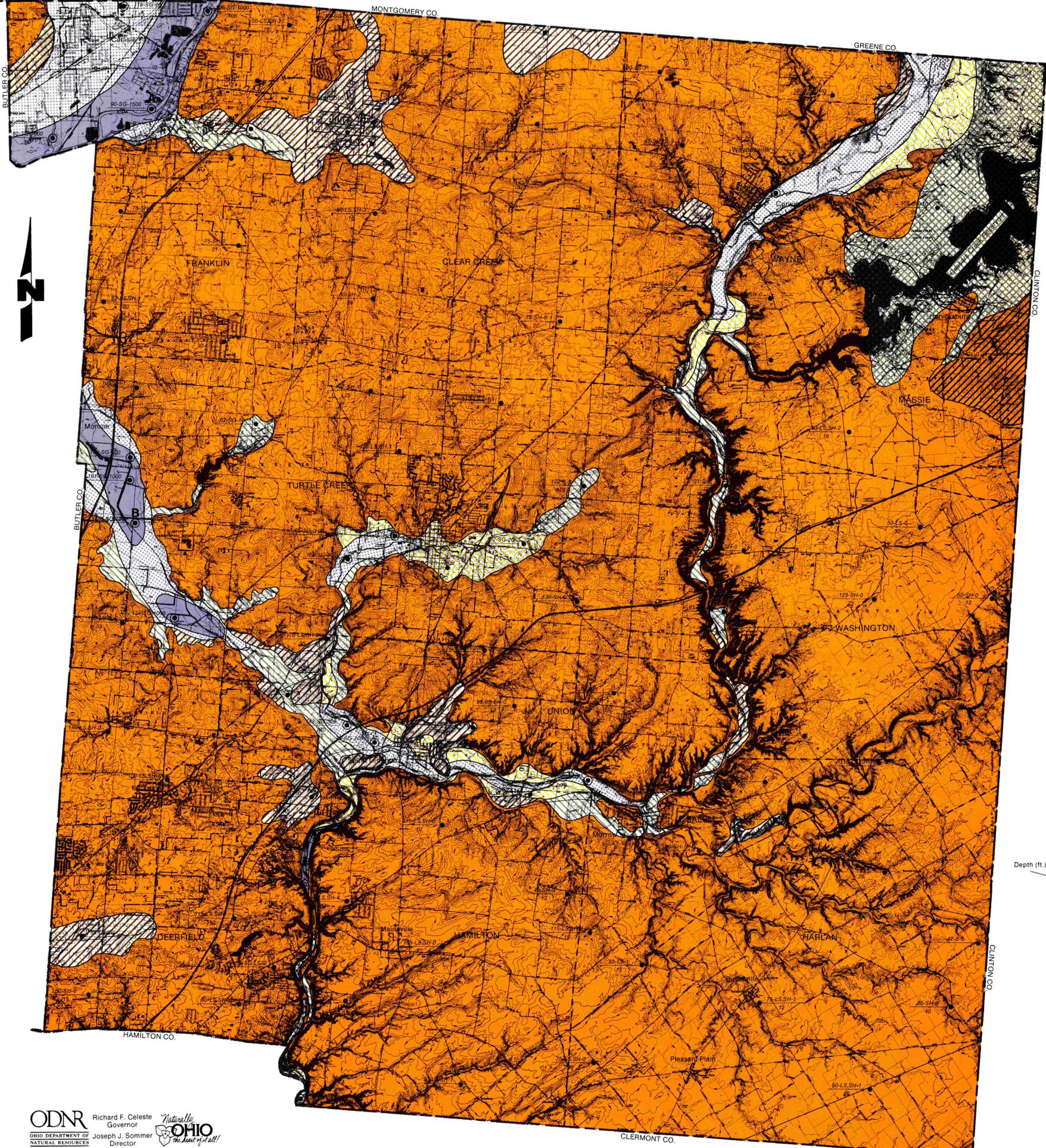
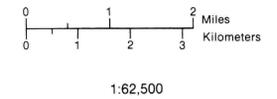


# Ground-Water Resources of WARREN COUNTY

by  
Alfred C. Walker



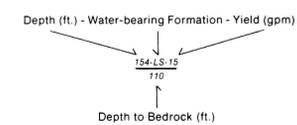
### Well Yields

- AREAS IN WHICH YIELDS OF MORE THAN 500 GALLONS PER MINUTE CAN BE DEVELOPED.**  
Best ground-water areas in Warren County. Permeable sand and gravel deposits in ancient stream channels. Wells may yield more than 1000 gallons per minute. Suitable for large industrial well field development.
- AREAS IN WHICH YIELDS OF 100 TO 500 GALLONS PER MINUTE CAN BE DEVELOPED.**  
Sand and gravel deposits, generally well sorted, yield several hundred gallons per minute. Highest yields are reported where recharge is available from nearby streams. Exploratory drilling may be necessary to locate coarser materials.
- AREAS IN WHICH YIELDS OF 25 TO 100 GALLONS PER MINUTE CAN BE DEVELOPED.**  
Valley fill contains thick local deposits of sand and gravel. Wells encountering permeable deposits may yield as much as 100 gallons per minute. Small diameter domestic wells may only produce 15 to 25 gallons per minute. Shale bedrock will yield very limited supplies.
- AREAS IN WHICH YIELDS OF 10 TO 25 GALLONS PER MINUTE CAN BE DEVELOPED.**  
Valley fill containing sand and gravel deposits of limited thickness and extent. Thicker sand and gravel zones may yield up to 25 gallons per minute. Wells drilled into underlying bedrock generally yield less than 3 gallons per minute.
- End moraine consisting of clay with sand and gravel layers. Depth to rock may range from 100 to 200 feet. Wells encountering coarse sands and gravels may obtain yields of 10 to 15 gallons per minute from properly developed screened wells. Shale bedrock is a poor water source.
- AREAS IN WHICH YIELDS OF 3 TO 10 GALLONS PER MINUTE MAY BE DEVELOPED.**  
Thick deposits of clay with thin lenses of sand and gravel may yield as much as 10 gallons per minute to screened wells. With few exceptions (mainly in the Springboro area) depth to bedrock is less than 100 feet. Wells not encountering sand and gravel produce less than 3 gallons per minute from the underlying limey shale.
- AREAS IN WHICH YIELDS SELDOM EXCEED 3 GALLONS PER MINUTE.**  
Poor source of ground water. Bedrock consists of interbedded plastic shales and thin limestone layers. If water is present in the rock, it usually occurs in the upper few feet where the strata have been somewhat weathered and broken. Overlying glacial cover is generally less than 50 feet thick and consists largely of clay. Occasional lenses of sand and gravel will supply small yields. Wells seldom produce more than 3 gallons per minute.
- Little or no ground water available from thin silt and clay deposits overlying shale bedrock. Depth to rock may exceed 200 feet.

### Note

The ground-water characteristics have been mapped regionally, based upon interpretations of water well records and the area's geology and hydrology. Well sites mapped were selected as typical for the areas shown. Information regarding specific sites may be obtained from the Division of Water.

### Well Site Symbols



- S - Sand
- G - Gravel
- CL - Clay
- SH - Shale
- LS - Limestone

- Well Site
- Municipal-Industrial Well

**A** Chemical Analyses

### Chemical Analysis Table

Well Site	A	B	C
Depth (ft.)	90	129	75
Aquifer	SG	SG	SG
Hardness as CaCO <sub>3</sub>	292.0	400.	360.
pH	7.6	7.2	7.1
Nitrate (N)	1.1	0.05	3.1
Sulfate (SO <sub>4</sub> )	38.0	15.0	54.0
Chloride (Cl)	1.7	30.0	44.0
Fluoride (F)	0.23	0.56	0.14
Iron (Fe)	0.29	2.82	0.15
Manganese (Mn)	0.15	0.03	0.03

Chemical constituents as milligrams per liter (mg/l).