

Low Activity Waste Disposal At Waste Control Specialists

**William P. Dornsife
Executive VP Licensing & Regulatory Affairs
WM2009 March 4, 2009**

Disposal of low activity radioactive waste at RCRA Subtitle C disposal facilities can be performed safely and provides an equivalent level of protection to public health and safety as disposal at licensed LLRW disposal facilities. RCRA disposal facility requirements meet or exceed 10 CFR Part 61 requirements in the following areas related to design and institutional control:

- RCRA requires a minimum of 30 years active maintenance verses 5 years for Part 61.
- RCRA requires deed restrictions that prevent disturbing the cover after the facility has been closed, Part 61 has no such requirement.
- Many RCRA disposal facilities include a five meter engineered cover that would satisfy the Part 61 intruder barrier requirement for Class C waste.
- RCRA facilities must meet prescriptive design requirements that include double liners, minimum permeability standards, and leachate collection and monitoring systems. Part 61 has no facility design requirements.
- There is no requirement under RCRA for long-term government ownership of the facility after closure, but this requirement has been waived by the NRC for the Envirocare facility.
- Existing RCRA disposal facility site permits and other licenses require various financial assurance instruments that provide for equivalent levels of funding for site decommissioning and closure, site maintenance and monitoring after closure, liability protection, and cleanup and removal of all waste stored on site under the license, if the licensee cannot perform this activity
- Various studies have shown that the long-lived toxicity of RCRA waste is comparable to low activity LLRW.[\[1\]](#)

[\[1\]](#) "A Perspective on the Relative Hazard of Low-Level Radioactive Waste Disposal", Low-Level Radioactive Waste Management - Proceedings of Health Physics Society Twelfth Midyear Topical Symposium, February, 1979, W. P. Dornsife.

Exempt Material Authorized for Disposal in Texas

- **Naturally Occurring Radioactive Material (NORM) containing Ra-226 or Ra-228 at less than 30 pCi/gm or any other NORM radionuclide less than 150 pCi/gm**
- **Source material with <0.05% by weight of U and Th (U-238 up to 166.5 pCi/gm and Th-232 up to 54.5 pCi/gm)**
- **Finished products or parts containing metal Th alloys with Th <4% by weight**
- **Depleted U in counterweights installed in aircraft, rockets, projectiles, or missiles**
- **Specifically exempt items manufactured under a specific license that authorizes the transfer to exempt persons**
- **Unrefined or unprocessed ores containing source material (U or Th)**
- **Any other specific item exempt from licensing under Texas rules**
- **Rare earth metals, compounds, mixtures, or products containing <0.25% by weight of Th or U or any combination thereof**
- **Depleted U used as shielding material in a shipping container**

Safety Assessment

- **For NRC exempt waste a RESRAD and TSD-Dose assessment is performed prior to approval – use 1 mem/yr standard including site and transportation workers**
- **A conservative dose assessment has been performed for disposal of all exempt material in the WCS RCRA landfill**
- **The results of this assessment are as follows:**
 - Future On-Site Resident - zero mrem/yr during first 100,000 years
 - Inadvertant intruder (well drillers) – 0.04 mrem every 50 years
- **This assessment conservatively assumes that all of the waste in the RCRA cell is exempt (about twice the actual volume disposed) and all exempt waste streams are at their maximum allowable concentrations**

Radiological Safety Program

- **Licensed treatment and storage facility in RCRA permitted area**
- **All workers that handle exempt material are badged as radiation workers and covered under site radiation safety program**
- **Complete site environmental monitoring program is conducted for licensed facility, including air, radon, soil, and water monitoring around RCRA cell and rail offloading area**

Exempt material receipt requirements

- **Exempt waste is received as industrial waste under RCRA permit and requires approval of waste profile by WCS**
- **RCRA permit condition requires notification to TCEQ (including profile, sampling plan, and characterization data) – TCEQ has 14 days to review**
- **Notification is required prior to shipment and waste shipments are tracked by transportation company**
- **Screening surveys and fingerprinting is required for all exempt waste prior to acceptance by WCS**

Case Study of Unimportant Quantities of Source Material Exemption by USNRC

- **Prior to 1999, NRC required that source material < 0.05% at licensed facilities had to be disposed of as licensed LLRW.**
- **WCS recognized that many facilities, especially rare earth ore processors, under going decommissioning, had lots of this potentially exempt material.**
- **WCS requested that NRC formally recognize that this material is exempted from licensing and, using risk based decisionmaking, could be disposal of at non-licensed facilities.**
- **WCS met with NRC Commissioners and high-level management staff to discuss this concept.**
- **NRC adopted as policy that unimportant quantities of source material could be disposed at a non-licensed disposal site after NRC approval of a site specific risk assessment.**

WCS Efforts to Develop Concentration Based Rule

- Petition for proposed rule submitted to TDH July 2002
- Implementation methodology similar to TX short half life disposal rule
- Modeled after EPA draft rule using wet and dry site
- Risk assessment based on 1 mrem/yr using RERAD and TSD-DOSE
- TDH requested review by USNRC – NRC recommended not to get ahead of the national effort

TRAB Proposed Rule

- Texas Radiation Advisory Board (TRAB) expressed interest in pursuing WCS LAW RCRA disposal concept as a good risk based concept to help solve the radioactive waste disposal problem.
- At their Jan 2007 meeting TRAB presented and recommended adoption of a proposed rule based on a different implementation strategy and revised risk assessment.
- Risk assessment based on not exceeding 1 mrem/yr to any non - radiation worker or member of the public and 0.1 person-rem/yr integrated dose to all non-radiation workers.
- All LLRW processed and released through a licensed TX treatment and storage facility.

Radionuclide	Allowable Concentration based on not exceeding 0.1 mrem per shipment (pCi/gm)	Total Activity/yr (Receiving worker 0.1 person-rem/yr) (Ci/yr)	Allowable Concentration at humid RCRA site (pCi/gm)	Indoor Radon (pCi/l)	Concentration to not exceed 4 pCi/l (pCi/gm)	Total activity limit per site (Ci/site)	Allowable concentration based on IAEA exempt transport limits (pCi/gm)	Allowable concentration based on TDH unrestricted soil limits (pCi/gm)
Am-241	4.00E+02	1.87E-01	NL				2.70E+01	6.00E+00
C-14	8.16E+07	1.88E-01	1.31E+00			6.60E-01	2.70E+05	8.00E+02
Cl-36	1.01E+06	2.42E-01	7.20E-02			3.60E-02	2.70E+05	
Co-60	1.69E+02	2.41E-01	SL				2.70E+02	3.00E+02
Cs-137+D	7.58E+02	2.52E-01	SL				2.70E+02	4.00E+01
Fe-55	5.26E+07	2.33E-01	NL				2.70E+05	2.00E+03
Fe-59	3.50E+02	2.50E-01	NL				2.70E+02	
H-3	1.67E+04	3.06E+04	7.72E+05			3.86E+05	2.70E+07	3.00E+03
I-125	7.25E+06	1.88E-01	NL				2.70E+04	2.00E+02
I-129	1.01E+06	1.90E-01	9.33E-03			4.66E-03	2.70E+03	2.00E+02
Ir-192	5.48E+02	2.48E-01	SL				2.70E+02	4.00E+01
Mn-54	5.17E+02	2.47E-01	SL				2.70E+02	
Nb-94	2.72E+02	2.47E-01	SL				2.70E+02	
Ni-59	6.45E+07	1.90E-01	NL				2.70E+05	
Ni-63	2.82E+07	1.81E-01	NL				2.70E+06	7.00E+02
Np-237+D	2.87E+02	1.94E-01	NL				2.70E+01	
Pb-210+D(U8)	1.29E+04	1.82E-01	SL				2.70E+02	
Pm-147	4.24E+06	1.90E-01	NL				2.70E+05	2.00E+02
Po-210(U8)	1.90E+04	1.89E-01	NL				2.70E+02	
Pu-238	1.90E+04	1.89E-01	NL				2.70E+01	6.00E+00
Pu-239	4.17E+02	1.84E-01	NL				2.70E+01	6.00E+00
Pu-241+D	2.15E+04	1.90E-01	NL				2.70E+03	
Ra-226+D(U8)	2.37E+02	2.35E-01	NL	2.72E-02	1.47E+02		2.70E+02	
Ra-228+D	4.34E+02	2.47E-01	NL				2.70E+02	
Sr-90+D	1.36E+05	1.87E-01	NL				2.70E+03	4.00E+01
Tc-99	1.17E+07	2.17E-01	0.582			2.91E-01	2.70E+05	2.00E+02
Th-232+D	5.83E+01	2.03E-01	SL				2.70E+02	8.00E+00
Th-230(U8)	5.41E+02	1.89E-01	SL				2.70E+01	6.00E+00
U-234(U8)	1.35E+03	1.89E-01	NL				2.70E+02	6.00E+00
U-235+D	1.01E+03	2.02E-01	NL				2.70E+02	
U-238+D	1.40E+03	1.90E-01	NL				2.70E+02	9.00E+00
Zn-65	7.38E+02	2.44E-01	SL				2.70E+02	
Zr-95+D	5.85E+02	2.43E-01	SL				2.70E+02	
U-nat			NL					3.00E+01

- **Alternate low activity waste disposal options have resulted in disposal of over 2 million yd³ of LAW at an average price range of about \$2 to \$3 per ft³. Decommissioning of many sites have been accelerated, including many on the NRC priority list, as well as saving millions of tax dollars for cleanup of FUSRAP sites.**
- **In looking at future options, care should be taken not to preempt the existing so-called “patchwork” system, since it has been working.**