

December 5, 2016

Mr. Willie Thomas  
ComEd  
Two Lincoln Centre, 7th Floor  
Oakbrook Terrace, IL 60181

RE: Radiological Survey of Right-of-Way Utility Excavation  
Permit No.: DOT712194  
Permit Address: 232 E. Ohio St., Chicago, IL  
AECOM Project No. 60493426

Dear Mr. Thomas:

Pursuant to conditions specified in the Chicago Department of Public Health permit (attached), radiation monitoring was required to be performed at the above referenced site. AECOM Technical Services, Inc. (AECOM) provided the required radiation monitoring for excavation activities that were conducted for the replacement of a vault roof on November 1 and 3, 2016.

The vault is located in the sidewalk at the western edge of the 232 E. Ohio St. building (refer to attach CDPH permit and the attached drawing). The replacement of the vault roof involved the removal of the existing vault roof as well as the replacement of the upper 18 inches of the original vault walls. The Chicago Department of Transportation (CDOT) permit required that the sidewalk be removed to the next existing joint in the sidewalk pavement. Thus, sidewalk removal extended on both the east and west sides beyond the vault as well as including the replacement of the curb along most of the work area.

The gamma surveying consisted of surface surveys of the subgrade exposed beneath the sidewalk and curb after removal of the concrete as well as a survey of the shallow 15-18 inch excavations adjacent to the vault walls. The limited volume of fill excavated was from immediately adjacent to the vault in order to place a sheet of plywood to be used as a concrete form for the new portions of the vault wall.

The U.S. Environmental Protection Agency (USEPA) removal action level for Chicago's Streeterville area is 7.1 picocuries per gram (pCi/g) total radium (Ra-226 + Ra-228). Gamma radiation count measurements for the project were made using a Ludlum Model 2221 survey meter and an unshielded 2 x 2 inch sodium iodide (NaI) probe Model 44-10. For the instrument used, the gamma count threshold indicative of the USEPA removal action level of 7.1 pCi/g was 17,193 counts per minute (cpm) unshielded (6,175 cpm shielded). The field instrument gamma background for the area was measured at approximately 8,590 – 9,200 cpm unshielded. Field gamma measurements greater than twice the field background represent potential anomalous results that require more cautious and frequent field screening, but are not necessarily indications of the presence of thorium contaminated fill soil. However, field instrument readings above the threshold are regarded as potential indications of contamination.

Work removing the sidewalk was initiated on November 1, 2016. After the concrete sidewalk west of the vault was broken up, elevated gamma readings were observed at the surface of the subgrade in the southwest corner of the work area where the sidewalk was being removed. These were the only elevated readings observed during the project. There was no apparent fill adhering to the concrete nor were any elevated gamma readings indicated. Photograph #1 in the attachments shows the area of elevated readings delineated with pink paint after the concrete was removed.

A shield was placed on the probe after a maximum reading of 29,000 cpm unshielded was noted for the fill. Gamma readings in the potential area of contamination were between 6,000 cpm and 12,000 cpm shielded. The field instrument shielded threshold equivalent to 7.1 pCi/g total radium is 6,175 cpm. The

western extent of the sidewalk that was removed was 32 inches west of the corner of the building at 232 E. Ohio St. The exposed contaminated area extended approximately 4.5 feet parallel to the curb and 5 feet north of the curb (refer to attached sketch). The one foot wide strip of the fill immediately adjacent to the curb did not exhibit elevated gamma readings. This section of curb immediately south of the contaminated area was not be removed or replaced for the proposed work. Field readings indicated that the apparent contamination did not extend to the western wall of the vault. However, the contamination did appear to extend to the west beneath the sidewalk pavement. The results of the discovery of contamination were reported to USEPA via a phone call on November 1, 2016.

AECOM collected a sample from the southeast corner of the contaminated area. This location exhibited the highest readings (23,000 cpm shielded) at approximately 3 inches below the top of the fill. The sample was collected from a depth of 7-10 inches below the original grade of the sidewalk pavement. Readings after the collection of the sample were approximately 13,000 cpm. After the collection of the sample the contaminated area was covered with a sheet of plastic to eliminate direct contact. The sample was delivered to RSSI for analysis. The results (refer to attached gamma spectroscopy report) indicated a radium-228 activity of 19.39 pCi/g and radium-226 activity of 4.93 pCi/g (total radium of 24.3 pCi/g). The results were reported on an as received basis and not corrected for moisture content. The moisture content of the sample is believed to be minimal since the area was previously covered by concrete. The results along with the analytical report were emailed to the USEPA on November 2, 2016.

The contamination was discovered because the CDOT permit required replacement of the sidewalk paving to the first joint west of the excavation. No excavation within the area of elevated gamma readings was required to complete the proposed work. Therefore, a proposal to leave the contamination in place was proposed and approved by the USEPA. At 9 AM on November 3, 2016, plastic sheeting was placed over the entire exposed fill area west of the vault. The larger piece of plastic was placed over the top of the plastic sheeting that was already covering the area of contamination. The plastic was covered with about 2 inches of gravel (refer to Photograph #2). The unshielded surface gamma readings after placement of the gravel in the original area of contamination ranged between 8,000 and 11,500 cpm with a maximum of 14,500 cpm (the instrument threshold was 17,193 cpm unshielded). As well as securely holding the plastic in place, the gravel shielded the gamma from the contamination below.

The rest of the morning of November 3, 2016, was spent removing the curb immediately in front of the vault. Unshielded gamma reading for the fill beneath the curb ranged from 5,800 to 7,200 cpm unshielded. Thus, there were no indications of potential contamination beneath the curb area.

It was necessary to complete the vault walls and roof before the sidewalk was poured. The concrete for the sidewalk area was poured on November 15, 2016. The vault work was completed and barricades and fencing were removed to reopen the sidewalk to pedestrian traffic on November 28, 2016. Photograph #3 shows the area after the barricades and fencing were removed.

As part of the permit conditions this letter has been forwarded to:

Chicago Department of Public Health  
Attn: Mr. Terry Sheahan  
333 South State Street, Rm. 200  
Chicago, Illinois 60604

Please contact us with any questions you have regarding this letter or the reported results.

Regards,



Andrew Kozak



Steven C. Kornder, Ph.D.

Permit No.: DOT712194  
Permit Address: 232 E. Ohio St.  
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Geologist

Senior Project Geoscientist

cc: Dan Haag, USEPA  
Verneta Simon, USEPA

Attachments: CDPH Permit  
Sketch  
Gamma Spec. Rpt.  
Photographs

# PERMIT



DEPARTMENT OF PUBLIC HEALTH  
CITY OF CHICAGO

FORM NO. CDPH.ROW.03 (STREETERVILLE Right-of-Way)

Notice is hereby given that the site you have requested a permit for is recorded with the City of Chicago Department of Public Health (CDPH) as potentially having environmental contamination on the site and adjacent right-of-way. This environmental contamination could present a threat to human health and safety in connection with work performed at the site, or in the adjacent right-of-way, if proper safeguards are not employed.

A file containing detailed information regarding the aforementioned environmental contamination is available for review at CDPH at 333 S. State St., Room 200, Chicago, Illinois 60604 during normal business hours (8:30AM-4:30PM, Monday through Friday). Contact (312) 745-3152 for an appointment. This file must be reviewed and the remainder of this form completed before the permit can be issued if the ground is exposed or excavated. Please note that for some locations, additional health and safety procedures may be required by law.

Please complete the following:

I have reviewed and understand the documents, maintained by CDPH, regarding environmental contamination of the site and adjacent right-of-way. Further, I will ensure that all work at the subject site and adjacent right-of-way, and any monitoring required including but not limited to radiation monitoring, will be performed in a manner that is protective of human health and the environment and in compliance with all applicable local, state, and federal laws, rules, and regulations, especially those pertaining to worker safety and waste management. I will ensure that the results of any radiation monitoring and/or surveying conducted shall be provided to the CDPH and the United States Environmental Protection Agency within two (2) weeks of their completion. If any elevated levels of radioactive material are detected, I will immediately contact the United States Environmental Protection Agency at (800) 424-8802.

Applicant Name (print): William Nolan Signature: 

Site Address and Work Location (Describe exact site location and attach map): Permit address 228-240 E Ohio St.,

Vault within the sidewalk on the north side of street in front of 232 E Ohio St (refer to drawing).

Nature of Work: Vault roof replacement

Company Name, Address, Phone No.: Commonwealth Edison, Lincoln Centre 1, Oak Brook Terrace, IL 60181 (312-550-6058)

General / Prime Contractor Name, Address, Phone No.: Meade Electric Co., 9550 W 55th St., Ste A, Countryside IL, 60525


*Include subcontractor information if applicable*

Safety Officer / Phone No. Dion Creggett (ComEd) 630-726-2168

Radiation Contractor / Phone No. (if applicable) AECOM (Steve Kornder 262-515-7700 - steve.kornder@aecom.com)

Check if City Department Work  Department Name: \_\_\_\_\_

CDOT Permit No.: DOT712194

Today's Date: 10/10/16 Expected Start Date: 10/13/16 CDPH Approval / Date:  10-11-16

Please return this completed form to the Chicago Department of Transportation, Division of Infrastructure Management, Public Way Permit Office, City Hall - Room 905, 121 N. LaSalle St., Chicago, Illinois 60602 during normal business hours (8:30 AM - 4:30 PM, Monday through Friday)

For CDPH Use Only



E

D

C

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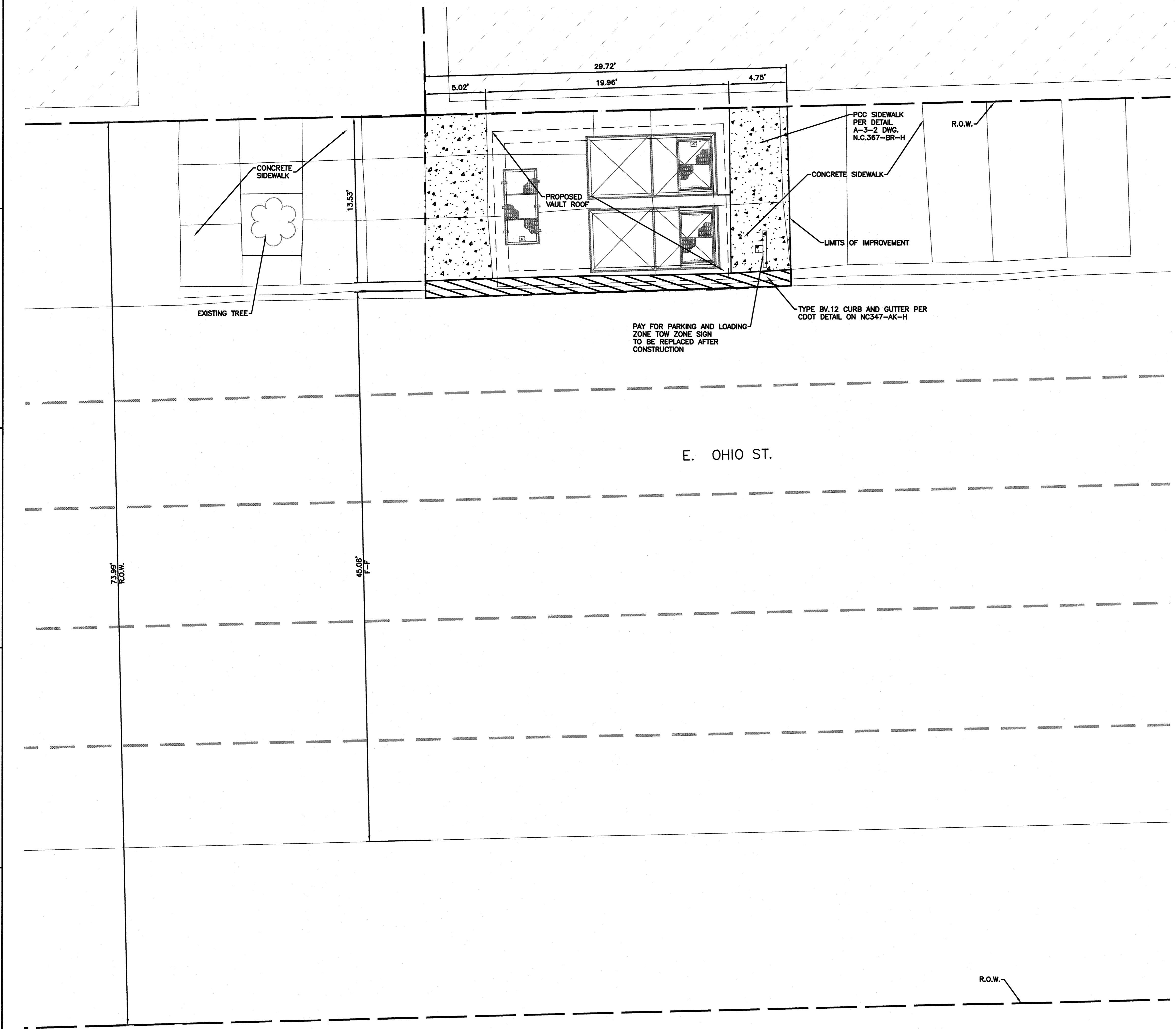
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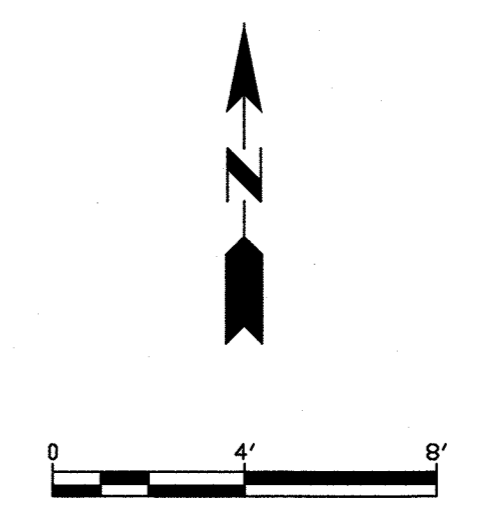
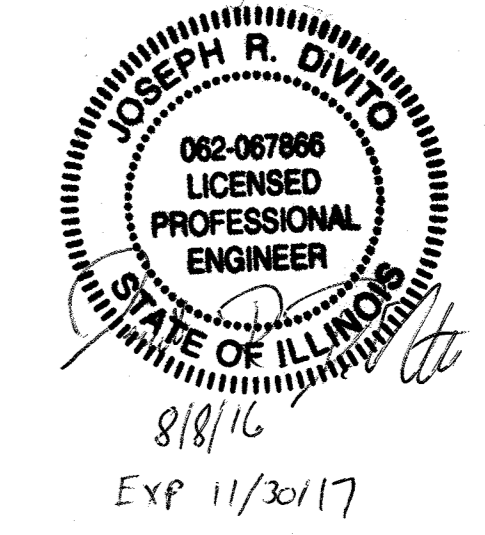
**GENERAL NOTES:**

1. TRANSFORMER VAULT ACCESS PANELS ARE FABRICATED FLAT. SLOPE MUST REMAIN CONSTANT ACROSS ACCESS PANELS.
2. SEE DRAWINGS N.C.367-BR-A & N.C.367-BR-B FOR STRUCTURAL NOTES AND DETAILS.
3. NO WORK SHALL BE PERFORMED ON ADJACENT PRIVATE PROPERTY WITHOUT THE WRITTEN AUTHORIZATION OF THE PROPERTY OWNER.
4. ALL CONSTRUCTION WORK SHALL BE PERFORMED IN ACCORDANCE WITH OSHA STANDARDS.
5. PROPOSED P.C.C. SIDEWALK JOINTS SHALL MATCH ADJACENT SIDEWALK JOINT LAYOUT AS MUCH AS FEASIBLY POSSIBLE.
6. PROPOSED P.C.C. SIDEWALK SHALL BE CONSTRUCTED PER DETAIL A-3-2, "DETAILS OF PORTLAND CEMENT CONCRETE CONSTRUCTION" ON DRAWING N.C.367-BR-H.
7. EXTREME CAUTION MUST BE TAKEN TO AVOID DAMAGE TO ANY OTHER WATER MAIN OR WATER APPURTENANCES. IF DAMAGE OCCURS, THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL NECESSARY REPAIRS.

**LEGEND:**

- PROPOSED P.C.C. SIDEWALK PER DETAIL A-3-2 ON DWG. N.C.367-BR-H
- LANDSCAPED AREA
- CONCRETE CURB AND GUTTER IMPROVEMENT PER DETAIL A-2-6 ON DWG. N.C.367-BR-H
- LIMITS OF IMPROVEMENT

E. OHIO ST.



02	8/10/16	ISSUED FOR CONSTRUCTION	QHK	JRD
01	6/24/16	ISSUED FOR OUC EFF REVIEW	QHK	JRD
REVI	DATE	DESCRIPTION	TECH.	ENG.
<b>ComEd</b> Commonwealth Edison Co. Chicago, Illinois An Exelon Company Transmission and Distribution Operations				
<b>2016 COMED NETWORK CENTER VAULT ROOF REPLACEMENT DESIGN SITE PLAN</b> <b>232 E. OHIO ST.</b>				
SCALE AS SHOWN DATE 4/25/2016 DRAWN BY QHK ENG. BY JRD FILENAME N.C.367-BR-E.DWG			THIS MATERIAL IS THE PROPERTY OF COMED AND CONTAINS CONFIDENTIAL INFORMATION WHICH MUST NOT BE REPLICATED, USED, OR DISCLOSED OTHER THAN AS EXPRESSLY AUTHORIZED BY COMED. DC SC	
<b>N.C.367-BR-E</b>				



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 Keith\_Doss  
 8/8/2016 2:52 PM

**SKETCH**

Job 232 E. Ohio St.

 Project No. 60493426

 Sheet 1 of 1

 Description ComEd Vault Roof Replacement

 Computed by K. Korczak

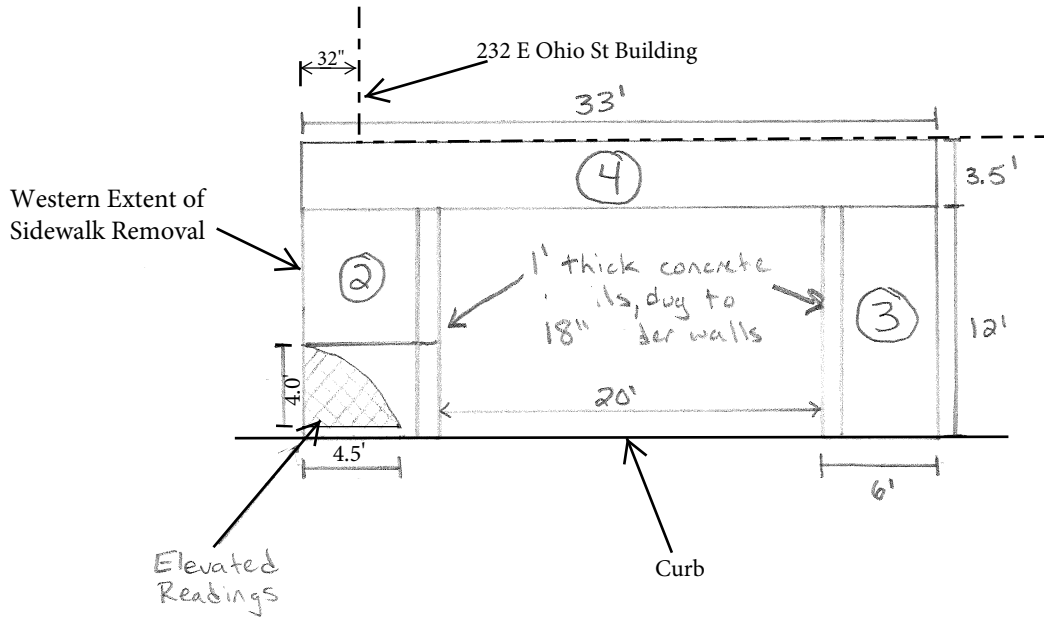
 Date 12/2/16

Not to Scale

 Checked by S Kornder

 Date 12/4/16

Reference



Depth	CPM without shield	CPM with shield
① 0 18" (below 1' wide concrete wall)	11,000 - 29,000 —	up to 21,000 1,900 - 4,200
② 0 18" (below 1' wide concrete wall)	8,100 - 12,000 8,000 - 10,500	— —
③ 0 18" (below 1' wide concrete wall)	6,100 - 8,600 6,000 - 9,000	— —
④ 0 18"	N/A 5,600 - 6,900	— 1,900 - 3,000

Instrument threshold value is 17,193 cpm unshielded (S/N: 326720)



## GAMMA SPECTROSCOPY



6312 Oakton Street  
Morton Grove, IL 60053-2723  
847-965-1999  
Fax 847-965-1991

Wednesday, November 02, 2016

Steve Kornder  
AECOM  
303 E. Wacker Dr.  
Suite 1400  
Chicago, IL 60601

RE: 232 E. Ohio St.

Dear Dr. Kornder:

A summary of gamma spectroscopy results for our sample number G160179 is in Table 1. AECOM identified the sample as 232 E. Ohio St. The table below lists the concentrations of selected radionuclides. Values with a less-than symbol (" $<$ ") indicate a concentration below RSSI's minimum detectable concentration (MDC). Additional identified radionuclides are in the complete gamma spectroscopy report.

Table 1. High-resolution Gamma Spectroscopy Results [pCi/g]

Radionuclide	Sample
	G160179
	232 E. Ohio St.
Pb-214	4.85
Bi-214	5.01
Ra-226 <sup>1</sup>	4.93
Ac-228	19.39
Ra-228 <sup>2</sup>	19.39
Th-232 <sup>3</sup>	19.39
Tl-208	5.64
K-40	9.05
Pb-212	15.92
Bi-212	20.45
Th-234	3.03
Pa-234m	11.08
U-238 <sup>4</sup>	7.05

<sup>1</sup> The concentration of Ra-226 is based on the average concentration of Pb-214 and Bi-214.

<sup>2</sup> The concentration of Ra-228 is based on the surrogate Ac-228.

<sup>3</sup> The concentration of Th-232 is based on the surrogate Ac-228.

<sup>4</sup> The concentration of U-238 is based on the average concentrations of Th-234 and Pa-234m.

Some radionuclides of interest, thorium-232 (Th-232), radium-226 (Ra-226), radium-228 (Ra-228), and uranium-238 (U-238), are difficult to identify and quantify directly at low concentrations with reasonable counting intervals. The concentrations of surrogates with more abundant high energy photons usually represent the concentration of Th-232, Ra-226, Ra-228, and U-238. The successful use of surrogates depends upon the radionuclides in each series being in equilibrium.

Radium-226 (Ra-226), in the uranium series, has only one significant photon at 186.21 keV with a gamma fraction slightly greater than 0.03. Analysis for Ra-226 using this energy is difficult because of the possible presence of uranium-235 (U-235), which has an interfering 185.72 keV photon with a 0.57 gamma fraction, and protactinium-234 (Pa-234) which emits an interfering 186.15 keV photon with a 0.02 gamma fraction. The gamma fraction is the fraction of decays that produce a photon of a given energy. Bismuth-214 (Bi-214) and lead-214 (Pb-214) are used as surrogates for Ra-226.

The equilibrium between Ra-226 and its decay products, including Pb-214 and Bi-214, may be disturbed if radon-222 (Rn-222) is released when samples are collected. Rn-222, a gaseous Ra-226 decay product, has a half-life of 3.8 days. Pb-214 and Bi-214 reestablish equilibrium with Ra-226 in a sample after an in-growth period, typically seven Rn-222 half-lives. As a standard protocol, samples are normally held for 30-days to reestablish equilibrium. These samples were analyzed as received and were not held for in-growth. The average of the activities of Pb-214 and Bi-214 is shown as the activity of Ra-226.

Both Th-232 and Ra-228, in the thorium series, emit photons with very low gamma fractions at very low energies. In the thorium series, actinium-228 (Ac-228) is usually in equilibrium with both Th-232 and Ra-228 when collected. Bi-212 has a branching fraction of approximately 0.36 for decays to thallium-208 (Tl-208). Therefore, the activity of Tl-208 is approximately 36% the activity of other radionuclides in the thorium series. The branching fraction is the fraction of decays that proceed through a given decay path.

U-238, in the uranium series, emits photons with very low gamma fractions at low energies. Thorium-234 (Th-234) and protactinium-234m (Pa-234m), both with photons at higher energies and with larger gamma fractions, are usually in

Steve Kornder  
November 2, 2016  
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**RSSI**

equilibrium with U-238. The average of the activities of Th-234 and Pa-234m is shown as the activity of U-238.

These samples were run as-received and these results have not been corrected for moisture content.

The complete spectroscopy analysis results are attached. Please call me at 847-965-1999 if you have any questions.

Sincerely,



Aaron Morris

attachment

Sample description  
 G160179 AECOM, 232 E. Ohio St., 766.9 g

Spectrum Filename: H:\GammaVision\User\Spectra\G160179.An1

\*\*\*\*\* S U M M A R Y O F N U C L I D E S I N S A M P L E \*\*\*\*\*

Nuclide	Activity uCi/g	Uncertainty Counting	1 Sigma Total
AC-228	1.9387E-05	8.061E-01%	2.834E+00%
PB-214	4.8470E-06	1.762E+00%	5.365E+00%
BI-214	5.0126E-06	1.167E+00%	3.615E+00%
K-40	9.0453E-06	2.537E+00%	4.437E+00%
Th-234 C	3.0300E-06	5.961E+01%	5.970E+01%
Pa-234m#	1.1079E-05	2.152E+01%	2.167E+01%
Pb-212	1.5924E-05	3.536E-01%	6.429E+00%
Bi-212	2.0448E-05	2.434E+00%	3.978E+00%
Tl-208	5.6354E-06	7.594E-01%	3.576E+00%
U-235 <	7.9752E-08		
Ra-224	1.5831E-05	3.985E+00%	7.541E+00%
Th-228	3.4419E-05	5.448E+00%	6.533E+00%

- # - All peaks for activity calculation had bad shape.
- \* - Activity omitted from total
- & - Activity omitted from total and all peaks had bad shape.
- < - MDA value printed.
- A - Activity printed, but activity < MDA.
- B - Activity < MDA and failed test.
- C - Area < Critical level.
- F - Failed fraction or key line test.
- H - Half-life limit exceeded

----- S U M M A R Y -----  
 Total Activity ( 1630.6 to 1768.6 keV) 1.447E-04 uCi/g  
 This section based on library: AECOM - 2016-08.Lib

Sample description  
 G160179 AECOM, 232 E. Ohio St., 766.9 g

Spectrum Filename: H:\GammaVision\User\Spectra\G160179.An1

\*\*\*\*\* S U M M A R Y O F L I B R A R Y P E A K U S A G E \*\*\*\*\*

- Nuclide -	Average	Peak					
Name	Code	Activity	Energy	Activity	Code	MDA Value	COMMENTS
		uCi/g	keV	uCi/g		uCi/g	
AC-228	N	1.9387E-05					
			911.20	1.938E-05	(	5.116E-08 8.55E-01	G
			968.97	1.957E-05	(	6.732E-08 9.59E-01	G
			338.32	1.602E-05	-	1.942E-07 1.24E+00	G
			964.77	1.885E-05	(	2.385E-07 2.05E+00	G
			463.00	1.597E-05	-	4.138E-07 3.42E+00	G
			93.35	1.932E-05	}	6.531E-07 2.24E+00	XA
			89.96	1.939E-05	}	1.202E-06 4.22E+00	XA
			1638.28	2.783E-05	+	3.150E-06 1.41E+01	GA
			1630.63	2.794E-05	+	1.472E-06 7.00E+00	G
			1588.19	2.126E-05	+	8.500E-07 3.13E+00	G
			1580.53	3.027E-05	+	2.844E-06 1.24E+01	GA
			1557.10	5.785E-05	+	8.797E-06 2.51E+01	GA
			1501.57	1.725E-05	-	3.526E-06 3.37E+01	GA
			1495.93	2.475E-05	+	2.083E-06 8.98E+00	GA
			1459.14	1.854E-05		3.696E-06 1.92E+01	GA
			1110.61	3.809E-05	+	4.950E-06 1.90E+01	GA
			1065.19	8.109E-05	+	1.073E-05 2.54E+01	GA
			904.19	2.116E-05	+	1.909E-06 1.30E+01	GA
			840.38	1.805E-05	-	1.775E-06 1.80E+01	GA
			835.71	1.622E-05	-	9.416E-07 7.50E+00	GA
			830.49	2.173E-05	+	2.705E-06 2.26E+01	GA
			794.95	1.763E-05	-	5.374E-07 3.38E+00	G
			782.14	2.083E-05	+	2.759E-06 1.24E+01	GA
			772.29	1.601E-05	-	1.059E-06 7.20E+00	G
			755.32	1.770E-05	-	1.687E-06 1.46E+01	G
			562.50	1.757E-05	-	1.618E-06 1.56E+01	GA
			478.40	2.402E-05	+	5.970E-06 4.69E+01	GA
			409.46	1.485E-05	-	7.122E-07 5.43E+00	G
			328.00	1.547E-05	-	5.093E-07 4.21E+00	G
			270.25	1.483E-05	-	4.081E-07 3.30E+00	G
			209.25	1.402E-05	-	3.929E-07 3.48E+00	G
			153.98	1.757E-05	-	1.802E-06 1.22E+01	GA
			129.06	1.268E-05	-	6.062E-07 5.30E+00	GA
			108.58	2.340E-05	+	4.617E-06 2.88E+01	XA
			105.60	2.828E-05	+	2.341E-06 1.09E+01	XA
			99.51	1.482E-05	-	1.423E-06 1.24E+01	GA
PB-214	N	4.8470E-06					
			351.93	4.864E-06	(	3.448E-08 2.21E+00	G
			295.22	4.828E-06	(	5.806E-08 2.17E+00	G
			242.00	4.812E-06	(	1.951E-07 4.28E+00	G
			258.87	5.975E-06	+	1.950E-06 3.92E+01	G
			785.96	4.847E-06	}	1.400E-06 2.13E+01	G
							Energy duplication
			77.11	4.847E-06	}	5.527E-07 3.82E+00	XA
							Energy duplication
			74.82	4.847E-06	}	7.822E-07 1.61E+01	XA
			89.78	0.000E+00		1.519E-08 0.00E+00	XA
BI-214	N	5.0126E-06					
			609.31	5.015E-06	(	2.787E-08 1.17E+00	G
			1120.29	5.912E-06	+	1.784E-07 3.18E+00	G
			1764.49	0.000E+00	%	2.959E-09 1.00E+03	G

Sample description  
 G160179 AECOM, 232 E. Ohio St., 766.9 g

Spectrum Filename: H:\GammaVision\User\Spectra\G160179.An1

			768.36	4.989E-06	(	2.643E-07	8.07E+00	G
			1238.11	6.504E-06	+	3.739E-07	7.10E+00	G
			934.06	5.684E-06	+	4.618E-07	9.62E+00	G
			1377.67	8.561E-06	+	5.387E-07	9.43E+00	G
			1729.60	9.538E-06	+	6.881E-07	9.49E+00	G
			1509.23	7.211E-06	+	7.950E-07	9.67E+00	G
			1407.98	6.402E-06	+	7.214E-07	1.32E+01	G
			1401.50	9.847E-06	+	1.287E-06	2.03E+01	GA
			1280.96	6.067E-06	+	1.126E-06	3.09E+01	GA
			665.45	6.039E-06	+	9.158E-07	1.93E+01	GA
			89.81	0.000E+00		4.581E-08	0.00E+00	XA
			89.26	0.000E+00		8.881E-08	0.00E+00	XA
K-40	N	9.0453E-06	1460.82	9.045E-06	(	1.471E-07	2.54E+00	G
Th-234	N	3.0300E-06	92.38	1.189E-07	}	7.655E-07	5.72E+02	G
			92.80	2.140E-06	}	7.817E-07	2.78E+01	G
			63.29	3.030E-06	(	1.227E-06	5.96E+01	G
Pa-234m	N	1.1079E-05	1001.03	1.108E-05	*(	1.154E-06	2.15E+01	G
			98.43	0.000E+00		3.727E-08	0.00E+00	XA
Pb-212	N	1.5924E-05	238.63	1.592E-05	(	2.474E-08	3.54E-01	G
			300.09	1.468E-05	-	4.245E-07	3.67E+00	G
			115.18	1.873E-05	+	2.564E-06	1.79E+01	G
			77.11	1.592E-05	}	1.813E-07	1.25E+00	XA
			74.82	1.592E-05	}	4.242E-07	2.07E+00	XA
			87.35	1.592E-05	}	6.583E-07	2.65E+00	XA
			86.83	1.592E-05	}	1.253E-06	7.10E+00	XA
			89.78	1.592E-05	}	1.589E-06	8.85E+00	XA
Bi-212	N	2.0448E-05	727.33	2.045E-05	(	2.477E-07	2.43E+00	G
			785.37	1.724E-05	}	1.408E-06	6.88E+00	G
			288.20	1.860E-05	-	3.298E-06	2.20E+01	G
			1620.50	2.572E-05	+	1.447E-06	4.47E+00	G
Tl-208	N	5.6354E-06	583.19	5.635E-06	(	1.839E-08	7.59E-01	G
			277.35	4.779E-06	-	2.067E-07	7.04E+00	G
			860.56	7.135E-06	+	1.915E-07	3.32E+00	G
			74.97	5.635E-06	}	1.250E-06	1.41E+01	XA
			72.81	1.481E-05	+	1.856E-06	1.23E+01	XA
U-235	N	0.0000E+00	143.76	0.000E+00	&	7.975E-08	1.00E+03	G
			163.36	0.000E+00	&	2.537E-07	1.00E+03	G
			205.31	0.000E+00	&	2.584E-07	1.00E+03	G
			93.35	0.000E+00	%	2.045E-07	1.00E+03	XA
			89.96	0.000E+00	%	3.518E-07	1.00E+03	XA
Ra-224	N	1.5831E-05	240.99	1.583E-05	(	6.099E-07	3.99E+00	G



Sample description  
G160179 AECOM, 232 E. Ohio St., 766.9 g

Spectrum Filename: H:\GammaVision\User\Spectra\G160179.An1

Th-228 N 3.4419E-05  
84.37 3.442E-05 ( 1.790E-06 5.45E+00 G  
215.98 2.574E-05 - 4.866E-06 2.53E+01 G  
166.41 4.340E-05 + 1.032E-05 3.68E+01 G  
( - This peak used in the nuclide activity average.

- \* - Peak is too wide, but only one peak in library.
- ! - Peak is part of a multiplet and this area went negative during deconvolution.
- ? - Peak is too narrow.
- @ - Peak is too wide at FW25M, but ok at FWHM.
- % - Peak fails sensitivity test.
- \$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.
- + - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
- = - Peak outside analysis energy range.
- & - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
- P - Peakbackground subtraction
- } - Peak is too close to another for the activity to be found directly.

Nuclide Codes:	Peak Codes:
T - Thermal Neutron Activation	G - Gamma Ray
F - Fast Neutron Activation	X - X-Ray
I - Fission Product	P - Positron Decay
N - Naturally Occurring Isotope	S - Single-Escape
P - Photon Reaction	D - Double-Escape
C - Charged Particle Reaction	K - Key Line
M - No MDA Calculation	A - Not in Average
R - Coincidence Corrected	C - Coincidence Peak
H - Half-life limit exceeded	

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This section based on library: AECOM - 2016-08.Lib

Sample description  
 G160179 AECOM, 232 E. Ohio St., 766.9 g

Spectrum Filename: H:\GammaVision\User\Spectra\G160179.An1

***** U N I D E N T I F I E D P E A K S U M M A R Y *****								
Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 1 Sigma %	FWHM keV	Suspected Nuclide	
113.34	23.78	11778.	18315.	1.696	1.12	1.129	-	D
118.66	25.21	26286.	5726.	0.530	4.22	1.130	-	D
122.61	25.79	40579.	13217.	1.224	2.32	1.131	-	D
138.30	29.47	31584.	2988.	0.277	11.54	1.147	-	D
157.37	33.61	32153.	3236.	0.300	14.24	1.635	-	sD
184.08	39.41	16380.	3054.	0.283	8.40	1.113	-	
256.63	55.16	7240.	176.	0.016	66.91	0.302	-	c
319.26	68.69	18928.	565.	0.052	34.69	1.159	-	D
336.54	72.50	26174.	362.	0.034	63.45	1.162	-	c
347.60	74.90	26174.	1023.	0.095	22.58	1.163	-	D
404.78	87.31	23108.	1771.	0.164	12.37	1.172	-	D
416.86	89.93	23108.	1350.	0.125	16.15	1.173	-	D
634.56	137.19	23348.	436.	0.040	60.89	0.476	-	s
653.52	141.30	9011.	299.	0.028	48.78	0.730	-	s
860.68	186.28	19884.	5040.	0.467	5.20	1.267	-	s
1463.92	317.23	4335.	382.	0.035	29.67	1.035	-	s
1795.27	389.18	4297.	211.	0.020	52.34	0.437	-	s
1960.07	424.96	1515.	120.	0.011	46.96	0.569	-	s
2087.94	452.73	3112.	700.	0.065	16.71	1.337	-	s
2355.02	510.72	6095.	10378.	0.961	2.09	1.567	-	s
2445.47	530.36	1461.	118.	0.011	50.84	0.419	-	s
3250.45	705.18	901.	48.	0.004	84.77	0.289	-	sc
3423.10	742.68	1999.	229.	0.021	39.08	0.384	-	s
3459.66	750.62	820.	96.	0.009	73.77	0.529	-	sM
4026.92	873.84	957.	158.	0.015	37.57	0.764	-	s
4116.07	893.21	1286.	466.	0.043	16.24	0.465	-	s
4680.38	1015.81	382.	48.	0.004	69.35	0.320	-	s
5542.82	1203.20	562.	126.	0.012	45.21	0.427	-	s
5855.16	1271.08	424.	126.	0.012	35.64	0.295	-	s
6192.28	1344.34	425.	199.	0.018	29.18	0.438	-	s
6967.71	1512.91	591.	239.	0.022	15.79	2.074	-	D
7087.54	1538.93	485.	100.	0.009	63.32	0.513	-	s
7334.92	1592.69	666.	948.	0.088	5.04	2.122	-	D
7483.58	1624.74	591.	188.	0.017	19.70	2.141	-	D
7797.99	1693.38	278.	135.	0.012	29.03	0.327	-	s

- s - Peak fails shape tests.
- D - Peak area deconvoluted.
- L - Peak written from unknown list.
- C - Area < Critical level.
- M - Peak is close to a library peak.

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 This section based on library: AECOM - 2016-08.Lib

Sample description  
G160179 AECOM, 232 E. Ohio St., 766.9 g

Spectrum Filename: H:\GammaVision\User\Spectra\G160179.An1

Acquisition information

Start time: 01-Nov-2016 17:07:48  
Live time: 10800  
Real time: 10913  
Dead time: 1.03 %  
Detector ID: 3

Detector system  
CLTCOMP MCB 9

Calibration

Filename: G160179.An1  
2016-08-17 30% GEM-30185-P Calibration

Energy Calibration

Created: 01-Nov-2016 17:03:15  
Zero offset: -0.545 keV  
Gain: 0.217 keV/channel  
Quadratic: 2.388E-08 keV/channel<sup>2</sup>

Efficiency Calibration

Created: 17-Aug-2016 11:26:50  
Type: Polynomial  
Uncertainty: 0.520 %  
Coefficients: -0.457794 -4.470239 0.642789  
-0.080870 0.003615 -0.000068

Library Files

Main analysis library: AECOM - 2016-08.Lib  
Library Match Width: 0.500  
Peak stripping: Library based

Analysis parameters

Analysis engine: Env32 G53W4.22  
Start channel: 20 ( 3.80keV )  
Stop channel: 8144 ( 1768.61keV )  
Peak rejection level: 100.000%  
Peak search sensitivity: 3  
Sample Size: 7.6690E+02  
Activity scaling factor: 1.0000E+00/( 1.0000E+00\* 7.6690E+02) =  
1.3040E-03  
Detection limit method: Traditional ORTEC method  
Random error: 1.0000000E+00  
Systematic error: 1.0000000E+00  
Fraction Limit: 0.000%  
Background width: best method (based on spectrum).  
Half lives decay limit: 12.000  
Activity range factor: 2.000  
Min. step backg. energy: 0.000  
Multiplet shift channel: 2.000

Corrections	Status	Comments
Decay correct to date:	NO	
Decay during acquisition:	NO	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	NO	
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 85 cutoff 20.00000 %  
Energy Calibration  
Normalized diff: 0.1064

**HIGH-RESOLUTION GAMMA SPECTROSCOPY REQUEST**

Date: 11/1/16 Chain of Custody ID (if applicable): None  
 Organization: AECOM  
 Address: 100 S Wacker Dr., Suite 500, Chicago IL 60601  
 Contact: Steve Kornder Phone: 262-515-7700  
 E-mail: steve.kornder@aecom.com

LICENSE IL-01429-01  
**THIS SHIPMENT MUST COMPLY  
 WITH DOT REGULATIONS**

**CALL RSSI BEFORE SENDING SAMPLES**

Sampling Site: Flyover (AECOM Project #60318016 Task 500) Collection Date: 11/1/16 Collected By: Steve Kornder

Laboratory Use Only	Client Sample ID	Sample Volume or Mass	Required Limit of Detection	Expected or Required Radionuclides	Analyze		
					Upon Receipt	After In-Growth	Dry Weight
<u>6160179</u>	<u>232E@ho ST</u>	<u>500ml Marinelli</u>	<u>standard</u>	<u>thorium/uranium series</u>	<u>yes</u>	<u>no</u>	<u>No</u>
		<u>766.9g</u>					
	<u>AECOM Proj #60318016</u>						

Possible Contaminants and/or Chemical Hazards: Streetsville thorium sample

Comments: \_\_\_\_\_  
 \_\_\_\_\_

## PHOTOGRAPHS

Permit No.: DOT712194  
Permit Address: 232 E. Ohio St



1) Photograph taken on 11/1/16 looking north from street at the area of contaminated fill (delineated to the east and north with pink spray paint). A layer of plastic sheeting was placed over the area of contamination immediately following delineation and the collection of sample for gamma spectroscopy analysis.



Permit No.: DOT712194  
Permit Address: 232 E. Ohio St



2) Photograph taken on 11/3/16 looking north from street at the area of contaminated fill. On the morning of 11/3/16 a second layer of plastic sheeting was placed over the initial plastic sheeting along with approximately 2 inches of  $\frac{3}{4}$  inch gravel. The concrete for this sidewalk area was poured on 11/15/16.



Permit No.: DOT712194  
Permit Address: 232 E. Ohio St



3) Photograph of completed sidewalk taken on 11/28/16 as barricades and fencing were being removed to reopen the sidewalk to pedestrian traffic.