detecting radionuclide releases—a system which would almost certainly not be detecting anything for several times the history of the United States—is not likely to be maintained for long enough to be of much use.

(3) Within the above constraints, however, there are likely to be monitoring approaches which may, in a relatively short time, significantly improve confidence that a repository is performing as intended. Two examples are of particular interest. One involves the concept of monitoring groundwater sources at a variety of distances for benign tracers intentionally released to the ground water in the repository; this approach can evaluate the delay involved in groundwater movement from the repository to the environment and can serve to validate expectations of the performance expected from the system's natural barriers. Another concept involves monitoring the small uplift of the land surface over the repository in order to validate predictions of the system's thermal behavior. Both of these approaches can be carried out without enhancing pathways for the wastes to escape from the repository.

Based on these conclusions and the public comments on this question, the Agency included a provision (in the assurance requirements of the final disposal standards) for long-term monitoring after disposal: "Disposal systems shall be monitored after disposal to detect substantial and detrimental deviations from expected performance. This monitoring shall be done with techniques that do not jeopardize the isolation of the wastes and shall be conducted until there are no significant concerns to be addressed by further monitoring."

Accordingly, EPA is proposing criteria for complying with the monitoring requirements in the disposal standards. EPA is proposing that monitoring programs be designed to detect the movement of radionuclides toward the accessible environment at the earliest practicable time. Such monitoring programs shall be consistent with monitoring required under applicable federal hazardous waste regulations and shall be done with techniques that do not jeopardize the containment of waste in the disposal system. Due to the long-term nature of the potential hazard associated with disposal of transuranic radioactive waste, any unpredicted detection of movement of radionuclides away from the disposal system and toward the accessible environment would be cause for concern that an exceedance of what is permitted under the disposal regulations is likely to occur. If releases are detected early enough, remedial action can be implemented before radionuclides reach the accessible environment.

EPA is proposing in today's criteria that any compliance certification application include a detailed plan for monitoring the performance of the WIPP after disposal. At a minimum, this plan shall: Identify parameters that will be monitored and how baseline states will be determined; indicate how each parameter will be used to evaluate the performance of the disposal system; and discuss the length of time over which each parameter will be monitored to detect deviations from expected performance. Radionuclide monitoring programs should be consistent with applicable federal hazardous waste monitoring programs in order to minimize duplication of monitoring efforts. The Agency solicits comments on this approach.

In addition to monitoring after closure of the disposal system (i.e., when all of the shafts to the repository are backfilled and sealed), EPA proposes that, to the extent practicable, preclosure monitoring of parameters which may affect the long-term performance of the disposal system after closure shall also be conducted. The Agency believes that such monitoring can provide important information about the disposal system and that such information can contribute to a better understanding of how the disposal system is likely to perform after closure. Furthermore, such information can be used to verify assumptions (about the disposal system) which form the basis of a compliance assessment.

The Agency is proposing to require that, as a part of the pre-closure monitoring plan for the WIPP, monitoring of parameters which can affect the containment of waste in the disposal system shall be conducted to the extent practicable. The Agency believes that the following parameters can affect the containment capability of the WIPP: Brine quantity, flux, composition, and spatial distribution; gas quantity and composition; and temperature distribution. Since there may be additional disposal system parameters important to the containment of waste, EPA is proposing that DOE undertake a study to determine the effect of various disposal system parameters on the performance of the disposal system. Such study shall consider whether a disposal system parameter should be monitored because the parameter either provides information regarding the disposal system's ability to contain waste or regarding the ability to predict the future performance of the disposal system. The parameters studied shall include, but need not be limited to: Backfilled mechanical state including

porosity, permeability, and degree of compaction and reconsolidation; extent of deformation of the surrounding roof, walls, and floor of the disposal room; and initiation or displacement of major brittle deformation features in the roof or surrounding rock. The results of the study shall be provided to EPA along with documentation of the methodology and information describing the importance of each disposal system parameter studied. The results of such study shall dictate the breadth of monitoring of disposal system parameters.

The parameters specifically mentioned above and in the proposed criteria were identified as important to the containment capability of the WIPP by the Agency in its comments to the Department (dated October 19, 1989) regarding the Test Phase Plan for the WIPP. In those comments, EPA recommended that the Department implement monitoring systems in disposal rooms that would be "indicative of waste system performance" (Recommendation 7). In response to EPA's comments, the DOE agreed to conduct a feasibility study on underground monitoring of the WIPP.

EPA solicits comment on whether monitoring should be required for the specific parameters listed above, on whether additional or other parameters should be specified, and on the feasibility of continuing such monitoring after disposal (i.e., after the repository has been backfilled and sealed). Additionally, the Agency solicits comment on whether EPA should require the use of specific monitoring methods.

Passive Institutional Controls

The assurance requirements of 40 CFR part 191 require that "disposal systems shall be designated by the most permanent markers, records, and other passive institutional controls practicable to indicate the dangers of the wastes and their location." Section 14(c) of 40 CFR part 191. The standards define "passive institutional controls" as "(1) permanent markers placed at a disposal site, (2) public records and archives, (3) government ownership and regulations regarding land or resource use, and (4) other methods of preserving knowledge about the location, design and contents of a disposal system."

In light of the requirement for use of passive institutional controls set forth in 40 CFR part 191, the Agency is proposing that any application for certification of compliance include detailed descriptions of the measures that will be employed to preserve knowledge about the location, design,

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