Radium Removal and Disposal in Wisconsin

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Wisconsin Radionuclide Exceedances

- Municipal Systems
  - 26 with combined radium
  - 5 with gross alpha only
  - 2 with uranium

- OTM Systems
  - 8 with combined radium
  - 2 with gross alpha only
Reduction Methods in WI

- Replacement/blending with surface water
- Replacement/blending with low radium content groundwater
- Approved/existing radium treatment
  - cation exchange softening
  - lime softening
  - HMO filtration
- Anion exchange for uranium removal (2)
Reduction Methods in WI (Continued)

• Piloted Treatment
  – Dow Company RSC (Layne-Northwest)
  – WRT Z-88 selective resin
  – HMO filtration
  – Well geophysical investigation & selective packer installation
  – Electrodialysis Reversal (EDR) (1 system)
  – Reverse osmosis (1 system)
WI Rad Disposal Issues

• WI DNR & WI DHFS Rad Section have been working on this issue since the 1980’s
• POTW Ra sludge landfill criteria codified in NR 204 (Also used for lime sludge)
• WI DNR radionuclide waste disposal guidance updated in 3/04
• DHFS license required for operation of a facility creating a LL radioactive waste
WI DNR Rad Waste Disposal Guidance

- Ra already received at the POTW unless removed by a Ra selective resin
- Compliance w/10CFR20 Unity Equation for discharges of WW to a sanitary sewer
  \[ \frac{Ra_{226}}{600} + \frac{Ra_{228}}{600} + \frac{U}{3000} \leq 1 \]
- Compliance w/10CFR20 Unity Equation for discharges of WW to surface water
  \[ \frac{Ra_{226}}{60} + \frac{Ra_{228}}{60} + \frac{U}{300} \leq 1 \]
• Spent WTP media must be examined for rad content prior to disposal
• Case-by-case DNR review and approval of NORM waste to an engineered WI landfill
• DHFS consulted before DNR approves rad waste disposal w/rads of 50 to 2,000 pCi/g
• Waste > 2,000 pCi/g to a LLRW disposal site
• 2002 biosolids disposal in WI (by number of facilities)
  – 94% landspread
  – 3% fertilizer production (example: Milorganite)
  – 2.5% landfill
  – 0.5% incinerate
WI DNR Rad Waste Disposal Guidance (Continued)

• POTW landspreading
  – Ra226 the controlling factor (1/2 life & Rn)
  – Max 2 pCi/g (dry weight) in top 12”
  – Soil pH >= 6
  – Minimum organic matter content required
  – Stop at calculated load of 1,640 microC per acre
  – Can sample to extend site life if soils favorable
WI Rad Waste Disposal Guidance (Continued)

- Deep well injection not allowed in WI
- Disposal to a private septic system approved on a case-by-case basis
- Private septic system sludge rad content currently not regulated
- Some investigation of gamma radiation and radon gas in WTPs/operators not present during regen & backwash/proper ventilation