AN UPDATE ON THE THICKNESS AND EXTENT OF THE SURFICIAL AQUIFER SYSTEM AND ITS POTENTIAL USE AS AN ALTERNATIVE WATER SOURCE IN COASTAL GEORGIA

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Abstract. The Georgia Environmental Protection Division (GaEPD) has capped withdrawals from the Upper Floridan aquifer in coastal Georgia because of saltwater contamination at Hilton Head Island, South Carolina, and Brunswick, Georgia. To offset demand, GaEPD recommends seeking alternative groundwater sources, including the surficial and Brunswick aquifer systems in the coastal area. The surficial aquifer system is a relatively untapped resource in coastal Georgia that could have potential use as an alternative water source for irrigation or other water uses in the region.

The surficial aquifer system in coastal Georgia consists mostly of sands and clays of Pleistocene and Pliocene age and, in some areas, hydraulically connected sediments of Miocene age (Fig. 1). The aquifer system, formerly called the surficial aquifer (Clarke and others, 1990), consists of three zones—the shallow water-table zone and two deeper zones identified as the confined upper and confined lower water-bearing zones (Leeth, 1999). The areal extent of the confined units of the surficial aquifer system is currently unknown; however, Leeth (1999) reported two confined water-bearing zones in Camden County, and Clarke and others (1990) reported one confined water-bearing zone at Brunswick, Glynn County, and one at Skidaway Island, Chatham County (Clarke, 2003).

A map showing the total composite thickness of permeable layers in the water-table and confined zones of the surficial aquifer system was compiled using data from published reports and additional data recently compiled from the files of the U.S. Geological Survey (USGS; Fig. 2). In coastal Georgia, the surficial aquifer system is thickest in the southeast Georgia embayment, with thickness exceeding 200 feet (ft) in much of Glynn County, and is greater than 100 ft in parts of Camden, Charlton, Brantley, Wayne, Liberty, Tattnall, Toombs, McIntosh, and Chatham Counties. In these areas, the surficial aquifer system is composed of both a water-table zone and one or more confined zones. Thick deposits of alluvial materials also lie in the flood plains of major rivers, such as the Altamaha River in Wayne County, where thicknesses of 120 ft in are reported for the water table zone in some areas (Watson, 1979). In the central part of the coastal plain, a coarse-to-fine gravelly layer about 30 to 50 ft below the land surface was identified by Watson (1979) as part of his “surface” aquifer (hatched area in Fig. 2). This layer is reported to vary in thickness from 5 to 15 ft and is laterally extensive within the water-table zone.

Well yields vary greatly over the area depending on the thickness and permeability of zones that make up the surficial aquifer system. For the water-table zone, Clarke and others (1990) and Leeth (1999) reported well yields ranging from 2 to 140 gallons per minute (gal/min) and transmissivity ranging from 14 to 6,700 feet squared per day (ft^2/d) in Glynn and Camden Counties (Clarke, 2003). For the confined surficial zones, Clarke and others (1990) reported well yields ranging from 40 to 180 gal/min and transmissivity ranging from 150 to 6,000 ft^2/d. Leeth (1999) reported well yields from 15 to 100 gal/min and a transmissivity of 180 ft^2/d at Camden County. In Wayne County, industrial supply wells at Jesup yielded about 250 gal/min, with a total average withdrawal of 0.86 million gallons per day in 1986 (Clarke and others, 1990). A recent 100-ft deep well constructed in a confined zone of the surficial aquifer system by the U.S. Army at Fort Stewart, Liberty County, obtained about 550 gal/min during a 24-hour pumping test with an estimated transmissivity of 2,500 ft^2/d (Gerard Gonthier, U.S. Geological Survey, written commun., June 2010).

Because of the relatively smaller well yields, the surficial aquifer system in coastal Georgia is probably a viable alternative water source for some small commercial, industrial, and irrigation water uses. Although the thickness of this aquifer is highly variable, local drilling data could be used to identify places where it is thickest and most productive. Some water-quality problems, such as iron and manganese, have been noted and could limit the use in some areas (Clarke and Others, 1990). To date, the development potential of the surficial aquifer is mostly confirmed in the southeastern Georgia embayment; however, substantial thicknesses have been mapped elsewhere, thus indicating the potential for develop–ment in other coastal areas. The effects of heavy withdrawals on streams and wetlands will be one of the considerations and limiting factors for development—groundwater level and quality monitoring would help to assess the effects of increased development.

Series	Stage	Geologic unit[1]	Hydrogeologic unit[2] Savannah	Hydrogeologic unit[2] St Marys	
Holocene/Pleistocene		Satilla Formation	Water-table zone		Surficial aquifer system
Pliocene		Cypresshead Formation			
Miocene	Upper	Ebenezer Formation	Confining unit	Upper water-bearing zone Lower water-bearing zone	
	Middle	Coosawhatchie Formation	Confining unit	Upper Brunswick aquifer	Brunswick aquifer system
	Lower	Marks Head Formation			
		Parachucla Formation			
		Tiger Leap Formation		Lower Brunswick aquifer	
Oligocene		Lazaretto Creek Formation	Confining unit		
		Suwannee Limestone	Upper Floridan aquifer		

[1]Weems and Edwards, 2001 [2]Clarke and others, 1990; Leeth, 1999

Figure 1. Geologic and hydrogeologic units of Oligocene and younger age, coastal Georgia (Clarke, 2003).

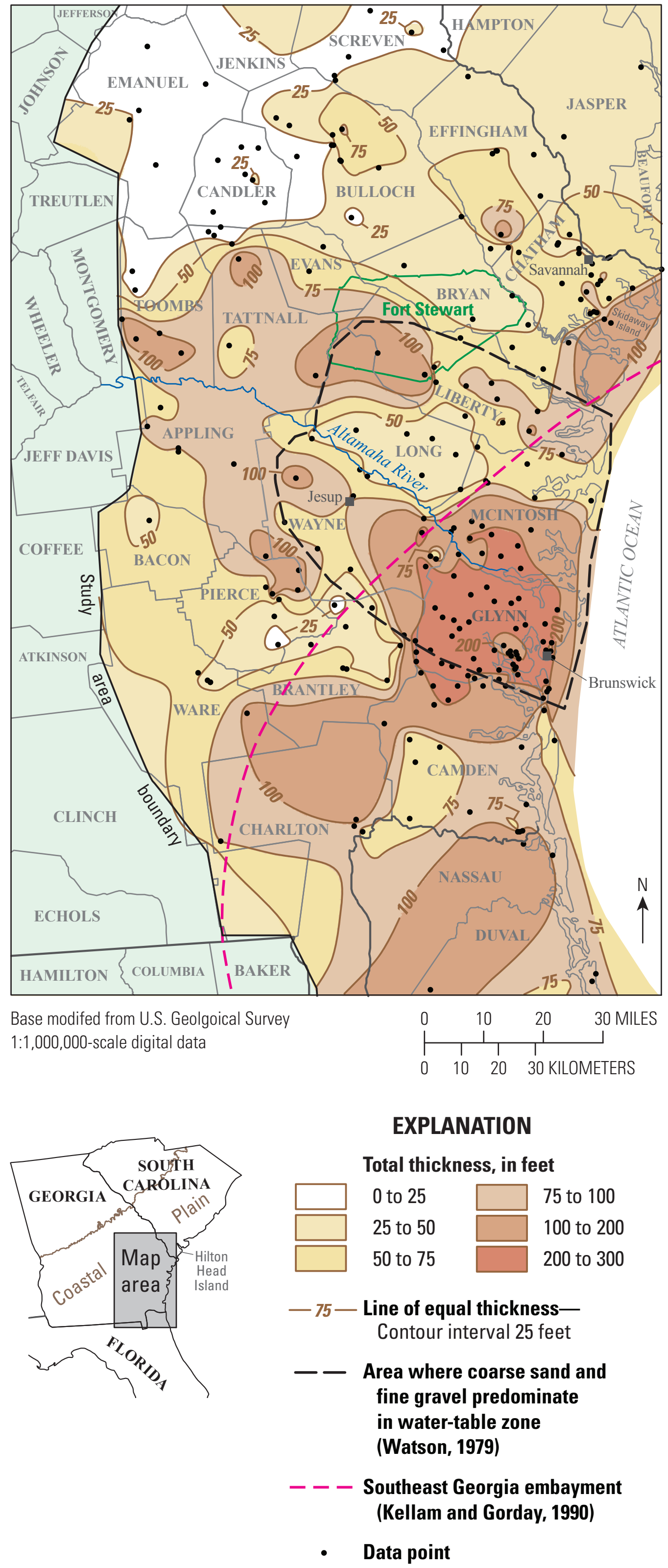

Figure 2. Composite thickness of permeable layers comprising the water-table and confined zones of the surfical aquifer system in coastal Georgia.

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