2009 Compliance Recertification Application (2009 CRA)
Compliance Application Review Document (CARD) No. 53

Consideration of Underground Sources of Drinking Water

53.0 BACKGROUND

Section 194.53 requires the U.S. Department of Energy (DOE or Department) to consider, in compliance assessments, underground sources of drinking water near the Waste Isolation Pilot Plant (WIPP) and their interconnections. An underground source of drinking water is defined at 40 CFR 191.22 as "an aquifer or its portion that supplies a public water system, or contains a sufficient quantity of ground water to do so and (i) currently supplies drinking water for human consumption or (ii) contains fewer than 10,000 mg per liter of total dissolved solids." The groundwater protection requirements limit releases to the maximum contamination level (MCL) established in 40 CFR Part 141 of the Safe Drinking Water Act.

The disposal standards in 40 CFR 191.24(a) (l) require that "Disposal systems for waste and any associated radioactive material shall be designed to provide a reasonable expectation that 10,000 years of undisturbed performance after disposal shall not, cause the levels of radioactivity in any underground source of drinking water, in the accessible environment, to exceed the limits specified in 40 CFR part 141 as they exist on January 19, 1994".

53.1 REQUIREMENT (194.53)

"In compliance assessments that analyze compliance with part 191, subpart C of this chapter, all underground sources of drinking water in the accessible environment that are expected to be affected by the disposal system over the regulatory time frame shall be considered. In determining whether underground sources of drinking water are expected to be affected by the disposal system, underground interconnections among bodies of surface water, groundwater, and underground sources of drinking water shall be considered."

53.2 1998 CERTIFICATION DECISION

The U.S, Environmental Protection Agency (EPA or Agency) expected the Compliance Certification Application (CCA) to discuss the assumptions and approaches used to consider underground sources of drinking water, as well as the uncertainty associated with the analyses. EPA expected DOE to provide detailed information on the location and nature of underground sources of drinking water and indicated the estimated concentrations of radionuclides in the underground sources of drinking water (USDWs) in the accessible environment and show that the MCLs for radionuclides will not be exceeded during the regulatory time period.

In the CCA, DOE presented an evaluation of the USDWs to the accessible environment around the WIPP that were expected to be affected by the disposal system over the regulatory time frame. This information was included in CCA Chapter 8 and CCA Appendix USDW. Based on the definitions in 40 CFR Part 191.22, DOE identified three sub-criteria to determine

whether a water-bearing horizon located within the WIPP controlled area would qualify as USDW. These were:

(1) a minimum pumping rate of five gallons per minute,

(2) supply of water at that rate of 5 gallons per minute for a 40 year period, and

(3) a maximum of 10,000 milligrams per liter (mg/l) of Total Dissolved Solids (TDS).

These requirements characterize the capacity and quality of a public water system. A public water system is defined in 40 CFR Part 191.22, as a system providing piped water for human consumption to 25 individuals, or has at least 15 service connections. (CCA Chapter 8.2.1)

Using the above criteria, DOE selected the Culebra, Dewey Lake, and Santa Rosa as potential USDW's (CCA Chapter 8.2.2) to be evaluated. DOE conducted a bounding analysis of the concentrations of the contaminants to assess compliance (Subpart C of 40 CFR part 191). In this analysis DOE assumed 10,000 parts per million total dissolved solids (TDS), which is much less than the observed concentration of brine derived from the Salado anhydrite marker beds. Also, a USDW was assumed to be present near the WIPP Land Withdrawal Boundary (LWB). DOE indicated in the CCA that in spite of this conservative approach, the bounding analysis showed that radionuclide concentrations in the USDWs would be less than half of the EPA's groundwater protection standard, and the dose to a receptor drinking from the USDW would be a factor of ten less than the standard (CCA Chapter 8.2.3).

Overall, DOE believed that the bounding analysis, using very conservative ("unrealistic") assumptions, resulted in an overestimation of the potential doses and contaminant concentrations. In addition DOE assumed a USDW in close proximity to the land withdrawal boundary. DOE's findings indicated that even with these "unrealistic" assumptions the estimated potential dose to an individual were below the 40 CFR 191 requirements. The CCA analysis also assumed that all contaminants reaching the accessible environment were directly available to the receptor so that the interconnections of surface, ground and underground drinking water were all considered and treated as one USDW source. (CCA Chapter 8.1.2.2 and 8.3)

EPA examined DOE's approach and assumptions associated with the USDW determination in the CCA. EPA found the analyses to be well supported and accurate, including the uncertainty associated with these analyses. In addition, EPA assessed all possible aquifers to determine how USDWs were identified and discussed in the CCA. EPA also examined whether the flow rates and directions were included in the description. The modeling assumptions and specifications for the bounding analysis were examined thoroughly to assess reliability and assurance of safety. EPA reviewed the estimated concentrations of radionuclides to determine if they adequately comply with the groundwater protection standard. (see CCA CARD 53 for details of our CCA review)

EPA found that DOE's determination of USDWs were in accordance with the Section 191.22 definitions and Section 194.53. The bounding analysis was performed with conservative assumptions for a hypothetical USDW to estimate contamination and potential doses to a receptor.

A complete description of EPA's 1998 Certification Decision for Section 194.53 can be obtained from EPA Air Docket, A-93-02, Items V-A-1 and V-B-2.

53.3 CHANGES IN THE 2004 COMPLICATION RECERTIFICATION APPLICATION (2004 CRA)

In Chapter 8 of the 2004 Compliance Recertification Application (2004 CRA), DOE updated some aspects of the analysis of USDWs. DOE updated the data for ground water quantity determination to define a USDW. In the CCA, DOE used 1990 census data to determine the average water usage per person per day and the estimated quantity was 282 gallons. In the 2004 CRA, DOE used 2000 census data to determine that the average water usage per person per day increased to 305 gallons. DOE did not believe it was necessary to change the sub-criterion of 5 gallons per minute rate of production from a well to define a USDW (2004 CRA Chapter 8.2.1.1).

DOE monitored and evaluated new wells drilled in the area since the completion of CCA. A new well, C-2737, was drilled to replace H-1 in 2001. Water sampled from the Dewey Lake Formation showed 2,590 parts per million (ppm), Total Dissolved Solids (TDS) concentration (2004 CRA Chapter 8.2.2). Additional wells were drilled at the WIPP site to investigate the extent of groundwater at the contact of Santa Rosa and Dewey Lake Formations. The groundwater samples indicate TDS at both below and above 10,000 ppm TSD. DOE was unable to pump water from any one of these holes at a rate of 5 gpm or more (2004 CRA Chapter 8.2.2).

The updates and changes made by DOE in the 2004 CRA did not significantly impact the conclusions regarding USDWs in the CCA. In the 2004 CRA, DOE continued to identify the Culebra, Dewey Lake, and Santa Rosa as the only potential USDW's (CCA Chapter 8.2.2). DOE states that the conservative bounding analysis used for the 1998 Certification Decision compliance assessment is still applicable.

53.3.1 EVALUATION OF COMPLIANCE FOR 2004 RECERTIFICATION

EPA evaluated the information on USDWs contained in the 2004 CRA, Chapter 8 and Appendix USDW. EPA examined the data from the new wells drilled within the study area since the 1998 Certification Decision and determined that DOE applied adequately conservative assumptions to the data for a hypothetical USDW to determine compliance with Section 194.53.

Because of the lack of significant changes to the parameters for the protected individual, the potential exposure pathways and the sources of underground drinking water, DOE determined that the bounding analysis that was performed for the dose calculation in the CCA still applies. See 2004 CRA CARD 55 for more information on the results of the compliance assessment.

In performing the compliance assessment for the 2004 CRA DOE concluded that the maximum concentrations of contamination in the hypothetical USDW would be much less than half of the EPA groundwater protection limits, and the maximum potential dose to a receptor who drinks from the hypothetical USDW would be well below one-quarter of the standard (Appendix IGP).

EPA did not receive any public comments on DOE's continued compliance with the consideration of underground sources of drinking water requirements of Section 194.53.

53.3.2 2004 RECERTIFICATION DECISION

Based on a review and evaluation of the 2004 CRA and supplemental information provided by DOE (FDMS Docket ID No. EPA-HQ-OAR-2004-0025, Air Docket A-98-49), EPA determines that DOE continues to comply with the requirements for Section 194.53.

53.4. CHANGES IN THE 2009 COMPLICATION RECERTIFICATION APPLICATION (2009 CRA)

In Section 53 and Appendix IGP-2009 of the 2009 Compliance Recertification Application (2009 CRA), DOE reviewed and updated information related to USDWs.

DOE updated the data for ground water quantity determination to define a USDW. In the 2009 CRA, DOE continued to use 2000 census data as in the 2004 CRA (2009 CRA Appendix IGP-2009 page IGP-15), but updated average household water consumption values with data obtained from the New Mexico Office of the State Engineer (Longworth et al. 2008). The water consumption data show that the average per capita consumption decreased to 273 gpd (Appendix IGP-2009 Table IGP-7). Using these new data the updated average consumption value, the rate of consumption for 15 service connections is 7.51 gpm. For 25 people, the value is 4.74 gpm. DOE concludes that the sub-criterion of 5 gallons per minute rate (gpm) of production from a well continues to accurately define a USDW (Appendix IGP-2009) and any change in this sub-criterion is not warranted as a result of applying more current water-consumption data to the calculation.

Three shallow (77 feet deep) piezometer wells were drilled on the WIPP site in 2007 to determine whether shallow subsurface water exists in this area (DOE 2008b Section 3.2). Two wells showed TDS concentrations significantly in excess of 10,000 mg/L; the third showed levels below that concentration (DOE 2008b Table 3-2). None of the wells met the 5-gpm pumping rate sub-criterion, so there is no indication of the presence of a USDW. In the 2009 CRA, DOE continues to identify the Culebra, Dewey Lake, and Santa Rosa as the only potential USDW's (2009 CRA Section 53). In Appendix IGP-2009, Section IGP-3.2 DOE presents recent TDS data available through the WIPP WQSP (detection monitoring program) operated under the provisions of the WIPP Hazardous Waste Facility Permit. One WQSP well, WQSP – 6A, in the Dewey Lake shows TDS concentration below 10,000mg/L and all the other WQSP wells 1 – 6, completed in the Culebra show TDS concentration above 10,000mg/L. The Department concluded that the recent data from the WQSP wells are consistent with earlier data

in reference to the USDW determinations and changes to the earlier USDW determinations are not necessary.

The updates made by DOE in the 2009 CRA did not significantly impact the conclusions regarding USDWs in the CCA. DOE did not change the criteria for making USDW determinations, and for the 2009 CRA evaluation, the maximum potential dose remains below the CCA value calculated and continued compliance with the individual protection standard is maintained. DOE states that the conservative bounding analysis used for the 1998 Certification Decision compliance assessment is still applicable for 2009 CRA.

53.4.1 Evaluation of Compliance for 2009 Recertification

EPA evaluated the information on USDWs contained in the 2009 CRA, Section 53 and Appendix IGP-2009. EPA examined the data from the new wells drilled within the study area since the 1998 Certification and the 2004 Recertification Decisions and determined that DOE applied adequately conservative assumptions to the data for a hypothetical USDW to determine compliance with 40 CFR 194.53.

Because of the lack of significant changes to the parameters for the protected individual, the potential exposure pathways, and the sources of underground drinking water, DOE determined that the bounding analysis that was performed for the dose calculation in the CCA still applies. See 2009 CRA CARD 55 for more information on the results of the compliance assessment.

For the 2009 CRA evaluation (Appendix IGP-2009), DOE notes that the maximum potential dose remains below the CCA value and continued compliance with the individual protection standard is maintained. The potential concentrations of contaminants in the hypothetical USDW and the maximum potential dose to a receptor that drinks from the hypothetical USDW continue to be bounded by the CCA analysis results.

EPA did not receive any public comments on DOE's continued compliance with the consideration of underground sources of drinking water requirements of Section 194.53.

53.4.2 2009 Recertification Decision

Based on a review and evaluation of the 2009 CRA and supplemental information provided by DOE (FDMS Docket ID No. EPA-HQ-OAR-2009-0330, Air Docket A-98-49), EPA determines that DOE continues to comply with the requirements for Section 194.53.