REGULATORY ISSUES ASSOCIATED WITH GROUNDWATER COMPLIANCE AT THE FALLS CITY, TEXAS, UMTRA SITE CLEANUP

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ABSTRACT

This paper discusses the problems associated with the application of supplemental standards for groundwater compliance for the disposal of uranium mill tailings at the DOE's Falls City UMTRA Project site. This includes a discussion of the difficulty in determining background water quality at the site. A discussion of the regulating agency's (NRC) concerns and the resolution of the various NRC issues with demonstrating Class III (limited use) groundwater is provided. An additional item of discussion is the problem of the conflict with the UMTRA definition of an uppermost aquifer and the 1986 EPA draft groundwater classification guidelines.

THE UMTRA PROGRAM

The U.S. Department of Energy's (DOE) Uranium Mill Tailing Remedial Action (UMTRA) Project is the result of Congressional legislation directing the proper cleanup and disposal of inactive and active uranium tailings sites and associated contamination. The Uranium Mill Tailings Radiation Control Act (UMTRCA) of 1978 (Public Law 95-604) directed the DOE to remediate 24 inactive uranium processing sites. In addition, the UMTRCA directs the EPA to establish standards for the cleanup of both the inactive (Title I) and active (Title II) mill sites. In accordance with the UMTRCA, the affected states enter into cooperative agreements and share the cost of remediation with the DOE. States are required to fund 10 percent of the cost of remedial actions. The Nuclear Regulatory Commission (NRC) and the respective state are required to concur with the selected DOE remedial action.

DESCRIPTION OF SITE

The DOE Falls City UMTRA Project site is located 73,600 meters (46 miles) southeast of San Antonio, Texas. The site is divided into two parcels, totaling 2.4 E + 6 square meters (593 acres). The first parcel contains five uranium tailings piles and one pond, and the second parcel contains one tailings pile. Each parcel also contains windblown contamination from the uranium tailings (Fig. 1). The total volume of tailings and other contaminated materials to be cleaned up is approximately 4.4 E + 6 cubic meters (5,800,000 cubic yards).

The history of the site is complex. The site is located in the south Texas uranium belt and was open pit mined between 1959 and 1960 in the current locations of piles 3, 4, and 5 and pond 6. The site was then used for uranium milling during the years 1961 through 1973. Additionally, piles 4, 5, and 7 were in situ mined in the late 1970s and early 1980s.

Due to the presence of uranium ore bodies, both on-site and off-site, the background water quality is naturally contaminated with heavy metals and salts and is extremely variable. For example, cadmium concentrations range from <0.01 to 0.02 mg/l; selenium ranges from <0.005 to 0.045 mg/l; chloride ranges from 212 to 1500 mg/l. Additionally, there is groundwater contamination associated with the milling operation. To further complicate the hydrologic issues, the site is situated on groundwater and surface water divides (Fig. 1).

There are two low-yield aquifers of interest at the site which exist under both unconfined and confined conditions (Fig. 2). These are the Deweesville/Conquista and the Dilworth aquifers. Lower aquifers are separated by the 91-meter (300-foot) thick Manning Clay. The aquifers consist of clays, silts, and some sandstones. Groundwater flow for the unconfined system follows the local topography. Confined groundwater flows toward the southeast.

The estimated groundwater velocity at the site is 10 meters (34 feet) per year. The aquifers have never been developed for drinking water sources because of the poor background water quality and very low water yields. Wells in these aquifers typically yield less than 0.0003 cubic meter (1 gallon) per minute.

Numerous professional papers describe the Falls City region, primarily focusing on the presence of uranium in the area. The DOE and others have conducted numerous site characterization activities at the Falls City site to determine background water quality and hydrologic properties. The DOE monitoring well network has included approximately 80 wells. Figure 3 illustrates the locations of the background wells. Because the site is located on a groundwater divide, there is no upgradient for the Deweesville/Conquista aquifer. Background wells were located either crossgradient or downgradient.

DESCRIPTION OF REMEDIAL ACTION

The remedial action at the Falls City site consists of the consolidation and stabilization of the tailings into a single disposal cell. The disposal cell will be located at the existing locations of piles 1, 2, and 7 (Fig. 1). Piles 3, 4, and 5 and pond 6 will be moved and placed in the disposal cell. The final pile dimensions will be 670 meters (2200 feet) by 792 meters (2600 feet) and approximately 14 meters (45 feet) above the existing grade. The sideslopes will be rock armored and the topslope will be vegetated. The tailings will be covered with a 0.6-meter (24-inch) thick radon barrier, a 0.8-meter (30-inch) thick rooting medium (topslope only), and a 0.15-meter (6-inch) topsoil layer (topslope only).

EPA TITLE I REGULATIONS

The EPA disposal and cleanup standards for the inactive sites (40 CFR 192) were finalized in 1983. In 1985, the 10th Circuit Court of Appeals remanded the groundwater standards to the EPA to establish standards of general nature, similar to the EPA groundwater regulations for active uranium mill sites, which withstood the Court's scrutiny. In 1987, the EPA issued proposed groundwater standards as ordered

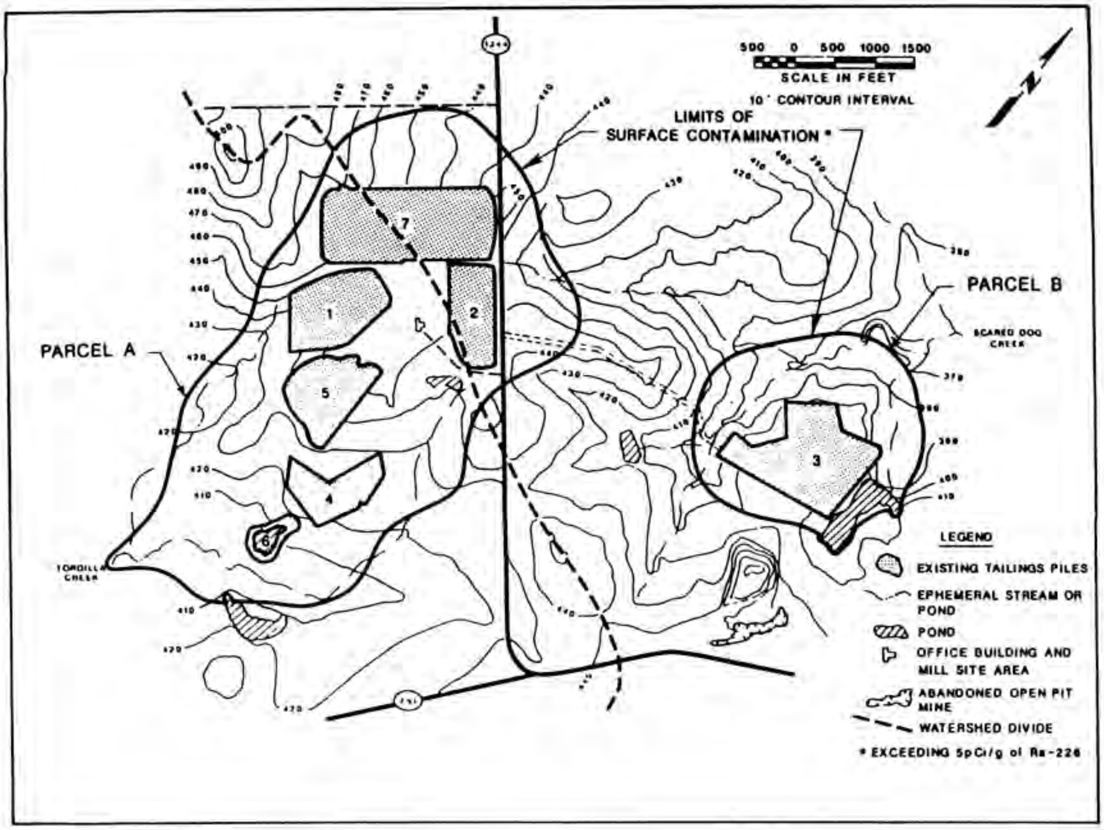

Fig. 1. Present conditions, Falls City, Texas site.

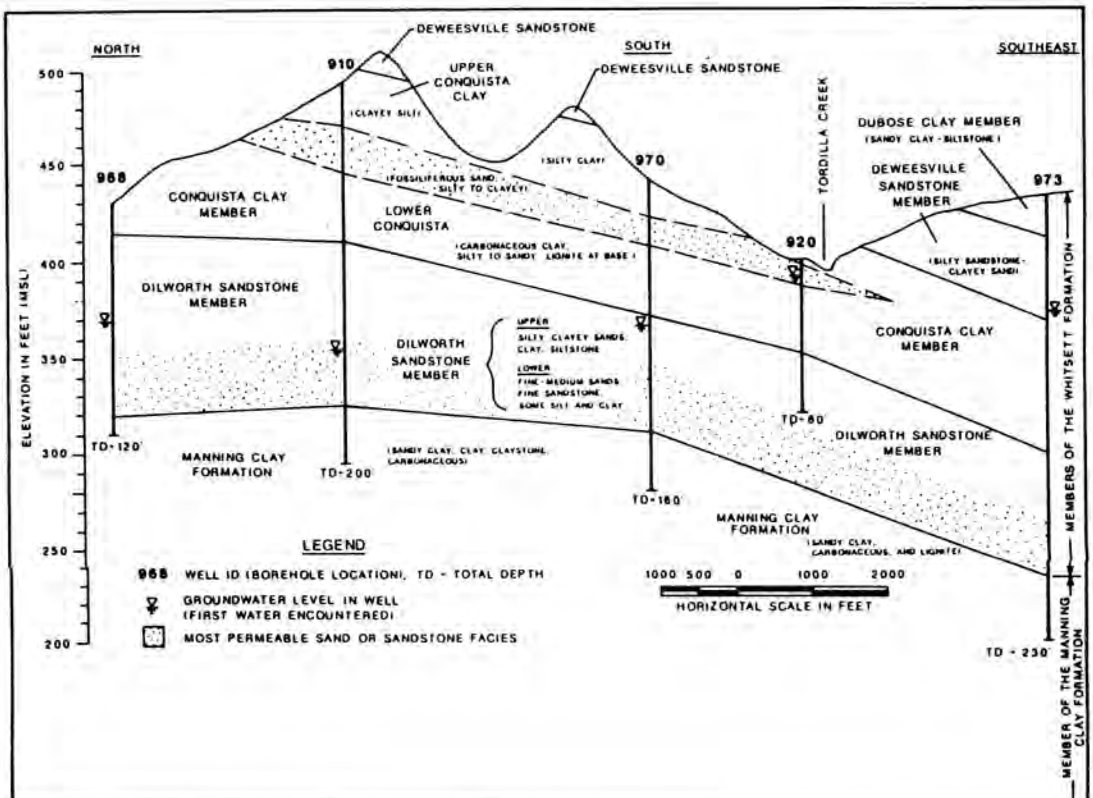

Fig. 2. Geologic cross section, Falls City, Texas site.

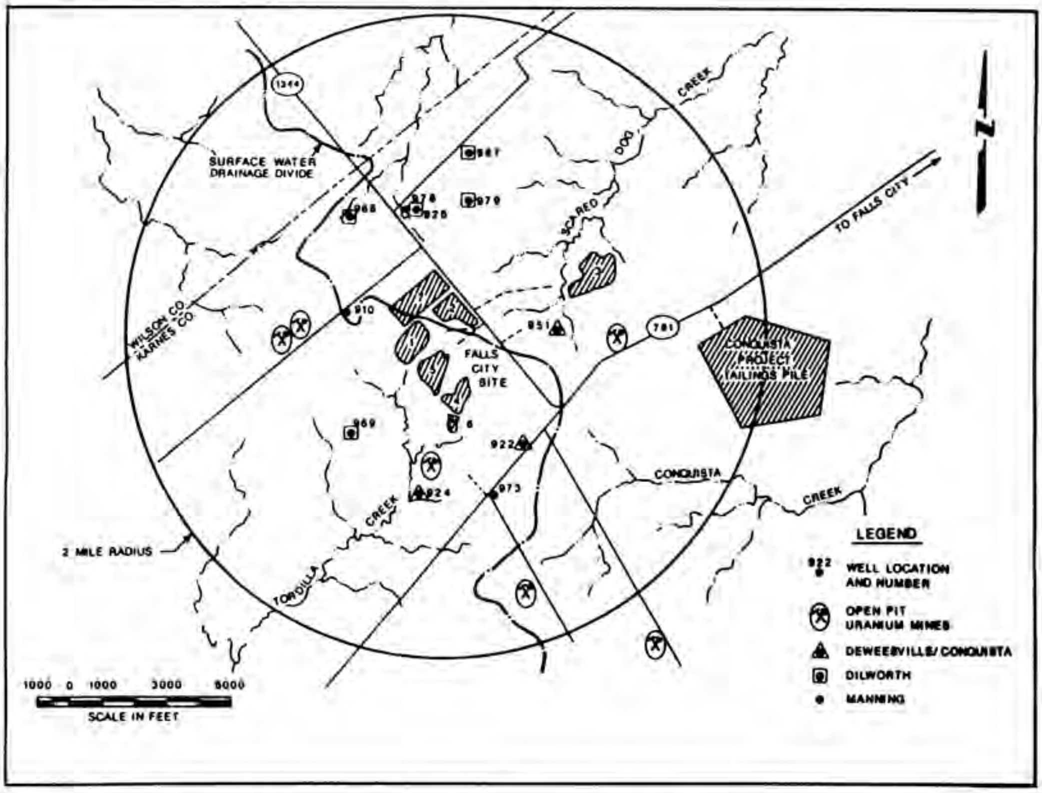

Fig. 3. Locations of background wells, Falls City, Texas site.

by the Court, which incorporated identification of hazardous constituents, the establishment of concentration limits of those constituents, and points of compliance, similar to the (Resource Conservation and Recovery Act) RCRA groundwater compliance regulations.

The proposed EPA standards recognized heavy metal contamination to be of concern at the UMTRA sites, as well as the expected radiological contaminants such as radium and uranium. Organics were recognized as possible contaminants due to the types of processes used in milling the uranium. However, analytical screening for organics at the 24 UMTRA sites has not found the presence of organics to be a problem.

In proposing the UMTRA Project groundwater standards, the EPA included a provision for obtaining supplemental standards for groundwater compliance. Supplemental standards may be obtained under a number of different criteria, including the presence of Class III (limited use) groundwaters. Class III groundwaters are defined as one of the following: (1) total dissolved solids greater than 10,000 mg/l; (2) limited yield of 0.6 cubic meter (150 gallons) per day or less; and (3) widespread ambient contamination, not caused by milling activities, that cannot be cleaned up using methods reasonably employed by public water supply systems in the region.

GROUNDWATER COMPLIANCE

It was determined that the groundwater at the Falls City site meets the supplemental standard criterion of widespread ambient contamination, primarily due to the presence of several uranium ore bodies associated with the site. In order to prove the additional criterion requirement that the water is uneconomical to treat to potable standards, the DOE conducted a treatability study to determine the economic feasibility of treating the natural background groundwater to drinking water standards. The results indicated that not only would the costs be significant (approximately ten times higher than average water supply costs), but due to the presence of various heavy metals and salts, large amounts of treatment sludges and wastes would be generated. The volume of waste generated would be double the amount that an average water supply treatment plant generates. The large volumes of waste that would be generated would be extremely expensive to dispose of since the wastes would be classified as hazardous under RCRA.

NRC ISSUES

It is no surprise that the most significant issues and questions raised by the NRC in its review of the remedial action plan for the Falls City site related to groundwater. Since the groundwater quality at the site is extremely variable and naturally contaminated, and the history of the site is complex, these questions and issues included the determination of background groundwater quality, groundwater travel times, aquifer interconnections, and the issue of treatability of the groundwater.

An additional dilemma that delayed issue resolution was the turnover in the NRC review personnel for hydrology. As one would expect, different hydrologists have different perceptions and emphasis. This added an additional level of complexity to obtaining groundwater compliance concurrence for disposal of the tailings at the Falls City site.

CONFLICTING REGULATORY DEFINITIONS

A significant problem was encountered when trying to apply the UMTRA Project EPA groundwater standard concept of an uppermost aquifer in comparison to the draft EPA guidelines for classification of groundwater (2). The EPA draft classification guidelines require the inclusion of aquifers as one unit if there are improperly abandoned boreholes penetrating lower aquifer. This is the case with the Falls City site. During the 1950s, 60s, and 70s, thousands of boreholes were drilled for uranium exploration. Many of these were drilled on 100-foot centers that penetrated through the Dilworth aquifer into the Manning Clay. As was the practice at the time, these boreholes were never sealed upon completion of drilling. However, no evidence of interconnection has been found between the Conquista and the Dilworth aquifers, as there is no chemical evidence of contamination in the lower aquifer, and pump tests have not detected interconnection. Since the draft guidelines require inclusion of a lower aquifer that has unsealed boreholes, regardless of evidence of interconnection, the Deweesville/Conquista and the Dilworth aquifers constitute the uppermost aquifer at the site. The interconnection issue is one of the reasons why the EPA draft guidelines were widely recognized as unworkable within the EPA and scientific community. However, EPA never retracted the document and the EPA specifically mentioned the document in its guidance on implementing the proposed Title I groundwater regulations.

In contrast to the EPA classification guidelines, the UMTRA definition of uppermost aquifer includes a geologic formation, groups of formations, or parts of formations that yield significant amounts of water to wells and springs (3). An uppermost aquifer can include lower aquifers, provided there is physical or chemical evidence of interconnection. The UMTRA definition, which is supported by the NRC, is more in keeping with the scientific concept of aquifers.

CONCLUSIONS AND OBSERVATIONS

- The Falls City site is hydrologically and geochemically complex, and the groundwater is naturally contaminated.
- Open pit mining, uranium milling, and in situ mining of the tailings have all occurred at the site, in addition to the drilling of thousands of exploratory boreholes. These activities have contributed to the complexity of issues concerning groundwater compliance.
- The background groundwater at the site meets the definition of a Class III or limited use groundwater, based on widespread natural contamination. The naturally contaminated groundwater is uneconomical to treat to drinking water standards. As a result, supplemental standards form the basis of the groundwater compliance strategy.
- As would be expected, the more complicated a site is hydrologically and geochemically, the more difficult it is to obtain regulatory approval for groundwater compliance.
- Regulatory staff turnover created some additional problems with achieving concurrence for disposal.
- Conflicting regulations and guidelines caused problems with the definition of uppermost aquifer.
- Be prepared for the unexpected when negotiating groundwater compliance issues.

REFERENCES

1. U.S. Environmental Protection Agency (EPA), 1987. "EPA's Proposed Standards for Remedial Action at Inactive Uranium Processing Sites with Groundwater Contamination (52 Federal Register 36000), September 24, 1987, Washington D.C.
2. U.S. Environmental Protection Agency (EPA), 1986. "Guidelines for Ground-Water Classification Under the EPA Ground-Water Protection Strategy," final draft, EPA Office of Groundwater Protection, Office of Water.
3. U.S. Department of Energy, 1987. Technical Approach Document, UMTRA-DOE/AL-050425.0000, DOE UMTRA Project Office, Albuquerque, New Mexico.