William L. Going &Associates, Inc.

Environmental Site Investigation-Remediation

5 Stella Drive
Gardiner, New York 12525
Tel. 845-895-1744
Fax. 845-895-1722
E-mail: budgoing@frontier.com

May 12, 2016

Mr. Edward Moore
NYSDEC Region III
Div. of Environmental Remediation
21 South Putt Corners Road
New Paltz, New York 12561

RE: **Site Investigation Report And Proposed Remediation Plan**
Spill No. 1601483… 201 Charles Street, Maybrook, New York

Dear Mr. Moore:

William L. Going & Associates Inc. (WLG) was authorized by the owner of subject commercial property to conduct a site investigation with the objective of delineating soil and groundwater contamination that was discovered by LCS Inc. during ASTM E1527-13 Phase I and II Environmental Site Investigations. WLG collected additional soil, groundwater, and air [ambient and sub-slab vapor] samples. The samples were analyzed for volatile organic compounds (Methods 8260 and TO-15) by Envirotest Laboratories and by Alpha Analytical following New York State Department of Environmental Conservation (NYSDEC) Analytical Services Protocol (ASP) methodologies. Envirotest and Alpha are NYSDOH-certified laboratories. All of the sampling locations are presented herein on a recent survey of subject property created by T.M. DePuy Engineering & Land Surveying, P.C. A Data Usability Summary Report (DUSR) has been prepared by ZDataReports Data Management and Validation Services, which finds that all of the data are usable with no exceptions. Tetrachloroethene (PCE) has been detected in soil and groundwater within an area approximately 65 ft. by 150 ft. in size immediately southeast of a portion of the commercial building and in soil vapor beneath a portion of the commercial building. With the owner's permission, WLG intends to install a passive sub-slab soil vapor venting system inside a portion of the commercial building and to utilize Regenesis products to eliminate the PCE in soil and groundwater. The remedial systems and methodologies have been reviewed and approved by Jansen Engineering, PLLC.

BACKGROUND

In January 2015, LCS, Inc. LCS) issued an ATM E1527-13 All Appropriate Inquiries Phase I Environmental Site Assessment (ESA) for the property identified as 201 Charles Street, 116 Wallace Avenue, and two unaddressed parcels on Creamery Road (Tax Parcel Nos. 112-5-5.2, 112-5-1, 114-1-1 and 114-1-2), Maybrook, New York 12543. The report included a description of subject property and improvements and vicinity, a discussion of subject's history and use and physical-hydrogeological setting, and a discussion of relevant regulatory information. The report established that the property consisted of 7.2 acres of land (in a commercial-residential neighborhood) that featured one single-story commercial building that served as a bus sales and service facility, which was surrounded by extensive flat paved bus parking and storage lots. It was noted that the building had been constructed in two sections, i.e. an original section sometime between 1957 and 1975 and an addition sometime later. The report indicated that public utilities provide electric, natural gas, water and sewer services. It was noted that hazardous materials, including degreasers, antifreeze, paints and windshield fluids were stored properly and that there were no floor drains in the commercial building. The report recommended further investigation. A copy of the complete report (290 pages) is available upon request under separate cover.

In February 2016, LCS, Inc. (LCS) issued a Supplemental Limited and Focused Subsurface Soil and Groundwater Investigation and Vapor Intrusion Assessment Report for subject property. The investigation included the installation of 13 soil borings, some of which were converted to temporary groundwater monitoring wells, as well as collection of ambient air and soil vapor inside, outside and beneath the commercial building. The soil borings were installed with a percussion and hydraulically driven drive system, and were able to penetrate to depths ranging from 3 to 11.5 feet below ground surface where they met with refusal (*assumed to be shallow bedrock underlying the property*). Overburden was described as gray-brown silt and gravelly silty sand (low plasticity, mostly dry) over weathered rock. Not all borings were converted to temporary monitoring wells because most were dry. The investigation also included collection of 5 air samples from inside the building, beneath the building slab and outside the building. This report identified tetrachloroethene (PCE), trichloroethene (TCE), cis 1, 2 dichloroethene (1,2 DCE) and 1,1,1 trichloroethane (1,1,1 TCA) as chemicals of concern, and it included soil, groundwater and air chemistry data and soil boring logs. The report concluded that there was evidence of PCE and (to a much lesser extent) TCE and cis-1,2 DCE contamination in soil and groundwater immediately downgradient of the oldest (original) portion of the commercial building, as well as in soil vapor beneath the building. The report recommended additional investigation. A copy of the complete report is available upon request under separate cover.

SITE INVESTIGATION-FIELD ACTIVITY

In March 2016, William L. Going & Associates, Inc. (WLG) installed 13 additional soil borings in the overburden (all of which were converted to piezometers) with Geoprobe equipment and 6 groundwater monitoring wells in bedrock with truck-mounted auger and air rotary equipment. Three (8 hr.) air samples were collected from the workspace breathing zone inside the commercial building, along with 18 (8 hr.) sub-slab soil vapor samples from beneath the commercial building, and 1 (8 hr.) air sample from outside the commercial building (using SUMMA canisters and flow controllers).

In March 2016, the commercial building and the entire property was completely vacant and empty. The commercial building was closed but very well maintained and heated. The address and vicinity of the commercial building and the area that LCS found to be contaminated are identified on the attached locator map (aerial photo). All of the LCS and WLG sampling locations are identified on the attached site survey, which was prepared by T.M. DePuy Engineering & Land Surveying, P.C.

LCS soil and groundwater chemistry data are represented here by contour lines and thus show the two dimensional distribution of PCE in LCS soil and groundwater samples (Figures 1 and 2).

The air samples were collected from inside and beneath the original building (*beneath the dark gray roof in the locator map*) and from inside and beneath the addition to the original building (*beneath the light gray roof in the locator map*), which are on separate concrete slabs, i.e. the original building was constructed in the early 1960s and the addition of approximately equal size was constructed in 1990. Sub-slab samples were collected through a PVC tube that was inserted through the concrete slab and cemented in place. The building was empty at the time, although it was heated and all windows and doors were closed. Samples were transported to Envirotest Laboratories under strict chain-of custody and were shipped to Alpha Analytical where they were analyzed for TO-15 VOCs following NYSDEC Analytical Services Protocol (ASP) methodologies.

Soil borings were advanced to refusal using a Geoprobe® and piezometers were installed in each boring. Refusal was identified as bedrock at depths ranging from 4 feet in SB-1 upgradient of the commercial building to a maximum depth of 12 feet in SB-12 downgradient of the commercial building. Boring logs and piezometer construction diagrams are available under separate cover. Soil from the entire depth of each of the borings was scanned onsite with a MiniRAE Model PGM-7300 (PID) for VOC upon opening each sampling tube. The only significant evidence of VOC was observed in SB-7 downgradient of the commercial building at 10’ below ground surface [bgs] (58.4 ppm) and in SB-10 also downgradient of the commercial building at 10’bgs (535 ppm). Soil samples were collected from near the bottom of each boring and placed in a cooler and transported to Envirotest Laboratories under strict chain-of custody where they were analyzed for EPA 8260 VOCs following NYSDEC Analytical Services Protocol (ASP) methodologies.

Monitoring wells were advanced into the top of bedrock (depth of penetration of bedrock ranging from 3-10 feet) with truck-mounted auger and air rotary equipment. Well logs and construction diagrams are available under separate cover. Piezometers and monitoring wells were developed and samples of groundwater were collected using dedicated disposable bailers. Samples were placed in a cooler and transported to Envirotest Laboratories under strict chain-of custody where they were analyzed for EPA 8260 VOCs following NYSDEC Analytical Services Protocol (ASP) methodologies.

GEOLOGY AT SUBJECT 201 CHARLES STREET

Soil borings were advanced in 13 locations with Geoprobe® equipment and where groundwater was encountered PVC piezometers were installed. Standard 4-foot cores were collected from the Geoprobe® borings. Also six monitoring wells were installed (Figure 3). Soil boring logs/well construction diagrams will be submitted under separate cover.

The piezometers in soil borings (GP) were constructed of 1-inch inner diameter schedule 40 PVC materials and #1 sand installed within the 2-inch diameter Geoprobe® boring. Each well was constructed with five- or ten-foot lengths of 0.010-inch slotted screen. The deep monitoring wells (DMW 1, 2, 2S, 3, 4 and 5) were drilled to auger refusal and then drilled with air rotary into the bedrock. A 4-inch steel casing was grouted into the bedrock socket in DMWs 1, 2, 2S and 3 to prevent groundwater contaminant migrating from overburden down into bedrock. The following day, the rotary rig pierced the grout seal and advanced the well from top of grout into the bedrock. Specific dimensions measured in feet below ground surface are as follows:

Construction Dimensions for WLG Monitoring Wells at 201 Charles Street
Monitoring Wells were constructed on March 9, 10, 11, and 31, 2016.
All measurements are depth measured in feet from ground surface.

Monitoring Well	Auger Refusal	Total Depth of Boring	Screened Interval	Sand in Annulus	Bentonite Seal	Backfill
DMW4	14	14	9-14	8-14	6-8	0-6
DMW5	14	18	8-18	7-14	5-7	0-5

Construction of Deep Monitoring Wells
Depth of Auger Refusal
Depth of Rotary Drilling & Setting Casing
Total Depth of Bedrock Borehole (Well)
All Depths are in Feet from Surface

WLG Monitoring Well Identification	Auger Refusal	Depth Steel Casing Set	Total Depth Bedrock Borehole
DMW1	7	11	14

DMW2	13	19	23
DMW2S	13	15	17
DMW3	13	19	23

Water Levels in WLG Monitoring Wells April 15, 2016
201 Charles Street, Maybrook, NY
Converted to Elevations Above Mean Sea Level
Based on Survey by T.M. DePuy of April 14, 2016
All measurements are in feet.

Monitoring Well	Elevation Top Casing	Depth to Groundwater	Elevation of Water Table
DMW1	416.08	8.60	407.48
DMW2	410.71	10.21	400.50
DMW2S	412.08	11.50	400.58
DMW3	410.98	10.02	400.96
DMW4	416.71	10.91	405.08
DMW5	412.04	12.71	399.34

A survey of the site was prepared by T.M. DePuy Engineering & Land Surveying, P.C. and the elevations were determined for the top of the casing for each of the monitoring wells and for the land surface at each boring location. All elevations are relative to mean sea level.

Depth to groundwater was measured in each of the monitoring wells and piezometers with an electronic tape on April 15, 2016. Water level measurements in the piezometers and monitoring wells on subject property were converted to feet of elevation relative to sea level. A contour map of the water table elevations (Figure 3) shows the southeast sloping water table or hydraulic gradient under the site. The direction of groundwater flow is southeast as shown by the arrows on the drawing. There do not appear to be any sensitive receptors downgradient of the contaminated area.

Detailed examination and description of the soil boring material leads to a three-dimensional conceptual model of the strata within the unconsolidated overburden material and its relation to the underlying bedrock and groundwater occurrence. Overburden thickness ranges from a minimum thickness of 4 feet in SB-1 on the upgradient northwestern edge of subject property to a maximum observed thickness of 12 feet in SB-12 on the downgradient southeastern side of subject property. The parking lot around the commercial building is generally flat. As the overburden thickness increases to the south-southeast, the surface of bedrock dips in elevation.

The overburden stratigraphy consists of four lithologies:

- Asphalt or Root zone with top soil
- Clean fill material
- Yellow-brown silt with or without fine to medium grain sand and with varying amounts and sizes of rock fragments ranging in size from 1/8 inch to 1-inch channels cut out with drill,
- Rock fragments made up of gray shale, sandstone, and siltstone

Correlation of strata between borings is not easily achieved due to the presence of lenses of material of limited horizontal extent or possibly compaction or collapse possibly as a result of melting of ice below sediments creating a misalignment of strata. However, two hydrostratigraphic units are easily identified and found in nearly all of the soil borings.

The upper unit consists of yellow-brown silt layers. Various percentages of fine to medium gravel size rock fragments occur in the silt layers, although many layers are pure silt. Many of the silt strata contain fine to medium sand grains. The silt layers are wind-blown loess deposits as shown by the yellow brown iron staining indicative of a sub-aerial oxidizing environment of deposition.

The lower zone is comprised of loose, highly porous fractured rock fragments. This unit is found in nearly all soil borings at 4 feet below the land surface and is derived from the underlying bedrock. The bedrock consists of laminated siltstone, greywacke sandstone, and gray to dark gray mudstone and shale, identified as the Normanskill Formation (map symbol “On” on the Geologic Map of NY) of Middle to Upper Ordovician age about 461 million years ago (mya). The rock fragments are likely the result of glacial grinding and compression from the underlying bedrock surface.

The following tables summarize the distribution of the hydrostratigraphic zones and occurrence of groundwater in the soil borings, piezometers, and monitoring wells.

Identification of Hydrostratigraphic Units in Borings & Monitoring Wells
Upper Zone: Root Zone & Yellow-Brown Silt (Loess) Zone
Lower Zone: Porous Bedrock Fragments
Also Identification of the Depth and Thickness of Water

Soil Boring Identification	Interval Root & Silt Zone	Depth to Water	Thickness of Water in PZ	Porous Bedrock Fragment Interval	Depth to Bedrock
SB1	0-4	Dry		not found	4
SB2 *	0-8	Dry		8-11	11

SB3	0-4	Dry		4-6	6
SB4	0-4	Dry		4-7	7
SB5	0-3	Dry		3-4	4
SB6	0-4	Dry		4-8	8
SB7 *	0-4	10.5	0.5	4-11	11
SB8 *		9.93			
SB9 *		10.19			
SB10 *	0-4	9.64	0.36	4-10	10
SB11 *	0-6	8.22	?	6-7	7
SB12 *	0-8	9.72	2.28	8-12	12
SB13	0-4	Dry		4-8	8
* Piezometer Installed					

In Monitoring Wells, Hydrostratigraphic Units Were not Identified
However, Depth to Water and Thickness of Water in Well was Measured
Auger Refusal was also identified and Total Depth of Boring & Well

Monitoring Well	Depth to Water	Thickness of Water in Well	Auger Refusal	Total Depth
MW1	8.60	?	7	14
MW2	10.21	1.8	13	23
MW2S	11.50	1.5	13	17
MW3	10.02	3.0	13	23
MW4	10.91	3.1	14	14
MW5	12.71	1.3	14	18

The area of greatest concern lies immediately southeast of the building where a plume of PCE occurs in the overburden and groundwater above the bedrock. In that area, the greatest overburden thickness (10 to 12 feet) is found in the central area in Soil Borings identified as GP-12, GP-9, GP-8, GP-10, and GP-7. The overburden thins to the northeast and southwest. As will be shown later, the highest concentrations of PCE in soil and groundwater are in the area where the overburden material is thickest. Ranging in thickness from a fraction of a foot to about three feet, a thin zone of groundwater is found in the lowest part of the lower porous rock fragment unit. The bedrock is higher and the associated porous zone is higher and dry to southwest and northeast as well as upgradient to the northwest. To the southeast, the unit may be intercepted by the depression of a railroad track. The bedrock configuration seems to form a basin with water centered in the thickest part of the porous fractured rock fragment zone. The location of the plumes in soil and groundwater appears to be confined to a basin under the parking lot between the building and the railroad track.

ANALYTICAL CHEMISTRY RESULTS…SOIL VAPOR AND AMBIENT AIR

The results of chemical analysis of sub-slab and ambient air samples are attached. A Data Usability Summary Report is also attached. The DUSR indicates that all of the data are valid with respect to laboratory compliance with USEPA analytical methods and NYSDEC protocols. Therefore, the laboratory concentrations are deemed usable with no exceptions. Chemicals detected for which there are NYSDOH CEH BEEI Soil Vapor Intrusion Guidance and the corresponding results in µg/cu.m. are summarized below:

	VOC*	**VOC***	**VOC***	**VOC***	
Sampling Location	**Carbon Tetrachloride**	**1,1,1 TCA**	**TCE**	**PCE**	Building Constructed In Two Sections…
Summa 1	-	-	-	35.9	New Building
Summa 2	-	-	-	13.5	New Building
Summa 3	-	-	-	4.83	New Building
Summa 4	-	-	-	64.2	New Building
Summa 5	-	-	-	22	New Building
Summa 6	-	4.29	-	86.1	New Building
Summa 7	-	-	-	-	New Building
Summa 8	-	-	-	41.5	New Building
Summa 9	-	-	-	119	New Building
Summa 10	-	63.8	-	9,970	**Old Building**
Summa 11	-	29.7	-	3,040	**Old Building**
Summa 12	-	-	48.3	13,100	**Old Building**
Summa 13	-	-	35.4	9,490	**Old Building**
Summa 14	-	-	92.4	30,700	**Old Building**
Summa 15	-	-	-	39,500	**Old Building**
Summa 16	-	-	23.5	10,500	**Old Building**
Summa 17	-	-	-	1,510	**Old Building**
Summa 18	-	-	160	37,400	**Old Building**
Ambient 1	0.484	-	-	16.3	New Building
Ambient 2	0.491	-	0.113	30.4	**Old Building**
Ambient 3	0.516	-	-	7.26	**Old Building**
Ambient Outdoor	0.503	-	-	0.502	Outdoors
	NFA	**NFA**	**NFA**	**Mitigate**	**Action Required…**

*=Volatile Organics TO-15 (µg/cu.m.)
- = Not Detected
NFA= No Further Action

Significant concentrations of PCE were detected beneath the old portion of the commercial building. Contour lines for PCE concentration (Figure 4) are drawn on the floor plan to show the two dimensional distribution beneath the floor slab. The highest concentrations of PCE were detected beneath the center of the old portion of the building.

ANALYTICAL CHEMISTRY RESULTS…SOIL

The results of chemical analysis of soil samples are attached (Data Summary 1). A Data Usability Summary Report is also attached. The DUSR indicates that all of the data are usable with no exceptions. No volatile organic compounds exceeded the NYSDEC Part 376-6 .8(b) Soil Cleanup Objectives For Commercial Property. The concentrations of PCE (chemical of concern in highest concentration) are summarized below.

Sampling Location (*Depth*)	Concentration (mg/kg)
SB 1 (*3-4 ft. bgs* [*refusal*])	Undetected
SB 2 (*10-11 ft. bgs* [*refusal*])	0.0003
SB 3 (*5-6 ft. bgs* [*refusal*])	0.0009
SB 4 (*6-7 ft. bgs* [*refusal*])	0.001
SB 5 (*3-4 ft. bgs* [*refusal*])	0.12
SB 6 (*7-8 ft. bgs* [*refusal*])	4.0
SB 7 (*10-11 ft. bgs* [*refusal*])	6.0
SB 8 (*9-10 ft. bgs* [*refusal*])	0.11
SB 9 (*9-10 ft. bgs* [*refusal*])	0.67
SB 10 (*9-10 ft. bgs* [*refusal*])	77.0
SB 11 (*6-7 ft. bgs* [*refusal*])	0.024
SB 12 (*11-12 ft. bgs* [*refusal*])	0.016
SB 13 (*7-8 ft. bgs* [*refusal*])	0.059

The two dimensional distribution of PCE in soil samples is shown by contour lines (Figure 5). Where PCE was detected, it was detected in the layer of soil immediately above refusal (bedrock).

ANALYTICAL CHEMISTRY RESULTS…GROUNDWATER

Results of chemical analysis of groundwater samples are attached (Data Summary 2-4). A Data Usability Summary Report is also attached. The DUSR indicates that all of the data are usable with no exceptions. Only PCE, TCE, 1, 2 DCE and 1,1,1 TCA exceeded the NYSDEC Part 703: Surface Water and Groundwater Quality Standards and Groundwater Effluent Limitations Class GA in certain piezometers and monitoring wells. The concentrations of these chlorinated hydrocarbons in groundwater are summarized below (bold numbers represent concentrations that exceed the standard of 5 µg/L for these compounds).

Piezometer/Well	PCE µg/l	TCE µg/l	1,2 DCE µg/l	1,1,1 TCA µg/l
SB 2	2.8	-	-	-
SB 7	**870**	**9.4**	0.78J	0.76J
SB 8	**120**	3.4	2.5	-
SB 9	**160**	2.4	0.37J	-
SB 10	**10,000**	**36**	2.0	0.54J
SB 12	**14**	-	-	-
DMW 1	-	-	-	-
DMW 2	**24,000**	**3,100**	**710**	**7.9**
DMW 2S	**6,300**	**200**	**12**	1.7
DMW 3	**66**	1.4	-	0.31J
DMW 4	-	-	-	-
DMW 5	**230**	1.6	1.1	1.1
ORM	1.1	-	-	-
- = undetected				

Contour lines show the two dimensional distribution of PCE in groundwater samples (Figure 6).

SUB-SLAB DEPRESSURIZATION SYSTEM TEST

On March 31, 2016 a test was conducted to determine the feasibility of installing a Sub-Slab Depressurization System (SSDS) in the old original section of the commercial building. Two locations were chosen for testing in the PCE impacted section of the building. Slotted PVC pipes, 2 in. diameter and 30 in. in length, were installed vertically in excavations made through holes cut in the concrete floor. The floor was then repaired with cement creating an air tight seal around the slotted pipes. A 1.5 HP blower capable of pulling a vacuum of approximately 50 in. of water and/or moving approximately 100 CFM of air was connected to each of the installed test pipes. The locations of SUMMA canister sampling points and several additional sampling points installed 10 and 20 ft. from the test pipes were established as pressure monitoring points (Figure 7). Prior to starting the blower, the static pressure under the slab was measured and recorded at all chosen pressure monitoring points. The blower was then started and the suction pressure and air flow was recorded. The sub-slab pressures were monitored and recorded after about an hour of blower operation and again after the blower was turned off.

<u>Test No. 1 At Location C</u>

Prior to the test, SUMMA locations 10-18 were monitored. All pressures were at 0.0 in. water with the exception of location 15, which showed a slightly elevated pressure of approximately 0.50 in. water that remained constant throughout the test. The blower was started and it was noted that the suction pressure at the blower was -50.0 in. water, and the <u>air flow through the blower was 0 CFM</u>. A very slight influence was noted at monitoring points 19 (-0.07 in. water) and 20 (-0.02 in. water). All floor pressures returned to pre-test values when the blower was turned off.

Test No. 2 At Location D

Prior to the test, SUMMA locations 13-17, 21 and 22 were monitored. All pressures were at 0.0 in. water with the exception of location 15, which showed a slightly elevated pressure of approximately 0.50 in. water that remained constant throughout the test. The blower was started and it was noted that the suction pressure at the blower was -50.0 in. water, and the air flow through the blower was 0 CFM. A very slight influence was noted at monitoring points 14 (-0.07 in. water) and 21 (-0.25 in. water). All floor pressures returned to pre-test values when the blower was turned off.

It can be concluded that the sub-slab geology is not appropriate for the installation of an active sub-slab depressurization system. Installation of a passive sub-slab soil vapor venting system will prove more effective because there will be eleven locations where the sub-slab soil vapor will be vented directly to the atmosphere and barometric pressure variations will help VOCs to volatilize and flow to the atmosphere.

CONCLUSIONS AND RECOMMENDATIONS

NYSDOH CEH BEEI Soil Vapor Intrusion Guidance indicates that concentrations of PCE in sub-slab air warrant mitigation. WLG proposes to install a passive sub-slab soil vapor venting system. Eleven vents will be installed in locations that span the highest sub-slab PCE concentrations (Figure 7). Refer to the attached diagram of the proposed passive vent (Figure 8).

WLG also proposes to utilize Regenesis products “PersulOx/ISCO” and “PlumeStop” to eliminate PCE in soil and groundwater immediately south of the old original portion of the commercial building. The proposed treatment area is accurately superimposed on the contour map of PCE in groundwater (see attached proposed PersulOx/ISCO and PlumeStop treatment zones and Application Design Summaries). PersulOx/ISCO will be applied to the treatment area using direct push technology (*size and volume of treatment area and volume of PersulOx/ISCO is presented on attached Application Design Summary*). Samples of groundwater will be collected from all monitoring wells in the immediate vicinity of the plume and analyzed 30 days post treatment. A second application of PersulOx/ISCO will be applied to the treatment area using direct push technology. Again, samples of groundwater will be collected and analyzed 30 days post treatment. PlumeStop will then be applied across the area (*size and volume of treatment area and volume of PlumeStop is presented on attached Application Design Summary*). Finally, samples of groundwater will be collected and analyzed 30 days post treatment. Results will be reported to NYSDEC on a timely basis. These products have a proven track record in New York and across the United States and in Canada. It is estimated that this program of soil and groundwater remediation will reduce the concentrations of PCE in groundwater to 5µg/L or below within 120 days.

The owner of subject property has asked that we commence remediation as soon as possible. We are prepared to commence remediation on May 30, 2016.

We await your review and comments.

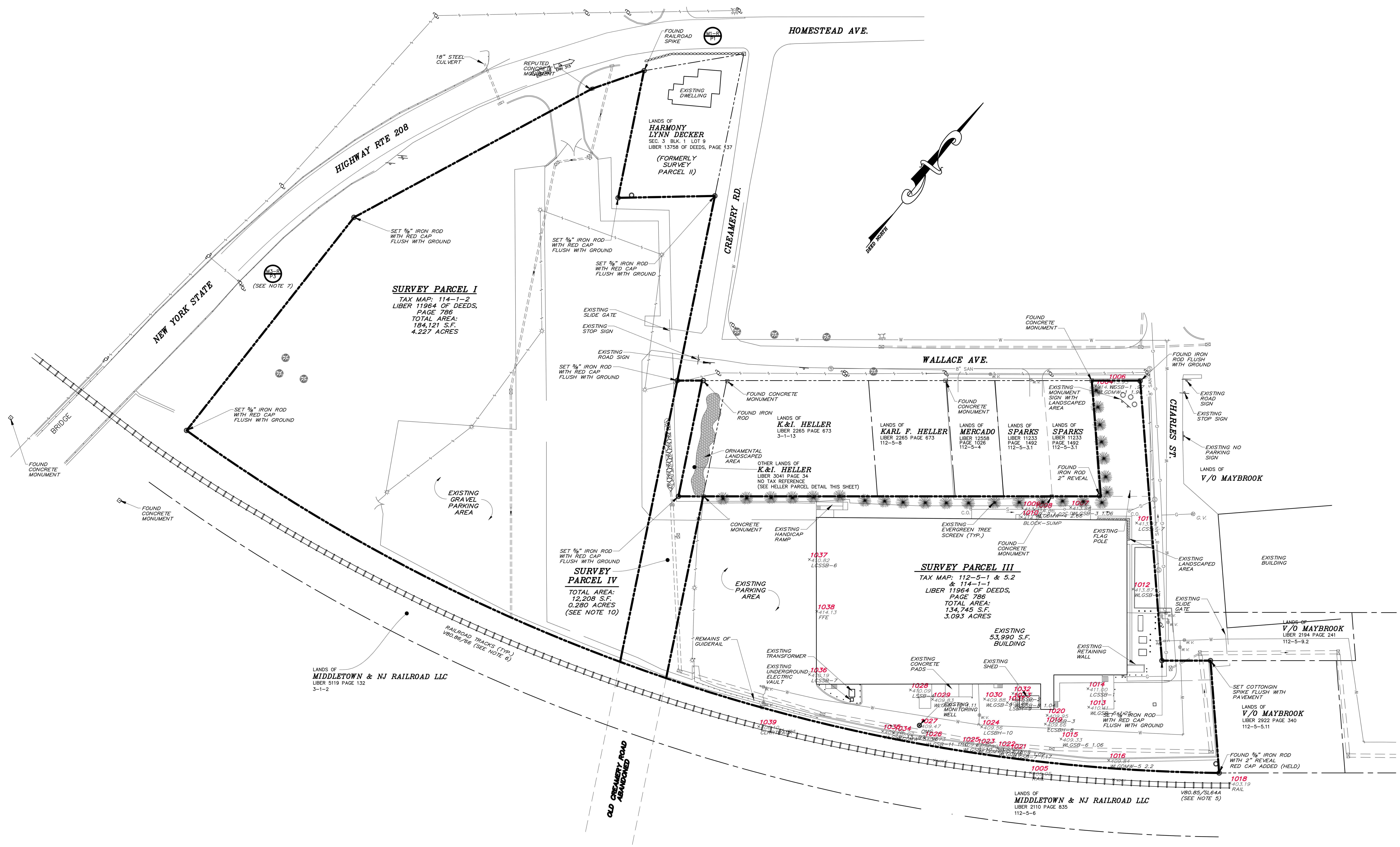
Sincerely,

William L. Going, Principal

Katherine J. Beinkafner, Ph.D.
Certified Professional Geologist 6611

Jolanda G. Jansen, P.E.

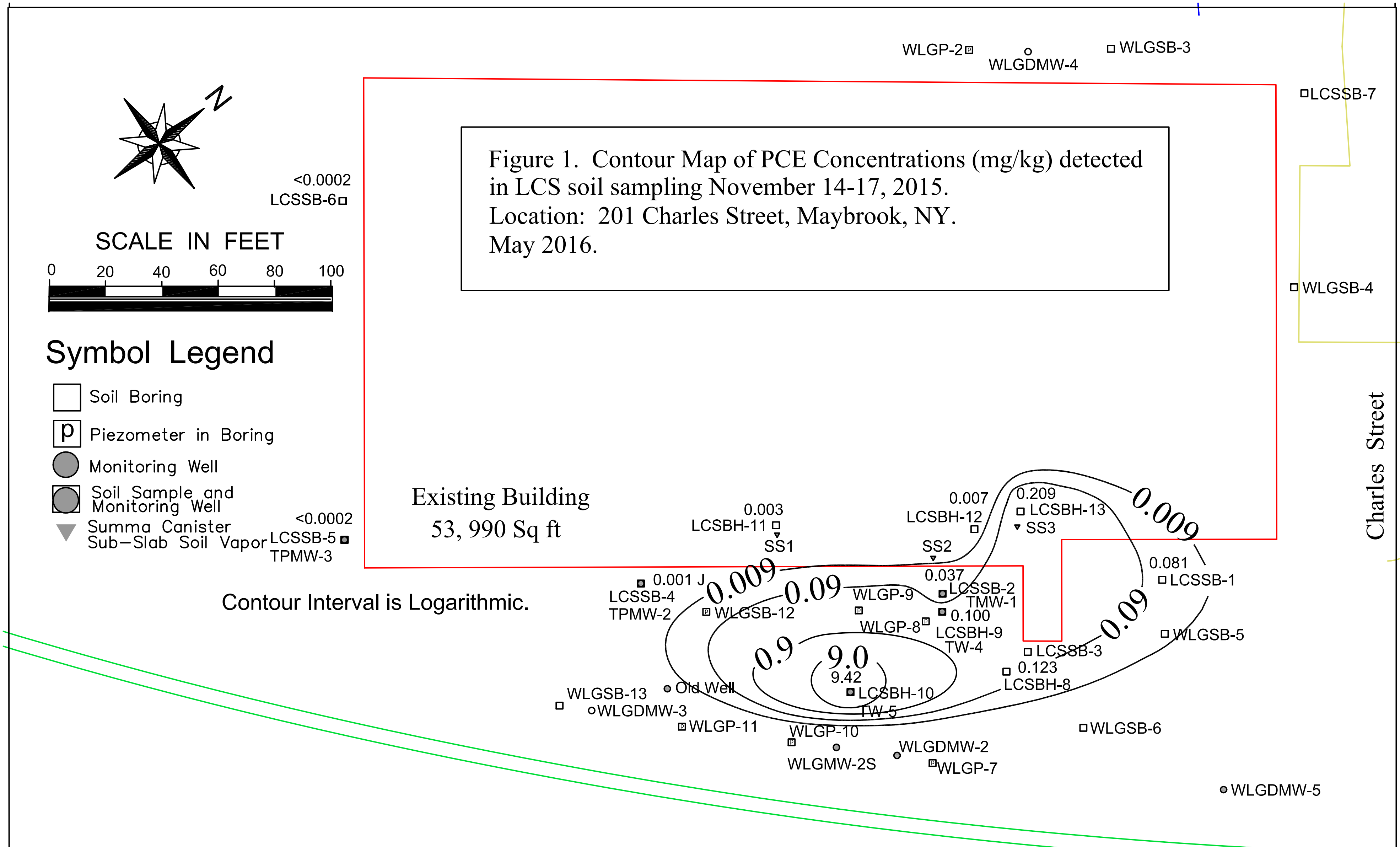
Locator Map; 201 Charles Street, Maybrook, New York



APRIL 14, 2016
SCALE: 1" = 40'

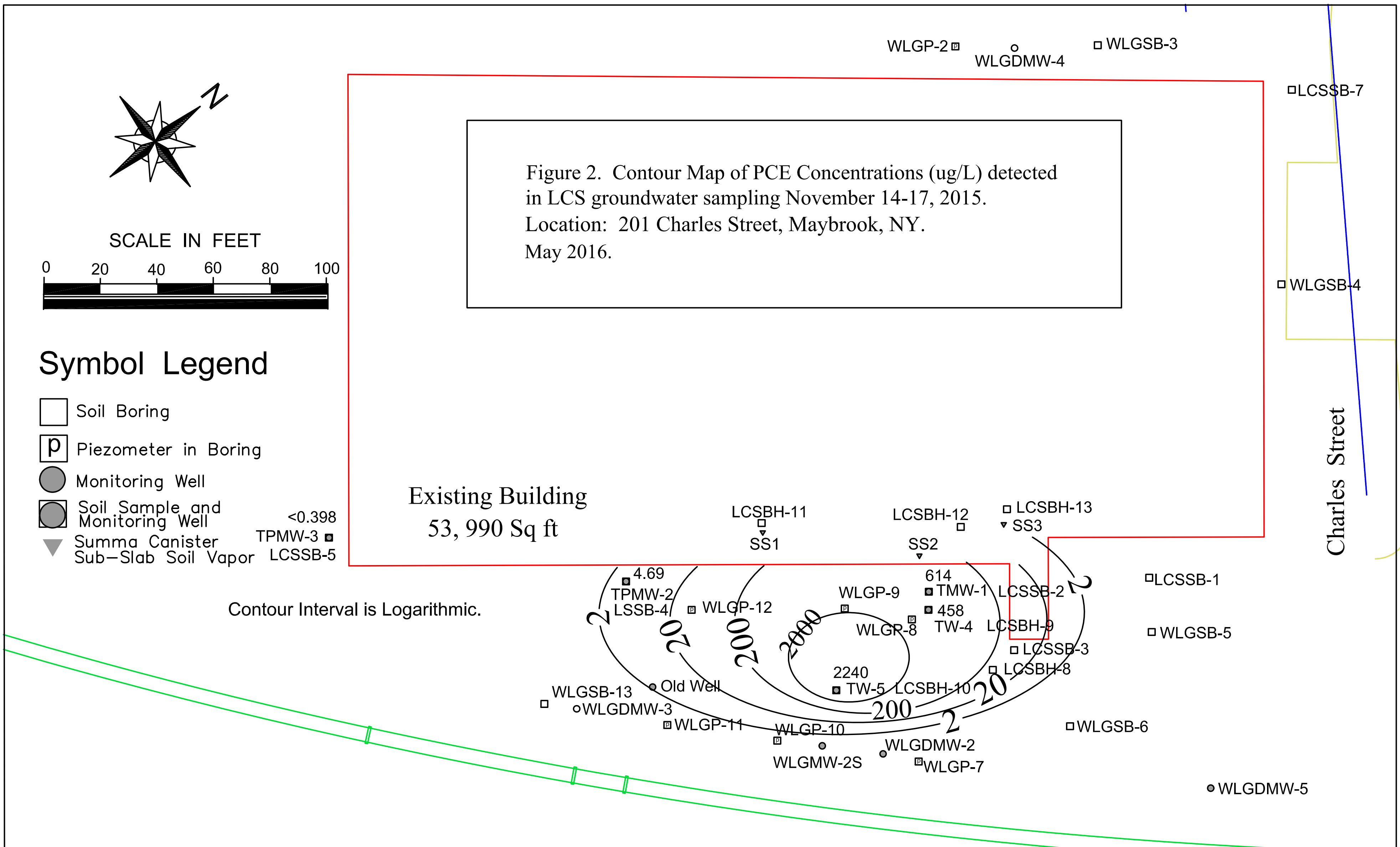
TMD
T.M DEPUY
ENGINEERING & LAND SURVEYING, P.C.
2656 ROUTE 302, MIDDLETOWN, NY 10941
PHONE: (845) 361-5421 FAX: (845) 361-5229

Figure 1. Contour Map of PCE Concentrations (mg/kg) detected in LCS soil sampling November 14-17, 2015.
Location: 201 Charles Street, Maybrook, NY.
May 2016.



William L. Going & Associates, Inc.
5 Stella Drive, Gardiner, NY 12525 (845) 895-1744 budgoing@gmail.com

Middletown & NJ Railroad LLC



William L. Going & Associates, Inc.
5 Stella Drive, Gardiner, NY 12525 (845) 895-1744 budgoing@gmail.com

Middletown & NJ Railroad LLC

Figure 3. Contour Map of Water Table Elevations showing Hydraulic Gradient and Direction of Groundwater Flow. Measurments taken April 5, 2016 adjusted to elevations relative to sea level based on Survey by T.M. Depuy April 5, 2016.

Location: 201 Charles Street, Maybrook, NY. May 2016

William L. Going & Associates, Inc.
5 Stella Drive, Gardiner, NY 12525 (845) 895-1744 budgoing@gmail.com

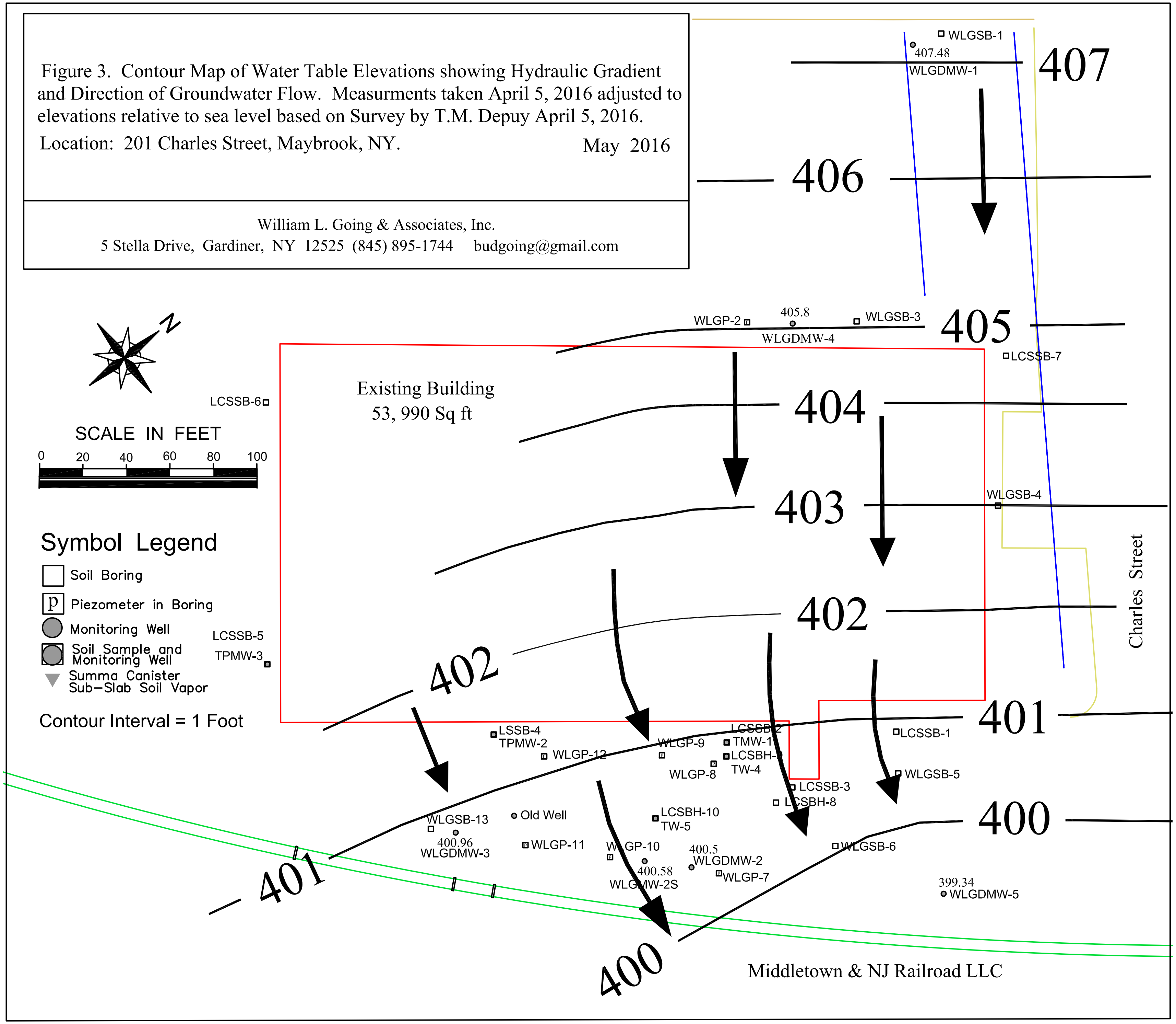


Figure 4. Map of Sub-Slab PCE Concentrations (ug/m^3) in soil vapor sampled on March 3, 2016. Concentrations are contoured on right (old building). On the left side (new building) concentrations are two orders of magnitude lower. Basemap from Survey by T.M. Depuy (April 5, 2016). Location: 201 Charles Street, Maybrook, NY. May 2016.

William L. Going & Associates, Inc.
5 Stella Drive, Gardiner, NY 12525 (845) 895-1744 budgoing@gmail.com

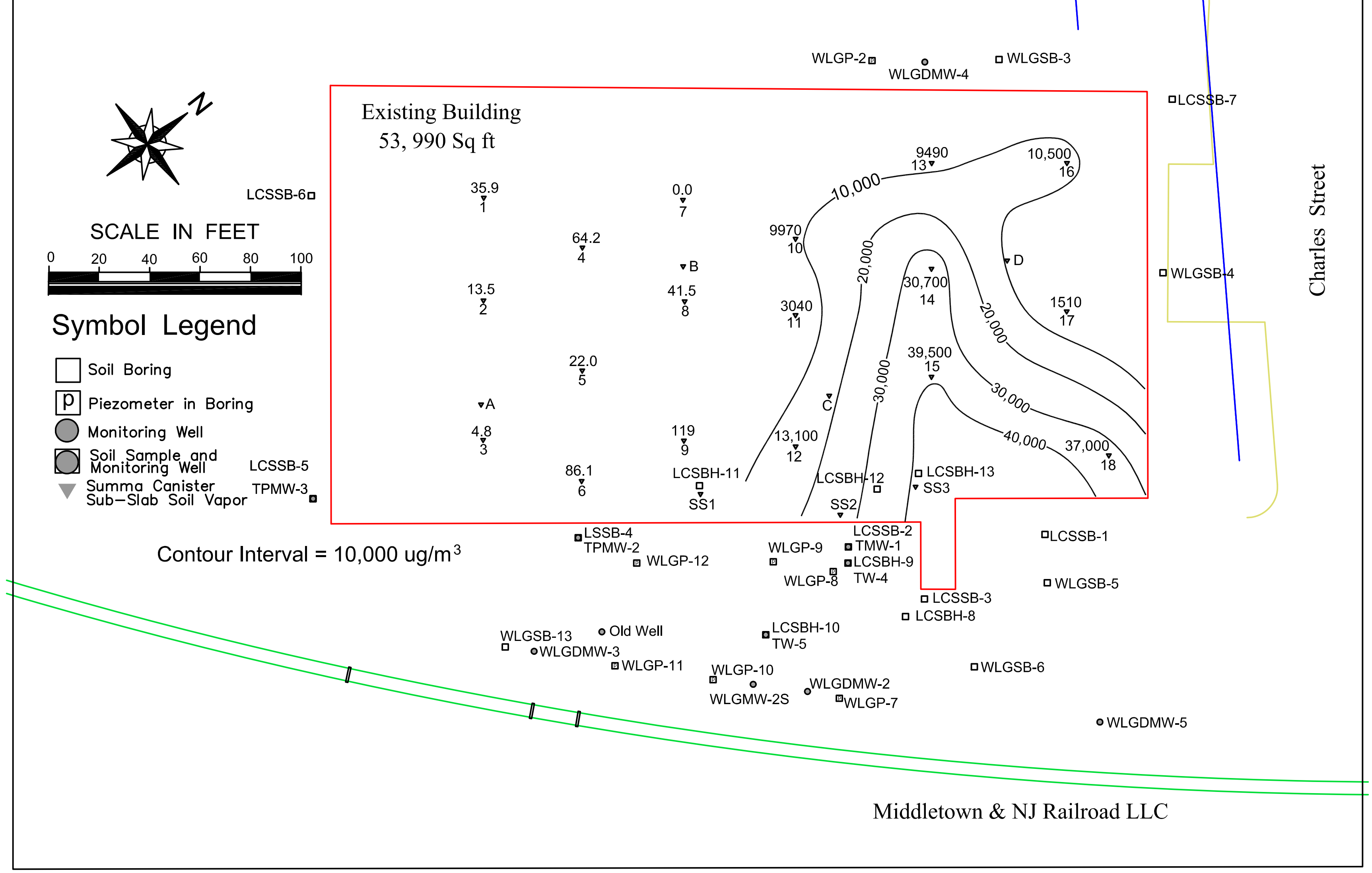
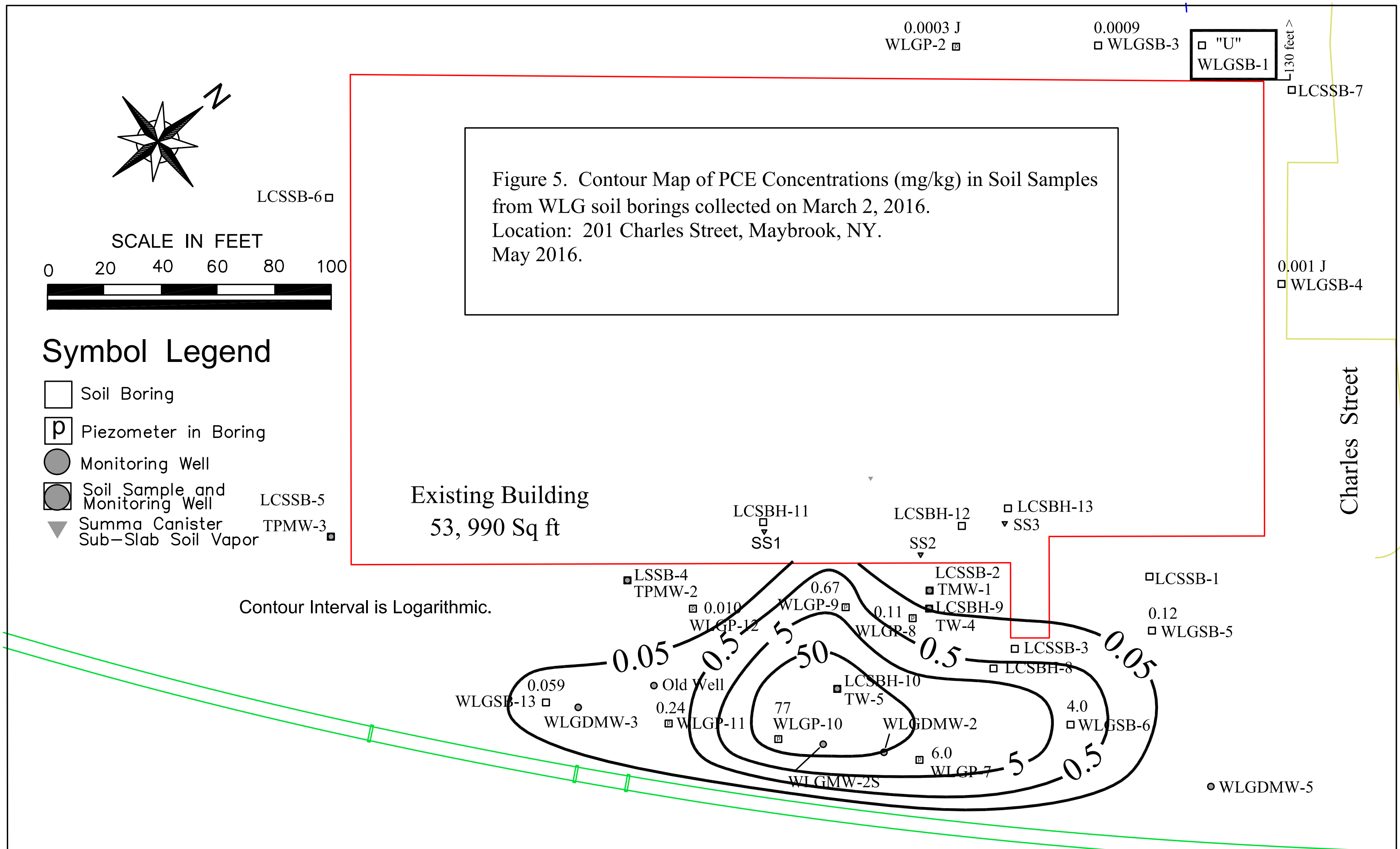
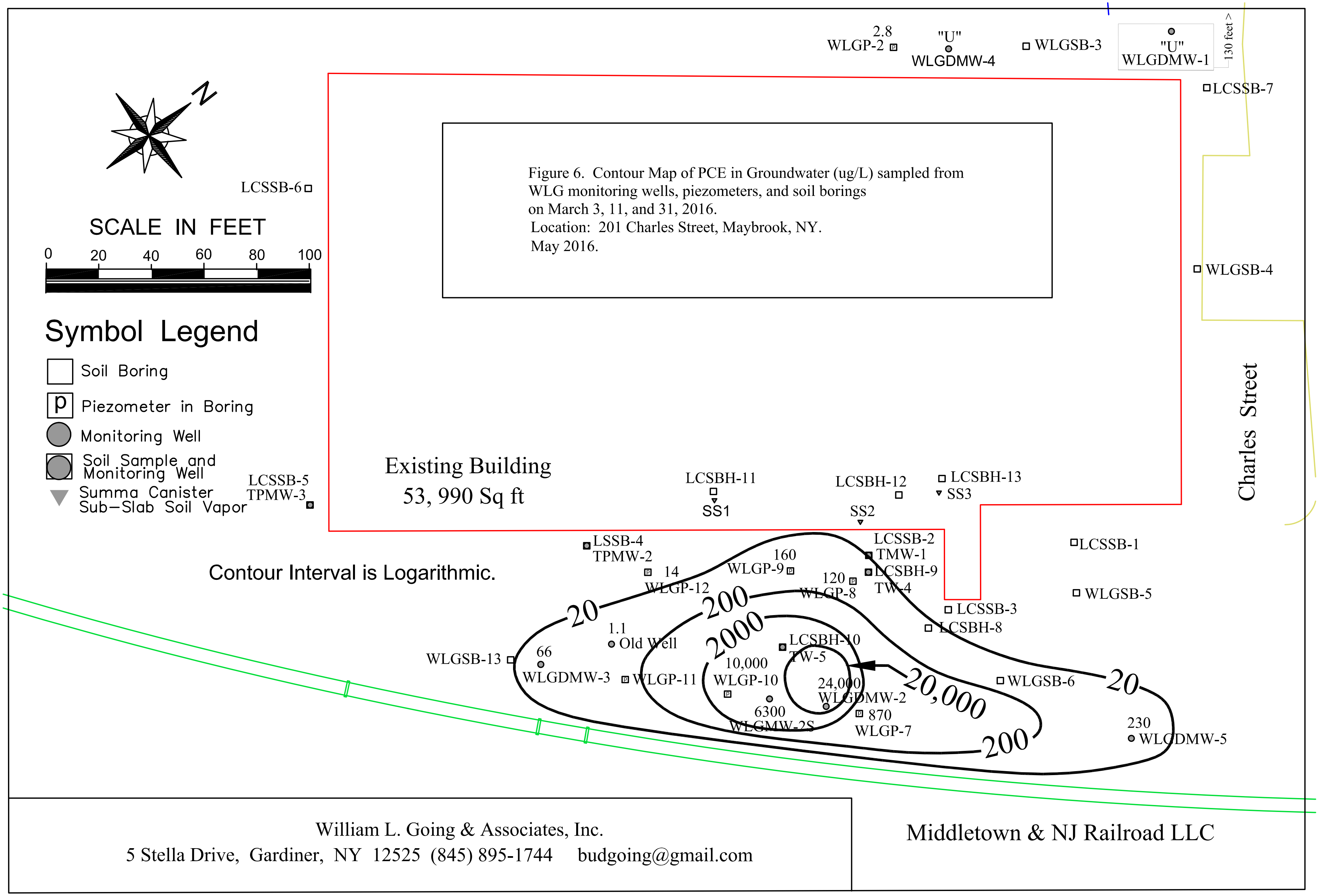


Figure 5. Contour Map of PCE Concentrations (mg/kg) in Soil Samples from WLG soil borings collected on March 2, 2016.
Location: 201 Charles Street, Maybrook, NY.
May 2016.



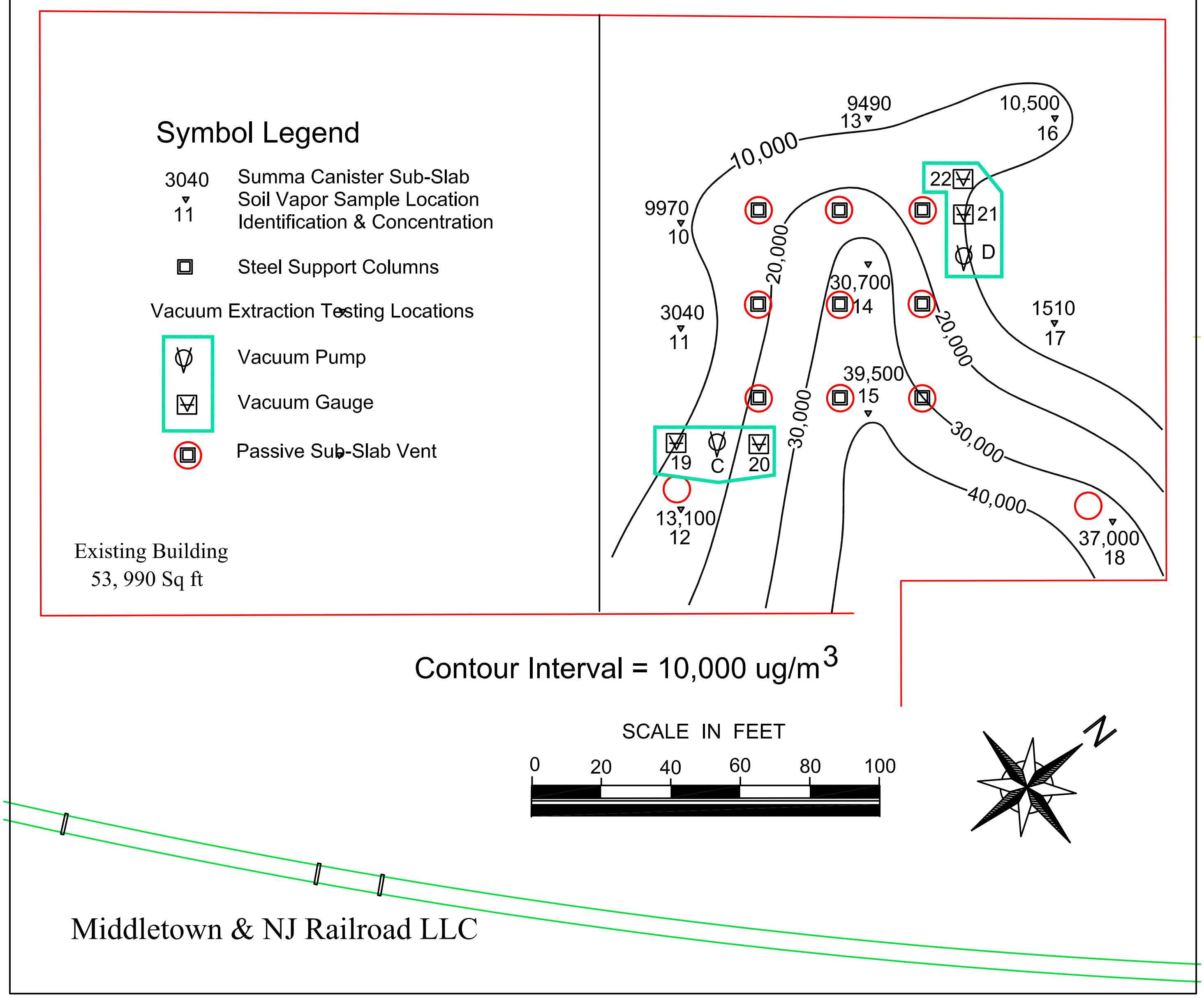
William L. Going & Associates, Inc.
5 Stella Drive, Gardiner, NY 12525 (845) 895-1744 budgoing@gmail.com



William L. Going & Associates, Inc.
5 Stella Drive, Gardiner, NY 12525 (845) 895-1744 budgoing@gmail.com

Figure 7. Proposed Locations for Passive Vents for Sub-Slab Soil Vapor Remediation. 11 vertical vents are planned to vent the vapor from beneath the slab to above the roof on the northeastern side of the building where sampling results are shown. Location: 201 Charles Street, Maybrook, NY. May 2016.

William L. Going & Associates, Inc.
5 Stella Drive, Gardiner, NY 12525 (845) 895-1744 budgoing@gmail.com



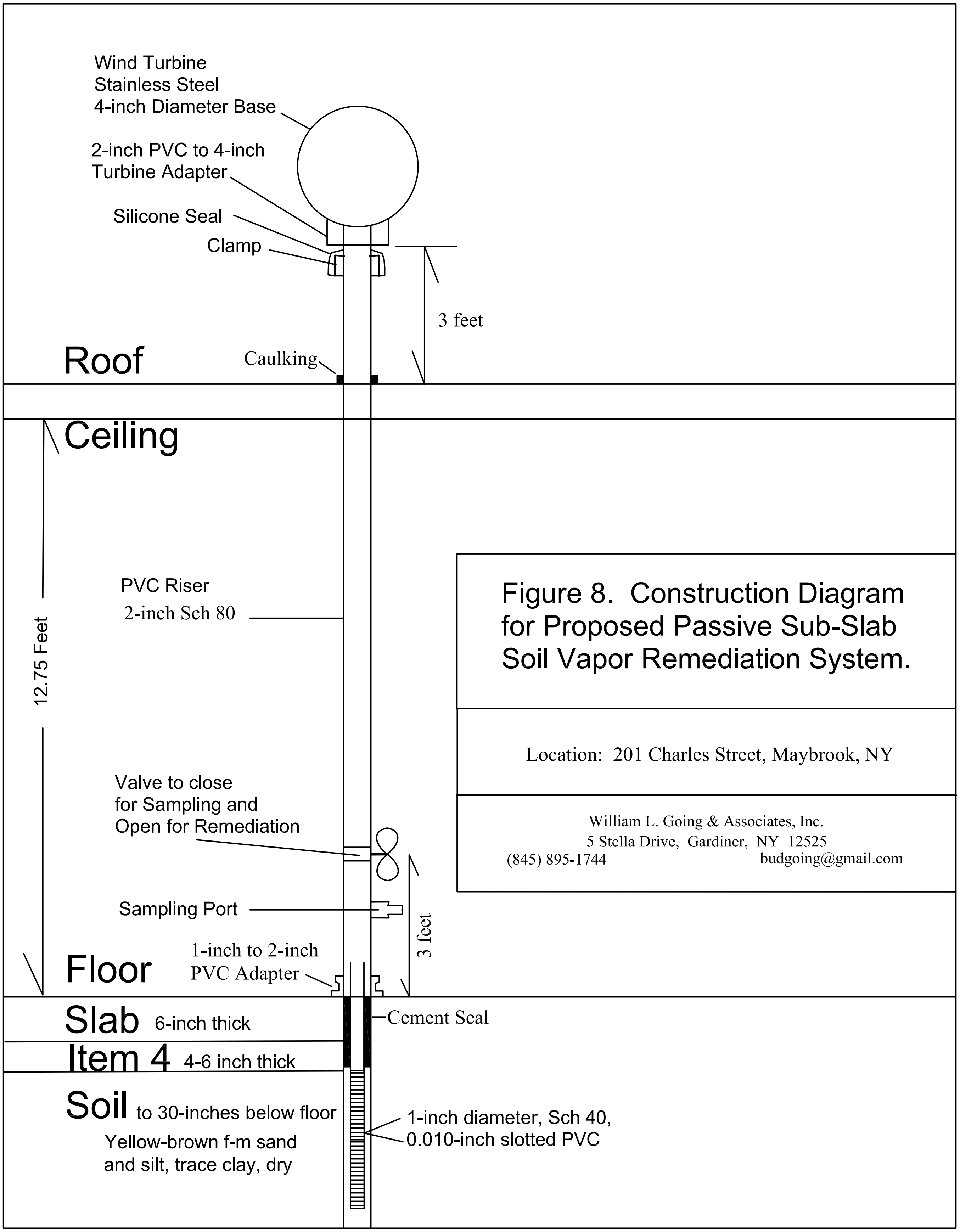
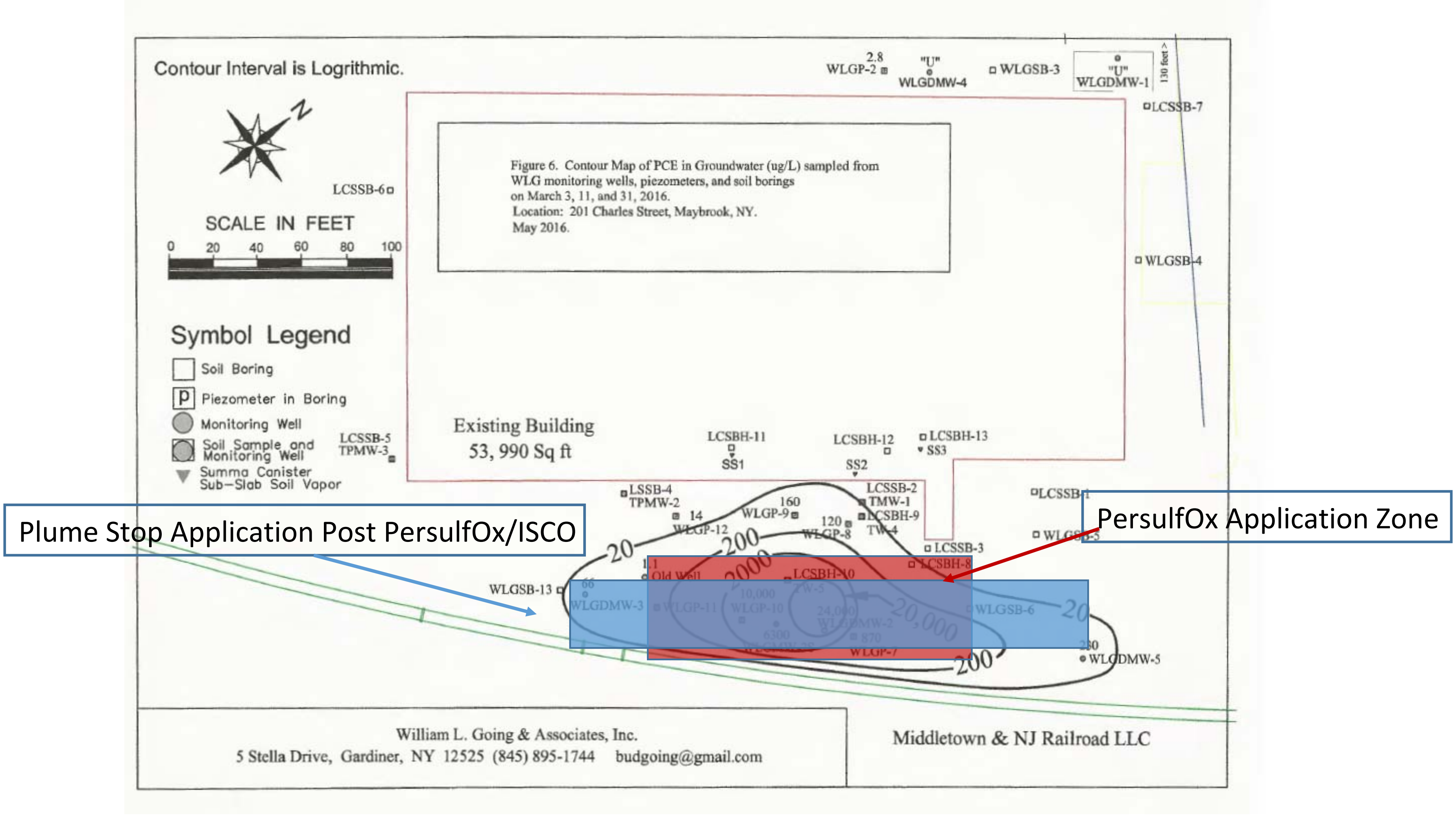


Figure 8. Construction Diagram for Proposed Passive Sub-Slab Soil Vapor Remediation System.

Location: 201 Charles Street, Maybrook, NY

William L. Going & Associates, Inc.
5 Stella Drive, Gardiner, NY 12525
(845) 895-1744 budgoing@gmail.com


Contour Interval is Logrithmic.
SCALE IN FEET
0 20 40 60 80 100
Symbol Legend
Soil Boring
Piezometer in Boring
Monitoring Well
Soil Sample and Monitoring Well
Summa Canister Sub-Slab Soil Vapor
Figure 6. Contour Map of PCE in Groundwater (ug/L) sampled from WLG monitoring wells, piezometers, and soil borings on March 3, 11, and 31, 2016.
Location: 201 Charles Street, Maybrook, NY.
May 2016.
Existing Building
53, 990 Sq ft
WLGP-2
WLGDMW-4
WLGSB-3
WLGDMW-1
LCSSB-7
LCSSB-6
WLGSB-4
LCSSB-5
TPMW-3
LCSBH-11
SS1
LCSBH-12
SS2
LCSBH-13
SS3
LSSB-4
TPMW-2
LCSSB-2
TMW-1
LCSBH-9
WLGP-9
WLGP-12
WLGP-8
LCSSB-3
LCSBH-8
LCSBH-10
Old Well
WLGSB-13
WLGDMW-3
WLGP-11
WLGP-10
WLGDMW-2
WLGP-7
WLGSB-6
WLGDMW-5
Plume Stop Application Post PersulfOx/ISCO
PersulfOx Application Zone
William L. Going & Associates, Inc.
5 Stella Drive, Gardiner, NY 12525 (845) 895-1744 budgoing@gmail.com
Middletown & NJ Railroad LLC

REGENESIS

Project Information		
0.0		
Maybrook NY		
source		
Prepared For:		
William Going Associates Bud Going		
Target Treatment Zone (TTZ) Info	**Unit**	**Value**
Treatment Area	ft^2	5,000
Top Treat Depth	ft	8.0
Bot Treat Depth	ft	23.0
Vertical Treatment Interval	ft	15.0
Treatment Zone Volume	ft^3	75,000
Treatment Zone Volume	cy	2,778
Soil Type	---	#NAME?
Porosity	cm^3/cm^3	0.20
Effective Porosity	cm^3/cm^3	0.10
Treatment Zone Pore Volume	gals	112,208
Treatment Zone Effective Pore Volume	gals	56,104
Fraction Organic Carbon (foc)	g/g	0.005
Soil Density	g/cm^3	1.67
Soil Density	lb/ft^3	104
Soil Weight	lbs	7.8E+06
Hydraulic Conductivity	ft/day	10.0
Hydraulic Conductivity	cm/sec	3.53E-03
Hydraulic Gradient	ft/ft	0.005
GW Velocity	ft/day	0.50
GW Velocity	ft/yr	183
Sources of Oxidant Demand	**Unit**	**Value**
Sorbed Phase Contaminant Mass	lbs	391
Dissolved Phase Contaminant Mass	lbs	18.7
Total Contaminant Mass	lbs	410
Stoichiometric PersulfOx Demand	lbs	1,366
Engineering/Safety Factor	---	**1.0**
Stoichiometric PersulfOx Required	lbs	1,366
Additional Soil Oxidant Demand	g/kg	1.0
SOD PersulfOx Required	lbs	8,686
Total PersulfOx Required	**lbs**	**10,052**
Application Dosing		
PersulfOx Required	**lbs**	**13,940**

PersulfOx® Application Design Summary

source		Field App. Instructions
Application Method	**Direct Push**	
Spacing Within Rows (ft)	10	
Spacing Between Rows (ft)	25	
Injection Points (per app.)	**20**	
Number of Applications	**2**	
Areal Extent (square ft)	5,000	**Field Mixing Ratios**
Top Application Depth (ft bgs)	8	Water per Pt per app (gals)
Bottom Application Depth (ft bgs)	23	237
PersulfOx to be Applied (lbs)	**13,940**	PersulfOx per Pt per app (lbs)
PersulfOx Solution %	15%	349
Volume Water (gals)	**9,466**	Total Volume per Pt per app (gals)
Total Volume (gals)	**10,163**	254
<u>Per Application Totals</u>		
PersulfOx per opp. (lbs)	*6,970*	*Volume per vertical ft (gals)*
Volume Water per app. (gals)	*4,733*	*17*
Total Volume per app. (gals)	*5,082*	

Technical Notes/Discussion

Prepared By: Name
Date: 5/8/2016

Assumptions/Qualifications

In generating this preliminary estimate, Regenesis relied upon professional judgment and site specific information provided by others. Using this information as input, we performed calculations based upon known chemical and geologic relationships to generate an estimate of the mass of product and subsurface placement required to affect remediation of the site.

REGENESIS

Project Info

0.0
Maybrook NY
source
Prepared For:
William Going Associates Bud Going

Target Treatment Zone (TTZ) Info	Unit	Value
Treatment Area	ft^2	4,500
Top Treat Depth	ft	8.0
Bot Treat Depth	ft	23.0
Vertical Treatment Interval	ft	15.0
Treatment Zone Volume	ft^3	67,500
Treatment Zone Volume	cy	2,500
Soil Type	---	bedrock
Porosity	cm^3/cm^3	0.33
Effective Porosity	cm^3/cm^3	0.15
Treatment Zone Pore Volume	gals	166,629
Treatment Zone Effective Pore Volume	gals	75,740
Fraction Organic Carbon (foc)	g/g	0.005
Soil Density	g/cm^3	1.67
Soil Density	lb/ft^3	104
Soil Weight	lbs	7.0E+06
Hydraulic Conductivity	ft/day	5.0
Hydraulic Conductivity	cm/sec	1.76E-03
Hydraulic Gradient	ft/ft	0.005
GW Velocity	ft/day	0.17
GW Velocity	ft/yr	61

Sources of Hydrogen Demand	Unit	Value
Dissolved Phase Contaminant Mass	lbs	7
Sorbed Phase Contaminant Mass	lbs	35
Competing Electron Acceptor Mass	lbs	125
Total Mass Contributing to H_2 Demand	**lbs**	**167**

Stoichiometric Demand	Unit	Value
Stoichiometric H_2 Demand	lbs	10
Stoichiometric HRC Demand	**lbs**	**456**
Engineering/Safety Factor	--	**2**

Application Dosing	Unit	Value
Plume Stop to be Applied	**lbs**	**26,400**
HRC to be Applied	**lbs**	**1,350**
BDI Plus to be Applied	**Liters**	**21**

PlumeStop® Application Design Summary

source		Field App Instructions
Application Method	**Direct Push**	
Spacing Within Rows (ft)	25	
Spacing Between Rows (ft)	25	
Application Points	**7**	
Areal Extent (square ft)	4,500	
Top Application Depth (ft bgs)	8	
Bottom Application Depth (ft bgs)	23	
PlumeStop to be Applied (lbs)	**26,400**	
PlumeStop per point (lbs)	3771	
PlumeStop per point (gals)	452	
Mixing Water (gal)	**28,483**	
Mixing Water (per pt)	4,069	
Total Application Volume (gals)	**31,647**	
Injection Volume per Point (gals)	4521	
Anaerobic Bioremediation - HRC		
HRC Application Points	**7**	
HRC to be Applied (lbs)	**1,350**	
HRC per point (lbs)	193	
Total Application Volume (gals)	**124**	
Injection Volume per Point (gals)	17.8	
Bioagumentation - BDI Plus		
BDI Plus Application Points	**7**	
BDI Plus to be Applied (Liters)	**29**	
BDI Plus per point (Liters)	4.1	

Technical Notes/Discussion

Prepared By: Name
Date: 5/8/2016

Assumptions/Qualifications

In generating this preliminary estimate, Regenesis relied upon professional judgment and site specific information provided by others. Using this information as input, we performed calculations based upon known chemical and geologic relationships to generate an estimate of the mass of product and subsurface placement required to affect remediation of the site.