US Department of Energy Groundwater Database
Groundwater Master Report

Installation Name, State: Mexican Hat
Responsible DOE Office: Office of Legacy Management

Plume Name: Mexican Hat
Remediation Contractor: SM Stoller Corporation

Report Last Updated: 2009

Contaminants

Halogenated VOCs/SVOCs Present? **No**
Fuel Present? **No**
Metals Present? **No**
Isotopes Present? **No**
Explosives Present? **No**
Other Contaminants?**No**
Tritium Present? **No**
Nitrates Present? **No**
Sulfates Present? **No**

Hydrogeology

Conduit Flow? **No**
Multiple Units Affected? **No**
Depth (feet): **0**
Avg Velocity (feet/year): **0**

Plume Information (no source)

Source **Controlled**
Plume Status **Plume static or shrinking in size**
Area of Plume (acres): **0**

Remedial Approach

Remedy Name	Status	Start Date	End Date
monitoring only	Confirmed		

Groundwater Use / Exit Strategy

Potable? **No**
Sole Source Aquifer? **No**
Does an Exit Strategy Exist? **No**
Basis for Exit Strategy: **No Response**

Environmental Indicators (EIs)

Groundwater Migration Under Control? **No**
Confirmed by Lead Regulator? **Yes**
Current Human Exposure Acceptable? **Yes**
Confirmed by Lead Regulator? **Yes**

Regulatory

Decision Document? **Remedial Approach Proposed**
Date Approved **1/1/1997**
Lead Regulatory Agency: **Federal**
Regulatory Driver: **Other**

Regulatory Position on Groundwater Use Same as Site? **Yes**

Comments

Ground Water Conditions Ground water within the upper unit of the Halgaito Shale beneath and directly downgradient of the site is contaminated from, and primarily the result of, historical on-site uranium-processing operations. However, the upper unit of the Halgaito Shale is not considered an aquifer and has no current or potential use as a ground water resource because it is limited in areal extent and yield, and has naturally poor water quality. Because the ground water in this upper unit is not considered an aquifer and cannot be used for production, any risk from exposure to site-related contaminants within ground water in this unit is only of concern where it surfaces via seeps along North Arroyo, South Arroyo, and Gypsum Creek. Based on the low flows observed historically from these seeps, they also do not constitute a water resource and do not provide sufficient volume to present a significant risk to human health and the environment. Ground water within the lower unit of the Halgaito Shale, classified as the uppermost aquifer beneath the site, is hydrogeologically isolated from the site-related ground water contamination that occurs in the upper unit of the Halgaito Formation. As a result, ground water in this uppermost aquifer beneath the site was not contaminated from historical uranium processing operations (or remedial actions), and will not likely become contaminated from

the disposal cell, as designed. Recharge to the uppermost aquifer is also not affected by site-related contamination since it occurs upgradient (southwest) of the site, and from upward flow from deeper formations. Ground water within the Honaker Trail Formation aquifer that lies directly beneath the Halgaito Shale is also effectively isolated hydrogeologically from the site-related contamination that is found in ground water within the upper unit of the Halgaito Shale by the overlying confining layers and an upward hydraulic gradient. The ground water in the Honaker Trail Formation is not contaminated from the uranium processing activities, but its natural quality in the vicinity of the Mexican Hat Disposal Site likely is unsuitable for consumption. Former monitor wells at the disposal site showed the presence of hydrogen sulfide gas and naturally occurring petroleum. The Halgaito Shale and Honaker Trail Formation produced a limited amount of oil in the oil field near the town of Mexican Hat. Background Ground Water Quality Background ground water quality was determined for the Halgaito Shale and underlying Honaker Trail Formation at the Mexican Hat Disposal Site. The Halgaito Shale contains only minor amounts of naturally occurring water, and upgradient monitor wells in the shale were dry. Therefore, background ground water quality for the Halgaito Shale was determined using Seep 256 in Halgaitoh Wash and Seep 261 in Gypsum Creek upgradient of the disposal site. The water quality of these seeps is very similar, and both seeps appear to be isolated from ground water contamination related to the disposal site. Background ground water quality for the Honaker Trail Formation was determined using monitor well MW−0909 upgradient of the disposal site. The background ground water quality of the Halgaito Shale and Honaker Trail Formation is generally similar because both units are lithologically similar. Both units contain the same calcium sulfate as the mineral gypsum, which has been positively identified in outcrops of the Halgaito Shale. This is reflected in the background ground water quality. Ground waters from both units contain relatively high concentrations of sulfate as the dominant anion (2,000 to 3,300 milligrams per liter [mg/L]) balanced by nearly equal equivalents of sodium, calcium, and magnesium. The pH of the ground waters is slightly alkaline, and the ground waters in both units are oxidizing. Total dissolved solids in the ground waters range from 3,200 to 5,300 mg/L. Several constituents commonly found in the solutions produced by the uranium processing at the Mexican Hat site are also present naturally in ground water from the seeps upgradient of the site. However, the concentrations of these constituents in the ground water are below those in the tailings piles pore water. Constituents that occur naturally in ground water from the upgradient seeps include ammonium, boron, magnesium, manganese, molybdenum, nitrate, silica, sulfate, and uranium. Historical Ground Water Monitoring Ground water monitoring is not required at the Mexican Hat Disposal Site under the current protection strategy (NRC concurrence received in 1996). Ground water monitoring is not required because the upper unit of the Halgaito Shale is not considered an aquifer, and therefore is not a current or potential source of drinking water, and the underlying uppermost aquifer within the lower unit of the Halgaito Shale and the Honaker Trail Formation is hydrogeologically isolated from contamination in the overlying formation. No contamination related to the former Mexican Hat processing site was detected in the uppermost aquifer during operational and pre-disposa-cell construction monitoring. However, due to concerns raised by the Navajo Nation, additional ground water monitoring was performed at the site from November 2000 to August 2002, as a best management practice (BMP). This monitoring was performed to demonstrate analytically that no site-related contamination occurred in the confined uppermost aquifer and that the upward hydraulic gradient continued. Ground water monitoring was conducted both upgradient and downgradient of the current disposal cell (and of the former processing site and tailings piles). Concurrence to discontinue ground water monitoring and to decommission the remaining monitor wells at the site was received from the Navajo AML/UMTRA Department by letter correspondence in July 2006. DOE completed the well decommissioning activities on April 28, 2007. Currently, no ground water monitoring wells remain at the site. Historical Seep Monitoring Seep monitoring is not required at the Mexican Hat Disposal Site under the current protection strategy (NRC concurrence received in 1996), although discontinuous ephemeral perched ground water, contaminated as a result of historical site-related uranium processing activities, occurs within the upper unit of the Halgaito Shale beneath the site. This perched ground water intermittently seeps out at several locations along North Arroyo, South Arroyo, and Gypsum Creek downgradient of the site. Due to concerns raised by the Navajo Nation, DOE performed annual monitoring of six seeps under the LTSP (Revision 2) as a BMP to evaluate disposal cell performance (in accordance with Subpart A of 40 CFR 192), and quarterly monitoring of 11 seeps for 3 years under the ground water compliance action plan as a BMP to demonstrate ground water compliance (in accordance with Subpart B of 40 CFR 192). Seep monitoring performed by DOE included water quality sampling and analysis for uranium, sulfate, and nitrate (indicator parameters of site-related contamination), and flow rate. Monitoring was performed from 1998 through 2005 (historical monitoring of some seeps occurred as early as 1985). In 2006, an evaluation of the seep-monitoring program was conducted and presented in the report Resolution of Seep and Ground Water Monitoring at the Mexican Hat, Utah, UMTRCA Title I Disposal Site. This report, submitted to the Navajo Nation and NRC, concluded that due to the intermittent low to non-existent flows observed in the seeps over the years that there was no significant risk to human health and the environment unless the seep flows were to significantly increase. Based on the monitoring results, the hydrogeological conditions at the site, the continued low yield (flows) from the seeps, and the absence of any receptors to demonstrate risk, a recommendation was made to discontinue water quality monitoring of the seeps and to only continue monitoring the flow rate of the seeps. The recommendation was to monitor seep flow rates qualitatively through photo documentation and observational description during the site annual inspections, with the understanding that if flows were to significantly increase, as compared to historical levels, the need to resume water quality monitoring would be re evaluated. Concurrence to the recommendation to discontinue all water quality monitoring of the seeps and to continue monitoring the flow rate of the several seeps at the site was received from the Navajo AML/UMTRA Department by letter correspondence in July 2006.