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Department of Energy
Carlsbad Area Office
P. O. Box 3090
Carlsbad, New Mexico 88221

January 24, 1997

Ms. Ramona Trovato, Director
US Environmental Protection Agency
Office of Radiation Programs
401 M. Street SW
Washington, DC 20460

Dear Ms. Trovato:

The Carlsbad Area Office (CAO) received a copy of the letter addressed to Al Alm dated December 19, 1996, requesting that we provide supporting documentation for the Agency review of the Compliance Certification Application (CCA) for the Waste Isolation Pilot Plant (WIPP). My staff has indicated that some of the supplementary information requested will require more time to collect. In the interest of facilitating a timely review we will provide the requested information in a phased manner over the next few weeks.

Enclosed you will find the second response package. We have reproduced the issue verbatim from the enclosures to the December 19, 1996, letter and inserted the response from the CAO in each case. We are confident that you will find this supplementary information helpful in your review process. We will continue to provide additional packages which you will receive over the next few weeks.

Should you have any questions regarding this information or require anything further, please contact me at (505) 234-7300.

Sincerely,

George E. Dials
Manager

Enclosure

cc:
F. Marcinowski, EPA

Preface to DOE's Response to Request for Additional Information

Note: This is the Department of Energy's (DOE) second submittal responding to the requests for additional information; as requested in the Environmental Protection Agency's (EPA) December 19, 1996, letter from Mary D. Nichols to Alvin L. Alm. To expedite EPA's review of the CCA, the Carlsbad Area Office (CAO) of DOE is providing responses as they are developed. Subsequent submittals will address the remaining requests for additional information as that information is developed by CAO. This process is expected to continue over a period measured in terms of a few weeks.

Each request for additional information is identified by the enclosure number, page number, and rule reference called out in the EPA's enclosures to the above cited letter. The format for these responses includes prefacing each response with the original request text verbatim followed by the CAO response. Each comment and response is presented as a unit to facilitate integration of additional submittals.

Comment Text

194.33(c)(1)
Section 194.33(c)(1) on future drilling practices requires that "...such future drilling practices shall include, but shall not be limited to: ...the fraction of such boreholes that are sealed by humans...."

Section 6.4.7.2 of the CCA provides this information as the fraction of recently drilled (since 1988) boreholes that had been declared by the owners to be shut-in or temporarily abandoned that were eventually plugged. A survey indicated that 100% were plugged. However, there has been a recognized problem in recent years in the Delaware Basin of inactive wells that have never been declared as shut-in or temporarily abandoned by their owners. Appendix DEL (page DEL-45) recognizes one category of such wells (orphan wells whose owners cannot be located). Also, Table DEL-2 indicates an increase in active wells in southeastern New Mexico (since 1971) that is 7,428 wells less than the number of wells drilled minus the number abandoned. Assumptions about the existence, location, and effectiveness of borehole plugs drastically affect calculated amounts of Castile or Culebra brines in the repository as well as their movement toward the accessible environment.

The Department needs to provide detailed information about the large number of unaccounted for wells (e.g. the 7,428 wells in Table DEL-2). The effect of non-plugged boreholes needs to be included in intrusion scenarios.

DOE Response

The DOE will respond to this comment in three parts; subpart **a** will respond to the apparent inability to reconcile the numbers represented in Table DEL-2; subpart **b** will respond to the perceived problem of inactive wells which have been abandoned by their owners; and subpart **c** will respond to the inclusion of unplugged boreholes in intrusion scenarios.

a) The EPA appears to have interpreted information presented in Appendix DEL, Table DEL-2 in a manner inconsistent with the record keeping system employed by the NMOCD (the source of the data). These data do not support a conclusion that at least 7,428 wells are unaccounted for. Reasons for this include:

1. From the information provided in the table, it is not possible to discern the number of temporarily abandoned holes;
2. The "Wells Completed" column includes dry holes;
3. The "Wells Abandoned" column includes service wells; and
4. The "Active Wells" column includes injection wells.

Apparently the EPA summed the "Wells Completed" column entries, subtracted the sum of the "Wells Abandoned" column, and concluded the remainder is significantly smaller that the annual increase in the "Active Wells" column.

The data presented in this table were gathered by different agencies using different assumptions; i.e., they cannot be reconciled because a one-to-one relationship between the data does not exist. The table was merely provided to present as much drilling information as possible.

b) As described in Appendix DEL, the DOE performed a review of borehole drilling and plugging records available through the BLM. As stated on page DEL-64, BLM has identified no incident of noncompliance related to borehole plugging during the period 1991 through 1996. Also, as explained on page DEL-71, the DOE reviewed industry records to determine that 875 hydrocarbon boreholes in the New Mexico portion of the Delaware Basin had completion dates from 1988 to 1995. The period beginning in 1988 was selected because this is the period in which the current regulatory framework for wells located on federally controlled land has been in place. New Mexico Oil Conservation Division records for each of these 875 boreholes were reviewed to determine the current status of each well. This review showed that all of the wells were either actually already plugged or were soon to be plugged; i.e., the notice of intent to plug had been filed, and action was pending by either the regulatory agency or the operator. The DOE review of the well records revealed no instances in which wells were inappropriately left unplugged.

The DOE believes that it is appropriate to apply current conditions regarding the frequency of borehole plugging to the Performance Assessment because this is consistent with EPA's guidance in 40 CFR 194.33(c)(1). Current conditions, in this context, are defined as the current regulatory situation pertaining to borehole plugging on land that is currently under the control of the federal government.

Consistent with this rationale, problems that may have occurred regarding unplugged boreholes prior to 1988, and before the current regulatory criteria were imposed, are not considered in determining the frequency at which boreholes can

be expected to be plugged in the future. The current regulatory process was designed, in part, to be responsive to historical problems with holes remaining unplugged.

For example, the most recent plugging requirements require the operator to request approval for any temporarily abandoned (TA) or shut-in well on an annual basis. In such requests, the operator must include their basis for maintaining the well as either shut-in or TA, including economic and operational reasoning. If a convincing argument is provided for maintaining the well's status as TA or shut-in, the operator will be granted a one-year extension. No more than five one-year extensions may be granted. After this point the well must either resume production (assuming resources are still present) or be plugged.

This administrative control over inactive wells combined with other aspects of the current regulation (such as a plugging bond posted by all drillers) provides additional assurance measures not present under earlier regulatory conditions (pre-1988). The DOE believes that the current regulatory process is effective in preventing orphan holes from occurring. A review of the plugging records support this belief.

c) As stated previously, since the implementation of the most recent plugging regulations applicable to wells in this area, compliance with the plugging requirements has greatly improved. This notwithstanding, the DOE feels that the effects of unplugged boreholes are accounted for in the performance assessment analysis. While it is assumed that boreholes are plugged 100% of the time, the borehole properties change with time, quickly (relatively) degrading to properties of silty sand. (Silty sand is the analogue used by the DOE as that material which "would normally settle into an open hole over time-not the permeability of a carefully sealed borehole" [40 CFR 191, Appendix C]). These borehole properties are described in Section 6.4.13.5, listed in Table 6-29, and their effects (in terms of repository pressures) are evaluated in Section 3.3 of the "Preliminary Summary of Uncertainty and Sensitivity Analysis Results Obtained in Support of the 1996 Compliance Certification Application for the Waste Isolation Pilot Plant, December 1996."

The DOE believes that the current treatment of borehole properties in performance assessment adequately accounts for unplugged boreholes.

194.33(c)(1)

Section 194.33(c)(1) requires that future drilling practices remain consistent with present practices in the Delaware Basin. These practices include borehole plugs or seals.

Section 6.4.7.2 assumes that all intrusion borehole plugs were effectively emplaced (i.e., the boreholes are completely sealed). No evidence is provided in Appendix DEL or it's attachments to support this assumption. Only about one-half of plugging operations on Bureau of Land Management (BLM) land are inspected by BLM during plugging and there is no indication of follow-up studies to determine effectiveness of emplaced plugs. This assumption is potentially important because defective 2-plug or 3-plug configurations could result in increased flows between Castile brine reservoirs, the repository, and the Culebra aquifer.

The Department needs to provide documentation on the percentage of plugs that are assumed to be effectively emplaced and the basis for the assumption.

DOE Response

The plugging requirements specify the appropriate plugging configurations and were developed by the regulating agency based on the need to adequately protect other resources (water, other hydrocarbon-bearing intervals, as well as mineral resources such as potash) and the general environment. Therefore, DOE assumes that a borehole plugged to the specifications cited in the plugging requirements would effectively protect the Salado formation.

A historical perspective of the required techniques and materials utilized clearly indicates that properly plugged boreholes are *effectively* plugged boreholes. Hence, the focus shifts to how often are boreholes plugged in accordance with the regulatory specifications. As the EPA has stated in the comment, the BLM field verifies approximately 50% of all plugging operations conducted on federal lands. However, discussions with the BLM show that these field verification activities are not selected randomly; rather they are prioritized in accordance with the related hazards at the borehole. For instance, a borehole intersecting the Capitan Aquifer would be given a higher priority than one which does not intersect a water-bearing zone. Similarly, a borehole in the Known Potash Lease Area (KPLA) would also receive a higher priority for inspection. The BLM ardently attempts to witness such high-priority

plugging activities 100% of the time, despite other competing priorities and manpower limitations. The WIPP lies within the KPLA [1].

The applicable plugging regulations also provide a high degree of administrative control over plugging activities. For example, prior to actual plugging, the operator must submit a *Sundry Notice of Intent to Plug* which describes the proposed plugging configuration and composition, along with pertinent information regarding the borehole. The regulatory agency, in this case the BLM, reviews the plugging plan and makes any changes to or enhancements of the proposed configuration that are deemed necessary. The plan is then approved by the regulator and transmitted back to the operator. The operator must then notify the BLM at least 24 hours prior to the initiation of any plugging activities. This advance notice provides the BLM the opportunity to witness plugging operations as deemed necessary, based on the prioritization mentioned earlier as well as the BLM's first-hand historical knowledge of the reputation, operational practices, and capabilities of the various operators in the Delaware Basin.

From the operators' perspective, it is not worth the legal and/or liability related risks involved in failing to meet the specifications in the approved plugging configuration. Penalties for infractions of this nature can range from substantial monetary fines up to loss of the possible opportunities to conduct drilling operations on public lands in the future. The fact that a federal inspector could arrive at any point throughout the plugging operation coupled with the costs of corrective action(s) far outweigh the costs of plugging to the regulatory specifications. Moreover, documentation of compliant plugging would be very beneficial to the operator in the event of future litigation. Thus, operators realize that it is in their best interest to conduct plugging operations as specified by the regulator. Especially in light of the fact that cement costs represent less than 5 - 10% of the aggregate costs associated with plugging and abandonment operations.

Based on this information, as well as information acquired from plugging records, the DOE assumes that all boreholes are effectively plugged. However, in performance assessment, borehole properties are assumed to change over time. As mentioned in the previous response, the properties of the plug which separate the repository from overlying water-bearing zones (the Rustler plug) is assumed to degrade to the properties of silty sand in 200 years, thereby accounting for the effects of defective or poor performing borehole plugs.

[1] *Personal communication with Jim Amos, Unites States Department of the Interior (DOI) Bureau of Land Management, (BLM), Carlsbad Office, January 16, 1997, Re: BLM inspection of plugging procedures on federal lands.*