Environmental Geology of Fountain, Parke, and Vermillion Counties, Indiana

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Introduction

This is one of a series of environmental studies of Indiana counties which I have undertaken in the past few years. An adjacent region was described last year (1). The object of this paper is to provide county planners and others involved in zoning decisions with the data necessary to make sound decisions on future growth patterns in the counties. Data necessary for such a study is available in the form of soil surveys by the federal government and water well data on file with the Division of Water, Indiana Department of Natural Resources.

The soil surveys used for this report (2, 3, 4) were necessary in that the soil type has a direct bearing upon the intended land usage. Modern soil surveys are used for many more purposes than the strictly agricultural uses of the past. Each soil type has specific parameters which must be taken into account when different uses are proposed for an area which has originally been agricultural. As an example, Genesee soil develops in an area which is subjected to periodic flooding. This may be a minor factor in farm land but it would be a major factor if a subdivision were to be proposed for the area.

The water well records of a county are just as valuable in this type of investigation as the soil survey. The well data is useful in that it records the type of material at depth. Also it records the pressure surface of the ground water and, in some cases, depth to bedrock.

Setting

These three counties are along the western boundary of the state. The physiography of the area is of generally medium relief. There are fairly wide river valleys and rolling upland areas. Some of the soils are prairie-type soils and the tall grass prairie covered portions of this area when the land was originally settled. The remainder was in hardwood forest of the oak-maple-hickory association (2, 3, 4).

The relief in the region is generally less than 200 feet. The most rugged topography may be found along Sugar Creek in Parke County. Turkey Run State Park has cliffs along the river that are quite steep. The entire area has been glaciated. The major portion has Wisconsin age material on the surface (7, 8). In the southeastern corner of Parke County there is an area of Illinoian age material (8).

The area is along the eastern edge of the Illinois Basin. Bedrock is mainly Pennsylvanian shales and sandstones with some valuable coal seams throughout the section. In the northeastern portion there are some Mississippian age shales and limestones. Coal mining has been a minor activity for some years in this area. Presently Vermillion County has mining actively going on. The price of coal is high enough so that other mining ventures—particularly strip mining—is likely to begin in the near future. Weir (8) has estimated the recoverable coal reserves in this area as approximately 400 million tons, most of which occur in Vermillion County.

Figure 1 illustrates the bedrock topography of the area. Three pre-glacial bedrock valleys cross this area (5). The largest is the Danville Valley, which enters in the vicinity of Shades State Park and travels westerly to the present valley of the Wabash River then turns northwesterly and leaves the area near its northwest corner. A second pre-glacial valley follows the present valley of the Wabash River in a southerly direction. The Montclair Valley enters the area in its southeastern corner and travels southwestward to a junction with the preglacial Wabash Valley a few miles south of the county boundary in Vigo County. The circular depressions indicate sinkholes in the bedrock. These are not evident from topographic maps having been filled in with glacial material.

Figure 2 shows the elevation above sea level of the ground water pressure surface. The ground water flow is toward the Wabash River then south along the river valley. Water wells generally appear adequate for domestic use. The average six-inch diameter well has a flow rate of 15 gallons per minute. Generally flow rates are higher in the Wabash Valley sands and gravels than in most other sites. Bedrock wells yield lower flow rates than those in the unconsolidated glacial material. Industries seeking locations for new factories should consider locations near the Wabash River if they use large quantities of water.

Figure 3 shows the flood plains in the area. There are certain soils which only develop on areas which are flooded with some regularity. In this area these soil types are: Allison, Armiesburg, Eel, Genesee, Huntsville, Landes, Shoals, Sloan, Tawas, Wallkill, and Zipp. No permanent structures should be built on any of these soils. Their best use is probably as wetlands for wildlife reserves. Compatable with this use would be selective logging of the mature trees. Some communities may wish to establish parks along portions of these areas. Occasional spring flooding would not interfer with this use. Some of these sites have been cleared and are farmed. This is another acceptable use for flood plains.

Figure 4 is a map of the soil types with good to fair drainage and soils with poor drainage. This map is an aid to planners who must judge whether large subdivisions should be allowed to use septic systems or should be connected to a centralized waste treatment facility. The internal drainage of a soil is a function of the fine grained material present. The greater the percentage of fine grained material (clay) the slower the drainage of water through the soil.

The slope of a soil is important if it is higher than 12 per cent. Sewage traveling through steep sloping soil will drain too fast to allow for complete breakdown of the organic matter by the soil bac-

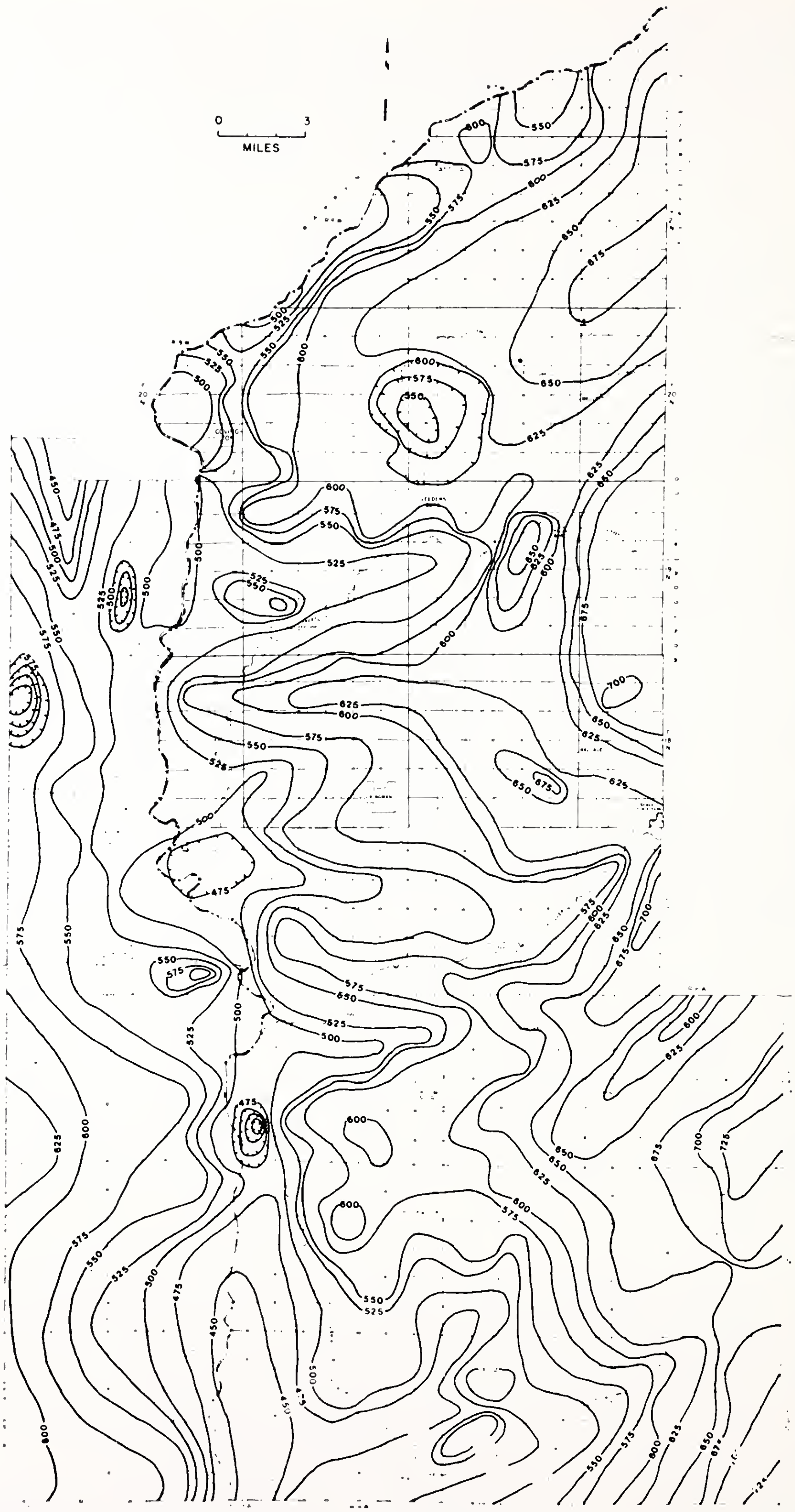

FIGURE 1. *Bedrock surface elevation, in feet, above sealevel.*

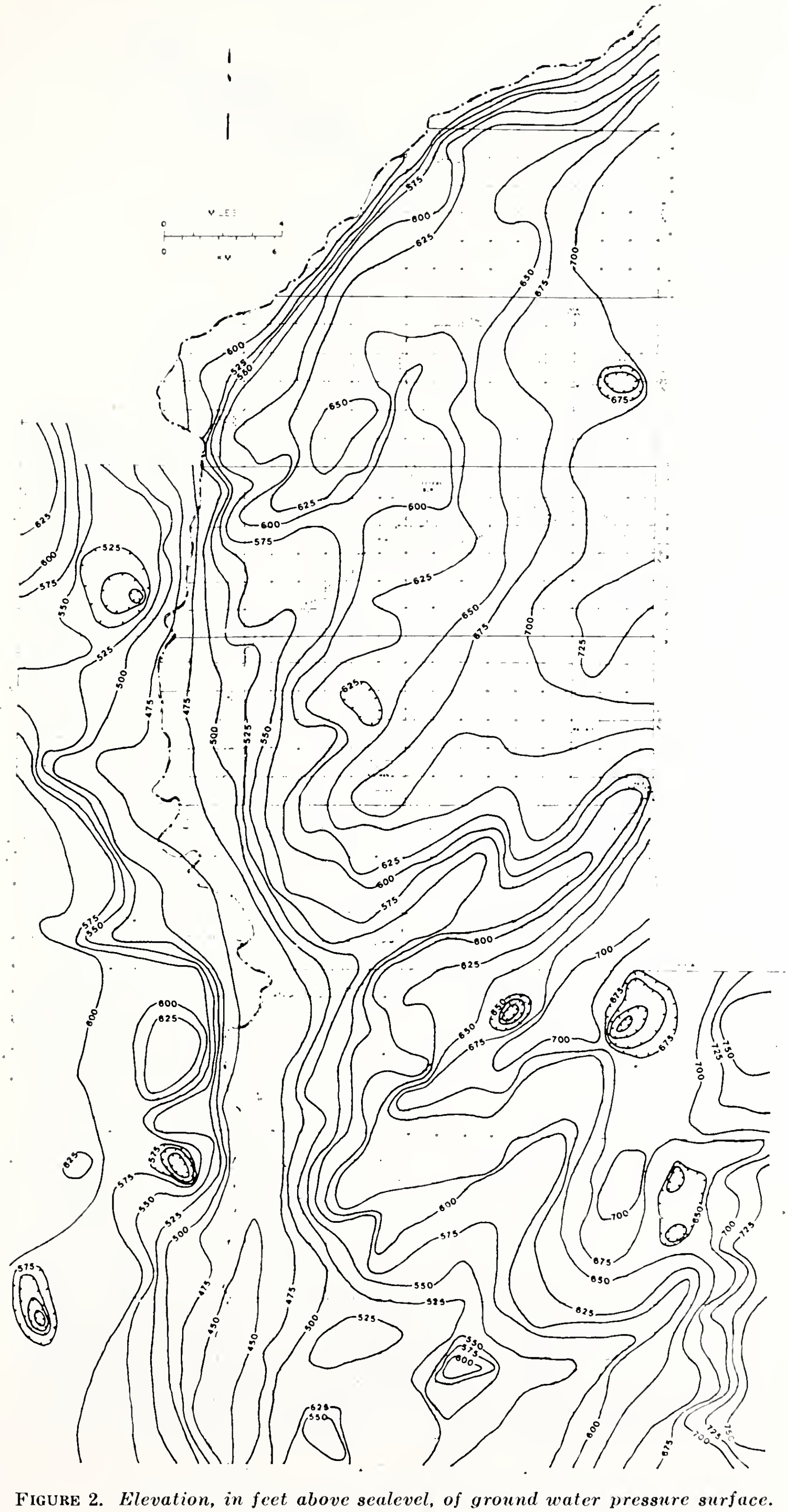

FIGURE 2. *Elevation, in feet above sealevel, of ground water pressure surface.*

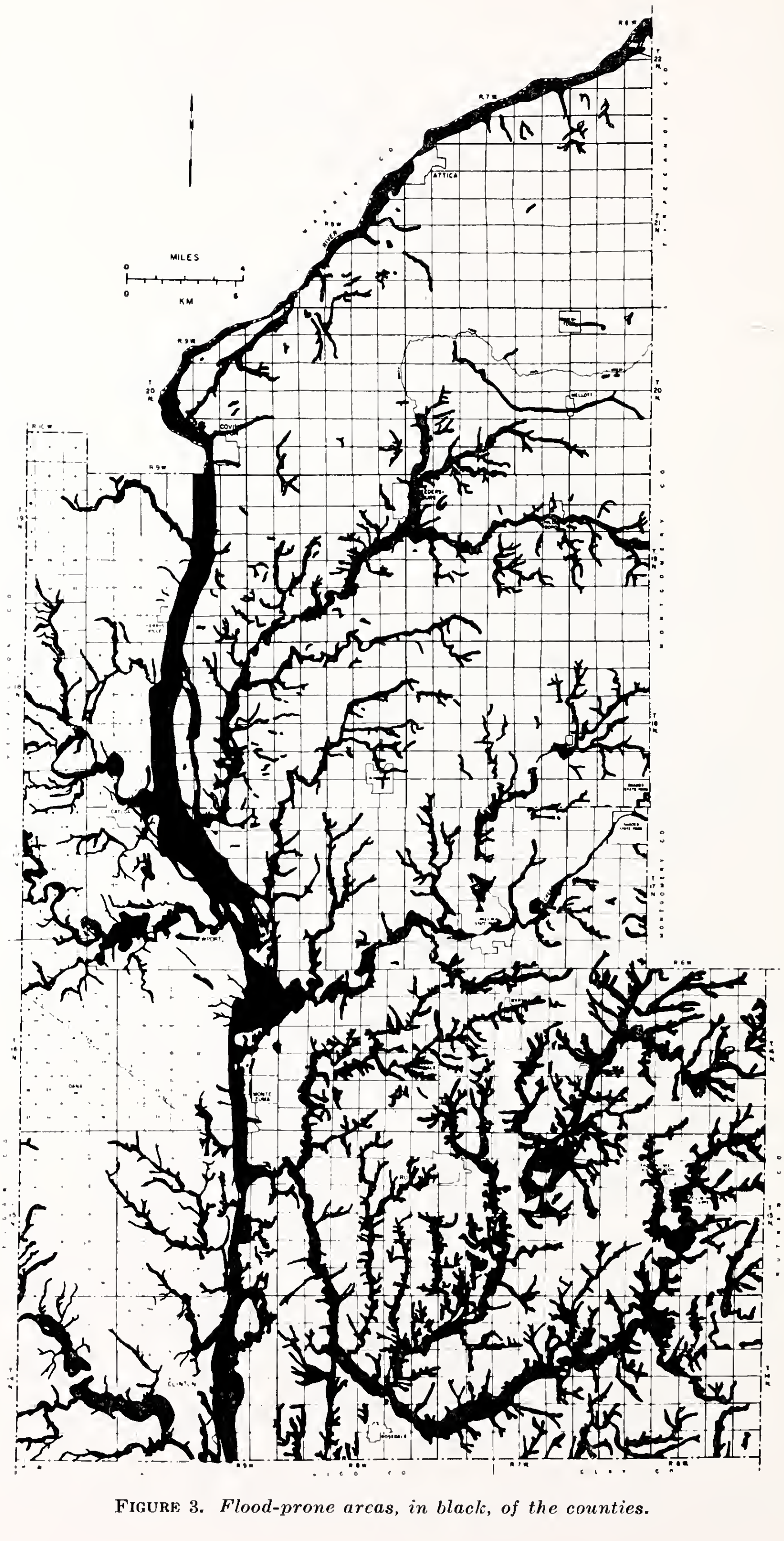

FIGURE 3. *Flood-prone areas, in black, of the counties.*

FIGURE 4. *Suitability of soils for septic tank fields. Black areas are poor and white areas are fair to good.*

teria. As a general rule septic systems should not be built on 12% or higher slopes.

A third type of land that is not recommended for subdivisions are those areas in which bedrock is very close to the surface. Construction costs are high where bedrock knobs must be leveled. Also, the problem of aquifer contamination is greatly increased when septic systems are close to porous bedrock. Underground utilities are difficult to place in some areas without blasting trenches. Soil types which develop over shallow bedrock should be avoided.

These soil types which have fair to good drainage characteristics are:

> Alford, Ayrshire, Birkbeck, Camden, Carrington, Celina, Chelsea $<12\%$ slopes, Cincinnati, Crane, Crosby, Dana, Elston, Fincastle, Fox $<12\%$ slopes, Iva, Ockley $<12\%$ slopes, Parke $<12\%$ slopes, Parr, Princeton $<12\%$ slopes, Raub, Reesville, Rush, Russell $<12\%$ slopes, Sidell, Sleeth, Sunbury, Tippecanoe, Toronto, Warsaw, Wea, Whitaker, Wingate, and Xenia.

The soils with poor drainage are:

> Bonpas, Brookston, Clyde, Conover, Delmar, Helt, Linwood, Ragsdale, Romney, Washtenaw, Westland, and Whitson. Soils with steep slopes are: Chelsea $>12\%$ slopes, Fox $>12\%$ slopes, Hennepin, Hickory, Negley, Ockley $>12\%$ slopes, Parke $>12\%$ slopes, Princeton $>12\%$ slopes, Rodman and Russell $>12\%$ slopes. Soils that develop over shallow bedrock are: High Gap, Lordstown, Muskingum, and Shadeland.

Figure 5 shows the thickness of glacial drift in the area. Generally the thickness of unconsolidated material is sufficient in most areas so that shallow bedrock will not be a problem for most construction projects. Shallow bedrock is usually found along the cliffs of some rivers. Such places are not good building sites for the most part due to the steepness of the slopes.

Figure 6 is a map of potential sanitary landfill sites. There are a number of potential sites in the area. Sanitary landfills must be located in soils that have high clay content. The low permiability of such soils retards the movement of leachates from the buried trash. The best sites have fifty feet of clay measured from the surface. Acceptable sites have thirty feet of clay measured from the surface.

These are only suggested sites. A detailed drilling program under the supervision of a person familiar with the State Board of Health Regulations governing sanitary landfills would be needed to evaluate a specific site.

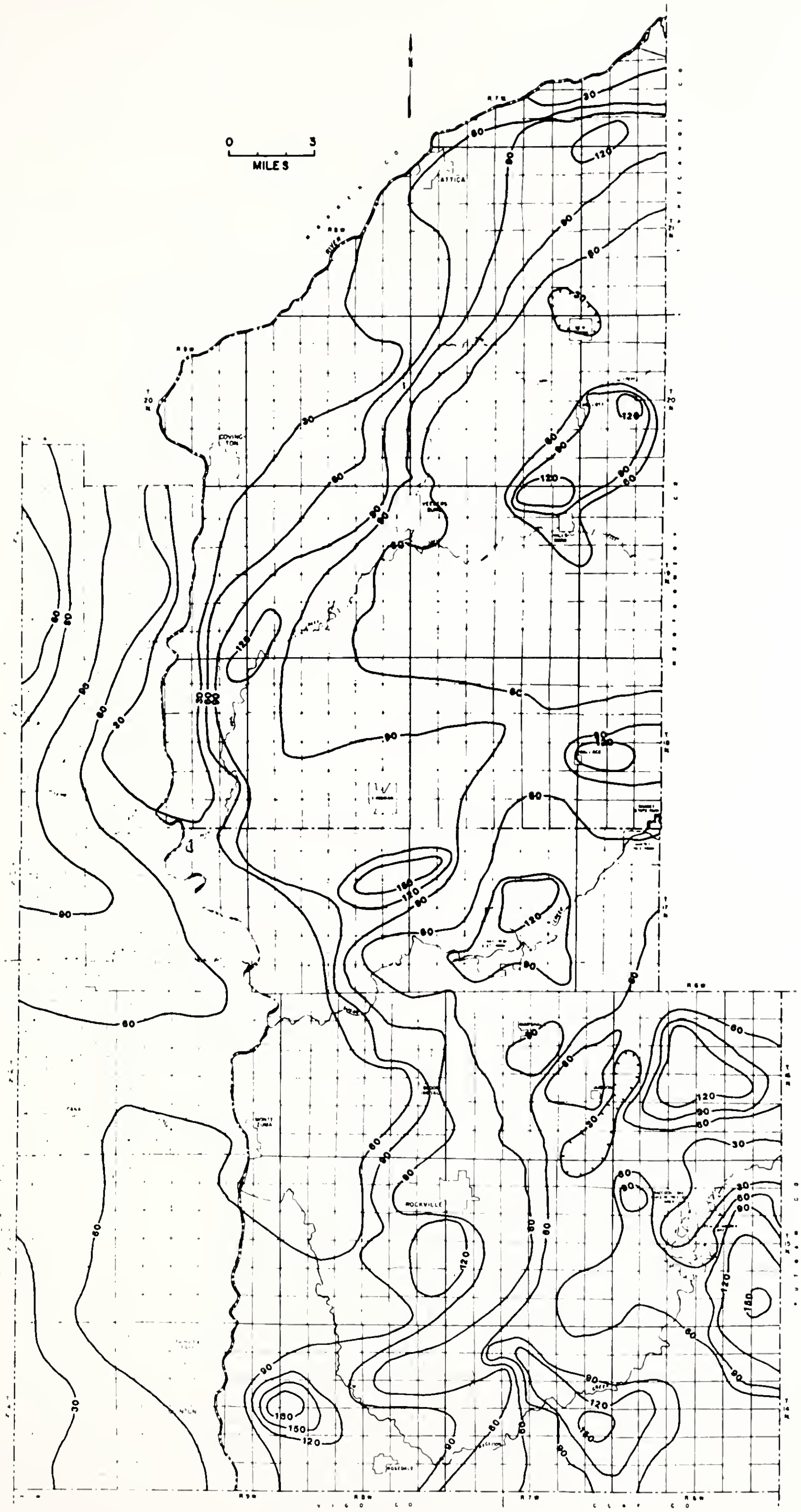

FIGURE 5. *Thickness, in feet, of glacial drift.*

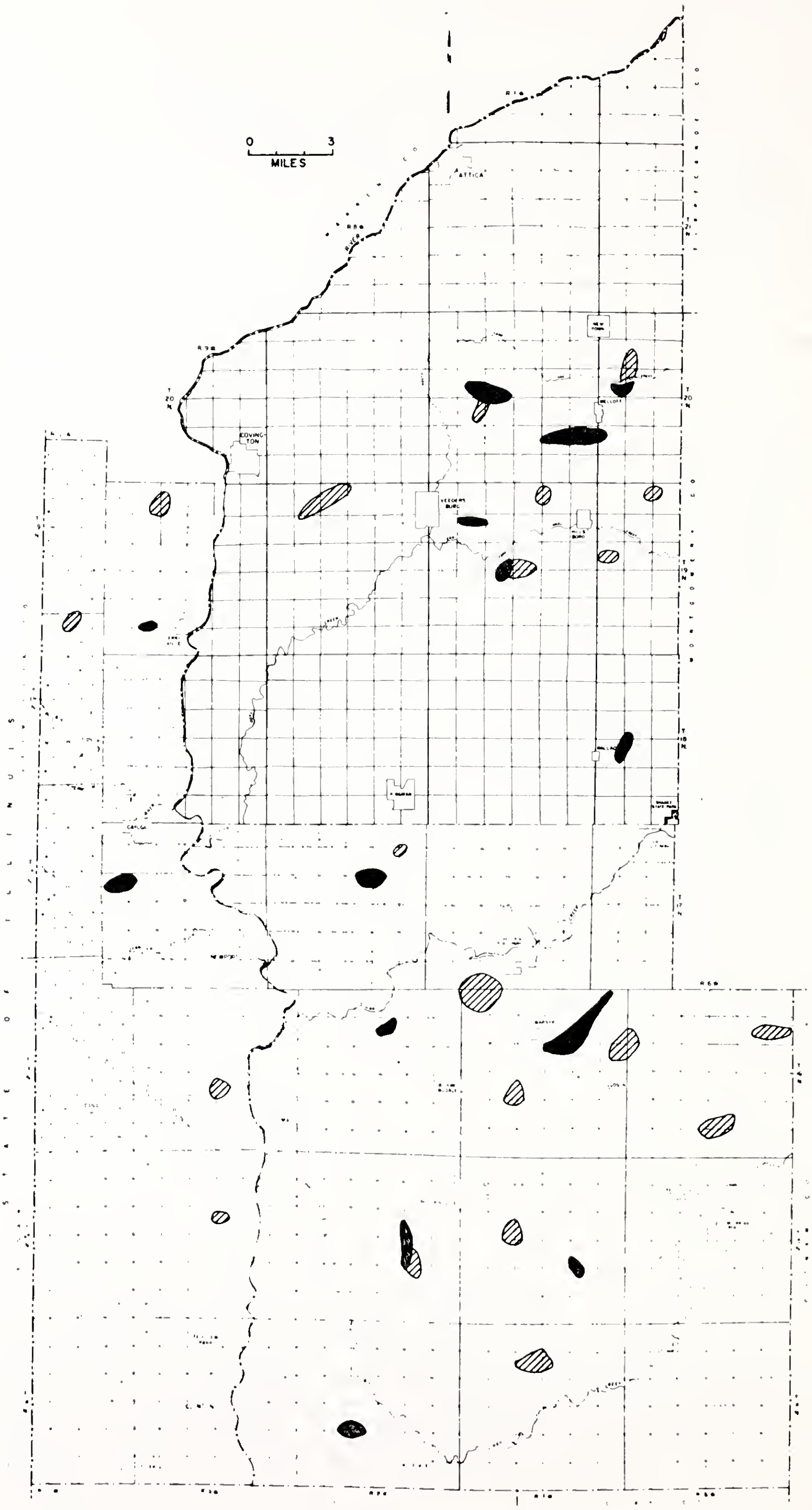

FIGURE 6. *Potential sanitary landfill sites. Black areas have 50 feet of clay and striped areas have 30 feet of clay.*

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