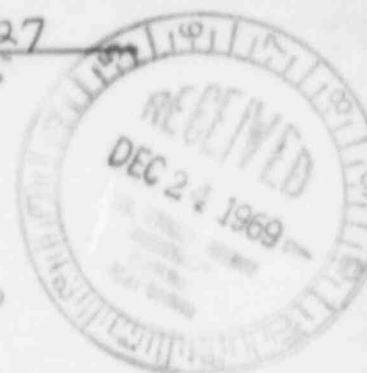




DOCKET NO. 40-8027
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UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
WASHINGTON, D.C. 20242



December 19, 1969

Mr. Donald A. Nussbaumer, Chief
Source and Special Nuclear Materials Branch
Division of Materials Licensing
U.S. Atomic Energy Commission
Washington, D. C. 20545

Dear Mr. Nussbaumer:

Reference is made to your letter of November 25, 1969 to Mr. W. G. Belter, Division of Reactor Development and Technology, requesting assistance from E. H. Baltz of the Geological Survey in reviewing parts of an Application for Source Material License, dated September 23, 1969, submitted to your office by Kerr-McGee Corporation in connection with their Sequoyah, Oklahoma Facility. In accordance with this request and discussions between Mr. Harmon of your staff and Dr. Baltz of my staff, we have reviewed the section of the application on waste disposal (pages IV-1 through IV-8). Our review efforts were concentrated mainly on the geology and hydrology as they might affect the movement of radioactive wastes from the proposed waste-disposal well. It is our understanding that the wastes to be disposed of in this well will contain natural uranium in concentrations about 7 times the allowable release concentrations of 10 CFR 20, and thorium-234 in concentrations about 2,000 times the allowable release limits of 10 CFR 20.

In general, the section on waste disposal in the application does not present a sufficient amount of geologic or hydrologic data to provide a basis for judgement as to whether the proposed disposal well would provide a satisfactory method for the disposal of radioactive waste at the Sequoyah Facility. The application states (p. IV-4) that the Arbuckle Limestone is considered to be an ideal waste-disposal zone and (p. IV-5) presents generalized reasons for choosing the Arbuckle as the proposed reservoir. These reasons, however, are not documented or confirmed by data on the hydrology of the site and its environs. Similarly, items 2 and 3 of the section on radiological aspects of well disposal (p. IV-6) are not documented by data from the site that would support the validity of the conclusions.

The Arbuckle Limestone has been used widely in parts of Kansas, Texas, and Oklahoma for injection of oil-field brines. Apparently this kind of injection has been mainly successful; it constitutes the return of brines to the deep formations from which they were originally produced and, therefore, usually has not been considered as a form of pollution. However, this cannot be taken to indicate necessarily that deep-well injection will be successful at all places or for other kinds of wastes because geologic and hydrologic conditions vary from place to place.

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In order to evaluate the feasibility of deep-well injection of radioactive wastes, several kinds of information and analyses would be necessary. The major problems to be assessed are those connected with (1) injecting the fluid successfully and safely into the disposal reservoir, and (2) predicting, in a convincing manner, the long-term movement characteristics of injected fluids and the physical and chemical effects of the injection in perturbing the natural hydrologic regime. Data for assessing these problems should include, as a minimum:

A. Geology

1. Maps and cross sections showing the regional surface and subsurface geology, including the locations of data control points such as wells.
2. Information on the lithology, thickness, and lateral extent of porous and permeable stratigraphic units and confining beds, including not only those units that might be used for waste-disposal reservoirs, but also those that are actual or potential sources of water supply.
3. Information on faults and fractures that might provide avenues for the migration of fluids or that might be influenced by the buildup of injection pressures.
4. Data on wells, including those at the site and within several miles of the site. Since wells might provide avenues for the migration of injected fluids into shallower permeable rocks, the state of all nearby wells, whether currently producing or abandoned, should be determined.

B. Hydrology

1. Existing data on porosity, permeability, and yields of reservoirs and confining rocks.
2. Existing data on the chemical quality of shallow and deep underground water.
3. Existing data on pressures in various reservoir or confining units, including regional hydraulic gradients and interpretations of the direction and rate of movement of underground water.

C. References to existing literature and other sources of information pertinent to the above.

The above outline provides a general background of the types of existing information that should be analyzed. However, the feasibility of waste disposal by injection at a particular site can be demonstrated only by investigations at the site. This would require a carefully planned program of drilling, coring, and laboratory testing of specific units of

rocks, geophysical logging, and hydrologic testing of various units of rocks that are isolated by packers in the well. During the hydrologic testing static water levels or bottom-hole pressures should be obtained, fluids should be sampled for chemical analysis, and permeabilities and transmissivities should be determined for the proposed injection zones, for the overlying confining beds, and for any developed aquifers or potential sources of water. Generally used methods of hydrologic analysis require at least two observation wells to develop a reasonable degree of predictive capability because they record the hydraulic responses of a relatively large volume of rock, rather than just the hydraulic characteristics of the rocks at the face of the test well. The data obtained from testing at the site can be used, in conjunction with the pre-existing regionwide data specified above, for estimating the amounts of fluid that can be injected, the injection pressures, the rates of movement underground, and the effects of perturbing the natural system. They also will provide data necessary for constructing and operating the well system.

If we can be of further assistance please let us know.

Yours truly,

Robert Schneider

Robert Schneider
Chief, Office of Radiohydrology

cc: Walter G. Belter, AEC, Germantown