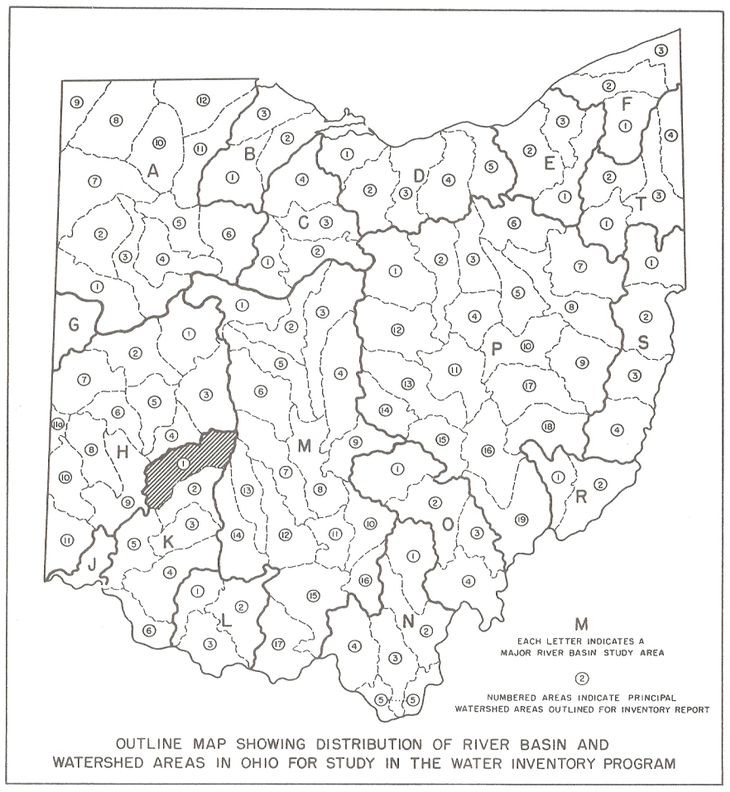
OHIO DEPARTMENT OF NATURAL RESOURCES, DIVISION OF WATER
1562 W. First Ave., Columbus 12, Ohio

OHIO WATER PLAN INVENTORY
1960

UPPER LITTLE MIAMI RIVER BASIN

UNDERGROUND WATER RESOURCES

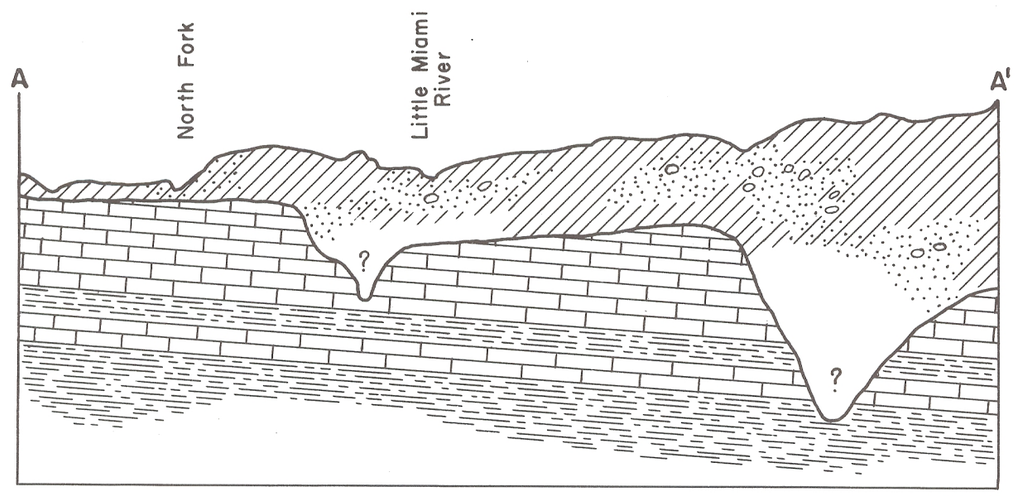
Prepared by ALFRED C. WALKER, Geologist,
Ohio Division of Water

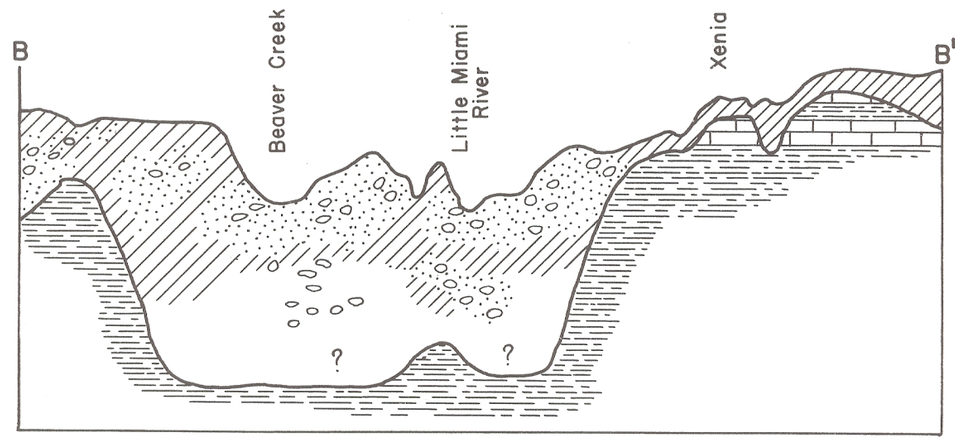


OUTLINE MAP SHOWING DISTRIBUTION OF RIVER BASIN AND WATERSHED AREAS IN OHIO FOR STUDY IN THE WATER INVENTORY PROGRAM

FILE INDEX K-1

GENERALIZED CROSS SECTIONS SHOWING THE GEOLOGY OF THE UPPER LITTLE MIAMI RIVER BASIN.





The occurrence of water beneath the surface of the earth is controlled by the size, shape and number of openings in the rocks of the region, for it is in these spaces that water is contained. The openings are usually interconnected and therefore permit the movement of water from one to another. The characteristics of the water-bearing openings in various formations differ greatly. For this reason, wide variations in underground-water conditions are found as the geology differs from place to place. Shale is a dense rock and a poor source of underground water. Limestone may be a good water source depending on the number and extent of joints and fractures present. Sand and gravel deposits, because of their permeability, are the most important sources of underground water.

The entire basin area is covered with glacial deposits of clay, sand and gravel which range in thickness from a thin veneer to over 400 feet. The bedrock surface beneath these deposits consists of limestones and dolomites of Silurian age and Ordovician shales with thin limestone layers. Sections AA' and BB' show the relative positions and thicknesses of these formations across the basin.

GENERALIZED STRATIGRAPHIC SEQUENCE OF THE ROCKS IN THE UPPER LITTLE MIAMI RIVER BASIN

System or Series		Group or Formation	Character of Material	Water-bearing Characteristics
Quaternary	Recent		Silts and gravels deposited on flood plains of the major valleys.	Generally a poor water source because deposits are thin and impermeable.
Quaternary	Pleistocene		Interbedded and interlensing sands and gravels deposited as outwash (stratified drift) by glacial meltwaters.	Quantity of water available depends upon the material and source of recharge. Where conditions are good, large supplies may be obtained.
Quaternary	Pleistocene		Till, largely clay, with buried sand or gravel beds in some places.	Good farm and domestic supplies available from sand and gravel layers. Poor supplies where clay predominates or where deposits are thin.
Silurian		Niagaran	Massive to thin-bedded limestones and dolomites with some dense, calcareous shale beds.	Adequate supplies for farm, domestic and possibly small industrial needs. Water is hard.
Silurian		Clinton	Massive to irregularly-bedded limestone.	
Ordovician		Richmond and Maysville	Interbedded soft shales and thin, hard limestones.	Poor source of water. Water, where present, generally occurs in top few feet of strata. May be high in iron, sulfur and hardness.

Records of approximately 1250 water wells in the basin are on file at the Ohio Division of Water. Locations of 33 typical wells are indicated on the map which also shows the availability of underground water.

A number of buried valleys are present in the area. These are channels that were cut into the bedrock by early streams before and during glaciation, and have since been filled with glacial deposits. Where these old valleys have been filled with permeable sands and gravels, which have access to sufficient stream recharge, they may be capable of supplying over 1000 gallons a minute to wells. Wells in the Xenia well field at Oldtown obtain large yields because of these conditions. Where such deposits are not crossed by a surface stream, smaller yields are obtained. Small industrial and municipal supplies are available, although quantities are more limited than in the areas which are subject to stream infiltration.

Glacial drift covering the uplands of the basin area consists largely of clay till. Where the till contains interbedded sand and gravel deposits, good supplies for farm and domestic use can be developed. In much of the northern part of the basin, water-bearing limestone underlies the till and may supply yields of as much as 100 gallons a minute.

The poorest underground-water conditions occur in the extreme southwestern part of the basin. In this area, thin clay till overlies impermeable shales interbedded with thin limestone layers and underground-water supplies are very small.

Detailed information covering underground-water supplies in parts of the basin area is contained in Ohio Division of Water Bulletin 19, "Water Resources of Greene County", and Bulletin 22, "The Water Resources of Clark County".

QUALITY OF WATER

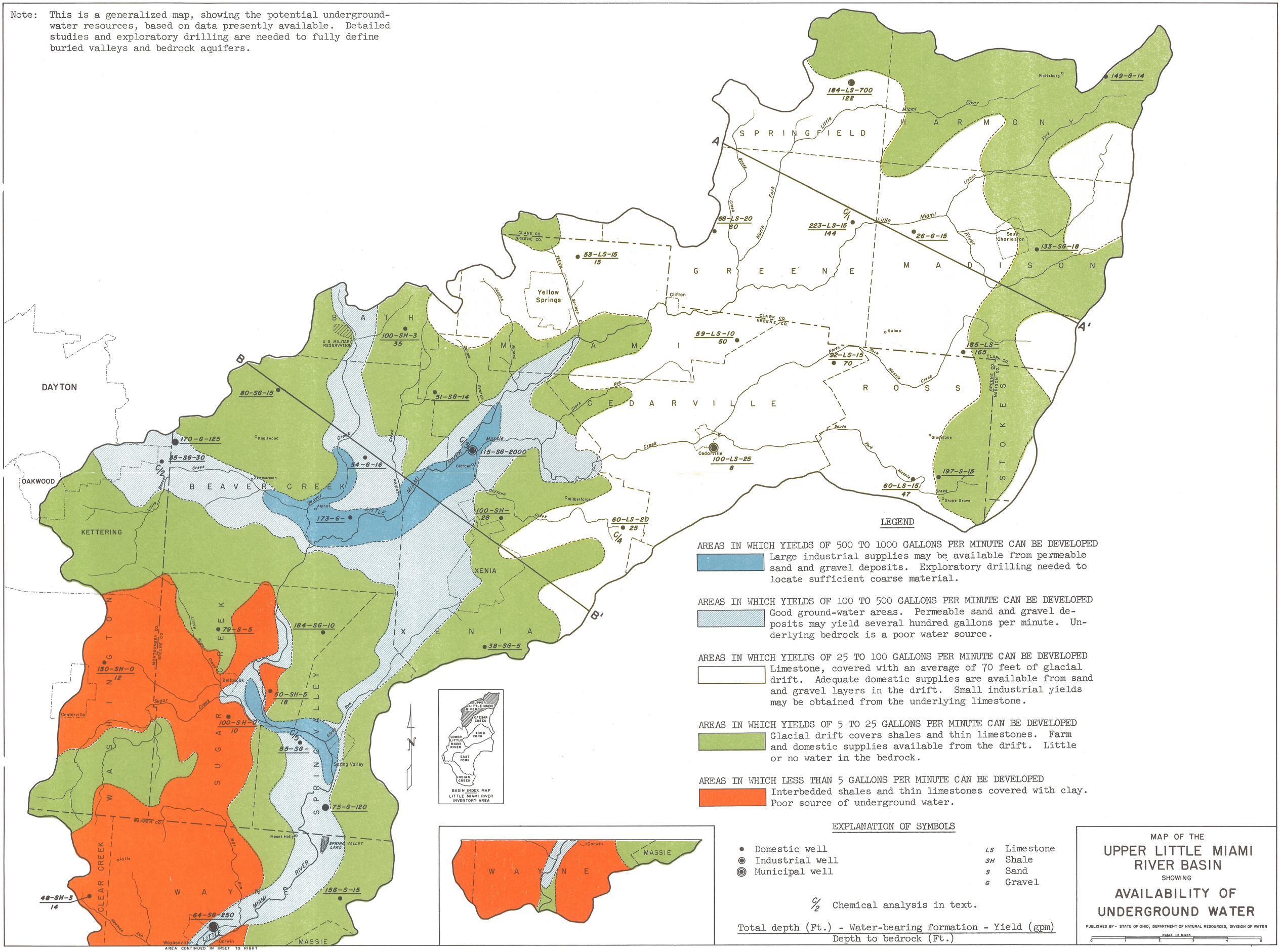
Underground water from all sources in the basin is generally hard and contains objectionable amounts of iron. Some of the water from limestone and shale may contain hydrogen sulfide and some wells in the shale also yield water that is high in chloride.

Partial analyses of the water obtained from five wells are shown in the following table.

Well Number	C-1	C-2	C-3	C-4	C-5
Depth (feet)	223	35	115	60	85
Water-bearing formation	Limestone	Sand and gravel	Sand and gravel	Limestone	Sand and gravel
	Parts per Million				
Iron (Fe)	10. *	2.6*	.7	1.0*	1.0*
Chloride (Cl)	155.	1.9	7.0	5.0	4.2
Dissolved Solids	520.	356.	358.	305.	394.
Total hardness	249. *	357. *	322. *	297. *	383. *
pH	7.8	7.4	7.3	7.5	7.5

*Would require treatment for most uses.

Note: This is a generalized map, showing the potential underground-water resources, based on data presently available. Detailed studies and exploratory drilling are needed to fully define buried valleys and bedrock aquifers.



LEGEND

AREAS IN WHICH YIELDS OF 500 TO 1000 GALLONS PER MINUTE CAN BE DEVELOPED
Large industrial supplies may be available from permeable sand and gravel deposits. Exploratory drilling needed to locate sufficient coarse material.

AREAS IN WHICH YIELDS OF 100 TO 500 GALLONS PER MINUTE CAN BE DEVELOPED
Good ground-water areas. Permeable sand and gravel deposits may yield several hundred gallons per minute. Underlying bedrock is a poor water source.

AREAS IN WHICH YIELDS OF 25 TO 100 GALLONS PER MINUTE CAN BE DEVELOPED
Limestone, covered with an average of 70 feet of glacial drift. Adequate domestic supplies are available from sand and gravel layers in the drift. Small industrial yields may be obtained from the underlying limestone.

AREAS IN WHICH YIELDS OF 5 TO 25 GALLONS PER MINUTE CAN BE DEVELOPED
Glacial drift covers shales and thin limestones. Farm and domestic supplies available from the drift. Little or no water in the bedrock.

AREAS IN WHICH LESS THAN 5 GALLONS PER MINUTE CAN BE DEVELOPED
Interbedded shales and thin limestones covered with clay. Poor source of underground water.

EXPLANATION OF SYMBOLS

- Domestic well
- Industrial well
- Municipal well

LS Limestone
SH Shale
S Sand
G Gravel

C/2 Chemical analysis in text.

Total depth (Ft.) - Water-bearing formation - Yield (gpm)
Depth to bedrock (Ft.)

MAP OF THE UPPER LITTLE MIAMI RIVER BASIN SHOWING AVAILABILITY OF UNDERGROUND WATER

PUBLISHED BY- STATE OF OHIO, DEPARTMENT OF NATURAL RESOURCES, DIVISION OF WATER

SCALE IN MILES
0 1 2 3 4 5