

TO: Distribution

FROM: April Gil

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SUBJECT: Status of U.S. Department of Energy (DOE)
Office of Legacy Management Proposed Work Plan
Ambrosia Lake and Bluewater
Uranium Mill Tailings Radiation Control Act (UMTRCA) Disposal Sites
For Discussion at April 27, 2011 Technical Meeting

Background and Status of Current Monitoring Program

As discussed in Section 3.0 of the Five-Year Plan, DOE is planning additional site characterization at the Ambrosia Lake and Bluewater UMTRCA disposal sites, including new wells, conducting repairs on existing wells, evaluating groundwater data from the well networks at the sites, and conducting hydrogeologic studies through compilation of available data and hydrogeologic mapping.

Ambrosia Lake

Groundwater monitoring is not a regulatory requirement at the site because of the application of supplemental standards. However, the DOE's Long Term Surveillance Plan (LTSP) calls for sampling an alluvium well and a bedrock well every 3 years as requested by the New Mexico Environment Department (NMED) to provide groundwater data. As a result of their San Mateo drainage basin groundwater investigation, NMED has concerns that contaminated groundwater from the site is entering the San Mateo alluvial system. The *Five-Year Plan* calls for one new bedrock monitoring well to evaluate the alluvial-bedrock interconnections at the site.

A hydrogeologic analysis has been conducted based on existing data developed by DOE as part of the remedial action plan. This information was summarized in the DOE report *Groundwater Investigations at the Ambrosia Lake and Bluewater Uranium Mill Tailings Disposal Sites* issued in May 2010.

Bluewater

The LTSP requires sampling of four alluvium wells and three San Andres/Glorieta (SAG) aquifer wells every 3 years for specified constituents (the alluvium wells are also sampled annually for PCBs). Two point-of-exposure (POE) wells are available for sampling; one is in the alluvium (X(M)) and one is in the SAG aquifer (I(SG)) in case a respective point-of-compliance (POC) well has a regulated constituent in excess of the approved alternate concentration limit (ACL). In support of NMED's regional groundwater investigation, DOE began monitoring the

POE wells in 2008. Unfortunately, alluvium well X(M) has been dry and DOE has never been able to collect a sample.

The *Five-Year Plan* calls for replacing one monitoring well and installing additional wells at the Bluewater site. A preliminary hydrogeologic analysis has been conducted based on information developed by the former licensee (Anaconda/ARCO) in their ACL application and field investigations conducted by DOE. This information was summarized in the report *Groundwater Investigations at the Ambrosia Lake and Bluewater Uranium Mill Tailings Disposal Sites*. The existing well network does not provide sufficient information to verify the groundwater model originally developed by ARCO.

Beginning in 2008, DOE expanded the sampling and analysis of an expanded list of constituents in response to NMED concerns about regional groundwater contamination. Uranium concentrations have been trending upward in alluvium well T(M), and the ACL was exceeded during the November 2010 sampling event. The U.S. Nuclear Regulatory Commission (NRC) was forewarned of this possibility in a letter dated May 26, 2010. NRC was verbally notified of the actual exceedance on January 21, 2011, during the validation process of the analytical data. Written notice was transmitted to NRC on February 28 after data validation was completed and DOE had confirmed the exceedance.

In response to NMED concerns about elevated nitrate concentrations in a domestic well downgradient of the Bluewater site, DOE began sampling for nitrate in 2008. Nitrate, which is not an LTSP-required constituent, is substantially above the U.S. Environmental Protection Agency (EPA) maximum concentration limit (MCL) in well T(M). However, without a viable POE well, it cannot be determined if nitrate in excess of the MCL is leaving the site.

Compliance Requirements

Ambrosia Lake

There are no groundwater monitoring compliance requirements for the UMTRCA Title I site.

Bluewater

DOE is required to monitor a POE well and to develop an evaluative monitoring plan in accordance with the LTSP and implement a corrective action program in accordance with applicable regulations if an ACL is exceeded. The uranium concentration in alluvium well T(M) exceeded the ACL during the November 2010 sampling event. Alluvium POE well X(M) has been dry, so it cannot be confirmed if contaminated alluvial groundwater is limited to the site.

Also, Homestake Mining Company (HMC) has been pumping well HMC-951, located next to the Bluewater site entrance, at an average rate of approximately 350 gallons per minute since 2002. That well is completed in the SAG aquifer. Uranium concentrations in that well have trended upward since pumping began and have exceeded the MCL starting in 2005.

Work Plan to Meet Commitments and Compliance Requirements

In 2009, DOE began an expanded monitoring and evaluation program including conducting hydrogeologic evaluations of available data for the sites and preparing a report addressing possible groundwater contamination concerns. Planning at that time included the proposed installation of Geoprobe wells in the alluvium downgradient of the Ambrosia Lake disposal cell, and four unspecified wells in the alluvial and SAG aquifers at the Bluewater site. However, due to a number of factors, the plans for the number of wells and their locations have changed. These factors include results from hydrogeologic investigations, increasing cost estimates due to the geologic complexity of the Bluewater site, and a better understanding of the severity of the data gap regarding groundwater model predictions developed by ARCO.

Ambrosia Lake

Although there is no regulatory requirement for groundwater sampling at the site, the *Five-Year Plan* includes drilling a well at the site to evaluate the alluvium/bedrock aquifer interface. Although the plan calls for bedrock well, a low-cost Geoprobe well will be installed in the alluvium at the southwest toe of the disposal cell using available budget. This well would show contaminant levels in the alluvial groundwater, and its water level (when compared to the water level in the existing alluvium well on the south side of the cell) may verify that alluvial groundwater is discharging into the underlying sandstone unit as predicted. A bedrock well may still be needed later to confirm that contaminated alluvial groundwater is recharging the bedrock aquifer.

Bluewater

DOE will continue to monitor the existing well network. For now, monitoring will occur twice per year instead of every 3 years as required by the LTSP. In addition to required analytes, DOE will continue to monitor for additional analytes to better characterize the site aquifers.

The hydrogeologic investigation, coupled with additional groundwater sampling data, indicated that more monitoring wells are needed than originally anticipated at Bluewater to gain a better understanding of the aquifer characteristics at the site. Additionally, the optimal well locations not only require well depths greater than those originally anticipated, but would result in artesian well conditions for several wells. Artesian wells have construction requirements that are more rigorous and expensive than the standard wells that were originally planned. Also, well development and sampling activities have shown that several wells are corroded or improperly constructed and may not be providing representative or defensible sample results. Consequently, several wells will be replaced.

Alluvium POC well T(M), which has elevated uranium and nitrate concentrations, is nearly dry and needs to be replaced. Alluvium POE well X(M) is dry because the water level presumably has dropped below the screened interval. For compliance purposes, a new POE well needs to be drilled at a location where the greatest saturated thickness of alluvium is expected. These two wells are scheduled for installation in 2011 using existing budget. Well construction is

complicated because approximately 120 feet of basalt needs to be penetrated to reach the underlying alluvium of an ancient channel that was buried by lava flows.

A major east-striking fault bisects the site. It is suspected that most of the SAG aquifer groundwater flow is in the area south of the fault. Homestake's HMC-951 well is located south of the fault, but there are no DOE wells south of the fault. Consequently, DOE does not have groundwater data to determine what is occurring in the south half of the site. Due to limited budget, new SAG wells that were planned to be drilled in the area south of the fault have been postponed until 2013. These wells would include an upgradient (background) well near the west site boundary, a centrally located well east of the disposal cells, and a POE well near the east site boundary. After completion of these new wells, an aquifer test would be coordinated with HMC to evaluate the effect that pumping their well has on the groundwater flowing through the Bluewater site (HMC has verbally agreed to this activity).

Contaminant concentrations in the SAG POC wells S(SG) and OBS-3 have been below MCL concentrations and well below ACLs. However, uranium concentrations dropped substantially corresponding to the time that the sampling method changed from a casing-purge method to a low-flow method. Also, the wells have very long intervals of slotted casing (120 feet in S(SG) and 198 feet in OBS-3), and these lengths have led to questions regarding the representativeness of the aquifer. During the November 2010 sampling event, well S(SG) was found to be corroded with iron scale. Well OBS-3 did not appear to be as corroded, and samples were collected at two different depths within the screened interval. Sample results were inconclusive regarding possible contaminant stratification within the aquifer. In April 2011 an attempt was made to scour out iron scale in both wells to open up the screens and allow multi-level sampling. Although scouring was successful in reducing the amount of scale in the casings, the rate of water production was very low. A downhole video of the wells indicated that the casing slots were essentially rusted shut. Consequently, sample results may not be representative of the aquifer. A replacement well located between the two wells is proposed for 2014, depending on the availability of funding. In the meantime, the wells will be sampled twice per year.

Background SAG well L(SG) is located upgradient of the main tailings disposal cell and north of the east-striking fault. A video of this well in November 2010 indicated that it is not properly completed—the bottom portion within the SAG aquifer has either collapsed or filled with sand. Therefore, sample results may not accurately represent SAG aquifer water quality. DOE proposes to replace this well in 2014, depending on the availability of funding.

The sampling method will be changed for S(SG), OBS-3, and L(SG) until the wells are replaced. The casings will be purged and the water levels allowed to recover prior to sampling. This method will avoid sampling stagnant water in the well casings.

Sampling and evaluation of these wells, and the results of an aquifer test coordinated with HMC, may indicate the need for additional wells in the SAG aquifer. Currently, there is no proposed budget for these potential wells.

Groundwater data collected by DOE is too limited to evaluate the aquifers, historical trends, or the groundwater model developed by ARCO. DOE plans to acquire and evaluate groundwater

data developed by Anaconda and its successor, ARCO. Hard copies of these data can be obtained from NRC and NMED records. These data will need to be hand-entered into DOE's database, checked, and evaluated.

Summary

DOE's primary responsibility is to meet regulatory compliance requirements for the sites. Because of the exceedance of an ACL in alluvium POC well T(M) at the Bluewater site and the dry condition of alluvium POE well X(M), well X(M) will be replaced in 2011. Also, because well T(M) is nearly dry, it will be replaced in 2011 to verify whether sample results for that well are representative of the aquifer.

A better understanding of SAG aquifer characteristics south of the east-striking fault at the Bluewater site is needed because of the elevated uranium concentrations in well HMC-951. Acquisition and evaluation of former licensee groundwater data will begin in 2011.

Although there are no compliance requirements for groundwater at the Ambrosia Lake site, the *Five-Year Plan* includes installation of an additional well at that site. An alluvium well will be installed in 2011 to meet that commitment.

The proposed activities for meeting regulatory requirements and *Five-Year Plan* commitments are summarized in Table 1.

Table 1. Proposed Activity Schedule for the Ambrosia Lake and Bluewater Sites

Site	2011	2012	2013	2014
Ambrosia Lake	Install geoprobe well in alluvium		Install bedrock well (if proposed budget is approved)	
	Sample well network (completed)	Sample well network	Sample well network	Sample well network
	Evaluate groundwater data	Evaluate groundwater data	Evaluate groundwater data	Evaluate groundwater data
Bluewater	Install replacement alluvium POC and POE wells		Install three SAG wells south of fault (if proposed budget is approved)	Install replacement SAG POC and background wells (if proposed budget is approved)
	Rehab SAG POC wells (completed)		Coordinate aquifer test with HMC after new SAG wells are installed	
	Sample well network twice (first event completed)	Sample well network twice	Sample well network twice	Sample well network twice
	Acquire and enter ARCO groundwater data; begin evaluating ARCO data	Evaluate groundwater data	Evaluate groundwater data	Evaluate groundwater data

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