ST. LOUIS FUSRAP OVERSIGHT COMMITTEE
C/O 111 So. Meramec
Clayton, MO 63105
314.615.1635

MEMORANDUM

TO: St. Louis FUSRAP Oversight Committee
Other Interested Parties

FROM: Richard R. Cavanagh, CHE
Committee Chairperson

RE: Next Meeting

The next meeting of the St. Louis FUSRAP Oversight Committee will be on Friday, December 10, 1999, 11:30 am, at the trailers on Latty Ave.

Committee members who cannot attend should contact the Chairperson at the above phone number to be excused.

Thank you.

:RRC

ST. LOUIS FUSRAP OVERSIGHT COMMITTEE
111 So. Meramec
Clayton, MO 63105
314.615.1635

Summary of November 12, 1999 Meeting

Committee Members Present: Tom Binz, Ric Cavanagh, Jack Frauenhoffer, Sally Price, Donovan Larson

Committee Members Excused: Tom Manning, Bill Brandes, Anna Ginsberg

Other Interested Parties: Bob Boland, Larry Erickson, Eric Gilstrap, Michelle Redmann, Mike Zlatic, Dave Wagoner, Lou Dell'Orco, Sharon Cotner, Tom Horgan

The following comments are in addition to the handouts provided by USACE at the meeting (see attached).

Page 4 – Clean fill is coming from Dupo, IL. Eventually will utilize Fort Bellefontaine Quarry.

Page 5 – There have been more hits on Thorium than Radium (contrary to expectations based on old data from Bechtel). Therefore, the PPE will be driven by Thorium, not Radium. The volume in the pits was greater than projected. Sally Price asked to have data on expected background levels.

Page 6 - Contractor is Engineering Demolition. Supplementary Pile refers to the small pile up front.

Page 7 – The remaining trailers will not move until spring. (The Oversight Committee will plan a tour of the lab trailers in January).

Page 8 – 40 CFR 192 will be discussed in detail in December with a health physicist present to answer questions. North County ROD goes to the EPA Remedy Review Board during the week of January 10 (meeting is in Seattle). The thirty day review is in March 30. (Copies of 40 CFR 40 and 40 CFR 192 are attached to the end of this packet). Donovan Larson requested more information on the work of the Groundwater Technical Work Group. Staff will supply same at next meeting.

Page 9 – Plant 6E is really just a designated site. Diesel fuel was found in one of the hot spots.

Page 10 – Goal is to have a ROD by 12/00. Sharon Cotner reported on the Program Review Meeting in Cincinnati: St. Louis is in much better shape than most sites: EE/CA's have allowed work to continue.

Sharon also reported on a visit by Gen. Van Winkel who has responsibility for civilian projects. (He expressed some concern about St. Louis trying to get money away from projects in other states).

Discussion focused on there still being no POC (Point of Contact) regarding long term stewardship of sites. Larry Erickson indicated that Donna Bergman Tabert (Grand Junction, CO, DOE) was coming to visit Missouri January 18 to discuss stewardship at Weldon Springs. The Committee expressed an interest in meeting with her to discuss St. Louis sites if possible. (NOTE: the scheduled meeting had to be canceled due to her illness. Efforts are being made to schedule a meeting to discuss St. Louis sites in January).

Enclosures in this packet:

1) ***Documents regarding NRC guidance as supplied by Lou Dell'Orco***
2) ***Letter supplied by Dave Wagoner regarding some decisions made in the Buffalo District***

NEXT MEETING:

Friday, December 10, 1999
11:30 am – 1:00 pm
Trailers on Latty Ave.

15 Nov 99

Ric-

Enclosed are 3 documents the Oversight Committee requested in the meeting last Friday. They are:

1. 40 CFR PART 192 – Sets the standard for cleanup of radium-226.
2. 10 CFR PART 40 – Criterion 6.6 on page 17510 ties in other radionuclides (Uranium & Thorium)
3. Draft guidance on dose modeling from the NRC.

NUCLEAR REGULATORY COMMISSION

10 CFR Part 40

RIN 3150-AD65

Radiological Criteria for License Termination of Uranium Recovery Facilities

AGENCY: Nuclear Regulatory Commission.

ACTION: Final rule.

SUMMARY: The U. S. Nuclear Regulatory Commission (NRC) is amending its regulations regarding decommissioning of licensed thorium mills and uranium recovery facilities to provide specific radiological criteria for the decommissioning of lands and structures. This final rule uses the existing soil radium standard to derive a dose criterion (benchmark approach) for the cleanup of byproduct material other than radium in soil and for the cleanup of surface activity on structures to be released for unrestricted use. This final rule is intended to provide a clear and consistent regulatory basis for determining the extent to which lands and structures can be considered to be decommissioned.

EFFECTIVE DATE: This regulation becomes effective on June 11, 1999.

FOR FURTHER INFORMATION CONTACT: Frank Cardile, telephone: (301) 415-6185; e-mail: fpc@nrc.gov; or Elaine Brummett, telephone: (301) 415-6606, e-mail: esb@nrc.gov, Office of Nuclear Material Safety and Safeguards, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001.

SUPPLEMENTARY INFORMATION:

I. Introduction

The NRC is amending its regulations regarding decommissioning of licensed thorium mills and uranium recovery (UR) facilities (conventional uranium mills and uranium extraction processes such as in situ leach (ISL) facilities) to provide radiological criteria for the decommissioning of lands and structures. These criteria apply to the decommissioning of licensed UR facilities subject to the NRC's jurisdiction and will also apply to thorium mills if any become licensed in the future. The criteria apply to decommissioning of UR facilities that operate through their normal lifetime and to those that may be shut down prematurely. The NRC will apply these criteria in determining the adequacy of remediation of residual radionuclides resulting from the possession or use of byproduct material.[1]

The intent of this rulemaking is to provide a clear and consistent regulatory basis for determining the extent to which lands and structures at UR facilities must be remediated before decommissioning of a site can be considered complete and the license terminated. The NRC has previously applied site release criteria for decommissioning on a site-specific basis using existing guidance for surface activity and radionuclides other than radium in soil. The NRC believes that inclusion of criteria in the regulations will result in more efficient and consistent licensing actions related to site remediation activities.

II. Background

On August 22, 1994 (59 FR 43200), the NRC published a proposed rule to amend 10 CFR Part 20 of its regulations "Standards for Protection Against Radiation" to include radiological criteria for license termination as subpart E. The proposed rule applied to uranium mills and other NRC-licensed facilities, but did not apply to mill tailings or to soil radium cleanup at mills because they are regulated under 10 CFR Part 40, Appendix A.

On July 21, 1997 (62 FR 39058), the NRC published a final rule that codified radiological criteria for license termination for NRC licensees, but excluded UR facilities. The NRC excluded UR facilities from the scope of the final cleanup rule to allow further consideration of the issues unique to the decommissioning of these facilities. These unique issues include the existing regulatory framework for UR facilities and the nature of contamination at UR facilities, both of which are discussed below.

Under the existing regulatory framework for UR facilities, the Environmental Protection Agency (EPA) has the authority to set cleanup standards for uranium and thorium mills and, based on that authority, issued regulations in 40 CFR Part 192 that contain some decommissioning criteria for these facilities. NRC's regulations in 10 CFR Part 40, Appendix A, Criterion 6(6), conform to EPA's standards for radium in soil. Appendix A also provides ground-water protection criteria.

Therefore, this rulemaking addresses only the radiological criteria for decommissioning of lands and structures. The rule only applies to those UR facilities that do not have an approved decommissioning plan for buildings and soil when the rule becomes effective. The sites with approved decommissioning plans may request an amendment to their license to adopt the criteria of this rule after the revision to Criterion 6(6) is promulgated.

The applicable cleanup standards for soil radium in 10 CFR Part 40, Appendix A, Criterion 6(6), address the main contaminant at uranium mills in the large areas where windblown contamination from the tailings pile has occurred, and to a lesser extent, at ISLs in holding/settling ponds and process or bleed solution spills. These standards require that the concentration of radium (Ra-226 at UR facilities, Ra-228 at thorium mills) not exceed the background level by more than 5 pCi/g (0.19 Bq/g) in the first 15 cm (6 inches) of soil and 15 pCi/g (0.56 Bq/g) for every subsequent 15 cm (6 inch) layer. However, in other mill and ISL site areas proximate to locations where radium contamination exists (e.g., under/around the mill/process building, in a yellow cake storage area, and under/around an ore crusher), uranium (U-nat) is the radionuclide of concern. At least one mill site must also address soil cleanup of thorium (Th-230, the parent of Ra-226, is usually in approximate equilibrium (same activity concentration) with Ra-226) because thorium is more mobile in the acidic milling solutions and leaches farther into the ground than the radium under raffinate ponds and heap leach pads. Because 10 CFR Part 40, Appendix A, does not have cleanup standards for surface activity or for soil contamination from radionuclides other than radium, NRC guidance documents have been the source of cleanup criteria for residual uranium, thorium, and building surface activity.

An additional difficulty for remediation of UR facilities is that the residual radionuclides to be addressed in the site decommissioning are also present in the surrounding background soil in elevated and widely variable concentrations. Some mill sites even have uranium mine pits and/or piles of

[1] As defined in 10 CFR Part 40, byproduct material is the tailings or wastes produced by the extraction of uranium or thorium from any ore processed primarily for its source material content, including discrete surface wastes resulting from uranium solution extraction processes.

overburden soil containing low-grade ore on or adjacent to the areas to be remediated. This complicates the determination of background values and limits the ability of the licensee to distinguish residual radioactivity from naturally occurring (in-situ) radioactivity.

To allow for consideration of these issues, the NRC also published, on July 21, 1997 (62 FR 39093), a request for additional comments on regulatory options for decommissioning of UR facilities. Included as part of the request was a discussion of an option to codify a dose objective for radionuclides other than radium (uranium and thorium) at UR facilities consistent with the radium cleanup standard. Under this approach, UR facilities would use the dose, excluding radon, from radium at the cleanup standard in existing 10 CFR Part 40, Appendix A, Criterion 6(6), as a benchmark for the cleanup of building surface activity and radionuclides other than radium in soil. Commenters were requested to provide input on options for decommissioning and, specifically, on the benchmark approach.

Use of the benchmark approach would provide for a common dose criterion across a UR site for those areas contaminated with radium and for those areas contaminated with other radionuclides.

The radium dose benchmark approach would require UR licensees subject to the rule to calculate the potential total effective dose equivalent to the average member of the critical group for the site that would result from the radium standard within 1000 years, based upon site-specific parameters. These licensees would be required to provide justification for the models and parameters selected in the dose calculations. The dose from the 5 pCi/g (0.19 Bq/g) radium standard would be applicable for most of the site contamination. Licensees would then remediate the site such that the residual radionuclides (byproduct material) remaining on the site that are distinguishable from background would not result in a dose that is greater than that which would result from the radium soil standard. The radionuclides of concern are uranium and thorium, because it is assumed that the progeny of Ra-226 are at acceptable levels when the radium standard is achieved. Licensees would also be required to demonstrate that doses were "as low as is reasonably achievable" (ALARA). In the unlikely event that a site benchmark dose (before application of ALARA) exceeds 100 mrem/yr (1 mSv/yr), the NRC staff would consult with the Commission before approving such a benchmark dose.

III. Summary of Public Comments and Responses to Comments

Comments received on the 1994 proposed rule for 10 CFR Part 20 subpart E were summarized in NUREG/CR-6353 and in the final rule notice (62 FR 39058, July 21, 1997). The eleven responses (nine commenters) to the July 21, 1997, request for additional comments on radiological criteria for UR facilities are addressed here.

A. Comments on Approach to the Criteria

One commenter indicated that the standards should be technically-based, protective of human health, and based on a substantial fraction of the 100 mrem/yr (1 mSv/yr) public dose limit. The use of dose-objective standards was encouraged. Evaluation of radon and thoron exposure was considered essential. This commenter also pointed out that the benchmark approach would codify a different dose limit for each facility.

The EPA commented that the soil radium standard of 5 pCi/g (0.19 Bq/g) is consistent with the minimally acceptable dose limit of 15 mrem/yr (0.15 mSv/yr) for the residential scenario, and that for other land use scenarios, the cleanup standards are more stringent for Ra-226, Ra-228, Th-232, and Th-230. The EPA also cautioned that a dose limit for uranium cleanup should not exceed 15 mrem/yr (0.15 mSv/yr).

A third commenter stated that the proposed rule is not acceptable because doses resulting from the benchmark approach could exceed 100 mrem/yr; NRC's existing guidance on cleanup of uranium, thorium, and surface activity should be used to set the minimum requirements; the expected dose from the radium standard should be clarified; the radon dose should be included in demonstrating compliance; and the time frame for dose modeling should be 10,000 years. The commenter also indicated that the proposed approach seems to allow a total dose of twice the radium dose; and that if more types of areas are to be included than those indicated in the proposal, then the enlargement of scope would require additional notice and review.

Six other commenters supported the Ra-226 benchmark dose approach for cleanup of other radionuclides such as U-nat, Th-230, and Th-232. These commenters indicated that the existing regulatory framework is appropriate and provides for flexibility to allow optimum tailings disposal on a site-specific basis. One of these commenters also pointed out that uranium mill sites will be turned over to the custodial care of the Department of Energy (DOE) or the State for long-term care, effectively eliminating substantial portions of these sites from the public exposure pathways. In addition, some of the vicinity properties remediated with neighboring abandoned mills (under the DOE's's Uranium Mill Tailings Remedial Action Project) have deposits of contamination (Ra-226, Th-230, or U-nat) above the limits remaining under the supplemental standards provisions of 40 CFR 192.21.

A. Response: The NRC agrees with the need to develop regulations that are protective of public health and safety with regard to decommissioning of UR facilities. NRC has previously addressed considerations related to radioactivity and dose to the public, public health aspects, fraction of the 100 mrem/yr (1 mSv/yr) dose, and the rationale for excluding the radon dose in Sections A.2.2.1, A.2.2.2, and F.6 of the July 21,1997, **Federal Register** notice (62 FR at 39060–64 and 39082) for the final rule for 10 CFR Part 20, subpart E; those discussions remain applicable to this final rulemaking.

As discussed above, the UR facilities have large areas contaminated with radium in soils where the existing radium standard is applied. The NRC believes that it is important to promulgate cleanup standards for other residual radionuclides that are consistent with the radium cleanup standards. Use of such an approach would result in a common dose criterion across an entire UR site, both for those areas contaminated with radium and for those areas contaminated with uranium and thorium. As noted above, the 5 pCi/g radium standard was promulgated by EPA for UR sites. The 5 pCi/g radium value has also been recommended as an exemption level by the Board of Directors of the Conference of Radiation Control Program Directors (October 1998) for the Suggested State Regulations on technologically enhanced naturally occurring radioactive materials.

The NRC staff's preliminary dose modeling, using realistic parameter values and the RESRAD code, indicates that at typical UR facilities, where the background radiation results in doses of over 200 mrem/yr (2.0 mSv/yr), the Ra-226 standard of 5 pCi/g (0.19 Bq/g) could typically result in a potential peak annual dose on the order of 20 to 35 mrem/yr (0.2 to 0.35 mSv/yr) to the average member of the critical group. Although it is possible that some site-

specific parameter values and subsurface contamination could result in a higher benchmark dose than that estimated by the staff for the various scenarios, the staff has high confidence that a site-specific dose using the benchmark approach will typically be a small fraction of 100 mrem/yr (1 mSv/yr), and in all cases will not exceed 100 mrem/yr (1 mSv/yr). The rule also requires licensee's to demonstrate that doses are ALARA which should result in a potential dose of less than 25 mrem/yr (0.2 mSv/yr) from the residual Ra-226 on the remediated site for most sites. Therefore, the potential health risk should be similar to the NRC dose limit established for other facilities in Part 20, subpart E, and approximate the level suggested in the EPA comment.

The radium benchmark dose modeling results are greater than the 5 pCi/g (0.19 Bq/g) radium modeling results reported by the EPA. The main reason for the difference in results is that the EPA modeled a much smaller area of contamination than that used by NRC staff (100 m^2 versus 404,687 m^2). Also, EPA modeled a much smaller fraction of time an individual would spend outdoors (0.02 versus 0.25) and used a less conservative root depth value (0.9 versus 0.25 meters) which generally decreases the calculated potential dose. What is not factored into the dose modeling is the low probability of anyone constructing a house or growing a large garden on the areas of residual contamination at these facilities. The UR facilities are in semi-arid (7–15 inches (18–39 cm) annual precipitation), sparsely populated areas (1–13 persons/$mile^2$ (0.4–5 persons/km^2)) where mining and grazing (3 cows/acre (1 cow/1348 m^2)) are the main land uses.

The existing regulatory framework does not provide criteria for the cleanup of radionuclides other than radium in soil. Also, the existing guidance does not provide dose criteria, so additional criteria are warranted. In areas where there is more than one residual radionuclide, the benchmark dose would apply to the sum of all radionuclides present in that area (i.e., radium, uranium, thorium, etc.). This is indicated in the rule text, and in draft guidance for implementation of the benchmark approach, where it is stated that, for each 100 m^2 area, the unity rule will apply such that the sum of the ratios for each radionuclide of the concentration present to the concentration limit may not exceed "1" (i.e., unity). The rule text and guidance also stipulate that the total effective dose equivalent limit is based on the peak annual dose within a 1000 year period to the average member of the critical group. This time frame is in keeping with the EPA regulatory time frame for these facilities (40 CFR Part 192).

Only portions of uranium mill sites and no portion of ISL facilities are anticipated to be turned over to the custodial care of Government entities. The radium standard applies to all areas of a site except the disposal cell, regardless of future use. The NRC staff plans a similar approach for the criteria for other radionuclides. The restricted use of areas that will be in perpetual custodial care could be considered under the ALARA provision, if cleanup is difficult or expensive in these areas.

B. Radionuclides at UR Sites are Naturally Occurring and of Variable Concentration in Nature

Several commenters indicated that the residual radionuclides at UR sites (uranium, thorium, radium) are naturally occurring in the local environment and that there is significant variability in soil background concentrations of these radionuclides, in particular at UR facilities where uranium pit mines or mineral outcrops exist. This leads to variability in potential dose such that the 25 mrem/yr (0.25 mSv/yr) dose in Part 20 subpart E would be indiscernible in the natural variability of background at a UR site. Any concentration standard must account for the significant variability in background and state that the limits are for "concentrations above background" at the different areas of the site. Also, two commenters indicated that a statistical approach, not just an average value, should be used to determine the background values for a site.

It was also mentioned that measurement of U-238 and Th-230 at levels above background, which result in an annual dose to residents of 25 mrem (0.25 mSv), would not be possible using reasonably available field techniques and that the additional cost of laboratory analyses to demonstrate compliance could be $100,000 per acre.

Several commenters stated that there is no reliable way to distinguish natural (in situ) ore material from processed (licensed) ore. A related concern was that decommissioning standards for UR facilities must not regulate mining activities and the associated ore material that may be present at UR sites.

B. Response: As noted above in Section II, and as described in the rule implementation guidance, the radionuclide dose limit is applied to the level of licensed (byproduct) material distinguishable from background. Site cleanup guidance indicates that background values should be based on areas with characteristics similar to the contaminated area(s) and that distinct areas of the site could have different background values. Statistical approaches, such as those discussed in the Multi-Agency Radiation Survey and Site Investigation Manual (NUREG–1575, 1997), will be considered.

Field measurements for soil U-nat and Th-230 in general are difficult and not just in the concentration equivalent of 25 mrem/yr (0.25 mSv/yr). Laboratory measurements are practical because site-specific dose modeling provides derived concentration limits for U-nat and Th-230 that can exceed current guideline values. For most sites, cleanup of soil U-nat and Th-230 would involve less than an acre (4,047 m^2). Therefore, the costs of sampling and of laboratory analysis for these radionuclides would be a minor part of the decommissioning costs.

Distinguishing in situ ore from processed ore material can be a problem on some sites and is addressed in the guidance. The NRC will regulate only NRC-licensed materials remaining at UR facilities, not in situ ore or mine waste. In determining compliance with the new regulation, the NRC staff will consider 10 CFR 40.42 (j) and (k) that state, in part, that as a final step in decommissioning, the licensee shall demonstrate that the site is suitable for release and that reasonable effort has been made to eliminate residual radioactive contamination.

C. Considerations of Risks, Costs, and Benefits of Cleanup

Several commenters pointed out that the actual risk of excavating and moving dirt (construction and transport accident risks that are actuarial) must be compared against health risks of radiation exposure which have not been demonstrated below 10 rem/yr (0.1 Sv/yr). The risk of cleaning up areas to below regional background levels would likely result in net human health and environmental detriment. Lowering of the current radium standard for uranium and thorium could cause undue economic burden to industry and the Government based on the need for cleanup of large soil areas and would not result in significant (if any) risk reduction.

At ISL facilities, lowering dose criteria could result in large areas retroactively becoming disposal areas requiring substantial and costly cleanup, and could inhibit efficiency of mining if irrigation practices with restoration fluids were effectively prohibited.

C. Response: The NRC considered the risk of the cleanup work in the regulatory analysis. The radium standard is not lowered by the rulemaking; therefore, there is no undue economic burden for licensees. Providing a radium benchmark dose standard for U-nat and Th-230 should not result in significant decrease in the soil concentration allowed to remain, compared to current guidance.

D. Regulatory Guidance

Several commenters offered suggestions for regulatory guidance and requested that the regulatory guidance implementing the standard include determination of background and dose modeling flexibility.

D. Response: The NRC recognizes that there may be difficulties in the determination of background concentrations of radionuclides at some UR facility sites. The NRC staff has prepared guidance (in the form of evaluation criteria) on mill site cleanup in the draft Standard Review Plan (SRP) for reclamation plans. This draft SRP will soon be published for public comment. The NRC staff is preparing another chapter of this SRP to address the implementation of the radium benchmark dose approach and dose modeling flexibility for this unique set of licensees. This chapter will also be published as a draft for public comment before finalization and incorporation into the SRP.

IV. Agreement State Compatibility

This rule will be a matter of compatibility between the NRC and the Agreement States, thereby providing consistency among State and Federal safety requirements. The final rule on radiological criteria for license termination for nuclear facilities issued July 21, 1997 (62 FR 39058), was determined to be a Division 2 matter of compatibility under the previous Commission policy for Agreement State compatibility. As noted for that final rule (at 62 FR 39079), Division 2 rules address basic principles of radiation safety and regulatory functions. Although Agreement States must address these principles in their regulations, the use of language identical to that in NRC rules is not necessary if the underlying principles are the same. Also, the Agreement States may adopt requirements more stringent than NRC rules. Under the current NRC policy, Category C compatibility would be consistent with that indicated in 62 FR 39079, and, hence, the NRC has determined that this rule will be a Category C matter of compatibility.

V. Finding of No Significant Environmental Impact: Availability

The NRC has determined under the National Environmental Policy Act of 1969, as amended, and the regulations in Subpart A of 10 CFR Part 51, that this rule will not be a major Federal action significantly affecting the quality of the human environment and, therefore, an environmental impact statement is not required. The final rule amends the NRC's regulations in 10 CFR Part 40 to include radiological dose criteria for decommissioning of lands and structures at UR facilities. The rule will affect 11 current NRC licensees. The environmental impact of this rule will be insignificant compared to current practice and to the decommissioning process in general because the areas requiring cleanup for residual radionuclides other than radium are small.

The final environmental assessment and finding of no significant impact on which this determination is based are available for inspection in the NRC Public Document Room, 2120 L Street NW (Lower Level), Washington, DC. Single copies of the environmental assessment and the finding of no significant environmental impact are available from Elaine Brummett, Office of Nuclear Material Safety and Safeguards, U.S. Nuclear Regulatory Commission, Mailstop T7-J9, Washington, DC 20555-0001, telephone (301) 415-6066.

VI. Paperwork Reduction Act Statement

This final rule does not contain a new or amended information collection requirement subject to the Paperwork Reduction Act of 1995 (44 U.S.C. 3501 et seq.). Existing requirements were approved by the Office of Management and Budget, approval number 3150-0014.

Public Protection Notification

If an information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.

VII. Regulatory Analysis

The NRC has prepared a regulatory analysis on this final regulation. The analysis examines the costs and benefits of the alternatives considered by the NRC. The analysis is available for inspection in the NRC Public Document Room, 2120 L Street NW (Lower Level), Washington, DC. Single copies of the analysis may be obtained from Frank Cardile, Office of Nuclear Material Safety and Safeguards, U.S. Nuclear Regulatory Commission, Mailstop T-C24, Washington, DC 20555-0001, telephone (301) 415-6185.

VIII. Regulatory Flexibility Certification

As required by the Regulatory Flexibility Act of 1980, 5 U.S.C. 605(b), the NRC certifies that this rule, if adopted, does not have a significant economic impact upon a substantial number of small entities. The rule will affect 11 current NRC licensees and any future licensees who will be conducting uranium milling operations. These licensees are not small entities as defined in 10 CFR 2.810.

IX. Backfit Analysis

The NRC has determined that the backfit rule, 10 CFR 50.109, does not apply to this final rule and therefore, a backfit analysis is not required for this final rule because these amendments do not involve reactor operations and do not involve any provisions that would impose backfits as defined in 10 CFR 50.109(a)(1).

X. Small Business Regulatory Enforcement Fairness Act

In accordance with the Small Business Regulatory Enforcement Fairness Act of 1996, the NRC has determined that this action is not a "major" rule and has verified this determination with the Office of Information and Regulatory Affairs, Office of Management and Budget.

XI. Criminal Penalties

For the purposes of Section 223 of the Atomic Energy Act (AEA), the NRC is issuing the final rule under one or more of sections 161b, 161i, or 161o of the AEA. Willful violations of the rule will be subject to criminal enforcement.

List of Subjects in 10 CFR Part 40

Criminal penalties, Government contracts, Hazardous materials transportation, Nuclear materials, Reporting and recordkeeping requirements, Source material, Uranium.

For the reasons set out in the preamble and under the authority of the Atomic Energy Act of 1954, as amended; the Energy Reorganization Act of 1974, as amended; and 5 U.S.C. 552 and 553; the NRC is adopting the following amendments to 10 CFR Part 40.

PART 40—DOMESTIC LICENSING OF SOURCE MATERIAL

1. The authority citation for Part 40 continues to read as follows:

Authority: Secs. 62, 63, 64, 65, 81, 161, 182, 183, 186, 68 Stat. 932, 933, 935, 948,

953, 954, 955, as amended, secs. 11e(2), 83, 84, Pub. L. 95-604, 92 Stat. 3033, as amended, 3039, sec. 234, 83 Stat. 444, as amended (42 U.S.C. 2014(e)(2), 2092, 2093, 2094, 2095, 2111, 2113, 2114, 2201, 2232, 2233, 2236, 2282); sec. 274, Pub. L. 86-373, 73 Stat. 688 (42 U.S.C. 2021); secs. 201, as amended, 202, 206, 88 Stat. 1242, as amended, 1244, 1246 (42 U.S.C. 5841, 5842, 5846); sec. 275, 92 Stat. 3021, as amended by Pub. L. 97-415, 96 Stat. 2067 (42 U.S.C. 2022); 193, 104 Stat. 2835 as amended by Pub. L. 104-134, 110 Stat. 1321, 1321-349 (42 U.S.C. 2243).

Section 40.7 also issued under Pub. L. 95-601, sec. 10, 92 Stat. 2951 (42 U.S.C. 5851). Section 40.31(g) also issued under sec. 122, 68 Stat. 939 (42 U.S.C. 2152). Section 40.46 also issued under sec. 184, 68 Stat. 954, as amended (42 U.S.C. 2234). Section 40.71 also issued under sec. 187, 68 Stat. 955 (42 U.S.C. 2237).

2. In 10 CFR Part 40, Appendix A, Criterion 6(6), a second paragraph is added to read as follows:

Appendix A to Part 40

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I. Technical Criteria

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Criterior 6 * * *

(6) * * *

Byproduct material containing concentrations of radionuclides other than radium in soil, and surface activity on remaining structures, must not result in a total effective dose equivalent (TEDE) exceeding the dose from cleanup of radium contaminated soil to the above standard (benchmark dose), and must be at levels which are as low as is reasonably achievable. If more than one residual radionuclide is present in the same 100-square-meter area, the sum of the ratios for each radionuclide of concentration present to the concentration limit will not exceed "1" (unity). A calculation of the potential peak annual TEDE within 1000 years to the average member of the critical group that would result from applying the radium standard (not including radon) on the site must be submitted for approval. The use of decommissioning plans with benchmark doses which exceed 100 mrem/yr, before application of ALARA, requires the approval of the Commission after consideration of the recommendation of the NRC staff. This requirement for dose criteria does not apply to sites that have decommissioning plans for soil and structures approved before June 11, 1999.

* * * * *

Dated at Rockville, Maryland, this 6th day of April 1999.

For the Nuclear Regulatory Commission.

Annette L. Vietti-Cook,

Secretary of the Commission.

[FR Doc. 99-9035 Filed 4-9-99; 8:45 am]

BILLING CODE 7590-01-P

NUCLEAR REGULATORY COMMISSION

10 CFR Part 72

RIN 3150-AG02

Elimination of Reporting Requirement and 30-Day Hold in Loading Spent Fuel After Preoperational Testing of Independent Spent Fuel Storage or Monitored Retrievable Storage Installations

AGENCY: Nuclear Regulatory Commission.

ACTION: Final rule.

SUMMARY: The Nuclear Regulatory Commission (NRC) is amending its regulations to eliminate the requirement that a report of the preoperational testing of an independent spent fuel storage installation or monitored retrievable storage installation be submitted to the NRC at least 30 days before the receipt of spent fuel or high-level radioactive waste. Experience has shown that the NRC staff does not need the report or the holding period because the NRC staff is on site and evaluates preoperational testing as it occurs. This amendment will eliminate an unnecessary regulatory impact on licensees.

EFFECTIVE DATE: May 12, 1999.

FOR FURTHER INFORMATION CONTACT: Gordon Gundersen, Office of Nuclear Material Safety and Safeguards, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, telephone (301) 415-6195, e-mail gegl@nrc.gov.

SUPPLEMENTARY INFORMATION:

Background

On September 14, 1998 (63 FR 49046), the NRC published a proposed rule in the **Federal Register** that would amend NRC's regulations in 10 CFR part 72 to eliminate a preoperational testing reporting requirement and a 30-day hold in loading spent fuel. Part 72 requires that the conditions for a site-specific license (10 CFR 72.24(g)) and the conditions for a Certificate of Compliance (CoC) (10 CFR 72.236(l)) contain requirements for the performance of preoperational testing by the site-specific licensee or the general licensee, respectively. The licensee is required to complete the preoperational testing program described in the applicable Safety Analysis Report (SAR) before spent fuel is loaded into an independent spent fuel storage installation (ISFSI) or before spent fuel or high-level radioactive waste (HLW) is loaded into a monitored retrievable storage installation (MRS). Information on the preoperational test program, including the specific tests and their acceptance criteria, are contained in the SAR submitted by the site-specific licensee or by the certificate holder for the design of the spent fuel storage cask to be used by the general licensee.

Section 72.82(e) requires licensees to submit to the NRC a report of the preoperational test acceptance criteria and test results at least 30 days before the receipt of spent fuel or HLW for loading into an ISFSI or MRS. However, the licensee is not required to submit test procedures, only a summary report of the test results. A copy of this report is subsequently placed in the NRC Public Document Room (PDR). The purpose of the 30-day period is to establish a sufficient hold point to ensure that the NRC has sufficient time to inspect a new licensee's preparations and, if necessary, exercise its regulatory authority before spent fuel is received at an ISFSI or spent fuel and HLW at an MRS. The licensee is not required to obtain NRC approval of the report before commencing loading operations.

Comments on the Proposed Rule

The Commission received four letters commenting on the proposed rule. Copies of the letters are available for public inspection and copying for a fee at the Commission's Public Document Room, located at 2120 L Street, NW. (Lower Level), Washington, DC. One letter was from NEI, one letter from a CoC holder, and two letters were from utilities holding 10 CFR part 50 reactor licenses. All of the letters supported the proposed rule. One utility quantified the savings of eliminating the 30-day hold as more than $300,000.

Discussion

The requirement for a preoperational test report and 30-day hold period was added to the part 72 regulations governing licensing requirements for ISFSIs and an MRS at the time they became effective on November 28, 1980 (45 FR 74693), and before the NRC staff had any practical experience in licensing such facilities. However, in the intervening period, the Commission's practice has been for the NRC staff to maintain an extensive oversight presence during the preoperational testing phase of ISFSIs, reviewing the acceptance criteria, preoperational test, and test results a

PART 192—HEALTH AND ENVIRONMENTAL PROTECTION STANDARDS FOR URANIUM AND THORIUM MILL TAILINGS

Subpart A—Standards for the Control of Residual Radioactive Materials from Inactive Uranium Processing Sites

Subpart B—Standards for Cleanup of Land and Buildings Contaminated with Residual Radioactive Materials from Inactive Uranium Processing Sites

Subpart C—Implementation

Subpart D—Standards for Management of Uranium Byproduct Materials Pursuant to Section 84 of the Atomic Energy Act of 1954, as Amended

Subpart E—Standards for Management of Thorium Byproduct Materials Pursuant to Section 84 of the Atomic Energy Act of 1954, as Amended

AUTHORITY: Sec. 275 of the Atomic Energy Act of 1954, 42 U.S.C. 2022, as added by the Uranium Mill Tailings Radiation Control Act of 1978, Pub. L. 95-604, as amended.

SOURCE: 48 FR 602, Jan. 5, 1983, unless otherwise noted.

Subpart A—Standards for the Control of Residual Radioactive Materials from Inactive Uranium Processing Sites

§ 192.00 Applicability.

This subpart applies to the control of residual radioactive material at designated processing or depository sites under section 108 of the Uranium Mill Tailings Radiation Control Act of 1978 (henceforth designated "the Act"), and to restoration of such sites following any use of subsurface minerals under section 104(h) of the Act.

§ 192.01 Definitions.

(a) *Residual radioactive material* means:

(1) Waste (which the Secretary determines to be radioactive) in the form of tailings resulting from the processing of ores for the extraction of uranium and other valuable constituents of the ores; and

(2) Other wastes (which the Secretary determines to be radioactive) at a processing site which relate to such processing, including any residual stock of unprocessed ores or low-grade materials.

(b) *Remedial* action means any action performed under section 108 of the Act.

(c) *Control* means any remedial action intended to stabilize, inhibit future misuse of, or reduce emissions or effluents from residual radioactive materials.

(d) *Disposal site* means the region within the smallest perimeter of residual radioactive material (excluding cover materials) following completion of control activities.

(e) *Depository site* means a site (other than a processing site) selected under Section 104(b) or 105(b) of the Act.

(f) *Curie* (Ci) means the amount of radioactive material that produces 37 billion nuclear transformation per second. One picocurie (pCi) = 10^{-12}Ci.

(g) *Act* means the Uranium Mill Tailings Radiation Control Act of 1978, as amended.

(h) *Administrator* means the Administrator of the Environmental Protection Agency.

(i) *Secretary* means the Secretary of Energy.

(j) *Commission* means the Nuclear Regulatory Commission.

(k) *Indian tribe* means any tribe, band, clan, group, pueblo, or community of Indians recognized as eligible for services provided by the Secretary of the Interior to Indians.

(l) *Processing site* means:

(1) Any site, including the mill, designated by the Secretary under Section 102(a)(1) of the Act; and

(2) Any other real property or improvement thereon which is in the vicinity of such site, and

is determined by the Secretary, in consultation with the Commission, to be contaminated with residual radioactive materials derived from such site.

(m) *Tailings* means the remaining portion of a metal-bearing ore after some or all of such metal, such as uranium, has been extracted.

(n) *Disposal period* means the period of time beginning March 7, 1983 and ending with the completion of all subpart A requirements specified under a plan for remedial action except those specified in § 192.03 and § 192.04.

(o) *Plan for remedial action* means a written plan (or plans) for disposal and cleanup of residual radioactive materials associated with a processing site that incorporates the results of site characterization studies, environmental assessments or impact statements, and engineering assessments so as to satisfy the requirements of subparts A and B of this part. The plan(s) shall be developed in accordance with the provisions of Section 108(a) of the Act with the concurrence of the Commission and in consultation, as appropriate, with the Indian Tribe and the Secretary of Interior.

(p) *Post-disposal period* means the period of time beginning immediately after the disposal period and ending at termination of the monitoring period established under § 192.03.

(q) *Groundwater* means water below the ground surface in a zone of saturation.

(r) *Underground source of drinking water* means an aquifer or its portion:

(1)(i) Which supplies any public water system as defined in § 141.2 of this chapter; or

(ii) Which contains a sufficient quantity of groundwater to supply a public water system; and

(A) Currently supplies drinking water for human consumption; or

(B) Contains fewer than 10,000 mg/l total dissolved solids; and

(2) Which is not an exempted aquifer as defined in § 144.7 of this chapter.

[48 FR 602, Jan. 5, 1983, as amended at 60 FR 2865, Jan. 11, 1995]

§ 192.02 Standards.

Control of residual radioactive materials and their listed constituents shall be designed [1] to:

(a) Be effective for up to one thousand 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 [2] 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.

(c) Provide reasonable assurance of conformance with the following groundwater protection provisions:

(1) The Secretary shall, on a site-specific basis, determine which of the constituents listed in Appendix I to Part 192 are present in or reasonably derived from residual radioactive materials and shall establish a monitoring program adequate to determine background levels of each such constituent in groundwater at each disposal site.

(2) The Secretary shall comply with conditions specified in a plan for remedial action which includes engineering specifications for a system of disposal designed to ensure that constituents identified under paragraph (c)(1) of this section entering the groundwater from a depository site (or a processing site, if residual radioactive materials are retained on the site) will not exceed the concentration limits established under paragraph (c)(3) of this section (or the supplemental standards established under § 192.22) in the uppermost aquifer underlying the site beyond the point of compliance established under paragraph (c)(4) of this section.

(3) Concentration limits:

(i) Concentration limits shall be determined in the groundwater for listed constituents identified under paragraph (c)(1) of this section. The concentration of a listed constituent in groundwater must not exceed:

(A) The background level of that constituent in the groundwater; or

(B) For any of the constituents listed in Table 1 to subpart A, the respective value given in that Table if the background level of the constituent is below the value given in the Table; or

(C) An alternate concentration limit established pursuant to paragraph (c)(3)(ii) of this section.

(ii)(A) The Secretary may apply an alternate concentration limit if, after considering remedial or corrective actions to achieve the levels specified in paragraphs (c)(3)(i)(A) and (B) of this section, he 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

[1] Because the standard applies to design, monitoring after disposal is not required to demonstrate compliance with respect to § 192.02(a) and (b).

[2] This average shall apply over the entire surface of the disposal site and over at least a one-year period. Radon will come from both residual radioactive materials and from materials covering them. Radon emissions from the covering materials should be estimated as part of developing a remedial action plan for each site. The standard, however, applies only to emissions from residual radioactive materials to the atmosphere.

concentration limit is not exceeded, and the Commission has concurred.

(B) In considering the present or potential hazard to human health and the environment of alternate concentration limits, the following factors shall be considered:

(*1*) Potential adverse effects on groundwater quality, considering:

(*i*) The physical and chemical characteristics of constituents in the residual radioactive material at the site, including their potential for migration;

(*ii*) The hydrogeological characteristics of the site and surrounding land;

(*iii*) The quantity of groundwater and the direction of groundwater flow;

(*iv*) The proximity and withdrawal rates of groundwater users;

(*v*) The current and future uses of groundwater in the region surrounding the site;

(*vi*) The existing quality of groundwater, including other sources of contamination and their cumulative impact on the groundwater quality;

(*vii*) The potential for health risks caused by human exposure to constituents;

(*viii*) The potential damage to wildlife, crops, vegetation, and physical structures caused by exposure to constituents;

(*ix*) The persistence and permanence of the potential adverse effects;

(*x*) The presence of underground sources of drinking water and exempted aquifers identified under § 144.7 of this chapter; and

(*2*) Potential adverse effects on hydraulically-connected surface-water quality, considering:

(*i*) The volume and physical and chemical characteristics of the residual radioactive material at the site;

(*ii*) The hydrogeological characteristics of the site and surrounding land;

(*iii*) The quantity and quality of groundwater, and the direction of groundwater flow;

(*iv*) The patterns of rainfall in the region;

(*v*) The proximity of the site to surface waters;

(*vi*) The current and future uses of surface waters in the region surrounding the site and any water quality standards established for those surface waters;

(*vii*) The existing quality of surface water, including other sources of contamination and their cumulative impact on surface water quality;

(*viii*) The potential for health risks caused by human exposure to constituents;

(*ix*) The potential damage to wildlife, crops, vegetation, and physical structures caused by exposure to constituents; and

(*x*) The persistence and permanence of the potential adverse effects.

(4) Point of compliance: The point of compliance is the location at which the groundwater concentration limits of paragraph (c)(3) of this section apply. The point of compliance is the intersection of a vertical plane with the uppermost aquifer underlying the site, located at the hydraulically downgradient limit of the disposal area plus the area taken up by any liner, dike, or other barrier designed to contain the residual radioactive material.

(d) Each site on which disposal occurs shall be designed and stabilized in a manner that minimizes the need for future maintenance.

[60 FR 2865, Jan. 11, 1995]

§ 192.03 Monitoring.

A groundwater monitoring plan shall be implemented, to be carried out over a period of time commencing upon completion of remedial actions taken to comply with the standards in § 192.02, and of a duration which is adequate to demonstrate that future performance of the system of disposal can reasonably be expected to be in accordance with the design requirements of § 192.02(c). This plan and the length of the monitoring period shall be modified to incorporate any corrective actions required under § 192.04 or § 192.12(c).

[60 FR 2866, Jan. 11, 1995]

§ 192.04 Corrective Action.

If the groundwater concentration limits established for disposal sites under provisions of § 192.02(c) are found or projected to be exceeded, a corrective action program shall be placed into operation as soon as is practicable, and in no event later than eighteen (18) months after a finding of exceedance. This corrective action program will restore the performance of the system of disposal to the original concentration limits established under § 192.02(c)(3), to the extent reasonably achievable, and, in any case, as a minimum shall:

(a) Conform with the groundwater provisions of § 192.02(c)(3), and

(b) Clean up groundwater in conformance with subpart B, modified as appropriate to apply to the disposal site.

[60 FR 2866, Jan. 11, 1995]

TABLE 1 TO SUBPART A.—MAXIMUM CONCENTRATION OF CONSTITUENTS FOR GROUNDWATER PROTECTION

Constituent concentration[1]	Maximum
Arsenic	0.05
Barium	1.0
Cadmium	0.01
Chromium	0.05
Lead	0.05
Mercury	0.002
Selenium	0.01

TABLE 1 TO SUBPART A.—MAXIMUM CONCENTRATION OF CONSTITUENTS FOR GROUNDWATER PROTECTION—Continued

Constituent concentration[1]	Maximum
Silver	0.05
Nitrate (as N)	10.
Molybdenum	0.1
Combined radium-226 and radium-228	5 pCi/liter
Combined uranium-234 and uranium-238[2].	30 pCi/liter
Gross alpha-particle activity (excluding radon and uranium).	15 pCi/liter
Endrin (1,2,3,4,10,10-hexachloro-6,7-exposy-1,4,4a,5,6,7,8,8a-octahydro-1,4-endo,endo-5,8-dimethanonaphthalene).	0.0002
Lindane (1,2,3,4,5,6-hexachlorocyclohexane, gamma Insomer).	0.004
Methoxychlor (1,1,1-trichloro-2,2'-bis(p-methoxyphenylethane)).	0.1
Toxaphene ($C_{10}H_{10}Cl_8$, technical chlorinated camphene, 67–69 percent chlorine).	0.005
2,4-D (2,4-dichlorophenoxyacetic acid)	0.1
2,4,5-TP Silvex (2,4,5-trichlorophenoxypropionic acid).	0.01

[1] Milligrams per liter, unless stated otherwise.
[2] Where secular equilibrium obtains, this criterion will be satisfied by a concentration of 0.044 milligrams per liter (0.044 mg/l). For conditions of other than secular equilibrium, a corresponding value may be derived and applied, based on the measured site-specific ratio of the two isotopes of uranium.

[60 FR 2866, Jan. 11, 1995]

Subpart B—Standards for Cleanup of Land and Buildings Contaminated with Residual Radioactive Materials from Inactive Uranium Processing Sites

§192.10 Applicability.

This subpart applies to land and buildings that are part of any processing site designated by the Secretary of Energy under section 102 of the Act. section 101 of the Act, states, in part, that "processing site" means—

(a) Any site, including the mill, containing residual radioactive materials at which all or substantially all of the uranium was produced for sale to any Federal agency prior to January 1, 1971, under a contract with any Federal agency, except in the case of a site at or near Slick Rock, Colorado, unless—

(1) Such site was owned or controlled as of Januray 1, 1978, or is thereafter owned or controlled, by any Federal agency, or

(2) A license (issued by the (Nuclear Regulatory) Commission or its predecessor agency under the Atomic Energy Act of 1954 or by a State as permitted under section 274 of such Act) for the production at site of any uranium or thorium product derived from ores is in effect on January 1, 1978, or is issued or renewed after such date; and

(b) Any other real property or improvement thereon which—

(1) Is in the vicinity of such site, and

(2) Is determined by the Secretary, in consultation with the Commission, to be contaminated with residual radioactive materials derived from such site.

§192.11 Definitions.

(a) Unless otherwise indicated in this subpart, all terms shall have the same meaning as defined in subpart A.

(b) *Land* means any surface or subsurface land that is not part of a disposal site and is not covered by an occupiable building.

(c) *Working Level* (WL) means any combination of short-lived radon decay products in one liter of air that will result in the ultimate emission of alpha particles with a total energy of 130 billion electron volts.

(d) *Soil* means all unconsolidated materials normally found on or near the surface of the earth including, but not limited to, silts, clays, sands, gravel, and small rocks.

(e) *Limited use groundwater* means groundwater that is not a current or potential source of drinking water because (1) the concentration of total dissolved solids is in excess of 10,000 mg/l, or (2) widespread, ambient contamination not due to activities involving residual radioactive materials from a designated processing site exists that cannot be cleaned up using treatment methods reasonably employed in public water systems, or (3) the quantity of water reasonably available for sustained continuous use is less than 150 gallons per day. The parameters for determining the quantity of water reasonably available shall be determined by the Secretary with the concurrence of the Commission.

[48 FR 602, Jan. 5, 1983, as amended at 60 FR 2866, Jan. 11, 1995]

§192.12 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:*

(a) The concentration of radium-226 in land averaged over any area of 100 square meters shall not exceed the background level by more than—

(1) 5 pCi/g, averaged over the first 15 cm of soil below the surface, and

(2) 15 pCi/g, averaged over 15 cm thick layers of soil more than 15 cm below the surface.

(b) In any occupied or habitable building—

(1) The objective of remedial action shall be, and reasonable effort shall be made to achieve, an

annual average (or equivalent) 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

(2) The level of gamma radiation shall not exceed the background level by more than 20 microroentgens per hour.

(c) The Secretary shall comply with conditions specified in a plan for remedial action which provides that contamination of groundwater by listed constituents from residual radioactive material at any designated processing site (§ 192.01(1)) shall be brought into compliance as promptly as is reasonably achievable with the provisions of § 192.02(c)(3) or any supplemental standards established under § 192.22. For the purposes of this subpart:

(1) A monitoring program shall be carried out that is adequate to define backgroundwater quality and the areal extent and magnitude of groundwater contamination by listed constituents from residual radioactive materials (§ 192.02(c)(1)) and to monitor compliance with this subpart. The Secretary shall determine which of the constituents listed in Appendix I to part 192 are present in or could reasonably be derived from residual radioactive material at the site, and concentration limits shall be established in accordance with § 192.02(c)(3).

(2) (i) If the Secretary determines that sole reliance on active remedial procedures is not appropriate and that cleanup of the groundwater can be more reasonably accomplished in full or in part through natural flushing, then the period for remedial procedures may be extended. Such an extended period may extend to a term not to exceed 100 years if:

(A) The concentration limits established under this subpart are projected to be satisfied at the end of this extended period,

(B) Institutional control, having a high degree of permanence and which will effectively protect public health and the environment and satisfy beneficial uses of groundwater during the extended period and which is enforceable by the administrative or judicial branches of government entities, is instituted and maintained, as part of the remedial action, at the processing site and wherever contamination by listed constituents from residual radioactive materials is found in groundwater, or is projected to be found, and

(C) The groundwater is not currently and is not now projected to become a source for a public water system subject to provisions of the Safe Drinking Water Act during the extended period.

(ii) Remedial actions on groundwater conducted under this subpart may occur before or after actions under Section 104(f)(2) of the Act are initiated.

(3) Compliance with this subpart shall be demonstrated through the monitoring program established under paragraph (c)(1) of this section at those locations not beneath a disposal site and its cover where groundwater contains listed constituents from residual radioactive material.

[48 FR 602, Jan. 5, 1983, as amended at 60 FR 2867, Jan. 11, 1995]

Subpart C—Implementation

§ 192.20 Guidance for implementation.

Section 108 of the Act requires the Secretary of Energy to select and perform remedial actions with the concurrence of the Nuclear Regulatory Commission and the full participation of any State that pays part of the cost, and in consultation, as appropriate, with affected Indian Tribes and the Secretary of the Interior. These parties, in their respective roles under section 108, are referred to hereafter as "the implementing agencies." The implementing agencies shall establish methods and procedures to provide "reasonable assurance" that the provisions of Subparts A and B are satisfied. This should be done as appropriate through use of analytic models and site-specific analyses, in the case of Subpart A, and for Subpart B through measurements performed within the accuracy of currently available types of field and laboratory instruments in conjunction with reasonable survey and sampling procedures. These methods and procedures may be varied to suit conditions at specific sites. In particular:

(a)(1) The purpose of Subpart A is to provide for long-term stabilization and isolation in order to inhibit misuse and spreading of residual radioactive materials, control releases of radon to air, and protect water. Subpart A may be implemented through analysis of the physical properties of the site and the control system and projection of the effects of natural processes over time. Events and processes that could significantly affect the average radon release rate from the entire disposal site should be considered. Phenomena that are localized or temporary, such as local cracking or burrowing of rodents, need to be taken into account only if their cumulative effect would be significant in determining compliance with the standard. Computational models, theories, and prevalent expert judgment may be used to decide that a control system design will satisfy the standard. The numerical range provided in the standard for the longevity of the effectiveness of the control of residual radioactive materials allows for consideration of the various factors affecting the longevity of control and stabilization methods and their costs. These factors have different levels of predictability and may vary for the different sites.

(2) Protection of water should be considered on a case-specific basis, drawing on hydrological and geochemical surveys and all other relevant data. The hydrologic and geologic assessment to be conducted at each site should include a monitoring program sufficient to establish background groundwater quality through one or more upgradient or other appropriately located wells. The groundwater monitoring list in Appendix IX of part 264 of this chapter (plus the additional constituents in Table A of this paragraph) may be used for screening purposes in place of Appendix I of part 192 in the monitoring program. New depository sites for tailings that contain water at greater than the level of "specific retention" should use aliner or equivalent. In considering design objectives for groundwater protection, the implementing agencies should give priority to concentration levels in the order listed under § 192.02(c)(3)(i). When considering the potential for health risks caused by human exposure to known or suspected carcinogens, alternate concentration limits pursuant to paragraph 192.02(c)(3)(ii) should be established at concentration levels which represent an excess lifetime risk, at a point of exposure, to an average individual no greater than between 10^{-4} and 10^{-6}.

TABLE A TO § 192.20(a)(2)—ADDITIONAL LISTED CONSTITUENTS

Nitrate (as N)
Molybdenum
Combined radium-226 and radium-228
Combined uranium-234 and uranium-238
Gross alpha-particle activity (excluding radon and uranium)

(3) The plan for remedial action, concurred in by the Commission, will specify how applicable requirements of subpart A are to be satisfied. The plan should include the schedule and steps necessary to complete disposal operations at the site. It should include an estimate of the inventory of wastes to be disposed of in the pile and their listed constituents and address any need to eliminate free liquids; stabilization of the wastes to a bearing capacity sufficient to support the final cover; and the design and engineering specifications for a cover to manage the migration of liquids through the stabilized pile, function without maintenance, promote drainage and minimize erosion or abrasion of the cover, and accommodate settling and subsidence so that cover integrity is maintained. Evaluation of proposed designs to conform to subpart A should be based on realistic technical judgments and include use of available empirical information. The consideration of possible failure modes and related corrective actions should be limited to reasonable failure assumptions, with a demonstration that the disposal design is generally amenable to a range of corrective actions.

(4) The groundwater monitoring list in Appendix IX of part 264 of this chapter (plus the additional constituents in Table A in paragraph (a)(2) of this section) may be used for screening purposes in place of Appendix I of part 192 in monitoring programs. The monitoring plan required under § 192.03 should be designed to include verification of site-specific assumptions used to project the performance of the disposal system. Prevention of contamination of groundwater may be assessed by indirect methods, such as measuring the migration of moisture in the various components of the cover, the tailings, and the area between the tailings and the nearest aquifer, as well as by direct monitoring of groundwater. In the case of vicinity properties (§ 192.01(l)(2)), such assessments may not be necessary, as determined by the Secretary, with the concurrence of the Commission, considering such factors as local geology and the amount of contamination present. Temporary excursions from applicable limits of groundwater concentrations that are attributable to a disposal operation itself shall not constitute a basis for considering corrective action under § 192.04 during the disposal period, unless the disposal operation is suspended prior to completion for other than seasonal reasons.

(b)(1) Compliance with § 192.12(a) and (b) of subpart B, to the extent practical, should be demonstrated through radiation surveys. Such surveys may, if appropriate, be restricted to locations likely to contain residual radioactive materials. These surveys should be designed to provide for compliance averaged over limited areas rather than point-by-point compliance with the standards. In most cases, measurement of gamma radiation exposure rates above and below the land surface can be used to show compliance with § 192.12(a). Protocols for making such measurements should be based on realistic radium distributions near the surface rather than extremes rarely encountered.

(2) In § 192.12(a), "background level" refers to the native radium concentration in soil. Since this may not be determinable in the presence of contamination by residual radioactive materials, a surrogate "background level" may be established by simple direct or indirect (e.g., gamma radiation) measurements performed nearby but outside of the contaminated location.

(3) Compliance with § 192.12(b) may be demonstrated by methods that the Department of Energy has approved for use under Pub. L. 92–314 (10 CFR part 712), or by other methods that the implementing agencies determine are adequate. Residual radioactive materials should be removed from buildings exceeding 0.03 WL so that future replacement buildings will not pose a hazard [un-

less removal is not practical—see § 192.21(c)]. However, sealants, filtration, and ventilation devices may provide reasonable assurance of reductions from 0.03 WL to below 0.02 WL. In unusual cases, indoor radiation may exceed the levels specified in § 192.12(b) due to sources other than residual radioactive materials. Remedial actions are not required in order to comply with the standard when there is reasonable assurance that residual radioactive materials are not the cause of such an excess.

(4) The plan(s) for remedial action will specify how applicable requirements of subpart B would be satisfied. The plan should include the schedule and steps necessary to complete the cleanup of groundwater at the site. It should document the extent of contamination due to releases prior to final disposal, including the identification and location of listed constituents and the rate and direction of movement of contaminated groundwater, based upon the monitoring carried out under § 192.12(c)(1). In addition, the assessment should consider future plume movement, including an evaluation of such processes as attenuation and dilution and future contamination from beneath a disposal site. Monitoring for assessment and compliance purposes should be sufficient to establish the extent and magnitude of contamination, with reasonable assurance, through use of a carefully chosen minimal number of sampling locations. The location and number of monitoring wells, the frequency and duration of monitoring, and the selection of indicator analytes for long-term groundwater monitoring, and, more generally, the design and operation of the monitoring system, will depend on the potential for risk to receptors and upon other factors, including characteristics of the subsurface environment, such as velocity of groundwater flow, contaminant retardation, time of groundwater or contaminant transit to receptors, results of statistical evaluations of data trends, and modeling of the dynamics of the groundwater system. All of these factors should be incorporated into the design of a site-specific monitoring program that will achieve the purpose of the regulations in this subpart in the most cost-effective manner. In the case of vicinity properties (§ 192.01(l)(2)), such assessments will usually not be necessary. The Secretary, with the concurrence of the Commission, may consider such factors as local geology and amount of contamination present in determining criteria to decide when such assessments are needed. In cases where § 192.12(c)(2) is invoked, the plan should include a monitoring program sufficient to verify projections of plume movement and attenuation periodically during the extended cleanup period. Finally, the plan should specify details of the method to be used for cleanup of groundwater.

[48 FR 602, Jan. 5, 1983, as amended at 60 FR 2867, Jan. 11, 1995]

§ 192.21 Criteria for applying supplemental standards.

Unless otherwise indicated in this subpart, all terms shall have the same meaning as defined in Title I of the Act or in subparts A and B. The implementing agencies may (and in the case of paragraph (h) of this section shall) apply standards under § 192.22 in lieu of the standards of subparts A or B if they determine that any of the following circumstances exists:

(a) Remedial actions required to satisfy subpart A or B would pose a clear and present risk of injury to workers or to members of the public, notwithstanding reasonable measures to avoid or reduce risk.

(b) Remedial actions to satisfy the cleanup standards for land, § 192.12(a), and groundwater, § 192.12(c), or the acquisition of minimum materials required for control to satisfy §§ 192.02(b) and (c), would, notwithstanding reasonable measures to limit damage, directly produce health and environmental harm that is clearly excessive compared to the health and environmental benefits, now or in the future. A clear excess of health and environmental harm is harm that is long-term, manifest, and grossly disproportionate to health and environmental benefits that may reasonably be anticipated.

(c) The estimated cost of remedial action to satisfy § 192.12(a) at a "vicinity" site (described under section 101(6)(B) of the Act) is unreasonably high relative to the long-term benefits, and the residual radioactive materials do not pose a clear present or future hazard. The likelihood that buildings will be erected or that people will spend long periods of time at such a vicinity site should be considered in evaluating this hazard. Remedial action will generally not be necessary where residual radioactive materials have been placed semipermanently in a location where site-specific factors limit their hazard and from which they are costly or difficult to remove, or where only minor quantities of residual radioactive materials are involved. Examples are residual radioactive materials under hard surface public roads and sidewalks, around public sewer lines, or in fence post foundations. Supplemental standards should not be applied at such sites, however, if individuals are likely to be exposed for long periods of time to radiation from such materials at levels above those that would prevail under § 192.12(a).

(d) The cost of a remedial action for cleanup of a building under § 192.12(b) is clearly unreasonably high relative to the benefits. Factors that should be included in this judgment are the anticipated period of occupancy, the incremental radi-

ation level that would be affected by the remedial action, the residual useful lifetime of the building, the potential for future construction at the site, and the applicability of less costly remedial methods than removal of residual radioactive materials.

(e) There is no known remedial action.

(f) The restoration of groundwater quality at any designated processing site under § 192.12(c) is technically impracticable from an engineering perspective.

(g) The groundwater meets the criteria of § 192.11(e).

(h) Radionuclides other than radium-226 and its decay products are present in sufficient quantity and concentration to constitute a significant radiation hazard from residual radioactive materials.

[48 FR 602, Jan. 5, 1983, as amended at 60 FR 2868, Jan. 11, 1995]

§ 192.22 Supplemental standards.

Federal agencies implementing subparts A and B may in lieu thereof proceed pursuant to this section with respect to generic or individual situations meeting the eligibility requirements of § 192.21.

(a) When one or more of the criteria of § 192.21(a) through (g) applies, the Secretary shall select and perform that alternative remedial action that comes as close to meeting the otherwise applicable standard under § 192.02(c)(3) as is reasonably achievable.

(b) When § 192.21(h) applies, remedial actions shall reduce other residual radioactivity to levels that are as low as is reasonably achievable and conform to the standards of subparts A and B to the maximum extent practicable.

(c) The implementing agencies may make general determinations concerning remedial actions under this section that will apply to all locations with specified characteristics, or they may make a determination for a specific location. When remedial actions are proposed under this section for a specific location, the Department of Energy shall inform any private owners and occupants of the affected location and solicit their comments. The Department of Energy shall provide any such comments to the other implementing agencies. The Department of Energy shall also periodically inform the Environmental Protection Agency of both general and individual determinations under the provisions of this section.

(d) When § 192.21(b), (f), or (g) apply, implementing agencies shall apply any remedial actions for the restoration of contamination of groundwater by residual radioactive materials that is required to assure, at a minimum, protection of human health and the environment. In addition, when § 192.21(g) applies, supplemental standards shall ensure that current and reasonably projected uses of the affected groundwater are preserved.

[48 FR 602, Jan. 5, 1983, as amended at 60 FR 2868, Jan. 11, 1995]

§ 192.23 Effective date.

Subparts A, B, and C shall be effective March 7, 1983.

Subpart D—Standards for Management of Uranium Byproduct Materials Pursuant to Section 84 of the Atomic Energy Act of 1954, as Amended

SOURCE: 48 FR 45946, Oct. 7, 1983, unless otherwise noted.

§ 192.30 Applicability.

This subpart applies to the management of uranium byproduct materials under section 84 of the Atomic Energy Act of 1954 (henceforth designated "the Act"), as amended, during and following processing of uranium ores, and to restoration of disposal sites following any use of such sites under section 83(b)(1)(B) of the Act.

§ 192.31 Definitions and cross-references.

References in this subpart to other parts of the Code of Federal Regulations are to those parts as codified on January 1, 1983.

(a) Unless otherwise indicated in this subpart, all terms shall have the same meaning as in Title II of the Uranium Mill Tailings Rediation Control Act of 1978, subparts A and B of this part, or parts 190, 260, 261, and 264 of this chapter. For the purposes of this subpart, the terms "waste," "hazardous waste," and related terms, as used in parts 260, 261, and 264 of this chapter shall apply to byproduct material.

(b) *Uranium byproduct material* means the tailings or wastes produced by the extraction or concentration of uranium from any ore processed primarily for its source material content. Ore bodies depleted by uranium solution extraction operations and which remain underground do not constitute "byproduct material" for the purpose of this subpart.

(c) *Control* means any action to stabilize, inhibit future misuse of, or reduce emissions or effluents from uranium byproduct materials.

(d) *Licensed site* means the area contained within the boundary of a location under the control of persons generating or storing uranium byproduct materials under a license issued pursuant to section 84 of the Act. For purposes of this subpart, "licensed site" is equivalent to "regulated unit" in subpart F of part 264 of this chapter.

(e) *Disposal site* means a site selected pursuant to section 83 of the Act.

(f) *Disposal area* means the region within the perimeter of an impoundment or pile containing uranium by product materials to which the post-closure requirements of § 192.32(b)(1) of this subpart apply.

(g) *Regulatory agency* means the U.S. Nuclear Regulatory Commission.

(h) *Closure period* means the period of time beginning with the cessation, with respect to a waste impoundment, of uranium ore processing operations and ending with completion of requirements specified under a closure plan.

(i) *Closure plan* means the plan required under § 264.112 of this chapter.

(j) *Existing portion* means that land surface area of an existing surface impoundment on which significant quantities of uranium byproduct materials have been placed prior to promulgation of this standard.

(k) *As expeditiously as practicable considering technological feasibility* means as quickly as possible considering: the physical characteristics of the tailings and the site; the limits of available technology; the need for consistency with mandatory requirements of other regulatory programs; and factors beyond the control of the licensee. The phrase permits consideration of the cost of compliance only to the extent specifically provided for by use of the term "available technology."

(l) *Permanent Radon Barrier* means the final radon barrier constructed to achieve compliance with, including attainment of, the limit on releases of radon-222 in § 192.32(b)(1)(ii).

(m) *Available technology* means technologies and methods for emplacing a permanent radon barrier on uranium mill tailings piles or impoundments. This term shall not be construed to include extraordinary measures or techniques that would impose costs that are grossly excessive as measured by practice within the industry or one that is reasonably analogous, (such as, by way of illustration only, unreasonable overtime, staffing or transportation requirements, etc., considering normal practice in the industry; laser fusion, of soils, etc.), provided there is reasonable progress toward emplacement of a permanent radon barrier. To determine grossly excessive costs, the relevant baseline against which cost increases shall be compared is the cost estimate for tailings impoundment closure contained in the licensee's tailings closure plan, but costs beyond such estimates shall not automatically be considered grossly excessive.

(n) *Tailings Closure Plan (Radon)* means the Nuclear Regulatory Commission or Agreement State approved plan detailing activities to accomplish timely emplacement of a permanent radon barrier. A tailings closure plan shall include a schedule for key radon closure milestone activities such as wind blown tailings retrieval and placement on the pile, interim stabilization (including dewatering or the removal of freestanding liquids and recontouring), and emplacement of a permanent radon barrier constructed to achieve compliance with the 20 pCi/ m^2-s flux standard as expeditiously as practicable considering technological feasibility (including factors beyond the control of the licensee).

(o) *Factors beyond the control of the licensee* means factors proximately causing delay in meeting the schedule in the applicable license for timely emplacement of the permanent radon barrier notwithstanding the good faith efforts of the licensee to achieve compliance. These factors may include, but are not limited to, physical conditions at the site; inclement weather or climatic conditions; an act of God; an act of war; a judicial or administrative order or decision, or change to the statutory, regulatory, or other legal requirements applicable to the licensee's facility that would preclude or delay the performance of activities required for compliance; labor disturbances; any modifications, cessation or delay ordered by state, Federal or local agencies; delays beyond the time reasonably required in obtaining necessary governmental permits, licenses, approvals or consent for activities described in the tailings closure plan (radon) proposed by the licensee that result from agency failure to take final action after the licensee has made a good faith, timely effort to submit legally sufficient applications, responses to requests (including relevant data requested by the agencies), or other information, including approval of the tailings closure plan by NRC or the affected Agreement State; and an act or omission of any third party over whom the licensee has no control.

(p) *Operational* means that a uranium mill tailings pile or impoundment is being used for the continued placement of uranium byproduct material or is in standby status for such placement. A tailings pile or impoundment is operational from the day that uranium byproduct material is first placed in the pile or impoundment until the day final closure begins.

(q) *Milestone* means an enforceable date by which action, or the occurrence of an event, is required for purposes of achieving compliance with the 20 pCi/m^2 · s flux standard.

[48 FR 45946, Oct. 7, 1983, as amended at 58 FR 60355, Nov. 15, 1993]

§ 192.32 Standards.

(a) *Standards for application during processing operations and prior to the end of the closure period.* (1) Surface impoundments (except for an existing portion) subject to this subpart must be designed, constructed, and installed in such manner

as to conform to the requirements of § 264.221 of this chapter, except that at sites where the annual precipitation falling on the impoundment and any drainage area contributing surface runoff to the impoundment is less than the annual evaporation from the impoundment, the requirements of § 264.228(a)(2) (iii)(E) referenced in § 264.221 do not apply.

(2) Uranium byproduct materials shall be managed so as to conform to the ground water protection standard in § 264.92 of this chapter, except that for the purposes of this subpart:

(i) To the list of hazardous constituents referenced in § 264.93 of this chapter are added the chemical elements molybdenum and uranium,

(ii) To the concentration limits provided in Table 1 of § 264.94 of this chapter are added the radioactivity limits in Table A of this subpart,

(iii) Detection monitoring programs required under § 264.98 to establish the standards required under § 264.92 shall be completed within one (1) year of promulgation,

(iv) The regulatory agency may establish alternate concentration limits (to be satisfied at the point of compliance specified under § 264.95) under the criteria of § 264.94(b), provided that, after considering practicable corrective actions, these limits are as low as reasonably achievable, and that, in any case, the standards of § 264.94(a) are satisfied at all points at a greater distance than 500 meters from the edge of the disposal area and/or outside the site boundary, and

(v) The functions and responsibilities designated in Part 264 of this chapter as those of the "Regional Administrator" with respect to "facility permits" shall be carried out by the regulatory agency, except that exemptions of hazardous constituents under § 264.93 (b) and (c) of this chapter and alternate concentration limits established under § 264.94 (b) and (c) of this chapter (except as otherwise provided in § 192.32(a)(2)(iv)) shall not be effective until EPA has concurred therein.

(3)(i) Uranium mill tailings piles or impoundments that are nonoperational and subject to a license by the Nuclear Regulatory Commission or an Agreement State shall limit releases of radon-222 by emplacing a permanent radon barrier. This permanent radon barrier shall be constructed as expeditiously as practicable considering technological feasibility (including factors beyond the control of the licensee) after the pile or impoundment ceases to be operational. Such control shall be carried out in accordance with a written tailings closure plan (radon) to be incorporated by the Nuclear Regulatory Commission or Agreement State into individual site licenses.

(ii) The Nuclear Regulatory Commission or Agreement State may approve a licensee's request to extend the time for performance of milestones if, after providing an opportunity for public participation, the Nuclear Regulatory Commission or Agreement State finds that compliance with the 20 $pCi/m^2 \cdot s$ flux standard has been demonstrated using a method approved by the NRC, in the manner required in 192.32(a)(4)(i). Only under these circumstances and during the period of the extension must compliance with the 20 $pCi/m^2 \cdot s$ flux standard be demonstrated each year.

(iii) The Nuclear Regulatory Commission or Agreement State may extend the final compliance date for emplacement of the permanent radon barrier, or relevant milestone, based upon cost if the new date is established after a finding by the Nuclear Regulatory Commission or Agreement State, after providing an opportunity for public participation, that the licensee is making good faith efforts to emplace a permanent radon barrier; the delay is consistent with the definition of "available technology" in § 192.31(m); and the delay will not result in radon releases that are determined to result in significant incremental risk to the public health.

(iv) The Nuclear Regulatory Commission or Agreement State may, in response to a request from a licensee, authorize by license or license amendment a portion of the site to remain accessible during the closure process to accept uranium byproduct material as defined in section 11(e)(2) of the Atomic Energy Act, 42 U.S.C. 2014(e)(2), or to accept materials similar to the physical, chemical and radiological characteristics of the in situ uranium mill tailings and associated wastes, from other sources. No such authorization may be used as a means for delaying or otherwise impeding emplacement of the permanent radon barrier over the remainder of the pile or impoundment in a manner that will achieve compliance with the 20 $pCi/m^2 \cdot s$ flux standard, averaged over the entire pile or impoundment.

(v) The Nuclear Regulatory Commission or Agreement State may, in response to a request from a licensee, authorize by license or license amendment a portion of a pile or impoundment to remain accessible after emplacement of a permanent radon barrier to accept uranium byproduct material as defined in section 11(e)(2) of the Atomic Energy Act, 42 U.S.C. 2014(e)(2), if compliance with the 20 $pCi/m^2 \cdot s$ flux standard of § 192.32(b)(1)(ii) is demonstrated by the licensee's monitoring conducted in a manner consistent with § 192.32(a)(4)(i). Such authorization may be provided only if the Nuclear Regulatory Commission or Agreement State makes a finding, constituting final agency action and after providing an opportunity for public participation, that the site will continue to achieve the 20 $pCi/m2 \cdot s$ flux standard when averaged over the entire impoundment.

(4)(i) Upon emplacement of the permanent radon barrier pursuant to 40 CFR 192.32(a)(3), the

licensee shall conduct appropriate monitoring and analysis of the radon-222 releases to demonstrate that the design of the permanent radon barrier is effective in limiting releases of radon-222 to a level not exceeding 20 $pCi/m^2 \cdot s$ as required by 40 CFR 192.32(b)(1)(ii). This monitoring shall be conducted using the procedures described in 40 CFR part 61, Appendix B, Method 115, or any other measurement method proposed by a licensee that the Nuclear Regulatory Commission or Agreement State approves as being at least as effective as EPA Method 115 in demonstrating the effectiveness of the permanent radon barrier in achieving compliance with the 20 $pCi/m^2 \cdot s$ flux standard.

(ii) When phased emplacement of the permanent radon barrier is included in the applicable tailings closure plan (radon), then radon flux monitoring required under § 192.32(a)(4)(i) shall be conducted, however the licensee shall be allowed to conduct such monitoring for each portion of the pile or impoundment on which the radon barrier has been emplaced by conducting flux monitoring on the closed portion.

(5) Uranium byproduct materials shall be managed so as to conform to the provisions of:

(i) Part 190 of this chapter, "Environmental Radiation Protection Standards for Nuclear Power Operations" and

(ii) Part 440 of this chapter, "Ore Mining and Dressing Point Source Category: Effluent Limitations Guidelines and New Source Performance Standards, Subpart C, Uranium, Radium, and Vanadium Ores Subcategory."

(6) The regulatory agency, in conformity with Federal Radiation Protection Guidance (FR, May 18, 1960, pgs. 4402–4403), shall make every effort to maintain radiation doses from radon emissions from surface impoundments of uranium byproduct materials as far below the Federal Radiation Protection Guides as is practicable at each licensed site.

(b) *Standards for application after the closure period.* At the end of the closure period:

(1) Disposal areas shall each comply with the closure performance standard in § 264.111 of this chapter with respect to nonradiological hazards and shall be designed[1] to provide reasonable assurance of control of radiological hazards to

(i) Be effective for one thousand years, to the extent reasonably achievable, and, in any case, for at least 200 years, and,

(ii) Limit releases of radon-222 from uranium byproduct materials to the atmosphere so as to not exceed an average[2] release rate of 20 picocuries per square meter per second (pCi/m^2s).

(2) The requirements of § 192.32(b)(1) shall not apply to any portion of a licensed and/or disposal site which contains a concentration of radium-226 in land, averaged over areas of 100 square meters, which, as a result of uranium byproduct material, does not exceed the background level by more than:

(i) 5 picocuries per gram (pCi/g), averaged over the first 15 centimeters (cm) below the surface, and

(ii) 15 pCi/g, averaged over 15 cm thick layers more than 15 cm below the surface.

[48 FR 45946, Oct. 7, 1983, as amended at 58 FR 60355–60356, Nov. 15, 1993]

§ 192.33 Corrective action programs.

If the ground water standards established under provisions of § 192.32(a)(2) are exceeded at any licensed site, a corrective action program as specified in § 264.100 of this chapter shall be put into operation as soon as is practicable, and in no event later than eighteen (18) months after a finding of exceedance.

§ 192.34 Effective date.

Subpart D shall be effective December 6, 1983.

TABLE A TO SUBPART D

	pCi/liter
Combined radium-226 and radium-228	5
Gross alpha-particle activity (excluding radon and uranium)	15

Subpart E—Standards for Management of Thorium Byproduct Materials Pursuant to Section 84 of the Atomic Energy Act of 1954, as Amended

SOURCE: 48 FR 45947, Oct. 7, 1983, unless otherwise noted.

§ 192.40 Applicability.

This subpart applies to the management of thorium byproduct materials under section 84 of the Atomic Energy Act of 1954, as amended, during and following processing of thorium ores, and to

[1] The standard applies to design with a monitoring requirement as specified in § 192.32(a)(4).

[2] This average shall apply to the entire surface of each disposal area over periods of at least one year, but short compared to 100 years. Radon will come from both uranium byproduct materials and from covering materials. Radon emissions from covering materials should be estimated as part of developing a closure plan for each site. The standard, however, applies only to emissions from uranium byproduct materials to the atmosphere.

restoration of disposal sites following any use of such sites under section 83(b)(1)(B) of the Act.

§ 192.41 Provisions.

Except as otherwise noted in § 192.41(e), the provisions of subpart D of this part, including §§ 192.31, 192.32, and 192.33, shall apply to thorium byproduct material and:

(a) Provisions applicable to the element uranium shall also apply to the element thorium;

(b) Provisions applicable to radon-222 shall also apply to radon-220; and

(c) Provisions applicable to radium-226 shall also apply to radium-228.

(d) Operations covered under § 192.32(a) shall be conducted in such a manner as to provide reasonable assurance that the annual dose equivalent does not exceed 25 millirems to the whole body, 75 millirems to the thyroid, and 25 millirems to any other organ of any member of the public as a result of exposures to the planned discharge of radioactive materials, radon-220 and its daughters excepted, to the general environment.

(e) The provisions of § 192.32(a) (3) and (4) do not apply to the management of thorium byproduct material.

[48 FR 45946, Oct. 7, 1983, as amended at 58 FR 60356, Nov. 15, 1993]

§ 192.42 Substitute provisions.

The regulatory agency may, with the concurrence of EPA, substitute for any provisions of § 192.41 of this subpart alternative provisions it deems more practical that will provide at least an equivalent level of protection for human health and the environment.

§ 192.43 Effective date.

Subpart E shall be effective December 6, 1983.

APPENDIX I TO PART 192—LISTED CONSTITUENTS

Acetonitrile
Acetophenone (Ethanone, 1-phenyl)
2-Acetylaminofluorene (Acetamide, N-9H-fluoren-2-yl-)
Acetyl chloride
1-Acetyl-2-thiourea (Acetamide, N-(aminothioxymethyl)-)
Acrolein (2-Propenal)
Acrylamide (2-Propenamide)
Acrylonitrile (2-Propenenitrile)
Aflatoxins
Aldicarb (Propenal, 2-methyl-2-(methylthio)-,O-[(methylamino)carbonyl]oxime
Aldrin (1,4:5,8-Dimethanonaphthalene, 1,2,3,4,10,10-hexachloro-1,4,4a,5,8,8a-hexahydro(1α,4α,4aβ,5α,8α,8aβ)-)
Allyl alcohol (2-Propen-1-ol)
Allyl chloride (1-Propane,3-chloro)
Aluminum phosphide
4-Aminobiphenyl ([1,1'-Biphenyl]-4-amine)
5-(Aminomethyl)-3-isoxazolol (3(2H)-Isoxazolone,5-(aminomethyl)-)
4-Aminopyridine (4-Pyridineamine)
Amitrole (1H-1,2,4-Triazol-3-amine)
Ammonium vanadate (Vanadic acid, ammonium salt)
Aniline (Benzenamine)
Antimony and compounds, N.O.S.[1]
Aramite (Sulfurous acid, 2-chloroethyl 2-[4-(1,1-dimethylethyl)phenoxy]-1-methylethyl ester)
Arsenic and compounds, N.O.S.
Arsenic acid (Arsenic acid H_3AsO_4)
Arsenic pentoxide (Arsenic oxide As_2O_5)
Auramine (Benzamine, 4,4'-carbonimidoylbis[N,N-dimethyl-])
Azaserine (L-Serine, diazoacetate (ester))
Barium and compounds, N.O.S.
Barium cyanide
Benz[c]acridine (3,4-Benzacridine)
Benz[a]anthracene (1,2-Benzanthracene)
Benzal chloride (Benzene, dichloromethyl-)
Benzene (Cyclohexatriene)
Benzenearsonic acid (Arsenic acid, phenyl-)
Benzidine ([1,1'-Biphenyl]-4,4'-diamine)
Benzo[b]fluoranthene (Benz[e]acephananthrylene)
Benzo[j]fluoranthene
Benzo[k]fluoranthene
Benzo[a]pyrene
p-Benzoquinone (2,5-Cyclohexadiene-1,4-dione)
Benzotrichloride (Benzene, (trichloromethyl)-)
Benzyl chloride (Benzene, (chloromethyl)-)
Beryllium and compounds, N.O.S.
Bromoacetone (2-Propanone, 1-bromo-)
Bromoform (Methane, tribromo-)
4-Bromophenyl phenyl ether (Benzene, 1-bromo-4-phenoxy-)
Brucine (Strychnidin-10-one, 2,3-dimethoxy-)
Butyl benzyl phthalate (1,2-Benzenedicarbozylic acid, butyl phenylmethyl ester)
Cacodylic acid (Arsinic acid, dimethyl)
Cadmium and compounds, N.O.S.
Calcium chromate (Chromic acid H_2CrO_4, calcium salt)
Calcium cyanide ($Ca(CN)_2$)
Carbon disulfide
Carbon oxyfluoride (Carbonic difluoride)
Carbon tetrachloride (Methane, tetrachloro-)
Chloral (Acetaldehyde, trichloro-)
Chlorambucil (Benzenebutanoic acid, 4-[bis(2-chloroethyl)amino]-)
Chlordane (4,7-Methano-1H-indene,1,2,4,5,6,7,8,8-octachloro-2,3,3a,4,7,7a-hexahydro-)
Chlorinated benzenes, N.O.S.
Chlorinated ethane, N.O.S.
Chlorinated fluorocarbons, N.O.S.
Chlorinated naphthalene, N.O.S.
Chlorinated phenol, N.O.S.
Chlornaphazin (Naphthalenamine, N,N'-bis(2-chlorethyl)-)
Chloroacetaldehyde (Acetaldehyde, chloro-)
Chloroalkyl ethers, N.O.S.
p-Chloroaniline (Benzenamine, 4-chloro-)
Chlorobenzene (Benzene, chloro-)
Chlorobenzilate (Benzeneacetic acid, 4-chloro-α-(4-chlorophenyl)-α-hydroxy-, ethyl ester)

[1] The abbreviation N.O.S. (not otherwise specified) signifies those members of the general class not specifically listed by name in this appendix.

p-Chloro-m-cresol (Phenol, 4-chloro-3-methyl)
2-Chloroethyl vinyl ether (Ethene, (2-chloroethoxy)-)
Chloroform (Methane, trichloro-)
Chloromethyl methyl ether (Methane, chloromethoxy-)
β-Chloronapthalene (Naphthalene, 2-chloro-)
o-Chlorophenol (Phenol, 2-chloro-)
1-(o-Chlorophenyl)thiourea (Thiourea, (2-chlorophenyl-))
3-Chloropropionitrile (Propanenitrile, 3-chloro-)
Chromium and compounds, N.O.S.
Chrysene
Citrus red No. 2 (2-Naphthalenol, 1-[(2,5-dimethoxyphenyl)azo]-)
Coal tar creosote
Copper cyanide (CuCN)
Creosote
Cresol (Chresylic acid) (Phenol, methyl-)
Crotonaldehyde (2-Butenal)
Cyanides (soluble salts and complexes), N.O.S.
Cyanogen (Ethanedinitrile)
Cyanogen bromide ((CN)Br)
Cyanogen chloride ((CN)Cl)
Cycasin (beta-D-Glucopyranoside, (methyl-ONN-azoxy)methyl)
2-Cyclohexyl-4,6-dinitrophenol (Phenol, 2-cyclohexyl-4,6-dinitro-)
Cyclophosphamide (2H-1,3,2-Oxazaphosphorin-2-amine,N,N-bis(2-chloroethyl) tetrahydro-,2-oxide)
2,4-D and salts and esters (Acetic acid, (2,4-dichlorophenoxy)-)
Daunomycin (5,12-Naphthacenedione,8-acetyl-10-[(3-amino-2,3,6-trideoxy-α-Llyxo-hexopyranosyl)oxy]-7,8,9,10-tetrahydro-6,8,11-trihydroxy-1-methoxy-,(8S-cis))
DDD (Benzene, 1,1'-(2,2-dichloroethylidene)bis[4-chloro-)
DDE (Benzene, 1,1-(dichloroethylidene)bis[4-chloro-)
DDT (Benzene, 1,1'-(2,2,2-trichloroethlyidene)bis[4-chloro-)
Diallate (Carbomothioic acid, bis(1-methylethyl)-,S-(2,3-dichloro-2-propenyl) ester)
Dibenz[a,h]acridine
Dibenz[a,j]acridine
Dibenz[a,h]anthracene
7H-Dibenzo[c,g]carbazole
Dibenzo[a,e]pyrene (Naphtho[1,2,4,5-def)crysene)
Dibenzo[a,h]pyrene (Dibenzo[b,def]crysene)
Dibenzo[a,i]pyrene (Benzo[rst]pentaphene)
1,2-Dibromo-3-chloropropane (Propane, 1,2-dibromo-3-chloro-)
Dibutylphthalate (1,2-Benzenedicarboxylic acid, dibutyl ester)
o-Dichlorobenzene (Benzene, 1,2-dichloro-)
m-Dichlorobenzene (Benzene, 1,3-dichloro-)
p-Dichlorobenzene (Benzene, 1,4-dichloro-)
Dichlorobenzene, N.O.S. (Benzene; dichloro-, N.O.S.)
3,3'-Dichlorobenzidine ([1,1'-Biphenyl]-4,4'-diamine, 3,3'-dichloro-)
1,4-Dichloro-2-butene (2-Butene, 1,4-dichloro-)
Dichlorodifluoromethane (Methane, dichlorodifluoro-)
Dichloroethylene, N.O.S.
1,1-Dichloroethylene (Ethene, 1,1-dichloro-)
1,2-Dichloroethylene (Ethene, 1,2-dichloro-,(E)-)
Dichloroethyl ether (Ethane, 1,1'-oxybis[2-chloro-)
Dichloroisopropyl ether (Propane, 2,2'-oxybis[2-chloro-)
Dichloromethoxy ethane (Ethane, 1,1'-[methylenebis(oxy)bis[2-chloro-)
Dichloromethyl ether (Methane, oxybis[chloro-)
2,4-Dichlorophenol (Phenol, 2,4-dichloro-)
2,6-Dichlorophenol (Phenol, 2,6-dichloro-)
Dichlorophenylarsine (Arsinous dichloride, phenyl-)
Dichloropropane, N.O.S. (Propane, dichloro-,)
Dichloropropanol, N.O.S. (Propanol, dichloro-,)
Dichloropropene; N.O.S. (1-Propane, dichloro-,)
1,3-Dichloropropene (1-Propene, 1,3-dichloro-)
Dieldrin (2,7:3,6-Dimethanonaphth[2,3-b]oxirene,3,4,5,6,9,9-hexachloro-1a,2,2a,3,6,6a,7,7a,octahydro-,(1aα,2β,2aα,3β,6β,6aα,7β,7aα)-)
1,2:3,4-Diepoxybutane (2,2'-Bioxirane)
Diethylarsine (Arsine, diethyl-)
1,4 Diethylene oxide (1,4-Dioxane)
Diethylhexyl phthalate (1,2-Benzenedicarboxlyic acid, bis(2-ethylhexl) ester)
N,N-Diethylhydrazine (Hydrazine, 1,2-diethyl)
O,O-Diethyl S-methyl dithiophosphate (Phosphorodithioic acid, O,O-diethyl S-methyl ester)
Diethyl-p-nitrophenyl phosphate (Phosphoric acid, diethyl 4-nitrophenyl ester)
Diethyl phthalate (1,2-Benzenedicarboxylic acid, diethyl ester)
O,O-Diethyl O-pyrazinyl phosphorothioate (Phosphorothioic acid, O,O-diethyl O-pyrazinyl ester)
Diethylstilbesterol (Phenol, 4,4'-(1,2-diethyl-1,2-ethenediyl)bis-,(E)-)
Dihydrosafrole (1,3-Benxodioxole, 5-propyl-)
Diisopropylfluorophosphate (DFP) (Phosphorofluoridic acid, bis(1-methyl ethyl) ester)
Dimethoate (Phosphorodithioic acid, O,O-dimethyl S-[2-(methylamino) 2-oxoethyl] ester)
3,3'-Dimethoxybenzidine ([1,1'-Biphenyl]-4,4'-diamine, 3,3'-dimethoxy-)
p-Dimethylaminoazobenzene (Benzenamine, N,N-dimethyl-4-(phenylazo)-)
7,12-Dimethylbenz[a]anthracene (Benz[a]anthracene, 7,12-dimethyl-)
3,3'-Dimethylbenzidine ([1,1'-Biphenyl]-4,4'-diamine, 3,3'-dimethyl-)
Dimethylcarbamoyl chloride (carbamic chloride, dimethyl-)
1,1-Dimethylhydrazine (Hydrazine, 1,1-dimethyl-)
1,2-Dimethylhydrazine (Hydrazine, 1,2-dimethyl-)
α,α-Dimethylphenethylamine (Benzeneethanamine, α,α-dimethyl-)
2,4-Dimethylphenol (Phenol, 2,4-dimethyl-)
Dimethylphthalate (1,2-Benzenedicarboxylic acid, dimethyl ester)
Dimethyl sulfate (Sulfuric acid, dimethyl ester)
Dinitrobenzene, N.O.S. (Benzene, dinitro-)
4,6 Dinitro-o-cresol and salts (Phenol, 2-methyl-4,6-dinitro-)
2,4-Dinitrophenol (Phenol, 2,4-dinitro-)
2,4-Dinitrotoluene (Benzene, 1-methyl-2,4-dinitro-)
2,6-Dinitrotoluene (Benzene, 2-methyl-1,3-dinitro-)
Dinoseb (Phenol, 2-(1-methylpropyl)-4,6-dinitro-)
Di-n-octyl phthalate (1,2-Benzenedicarboxylic acid, dioctyl ester)
1,4-Dioxane (1,4-Diethyleneoxide)
Diphenylamine (Benzenamine, N-phenyl-)
1,2-Diphenylhydrazine (Hydrazine, 1,2-diphenyl-)
Di-n-propylnitrosamine (1-Propanamine,N-nitroso-N-propyl-)

Disulfoton (Phosphorodithioic acid, O,O-diethyl S-[2-(ethylthio)ethyl] ester)
Dithiobiuret (Thioimidodicarbonic diamide [$(H_2N)C(S)]_2NH$)
Endosulfan (6,9,Methano-2,4,3-benzodioxathiepin,6,7,8,9,10,10-hexachloro-1,5,5a,6,9,9ahexahydro,3-oxide)
Endothall (7-Oxabicyclo[2.2.1]heptane-2,3-dicarboxylic acid)
Endrin and metabolites (2,7:3,6-Dimethanonaphth[2,3-b]oxirene,3,4,5,6,9,9-hexachloro1a,2,2a,3,6,6a,7,7a-octahydro,(1aα,2β,2aβ,3α,6α,6aβ,7β,7aα)-)
Epichlorohydrin (Oxirane, (chloromethyl)-)
Epinephrine (1,2-Benzenediol,4-[1-hydroxy-2-(methylamino)ethyl]-,(R)-,)
Ethyl carbamate (urethane) (Carbamic acid, ethyl ester)
Ethyl cyanide (propanenitrile)
Ethylenebisdithiocarbamic acid, salts and esters (Carbamodithioic acid, 1,2-Ethanediylbis-)
Ethylene dibromide (1,2-Dibromoethane)
Ethylene dichloride (1,2-Dichloroethane)
Ethylene glycol monoethyl ether (Ethanol, 2-ethoxy-)
Ethyleneimine (Aziridine)
Ethylene oxide (Oxirane)
Ethylenethiourea (2-Imidazolidinethione)
Ethylidene dichloride (Ethane, 1,1-Dichloro-)
Ethyl methacrylate (2-Propenoic acid, 2-methyl-, ethyl ester)
Ethylmethane sulfonate (Methanesulfonic acid, ethyl ester)
Famphur (Phosphorothioic acid, O-[4-[(dimethylamino)sulphonyl]phenyl] O,O-dimethyl ester)
Fluoranthene
Fluorine
Fluoroacetamide (Acetamide, 2-fluoro-)
Fluoroacetic acid, sodium salt (Acetic acid, fluoro-, sodium salt)
Formaldehyde (Methylene oxide)
Formic acid (Methanoic acid)
Glycidylaldehyde (Oxiranecarboxyaldehyde)
Halomethane, N.O.S.
Heptachlor (4,7-Methano-1H-indene, 1,4,5,6,7,8,8-heptachloro-3a,4,7,7a-tetrahydro-)
Heptachlor epoxide (α, β, and γ isomers) (2,5-Methano-2H-indeno[1,2-b]-oxirene, 2,3,4,5,6,7,7-heptachloro-1a,1b,5,5a,6,6a-hexa-hydro-,(1aα,1bβ,2α,5α,5aβ,6β,6aα)-)
Hexachlorobenzene (Benzene, hexachloro-)
Hexachlorobutadiene (1,3-Butadiene, 1,1,2,3,4,4-hexachloro-)
Hexachlorocyclopentadiene (1,3-Cyclopentadiene, 1,2,3,4,5,5-hexachloro-)
Hexachlorodibenzofurans
Heptachlorodibenzo-p-dioxins
Hexachloroethane (Ethane, hexachloro-)
Hexachlorophene (phenol, 2,2'-Methylenebis[3,4,6-trichloro-)
Hexachloropropene (1-Propene, 1,1,2,3,3,3-hexachloro-)
Hexaethyl tetraphosphate (Tetraphosphoric acid, hexaethyl ester)
Hydrazine
Hydrocyanic acid
Hydrofluoric acid
Hydrogen sulfide (H_2S)
Indeno(1,2,3-cd)pyrene
Isobutyl alcohol (1-Propanol, 2-methyl-)
Isodrin (1,4,5,8-Dimethanonaphthalene, 1,2,3,4,10,10-hexachloro-1,4,4a,5,8,8a-hexahydro, (1α,4α,4aβ,5β,8β,8aβ)-)
Isosafrole (1,3-Benzodioxole, 5-(1-propenyl)-)
Kepone (1,3,4-Metheno-2H-cyclobuta[cd]pentalen-2-one, 1,1a,3,3a,4,5,5,5a,5b,6-decachlorooctahydro-)
Lasiocarpine (2-Butenoic acid, 2-methyl-,7-[[2,3-dihydroxy-2-(1-methoxyethyl)-3-methyl-1-oxobutoxy]methyl]-2,3,5,7a-tetrahydro-1H-pyrrolizin-1-yl ester)
Lead and compounds, N.O.S.
Lead acetate (Acetic acid, lead(2+) salt)
Lead phosphate (Phosphoric acid, lead(2+) salt(2:3))
Lead subacetate (Lead, bis(acetato-O)tetrahydroxytri-)
Lindane (Clohexane, 1,2,3,4,5,6-hexachloro-, (1α,2α,3β,4α,5α,6β)-)
Maleic anhydride (2,5-Furandione)
Maleic hydrazide (3,6-Pyridazinedione, 1,2-dihydro-)
Malononitrile (Propanedinitrile)
Melphalan (L-Phenylalanine, 4-[bis(2-chloroethyl)amino]-)
Mercury and compounds, N.O.S.
Mercury fulminate (Fulminic acid, mercury(2+) salt)
Methacrylonitrile (2-Propenenitrile, 2-methyl-)
Methapyrilene (1,2-Ethanediamine, N,N-dimethyl-N'-2-pyridinyl-N'-(2-thienylmethyl)-)
Methomyl (Ethamidothioic acid, N-[[(methylamino)carbonyl]oxy]thio-, methyl ester)
Methoxychlor (Benzene, 1,1'-(2,2,2-trichloroethylidene)bis[4-methoxy-)
Methyl bromide (Methane, bromo-)
Methyl chloride (Methane, chloro-)
Methyl chlorocarbonate (Carbonchloridic acid, methyl ester)
Methyl chloroform (Ethane, 1,1,1-trichloro-)
3-Methylcholanthrene (Benz[j]aceanthrylene, 1,2-dihydro-3-methyl-)
4,4'-Methylenebis(2-chloroaniline) (Benzenamine, 4,4'-methylenebis(2-chloro-)
Methylene bromide (Methane, dibromo-)
Methylene chloride (Methane, dichloro-)
Methyl ethyl ketone (MEK) (2-Butanone)
Methyl ethyl ketone peroxide (2-Butanone, peroxide)
Methyl hydrazine (Hydrazine, methyl-)
Methyl iodide (Methane, iodo-)
Methyl isocyanate (Methane, isocyanato-)
2-Methyllactonitrile (Propanenitrile, 2-hydroxy-2-methyl-)
Methyl methacrylate (2-Propenoic acid, 2-methyl-, methyl ester)
Methyl methanesulfonate (Methanesulfonic acid, methyl ester)
Methyl parathion (Phosphorothioic acid, O,O-dimethyl O-(4-nitrophenyl) ester)
Methylthiouracil (4(1H)Pyrimidinone, 2,3-dihydro-6-methyl-2-thioxo-)
Mitomycin C (Azirino[2',3':3,4]pyrrolo[1,2-a]indole-4,7-dione,6-amino-8-[[(aminocarbonyl) oxy]methyl]-1,1a,2,8,8a,8b-hexahydro-8a-methoxy-5-methy-, [1aS-(1aα,8β,8aα,8bα)]-)
MNNG (Guanidine, N-methyl-N'-nitro-N-nitroso-)
Mustard gas (Ethane, 1,1'-thiobis[2-chloro-)
Naphthalene
1,4-Naphthoquinone (1,4-Naphthalenedione)
α-Naphthalenamine (1-Naphthylamine)
β-Naphthalenamine (2-Naphthylamine)
α-Naphthylthiourea (Thiourea, 1-naphthalenyl-)

Nickel and compounds, N.O.S.
Nickel carbonyl ($Ni(CO)_4$ (T-4)-)
Nickel cyanide ($Ni(CN)_2$)
Nicotine and salts (Pyridine, 3-(1-methyl-2-pyrrolidinyl)-, (S)-)
Nitric oxide (Nitrogen oxide NO)
p-Nitroaniline (Benzenamine, 4-nitro-)
Nitrobenzene (Benzene, nitro-)
Nitrogen dioxide (Nitrogen oxide NO_2)
Nitrogen mustard, and hydrochloride salt (Ethanamine, 2-chloro-N-(2-chloroethyl)-N-methyl-)
Nitrogen mustard N-oxide and hydrochloride salt (Ethanamine, 2chloro-N-(2-chloroethyl)N-methyl-, N-oxide)
Nitroglycerin (1,2,3-Propanetriol, trinitrate)
p-Nitrophenol (Phenol, 4-nitro-)
2-Nitropropane (Propane, 2-nitro-)
Nitrosamines, N.O.S.
N-Nitrosodi-n-butylamine (1-Butanamine, N-butyl-N-nitroso-)
N-Nitrosodiethanolamine (Ethanol, 2,2'-(nitrosoimino)bis-)
N-Nitrosodiethylamine (Ethanamine, N-ethyl-N-nitroso-1)
N-Nitrosodimethylamine (Methanamine, N-methyl-N-nitroso-)
N-Nitroso-N-ethylurea (Urea, N-ethyl-N-nitroso-)
N-Nitrosomethylethylamine (Ethanamine, N-methyl-N-nitroso-)
N-Nitroso-N-methylurea (Urea, N-methyl-N-nitroso-)
N-Nitroso-N-methylurethane (Carbamic acid, methylnitroso-, ethyl ester)
N-Nitrosomethylvinylamine (Vinylamine, N-methyl-N-nitroso-)
N-Nitrosomorpholine (Morpholine, 4-nitroso-)
N-Nitrosonornicotine (Pyridine, 3-(1-nitroso-2-pyrrolidinyl)-, (S)-)
N-Nitrosopiperidine (Piperidine, 1-nitroso-)
Nitrosopyrrolidine (Pyrrolidine, 1-nitroso-)
N-Nitrososarcosine (Glycine, N-methyl-N-nitroso-)
5-Nitro-o-toluidine (Benzenamine, 2-methyl-5-nitro-)
Octamethylpyrophosphoramide (Diphosphoramide, octamethyl-)
Osmium tetroxide (Osmium oxide OsO_4, (T-4)-)
Paraldehyde (1,3,5-Trioxane, 2,4,6-tri methyl-)
Parathion (Phosphorothioic acid, O,O-diethyl O-(4-nitrophenyl) ester)
Pentachlorobenzene (Benzene, pentachloro-)
Pentachlorodibenzo-p-dioxins
Pentachlorodibenzofurans
Pentachloroethane (Ethane, pentachloro-)
Pentachloronitrobenzene (PCNB) (Benzene, pentachloronitro-)
Pentachlorophenol (Phenol, pentachloro-)
Phenacetin (Acetamide, N-(4-ethoxyphenyl)-)
Phenol
Phenylenediamine (Benzenediamine)
Phenylmercury acetate (Mercury, (acetato-O)phenyl-)
Phenylthiourea (Thiourea, phenyl-)
Phosgene (Carbonic dichloride)
Phosphine
Phorate (Phosphorodithioic acid, O,O-diethyl S-[(ethylthiomethyl] ester)
Phthalic acid esters, N.O.S.
Phthalic anhydride (1,3-isobenzofurandione)
2-Picoline (Pyridine, 2-methyl-)
Polychlorinated biphenyls, N.O.S.
Potassium cyanide (K(CN))
Potassium silver cyanide (Argentate(1-), bis(cyano-C)-, potassium)
Pronamide (Benzamide, 3,5-dichloro-N-(1,1-dimethyl-2-propynyl)-)
1,3-Propane sultone (1,2-Oxathiolane, 2,2-dioxide)
n-Propylamine (1-Propanamine)
Propargyl alcohol (2-Propyn-1-ol)
Propylene dichloride (Propane, 1,2-dichloro-)
1,2-Propylenimine (Aziridine, 2-methyl-)
Propylthiouracil (4(1H)-Pyrimidinone, 2,3-dihydro-6-propyl-2-thioxo-)
Pyridine
Reserpinen (Yohimban-16-carboxylic acid, 11,17-dimethoxy-18-[(3,4,5-trimethoxybenzoyl)oxy]-smethyl ester, (3β,16 β,17α,18β,20α)-)
Resorcinol (1,3-Benzenediol)
Saccharin and salts (1,2-Benzisothiazol-3(2H)-one, 1,1-dioxide)
Safrole (1,3-Benzodioxole, 5-(2-propenyl)-)
Selenium and compounds, N.O.S.
Selenium dioxide (Selenious acid)
Selenium sulfide (SeS_2)
Selenourea
Silver and compounds, N.O.S.
Silver cyanide (Silver cyanide Ag(CN))
Silvex (Propanoic acid, 2-(2,4,5-trichlorophen oxy)-)
Sodium cyanide (Sodium cyanide Na(CN))
Streptozotocin (D-Glucose, 2-deoxy-2-[[methylnitrosoamino)carbonyl]amino]-)
Strychnine and salts (Strychnidin-10-one)
TCDD (Dibenzo[b,e][1,4]dioxin, 2,3,7,8-tetrachloro-)
1,2,4,5-Tetrachlorobenzene (Benzene, 1,2,4,5-tetrachloro-)
Tetrachlorodibenzo-p-dioxins
Tetrachlorodibenxofurans
Tetrachloroethane, N.O.S. (Ethane, tetrachloro-, N.O.S.)
1,1,1,2-Tetrachloroethane (Ethane, 1,1,1,2-tetrachloro-)
1,1,2,2-Tetrachloroethane (Ethane, 1,1,2,2-tetrachloro-)
Tetrachloroethylene (Ethene, tetrachloro-)
2,3,4,6-Tetrachlorophenol (Phenol, 2,3,4,6-tetrachloro-)
Tetraethyldithiopyrophosphate (Thiodiphosphoric acid, tetraethyl ester)
Tetraethyl lead (Plumbane, tetraethyl-)
Tetraethyl pyrophosphate (Diphosphoric acid, tetraethyl ester)
Tetranitromethane (Methane, tetranitro-)
Thallium and compounds, N.O.S.
Thallic oxide (Thallium oxide Tl_2O_3)
Thallium (I) acetate (Acetic acid, thallium (1+) salt)
Thallium (I) carbonate (Carbonic acid, dithallium (1+) salt)
Thallium (I) chloride (Thallium chloride TlCl)
Thallium (I) nitrate (Nitric acid, thallium (1+) salt)
Thallium selenite (Selenius acid, dithallium (1+) salt)
Thallium (I) sulfate (Sulfuric acid, thallium (1+) salt)
Thioacetamide (Ethanethioamide)
3,Thiofanox (2-Butanone, 3,3-dimethyl-1-(methylthio)-, O-[(methylamino)carbonyl] oxime)
Thiomethanol (Methanethiol)
Thiophenol (Benzenethiol)
Thiosemicarbazide (Hydrazinecarbothioamide)
Thiourea
Thiram (Thioperoxydicarbonic diamide $[(H_2N)C(S)]2S_2$, tetramethyl-)

Toluene (Benzene, methyl-)
Toluenediamine (Benzenediamine, ar-methyl-)
Toluene-2,4-diamine (1,3-Benzenediamine, 4-methyl-)
Toluene-2,6-diamine (1,3-Benzenediamine, 2-methyl-)
Toluene-3,4-diamine (1,2-Benzenediamine, 4-methyl-)
Toluene diisocyanate (Benzene, 1,3-diisocyanatomethyl-)
o-Toluidine (Benzenamine, 2-methyl-)
o-Toluidine hydrochloride (Benzenamine, 2-methyl-, hydrochloride)
p-Toluidine (Benzenamine, 4-methyl-)
Toxaphene
1,2,4-Trichlorobenzene (Benzene, 1,2,4-trichloro-)
1,1,2-Trichloroethane (Ethane, 1,1,2-trichloro-)
Trichloroethylene (Ethene,trichloro-)
Trichloromethanethiol (Methanethiol, trichloro-)
Trichloromonofluoromethane (Methane, trichlorofluoro-)
2,4,5-Trichlorophenol (Phenol, 2,4,5-trichloro-)
2,4,6-Trichlorophenol (Phenol, 2,4,6-trichloro-)
2,4,5-T (Acetic acid, 2,4,5- trichlorophenoxy-)
Trichloropropane, N.O.S.
1,2,3-Trichloropropane (Propane, 1,2,3-trichloro-)
O,O,O-Triethyl phosphorothioate (Phosphorothioic acid, O,O,O-triethyl ester)
Trinitrobenzene (Benzene, 1,3,5-trinitro-)
Tris(1-aziridinyl)phosphine sulfide (Aziridine, 1,1',1''phosphinothioylidynetris-))
Tris(2,3-dibromopropyl) phosphate (1-Propanol, 2,3-dibromo-, phosphate (3:1))
Trypan blue (2,7-Naphthalendisulfonic acid, 3,3'-[(3,3'-dimethyl[1,1'-biphenyl]-4,4'-diyl)bis(azo)]bis(5-amino-4-hydroxy-, tetrasodium salt)
Uracil mustard (2,4-(1H,3H)-Pyrimidinedione, 5-[bis(2-chloroethyl)amino]-)
Vanadium pentoxide (Vanadium oxide V_2O_5)
Vinyl chloride (Ethene, chloro-)
Wayfarin (2H-1-Benzopyran-2-one, 4-hydroxy-3-(3-oxo-1-phenlyhutyl)-)
Zinc cyanide ($Zn(CN)_2$)
Zinc phosphide (Zn_3P_2)

[60 FR 2868, Jan. 11, 1995]

NUCLEAR REGULATORY COMMISSION

DRAFT GUIDANCE ON THE BENCHMARK DOSE MODELING FOR THE RADIOLOGICAL CRITERIA FOR LICENSE TERMINATION OF URANIUM RECOVERY FACILITIES

AGENCY: U.S. NUCLEAR REGULATORY COMMISSION

ACTION: NOTICE OF AVAILABILITY; OPPORTUNITY FOR COMMENT

SUMMARY: The U.S. Nuclear Regulatory Commission (NRC) is soliciting comments on draft guidance for the radium benchmark dose approach, associated with the final rule,"Radiological Criteria for License Termination of Uranium Recovery Facilities," that is in this publication. The guidance will be incorporated into the NRC final Standard Review Plan (SRP) for the Review of Reclamation Plans for Mill Tailings Sites and the SRP for In-Situ Leach Uranium Extraction License Applications. Public comments should be submitted within sixty (60) days of publication of this Notice.

SUPPLEMENTARY INFORMATION:

Background

In 10 CFR 40.4, uranium milling is defined as any activity resulting in byproduct material(1). Therefore, Part 40, Appendix A, applies to in situ leach (ISL), heap leach, and ion-exchange facilities (i.e., uranium recovery (UR) facilities) that produce byproduct material, as well as to conventional uranium and thorium mills. The draft guidance only addresses UR facilities because there are no currently licensed or planned thorium mills.

Decommissioning of ISLs and mills are similar in that the type of soil and building contamination is the same, consisting mainly of residual radium (Ra-226) and uranium (U-nat). The applicable cleanup standards for soil radium in Criterion 6 (6) address the main contaminant at uranium mills in the large areas (hundreds of acres) where windblown contamination from the tailings pile has occurred, and at ISLs in holding/settling ponds and process solution spills. In other mill and ISL site areas proximate to locations where radium contamination exists (e.g., under the mill or process building or in a yellowcake storage area), uranium would be the radionuclide of concern. Thorium (Th-230, the parent of Ra-226) would be the radionuclide of concern at some mill raffinate evaporation ponds.

Because Part 40, Appendix A, provides only decommissioning soil radium(2) and ground-water protection criteria, Criterion 6 (6) was amended to address criteria for residual radionuclides, other than radium in soil, for decommissioning of lands and structures at UR facilities. The final rule,"Radiological Criteria for License Termination of Uranium Recovery Facilities," added a paragraph after the radium in soil criteria in Criterion 6(6), to read:

Byproduct material containing concentrations of radionuclides other than radium in soil, and surface activity on remaining structures, must not result in a total effective dose equivalent (TEDE) exceeding the dose from cleanup of radium contaminated soil to the above standard (benchmark dose), and must be at levels which are as low as is reasonably achievable. If more that one residual radionuclide is present in the same 100-square-meter area, the sum of the ratios for each radionuclide, of concentration present to the concentration limit, will not exceed "1" (unity). A calculation of the peak potential annual TEDE within 1000 years to the average member of the critical group that would result from applying the radium standard (not including radon) on the site, must be submitted for approval. If the benchmark dose, before application of ALARA, exceeds 100 mrem/yr, the staff will consult the Commission before approving the

decommissioning plan. This requirement for dose criteria does not apply to sites that have decommissioning plans for soil and structures approved before the effective date of this rule.

The final rule, "Radiological Criteria for License Termination of Uranium Recovery Facilities," requires the use of the soil radium standard to develop a site-specific dose benchmark for the cleanup of residual radionuclides, other than radium, at UR sites. The radium benchmark approach ensures that the dose limit across the UR site will be equal for all radionuclides (other than radon).

The NRC-licensed sites subject to the new rule currently include four uranium mills (one operating, others in stand-by status), seven in situ leach (ISL) facilities, and any new UR facility licensed by NRC after promulgation of the rule (two ISL license applications are under review at NRC, also in the Agreement States, several ISLs in Texas could be affected by the rule). These sites are located in semi-arid (7-15 inches (18-39 cm) of precipitation), high evapo-transpiration, sparsely populated (1-5 people per sq. mile (0.4-3 per sq. km)) areas of New Mexico, Utah, Wyoming, and Nebraska. The land use around these facilities is predominately mining and ranching, and the potable water aquifer is usually 100-200 feet deep. Also, many of the sites have natural (in situ) uranium and/or radium deposits or mine pits that create a wide range of radium, thorium and uranium background values. Because of these unique properties and the specific regulations in 10 CFR Part 40, Appendix A, the UR facilities are exempt from the decommissioning criteria in Part 20 Subpart E, as specified in Section 20.1401(a).

The benchmark dose applies to surface cleanup (buildings or the top 15 cm (6 inches) of soil) of radionuclides other than radium and it is the estimated dose resulting from cleanup of areas to 5 pCi/g (0.19 Bq/g) Ra-226 at that site. For the small areas requiring the use of the radium subsurface soil standard, the estimated dose resulting from 15 pCi/g (0.56 Bq/g)

Ra-226 at that site and for those areas, would be used. The same concept of regulation (using a Ra-228 benchmark dose) would be applicable to thorium mills, if any are licensed in the future.

The draft guidance on dose modeling and implementation of the radium benchmark approach was developed in conjunction with the final rule and the SRPs under development for uranium mill site reclamation and ISL licensing. The draft SRPs have already been published for comment as NUREG-1569 (NRC, 1997) and NUREG-1620 (NRC, 1999). After review of the comments received on the draft guidance, the final benchmark dose guidance will be incorporated into the final SRPs for UR facilities.

Draft Guidance: Standard Review Plan - Chapter 6

6.0 DECOMMISSIONING PLAN FOR SOIL AND BUILDINGS -

THE RADIUM BENCHMARK DOSE APPROACH

A mill reclamation plan, required for licensing or license renewal, generally focuses on the tailings disposal cell and contains only brief mention of anticipated decommissioning activities. The licensee submits a detailed mill or ISL decommissioning plan and a soil cleanup/verification plan for NRC approval at least six months before decommissioning is to begin. The general requirements for a decommissioning plan, and the remediation and verification of soil Ra-226 contamination cleanup are addressed in Chapter 5 of the Standard Review Plan (SRP). This chapter discusses the evaluation of the radium benchmark dose approach for the cleanup of thorium and uranium, specifically dose modeling and its application to site cleanup activities that should be addressed in the decommissioning plan.

This chapter applies to those uranium recovery (UR) facilities licensed by the NRC and subject to the new requirements for cleanup of contaminated soil and buildings under 10 CFR Part 40, Appendix A, Criterion 6(6) (as amended in 1999). The facilities that did not have an approved decommissioning plan at the time the rule became final are required to reduce residual radioactivity, i.e., byproduct material, as defined by Part 40, to levels based on the potential dose, excluding radon, resulting from the application of the radium (Ra-226) standard at the site. This is referred to as the radium benchmark dose approach.

This chapter would also apply to any future thorium processing facilities and uranium heap leach operations, because Part 40 defines uranium milling as any activity resulting in byproduct material. This chapter also applies to any revised decommissioning plan submitted for NRC review and approval, after the final rule is effective. However, if a subject licensee can demonstrate that no contaminated buildings will remain, and that soil thorium or total uranium levels are not discernable from background, radium benchmark dose modeling is not required. Other aspects of decommissioning are addressed in Chapter 5 of this SRP.

In order for NRC staff to evaluate the radium benchmark dose modeling and the implementation of the modeling results, as proposed in the building and soil decommissioning plan, an understanding of the site conditions and site operations is essential. The required site information should be provided by the licensee, or relevant portions of previously submitted documents (e.g., environmental assessments, license renewal, reclamation plan, and characterization report) should be summarized and referenced. The information should include: (1) processes used at the facility; (2) type and location of possible contamination; (3) geologic and climatic data; and (4) surrounding land use information (also see Section 3 of Inspection Procedure 87654).

6.1 Radium Benchmark Dose Modeling

6.1.1 Areas of Review

In implementing the radium benchmark approach, the licensee calculates the peak potential dose for the site resulting from the 5 pCi/g (0.19 Bq/g) concentration of radium in the surface (top 15 cm (6 inches)) soil. The dose from the 15 pCi/g (0.56 Bq/g) subsurface radium limit would be calculated for any area that may require subsurface cleanup. The dose modeling review involves examination of the computer code or other calculations employed for the dose estimates, the code or calculation input values and assumptions, and the modeling results (data presentation).

6.1.2 Review Procedures

The radium benchmark dose modeling review consists of ascertaining that an acceptable dose modeling computer code or other type of calculation has been used; that input parameter values appropriate (reasonable considering long-term conditions and representative of the application) for the site have been used in the modeling; that a realistic (overly conservative is not acceptable as it would result in higher allowable levels of uranium or thorium which would not be ALARA) dose estimate is provided; and that the data presentation is clear and complete.

6.1.3 Acceptance Criteria

The radium benchmark dose modeling results will be acceptable if the dose assessment (modeling) meets the following criteria:

(1) Dose Modeling Codes and Calculations

The assumptions are considered reasonable for the site analysis and the calculations employed are adequate. Reference to documentation concerning the code or calculations is provided (for example, the RESRAD Handbook and Manual (Argonne, 1993a and b)).

The RESRAD code developed by the U.S. Department of Energy (version 5.82, 1998) (see website www.ead.anl.gov/resrad/html), may be acceptable for dose calculations because, while the RESRAD ground-water calculations have limitations, this does not impact the UR sites that have deep aquifers (ground-water exposure pathway is insignificant). The DandD code developed by the NRC (version 1.0, August 1998, see website ftp://nwerftp.nwer.sandia.gov/nrc/DandD/; also see the website at http://techconf.llnl.gov/radcri/dose-top.html) provides conservative default values, but does not allow for modeling subsurface soil contamination, and does not allow calculation of source removal due to soil erosion. Neither the RESRAD nor the DandD code would be adequate to model the dose from off-site contamination, but codes such as GenII would be considered. If the code or calculation's assumptions are not acceptable for site conditions, adjustments have been made in the input to adequately modify these assumptions.

The RESRAD code assumes a circular contaminated zone. The shape factor (external gamma, screen R017) must be adjusted for a non-circular-shaped area. The code or calculation provides an annual dose (total effective dose equivalent (TEDE)) estimate (mrem/yr). The DandD code provides the annual dose, but RESRAD calculates the highest instantaneous dose. However, RESRAD results are acceptable for long-lived radionuclides that do not move rapidly out of surface soils.

(2) Input Parameter Values

The code/calculation input data are appropriate for the site and represent current or long-term conditions, whichever is more applicable to the time of maximum dose. When code default values are used, they are justified as appropriate (representative) for the site. Excessive conservatism (i.e., upper bound value) is not used as this would result in a higher dose and thus higher levels of uranium and thorium would be allowed to remain on site. Previously approved MILDOS code input parameter values may not be appropriate, because derived operational doses in the restricted area may be an order of magnitude higher than acceptable doses for areas to be released for unrestricted use.

Site-specific input values are demonstrated to be average values of an adequate sample size. Confidence limits are provided for important parameters so that the level of uncertainty can be estimated for that input value. Alteration of input values considers that some values are inter-related (see draft NUREG-1549, Appendix C) (NRC, 1998a) and relevant parameters are modified accordingly. The preponderance of important parameter values are based on site measurements and not conservative estimates. One or more models consider the annual average range of parameter values likely to occur within the next 200-year time period; for important parameters that can reasonably be estimated. Some other considerations for the input parameter values are as follows:

a. Exposure Pathways and Scenarios for the Critical Group

The scenario(s) chosen to model the potential dose to the average member of the critical group[3] from residual radionuclides at the site reflects reasonable probable future land use. The licensee has considered ranching, mining, home-based business, light industry, and residential farmer scenarios, and has justified the scenarios modeled. Based on one or more of these projected (within 200 years is reasonably foreseeable) land uses to define the critical group(s), the licensee has determined and justified what exposure pathways are probable for potential exposure of the critical group to residual radionuclides at the site.

Dairies are not likely to be established in the area of former UR facilities, and even if some milk cows were to graze in contaminated areas, the milk would probably be sent for processing (thus diluted), and not be consumed at the site. Therefore, milk consumption is not a likely ingestion exposure pathway. Also, a pond in the contaminated area providing a significant quantity of fish in the resident's diet is not likely, so the aquatic exposure pathway may not have to be modeled. However, the external gamma, plant ingestion, and inhalation pathways are likely to be important.

The radon pathway is excluded from the benchmark dose calculation as defined in Criterion 6(6) of Appendix A, to 10 CFR Part 40. This also reflects the approach in the main decommissioning rule (radiological criteria for license termination, Part 20 subpart E).

b. Source Term

If the RESRAD code is used, the input includes Pb-210 at the same input value as for Ra-226. The other radium progeny are automatically included in the code calculations. The chemical form of the contamination in the environment is considered in determining input values related to transport, or inhalation class (solubility in the lung) for dose conversion factors.

c. Time Periods

The time periods for calculation of the dose from soil Ra-226 include the 1000-year time frame. The calculated maximum annual dose and the year of occurrence is provided in the results.

d. Cover and Contaminated Zone

A cover depth of zero is used in the surface contamination model and a depth of at least 15 cm (6 inches) for the subsurface model. The values for area and depth of contamination are derived from site characterization data. The erosion rate value for the contaminated zone is less than the RESRAD default value because in regions drier than normal, the erosion rate is less, as discussed in the RESRAD Data Collection Handbook (Argonne, 1993a), and the value is justified. The soil properties are based on site data (sandy loam or sandy silty loam are typical for UR sites) and other input parameters are based on this demonstration of site soil type (see RESRAD Handbook pages, 23, 29, 77, and 105).

The evapo-transpiration coefficient for the semi-arid UR sites is between 0.6 and 0.99. The precipitation value is based

on annual values averaged over at least 20 years, obtained from the site or a nearby meteorological station.

The irrigation rate value may be zero, or less than a code's default value, if supported by data on county or regional irrigation practices (e.g., irrigation water is obtained from a river not a well). The runoff coefficient value is based on the site's soil type, expected land use, and morphology of the region.

e. Saturated Zone

The dry bulk density, porosity, "b" parameter, and hydraulic conductivity values are based on local soil properties. The hydraulic gradient for an unconfined aquifer is approximately the slope of the water table. For a confined aquifer, it represents the difference in potentiometric surfaces over a unit distance.

If the RESRAD code is used, the nondispersion model parameter is chosen for areas greater than 1000 sq. meters (screen R014), and the well pump rate is based on irrigation, stock, or drinking water well pump rates in the area.

f. Uncontaminated and Unsaturated Strata

The thickness value represents the typical distance from the soil contamination to the saturated zone. Since the upper aquifer at UR sites is often of poor quality and quantity, the depth of the most shallow well used for irrigation or stock water in the region is chosen for the unsaturated zone thickness. A value of 18 meters (60 feet) is typical for most sites and 15 meters (50 feet) for the Nebraska site, but regional data are provided for justification. The density, porosity, and "b" parameter values are similar to those for the saturated zone or any changes are justified.

g. Distribution Coefficients and Leach Rates

The distribution coefficient (Kd) is based on the site's soil physical and chemical characteristics. The leach rate value of zero in the RESRAD code is acceptable as it allows calculation of the value. If a value greater than zero is provided, justification for the value is also provided.

h. Inhalation

An average inhalation rate value of approximately 8,395 m^3/yr is used for the activity assumed for the rancher or farmer scenario (based on Draft Letter Report, Sandia, 1998a). The mass loading for inhalation (air dust loading factor) value is justified based on the average level of airborne dust in the local region for similar activities as assumed in the model.

i. External Gamma

The shielding factor for gamma is in the range of 0.33 to 0.55 (PG-8-08, NRC 1994; DandD code screening default value), based mainly on the type (foundation, materials) of the house likely to be built on the site.

The time fractions for indoor and outdoor occupancy are similar to default values in RESRAD and draft guidance developed for the main decommissioning rule (NUREG/CR-5512, Volume 3, NRC, 1996b). For example, the staff would consider fraction values approximating 0.7 indoors and 0.15 outdoors for a resident working at home, and 0.5 outdoors and 0.25 indoors for the farmer scenario.

The site specific wind speed value is based on adequate site data (the average annual wind speed for the UR sites varies from 7 to 13 mph (3.1 to 5.5 meters/sec)). The maximum and annual average wind speed are also considered when justifying/evaluating proposed erosion rates.

j. Ingestion

Average consumption values (g/yr) for the various types of foods are based on average values as discussed in NUREG 5512, Volume 3, or the Sandia Draft Letter Reports (1998a and b) , or otherwise justified. Livestock ingestion parameters are default values, or are otherwise justified.

For sites with over 25 acres of contamination, the fraction of diet from the contaminated area is assumed to be 0.25 for the farmer scenario (Sandia 1998a), or is otherwise justified based on current or anticipated regional consumption practices for home-grown food. Because of the low level of precipitation in the UR facilities regions, extensive gardens or dense animal grazing are not likely, so the percentage of the diet from contaminated areas is likely to be lower than th

code default value.

Note that the default plant mass loading factor in the DandD code can reasonably be reduced to 1 percent (Sandia, Draft Report, 1998c). The depth of roots is an important parameter for UR licensees using the RESRAD code. The value is justified based on the type of crops likely to be grown on the site in the future. For vegetable gardens, a value of 0.3 is more appropriate than the RESRAD default value of 0.9 meters that is reasonable for alfalfa or a similar deep-rooted plant.

(3) Presentation of Modeling Results

The radium benchmark dose modeling section of the decommissioning plan includes the code or calculation results as the maximum annual dose (TEDE) in mrem/yr, the year that this dose would occur, and the major exposure pathways by percentage of total dose. The modeling section also includes discussion of the likelihood of the various land use scenarios (reflecting the probable critical groups) modeled, and provides the variations in dose (dose distribution) created by changing key parameter values to reflect the range of dose values that are likely to occur on the site. The section also contains the results of a sensitivity analysis (RESRAD code can provide a sensitivity analysis via the graphics function) to identify the important parameters for each scenario.

NOTE: As indicated in Criterion 6(6), if a licensee submits a radium benchmark dose result that is 100 mrem/yr or higher, the staff will consult with the Commission before approving the decommissioning plan based on this value.

6.1.4 Evaluation Findings

If the staff review, as described in this section, results in the acceptance of the radium benchmark dose modeling, the following conclusions may be presented in the technical evaluation report (TER).

The staff has completed its review of the site benchmark dose modeling for the _____ uranium recovery facility. This review included an evaluation using the review procedures in the Title II SRP (NRC, 1999), Section 6.1.2, and the acceptance criteria outlined in SRP Section 6.1.3.

The applicant has provided an acceptable radium benchmark dose model and staff evaluation determines that: (1) the computer code or set of calculations used to model the benchmark dose is appropriate for the site; (2) input parameter values used in each model are site-specific or reasonably estimates; (3) the dose modeling information includes adequate estimates of dose uncertainty.

6.2 Implementation of the Benchmark Dose

6.2.1 Areas of Review

The results of the radium benchmark dose calculations are used to establish a surface and subsurface soil dose limit for residual radionuclides other than radium, as well as a limit for surface activity on structures that will remain after decommissioning. The staff reviews the licensee's conversion of the benchmark dose limit to soil concentration (pCi/g) or surface activity levels (dpm/100 cm^2) as a first step to provide cleanup levels. Alternatively, the licensee can derive the estimated dose from the uranium or thorium contamination (as discussed in Section 6.1.3) and compare this to the radium benchmark dose.

The cleanup levels adequately consider the ALARA principle and the unity rule to demonstrate that the Part 40.42 (k) requirements (the premises are suitable for release and reasonable effort has been made to eliminate residual radioactive contamination) can be met.

6.2.2 Review Procedures

The decommissioning plan section on cleanup criteria will be evaluated for appropriate conversion of the radium standard benchmark dose to cleanup limits for soil uranium and thorium and/or surface activity concentration. The plan will also be examined to ensure reasonable application of the ALARA principle to the cleanup guideline values.

6.2.3 Acceptance Criteria

The soil concentration limit is derived from the site radium dose estimate. The modeling performed to estimate mrem/year per pCi/g of Th-230 and/or U-nat follows the criteria listed in Section 6.1.3. In addition, the U-nat source term

is represented as percent activity by 49.14% U-238, 49.14% U-234, and 0.71% U-235, or is based on analyses of the ore processed. For a soil uranium criterion, the chemical toxicity is considered in deriving a soil concentration limit if soluble forms of uranium are present.

Detailed justification for the inhalation pathway parameters is provided, such as the determination of the chemical form in the environment, to support the inhalation class.

(1) The derived Th-230 soil limit will not cause any 100 square meter (m^2) area to exceed the Ra-226 limit at 1000 years (i.e., current concentrations of 14 pCi/g Th-230 surface and 43 pCi/g subsurface, if Ra-226 is at approximately background levels).

(2) In conjunction with the activity limit, the ALARA principle is considered in setting cleanup levels (derived concentration guideline levels). The ALARA guidance in draft Regulatory Guide 4006 is considered.

In recent practice at mill sites, ALARA is implemented by removing at least two more inches (5 cm) of soil than is estimated to achieve the radium standard. (reduce any possible excess or borderline contamination). At mills, it is generally cheaper to remove more soil than to do sampling and testing that may indicate failure and require additional soil removal plus additional testing.

(3) The unity rule is applied to the cleanup if more than one residual radionuclide is present in a soil verification grid (100 m^2). This means that the sum of the ratios for each radionuclide of the concentration present/concentration limit may not exceed "1" (i.e., unity).

(4) The subsurface soil standard, if it is to be used, is applied to small areas of deep excavation where at least 15 cm (6 inches) of compacted clean fill is to be placed on the surface.

(5) The surface activity limit for remaining structures is appropriately derived using an approved code or calculation. If the DandD code is used, data is provided to support that 10% or less of the activity is removable; otherwise the resuspension factor is scaled to reflect the site-specific removable fraction. Note that this code assumes that the contamination is only on the floor, which can be overly conservative. If the RESRAD-Build code is used, the modeled distribution of contamination on walls vs. floor is justified.

6.2.4 Evaluation Findings

If the staff review, as described in this section, results in the acceptance of the application of the radium benchmark dose modeling to the site cleanup criteria, the following conclusions may be presented in the technical evaluation report.

The staff has completed its review of the proposed implementation of the benchmark dose modeling results for the _____ uranium recovery facility. This review included an evaluation using the review procedures in the Title II SRP, Section 6.2.2, and the acceptance criteria outlined in SRP Section 6.2.3.

The licensee has provided an acceptable implementation of the benchmark dose modeling results to the proposed site cleanup activities and staff evaluation determines that: (1) the cleanup criteria will allow the licensee to meet Part 40.42 (k) and Part 40, Appendix A, criterion 6(6) requirements; (2) the soil and structures of the decommissioned site will permit termination of the license because public health and the environment will not be adversely affected by any residual radionuclides.

6.3 REFERENCES

Argonne National Laboratory (for the U.S. Department of Energy), "Data Collection Handbook to Support Modeling the Impacts of Radioactive Material in Soil," ANL/EAIS-8, April 1993a.

Argonne National Laboratory (for the U.S. Department of Energy), "Manual for Implementing Residual Radioactive Material Guidelines Using RESRAD, Version 5.0," ANL/EAD/LD-2, September 1993b.

Sandia National Laboratories, "Review of Parameter Data for the NUREG-5512 Residential Farmer Scenario and Probability Distributions for the DandD Parameter Analysis," Draft Letter Report, January 30, 1998a.

Sandia National Laboratories, "Review of Parameter Data for the NUREG-5512 Building Occupancy Scenario and Probability Distributions for the DandD Parameter Analysis," Draft Letter Report, January 30, 1998b.

Sandia National Laboratories, "Comparison of the Models and Assumptions Used in the DandD 1.0, RESRAD 5.61, and RESRAD-Build Computer Codes with Respect to the Residential Farmer and Industrial Occupant Scenarios Provided in NUREG/CR5512." Draft Report, October 15, 1998c.

U. S. Nuclear Regulatory Commission, "Residual Radioactive Contamination from Decommissioning," NUREG/CR-5512, PNL-7994, Vol. 1, 1992.

U.S. Nuclear Regulatory Commission, Office of Nuclear Material Safety and Safeguards, Division of Waste Management, Policy and Guidance Directive PG-8-08, "Scenarios for Assessing Potential Doses Associated with Residual Radioactivity," May 1994.

U. S. Nuclear Regulatory Commission, "Residual Radioactive Contamination from Decommissioning - User's Manual," NUREG/CR-5512, Vol. 2, October 1996a.

U. S. Nuclear Regulatory Commission, "Residual Radioactive Contamination from Decommissioning - Parameter Analysis," (DRAFT FOR REVIEW), NUREG/CR-5512, Vol. 3, April 1996b.

U.S. Nuclear Regulatory Commission, Office of Nuclear Material Safety and Safeguards, "Draft Standard Review Plan for In Situ Leach Uranium Extraction License Applications," NUREG-1569, October 1997.

U.S. Nuclear Regulatory Commission,"Decision Methods for Dose Assessment to Comply With Radiological Criteria for License Termination," Draft NUREG-1549, July 1998a.

U.S. Nuclear Regulatory Commission, Draft Regulatory Guide-4006, "Demonstrating Compliance With the Radiological Criteria for License Termination," August 1998b.

U.S. Nuclear Regulatory Commission, Office of Nuclear Material Safety and Safeguards, "Draft Standard Review Plan for the Review of a Reclamation Plan for Mill Tailings Sites Under Title II of the Uranium Mill Tailings Radiation Control Act," NUREG-1620, January 1999.

Notice of Opportunity to Provide Comments

The Commission hereby provides notice of opportunity for public comment on the draft guidance addressing the radium benchmark approach for decommissioning UR facilities. Written comments should be sent, within sixty (60) days from the date of publication of this Federal Register Notice (FRN), to the Chief, Rule and Directives Branch, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001. Comments may also be provided electronically (esb@nrc.gov) and the final rule FRN may also be viewed on the NRC Uranium Recovery and Low Level Waste Program website (http://www.nrc.gov/NRC/NMSS/URANIUM/urllwp.htm). Also, the draft guidance can be accessed directly (http://www.nrc.gov/NRC/NMSS/URANIUM/guidance.htm).

FOR FURTHER INFORMATION CONTACT: Ms. Elaine S. Brummett, Uranium Recovery Branch, Mail Stop T7-J9, Division of Waste Management, Office of Nuclear Material Safety and Safeguards, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555-0001. Telephone 301/415-6606.

Footnotes

1. Byproduct material means the tailings or waste produced by the extraction or concentration of uranium or thorium from any ore processed primarily for its source material content, including discrete surface wastes resulting from uranium solution extraction processes.

2. The concentration of radium, as a result of byproduct material, averaged over areas of 100 square meters, should not exceed the background level by more than 5 pCi/g (0.19 Bq/g) in the first 15 cm (6 inches) of soil, and 15 pCi/g (0.56 Bq/g) for every subsequent 15 cm (6 inch) layer.

3. As defined in 10 CFR Part 20, "the group of individuals reasonably expected to receive the greatest exposure to residual radioactivity for any applicable set of circumstances."

Cataloging Form
{Technical/Project Managers fill in C through G, K through Q. RM completes other fields}

A. Document ID Number: Assigned by database ~~539~~ 00-539 B. *Further Information Required?*: ☐

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SLDS VPs	☐
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SLAPS VPs	☐
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K. *Subject:/Title:* St. Louis Oversight Comittee Meeting Minutes for November 199

L. *Author:* Richard Casanagh M. *Author's Company:* Oversight Committee

N. *Recipient(s):* Distribution O. *Recipient(s) Company:* _____

P. *Version (Choose One):* Draft ☐ Final ☒ Q. Date: 12/06/99

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Secondary Document Types

- ☐ Amendments to Record of Decision (ROD)
- ☐ Anomaly Review Board Documents (Management Plan, Correspondence, Standard Operating Procedures, Findings)
- ☐ Applicable or Relevant and Appropriate Requirements (ARAR) Determinations
- ☐ Archives Search Reports (ASR)
- ☐ Briefing Papers
- ☐ Chain of Custody Forms
- ☐ Community Relations Plan
- ☐ Correspondence
- ☐ Daily Operations Summary/Situation Reports
- ☐ Engineering Evaluation and Cost Analysis (EE/CA) Action Memo
- ☐ Engineering Evaluation and Cost Analysis (EE/CA) Approval Memorandum
- ☐ Engineering Evaluation and Cost Analysis (EE/CA)
- ☐ Explanation of Significant Differences
- ☐ Fact Sheets/Newsletters
- ☐ Feasibility Study (FS) Reports
- ☐ Federal, State, Local Tech. Records
- ☐ Final Approved Findings and Determinations
- ☐ Final Remedial Design Documents
- ☐ Freedom of Information (FOIA) Requests
- ☐ Freedom of Information (FOIA Responses)
- ☐ Health and Endangerment Assessments
- ☐ Interagency Agreements/Memoranda
- ☐ Interim Deliverables
- ☐ Inventory Project Report (INPR) Risk Assessment Code (RAC)
- ☐ Invoices/Contractor Payments/Cost Reports
- ☐ Land Grants/Deeds
- ☐ Mailing Lists
- ☐ News Clippings and Press Releases
- ☐ No Further Action Docs (NOFA)
- ☐ On-Scene Coordinator Reports
- ☐ Proposed Plans for Remedial Action
- ☐ Public Meeting Minutes/Transcripts
- ☐ Public Notices
- ☐ Public notices, Comments Received, Responses to the Comments
- ☐ Published Hearings
- ☐ Record of Decision (ROD)
- ☐ Reference Documents
- ☐ Remedial Action Documents
- ☐ Remedial Investigation (RI) Reports
- ☐ Removal Response Reports (Emergency Evacuation Orders)
- ☐ Rights of Entry Documents
- ☐ Sampling/Analysis Data and Plans
- ☐ Scopes of Work/Contractual Documents
- ☐ Site Descriptions and Chronologies
- ☐ Site Inspection Documents
- ☐ Site Photographs and Maps
- ☐ Testimonies
- ☐ Title Search Documents
- ☐ Work Logs
- ☐ Work Plans and Progress Reports
- ☐ Work Plans/Site Safety and Health Plans and Progress Reports
- ☐ Work Register and Logs