



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

May 5, 2017

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SUBJECT: INDIANA RADIUM INSTITUTE-4—RESULTS AND CONCLUSIONS OF THE
U.S. NUCLEAR REGULATORY COMMISSION'S INITIAL SITE VISIT

Dear []

I am writing to provide you with the results of the U.S. Nuclear Regulatory Commission (NRC) staff's initial site visit to your property at [] performed on December 13, 2016.

The purposes of the initial site visit were to: 1) determine if there are health and safety concerns to current property occupants or site visitors; and 2) identify the locations with the potential for contamination and gather information for a scoping survey plan, should it be needed.

As described in the site summary, attached to the letter dated October 6, 2016, a building previously located on your property was associated with the former Indiana Radium Institute and was torn down as part of a redevelopment project. Your property is one of five townhomes that is a portion of the historical site. Based on the history of the site and its redevelopment, NRC staff considered the likelihood of discrete sources of radium-226 (Ra-226) being located within the existing structures to be negligible. Therefore, the initial site visit focused on the accessible areas of your property to identify any discrete Ra-226 sources, which may be indicative of additional Ra-226 in subsurface soil.

As discussed within the enclosed report, NRC staff and staff from the Oak Ridge Institute for Science and Education performed radiological surveys consisting of gamma radiation scans and exposure rate measurements. Surveys were conducted on accessible areas outside your property. Surveys were not conducted inside your property because access was not granted to interior spaces. Surveys covered approximately 60 percent of the area within the boundary that includes the five townhomes located at the historical site. With the redevelopment history of the site, it is assumed that the area surveyed in the surface scans is representative of the currently inaccessible subsurface soil covered by the footprint of your property. The NRC did not survey under the current driveway or building foundations.

NRC staff concludes, based on radiological conditions observed during the initial site visit and a review of the site history, that: 1) there is no indication of discrete sources of Ra-226 on the

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DISTRIBUTION:

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***via e-mail**

OFFICE	DUWP/MDB/PM	DUWP/LA	DUWP/MDB	DUWP/MDB
NAME	JWhited	CHolston	ASchwartzman*	RNelson*
DATE	02/28/2017	02/28/2017	03/16/2017	03/02/2017
OFFICE	RIII/DNMS/BC	DUWP/MDB/BC (A)	OGC (NLO)	DUWP
NAME	MKunowski*	TSmith	AWase*	JTappert
DATE	03/23/2017	03/24/2017	04/06/2017	05/05/2017

OFFICIAL RECORD COPY

Enclosure

OAK RIDGE INSTITUTE FOR SCIENCE AND EDUCATION:
SITE STATUS REPORT FOR THE INDIANA RADIUM INSTITUTE AT
[]

May 5, 2017

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EXECUTIVE SUMMARY

The U.S. Nuclear Regulatory Commission (NRC) requested that the Oak Ridge Institute for Science and Education (ORISE) perform a radiation survey of the property at [

] This property covers part of the footprint once occupied by the Indiana Radium Institute, which used radium sources to treat cancers and other skin diseases into the early 1920s. The original building was torn down, and the land has been redeveloped. The objective of this survey was to locate possible discrete sources of radium, if any, that would be associated with the Indiana Radium Institute's operations.

ORISE performed the radiation survey on December 13, 2016, and did not identify elevated levels of radiation indicative of discrete sources of radium. Because no elevated levels of radiation were identified, ORISE concludes that discrete sources of radium are likely not present in subsurface soils. Based on these results, it is recommended that the NRC not pursue additional action at the [] property. The inspection team did not access interior spaces.

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]. The scope of this report is limited to a single townhome in the west section of that building. Directly on either side of [] are grassy areas sloping up to the interstate with residential and shopping areas further down the road.

The exact amount of radium that was used at the Indiana Radium Institute is unknown. According to advertisements, the Indiana Radium Institute performed “accurate and scientific application of radium,” provided “radium for renting purposes,” and used radium in “solution for emanation” (ORNL 2015).

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Figure 1. Approximate Location of the Indiana Radium Institute in Indianapolis (Google Earth, 2014)

2.2 Initial Site Visit Considerations

Based on the history of the property and its redevelopment, NRC staff considers the likelihood of discrete sources of Ra-226 existing in current property structures to be negligible. Rather, were discrete sources of Ra-226 present, they would likely be in subsurface soils. However, it is likely that existing surface soils were transported off site and backfill materials were brought in during redevelopment activities. As a result, potential mixing between the backfill and remaining subsurface soils would likely further dilute any remaining discrete subsurface sources of Ra-226. The structures, pavement, and other obstructions on the property limited the area in which soil surveys could be performed. Therefore, this initial site visit focused on identifying discrete sources of Ra-226 associated with the areas surrounding the townhomes. Surveys covered approximately 60 percent of the area within the property boundary that includes the five townhomes located at the historical site.

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3.0 SITE OBSERVATIONS AND FINDINGS

3.1 Summary of Activities

The inspection team conducted an initial site visit with radiological surveys at the [] property on December 13, 2016. A pre-inspection meeting was held with Mike Kunowski, Herral Logaras, and Maureen Conley from NRC, Amber Kent from the State of Indiana, and Teresa Brown from ORAU. Participants discussed the inspection team’s intention to perform general area surveys outside the [] property. The current owners did not give consent to survey the inside of the townhome, but did allow the inspection team to survey outside areas.

Radiological surveys consisted of gamma radiation scans using a Ludlum model 44-10 2-inch by 2-inch sodium iodide detector (2×2) connected to a Ludlum model 2221 ratemeter/scaler, and exposure rate measurements using a Ludlum model 192 ratemeter. The 2×2 sodium iodide detector can respond to gamma-emitting radionuclides located in the top 6 to 12 inches of soil. A Ludlum model 44-142 plastic scintillator was available for direct surface activity measurements. Surface scans outside the townhome focused on the garden, deck, and driveway areas. Table 1 presents the specific instruments used during the initial site visit.

Radiation Type (units)	Detector Type	Detector (Number)	Ratemeter (Number)
Alpha-plus-beta (cpm)	Plastic Scintillator	44-142 (690)	2221 (602)
Gross gamma (cpm)	Sodium Iodide	44-10 (1151)	2221 (693)
Gross gamma (µR/h)	Exposure Rate Meter	192 (1128)	N/A

N/A = not applicable; ratemeter is not required
Number = equipment tracking number
cpm = counts per minute
µR/h = microRoentgen per hour

3.2 Summary of Results

Figure 2 presents a summary of results from the initial site visit. Inspectors identified no anomalous gamma radiation measurements and did not identify any discrete Ra-226 materials in the surveyed areas at the [] property. In general, the sodium iodide detector background responses ranged from about 5,400 to 7,000 counts per minute (cpm), depending on proximity to brick buildings, sidewalks, and grassy areas, while exposure rates varied similarly depending on proximity to naturally occurring radioactive materials (NORM), with a consistent range from 4 to 5 microRoentgens per hour (µR/h¹). These results are expected with NORM in this configuration.

¹ NOTE: Roentgen (R) is a unit of exposure (energy absorbed in air), whereas a Rem is a unit of dose delivered to a person (resulting from the radiation energy absorbed in that person). While Roentgen and Rem are related, these are different units. Because they are similar for gamma ray energies from Ra-226, NRC makes the simplifying assumption in this case that these units are equivalent (1 Roentgen = 1 Rem).

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In addition, no records were identified that suggest discrete sources of radium exist after the property's redevelopment.

SITE: Indiana Radium Institute	AREA: []	DATE: 12/13/2016	TIME: 14:00 - 18:30
SURVEYOR(S): T. Brown		PURPOSE: Site Visit	

TYPE	INSTRUMENT	DETECTOR	BACKGROUND
Gamma	2221 #693	44-10 #1151	5.4 – 6.9 kcpm ^a
Exp. Rate	192 #1128	NA	4 – 5 µR/h ^a

^aBackground varied depending on NORM in the area.

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Figure 2. Survey Results of [] Property

3.3 Summary of Dose Assessment Results

Because no radiation levels were detected above background and no discrete sources of radium were encountered, a dose attributed to discrete radium sources could not be calculated.

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4.0 OBSERVATIONS AND RECOMMENDATIONS

There was no indication from the areas surveyed that the [] property, occupying a portion of the former Indiana Radium Institute, contains discrete sources of Ra-226 as determined by the following observations:

- Gamma radiation levels were consistent with background.
- The absence of observable gamma radiation anomalies is indicative that there are no discrete sources of Ra-226 present.
- There was no historical evidence that discrete sources of Ra-226 are present following the Institute's demolition and the property's subsequent redevelopment.
- Risk of potential contamination on the site is low and, if present, would most likely be found at a significant depth in the subsurface soil.

Therefore, the recommendation to the NRC staff is that a more detailed scoping survey is not necessary at this time, and NRC staff should not pursue additional action at the [] property.

5.0 REFERENCES

NRC 2016. *Inspection of Facilities Potentially Contaminated with Discrete Radium-226 Sources*, Temporary Instruction 2800/043, U.S. Nuclear Regulatory Commission, Office of Nuclear Material Safety and Safeguards, Washington, D.C., October. (Agencywide Documents Access and Management System [ADAMS] Accession No. ML16035A053).

ORNL 2015. *Historical Non-Military Radium Sites Research Effort Addendum*, "Indiana Radium Institute: Site Summary," Pages 68-72, Oak Ridge National Laboratory, Oak Ridge, Tennessee, November 24 (ADAMS Accession No. ML16291A488).