REPORT

Independent Evaluation: Residential Soil Vapor Intrusion 58 North Clinton Avenue, Bay Shore, New York

SUBMITTED TO

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SUBMITTED BY

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INTRODUCTION

This report is in response to a request by McCallion & Associates, LLC for an independent evaluation of the likelihood of periodic, residential soil vapor intrusion (SVI) arising from contaminated groundwater beneath the Mousis property, 58 North Clinton Avenue, Bay Shore, New York. The contaminated groundwater is attributable to past disposal practices of the nearby former Bay Shore/Brightwaters manufactured gas plant (MGP) currently being remediated by National Grid (formerly KeySpan). Injection of oxygen (O_2) into the contaminated groundwater – which has adversely affected the Mousis property – began in earnest during January 2010. Also referred to as oxygenation, the goal of oxygen injection is to enhance the aerobic processes in the groundwater plume, with the end result being a reduction in its contaminant loading.

We have based our evaluation on: (a) all relevant, publicly available groundwater and oxygenation data; (b) the SVI sampling performed at the Mousis residence by National Grid on October 9-10, 2013; and (c) relevant State and Federal guidance concerning SVI sampling and oxygenation as a means to reduce groundwater contamination.

SUMMARY OF CONCLUSIONS AND RECOMMENDATIONS

The following conclusions and recommendations were reached based on detailed analyses of the above-identified data.

- A highly contaminated groundwater plume was shown to be present directly beneath the Mousis property at all times during (and before) the entire span of the remediation (2008 until present).

- To a reasonable degree of scientific certainty, the oxygenation program – which presumably continues today – caused a significant increase in the upward mobilization of contaminants through the soil, which adversely impacted the Mousis property and house, starting in 2010.

- Relatively warm ambient air temperatures observed during the 2013 SVI sampling campaign, together with results of a barometric pressure analysis (performed herein), evidenced that indoor sampling was performed under conditions which were not reasonably worst-case, thus indicating that further sampling was warranted (yet apparently never performed).

- National Grid failed to follow current New York State Department of Health mitigation guidance, based on the presence of unacceptably high sub-slab contaminant levels during the 2013 SVI sampling campaign.

- We strongly recommend that a vapor intrusion mitigation system be immediately implemented on the Mousis property to prevent any further exposure to harmful indoor air contaminants.

Groundwater Contamination and Oxygenation

The Mousis property was shown to lie atop a contaminated groundwater plume based on: (a) the Remedial Investigation (RI) findings and (b) results of quarterly groundwater monitoring which spanned the remediation, as presented in National Grid's "Fact Sheets" and/or quarterly or annual Operation & Maintenance (O&M) Reports, beginning in 2008 and continuing until June 2018. The RI and O&M reports can be found here, and the Fact Sheets here.

Figures 1 through **8** (all figures begin on Page 9), respectively, are selected quarterly "snapshots" depicting both the contaminated groundwater plume with respect to the Mousis property, as well as the location of all oxygenation systems – either planned or in operation – upon completion of the following milestones: the RI in 2003 (Figure 1); Quarter 3, 2009 (Figure 2); Quarter 2, 2010 (Figure 3); Quarter 4, 2010 (Figure 4); Quarter 1, 2012 (Figure 5); Quarter 4, 2012 (Figure 6); Quarter 2, 2013 (Figure 7); and Quarter 2, 2015 (Figure 8).

Each quarterly map marks the initial time an updated plume configuration was depicted by National Grid's consultants. These figures clearly evidence that the contaminated plume remained beneath the Mousis property during this entire period (and likely still today).

Several oxygenation systems were installed over the course of the remediation. Two of these, installed in 2009, had the potential to enhance the upward contaminant mobility in the vicinity of the Mousis property. These systems were just upgradient of the property (i.e., to the north-northwest) on the downgradient edge of Operable Unit 1 (OU-1). They are known as the 66 N. Clinton Avenue system and the Union Boulevard system, and are depicted by the green and/or orange lines in the quarterly maps (labeled in Figures 2 through 8). Oxygenation has been shown to increase the risk of fugitive vapors entering buildings, and for this reason has been deemed by the U.S. Environmental Protection Agency (U.S. EPA) to be a disadvantage compared to other enhanced aerobic bioremediation technologies employed for mitigating contaminated groundwater plumes (for example, see here, PDF page 10 of 74).

Table 1 (following the figures) presents a summary of the monthly oxygen injection data for the two systems discussed above (66 N. Clinton Avenue and Union Boulevard) for the five-year period spanning 2009 through 2013. It should be noted that operation of each system went beyond 2013 – to 2018, at least – and that, to the best of our knowledge, both systems are still operating today. This data can be found in the O&M Reports (link provided above), with the relevant PDF page number for each month and system included in the table.

Figure 9 graphically depicts the monthly combined oxygen injection rates for the two systems, based on the data presented in Table 1. Oxygenation increased markedly beginning in January 2010, with the highest rates from the middle of 2011 through 2013.

SVI Sampling

Appendix A (following Table 1) presents the first several pages of a November 8, 2013 National Grid letter report sent to Mrs. Mousis, which summarized results of their soil vapor intrusion assessment. From this report, **"Based on the sampling conducted at the 58 North Clinton Avenue property, it does not appear that the indoor air at the property is being impacted by MGP site-related chemicals through soil vapor intrusion** [emphasis provided in original report]." As discussed below, this conclusion is misleading and clearly not supported by the facts.

Beginning at approximately 10:40 am, October 9, 2013, a total of six, 24-hour-averaged air samples were collected as follows:

- four indoor samples (basement, kitchen, living room, and living room duplicate);
- one outdoor sample; and
- one sub-slab sample.

In general, for the indoor and outdoor samples, those contaminants associated with MGP sites were either not detected or were shown to be present at low levels. Conversely, the sub-slab sample showed significantly elevated levels of these "fingerprint" contaminants (discussed below). That vapors originating from the contaminated groundwater plume are emanating upward through the soil under the house is indisputable. National Grid's conclusion that the indoor air is not being impacted by soil vapor intrusion must, therefore, assume that the basement slab (floor) provides an effective barrier to the toxic vapors.

EXISTING SVI SAMPLING GUIDANCE

We reviewed existing SVI sampling guidance, focusing on two documents for preparation of this portion of our report. They present recommended approaches and environmental conditions to consider when designing investigations to determine whether a given subsurface source poses a potential SVI health threat to building occupants. Further, they provide comprehensive discussion on the myriad factors governing soil vapor intrusion and, despite their publication dates, are the most recent versions – still widely considered to be state-of-the-art reference material. They are:

- "*Final Guidance for Evaluating Soil Vapor Intrusion in the State of New York*," New York State Department of Health, Center for Environmental Health, Bureau of Environmental Exposure Investigation, October 2006. This is subsequently referred to as the New York State Department of Health (NYSDOH) guidance, and can be viewed here.

- "*Conceptual Model Scenarios for the Vapor Intrusion Pathway*," U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response, Washington D.C. 20460, EPA 530-R-10-003, February 2012. This is subsequently referred to as the U.S. EPA guidance, and can be viewed here.

Based on these documents, the following questions should generally be asked in order to determine the need for either mitigation, or at least intensive investigation (involving multiple sampling campaigns):

- Are there high concentrations of vapors in the sub-slab soil?
- Is there a correlation between the indoor and/or sub-slab vapors detected and the volatile compounds present in the subsurface source?
- If previous sampling was limited to a single round, was it conducted under reasonably worst-case conditions?

ANALYSIS

An analysis of the SVI sampling is discussed first, which shows that the October 2013 campaign was not performed under reasonably worst-case conditions; further, had the sampling been performed under such conditions, there would have assuredly been significant indoor concentrations. The second component of this analysis discusses the oxygenation and its contribution to the myriad indoor odor complaints since at least 2013.

SVI Sampling Results

The October 9-10, 2013 data set is discussed in terms of the above questions:

Sub-Slab Concentration

In general, the concentration of vapors in the sub-slab sample was very high, ranging up to 12,300 micrograms per cubic meter (ug/m^3) for m/p xylene (see Table 1 of Appendix A – the National Grid letter report). This alone provides justification for mitigation, as is indicated in the NYSDOH guidance which essentially states that if sub-slab concentrations are above 1,000 ug/m^3, mitigation is called for even if all indoor concentrations are below the detection limits during the time of measurement (see PDF page 64 of 241).

Correlation with Subsurface Source

From the universe of compounds analyzed for, the NYSDOH guidance identifies a total of eight typically associated with MGP waste (see PDF page 41 of 241). These are: trimethylbenzene isomers (three), tetramethylbenzene isomers (one), thiopenes (one), indene, indane, and naphthalene.

High concentrations of seven of these fingerprint compounds were detected in the sub-slab sample, confirming that the contaminated groundwater plume was the source (see Table 1 of Appendix A – the National Grid letter report).

Reasonable Worst-Case Conditions

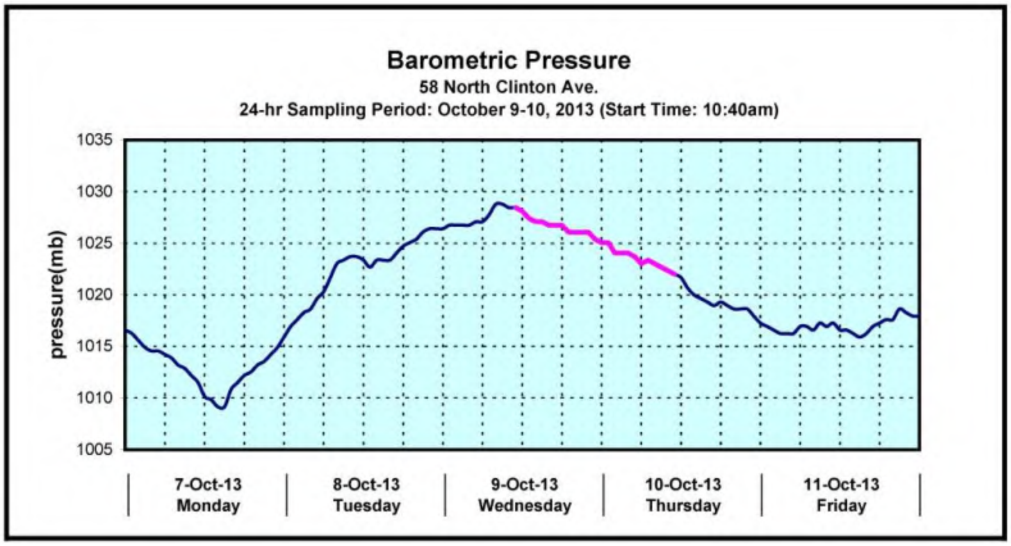
As discussed in detail in the U.S. EPA guidance, there are many conditions – environmental and otherwise – which need to be considered when designing a sampling program to ensure the capture of worst-case situations. Perhaps the most important of these conditions are: (a) whether the building is being heated when it is sampled (see Section 3.2); and (b) the barometric pressure tendency before and during sample collection (see Section 6.3). If care is not exercised, each of these factors can act to reverse the expected air flow up through the soil into the building, such that the indoor air can actually flow from the building back into the ground.

When the building is heated, the air inside tends to rise up, thus causing vapors in the subsurface to migrate up into the building. This is commonly referred to as the "stack effect" or the "chimney effect."

The barometric pressure tendency (i.e., rising or falling barometer), also know as barometric pumping, has a pronounced effect upon the release and migration of soil gas from subsurface contamination. When the barometer is rising, the continually increasing atmospheric pressure acts as a lid, suppressing the soil-bound vapors and inhibiting their release into the building (or the atmosphere). Conversely, when the barometer begins to fall, the atmospheric pressure and subsurface pressure reaches equilibrium, after which time the above process is reversed and the soil-bound vapors are then released. The lag-time between when the atmospheric pressure starts to fall and the vapors begin to enter the building is a function of many factors, including the rate of pressure fall, the soil type, and the depth of the subsurface source.

Following is an analysis of the above two worst-case conditions for this home.

> Building Heating. According to meteorological records from JFK Airport (the nearest National Weather Service station), the ambient temperature ranged between 55 and 64 ºF during the 24-hour period that sampling was performed. We judge it likely that the heating system was not operating during this period, in which case neither the chimney effect nor reasonable worst-case conditions would have been realized.
>
> Barometric Pressure Tendency. The following graph depicts the atmospheric pressure trend observed before, during, and after sample collection (also from JFK Airport).
>
> From this graph, it can be seen that the pressure rose steadily for 2 days prior to sampling commencement, rising some 20 millibars (mb) – a very significant rise. While it is true that the pressure was falling during the 24-hour sample-collection period (depicted in purple on the graph), this decline was relatively slow, amounting to only about 6 mb over the entire time.



As implied earlier, the effects of barometric pumping upon soil vapor intrusion are complex. In this case, the slow pressure fall during sampling was judged insufficient to offset the inhibiting effects of the more significant pressure rise during the prior 2 days.

In summary, the 2013 testing was not performed under reasonable worst-case conditions, which would have been when the barometer was falling sharply for at least several hours prior to initiation of sampling. Accordingly, the home should have been retested under these worst-case conditions before reaching any conclusion as to whether or not the indoor air at the Mousis residence was adversely affected.

Oxygenation Considerations

As discussed earlier, oxygen injection can enhance upward contaminant mobility, thereby increasing the risk of fugitive vapors entering buildings. In this case, not only was oxygen injection responsible for the high contaminant concentrations observed in the single sub-slab sample in October 2013, but we can say, with a reasonable degree of scientific certainty, that high sub-slab concentrations were present throughout the entire time that significant oxygenation was performed (2010 until present); this is borne out by the odor complaints from the Mousis's and other residents.

The role of barometric pumping in determining how and when gaseous contaminants are released to buildings was discussed above. Here, given the persistent presence of high levels of contamination beneath the basement slab, release into the house was governed largely by this phenomenon. In general, whenever the atmospheric pressure is (or had recently been) rising rapidly, an equilibrium is maintained between the atmospheric and subsurface pressure, and there is no appreciable concentration of indoor contaminants; this was the situation during the October 2013 sampling campaign. On the other hand, whenever the atmospheric pressure is (or had recently been) falling rapidly, this equilibrium is disrupted and the soil vapor enters the house unimpeded.

RECOMMENDED MITIGATION SYSTEM

A residential vapor intrusion mitigation (VIM) system is an effective, simple, and inexpensive means of rerouting soil gas from under a home directly into the open atmosphere, thus precluding the possibility that harmful vapors can accumulate indoors. Briefly, this typically involves inserting a PVC or aluminum pipe into the basement floor at a centrally located position. Mechanical suction is then induced, and the contaminated vapors are discharged, via the piping, and vented near the building's roof.

A system of this type is strongly recommended here. The estimated cost is on the order of $15,000 or $20,000.

CONCLUSIONS

Five main conclusions can be drawn from this analysis.

First, a highly contaminated groundwater plume, attributable to past disposal practices of the former Bay Shore/Brightwaters MGP facility, was shown to be present directly beneath the Mousis property at all times during (and prior to) the entire span of the remediation (2008 until present). This is based on the RI findings and groundwater maps presented in a series of Fact Sheets provided to the public by National Grid.

Second, to a reasonable degree of scientific certainty, the oxygenation program – which presumably continues today – caused a significant increase in the upward mobilization of contaminants through the soil, which adversely impacted the Mousis property and house. In the absence of additional data, the 2013 sampling results provide strong evidence that frequent episodes of indoor soil vapor intrusion had been occurring for some time – since at least 2013 and most likely 2010.

Third, the relatively warm ambient air temperatures observed during the 2013 SVI sampling campaign, together with results of a barometric pressure analysis, evidenced that indoor sampling was performed under conditions which were not reasonably worst-case; this indicates, at a minimum, that further sampling was warranted (yet apparently never performed, counter to applicable State and Federal guidance).

Fourth, National Grid failed to follow current mitigation guidance, given the presence of unacceptably high sub-slab contaminant levels during the 2013 SVI sampling campaign. Based on the most recent NYSDOH guidance, the high levels of sub-slab soil vapor dictated the need for immediate mitigation.

Finally, it is strongly recommended that a residential VIM system be implemented immediately on the Mousis property to prevent any further exposure to harmful indoor air contaminants.

* * * * *

FIGURE 1:
LOCATION OF PLAINTIFF WITH RESPECT TO SELECTED QUARTERLY GROUNDWATER PLUMES: RI REPORT (2004)

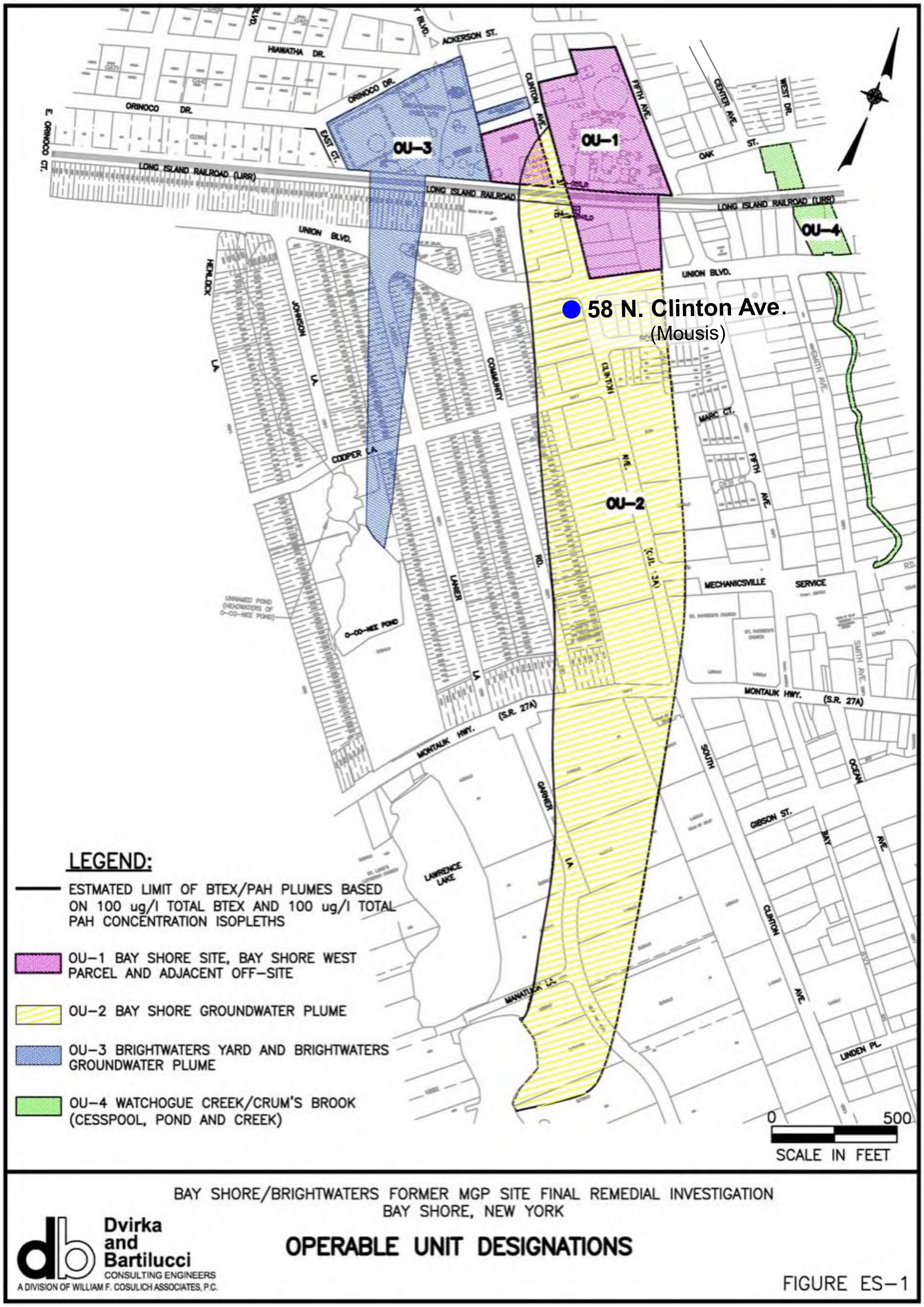


FIGURE 2:
LOCATION OF PLAINTIFF WITH RESPECT TO SELECTED
QUARTERLY GROUNDWATER PLUMES: 2009 Q3

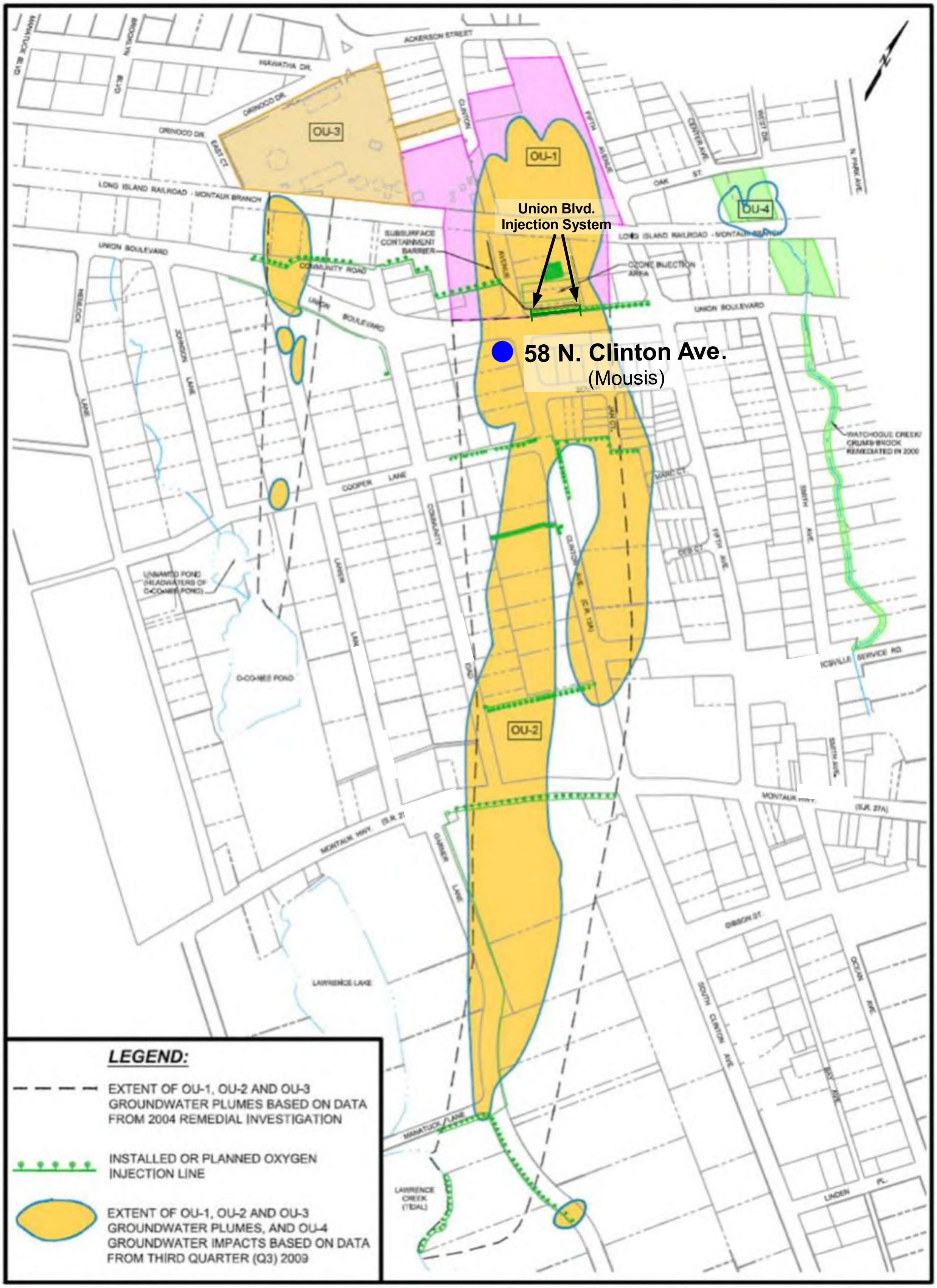


FIGURE 3:
LOCATION OF PLAINTIFF WITH RESPECT TO SELECTED QUARTERLY GROUNDWATER PLUMES: 2010 Q2

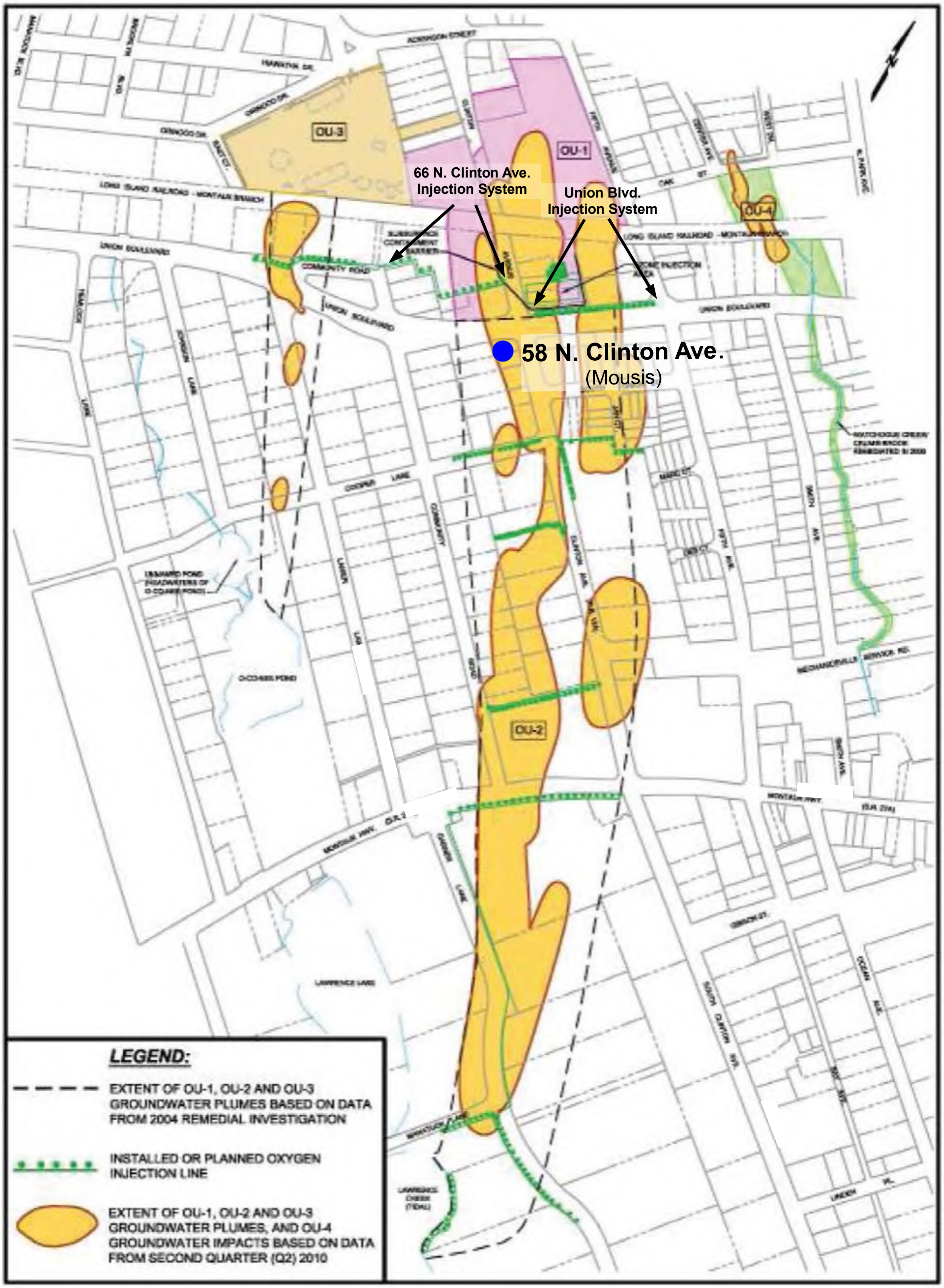


FIGURE 4:
LOCATION OF PLAINTIFF WITH RESPECT TO SELECTED QUARTERLY GROUNDWATER PLUMES: 2010 Q4

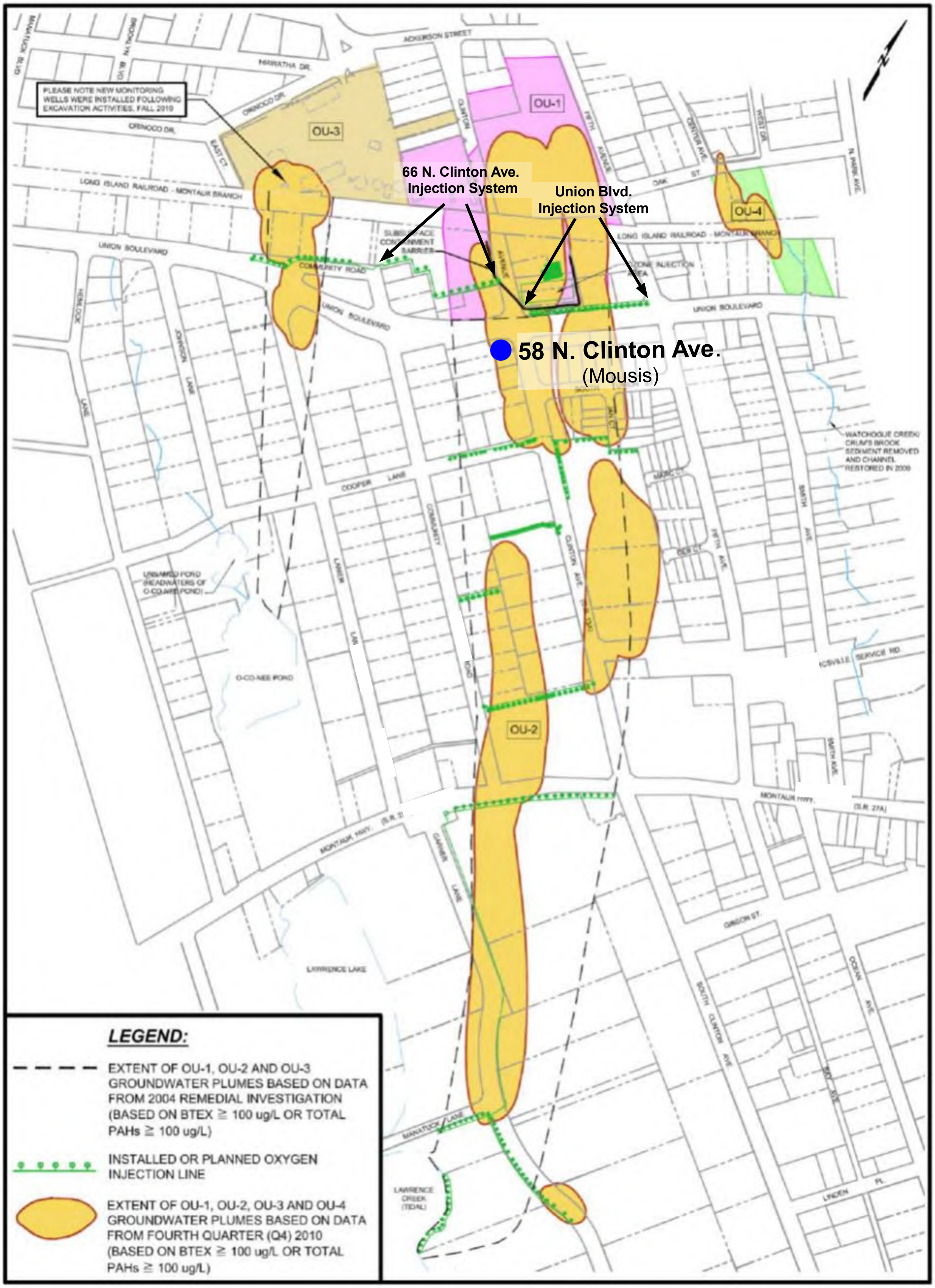


**FIGURE 5:
LOCATION OF PLAINTIFF WITH RESPECT TO SELECTED
QUARTERLY GROUNDWATER PLUMES: 2012 Q1**

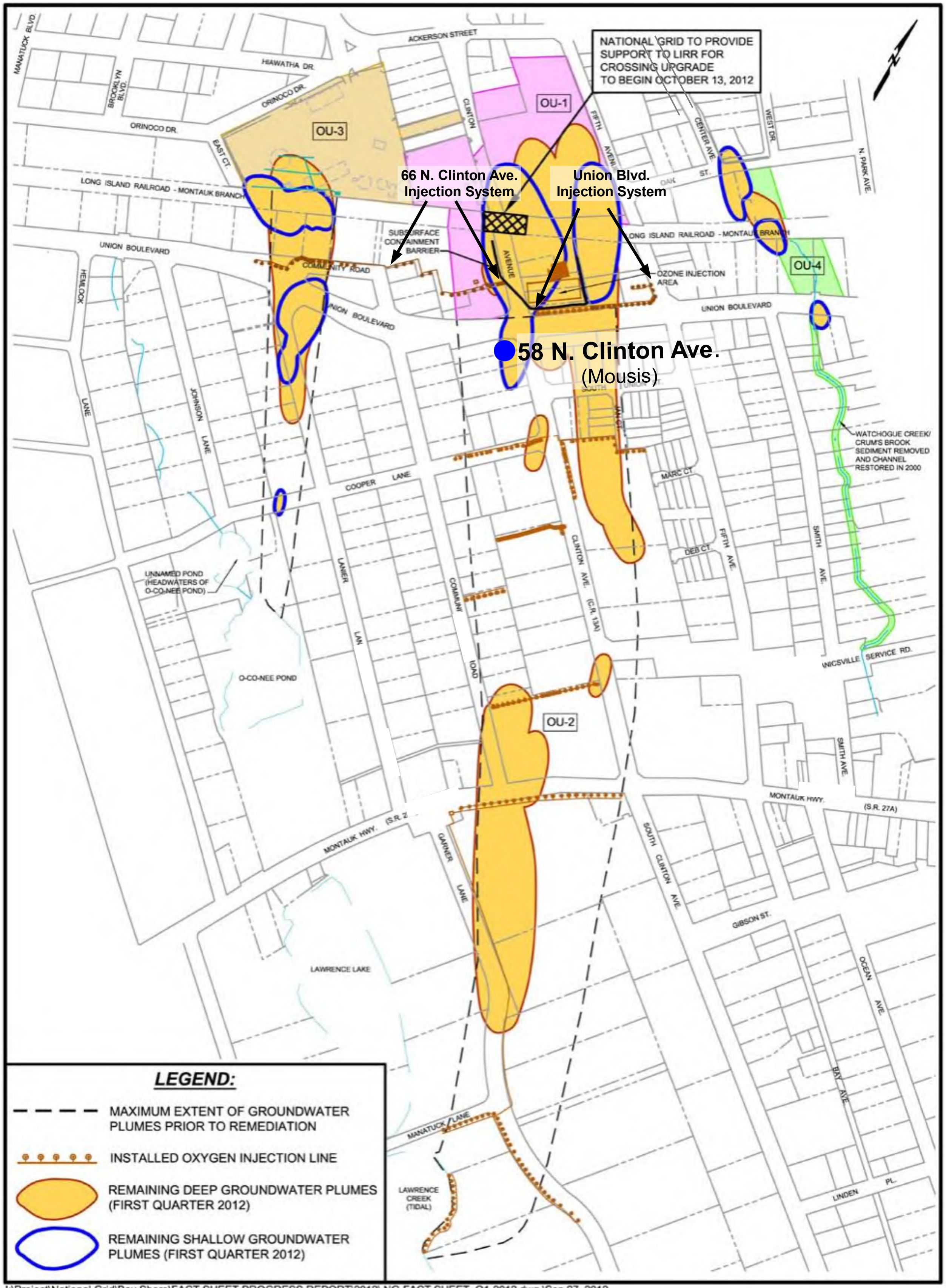


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FIGURE 6:
LOCATION OF PLAINTIFF WITH RESPECT TO SELECTED QUARTERLY GROUNDWATER PLUMES: 2012 Q4

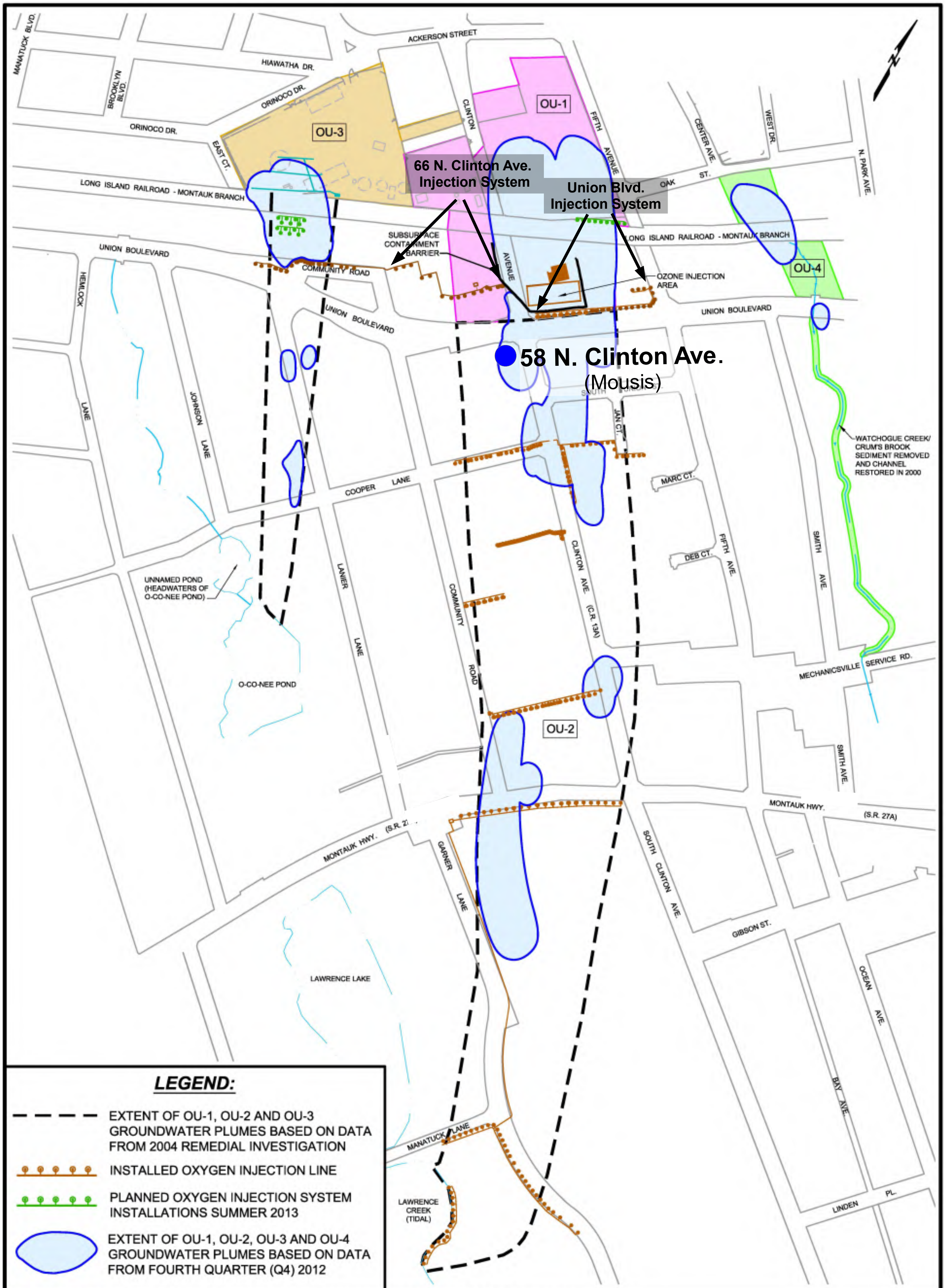

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**FIGURE 7:
LOCATION OF PLAINTIFF WITH RESPECT TO SELECTED
QUARTERLY GROUNDWATER PLUMES: 2013 Q2**

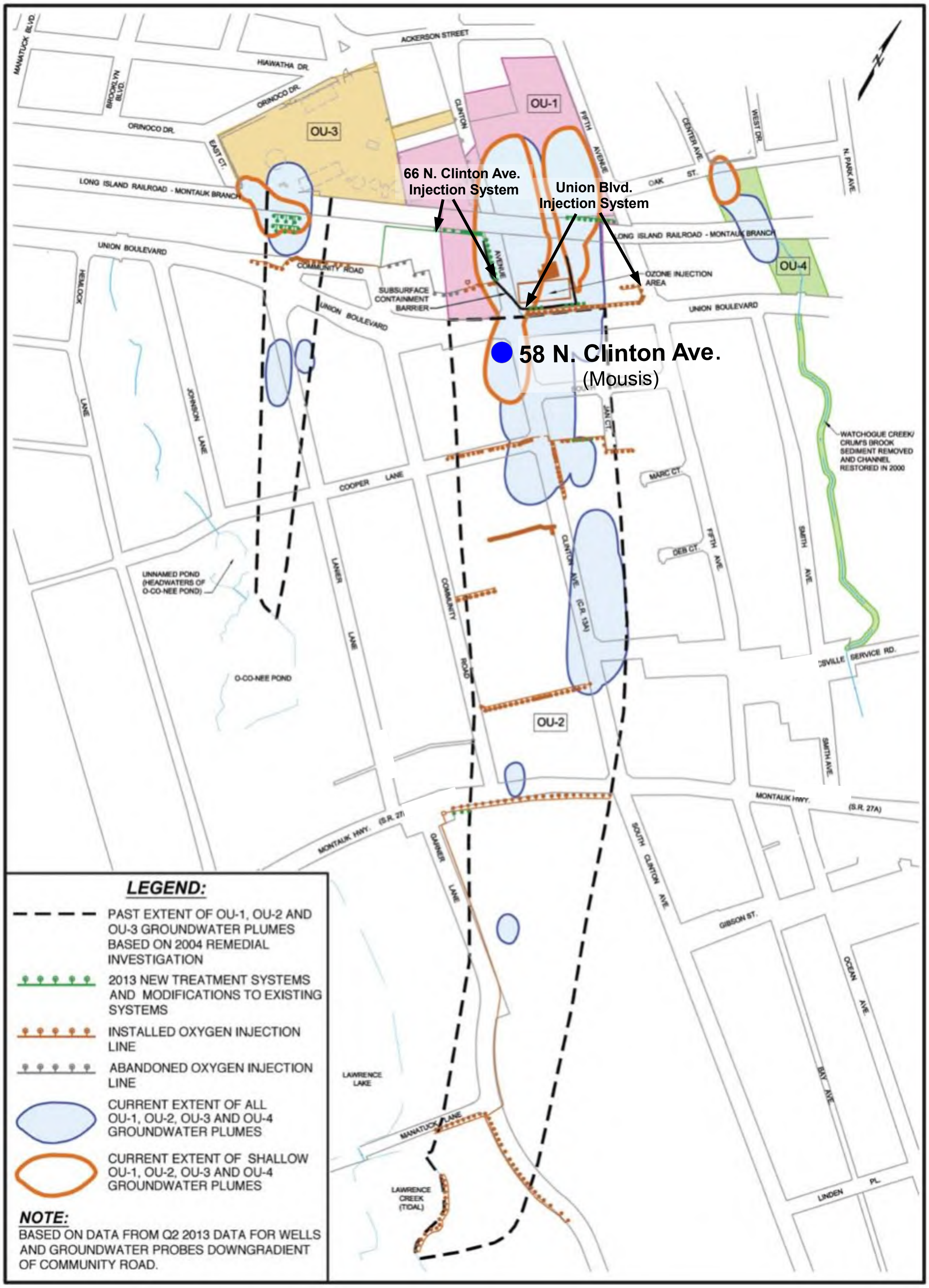

**FIGURE 8:
LOCATION OF PLAINTIFF WITH RESPECT TO SELECTED
QUARTERLY GROUNDWATER PLUMES: 2015 Q2**

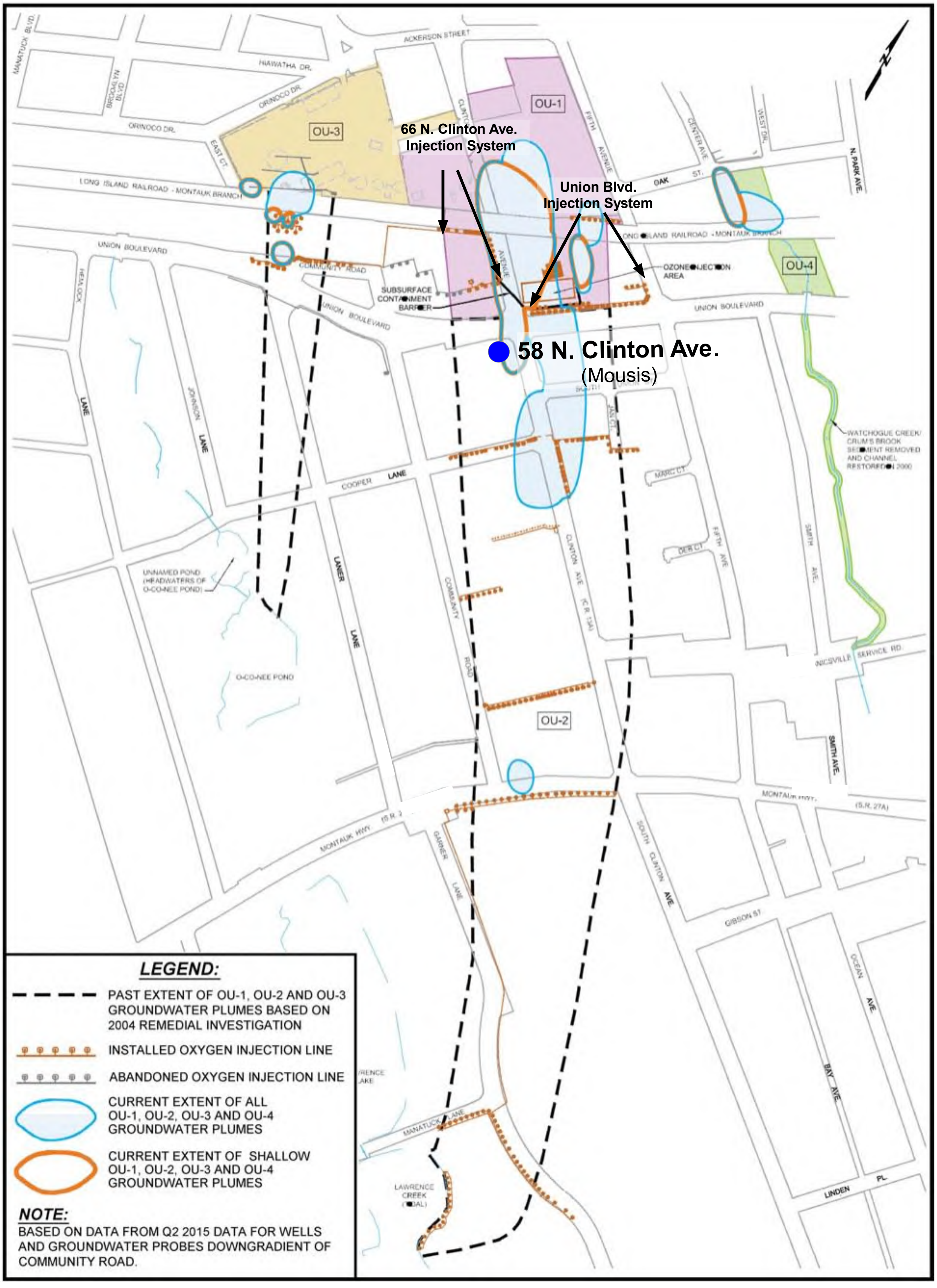

FIGURE 9:
MONTHLY COMBINED OXYGEN INJECTION RATES FOR THE 66 N. CLINTON AVENUE AND UNION BOULEVARD SYSTEMS

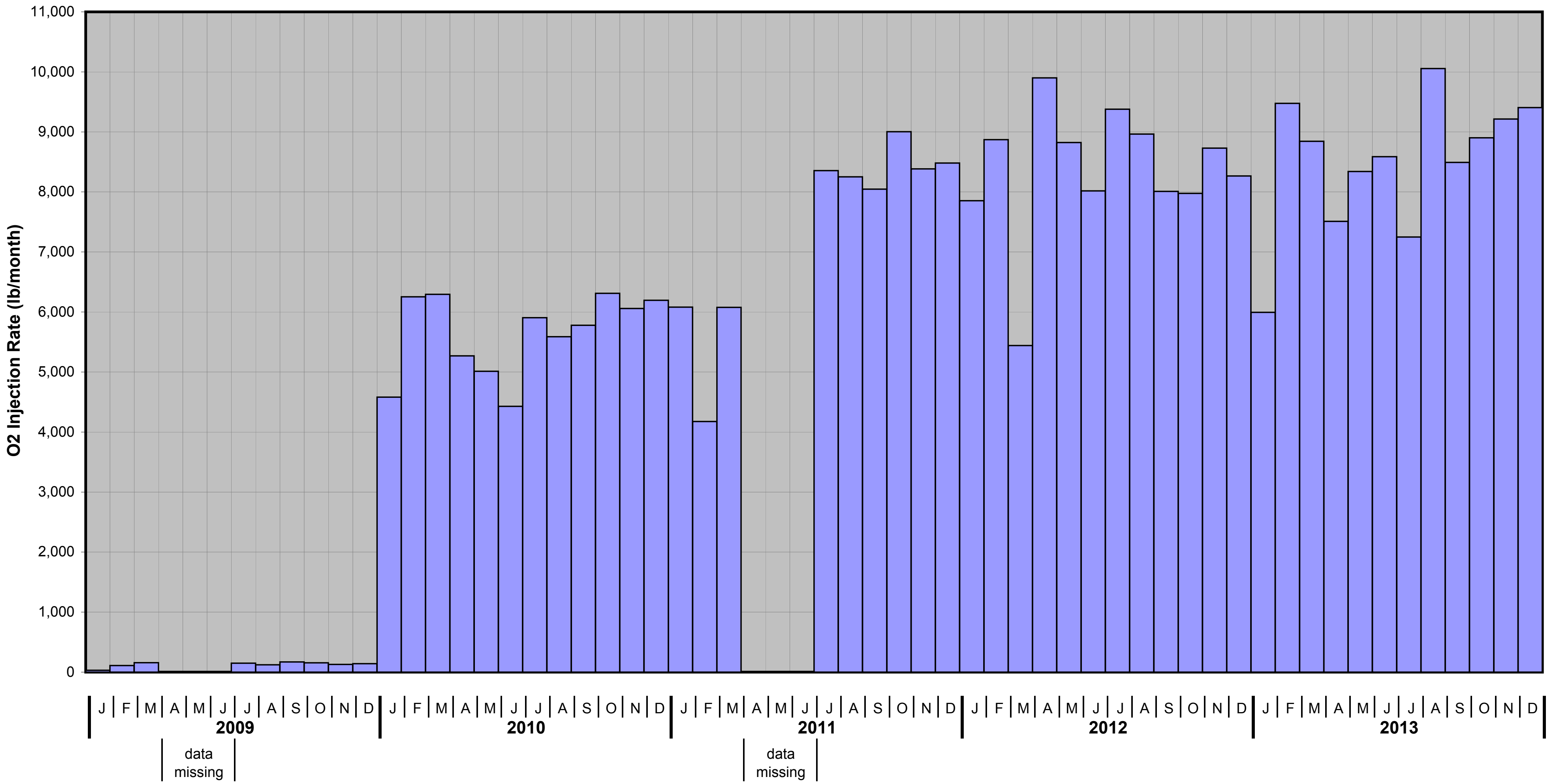

TABLE 1:
SUMMARY OF MONTHLY OXYGEN INJECTION DATA: 66 N. CLINTON AVE. AND UNION BLVD. SYSTEMS
(2009 THROUGH 2013)

		OU-1 O2 Injection System						
		66 N. Clinton Ave.			Union Blvd. Beginning in Q1, 2010,O_2 line extended from "Gate" portion east to Fifth Ave.			total
year	month	operation days	pounds/ month	O&M Report pdf page	operation days	pounds/ month	O&M Report pdf page	pounds/ month*
2009	January				31	31		31
2009	February				26	110	321	110
2009	March				31	157		157
2009	April				NA	NA		NA
2009	May				NA	NA	(data not provided online)	NA
2009	June				NA	NA		NA
2009	July				31	150		150
2009	August				31	122	495	122
2009	September				30	170		170
2009	October				31	155		155
2009	November				30	129	667	129
2009	December				31	140		140
2010	January	4	378		31	4,203		4,581
2010	February	28	2,852	449	28	3,401	448	6,253
2010	March	29	2,537		29	3,757		6,294
2010	April	30	1,412		30	3,858		5,270
2010	May	31	607	720	31	4,406	719	5,013
2010	June	30	1,283		30	3,145		4,428
2010	July	31	2,036		31	3,868		5,904
2010	August	31	1,854	682	31	3,733	681	5,587
2010	September	30	2,065		30	3,713		5,778
2010	October	31	2,822		31	3,488		6,310
2010	November	30	2,688	651	30	3,370	650	6,058
2010	December	31	2,786		31	3,408		6,194
2011	January	31	2,623		31	3,457		6,080
2011	February	14	1,033	709	28	3,143	708	4,176
2011	March	31	2,540		31	3,537		6,077
2011	April							
2011	May	Downloaded O&M report is unreadable						
2011	June							
2011	July	21	2,174		31	6,181		8,355
2011	August	26	2,993	509	28	5,258	508	8,251
2011	September	30	3,240		29	4,807		8,047
2011	October	23	2,978		30	6,026		9,004
2011	November	24	2,741	540	29	5,643	539	8,384
2011	December	23	2,773		30	5,708		8,481
2012	January	23	2,599		28	5,255		7,854
2012	February	24	2,792	517	29	6,079	516	8,871
2012	March	0	0		30	5,441		5,441
2012	April	30	3,588	512	30	6,312		9,900
2012	May	31	2,919	513	31	5,904	511	8,823
2012	June	27	2,513		28	5,504		8,017
2012	July	29	3,370		31	6,008		9,378
2012	August	20	2,324	50 (Appdx. D)	31	6,641	46 (Appdx. D)	8,965
2012	September	21	2,046		30	5,963		8,009
2012	October	29	3,000		28	4,976		7,976
2012	November	20	2,606	51 (Appdx. D)	27	6,123	47 (Appdx. D)	8,729
2012	December	21	2,395		30	5,872		8,267
2013	January	30	2,888		14	3,105		5,993
2013	February	28	3,176	52 (Appdx. D)	28	6,299	48 (Appdx. D)	9,475
2013	March	30	3,303		31	5,541		8,844
2013	April	29	3,012		30	4,498		7,510
2013	May	27	2,837	53 (Appdx. D)	31	5,503	49 (Appdx. D)	8,340
2013	June	30	2,701		30	5,887		8,588
2013	July	31	2,773		31	4,477		7,250
2013	August	31	3,463	618	31	6,593	610	10,056
2013	September	28	3,109		30	5,382		8,491
2013	October	29	2,982		31	5,919	611	8,901
2013	November	28	2,801	619	30	6,413	612	9,214
2013	December	31	3,020		31	6,385		9,405

APPENDIX A

NOVEMBER 8, 2013 LETTER FROM NATIONAL GRID TO ARISTA MOUSIS

(First Several Pages Only)

nationalgrid

William J. Ryan
Project Manager

November 8, 2013

Mrs. Aristea Mousis
58 North Clinton Avenue
Bay Shore, New York 11706

***Re*:** **Soil Vapor Intrusion Assessment**
58 North Clinton Avenue, Bay Shore, New York

Dear Mrs. Mousis:

We are providing this letter to summarize the results of the soil vapor intrusion assessment performed on October 9 and 10, 2013 at your property located at 58 North Clinton Avenue, Bay Shore, New York. Representatives of National Grid and their environmental consultant, GEI Consultants, Inc., P. C., conducted a pre-sampling property visit and interview with your son-in-law, Mr. Vincent Arena, and collected indoor and outdoor air samples, and a sub-slab soil vapor sample at your property. The sampling was conducted using a sampling procedure reviewed by the New York State Department of Environmental Conservation (NYSDEC) and the New York State Department of Health (NYSDOH).

This work was performed to evaluate the potential for any vapors from groundwater contamination associated with the Bay Shore/Brightwaters former MGP site to affect the indoor air quality at the property located at 58 North Clinton Avenue through a process known as vapor intrusion. Previous sampling events of the residence located at 58 North Clinton Avenue in April 2007 had indicated that the indoor air was not being impacted by soil vapor intrusion of MGP site-related chemicals.

The analytical results of the indoor and outdoor air samples, and the soil vapor sample collected on the property are provided in Table 1. The sample locations are shown on Figure 1 and Figure 2. The interview questionnaire (Off-site Property Sampling Questionnaire), product inventory, sample collection information forms, data usability summary report, and laboratory analysis Form 1s are provided in Attachment 1.

Based on the sampling conducted at the 58 North Clinton Avenue property, it does not appear that the indoor air at the property is being impacted by MGP site-related chemicals through soil vapor intrusion. NYSDEC and NYSDOH agreed with the findings of this assessment.

Volatile organic chemicals were detected in the indoor air at the property that are not related to the former MGP site. Attachment 2 includes a fact sheet prepared by NYSDOH regarding sources of chemicals in household products. The NYSDOH recommends that products containing volatile organic chemicals be kept in the original containers; that the containers be tightly capped and stored in places not frequently occupied by people. When using products containing VOCs, adequate ventilation should be provided.

If you have any questions regarding these results or the potential for any health effects, please contact Mr. Steve Karpinski of the NYSDOH at (518) 402-7880. Should you have any questions pertaining to the environmental remediation of the Bay Shore/Brightwaters former MGP site, please contact Mr. Richard Dana of the NYSDEC at (518) 402-9662.

If you have any questions for National Grid, or wish to discuss this matter further, please do not hesitate to contact me at (516) 545-2586. We thank you for your cooperation.

Sincerely,

for

William J. Ryan
Project Manager

Enclosures

cc: R. Dana (NYSDEC)
S. Karpinski (NYSDOH)
R. Milito (SCDHS)
A. Juchatz (SCDHS)

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Table

Table 1. 58 North Clinton Avenue
Indoor and Outdoor Air, and Soil Vapor
Analytical Results
National Grid Former Bay Shore MGP
Sampling Dates: 10/9-10/10/2013

			Indoor Air				Outdoor Air	Soil Vapor
		Sample Name / Sample Date	58 N. CLINTON - BSMT 10/10/2013	58 N. CLINTON - KITCHEN 10/10/2013	58 N. CLINTON - LR 10/10/2013	58 N. CLINTON - LR DUP 10/10/2013	58 N. CLINTON - OUTDOOR 10/10/2013	58 N. CLINTON - SS 10/10/2013
Analyte	Units	NYSDOH Background Outdoor Air Concentrations 25th - 95th Percentile Range[1]						
BTEX								
Benzene	ug/m^3	1.1 - 29	**0.256 J**	**0.259 J**	**0.246 J**	**0.268 J**	**0.217 J**	**53.7**
Toluene	ug/m^3	3.5 - 110	**1.73**	**1.06**	**1.04**	**0.984**	**0.577 J**	**4900**
Ethylbenzene	ug/m^3	0.4 - 13	**0.447 J**	**0.243 J**	0.869 U	0.869 U	0.869 U	**1030**
o-Xylene	ug/m^3	0.4 - 13	**2.56**	**0.921**	**0.786 J**	**0.712 J**	0.869 U	**8990**
m/p-Xylene	ug/m^3	0.5 - 21	**3.83**	**1.49 J**	**1.28 J**	**1.24 J**	1.74 U	**12300**
Other VOCs								
Acetaldehyde	ug/m^3	NE	**5.66**	**8.27**	**9.28**	**9.44**	**4.36 J**	45 UJ
Acetone	ug/m^3	9.9 - 140	**9.36**	**12.5**	**15.2**	**15.3**	**5.04**	**119**
Acrolein (propenal)	ug/m^3	NE	**0.991 J**	**0.681 J**	**0.828 J**	**0.773 J**	1.15 U	11.5 U
Allyl chloride (3-Chloropropene)	ug/m^3	NE	0.626 U	0.626 U	0.626 U	0.626 U	0.626 U	6.26 U
Benzothiophene (1-Benzothiophene)	ug/m^3	NE	2.74 U	2.74 U	2.74 U	2.74 U	2.74 U	27.4 U
Bromodichloromethane	ug/m^3	NE	1.34 U	1.34 U	1.34 U	1.34 U	1.34 U	13.4 U
Bromoform	ug/m^3	NE	2.07 U	2.07 U	2.07 U	2.07 U	2.07 U	20.7 U
Bromomethane	ug/m^3	0.25 - 0.9	0.777 U	0.777 U	0.777 U	0.777 U	0.777 U	7.77 U
1,3-Butadiene	ug/m^3	NE	0.442 U	0.442 U	0.442 U	0.442 U	0.442 U	4.42 U
Butane	ug/m^3	NE	**1.01**	**1.4**	**1.42**	**1.4**	**0.903**	**10.7**
t-Butyl alcohol (Tertiary Butyl Alcohol)	ug/m^3	NE	0.606 U	0.606 U	0.606 U	0.606 U	0.606 U	**1.88 J**
Carbon disulfide	ug/m^3	NE	0.623 U	**0.159 J**	**0.14 J**	**0.121 J**	0.623 U	**1.68 J**
Carbon tetrachloride	ug/m^3	0.25 - 1.1	**0.541 J**	**0.516 J**	**0.51 J**	**0.528 J**	**0.472 J**	12.6 U
Chlorobenzene	ug/m^3	0.25	0.921 U	0.921 U	0.921 U	0.921 U	0.921 U	9.21 U
Chloroethane	ug/m^3	0.25 - 0.6	0.528 U	0.528 U	0.528 U	0.528 U	0.528 U	5.28 U
Chloroform	ug/m^3	0.25 - 4.6	0.977 U	0.977 U	0.977 U	0.977 U	0.977 U	9.77 U
Chloromethane	ug/m^3	0.25 - 5.2	**0.958**	**1.03**	**1.28**	**1.19**	**1.08**	4.13 U
2-Chlorotoluene (o-Chlorotoluene)	ug/m^3	NE	1.04 U	1.04 U	1.04 U	1.04 U	1.04 U	10.4 U
Cryofluorane (Freon-114)	ug/m^3	0.25 - 1.2	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	14 U
Cyclohexane	ug/m^3	0.25 - 19	0.688 U	0.688 U	0.688 U	0.688 U	0.688 U	**2.48 J**

Table 1. 58 North Clinton Avenue
Indoor and Outdoor Air, and Soil Vapor
Analytical Results
National Grid Former Bay Shore MGP
Sampling Dates: 10/9-10/10/2013

			Indoor Air				Outdoor Air	Soil Vapor
		Sample Name / Sample Date	58 N. CLINTON - BSMT 10/10/2013	58 N. CLINTON - KITCHEN 10/10/2013	58 N. CLINTON - LR 10/10/2013	58 N. CLINTON - LR DUP 10/10/2013	58 N. CLINTON - OUTDOOR 10/10/2013	50 N. CLINTON - SS 10/10/2013
Analyte	**Units**	**NYSDOH Background Outdoor Air Concentrations 25th - 95th Percentile Range[1]**						
n-Decane	ug/m^3	1.2 - 31	**0.838 J**	**0.367 J**	**0.419 J**	**0.407 J**	1.16 U	**356**
Dibromochloromethane	ug/m^3	NE	1.7 U	1.7 U	1.7 U	1.7 U	1.7 U	17 U
1,2-Dibromoethane (EDB)	ug/m^3	0.25	1.54 U	1.54 U	1.54 U	1.54 U	1.54 U	15.4 U
1,2-Dichlorobenzene	ug/m^3	0.25 - 1	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U	12 U
1,3-Dichlorobenzene	ug/m^3	0.25 - 0.9	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U	12 U
1,4-Dichlorobenzene	ug/m^3	0.25 - 2.6	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U	12 U
Dichlorodifluoromethane (Freon 12)	ug/m^3	0.25 - 26	**2.42**	**2.29**	**2.68**	**2.73**	**2.5**	**2.62 J**
1,1-Dichloroethane	ug/m^3	0.25	0.809 U	0.809 U	0.809 U	0.809 U	0.809 U	8.09 U
1,2-Dichloroethane	ug/m^3	0.25	0.809 U	0.809 U	0.809 U	0.809 U	0.809 U	8.09 U
1,1-Dichloroethene	ug/m^3	0.25 - 0.7	0.793 U	0.793 U	0.793 U	0.793 U	0.793 U	7.93 U
cis-1,2-Dichloroethene	ug/m^3	0.25 - 1.2	0.793 U	0.793 U	0.793 U	0.793 U	0.793 U	7.93 U
trans-1,2-Dichloroethene	ug/m^3	NE	0.793 U	0.793 U	0.793 U	0.793 U	0.793 U	7.93 U
1,2-Dichloropropane	ug/m^3	0.25	0.924 U	0.924 U	0.924 U	0.924 U	0.924 U	9.24 U
cis-1,3-Dichloropropene	ug/m^3	0.25	0.908 U	0.908 U	0.908 U	0.908 U	0.908 U	9.08 U
trans-1,3-Dichloropropene	ug/m^3	0.25	0.908 U	0.908 U	0.908 U	0.908 U	0.908 U	9.08 U
1,4-Dioxane	ug/m^3	NE	0.721 U	0.721 U	0.721 U	0.721 U	0.721 U	7.21 U
n-Dodecane	ug/m^3	0.4 - 19	**2.09**	**0.864 J**	**0.808 J**	**0.787 J**	1.39 U	**613**
Ethanol	ug/m^3	27 - 3000	**22**	**79.9**	**80.8**	**78.8**	**3.05**	18.8 U
2-Ethylthiophene	ug/m^3	NE	0.918 U	0.918 U	0.918 U	0.918 U	0.918 U	9.18 U
4-Ethyltoluene (p-Ethyltoluene)	ug/m^3	NE	**0.531 J**	0.983 U	0.983 U	0.983 U	0.983 U	**1160**
n-Heptane	ug/m^3	1 - 33	0.82 U	**0.242 J**	0.82 U	0.82 U	0.82 U	**14.3**
Hexachlorobutadiene	ug/m^3	0.25 - 11	2.13 U	2.13 U	2.13 U	2.13 U	2.13 U	21.3 U
n-Hexane	ug/m^3	0.6 - 35	**0.211 J**	**0.229 J**	**0.194 J**	**0.219 J**	**0.388 J**	7.05 U
2-Hexanone	ug/m^3	NE	0.82 U	0.82 U	0.82 U	0.82 U	0.82 U	8.2 U
Indane	ug/m^3	NE	0.967 UJ	0.967 UJ	0.967 UJ	0.967 UJ	0.967 UJ	**682 J**
Indene	ug/m^3	NE	**0.737 J**	0.951 UJ	0.951 UJ	0.951 UJ	0.951 UJ	**1840 J**

Table 1. 58 North Clinton Avenue
Indoor and Outdoor Air, and Soil Vapor
Analytical Results
National Grid Former Bay Shore MGP
Sampling Dates: 10/9-10/10/2013

			Indoor Air				Outdoor Air	Soil Vapor
		Sample Name / Sample Date	58 N. CLINTON - BSMT 10/10/2013	58 N. CLINTON - KITCHEN 10/10/2013	58 N. CLINTON - LR 10/10/2013	58 N. CLINTON - LR DUP 10/10/2013	58 N. CLINTON - OUTDOOR 10/10/2013	58 N. CLINTON - SS 10/10/2013
Analyte	Units	NYSDOH Background Outdoor Air Concentrations 25th - 95th Percentile Range[1]						
Methyl ethyl ketone (2-Butanone)	ug/m³	1.4 - 39	**0.646**	**0.549 J**	**0.631**	**0.731**	**0.487 J**	**18.4**
Methyl tert-butyl ether (MTBE)	ug/m³	0.25 - 71	0.721 U	0.721 U	0.721 U	0.721 U	0.721 U	7.21 U
4-Methyl-2-pentanone (MIBK)	ug/m³	0.25 - 5.3	0.82 U	0.82 U	0.82 U	0.82 U	0.82 U	8.2 U
Methylene chloride	ug/m³	0.3 - 45	**1.96 J**	**1.38 J**	**1.43 J**	**1.44 J**	**1.26 J**	34.7 U
1-Methylnaphthalene	ug/m³	NE	**1.63 J**	5.82 UJ	5.82 UJ	5.82 UJ	5.82 UJ	**692 J**
2-Methylnaphthalene	ug/m³	NE	**4.97 J**	5.82 U	5.82 U	5.82 U	5.82 U	**2300**
2-Methylthiophene	ug/m³	NE	0.803 U	0.803 U	0.803 U	0.803 U	0.803 U	**6.62 J**
3-Methylthiophene	ug/m³	NE	0.803 U	0.803 U	0.803 U	0.803 U	0.803 U	**11.2**
Naphthalene	ug/m³	<2 - 12	**3.62**	**1.16**	**0.944 J**	**0.881 J**	1.05 U	**2040**
n-Nonane	ug/m³	0.4 - 13	**0.42 J**	1.05 U	1.05 U	1.05 U	1.05 U	**238**
n-Octane	ug/m³	0.3 - 5.5	0.934 U	0.934 U	0.934 U	0.934 U	0.934 U	**79.4**
Pentane	ug/m³	NE	**0.652**	**0.688**	**0.779**	**0.767**	**0.664**	**2.57 J**
2-Propanol (Isopropyl Alcohol)	ug/m³	NE	**1.86**	**2.18**	**2.46**	**2.4**	**0.425 J**	**1.92 J**
Styrene	ug/m³	0.25 - 2.3	0.852 U	0.852 U	0.852 U	0.852 U	0.852 U	**720**
1,1,2,2-Tetrachloroethane	ug/m³	0.25	1.37 U	1.37 U	1.37 U	1.37 U	1.37 U	13.7 U
Tetrachloroethene (PCE)	ug/m³	0.25 - 4.1	**0.549 J**	1.36 U	1.36 U	1.36 U	1.36 U	13.6 U
1,2,4,5-Tetramethylbenzene	ug/m³	NE	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	**90.6**
Thiophene	ug/m³	NE	0.688 U	0.688 U	0.688 U	0.688 U	0.688 U	6.88 U
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon-113)	ug/m³	0.25 - 3.4	**0.552 J**	**0.506 J**	**0.644 J**	**0.583 J**	**0.498 J**	15.3 U
1,2,4-Trichlorobenzene	ug/m³	0.25 - 6.3	1.48 U	1.48 U	1.48 U	1.48 U	1.48 U	14.8 U
1,1,1-Trichloroethane	ug/m³	0.25 - 6.9	1.09 U	1.09 U	1.09 U	1.09 U	1.09 U	10.9 U
1,1,2-Trichloroethane	ug/m³	0.25	1.09 U	1.09 U	1.09 U	1.09 U	1.09 U	10.9 U
Trichloroethene (TCE)	ug/m³	0.25 - 0.8	1.07 U	1.07 U	1.07 U	1.07 U	1.07 U	10.7 U
Trichlorofluoromethane (Freon 11)	ug/m³	1.1 - 30	**1.51**	**1.42**	**1.67**	**1.7**	**1.39**	11.2 U

Table 1. 58 North Clinton Avenue
Indoor and Outdoor Air, and Soil Vapor
Analytical Results
National Grid Former Bay Shore MGP
Sampling Dates: 10/9-10/10/2013

			Indoor Air				Outdoor Air	Soil Vapor
		Sample Name Sample Date	58 N. CLINTON - BSMT 10/10/2013	58 N. CLINTON - KITCHEN 10/10/2013	58 N. CLINTON - LR 10/10/2013	58 N. CLINTON - LR DUP 10/10/2013	58 N. CLINTON - OUTDOOR 10/10/2013	58 N. CLINTON - SS 10/10/2013
Analyte	Units	NYSOOH Background Outdoor Air Concentrations 25th - 95th Percentile Range[1]						
1,2,3-Trimethylbenzene	ug/m^3	0.25 - 5	**0.742 J**	0.983 UJ	0.983 UJ	0.983 UJ	0.983 UJ	**959 J**
1,2,4-Trimethylbenzene	ug/m^3	0.7 - 18	**2.08**	**0.777 J**	**0.659 J**	**0.674 J**	0.983 U	**2430**
1,3,5-Trimethylbenzene	ug/m^3	0.3 - 6.5	**1.05**	**0.364 J**	**0.324 J**	0.983 U	0.983 U	**1840**
2,2,4-Trimethylpentane (iso-Octane)	ug/m^3	0.25 - 14	0.934 U	0.934 U	0.934 U	0.934 U	0.934 U	9.34 U
n-Undecane	ug/m^3	0.6 - 20	**1.19 J**	**0.543 J**	**0.435 J**	**0.447 J**	1.28 U	**419**
Vinyl bromide (Bromoethene)	ug/m^3	NE	0.874 U	0.874 U	0.874 U	0.874 U	0.874 U	8.74 U
Vinyl chloride	ug/m^3	0.25	0.511 U	0.511 U	0.511 U	0.511 U	0.511 U	5.11 U
Other								
Helium	%	NE						**0.043**

Table 1. 58 North Clinton Avenue
Indoor and Outdoor Air and Soil Vapor
Analytical Results
National Grid Former Bay Shore MGP Site
Sampling Oate: 10/9-10/10/2013

Notes:

ug/m^3 - micrograms per cubic meter

BTEX - benzene, toluene, ethylbenzene, and xylenes
VOCs - volatile organic compounds

[1] Source: NYSOOH, October 2006. Summary of Indoor and Outdoor Levels of Volatile Organic Compounds from Fuel Oil Heated Homes reported in various locations within sampled homes in NYS, 1997-2003 as presented in Table C1. Background values for naphthalene are from the NYSDOH 1997 Control Home Database as presented in Table C3 of the NYSOOH 2006 Guidance.

NE - not established

Bolding indicates a detected result concentration
Shading and bolding indicates that the detected concentration is above the NYSDOH guidance it was compared to

Validation Qualifiers:

J - estimated value
U - indicates not detected to the reporting limit
UJ - not detected at or above the reporting limit shown and the reporting limit is estimated

Sample Designations:

58 N. CLINTON - KITCHEN : Indoor air sample collected from the kitchen of the residence at 58 N. Clinton Ave.
58 N. CLINTON - BSMT: Indoor air sample collected from the basement of the residence at 58 N. Clinton Ave.
58 N. CLINTON - LR: Indoor air sample collected from the living room of the residence at 58 N. Clinton Ave.
58 N. CLINTON - LR Dup: Ouplicate indoor air sample collected from the living room of the residence at 58 N. Clinton Ave.
58 N. CLINTON - Outdoor: Ambient air sample collected outside the residence at 58 N. Clinton Ave.
58 N. CLINTON - SS: Soil vapor sample collected through an impervious surface (cement) inside basement of the residence at 58 N. Clinton Ave.