CHAPTER OUTLINE

I. Chapter Focus

II. Findings

A. Geology

B. Aquifers

C. Topography

D. Soils

III. Goals and Objectives

IV. Implementation Statement

I. CHAPTER FOCUS

The area's geological conditions are important to planning efforts because geology and soil characteristics affect the feasibility and construction costs of everything that is built on or under the ground. Geological conditions also influence development's impact on natural systems such as drainage, groundwater resources and soils.

Most of the region's identifiable surface features were created during the last ice age, when the advance and retreat of glaciers modified the previous landforms to produce the landforms we see today. Erosion and other geological processes continue, but they occur on such a long time scale that it is difficult to detect their effects even over the course of a lifetime. The changes produced by man, on the other hand, have occurred quickly.

Native Americans probably had a relatively minor impact on the geology, soils, and ecology of the St. Charles area. Their crops were limited to small areas, and locations sometimes shifted from year to year. The impact of the early European settlers, however, was more significant. They drained wetlands, tilled the prairie, cut wooded areas for building materials and fuel, quarried limestone for building, and generated wastes from both human and industrial sources. As the population grew and human activity increased, the impact of human settlement also increased.

Many of today's environmental problems result either from past ignorance of the impact of man's actions or insufficient attention to the importance of natural systems. This Chapter presents information about the geological and soil conditions in the St. Charles region. An understanding of this information will enable the community to build and maintain a harmony between development and nature.

II. FINDINGS

A. Geology

The geology of Kane County has three major components: Glacial "drift" or loose material deposited by the glaciers in the Cenozoic era, sedimentary bedrock deposited in the Paleozoic period, and crystalline basement rock formed in the Precambrian period. The oldest geological formations are found deep underground and the most recent near the surface, telling the story of the how St. Charles' place on the earth came to be the way it is.

The present surface geology and topography in the St. Charles area is the product of glacial action and water erosion during the Illinoian and late Wisconsonian periods. The Illinoian glaciation occurred between 245,000 and 130,000 years ago. A warmer period followed, during which soils were formed, between 130,000 to 25,000 years ago. The late Wisconsonian glaciation followed, commencing about 25,000 years ago.

The action of the glaciers was dynamic, especially along the front of the ice sheets. The glaciers advanced and retreated, and through time covered or removed earlier deposits. The material deposited by the glaciers ("glacial drift"), therefore, is not found in simple layers but is very diverse and complex, being made up of glacial till (loam and clay), outwash (sand and gravel), lacustrine deposits (silt and clay), and buried soils formed in an earlier era.

The top of the layered sedimentary bedrock can be found at depths ranging from less than one foot to nearly 350 feet below the surface, and can be up to 4,000 feet thick. The upper bedrock formations consist primarily of dolomite, limestone, and shale. Typically, the Silurian dolomites are immediately below the glacial drift and range up to 50 feet in thickness. They tend to lie near the surface in the Fox River Valley, where the glacial drift has been eroded by the river. Where the Silurian dolomites themselves have been removed by erosion, the underlying Maquoketa group is exposed. Below that are various layers of dolomite, limestone, shale, and sandstone. The top of the crystalline basement rock (granite) occurs at depths of 2,400 to 3,550 feet below mean sea level. Because of its depth, this formation is of limited interest in municipal planning. Figure 5-1 shows the typical layering (stratigraphy) of the rocks underlying Kane County.

FIGURE 5-1
STRATIGRAPHY OF ROCKS UNDERLYING KANE COUNTY

ERA	SYSTEM	Group/Formation, Description, and Thickness in Feet	AQUI-GROUP
Cenozoic	Quaternary	glacial drift and other surface materials: silt and loess peat and muck sand and gravel diamicton (clay, silt, sand, gravel, and boulders) (0-350 ft.)	Prairie
	Silurian	Joliet-Kankakee: dolomite (0-50 ft.)	Upper Bedrock
		Elwood: dolomite (0-30 ft.)	
		Wilhelmi: dolomite (0-20 ft.)	
	Ordovician	Maquoketa: shale, argillaceous dolomite and limestone (0-210 ft.)	
		Galena: dolomite, some limestone, (155-185 ft.)	
		Platteville: dolomite, some limestone (140-150 ft.)	
		Ancell; Glenwood St. Peter: sandstone (60-520 ft.)	
		Prairie du Chien: dolomite, sandstone (0-400 ft.)	
	Cambrian	Eminence: dolomite (20-150 ft.)	
		Potosi: dolomite, trace sand (90-225 ft.)	
		Franconia: sandstone, green & red shale (75-150 ft.)	
		Ironton-Galesville: sandstone (155-220 ft.)	
		Eau Claire: sandstone, siltstone, shale, & dolomite (350-450 ft.)	Basal Bedrock
		Mt. Simon: sandstone (1400-2600 ft.)	
Precambrian		granite (13,000 ft. +)	crystalline

B. Aquifers

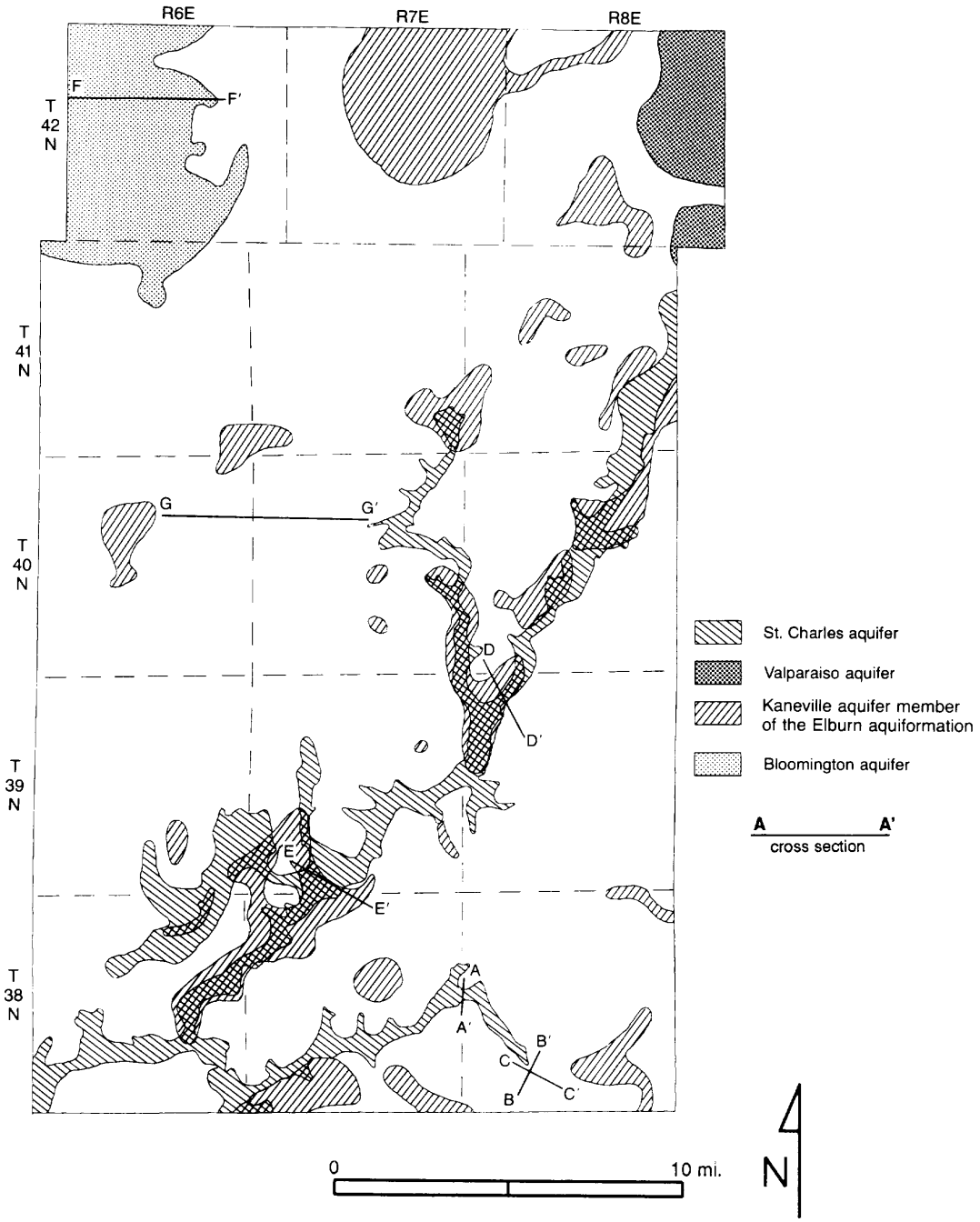
Aquifers are essentially layers of water-bearing rock. They are just one of many components of the area's geology, but have a profound effect on the development of the region. St. Charles has several types of aquifers, the most significant of which are highly variable in their distribution and character.

The shallowest aquifers, and the most highly variable, are found in the glacial drift. These consist of sand and gravel deposits of various thicknesses, shapes and sizes. The uppermost drift aquifers are noncontinuous deposits, located either at the surface or interbedded with other materials. Below these aquifers is the most significant shallow aquifer for St. Charles, known as the St. Charles Aquifer. It lies within a buried bedrock valley that extends across four-fifths of the County, but in a fairly narrow band which crosses under the Fox River in St. Charles, as shown in Map 5. This bedrock valley is filled with glacial drift made up of both pervious and impervious layers. The St. Charles aquifer is formed by the pervious layers, including sand and gravel deposits up to 120 feet thick, and is continuous within the buried valley.

The other type of shallow aquifer is the upper bedrock or shallow dolomite aquifer. These consist of dolomite, whose capacity to yield water depends on the occurrence of cracks and crevices. Sometimes, the cracks and crevices coincide with a glacial drift aquifer above, such as the St. Charles aquifer. This type of condition yields the greatest potential for water production.

Below the formations which carry the shallow aquifers lies the relatively impermeable Maquoketa formation. Below that is the Cambrian-Ordovician aquifer system, also known as the Midwest Bedrock aquifer. This system of interconnected aquifers consists of the Galena and Platteville dolomite groups, the Glenwood-St. Peter sandstone, Eminence-Potosi Dolomite, Franconia Formation, and Ironton-Galesville sandstone. Non-porous Eau-Claire formation shales and dolomites separate these rocks from even deeper porous sandstones of the Mt. Simon group. In general, these sandstone aquifers are slow to recharge and have been overused in the past. Therefore, the potential for additional water production from them is low.

MAP 5
MAJOR AQUIFERS OF PRAIRIE AQUIGROUP
KANE COUNTY



C. Topography

The most notable topographic feature, and the one which gives St. Charles its identity, is the valley of the Fox River. From a topographic point of view, without it St. Charles would be just another flat place on the map of the midwest. The Fox River Valley was primarily formed by the flow of melt water from the receding glaciers, and secondarily by the Fox River. That is why the valley is so much wider than the river.

The irregular topography of the region is evident on the map indicating steepness of slopes. (See Map 4). The advance and retreat of the glaciers produced irregular ridges and hills on both sides of the Fox River. One major feature is a terminal moraine just east of St. Charles known as the Valparaiso Moraine, which marks the edge of the Lake Woodfordian stage of Wisconsonian glaciation.

D. Soils

A study of soils in an area provides much useful information for planning: drainage, probability of erosion, depth to water table, and suitability for various land uses and septic systems.

The Soil Conservation Service has identified the following general soil associations within the Planning Area.

Bowes-Dresden-Fox Moderately deep and deep to sand and gravel, nearly level to strongly sloping, well drained and moderately well drained soils. This soil series, formed in sandy outwash material, occupies glacial outwash plains and terraces. Gravel excavations are common in areas where this soil association occurs. This association occurs in the northwesterly part of the planning area, from Five Islands north and east toward South Elgin, generally north of Brewster Creek.

Miami-Octagon Deep, gently sloping to moderately steep, well drained soils. These soils formed in a thin loess mantle and the underlying loamy till. This association is found in the southerly part of the planning area, west of Peck Road, extending to Wasco.

Octagon-Saybrook-Drummer Deep, nearly level to strongly sloping, well drained, moderately well drained, and poorly drained soils that formed in loess and the underlying loamy till. This association is found generally west of Crane Road and Ferson Creek, in the northwesterly part of the planning area.

Miami-Dodge Deep, gently sloping to strongly sloping, well drained soils that formed in loess and the underlying loamy till. These soils occupy the steeper well drained areas west of Burr Road and north of Illinois Route 64.

Drummer-Harvard. Deep, nearly level to moderately sloping, poorly drained, well drained and moderately well drained soils. This soil association is found along the easterly edge of the planning area, south of Route 64, extending into DuPage County.

Dresden-Millington Moderately deep to sand and gravel and deep, nearly level to moderately sloping, well drained and poorly drained soils that formed in loamy alluvium or outwash material and have a loamy subsoil. This soil association encompasses the valley of the Fox River from just west of Route 31 to Route 25 (north of Main Street), and from about Fifth Street to Fifth Avenue (south of Main Street).

Morely-Beecher Deep, nearly level to moderately steep. These soils were formed in loess covered glacial deposits. The soils in this association are poorly drained to well drained, depending on the slopes. The northwesterly part of Fox Chase, as well as most of Wayne and Valley View, are in this soil association.

Milford-Varna-Markham Deep, moderately level to sloping. This soil association encompasses most of the developed area of the City, except for the Fox river valley area included within the Dresden-Millington soil association.

Complete information on individual soils is available in the Soil Survey of Kane County, Illinois, published in 1979, and the Soil Survey of DuPage and Part of Cook Counties, Illinois, published in 1979. A complete soil survey should be conducted and its results considered when reviewing proposed development Although the Soil Conservation District reports provide general information, a specific site investigation is required to determine the exact nature and extent of the different soil types on the site.

Soil characteristics of particular importance are wetness, slope, and permeability. Shallow bedrock, which is common along the Fox River, is also important because it increases construction cost and can impact the feasibility of building and utility construction.

Wetness is the primary characteristic of the hydric soils. A hydric soil is one that is saturated, flooded, or ponded long enough during the growing season to develop anaerobic conditions in the upper part. Hydric soils generally have severe limitations for building site development, including dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping. The water

table tends to be high and drainage poor. Areas intended for urban use must be artificially drained; basement sump pumps are the most common method of accommodating building construction. Areas intended for rural development may be faced with unacceptable conditions for septic systems, as well as roads and buildings. In some cases, the problems associated with hydric soils may be severe enough so as to prevent or severely limit development. The following lists the hydric soils found in the St. Charles area:

Canisteo loam
Drummer silty clay loam
Faxon-Ripon complex
Harpster silty clay loam
Houghton muck
Houghton muck, wet
Lena muck
Milford silty clay loam
Millington loam
Otter silt loam
Peotone silty clay loam
Selma loam
Thorp silt loam
Will silty clay loam

Slopes of 12 percent or greater, as identified on Map 4, are generally unstable and highly sensitive to changes in surface vegetation. Serious erosion and sedimentation problems may occur if these areas are disturbed. Steeper slopes occur in the Rodman, Morley, Casco and Miami soils. Where their slope exceeds 10 to 15 percent, these soils have severe limitations for all types of building and site development. A complete soil survey should be conducted to identify areas where these limitations will restrict development.

Soil permeability affects both surface runoff and groundwater recharge. Permeable soils can provide a path for migration of soil contaminants, so land uses where spills or leaks could occur should not be located in areas with permeable soils.

Where soils are rated as having severe limitations, alternative sites for urban use should be selected whenever possible. If an alternative site is not feasible, then in some cases measures may be taken to deal with the soil's limitations. In other cases, development will need to be configured so that it is located on that part of the site with more suitable soils. The maps in the 1979 Soil Survey are general indications of the soils present in a given area. In making decisions regarding development feasibility and design, more specific on-site investigations should always be conducted.

III. GOALS AND OBJECTIVES

A. Preserve the natural setting and environmental balance of the St. Charles region.

1. Enact a grading and fill permit system and other related regulations to minimize the impact of geological modifications.

2. Encourage site development to respect existing site topography.

B. Insure that development designs and land uses are appropriate for the given soil characteristics.

1. Enact regulatory controls over construction to limit the mixing of natural soil layers, wind and water erosion, and compaction to the minimum necessary for development.

2. Carefully review development proposed in areas with hydric soils and soils having severe limitations due to slopes in excess of 10 to 15 percent, and locate development so as to avoid construction in these areas wherever possible.

3. Consider the findings of the Kane-DuPage Soil and Water Conservation District when evaluating development proposals.

4. Enact regulatory controls to require a soil survey with the preliminary plan submittal, for any site in excess of one acre.

IV. IMPLEMENTATION STATEMENT

This Chapter provides a foundation for understanding the geology and surface materials of the St. Charles area. This information should be used to develop plans and regulations designed to minimize the adverse impact of development on the environment, and to maximize the safety and long-term viability of development.

Regulations that should be considered include an erosion control ordinance, and grading and clearing controls. Development review should consider the location of areas to be disturbed, and should guide construction away from sensitive areas.