

DeKalb County
Water Resources Management Plan

Scope of Work Development

DeKalb County Regional Planning
Commission Workshop

January 24, 2008

A meeting of the DeKalb County Regional Planning Commission was held at 7:00 pm on January 24, 2008 at the DeKalb County Administration Building. All commission members but one were in attendance, along with several county officials and several additional residents of DeKalb County.

The following members of the project team were in attendance to give a presentation on scope development for the countywide groundwater resources management plan:

- Larry Thomas, Baxter & Woodman Inc.;
- Jack Wittman, Wittman Hydro Planning;
- Chris Greer, NIU; and
- Kristin Rehg, Baxter & Woodman Inc.

Purpose of Project

- Maintain adequate water supplies throughout DeKalb County as development occurs.
- Develop a plan that anticipates and prevents water supply problems.
- Focus on water quantity issues at this time.

Fundamental Questions

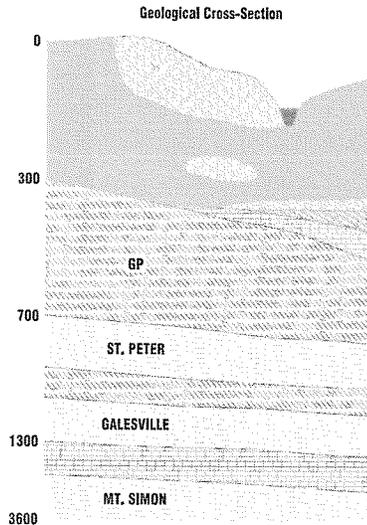
1. What are the current and future water demands?
2. How much water is available and how much can we safely use?
3. How can we extend water supplies as growth occurs?
4. What is the appropriate time frame and level of accuracy for answering these questions?

General Outline of Presentation

- Brief intro to geology and hydrology
- Discussion of water laws
- Regional context
- Scope of work development for water resources study – answers to fundamental questions
- Discussion of scope options.

•The first three items – geology, water law, and regional context – set up the background for discussion of work scope items for a water resources management plan.

Geology & Hydrogeology



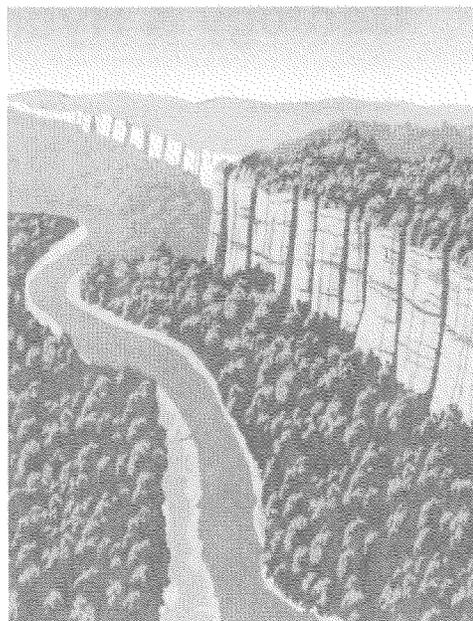
- Surface deposits laid down by glaciers, flowing water, and wind: sand, gravel, clay, silt
- Galena-Platteville: dolomite deposits
- St. Peter and Galesville: sandstones
- Mt. Simon: sandstone

•Underlying the ground surface is a thick layer (several hundred feet) of unconsolidated materials such as sand, gravel, clay, and silt. This material was put down tens of thousands of years ago when glaciers covered this part of the country.

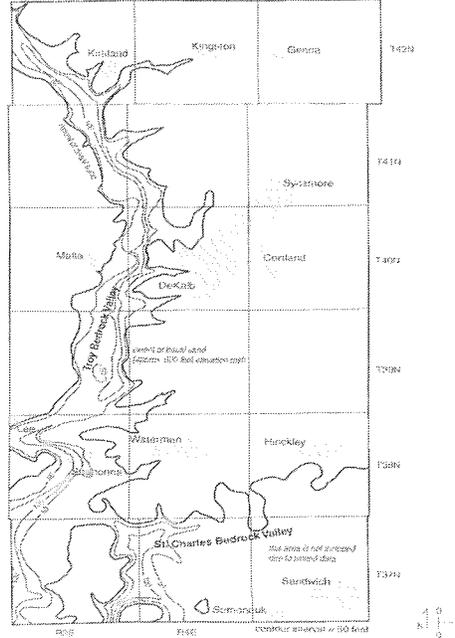
•Underneath the unconsolidated surface deposits is several thousand feet of sedimentary rocks.

- Mostly alternating dolomite, sandstone, and shale formations
- Deposited in shallow seas and near coastlines during the Cambrian through Tertiary Periods (543-290 million years ago)
- Between 290 million years ago and present, the exposed bedrock surface was eroded by rivers and streams into a complex valley system – one of these is the Troy bedrock valley in western DeKalb County.
- The advancing and retreating glaciers of the last ice age deposited sand, gravel, silt, and clay that eventually filled the Troy Valley and created the surface features present today.

**DeKalb's
Troy Valley
Before the
Glaciers**

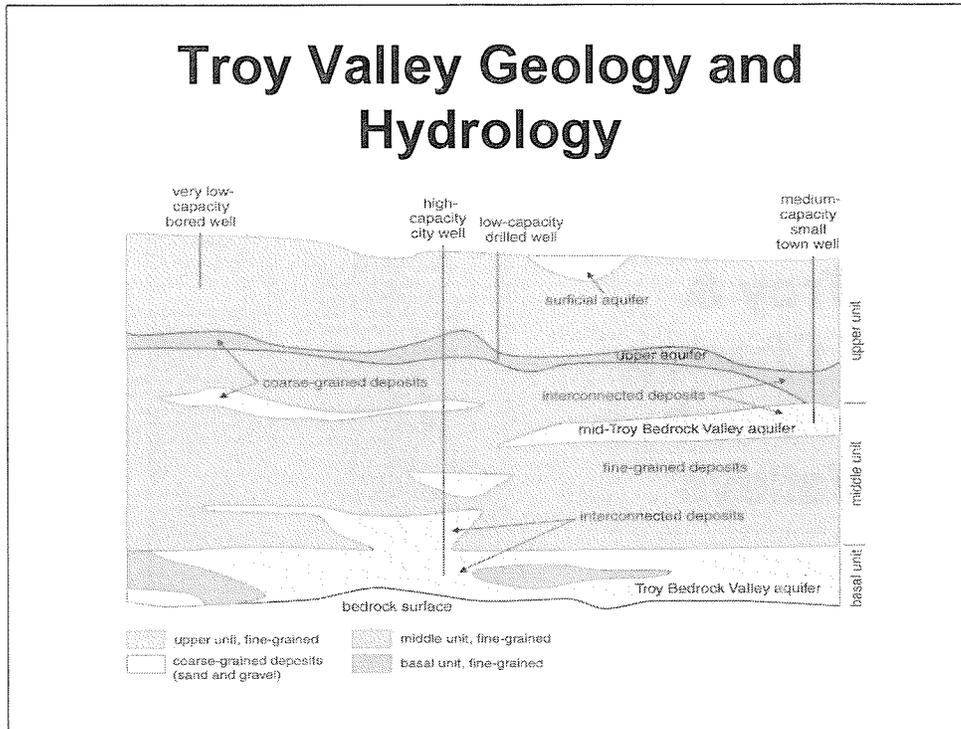


Current Day Troy & St. Charles Bedrock Valleys



- The Troy Valley is one of the most productive aquifer systems in DeKalb County. The St. Charles Valley, which runs along the southern end of the county, is largely unexplored, but could be another good source of drinking water.
- An aquifer is an underground layer of material that can transmit enough water through it to supply a well (such as sand, gravel and bedrock).
- Besides the sand and gravel that fills the Troy Valley, deep layers of sandstone (over 1,000 feet below the ground surface) also serve as major aquifers in DeKalb County.

Troy Valley Geology and Hydrology

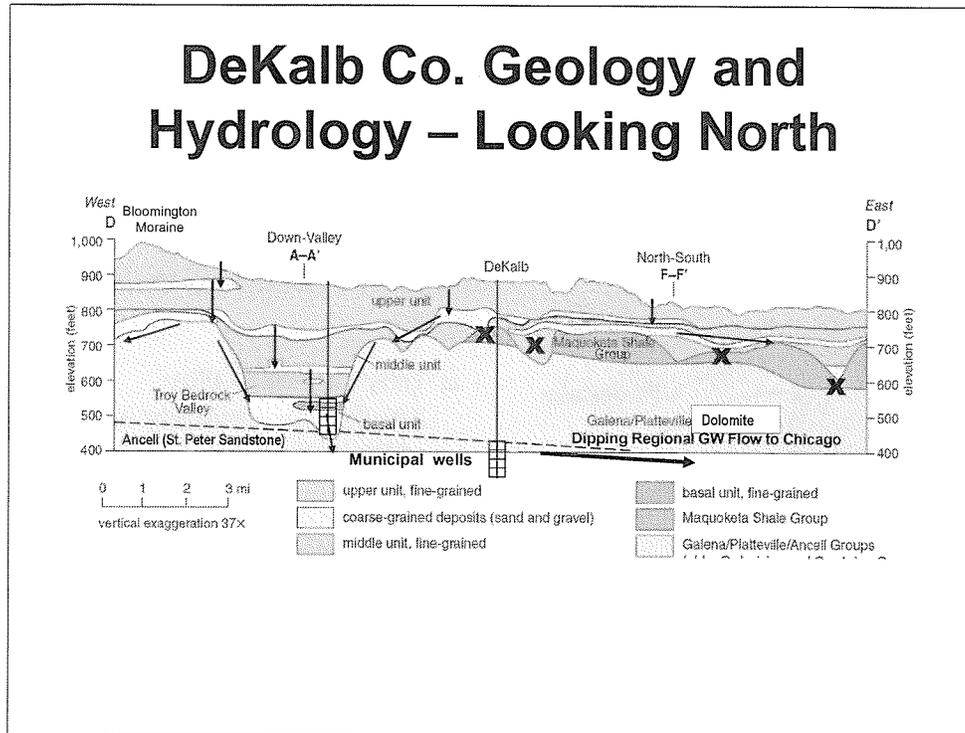


- This graph shows the distribution of glacial materials and which ones serve as aquifers in DeKalb County.

- The top layer represents clays and silts, which do not transmit water very well and therefore are not productive sources of water for anything larger than a small domestic well.

- The layers labeled “upper aquifer” and “Troy Bedrock Valley aquifer” represent sands and gravels, which transmit water much better than clays and silts because they are not as fine grained. These sand and gravel aquifers are the primary sources of water for communities near the Troy Valley (western part of DeKalb County).

DeKalb Co. Geology and Hydrology – Looking North



- This slide shows aquifer conditions and recharge/interaction pathways. The downward arrows show how water moves through the underground deposits. The X's indicate areas that would not be conducive to a high capacity municipal well.

- Relatively fast recharge into glacial aquifers closer to the surface. These near-surface aquifers are composed of sand and gravel.

- The glacial aquifers in the Troy Valley recharge the bedrock aquifers where the Troy Valley aquifers are in direct contact with the bedrock surface. The bottom layer in the above figure represents the shallowest bedrock aquifer in this area, the Galena/Platteville Dolomite. Note how the bottom aquifer unit of the Troy Valley (on the left side of the figure) lies directly above the bedrock surface.

- This means that the Troy Valley is one of the primary sources for recharging the deep sandstone aquifers on which much of DeKalb County and the Chicagoland area in general depends.

Regional Sandstone Geology and Hydrology

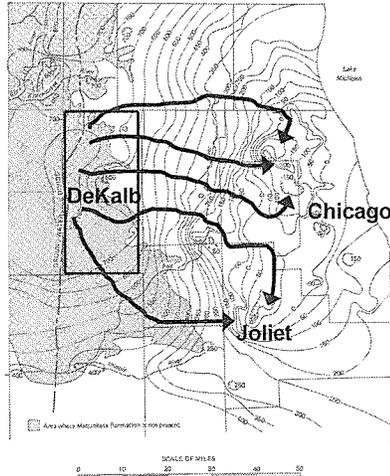


Figure 11. Elevation (in feet msl) of the potentiometric surface of the Cambrian and Ordovician aquifers, October 1983

- Primary recharge areas for bedrock groundwater supply in Greater Chicago area:
 - Troy Buried Valley Aquifer immediately west of DeKalb
 - Where the Maquoketa Shale is absent (western DeKalb and Boone Counties)

•The deep sandstone aquifers are utilized as sources of drinking water for many communities in DeKalb, Kane, Boone, McHenry, and Will Counties.

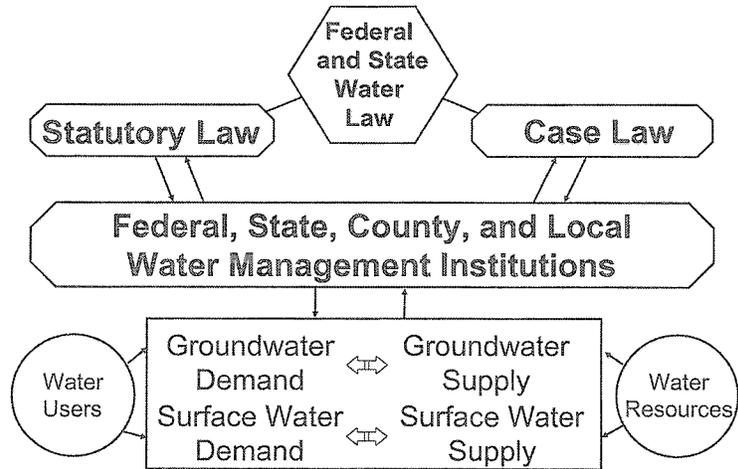
•In much of the Chicagoland area (areas in white on the above figure) there is a layer of shale overlying the deep sandstone aquifers. Shale does not transmit water, which means that the deep aquifer cannot be recharged in the areas shown in white above.

•The areas shown in gray above are where the shale layer is mostly absent, which means that water can seep down from the surface directly into the deep sandstone layers which serve as aquifers.

•This all means that DeKalb County (and the Troy Valley in particular) is one of the critical recharge areas for the deep sandstone aquifers that so many communities in this area rely on.

•DeKalb County is in a favorable position from a water supply perspective, being on the “upstream” or “uphill” end of the deep sandstone aquifer.

Legal Framework



Laws Impacting Groundwater Quantity

- **Federal**

- There is no federal law that regulates water supply – managing water supplies is left up to the states.

Laws Impacting Groundwater Quantity

- State
 - Case Law, 1899, 1959, & 1981
 - Established Absolute Ownership Doctrine
 - Water Use Act of 1983
 - Revised law to Reasonable Use Doctrine
 - Notification Requirements
 - Water Authorities Act

•Illinois' water supply laws have evolved over the last 100 years.

•Before statutory law on this topic existed, the requirements were set through case law. These cases primarily involved plaintiffs whose water supplies were impacted when a new water supply well was drilled on a neighboring piece of land. In all these cases, the courts ruled that an owner of a well could pump as much water as they wanted from that well even if it dewatered their neighbor's well.

•The Water Use Act revised the case law by implementing the Reasonable Use Doctrine. This still allows a well owner to dewater a neighboring well, but it does prohibit wasteful or malicious uses of water, which the earlier case law did not do. This act also differentiates between natural uses for water, which include domestic use and watering livestock, and artificial uses including lawn watering and irrigating crops. The act places a higher priority on natural uses and indicates that these uses must be satisfied first in the case of a water shortage.

•The Water Authorities allows the creation of water authorities in contiguous geographical areas, which have the power to tax and to impose restrictions on water production.

Laws Impacting Groundwater Quantity

- State (continued)
 - Conservation District Act
 - Wastewater Land Treatment Site Regulation Act
 - Northeastern Illinois Planning Act
 - Water Commission Act
 - Sanitary District Act of 1936
 - Public Water Supply Regulation Act
 - Public Water Supply Operations Act
 - Illinois Water Well Construction Code
 - Illinois Water Well Pump Installation code
 - Township Code
 - Counties code
 - Municipal Wastewater Disposal Zones Act
 - Illinois Municipal Code

•These acts all pertain to water supply in some way, but the last slide describes the two main regulations in this area.

Basics of State Groundwater Quantity Law

- Water quantity is a state, not federal, issue.
- Groundwater quantity law in Illinois:
 - Water rights go to the overlying land
 - Reasonable Use standard:
 - Use of water to meet natural wants and a fair share of artificial wants
 - Wasteful or malicious use not allowed

•Jack is working with a group that is studying the direction that water law has and will take in Illinois. However, this evaluation is in a very preliminary stage, and there is no strong indication yet of a major shift in Illinois water law.

Prominent State Laws

Water Use Act of 1983

- Rule of “reasonable use” for groundwater withdrawals
- Means for reviewing potential groundwater conflicts
- Withdrawals >100,000 gallons/day required to notify local Soil and Water Conservation District (SWCD)
- SWCD notifies other users and local authorities regarding impacts
- Does not require registration of water withdrawals, but local water authorities can be set up to do this
- Method of regulating groundwater withdrawals during emergencies

Prominent State Laws

- **Water Authorities Act (70 ILCS 3715)**
 - Creation of a water authority:
 - 500+ voters petition circuit court
 - Court holds public hearings to set the authority boundary
 - Requires majority vote in general election to pass
 - Area must be contiguous, can cross political boundaries

Prominent State Law

- **Water Authorities Act (continued)**
 - Water authorities can:
 - require information on supply, withdrawal, and use of the water
 - require registration of existing wells and permits for new or modified wells
 - regulate water use during shortages and establish limits/priorities for water use
 - supplement existing water supply via property acquisition, constructing new facilities, and selling water
 - levy and collect taxes and establish penalties

Prominent State Law

□ Water Authorities Act (continued)

□ Some exemptions:

- "... any person, firm, corporation, or agency of the public diverting or obtaining water at the time of the establishment of a Water Authority...shall have the right of continuing to take from the same source, the quantity of water which is the rated capacity of the equipment used to divert or obtain water..."
- "... this act shall not apply to water used for agricultural purposes, farm irrigation, or water used for domestic purposes where not to exceed 4 families are supplied from the same well or other immediate source."

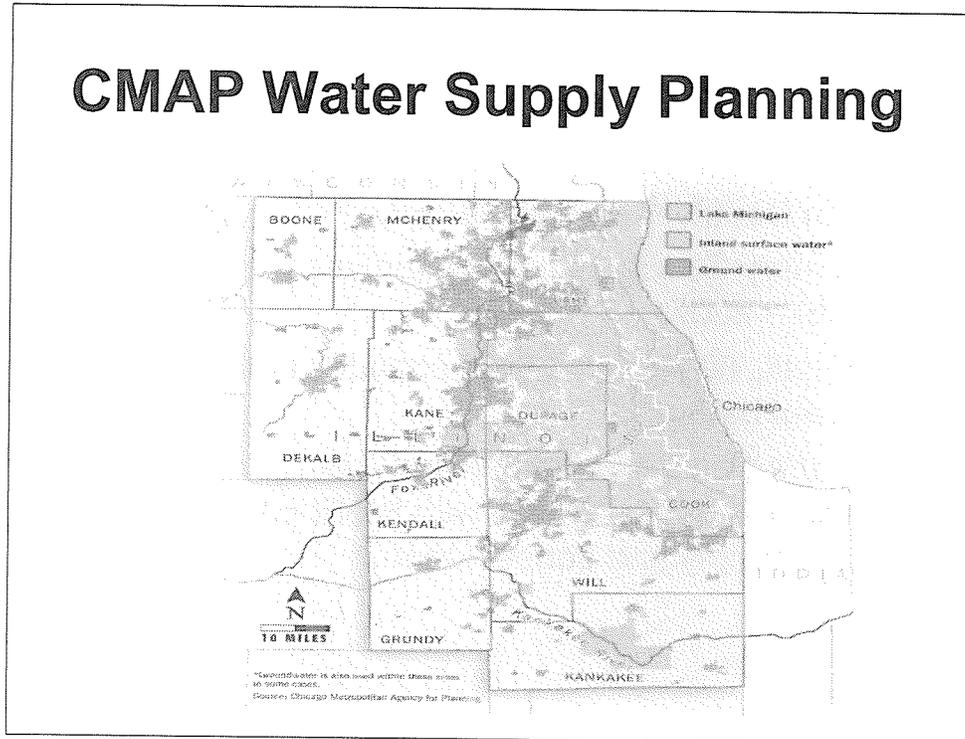
•Existing wells are exempted from the Water Authorities Act until such time as they are expanded or deepened.

•Agricultural uses and private domestic wells are not regulated by Water Authorities, meaning that they primarily regulate high capacity municipal wells.

Regional Context

- 2003 ISWS use-to-yield study showed potential for groundwater supply problems in NE Illinois
- In response, CMAP is now preparing a water supply plan for all of Northeastern Illinois
 - Involvement from government, business, water/wastewater, environmental advocacy, agriculture, academia, and public interest sectors
 - Plan is to identify general areas of concern and implement initiatives to encourage responsible growth

CMAP Water Supply Planning



- CMAP is studying water supply in an 11-county area, which includes DeKalb County. This group appears to be developing solutions in the area of water conservation, rather than trying to create agencies to regulate water supply.
- The dark blue areas indicate communities where groundwater is the primary source of drinking water.
- The light blue areas indicate communities where Lake Michigan water is the primary source of drinking water.
- The green areas indicate communities where rivers (Fox and Kankakee) are the primary source of drinking water.

Regional Context

- Kane County Groundwater Study (2002-present)
- McHenry County Groundwater Resources Study (2000 – 2007)
- Kendall, Will Counties are conducting limited studies currently.
- Other areas closer to Chicago use Lake Michigan water and deal primarily with IDNR concerning water supply and conservation.

•The Kane County groundwater study cost about \$3,000,000 because Kane County collected extensive original data (soil borings, test wells, data analysis at existing wells). This study focused primarily on water quantity.

•The McHenry County groundwater study cost about \$300,000 because McHenry County relied on existing data (studies and maps done by the Illinois State Water Survey and Illinois State Geological Survey). This study focused on both water quantity and water quality. It included a study of the impact of road salt on groundwater quality (chlorides) and recommendations for managing septic tanks so as to protect water quality.

•Relying on existing data means making more assumptions, although too much data collection can lead to overly complicated analyses that are difficult to complete. DeKalb County should be looking for a middle ground in this area.

Work Scope Development

- **Question 1: What are the current and future water demands in DeKalb County?**
 - Compile municipal well logs & use records to estimate current usage by public water supplies.
 - Compile private well records from ISWS to estimate current usage in unincorporated areas.
 - To the extent possible, estimate water usage by sector – residential, commercial, industrial, agricultural, etc.

•This is the critical first step in developing a plan to manage water quantity in DeKalb County.

•Estimate current water demands involves extensive data collection/analysis and cooperation from the municipalities to obtain the necessary information on municipal water production and consumption. It also involves making some assumptions to estimate pumpage from private wells, based on the number and size of private wells throughout the County.

Work Scope Development

- **Question 1: What are the current and future water demands in DeKalb County? (cont.)**
 - Use current population estimates from county and local governments to determine per capita water usage.
 - Use county and municipal comprehensive plans to project future growth.
 - Use growth projections and per capita water usage estimates to estimate future water demands throughout the county.

•Estimating current population may also require extensive data collection and participation from the municipalities. By comparing the current population to the current water demand, we can estimate the average per capita (or per person) water demand in the county.

•We would request copies of pertinent sections of municipal and county comprehensive plans, and overlay them on a map to get an idea of what future land use will be throughout the county. Land use projections will be used to estimate future populations and growth in non-residential sectors such as commercial and industrial.

•The estimated per capita water demand will be used along with population estimates to project water demands in the future. The water demands will be broken out by township to show the distribution of water needs throughout the county.

Work Scope Development

- **Question 1: What are the current and future water demands in DeKalb County? (cont.)**
 - Create three water demand scenarios:
 - Current per capita water usage
 - Per capita water usage decreased by passive conservation
 - Per capita water usage decreased by active conservation

•Passive conservation: Water saving fixtures are required only in new construction and during major remodeling projects.

•Active conservation: Water saving fixtures are required in new construction and during remodeling. Voluntary replacement of fixtures on an ongoing basis (rather than just during remodeling) is also promoted by offering rebates, as well as conducting free water use audits for residents.

Work Scope Development

- **Question 2: How much water is available and how much can we safely use?**
 - Identify major aquifer systems in DeKalb County and estimate the extent and sustainable yield of each aquifer.
 - Track the geologic formations used by municipal and private wells, and production capabilities.

•Existing data compiled by the Illinois State Water Survey and Illinois State Geological Survey can be used to make a rough estimate of the sustainable yield of each of the major aquifer systems in the county. Sustainable yield is defined as the maximum amount of water that can be pumped from an aquifer without drawing down the water level in the aquifer and eventually depleting it.

•Tracking the geological formations used by water supply wells (e.g. shallow sand and gravel aquifers, deep sandstone aquifers, etc.) will help to better understand the demands placed on each aquifer in DeKalb County. This enables a comparison of the sustainable yield of each aquifer to the demands currently being placed on it.

Work Scope Development

- **Question 2: How much water is available and how much can we safely use? (cont.)**
 - Computer-based groundwater flow modeling
 - Approximate distribution of groundwater supplies
 - Determine areas that may experience water supply issues
 - Additional data may be necessary to better define supply.
 - Test borings
 - Test pumping

•The groundwater flow model is a computerized representation of the aquifers used to supply water in DeKalb County. It can be used to better approximate the distribution of aquifers throughout the county and better understand how those aquifers are connected.

•Models are also good for evaluating “what if” scenarios. What if an ethanol plant is constructed in a certain township? What if a certain township implements active conservation measures in response to an anticipated water supply issue in the future? These are the types of questions that a model can be used to efficiently answer.

•Assumptions and data collection are needed with any model; however, the more data that is collected, the more complex the model becomes. It is probably most practical to collect a manageable set of data that will address major points of concern, and use assumptions to address the more minor issues.

•Test borings could be particularly helpful in determining the true extent of the Troy Buried Bedrock Valley and to learn more about the extent of the St. Charles Buried Bedrock Valley. However, borings only indicate where the valleys are located. Test wells would be an additional step to confirm whether water is present in these locations as well.

•There are a variety of options for test borings and test pumping, which can significantly affect the cost of the project. In order to limit costs, it would be beneficial to first determine what level of accuracy is desired, and then relate that to a specific number of test borings and wells.

Work Scope Development

□ Question 2: How much water is available and how much can we safely use? (cont.)

□ Related topics:

- Relationship between land use and groundwater quantity
- Effects of water use in adjacent counties
- Typical water quality in each aquifer and types of contamination they may be subject to
- Critical recharge areas identification.

•Two considerations for answering Question 2:

•“What about us?” How are growth and water use in DeKalb County affecting the water supplies in DeKalb County?

•“What about everyone else?” How are growth and water use in DeKalb County affecting the water supplies outside DeKalb County and vice versa?

•The deep sandstone aquifers are relatively continuous throughout all of Northeastern Illinois. DeKalb County is up-gradient of other areas in the Chicagoland region that use the deep sandstone aquifers, meaning that DeKalb County gets the first chance to extract water from these aquifers before it can move through the aquifer to reach other communities that are down-gradient (east) of DeKalb County.

•The groundwater flow model should take into account the eastward movement of water through the deep sandstone aquifers and the pumpage from these aquifers in other communities east of DeKalb County.

•It is important to identify critical aquifer recharge areas so that communities have this information at hand when making decisions on land use and zoning.

Work Scope Development

- **Question 3: How can we extend the water supplies as growth occurs?**
 - Water conservation programs (active/passive)
 - Using zoning and development ordinances to protect critical recharge areas
 - Alternative water supply development (remote well fields, surface water)
 - Countywide water authority
 - Protect water quality – keep aquifers viable

Work Scope Development

- **Question 4: What is the appropriate time frame and level of accuracy for answering these questions?**
 - Determine time frame and coordination plan needed to implement each alternative.
 - Evaluate costs and potential funding sources.
 - Refer to legal framework in consideration of each alternative.

•One commission member asked how we can accurately project growth when communities are continuously having to revise their growth projections. The answer is that, even though this water management plan would look 20 to 30 years into the future, it is not meant to be 100% accurate throughout that entire planning horizon. Growth forecasting is an ongoing process, and therefore the water management plan would have to be updated every few years as comprehensive plans are updated. The goal is to lay a solid framework for growth, water demand, and aquifer yield the first time around, so that future updates of the water management plan will be a simpler and much less time consuming processes.

•It would take approximately one year to complete the base scope of the water management plan – estimate current populations and water demands; estimate future populations and water demands; estimate aquifer capacity based on existing information only; complete a groundwater flow model using existing information only; and evaluate conservation and alternative supply programs in response to future water supply issues. This would probably cost around \$200,000.

•It would take one additional year to collect original data (test borings and test wells in the Troy and St. Charles Buried Bedrock Valleys) and incorporate that data into the aquifer capacity analysis and groundwater flow model. This could add another \$200,000 to \$300,000 to the scope for a total project cost of up to \$500,000.

Discussion

- ❑ Any other scope items to consider?
- ❑ Desired level of accuracy in sustainable yield projections – affects data gathering costs and time frame
- ❑ Extent to which aquifers are modeled – affects modeling costs and time frame
- ❑ End products such as reports, exhibits, GIS mapping, modeling outputs, and presentations – affects overall staffing needs and costs

•The commission members and county officials discussed how to raise funding for this project. A referendum would be needed if funding were raised through taxes throughout the county.

•In discussing appropriate funding vehicles, Jack Wittman urged the commission members to think of their water supply as critical infrastructure, just like roads or parks or schools.

•The commission will meet again on February 28 to discuss tonight's presentation on the water resources management plan scope. The members of the project team (Larry Thomas, Jack Wittman, Kristin Rehg, and Chris Greer) will be in attendance at that meeting as well.

