



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

December 19, 2017

Ms. Kim Filson
Right of Way Engineering Assistant
INDOT Greenfield District Office
32 South Broadway
Greenfield, Indiana 46140

SUBJECT: INDIANA RADIUM INSTITUTE-6—RESULTS AND CONCLUSIONS OF THE
U.S. NUCLEAR REGULATORY COMMISSION'S INITIAL SITE VISIT

Dear Ms. Filson:

I am writing to provide you with the results of the U.S. Nuclear Regulatory Commission (NRC) staff's initial site visit to the property described below performed on September 27, 2017.

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 attached site summary, a building previously located on the property now owned by the State of Indiana was associated with the former Indiana Radium Institute and was torn down as part of a redevelopment project. The property of interest is adjacent to five nearby private townhomes, which are also within the boundary of the historic sanatorium and near the corner of [] in Indianapolis, Indiana, and is currently an abutment near [].

The NRC staff conducted surveys in December 2016, at the five nearby townhomes and concluded that there were no discrete sources of radium-226 (Ra-226) present on the townhome owners' properties.¹ The initial site visit at the property of interest was conducted as it represented the remaining footprint of the historic sanitarium.

As discussed within the enclosed report, NRC staff performed radiological surveys consisting of gamma radiation scans. Surveys were conducted on accessible areas of the property covering approximately 80 percent of the area within the boundary of the historical site. With the

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BRACKETED INFORMATION THE LETTER AND ITS ENCLOSURES CAN BE MADE
PUBLICALLY AVAILABLE.**

¹ The reports detailing the initial site visits at the townhomes can be found in the NRC's Agencywide Document Access and Management System (ADAMS) at Accession Nos. ML17061A702, ML17061A704, ML17061A705, ML17061A706, and ML17061A707.

K. Filson

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redevelopment history of the site, it is assumed that the area surveyed in the surface scans is representative of the currently inaccessible subsurface soil.

The NRC staff concludes, based on radiological conditions observed during the initial site visit and review of the site history, that: 1) there is no indication of discrete sources of Ra-226 on the portions of the property that were evaluated; and 2) a follow-up scoping survey is not required as it would be unlikely to yield additional information. Given these conclusions, no further actions are needed from you at this time.

The enclosed Site Summary Report provides all of the information that the NRC has concerning historical radium storage at the former Indiana Radium Institute, which we found through a search of publicly available information. The enclosed Backgrounder provides more detail on the history of radium use and its potential health effects.

In accordance with 10 CFR 2.390 of the NRC's "Agency Rules of Practice and Procedure," upon removal of the bracketed information, a copy of this letter will be available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records component of NRC's Agencywide Documents Access and Management System (ADAMS). ADAMS is accessible from the NRC Web site at <http://www.nrc.gov/reading-rm/adams.html>.

If you have any questions concerning this letter, please contact Mr. Stephen Koenick, Chief, Materials Decommissioning Branch, Division of Decommissioning, Uranium Recovery and Waste Programs, Office of Nuclear Material Safety and Safeguards, at (301) 415-6721, or Mr. Jeffrey Whited, Project Manager, at (301) 415-4090.

Sincerely,

/RA/

John R. Tappert, Director
Division of Decommissioning, Uranium Recovery
and Waste Programs
Office of Nuclear Material Safety
and Safeguards

Docket No.: 03039054

Enclosures:

1. Site Summary Report
2. Radium Backgrounder
3. Site Status Report for Indiana Radium Institute-6 []

REGISTERED LETTER – RETURN RECEIPT REQUESTED

Enclosure 1

SITE SUMMARY REPORT:
FOR THE INDIANA RADIUM INSTITUTE AT

[

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November 24, 2015

Indiana Radium Institute: Site Summary

The following information was extracted from public records.

Address

[]

Site Description/History

According to early 1920s advertisements, the Indiana Radium Institute contained “ample laboratory facilities and consulting staff for accurate and scientific application of radium” (JAMA, 1921) and provided “radium for renting purposes” (JMSMS, 1921). Also, the advertisements referenced the use of radium in solution for emanation and suggested a relatively high activity of radium in their possession.

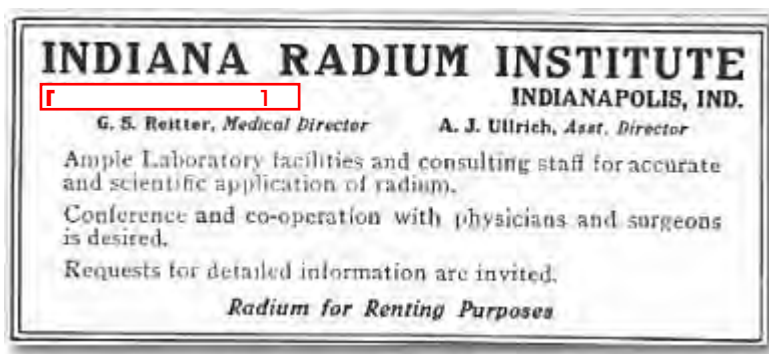


Figure 1. Advertisement from JAMA (1921)

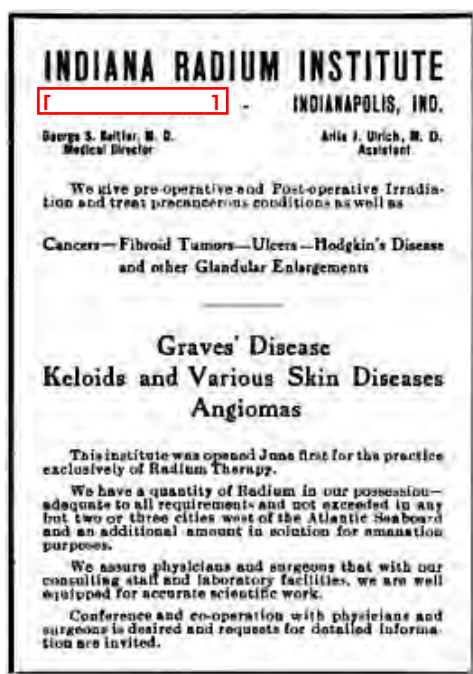


Figure 2. Advertisement from JMSMS (1921)

According to 1940 Census results found on ancestry.com (2015), the address appeared to be a residence for several women. There is no information in the public records about this address post 1940.

The amount/extent of radium contamination at these sites (including historical information and/or informed assumptions about the radium facilities' structures/areas, processes, and activities)

It is unknown the exact amount of radium that was available at this facility. According to advertisements, the Indiana Radium Institute performed accurate and scientific application of radium, rented radium, and used radium in solution for emanation.

Summary of Current Levels of Radium:

As of November 2015, current levels of radium are unknown based on information reviewed for this report.

Location and population near the sites

In order to identify the exact location of the former facility, a 1915 Sanborn Fire Insurance map (Indiana University, 2015) was overlaid on a high resolution aerial photo from 2006. The resulting image is Figure 3. The map shows the location of the former Indiana Radium Institute (sanitarium) on [redacted]. The location is currently within a parking lot for apartments to the south and the [redacted] easement to the north (see Figure 4). This area appears to be mostly residential.

A close-up of this location (Figure 4) shows that the Institute is no longer there. It is unknown when the building was demolished. The site may contain soil that is contaminated with radium.

Indianapolis is the capital of the U.S. state of Indiana and the county seat of Marion County. Indianapolis is the largest city in Indiana, second largest in the American Midwest, and 14th largest in the U.S. According to the 2010 U.S. census, the population of Indianapolis was 820,445; the 2014 population estimate for the city was 848,788 (United States Census Bureau, 2015).

[

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Figure 3. Location of Indiana Radium Institute ([, see red arrow). Image created by overlaying a Sanborn Fire Insurance map from 1915 (yellow and pink buildings) onto a 2006 aerial photo

[

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Figure 4. Enlargement of Figure 3 showing the location of Indiana Radium Institute in 1915.

Current State/other Federal involvement

As of November 2015, no information about radium cleanup was located in the public records.

Current access, activities, and uses at the site

There are apartments adjacent to the site location and other residences nearby. The rest of the area is part of the [] easement.

Existing Engineering Controls

There are no engineering controls.

Prioritization Ranking

Radium is confirmed to have been present at the site based on historical documentation that radium was used at the facility. The original building has been demolished. The site consists of soil that is potentially contaminated by radium. The site is occupied or frequented by visitors. Therefore, the site is classified as Tier 1.

References

Ancestry.com. 1940. Accessed June 3, 2015. 1940 Census. [

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Google Earth. 2014. Accessed June 3, 2015. <https://www.google.com/maps/>.

Indiana University. 2015. Accessed October 2015. Spatial Data Portal. Map number 02371_04_1915-0359.pdf.

<https://spatialdata.iu.edu/DOQQS/state/sanborn/public/pdf/1915/>

Journal of the American Medical Association (JAMA). 1921. Advertisement for Indiana Radium Institute. Vol. 76: p 52. February 26, 1921.

Journal of the Missouri State Medical Society (JMSMS). 1920. Advertisement for Indiana Radium Institute. 17(10):xvii . 1920.

United States Census Bureau. Accessed October 2015.

<http://www.census.gov/quickfacts/table/PST045214/1836003,00>.

Enclosure 2

RADIUM BACKGROUNDER

October 2016

Radium

Radium was one of the first radioactive elements ever discovered. Marie and Pierre Curie unlocked the atom's secrets in 1898, opening the door for important innovations using radioactivity in medicine and industry. Radiation quickly became a consumer and medical sensation and radium was the posterchild. Experts concluded radiation was a lifesaver after finding it reduced tumor growth and was present in the waters at some health spas. Soon there were many radium products on the market that purported to improve health and vitality. But tragic stories began to emerge of the health impacts. Perhaps the most well-known is the "radium girls," who painted watch faces with glow-in-the-dark radium paint and developed infections and jaw cancer from licking their brushes into fine points.

Early regulation

When evidence of harm began to emerge in the early 1900s, the states each made their own decisions about how to regulate. Courts also took varying approaches on victim compensation. The federal government took action to guard against false advertising and regulate mail shipments, conducted studies, and organized some voluntary protections.

As radioactive materials became more widely available following World War II, they remained largely under state control. Radium use declined in medical and consumer products in favor of other safer materials.

Regulation today

Work on securing radioactive materials took on new urgency following the terrorist attacks on the United States in September 2001. Those attacks prompted the International Atomic Energy Agency to develop a code of conduct in 2004 to limit the potential for malicious acts. That code places one form of radium, known as radium-226, and other radioactive materials into categories based on their quantity and potential hazard.

The NRC has specific security requirements tied to these categories. As support for the IAEA code grew, Congress passed the Energy Policy Act in 2005, giving the NRC authority over radium-226. This law marked the first time the federal government had a comprehensive role in ensuring the safe use of radium-226.

Many states had developed strong programs for regulating radium and other naturally-occurring radioactive materials and it took time to transition authority. The NRC had regulations in place and fully assumed oversight in 2009. Initially, NRC staff worked exclusively with the military to identify sites

where radium might be present. These discussions made clear that the NRC's role would include ensuring that sites where radium was used are maintained in a way that protects public health and safety.

In 2016, the NRC and Department of Defense signed a [Memorandum of Understanding \(MOU\)](#) describing roles in the cleanup of radium and other unlicensed radioactive materials at military sites. The MOU and a [Regulatory Issue Summary](#) clarify NRC's jurisdiction over military radium. In late 2016, the NRC began monitoring two sites under the MOU: Treasure Island Naval Station in San Francisco and Dugway Proving Ground in Utah.

In 2013, the agency learned of two commercial sites where radium-226 had been found and other federal agencies had gotten involved. The Environmental Protection Agency was overseeing portions of the Waterbury Clock Company in Connecticut. The National Park Service was overseeing Great Kills Park in New York.

NRC staff is working with the current owner of the Waterbury Clock Company site. Contaminated areas of the site are under EPA oversight through its Brownfields Program, which provides assistance to clean up contaminated properties. NRC staff is working with EPA to clarify oversight roles and responsibilities under that program.

In 2016, NRC staff began developing an MOU with the National Park Service that will also clarify the NRC's jurisdiction over radium at Great Kills Park. The NRC is monitoring cleanup activities that the Park Service is implementing under Superfund, more formally known as the Comprehensive Environmental Response, Compensation and Liability Act.

Those projects prompted a search to identify sites in NRC's jurisdiction where radium was used, and to find out how much, if any, cleanup was done. This search was not a result of any known health and safety issues. Rather, because of its mandate to protect public health and safety, the NRC wanted to be sure there were no additional sites that might pose a risk.

With the help of the Oak Ridge National Laboratory, the NRC began to develop a fuller picture of commercial radium use. The lab produced a [catalog](#) of the various products developed and sold to the public in the early 20th century. By reviewing publicly available records, Oak Ridge identified sites where radium may have been used to make consumer goods. Then the lab looked for any cleanup records. Oak Ridge transmitted the results to the NRC in November 2015. Since that time, the agency has been working on plans to gather more information about those sites.

The NRC is working with state and local governments to identify any additional records that may help clarify whether any site cleanup has taken place. The goal is to ensure that public health and safety is adequately protected at these sites.

October 2016

Enclosure 3

U.S. NUCLEAR REGULATORY COMMISSION:

SITE STATUS REPORT FOR THE INDIANA RADIUM INSTITUTE AT

[

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December 19, 2017

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EXECUTIVE SUMMARY

The U.S. Nuclear Regulatory Commission (NRC) performed 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.

The NRC staff performed the radiation survey on September 27, 2017, and did not identify elevated levels of radiation indicative of discrete sources of radium. Because no elevated levels of radiation were identified, the NRC staff concludes that discrete sources of radium are likely not present in subsurface soils. Based on these results, no additional actions are necessary at the property.

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SITE STATUS REPORT

Property: Former Indiana Radium Institute

[]

Docket Number: 03039054

Current Property Name: Interstate Abutment

Current Property Owner: State of Indiana

Inspection Date: September 27, 2017

Participants: Bill Lin/ NRC, and Edgardo Montalvo/ Indiana State Department of Transportation

1.0 INTRODUCTION

The Energy Policy Act of 2005 amended section 11e.(3) of the Atomic Energy Act of 1954 to place discrete sources of radium-226 (Ra-226) under U.S. Nuclear Regulatory Commission (NRC) regulatory authority as byproduct material. The NRC is evaluating properties where a review of historical information has identified Ra-226 use. The property at [] was identified as a portion of the Indiana Radium Institute, a medical facility that operated from 1917 to 1922 (Oak Ridge National Laboratory (ORNL) 2015). The objectives of the initial site visit were to determine if there are health and safety concerns to current property occupants or site visitors and to identify the locations with the potential for contamination and gather information for a scoping survey plan, should it be needed. Surveys were performed as described within NRC's procedure, Temporary Instruction (TI) 2800/043, "Inspection of Facilities Potentially Contaminated with Discrete Radium-226 Sources" (NRC 2017).

Data collected during the September 27, 2017, site visit, including gamma radiation scans, are used to plan future actions that may be needed to reduce Ra-226 exposure to current or future site occupants to levels that do not exceed the applicable regulatory requirement. It is important to note that destructive testing is not generally performed as described within TI 2800/043.

2.0 PROPERTY DESCRIPTION AND INITIAL SITE VISIT CONSIDERATIONS

2.1 Property Description and History

The site summary included in the "Historical Non-Military Radium Sites Research Effort Addendum" report (ORNL 2015) provides known site details about the type, form, history, potential locations and other information related to discrete sources of Ra-226 used at the site. The Indiana Radium Institute, a medical facility that performed radium therapy, was once located at [] in Indianapolis, Indiana (see Figure 1). The northern portion of this area is now located near the [] while the southern portion has been re-developed into a single building containing five townhomes on []. The scope of this report is limited to the abutment of []. Residential areas are next to this

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abutment and on the other side of [] there is a 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, the NRC staff considers the presence of discrete sources of Ra-226 existing on the property to be unlikely. If discrete sources of Ra-226 are present, they would likely be in subsurface soils. However, it is likely that backfill materials were brought in during redevelopment activities and as a result, potential mixing between the backfill and remaining subsurface soils would likely dilute any remaining discrete subsurface sources of Ra-226. This initial site visit focused on identifying discrete sources of Ra-226 associated with the areas near the townhomes. Surveys covered approximately 80 percent of the area within the property boundary located at the historical site; the remaining area was not surveyed because vegetation growth (shrubs and trees) made it inaccessible.

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3.0 SITE OBSERVATIONS AND FINDINGS

3.1 Summary of Activities

An NRC inspector conducted an initial site visit with radiological surveys at the [] property on September 27, 2017. A pre-inspection meeting was held with Inspector Bill Lin from NRC and Edgardo Montalvo, an Operations Manager for the Indiana Department of Transportation for Marion County who provided access to the area. Participants discussed the inspection team's intention to perform general area surveys at the property. The NRC inspector obtained consent from the State of Indiana prior to commencing survey activities.

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 2241-3 ratemeter/scaler. The 2×2 sodium iodide detector can respond to gamma-emitting radionuclides located in the top 6 to 12 inches of soil.

Surface scans focused on areas that were near the original facility footprint. Specifically, the NRC inspector surveyed the level area between the fence adjacent to the townhomes and the slope of the abutment for []. This area was bounded on the north by []; the fence, the townhomes, and [] on the south; and [] on the east.

Table 1 presents the specific instrument used during the initial site visit.

Table 1. Indiana Radium Institute Survey Instruments			
Radiation Type (units)	Detector Type	Detector (Number)	Ratemeter (Number)
Gross gamma (cpm)	Sodium Iodide	44-10 (303731)	2241-3 (286671)

Number = equipment tracking number

cpm = counts per minute

3.2 Summary of Results

Figure 2 presents a summary of results from the initial site visit. The inspector 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 5,800 to 8,100 counts per minute (cpm) in the surveyed area. The survey instrument was within calibration and the background taken with the 2×2 was approximately 5,800 cpm.

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

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SITE: Indiana Radium Institute	AREA: []	DATE: 09/27/2017	TIME: Approximately 1 hour
SURVEYOR(S): B. Lin		PURPOSE: Site Visit	
TYPE	INSTRUMENT	DETECTOR	BACKGROUND
Gamma	2241-3 #286671	44-10 #303731	5.8 kcpm

[

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Figure 2. Survey Results of the []

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 calculation attributed to discrete radium sources was not necessary.

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4.0 OBSERVATIONS AND CONCLUSIONS

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 NRC staff concludes that a more detailed scoping survey is not necessary at this time, and that no additional action by the State of Indiana is necessary concerning radiological status of the [].

5.0 REFERENCES

NRC 2017. *Inspection of Facilities Potentially Contaminated with Discrete Radium-226 Sources*, Temporary Instruction 2800/043, Revision 1, 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. ML16330A678).

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).

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U.S. NUCLEAR REGULATORY COMMISSION'S INITIAL SITE VISIT

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RidsRgn3MailCenter

M. Kunowski, RIII

B. Lin, RIII

M. Meyer, NMSS

ADAMS Accession No.: ML17025A351

***via e-mail**

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