

June 7, 2000

MEMORANDUM TO: C. William Reamer, Chief  
High Level Waste Branch  
Division of Waste Management

FROM: Neil Coleman */RA/*  
Repository Site Section  
High Level Waste Branch  
Division of Waste Management

SUBJECT: TRIP REPORT: (1) MEETING OF THE U.S. NUCLEAR WASTE  
TECHNICAL REVIEW BOARD; (2) DEATH VALLEY REGIONAL FLOW  
MODEL MEETING; AND (3) DEVILS HOLE 2000 WORKSHOP

On May 1, 2000, I attended the Spring 2000 meeting of the U.S. Nuclear Waste Technical Review Board. The Board met at the Bob Ruud Community Center in Pahrump, NV to review repository design and geochemistry for the Yucca Mountain site. On May 2-3, I attended the Death Valley Regional Flow Model Meeting and the Devils Hole 2000 Workshop. These two meetings were held at the National Park Service facility at Furnace Creek, in Death Valley, CA. Highlights are listed below.

#### U.S. Nuclear Waste Technical Review Board

1. Mike Anderson (Management and Operating Contractor [M&O]) gave an update on subsurface design and waste package. Preclosure ventilation rates will now be 15 m<sup>3</sup>/s, rather than 10 m<sup>3</sup>/s. Backfill around waste packages will no longer be included. Fuel cladding temperatures are predicted to be above 350 degrees C. The U.S. Department of Energy (DOE) will use a gantry similar to that planned to insert waste packages to emplace drip shields. Surfaces of drip shields will be smooth rather than corrugated, and the drip shield thickness will be reduced to 15 mm from 20 mm. DOE predicts that the drip shields can protect waste packages from a 13 ton rock.

2. Jean Younker (M&O) discussed uncertainties in heat-driven processes. Current design calls for 50 years of ventilation, a spacing between emplacement drifts of 81 m, and a waste package spacing of 0.1 m. The maximum "boiling" extent would occur 200-500 years after closure. Drift walls would be below boiling around 1200 to 2000 years after closure. Younker noted that the 81-m spacing between drifts would keep a large portion of the space between drifts below the boiling point. This should allow water to condense and flow downward between disposal drifts. DOE's thermal studies will help address our subissues related to the emplacement drift environment (near field) and thermal effects on flow.

CONTACT: Neil Coleman  
301-415-6615

3. Dick Craun (DOE) discussed operational flexibility and repository design. He showed how temperatures within a repository can be kept cooler by increasing the spacing between waste packages, by increasing the ventilation period, and through aging of wastes before emplacement. However, significantly increasing the separation distance between packages would reduce the amount of waste that DOE could store in a Yucca Mountain repository. Current design calls for a relatively "hot" repository where the post closure wall temperature would be about 200 degrees C in the last drift loaded.

4. Don Shettel, consultant to Nye county, NV, gave an update on the chemistry of groundwater and cuttings from wells in the Early Warning Drilling Program. Nye County previously reported higher than background levels of radioactivity in well NC-EWDP-4D. Nye County had drilled this well just south of the Nevada Test Site, several km north-northwest of the village of Lathrop Wells. Nye County has checked the early results by resampling the well. New analyses show no evidence of off-site migration of contaminants from the Nevada Test Site. Filtered water samples have gross alpha and beta activities well below the U.S. Environmental Protection Agency thresholds for safe drinking water. The Nye County data help to characterize the geochemistry of the valley fill aquifer downgradient from Yucca Mountain.

5. A new validation study found no evidence for bomb-pulse chlorine-36 ( $^{36}\text{Cl}$ ) in the Sundance Fault zone, where previous work found elevated  $^{36}\text{Cl}$ . Marc Caffee of Lawrence Livermore National Laboratory (LLNL) discussed the validation study.  $^{36}\text{Cl}$  is a bomb-pulse radionuclide that peaked in the atmosphere around 1955 because of atmospheric nuclear tests. The goal of the validation study is to verify bomb-pulse  $^{36}\text{Cl}$  in samples from the underground Exploratory Studies Facility (ESF). Previous work by Los Alamos National Laboratory (LANL) found many sites in the ESF where measured  $^{36}\text{Cl}/\text{Cl}$  ratios clearly showed bomb-pulse levels. These locations contained features such as fractures, faults, and breccias. Samples with ratios exceeding  $1500 \times 10^{-15}$  are thought to contain bomb-pulse  $^{36}\text{Cl}$ . Some of the highest  $^{36}\text{Cl}/\text{Cl}$  ratios found by Los Alamos workers occurred in or near the Sundance Fault. LLNL workers gathered more than 20 rock samples from the Sundance Fault. Analyses showed that none of the  $^{36}\text{Cl}/\text{Cl}$  ratios exceeded  $300 \times 10^{-15}$ . Caffee concluded that the data show no evidence of bomb-pulse  $^{36}\text{Cl}$  in the Sundance Fault, consistent with the fact that no bomb-pulse tritium has been found in this fault. He noted that the sample processing procedure may have selected phases that do not contain bomb-pulse  $^{36}\text{Cl}$ . Future sampling may yet confirm bomb-pulse levels. Members of the U.S. Nuclear Waste Technical Review Board were greatly concerned about the large differences between LANL's past work and the new validation study. DOE officials committed to do new work to resolve the differences. I note that LLNL used different sampling and analysis methods in the validation study, which could account for the conflicting results. We will closely monitor the progress of all new  $^{36}\text{Cl}$  work at Yucca Mountain. We need the data to help resolve our subissue on deep percolation of groundwater.

#### Death Valley Regional Flow Model Meeting

1. Russ Patterson (DOE) discussed saturated zone studies that support the Death Valley Regional Model. Over the next year DOE plans to support both the Nye County and Inyo County drilling and data collection programs. DOE will conduct hydraulic tests and develop an alluvial testing complex around Nye County well NC-EWDP-19D. DOE will continue to develop the Death Valley Regional Model. This model is a multiyear collaboration involving the Yucca Mountain Project and the Nevada Test Site program of environmental monitoring, the U.S.

Geological Survey (USGS), Nye and Inyo Counties, and other parties. We need data from the work described by Patterson to help resolve our subissue on the saturated zone and dilution.

2. Other speakers reviewed the status of components of the regional flow model. Frank D'Agnesse (USGS) discussed how two previous hydrologic framework models are being merged to form the Death Valley Regional Flow Model. Don Sweetkind (USGS) discussed development of the geologic cross sections that support the three-dimensional framework model. Joe Hevesi (USGS) referred to work being done to improve estimates of regional groundwater recharge. Al Eddebbarh (M&O) discussed progress on the site-scale flow and transport model. This model is a subset of the regional model. Current DOE assumptions are that flowpaths from Yucca Mountain reach alluvium at 10 km from the site.

#### Devils Hole 2000 Workshop

1. In February 2000, the Nye County Board of County Commissioners filed ten applications for water rights with the State of Nevada. The county took this action because they forecast large increases in water demand through the year 2050. Forecasts project that Nye County's population will be at least 162,000 by 2050, and the population of Pahrump is expected to reach at least 150,000. The county estimates the future demand for water in Pahrump at ~100 million m<sup>3</sup>/yr. This exceeds the natural replenishment of the aquifers by a factor of four, and predicts a significant water shortfall. Nye County seeks to take the remaining water resources of Crater Flat, Jackass Flats, Rock Valley, Mercury Valley, and Frenchman Flat. The applications would appropriate 42 million m<sup>3</sup>/yr. The county proposes municipal use of the water along the Science Technology Corridor (south of Yucca Mountain) and in populated areas of the Amargosa Desert and Pahrump Valley. One reason given for the Nye County action was to achieve "...resolution of the many issues associated with Federal land use and management policies and their impacts on the water resources that are available to Nye County." It is unclear how the license review of Yucca Mountain might be affected if Nye County gets water rights to groundwater in Jackass Flats.

2. James Harrill, consultant to the National Park Service, discussed data on groundwater levels in Devils Hole. Devils Hole is an open fault zone in the regional carbonate aquifer. The water table intersects the fault zone about 17 m below land surface, forming a small exposed pool. A unique specie, the Devils Hole pupfish (*Cyprinodon diabolis*), inhabits the pool. Their population varies in response to food supplies and stresses. Past groundwater pumping in the area lowered water levels in the pool, threatening the ability of the fish to reproduce. That led to limits on local groundwater pumping and detailed studies on the causes of water-level changes. Since large-scale groundwater pumping ended in Ash Meadows, the water level in Devils Hole has largely recovered but has not yet reached prepumping levels. The water level in this pool responds to large earthquakes in the region, such as the Landers-Little Skull Mountain earthquakes (July 18 and 19, 1992) and the Hector Mine earthquake (October 16, 1999).

3. Mike King, consultant to Inyo County, CA, gave an overview of the county's Oversight and DOE Grant Research. The county has participated in Yucca Mountain oversight work since 1987. Inyo County's main concern is the protection of the carbonate aquifer spring waters in Death Valley, which are within the county. They are concerned about potential hydraulic connections between these springs and the Lower Carbonate Aquifer beneath Yucca Mountain. Inyo County's current DOE Grant Research includes the following:

Evapotranspiration station in Death Valley;  
Installation and monitoring of stream flow gauges at Tecopa and Dumont Dunes;  
Infiltration studies at Gold Valley;  
Collection and analysis of spring water samples from Death Valley; and  
Analysis of regional data from the Lower Carbonate Aquifer.

Inyo County proposes a drilling program of five wells near the southern extent of the Funeral Mountains in Death Valley. The goal is to evaluate possible connections between the Lower Carbonate Aquifer at Yucca Mountain and the discharge sites for this aquifer in Death Valley. The data would help improve regional models of groundwater flow, and thereby improve site-scale models that obtain boundary conditions from the larger-scale regional model.

4. Dave Cox, consultant to Nye County, described results of valley fill hydraulic testing at the Aeropark well in Lathrop Wells. During June 10-12, 1999, Nye County pumped the Aeropark well for almost 48 hours at a rate of 5000 liters/minute. Of five observation wells, only the "Garlic" well responded, yielding an estimated transmissivity of  $\sim 200 \text{ m}^2/\text{day}$ . The storage coefficient was reported to be  $2.2 \times 10^{-4}$ . These and other data on the valley-fill aquifer are needed to help resolve our subissue on the saturated zone and dilution.

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