

Environmental Protection Agency

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§ 197.26 What are the circumstances of the human intrusion?

For the purposes of the analysis of human intrusion, DOE must make the following assumptions:

- (a) There is a single human intrusion as a result of exploratory drilling for ground water;
- (b) The intruders drill a borehole directly through a degraded waste package into the uppermost aquifer underlying the Yucca Mountain repository;
- (c) The drillers use the common techniques and practices that are currently employed in exploratory drilling for ground water in the region surrounding Yucca Mountain;
- (d) Careful sealing of the borehole does not occur, instead natural degradation processes gradually modify the borehole;

(e) Only releases of radionuclides that occur as a result of the intrusion and that are transported through the resulting borehole to the saturated zone are projected; and

(f) No releases are included which are caused by unlikely natural processes and events.

GROUND WATER PROTECTION STANDARDS

§ 197.30 What standards must DOE meet?

The DOE must demonstrate that there is a reasonable expectation that, for 10,000 years of undisturbed performance after disposal, releases of radionuclides from waste in the Yucca Mountain disposal system into the accessible environment will not cause the level of radioactivity in the representative volume of ground water to exceed the limits in the following Table 1:

TABLE 1—LIMITS ON RADIONUCLIDES IN THE REPRESENTATIVE VOLUME

Radionuclide or type of radiation emitted	Limit	Is natural background included?
Combined radium-226 and radium-228	5 picocuries per liter	Yes.
Gross alpha activity (including radium-226 but excluding radon and uranium).	15 picocuries per liter	Yes.
Combined beta and photon emitting radionuclides	40 microsieverts (4 millirem) per year to the whole body or any organ, based on drinking 2 liters of water per day from the representative volume.	No.

§ 197.31 What is a representative volume?

(a) It is the volume of ground water that would be withdrawn annually from an aquifer containing less than 10,000 milligrams of total dissolved solids per liter of water to supply a given water demand. The DOE must project the concentration of radionuclides released from the Yucca Mountain disposal system that will be in the representative volume. The DOE must then use the projected concentrations to demonstrate a reasonable expectation to NRC that the Yucca Mountain disposal system complies with § 197.30. The DOE must make the following assumptions concerning the representative volume:

- (1) It includes the highest concentration level in the plume of contamination in the accessible environment;
- (2) Its position and dimensions in the aquifer are determined using average

hydrologic characteristics which have cautious, but reasonable, values representative of the aquifers along the radionuclide migration path from the Yucca Mountain repository to the accessible environment as determined by site characterization; and

(3) It contains 3,000 acre-feet of water (about 3,714,450,000 liters or 977,486,000 gallons).

(b) The DOE must use one of two alternative methods for determining the dimensions of the representative volume. The DOE must propose its chosen method, and any underlying assumptions, to NRC for approval.

(1) The DOE may calculate the dimensions as a well-capture zone. If DOE uses this approach, it must assume that the:

- (i) Water supply well(s) has (have) characteristics consistent with public water supply wells in the Town of Amargosa Valley, Nevada, for example,

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well-bore size and length of the screened intervals;

(ii) Screened interval(s) include(s) the highest concentration in the plume of contamination in the accessible environment; and

(iii) Pumping rates and the placement of the well(s) must be set to produce an annual withdrawal equal to the representative volume and to tap the highest concentration within the plume of contamination.

(2) The DOE may calculate the dimensions as a slice of the plume. If DOE uses this approach, it must:

(i) Propose to NRC, for its approval, where the location of the edge of the plume of contamination occurs. For example, the place where the concentration of radionuclides reaches 0.1% of the level of the highest concentration in the accessible environment;

(ii) Assume that the slice of the plume is perpendicular to the prevalent direction of flow of the aquifer; and

(iii) Assume that the volume of ground water contained within the slice of the plume equals the representative volume.

ADDITIONAL PROVISIONS

§ 197.35 [Reserved]

§ 197.36 Are there limits on what DOE must consider in the performance assessments?

(a) Yes, there are limits on what DOE must consider in the performance assessments.

(1) The DOE's performance assessments conducted to show compliance with §§197.20(a)(1), 197.25(b)(1), and 197.30 shall not include consideration of very unlikely features, events, or processes, i.e., those that are estimated to have less than one chance in 100,000,000 per year of occurring. Features, events, and processes with a higher chance of occurring shall be considered for use in performance assessments conducted to show compliance with §§197.20(a)(1), 197.25(b)(1), and 197.30, except as stipulated in paragraph (b) of this section. In addition, unless otherwise specified in these standards or NRC regulations, DOE's performance assessments need not evaluate the impacts resulting from features, events, and processes or sequences of events and processes with

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a higher chance of occurring if the results of the performance assessments would not be changed significantly in the initial 10,000-year period after disposal.

(2) The same features, events, and processes identified in paragraph (a)(1) of this section shall be used in performance assessments conducted to show compliance with §§197.20(a)(2) and 197.25(b)(2), with additional considerations as stipulated in paragraph (c) of this section.

(b) For performance assessments conducted to show compliance with §§197.25(b) and 197.30, DOE's performance assessments shall exclude unlikely features, events, or processes, or sequences of events and processes. The DOE should use the specific probability of the unlikely features, events, and processes as specified by NRC.

(c) For performance assessments conducted to show compliance with §§197.20(a)(2) and 197.25(b)(2), DOE's performance assessments shall project the continued effects of the features, events, and processes included in paragraph (a) of this section beyond the 10,000-year post-disposal period through the period of geologic stability. The DOE must evaluate all of the features, events, or processes included in paragraph (a) of this section, and also:

(1) The DOE must assess the effects of seismic and igneous scenarios, subject to the probability limits in paragraph (a) of this section for very unlikely features, events, and processes. Performance assessments conducted to show compliance with §197.25(b)(2) are also subject to the probability limits for unlikely features, events, and processes as specified by NRC.

(i) The seismic analysis may be limited to the effects caused by damage to the drifts in the repository, failure of the waste packages, and changes in the elevation of the water table under Yucca Mountain. NRC may determine the magnitude of the water table rise and its significance on the results of the performance assessment, or NRC may require DOE to demonstrate the magnitude of the water table rise and its significance in the license application. If NRC determines that the increased elevation of the water table does not significantly affect the results