RSSI

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994673

RADIOLOGICAL MEASUREMENTS AT 227 EAST ONTARIO STREET CHICAGO, ILLINOIS

FOR:

CARLSON ENVIRONMENTAL
8501 WEST HIGGINS ROAD
SUITE 790
CHICAGO, ILLINOIS

ON:

AUGUST 19, 2024 AND AUGUST 21, 2024

BY:

RSSI
6312 OAKTON STREET
MORTON GROVE, ILLINOIS 60053

AUGUST 23, 2024

Introduction

On August 19, 2024 and August 21, 2024, RSSI measured radiation levels from subsurface borings as part of a site evaluation at 227 East Ontario Street in Chicago, Illinois. The purpose of the measurements was to determine if elevated radiation levels associated with thorium-contaminated soils were present.

Thorium-contaminated soils have been found at multiple 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. 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, and decay through a progression of radionuclides to stable isotopes of lead. The radionuclides include intermediate progeny such as radium-226 (Ra-226) in the uranium series and Ra-228 and Ra-224 in the thorium series.

The EPA has set an action level in soil of 5 picocuries per gram (pCi/g) total radium (Ra-226+Ra-228) above a background concentration of 2.1 pCi/g for an action level of 7.1 pCi/g total radium. The EPA guidelines permit release of areas for unrestricted use when the concentration of total radium in soil does not exceed the action level.

Methodology

RSSI measured radiation levels using a Ludlum Model 193 survey meter with a side-shielded 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"×2" thallium-doped sodium iodide (NaI(Tl)) gamma scintillator that responds to photons. The shielded detector restricts the angular response to radiation to in front of the scintillator crystal.

The instrument response was 620 counts per minute (cpm) per pCi/g of total radium when calibrated against a thorium source block. The EPA's action level of 7.1 pCi/g total radium corresponds to 4402 cpm above the instrument background (net cpm).

Results

A Geoprobe was used to remove subsurface cores from four sites inside 227 East Ontario Street; three in a restaurant and one in a utility room. Once removed from the Geoprobe, the cores were surveyed before material was extracted for [non-radiological] environmental testing. Any excess material was poured back down the boreholes before they were capped with concrete.

All radiation levels were below the action level. The highest measurement of around 400 net cpm was seen in cores 3 and 4. 400 net cpm corresponds to around 0.6 pCi/g total radium.

Results are in Appendix A and measurement locations are in Appendix B. Instrument calibration records are in Appendix C.

Conclusions

No measurements exceeded the action level of 7.1 pCi/g total radium. No further action is required at this time.

Appendix A: Full Results

Table 1: Daily Instrumentation Configuration

Date	**Meter SN**	**Background [cpm]**	**Action Level [gross cpm]**	**Efficiency[1]**
8/19/2024	149080	2200	6602	620
8/21/2024	149080	2200	6602	620

All measurements were taken with a 3-foot cable and a side-shielded probe.

Table Notes:
[1] Efficiency is measured in net cpm per pCi/g total radium based on thorium block calibration.

Table 2: Survey Results

Core	Depth	Date	Reading (gross cpm)	Reading (net cpm)	Concentration (pCi/g total radium)
1	1	8/19/2024	2400	200	0.3
1	2	8/19/2024	2200	0	0.0
1	3	8/19/2024	2400	200	0.3
1	4	8/19/2024	2400	200	0.3
2	1	8/19/2024	2200	0	0.0
2	2	8/19/2024	2200	0	0.0
2	3	8/19/2024	2400	200	0.3
3	1	8/21/2024	2600	400	0.6
3	2	8/21/2024	2400	200	0.3
4	1	8/21/2024	2600	400	0.6
4	2	8/21/2024	2600	400	0.6
4	3	8/21/2024	2600	400	0.6

Appendix B: Figures

Figure 1: Hole IDs (C# = Core #)

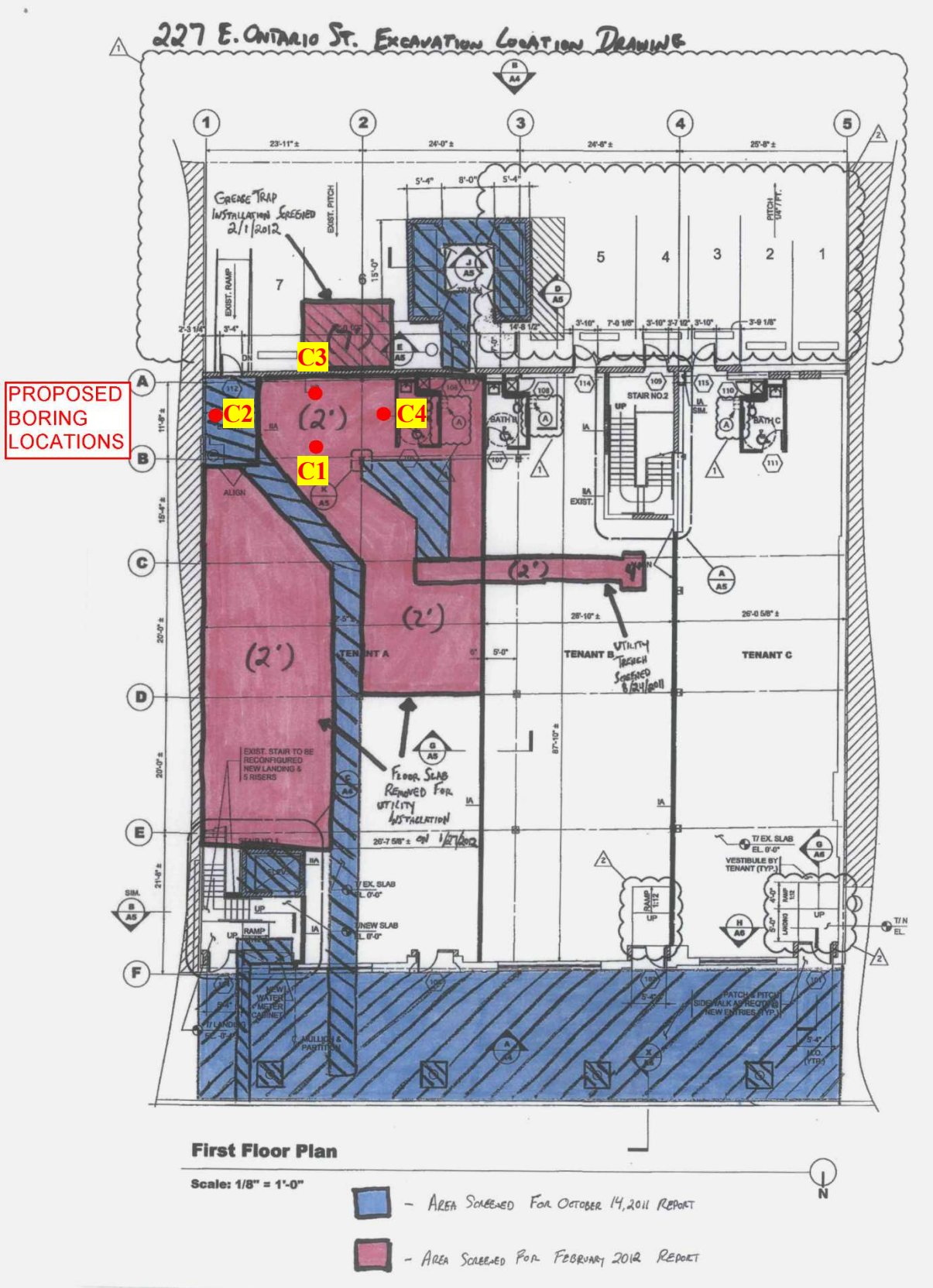

Figure 2: Core 1 location

Figure 3: Core 2 location

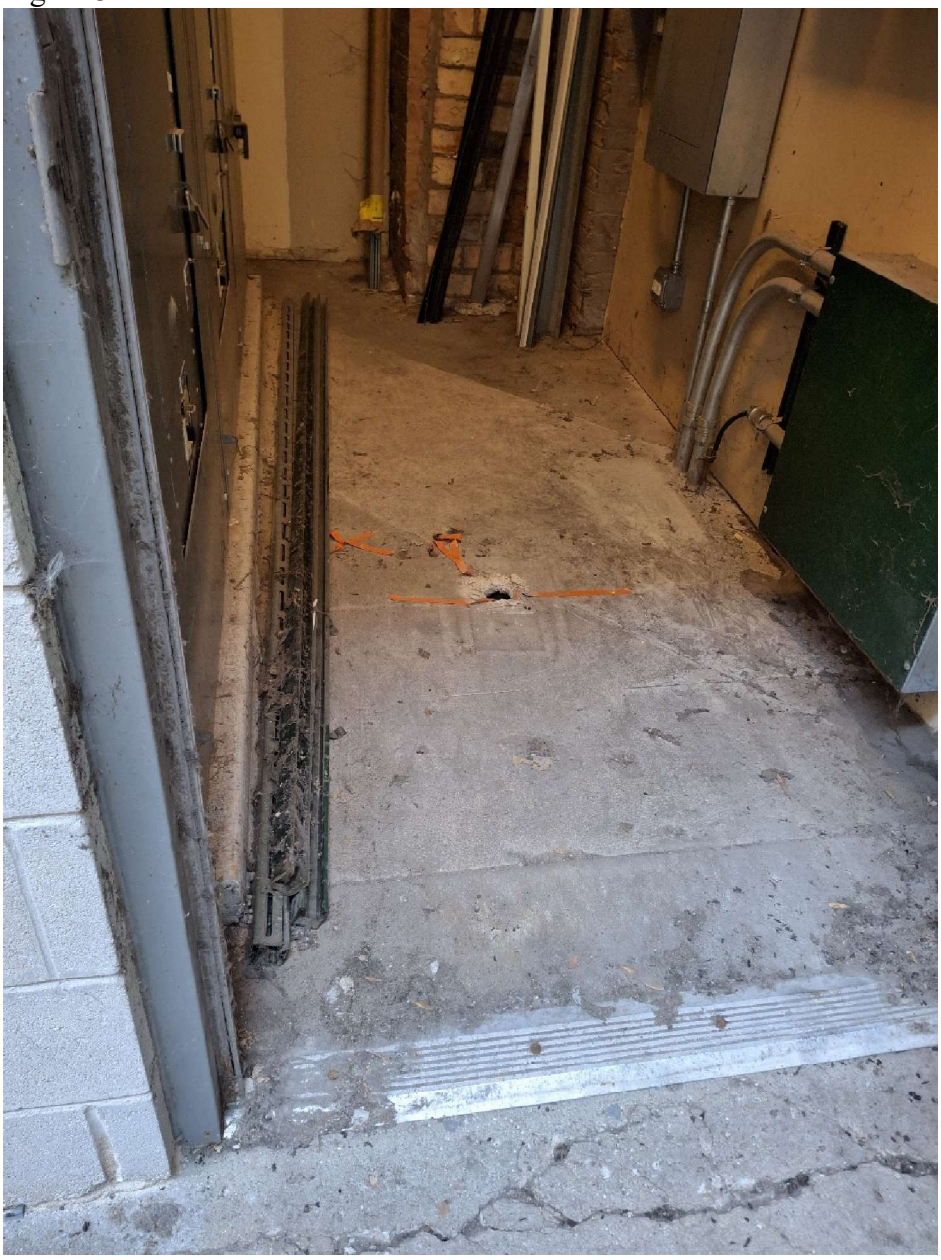

Figure 4: Core 3 location

Figure 5: Core 4 location (under Geoprobe)

Appendix C: Calibration Records

RSSI

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consult@rssi.us

CERTIFICATE OF CALIBRATION

Certificate No. 055799

RSSI
6312 Oakton Street
Morton Grove, IL 60053-2723

Manufacturer: LUDLUM
Model: 193
Serial No.: 149080
Probe(s): LUDLUM 44-10, Sn: PR155592 (#2)

CALIBRATION DATA

SOURCE*	SCALE	FIELD (cpm)	READING (cpm)	FIELD (cpm)	READING (cpm)
5	x1	200	200	800	800
5	x10	2 K	2 K	8 K	8 K
5	x100	20 K	20 K	80 K	80 K
5	x1000	200 K	200 K	800 K	800 K

If the accuracy of a scale is not within +/-10% but is within +/-20% a correction factor is supplied.

LUDLUM 44-10 γ Efficiencies in cpm per pCi/g:

	Thorium		Radium	
	Shielded	**Unshielded**	**Shielded**	**Unshielded**
3' Cable	620	1,540	1,000	2,140
25" Cable	226	296	286	386

LUDLUM 44-10 US EPA Action Level of 7.1 pCi/g in net cpm:

	Thorium		Radium	
	Shielded	**Unshielded**	**Shielded**	**Unshielded**
3' Cable	4,402	10,934	7,100	15,194
25" Cable	1,605	2,102	2,031	2,741

Check Source: Ba-133 **Reading:** 180 kcpm **Cable Length:** 3'
Check Source: Ba-133 **Reading:** 12 kcpm **Cable Length:** 25'

Comments: Check source readings taken with label side facing detector.

Calibrated by: Aaron D. Morin _____ **Date**: 05/06/24

Calibration Frequency: Annual **Recalibrate by**: 05/06/25

***SOURCE**	**1. Cs-137**	**2. Cs-137**	**5. Electronic**	**6. Other**
Manufacturer	U.S. Nuclear	Eon Corp.	LUDLUM	
Model	CCs-D-20E	64-764	500	
Serial Number	69036EZ	222	32789	
Activity	15 Ci	100 mCi	NONE	
Date	4/23/2009	5/2/1978	12/14/2023	

Calibration authorized by Illinois Department of Nuclear Safety License No. IL-01429-01 and meets the requirements of ANSI 323-1978 and MIL-STD-45662A. Exposure rate traceable to the International System of Units (SI) through the national standard of Canada with a Radcal model 2186 (SN 27-0593) transfer instrument. NRC-CNRC Exposure Calibration Reports IRS-2023-3949, IRS-2023-3950, and IRS-2023-3951.

PREVENTIVE MAINTENANCE PERFORMED

BATTERIES/CONTACTS CHECKED	✓	1.50, 1.50 V
HIGH VOLTAGE MEASURED	✓	881 VOLTS
SENSITIVITY MEASURED	✓	10 mVOLTS
METER ZERO CHECKED	✓	
INSTRUMENT CLEANED	✓	

REPAIR AND PART INFORMATION

Quantity	Description

Repair Time: _____ hours

Comments: _____
_____
_____
_____
_____

Lab Reference: 21
Certificate No.: 055799