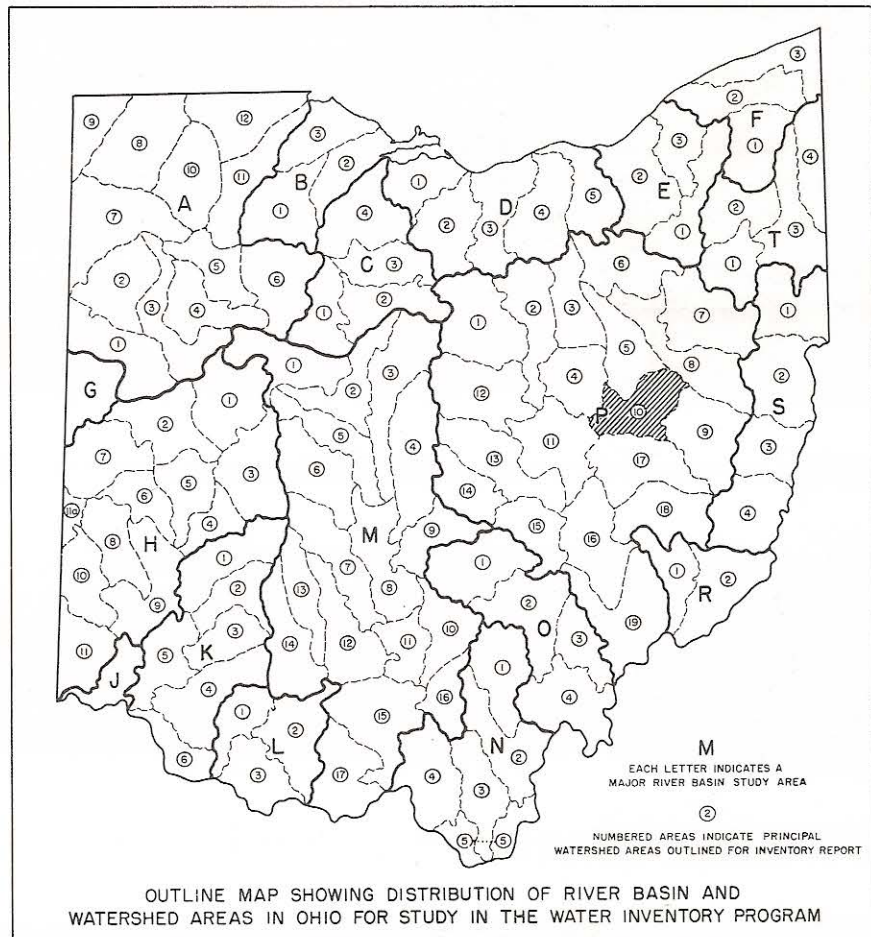


OHIO WATER PLAN INVENTORY
1962

A PART OF THE LOWER PORTION
TUSCARAWAS RIVER BASIN
UNDERGROUND WATER RESOURCES

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

The quantity of water available to wells depends upon the types of geologic formations present in the area. Underground water is contained in the small open spaces that are present in the rocks. The number, kind, and size of these openings in a formation determine its water-bearing characteristics.

Although the amount of water stored at any one time in all of our rivers and lakes is enormous, the volume of fresh water available from the countless natural openings in the rocks beneath the surface is probably several times greater. The type of rocks, and thus the amount of underground water available, varies greatly from place to place.

Shale and clay are very dense and are poor sources of underground water. Sandstone varies from dense to rather porous, depending upon the degree of cementation between the individual grains. Sand and gravel are the least dense and the most important source of underground water.

The rocks in the Lower Tuscarawas River basin can be divided into two major units: (1) sandstone, shale, limestone, and coal layers which form the bedrock, and (2) unconsolidated deposits of clay, silt, sand, and gravel.

Records of approximately 2000 water wells in the Upper Tuscarawas River basin are on file at the Ohio Division of Water. Locations of a number of typical wells are indicated on the map.

Although this basin lies beyond the glaciated portion of the state, meltwater from the glaciers to the north has deposited well-sorted sands and gravels in the valley beneath the Tuscarawas River. This old valley contains as much as 250 feet of fill in many places.

These permeable outwash deposits of sand and gravel constitute the best water sources in the basin area. Large industrial and municipal supplies are available to wells in the valley fill deposits by induced infiltration from the river. The amount of underground water available by induced infiltration depends on the mud and silts on the river bottom, the thickness and permeability of the sand and gravel deposits, and the distance between the wells and the river. Properly constructed individual wells near the river may yield from 500 to 1000, or more, gallons per minute.

Extensive sand and gravel deposits which are not adjacent to the river may supply as much as 500 gallons per minute.

Municipal wells, developed in valley fill, supply New Philadelphia, Tuscarawas, Midvale, Gnadenhutten, Newcomerstown, and West Lafayette.

In the extreme eastern and south-eastern parts of the basin, where the bedrock is predominantly shale and shaly sandstone, quantities available from drilled wells are more limited. Yields average around three gallons per minute and wells will seldom produce more than five gallons per minute.

Valley fill along many of the streams, tributary to the Tuscarawas River, ranges from 30 feet to as much as 200 feet. This consists largely of clay, silt, and fine sand which is not a source of underground water. Although large diameter dug wells may be developed in this valley fill, wells are normally drilled through these deposits into the underlying bedrock for water supplies.

Bedrock beneath the basin area consists of alternating layers of sandstone, shale, limestone, fireclay, and coal. Adequate farm and domestic supplies are generally available from the sandstones. Occasionally, where thick, porous sandstones are present, yields of as much as 25 gallons per minute have been obtained. These sandstones, however, are not consistent in thickness, character, or areal extent and large yields locally do not indicate extensive water-bearing sandstone deposits.

QUALITY OF UNDERGROUND WATER

Partial analyses of water samples from five municipal wells, drilled into outwash deposits, are given below.

Well number	C-1	C-2	C-3	C-4	C-5
Depth (Ft.)	115	99	101	56	88
Aquifer	Sand and gravel	Sand and gravel	Sand and gravel	Sand and gravel	Sand and gravel
	Parts per million				
Iron (Fe)	0.1	0.	3.8	0.05	0.
Chloride (Cl)	23.	4.	33.	130.	19.
Total solids	500.	565.	407.	640.	530.
Total hardness	360.	390.	250.	360.	270.
pH	7.9	7.9	8.1	8.0	8.05

The following table contains a summary of the analyses of five water samples from domestic wells, drilled into sandstone.

	Range (ppm)	Average (ppm)
Iron (Fe)	0.1 - 2.2	1.03
Chloride (Cl)	4. - 540.	115.
Total solids	253. - 1480.	546.
Total hardness	85. - 175.	116.
pH	7.4 - 7.75	7.56

The analyses from both sandstone and sand and gravel aquifers, show a wide range in the chemical content of the waters.

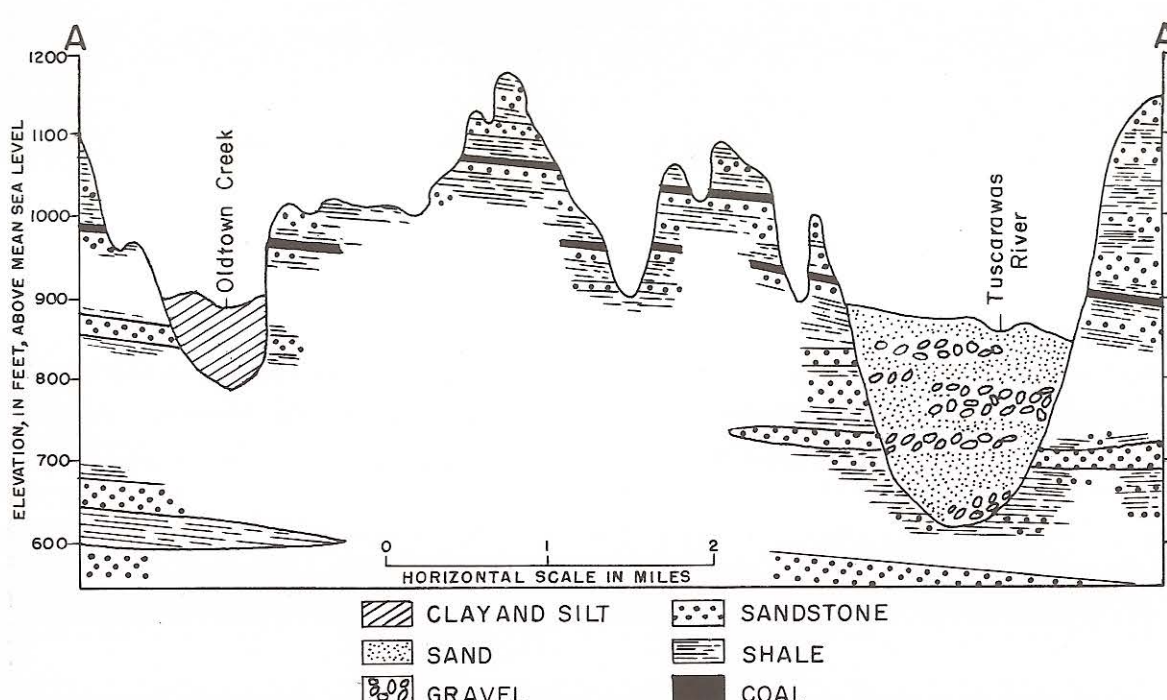
Total hardness ranges from a minimum of 85 ppm to a maximum of 390 ppm. Water sampled from the outwash deposits is consistently higher in hardness than that from sandstone aquifers.

Iron content ranges from 0 to 3.8 ppm with three samples showing more than 1 ppm. Generally, the iron content is found to be excessive in the sandstone formations. Water containing more than about 0.3 ppm will, on exposure to air, form an iron oxide precipitate. Excessive iron will stain laundry and plumbing fixtures.

Chloride is present in all of the samples analyzed, but usually in small amounts. Salt water is not generally encountered in the basin at depths shallower than 300 feet.

GENERALIZED STRATIGRAPHIC TABLE OF THE ROCKS
IN THE LOWER TUSCARAWAS RIVER BASIN

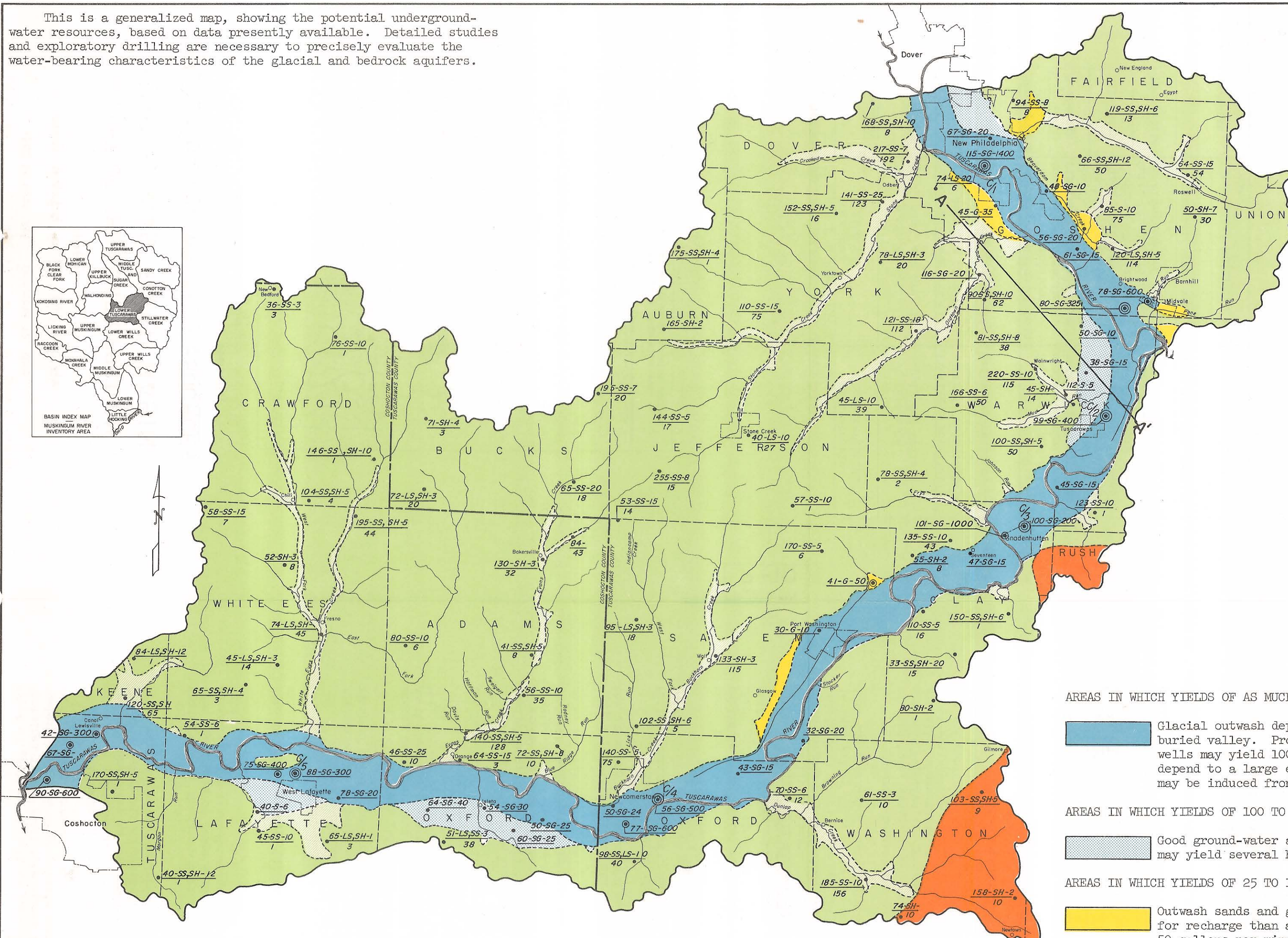
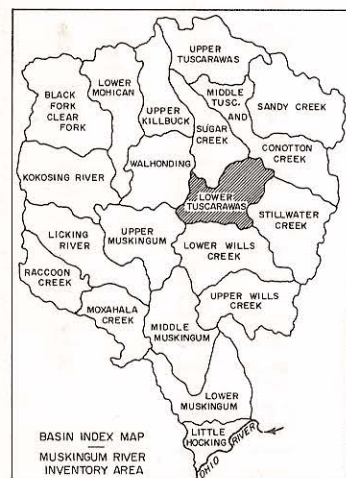
System or Series	Group or Formation	Character of Material	Water-bearing Characteristics
Quaternary	Recent	Flood plain deposits. Silt, sand, and gravel.	Not favorable. May supply dug wells.
	Pleistocene	Interbedded and stratified deposits of silt, sand, and gravel in main valleys. Clay and silt deposits in tributary valleys.	Excellent supplies of water in main valleys. Poor supplies in tributary valleys.
Pennsylvanian	Monongehela	Variable sequence of thin to massive sandstones interbedded with shale, fireclay, limestone, or coal. Sandstones may be patchily developed and range from fine to coarse texture. Principal water-bearing formations in Allegheny and Pottsville.	Sandstones and sandy shales supply adequate water for domestic and farm uses. Larger yields are developed where thick, permeable sandstones are encountered.
	Conemaugh		
	Allegheny		
	Pottsville		
Mississippian	Cuyahoga	Massive sandstone with shale layers.	Good supplies locally.
		Interbedded sandstone and shale.	Very poor water source.



CROSS SECTION A-A', SHOWING GENERAL GEOLOGY OF THE LOWER TUSCARAWAS RIVER BASIN.

FILE INDEX
P-10

This is a generalized map, showing the potential underground-water resources, based on data presently available. Detailed studies and exploratory drilling are necessary to precisely evaluate the water-bearing characteristics of the glacial and bedrock aquifers.



- AREAS IN WHICH YIELDS OF AS MUCH AS 1000 GALLONS PER MINUTE CAN BE DEVELOPED
- Glacial outwash deposits of permeable sand and gravel in buried valley. Properly constructed, large diameter drilled wells may yield 1000 gallons, or more, per minute. Yields depend to a large extent upon the amount of infiltration which may be induced from the river.
- 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.
- AREAS IN WHICH YIELDS OF 25 TO 100 GALLONS PER MINUTE CAN BE DEVELOPED
- Outwash sands and gravels occur under less favorable conditions for recharge than above. Drilled wells may obtain as much as 50 gallons per minute from these deposits.
- AREAS IN WHICH YIELDS OF 5 TO 25 GALLONS PER MINUTE CAN BE DEVELOPED
- Sandstone and sandy shale bedrock will generally yield adequate farm and domestic water supplies. Rarely, quantities in excess of 25 gallons per minute are obtained from thick sandstones.
- AREAS IN WHICH LESS THAN 5 GALLONS PER MINUTE CAN GENERALLY BE DEVELOPED
- Deep fill, largely silt and fine sand, is present in stream valleys. Valley fill is not a source of underground water. Wells are generally drilled into the underlying bedrock for domestic water requirements.
 - Small domestic supplies obtained from sandstone and shale bedrock. Average yield for drilled wells is three gallons per minute.

EXPLANATION OF SYMBOLS

- Domestic well
- ⊙ Industrial well
- ⊙ Municipal well
- s Sand
- g Gravel
- SS Sandstone
- SH Shale
- LS Limestone

$\frac{C}{2}$ Chemical analysis in text.

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

MAP OF A PART OF THE LOWER PORTION
TUSCARAWAS RIVER BASIN
SHOWING

AVAILABILITY OF
UNDERGROUND WATER

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

