U.S. EPA URANIUM AND THORIUM MILL TAILINGS REGULATIONS REVIEW

Public Information Meetings

Casper, Wyoming **Denver, Colorado**

May 24, 2010 **May 26, 2010**

UraniumReview@epa.gov

not yet active

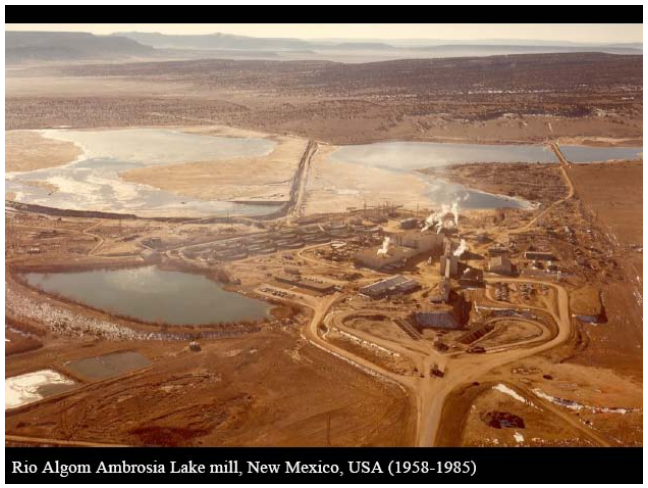
Background

- EPA is reviewing and potentially revising its regulations for uranium and thorium milling

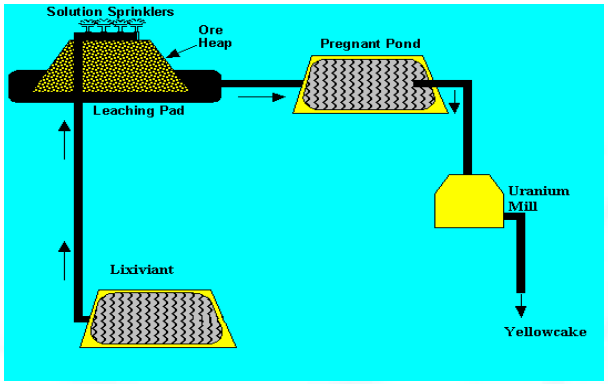
- 40 CFR Part 192 issued under authority of Uranium Mill Tailings Radiation Control Act. Establishes health and environmental protection standards utilized by the NRC and its Agreement States, and DOE for their oversight of uranium and thorium extraction facility licensing, operations, sites, and wastes

- These regulations apply to byproduct material from conventional mills, In Situ Leach/Recovery (ISL/ISR) facilities, and heap leach facilities, but not conventional mines (open pit or underground)

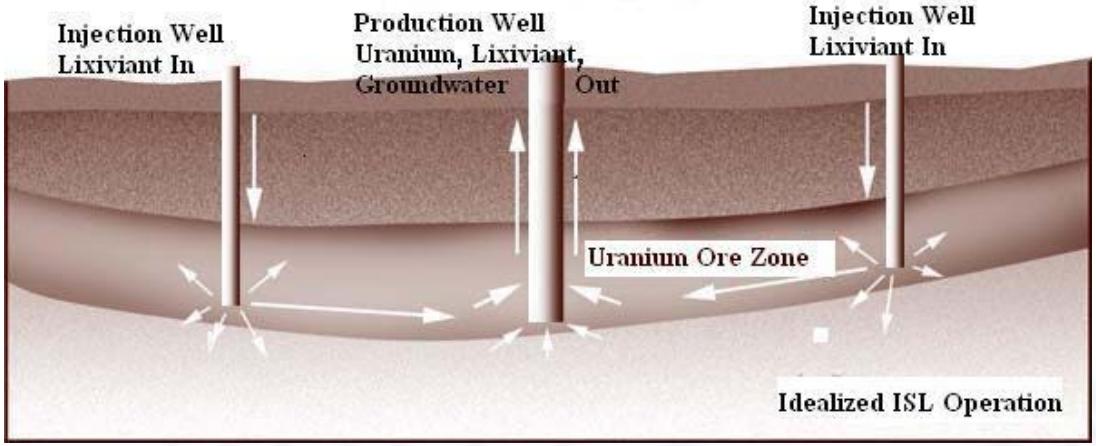
Background

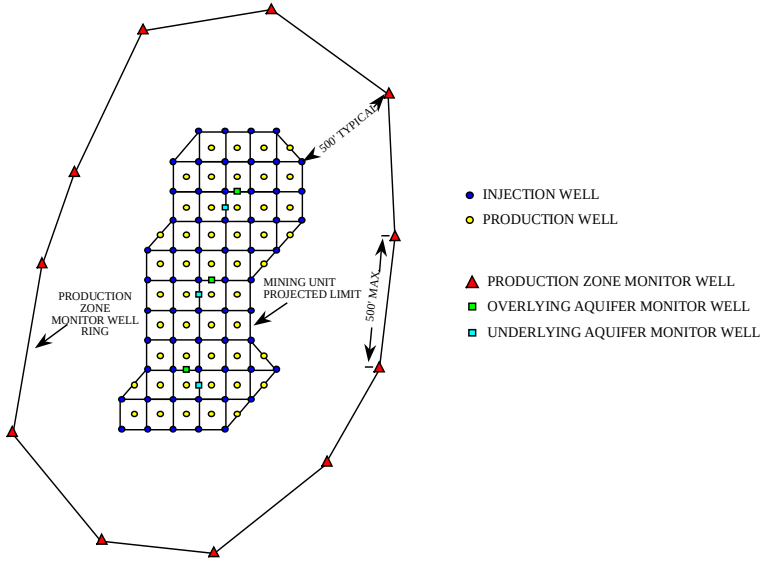

Rio Algom Ambrosia Lake mill, New Mexico, USA (1958-1985)

Conventional Surface mill



Heap leaching





40 CFR Part 192

- Provides standards for closed/abandoned mills under DOE jurisdiction (Title I Mills)

- Provides standards for uranium and thorium mills operating in 1978 as well as new NRC and Agreement State licensed uranium and thorium extraction facilities (Title II Mills)

- Provides standards for cleanup of contaminated soil and buildings

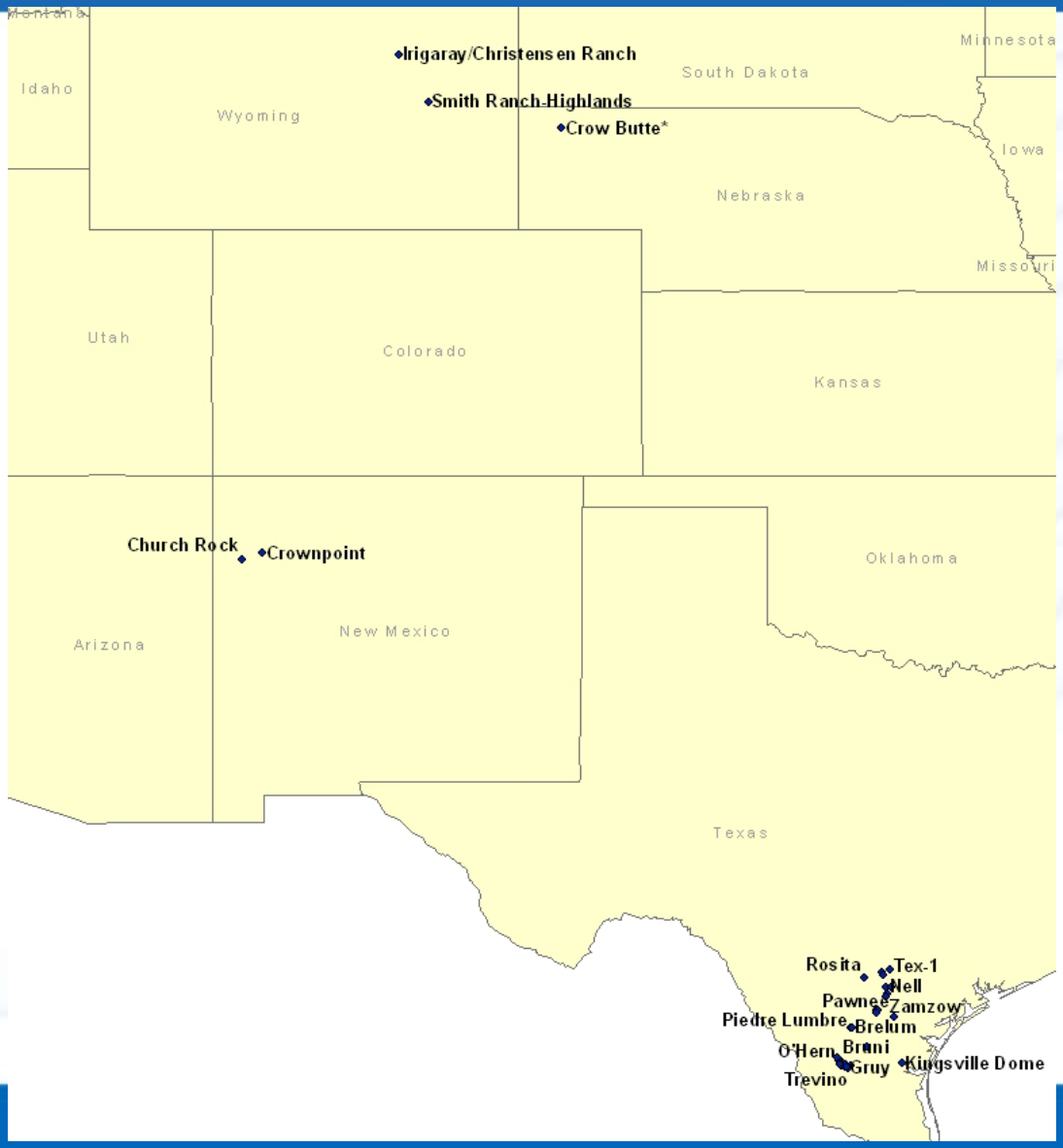
40 CFR Part 192

- Over 25 years since originally issued, ~15 years since last update for groundwater protection
- Standards include:
  - Construction standards for mill tailings impoundments
  - Radon emission standards
  - Limits on groundwater concentrations of hazardous substances including radionuclides
  - Remediation standards for contaminated soils/buildings
  - Monitoring, corrective action, post-closure monitoring

Title I Closed Mills

Title II Mills (Excluding ISL/ISRs)

ISL/ISRs (Closed, Active, Standby)



Proposed ISL/ISR/s, Mills, Heap Leach Facilities

Expected Uranium Recovery Facility Applications

Updated 04/27/2010

Company	Site	Design type	Estimated Application Date	State	Letter of Intent
Fiscal 2007 Applications					
Cogema	Christensen Ranch	ISR - Restart	Rec. 4/07, Comp. 9/08	WY	None
Cameco (Crow Butte Resources, Inc.)	North Trend	ISR - Expansion	Received June 2007	NE	None
Cameco (Crow Butte Resources, Inc.)	Plant Upgrade	ISR - Expansion	Rec. 10/06, Comp. 12/07	NE	None
Fiscal 2008 Applications					
Lost Creek ISR, LLC	Lost Creek	ISR - New	Resubmitted Mar 2008	WY	05/23/07
Uranerz Energy Corp.	Hank and Nichols	ISR - New	Received December 2007	WY	06/27/07
Uranium One (Energy Metals Corporation)	Moore Ranch	ISR - New	Received October 2007	WY	05/31/07
Uranium One (Energy Metals Corporation)	Jab and Antelope	ISR - New	Received September 2008	WY	05/31/07
Fiscal 2009 Applications					
Powertech Uranium Corporation	Dewey Burdock	ISR - New	Resubmitted 8/09	SD	01/26/07
Fiscal 2010 Applications					
Uranium One (Energy Metals Corporation)	Ludeman	ISR - Expansion	Received Jan 2010	WY	02/26/09
Uranium One (Energy Metals Corporation)	Allemand-Ross	ISR-Expansion	Jun-10	WY	02/26/09
Cameco (Crow Butte Resources, Inc.)	Three Crow	ISR - Expansion	Jun-10	NE	01/11/10
Lost Creek ISR, LLC	Lost Creek	ISR - Expansion	Jul-10	WY	01/06/10
Fiscal 2011 Applications					
Strata Energy, Inc.	Ross	ISR - New	Dec-10	WY	01/08/10
UR-Energy Corp.	Lost Soldier	ISR - Expansion	Dec-10	WY	01/06/10
Cameco (Power Resources, Inc.)	Smith Ranch/Highland CPP	ISR - Expansion	FY 2011	WY	01/14/10
Titan Uranium USA, Inc.	Sheep Mountain	Heap Leach - New	Apr-11	WY	02/16/10
Neutron Energy	Marquez	Conv. - New	May-11	NM	01/15/10
Uranium Energy Corporation	Grants Ridge	Heap Leach - New	Jun-11	NM	02/04/10
Rio Grande Resources	Mt. Taylor	Conv. - New	TBD	NM	12/15/09
Wildhorse Energy	West Alkali Creek	ISR - New	TBD	WY	01/07/10
Fiscal 2012 Applications					
Strathmore Minerals Corporation	Gas Hills	Conv. - New	Oct-11	WY	01/18/10
Strathmore Minerals Corporation	Roca Honda	Conv. - New	Dec-11	NM	01/18/10
NCA Nuclear, Inc.	Reno Creek	ISR - New	Dec-11	WY	04/13/10
Cameco (Crow Butte Resources, Inc.)	Marsland	ISR - Expansion	Jun-12	NE	01/11/10
Fiscal 2013 Applications					
Cameco (Power Resources, Inc.)	Ruby Ranch	ISR-Expansion	FY 2013	WY	01/14/10
			Projected total reviews = 25		
			Total Uranium Recovery Applications Received = 9		
			Total New Uranium Recovery Applications = 14		
			Total Restart/Expansion Uranium Recovery Applications = 11		

ISR = In Situ Recovery Facility
TBD = To Be Determined

Conv = Conventional Uranium Mill
FY = Fiscal Year

Regulatory Review Process (1)

Existing regulations and standards are being reviewed to determine if they are still appropriate in light of:

- Dominant use of ISL/ISR, now principal means of uranium recovery in U.S., and for heap leach facilities
  - Lack of provisions in current regulations
  - Free release of these facility sites after decommissioning -- implications for 40 CFR Part 192
- Technology and design of mill tailings impoundments

Regulatory Review Process (2)

Existing regulations and standards are being reviewed to determine if they are still appropriate also in light of:

- Changes in risk and dose factors for radiation/radon,
- Principal scenarios for exposure,
- Subsistence and cultural lifestyles of affected communities including Tribal, EJ and children's health issues

Regulatory Review Process (3)

Existing regulations and standards are being reviewed to determine if they are still appropriate also in light of:

- Changes in EPA protective standards for hazardous substances in groundwater and drinking water for 40 CFR Part 192
- Changes in economics of extraction & site remediation
- Potential for uranium/thorium extraction in different geographic locations
- Court cases

Standards—Closed Mills, Soil, Buildings

Air emission standards:

Control of residual radioactive materials and their listed constituents shall be designed to:

(a) Be effective for up to 1000 years, to the extent reasonably achievable, and, in any case, for at least 200 years, and,

(b) Provide reasonable assurance that releases of radon-222 from residual radioactive material to the atmosphere will not:

(1) Exceed an average release rate of 20 picocuries per square meter per second, or

(2) Increase the annual average concentration of radon-222 in air at or above any location outside the disposal site by more than one-half picocurie per liter.

Standards—Closed Mills, Soil, Buildings

Groundwater protection standards

The Secretary of Energy, on a site-specific basis was to:

- Identify hazardous constituents present
- Establish a monitoring program to determine background levels in groundwater
- Comply with remedial action plans which include engineering specifications for a disposal system
- Ensure hazardous constituents will not exceed concentration limits established for the uppermost aquifer underlying the site beyond identified points of compliance
- Provide for institutional control of the site
- Provide for corrective actions to be taken in no event later than 18 months after finding of an exceedance

Standards—Closed Mills, Soil, Buildings

Groundwater protection standards (2) (paraphrase)

The concentration limit of a listed constituent in groundwater must not exceed whichever is higher:

- The background level of that constituent in the groundwater; or
- For any of the constituents listed in 40 CFR Part 192—the MCLs
- Or an alternate concentration limit

The Secretary may apply an alternate concentration limit (ACL) if, after considering remedial or corrective actions to achieve the levels:

- DOE has determined that the constituent will not pose a substantial present or potential hazard to human health and the environment as long as the alternate concentration limit is not exceeded,
- The determination has taken into consideration the 20 factors enumerated in 40 CFR 192, and
- The U.S. NRC has concurred

Standards—Closed Mills, Soil, Buildings

Soil cleanup standards:

Remedial actions shall be conducted so as to provide reasonable assurance that, *as a result of residual radioactive materials from any designated processing site:*

- The concentration of radium-226 in land averaged over any area of 100 square meters shall not exceed the

background level by more than—

  - 5 pCi/g, averaged over the first 15 cm of soil below the surface, and
  - 15 pCi/g, averaged over 15 cm thick in layers of soil more than 15 cm below the surface.

Standards—Closed Mills, Soil, Buildings

In any occupied or habitable building—The objective of remedial action shall be:

- To achieve, an annual average radon decay product concentration (including background) not to exceed 0.02 WL. In any case, the radon decay product concentration (including background) shall not exceed 0.03 WL, and
- The level of gamma radiation shall not exceed the background level by more than 20 microRoentgens (μR) per hour

Standards—Operating Mills

During and following processing of uranium ores, and restoration of disposal sites

- Provides design and construction requirements
- Provides groundwater protection standard including radionuclides (radium-226 and 228, gross alpha), molybdenum and uranium
- Provides for detection monitoring program

Standards—Operating Mills

Groundwater protection (cross-referencing EPA regulations for surface hazardous waste facilities (RCRA-Subtitle C) [paraphrase]:

The concentration limit of a listed constituent in groundwater must not exceed whichever is higher:

- The background level of that constituent in the groundwater; or
- For any of the constituents listed in 40 CFR Part 192—the MCLs

Regulatory authority (NRC or its Agreement States) may establish alternate concentration limits (to be satisfied at the point of compliance) provided:

  - after considering practicable corrective actions, limits are as low as reasonably achievable,
  - the determination has taken into consideration 20 factors enumerated in EPA specific RCRA regulations (40 CFR 264.94 (b))
  - standards are satisfied at all points >500 meters from edge of the disposal area and/or outside the site boundary

Standards—Operating Mills

- Non-operational uranium mill tailings piles or impoundments to limit releases of radon-222 by emplacing a permanent radon barrier
- Provides for extensions for meeting closure milestones as long as radon flux standard of 20 picocuries per square meter per second complied with
- Allows for acceptance of uranium 11(e)(2) byproduct material or materials similar to physical-chemical-radiological characteristics of uranium mill tailings and associated wastes

Standards—Operating Mills

Upon emplacement of radon barrier:

Monitoring of radon required to demonstrate compliance with radon standard

Uranium byproduct materials to be managed to comply with

- 40 CFR Part 190 uranium fuel cycle radiation protection standards, exposure limit to member of public to radiation dose of 25 millirems annually to the whole body, 75 millirems annually to the thyroid, and 25 millirems to any other body organ
- 40 CFR Part 440, Subpart C effluent discharge standards
- Limits of radiation doses from radon emissions from surface impoundments to as far below the Federal Radiation Protection Guides as is practicable at each licensed site

Standards—Operating Mills

After closure period:

Disposal areas shall comply with RCRA closure performance standard (40 CFR 264.111) (unless having met radium soil cleanup standards for closed mills) and shall be designed to provide reasonable assurance of control of radiological hazards to:

- Be effective for one thousand years, to the extent reasonably achievable, and, in any case, for at least 200 years, and,
- Limit releases of radon-222 from uranium byproduct materials to the atmosphere so as to not exceed an average release rate of 20 picocuries per square meter per second

Standards—Operating Thorium Mills

Subpart D for uranium mills applies to thorium mills, except:

- Provisions for radon-222 apply to radon-220
- Provisions for radium-226 apply to radium-228
- Enumerated 40 CFR Part 190 uranium fuel cycle radiation protection standards apply to thorium mills excepting exposure to radon-220
- Certain closure requirements for radon barrier emplacement for uranium mills do not apply to thorium mills

Relationship Between EPA and NRC Requirements for ISL/ISR Facilities

NRC utilizes its existing regulations for uranium milling, along with published guidances, to approve ISL/ISR licenses. UMTRCA requires (paraphrase):

- NRC shall insure management of 11e.(2) byproduct material, is carried out in such manner as:
  - the Commission deems appropriate to protect public health, safety and environment from radiological and nonradiological hazards associated with processing, possession and transfer of such material,
  - conforms with applicable general standards promulgated by the Administrator of the Environmental Protection Agency, and
  - conforms to general requirements established by the Commission,
  - with the concurrence of the Administrator, which are, to the maximum extent practicable, at least comparable to requirements applicable to the possession, transfer, and disposal of similar hazardous material regulated by the Administrator under the Solid Waste Disposal Act, as amended (now RCRA)

Relationship Between EPA and NRC Requirements for ISL/ISR Facilities

Under UMTRCA authority, EPA 40 CFR Part 192 standards provide for groundwater protection during production and for aquifer restoration following production

- As interpreted by NRC, includes the underground mining unit and aquifers above, below and adjacent
- During operations, and prior to closure, monitoring and corrective actions are required to protect groundwater at compliance point(s) from excursions—this is regardless of exempted aquifer status
- Applies to surface and subsurface facilities
- Restoration Standards require groundwater hazardous constituents to be restored to background or maximum concentration limits, whichever is higher
- After considering practicable corrective actions, ACL's may be applied for by the operator, and granted by NRC (or its Agreement States) for each contaminant:
  - provided limits are as low as reasonably achievable,
  - the determination has taken into consideration 20 factors enumerated in EPA RCRA, and NRC regulations

Relationship Between EPA and NRC Requirements for ISL/ISR Facilities

Under Safe Drinking Water Act (SDWA) authority, EPA promulgated regulations 40 CFR Parts 144-146

- EPA issues underground injection well permits (Class III) for uranium ISL/ISR facilities
- EPA issues aquifer exemptions for aquifers or portions of aquifers from SDWA protections
- ISL/ISR facilities cannot operate without these, even if they have an NRC or Agreement State license

Relationship Between EPA and NRC Requirements for ISL/ISR Facilities

EPA regulations to protect underground sources of drinking water (USDW) from contamination by underground injection

- 40 CFR 144.1 (g)--no injection shall be authorized by permit or rule if it results in the movement of fluid containing any contaminant into Underground Sources of Drinking Water (USDW), if the presence of that contaminant may cause a violation of any primary drinking water regulation under 40 CFR part 141 or may adversely affect the health of persons
- 40 CFR 144.12--if any water quality monitoring of an underground source of drinking water indicates the movement of any contaminant into the underground source of drinking water, except as authorized under part 146, the Director shall prescribe such additional requirements for construction, corrective action, operation, monitoring, or reporting (including closure of the injection well) as are necessary to prevent such movement.

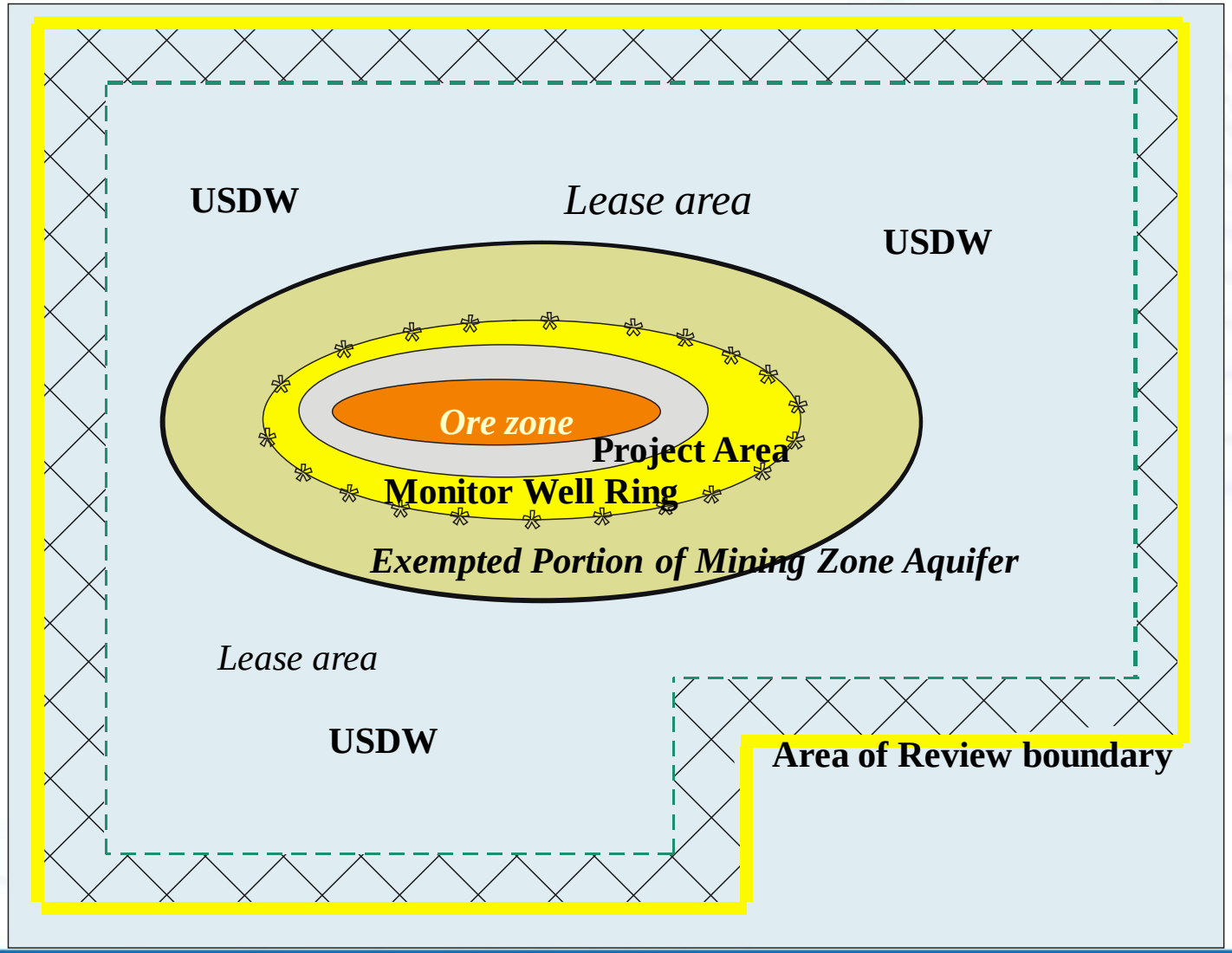
Relationship Between EPA and NRC Requirements for ISL/ISR Facilities

EPA 40 CFR 146.4 Criteria for exempted aquifers.

An aquifer or a portion thereof which meets the criteria for an "underground source of drinking water" in §146.3 may be determined under § 144.8 to be an "exempted aquifer" if it meets the following criteria:

- (a) It does not currently serve as a source of drinking water; and
- (b) It cannot now and will not in the future serve as a source of drinking water because:
  - **(1) It is mineral, hydrocarbon or geothermal energy producing, or can be demonstrated by a permit applicant as part of a permit application for a Class II or III operation to contain minerals or hydrocarbons that considering their quantity and location are expected to be commercially producible.**
  - **(2) It is situated at a depth or location which makes recovery of water for drinking water purposes economically or technologically impractical;**
  - **(3) It is so contaminated that it would be economically or technologically impractical to render that water fit for human consumption; or**
  - **(4) It is located over a Class III well mining area subject to subsidence or catastrophic collapse; or**
- (c) The total dissolved solids content of the ground water is more than 3,000 and less than 10,000 mg/l and it is not reasonably expected to supply a public water system.

Relationship Between EPA and NRC Requirements for ISL/ISR Facilities



Clean Air Act Regulations
40 CFR Part 61, Subpart W

- Promulgated on 12/15/1989 -- Applies to radon emissions from operating uranium mill tailings -- flux standard: 20 pCi/m^{2}-sec

- After 12/15/1989, new impoundments must meet one of two new work practices to achieve at least equivalent emissions reductions
  - Phased disposal – Impoundment size of 40 acres or <
  - Continuous disposal – dewatered tailings with no more than 10 acres uncovered
  - Both must meet design, construction, groundwater monitoring standards at 40 CFR 192.32(a)

Clean Air Act Regulations
40 CFR Part 61, Subpart W

- EPA is reviewing these regulations.
- Review began after receiving Notice of Intent to Sue (NOI) by two Colorado environmental groups
  - Based on EPA's alleged failure to review & revise regulation within ten years after enactment of Clean Air Act Amendments of 1990 (11/15/2000)
  - Plaintiffs filed suit against EPA in October 2008
  - Settlement agreement reached November 2009

40 CFR Part 61, Subpart W

- While performing early research for the NOI, EPA determined uranium ISL/ISR and heap leach impoundments are subject to Subpart W:
  - Preconstruction approval, impoundment construction and operation requirements in 40 CFR Part 192 cross referenced in Subpart W, limit on number/size of impoundments
  - Phased or continuous disposal -- annual reporting requirements, notification in advance of testing

EPA's Rulemaking Process

- Tiering
  - The lead office submits a request for a new action; the Regulatory Steering Committee (RSC) reviews it; the Regulatory Policy Officer (RPO) approves; the Office of Policy, Economics, and Innovation (OPEI) approves the tier
    - Tier 1: Top actions that demand the ongoing involvement of the Administrator – precedent setting and controversial
    - Tier 2: Include significant science, policy, economic and/or implementation issues – decision may be based on a risk assessment – 40 CFR Part192 review is Tier 2
    - Tier 3: Generally involves use of well-known and accepted science principles

EPA's Rulemaking Process

- **Analytic Blueprint and Early Guidance**
  - The workgroup creates a Preliminary Analytic Blueprint (ABP), management gives Early Guidance, and the workgroup creates a Detailed ABP
- **Analysis and Consultation**
  - The workgroup gathers scientific, economic, legal, stakeholder, enforcement, and compliance information. Also, the workgroup drafts regulatory options
- **Options Selection**
  - Senior management selects options or narrows the list to a select few that require further research

EPA's Rulemaking Process

Drafting

- The workgroup creates a draft of the action

Final Agency Review

- This is the last point for EPA review. Senior management from participating offices concur or non-concur with the action as it is written

Office of Management and Budget (OMB) Review

- If the action is significant, OPEI submits it to OMB for review

Signature

- The EPA Administrator, an Assistant/Associate or Regional Administrator, or a delegate signs the action

EPA's Rulemaking Process

Docketing

- The lead office ensures that the action and appropriate supporting documents are deposited in the official docket

Federal Register Publishing

- The action is published in the Federal Register

Public Comments

- The action is open for a formal comment period, during which the public may submit comments and request public hearings

EPA’s Rulemaking Process

Final Action

- After the proposed action's public comment period closes, the workgroup reviews all comments and usually starts preparing a final rule
- The process begins again, usually with a new Analytic Blueprint
- Final actions are often subject to the Congressional Review Act and Courtesy Copy Policy

Coordination and Stakeholder Input

Federal Agency Coordination

- NRC and DOE
- Other involved agencies (Interior, Agriculture…)
- ISCORS—Interagency Steering Committee on Radiation Standards

- EPA Intra-agency Workgroups
  - Regional offices
  - HQ – Office of Water, Office of Research and Development, Office of Solid Waste and Emergency Response, Office of General Counsel,
  - Office of Policy, Economics and Innovation

Coordination and Stakeholder Input

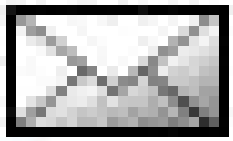
- For 40 CFR Part 192:
- Presentations at State association and other conferences:
  - CRCPD, ASTSWMO, OAS
  - National Mining Association Uranium Recovery Workshop
  - National Tribal Science Forum
  - Navajo Uranium Contamination Workshop
- EPA Regional Offices in coordination with EPA HQ to provide lead role for outreach to:
  - Public
  - Industry
  - States
  - Tribes and EJ populations
  - Environmental and other NGO's

Coordination and Stakeholder Input

Interactive Internet Site – Discussion Forum

http://blog.epa.gov/milltailingblog/

- Contains
  - site for public input on general discussion topics related to this review
  - calendar of events
  - library of relevant documents



For 40 CFR Part 61, Subpart W
http://www.epa.gov/radiation/neshaps/subpartw/rulemaking-activity.html

Discussion Topics Tonight

- Changes in uranium industry technologies
- Revisions in EPA drinking and groundwater protection standards
- Judicial decisions concerning the existing regulations
- Issues relating to children's health and environmental justice (e.g., impact on Tribal and low-income communities)
- Dose and risk factors and scenarios for assessing radiological and non-radiological risk
- Facilities proposed in states outside exist

THANK YOU !!