Geohydrology of the Telegraph Hill area, St. Paul Island, Alaska

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The purpose of this study was to depict steady-state, ground-water flow directions in the Telegraph Hill area, St. Paul Island, Pribilof Islands, Alaska, using the ground-water modeling program Modflow-2000. Available climate, geology, and hydrology information were integrated into several models and reproduced, with acceptable error, June 1993 to July 2000 observed water levels using August 1999 to July 2000 recharge rates.

St. Paul Island consists of several Pleistocene to Recent age geologic units of volcanic and aeolian origin altered by tectonic, weathering, wave, and frost processes. For modeling purposes, the geology was simplified into four hydrogeologic units: two unconfined aquifers, one confining unit, and a basal aquifer. To represent the physical ground-water system on St. Paul Island, incorporated varying thickness and hydraulic conductivity were assigned to the models' aquifers and two boundary conditions were used: the Ghyben-Herzberg freshwater-saltwater interface as a no-flow boundary and the coast as a constant-head boundary.

Simulated ground-water contours show flow in the basal aquifer radiating outward from higher heads near the island's center toward coastal discharge areas. In contrast, ground-water flow in the unconfined aquifers mimics the topography of the island and discharges at coastal areas and to surface-water bodies. Surface water and unconfined ground water either evaporate or flow vertically through the confining unit to the basal aquifer. At the position of the Ghyben-Herzberg freshwater-saltwater interface, freshwater flows parallel to the interface directed from the center of the island toward the coast. Although the models reasonably simulate ground-water flow, the models cannot assess the migration of contaminants or the intrusion of saltwater.