

HYDROGEOCHEMICAL INVESTIGATION AND STATISTICAL ANALYSES OF BACKGROUND SUBSURFACE WATERS NEAR LOS ALAMOS NATIONAL LABORATORY

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Background hydrogeochemical data with corresponding statistical information are required to distinguish between contaminated and non-contaminated groundwater at Los Alamos National Laboratory, New Mexico. Results of this investigation provide a comprehensive, validated database of inorganic, selected organic, stable isotope, and radionuclide analyses of up to 568 groundwater samples collected from fifteen background springs and wells. The region extends from the western edge of the Jemez Mountains eastward to the Rio Grande and from Frijoles Canyon northward to Garcia Canyon. Eleven springs and four wells are separated into three aquifer types: alluvium, perched intermediate (depth) volcanic rocks (Bandelier Tuff, Tschicoma Formation, phreatic-magmatic deposits, and Cerros del Rio basalt), and the regional aquifer (Puye Formation and Santa Fe Group sediments). Filtered and non-filtered water samples, with turbidity values less than five Nephelometric turbidity units, were collected and analyzed for chemical constituents in 1997, 1998, 1999, and 2000 during six sampling events. Inorganic analytes include major ions, minor elements, and trace elements; naturally occurring humic substances and small-molecular weight organic compounds; and natural and fallout-derived radionuclides. Groundwaters sampled as part of this investigation have low concentrations of major ion and trace elements (chloride, nitrate, perchlorate, sulfate, barium, boron, and natural uranium) and relatively low concentrations of tritium. Results of statistical analyses are provided for nine major ion species; thirty-nine trace elements; stable isotopes of hydrogen, nitrogen, and oxygen; tritium; hydrophobic and hydrophilic organic compounds; and eleven radiological isotopes in addition to gross alpha, gross beta, and gross gamma.