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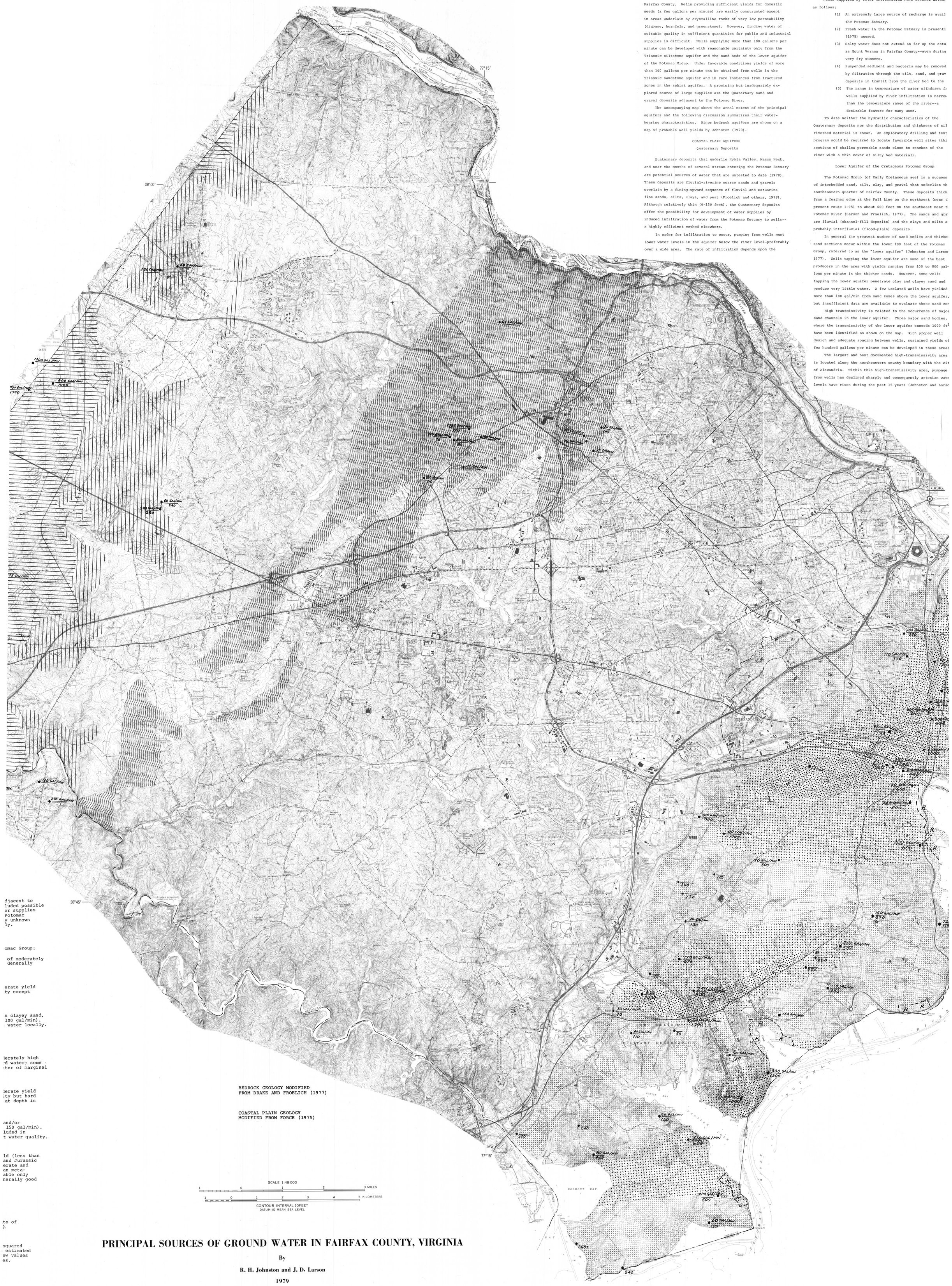

PRINCIPAL SOURCES OF GROUND WATER IN FAIRFAX COUNTY, VIRGINIA

By

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INTRODUCTION

Potable ground water is available nearly everywhere in Fairfax County. Wells providing sufficient yields for domestic needs (a few gallons per minute) are easily constructed except in areas underlain by crystalline rocks of very low permeability (diabase, hornfels, and greenstone). However, finding water of suitable quality in sufficient quantities for public and industrial supplies is difficult. Wells supplying more than 100 gallons per minute can be developed with reasonable certainty only from the Triassic siltstone aquifer and the sand beds of the lower aquifer of the Potomac Group. Under favorable conditions yields of more than 100 gallons per minute can be obtained from wells in the Triassic sandstone aquifer and in rare instances from fractured zones in the schist aquifer. A promising but inadequately explored source of large supplies are the Quaternary sand and gravel deposits adjacent to the Potomac River.

The accompanying map shows the areal extent of the principal aquifers and the following discussion summarizes their water-bearing characteristics. Minor bedrock aquifers are shown on a map of probable well yields by Johnston (1978).

COASTAL PLAIN AQUIFERS

Quaternary Deposits

Quaternary deposits that underlie Hybla Valley, Mason Neck, and near the mouths of several stream entering the Potomac Estuary are potential sources of water that are untested to date (1978). These deposits are fluvial-riverine coarse sands and gravels overlain by a fining-upward sequence of fluvial and estuarine fine sands, silts, clays, and peat (Froelich and others, 1978). Although relatively thin (0-150 feet), the Quaternary deposits offer the possibility for development of water supplies by induced infiltration of water from the Potomac Estuary to wells--a highly efficient method elsewhere.

In order for infiltration to occur, pumping from wells must lower water levels in the aquifer below the river level-preferably over a wide area. The rate of infiltration depends upon the permeability of the streambed material, the transmissivity of the aquifer, and the hydraulic gradient from river to wells.

Wells supplied by river infiltration have several advant as follows:

(1) An extremely large source of recharge is avail the Potomac Estuary.

(2) Fresh water in the Potomac Estuary is presentl (1978) unused.

(3) Salty water does not extend as far up the estu as Mount Vernon in Fairfax County--even during very dry summers.

(4) Suspended sediment and bacteria may be removed by filtration through the silt, sand, and grav deposits in transit from the river bed to the

(5) The range in temperature of water withdrawn fi wells supplied by river infiltration is narrow than the temperature range of the river--a desirable feature for many uses.

To date neither the hydraulic characteristics of the Quaternary deposits nor the distribution and thickness of sil riverbed material is known. An exploratory drilling and test program would be required to locate favorable well sites (thi sections of shallow permeable sands close to reaches of the river with a thin cover of silty bed material).

Lower Aquifer of the Cretaceous Potomac Group

The Potomac Group (of Early Cretaceous age) is a success of interbedded sand, silt, clay, and gravel that underlies th southeastern quarter of Fairfax County. These deposits thick from a feather edge at the Fall Line on the northwest (near t present route I-95) to about 600 feet on the southeast near t Potomac River (Larson and Froelich, 1977). The sands and gra are fluvial (channel-fill deposits) and the clays and silts a probably interfluvial (flood-plain) deposits.

In general the greatest number of sand bodies and thicke sand sections occur within the lower 100 feet of the Potomac Group, referred to as the "lower aquifer" (Johnston and Larso 1977). Wells tapping the lower aquifer are some of the best producers in the area with yields ranging from 100 to 800 gallons per minute in the thicker sands. However, some wells tapping the lower aquifer penetrate clay and clayey sand and produce very little water. A few isolated wells have yielded more than 100 gal/min from sand zones above the lower aquifer, but insufficient data are available to evaluate these sand zor

High transmissivity is related to the occurrence of majo sand channels in the lower aquifer. Three major sand bodies, where the transmissivity of the lower aquifer exceeds 1000 ft^2 have been identified as shown on the map. With proper well design and adequate spacing between wells, sustained yields of few hundred gallons per minute can be developed in these areas

The largest and best documented high-transmissivity area is located along the northeastern county boundary with the cit of Alexandria. Within this high-transmissivity area, pumpage from wells has declined sharply and consequently artesian wate levels have risen during the past 15 years (Johnston and Larso