



HYDROGEOLOGY

What is hydrogeology?

Groundwater is water beneath the land surface in openings (pores and fractures) within sediments and rock. Depending on the types of rock present, groundwater can be stored in different quantities and move at different speeds.

“Permeability” refers to how easily groundwater can flow through rocks. In low-permeability rocks, groundwater flows very slowly—as slow as a few feet over hundreds or even thousands of years. The study of groundwater and the rocks that contain it is known as hydrogeology.

WIPP hydrogeology

Hydrogeologic studies for WIPP have been conducted to understand the rates and directions of groundwater flow in the salt beds of the Salado Formation where the waste is stored and in the rock units above and below the Salado. These studies have shown that this formation, which primarily consists of rock salt (halite) with interspersed anhydrite and clay layers, has extremely low permeability. It has been estimated that the small amount of halite-saturated brine in the Salado would move less than three feet in 10,000 years under the likely pressure gradients. If the repository is left undisturbed, therefore, no radionuclide release from the repository will occur through groundwater.

In the event of human intrusion by drilling into the WIPP repository at some time in the future, radionuclides could be released to other geologic units. WIPP studies have identified the Culebra Dolomite Member of the Rustler Formation, which lies approximately 1,400 feet above the repository, as the most permeable geologic unit at the WIPP site with the potential to transport radionuclides off site. Field studies conducted since 1977 have resulted in very good understanding of the hydrogeology of the Culebra and other shallow geologic units at and in the vicinity of the WIPP site. The results of these studies have been presented to the EPA and the public in the 1996 WIPP Compliance Certification Application (CCA) and in the 2004 and 2009 Compliance Recertification Applications (CRAs). In recent years, the Culebra investigations have focused on improving our understanding of the Culebra hydrology by:

- Identifying the reasons for observed rise of water levels in wells
- Drilling and testing of new wells to fill gaps in the regional hydrogeology
- Refining the evaluation of the regional groundwater geochemistry

Neither the Culebra nor the Salado contains water fit for human consumption or agricultural use. Culebra groundwater at WIPP is generally saltier than sea water, and Salado brine is fully saturated with halite (table salt).

Monitoring of groundwater at WIPP

As part of the overall monitoring plan for WIPP, DOE maintains an extensive groundwater monitoring program to identify any changes in the water levels, or geochemistry of the groundwater. EPA conducts annual inspections of the DOE’s groundwater monitoring program and receives and analyzes periodic reports on groundwater data from DOE.

- Since 1998, DOE has reported overall increases in water levels in the wells that monitor the Culebra dolomite
- DOE has drilled 16 new wells since 2003 to enhance understanding and monitoring of the Culebra dolomite
- Most wells are now monitored using pressure transducers that collect data hourly

What is New in the Recertification Application?

The 2009 Recertification Application documents changes in the water levels of the Culebra dolomite wells, and discusses possible reasons for the changes. It provides information on the drilling and testing of new wells, and plugging and abandonment of wells that were deteriorating and/or were no longer needed. It provides new information to resolve certain scientific questions on the regional groundwater geochemistry. And lastly, it presents the results of new geologic studies that were carried out to comprehensively address the question of the presence of karst at and in the vicinity of the WIPP site.

This issue has been raised by some stakeholders in the past. The new studies convincingly demonstrate that karst is confined to the Nash Draw area west and southwest of the WIPP site and does not impact the geohydrology at the WIPP site proper.

See *Appendix HYDRO-2009* of the Recertification Application for more information on groundwater.

Cross section showing major geologic units above and below the WIPP repository.

