

RESULTS OF RADIOLOGICAL MEASUREMENTS AT  
310 Lower Michigan Avenue  
CHICAGO, ILLINOIS

ON:

FEBRUARY 4, 2019

FOR:

**Member Mechanical, Inc. dba Burke Plumbing**

**6321 N Avondale Suite A 211**

**Chicago, ILLINOIS 60631**

By:

***RSSI***

6312 OAKTON STREET  
MORTON GROVE, ILLINOIS 60053

FEBRUARY 7, 2019

## **Introduction**

Member Mechanical, Inc. dba Burke Plumbing (Burke Plumbing) asked RSSI to perform surveys at 310 Lower Michigan Avenue as part of an emergency water shut off project. Beginning February 4, 2019, RSSI surveyed the excavated area surrounding a water shut off valve. The purpose of these radiological measurements was to determine if there were radiation levels associated with thorium contamination.

Thorium-contaminated soils have been found at various locations in the Streeterville area of Chicago. Beginning in 1915, the Lindsay Light and Chemical Company (Lindsay Light) refined and used thorium in industrial operations between Illinois Street and Grand Avenue, east of Michigan Avenue. The Lindsay Light operation produced large volumes of thorium-contaminated tailings used as fill throughout Streeterville.

All isotopes of thorium are radioactive. Thorium's predominant isotopes are in the uranium and thorium decay series of naturally occurring radioactive isotopes. These series begin with uranium-238 (U-238) and thorium-232 (Th-232), respectively. Each series decays through a progression of radionuclides to a stable isotope of lead. The radionuclides include intermediate progeny, such as

radium-226 (Ra-226) and radon-222 (Rn-222) in the uranium series and radium-228 (Ra-228), radium-224 (Ra-224), and radon-220 (Rn-220) in the thorium series as well as their decay products.

The EPA has set a concentration limit in soil of 5 picocuries per gram (pCi/g) total radium above background. Total radium is the sum of Ra-226 plus Ra-228. The EPA has stated that the background concentration in the Chicago Streeterville area is 2.1 pCi/g of total radium, resulting in an action level of 7.1 pCi/g total radium. The guidelines permit release of areas for unrestricted use when the concentration of total radium in soil is no more than the action level.

### **Methodology**

RSSI measured radiation levels using a Ludlum Model 193 with an unshielded Ludlum Model 44-10 gamma scintillation detector. The Ludlum Model 193 is a general purpose portable survey instrument with a fixed-point alarm and a quick deviation alarm that is based on the rate of change in radiation levels. The quick deviation alarm enables detection of slight changes in radiation levels. The Ludlum Model 44-10 has a 2"x2" thallium-doped sodium

iodide (NaI(Tl)) gamma scintillator that responds to photons.

The Ludlum Model 193 with a Ludlum model 44-10 detector was unshielded to expose it to the survey area as completely as possible. The instrument response was approximately 680 counts per minute (cpm) above background per picocurie per gram (pCi/g) of total radium. The EPA's limit of 7.1 pCi/g total radium (5 pCi/g above a background total radium level of 2.1 pCi/g results) corresponded to approximately 6628 cpm above background. Instrument calibration records are in Appendix A.

## Results

The instrument response varied with depth as shown in the table below.

<u>Location</u>	<u>CPM</u>
Background	1,800
Asphalt	2,000
Concrete Rubble	2,400
After 1st lift	2,800
Bottom of excavation (6 ft)	3,600

## Conclusions

The highest instrument count rate was 1800 cpm above background, corresponding to approximately 2 pCi/g combined radium, well below the EPA's action level.

**Appendix A: Calibration Records**

Ludlum 193 SN: 149073  
 2" x 2" ID #1  
 Date Calibrated: 3/28/2018  
 Certificate #: 051164

Background  
 3' Cable  
 25' Cable

Shielded	Unshielded
2,400	6,000
1,200	2,000

gross cpm  
 gross cpm

Thorium Blocks  
 3' Cable  
 25' Cable

Shielded	Unshielded
9,200	24,000
5,000	8,600

gross cpm  
 gross cpm

Radium Blocks  
 3' Cable  
 25' Cable

Shielded	Unshielded
9,000	24,000
4,800	8,400

gross cpm  
 gross cpm

Thorium Blocks  
 3' Cable  
 25' Cable

Shielded	Unshielded
6,800	18,000
3,800	6,600

net cpm  
 net cpm

Radium Blocks  
 3' Cable  
 25' Cable

Shielded	Unshielded
6,600	18,000
3,600	6,400

net cpm  
 net cpm

Thorium Blocks  
 3' Cable  
 25' Cable

Shielded	Unshielded
10	pCi/G
680	1,800
380	660

cpm/pCi/g  
 cpm/pCi/g

Radium Blocks  
 3' Cable  
 25' Cable

Shielded	Unshielded
10	pCi/G
660	1,800
360	640

cpm/pCi/g  
 cpm/pCi/g

Action Level  
 Thorium  
 3' Cable  
 25' Cable

Shielded	Unshielded
5	pCi/G
3,400	9,000
1,900	3,300

cpm above bkgr  
 cpm above bkgr

Action Level  
 Radium  
 3' Cable  
 25' Cable

Shielded	Unshielded
5	pCi/G
3,300	9,000
1,800	3,200

cpm above bkgr  
 cpm above bkgr

EPA Limit  
 Thorium  
 3' Cable  
 25' Cable

Shielded	Unshielded
7.1	pCi/G
4,828	12,780
2,698	4,686

cpm above bkgr  
 cpm above bkgr

EPA Limit  
 Radium  
 3' Cable  
 25' Cable

Shielded	Unshielded
7.1	pCi/G
4,686	12,780
2,556	4,544

cpm above bkgr  
 cpm above bkgr

Calibrated using the IEMA West Chicago blocks.