Revision of 40 CFR Part 61 Subpart W

EPA Subpart W Rulemaking

- Legal Considerations
- Scientific/Technical Considerations
- Real World Implications

Revision of 40 CFR Part 61 Subpart W

Legal Considerations

Legal Issues

- EPA has no legal or regulatory bases to apply 40 CFR Part 61, Subpart W to evaporation ponds at uranium recovery facilities.
- After 20 years of consistent interpretation that Subpart W is only applicable to uranium mill tailings impoundments, EPA is inexplicably asserting that Subpart W applies to evaporation ponds at *in-situ* recovery and conventional mill tailings facilities.
- EPA's position is inconsistent with the language and the rulemaking history associated with Subpart W.
- By its very language, Subpart W only applies to active uranium mill tailings impoundments and makes no mention of evaporation ponds
- Specific language in Subpart W references uranium mills and their associated tailings
  - EPA regulations discuss mill tailings "piles"
- Specific examples provided in regulations to which Subpart W applies do not include evaporation ponds.
- Rule specifically discusses the presence of water (i.e., such as in evaporation ponds) as a reason not to be concerned about radon emissions since the water minimizes or eliminates emissions
  - In Subpart W rule, EPA notes that it does not intend to apply the expeditious radon cover requirement that derived from Subpart T's rescission to apply to evaporation ponds located on top of tailings piles/impoundments

Revision of 40 CFR Part 61 Subpart W

Technical Considerations

Potential Revisions
Inclusion of Waste Fluid Retention Impoundments

- One potential revision is the inclusion of waste fluid retention impoundments (evaporation ponds, holding ponds and other lined waste impoundments) not containing uranium mill tailings under 40 CFR Part 61 Subpart W
- This is not justified due to the insignificant emissions of radon from fluid retention impoundments as described in the slides that follow.

NMA

Radon Emissions from Tailings Ponds

Doug Chambers SENES Consultants Limited - 2009

- *Rn-222 gas exchange via diffusion from surface of small lake has been measured (Experimental lakes, Ontario).*
- *The data is shown below:*

Ra-226 (pCi/L)	Depth of Turbulent Mixing (cm)	Rn-222 (pCi/$m^2 \cdot s$)
10	10	0.002
	50	0.01
100	10	0.02
	50	0.1
1000	10	0.2
	50	1

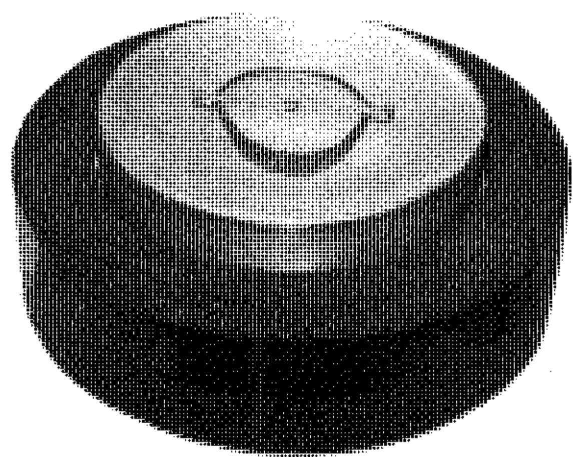
- These fluxes are very low.
- Given the worst case regarding turbulent mixing (50 centimeters) with a Radium-226 activity of the water of 1000 pCi/L the flux is only 1 pCi/m2-sec.
- Fluid retention ponds do not present a substantial risk regarding of dose to a member of the general public from radon releases.
- Based on the above flux rates, any Radon-222 emanating from fluid retention ponds would be lost in the natural variability of background.

Radon Flux from Evaporation Ponds
Dr. Kenneth Baker – ERG - 2010

- The flux rates for water containing 165 pCi/L Radium-226 were very low as shown below:

Canister Number	Flux ($pCi\ m^{-2}s^{-1}$)	Flux Standard Deviation ($pCi\ m^{-2}s^{-1}$)	Percent Moisture Increase
45	1.77	0.06	11.06
12	1.12	0.05	10.57
82	.99	0.05	13.58
44	1.02	0.05	10.68
15	0.77	0.05	9.38
Mean	1.13		11.0

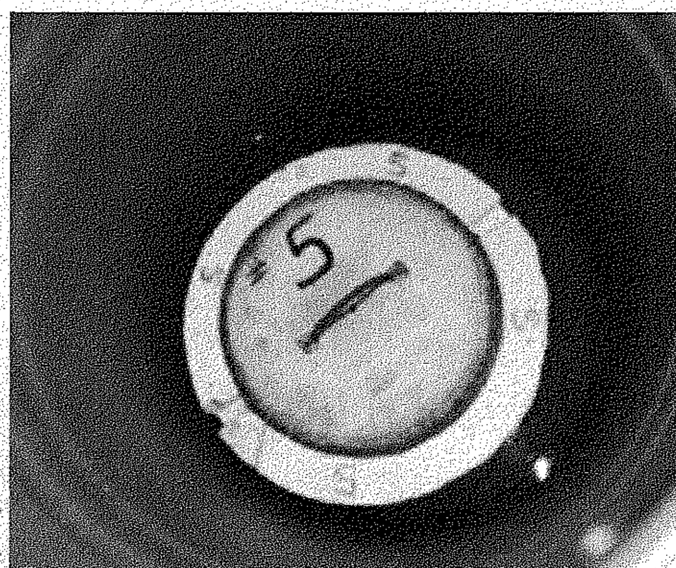
- These fluxes were measured by floating Large Area Activated Charcoal Canisters (LAACCs) on Radium-226 bearing water in a pond at Homestake's site North of Milan, New Mexico. A floating canister is shown below:



NMA

Experimental Determination of Radon Fluxes over Water
National Mining Association (NMA) 2012

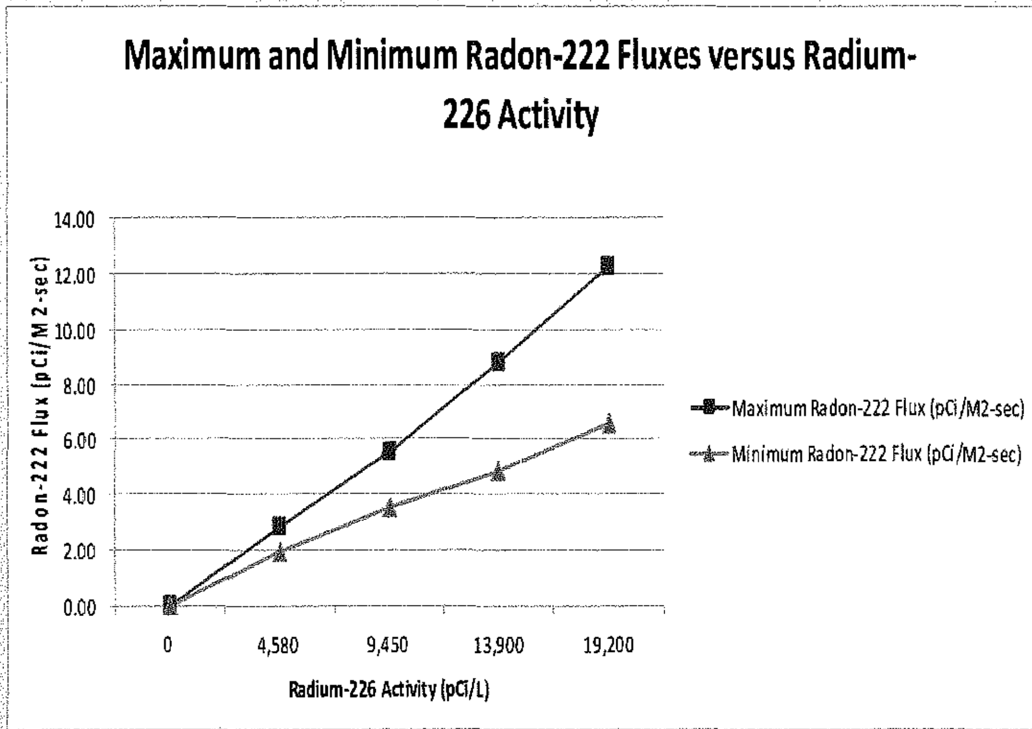
- Experimental work funded by the National Mining Association (NMA) and conducted by Energy Laboratories, Inc. to determine radon fluxes over water in a laboratory setting was conducted.
- Large Area Activated Charcoal Canisters (LAACCs) were floated over water in barrels containing activities of Radium-226 and Radon-222 varying from 0 to 20,000 pCi/L in 5,000 pCi/L increments.
- A floating Large Area Activated Charcoal Canister (LAACC) as used in the experiment is shown below:



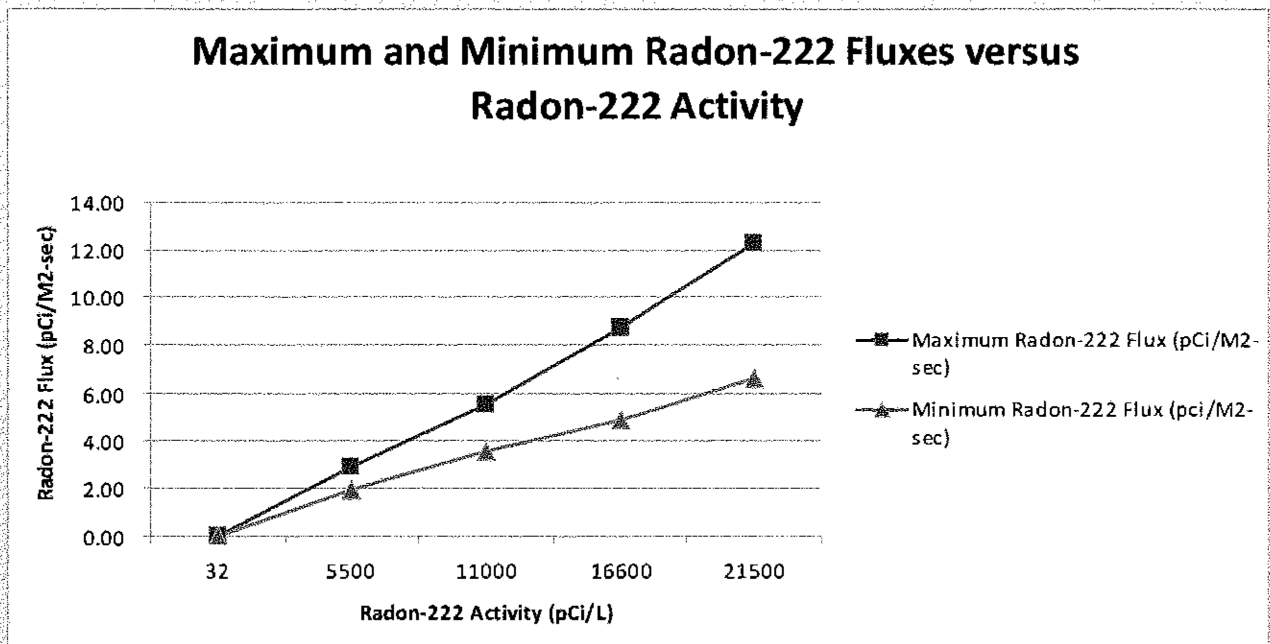
NMA

Experimental Determination of Radon Fluxes over Water National Mining Association (NMA) 2012 (con't)

- The results are shown below:



Experimental Determination of Radon Fluxes over Water National Mining Association (NMA) 2012 (con't)



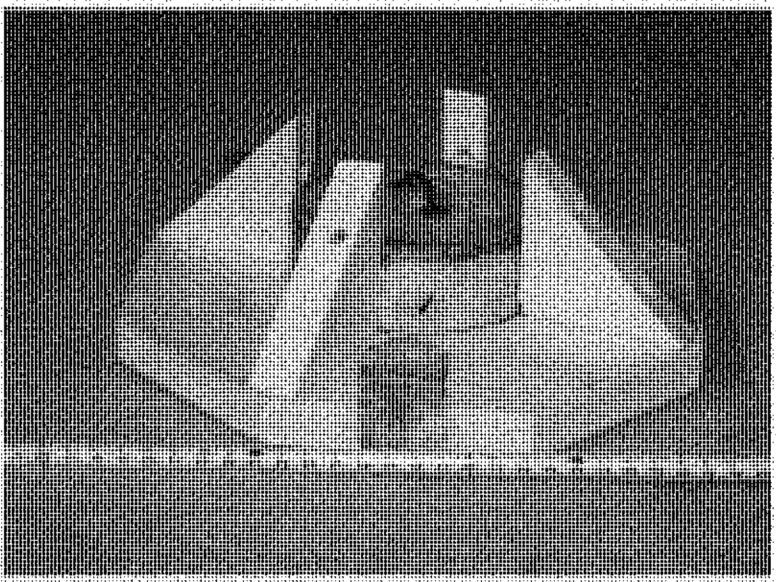
NMA

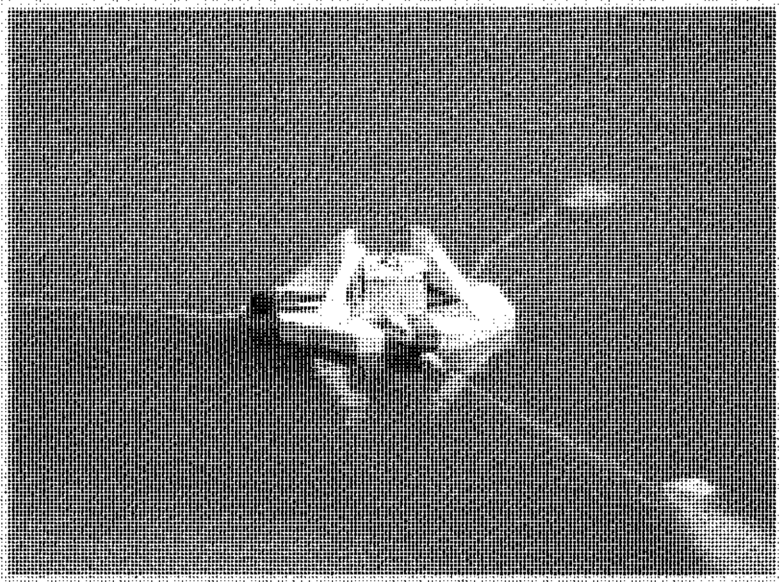
Experimental Determination of Radon Fluxes over Water National Mining Association (NMA) 2012 (con't)

- Radon flux rates are low even at relatively high Radium-226 and Radon-222 activities for the water.
- Radon flux rates in pCi/m2-sec were approximately 0.0004 times the Radium-226 or Radon-222 activity of the water.
- At a Radium-226/Radon-222 activity of 5,000 pCi/L radon fluxes ranged from 1.9 to 2.8 pCi/m2-sec.
- According to *NUREG-1910 - Generic Environmental Impact Statement for In-Situ Leach Uranium Milling Facilities* – May -2009 over 96.9% of the liquid wastes at in-situ leach uranium recovery operations are restoration wastes with Radium-226 activities of 50 to 100 picoCuries per liter.
- This is vastly lower than 5,000 pCi/L and would yield proportionately lower fluxes that would for all intents and purposes be insignificant.

Determination of Radon-222 Fluxes from Fluid Filled Lagoons – Kennecott Uranium Company 2010

- Kennecott Uranium Company conducted experiments using floating Large Area Activated Charcoal Canister (LAACC) units to determine radon fluxes from the lagoons.
- Floating Large Area Activated Charcoal Canisters (LAACCs) are depicted below:





NMA

Determination of Radon-222 Fluxes from Fluid Filled Lagoons – Kennecott Uranium Company 2010

Pool	Radium-226 Activity	Radon-222 Activity in	LAAC Number	Placed		Retrieved		Charcoal	Measured Flux
Name	Fluid	Fluid		Date	Time	Date	Time	Moisture	
	(pCi/L)	(pCi/L)						(Percent)	(pCi/M2-sec)
1-E	26	570	116	8/10/2010	11:24	8/11/2010	12:53	3.1	0.83
1-E	26	570	117	8/10/2010	11:27	8/11/2010	12:54	2.0	0.82
1-E	26	570	1	8/11/2010	12:53	8/12/2010	13:18	3.1	<0.05
1-E	26	570	2	8/11/2010	12:54	8/12/2010	13:18	3.1	0.50
5-E	39	1750	118	8/10/2010	11:33	8/11/2010	12:57	2.9	0.78
5-E	39	1750	119	8/10/2010	11:37	8/11/2010	12:58	2.4	0.78
5-E	39	1750	3	8/11/2010	12:57	8/12/2010	13:20	3.0	<0.05
5-E	39	1750	4	8/11/2010	12:58	8/12/2010	13:22	2.9	0.57
9-W	22	772	120	8/10/2010	11:43	8/11/2010	13:01	2.8	0.76
9-W	22	772	121	8/10/2010	11:49	8/11/2010	13:03	2.6	0.67
9-W	22	772	122	8/10/2010	11:53	8/11/2010	13:04	1.7	0.63
9-W	22	772	5	8/11/2010	13:01	8/12/2010	13:25	3.5	0.51
9-W	22	772	6	8/11/2010	13:03	8/12/2010	13:27	3.5	0.51
9-W	22	772	7	8/11/2010	13:04	8/12/2010	13:27	2.5	0.56
SE Pool	15	446	123	8/10/2010	12:00	8/11/2010	13:09	3.6	0.64
SE Pool	15	446	124	8/10/2010	12:03	8/11/2010	13:11	2.5	0.61
SE Pool	15	446	125	8/10/2010	12:07	8/11/2010	13:12	2.0	0.64
SE Pool	15	446	8	8/11/2010	13:09	8/12/2010	13:32	3.3	<0.05
SE Pool	15	446	9	8/11/2010	13:11	8/12/2010	13:34	3.0	0.51
SE Pool	15	446	10	8/11/2010	13:12	8/12/2010	13:33	2.3	0.53

Determination of Radon-222 Fluxes from Fluid Filled Lagoons – Kennecott Uranium Company 2010 (con't)

- Radon fluxes from these ponds were very low.
- In no case did a radon flux measurement exceed 1.0 pCi/m2-sec.
- These fluxes do not exceed and are indistinguishable from natural background fluxes.

Risks Related to Radon from Uranium Recovery

- The following three (3) papers discuss epidemiology in three (3) uranium producing areas (Karnes County, Texas; Montrose County, Colorado and the Grants Area in New Mexico:
  - *Cancer Mortality in a Texas County with Prior Uranium Mining and Milling Activities 1950 to 2001* (Boice, J.D. Jr. et al September 8, 2003)
  - *Cancer and Noncancer Mortality in Persons Living near Uranium and Vanadium Mining and Milling Operations in Montrose County, Colorado 1950 – 2000* (Boice, J.D. Jr. et al 2007)
  - *A cohort study of uranium millers and miners of Grants, New Mexico, 1979–2005* dated August 28, 2008
- *Cancer Mortality in a Texas County with Prior Uranium Mining and Milling Activities 1950 to 2001* (Boice, J.D. Jr. et al September 8, 2003) concludes:
  - *Overall, 1223 cancer deaths occurred in the population residing in Karnes County from 1950 to 2001 compared with 1392 expected based on general population rates for the US. There were 3857 cancer deaths in the four control counties during the same 52 year period compared with4389 expected. There was no difference between the total cancer mortality rates in KarnesCounty and those in the control counties (RR = 1.0; 95% confidence interval 0.9–1.1). There were no significant increases in Karnes County for any cancer when comparisons were made with either the US population, the State of Texas or the control counties.*

NMA

Risks Related to Radon from Uranium Recovery (con't)

- *Cancer and Noncancer Mortality in Persons Living near Uranium and Vanadium Mining and Milling Operations in Montrose County, Colorado 1950 – 2000* (Boice, J.D. Jr. et al 2007) concludes:
  - *Between 1950 and 2000 a total of 1,877 cancer deaths occurred in the population residing in Montrose County, compared with 1,903 expected based on general population rates for Colorado (SMRCO 0.99). There were 11,837 cancer deaths in the five comparison counties during the same 51-year period compared with 12,135 expected (SMRCO 0.98). These was no difference between the total cancer mortality rates in Montrose county and those in the comparison counties (RR= 1.01; 95% CI 0.96-1.06).*
- *A cohort study of uranium millers and miners of Grants, New Mexico, 1979–2005* dated August 28, 2008 concludes:
  - *No statistically significant elevation in any cause of death was seen among the 904 non-miners employed at the Grants uranium mill. Among 718 mill workers with the greatest potential for exposure to uranium ore, no statistically significant increase in any cause of death of a priori interest was seen, i.e., cancers of the lung, kidney, liver, or bone, lymphoma, non-malignant respiratory disease, renal disease or liver disease. Although the population studied was relatively small, the follow-up was long (up to 50 yrs) and complete.*
- Three epidemiological studies show no risks to maximally exposed population groups specifically those living in areas hosting uranium processing.

Revision of 40 CFR Part 61 Subpart W

Real World Implications

Real World Implications

- Regulation of fluid retention impoundments under Subpart W will limit or halt uranium recovery operations
  - To operate, both conventional mills and in-situ recovery facilities can require large areas of evaporation ponds
  - Inclusion of evaporation ponds within existing area limitations would halt existing operations and prevent new ones from starting.
  - It would force current and future operators to consider alternate methods for handling fluids such as deep well injection which may not be approved halting current or planned operations. Even if approved, these alternate methods may be cost prohibitive.
  - Conflicts with existing approvals
    - Example: Kennecott Uranium has a license amendment in place allowing it to add a second (40 acre) tailings impoundment plus eight 10-acre evaporation ponds
      - Regulation of evaporation ponds under 40 CFR Part 61 Subpart W and inclusion of their area in the maximum allowable area would interfere with previously reviewed and approved plans. These approved plans have undergone NEPA review.

Real World Implications (con't)

- Alternatives to evaporation ponds may be in certain circumstances less desirable from an environmental perspective than evaporation ponds.
- Evaporation ponds are a proven, environmentally sound method for managing wastewater especially in the arid West where most uranium production occurs.
- Uranium recovery operations both conventional and in-situ, require an environmentally sound, proven and cost effective means to handle and store wastewater even where final disposition (deep disposal or irrigation) may be utilized. Evaporation ponds fill those requirements.
- Regulation of evaporation ponds and fluid retention impoundments under 40 CFR Part 61 Subpart W will severely constrain existing operations and proposed ones, in some cases halting them. This is poor policy in light of the very small risk and the need for domestically produced uranium to power this nation's reactors.