ENVIRONMENTAL PROTECTION AGENCY

40 CFR Part 192

[FR 3227-5]

Standards for Remedial Actions at Inactive Uranium Processing Sites

AGENCY: U.S. Environmental Protection Agency.

ACTION: Proposed rule.

SUMMARY: The Environmental Protection Agency is proposing health and environmental regulations to correct and prevent contamination of ground water beneath and in the vicinity of inactive uranium processing sites by uranium tailings. EPA issued regulations (40 CFR Part 192 Subparts A, B, and C) for cleanup and disposal of tailings from these sites on January 5, 1983. These new regulations would replace existing provisions at 40 CFR 192.20(a) (2) and (3) that were remanded by the Tenth Circuit Court of Appeals on September 3, 1985. They are proposed pursuant to section 275 of the Atomic Energy Act (42 U.S.C. 2022), as amended by Section 206 of the Uranium Mill Tailings Radiation Control Act of 1978 (Pub. L. 95-604) (UMTRCA).

The regulations would apply to tailings at the 24 locations that qualify for remedial action under Title I of Pub. L. 95-604. They provide that tailings must be stabilized and controlled in a manner that permanently eliminates or minimizes contamination of ground water beneath stabilized tailings, so as to protect human health and the environment. They also provide for cleanup of contamination that existed before the tailings are stabilized.

DATES: *Comments.* Comments on this Notice of Proposed Rulemaking will be accepted until October 26, 1987.

Hearing. A Public Hearing will be held on October 29, 1987 at 9:00 a.m. (see below).

ADDRESSES: *Comments.* Comments should be submitted (in duplicate if possible) to: Central Docket Section (LE-130), U.S. Environmental Protection Agency, Attention: Docket Number R-87-01, Washington, DC 20460. The Docket is available for public inspection between 8:00 a.m. and 3:00 p.m., Monday through Friday, at EPA's Central Docket Section (LE-130), West Tower Lobby, 401 M Street SW., Washington, DC. A reasonable fee may be charged for copying.

Hearing. A Public Hearing will be held at the Strater Hotel, 699 Main Ave., Durango, Colorado 81301. Requests to participate should be made in writing to Floyd L. Galpin, Acting Director, Criteria and Standards Division (ANR-460), U.S. Environmental Protection Agency, Washington, DC 20460. All requests should include an outline of the topics to be addressed and names of the participants. Oral presentations should be limited to a maximum of 30 minutes. Presentations may also be made without prior notice, but may be subjected to time contraints at the discretion of the hearing officer. Written comments made during or in conjunction with the oral presentations will be accepted after the hearing for a period of time to be announced at the hearing.

FOR FURTHER INFORMATION CONTACT: Kurt L. Feldmann, Guides and Criteria Branch (ANR-460), Office of Radiation Programs, U.S. Environmental Protection Agency, Washington, DC 20460; telephone number (202) 475-9620.

SUPPLEMENTARY INFORMATION:

I. Supporting Document

A report ("Draft Background Information Document—Proposed Standard for the Control of Contamination in Ground Water in the Vicinity of Inactive Uranium Mill Sites," EPA 520/1-87-014) has been prepared to support these proposed regulations. Single copies may be obtained from the Program Management Office (ANR-458), Office of Radiation Programs, Environmental Protection Agency, Washington, DC 20460; (202) 475-8386.

The report contains a brief history of the Title I sites, a summary of the types and quantities of ground-water contamination present at sites for which such data are available, where and over what period of time the contamination is projected to disperse in the absence of control, and a description of alternate ground-water contamination control and cleanup technologies and their associated costs. An analysis of information supporting the decisions reflected in this proposed standard completes the report.

II. Scope of this Proposed Rulemaking

On November 8, 1978, Congress enacted the Uranium Mill Tailings Radiation Control Act of 1978, Pub. L. 95-604 (henceforth called "UMTRCA"). In UMTRCA, Congress enunciated its finding that uranium mill tailings ". . . may pose a potential and significant radiation health hazard to the public, and . . . that every reasonable effort should be made to provide for stabilization, disposal, and control in a safe and environmentally sound manner of such tailings in order to prevent minimize radon diffusion into the environment and to prevent or minimize other environmental hazards from such tailings." The Act directs the Administrator of the Environmental Protection Agency (EPA) to set ". . . standards of general application for the protection of the public health, safety, and the environment . . ." to govern this process of stabilization, disposal, and control.

UMTRCA directs the Department of Energy (DOE) to conduct such remedial actions at the inactive uranium processing sites as will insure compliance with the standards established by EPA. This remedial action is to be selected and performed with the concurrence of the Nuclear Regulatory Commission (NRC).

Standards are required for two types of remedial action: disposal and cleanup. Here disposal is used to mean the operation which places tailings in a permanent condition that will minimize risk to people and harm to the environment. Cleanup is the operation which eliminates or reduces to acceptable levels the potential health and environmental consequences of tailings or their constituents that have been dispersed from tailings piles by natural forces or people prior to disposal.

On January 5, 1983, EPA promulgated final standards for the disposal and cleanup of the inactive mill tailings sites under UMTRCA (48 FR 590). These standards were challenged in the Tenth Circuit Court of Appeals by several parties (Case Nos. 83-1014, 83-1041, 83-1206, and 83-1300). On September 3, 1985, the court dismissed all challenges except one: it set aside the ground-water provisions of the regulations at 40 CFR 192.20(a)(2)-(3) and remanded them to EPA ". . . to treat these toxic chemicals that pose a ground-water risk as it did in the active mill site regulations." With this notice, EPA is proposing new regulations to replace those set aside.

III. Summary of Background Information

Beginning in the 1940's, the U.S. Government purchased large quantities of uranium for defense purposes. As a result, large piles of tailings were created by the uranium milling industry. Tailings piles pose a hazard to public health and the environment because they contain radioactive and toxic constituents which emanate radon to the atmosphere and may leach into ground water. Tailings are a sand-like material, and have also been removed from tailings piles in the past for use in construction and for soil conditioning. These uses are inappropriate, because the radioactive and toxic constituents of tailings may elevate indoor radon levels,

expose people to gamma radiation, and leach into ground and surface waters.

Most of these mills are now inactive and many are abandoned. Congress designated 22 specific inactive sites in Title I of UMTRCA, and the DOE subsequently added 2 more. Most other uranium tailings sites are regulated by the NRC or States under Title II of UMTRCA (DOE owns one inactive site at Monticello, Utah, that is not included under UMTRCA). The Title I sites are all located in the West, predominantly in arid areas, except for a single site at Canonsburg, Pennsylvania. Tailings piles at the inactive sites range in area from 5 to 150 acres and in height from only a few feet to as much as 230 feet. The amount at each site ranges from residual contamination to 2.7 million tons of tailings. The 24 designated Title I sites combined contain about 26 million tons of tailings covering a total of about 1000 acres.

The disposal of tailings at these sites is currently being carried out by DOE under the provisions of Title I of UMTRCA. In addition, tailings that were dispersed from the piles by natural forces, or that have been removed for use in or around buildings, or on land, are being retrieved and replaced on the tailings piles prior to their disposal.

UMTRCA requires that DOE complete all these remedial actions within 7 years of the effective date of EPA's standards; that is by March 5, 1990. Remedial actions have been completed at the Canonsburg, Pennsylvania, pile, the only site in an area of high precipitation, and at Shiprock, New Mexico. Remedial actions are currently well advanced at two other sites: Salt Lake City, Utah and Lakeview, Oregon. Work is expected to begin at approximately six others during 1987–1988. In view of the rate of progress with remedial work, the DOE is requesting a legislative extension of the completion date until September 1993.

The most important hazardous constituent of uranium mill tailings is radium, which is radioactive. Other potentially hazardous substances in tailings piles include arsenic, molybdenum, selenium, uranium, and usually in lesser amounts, a variety of other toxic substances. The concentrations of these materials vary from pile to pile, ranging from 2 to more than 100 times applicable standards. Although a variety of organics are known to have been used at these sites, none has thus far been detected in tailings.

Exposure to radioactive and toxic substances may cause cancer and other diseases, as well as genetic damage and teratogenic effects. Tailings pose a risk to health because: (1) Radium in tailings decays into radon, a gaseous radioactive element which is easily transported in air, and whose radioactive decay products may lodge in the lungs; (2) individuals may be directly exposed to gamma radiation from the radioactivity in tailings; and (3) radioactive and toxic substances from tailings may leach into water and then be ingested with food or water. It is the last of these hazards that is primarily addressed here. (Although radon from radium in ground water is unlikely to pose a hazard in these locations, these proposed standards would also address that potential hazard.) The other hazards are covered by existing provisions of 40 CFR Part 192.

We have based our analysis on detailed reports for 12 of the 24 inactive uranium mill tailings sites that have been developed to date for the Department of Energy by its contractors. Preliminary data for the balance of the sites have also been examined. These data show that the volumes of contaminated water in the existing aquifers at the 24 sites range from 23 million gallons to 4 billion gallons. In a few instances, mill effluent was apparently the sole source of this ground water. Each of the 12 sites examined in detail have ground-water contamination beneath and/or beyond the site. In some cases, the ground water upgradient of the pile already exceeded EPA drinking water standards for one or more contaminants, thus making it unsuitable for use as drinking water and, in some extreme cases, for any other purpose before it was contaminated by effluent from the mill. Some contaminants from the tailings piles are moving offsite quickly and others are moving slowly. The time for natural flushing of the contaminated portions of these aquifers is estimated to vary from several years to many hundreds of years.

Contaminants that have been identified in the ground water downgradient from a majority of the sites include uranium, sulfate, iron, manganese, nitrate, chloride, molybdenum, selenium, and total dissolved solids. Radium, cobalt, arsenic, fluoride, chromium, cadmium, ammonium, boron, vanadium, lead, thorium, zinc, silver, copper, and magnesium, have also been found in the ground water at one or more sites.

UMTRCA requires that the standards established under Title I provide protection that is consistent, to the maximum extent practicable, with the requirements of the Resource Conservation and Recovery Act (RCRA). In this regard, regulations established by EPA for hazardous waste disposal sites under RCRA provide for the specification of ground-water protection limits for the specific hazardous constituents relevant to each regulated unit in permits. These regulations contain general numerical limits for some constituents in ground water; limits for other constituents are set at their background level in ground water at the regulated unit. Together with a provision for the point of compliance, these limits become the facility's ground-water protection standard, unless alternate concentration limits (ACLs) are approved. ACLs may be requested based upon data which would support a determination that, if the ACL is satisfied, the constituent would not present a current or potential threat to human health or the environment.

IV. The Proposed Standards

The proposed standards consist of two parts; a first part governing the control of any future ground-water contamination that may occur from tailings piles after disposal, and a second part that applies to the cleanup of contamination that occurred before disposal of the tailings piles.

A. The Ground-Water Standard for Disposal

The proposed standard (Subpart A) for control of potential contaminant releases to ground water after disposal is divided into two parts that separately address actions to be carried out during period of time designated as the remedial and post-disposal periods. The remedial and post-disposal periods are defined in a manner analogous to the closure and post-closure periods, respectively, in RCRA regulations. However, there are some differences regarding their duration and the timing of any corrective actions that may become necessary due to failure of disposal to perform as designed. (Because there are no mineral processing activities currently at these inactive sites, standards are not needed for an operational period.) The remedial period, for the purpose of this regulation, is defined as that period of time beginning on the effective date of the original Part 192 (Title I) standard (March 7, 1983) and ending with completion of remedial actions by DOE. The post-disposal period begins with completion of remedial actions and ends after an appropriate period for the monitoring of ground water to confirm the adequacy of the disposal, as determined by NRC for each site. The proposed ground-water standard for the disposal to be carried out during the remedial period adopts relevant

paragraphs from Subpart F of Part 264 of this Chapter (§§ 264.92–264.95). The proposed standard for the post-disposal period adopts § 264.111 (a) and (b) of this Chapter, and also incorporates provisions for monitoring and a corrective action program. These provisions are essentially the same as those governing the licensed (Title II) uranium mill tailings sites (40 CFR 192, Subparts D and E; see also the Federal Register notices for these standards published on April 29, 1983 and on October 7, 1983). However, additional constituents are here proposed to be regulated (in addition to the general RCRA list of hazardous constituents and table of applicable limits) that are applicable to these sites only.

These proposed regulations would require installation of monitoring systems upgradient of the point of compliance (i.e., in the uppermost aquifer upgradient of the edge of the tailings disposal site) to determine background levels of any listed constituents that occur naturally at the site. The disposal would then be designed to control, to the extent reasonably achievable for 1000 years and, in any case, for at least 200 years, all listed constituents identified in the tailings at the site to levels for each constituent derived in accordance with § 264.94. Accordingly, the elements of the ground-water protection standard to be specified for each disposal site would include a list of relevant constituents, the concentration limits for each such constituent, and the compliance point.

To obtain an ACL for any constituent, the DOE would have to provide data to support a finding that the presence of the constituent at the proposed ACL in ground water at the site would not pose a substantial present or potential hazard to human health or the environment. ACLs could be granted provided that, after considering practicable corrective actions, a determination can be made that it satisfies the lower of the values given by the standard for setting ACLs in § 264.94(b), and the corrective action that is as low as reasonably achievable (ALARA).

The standards of Title II sites require use of a liner under new tailings piles or lateral extensions of existing piles. These standards for remedial action at the inactive Title I sites do not contain a similar provision. We assume that the inactive piles will not need to be enlarged. Several, however, will be relocated. However, unlike tailings at the Title II sites, which generally may contain large amounts of process water, the inactive tailings contain little or no free water. Such tailings, if properly located and stablized with an adequate cover, are not likely to require a liner in order to protect ground water.

However, a liner may be required to satisfy the proposed ground-water standards in situations where tailings now, or may in the future, contain water above the level of specific retention. For example, tailings to which water is added to facilitate their removal to a new site (i.e., through slurrying) or piles in areas of high precipitation or within the zone of water table fluctuation could discharge contaminants to ground water. Under § 192.20(a)(2) of these proposed standards, it would be necessary for the DOE, with the concurrence of the NRC, to propose and carry out a disposal design in such circumstances which uses a liner or equivalent to assure that ground water would not be contaminated and, at the same time, satisfy the existing requirements of these standards for control of radon emissions. In such circumstances, this may be accomplished by installing a liner beneath the tailings whose permeability is greater than that of the cover material. If the tailings form an acid solution when mixed with water, a neutalizing material mixed with the tailings or added to the liner are additional methods that may need to be considered to fix listed constituents in the immediate vicinity of a pile. In addition, a capillary break may be necessary to prevent migration of water into a pile from below. Currently, however, DOE plans do not include slurrying any tailings to move them to new locations. Further, for all but one site that has already been closed (Canonsburg), the tailings are located in arid areas where annual precipitation is low.

Disposal designs which prevent migration of listed constituents in the ground water for a short period of time would not provide appropriate protection. Such approaches simply defer adverse ground-water effects. Therefore, measures which only modify the gradient in an aquifer or create barriers (e.g., slurry walls) would not of themselves provide an adequate disposal. Where feasible, it may be appropriate to protect ground water by preventing generation of leachate containing listed constituents. A method that appears promising is fixing the constituents *in situ* (in place) so they cannot be leached out. *In situ* treatment of constituents may be considered analogous to removal when it provides long-term protection of human health or the environment. While the Agency recognizes that *in situ* treatment is an emerging technology, applied in only limited circumstances to date, it should be considered where it can provide an effective ground-water protection strategy.

At the end of the remedial period (i.e., when disposal and any cleanup required under Subpart B has been completed), ground waters would be required to be in compliance with the standards established pursuant to these regulations. During the post-disposal period, the regulations would further require that methods used for disposal provide a reasonable expectation that the provisions of § 264.111 (a) and (b) will be met. Paragraph 264.111(a) requires that a site be closed in a manner that minimizes further maintenance. Paragraph 264.111(b) requires control, minimization, or elimination of post-disposal escape of listed constituents to ground or surface water to the extent necessary to prevent threats to human health and the environment. In the context of these regulations, this would mean control pursuant to the standards established under §§ 264.92–264.95. Depending on the properties of the sites, candidate disposal systems, and the effects of natural processes over time, measures required to satisfy the proposed standards would vary from site to site. Actual site data, computational models, and prevalent expert judgment would be used in deciding that proposed measures will satisfy the standards. Under the provisions of section 108(a) of UMTRCA, the adequacy of these judgments would be determined by the NRC.

During the post-disposal period, monitoring of the disposal would be required for a period sufficient to verify the adequacy of the disposal to achieve its design objectives for containment of listed constituents. This period is intended to be comparable to the time period required under § 264.117 for waste sites regulated under RCRA (i.e., a few decades). It is not intended that monitoring be carried out for the 200- to 1000-year period over which the disposal is designed to be effective.

If listed constituents from a disposal site appeared during the post-disposal period in excess of the ground-water standards for disposal, the proposed regulations would require a corrective action program designed to bring the disposal and the ground water back into compliance. Such a corrective action would have to last as long as is necessary to achieve conformance with the ground-water protection standard, and include a modification of the monitoring program sufficient to

demonstrate that the corrective measures will be permanently successful.

Additional Regulated Constituents

For the purpose of this regulation only, the Agency proposes to regulate, in addition to the hazardous constituents referenced by § 264.93: molybdenum, nitrate, combined radium-226 and radium-228, and combined uranium-234 and uranium-238. Molybdenum, radium, and uranium were addressed by the Title II standards because these radioactive and/or toxic constituents are found in high concentrations at many mill tailings sites. Nitrate is proposed for addition because it has been identified in concentrations far in excess of drinking water standards in ground water at a number of the inactive sites.

The proposed concentration limit for molybdenum in ground water from uranium tailings is 0.10 milligram per liter. This is the value of the provisional adjusted acceptable daily intake (AADI) for drinking water developed by EPA under the Safe Drinking Water Act (50 FR 46958). The Agency has proposed neither a maximum concentration limit goal (MCLG) nor a maximum concentration limit (MCL) for molybdenum because it occurs only infrequently in water. According to the most recent report of the National Academy of Sciences (*Drinking Water and Health*, 1980, Vol. III), molybdenum from drinking water, except for highly contaminated sources (e.g., molybdenum mining wastewater) is not likely to constitute a significant portion of the total human intake of this element. However, since uranium tailings can be a highly concentrated source of molybdenum, it is appropriate to include a standard for molybdenum in this proposed rule. In addition to the hazard to humans, our analysis of toxic substances in tailings in the Final Environmental Impact Statement for Remedial Action Standards for Inactive Uranium Processing Sites (EPA 520/4–82–013–1) found that, for ruminants, molybdenum in concentrations greater than 0.5 ppm in drinking water would lead to chronic toxicity.

The proposed limit for combined uranium-234 and uranium-238 due to contamination from uranium tailings is 30 pCi per liter. At this concentration, the estimated lifetime radiation risk of fatal cancer would be the same as that for the existing ground water standard for combined radium-226 and radium-228 (5 pCi per liter) (51 FR 34836), based on dose assessments for ingestion as determined by the International Commission on Radiological Protection. This proposed limit would apply to remedial actions for uranium tailings under these regulations only; the Agency has not made a proposal for a general standard for isotopes of uranium in water. However, this limit is within the range of values currently under consideration for drinking water.

The proposed concentration limit for nitrate (as nitrogen) is 10 mg per liter. This is the value of the interim drinking water standard for nitrate.

B. The Cleanup Standard

With the exception of the point of compliance provision, the proposed standard (Subpart B) for cleanup of contaminated ground water contains identical basic provisions (§§ 264.92–.94) as the standard for disposal in Subpart A. In addition, it provides for the establishment of supplemental standards under certain conditions and for use of institutional control to permit passive restoration through natural flushing when no community drinking water source is involved.

The standards do not specify a single point of compliance for the cleanup of ground water that has been contaminated by residual radioactive materials from uranium milling before final disposal. Instead, the "point of compliance" is any point where contamination is found in the ground water. The standard requires DOE to establish a monitoring program to determine the extent of contamination (§ 192.12(c)(1)) in ground water around a processing site (§ 192.11(b)). The possible presence of any of the inorganic or organic hazardous constituents identified in tailings or used in the processing operation should be assessed. The remedial action plan referenced under § 192.20(b)(4) would document the extent of contamination, the rate and direction of movement of contaminants, and consider future movement of the plume.

The proposed cleanup standards would normally require restoration of all contaminated ground water to the levels provided for under § 264.94. These levels are either background concentrations, the levels specified in Tables 1 and A, or ACLs. In cases where the ground water is not classified as Class III, any ACL should be determined under the assumption that the ground water may be used for drinking purposes.

In certain circumstances, however, supplemental standards set at levels that assure, at a minimum, protection of human health and the environment, and come as close to meeting the otherwise applicable standards as is reasonably achievable by remedial actions could be granted if:

- The ground water at the site is Class III (See definitions, § 192.11(e)) in the absence of contamination from tailings; or
- Complete restoration would cause more environmental harm than it would prevent; or
- Complete restoration is technically impracticable from an engineering perspective.

The use of supplemental standards for Class III ground water would apply the ground water classification system established in EPA's 1984 Ground Water Protection Strategy. Procedures for classifying ground water are presented in "Guidelines for Ground-Water Classification under the EPA Ground-Water Protection Strategy" released in final draft in December 1986 and due to be finalized during late 1987. Under these draft guidelines, Class I ground waters encompass highly vulnerable resources of particularly high value, e.g. an irreplaceable source of drinking water or ecologically vital ground water. Class II ground water include all non-Class I ground water that is currently used or is potentially adequate for drinking water. Class III encompasses ground waters that are not a current or potential source of drinking water due to widespread, ambient contamination caused by natural or human-induced conditions, or cannot provide enough water to meet the needs of an average household. Human-induced conditions would not include the contribution from the uranium mill tailings. At sites with Class III ground water, the proposed supplemental standards would require only such management of contamination due to tailings as would be required to prevent additional adverse impacts on human health and the environment from that contamination. For example, if the additional contamination from the tailings would cause an adverse effect on Class II ground water that has a significant interconnection with the Class III ground water over which the tailings reside, then the additional contamination from the tailings would have to be abated.

Supplemental standards may also be appropriate in certain other cases similar to those addressed in section 121(d)(4) of the Superfund Amendments and Reauthorization Act of 1986 (SARA). SARA recognizes that cleanup of contamination could sometimes cause environmental harm disproportionate to the health effects it would alleviate. For example, if fragile ecosystems would be impaired by any reasonable restoration process (or by carrying a restoration process to extreme lengths to remove small amounts of residual

contamination), then it might be prudent to protect them in lieu of completely restoring ground-water quality. Decisions regarding tradeoffs of environmental damage can only be based on characteristics peculiar to the location. We do not know whether there are such situations in the UMTRCA program, but we believe that DOE should be permitted to propose supplemental standards in such situations, after thorough investigation and consideration of all reasonable restoration alternatives, for concurrence by the NRC.

Based on currently available information, we are not aware that at least substantial restoration of ground-water quality is technically impracticable from an engineering perspective at any of the designated sites. However, our information may be incomplete. We believe DOE should not be required to institute active measures that would completely restore ground water at these sites if such restoration is technically impracticable from an engineering perspective, and if, at a minimum, protection of human health and the environment is assured. Consistent with the provisions of SARA for remediation of waste sites generally, the proposed standards would therefore permit DOE to propose supplemental standards in such situations at levels achievable by site-specific alternate remedial actions that are technically practicable. The concurrence role of the NRC would also apply to such proposals. A finding of technical impracticability from an engineering perspective would require careful and extensive documentation, including an analysis of the degree to which remediation is practicable. It should be noted that the word "practicable" is not identical in meaning to the word "practical." As used here, the former means "able to be put into practice" and the latter means "cost-effective." In addition to documentation of technical matters related to cleanup technology, DOE would also have to include a detailed assessment of such site-specific matters as transmissivity of the geologic formation, contaminant properties (e.g., withdrawal and treatability potential), and the exent of contamination.

Finally, for aquifers where passive restoration can be projected to occur naturally within a period less than 100 years, and where the ground water is not now and is not now projected to be used for a community water supply within this period, we propose to allow extension of the remedial period to that time, provided satisfactory institutional control of public use of ground water and an adequate monitoring program is established and maintained throughout this extended remedial period.

The proposal to allow extension of the remedial period to permit reliance on passive restoration through natural flushing is based on the judgment that no active cleanup is warranted to restore ground-water quality where ground-water concentration limits will be met within a period no greater than 100 years through natural processes and no substantial use of the water exists or is projected, if institutional control is established that will effectively protect public health in the interim. This mechanism may also be a useful supplement for situations where active cleansing to completely achieve the standards is impracticable, environmentally damaging, or excessively costly, if the partially cleansed ground water can achieve the levels required by the standards through natural flushing within an acceptable extended remedial period. Alternate standards would not be required where final cleanup is to be accomplished through natural flushing, since those established under § 264.94 would be met at the end of the remedial period.

The proposed regulations would establish a time limit on such extension of the remedial period to limit reliance on extended use of institutional controls to control public access to contaminated ground water. Following the precedent established by our final rule for high-level radioactive wastes (40 CFR 191.14(a)), it is proposed that use of institutional controls be permitted for this purpose only when they will be needed for periods of less than 100 years. Otherwise, active restoration rather than passive restoration through reliance on natural flushing would be required.

Institutional controls must be effective over the entire period of time that they would be in use. Examples of acceptable measures include legal use restrictions enforceable by permanent government entities, or measures with a high degree of permanence, such as Federal or State ownership of the land containing the contaminated water. In some instances, a combination of institutional controls may have to be used at the same time to provide adequate protection, such as providing an alternate source of drinking water and placing a deed restriction on the property to prevent use of contaminated ground water. Institutional controls that would not be adequate are measures such as health advisories, signs, posts, admonitions, or any other measure that requires the voluntary cooperation of private parties. In all cases in which DOE proposes to use institutional controls, the measures must have a high probability of protecting the human health and the environment and must receive the concurrence of the NRC.

Restoration methods for ground water include removal methods, wherein the contaminated water is removed from the aquifer, treated, and either disposed of, used, or reinjected into the aquifer, and *in situ* methods, such as the addition of chemical or biological agents to fix the contamination in place. Appropriate restoration methods will depend on characteristics of specific sites and may involve use of a combination of methods. Water can be removed from an aquifer by pumping it out through wells or by collecting the water from intercept trenches. Slurry walls can sometimes be put in place to contain contamination and prevent further migration of contaminants, so that the volume of contaminated water that must be treated is reduced. The background information document contains a more extensive discussion of candidate restoration methods.

We have reviewed preliminary information on all 24 sites and detailed information on 12 of the 24 to make a preliminary assessment of the extent of potential applicability of the proposed supplemental standards and use of passive remediation under institutional control. Based on these analyses, none of the pre-existing ground water beneath uranium mill tailings piles falls into Class I. Approximately two-thirds of the sites appear to be over Class II and the balance over Class III ground waters. The rate at which natural flushing is occurring at three or four of the 24 sites would permit consideration of passive remediation under institutional control as the sole remedial method. We are not able to predict the applicability of provisions regarding technical impracticability or excess environmental harm, since this requires detailed analysis of specific sites, but we anticipate that wide application would be unlikely. It is emphasized that the above assessments are not based on final results for the vast majority of these sites, and is, therefore, subject to change.

RCRA regulations provide that, for disposal units regulated by EPA under RCRA, the constituents to be included in the ground water protection standard (§ 264.93) and acceptable concentrations of each (§ 264.94) are decided by the Regional Administrator of EPA. The regulations also provide for ACLs to be issued by the Regional Administrator. The criteria to be considered when

issuing ACLs are listed in § 264.94(b). EPA's regulations under Title II of UMTRCA provide that the NRC, which regulates active sites, replace the EPA Regional Administrator for the above functions when any contamination permitted by an ACL will remain on the licensed site. Because section 108(a) of UMTRCA requires the Commission's concurrence with DOE's selection and performance of remedial actions to conform to EPA's standards, we propose that the Nuclear Regulatory Commission administer all such functions for Title I, including concurrence on supplemental standards.

C. Request for Comments

The Agency solicits comment on this entire proposed rule. In addition, we are particularly interested in receiving comments and recommendations on the following issues:

1. Should a liner requirement always be imposed on tailings piles that are moved to a new location? Should a liner be required only if the DOE or the NRC conclude that it is needed to satisfy the ground-water standards for disposal?

2. For designated processing sites from which tailings have been removed, is a specific requirement that DOE clean up the ground water before releasing the land to State or private owners needed to assure that such cleanup will occur?

3. Should institutional controls be relied upon, for a limited time, to prevent access of the public to ground water in order to permit-use of natural flushing of contaminants, as proposed? If so, what types of institutional controls should be allowed? Should these be specified in the rule? Is the proposed time period appropriate?

4. Should the option to make use of natural flushing for cleansing of contaminants be limited to cases where some restoration of the ground water has already been carried out? Should the use of an alternate concentration limit (ACL) be permitted, as proposed, in the case of clean up to be achieved (in whole or part) by natural flushing?

5. Are the proposed bases for supplemental standards for cleanup reasonable and adequate for the protection of public health? Should other bases be provided and, if so, what are they? Should the provisions for natural flushing and supplemental standards for cleanup apply only to existing contamination or should they also apply, as is proposed, to "new" contamination due to failure of the disposal design to perform as intended?

6. Under these proposed standards, alternate concentration limits would be concurred in by the NRC. Should EPA establish generic criteria and/or guidance governing the application of the provisions of § 264.94(b) of this Part to these judgments for these standards?

7. Should EPA publish, as part of this standard, a restricted list of just those radioactive and toxic constituents that are present at these sites, or continue to rely on the entire list (supplemented as proposed) of constituents encompassed by RCRA regulations? Should the proposed list of additional listed constituents be changed?

8. EPA could consider publishing a restricted list of just those radioactive and toxic constituents that are principal contaminants at these sites and specifying a limit for each of these, under the assumption that any minor contaminants would be taken care of in the cleanup of these principal contaminants. With such a restricted set of constituents and corresponding complete set of limits, EPA could then consider dropping the provisions for ACLs and relying solely on the remaining provisions for exceptional cases. Should EPA adopt this approach?

9. Should EPA specify a minimum or the entire period for post-disposal ground-water monitoring in Subpart A, or leave it to the DOE and NRC to determine this period on a site-specific basis, as proposed? If EPA should specify a period, what length would be appropriate to demonstrate conformance to the disposal design standard, and on what basis should this value be chosen?

10. For tailings regulated by NRC under Title II of the Act, section 84(a)(3) requires the NRC to develop regulations to conform to general requirements applicable to the possession, transfer, and disposal of hazardous materials regulated by the Administrator. Should the standards proposed here incorporate such requirements for tailings regulated under Title I?

11. Is it appropriate to base the uranium contaminant limit on radioactivity alone or should the chemical toxicity of uranium result in a more restrictive value?

12. Should the Agency consider revising the Title II regulations to incorporate those portions of the Title I regulations that are different from the Title II regulations, e.g., the additional contaminant limits in Table A?

13. Are the estimated costs of implementing these proposed standards accurate and based on reasonable assumptions?

14. What criteria should be used to judge "technically impracticable from an engineering perspective?" Can and should these criteria be specified in the rule or should they be left to the judgment of the Department of Energy and the Nuclear Regulatory Commission?

15. The criteria proposed here to specify ground water as Class III, and therefore qualified for supplemental standards, are based on draft proposals still under consideration by the Agency. Are these criteria appropriate for this application, or would others be more appropriate for use at these sites?

V. Implementation

UMTRCA requires the Secretary of Energy to select and perform the remedial actions needed to implement these standards, with the full participation of any State that shares the cost. The NRC must concur with these actions and, when appropriate, the Secretary of Energy must also consult with affected Indian tribes and the Secretary of the Interior.

The cost of remedial actions will be borne by the Federal Government and the States as prescribed by UMTRCA. The clean-up of ground water is a large-scale undertaking for which there is relatively little experience. Ground-water conditions at the inactive processing sites vary greatly, and, as noted above, engineering experience with some of the required remedial actions is limited. Although preliminary engineering assessments have been performed, specific engineering requirements and costs to meet the ground-water standards at each site have yet to be determined. We believe that costs averaging about 12 million (1986) dollars for each tailings site at which extensive cleanup is required are most likely.

The benefits from the cleanup of this ground water are difficult to quantify. We expect that, in a few instances, ground water that was unusable due to contamination from tailings piles and needed for use will be restored. In the areas where the tailings were processed, ground water is relatively scarce due to the arid condition of the land. However, most of the contamination at these sites occurs in shallow alluvial aquifers, which have limited current use in these locations because of their generally poor quality and the availability of better water from deeper aquifers.

Implementation of the disposal standard for protection of ground water will require a judgment that the method chosen provides a reasonable expectation that the provisions of the standard will be met, to the extent reasonably achievable, for up to 1000 years and, in any case, for at least 200 years. This judgment will necessarily be based on site-specific analyses of the properties of the sites, candidate

disposal systems, and the potential effects of natural processes over time. Therefore, the measures required to satisfy the standard will vary from site to site. We expect that actual site data, computational models, and expert judgment will be the major tools in deciding that a proposed disposal system will satisfy the standard.

The purpose of the proposed ground-water cleanup standard is to provide the maximum reasonable protection of public health and the environment. Costs incurred by remedial actions should be directed toward this purpose. We intend the standards to be implemented using verification procedures whose cost and technical requirements are reasonable. Procedures that provide a reasonable assurance of compliance with the standards will be adequate. Measurements to assess existing contamination and to determine compliance with the cleanup standards should be performed with reasonable survey and sampling procedures designed to minimize the cost of verification.

The explanatory discussions regarding implementation of these regulations in § 192.20 (a)(2) and (a)(3) are revised to remove those provisions that the Court remanded and to reflect these new proposals.

These standards are not expected to affect the disposal work DOE has already performed on tailings. We expect, in general, that a pile that has been properly designed to comply with the disposal standards now in effect for long term stabilization and control of radon emanation from a pile will also comply with these disposal standards for the control of ground-water contamination. DOE will have to determine, with the concurrence of the NRC, if any additional work may be needed to comply with the ground-water cleanup requirements. However, any such cleanup work should not adversely affect the control systems for tailings piles that have already been or are currently being installed.

VI. Regulatory Impact Analysis/ Regulatory Flexibility

Under Executive Order 12291, EPA must judge whether a regulation is "Major" and therefore subject to the requirement of a Regulatory Impact Analysis. That order requires such an analysis if the regulations would result in (1) an annual effect on the economy of $100 million or more; (2) a major increase in costs or prices for consumers, individual industries, Federal, State, or local government agencies or geographic regions; or (3) significant adverse effects on competition, employment, investment, productivity, innovation, or on the ability of United States-based enterprises to compete with foreign-based enterprises in domestic or export markets.

This proposed regulation is not Major, because we expect the costs of the remedial action program for ground water in any calendar year to be less than $100 million; States bear only 10% of these costs and there are no anticipated major affects on costs or prices for others; and we anticipate no significant adverse effects on domestic or foreign competition, employment, investment, productivity, or innovation. Estimated costs under these proposed regulations are discussed in the Background Information Document.

This proposed regulation was submitted to the Office of Management and Budget (OMB) for review as required by Executive Order 12291.

This rule does not contain any information collection requirements subject to OMB review under the Paperwork Reduction Act of 1980 U.S.C. 3501, et seq.

This proposed regulation will not have a signficant effect on a substantial number of small entities, as specified under section 605 of the Regulatory Flexibility Act, because there are no small entities subject to this regulation.

Dated: September 10, 1987.

Lee M. Thomas,

Administrator.

List of Subjects in 40 CFR Part 192

Environmental protection, Radiation protection, Uranium.

For reasons set forth in the preamble, 40 CFR Chapter I, Part 192, Subparts A, B and C are proposed to be amended as follows:

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

1. The authority citation for Part 192 continues to read as follows:

Authority: Section 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 as amended, Pub. L. 95-604.

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

* * * * *

2. Section 192.01 is amended by revising paragraph (a) and adding paragraphs (g), (h), (i), and (j) to read as follows:

§ 192.01 Definitions.

(a) Unless otherwise indicated in this subpart, all terms have the same meaning as in Title I of the Act. Reference to Part 264 of the Code of Federal Regulations is to that Part as codified on January 1, 1983. [These references will be replaced by the complete text in the final rule.]

* * * * *

(g) *Remedial period* means the period of time beginning March 7, 1983 and ending with the completion of requirements specified under a remedial action plan.

(h) *Remedial Action Plan* means a written plan for a specific site that incorporates the results of site characterization studies, environmental assessments or impact statements, and engineering assessments into a plan for disposal and cleanup which satisfies the requirements of Subparts A and B.

(i) *Post-disposal period* means the period of time beginning immediately after the completion of the requirements of Subpart A and ending at completion of the monitoring requirements established under § 192.02(b).

(j) *Ground water* is subsurface water within a zone in which substantially all the voids are filled with water under pressure equal to or greater than that of the atmosphere.

3. Section 192.02 is amended by redesignating and revising the introductory text as paragraph (a); paragraph (a) is redesignated as paragraph (a)(1); paragraph (b) introductory text is redesignated as paragraph (a)(2); paragraph (b)(1) is redesignated as paragraph (a)(2)(i); paragraph (b)(2) is redesignated as paragraph (a)(2)(ii); and paragraphs (a)(3), (a)(4), (b) and (c) are added to read as follows:

§ 192.02 Standards.

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

* * * * *

(3) Conform to the ground-water protection provisions of §§ 264.92–264.95 of Part 264 of this chapter, except that, for the purposes of this subpart:

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

[1] Because the standard applies to design, monitoring after disposal is not required to demonstrate compliance. This footnote applies only to § 192.02(a) (1) and (2).

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

TABLE A.

Constituent	Limit
Combined radium-226 and radium-228.	5 pCi/liter.
Combined uranium-234 and uranium-238.	30 pCi/liter.
Gross alpha-particle activity (excluding radon and uranium)..	15 pCi/liter.
Nitrate (as N).....	10 mg/liter.
Molybdenum.....	0.1 mg/liter.

(iii) The Secretary shall determine what listed constituents are present in the tailings at a disposal site,

(iv) A monitoring program shall be established upgradient of the disposal site adequate to determine background levels of listed constituents,

(v) The Secretary may propose and, with the Commission's concurrence, apply alternate concentration limits, provided that, after considering practicable corrective actions, the Commission determines that these are as low as reasonably achievable, and that, in any case, § 264.94(b) is satisfied, and

(vi) The functions and responsibilities designated in referenced paragraphs of Part 264 of this chapter as those of the "Regional Administrator" with respect to "facility permits" shall be carried out by the Commission.

(4) Comply with the performance standard in § 264.111 (a) and (b) of this chapter.

(b) The Secretary shall propose and, following concurrence by the Commission, implement a monitoring plan, to be carried out over a period of time which shall constitute the post-disposal period, which is adequate to demonstrate that initial performance of the disposal is in accordance with the design requirements of § 192.02(a).

(c) If the ground-water standards established under provisions of § 192.02(a) are found or projected to be exceeded, as a result of the monitoring program established for the post-disposal period under § 192.02(b), a corrective action program to restore the disposal to the design requirements of § 192.02(a) and, as necessary, to clean up ground water in conformance with Subpart B shall be put into operation as soon as is practicable, and in no event later than eighteen (18) months after a finding of exceedance.

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

* * * * *

4. Section 192.11 is amended by revising paragraph (b) and adding paragraph (e) to read as follows:

§ 192.11 Definitions.

* * * * *

(b) *Land* means (1) any surface or subsurface land that is not part of a disposal site and is not covered by an occupiable building, and (2) subsurface land that contains ground water contaminated by listed constituents from residual radioactive material from the processing site.

* * * * *

(e) *Class III ground water* [3] means ground water 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/1, (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-supply systems, or (3) the quantity of water available is less than 150 gallons per day.

5. In § 192.12, the introductory text is republished and paragraph (c) is added to read as follows:

§ 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:*

* * * * *

(c) The concentration of any listed constituent in ground water as a result of releases from residual radioactive material at any designated processing site shall not exceed the provisions of §§ 264.92–264.94 of this chapter as modified by § 192.02(a)(3) (i) and (ii), except that for the purposes of this subpart:

(1) The Secretary shall carry out a monitoring program adequate to define the extent of ground-water contamination by listed constituents from residual radioactive materials and to monitor compliance with this Subpart.

(2) The Secretary may propose and, with the Commission's concurrence, apply alternate concentration limits, provided that, after considering practicable corrective actions, the Commission determines that these are as low as reasonably achievable, and § 264.94(b) is satisfied.

(3) The functions and responsibilities designated in referenced paragraphs of Part 264 of this chapter as those of the "Regional Administrator" with respect to "facility permits" shall be carried out by the Commission.

(4) The remedial period established under Subpart A may be extended by an amount not to exceed 100 years if:

(i) The concentration limits established under this Subpart are not projected to be exceeded at the end of this extended remedial period,

(ii) Institutional control, which will effectively protect public health and satisfy beneficial uses of ground water during the extended remedial period, is instituted, as part of the remedial action, at the processing site and wherever contamination by listed constituents from residual radioactive materials is found in ground water, or is projected to be found,

(iii) The ground water is not currently and is not now projected to become a source of supply for public drinking water subject to provisions of the Safe Drinking Water Act during the extended remedial period, and

(iv) The requirements of Subpart A are satisfied within the time frame established under section 112(a) of the Act, or as extended by Act of Congress.

Subpart C—Implementation

6. In § 192.20, paragraphs (a)(2), and (a)(3) and (b)(1) are revised and paragraph (b)(4) is added to read as follows:

§ 192.20 Guidance for implementation.

* * * * *

(a) * * *

(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 shall include a monitoring program sufficient to establish background ground water quality through one or more upgradient wells. New disposal sites for tailings that still contain water at greater than the level of "specific retention" or tailings that are slurried to the new location shall use

[3] Class III ground waters are further defined in *Ground-Water Protection Strategy*, Office of Ground-Water Protection, USEPA, Washington, DC 20460, August 1984, and the Final Draft of *Guidelines for Ground-Water Classification under the EPA Ground-Water Protection Strategy*, Office of Ground-Water Protection, USEPA, Washington, DC 20460, December 1986.

a liner or equivalent to prevent contamination of ground water.

(3) The remedial action plan, following approval by the Commission, will specify how applicable requirements of Subpart A are to be satisfied. The plan shall include the schedule and steps necessary to complete disposal operations at the site. It shall include an estimate of the inventory of wastes to be disposed of in the pile and their listed constituents and address (i) any need to eliminate free liquids; (ii) stabilization of the wastes to a bearing capacity sufficient to support the final cover; and (iii) the design and construction of a cover to manage the migration of liquids through the stabilized pile, function with minimum maintenance, promote drainage and minimize erosion or abrasion of the cover, and accommodate settling and subsidence so that the cover's integrity is maintained.

(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 assuming realistic radium distributions near the surface rather than extremes rarely encountered.

* * * * *

(4) The remedial action plan, following approval by the Commission, 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 ground water 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 ground water. In addition, the assessment should consider future plume movement, including an evaluation of such processes as attenuation and dilution. In cases where § 192.12(c)(4) is invoked, the plan should include a monitoring program to verify projections of plume movement and attenuation throughout the remedial period. Finally, the plan should specify details of the method to be used for cleanup of ground water.

7. In § 192.21, the introductory text and paragraph (b) are revised, paragraph (f) is redesignated as paragraph (h), and new paragraphs (f) and (g) are added to read as follows:

§ 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 subsection (h) 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:

* * * * *

(b) Remedial actions to satisfy the cleanup standards for land, § 192.12 (a) and (c), or the acquisition of minimum materials required for control to satisfy § 192.02(a) (2) and (3), would, notwithstanding reasonable measures to limit damage, directly produce environmental harm that is clearly excessive compared to the health benefits to persons living on or near the site, now or in the future. A clear excess of environmental harm is harm that is long-term, manifest, and grossly disproportionate to health benefits that may reasonably be anticipated.

* * * * *

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

(g) The ground water is Class III.

* * * * *

8. In § 192.22, paragraphs (a) and (b) are revised and paragraph (d) is added to read as follows:

§ 192.22 Supplemental standards.

* * * * *

(a) When one or more of the criteria of § 192.21 (a) through (g) applies, the implementing agencies shall select and perform remedial actions that come as close to meeting the otherwise applicable standard as is reasonable under the circumstances.

(b) When § 192.21(h) applies, remedial actions shall, in addition to satisfying the standards of Subparts A and B, reduce other residual radioactivity to levels that are as low as is reasonably achievable.

* * * * *

(d) When § 192.21 (f) or (g) applies, implementing agencies must apply any remedial actions for the restoration of contaminated ground water that is required to assure, at a minimum, protection of human health and the environment.

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