of the salt during Quaternary time has averaged only a few miles per million years. Also, in central Kansas present rates of denudation have been found to average less than 1 ft per 1,000 years while stream incisions in the same area during Quaternary time have not exceeded several hundred feet. Finally, investigations have revealed that the buried wastes would not be affected adversely by the advance of a new continental ice sheet.

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GEOHYDROLOGY OF BURIED TRIASSIC BASIN AT SAVANNAH RIVER PLANT

At the Savannah River plant near Aiken, South Carolina, as at other locations where there are chemical-separation plants for the processing of nuclear fuels, the high-level radioactive wastes are stored in concrete-and-steel tanks buried just beneath the surface of the ground. This waste is of such activity and longevity that it cannot be dispersed into the environment, but it must be contained for periods of time extending at least into hundreds and perhaps thousands of years. One concept for the terminal containment of this waste is to store it in excavated chambers within the bedrock, which is covered by about 1,000 ft of coastal plain sediments at the plant site. As part of the safety evaluation of this concept, the geology and hydrology of both the coastal plain sediments and the bedrock have been studied. Intensive investigation of bedrock waste storage now has been postponed indefinitely while other concepts of waste storage and management are being investigated.

A buried Triassic basin that might have potential for waste storage was discovered beneath the southern third of the plant site. Investigation into the characteristics of this basin was started in 1971. This was not an engineering on design study but was aimed at understanding the geohydrology of the Triassic basin to determine its compatibility with the safe storage of waste.

Seismic surveys, gravity and magnetic surveys, and the drilling of several exploratory wells indicate that the Triassic basin is about 30 mi long, 6 or more mi wide, and perhaps 5,300 ft thick. One well penetrated the Triassic border, a second was in the center of the basin, and a third investigated an intrabasin fault. The rock is predominantly mudstone of very low permeability, with a few lenses of poorly sorted gritty sand. The water yield of all the exploratory wells is extremely low, and water-transmitting fractures are virtually nonexistent.

In 2 wells within the basin, heads above land surface have been measured that cannot be explained by connection with a recharge area. Ten possible explanations have been evaluated: aquifer head, fossil head, tectonic compression, rapid loading and compaction of sediments, water derived from igneous intrusions, infiltration of gas, precipitation of minerals, phase changes, temperature increase, and osmotic membrane phenomena. Systematic evaluation, particularly of the time for dissipation of the elevated head to the head of its surroundings, eliminates most of these explanations. Those that remain as possible explanations are: tectonic compression, temperature increase, and osmotic membrane phenomena. It is not known at present whether the high head is general over the entire basin or only in segments of it.

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DESIGN, DRILLING, COMPLETION, OPERATION, AND COST OF UNDERGROUND WASTE-DISPOSAL WELLS IN GULF COAST REGION OF TEXAS AND LOUISIANA

The first factor in considering the feasibility of underground waste disposal is the quality of the waste stream. A practicable method or methods of removing suspended solids must be planned. Equally important is that the effluent be chemically stable, after filtration, under elevated temperature conditions of the injection zone. Compatibility of the waste with the indigenous brine is necessary to avoid plugging. The disposal well is the final filter in the waste-disposal system; it is the nature of filters to become plugged, and a filter several thousand feet underground is difficult to clean and the cleaning process is usually expensive.

Once the suitability of the waste stream for underground waste disposal has been determined, the reservoir must be selected. Existing knowledge of the subsurface gained from oil and gas exploration will provide enough data to plan the well depth at which several probable reservoirs will have been penetrated. Sand parameters measured in the disposal well will permit selection of the most suitable reservoir. The geologic subsurface study will provide information as to the areal extent and thickness of probable reservoirs.

Well design must meet state requirements for protecting surface freshwater sands and confining the waste to the selected reservoir. Drilling and well-completion techniques, including casing and cement selection to meet corrosion protection needs, should all be planned so as to offer maximum protection against failure of any part of the waste system.

The quantity and quality of the waste stream, the type and size of drilling equipment, and the type of contract used are the principal factors affecting the cost of a disposal well. Area experience with drilling conditions and potential problems, together with a good equipment and material-inspection program, will produce surprising cost reducing results.

Operating an underground disposal well properly is just as important to success as good well design and good reservoir selection. Operating personnel should receive careful training in how to handle new waste sources and maintain good instrumentation and records. A dependable underground disposal system should include a standby or alternate well.

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POTENTIAL IMPACT OF COMMERCIAL LOW-LEVEL RADIOACTIVE-WASTE DISPOSAL PRACTICES ON HYDROGEOLOGIC ENVIRONMENT

The present practices, trends, and conditions in the shallow land burial of "low-level" radioactive wastes have a potential impact on the hydrogeologic environment and on environmental safety. New data are available from recently conducted inventories and surveys of operating conditions at the 6 commercial radioactive waste burial facilities in the United States.

"Low-level" radioactive wastes (as defined by the AEC) are being buried under widely differing conditions caused by local variations in geology, hydrology, weather, and operating procedures. The wastes themselves vary greatly in character from relatively harmless (due to decay or dilute concentration) to extremely hazardous (due to chemical or radioactive toxicity). Other new data include: (1) the potential environmental impact which present trends in "low-level" waste character and quantities pose to the hydrogeo-