

Complexities of Decommissioning a Uranium Mill Site

Matthew Meyer

U.S. Nuclear Regulatory Commission, Washington, D.C., 20555

INTRODUCTION

Homestake Mining Company (HMC), through a variety of partnerships and joint venture associations, operated a uranium mill in Cibola County, New Mexico, beginning in 1958, and continuing through 1990. During operations, approximately 19.9 million metric tons (mt) [22 million tons] of ore was milled at the site, using a conventional alkaline leach process. Reclamation activities started in 1993.

From 1993 to 1995, the mill was decommissioned and demolished. After the mill was demolished, final surface reclamation commenced in accordance with U.S. Nuclear Regulatory Commission (NRC) requirements. Surface reclamation is nearly complete, with final reclamation and stabilization to be completed after groundwater restoration is completed. Groundwater contamination from past mill activities remains, and groundwater restoration is the primary activity occurring at the site. Groundwater restoration is mandated by 10 CFR Part 40, Appendix A. The current Corrective Action Program (CAP) consists of groundwater recovery and injection, with treatment of the effluent through the use of evaporation ponds, an ion exchange process, and the Reverse Osmosis (RO) system. The goal of the groundwater CAP is to restore the groundwater to levels as close as practicable to the up-gradient groundwater quality background levels. This is accomplished by pumping contaminated groundwater to either the RO plant or one of two existing evaporation ponds. Once groundwater quality restoration is complete and approved, the site will be transferred to the U.S. Department of Energy (DOE), which will have responsibility for long-term site monitoring and maintenance.

Currently, the site configuration includes the large tailings pile (LTP), small tailings pile (STP), two evaporation ponds, a number of groundwater injection and collection wells, an ion exchange treatment building for groundwater remediation, a RO treatment facility, and several administrative and maintenance buildings. Site reclamation includes facility decommissioning, tailings impoundment area restoration, groundwater restoration and monitoring, and post-closure care and monitoring. It is currently

anticipated that groundwater cleanup objectives will be reached in 2017.

Due to the involvement of three regulatory agencies, high public interest, and a complex geologic setting and groundwater flow regime, decommissioning is not straight-forward. This paper summarizes the technical, regulatory, and public interaction complexities associated with decommissioning the HMC site.

DESCRIPTION OF THE ACTUAL WORK

Technical Complexities

The groundwater restoration program at the HMC uranium recovery site is a long-term restoration of the San Mateo Alluvial aquifer (Quaternary) and the Chinle formation (Permian). The Chinle formation consists of inter-bedded sandstone and shale strata forming the Upper, Middle and Lower Chinle aquifers that sub-crop into the alluvial aquifer creating a hydraulic connection with the overlying alluvium. Alluvial groundwater at HMC is derived from three drainage basins, the Rio San Jose to the northwest, the San Mateo to the north and the Lobo Creek to the East. In each of the three basins, mining activities and natural erosion of upgradient bedrock materials have contributed to the release of high concentrations of uranium, selenium and molybdenum. The aforementioned natural and anthropogenic releases have significantly contributed to the contamination of the groundwater at the Homestake site. The hydrogeology is further complicated by two faults located in the Chinle formation that trend northeast to southwest across the site. The faults have affected groundwater gradients, flow directions and have created highly permeable zones near the faults.

This complex geologic setting and the isolated areas of communication between the San Mateo Alluvial aquifer and the three Chinle aquifers have presented a highly complex hydrologic system that has been well studied and characterized for the last 40 years. The presence of sub-crop areas that allow subsurface flow from the San Mateo Alluvial aquifer to the Upper, Middle and Lower Chinle aquifers results in groundwater quality that represents a

mixture of alluvial water with water from each Chinle aquifer. The areas of mixing in the Chinle aquifers have been designated as the “mixing zone” and have further confused the delineation of reclamation standards within the Chinle aquifers.

The primary contaminants of concern for all aquifers are uranium, selenium, molybdenum, vanadium, thorium, sulfate, chloride, nitrate, total dissolved solids and radium. Since the inception of the groundwater restoration program 33 years ago, Homestake has significantly reduced concentration levels for each aquifer of concern. Even with the extensive restoration that has taken place over the years, continuous recontamination of the San Mateo Alluvial aquifer has been, and will continue to be, a problem for years to come. This analysis is based on the known presence of hydraulically up-gradient contamination migrating toward HMC in the San Mateo Alluvial aquifer, which has, and will, continue to influence concentration values of the alluvial aquifer and associated sub-cropping Chinle aquifers.

Regulatory Complexities

The NRC, U.S. Environmental Protection Agency (EPA), and State of New Mexico Environment Department (NMED) all have regulatory responsibilities at the HMC site. Although the overall goal of each agency is the same (to restore the site and groundwater to protect public health and safety) each agency has regulatory requirements that must be met during the reclamation process.

The HMC site is a Uranium Mill Tailings Radiation Control Act of 1978 (UMTRCA) Title II site. NRC has regulated activities at the site since June 1, 1986, under a source and byproduct material license issued in accordance with Title 10 of the Code of Federal Regulations, Part 40. HMC is required to implement a reclamation plan which meets the requirements of 10 CFR Part 40, Appendix A, “Uranium Mill Tailings Regulation: Ground Water Protection and Other Issues.”

Prior to June 1986, activities at the HMC site were regulated under a license issued by the State of New Mexico in accordance with its status as an NRC Agreement State. NRC assumed regulatory responsibility for the site after the State of New Mexico no longer had responsibility for 11(e)(2) byproduct material in June 1986. However, the State of New Mexico retains some regulatory oversight responsibility at the site through the issuance of Discharge Permits DP-200 and DP-725. DP-200 covers the injection of contaminated alluvial

groundwater to the tailings piles and the extraction and RO system within the NRC-licensed site boundary. DP-725 covers discharge to the evaporation ponds and two existing collection ponds.

In September 1983, the HMC site was placed on EPA’s Superfund National Priorities List (NPL) at the request of the State. Therefore, the site is also being overseen under EPA’s Superfund Program, in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA).

In an effort to address overlaps in the regulatory scheme, NRC and EPA signed a Memorandum of Understanding (MOU) in December 1993, defining the regulatory roles and responsibilities for each agency during reclamation of the HMC site. Under the MOU, NRC was designated as the lead regulatory agency for the byproduct material disposal area reclamation and closure activities. EPA was assigned responsibility to monitor all reclamation activities to assure that activities conducted under NRC’s regulatory authority will allow attainment of applicable or relevant, and appropriate requirements under CERCLA. EPA and NRC agreed that the requirements of 10 CFR Part 40, Appendix A are the Federal environmental and public health requirements applicable or relevant, and appropriate to the HMC site. EPA and NRC agreed that conformance with 10 CFR Part 40, Appendix A, will generally assure conformance with CERCLA requirements. In accordance with the MOU, after completion of closure of the disposal area and other remedial measures undertaken in full compliance with NRC’s 10 CFR Part 40, Appendix A, EPA, pursuant to 40 CFR Parts 425(e) and 515(c)(3) and in consultation with the State of New Mexico, shall determine whether all required response actions with respect to the site have been implemented. Following such a determination, the site may be considered for deletion from the NPL.

Further, in an effort to make the regulatory process more efficient, NRC, EPA, DOE and NMED have recently begun exploring ways to resolve cross-cutting regulatory and policy issues affecting reclamation activities at the site.

Public Interaction Complexities

Public interest in the reclamation activities at the HMC site is high. Local residents are represented by two public interest groups - - Bluewater Valley Downstream Alliance, and Multicultural Alliance for a Safe Environment. In addition to the local

community, a number of Native American Tribes have an interest in the reclamation activities at the HMC site due to the proximity of the site to tribal lands. The Pueblo of Acoma has been an active participant in public meetings.

The public has many opportunities to participate in NRC's decision making process during site reclamation. For example, the public is provided an opportunity to review and comment on major licensing actions, such as approval of decommissioning plans, and groundwater restoration plans. In addition, NRC also provides opportunities for public involvement through public meetings. Public meetings are held in the vicinity of the HMC site to enable the public to collect information, to comment on, and question, the reclamation actions at the site and to discuss reclamation issues. The public meetings include representatives from NRC, EPA, NMED, and the community. Due to the high public interest involving the reclamation of the HMC site, public meetings are usually held each year. In addition, the public has been involved in a number of studies conducted by EPA regarding the decommissioning of the HMC site.

In addition, NRC has implemented a number of formal consultation initiatives to provide outreach to, and communication with, the Pueblo of Acoma on major licensing actions regarding reclamation activities at the HMC site. It is the NRC's goal to have an open and transparent process during its review process by a variety of means including, phone calls and e-mails to tribal officials, meetings with tribal leaders and other public meetings, presentations to tribes on subjects of interest, consultation letters for selected aspects of licensing reviews, and copies of correspondence on matters of interest. These efforts provide the Pueblo of Acoma opportunities to participate in the licensing process and with information that is timely and complete.

RESULTS/ LESSONS LEARNED

The technical, regulatory, and public interaction complexities associated with reclamation of the HMC site have complicated the remediation effort. In most cases, the technical staffs have been resolve technical issues.

Solving regulatory and policy issues on the other hand, often requires management involvement. In an effort to more efficiently resolve regulatory and policy issues, the agencies involved have recently begun exploring ways to achieve multi-agency consensus on such issues.

REFERNCES

1. *"Code of Federal Regulations, Title 10, Part 40, Appendix A."*
2. HOMESTAKE MINING COMPANY, *"Grants Reclamation Project Groundwater Corrective Action Program (CAP)" Revision, (2006).*