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G. D. Johnpeer, D. J. Bobrow, S. Robinson-Cook, and D. Barrie

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Geotechnical investigation of a site in New Mexico for the Superconducting Super Collider

by *G. D. Johnpeer, D. J. Bobrow, S. Robinson-Cook, D. Barrie*, New Mexico Bureau of Mines and Mineral Resources, Socorro, NM 87801

Engineering geologists at New Mexico Bureau of Mines and Mineral Resources (NMBMMR) are conducting a geotechnical investigation within the northern Estancia Basin, approximately 40 mi east of Albuquerque (Fig. 1), as a possible location for the Superconducting Super Collider (SSC).

The SSC will be the largest scientific instrument ever constructed. Its major feature is a giant, buried ring-shaped tunnel 52 mi in circumference and 12 ft in diameter. It will consist of four basic components: 1) an injector complex where protons will be accelerated, 2) an approximately 52-mi-long underground collider ring, 3) experimental areas, and 4) a campus/laboratory area of approximately 500 acres. Although most of the facility is underground, up to 11,000 acres above ground are required for operation of the SSC. Details of the SSC siting parameters are given by the SSC Central Design Group (1985).

The SSC will be a scientific instrument for studying the fundamental nature of matter. A tunnel containing two adjacent tubes will be used to guide ultra high-energy protons in opposite directions at nearly the speed of light. At various locations along the SSC tunnel, the protons will collide to create subnuclear particles. This will provide physicists with an opportunity to witness conditions likely to have occurred at the inception of our universe.

If Congress funds the project, it will take about 6 years to construct at a funding level of $500,000,000 per year. Studies to locate a suitable site are being conducted currently in at least 17 states (at state expense) in an attempt to lure placement of the facility into each state. The state selected for the project will receive an enormous amount of outside money that will spawn numerous new businesses. Tremendous growth will take place in the SSC site region when administrative and technical personnel move in and scientists from around the world visit the facility. To support their needs, much new housing, laboratory, warehouse, and industrial construction will be required in and around the site. Resources of the Albuquerque metropolitan area would be drawn upon to meet many of the SSC growth demands.

The SSC siting criteria fall into eight broad categories: physical setting, environmental aspects, geology and tunneling, community resources, utilities, manmade disturbances, climate, and cost and schedule factors. To determine whether the northern Estancia Valley meets the above criteria, a 10-month-long study was initiated in June 1986 at the request of the New Mexico SSC Siting Committee. Currently, all work is being conducted by the NMBMMR. Prime objectives of the study are to identify any "fatal flaws" within the site (such as active faults or unsuitable foundation conditions) and to characterize geotechnically the main engineering-geologic units within the study area. If no "fatal flaws" are found, the SSC Siting Committee may recommend to the state legislature that more detailed geotechnical work be done. Eventually, the committee will decide whether or not to recommend the preparation of a detailed proposal (if requested by the Department of Energy).

Geotechnical field work to date has consisted of engineering-geologic mapping, a seismic reflection survey, logging of test trenches, and drilling. Although most field work is now complete, some laboratory testing and data analyses remain to be completed. However, it appears that no geotechnical flaws occur within the study area, and an adequate regional infrastructure exists to support the facility.

The Estancia Valley is a closed intermontane basin containing Pleistocene lake deposits approximately in its center. In the northern part of the valley, lake deposits of early to middle Pleistocene age generally occur below an elevation of 6,330 ft; late Pleistocene lake beds occur below 6,225 ft. The remaining surficial deposits (alluvium and eolian) occur above 6,330 ft elevation or bury and interfinger with lake beds below that elevation.

The criteria for geology and tunneling require that there are few lithologic changes and an absence of a high water table along the tunnel. The siting parameters allow up to 0.5 degree of tilt and a symmetrical fold, up to 1 degree, along the tunnel axis. These parameters enhance the northern Estancia Valley site by allowing the tunnel to be excavated mostly in the older, relatively dense, partly cemented, easily tunneled alluvium at depths generally less than 85 ft below the surface and above the water table almost everywhere. Soft sedimentary rock (limestone, sandstone, and shale) might be encountered in some reaches along the west and northeast sides of the tunnel. The extent to which these rock units would be encountered needs to be confirmed.

What are the chances that the lucrative SSC facility would be built in New Mexico? With some states spending millions of dollars on location of potential sites and because of the much larger political representation of more populous states, some would say that chances are very low. But, pending the results of preliminary studies by NMBMMR and continued prudent state investment in geotechnical research at the Estancia Basin site, there is some reason for optimism. Tunneling costs will be low in the alluvial sections of most of the tunnel, environmental disturbance will be minimal, and the utility capacity and existing infrastructure appear adequate to support construction and operation. The mild climate, proximity to Albuquerque International Airport, support of state universities and national laboratories, and cultural attractions enhance the chances that New Mexico will land the world's largest research facility.

Reference

SSC Central Design Group, 1985, Superconducting Super Collider siting parameters document: Universities Research Association (c/o Lawrence Berkeley Laboratory, University of California, Berkeley, CA 94720), 48 pp.

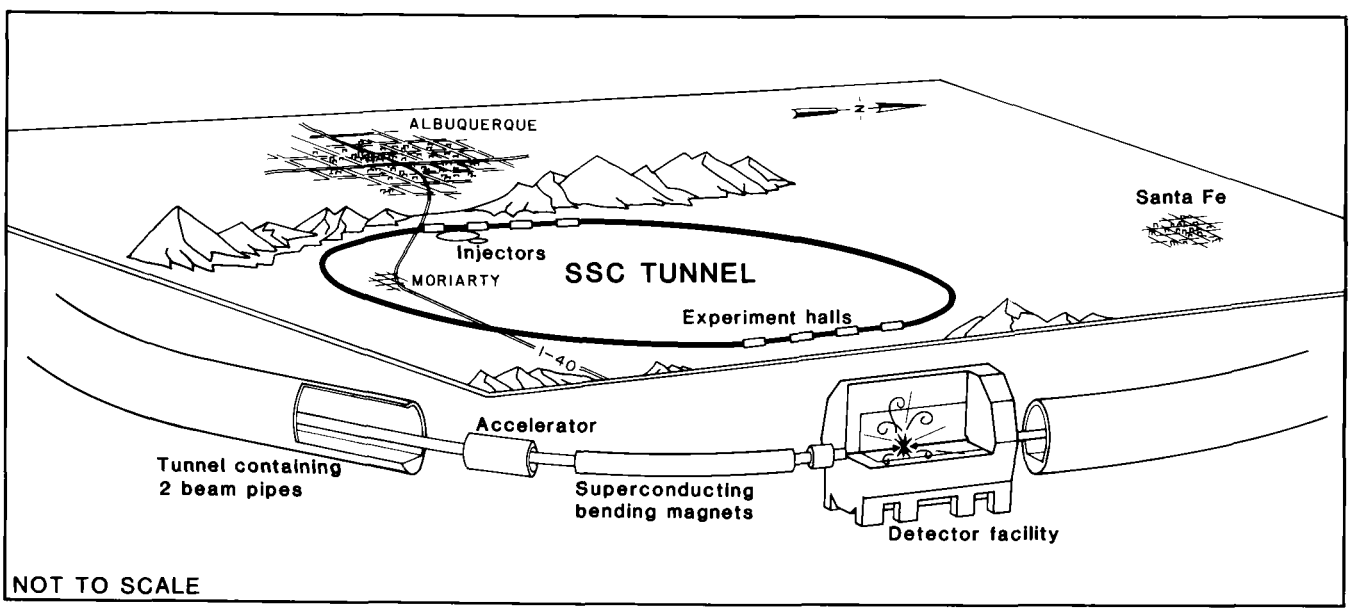

FIGURE 1—Artist's conception of Superconducting Super Collider in northern Estancia Valley, New Mexico.