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**Date:** Thu, May 26, 2005 1:48 PM  
**Subject:** Meetings with Water Remediation Technology Uranium, LLC

Dear Sir or Madam:

Pursuant to a request from several Commissioners regarding potential meetings with Water Remediation Technology Uranium, LLC (WRT), please find attached several documents regarding WRT's water treatment technology including a cover memo, powerpoint slides presented to NRC Staff, and descriptive materials of the company.

In addition, the following members of WRT and counsel will be attending the meetings:

Charles Williams, President, WRT

Mike LaFleur, Vice-President for Finance, WRT

Duane Bollig, Environmental Manager, WRT

Anthony J. Thompson, Esq., Thompson & Simmons, PLLC

Charles T. Simmons, Esq., Thompson & Simmons, PLLC

A further description of the members of WRT and the company is available at [www.wrt.net](http://www.wrt.net).

Please do not hesitate to contact me at 202-496-0780 if you have any questions or concerns. Thank you.

Christopher S. Pugsley, Esq.

COUNSEL TO WATER REMEDIATION TECHNOLOGY URANIUM, LLC

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**Creation Date:** Thu, May 26, 2005 1:44 PM  
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wrtUranium_NRC Presentation_111704.pdf	714281
WRT company info.pdf	976048
WRTLETTERCOMMISSION.doc	32768
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FROM: WATER REMEDIATION TECHNOLOGY URANIUM, LLC  
THOMPSON & SIMMONS, PLLC

SUBJECT: WATER REMEDIATION TECHNOLOGY URANIUM'S NRC  
LICENSE APPLICATION

DATE: MAY 26, 2005

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This memorandum is intended to provide the Nuclear Regulatory Commission (NRC) with information regarding Water Remediation Technology Uranium, LLC's (WRT's) proposed license application to provide uranium water treatment services for publicly and privately-operated drinking water treatment systems.

After Congress enacted the Safe Drinking Water Act (SDWA) and its subsequent amendments, the United States Environmental Protection Agency (EPA) promulgated a new uranium in drinking water standard. This new standard requires that all publicly or privately-operated drinking water systems comply with such standard by the effective date of January 1, 2008. As a result, operators of such drinking water sources are required to remove uranium from drinking water in excess of the new 30 ug/L uranium standard using one of many potential national treatment technologies or processes. Hundreds of drinking water supplies currently are known to exceed the new uranium in drinking water standard and hundreds more are expected to exceed this standard when full monitoring of such drinking water supplies is effectuated.

In response to this federal mandate, WRT has created a new, innovative technology designed to provide publicly or privately-operated drinking water systems with a "cradle-to-grave" service resulting in removal of uranium from drinking water sources using proven uranium removal resins, management of uranium water treatment residuals during treatment, and final disposition of such residuals via processing at an NRC or Agreement State-licensed facility as an alternate feed or direct disposal at an appropriately licensed facility as a waste. The attached documentation provides a brief overview of WRT's corporate profile and the methodology used in its uranium water treatment system. In short, WRT's uranium water treatment system can offer all publicly or privately-operated drinking water systems a service resulting in compliance with the SDWA's mandate without creating any significant risks to public health and safety or the environment.

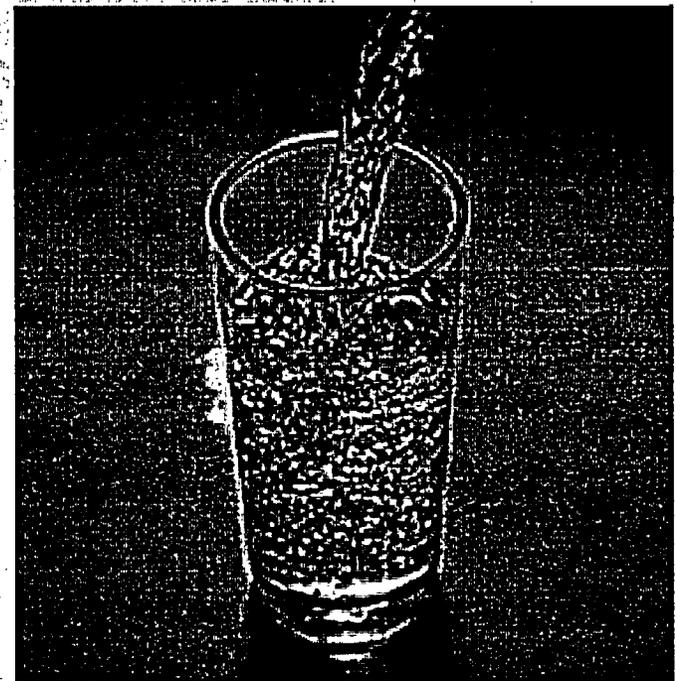
In order to proceed with the removal of uranium from drinking water sources, WRT proposes to submit a license application to NRC for a *performance-based, multi-site source material license*. This license is required because uranium in treatment resins

will exceed licensable source material concentrations. WRT's proposed license application is accompanied by a comprehensive environmental report (ER) that evaluates the various WRT water treatment systems based on flow rate and that provides a conservative "upper-bound" assessment of the potential public health and safety risks associated with uranium water treatment such as occupational dose assessments and potential upset conditions at the site or transportation accidents. WRT's license application also will provide NRC with a draft Safety Evaluation Report (SER) to justify the use of a performance-based license when addressing uranium water treatments systems at multiple geographic locations. WRT already has engaged in detailed discussions with NRC Staff regarding this proposed licensing approach and appreciate the opportunity to brief the Commission on it.

In light of the new SDWA uranium in drinking water standard, uranium water treatment is becoming an important national issue. The increasing number of drinking water systems that will require uranium water treatment is likely to expand significantly as cities and municipalities intensify monitoring of drinking water sources for uranium concentrations. Based on its Strategic Assessment Rebaselining Initiative (SARI), one of the Commission's goals is to implement licensing approaches that are risk-informed and performance-based. WRT's proposed licensing approach reflects this goal and provides the Commission with an opportunity to cost-effectively assist in assuring compliance with the SDWA mandate for uranium removal from drinking water sources. WRT's proposed performance-based licensing approach also will minimize the expenditure of NRC (or Agreement State) and water supplier resources for the management of licensable source material while providing adequate protection for public health and safety. Please do not hesitate to contact us if you have any questions prior to our meeting.

# Uranium Removal from Drinking Water

Pre-application Meeting with the NRC  
November 17, 2004



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*From Source to Solution*

# Agenda

- Who is WRT
- Uranium MCL and compliance dates
- Methods of uranium removal
- Disposal issues
- WRT process
- Regulatory approvals
- Questions, comments and discussion



# WRT™ Contaminant Removal

WRT provides contaminant removal systems using its synthetic and/or mined and formulated, mineral-based proprietary medias in patent pending processes for the cost effective removal of:

URANIUM

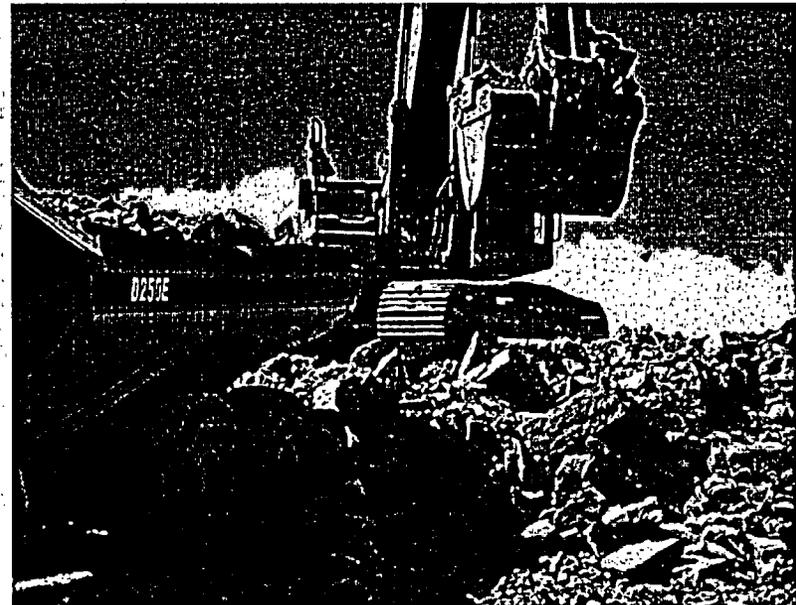
RADIUM

ARSENIC

CHROMIUM

BARIUM

Others



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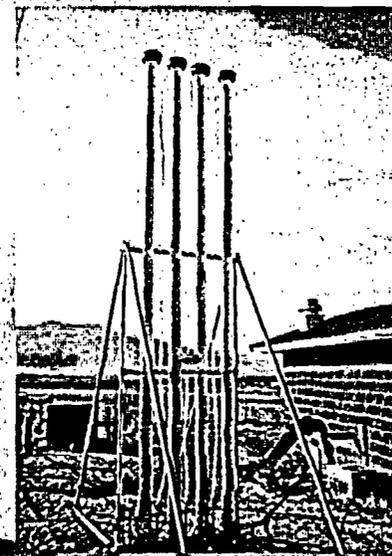
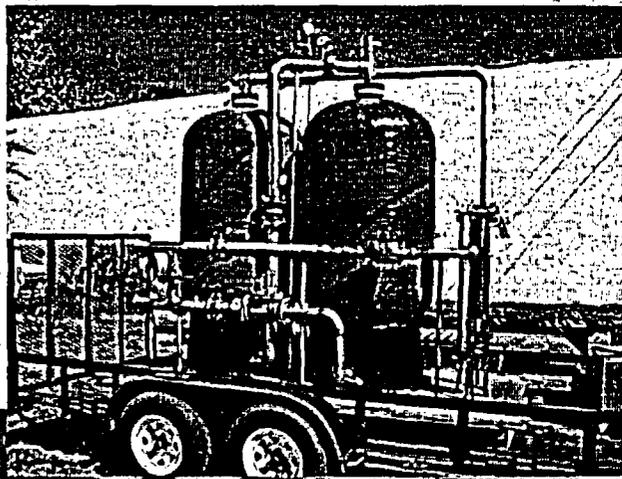
# WRT Business Concept

- Control raw materials
- Develop reliable technology that requires minimal operational supervision
- Relieve client's need to handle hazardous chemicals and materials
- Provide expertise and training that client may be lacking
- Provide a long-term disposal method for residuals



# WRT provides a complete contaminant removal solution:

- Design and deliver complete Uranium Removal System on the customer's site.
- Provide Z-92™ media, service of exchanging media and safe disposal of used media.
- Provided on a long term contract basis.



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# USEPA Radionuclides Rule Limits – Safe Drinking Water Act (SDWA)

	<u>MCL</u>
• Uranium	30 $\mu\text{g/L}$
• Radium 226 + Radium 228	5 pCi/L
• Beta/photon emitters	4 mrem/yr
• Gross alpha	15 pCi/L

The standards apply to levels in the water, measured at EACH Entry Point to the Distribution System (EPTDS).



# Environmental Protection Agency

- 49 CFR 141.66

## Maximum contaminant levels for radionuclides

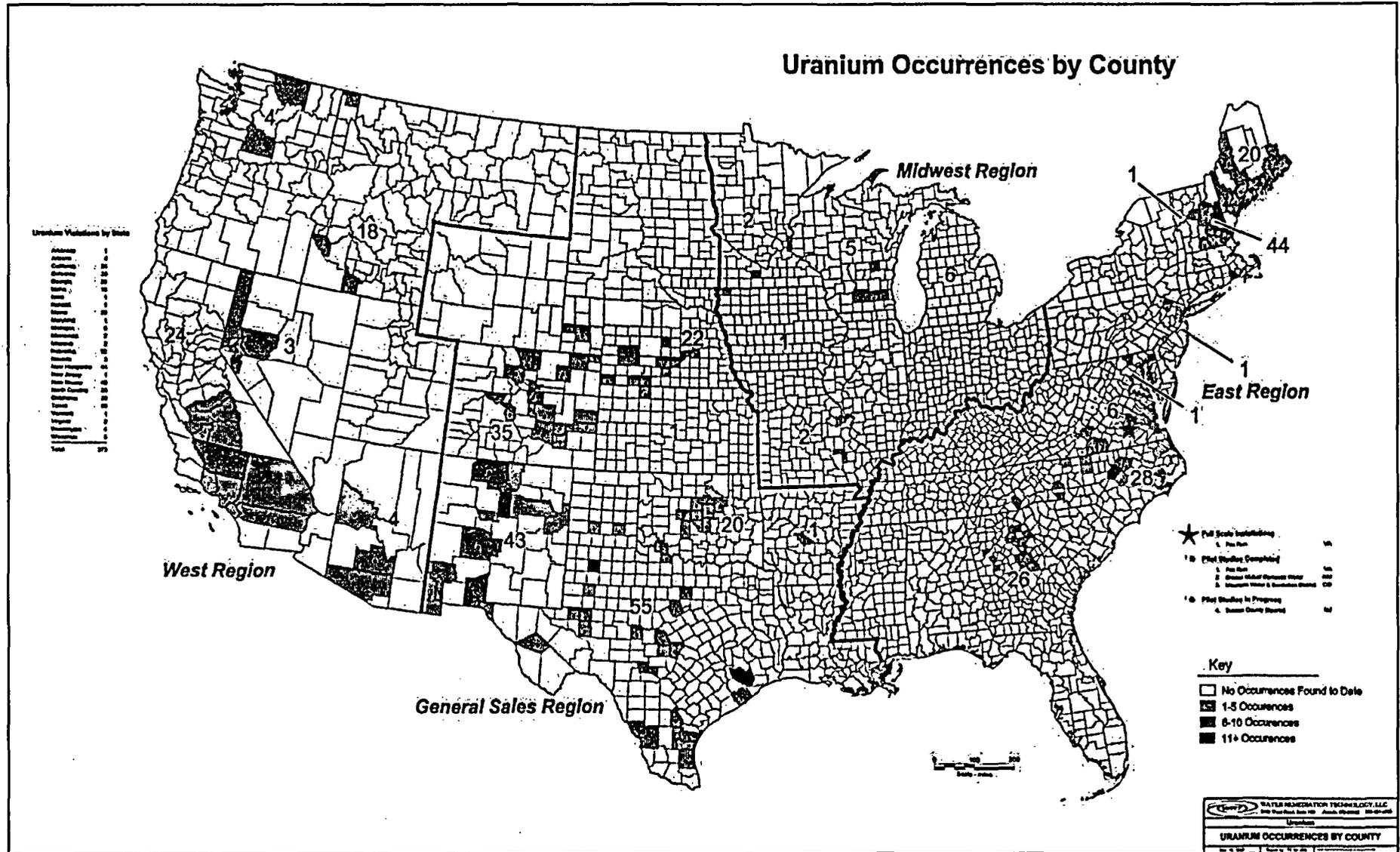
- *MCL for uranium.* The maximum contaminant level for uranium is 30  $\mu\text{g/L}$ .

- *Compliance dates for uranium.*

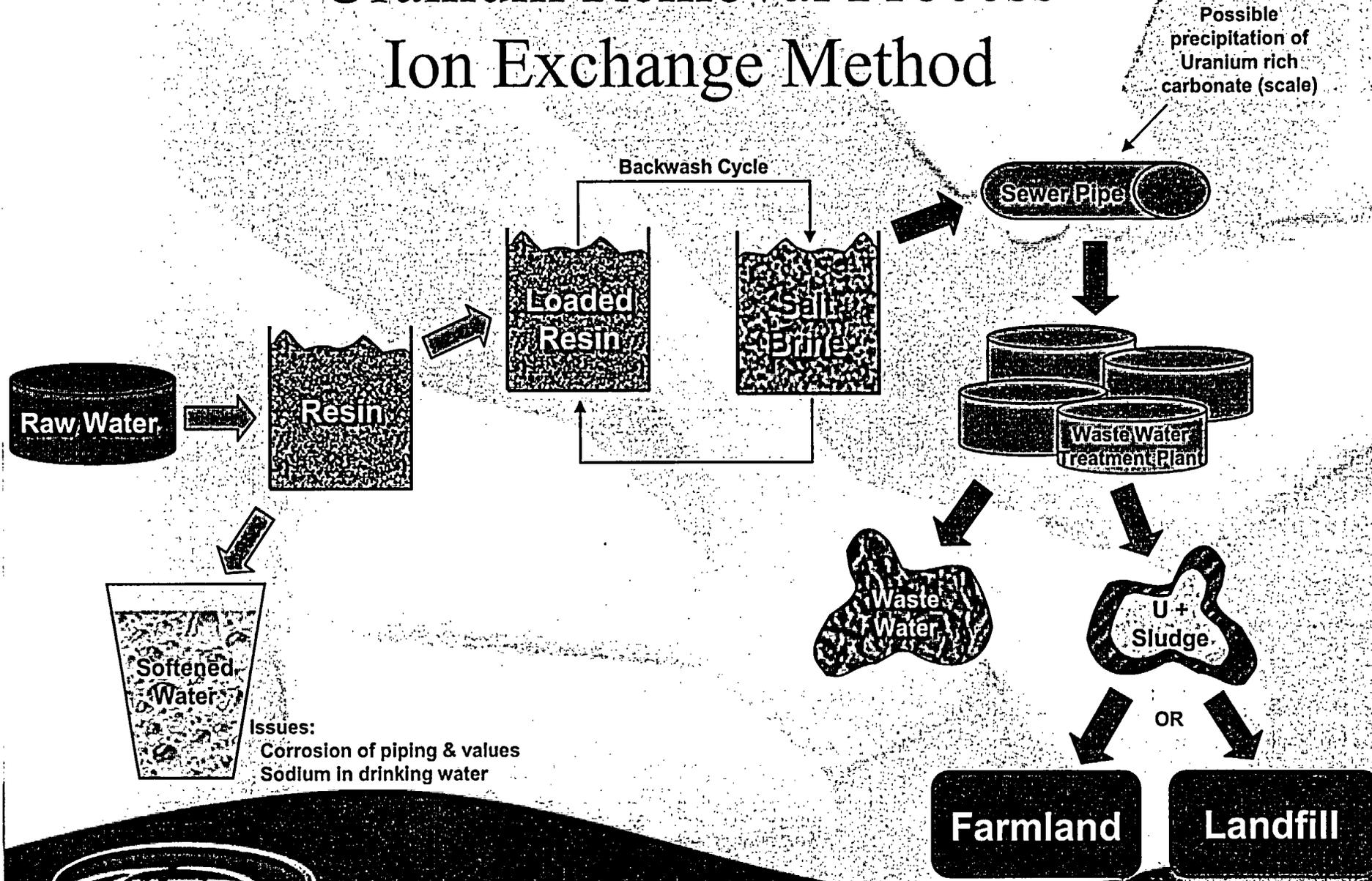
- Jun 2000 – 8 Dec 2003 – Grandfathered Data  
With state approval, can use monitoring data from this period.
- 8 Dec 2003 – 31 Dec 2007  
Initial compliance monitoring period – up to 4 quarterly samples per year.
- 1 Jan 2008  
First compliance cycle begins



# Uranium Occurrences by County



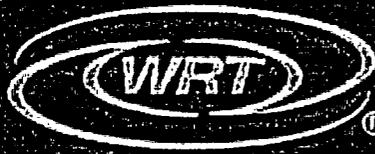
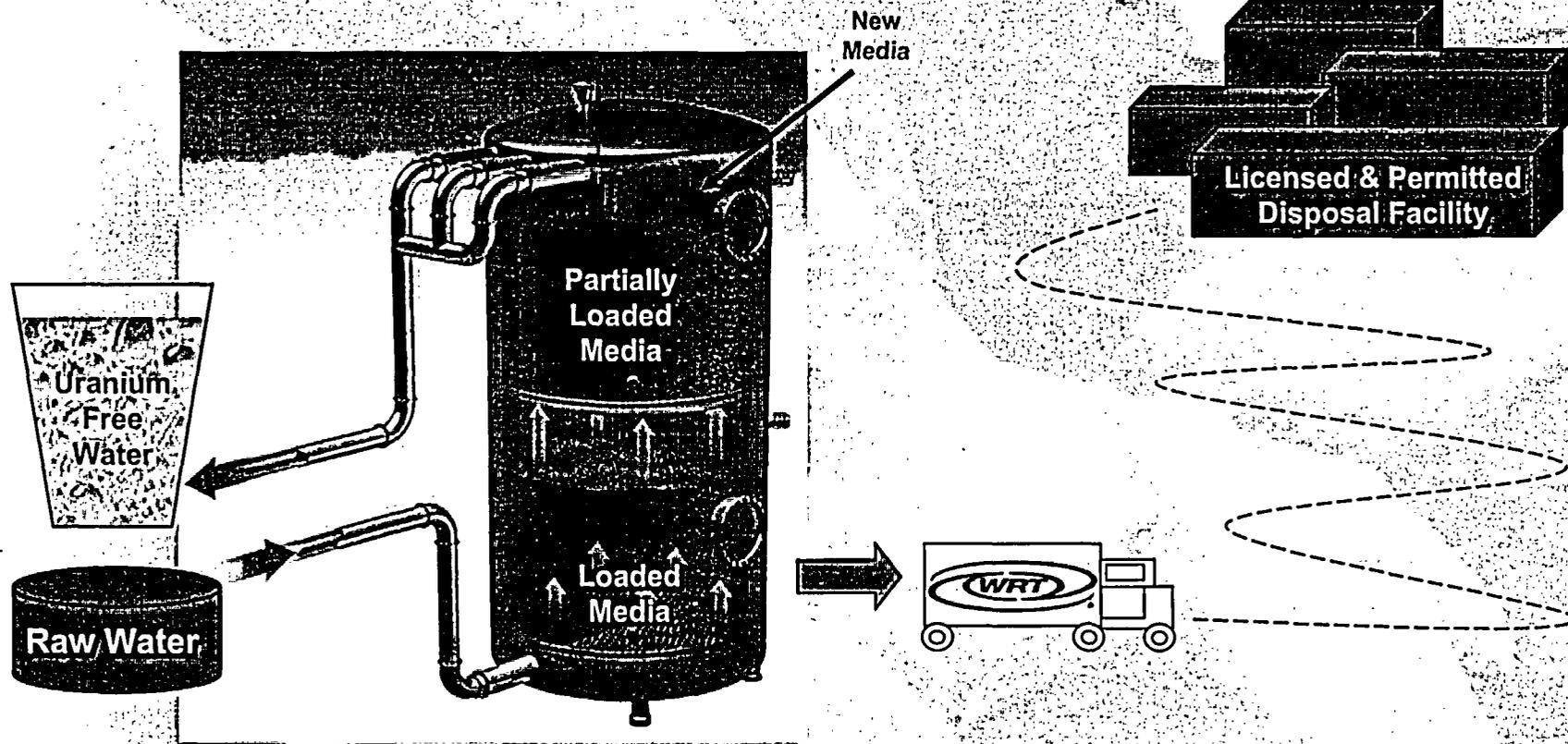
# Uranium Removal Process Ion Exchange Method



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# Uranium Removal Process Adsorptive Method



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# Process Comparison

	<b>ADSORPTIVE MEDIA</b>	<b>ION EXCHANGE</b>
<b>DISPOSAL TO SEWER</b>	No	Yes
<b>RINSE OR BACKWASH WATER</b>	No	1 - 3%
<b>COLLECTION PIPING CONTAMINATION</b>	No	Possible
<b>INCREASE CORROSIVITY OR INCREASE IN HEAVY METALS</b>	No	Yes
<b>DISPOSAL IN LICENSED RADIATION DISPOSAL SITE</b>	Yes	No



# Sewer Discharge Rules

## 10 CFR 20.2003 Disposal by Release into Sanitary Sewer\*

- A licensee may discharge licensed material into sanitary sewer if each of the following conditions is satisfied:
  - The material is readily soluble, or is readily dispersible biological material, in water;
  - Uranium disposal limit – monthly average activity is less than  $3 \text{ pCi/mL} = 3,000 \text{ pCi/L}$
- Radioactive solids (particulate)
  - Not allowed under 10 CFR 20.2003
- In solution
  - Must be within uranium disposal limits
  - Possible metals issues reporting to wastewater treatment plant

\* U.S. Nuclear Regulatory Commission (NRC)



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# Example of POTW Sludge as Source Material

## Uranium

### Sewer Sludge Application Parameters

required input numbers	
calculated numbers or available from sewer records	
comments	

### Drinking water parameters

Uranium concentration in water	60 ppb
Well Flow Rate (gpm)	100
Well Utilization (%)	40%
Gallons per day pumped	57,600
Gallons per year pumped	21,024,000 gallons/year
Miligrams uranium in water	4,768,243 milligrams uranium / year
Pounds uranium / year in water	10.5

### Sludge recovery parameters

Dilution factor	1.00	Adjustment for infiltration
Gallons of water/day treated in waste water facility	57,600	(may be higher than pumped to allow for infiltration)
Uranium in sewer influent	60.00	Reflects dilution of radium in raw water from infiltration
Gallons of treated water/year	21,024,000	
Grams of sludge/gallon of effluent	0.40	(Range - 0.23 to 0.8)
Tons of sludge produced per year dry weight	9	From sewer treatment plant reports
Grams sludge produced / year	8,409,600	grams
Miligrams Uranium in sewage influent/year	4,793,472	mg
% Uranium reporting to sludge	90%	
% Uranium remaining in water	10%	
Approx. Uranium content in sludge (mg/ kg)	513.0	mg/kg (ppm)
Approx. Uranium content of water effluent (ug/L)	6.0	micrograms/liter (ppb)



# Uranium Concentration in Sewer Sludge

<u>Raw Water</u> (ppb)	<u>U in Sludge*</u> (ppm)	<u>U in Effluent</u> (ppb)
60	513	6
150	1,283	14
400	3,420	36

\* 90% recovery of uranium in sludge, no influent dilution at POTW

"Source Material" = Compound/mixture with U concentration > 500 ppm

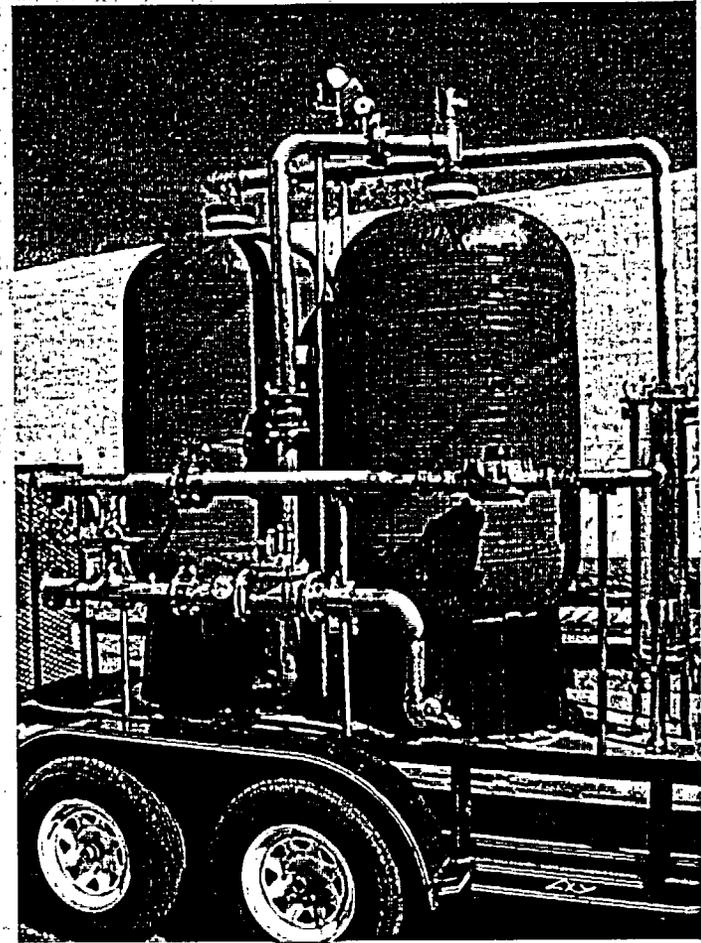


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# Z-92™ Uranium Removal Process

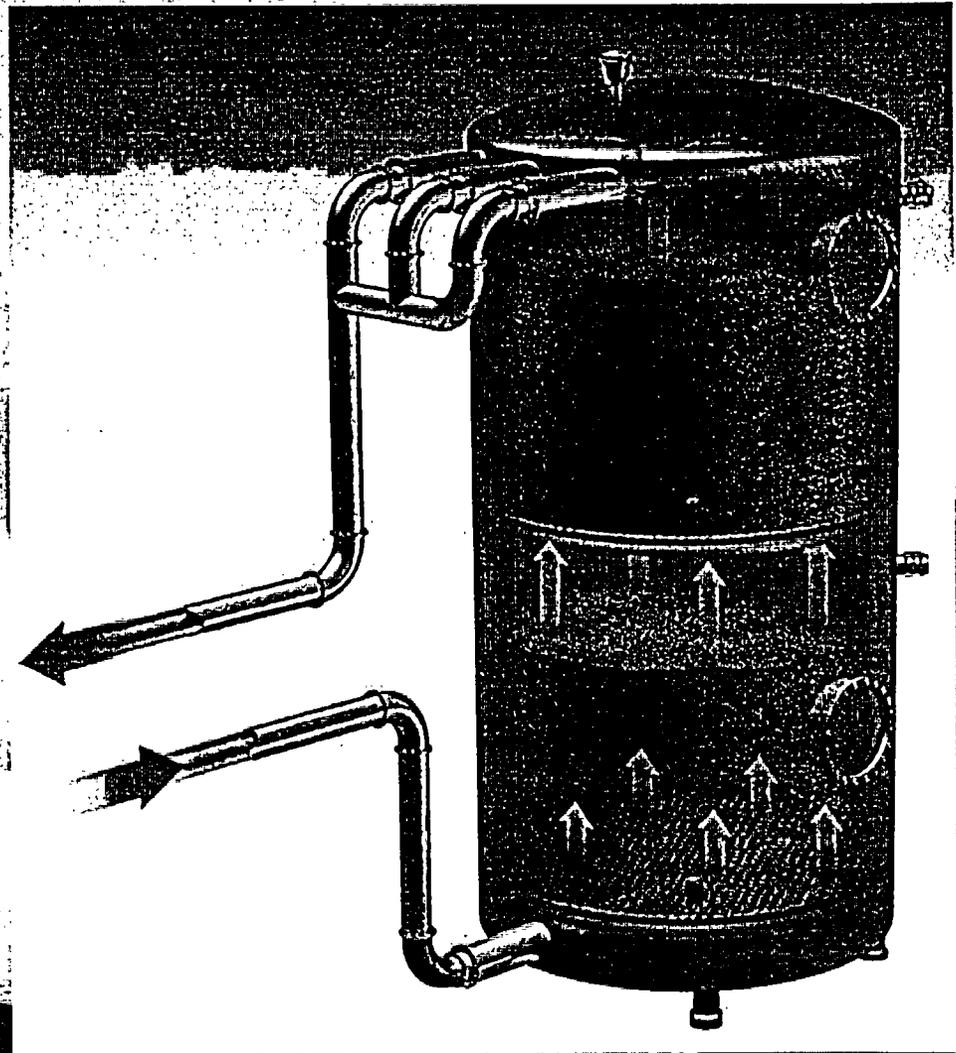
- WRT has developed a patent pending process for the cost effective removal of Uranium from drinking water using the Z-92™ media process.



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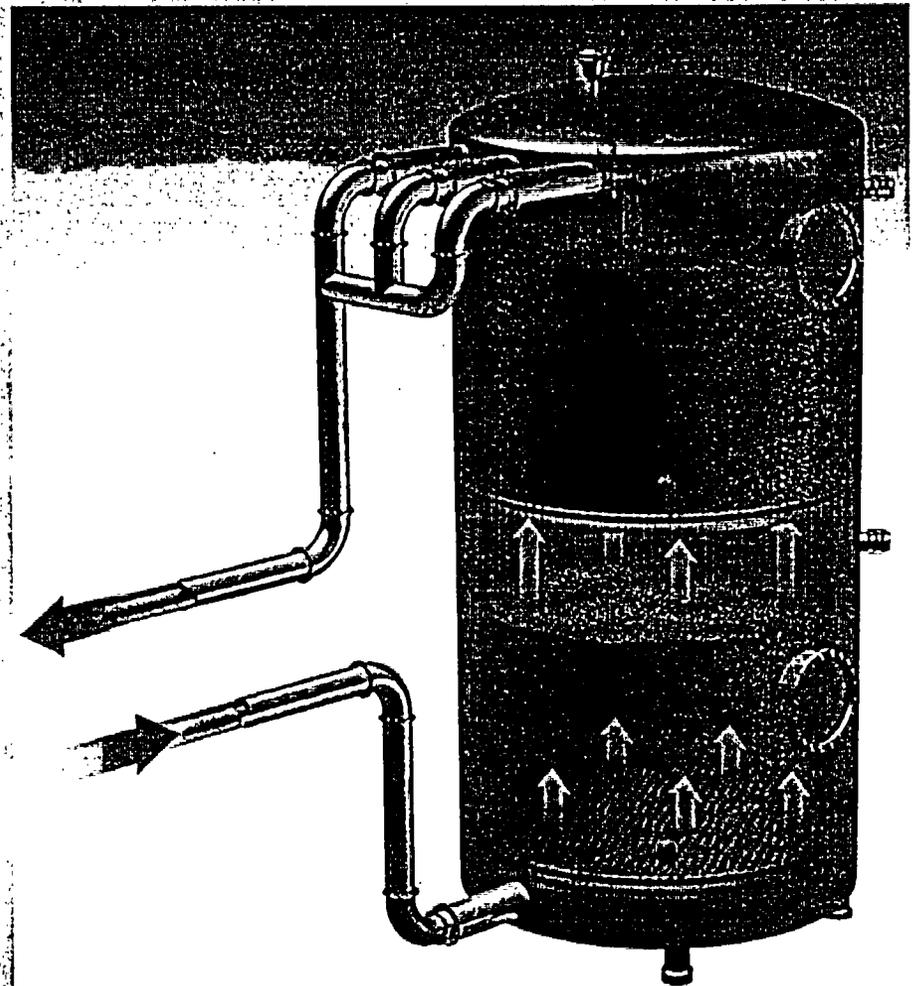
# Z-92™ Uranium Removal Process

- Water is passed through a fluidized bed of Z-92™ media. Uranium contacts the media and by means of adsorption, the uranium is physically captured by the media.



# Z-92™ Uranium Removal Process

- System operates in upflow direction.
  - Intimate contact of water and media particles.
  - No backwash cycle required.  
No liquid waste stream is generated.
- No chemicals are added to the water for removal process.
- Normal operation consists of monitoring and sampling.
- Pre-treatment for iron removal is not required.



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# WRT Uranium Removal System

## Typical Design Criteria

	Fox Run, VA System	500 gpm System	1,000 gpm System
Well flow rate (gpm)	80	500	1,000
Uranium in feed water ( $\mu\text{g/L}$ )	80	100	100
Specific flow rate (gpm/sq ft)	8	8	8
Media stages per site	2	2	2
Media height per stage (ft)	2	2	2
Volume Z-92™ media per stage (cu ft)	20	125	250
Treatment vessel – materials	FRP	FRP or SS	FRP or SS
Vessel size (ft diameter x ft height)	3.5 x 6	9 x 6	12.5 x 6



# WRT Uranium Removal System Typical Design Criteria (*cont.*)

	Fox Run, VA System	500 gpm System	1,000 gpm System
Media per stage (lb)	880	5,500	11,000
Final uranium loading on media (ppm)	60,000	60,000	60,000
Max weight uranium (lb)	56	350	705
Final activity / stage (mCi)	23	143	288
Media spec. activity (pCi/g)	54,000	54,000	54,000
<b><i>Time to &gt; 15 lb U on Site**</i></b>	<b>19 mo</b>	<b>2.4 mo</b>	<b>1.2 mo</b>
Typical time to max U loading (yr) (35% well utilization)	6.7	5.4	5.4

\*\* Limit of general license "small quantity of source material", 10 CFR 40.22



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# WRT Uranium Removal Systems

## Expected Maximum Exposure

- Example
  - Large treatment vessel, > 500 gpm sys
  - 60,000-ppm U loading after 4 - 6 years
- Comparison of Exposure – ~7% of the dose rate from
  - the exposure from a drum of yellowcake
  - the exposure from a typical WRT radium-removal vessel
- Approximate Dose Rates
  - Vessel surface ~ 0.2 mrem/hr
  - 1 meter from surface < 0.01 mrem/hr



# Waste Management of Z-92™ Media

- The Z-92™ Uranium Removal Process generates a solid, granular, low level waste.
- All handling, exchange, transportation and disposal of media is facilitated by WRT.
- Disposal by WRT to an approved/licensed facility.



# WRT - Uranium Pilot Studies

- Mountain Water, Conifer, Colorado
- Brazos Water Utility, NM
- Fox Run, VA



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# NRC License Objectives

- Performance-based license
- A Master nation-wide license that
  - Satisfies NRC licensing criteria
  - Is acceptable to Agreement States
- Covers public and private drinking water utilities.
- Structure
  - Municipality is the Owner and Possessor of the rad mat'l
  - WRT acts as an Agent of the Municipality-Water Provider
  - WRT provides its technology and expertise as a Service Provider



# Uranium Removal System Typical Decommissioning Costs

Well flow rate (GPM)	80	500	1,000
Tons of Z-92™ spent media on site	1.0	5.5	11.0
Costs:			
Disposal of media @ \$1,000/ton	\$ 1,000	\$ 5,500	\$11,000
Transportation	3,000	5,000	7,000
Loading & Packaging	3,500	6,500	9,500
Site Decommissioning**	<u>5,000</u>	<u>8,000</u>	<u>11,000</u>
<b>Total Cost</b>	<b>\$12,500</b>	<b>\$25,000</b>	<b>\$38,500</b>

\*\* (equipment removal and site survey)



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# Financial Assurances

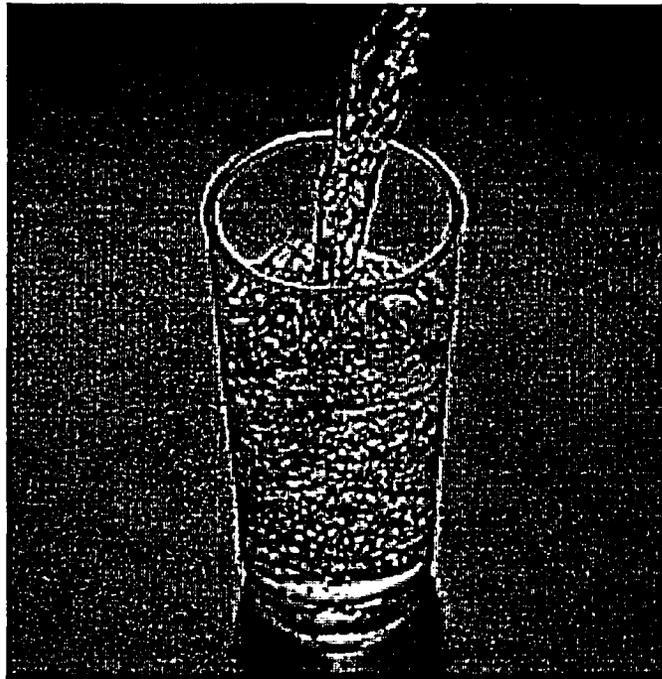
## Decommissioning – Part 40.36 (e)(4)

- Municipalities → financial equivalent of a parent-company guarantee
- Others → possibly a standby trust



## ***WRT's Mission***

Become the premier provider of  
complete, long-term, cost-  
effective contaminant removal  
solutions to the drinking water  
industry



**Thank you for attending**

**Questions?**



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## Water Remediation Technology LLC (WRT)

WRT designs, manufactures, and provides cost-effective, patent-pending processes for the removal of not only radium and uranium, but also arsenic, ammonia, barium, chromium, and other contaminants from drinking water supplies or wastewater. Available on a cost-per-1,000-gallons-treated, long-term-contract basis, WRT is quite possibly the only company offering a full-package solution to a water provider that represents the simplest and most effective and environmentally-sound processes/services in the industry for meeting regulatory compliance.

WRT's removal processes utilize proprietary mineral-based and synthetic treatment medias to reduce contaminant levels to meet the new radionuclide rules. These contaminant-removal systems are designed to be added to any new or existing potable water system, at the point of supply. WRT's technology does not rely on precipitation and filtration, typical of most water-treatment systems. Rather, water is passed in an upflow direction through a fluidized, partially-expanded bed of adsorptive media in a treatment vessel where the contaminant is removed. After a period of time, typically years, when the media is loaded to the point where fresh media is needed, WRT technicians remove the loaded media from the vessel and permanently dispose of it in a licensed facility, a LLRW site in the case of the radium and uranium systems.

Advantages of WRT's technology include the following.

- Nothing is added to the water. No chemicals are added in the process, and nothing is imparted into the water.
- No liquid waste stream is generated by this process.
- No precipitates are produced which can reduce flow through the treatment vessel. Therefore, no periodic backwashing is required which would result in the disposal of radioactive brines, and in some instances radioactive solids, to the sanitary sewer.
- Once the radioactive material is removed from the water, it remains removed from the environment, with disposal at a LLRW facility.
- Ease of Operation – Because no backwashing is required, operating the system is simplified to basically routine sampling and monitoring the equipment.
- The WRT technology is an excellent application for a rural water system, as it can operate at well sites that have no access to a sanitary sewer (for backwash discharges).

WRT has successfully completed approximately 25 on-site radium pilot tests and 3 uranium pilot tests, as the date for compliance with the uranium MCL approaches. WRT's first full-scale radium-removal systems are coming on line in February 2005 at five well sites in Oswego, IL, and WRT's first full-scale uranium removal system, an 80-gpm system for the Fox Run Water Company, Blackridge, VA, has been operating since December 2004. The treatment success at Fox Run is documented in the attached WRT newsletter.

FROM SOURCE TO SOLUTION™



# FROM SOURCE ...TO SOLUTION™



DECEMBER 2004  
Vol. 1/12-04

*The Monthly Newsletter for Water Quality Conscious People  
Published by Water Remediation Technology (WRT)*

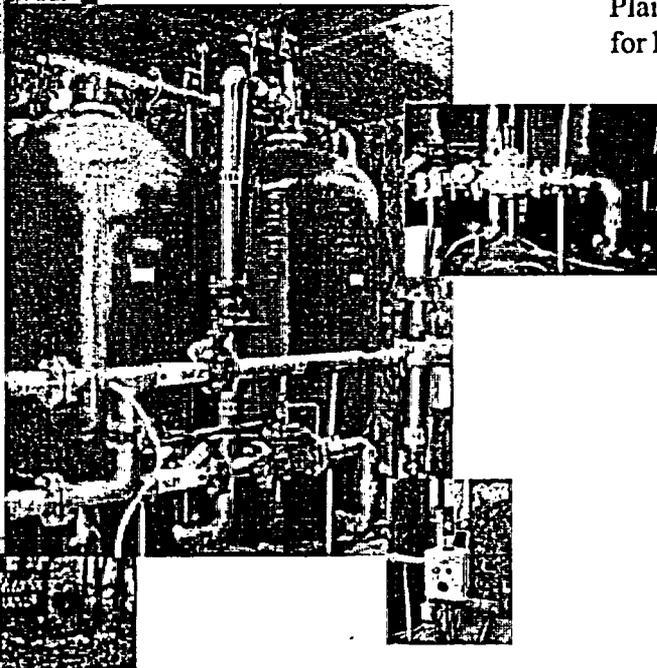
Welcome to the first issue of *From Source to Solution™*! This newsletter will bring the insight and experience of a company devoted to removing radioactive contaminants from drinking water. We will publish this newsletter monthly; your feedback is welcome.

## Fox Run Water Co. solves uranium contaminated drinking water problem with WRT treatment system

The Fox Run Water Co. in Dinwiddie County, Virginia is in a uranium contamination trend (see following article) that has impacted this water system and others across six states. As Fox Run can attest to, clean up of uranium contaminated drinking water was achieved in a timely and economical manner by a WRT Z-92™ Uranium Removal System. Analysis of water treated by the WRT System at Chesdin Manor reduced uranium levels from approximately 80 ppb to less than 1 ppb, well below the MCL of 30 ppb. As Bernard Nash, President of the Fox Run Water Co. says, "We are pleased with the work of this contractor". Other water systems in the uranium trend in Virginia are



Fox Run Water Company Project: Chesdin Manor Treatment Capacity: 80 GPM		
Uranium:	Column Concentrations (ppb)	
Date	Raw Water	Treated Water
11/23/04	80.7	<1.0
11/29/04	83.8	<1.0
12/06/04	90.0	<1.0
12/13/04	80.8	<1.0



## East Coast uranium trend could wreak havoc with water systems

In the late 1970's and early 1980's uranium industry geologists discovered and began exploring for uranium deposits in a north to south belt that stretched along the Piedmont Province (the geological area that lies between the Coastal Plain and Blue Ridge Mountains) for hundreds of miles. The zone of



(continue on page 2)

monitoring this Fox Run clean up program closely. WRT is pleased to be able to assist these impacted communities with its innovative technology.



Water Remediation Technology, LLC  
5460 Ward Rd., Suite 100, Arvada, CO 80002  
Ph. (303) 424-5355 · Fx. (303) 425-7497  
www.wrt.net.com



## East Coast uranium trend

(continued from page 1)

small to large uranium deposits is over 100 miles wide beginning in North Carolina, trending through eastern Virginia, north through Maryland, Washington DC, passing through eastern Pennsylvania, western New Jersey and terminating just to the north of New York City. Uranium and associated radium minerals occur both in granites and sandstone formations.

What would be the connection between drinking water systems and a mineral zone containing uranium? The folks at the Fox Run Water Co. in Dinwiddie County, Virginia found out that there is a direct connection between their water quality issues and uranium! (See previous article). Uranium is found in surface outcrops and deep strata within this trend. Groundwater coming into contact with this naturally occurring radioactive mineral becomes contaminated and in some cases the contamination level is so high that the MCL for uranium is exceeded in drinking water wells. In other portions of the trend there are occurrences of radium and contamination from this radioactive mineral also causes any nearby wells to exceed drinking water standards for radium. Historically, nothing was done about this problem because EPA guidelines had not been established concerning contamination levels until recently. Potentially hundreds of water systems operating within the trend could be affected.



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5460 Ward Rd., Suite 100, Arvada, CO 80002  
Ph. (303) 424-5355 • Fx. (303) 425-7497 • www.wrt.net.com

## LETTER FROM THE PRESIDENT

*WRT® designs, manufactures and provides cost-effective, environmentally safe, patent-pending processes for the removal of radium, uranium, and barium from drinking water and disposing of the radioactive residuals in a safe responsible manner.*

*WRT's removal processes utilize proprietary treatment medias to reduce contaminant levels to meet the new radionuclide rules. These contaminant removal processes are designed to be added to any new or existing potable water system. Water is passed in an upflow mode through a fluidized bed of media in the treatment columns, where the contaminant is removed. After the media is loaded with the contaminant, WRT removes it from the process vessel and permanently disposes of it in a licensed facility. Our trained technicians will handle all of the radioactive residuals relieving the client from that responsibility.*

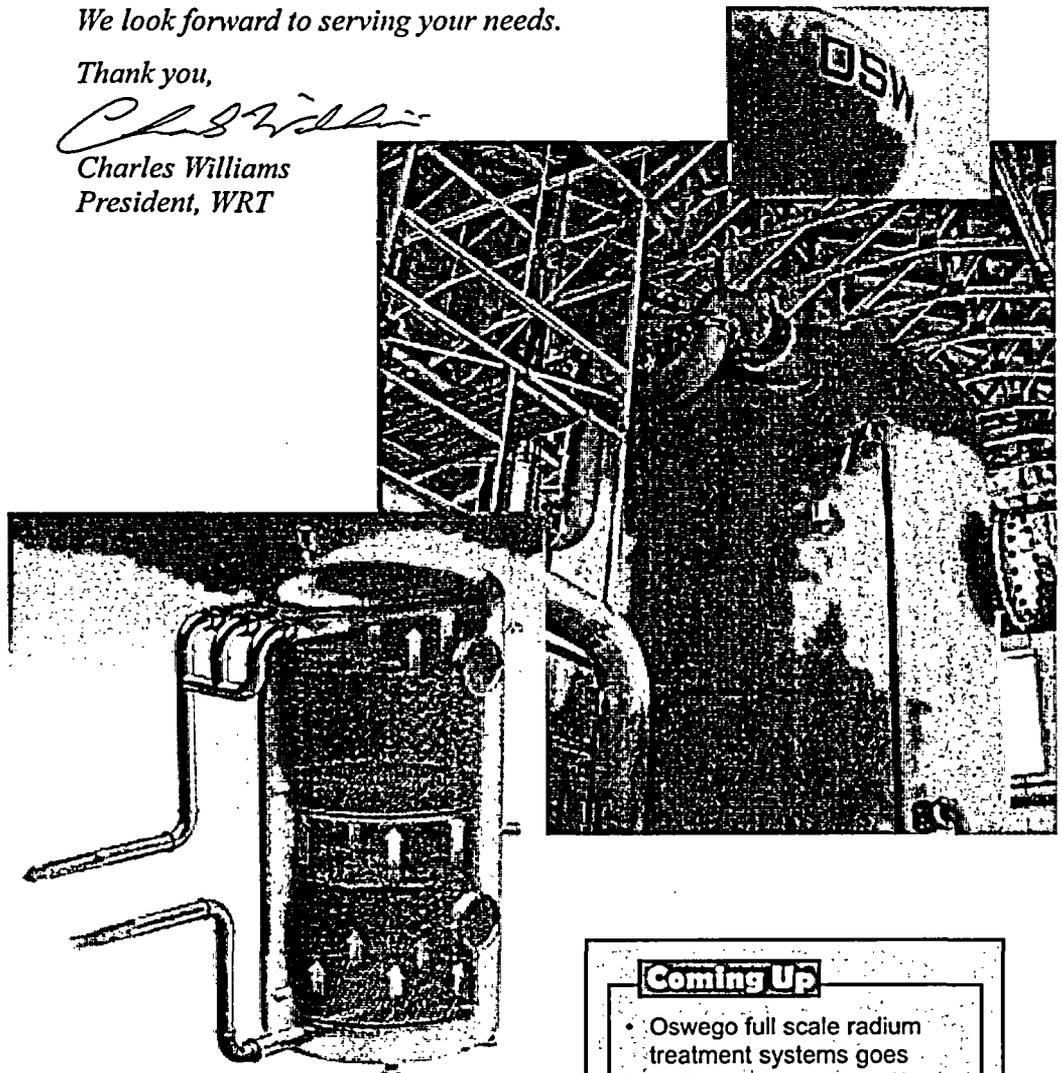
*Our mission is to become the premier drinking water contaminant removal company by offering cost effective, long term, total solutions including environmentally safe disposal.*

*For more information on our processes or to view case studies, pilot study reports and pilot studies in progress, visit [www.wrt.net.com](http://www.wrt.net.com) or contact us by calling (303) 424-5355.*

*We look forward to serving your needs.*

*Thank you,*

*Charles Williams  
President, WRT*



### Coming Up

- Oswego full scale radium treatment systems goes on-line