Multi-Agency Former Wolff Alport Chemical Company Neighborhood Radiological Assessment

July 29-August 5, 2013

Conducted by:

New York State Department of Health
New York City Department of Health and Mental Hygiene
United States Environmental Protection Agency

Final Report
March 12, 2014

Background

The Former Wolff Alport Chemical Company (FWACC) processed imported monazite sand to extract rare earth elements from 1940 until 1954. Waste by-products of this process include thorium and to a lesser degree uranium, both naturally-occurring radioactive elements. The chemical processes created these tailings and also liquid radioactive wastes. As a result of activities at the site, the site now has known levels of contamination. As a result of these activities, the site and nearby streets are contaminated underground and various locations exhibit measurable gamma exposure rates.

In November 2012, the EPA notified New York State and New York City of its intention to nominate the FWACC site to the Federal Superfund National Priorities List (NPL) based on measurements of low-levels of thoron gas at the site proper. USEPA has been conducting an Interim Removal Action (IRM) to reduce known gamma levels on the on-site properties.

Staff from the New York State Department of Health (NYSDOH), New York City Department of Health and Mental Hygiene (NYCDOHMH), and the United States Environmental Protection Agency (USEPA) (the agencies), agreed to perform an assessment to collect environmental radiation data in order to be able to answer anticipated questions from site workers and the neighboring community once the proposal to list the site is announced.

The agencies conducted the site assessment on July 29 - August 5, 2013, following a sampling plan that was developed and agreed upon by all the participating agencies. The site assessment was executed as follows:

- NYSDOH staff performed a gamma radiation walk over survey of the site proper and the surrounding 0.5 mile radius of the site. Results are presented in Table #1 and Figures 1, 2, 3, and 4.
- NYSDOH staff performed on-site and off-site soil samples. Results are presented in Figures 5a, 5b, and 5c.
- The USEPA's contractor collected on- and off-site thoron-220 gas measurements and provided in a draft report. Sampling locations are presented in Figures 6 & 7.
- NYCDOHMH staff performed gamma surveys using a vehicle equipped with a mobile detection system (MDS), and drove through the streets in the area (within half a mile). Their results are documented in the attached radiation survey map, which includes GPS coordinates (see Figures 8, 9, 10, 11). Results that support the measurements are presented in Table 2.

The results of the assessment are presented below.

Walk-over Gamma Surveys

NYSDOH conducted walk-over surveys using a Victoreen 451-P Pressurized Ion Chamber (PIC). The purpose of these surveys was to confirm earlier on-site gamma radiation measurements and to verify that there were no off-site elevated gamma radiation levels. All data was logged into the Rad Responder Application ("APP") through the use of a mobile device. A total of 250 gamma measurements were taken. The measurements were taken at three (3) feet and at ground level.

At one offsite location positioned on the sidewalk in front of 1103 Irving Avenue, a gamma radiation level was measured at 210 μR/hr on contact with the ground and 39 μR/hr at 3 feet. The affected area appears to be no larger than 1 square foot. Along Irving Avenue in front of the auto body shop, which is considered onsite, gamma radiation levels reached upwards of ~700 μR/hr at ground level and ~400 μR/hr at 3 feet. These locations are already known for elevated radiation levels. The remaining gamma radiation surveys within the 0.5 mile radius were all within background measurements, and ranged from 7-13 μR/hr. Individual results of the survey are presented in Table 1. Locations with readings greater than background are highlighted. Maps showing the gamma radiation levels are presented in Figures 1, 2, 3, and 4.

The readings recorded in Table 1 entitled "Gamma Radiation Surveys" were recorded at street corners as indicated in Figures 1 to 4. Readings were continuous between street corners but unless a significantly higher value was obtained (as in front of 1103 Irving Avenue), it was not recorded in the Figures. Street corner values are representative of the readings along the nearby sidewalks.

Radionuclide Analysis of Soil

As part of the IRM, USEPA's contractor laid crushed stone over the entire railroad spur area behind the buildings. This provided shielding from gamma radiation and easier access to the site. A section of the railroad spur was not backfilled with the crushed stone and native soils were visible. One (1) soil sample was taken on-site in this area (Figure 5a). The gamma radiation level in this area was 38 μR/hr at ground level. Two (2) background soil samples were taken, one within the 0.5 mile radius of the FWACC proper and one at nearby Highland Park (Figures 5b and 5c). The samples were analyzed via gamma spectroscopy (EPA Method 901.1)

Results from the soil sample collected at the site indicate elevated levels of thorium-232 (approximately by a factor or 8), radium-224 and radium-226 (approximately by a factor of 1.5). All other radionuclides from this sample are within normal background concentrations. All of the results from the two background locations samples are within normal background concentrations. For example, a background of 0.6 pCi/g of radium-226 in U.S. soil has been quoted in the literature for Th-232 and Ra-226 comparisons with background (see NCRP Report No. 77, p.22). All other radionuclides are within normal background concentrations.

Thoron in Air Measurements

The thoron (radon-220) gas measurements were performed by Weston Inc., a contactor of the USEPA. The Durridge RAD7 electronic radon/thoron detector with real-time monitoring and spectral analysis was used in the thoron sampling. The RAD7 is a sniffer that uses the 3-minute alpha decay of a radon daughter, without interference from other radiations, and the instantaneous alpha decay of a thoron daughter to determine radon and thoron concentrations. The thoron measurements consisted of 4-hour air samples on the sidewalk at the pre-determined locations. These locations are shown in Table 1.

Initial sampling locations were exclusively over concrete sidewalks. No special attention was paid to the condition of these surfaces. Cracks and seams were not necessarily avoided or sought out. Beginning Wednesday, July 31, 2013, sampling locations included tree-skirts and exposed surfaces beneath sidewalks.

Raw sampling results were downloaded to Weston computers and analyzed and modified using CAPTURE software version 4.8.8. The raw radon and thoron air concentration data was modified by this software to account for humidity, total measurement time at each location and spectrometric count spillovers between alpha energy windows.

Background sampling locations for this project were required to be farther than 0.25 miles from the site boundaries. This distance was chosen as it is the radius used by the USEPA to calculate the number of persons potentially exposed to elevated concentrations of thoron gas. (An estimate of the size of the exposed population is needed to perform the Hazard Ranking for potential inclusion of the site on the NPL). The six background sampling locations were generally located 0.5 miles from the Site boundaries. All sampling locations are shown in Figures 6 & 7.

According to the radon/thoron survey information and results provided by Weston Inc., the highest thoron-220 average concentration from a single location was 0.303 ± 0.25 pCi/L at Location #24. According to data reported by the United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR, p.203) (2006), thoron concentrations in uncontaminated or non-impacted areas have been known to vary by an order of magnitude, from 0.02 pCi/L to 2.7 pCi/L. An average outdoor thoron concentration in New Jersey, USA, was 0.4 pCi/L.

Mobile Detection System – NYCDOHMH

The purpose of this mobile detector survey was to seek out radiation emanating from beneath streets (or nearby structures) that may be due to thorium transported from the FWACC site. The survey was not intended to quantify above-street exposure rates or to estimate the amounts of thorium that may be causing the radiation exposures. The equipment used in this survey provides a relative reading above natural background radiation levels that can be used to determine if locality specific radiation levels exceed background.

The Thermo, Inc., Mobile Detection System (MDS) was mounted in the rear stowage compartment of a NYCDOHMH vehicle. The detector distance-to-street level is about 3 feet. The two detectors are a 5 liter plastic scintillation uncompensated gamma-detector capable of low-level detection and an energy-independent FH40G survey meter for high-level detection (up to 100 R/hr).

A laptop computer running MapTrack software with a Global Positioning Satellite feed is able to record the gamma-ray readings of both instruments and assign the data to specific geographic locations. The mapped data can then be downloaded for graphical presentation with professional mapping software such as the GIS Mapping Tool.

The MDS acquires a data point once every second. The NYCDOHMH vehicle was driven at a slow speed of approximately 15 miles per hour so that numerous data points could be collected per street-block traversed. The data were collated and over-laid onto street maps that use color-coded legends to indicate the radiation exposure range measured. Approximately 16,000 data points were collected over the course of three days of mobile sampling.

The plastic scintillator can be used to quickly detect small differences in the gamma-ray emission rate, but the device is not calibrated to provide true μR/h in air readings. The FH40G survey meter is less sensitive but does yield more accurate, energy independent exposure rate readings inside the vehicle; that is, within the quasi-shielded environment of the vehicle (the vehicle shields the detectors to some extent but that effect has not been quantified).

Background radiation measurements were obtained by parking the MDS for a minimum of 4 minutes on the streets near the six background locations used by the USEPA to obtain background thoron (radon-220) measurements (designated B1 to B6) in the sampling plan (Table 2). To create the four survey maps, all the plastic scintillator data were normalized by the mean of the measurements obtained at the background locations. This approach will directly illustrate any changes in the readings relative to these baseline data. The FH40G measurements were also recorded at these locations to estimate the absolute values of exposure rate (μR/h). If the gamma-readings at these "EPA background sites" had been very high (indicative of technological enhancement), the measurements would not be used to establish the background baseline. Other background sites would have been chosen and EPA informed of the above-normal readings. This proved to be unnecessary because the six locations were typical of natural background readings.

An overall area survey map (Figure 8) was produced to show that the streets surveyed cover the 0.5 mile radius selected for this project. A legend showing three exposure rate ranges is included. Figures 9, 10, and 11 are higher resolution maps with views that allow street names to be read more easily.

Tables 3 and 4 show the maximum, minimum, median and mean readings obtained using the relative-to-background data from all locations including over Irving Avenue in front of the FWACC.

Discussion

Table 2 indicates that the estimates of terrestrial background, as measured by the relatively insensitive FH40G (in μR/h), are reasonable at the six background locations. A mean of approximately 10 μR/h is not atypical of natural background exposure rates. It should be noted that this value is an estimate. The MDS is computer-driven and configured to search out man-made contamination above natural background. It employs proprietary algorithms that cannot be disabled. Those algorithms influence the μR/h readout, making the results estimates of exposure rate rather than the pure exposure-rate readings one might achieve with a portable meter. The data from B1 to B6 are however not high, i.e., not > 15 or 20 μR/h, which could result in the rejection of them collectively or individually as "background" locations.

The relative-results data as illustrated in Figures 8 thru 11 indicate that the above-street gamma-ray readings do not appear to be enhanced by thorium that was removed from the FWACC property, except under Irving Avenue (and to a much lesser degree on a connecting portion of Moffat Street). The inclusion of the Irving Avenue data increases the standard deviation of the total measurements. However, the measurements over Irving Avenue are relatively few in number compared to the many street measurements taken elsewhere, so the effect does not skew the standard deviation excessively. The single standard deviations of the relative average readings in Tables 3 and 4 are about ±1 implying that typical values about twice the mean background are commonly encountered beyond the FWACC site. Since this variation is within that observed for natural background previously measured across regions of the United States and particularly on the east coast (see NCRP Report 94, pp. 75-78), it is an indication that these readings are partially due to natural radioactivity in the components of a typical urban environment, i.e., from concrete, bricks, and metal, and partially from naturally radioactive constituents of the underlying soil rather than from thorium transported off the FWACC site.

NYCDOHMH Data Analysis

The primary sources of error in the MDS measurements include those mentioned above: the 3 foot distance from the street and the shielding afforded from the vehicle that decreases detection of lower energy photons. The vehicle speed may affect the ability of the detectors to respond to radiation. A 10 to 15 mph speed was successfully maintained for these measurements.

Some streets outside the 0.5 mile radius mentioned in the interagency sampling plan have been included. Some were used to turn the vehicle around in order to accommodate the survey pathway. Some streets were surveyed more than once. This occurred when it was difficult to reach target streets due to one-way restrictions. This is shown as multiple lines over the same street, the variation being due to slight GPS displacement of the data points from multiple passes. Multiple passes will also affect the mean and median discussed in the tables. Streets with more data points (larger N) will affect the mean, the standard deviation and the median (Tables 2 and 3) more than other streets measured only once. The effect is not expected to be severe but these statistics should only be viewed as estimates. Repeat data was included to avoid manipulating the numbers and possibly introducing errors into the summarized data.

Table 3 indicates that the estimates of terrestrial background as measured by the relatively insensitive FH40G (in μR/h) are reasonable at the six EPA chosen background locations. Table 3 also indicates that 50% of the relative measurements were less than 0.86 of the mean background radiation exposure rate and 50% were greater. Given that the background radiation exposure rate varies from location to location naturally, it is not unexpected to encounter a few measurements that are somewhat higher or lower than others in and around the survey territory. If for example, we eliminate the lowest and highest values from the six background measurements, the new mean is 2.43 ± 0.58 (N=4). The minimum, maximum and median of the street survey data then become 0.56, 27.7 and 0.91 respectively. The relative mean compared to the N=6 background becomes 1.0 (Table 3). Table 3 and 4 results indicate that the majority of the measurements are near background. Including the data from Irving Avenue and a short portion of Moffat Street adjacent to the contaminated FWACC property does not affect this conclusion.

Conclusion of NYCDOHM MDS Survey

Both the data normalized to measurements obtained at background locations and these same data mapped onto the streets of the survey territory (in an area approximately 0.5 miles in radius around the FWACC site) imply that only the natural background radiation field is present, unenhanced by FWACC operations, with the one exception being on a short portion of Irving Avenue that parallels the FWACC site. A short length of Moffat Street connecting with Irving Avenue is also elevated, but much less so (both were already known to exist). Since thorium contamination was not detected by the MDS technique on the vast majority of the avenues and streets chosen for the NYCDOHMH survey, it appears that the contamination is confined to the area proximal to the FWACC property.

CONCLUSION OF RADIOLOGICAL ASSESSMENT PROJECT

The collaborative radiological data collection from the gamma walk over surveys, soil sampling, thoron (radon-220) measurements, and the Mobile Detector Surveys suggests there is no off-site exposure to the surrounding community from radiological contaminants located on-site at the Former Wolff Alport Chemical Company. The one small area of off-site contamination located below the curb at 1103 Irving Avenue does not provide a significant source of exposure.

Site Photos

Figures

Tables

Maps

Photo #1 - FWACC Proper on Railroad Spur

Photo #2 - USEPA Work Trailer

Photo #3 - Thoron sampling location – July 29th, 2013

Photo #4 - Thoron Sampling Location – July 31st, 2013

Photo #5 - Location and Measurement of Elevated Exposure Rate at 1103 Irving Avenue

Photo #6 - MDS with FH 40G and plastic scintillation (not visible) detector

Photo #7 - MDS mounted at the back of a NYCDOHMH vehicle

Figure #1

Gamma Radiation Survey Results

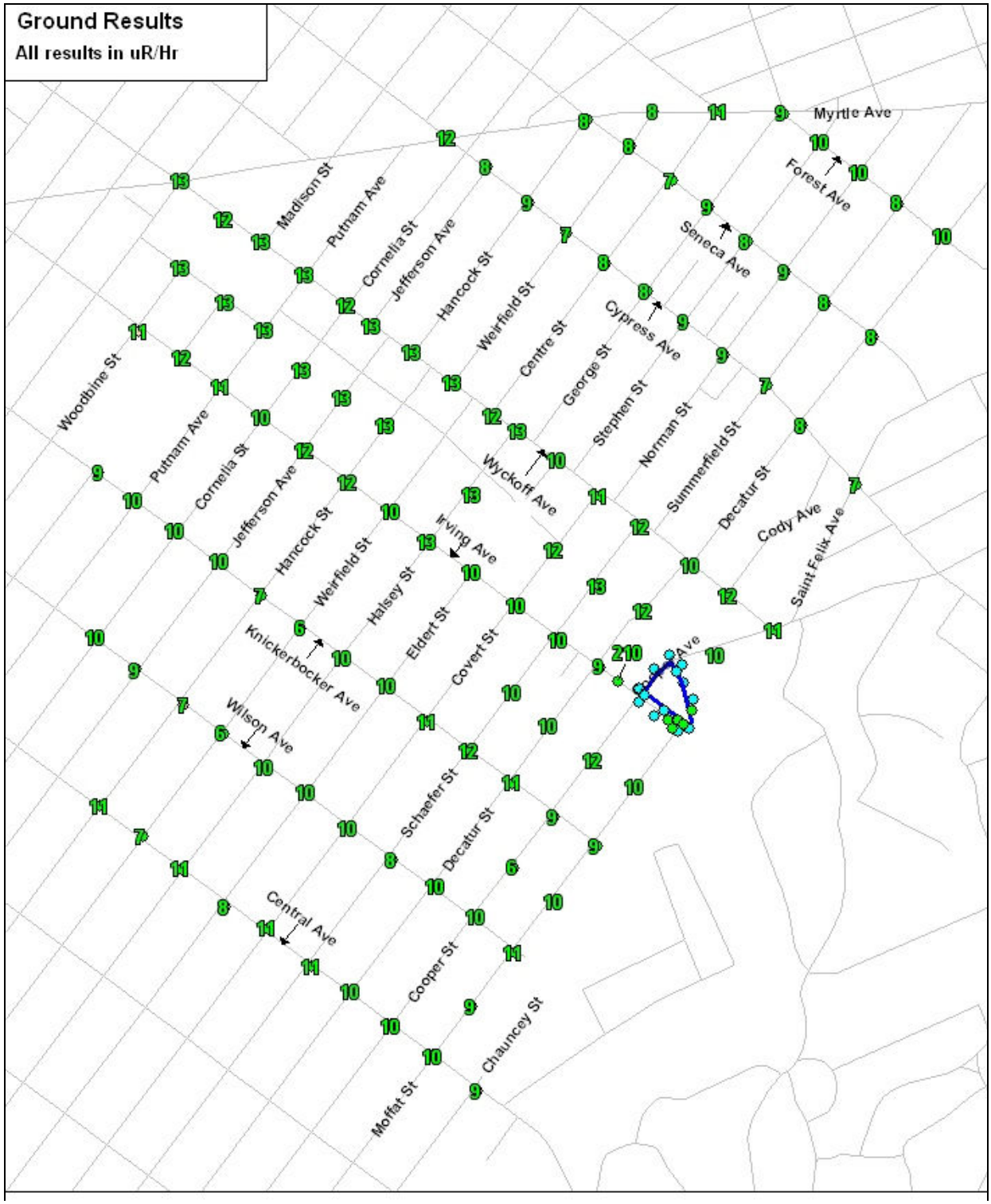

Figure #2

Gamma Radiation Survey Results

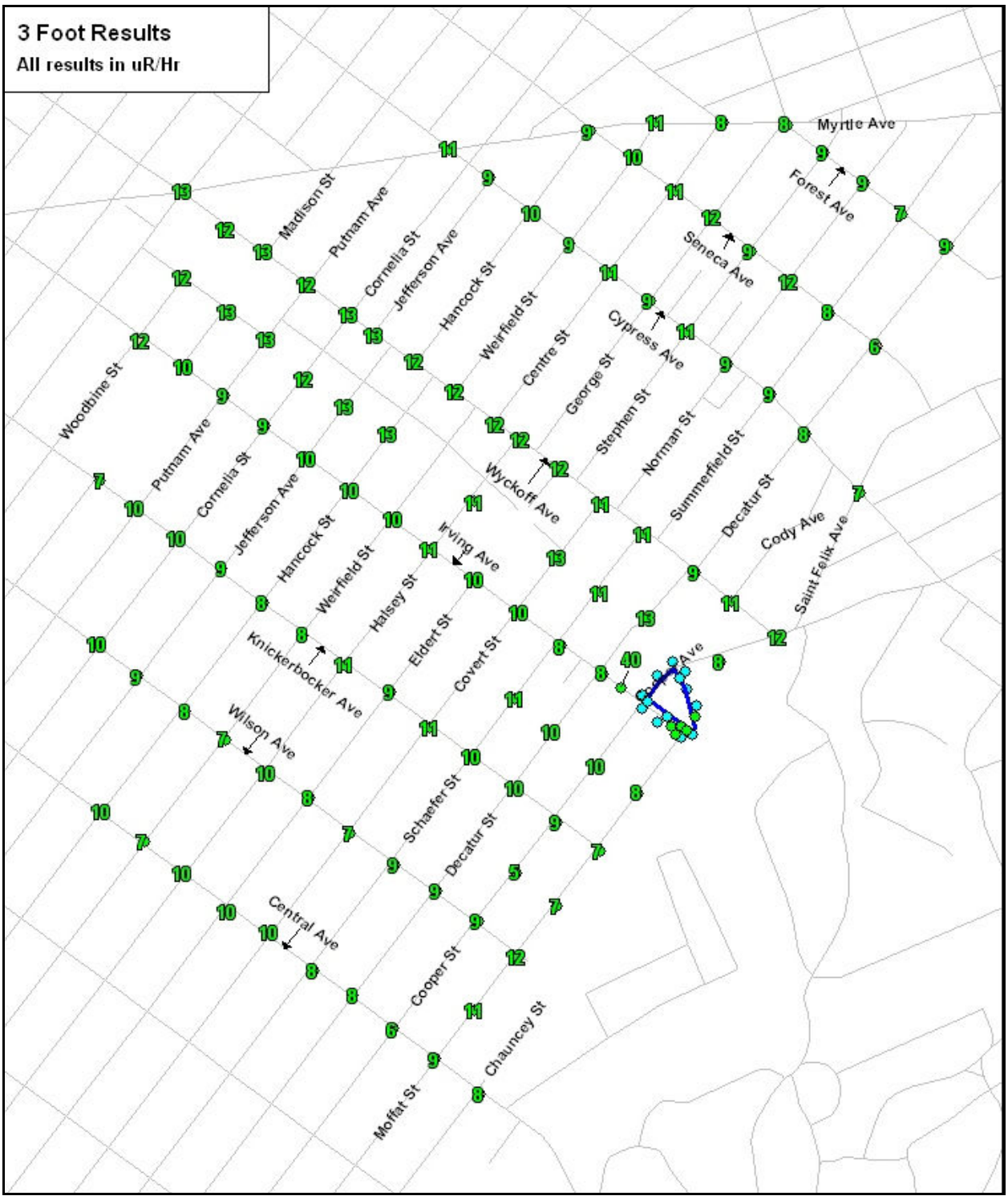

Figure #3

Gamma Radiation Survey Results

Figure #4

Gamma Radiation Survey Results

Figure #5a – Radionuclide Analysis of Soil FWACC Proper

New York State Department of Health

Wadsworth Center

PO Box 509, Albany, New York 12201-0509

Report No: **EHS1300023842-SR-1** Page 1 of 1

Report Date: **09/17/2013**

Report retrieved via NYSDOH Health Commerce System by cac04 on 09/19/2013

REQUESTED BY: DIRECTOR-CEHBERPCOMPLIANCE

DIRECTOR'S OFFICE
BUREAU OF ENVIRONMENTAL RADIATION PROTECTION (COMPLIANCE)
ROOM 1201
CORNING TOWER - EMPIRE STATE PLAZA
ALBANY NY 12237

Compliance Samples Radiation (BERP)

County: QUEENS
City (or) Town: QUEENS
Submitted by: NICKOLAS WEBSTER
Collected by: NICKOLAS WEBSTER

Grab / Composite Finish: 07/31/13 12:30
Date received: 08/08/13 09:00

Location/Project/Facility Name: RIDEGWOOD SOIL- FWACC #1
Sampling Location Details: FWACC PROPER NEAR IRVING AVE AND COOPER STREET

FINAL LABORATORY REPORT

Nuclear Chemistry Laboratory
NYS ELAP ID: 10762
Wadsworth Center, Empire State Plaza

LAB DIRECTOR: Dr. P. Parsons
CONTACT: Dr. M. Kitto 518-486-1476 or
CONTACT: Dr. T. Semkow 518-474-6071

Sample Id: EHS1300023842-01

Sample Type: Soil

Lab Tracking Id: 835113

Gamma Emitters EPA Method 901.1

Analysis Date: 9/16/2013

HPGe Preparation Date:	**8/29/2013**
HPGe Count Date:	**8/30/2013**
Uranium-238 (based on Th-234):	**7.E 2 +/- 5.E 2 pCi/kg**
Thorium-232 (based on Ac-228):	**7.7E 3 +/- 0.5E 3 pCi/kg**
Potassium-40:	**8.3E 3 +/- 0.5E 3 pCi/kg**
Cesium-137:	**2.5E 2 +/- 0.2E 2 pCi/kg**
Cobalt-60:	**< 5.E 0 pCi/kg**
Radium-226 (based on Bi-214):	**1.49E 3 +/- 0.10E 3 pCi/kg**
Uranium-235:	**< 9.E 1 pCi/kg**

Additional Parameters:

Analysis Date: 9/16/2013

Radium-224:	**7.2 E 3 +/- 0.4E 3 pCi/kg**

END OF REPORT

The Laboratory Director authorizes the release of this report. The results in this report relate only to the sample submitted to the laboratory.

Figure #5b – Radionuclide Analysis of Soil Background Location

New York State Department of Health

Wadsworth Center

PO Box 509, Albany, New York 12201-0509

Report No: **EHS1300023843-SR-1** Page 1 of 1

Report Date: **09/17/2013**

Report retrieved via NYSDOH Health Commerce System by eac04 on 09/19/2013

REQUESTED BY: DIRECTOR-CEHBERPCOMPLIANCE

DIRECTOR'S OFFICE
BUREAU OF ENVIRONMENTAL RADIATION PROTECTION (COMPLIANCE)
ROOM 1201
CORNING TOWER - EMPIRE STATE PLAZA
ALBANY NY 12237

Compliance Samples Radiation (BERP)

County: QUEENS
City (or) Town: QUEENS
Submitted by: NIKOLAS WEBSTER
Collected by: NIKOLAS WEBSTER

Grab / Composite Finish: 07/31/13 14:00
Date received: 08/08/13 09:00

Location/Project/Facility Name: RIDGEWOOD SOIL BKG - FWACC #2
Sampling Location Details: CENTRAL AVE AND PILLING ST

FINAL LABORATORY REPORT

Nuclear Chemistry Laboratory
NYS ELAP ID: 10762
Wadsworth Center, Empire State Plaza

LAB DIRECTOR: Dr. P. Parsons
CONTACT: Dr. M. Kitto 518-486-1476 or
CONTACT: Dr. T. Semkow 518-474-6071

Sample Id: EHS1300023843-01

Sample Type: Soil

Lab Tracking Id: 835114

Gamma Emitters EPA Method 901.1

Analysis Date: 9/16/2013

HPGe Preparation Date:	**8/29/2013**
HPGe Count Date:	**8/30/2013**
Uranium-238 (based on Th-234):	**< 3.E 2 pCi/kg**
Thorium-232 (based on Ac-228):	**8.7E 2 +/- 0.6E 2 pCi/kg**
Potassium-40:	**9.4E 3 +/- 0.6E 3 pCi/kg**
Cesium-137:	**9.E 1 +/- 0.8E 1 pCi/kg**
Cobalt-60:	**< 3.E 0 pCi/kg**
Radium-226 (based on Bi-214):	**5.5E 2 +/- 0.4E 2 pCi/kg**
Uranium-235:	**5.E 1 +/- 3.E 1 pCi/kg**

Additional Parameters:

Analysis Date: 9/16/2013

Radium-224:	**7.9E 2 +/- 0.5E 2 pCi/kg**

END OF REPORT

The Laboratory Director authorizes the release of this report. The results in this report relate only to the sample submitted to the laboratory.

Figure #5c – Radionuclide Analysis of Soil Background Location

New York State Department of Health

Wadsworth Center

PO Box 509, Albany, New York 12201-0509

Report No: **EHS1300023844-SR-1** Page 1 of 1

Report Date: **09/17/2013**

Report retrieved via NYSDOH Health Commerce System by cac04 on 09/19/2013

REQUESTED BY: DIRECTOR-CEHBERPCOMPLIANCE

DIRECTOR'S OFFICE
BUREAU OF ENVIRONMENTAL RADIATION PROTECTION (COMPLIANCE)
ROOM 1201
CORNING TOWER - EMPIRE STATE PLAZA
ALBANY NY 12237

Compliance Samples Radiation (BERP)

County: QUEENS
City (or) Town: QUEENS
Submitted by: NIKOLAS WEBSTER
Collected by: NIKOLAS WEBSTER

Grab / Composite Finish: 07/31/13 16:00
Date received: 08/08/13 09:00

Location/Project/Facility Name: RIDGEWOOD SOIL-BKG FWACC-#3
Sampling Location Details: HIGHLAND PARK ON VERMONT AVE

FINAL LABORATORY REPORT

Nuclear Chemistry Laboratory
NYS ELAP ID: 10762
Wadsworth Center, Empire State Plaza

LAB DIRECTOR: Dr. P. Parsons
CONTACT: Dr. M. Kitto 518-486-1476 or
CONTACT: Dr. T. Semkow 518-474-6071

Sample Id: EHS1300023844-01

Sample Type: Soil

Lab Tracking Id: 835115

Gamma Emitters EPA Method 901.1

Analysis Date: 9/16/2013

HPGe Preparation Date:	**8/29/2013**
HPGe Count Date:	**9/ 9/2013**
Uranium-238 (based on Th-234):	**7.E 2 +/- 4.E 2 pCi/kg**
Thorium-232 (based on Ac-228):	**8.7E 2 +/- 0.6E 2 pCi/kg**
Potassium-40:	**0.98E 4 +/- 0.06E 4 pCi/kg**
Cesium-137:	**2.61E 2 +/- 0.18E 2 pCi/kg**
Cobalt-60:	**< 3.E 0 pCi/kg**
Radium-226 (based on Bi-214):	**6.4E 2 +/- 0.4E 2 pCi/kg**
Uranium-235:	**< 3.E 1 pCi/kg**

Additional Parameters:

Analysis Date: 9/16/2013

Radium-224:	**7.7E 2 +/- 0.5E 2 pCi/kg**

END OF REPORT

The Laboratory Director authorizes the release of this report. The results in this report relate only to the sample submitted to the laboratory.

Figure #6 – Thoron Sampling Locations

Green Dots = Thoron Sample Locations
Pink Dot = Thoron Sample Locations – Background
Blue Dots = FWAC Proper Thoron Sample Locations
Blue Line = FWACC proper

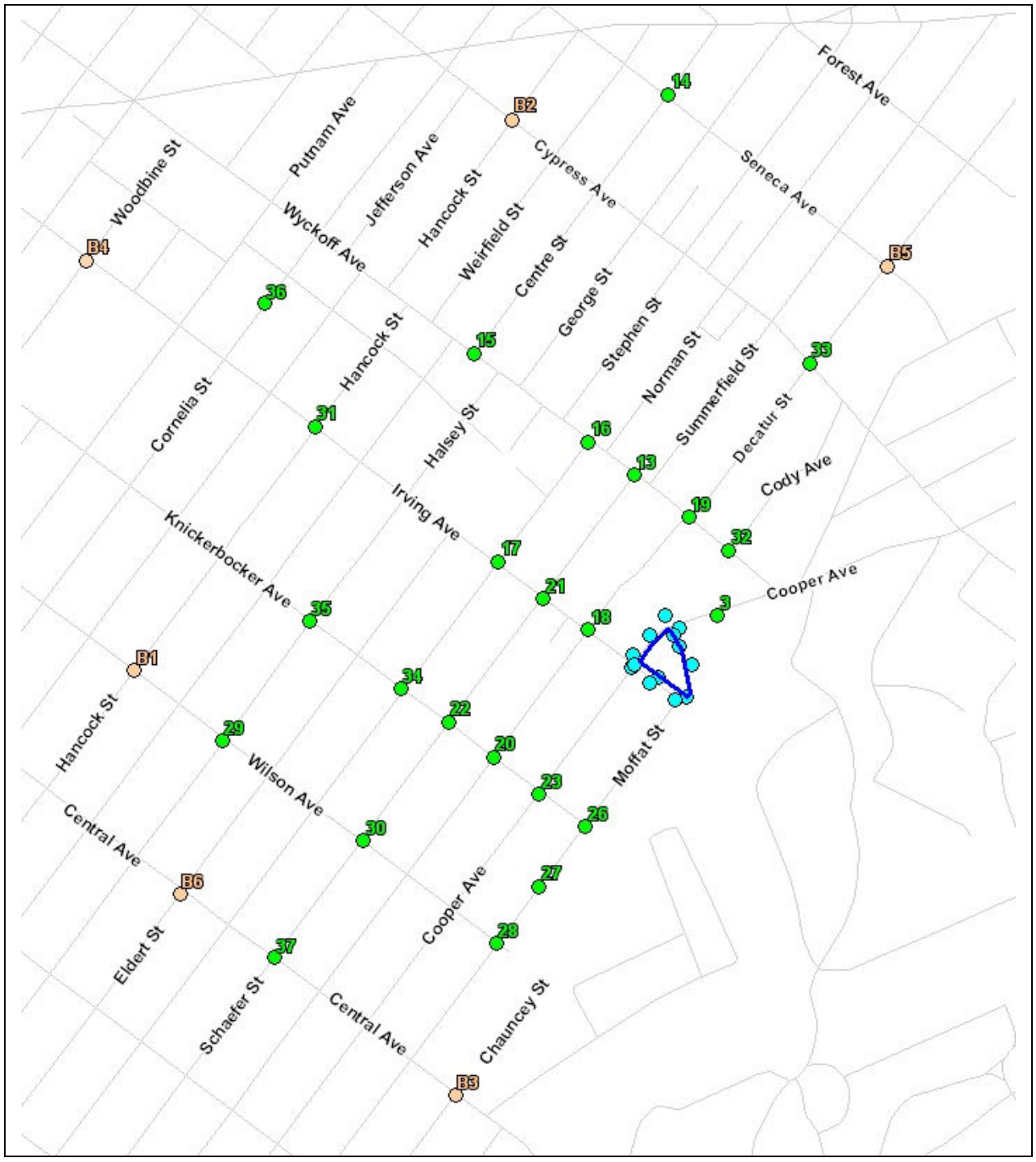

Figure #7 – Thoron Sampling Locations

Blue Dots = Thoron Sample Locations
Blue Line = FWACC proper

Figure #8

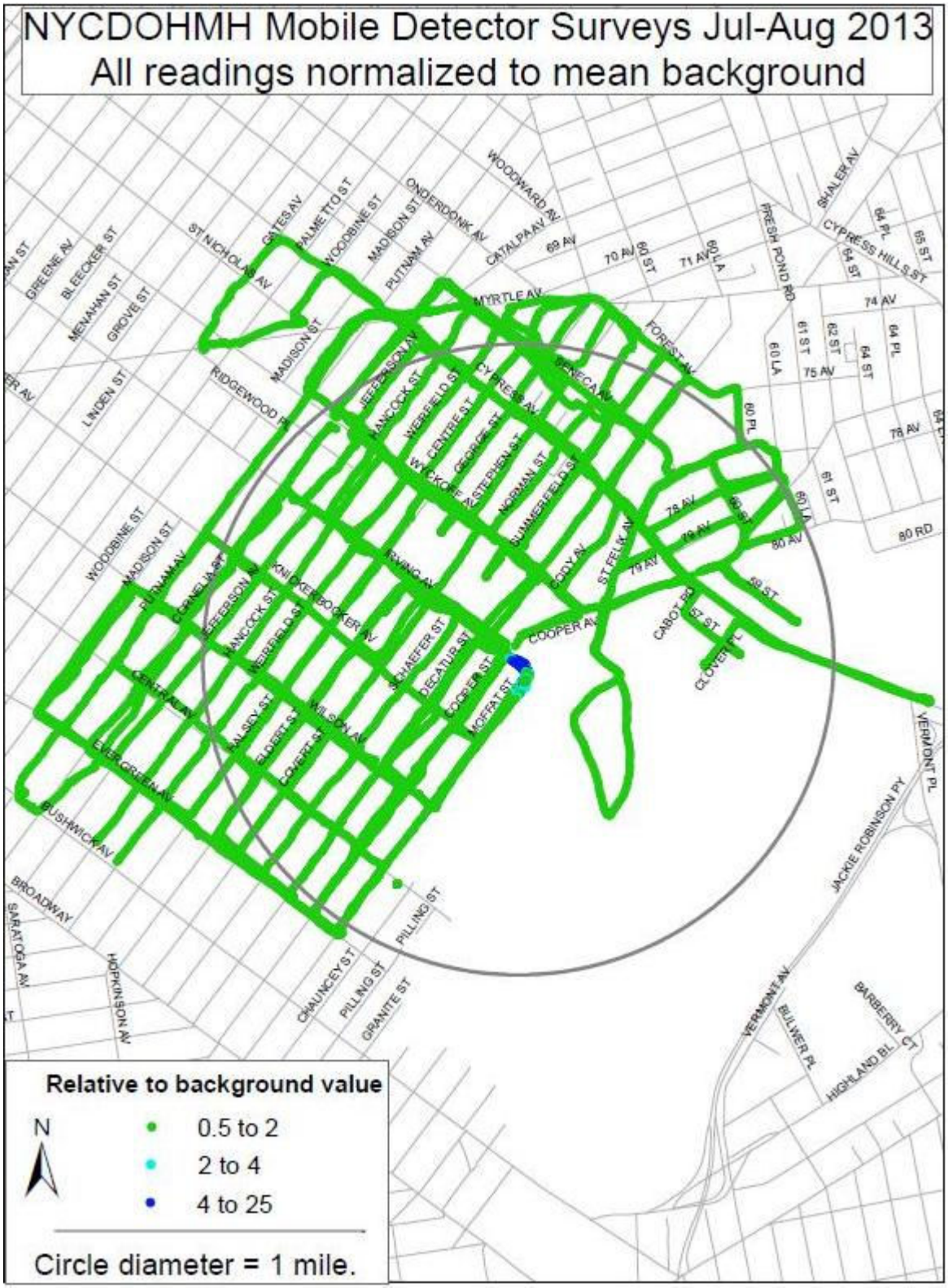
NYCDOHMH Mobile Detector Surveys Jul-Aug 2013
All readings normalized to mean background
Relative to background value
N
0.5 to 2
2 to 4
4 to 25
Circle diameter = 1 mile.

Figure #9


NYCDOHMH Mobile Detector Surveys Jul-Aug 2013
All readings normalized to mean background
Map 2
WOODBINE ST
MADISON ST
PUTNAM AV
CORNELIA ST
KNICKERBOCKER AV
IRVING AV
JEFFERSON AV
HANCOCK ST
WEIRFIELD ST
HALSEY ST
ELDERT ST
CENTRAL AV
WILSON AV
EVERGREEN AV
COVERT ST
SCHAEFER ST
DECATUR ST
BUSHWICK AV
COOPER ST
MOFFAT ST
BROADWAY
PILLING ST
CHAUNCEY ST
PILLING ST
GRANITE ST
Relative to background value
N
0.5 to 2
2 to 4
4 to 25

Figure #10

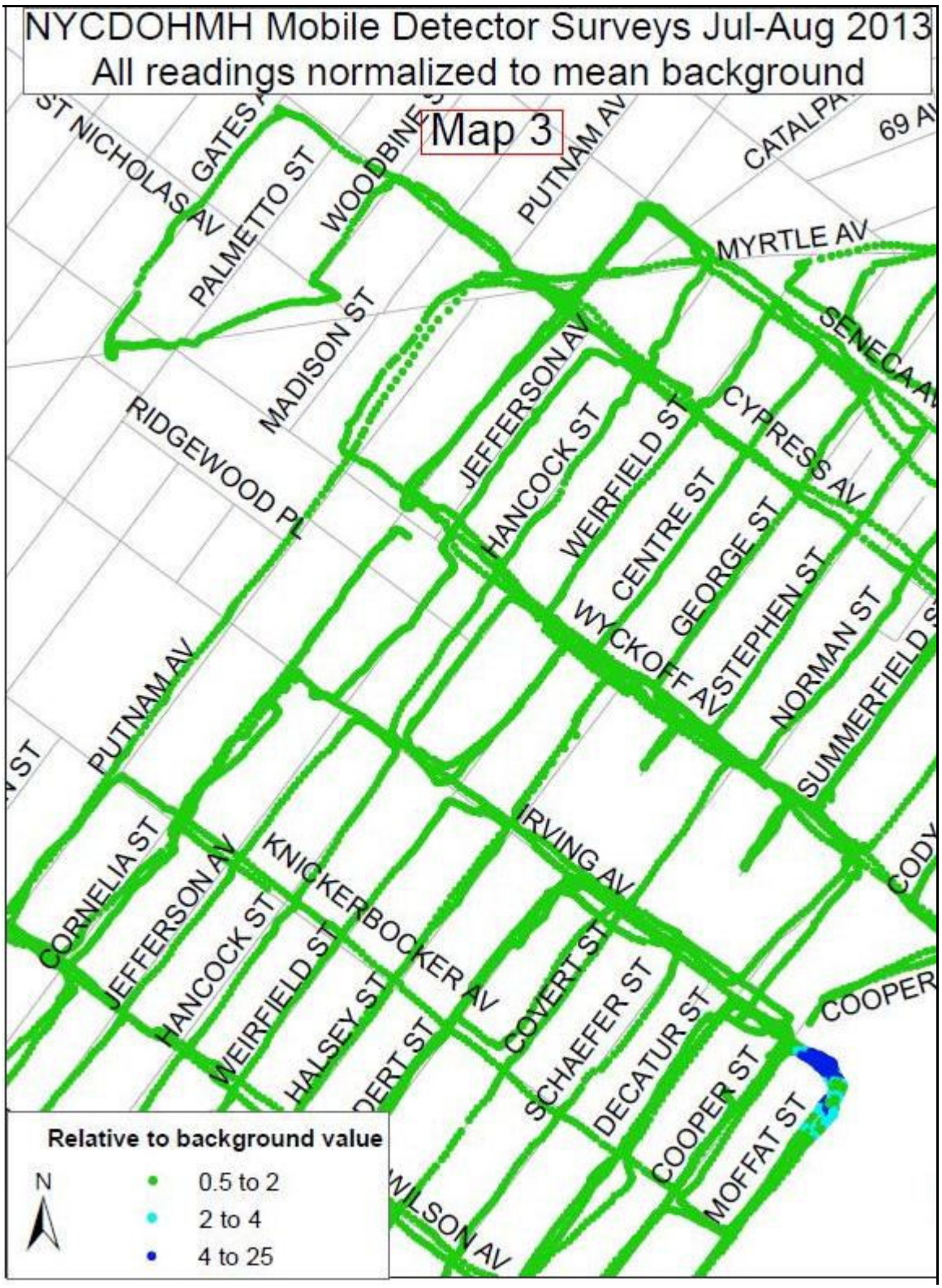
NYCDOHMH Mobile Detector Surveys Jul-Aug 2013
All readings normalized to mean background
Map 3
ST NICHOLAS AV
GATES A
PALMETTO ST
WOODBINE
PUTNAM AV
CATALPA
69 A
MYRTLE AV
SENECA A
MADISON ST
RIDGEWOOD P
JEFFERSON AV
HANCOCK ST
WEIRFIELD ST
CYPRESS AV
CENTRE ST
GEORGE ST
WYCKOFF
STEPHEN ST
NORMAN ST
SUMMERFIELD
PUTNAM AV
CORNELIA ST
JEFFERSON AV
HANCOCK ST
WEIRFIELD ST
KNICKERBOCKER AV
IRVING AV
HALSEY ST
COVERT ST
SCHAEFER ST
DECATUR ST
COOPER ST
MOFFAT ST
WILSON AV
Relative to background value
N
0.5 to 2
2 to 4
4 to 25

Figure #11

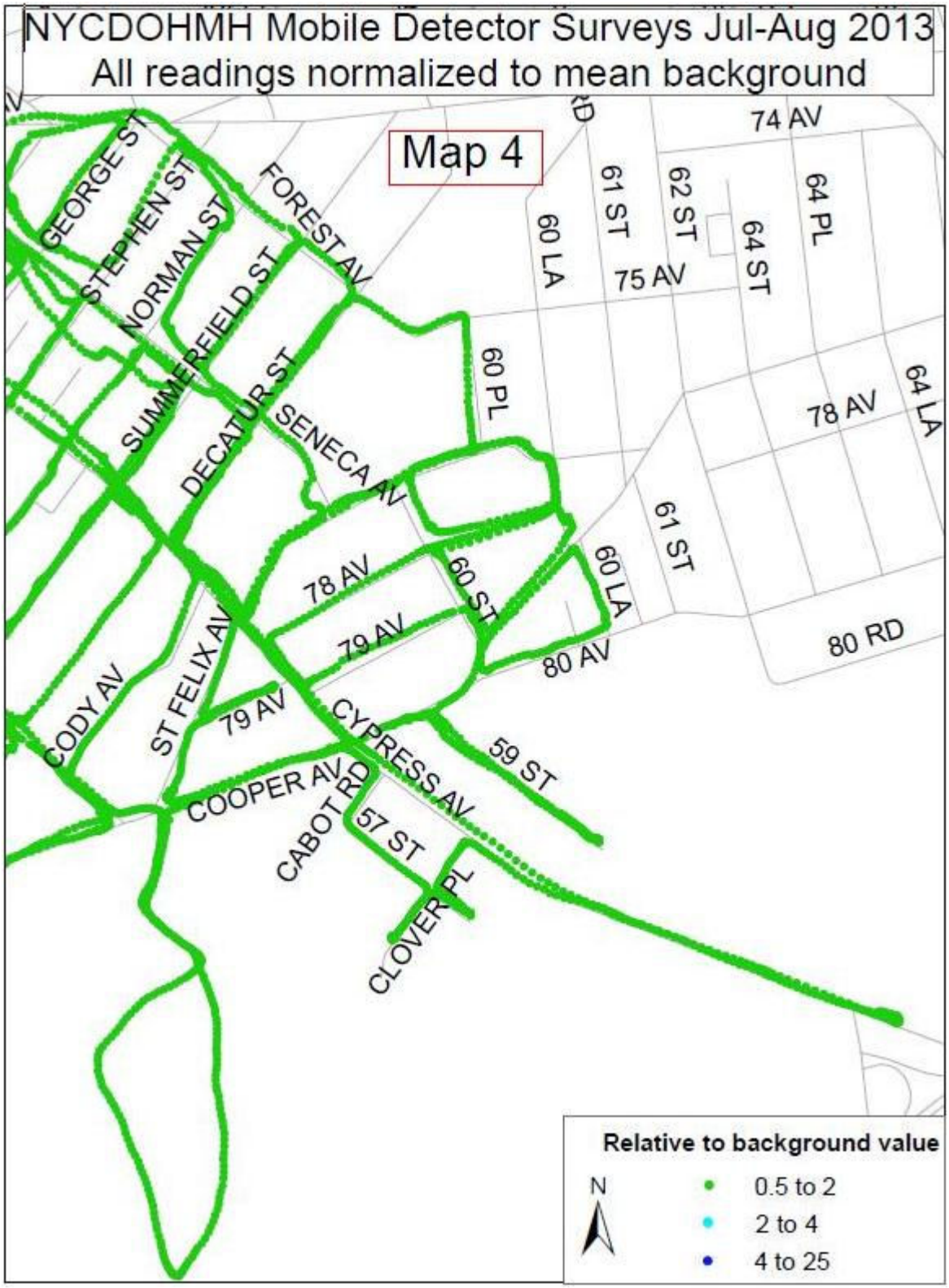
NYCDOHMH Mobile Detector Surveys Jul-Aug 2013
All readings normalized to mean background
Map 4
GEORGE ST
STEPHEN ST
NORMAN ST
FOREST AV
SUMMERFIELD ST
DECATUR ST
SENECA AV
60 PL
60 LA
61 ST
62 ST
64 ST
64 PL
74 AV
75 AV
78 AV
64 LA
61 ST
60 LA
60 ST
78 AV
79 AV
80 AV
80 RD
CODY AV
ST FELIX AV
79 AV
CYPRESS AV
59 ST
COOPER AV
CABOT RD
57 ST
CLOVER PL
Relative to background value
N
0.5 to 2
2 to 4
4 to 25

Table 1

NYSDOH Gamma Radiation Surveys
-Highlighted locations indicate above background levels

Label	Location Description	Ground (µR/hr)	3 feet (µR/hr)
1	WAC-BKG-01	7	8
2	WAC-BKG-04	30	8
3	WAC-BKG-05	10	8
4	WAC-BKG-06	8	11
5	WAC-PER-18	16	13
6	WAC-PER-07	11	12
7	WAC-SPUR-01	48	21
8	WAC-SPUR-02	15	12
9	WAC-IRV-10	750	470
10	WAC-IRV-31	94	111
11	Intersection of Cooper St and Irving Ave	10	9
12	Cooper St between WAC-BKG-06 and WAC-BKG-01	8	9
13	Schaefer St and Wyckoff Ave	12	11
14	IS 77 Sidewalk near Centre St and Seneca	7	11
15	Centre St and Wyckoff Ave	12	12
16	Covert St and Wyckoff Ave	11	11
17	Covert St and Irving Ave	10	10
18	Decatur St and Irving Ave	9	8
19	Decatur St and Wyckoff Ave	10	9
20	Decatur St and Knickerbocker Ave	11	10
21	Schaeffer St and Irving Ave	10	8
22	Schaeffer St and Knickerbocker Ave	12	10
23	Cooper St and Knickerbocker Ave	9	9
24	Cooper St and Irving Ave	10	8
25	Moffat St and Irving Ave	12	10
26	Moffat St and Knickerbocker Ave	9	7
27	Moffat St and between Knickerbocker Ave and Wilson	10	7
28	Moffat St and Wilson Ave	11	12
29	Wilson Ave and Halsey St	10	10
30	Wilson Ave and Schaefer St	8	9
31	Irving Ave and Hancock St	12	10
32	Cody Ave and Wyckoff Ave	12	11
33	Decatur St and Cypress Ave	8	8
34	Covert St and Knickerbocker Ave	11	11
35	Knickerbocker and Halsey	10	11
36	Between Irving and Wyckoff and Cornelia	13	12

Table 1

Label	Location Description	Ground (µR/hr)	3 feet (µR/hr)
37	Central and Schaefer	11	8
38	Moffat St between Knickerbocker and Wilson Ave	10	7
39	Moffat St between Wilson and Central	9	11
40	Central Ave and Moffat St	10	9
41	Central Ave and Cooper Ave	10	6
42	Central Ave and Decatur St	10	8
43	Central Ave and Covert St	11	10
44	Central Ave and Halsey	11	10
45	Central Ave and Weirfield St	7	7
46	Central Ave and Hancock St	11	10
47	Wilson Ave and Cornelia St	10	10
48	Wilson Ave and Jefferson Ave	9	9
49	Wilson Ave and Weirfield St	6	7
50	Wilson Ave and Eldert	10	8
51	Wilson Ave and Covert St	10	7
52	Wilson Ave and Decatur St	10	9
53	Wilson Ave and Cooper Ave	10	9
54	Cooper Ave between Wilson and Knickerbocker Ave	6	5
55	Knickerbocker Ave and Eldert St	10	9
56	Knickerbocker Ave and Weirfield	6	8
57	Knickerbocker Ave and Hancock St	7	8
58	Knickerbocker Ave and Jefferson Ave	10	9
59	Knickerbocker Ave and Cornelia St	10	10
60	Knickerbocker Ave and Putnam Ave	10	10
61	Knickerbocker Ave and Madison St	9	7
62	Irving Ave and Madison St	12	10
63	Irving Ave and Putnam Ave	11	9
64	Irving Ave and Cornelia St	10	9
65	Irving Ave and Jefferson Ave	12	10
66	Irving Ave and Weirfield St	10	10
67	Irving Ave and Halsey St	13	11
68	Irving Ave and Eldert St	10	10
69	Irving Ave - Between Cooper Ave and Decatur St	210	40
70	Cooper Ave between Irving and Knickerbocker Ave	12	10
71	Schaefer St between Knickerbocker Ave and Irving Ave	10	11
72	Decatur St between Knickerbocker Ave and Irving Ave	10	10
73	Decatur St between Irving Ave and Wyckoff Ave	12	13
74	Schaefer St between Irving Ave and Wyckoff Ave	13	11
75	Covert St between Irving Ave and Wyckoff Ave	12	13
76	Halsey St between Irving Ave and Wyckoff Ave	13	11
77	Hancock St between Irving Ave and Wyckoff Ave	13	13
78	Jefferson Ave between Irving and Wyckoff	13	13

Table 1

Label	Location Description	Ground (µR/hr)	3 feet (µR/hr)
79	Putnam St between Irving Ave and Wyckoff Ave	13	13
80	Ridgewood Place and Madison St	13	13
81	Ridgewood Place and Woodbine St	13	12
82	Wyckoff Ave and Myrtle St	13	13
83	Wyckoff Ave between Myrtle and Madison	12	12
84	Wyckoff Ave and Madison St	13	13
85	Wyckoff Ave and Putnam Ave	13	12
86	Wyckoff Ave and Cornelia St	12	13
87	Wyckoff Ave and Jefferson Ave	13	13
88	Wyckoff Ave and Hancock St	13	12
89	Wyckoff Ave and Weirfield St	13	12
90	Wyckoff Ave and Halsey St	13	12
91	Wyckoff Ave and Eldert St	10	12
92	Wyckoff Ave and Cooper Ave	11	12
93	Cypress Ave and St Felix Ave	7	7
94	Cypress Ave and Summerfield St	7	9
95	Cypress Ave and Norman St	9	9
96	Cypress and Stephen St	9	11
97	Cypress and George St	8	9
98	Cypress and Centre St	8	11
99	Cypress and Weirfield St	7	9
100	Cypress and Jefferson Ave	8	9
101	Cypress and Myrtle Ave	12	11
102	Seneca Ave and Myrtle Ave	8	9
103	Seneca Ave and Weirfield	8	10
104	Seneca Ave and George St	9	12
105	Seneca Ave and Stephen St	8	9
106	Seneca Ave and Norman St	9	12
107	Seneca Ave and Summerfield	8	8
108	Centre St an Myrtle Ave	11	8
109	Weirfield and Myrtle Ave	8	11
110	George St and Myrtle Ave	9	8
111	Forest Ave and Stephen St	10	9
112	Forest Ave and Norman St	10	9
113	Forest Ave and Summerfield St	8	7
114	Forest Ave and Decatur St	10	9
115	Irving Ave and Moffat St (left corner)	25	27
116	Between label #10 and label #118	118	87
117	Between label #9 and label #5 on sidewalk	320	220
118	Between label #120 and label #5	54	40
119	Between label #6 and Label #5	12	11
B1	Hancock St & Wilson Ave (B)	7	8

Table 1

Label	Location Description	Ground (µR/hr)	3 feet (µR/hr)
B2	Hancock St & Cypress Ave(B)	9	10
B3	Central Ave & Chauncy St(B)	9	8
B4	Irving Ave and Woodbine St (B)	11	12
B5	Decatur Av & Seneca St (B)	8	6
B6	Central Ave & Eldert St (B)	8	10

Table 2 - Background MDS Measurements Used to Obtain Relative Readings for NYCDOHMH Maps

Background Designation	Readout - Plastic Scintillator*	Readout (µR/h) FH40G*
B1	1.94	10.47
B2	2.22	9.51
B3	3.26	9.90
B4	3.87	12.08
B5	1.78	9.04
B6	2.31	11.01
Mean ± 1 SD (N=6)	2.56±0.82	10.33±1. 10
Mean ± 1 SD (N=4)**	2.43±0.58	

*Four minute stationary measurements at each USEPA Rad-7 background location (units not included for scintillator; instrument configured for contamination-search and not for ground-truth exposure rates in µR/h).

**Highest and lowest readings (B4 and B5) removed to obtain value with N=4.

Table 3 Data Summary – Relative MDS Readings Compared to Mean Background (N=6)*

Minimum	Maximum	Median	Mean ± 1 SD
0.53	26.3	0.86	0.95 ± 1.0

*All data including Irving Avenue

Table 4 Data Summary – Relative MDS Readings Compared to Mean Background (N=4)*

Minimum	Maximum	Median	Mean
0.56	27.7	0.91	1.0 ± 1.1

*All data including Irving Avenue

Field Staff

U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA), Region 2	E-mail Address
Eric Daly (EPA Lead/Lead On-Scene Coordinator)	Daly.Eric@epa.gov
Michael Ferriola (Alternate OSC)	ferriola.mike@epa.gov
Oleg Povetko (Lead Health Physicist for Site)	povetko.oleg@epa.gov
Mazeeda Khan	khan.mazeeda@epa.gov
New York City Department of Health and Mental Hygiene (NYCDHMH)	
Mark Maiello (Deputy Director, Emergency Preparedness & Response - Radiological Operations Unit)	mmaiello@health.nyc.gov
Hailu Tedla	htedla@health.nyc.gov
Elaine Vernetti, MD	evernett@health.nyc.gov
Narenta Bici	nbici@health.nyc.gov
Erik Finkelstein	efinkels@health.nyc.gov
New York State Department of Health (NYSDOH)	
Nikolas Webster	new03@health.state.ny.us
William Hom	wch03@health.state.ny.us
Weston Solutions-EPA Contractor	
Tim Benton	Tim.Benton@WestonSolutions.com
Nels Johnson (Weston CHP)	njoh559761@aol.com
Joel Petty (Weston Team Lead, Team 1)	joel.petty@westonsolutions
Bernard Nwosu (Weston Team Member, Team 2)	ben.nwosu@westonsolutions
Mark Conover (Weston Team Member, Team 3)	mark.conover@westonsolutions
Michael Beuthe (Weston Team Member, Team 4)	michael.beuthe@westonsolutions