Geological Society of America Abstracts and Program 30 (7)
Toronto, Ontario, 26-29 Oct 1998

SUSTAINABLE POTABLE WATER SUPPLIES FROM CONDUIT SYSTEMS: CARIBBEAN COAST, YUCATAN PENINSULA, MEXICO

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The Caribbean coast of the Yucatan Peninsula is undergoing intensive development, resulting in increased demand for potable water. Meteoric recharge rapidly infiltrates the limestone platform, contributing to a thin fresh water lens which floats above intruding saline water. As a result, there are no surface water bodies, and groundwater is the only available potable water source. It is proposed that large sustainable yields of potable water may be drawn from extensive conduit systems that are distributed along the Cancun-Tulum corridor. Our research demonstrates that the majority of the groundwater flux (>95%) occurs via extensive conduit systems associated with large coastal springs. Flow rates are 0.03-0.01 m/s. Groundwater tracing recorded discharges >2 m^3s^{-1} in conduits more than 2 km from the coast. Conduit water quality is comparable to well water (matrix) with respect to TDS and conductivity, based on field data and literature values. The conduits are effective hydrogeologic delivery systems from the recharge area several kilometers inland, to the coast, where water demand is the highest. The contamination potential of the conduits is limited by their high discharge rates, and the spatial concentration of industrial and domestic effluents at the coast. The location of large hydraulically connected conduits may be readily mapped by cave diving exploration via *cenotes* (sinkholes). Potential adverse effects that should be investigated prior to implementation of large-scale conduit abstraction include: effects on endemic conduit dwelling species, and altered hydrodynamics in the coastal zone. The present trend of groundwater resource development is increased reliance on randomly distributed wells drawing water from the matrix. Randomly distributed wells only capture a small proportion of the aquifer flux due to hydraulic conductivities (K) in the matrix that are orders of magnitudes lower than those in the conduits. Furthermore, low K plus the expanded matrix withdrawal may compromise the thin fresh water lens inducing salt water intrusion. In comparison, conduit water abstraction, is considered hydrogeologically feasible, and, environmentally and economically desirable.

Keywords: potable water, groundwater, conduit, salt-water-intrusion, Yucatan