

ENCLOSURE 1

Historical Non-Military Radium Sites Research Effort – Publicly Available

Historical Non-Military Radium Sites Research Effort Project Report

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1. Background and Regulatory Authority

The Energy Policy Act of 2005 (EPAcT) amended section 11e.(3) of the Atomic Energy Act of 1954 (AEA) to place certain accelerator-produced radioactive material and discrete sources of radium-226 (Ra-226) under U.S. Nuclear Regulatory Commission (NRC) regulatory authority as byproduct material.

Specifically, Section §651(e)(3)(A) of the EPAcT (§11e.(3) of the Atomic Energy Act of 1954, as amended (AEA); 42 U.S.C. 2014(e)) amended the definition of byproduct material to include “any discrete source of radium-226 that is produced, extracted, or converted after extraction, before, on, or after [August 8, 2005,] for use for a commercial, medical, or research activity.” On November 30, 2007, the NRC implemented this provision of the EPAcT by amending the definition of byproduct material in 10 CFR Parts 20, 30, 50, 72, 150, 170, and 171 to be consistent with the EPAcT in the final rule “Requirements for Expanded Definition of Byproduct Material” (72 FR 55864; October 1, 2007) (NARM rule).

Additionally, the NRC established a definition for the term “discrete source” to be used for the purposes of the new definition of byproduct material as this term was not specifically defined by the EPAcT.

Accordingly, the NRC’s regulations in 10 CFR Parts 20, 30, 110, and 150 define a discrete source as “a radionuclide that has been processed so that its concentration within a material has been purposely increased for use for commercial, medical, or research activities.” *Id.*, at 55870. The Statements of Consideration (SOC) for the NARM rule noted that “once a discrete source meets the definition of *Byproduct material*, any contamination resulting from the use of such discrete sources of this byproduct material will also be considered byproduct material.” *Id.*, at 55871.

Historically, each State had independent jurisdiction over Ra-226, and some States developed regulations for controlling this material. On November 30, 2007, NRC approved the certifications of Governors in Agreement States that they have a program to license this new byproduct material. Today, the 37 states in NRC’s Agreement State program have authority over discrete sources of radium-226. NRC has jurisdiction over discrete sources of radium-226 in the 13 non-Agreement States and the District of Columbia. NRC terminated its waiver to allow continued use and possession of NARM in all non-Agreement States on August 7, 2009, and thus implemented its authority.

From the late 1800s until the 1960s, radium was used in a variety of products, including toothpaste, watch and clock dials, medical uses, and military applications. Originally touted as a cure-all, radium use waned after it was found to cause serious adverse health effects. Due to its long half-life, approximately 1600 years, historical sites where radium was used could still pose a risk to human health.

2. Introduction

In response to NRC’s new jurisdiction for Ra-226, and with NRC staff becoming aware of commercial radium sites with residual contamination (e.g., Waterbury, CT) in 2013, NRC asked the Oak Ridge National Laboratory (ORNL) to identify, describe, and prioritize potential historic commercial radium sites using publically available records. It is expected that most of the potential sites identified would have never been licensed by the NRC. NRC emphasized four main points for this project:

1. ORNL would develop and maintain a list of sites where potential radium usage for the manufacture of consumer products occurred.
2. ORNL would need to prioritize this list of potential radium sites with a robust scheme and notify NRC immediately if, during its research, information suggests that a site poses an immediate public health or safety concern.
3. The focus for site identification should primarily be on non-military sites in the NRC non-Agreement States where NRC has jurisdiction. NRC staff will be working with the military on their sites with radium contamination under a separate initiative.
4. ORNL should research and gather enough information to aide NRC staff in determining whether NRC should follow-up at a potential radium site identified by the research effort. This information should be gathered, where possible, from publically available sources.

3. Radium Site Identification Process

The identification of Radium Sites has been a dynamic process that has continuously evolved and was refined during the data collection task. The preliminary site identification effort was to focus on the historic commercial uses of discrete sources of radium. From the historic commercial uses of radium, manufacturers of these radium products were identified. (Although the focus was on commercial manufacturers of radium, sometimes military manufacturers were identified during the searching process.) Once a manufacturer was identified, research continued to identify the site address, current use of the site, and publically available documentation of previous cleanup efforts, previous radiological surveys, and current levels of radium.

As part of this research, with direction of potential commercial radium sources from NRC, ORNL began to:

- Initially focus on watch/clock factories from the late 1800s to the early 1950s, where luminous radium material was part of the manufacturing process.
- Review the books *Radium Girls* (Clark, 1997) and *Deadly Glow* (Mullner, 1999) for radium consumer products.
- Search for radium sites associated with luminescent paints (e.g., clocks, dials, aircraft switches, etc.).
- Search for radium manufacturers of personal care products such as toothpaste and hair creams.
- Search for manufacturers of radium medical cures (e.g., radium water).
- Conduct a preliminary search for manufacturers of radium medical products, such as nasal implants for ear issues and radium needles for cancer treatment.
- Use existing literature, historical knowledge, and information from NRC.
- Research federal websites (e.g., NRC, EPA, DOE) for radium manufacturers.

The established list of radium uses provided key information to further search the internet for potential radium sites. The following list includes some search terms utilized to locate radium sites via the internet:

- radium cleanup
- radium contamination/waste
- luminescence/luminescent
- radium institute/center/clinic/sanitarium
- radium product/artifact
- radium manufacturer
- radium spray/fertilizer
- radium dial/watch/clock/instrument/repair
- radium capsule/tablet/tube/needle/pill
- radium + State
- radium paint
- luminous paint/watch/dial/products
- radium buttons/circuit/fuse/breaker/switch
- radium advertisement
- radium treatment
- radium plant
- undark/luma/radiolite/marvelite
- Department of Environmental Protection/Department of Public Health websites for each non-Agreement State

NRC later requested that ORNL expand data collection efforts on electrical switches, circuit breakers, fuse manufacturers, airplane scrap yards/boneyards, and medical uses. Therefore, these terms were added to the search criteria and identified sites were added to the database.

3.1. Data and Information Collection for Historical Commercial Radium Sites

NRC requested the following publically available data and information, at a minimum, be collected for radium sites in non-Agreement States:

1. The amount/extent of radium contamination at these sites (including historical information and/or informed assumptions about the radium facilities' structures/areas, processes, and manufacturing activities);
2. general information about the site (e.g., location, nearby population, etc.);
3. previous and current State/Federal involvement; and
4. current access, activities, and uses at the site (including existing controls, such as signs, fences, and restrictions on land use).

While not the primary focus of NRC activities, ORNL identified sites of commercial radium use in Agreement States during this research effort. NRC intends to share any identified radium site information with the Agreement States gathered through the site identification research effort.

3.2. Pilot Project

As part of a pilot project for ORNL, research of potential radium sites in Connecticut was completed to see what, if any, information could be identified on sites with potential historical radium contamination. ORNL sorted and reviewed approximately 3000 pages of scanned information and data related to files provided by the State of Connecticut on potential historical radium clock factory sites in Connecticut (CT-DEP, 2009). NRC requested that ORNL: 1) organize all information in the State of Connecticut PDF file related to the Waterbury Clock Factory and develop a summary report for NRC, 2) organize all information in the PDF file related to six other Connecticut clock factories into summary reports, and 3) research public records for other potential historical commercial radium sites in Connecticut as well as Michigan. Connecticut and Michigan were examined first, because it was suspected by NRC staff that these States would have the highest likelihood of generating results due to historical watch/clock making and aircraft gauge manufacturing activities in these States. NRC staff wanted to pilot this effort at a limited number of States to determine whether any information on historic commercial radium sites could be identified before resources would be expended for this effort at all non-Agreement States.

While performing this pilot project, ORNL developed a research plan for identifying potential historical radium sites. Based on information collected and the research process developed, then ORNL moved on to researching potential radium sites in the other non-Agreement States:

- Alaska
- Delaware
- Hawaii
- Idaho
- Indiana
- Missouri
- Montana
- South Dakota
- Vermont
- West Virginia
- Wyoming
- Washington DC

While working on the pilot project for potential radium contaminated sites in Connecticut and Michigan, ORNL developed a strategy and accompanying database to allow for better and consistent data collection, future sorting and reporting, and ease of tracking duplicate data and information. The original design of the database was created in order to efficiently prepare updates and summary reports.

3.3. Site Category

To help prioritize potential radium sites for further evaluation and develop a detailed site summary for each potential radium site, NRC defined a list of criteria and site categories as described below.

1. Eliminate the site from the list and do not prepare a site summary if:
 - NRC does not have jurisdiction.
 - Atomic weapons material excluded from NRC jurisdiction and addressed under the DOE or Army Corps Formerly Utilized Sites Remedial Action Plan (FUSRAP) Program (either evaluated and contamination is remote or contamination has been or is being cleaned up).
 - Atomic weapons test site excluded from NRC jurisdiction under AEA section 91(b).
 - “Diffuse” radium and not a “discrete source” and therefore not under NRC jurisdiction (e.g., phosphate mining/processing).
 - DOE cleanup and release or owned and controlled by the Department of Energy’s (DOE) Office of Legacy Management.
 - Consumer product did not contain radium (e.g., radium beer did not actually contain radium).
 - Do not suspect radium because facility was closed before radium was used in the consumer product, another radioactive material was used, or no mention of radium use.
 - NRC does have jurisdiction but addresses the site under another NRC program, such as UMTRCA Title I and II or an *in situ* recovery of uranium license.
 - NRC does have jurisdiction for radium on a DoD active base that would come under a future NRC/DoD MOU if radium is confirmed.
2. Prepare a site summary but the site would likely be eliminated with further information and documentation if:
 - NRC has jurisdiction today, but EPA conducted and completed a cleanup under CERCLA that is documented.
 - NRC has jurisdiction today, but a Non-Agreement State conducted and completed a cleanup when they had jurisdiction and the cleanup is well documented.
3. Prepare a site summary that would likely remain on list for further evaluation if:
 - NRC has jurisdiction, but current levels of radium contamination are unknown and past cleanup is unknown.
 - NRC has jurisdiction and some cleanup may have been done, but no documentation is available that the site has been cleaned to meet acceptable levels.

NRC staff performed an initial sort of the information initially provided by ORNL, using the process and categories defined above. The initial evaluation by NRC staff was to determine categories for the sites. A NRC staff Working Group, comprised of five members, was formed; each member categorized the sites using the criteria above. If all members unanimously agreed that a site should be eliminated from consideration, the NRC staff did not request that a detailed site summary be developed for that site.

Initial site summaries were created by ORNL for sites identified by NRC using the sorting methodology above. NRC staff then performed an additional review of each site summary to determine whether the site merited consideration for future NRC follow-up. Similarly to before, if the NRC staff Working Group did not unanimously agree that a site should be eliminated from consideration, the site was retained for further NRC follow-up action.

As part of the site summary review process, Dr. Paul Frame provided an independent review as a subject matter expert. Dr. Frame is curator of the Health Physics Historical Instrumentation Museum Collection, which chronicles the scientific and commercial history of radioactivity and radiation. This museum is the official repository for historical radiological instruments by the Health Physics Society. Dr. Frame has been certified by the American Board of Health Physics for over 30 years and is a recognized radiation expert.

The sites listed in the Appendix are the results of the NRC staff's evaluation of sites in non-Agreement States that they believe could merit further NRC follow-up action. Site summaries for these sites are provided in *Historical Non-Military Radium Sites Research Effort, Addendum* (ORNL, 2015).

3.4. Prioritization Ranking

In addition to the site category assignment, NRC requested a prioritization ranking for each site. The ranking is determined based on the schematic in Figure 1. Essentially, if radium has been confirmed to have been present at the site based on historical records or radiological surveys (for some sites) and there is no documentation that the radium contamination was previously remediated (or completed), it will be categorized as Tier 1, 2, or 3.

- Tier 1 = the building or contaminated soil is occupied or frequented by visitors and site access is not controlled.
- Tier 2 = the building or soil site is not occupied but site access is weakly controlled.
- Tier 3 = the building or contaminated soil site is not occupied or frequented by visitors and site access is strongly controlled.

Since the conception of the schematic in Figure 1, NRC added another ranking, Tier 4.

- Tier 4 = radium is suspected to have been at the site but not confirmed.

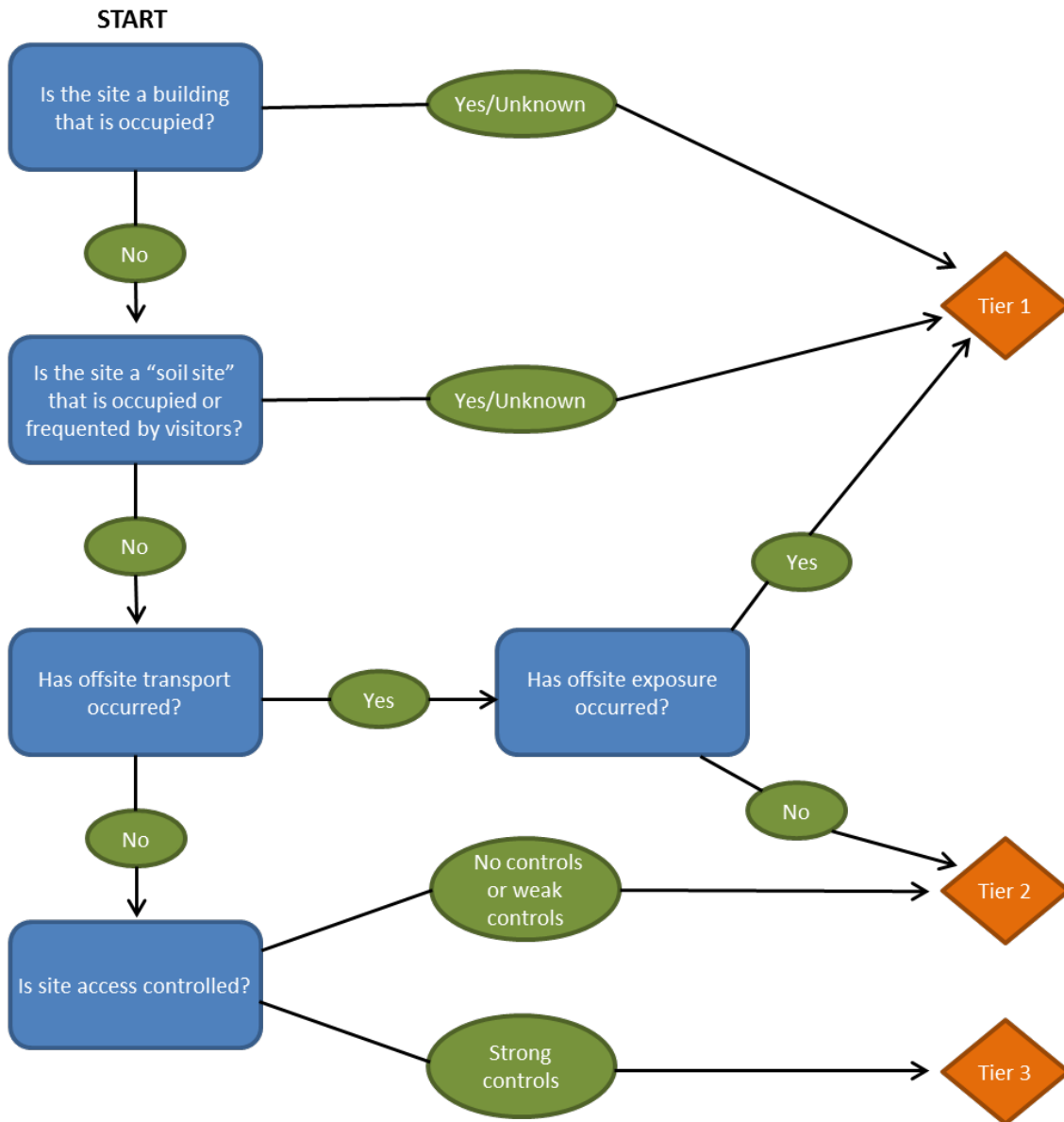


Figure 1. Radium Site Prioritization Scheme

4. Radium Site Database and Inventory

After the pilot project for potential radium sites in Connecticut and Michigan, ORNL began its search of public records for the other non-Agreement States. The following 3-step iterative process was used:

1. Citation Search – Locate books, periodicals, advertisements, newspapers, etc. in the public records (mainly the internet) that may contain useful information about historical commercial radium use.
2. Use Search – Identify additional uses of radium in the citations that will allow refined searching for radium sites.

3. Site Search – Identify potential radium sites.

The database was further refined to meet the needs of collecting data in the 3-step process. As a result, the database has a comprehensive format, where there may be multiple uses in one citation and multiple sites for a radium use (see Figure 2).

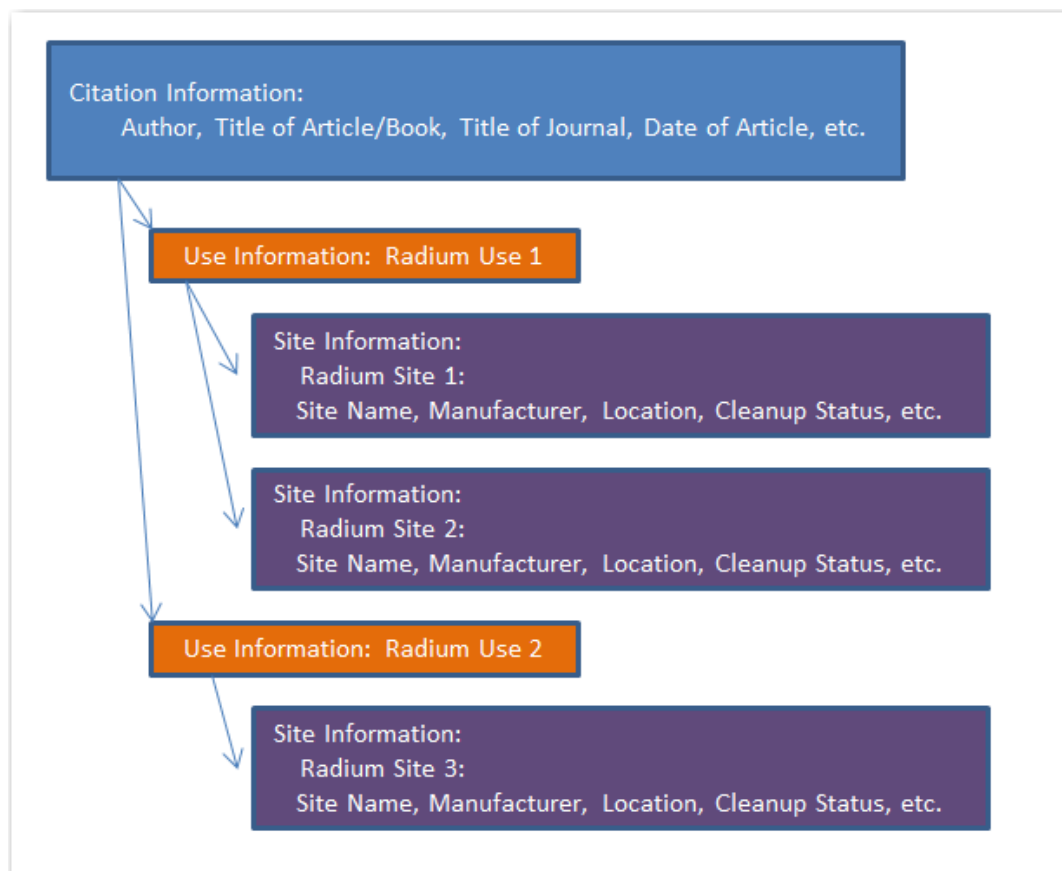


Figure 2. Radium Site Database Overview

4.1. Citation Information

Citation information is added to the database via a form that links the citation table to the use/site table. The citation table includes: author, title, source, source data, keywords, abstract, etc. In addition, this table ranks the citation potential as low, medium, or high with respect to providing pertinent information on radium use or a radium site. This ranking is used to determine the order for obtaining reference material. Once references were obtained, they were attached to this table via the form as a pdf or a URL link. The ORNL reviewer then reviewed the citation to see if it provided a potential radium use or site. If so, a checkbox in this form was selected that enabled the joined use/site table in the database to be active via a sub form.

4.2. Historical Radium Use Information

The use and site information are stored in the same table of the database and presented in the same sub form, as they are typically located concurrently from the citations.

At the top of the sub form is the use information, which includes product name, manufacturer, and historical use details.

4.3. Site Information

The use/site sub form is also the repository for site information. This includes: site name, state, city, current land use(s), current or suspected levels of radium, nearby populations, regulatory action, cleanup status, site category (see section 3.3), and prioritization ranking (see section 3.4).

5. Radium Site Summary Report Development

For the sites that NRC identified for further follow-up, the information and data collected was documented in site summary reports for each site. These site summary reports were prepared: 1) for sites that have confirmed or suspected historical commercial radium use and 2) for sites that are under NRC jurisdiction based on the criteria listed in section 3.3. These site summary reports are expected to assist NRC staff in determining future NRC actions. The site summary reports include information on the historical use of discrete radium at that site, historical and current information about the land use of the site, nearby population, status of any radiological surveys or data, as well as any State or Federal involvement, such as past remediation. Site summaries also include historical and current photos of the site, maps, references, the NRC prioritization rank and the basis for the prioritization (see section 3.4).

The Appendix of this report is a table that gives an overview of the site summary reports for sites in non-Agreement States. The table provides site names, addresses, historic radium activities, site conclusion, and prioritization ranking.

6. References

Clark, Claudia. 1997. *Radium Girls, Women and Industrial Health Reform, 1910-1935*. The University of North Carolina Press.

Connecticut Department of Environmental Protection (CT-DEP). 2009. Correspondence from CT-DEP to NRC NMSS. Collection of pdf documents about Connecticut Clock Companies. Document dates range from 1998-2004. 1806 pages.

Mullner, Ross. 1999. *Deadly Glow: The Radium Dial Worker Tragedy*. American Public Health Association Publications. January 28, 1999.

Oak Ridge National Laboratory (ORNL). 2015. *Historical Non-Military Radium Sites Research Effort, Addendum*. November 24, 2015.

Appendix: Historical Non-Military Radium Site Summaries in non-Agreement States

Site Name	Address	Historic Radium Activities	Site Conclusion	Prioritization Ranking
Aerospace Innovations	28919 Seven Mile Road, Livonia, MI	Radium may have been present at this facility if gauges with luminous dials were repaired at the site.	Radium is suspected to have been present at the site because Aerospace Innovations repaired aircraft gauges and flight instruments, which may have included vintage instruments that contained luminous radium.	Tier 4
Ansonia Electrical Company	63 Main Street, Ansonia, CT	Manufactured luminous radium front door bell pushes.	Radium is confirmed to have been present at the site based on historical documentation of radium use at the facility. The original building is gone and an asphalt covered parking lot remains. The site consists of soil that is potentially contaminated by radium. The site is occupied or frequented by visitors.	Tier 1
Arrow Electric Company	103 Hawthorn Street and 630 Capitol Avenue, Hartford, CT	Manufactured luminous radium flush switches and pull-chain pendants.	Radium is confirmed to have been present at the site based on historical documentation of radium use at the facility. The original building at the Hawthorne Street facility is gone and an asphalt covered parking lot remains. This soil site is potentially contaminated by radium. The site is occupied or frequented by visitors. The original building at the Capitol Avenue facility is still standing and is potentially contaminated by radium. The building is partially occupied.	Tier 1
Battle Creek Sanitarium	74 N. Washington Street, Battle Creek, MI (and other buildings as part of historic Battle Creek Sanitarium)	Provided large equipment and all accessory appliances for radium-therapy and treatment of both superficial and deep-seated lesions; maintained a supply of radium needles for direct contact treatment of deep-seated malignancies by actual introduction of radium into the tumor area; and provided radium loans to responsible physicians at moderate rental fees.	Radium is confirmed to have been present based on historical documentation that radium needles were used at the site. The site consists of buildings that are potentially contaminated by radium. The buildings are occupied by around 1,800 federal, civilian, and contractor employees.	Tier 1
Benrus Clock Company	145 Cherry Avenue, Waterbury, CT	Produced clocks and watches with luminous radium dials.	Radium is confirmed to have been present at the site based on historical documentation that radium was present and confirmed by radiological survey data. The site consists of a building potentially contaminated by radium. The building is occupied.	Tier 1

Site Name	Address	Historic Radium Activities	Site Conclusion	Prioritization Ranking
Billings Army Navy	10 N. 29th Street, (current location, 2012-present) 15 N. 29th Street, (previous location, 1980-2012) Billings, MT 59101	The site contains a large collection of "Vintage Aero Parts" including WWI and WWII airplane gauges, switches, meters, indicators, controls, compasses, and more that are known to contain luminous radium.	Radium is confirmed to have been present at the site based on historical documentation that luminous radium containing military items are located at the current store. This site is occupied or frequented by visitors. It is assumed luminous radium containing military items were also present at the former location of Billings Army Navy.	Tier 1
Bryant Electric Company	1421 State Street, Bridgeport, CT (and other adjacent properties)	Produced luminous radium switches and pendants.	Radium is confirmed to have been present at the site based on historical documentation that radium was used in the manufacturing facility. The original buildings are gone and the site has been redeveloped. The site consists of soil that is potentially contaminated by radium. The site is occupied or frequented by visitors.	Tier 1
Burton Aviation	6727 Airport Road, Marlette, MI	The company specializes in aircraft flight instrument repair. Radium may have been present at this facility if gauges with luminous dials were repaired at the site.	It is suspected that radium is present at the site because Burton Aviation specializes in aircraft instrument repairs. These services may include repairing historic gauges and instruments that contained luminous radium.	Tier 4
CT Dump site	330 Queen Street, Bristol, CT	An anonymous witness reported radium dumping that occurred in approximately 1958.	Radium is confirmed to have been present at the site based on historical documentation and radiological survey data from 1998. The site consists of soil that is potentially contaminated by radium. The site is occupied or frequented by visitors.	Tier 1
CT Radium Drums Site	unknown	Radium-contaminated waste was transferred from this site in four 55-gallon steel barrels to US Ecology for land burial in Richland Washington in mid-November 2001.	The location of the suspected site (i.e., original building and/or contaminated soil) is unknown but may be found by additional search activities. The contractor documented removal of radium contamination, but the available records do not document the cleanup level. It is also unknown if the removal met the federal or CT cleanup criteria. It is currently unknown if radium remains at the site.	Tier 1
Evansville Radium Institute	710 and 712 S. Fourth Street, Evansville, IN	Advertisement mentioned an adequate amount of radium for treatment of cancers.	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.	Tier 1
Hangermates	2300 N Grand River Avenue, Lansing, MI	Aircraft instruments were repaired at this facility.	It is suspected that radium is present at the site because Hangermates repaired aircraft flight instruments, which may include historic instruments that contain luminous radium.	Tier 4

Site Name	Address	Historic Radium Activities	Site Conclusion	Prioritization Ranking
Hart and Hegeman Manufacturing Company	340-342 Capitol Avenue, Hartford, CT	Manufactured luminous radium flush switches and pull-chain pendants.	Radium is confirmed to have been present at the site based on historical documentation of radium use at the facility. The original building is gone and an asphalt covered parking lot remains. The site consists of soil that is potentially contaminated by radium. The site is occupied or frequented by visitors.	Tier 1
Harvey-Hubbell	1575 State Street, Bridgeport, CT	Manufactured luminous radium flush switches, flip switches, and pull-chain pendants.	Radium is confirmed to have been present at the site based on historical documentation of radium use. The original building is gone and a vacant lot remains. The site consists of soil that is potentially contaminated by radium. The site is neither occupied nor frequented by visitors. Site access is weakly controlled.	Tier 2
Indiana Radium Institute	[]	According to early 1920s advertisements, the Indiana Radium Institute contained laboratory facilities for application of radium and provided radium for rental purposes. Also, the advertisements referenced the use of radium in solution for emanation and suggested a relatively high activity of radium in their possession.	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.	Tier 1
Ingraham Clock Company	284, 400, 420, and 430 N. Main Street and 210 Redstone Hill Road, Bristol, CT	Produced clocks and watches with luminous radium dials.	Radium is confirmed to have been present at the North Main Street site based on historical documentation that radium was used in the manufacturing facility on North Main Street. The original buildings are gone and the site has been redeveloped. The North Main Street site consists of soil that is potentially contaminated with radium. The site is occupied or frequented by visitors. When the Ingraham Company moved to Bristol's Redstone Hill Industrial Park at 210 Redstone Hill Road in 1958, it is unknown whether the use of luminous radium materials continued at this location. Additional information is needed to determine whether radium was present at the 210 Redstone Hill Road location.	Tier 1
Lux Clock Company	95 Johnson Street, Waterbury, CT	Produced clocks and watches with luminous radium dials.	Radium is confirmed to have been present at the site based on historical documentation and radiological surveys. The site consists of a building that is potentially contaminated by radium. The building is not occupied. Site access is weakly controlled.	Tier 2
Metro Aircraft Instruments	2135 Airport Road, Waterford, MI	Historic aircraft instruments were repaired at this facility.	It is suspected that radium is present at the site because Metro Aircraft Instruments specializes in aircraft instrument repairs. These services may include repairing historic gauges and instruments that contained luminous radium.	Tier 4

Site Name	Address	Historic Radium Activities	Site Conclusion	Prioritization Ranking
Military Truck Salvage Yard	5700 Boundary Avenue, Anchorage, AK	Storage of WWII-era vehicles and parts, such as luminous dials, gauges, and instruments.	It is suspected that radium is present at the site because historical military vehicles typically contained luminous radium dials, gauges, and instruments. The site is currently occupied or frequented by visitors.	Tier 4
New Haven Clock Company	133-135 Hamilton Street, New Haven, CT	Produced clocks and watches with luminous radium dials.	Radium is confirmed to have been present at the site based on historical documentation of radium use and radiological surveys. The site consists of buildings that are potentially contaminated by radium. Portions of the buildings are occupied.	Tier 1
Novelty Manufacturing Company	528 N. Mechanic Street, Jackson, MI	The Novelty Manufacturing Company advertised its "X-Radium" heater as the best and latest heating technology by using radium.	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. A new facility has been built on the soil site. The site is occupied or frequented by visitors.	Tier 1
Precision Dial Company	7240 West KL Avenue, Kalamazoo, MI	Precision Dial purchased assets of an aircraft/military instrument and dial refinishing shop that was subject to cleanup due to radium contamination. It is suspected that current instrument repairs at this site also involve luminous radium.	It is suspected that radium is present at the site because it is unknown what equipment (possible luminous radium dials, gauges, and instruments) was received from Sooner Dial Company (Clinton, OK). In addition, it is suspected that Precision Dial Company repairs historical aircraft dials and gauges that may contain luminous radium.	Tier 4
Radium Dye Company	318 West 10th St., Kansas City, MO (historic address)	Manufactured various consumer products such as a shoe cleaner that may have contained radium.	It is suspected that radium is present at this site based on the name of the company, The Radium Dye Company, as well as several advertisements that indicate radium was used in various consumer products associated with the company.	Tier 4
Sessions Clock Company	61 East Main St., Bristol, CT	Produced clocks watches with luminous radium dials.	Radium is confirmed to have been present at the site based on historical documentation and radiological surveys. The site consists of buildings that are potentially contaminated by radium. The buildings are occupied or occupancy is unknown. Site access is not controlled.	Tier 1
Seth Thomas Clock Company	135 S. Main St., Thomaston, CT	Produced clocks and watches with luminous radium dials.	Radium is confirmed to have been present at the site based on historical documentation of radium use and radiological surveys. The site consists of a building potentially contaminated by radium. The building is occupied.	Tier 1
South Bend Watch Company	1720-1730 Mishawaka Avenue, South Bend, IN	Used the "Luma" radium compound for luminous dials in watch production.	Radium is confirmed to have been present at the site based on historical documentation that radium luminous dials in watches were produced at the site. The original building no longer exists. The site has been redeveloped and is occupied. The site consists of soil that is potentially contaminated by radium. The site is occupied or frequented by visitors.	Tier 1

Site Name	Address	Historic Radium Activities	Site Conclusion	Prioritization Ranking
War Dog Militia	P.O. Box 1177 () Florence, MT	This supplier sells genuine military surplus and collectibles dating back to pre-WWI. Some of the items for sale include WWII Aircraft dials, gauges, and clocks that likely contain luminous radium.	It is suspected that radium is present at the site because vintage military items, such as aircraft dials, gauges, and instruments that are known to contain luminous radium, have been available for sale.	Tier 4
Waterbury Clock Company	0 Cherry Avenue, [], 39 Cherry Avenue, 177 Cherry Street, 205 Cherry Street, 215 Cherry Street, 232 N. Elm Street, Waterbury, CT	Produced clocks and watches with luminous radium dials.	Radium is confirmed to have been present at the site based on historical documentation of radium use and radiological surveys. The site consists of buildings that are potentially contaminated by radium. Some of the buildings are occupied. The extent of previous remediation at all locations is unknown.	Tier 1
William L. Gilbert Clock Corporation	13 Wallens Street, Winsted, CT	One of Gilbert's products was "Night and Day Radium Dial Clocks." The "LUMA-nous" dial was developed by the Gilbert Engineering Department. Produced clocks and watches with luminous radium dials.	Radium is confirmed to have been present at the site based on historical documentation of radium use. The site consists of buildings that are potentially contaminated with radium. The original clock manufacturing buildings were gutted and remodeled, except for the existing exterior walls and the wood floor beams. The extent of previous remediation is unknown. Soil at the site is potentially contaminated with radium. The site is occupied or frequented by visitors.	Tier 1