressure = Water Column (from Section top)	(Variable)	6.1	psi				
	14	168.0	iwc				
Total Resisting Pressure top of Cylinder	6.1	psi	0.42	Bar			
	168.8	iwc	42,009	kg/(m•sec ²)			
					Unsaturated Zone	Saturated Zone	
					k_i	2.14E-06	2.07E-07
					K	0.414	0.040

Using Darcy Equation for Vertical Air Flow				$Q = A \cdot (k_i \rho g / \mu) \cdot \Delta h / \Delta L$			$v = \frac{Q}{A \cdot n}$	
Hydraulic K for well zone								
ρ	0.113	lb/ft ³	1.81E-06	kg/cm ³	1.81E-03	g/cm ³	Zone: Unsaturated Saturated	
g	32.20	ft/s/s	981.46	cm/s/s	9.81	m/s/s	k_i	2.14E-06 2.07E-07
μ	3.90E-07	lb-sec/ft ²	1.87E-03	cPoise	g/s-cm		K	0.414 0.040
K	Saturated Zone K		0.04	ft/min			Q (cfm) = 107	
k_i	From Sat Zone K		2.07E-07	cm ²				
L_w	Depth		457.2	cm	15	ft	Depth	r
Δh	180	iwc	448,017	g/(cm•sec ²)	6.499	psi gauge	1	2.04
							2	1.42
							4	0.99
r	Flow Column Radius		14.4	cm	0.47	ft	6	0.79
r_w	Drill Hole Radius		5.1	cm	2.00	inches	8	0.68
A	Area Outside Drill Hole		572	cm ²			10	0.60
Q	Flow		5.05E+04	cm ³ /s	107	cfm	14	0.49
n			28%				15	0.47
v			3.15	m/s	10.3	ft/s		

$$P_1 + \frac{1}{2}\rho V_1^2 + \rho gh_1 = P_2 + \frac{1}{2}\rho V_2^2 + \rho gh_2 \qquad Q_1 = A_1 \cdot V_1 = Q_2 = A_2 \cdot V_2 = \pi r_2^2 \cdot n \cdot V_2$$

P	168	iwc	418,149	$g/(cm \cdot sec^2)$	6.07	psi
ρ	0.110		1.78E-03	g/cm^3		
v	2.88	m/s	288	cm/s		
$1/2 \rho \cdot v^2$			73.84	$g/(cm \cdot sec^2)$		
$\rho \cdot g \cdot h$			743.9	$g/(cm \cdot sec^2)$		
Section 2	14	ft	418,967	$g/(cm \cdot sec^2)$	6.08	psi
P	48	iwc	119,471	$g/(cm \cdot sec^2)$	1.73	psi
ρ	0.087		1.41E-03	g/cm^3		
v	0.65	m/s	65	cm/s		
$1/2 \rho \cdot v^2$			58.43	$g/(cm \cdot sec^2)$		
$\rho \cdot g \cdot h$			168.2	$g/(cm \cdot sec^2)$		
Section 3	4	ft	119,698	$g/(cm \cdot sec^2)$	1.74	psi
P	12	iwc	29,868	$g/(cm \cdot sec^2)$	0.43	psi
ρ	0.081		1.29E-03	g/cm^3		
v	0.15	m/s	15	cm/s		
$1/2 \rho \cdot v^2$			53.81	$g/(cm \cdot sec^2)$		
$\rho \cdot g \cdot h$			38.7	$g/(cm \cdot sec^2)$		
Section 3	1	ft	29,960	$g/(cm \cdot sec^2)$	0.43	psi



APPENDIX C

SOIL VAPOR LABORATORY REPORT



ANALYTICAL REPORT

Lab Number:	L1528291
Client:	Integral Consulting, Inc. 61 Broadway Suite 1601 New York, NY 10006-2756
ATTN:	Keith Brodock
Phone:	(212) 962-4301
Project Name:	BRIDGE CLEANERS
Project Number:	E075
Report Date:	11/25/15

The original project report/data package is held by Alpha Analytical. This report/data package is paginated and should be reproduced only in its entirety. Alpha Analytical holds no responsibility for results and/or data that are not consistent with the original.

Certifications & Approvals: NY (11627), CT (PH-0141), NH (2206), NJ NELAP (MA015), RI (LAO00299), ME (MA00030), PA (68-02089), VA (460194), LA NELAP (03090), FL (E87814), TX (T104704419), WA (C954), USFWS (Permit #LE2069641), USDA (Permit #P330-11-00109), US Army Corps of Engineers.

320 Forbes Boulevard, Mansfield, MA 02048-1806
508-822-9300 (Fax) 508-822-3288 800-624-9220 - www.alphalab.com



Project Name: BRIDGE CLEANERS
Project Number: E075

Lab Number: L1528291
Report Date: 11/25/15

Alpha Sample ID	Client ID	Matrix	Sample Location	Collection Date/Time	Receive Date
L1528291-01	RW-01-110215	AIR	39-26 30TH ST, LIC	11/02/15 13:59	11/02/15
L1528291-02	VM-02-110215	AIR	39-26 30TH ST, LIC	11/02/15 14:00	11/02/15

Project Name: BRIDGE CLEANERS
Project Number: E075

Lab Number: L1528291
Report Date: 11/25/15

Case Narrative

The samples were received in accordance with the Chain of Custody and no significant deviations were encountered during the preparation or analysis unless otherwise noted. Sample Receipt, Container Information, and the Chain of Custody are located at the back of the report.

Results contained within this report relate only to the samples submitted under this Alpha Lab Number and meet all of the requirements of NELAC, for all NELAC accredited parameters. The data presented in this report is organized by parameter (i.e. VOC, SVOC, etc.). Sample specific Quality Control data (i.e. Surrogate Spike Recovery) is reported at the end of the target analyte list for each individual sample, followed by the Laboratory Batch Quality Control at the end of each parameter. Tentatively Identified Compounds (TICs), if requested, are reported for compounds identified to be present and are not part of the method/program Target Compound List, even if only a subset of the TCL are being reported. If a sample was re-analyzed or re-extracted due to a required quality control corrective action and if both sets of data are reported, the Laboratory ID of the re-analysis or re-extraction is designated with an "R" or "RE", respectively. When multiple Batch Quality Control elements are reported (e.g. more than one LCS), the associated samples for each element are noted in the grey shaded header line of each data table. Any Laboratory Batch, Sample Specific % recovery or RPD value that is outside the listed Acceptance Criteria is bolded in the report. All specific QC information is also incorporated in the Data Usability format of our Data Merger tool where it can be reviewed along with any associated usability implications. Soil/sediments, solids and tissues are reported on a dry weight basis unless otherwise noted. Definitions of all data qualifiers and acronyms used in this report are provided in the Glossary located at the back of the report.

In reference to questions H (CAM) or 4 (RCP) when "NO" is checked, the performance criteria for CAM and RCP methods allow for some quality control failures to occur and still be within method compliance. In these instances the specific failure is not narrated but noted in the associated QC table. The information is also incorporated in the Data Usability format of our Data Merger tool where it can be reviewed along with any associated usability implications.

Please see the associated ADEx data file for a comparison of laboratory reporting limits that were achieved with the regulatory Numerical Standards requested on the Chain of Custody.

HOLD POLICY

For samples submitted on hold, Alpha's policy is to hold samples (with the exception of Air canisters) free of charge for 21 calendar days from the date the project is completed. After 21 calendar days, we will dispose of all samples submitted including those put on hold unless you have contacted your Client Service Representative and made arrangements for Alpha to continue to hold the samples. Air canisters will be disposed after 3 business days from the date the project is completed.

Please contact Client Services at 800-624-9220 with any questions.

Project Name: BRIDGE CLEANERS
Project Number: E075

Lab Number: L1528291
Report Date: 11/25/15

Case Narrative (continued)

Report Submission

This report replaces the report issued on November 9, 2015. It has been revised to change the Client ID for the L1528291-02 sample at the request of the client. The client declined to provide a revised CoC, the original has been provided in this submittal.

Volatile Organics in Air

Sample L1528291-01 was diluted and re-analyzed to quantify the sample within the calibration range. The result should be considered estimated, and are qualified with an E flag, for any compound that exceeded the calibration range in the initial analysis. The re-analysis was performed only for the compound that exceeded the calibration range.

Samples L1528291-01 and -02: Samples were transferred from a Tedlar bag into a fused silica lined canister upon receipt in order to extend the holding time for analysis.

Samples L1528291-01 and -02: The samples have elevated detection limits due to the dilution required by the elevated concentrations of target compounds in the samples.

The WG837779-3 LCS recovery for 1,2,4-Trichlorobenzene (133%) is above the upper 130% acceptance limit. The response for this compound was elevated however it was not detected in any of the associated samples therefore no further action was required.

I, the undersigned, attest under the pains and penalties of perjury that, to the best of my knowledge and belief and based upon my personal inquiry of those responsible for providing the information contained in this analytical report, such information is accurate and complete. This certificate of analysis is not complete unless this page accompanies any and all pages of this report.

Authorized Signature:  Christopher J. Anderson

Title: Technical Director/Representative

Date: 11/25/15

AIR

Project Name: BRIDGE CLEANERS**Project Number:** E075**Lab Number:** L1528291**Report Date:** 11/25/15**SAMPLE RESULTS**

Lab ID: L1528291-01 D
Client ID: RW-01-110215
Sample Location: 39-26 30TH ST, LIC
Matrix: Air
Anaytical Method: 48,TO-15
Analytical Date: 11/06/15 02:31
Analyst: RY

Date Collected: 11/02/15 13:59
Date Received: 11/02/15
Field Prep: Not Specified

Parameter	ppbV			ug/m3			Qualifier	Dilution Factor
	Results	RL	MDL	Results	RL	MDL		
Volatile Organics in Air - Mansfield Lab								
Dichlorodifluoromethane	ND	56.8	--	ND	281	--		284.3
Chloromethane	ND	56.8	--	ND	117	--		284.3
Freon-114	ND	56.8	--	ND	397	--		284.3
Vinyl chloride	ND	56.8	--	ND	145	--		284.3
1,3-Butadiene	ND	56.8	--	ND	126	--		284.3
Bromomethane	ND	56.8	--	ND	221	--		284.3
Chloroethane	ND	56.8	--	ND	150	--		284.3
Ethanol	ND	1420	--	ND	2680	--		284.3
Vinyl bromide	ND	56.8	--	ND	248	--		284.3
Acetone	ND	284	--	ND	675	--		284.3
Trichlorofluoromethane	ND	56.8	--	ND	319	--		284.3
Isopropanol	ND	142.	--	ND	349	--		284.3
1,1-Dichloroethene	ND	56.8	--	ND	225	--		284.3
Tertiary butyl Alcohol	ND	142.	--	ND	430	--		284.3
Methylene chloride	ND	142	--	ND	493	--		284.3
3-Chloropropene	ND	56.8	--	ND	178	--		284.3
Carbon disulfide	ND	56.8	--	ND	177	--		284.3
Freon-113	ND	56.8	--	ND	435	--		284.3
trans-1,2-Dichloroethene	ND	56.8	--	ND	225	--		284.3
1,1-Dichloroethane	ND	56.8	--	ND	230	--		284.3
Methyl tert butyl ether	ND	56.8	--	ND	205	--		284.3
2-Butanone	ND	142.	--	ND	419	--		284.3
cis-1,2-Dichloroethene	96.9	56.8	--	384	225	--		284.3
Ethyl Acetate	ND	142.	--	ND	512	--		284.3



Project Name: BRIDGE CLEANERS**Lab Number:** L1528291**Project Number:** E075**Report Date:** 11/25/15**SAMPLE RESULTS**

Lab ID: L1528291-01 D
 Client ID: RW-01-110215
 Sample Location: 39-26 30TH ST, LIC

Date Collected: 11/02/15 13:59
 Date Received: 11/02/15
 Field Prep: Not Specified

Parameter	ppbV			ug/m3			Qualifier	Dilution Factor
	Results	RL	MDL	Results	RL	MDL		
Volatile Organics in Air - Mansfield Lab								
Chloroform	ND	56.8	--	ND	277	--		284.3
Tetrahydrofuran	ND	142.	--	ND	419	--		284.3
1,2-Dichloroethane	ND	56.8	--	ND	230	--		284.3
n-Hexane	ND	56.8	--	ND	200	--		284.3
1,1,1-Trichloroethane	ND	56.8	--	ND	310	--		284.3
Benzene	ND	56.8	--	ND	181	--		284.3
Carbon tetrachloride	ND	56.8	--	ND	357	--		284.3
Cyclohexane	ND	56.8	--	ND	196	--		284.3
1,2-Dichloropropane	ND	56.8	--	ND	263	--		284.3
Bromodichloromethane	ND	56.8	--	ND	381	--		284.3
1,4-Dioxane	ND	56.8	--	ND	205	--		284.3
Trichloroethene	205	56.8	--	1100	305	--		284.3
2,2,4-Trimethylpentane	ND	56.8	--	ND	265	--		284.3
Heptane	ND	56.8	--	ND	233	--		284.3
cis-1,3-Dichloropropene	ND	56.8	--	ND	258	--		284.3
4-Methyl-2-pentanone	ND	142.	--	ND	582	--		284.3
trans-1,3-Dichloropropene	ND	56.8	--	ND	258	--		284.3
1,1,2-Trichloroethane	ND	56.8	--	ND	310	--		284.3
Toluene	ND	56.8	--	ND	214	--		284.3
2-Hexanone	ND	56.8	--	ND	233	--		284.3
Dibromochloromethane	ND	56.8	--	ND	484	--		284.3
1,2-Dibromoethane	ND	56.8	--	ND	437	--		284.3
Tetrachloroethene	32400	56.8	--	220000	385	--	E	284.3
Chlorobenzene	ND	56.8	--	ND	262	--		284.3
Ethylbenzene	ND	56.8	--	ND	247	--		284.3
p/m-Xylene	ND	114	--	ND	495	--		284.3
Bromoform	ND	56.8	--	ND	587	--		284.3
Styrene	ND	56.8	--	ND	242	--		284.3



Project Name: BRIDGE CLEANERS**Lab Number:** L1528291**Project Number:** E075**Report Date:** 11/25/15**SAMPLE RESULTS**

Lab ID: L1528291-01 D
 Client ID: RW-01-110215
 Sample Location: 39-26 30TH ST, LIC

Date Collected: 11/02/15 13:59
 Date Received: 11/02/15
 Field Prep: Not Specified

Parameter	ppbV			ug/m3			Qualifier	Dilution Factor
	Results	RL	MDL	Results	RL	MDL		
Volatile Organics in Air - Mansfield Lab								
1,1,2,2-Tetrachloroethane	ND	56.8	--	ND	390	--		284.3
o-Xylene	ND	56.8	--	ND	247	--		284.3
4-Ethyltoluene	ND	56.8	--	ND	279	--		284.3
1,3,5-Trimethylbenzene	ND	56.8	--	ND	279	--		284.3
1,2,4-Trimethylbenzene	ND	56.8	--	ND	279	--		284.3
Benzyl chloride	ND	56.8	--	ND	294	--		284.3
1,3-Dichlorobenzene	ND	56.8	--	ND	341	--		284.3
1,4-Dichlorobenzene	ND	56.8	--	ND	341	--		284.3
1,2-Dichlorobenzene	ND	56.8	--	ND	341	--		284.3
1,2,4-Trichlorobenzene	ND	56.8	--	ND	422	--		284.3
Hexachlorobutadiene	ND	56.8	--	ND	606	--		284.3

Internal Standard	% Recovery	Qualifier	Acceptance Criteria
1,4-Difluorobenzene	92		60-140
Bromochloromethane	92		60-140
chlorobenzene-d5	97		60-140



Project Name: BRIDGE CLEANERS**Project Number:** E075**Lab Number:** L1528291**Report Date:** 11/25/15**SAMPLE RESULTS**

Lab ID: L1528291-01 D2
 Client ID: RW-01-110215
 Sample Location: 39-26 30TH ST, LIC
 Matrix: Air
 Analytical Method: 48,TO-15
 Analytical Date: 11/06/15 09:00
 Analyst: RY

Date Collected: 11/02/15 13:59
 Date Received: 11/02/15
 Field Prep: Not Specified

Parameter	ppbV			ug/m3			Qualifier	Dilution Factor
	Results	RL	MDL	Results	RL	MDL		
Volatile Organics in Air - Mansfield Lab								
Tetrachloroethene	33400	114	--	226000	773	--		568.6

Internal Standard	% Recovery	Qualifier	Acceptance Criteria
1,4-Difluorobenzene	94		60-140
Bromochloromethane	94		60-140
chlorobenzene-d5	97		60-140

Project Name: BRIDGE CLEANERS**Project Number:** E075**Lab Number:** L1528291**Report Date:** 11/25/15**SAMPLE RESULTS**

Lab ID: L1528291-02 D
 Client ID: VM-02-110215
 Sample Location: 39-26 30TH ST, LIC
 Matrix: Air
 Analytical Method: 48,TO-15
 Analytical Date: 11/06/15 03:04
 Analyst: RY

Date Collected: 11/02/15 14:00
 Date Received: 11/02/15
 Field Prep: Not Specified

Parameter	ppbV			ug/m3			Qualifier	Dilution Factor
	Results	RL	MDL	Results	RL	MDL		
Volatile Organics in Air - Mansfield Lab								
Dichlorodifluoromethane	ND	148.	--	ND	732	--		742.3
Chloromethane	ND	148.	--	ND	306	--		742.3
Freon-114	ND	148.	--	ND	1030	--		742.3
Vinyl chloride	ND	148.	--	ND	378	--		742.3
1,3-Butadiene	ND	148.	--	ND	327	--		742.3
Bromomethane	ND	148.	--	ND	575	--		742.3
Chloroethane	ND	148.	--	ND	391	--		742.3
Ethanol	ND	3710	--	ND	6990	--		742.3
Vinyl bromide	ND	148.	--	ND	647	--		742.3
Acetone	ND	742	--	ND	1760	--		742.3
Trichlorofluoromethane	ND	148.	--	ND	832	--		742.3
Isopropanol	162000	371	--	398000	912	--		742.3
1,1-Dichloroethene	ND	148.	--	ND	587	--		742.3
Tertiary butyl Alcohol	ND	371.	--	ND	1120	--		742.3
Methylene chloride	ND	371	--	ND	1290	--		742.3
3-Chloropropene	ND	148.	--	ND	463	--		742.3
Carbon disulfide	ND	148.	--	ND	461	--		742.3
Freon-113	ND	148.	--	ND	1130	--		742.3
trans-1,2-Dichloroethene	ND	148.	--	ND	587	--		742.3
1,1-Dichloroethane	ND	148.	--	ND	599	--		742.3
Methyl tert butyl ether	ND	148.	--	ND	534	--		742.3
2-Butanone	ND	371.	--	ND	1090	--		742.3
cis-1,2-Dichloroethene	ND	148.	--	ND	587	--		742.3
Ethyl Acetate	ND	371.	--	ND	1340	--		742.3



Project Name: BRIDGE CLEANERS**Lab Number:** L1528291**Project Number:** E075**Report Date:** 11/25/15**SAMPLE RESULTS**

Lab ID: L1528291-02 D
 Client ID: VM-02-110215
 Sample Location: 39-26 30TH ST, LIC

Date Collected: 11/02/15 14:00
 Date Received: 11/02/15
 Field Prep: Not Specified

Parameter	ppbV			ug/m3			Qualifier	Dilution Factor
	Results	RL	MDL	Results	RL	MDL		
Volatile Organics in Air - Mansfield Lab								
Chloroform	ND	148.	--	ND	723	--		742.3
Tetrahydrofuran	ND	371.	--	ND	1090	--		742.3
1,2-Dichloroethane	ND	148.	--	ND	599	--		742.3
n-Hexane	ND	148.	--	ND	522	--		742.3
1,1,1-Trichloroethane	ND	148.	--	ND	807	--		742.3
Benzene	ND	148.	--	ND	473	--		742.3
Carbon tetrachloride	ND	148.	--	ND	931	--		742.3
Cyclohexane	ND	148.	--	ND	509	--		742.3
1,2-Dichloropropane	ND	148.	--	ND	684	--		742.3
Bromodichloromethane	ND	148.	--	ND	992	--		742.3
1,4-Dioxane	ND	148.	--	ND	533	--		742.3
Trichloroethene	ND	148	--	ND	795	--		742.3
2,2,4-Trimethylpentane	ND	148.	--	ND	691	--		742.3
Heptane	ND	148.	--	ND	607	--		742.3
cis-1,3-Dichloropropene	ND	148.	--	ND	672	--		742.3
4-Methyl-2-pentanone	ND	371.	--	ND	1520	--		742.3
trans-1,3-Dichloropropene	ND	148.	--	ND	672	--		742.3
1,1,2-Trichloroethane	ND	148.	--	ND	807	--		742.3
Toluene	ND	148.	--	ND	558	--		742.3
2-Hexanone	ND	148.	--	ND	607	--		742.3
Dibromochloromethane	ND	148.	--	ND	1260	--		742.3
1,2-Dibromoethane	ND	148.	--	ND	1140	--		742.3
Tetrachloroethene	8170	148	--	55400	1000	--		742.3
Chlorobenzene	ND	148.	--	ND	682	--		742.3
Ethylbenzene	ND	148.	--	ND	643	--		742.3
p/m-Xylene	ND	297.	--	ND	1290	--		742.3
Bromoform	ND	148.	--	ND	1530	--		742.3
Styrene	ND	148.	--	ND	630	--		742.3



Project Name: BRIDGE CLEANERS**Lab Number:** L1528291**Project Number:** E075**Report Date:** 11/25/15**SAMPLE RESULTS**

Lab ID: L1528291-02 D
 Client ID: VM-02-110215
 Sample Location: 39-26 30TH ST, LIC

Date Collected: 11/02/15 14:00
 Date Received: 11/02/15
 Field Prep: Not Specified

Parameter	ppbV			ug/m3			Qualifier	Dilution Factor
	Results	RL	MDL	Results	RL	MDL		
Volatile Organics in Air - Mansfield Lab								
1,1,2,2-Tetrachloroethane	ND	148.	--	ND	1020	--		742.3
o-Xylene	ND	148.	--	ND	643	--		742.3
4-Ethyltoluene	ND	148.	--	ND	728	--		742.3
1,3,5-Trimethylbenzene	ND	148.	--	ND	728	--		742.3
1,2,4-Trimethylbenzene	ND	148.	--	ND	728	--		742.3
Benzyl chloride	ND	148.	--	ND	766	--		742.3
1,3-Dichlorobenzene	ND	148.	--	ND	890	--		742.3
1,4-Dichlorobenzene	ND	148.	--	ND	890	--		742.3
1,2-Dichlorobenzene	ND	148.	--	ND	890	--		742.3
1,2,4-Trichlorobenzene	ND	148.	--	ND	1100	--		742.3
Hexachlorobutadiene	ND	148.	--	ND	1580	--		742.3

Internal Standard	% Recovery	Qualifier	Acceptance Criteria
1,4-Difluorobenzene	92		60-140
Bromochloromethane	92		60-140
chlorobenzene-d5	91		60-140



Project Name: BRIDGE CLEANERS

Lab Number: L1528291

Project Number: E075

Report Date: 11/25/15

Method Blank Analysis Batch Quality Control

Analytical Method: 48,TO-15

Analytical Date: 11/05/15 15:38

Parameter	ppbV			ug/m3			Qualifier	Dilution Factor
	Results	RL	MDL	Results	RL	MDL		
Volatile Organics in Air - Mansfield Lab for sample(s): 01-02 Batch: WG837779-4								
Propylene	ND	0.500	--	ND	0.861	--		1
Dichlorodifluoromethane	ND	0.200	--	ND	0.989	--		1
Chloromethane	ND	0.200	--	ND	0.413	--		1
Freon-114	ND	0.200	--	ND	1.40	--		1
Vinyl chloride	ND	0.200	--	ND	0.511	--		1
1,3-Butadiene	ND	0.200	--	ND	0.442	--		1
Bromomethane	ND	0.200	--	ND	0.777	--		1
Chloroethane	ND	0.200	--	ND	0.528	--		1
Ethanol	ND	5.00	--	ND	9.42	--		1
Vinyl bromide	ND	0.200	--	ND	0.874	--		1
Acetone	ND	1.00	--	ND	2.38	--		1
Trichlorofluoromethane	ND	0.200	--	ND	1.12	--		1
Isopropanol	ND	0.500	--	ND	1.23	--		1
1,1-Dichloroethene	ND	0.200	--	ND	0.793	--		1
Tertiary butyl Alcohol	ND	0.500	--	ND	1.52	--		1
Methylene chloride	ND	0.500	--	ND	1.74	--		1
3-Chloropropene	ND	0.200	--	ND	0.626	--		1
Carbon disulfide	ND	0.200	--	ND	0.623	--		1
Freon-113	ND	0.200	--	ND	1.53	--		1
trans-1,2-Dichloroethene	ND	0.200	--	ND	0.793	--		1
1,1-Dichloroethane	ND	0.200	--	ND	0.809	--		1
Methyl tert butyl ether	ND	0.200	--	ND	0.721	--		1
Vinyl acetate	ND	1.00	--	ND	3.52	--		1
2-Butanone	ND	0.500	--	ND	1.47	--		1
cis-1,2-Dichloroethene	ND	0.200	--	ND	0.793	--		1



Project Name: BRIDGE CLEANERS

Lab Number: L1528291

Project Number: E075

Report Date: 11/25/15

Method Blank Analysis Batch Quality Control

Analytical Method: 48,TO-15

Analytical Date: 11/05/15 15:38

Parameter	ppbV			ug/m3			Qualifier	Dilution Factor
	Results	RL	MDL	Results	RL	MDL		
Volatile Organics in Air - Mansfield Lab for sample(s): 01-02 Batch: WG837779-4								
Ethyl Acetate	ND	0.500	--	ND	1.80	--		1
Chloroform	ND	0.200	--	ND	0.977	--		1
Tetrahydrofuran	ND	0.500	--	ND	1.47	--		1
1,2-Dichloroethane	ND	0.200	--	ND	0.809	--		1
n-Hexane	ND	0.200	--	ND	0.705	--		1
1,1,1-Trichloroethane	ND	0.200	--	ND	1.09	--		1
Benzene	ND	0.200	--	ND	0.639	--		1
Carbon tetrachloride	ND	0.200	--	ND	1.26	--		1
Cyclohexane	ND	0.200	--	ND	0.688	--		1
1,2-Dichloropropane	ND	0.200	--	ND	0.924	--		1
Bromodichloromethane	ND	0.200	--	ND	1.34	--		1
1,4-Dioxane	ND	0.200	--	ND	0.721	--		1
Trichloroethene	ND	0.200	--	ND	1.07	--		1
2,2,4-Trimethylpentane	ND	0.200	--	ND	0.934	--		1
Heptane	ND	0.200	--	ND	0.820	--		1
cis-1,3-Dichloropropene	ND	0.200	--	ND	0.908	--		1
4-Methyl-2-pentanone	ND	0.500	--	ND	2.05	--		1
trans-1,3-Dichloropropene	ND	0.200	--	ND	0.908	--		1
1,1,2-Trichloroethane	ND	0.200	--	ND	1.09	--		1
Toluene	ND	0.200	--	ND	0.754	--		1
2-Hexanone	ND	0.200	--	ND	0.820	--		1
Dibromochloromethane	ND	0.200	--	ND	1.70	--		1
1,2-Dibromoethane	ND	0.200	--	ND	1.54	--		1
Tetrachloroethene	ND	0.200	--	ND	1.36	--		1
Chlorobenzene	ND	0.200	--	ND	0.921	--		1



Project Name: BRIDGE CLEANERS

Lab Number: L1528291

Project Number: E075

Report Date: 11/25/15

Method Blank Analysis Batch Quality Control

Analytical Method: 48,TO-15

Analytical Date: 11/05/15 15:38

Parameter	ppbV			ug/m3			Qualifier	Dilution Factor
	Results	RL	MDL	Results	RL	MDL		
Volatile Organics in Air - Mansfield Lab for sample(s): 01-02 Batch: WG837779-4								
Ethylbenzene	ND	0.200	--	ND	0.869	--		1
p/m-Xylene	ND	0.400	--	ND	1.74	--		1
Bromoform	ND	0.200	--	ND	2.07	--		1
Styrene	ND	0.200	--	ND	0.852	--		1
1,1,2,2-Tetrachloroethane	ND	0.200	--	ND	1.37	--		1
o-Xylene	ND	0.200	--	ND	0.869	--		1
4-Ethyltoluene	ND	0.200	--	ND	0.983	--		1
1,3,5-Trimethylbenzene	ND	0.200	--	ND	0.983	--		1
1,2,4-Trimethylbenzene	ND	0.200	--	ND	0.983	--		1
Benzyl chloride	ND	0.200	--	ND	1.04	--		1
1,3-Dichlorobenzene	ND	0.200	--	ND	1.20	--		1
1,4-Dichlorobenzene	ND	0.200	--	ND	1.20	--		1
1,2-Dichlorobenzene	ND	0.200	--	ND	1.20	--		1
1,2,4-Trichlorobenzene	ND	0.200	--	ND	1.48	--		1
Hexachlorobutadiene	ND	0.200	--	ND	2.13	--		1

Lab Control Sample Analysis

Batch Quality Control

Project Name: BRIDGE CLEANERS

Project Number: E075

Lab Number: L1528291

Report Date: 11/25/15

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Volatile Organics in Air - Mansfield Lab Associated sample(s): 01-02 Batch: WG837779-3								
Chlorodifluoromethane	85		-		70-130	-		
Propylene	100		-		70-130	-		
Propane	67	Q	-		70-130	-		
Dichlorodifluoromethane	102		-		70-130	-		
Chloromethane	90		-		70-130	-		
1,2-Dichloro-1,1,2,2-tetrafluoroethane	102		-		70-130	-		
Methanol	70		-		70-130	-		
Vinyl chloride	93		-		70-130	-		
1,3-Butadiene	93		-		70-130	-		
Butane	78		-		70-130	-		
Bromomethane	100		-		70-130	-		
Chloroethane	94		-		70-130	-		
Ethyl Alcohol	72		-		70-130	-		
Dichlorofluoromethane	85		-		70-130	-		
Vinyl bromide	102		-		70-130	-		
Acrolein	77		-		70-130	-		
Acetone	89		-		70-130	-		
Acetonitrile	79		-		70-130	-		
Trichlorofluoromethane	102		-		70-130	-		
iso-Propyl Alcohol	84		-		70-130	-		
Acrylonitrile	83		-		70-130	-		

Lab Control Sample Analysis

Batch Quality Control

Project Name: BRIDGE CLEANERS

Project Number: E075

Lab Number: L1528291

Report Date: 11/25/15

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Volatile Organics in Air - Mansfield Lab Associated sample(s): 01-02 Batch: WG837779-3								
Pentane	76		-		70-130	-		
Ethyl ether	72		-		70-130	-		
1,1-Dichloroethene	96		-		70-130	-		
tert-Butyl Alcohol	83		-		70-130	-		
Methylene chloride	94		-		70-130	-		
3-Chloropropene	88		-		70-130	-		
Carbon disulfide	100		-		70-130	-		
1,1,2-Trichloro-1,2,2-Trifluoroethane	105		-		70-130	-		
trans-1,2-Dichloroethene	87		-		70-130	-		
1,1-Dichloroethane	97		-		70-130	-		
Methyl tert butyl ether	93		-		70-130	-		
Vinyl acetate	107		-		70-130	-		
2-Butanone	89		-		70-130	-		
cis-1,2-Dichloroethene	105		-		70-130	-		
Ethyl Acetate	100		-		70-130	-		
Chloroform	102		-		70-130	-		
Tetrahydrofuran	83		-		70-130	-		
2,2-Dichloropropane	89		-		70-130	-		
1,2-Dichloroethane	95		-		70-130	-		
n-Hexane	88		-		70-130	-		
Isopropyl Ether	80		-		70-130	-		

Lab Control Sample Analysis

Batch Quality Control

Project Name: BRIDGE CLEANERS

Project Number: E075

Lab Number: L1528291

Report Date: 11/25/15

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Volatile Organics in Air - Mansfield Lab Associated sample(s): 01-02 Batch: WG837779-3								
Ethyl-Tert-Butyl-Ether	78		-		70-130	-		
1,1,1-Trichloroethane	92		-		70-130	-		
1,1-Dichloropropene	84		-		70-130	-		
Benzene	91		-		70-130	-		
Carbon tetrachloride	96		-		70-130	-		
Cyclohexane	84		-		70-130	-		
Tertiary-Amyl Methyl Ether	78		-		70-130	-		
Dibromomethane	88		-		70-130	-		
1,2-Dichloropropane	91		-		70-130	-		
Bromodichloromethane	93		-		70-130	-		
1,4-Dioxane	95		-		70-130	-		
Trichloroethene	107		-		70-130	-		
2,2,4-Trimethylpentane	88		-		70-130	-		
Methyl Methacrylate	79		-		70-130	-		
Heptane	84		-		70-130	-		
cis-1,3-Dichloropropene	96		-		70-130	-		
4-Methyl-2-pentanone	82		-		70-130	-		
trans-1,3-Dichloropropene	81		-		70-130	-		
1,1,2-Trichloroethane	101		-		70-130	-		
Toluene	106		-		70-130	-		
1,3-Dichloropropane	96		-		70-130	-		

Lab Control Sample Analysis

Batch Quality Control

Project Name: BRIDGE CLEANERS

Project Number: E075

Lab Number: L1528291

Report Date: 11/25/15

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Volatile Organics in Air - Mansfield Lab Associated sample(s): 01-02 Batch: WG837779-3								
2-Hexanone	98		-		70-130	-		
Dibromochloromethane	116		-		70-130	-		
1,2-Dibromoethane	109		-		70-130	-		
Butyl Acetate	94		-		70-130	-		
Octane	98		-		70-130	-		
Tetrachloroethene	118		-		70-130	-		
1,1,1,2-Tetrachloroethane	108		-		70-130	-		
Chlorobenzene	114		-		70-130	-		
Ethylbenzene	107		-		70-130	-		
p/m-Xylene	110		-		70-130	-		
Bromoform	121		-		70-130	-		
Styrene	109		-		70-130	-		
1,1,2,2-Tetrachloroethane	113		-		70-130	-		
o-Xylene	111		-		70-130	-		
1,2,3-Trichloropropane	99		-		70-130	-		
Nonane (C9)	91		-		70-130	-		
Isopropylbenzene	106		-		70-130	-		
Bromobenzene	98		-		70-130	-		
o-Chlorotoluene	108		-		70-130	-		
n-Propylbenzene	107		-		70-130	-		
p-Chlorotoluene	99		-		70-130	-		

Lab Control Sample Analysis

Batch Quality Control

Project Name: BRIDGE CLEANERS

Project Number: E075

Lab Number: L1528291

Report Date: 11/25/15

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Volatile Organics in Air - Mansfield Lab Associated sample(s): 01-02 Batch: WG837779-3								
4-Ethyltoluene	108		-		70-130	-		
1,3,5-Trimethylbenzene	110		-		70-130	-		
tert-Butylbenzene	109		-		70-130	-		
1,2,4-Trimethylbenzene	116		-		70-130	-		
Decane (C10)	98		-		70-130	-		
Benzyl chloride	114		-		70-130	-		
1,3-Dichlorobenzene	122		-		70-130	-		
1,4-Dichlorobenzene	121		-		70-130	-		
sec-Butylbenzene	106		-		70-130	-		
p-Isopropyltoluene	102		-		70-130	-		
1,2-Dichlorobenzene	123		-		70-130	-		
n-Butylbenzene	108		-		70-130	-		
1,2-Dibromo-3-chloropropane	99		-		70-130	-		
Undecane	104		-		70-130	-		
Dodecane (C12)	107		-		70-130	-		
1,2,4-Trichlorobenzene	133	Q	-		70-130	-		
Naphthalene	120		-		70-130	-		
1,2,3-Trichlorobenzene	121		-		70-130	-		
Hexachlorobutadiene	130		-		70-130	-		

Lab Duplicate Analysis Batch Quality Control

Project Name: BRIDGE CLEANERS

Project Number: E075

Lab Number: L1528291

Report Date: 11/25/15

Parameter	Native Sample	Duplicate Sample	Units	RPD	Qual	RPD Limits
Volatile Organics in Air - Mansfield Lab Associated sample(s): 01-02 QC Batch ID: WG837779-5 QC Sample: L1528284-01 Client ID: DUP Sample						
Dichlorodifluoromethane	0.418	0.502	ppbV	18		25
Chloromethane	ND	ND	ppbV	NC		25
1,2-Dichloro-1,1,2,2-tetrafluoroethane	ND	ND	ppbV	NC		25
Vinyl chloride	ND	ND	ppbV	NC		25
1,3-Butadiene	0.781	0.846	ppbV	8		25
Bromomethane	ND	ND	ppbV	NC		25
Chloroethane	ND	ND	ppbV	NC		25
Ethyl Alcohol	14.2	14.2	ppbV	0		25
Vinyl bromide	ND	ND	ppbV	NC		25
Acetone	45.8	48.3	ppbV	5		25
Trichlorofluoromethane	0.228	0.244	ppbV	7		25
iso-Propyl Alcohol	4.05	4.12	ppbV	2		25
1,1-Dichloroethene	ND	ND	ppbV	NC		25
tert-Butyl Alcohol	2.05	2.12	ppbV	3		25
Methylene chloride	0.953	1.04	ppbV	9		25
3-Chloropropene	ND	ND	ppbV	NC		25
Carbon disulfide	0.223	0.240	ppbV	7		25
1,1,2-Trichloro-1,2,2-Trifluoroethane	ND	ND	ppbV	NC		25
trans-1,2-Dichloroethene	ND	ND	ppbV	NC		25

Lab Duplicate Analysis

Batch Quality Control

Project Name: BRIDGE CLEANERS

Project Number: E075

Lab Number: L1528291

Report Date: 11/25/15

Parameter	Native Sample	Duplicate Sample	Units	RPD	RPD Limits
Volatile Organics in Air - Mansfield Lab Associated sample(s): 01-02 QC Batch ID: WG837779-5 QC Sample: L1528284-01 Client ID: DUP Sample					
1,1-Dichloroethane	ND	ND	ppbV	NC	25
Methyl tert butyl ether	ND	ND	ppbV	NC	25
2-Butanone	3.90	4.14	ppbV	6	25
cis-1,2-Dichloroethene	ND	ND	ppbV	NC	25
Ethyl Acetate	ND	ND	ppbV	NC	25
Chloroform	ND	ND	ppbV	NC	25
Tetrahydrofuran	ND	ND	ppbV	NC	25
1,2-Dichloroethane	ND	ND	ppbV	NC	25
n-Hexane	0.572	0.619	ppbV	8	25
1,1,1-Trichloroethane	1.12	1.16	ppbV	4	25
Benzene	2.56	2.60	ppbV	2	25
Carbon tetrachloride	ND	ND	ppbV	NC	25
Cyclohexane	0.493	0.533	ppbV	8	25
1,2-Dichloropropane	ND	ND	ppbV	NC	25
Bromodichloromethane	ND	ND	ppbV	NC	25
1,4-Dioxane	ND	ND	ppbV	NC	25
Trichloroethene	ND	ND	ppbV	NC	25
2,2,4-Trimethylpentane	ND	ND	ppbV	NC	25
Heptane	0.604	0.659	ppbV	9	25

Project Name: BRIDGE CLEANERS

Project Number: E075

Lab Duplicate Analysis

Batch Quality Control

Lab Number: L1528291

Report Date: 11/25/15

Parameter	Native Sample	Duplicate Sample	Units	RPD	RPD Limits
Volatile Organics in Air - Mansfield Lab Associated sample(s): 01-02 QC Batch ID: WG837779-5 QC Sample: L1528284-01 Client ID: DUP Sample					
cis-1,3-Dichloropropene	ND	ND	ppbV	NC	25
4-Methyl-2-pentanone	ND	ND	ppbV	NC	25
trans-1,3-Dichloropropene	ND	ND	ppbV	NC	25
1,1,2-Trichloroethane	ND	ND	ppbV	NC	25
Toluene	7.34	7.40	ppbV	1	25
2-Hexanone	0.500	0.546	ppbV	9	25
Dibromochloromethane	ND	ND	ppbV	NC	25
1,2-Dibromoethane	ND	ND	ppbV	NC	25
Tetrachloroethene	16.8	16.8	ppbV	0	25
Chlorobenzene	ND	ND	ppbV	NC	25
Ethylbenzene	1.10	1.08	ppbV	2	25
p/m-Xylene	4.43	4.47	ppbV	1	25
Bromoform	ND	ND	ppbV	NC	25
Styrene	0.311	0.331	ppbV	6	25
1,1,2,2-Tetrachloroethane	ND	ND	ppbV	NC	25
o-Xylene	2.05	2.08	ppbV	1	25
4-Ethyltoluene	0.506	0.482	ppbV	5	25
1,3,5-Trimethylbenzene	0.606	0.595	ppbV	2	25
1,2,4-Trimethylbenzene	2.39	2.38	ppbV	0	25

Project Name: BRIDGE CLEANERS

Project Number: E075

Lab Duplicate Analysis

Batch Quality Control

Lab Number: L1528291

Report Date: 11/25/15

Parameter	Native Sample	Duplicate Sample	Units	RPD	RPD Limits
Volatile Organics in Air - Mansfield Lab Associated sample(s): 01-02 QC Batch ID: WG837779-5 QC Sample: L1528284-01 Client ID: DUP Sample					
Benzyl chloride	ND	ND	ppbV	NC	25
1,3-Dichlorobenzene	ND	ND	ppbV	NC	25
1,4-Dichlorobenzene	ND	ND	ppbV	NC	25
1,2-Dichlorobenzene	ND	ND	ppbV	NC	25
1,2,4-Trichlorobenzene	ND	ND	ppbV	NC	25
Hexachlorobutadiene	ND	ND	ppbV	NC	25

Project Name: BRIDGE CLEANERS**Project Number:** E075**Lab Number:** L1528291**Report Date:** 11/25/15**Sample Receipt and Container Information**

Were project specific reporting limits specified? YES

Cooler Information Custody Seal**Cooler**

N/A Absent

Container Information

Container ID	Container Type	Cooler	pH	Temp deg C	Pres	Seal	Analysis(*)
L1528291-01A	Tedlar Bag 3 liter-Polypropylene	N/A	N/A		Y	Absent	TO15-LL(30)
L1528291-01X	Canister - 2.7 Liter (Split out	N/A	N/A		Y	Absent	TO15-LL(30)
L1528291-02A	Tedlar Bag 3 liter-Polypropylene	N/A	N/A		Y	Absent	TO15-LL(30)
L1528291-02X	Canister - 2.7 Liter (Split out	N/A	N/A		Y	Absent	TO15-LL(30)

*Values in parentheses indicate holding time in days

Project Name: BRIDGE CLEANERS
Project Number: E075

Lab Number: L1528291
Report Date: 11/25/15

GLOSSARY

Acronyms

EDL	- Estimated Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The EDL includes any adjustments from dilutions, concentrations or moisture content, where applicable. The use of EDLs is specific to the analysis of PAHs using Solid-Phase Microextraction (SPME).
EPA	- Environmental Protection Agency.
LCS	- Laboratory Control Sample: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.
LCSD	- Laboratory Control Sample Duplicate: Refer to LCS.
LFB	- Laboratory Fortified Blank: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.
MDL	- Method Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The MDL includes any adjustments from dilutions, concentrations or moisture content, where applicable.
MS	- Matrix Spike Sample: A sample prepared by adding a known mass of target analyte to a specified amount of matrix sample for which an independent estimate of target analyte concentration is available.
MSD	- Matrix Spike Sample Duplicate: Refer to MS.
NA	- Not Applicable.
NC	- Not Calculated: Term is utilized when one or more of the results utilized in the calculation are non-detect at the parameter's reporting unit.
NI	- Not Ignitable.
NP	- Non-Plastic: Term is utilized for the analysis of Atterberg Limits in soil.
RL	- Reporting Limit: The value at which an instrument can accurately measure an analyte at a specific concentration. The RL includes any adjustments from dilutions, concentrations or moisture content, where applicable.
RPD	- Relative Percent Difference: The results from matrix and/or matrix spike duplicates are primarily designed to assess the precision of analytical results in a given matrix and are expressed as relative percent difference (RPD). Values which are less than five times the reporting limit for any individual parameter are evaluated by utilizing the absolute difference between the values; although the RPD value will be provided in the report.
SRM	- Standard Reference Material: A reference sample of a known or certified value that is of the same or similar matrix as the associated field samples.
STLP	- Semi-dynamic Tank Leaching Procedure per EPA Method 1315.
TIC	- Tentatively Identified Compound: A compound that has been identified to be present and is not part of the target compound list (TCL) for the method and/or program. All TICs are qualitatively identified and reported as estimated concentrations.

Footnotes

- 1 - The reference for this analyte should be considered modified since this analyte is absent from the target analyte list of the original method.

Terms

Total: With respect to Organic analyses, a 'Total' result is defined as the summation of results for individual isomers or Aroclors. If a 'Total' result is requested, the results of its individual components will also be reported. This is applicable to 'Total' results for methods 8260, 8081 and 8082.

Analytical Method: Both the document from which the method originates and the analytical reference method. (Example: EPA 8260B is shown as 1,8260B.) The codes for the reference method documents are provided in the References section of the Addendum.

Data Qualifiers

- A** - Spectra identified as "Aldol Condensation Product".
- B** - The analyte was detected above the reporting limit in the associated method blank. Flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For MCP-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For DOD-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank AND the analyte was detected above one-half the reporting limit (or above the reporting limit for common lab contaminants) in the associated method blank. For NJ-Air-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte above the reporting limit. For NJ-related projects (excluding Air), flag only applies to associated field samples that have detectable concentrations of the analyte, which was detected above the reporting limit in the associated method blank or above five times the reporting limit for common lab contaminants (Phthalates, Acetone, Methylene Chloride, 2-Butanone).

Report Format: Data Usability Report



Project Name: BRIDGE CLEANERS**Lab Number:** L1528291**Project Number:** E075**Report Date:** 11/25/15**Data Qualifiers**

- C** - Co-elution: The target analyte co-elutes with a known lab standard (i.e. surrogate, internal standards, etc.) for co-extracted analyses.
- D** - Concentration of analyte was quantified from diluted analysis. Flag only applies to field samples that have detectable concentrations of the analyte.
- E** - Concentration of analyte exceeds the range of the calibration curve and/or linear range of the instrument.
- G** - The concentration may be biased high due to matrix interferences (i.e. co-elution) with non-target compound(s). The result should be considered estimated.
- H** - The analysis of pH was performed beyond the regulatory-required holding time of 15 minutes from the time of sample collection.
- I** - The lower value for the two columns has been reported due to obvious interference.
- M** - Reporting Limit (RL) exceeds the MCP CAM Reporting Limit for this analyte.
- NJ** - Presumptive evidence of compound. This represents an estimated concentration for Tentatively Identified Compounds (TICs), where the identification is based on a mass spectral library search.
- P** - The RPD between the results for the two columns exceeds the method-specified criteria.
- Q** - The quality control sample exceeds the associated acceptance criteria. For DOD-related projects, LCS and/or Continuing Calibration Standard exceedences are also qualified on all associated sample results. Note: This flag is not applicable for matrix spike recoveries when the sample concentration is greater than 4x the spike added or for batch duplicate RPD when the sample concentrations are less than 5x the RL. (Metals only.)
- R** - Analytical results are from sample re-analysis.
- RE** - Analytical results are from sample re-extraction.
- S** - Analytical results are from modified screening analysis.
- J** - Estimated value. This represents an estimated concentration for Tentatively Identified Compounds (TICs).
- ND** - Not detected at the reporting limit (RL) for the sample.

Project Name: BRIDGE CLEANERS
Project Number: E075

Lab Number: L1528291
Report Date: 11/25/15

REFERENCES

- 48 Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air. Second Edition. EPA/625/R-96/010b, January 1999.

LIMITATION OF LIABILITIES

Alpha Analytical performs services with reasonable care and diligence normal to the analytical testing laboratory industry. In the event of an error, the sole and exclusive responsibility of Alpha Analytical shall be to re-perform the work at it's own expense. In no event shall Alpha Analytical be held liable for any incidental, consequential or special damages, including but not limited to, damages in any way connected with the use of, interpretation of, information or analysis provided by Alpha Analytical.

We strongly urge our clients to comply with EPA protocol regarding sample volume, preservation, cooling, containers, sampling procedures, holding time and splitting of samples in the field.



Certification Information

The following analytes are not included in our Primary NELAP Scope of Accreditation:

Westborough Facility

EPA 8260C: 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene; Iodomethane (methyl iodide) (soil); Methyl methacrylate (soil); Azobenzene.

EPA 8270D: Dimethylnaphthalene, 1,4-Diphenylhydrazine.

EPA 625: 4-Chloroaniline, 4-Methylphenol.

SM4500: Soil: Total Phosphorus, TKN, NO₂, NO₃.

Mansfield Facility

EPA 8270D: Biphenyl.

EPA 2540D: TSS

EPA TO-15: Halothane, 2,4,4-Trimethyl-2-pentene, 2,4,4-Trimethyl-1-pentene, Thiophene, 2-Methylthiophene, 3-Methylthiophene, 2-Ethylthiophene, 1,2,3-Trimethylbenzene, Indan, Indene, 1,2,4,5-Tetramethylbenzene, Benzothiophene, 1-Methylnaphthalene.

The following analytes are included in our Massachusetts DEP Scope of Accreditation, Westborough Facility:

Drinking Water

EPA 200.8: Sb, As, Ba, Be, Cd, Cr, Cu, Pb, Ni, Se, Tl; **EPA 200.7:** Ba, Be, Ca, Cd, Cr, Cu, Na; **EPA 245.1:** Mercury;

EPA 300.0: Nitrate-N, Fluoride, Sulfate; **EPA 353.2:** Nitrate-N, Nitrite-N; **SM4500NO3-F:** Nitrate-N, Nitrite-N; **SM4500F-C, SM4500CN-CE, EPA 180.1, SM2130B, SM4500CI-D, SM2320B, SM2540C, SM4500H-B**

EPA 332: Perchlorate.

Microbiology: **SM9215B; SM9223-P/A, SM9223B-Colilert-QT, Enterolert-QT.**

Non-Potable Water

EPA 200.8: Al, Sb, As, Be, Cd, Cr, Cu, Pb, Mn, Ni, Se, Ag, Tl, Zn;

EPA 200.7: Al, Sb, As, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Mo, Ni, K, Se, Ag, Na, Sr, Ti, Tl, V, Zn;

EPA 245.1, SM4500H-B, EPA 120.1, SM2510B, SM2540C, SM2340B, SM2320B, SM4500CL-E, SM4500F-BC, SM426C, SM4500NH3-BH, EPA 350.1: Ammonia-N, **LACHAT 10-107-06-1-B:** Ammonia-N, **SM4500NO3-F, EPA 353.2:** Nitrate-N, **SM4500NH3-BC-NES, EPA 351.1, SM4500P-E, SM4500P-B, E, SM5220D, EPA 410.4, SM5210B, SM5310C, SM4500CL-D, EPA 1664, SM14 510AC, EPA 420.1, SM4500-CN-CE, SM2540D.**

EPA 624: Volatile Halocarbons & Aromatics,

EPA 608: Chlordane, Toxaphene, Aldrin, alpha-BHC, beta-BHC, gamma-BHC, delta-BHC, Dieldrin, DDD, DDE, DDT, Endosulfan I, Endosulfan II, Endosulfan sulfate, Endrin, Endrin Aldehyde, Heptachlor, Heptachlor Epoxide, PCBs

EPA 625: SVOC (Acid/Base/Neutral Extractables), **EPA 600/4-81-045:** PCB-Oil.

Microbiology: **SM9223B-Colilert-QT; Enterolert-QT, SM9222D-MF.**

For a complete listing of analytes and methods, please contact your Alpha Project Manager.



AIR ANALYSIS

CHAIN OF CUSTODY

PAGE _____ OF _____

320 Forbes Blvd, Mansfield, MA 02048

TEL: 508-822-9300 FAX: 508-822-3288

Client Information

Client: Integral Consulting Inc.Address: 61 Broadway Suite 1601
NY, NY 10006Phone: 212-440-6715Fax: SMCTABY@INTEGRAL-CORP.COMEmail: KBRODOCK@INTEGRAL-CORP.COM☐ These samples have been previously analyzed by Alpha

Project Information

Project Name: BRIDGE CLEANINGProject Location: 39-26 30th ST, LICProject #: E075Project Manager: KEITH BRODOCK

ALPHA Quote #:

Turn-Around Time

☒ Standard☐ RUSH (only confirmed if pre-approved!)

Date Due:

Time:

Date Rec'd in Lab: 11/3/15

Report Information - Data Deliverables

☐ FAX☒ TRADEX

Criteria Checker: _____

(Default based on Regulatory Criteria Indicated)

Other Formats: _____

☐ EMAIL (standard pdf report)☐ Additional Deliverables: _____

Report to: (if different than Project Manager)

ALPHA Job #: L1528291

Billing Information

☐ Same as Client info

PO #:

Regulatory Requirements/Report Limits

State/Fed	Program	Criteria

Other Project Specific Requirements/Comments:

VACUUM IN - LITERS PER MINUTE 2-ML TEDLAR BAGS RUN FOR TCE VOC'S

All Columns Below Must Be Filled Out

ALPHA Lab ID (Lab Use Only)	Sample ID	Collection						Sample Matrix*	Sampler's Initials	Can Size	I D Can	I D - Flow Controller	TO-14A	TO-15	TO-15 APH	FIXED	TO-13A	TO-4/7	Sample Comments (i.e. PID)
		Date	Start Time	End Time	Initial Vacuum	Final Vacuum													
28291.01	RN-01-110215	11/2/15	13:56	13:59	4.54m	4.8	AIR	SM	/	/	/		X						1 - TEDLAR BAG
02	AI-01R-110215	11/2/15	14:00	14:03	4.54m	4.5	AIR	SM	/	/	/		X						1 - TEDLAR BAG
																			</

*SAMPLE MATRIX CODES

AA = Ambient Air (Indoor/Outdoor)

SV = Soil Vapor/Landfill Gas/SVE

Other = Please Specify

Container Type

Please print clearly, legibly and completely. Samples can not be logged in and turnaround time clock will not start until any ambiguities are resolved. All samples submitted are subject to Alpha's Terms and Conditions. See reverse side.

Relinquished By:

Date/Time

Received By:

Date/Time:

Sam Hill (AAL)
Albert Wilkin

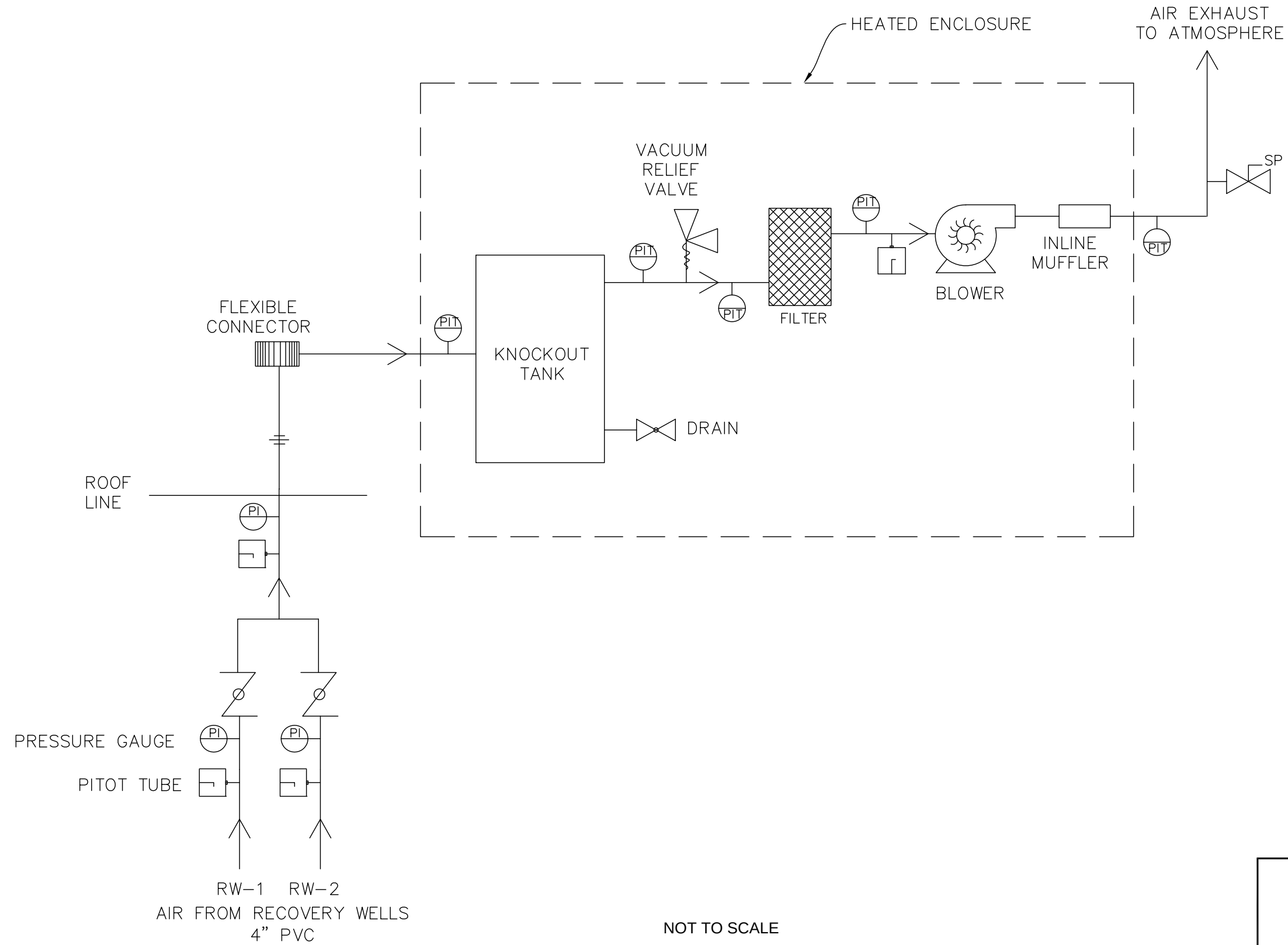
11/2/15 15:3011/2/15 22:3011/3/15 4:00

Don Hill (AAL)
Albert Wilkin
Don Hill

11/2/15 15:3011/2/15 22:3011/3/15 08:00

APPENDIX D

SVE DESIGN PLANS & ELEVATIONS

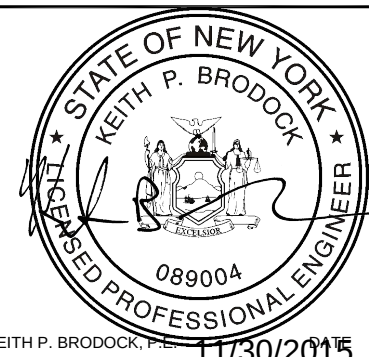


NOT TO SCALE

IT IS A VIOLATION OF THE NEW YORK STATE EDUCATION LAW FOR ANY PERSON TO ALTER ANY DOCUMENT THAT BEARS THE SEAL OF A PROFESSIONAL ENGINEER, UNLESS THE PERSON IS ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER.

KEITH P. BRODOCK, P.E.
NYSPE No. 089004

DATE 11/30/2015



SHEET

D1

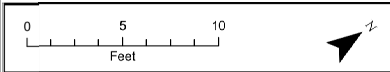
OF 4 REV 0

ZHONG CHUANG PROPERTIES LLC
 BRIDGE CLEANERS SITE
 39-26 30th ST
 NEW YORK CITY
 PROCESS FLOW DIAGRAM

integral
engineering pc
61 BROADWAY, SUITE 1601
NEW YORK, NEW YORK 10007
www.integral-corp.com

DWG	EUB/S	DATE	REV	DESCRIPTION	APP
CES	KPB	11-30-2015	0	FOR REGULATORY APPROVAL	
CHK	KPB	11-30-2015			
DWG SCALE	NOT TO SCALE				
DWG #6	D1_PFD_3Srev.dwg				
PROJ. No.	E075				

N:\GIS\Projects\E075_BridgeCleaners_Alenat\CAD\03_Roof.dwg 11/30/2015 12:47:44 PM



Insulated Pipe

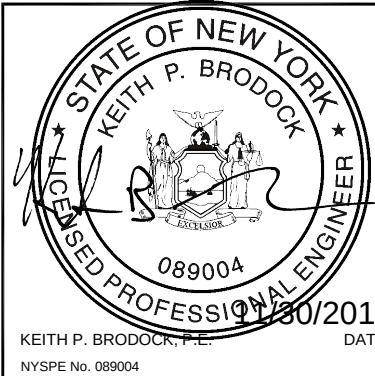
SVE Skid
(Heated enclosure)

Note: SVE exhaust discharge set at 3 ft above roofline.

Exhaust
Note: Exhaust shall be located at least 25 ft away from any operable windows.

Sidewalk

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KEITH P. BRODOCK, P.E.
NYSPE No. 089004

11/30/2015
DATE



ZHONG CHUANG PROPERTIES LLC
BRIDGE CLEANERS SITE
39-26 30th ST
LONG ISLAND CITY NEW YORK
ROOF LAYOUT

SHEET
D3
OF 4 REV 0

DRW	JS	DATE	REV	DATE	DESCRIPTION	APP
DES	KPB	11-30-2015	0	11-30-2015	FOR REGULATORY APPROVAL	
CHK	KPB	11-30-2015				
DWG SCALE	1" = 10'					
DWG NO.	D3_Roof.dwg					
PROJ. NO.	E075					

