

Handling and Disposal of Water Treatment Residuals



State of Illinois



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Objectives

- Explain what radium is and why it's an issue
- Give a brief timeline of water treatment residuals rulemaking
- Provide an overview of Part 622 requirements
- Review potential amendments to the rule
- Demonstrate how to access Part 622 and associated documents



What is Radium?

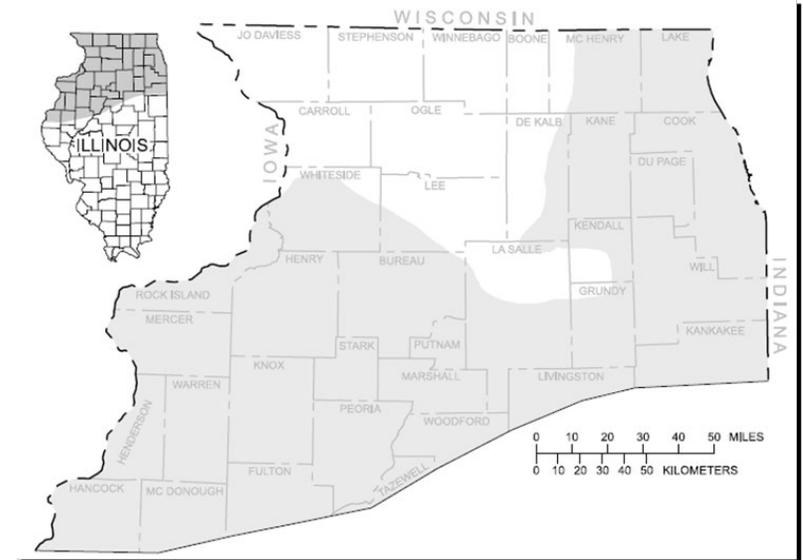
- What is Radium?
 - Radium is naturally occurring in rocks and soil
 - Multiple isotopes of radium, but for water treatment residuals we focus on radium-226 and radium-228
 - Radium-226 has a half-life of 1600 years
 - Radium-228 has a half-life of 5.75 years



What is Radium?

Aquifers Containing Elevated Radium

- Because of water chemistry, radium from rock surrounding aquifers leaches into the raw water
- Some wells yield concentrations > 5 pCi/L
- Typically deep wells in Northern Illinois
 - Devonian
 - Silurian
 - Cambrian
 - Ordovician



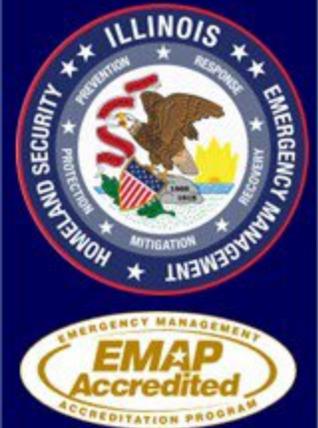
Why is Radium a Problem?

- How does radium concentrate in residuals?
 - 5 pCi/L drinking water standard
 - Drinking water facilities must employ treatment technologies to remove radium from the water
 - Even if a treatment technology is not specifically employed to remove radium, if it can remove any other divalent cation, it's capable of concentrating radium
 - Despite even low levels of radium in the raw water, treatment technologies capable of removing radium will concentrate it over time



Why is Radium a Problem?

- Treatment technologies capable of concentrating radium:
 - Ion Exchange
 - Lime Softening
 - Anthracite or Activated Carbon
 - Greensand Filtration
 - Reverse Osmosis
 - HMO
 - NPDES Discharge Filters



Why is Radium a Problem?

- Where does radium end up?
 - If a facility is actively removing radium with a treatment technology, 99% of the time it's concentrated in media or resin and backwashed downstream to the WWTP where it shows up in the sludge
 - This is not always the case – small number of systems where design allows radium to concentrate in previously unexpected locations



Why is Radium a Problem?

- Southern and Central Illinois
 - Drinking Water Facilities
 - Generally, the aquifers are low in radium, but designated treatment technologies can concentrate radium
 - Experience has shown leaving media in service extended period of time can result in radium concentrations that become both an exposure concern and a financial burden
 - Wastewater Treatment Facilities
 - These facilities are not regulated because the radium content is generally low upstream and is further diluted before it ends up in the sludge



Why is Radium a Problem?

- Northern Illinois
 - Drinking Water Facilities
 - Raw water concentration generally > 5 pCi/L when pulling from a deep well
 - Radium builds up in media whether treating specifically for radium or not
 - Elevated dose rates seen on ion exchange and HMO tanks
 - Residuals and decommissioned pipe, tanks, etc. can trip radiation alarms at scrap yards and landfills
 - Wastewater Treatment Facilities
 - Receive higher activity backwashes from upstream
 - Sludge concentrations are elevated, but typically < 200 pCi/g
 - Field tracking/sampling necessary to avoid environmental accumulation



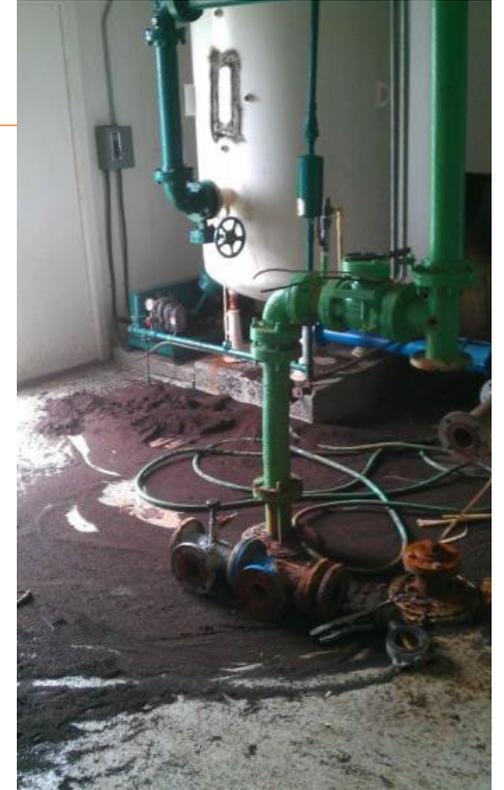
Why is Radium a Problem?



Up to 3000 pCi/g, 2,000 uR/hr

1400 pCi/g, 330 uR/hr

460 pCi/g, 100 uR/hr



Rulemaking Timeline

1984

MOA between IEPA
and IEMA-OHS

2003

Radionuclide
Drinking Water
Standards

2009

IPCB rules 1984 MOA
unpromulgated
regulation

2011

32 Illinois
Administrative Code
330.40(d) adopted

June 12, 2024

32 Illinois
Administrative Code
622 (Part 622)
Adopted



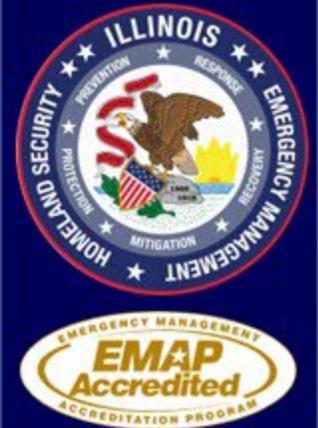
Part 622 Requirements

- 32 Illinois Administrative Code 622.30
 - Required to register:
 - Drinking water facilities treating groundwater and utilizing a treatment technology capable of concentrating radium
 - Wastewater treatment facilities receiving discharge from a drinking water facility that:
 - Pulls groundwater from a designated aquifer
 - Utilizes a treatment technology capable of concentrating radium
 - Landfills receiving water treatment residuals from a registered facility
 - Land Applicators



Part 622 Requirements

- All registrants must:
 - Test for Radon by a date TBD, then every 5 years
 - Sample water treatment residuals prior to disposal
 - Use an accredited lab to determine the combined radium concentration
 - Utilize an appropriate disposal option based on the combined radium concentration
 - Maintain records for inspection
 - Lab results, location of disposal, date(s), quantity, etc.
 - Keep records for 5 years



Part 622 Requirements

Disposal Options

≤ 3.1 pCi/g

- No disposal requirements
- Must maintain records
 - Sample analysis
 - Location of disposal

> 3.1 and ≤ 100 pCi/g

- Landfill
- Land application
- Sanitary sewer discharge
- Alternative disposal approved by Agency
- Low-Level Radioactive Waste (LLRW)

> 100 and ≤ 200 pCi/g

- Landfill with Agency approval
- Alternative disposal method approved by Agency
- Sanitary sewer discharge
- Low-Level Radioactive Waste (LLRW)



Part 622 Requirements

- Records for all disposals
 - Date(s) of disposal
 - Quantity of residuals disposed of
 - Combined radium concentration in pCi/g
 - Location of disposal
- Additional information required for land applications:
 - Tax parcel ID numbers
 - County, township, section and range,
 - Tillable acres for the tax parcel
 - Signed landowner acknowledgement
 - Cumulative increase and total combined radium concentration in the soil for each tax parcel



Part 622 Requirements

- Land Application Limits
 - Combined radium ceiling concentration for tax parcels increased from 3.0 pCi/g to 3.1 pCi/g
 - Cumulative radium increase to field cannot exceed 1.0 pCi/g
 - Registrants are responsible for calculating the radium increase to the tax parcel and ensuring it remains under the 3.1 pCi/g limit



Part 622 Requirements

- 32 Illinois Administrative Code 622.40
 - Applies to registrants producing or in possession of water treatment residuals > 200 pCi/g
 - Must register within 60 days of becoming aware of producing or possessing water treatment residuals at this concentration
 - Contains increased worker protection measures



Part 622 Requirements

Worker Protection

- Dose cannot exceed 2 mrem/hr in any unrestricted area
- Workers must be supplied with appropriate PPE when performing work that requires them to come in contact with water treatment residuals
- TENORM Awareness Training
 - 1-2 hours minimum
 - At least annually
 - Additional training required for workers who must enter restricted areas or come into contact with water treatment residuals



Part 622 Requirements

- Acquire and maintain radiation survey instruments
 - Instruments must be calibrated annually
 - Must perform surveys to ensure compliance
- Identification of a Responsible Individual
 - Approves radiation safety related issues
 - Responsible for ensuring requirements of the rule are implemented
- Provide notification to the Agency prior to removing material > 200 pCi/g for disposal, treatment or transport



Part 622 Requirements

- 622.40 Requirements
 - Disposal options
 - Release to sanitary sewer with conditions
 - Receive written authorization from wastewater treatment facility
 - Wastewater treatment facility must be registered with the Agency
 - Total quantity of material released in a year must not exceed 1.0 Ci
 - Alternative disposal method approved by the Agency
 - LLRW or other facility authorized to take residuals



Part 622 Requirements

- Inspections started in October 2025
- Anticipate scheduling approximately 30 days in advance
- All initial inspections are expected to be on-site
- Inspections will not include radon testing since there is currently no due date



Part 622 Amendment

- Radon testing due date not included in Part 622
- Clarify laboratory accreditation requirements
- Changes the posting requirements
- Clarifies the LLRW requirements for 622.30 registrants



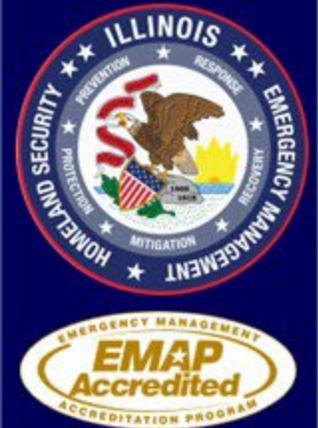
Radon

- Radon Testing
 - Radon testing due date
 - Due date was not included in Part 622, will be included in amendment
 - Waiting on amendment of Agency's radon regulations
 - Exemption for registrants being included in radon regulation amendment
 - Would allow registrant's employees to do their own radon testing
 - Employees must complete required training to do radon testing



Analysis of Water Treatment Residuals

- Combined radium concentration determined by a method approved by the Agency
- Laboratory doing analysis must be accredited through the National Environmental Laboratory Accreditation Program (NELAP) or a non-governmental accrediting body recognized by the National Environmental Laboratory Accreditation Conference (NELAC) to accredit laboratories to the NELAC environmental laboratory standard



Analysis of Water Treatment Residuals

- Several issues with analysis within the first year of Part 622
- Methods approved by Agency for soil/solid analysis
 - Approved methods currently include:
 - EPA 901.1 (modified for solids/Radium-226 and Radium-228)
 - EPA 903.1 (Radium-226)
 - EPA 904 (Radium-228)
 - EML HASL-300 Method Ga-01-R
 - RSSI-50-ANL-0001



Analysis of Water Treatment Residuals

- Factors the Agency is looking at to approve:
 - Lab accreditation for method/sample type
 - Minimum Detectable Concentration/Reporting Limit
 - Must be able to detect sufficiently small concentrations of Ra-226 and Ra-228
 - Recommendation to be made in guidance document is MDC or RL of ≤ 1.0 pCi/g Ra-226 and ≤ 1.0 pCi/g Ra-228



Posting Requirements

- Current rule requires registrants to post “CAUTION RADIOACTIVE MATERIALS” when the amount of material exceeds 1.0 mCi or Radium-226 and Radium-228.
- Requirement in amendment is for registrants to post an amended version of the Notice to Employees in places easily visible to workers.

 **Notice To Employees**
Illinois Emergency Management Agency
STANDARDS FOR PROTECTION AGAINST RADIATION

The Illinois Emergency Management Agency has adopted regulations with standards to protect you from hazards associated with radioactive materials and radiation emitting machines that are licensed or registered by IEMA. In particular, the following information is available for your review:

32 Ill. Adm. Code 340: Standards for Protection Against Radiation
32 Ill. Adm. Code 400: Notices, Instructions and Reports to Workers; Inspections
Any other documents your employer must provide, as noted below
These may be found at the following location:

YOUR EMPLOYER'S RESPONSIBILITY
Your employer is required to:

1. Comply with all applicable regulations and the conditions of the license or registration.
2. Post or otherwise make available to you a copy of the regulations, licenses, registration certificates and operating procedures that apply to work in which you are engaged, and explain the provisions to you.

YOUR RESPONSIBILITY AS A WORKER
You should:

1. Know the provisions of the IEMA regulations, the precautions, the operating procedures and the emergency procedures that apply to your work.
2. Observe the provisions for your own protection and for the protection of your co-workers.
3. Report unsafe working conditions or violations of the license or registration conditions or regulations to IEMA.

MEDICAL FACILITIES ONLY
Unless exempted by regulation, you must be accredited by IEMA in medical radiation technology if you apply ionizing radiation to human beings. Institutions licensed and/or registered by IEMA are required by law to employ as technologists only those persons who have appropriate credentials in medical radiation technology.

REPORTS ON YOUR OCCUPATIONAL RADIATION DOSE HISTORY

1. The IEMA regulations establish occupational limits for radiation dose and for concentrations of radioactive material in air and water. The regulations require your employer to give you a written report if you receive a dose in excess of any applicable limit. The limits on your occupational dose are in 32 Illinois Administrative Code 340.210, 340.270 and 340.280. While these are the maximum allowable limits, your employer is required to take steps to keep your radiation dose as far below the limits as is reasonably achievable.
2. If the regulations require your employer to monitor your occupational radiation dose:
 - a. Your employer must advise you of your occupational radiation dose each year, and
 - b. Upon termination of employment, your employer must give you a written report of your dose if you request it.

INSPECTIONS
All licensed or registered activities are subject to inspection by the Illinois Emergency Management Agency.

Direct all inquiries on matters outlined above to:
Illinois Emergency Management Agency
1035 Outer Park Drive
Springfield, Illinois 62704
Phone: (217) 782-7860

POSTING REQUIREMENT Copies of this notice must be posted in every establishment where employees are engaged in activities licensed or registered by the Illinois Emergency Management Agency. Posting must permit employees working in or frequenting any portion of a restricted area to observe a copy on the way to or from their place of employment.

Printed by the Authority of the State of Illinois

IEMA 3M (6/12)

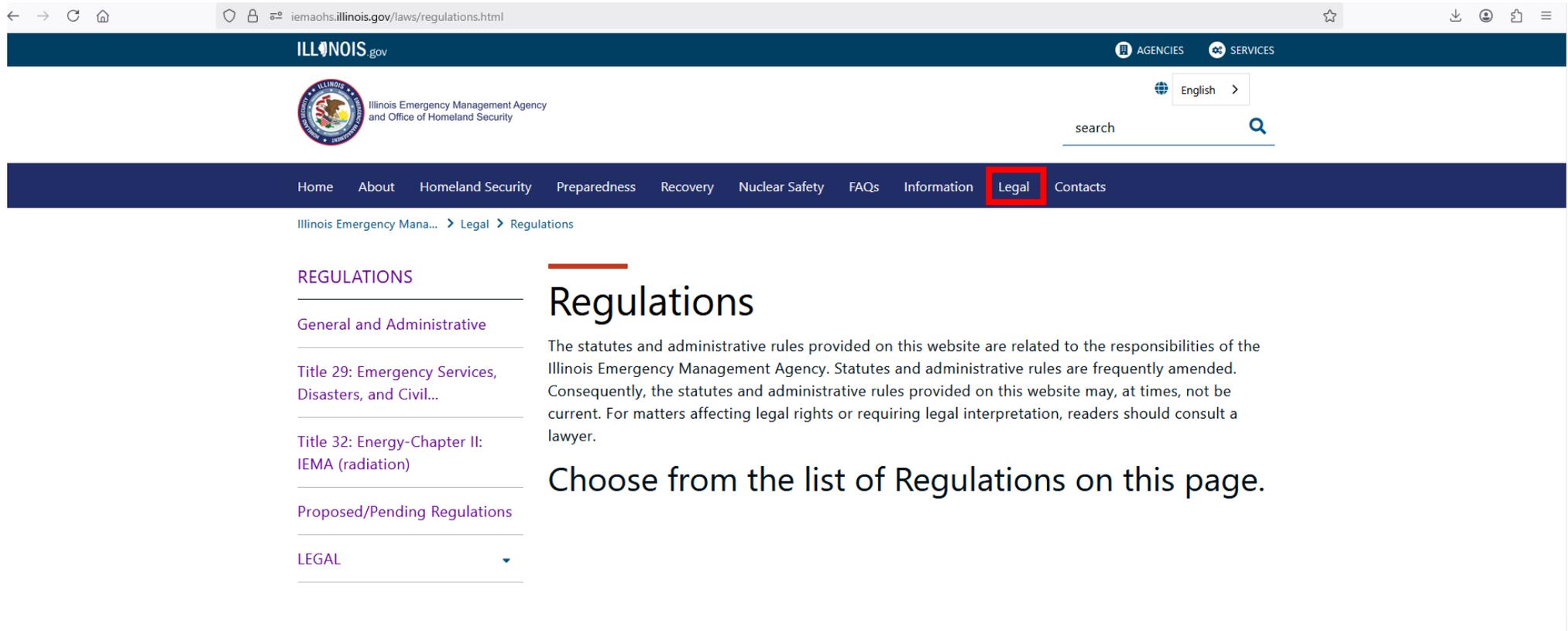


Low-Level Radioactive Waste

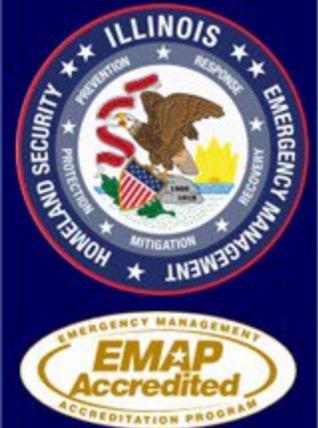
- Registrants who dispose of water treatment residuals ≤ 200 pCi/g are not subject to the low-level radioactive waste registration, reporting and permit requirements.
- Registrants in 622.40 disposing of water treatment residuals > 200 pCi/g are subject to the low-level radioactive waste requirements in 32 Illinois Administrative Code 609 and 620.



Accessing Part 622 Documents



The screenshot shows a web browser window with the URL `iemahs.illinois.gov/laws/regulations.html`. The page header includes the **ILLINOIS.gov** logo, navigation links for **AGENCIES** and **SERVICES**, a language selector set to **English**, and a search bar. The main navigation menu contains: **Home**, **About**, **Homeland Security**, **Preparedness**, **Recovery**, **Nuclear Safety**, **FAQs**, **Information**, **Legal** (highlighted with a red box), and **Contacts**. Below the navigation, a breadcrumb trail reads: **Illinois Emergency Mana... > Legal > Regulations**. The main content area features a section titled **REGULATIONS** with a sub-section **General and Administrative**. Under this sub-section, there are two links: **Title 29: Emergency Services, Disasters, and Civil...** and **Title 32: Energy-Chapter II: IEMA (radiation)**. Below these links is a section for **Proposed/Pending Regulations** and a **LEGAL** dropdown menu. To the right of the regulations list, a large heading **Regulations** is followed by a paragraph: "The statutes and administrative rules provided on this website are related to the responsibilities of the Illinois Emergency Management Agency. Statutes and administrative rules are frequently amended. Consequently, the statutes and administrative rules provided on this website may, at times, not be current. For matters affecting legal rights or requiring legal interpretation, readers should consult a lawyer." Below this paragraph, a text instruction states: "Choose from the list of Regulations on this page."



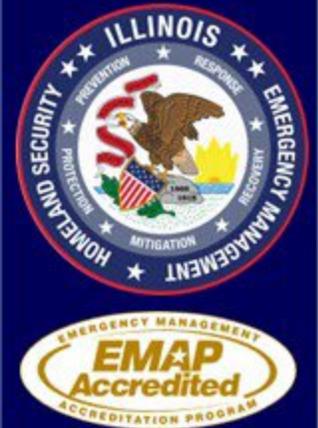
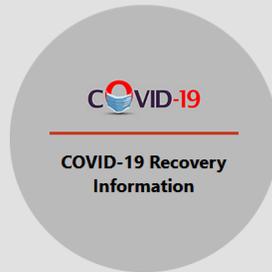
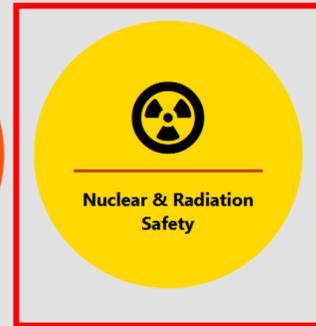
Accessing Part 622 Documents



Illinois Emergency Management Agency
and Office of Homeland Security



IEMA-OHS Most Requested



Accessing Part 622 Documents

Nuclear & Radiation Safety Programs of Interest



**Low-Level Radioactive
Waste**



**Medical Radiation
Technologist Login**



**Medical Radiation
Technologist Directory**



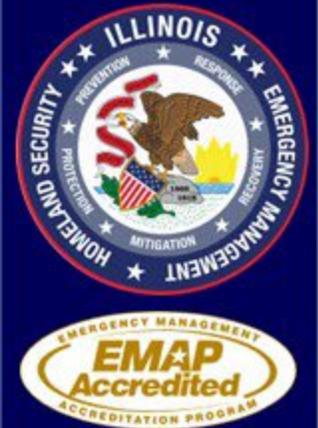
**PRND Initial Incident
Report**



**Radium Residual
Program**



**Radiological Facilities
Lookup**



Accessing Part 622 Documents

publiciema.state.il.us/Applications/WaterTreatment/



Illinois Emergency Management Agency
and Office of Homeland Security

[Return to main IEMA-OHS website](#)

[Glossary](#) [Help](#) [Guidance Document](#)

Part 622

[Implementation Guidance for 32 Illinois Administrative Code 622](#)

The new guidance document for Part 622 is now available. Facilities registered under 32 Illinois Administrative Code 330.40(d) are not required to re-register for Part 622. If you have any questions about Part 622 or the Guidance Document, please email them to ema.RadiumResiduals@illinois.gov.

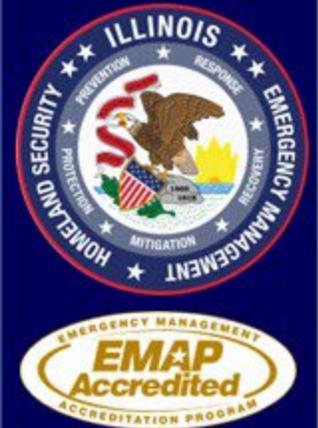
[32 IAC 622 Water Treatment Residuals Inspection Contact Information Survey](#)

Radium Residual Program Reporting Forms

[Wastewater Treatment Facility Annual Reporting Form](#) - Wastewater treatment facilities required to register under 32 Ill. Adm. Code 330.40(d) are required to submit this form annually. This form is used to report any landfill disposals for the reporting year. Any land applications are reported on the 'Land Application Reporting Form'. A commercial applicator may fill out and submit this form on behalf of the wastewater or drinking water treatment facility.

[Land Application Reporting Form](#) - This form is used to report the land application of biosolids and sludges to IEMA. The form is specific to each parcel of land in use and, therefore, a separate page is required for each parcel of land utilized. This form would also be used to report a new parcel of land which will be used under 32 Ill. Adm. Code 330.40(d). A commercial applicator may fill out and submit this form on behalf of the wastewater or drinking water treatment facility.

[Community Water Supply Reporting Form](#) - Community water supplies required to register under 32 Ill. Adm. Code 330.40(d) are required to submit this form annually. This form is used to report any landfill disposals for the reporting year. Any land applications are reported on the 'Land Application Reporting Form'.



Accessing Part 622 Documents

32 IAC 622 Water Treatment Residuals Inspection Contact Information

When you submit this form, it will not automatically collect your details like name and email address unless you provide it yourself.

* Required

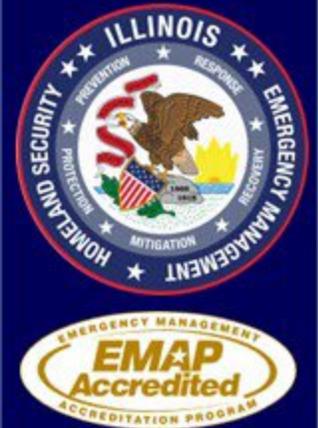
1. Facility Number *

2. Facility Name *

3. Primary Contact *

4. Primary Contact Phone Number *

5. Primary Contact Email Address *



Summary

- Explained what radium is and how it ends up in water and wastewater treatment facilities
- Reviewed a timeline of water treatment residuals regulations
- Discussed regulatory requirements
- Described anticipated changes to Part 622



Questions



Agency Contact



Any questions can be emailed to ema.RadiumResiduals@illinois.gov or directly to me at Cheryl.L.Head@illinois.gov

