



January 26, 2021

963611

Paul Muszynski
Electric Conduit Construction
816 Hicks Drive
Elburn, IL 60119

RE: Thorium Remediation at 250-367 N. Columbus Dr. (Columbus and Wacker)
CDOT Permit # 1238446

Dear Mr. Muszynski:

Stan A. Huber Consultants, Inc (SAHCI) was hired by your firm to provide radiation monitoring during the excavation of previously identified radiologically contaminated material and the continuation of installation of a fiber optic conduit at 250-367 N. Columbus Drive in Chicago, Illinois.

On August 14, 2020, radiologically contaminated soil was encountered along the trench in N. Columbus Dr. The contamination was identified approximately 2 to 3 feet below ground surface with a maximum count rate of 250,000 counts per minute (cpm).

Brian Schmidt, SAHCI Health Physics Technician, collected a soil sample of the contamination at a location measuring 80,000 cpm on contact. The sample was submitted to RSSI in Morton Grove, IL for gamma spectroscopy analysis. The total radium concentration (Ra-226 + Ra-228) was determined to be 673.9 picocuries per gram (pCi/g).

Additional exploratory excavation was performed on August 17, 2020 to determine the potential extent of contamination. The area of the planned trench with thorium contamination that could require packaging and disposal was estimated to be approximately 67 feet long, 3 feet wide, and 3 feet deep. Work was then stopped on the project until a plan could be developed to address remediation, transportation, and disposal of the contaminated material.

On November 3, 2020 Electric Conduit Construction submitted a Thorium Investigation Work Plan (Work Plan) to USEPA which outlined procedures for radiological monitoring during planned cleanup operations. USEPA approved the Work Plan on November 5, 2020.

On January 12, 2021, excavation of the utility trench was completed, and all soil was loaded into a single truck for transportation and disposal at the U.S. Ecology Grand View, Idaho facility. The soil monitoring was performed by Brian Schmidt.

Survey Instrumentation

Surface gamma scans were performed using a Ludlum Model 2221 Scaler / Ratemeter (serial no. 132844) with attached Ludlum Model 44-10 2"x2" NaI Detector (w/ 6" collimated lead shield). The instrument was calibrated on July 28, 2020.

The USEPA Field Action Level (FAL) of 7.1 pCi/g total radium for this instrument is 7,592 cpm. The background count rate for location was 1,817 cpm.

Personnel and equipment surveys were performed with a Ludlum Model 14 Survey Meter (serial no. 95056) with attached Ludlum Model 44-9 G-M Detector. This instrument was calibrated on May 12, 2020. The background count rate for this instrument was 60 cpm.

Waste truck surveys were performed using a Bicon MicroRem Tissue-Equivalent Scintillation Meter (serial no. C258C). This instrument was calibrated on June 30, 2020. The background dose rate for this instrument was 4 microrem per hour (μ Rem/hr).

Soil Gamma Scans

Gamma surface scans were performed of the trench floor (3 feet deep) and walls after excavation was complete using the Ludlum Model 2221 Scaler / Ratemeter described above.

The maximum gamma count rate for the post-excavation trench was recorded on the attached Radiation Survey Form. The count rates in the excavation ranged from 4,000 cpm to 102,400 cpm. Seven sections of trench remain (#6 to #8 and #10 to #13) that have count rates exceeding the instruments' FAL in the floor or walls after excavation was completed.

See Attachment A – Radiation Survey Form

Waste Truck Surveys and Sampling

After the excavation was completed, the truck trailer exterior (CC-004) was surveyed using the Bicon MicroRem instrument detailed above. The maximum on-contact dose rate was 6 μ Rem/hr and the average was 4 μ Rem/hr.

Grab samples were collected throughout the excavation process to form a single composite sample. This sample would represent the average concentration of radiologically contaminated material in the shipment. The sample was analyzed by gamma spectroscopy at RSSI in Morton Grove, IL on January 19, 2021. The average radium concentration (Ra-226 + Ra-228) for shipment CC-004 was found to be 42.22 pCi/g.

See Attachment B – Waste Truck Surveys and Sampling

Air Monitoring

A high-volume air sample was collected to evaluate effluent concentrations during excavation using a Staplex Model TFIA air sampler. The sample was analyzed after a minimum of 4 days to allow the decay of short-lived progeny. The sample was analyzed at the SAHCI laboratory in New Lenox, IL and the concentration of thorium-232 was determined to be at background levels.

A breathing zone air sample was also collected to evaluate for occupational exposures of the crew performing the excavation and loading work. The sample was collected using a Gillian BDX-II personal air sampling pump with a Zefon Model 739 MCE filter cartridge. The sample was analyzed at the SAHCI laboratory in New Lenox, IL and the concentration of thorium-232 was determined to be at background levels.

See Attachment C – Air Monitoring

Equipment Surveys

Surveys were performed and removable contamination smears were collected on both excavator buckets used during excavation. All surveys were below 1.5x the background count rate and removable contamination smears were all below the instrument's minimum detectable concentration of 8.45 dpm/100 cm².

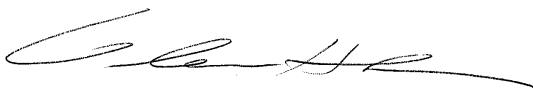
See Attachment D – Equipment Surveys

Regulatory Notification of Survey Completion

I will be providing a copy of this report to both the City of Chicago Department of Public Health and US Environmental Protection Agency, as required.

Thank you for your assistance with this project. If you have any questions or need additional information, please call me at (815) 485-6161.

Sincerely,
Stan A. Huber Consultants, Inc.



Glenn Huber, CHP
President

Attachment A

Radiation Survey Forms

Electric Conduit Construction
250-367 N. Columbus Dr.

Radiation Survey Form

Location/ Project ID: ECC - Lower Wacker + Columbus - ROW RADIOLOGICAL SOIL REMEDIATION EXCAVATION

Date: 1/12/2021

Technician: BRIAN SCHMIDT

Inst Model: LUOLVM-2221

Serial No.: 132844

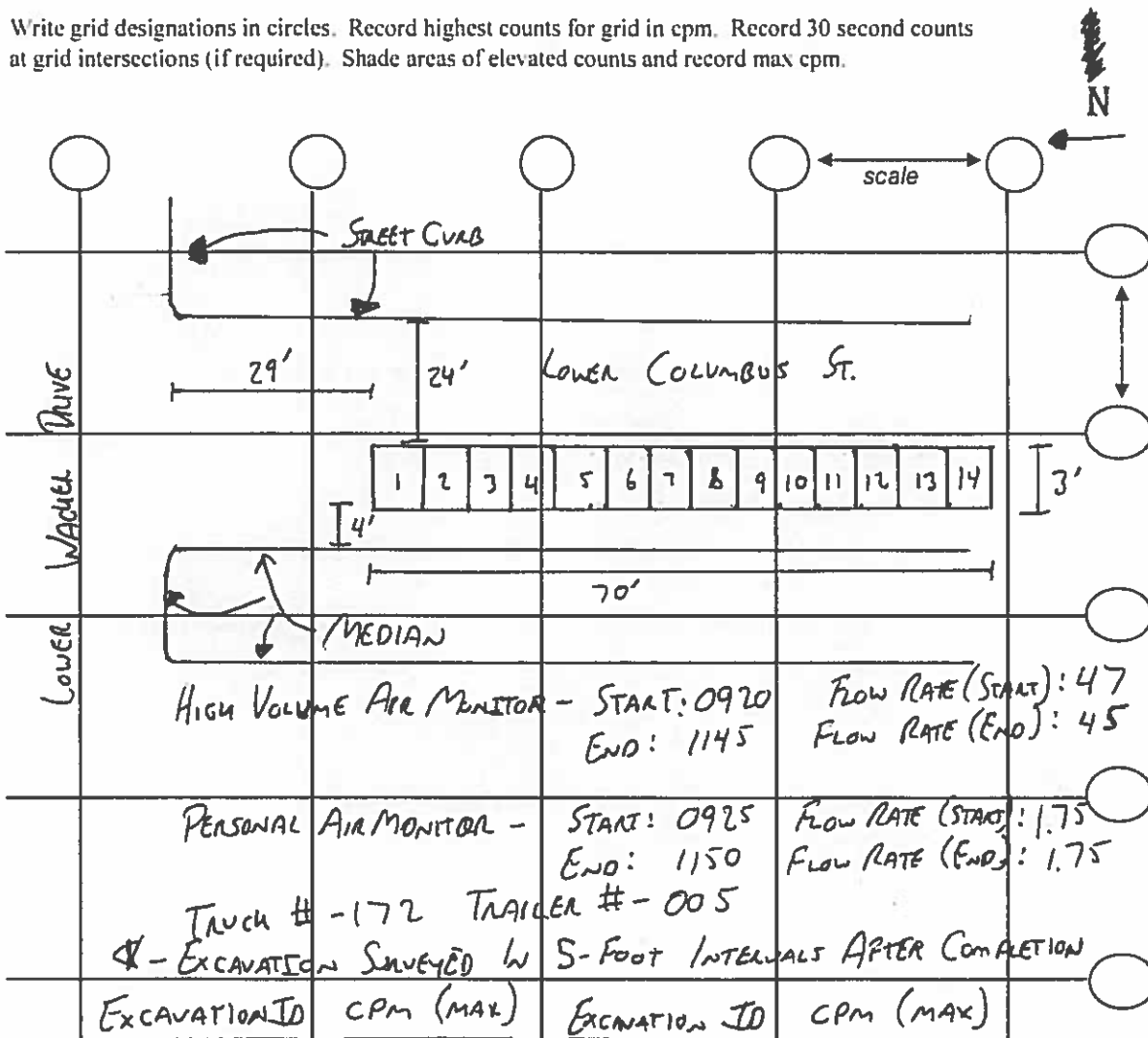
Probe Type: 1"x1" NaI / 2"x2" NaI
Shielded / Not Shielded

Lift Elevation: 0-36"

Background 1817 cpm

Action Level: 7592 cpm

Write grid designations in circles. Record highest counts for grid in cpm. Record 30 second counts at grid intersections (if required). Shade areas of elevated counts and record max cpm.



EXCAVATION ID	CPM (MAX)	EXCAVATION ID	CPM (MAX)
1	4000	8	8500
2	4000	9	6600
3	5300	10	9000
4	5600	11	60500
5	4500	12	102400
6	9100	13	15900
7	11700	14	5200

TRUCK # - 172 TRAILER # - 005
EXCAVATION SURVEYED IN 5-FOOT INTERVALS AFTER COMPLETION

Attachment B

Waste Truck Surveys and Sampling

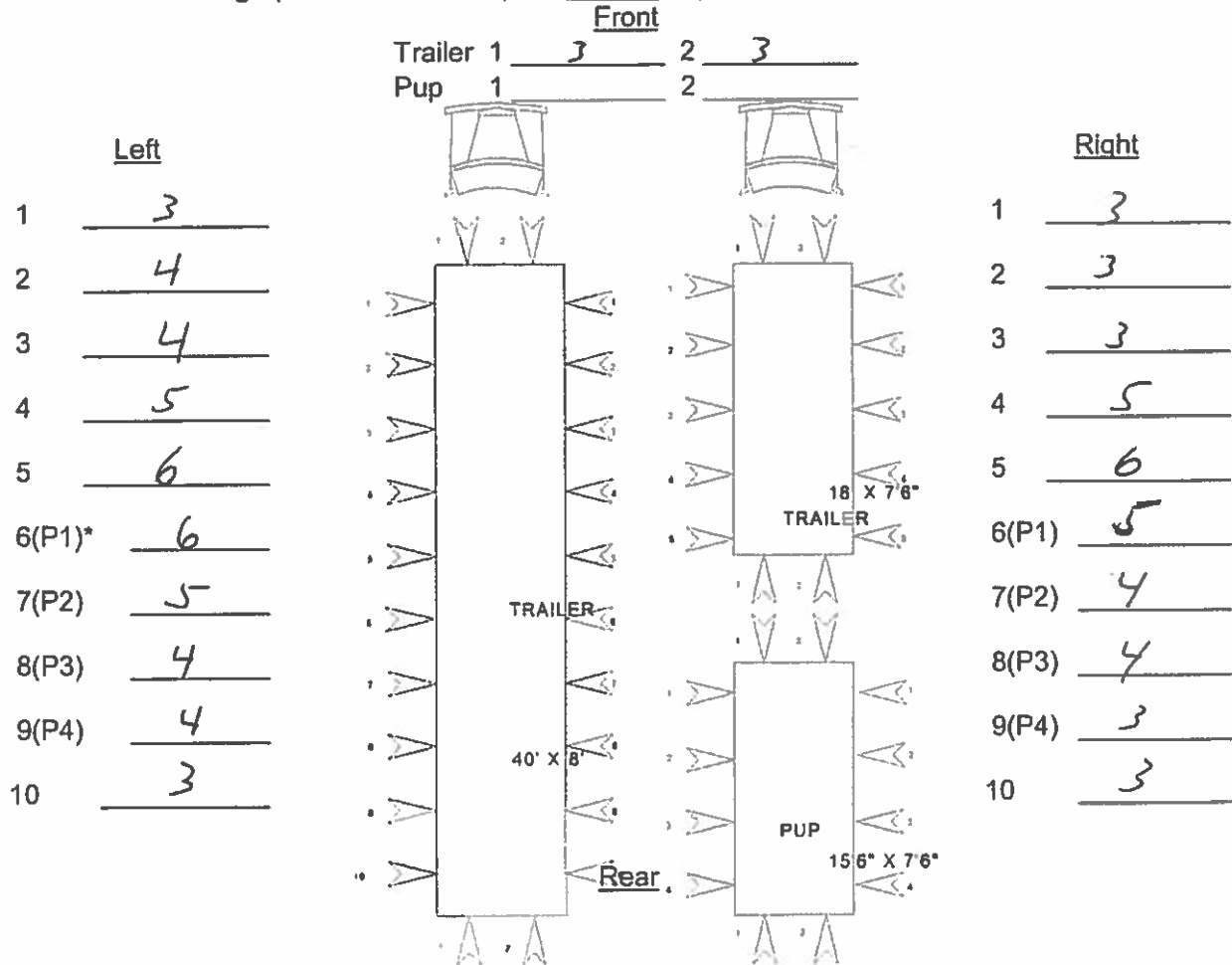
Electric Conduit Construction
250-367 N. Columbus Dr.

**Figure 1-3
USEI
Gamma Radiation Survey
Trailers**

Generator: Crown Castle
 Date: 1/12/21
 Meter Serial #: C258C

Shipping Document No. CC-004
 Car #: 172
 Time: 11:25A
 Model: Bicron MicroRem

Readings (in microrems/hour) for (check one): Trailer or Trailer & Pup*



Trailer 1 3 2 3
 Pup 1 1 2 2

MAXIMUM READING = 6
 AVERAGE READING = 4

ACTIVITY CONCENTRATIONS: _____ VS. U+Th-167 pCi/g
 Ra-500 pCi/g

*Note: Numbers in brackets are for "pup" readings, if applicable.

Name (Print): Glen Haber Signature: [Signature]
 (SAHCE)

File completed original with Work Order No.:

File this completed form with tracking paperwork.

USEI ERMP-01 July 24, 2009. Readings are provided approximately every 4 feet, not all containers are the same size.



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

Tuesday, January 19, 2021

Glenn Huber
Stan A. Huber Consultants, Inc.
200 N. Cedar Rd.
New Lenox, IL 60451

RE: CC-004 & CC-002

Dear Mr. Huber:

A summary of gamma spectroscopy results for our sample numbers G210022-3 is in Table 1. Stan A. Huber Consultants, Inc. identified the samples as CC-004 and CC-002. 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	Samples	
	G210022	G210023
	CC-004 (Soil)	CC-002 (Soil)
Pb-214	8.86	0.52
Bi-214	8.28	0.58
Ra-226 ¹	8.57	0.55
Ac-228	33.65	4.05
Ra-228 ²	33.65	4.05
Th-232 ³	33.65	4.05
Tl-208	11.63	1.44
K-40	9.99	6.89
Pb-212	34.33	4.41
Bi-212	41.61	5.54
Ra-224	34.76	4.28

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

² The concentration of Ra-228 is based on the surrogate Ac-228.

³ The concentration of Th-232 is based on the surrogate Ac-228.

Some radionuclides of interest, radium-226 (Ra-226) and radium-228 (Ra-228), 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 Ra-226 and Ra-228. The successful use of surrogates depends upon the radionuclides in each series being in equilibrium.

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 average of the activities of Pb-214 and Bi-214 is shown as the activity of 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 on receipt and have not been held for an in-growth period.

Ra-228, in the thorium series, emits 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.

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.

Glenn Huber
January 19, 2021
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RSSI

Sincerely,

A handwritten signature in purple ink that reads "Aaron J. Morris". The signature is written in a cursive style with a large initial 'A'.

Aaron Morris

attachment

Attachment C

Air Monitoring

Electric Conduit Construction
250-367 N. Columbus Dr.

Area Air Monitoring Summary Sheet - Staplex High Volume Pumps (Daily Analysis)

ECC - Columbus and Wacker

Report No. 1 250-367 N. Columbus Dr.

Sample ID	date sampled	total time sampled	cubic ft/ min (CFM)	sample volume analyzed	day after analysis							four day analysis							% of Limit 4.00E-15 Th-232 uCi/ml
					date analyzed	gross counts	gross cpm	bkg cpm	net cpm	eff	Concentration in uCi/ml	date analyzed	gross counts	gross cpm	bkg cpm	net cpm	eff	Concentration in uCi/ml	
ECC002	1/12/21	145	46	6.61E+06	No day after analysis - 4 day only							01/18/21	12	0.40	0.58	0.00	0.363	0.00E+00	0.00%
Sample Collection: 9:20am-11:45am																			

Personal Air Monitoring Summary Sheet (PAM's -Daily Analysis)

Report No. 1 250-367 N. Columbus Dr.

ECC - Columbus and Wacker

Date Collected	Init	Sample ID	Flow Rate (lpm)	Total Time Sampled	Total Sample Volume (ml)	day after analysis						four day analysis						
						Analysis Date	Gross Counts (30 min)	Gross CPM	Bkg CPM	Net CPM	eff	Sample Concentration (uCi/ml)	Analysis Date	Gross Counts (30 min)	Gross CPM	Bkg CPM	Net CPM	eff
1/12/21	MD	PAM002	1.75	145	2.54E+05	No day after analysis - 4 day only						01/18/21	9	0.30	0.58	0.00	0.383	0.00E+00
pump 20200301040 start 9:25am , stop 11:50am =1.75 LPM																		

***Note: Samples with counts greater than background on day after analysis are analyzed again after 4 days to allow for radon / thoron progeny decay

Occupational Dose Limit for Occupational Radiation Exposure = 5 rem Total Effective Dose Equivalent

2000 DAC-Hours = 5 rem

DAC (Derived Air Concentration) for Th-232 = 5E-13uCi/ml

Administrative Site Limit for Occupational Exposure = 30% Th-232 DAC = 1.5E-13 uCi/ml

Attachment D

Equipment Surveys

Electric Conduit Construction
250-367 N. Columbus Dr.

