



WATER SUPPLY ISSUES IN SOUTHEASTERN WISCONSIN: TECHNICAL AND POLICY NEEDS AND CHALLENGES



Presentation for Conference

**“STRADDLING THE DIVIDE
WATER SUPPLY PLANNING IN
THE LAKE MICHIGAN REGION”**

February 15-16, 2005



Water Supply Issues in Southeastern Wisconsin: Technical and Policy Needs and Challenges

PRESENTATION OVERVIEW

- **REGIONAL SETTING**
- **WATER SUPPLY ISSUES**
- **WATER SUPPLY PLANNING PROGRAMS (FOCUS ON REGIONAL)**
- **TECHNICAL AND POLICY NEEDS AND CHALLENGES**

Water Supply Issues in Southeastern Wisconsin Technical and Policy Needs and Challenges

AREAS SERVED BY PUBLIC AND PRIVATE WATER SUPPLY SYSTEMS IN SOUTHEASTERN WISCONSIN: 2000

2,700 Square Miles (62% west of Divide)

2.0 Million People

Public Water Supply

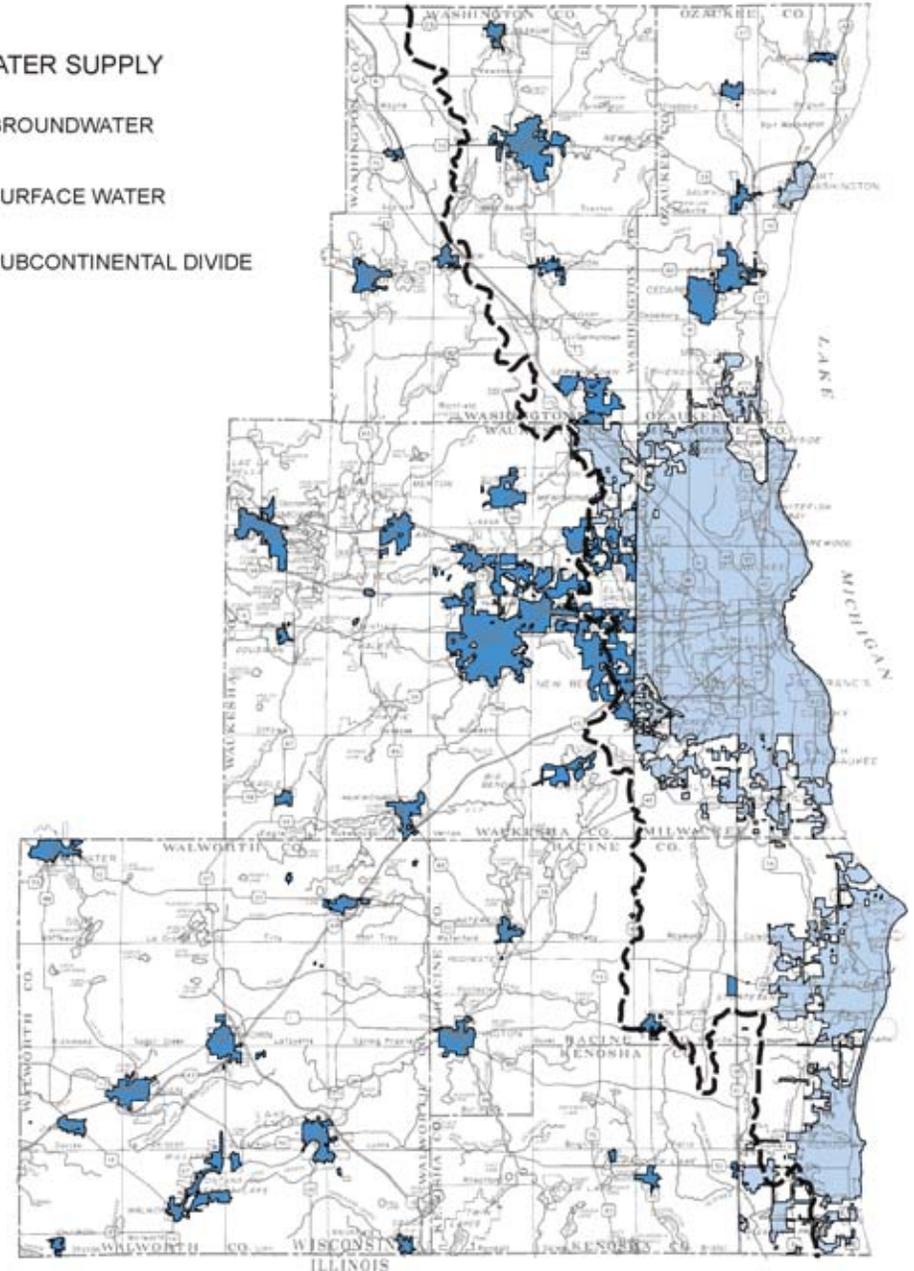
- Lake Michigan
 - Nine Plants (30 systems)
 - 1.2 Million People
 - 210 mgd
- Groundwater
 - 50 Systems
 - 400,000 People
 - 55 mgd

Private Water Supply

- 400,000 People
- 38 mgd

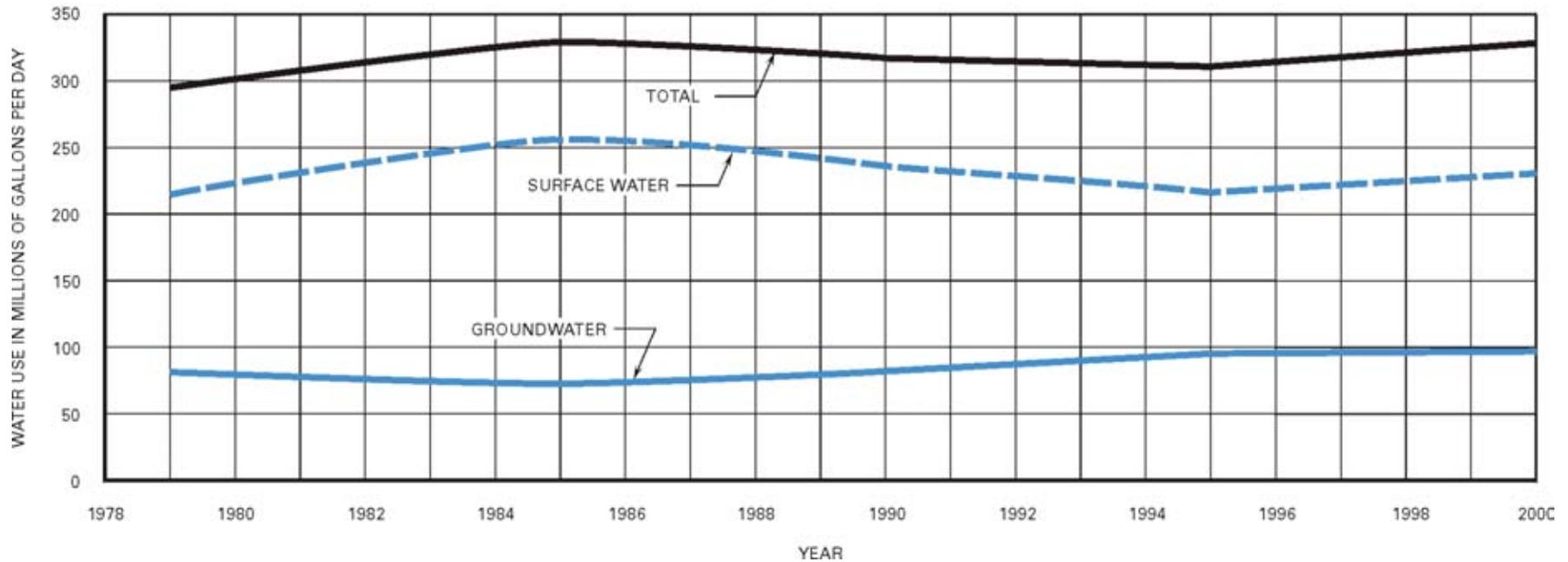
PUBLIC WATER SUPPLY

- GROUNDWATER
- SURFACE WATER
- SUBCONTINENTAL DIVIDE

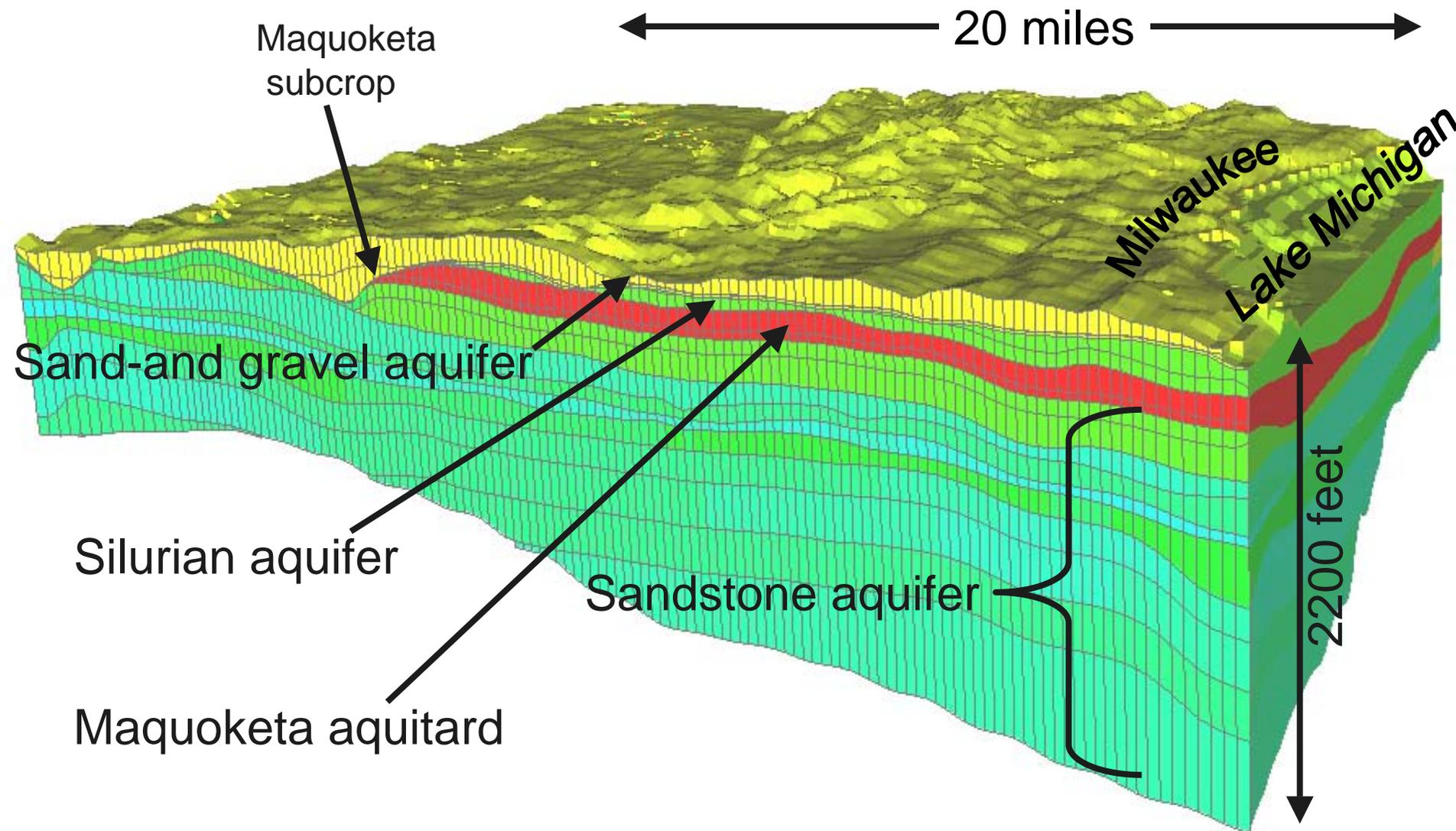


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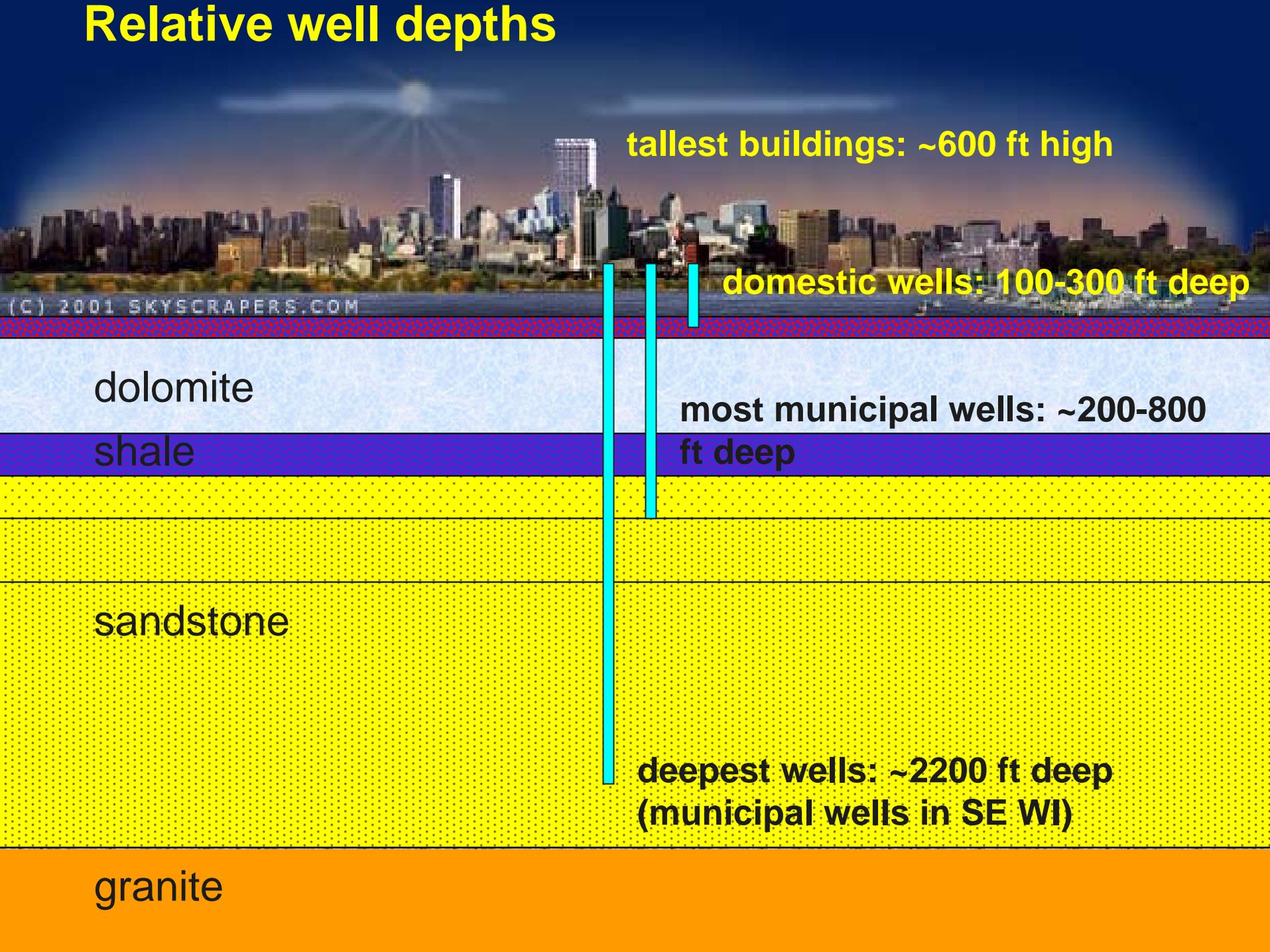
HISTORIC UTILIZATION OF LAKE MICHIGAN AND GROUNDWATER IN SOUTHEASTERN WISCONSIN



General Hydrogeology of Southeast Wisconsin



Relative well depths



tallest buildings: ~600 ft high

domestic wells: 100-300 ft deep

dolomite
shale

most municipal wells: ~200-800
ft deep

sandstone

deepest wells: ~2200 ft deep
(municipal wells in SE WI)

granite



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DEEP AQUIFER SYSTEM

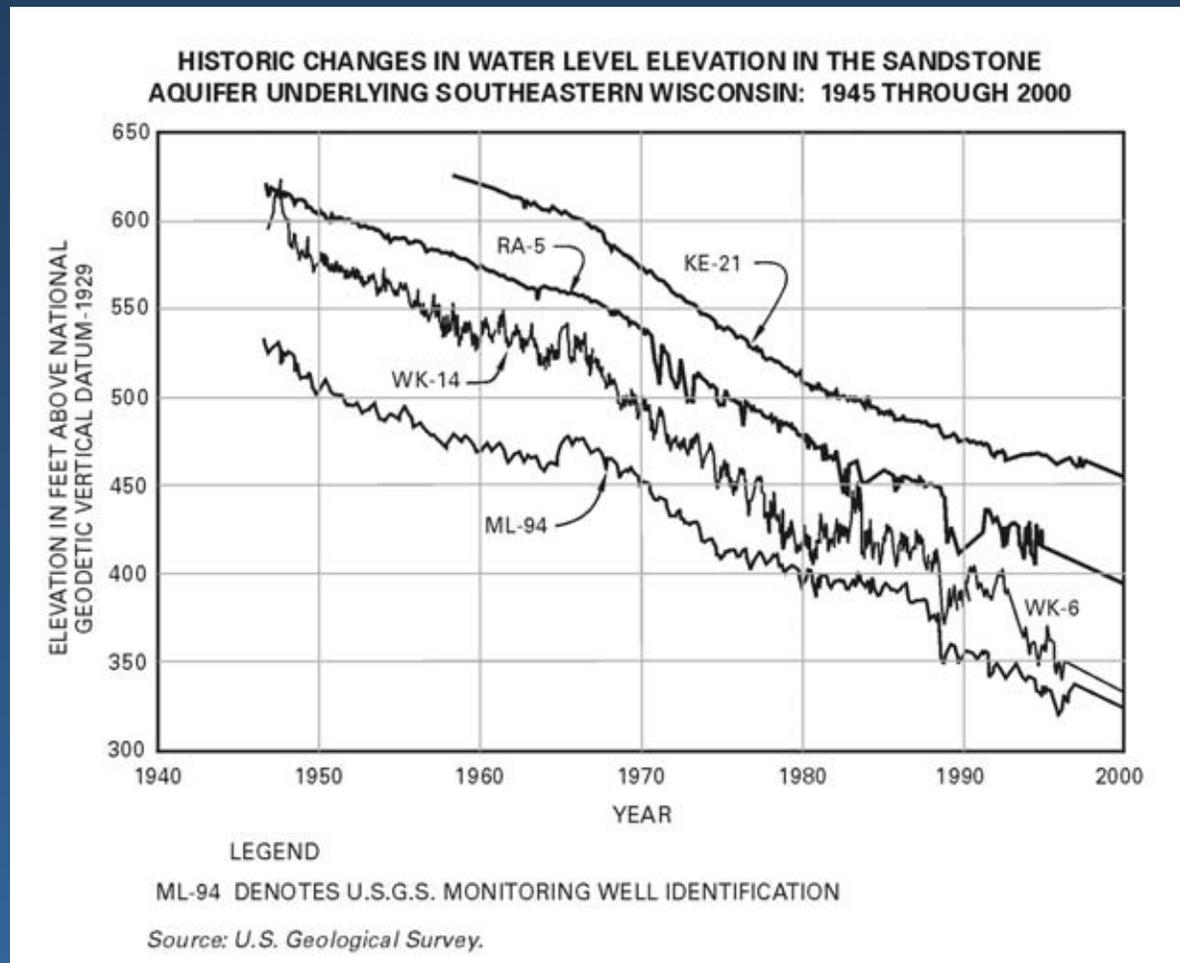
- **QUANTITY.** Historic and Continued Drawdown of Up to Four to Five Feet per Year
- **QUALITY.** Concerns in Some Systems Related to Radium and Dissolved Solids
 - **RADIUM COMPLIANCE ISSUES.** 22 Systems in Southeastern Wisconsin (53 in Wisconsin)
 - **COMPLIANCE DATES.** 2006-2009





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REGIONAL CHALLENGES





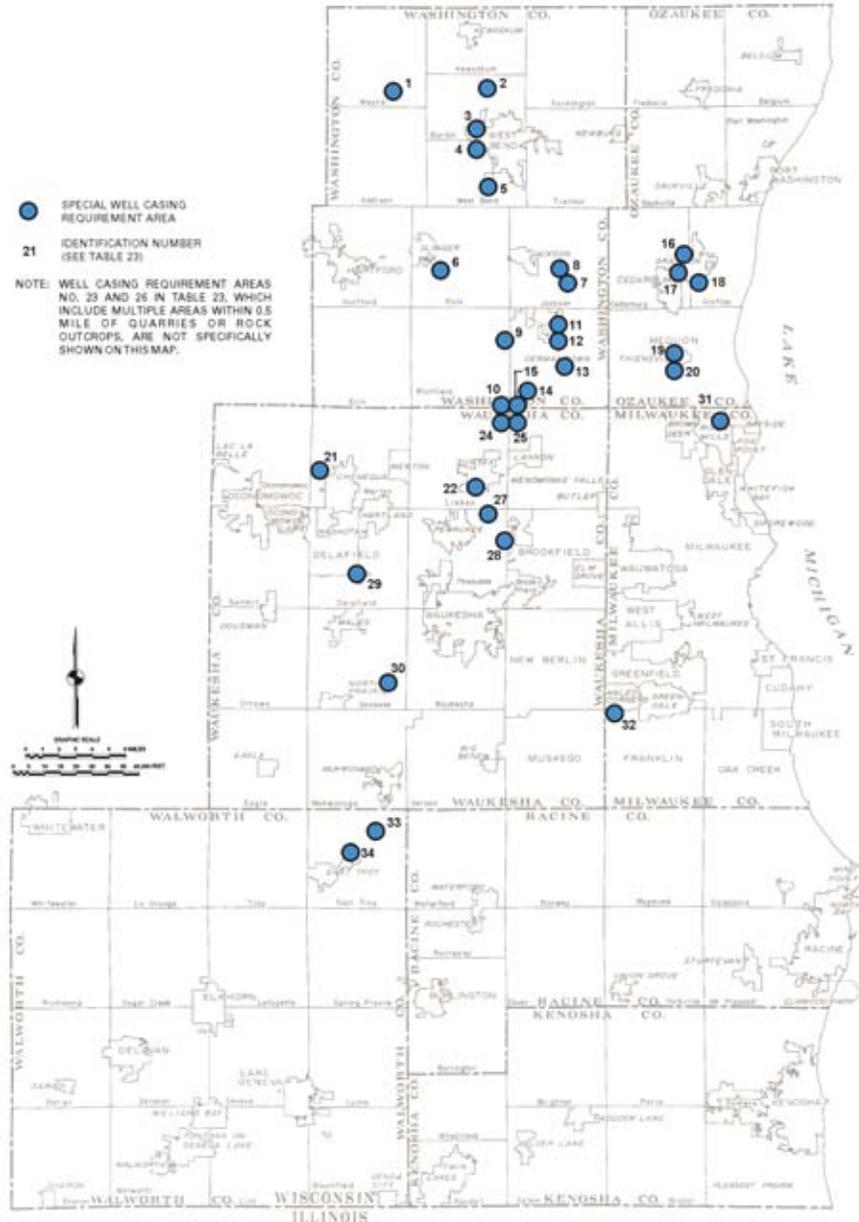
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SHALLOW AQUIFER SYSTEM

- **CURRENT QUANTITY.** Currently Very Limited Problems Due to Seasonal and Longer-Term Dry Weather Conditions. Problems Are Limited in Extent—Not Widespread
- **FUTURE QUANTITY.** There Are Sustainability and Potential Surface Water and Wetland Base Flow Impacts If Uses Greatly Increase, Particularly If This Aquifer is Used As An Alternative to the Deep Aquifer
- **SURFACE WATER CONFLICTS.** Conflicts Over New Well Siting and Surface Water Advocates and Existing Groundwater Users
- **QUALITY.** Isolated Problems
 - Arsenic Concerns. Six Municipal Systems
 - 24 Special Well Casing Areas

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LOCATION OF SPECIAL WELL CASING REQUIREMENT AREAS IN SOUTHEASTERN WISCONSIN



Source: Wisconsin Department of Natural Resources.



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LAKE MICHIGAN SUPPLY

- **LAKE MICHIGAN.** Treated Water is An Ample, High-Quality Source. Its Use is Constrained By Diversion Laws and Policies. Current Treatment Plants Have Substantial Potentially Excess Capacity





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CAPACITY AND USE OF LAKE MICHIGAN WATER TREATMENT PLANTS WITHIN SOUTHEASTERN WISCONSIN: 1997 AND 2000

Plant	1997 Pumpage ^a		2000 Pumpage ^a		Rated Plant Capacity (mgd) ^b	Potential Reserve Capacity (mgd) ^c
	Average	Maximum Day	Average	Maximum Day		
City of Cudahy.....	4.8	8.2	4.8	6.6	6.0	None
City of Kenosha.....	12.1	19.3	12.6	25.2	42.0	16.8
City of Milwaukee.....	131.7	183.5	123.2	166.8	380.0	196.5
Linwood Avenue.....	--	--	--	--	275.0	--
Howard Avenue.....	--	--	--	--	105.0	--
City of Oak Creek.....	6.1	10.3	6.6	11.9	20.0	8.1
City of Port Washington....	1.3	1.8	1.2	1.7	4.0	2.2
City of Racine.....	22.5	36.6	22.8	34.3	40.0	3.4
City of South Milwaukee....	2.4	3.9	2.4	3.6	5.1	1.2
North Shore Utility.....	4.3	7.9	3.8	6.7	18.0	10.1



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ACTIONS UNDERWAY TO ADDRESS ISSUES

- **Local Community Level**
- **Regional Level**
- **Tri-State**





Water Supply Issues in Southeastern Wisconsin: Technical and Policy Needs and Challenges

ACTIONS UNDERWAY TO ADDRESS ISSUES

CONTINUED LOCAL PLANNING

- Local Water Supply System Planning
- Review of Ongoing Great Lakes Charter Annex 2001 Activities and Participation in GLPF Case Studies

FACILITY DEVELOPMENT

In Some Cases Quality Problems Are Being Addressed

- New Well Construction
- Well Modifications
- Supply Operation Management Actions
- Radium Treatment Pilot Testing
- Others





Water Supply Issues in Southeastern Wisconsin: Technical and Policy Needs and Challenges

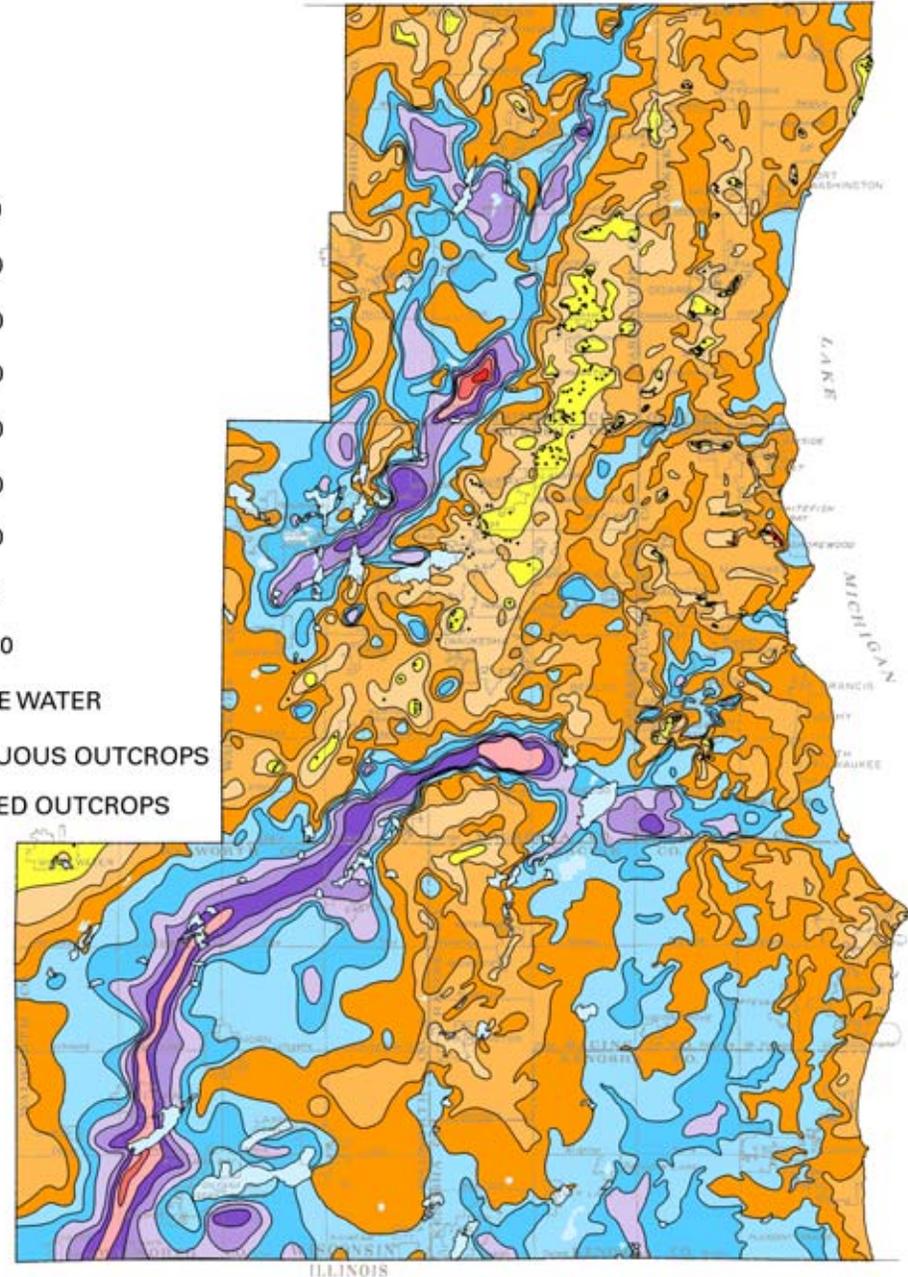
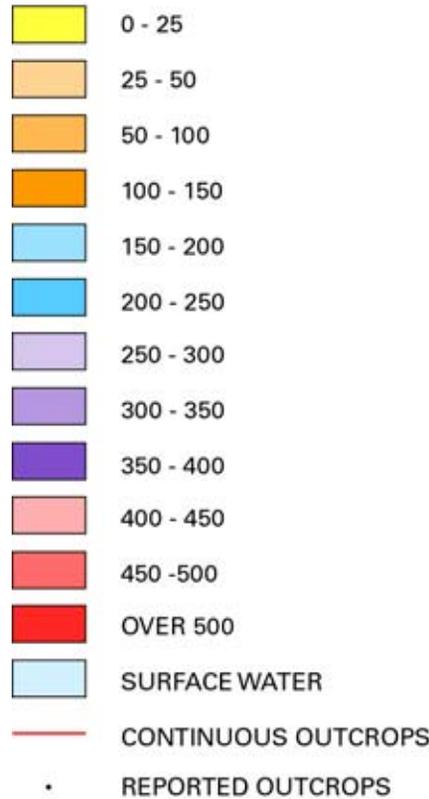
REGIONAL WATER SUPPLY PLANNING PROGRAM – THREE ELEMENTS (COORDINATED WITH AND DESIGNED TO COMPLEMENT LOCAL ACTIONS)

REGIONAL

- **Conduct Basic Groundwater Inventories
(Completed in 2001 With Partner—WGNHS
and WDNR)**
- **Collect Additional Inventory Data and Develop
Regional Groundwater Simulation Model
(Completed with Partners—USGS, WGNHS,
and WDNR)**
- **Prepare Regional Water Supply System Plan
(Preliminary Study Funding In Place, Study
Organization is Underway)**

First Element – Basic Groundwater Inventories

DEPTH TO BEDROCK IN SOUTHEASTERN WISCONSIN





Second Element – Groundwater Model Development

A Cooperative Project...



University **MILWAUKEE**
of Wisconsin





Second Element – Groundwater Model Development

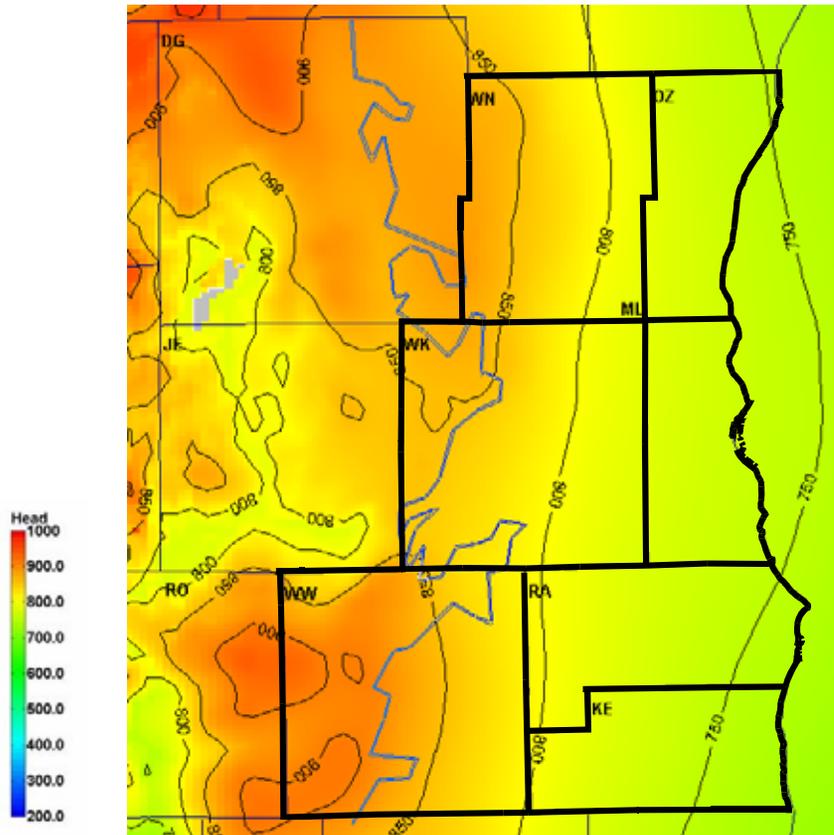
Modeling Objectives in Southeastern Wisconsin

- **Understand Present GW System**
- **Study Current and Future Impacts of Groundwater Use**
- **Water Supply Plan–Simulate Alternative Management Options**
- **Delineate Contributing Areas for Wellhead Protection**
- **Provide a Framework for Site-Specific Models and Studies**

Second Element – Groundwater Model Development

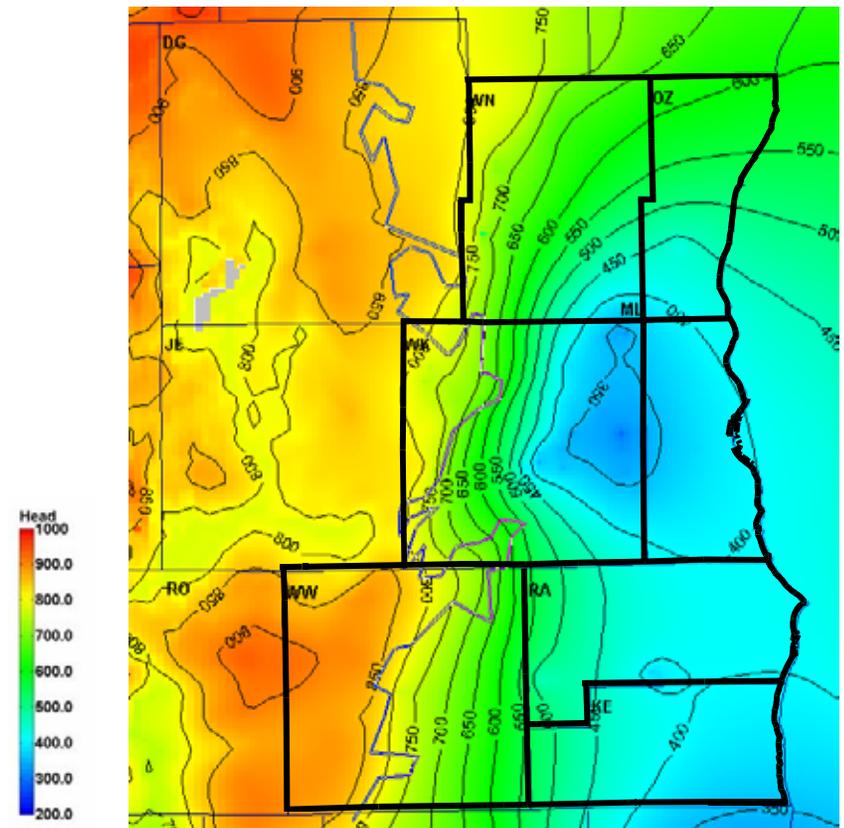
DEEP SANDSTONE AQUIFER DRAWDOWN

Pre-1864



Water Levels in the Sandstone Aquifer
(feet above sea level)

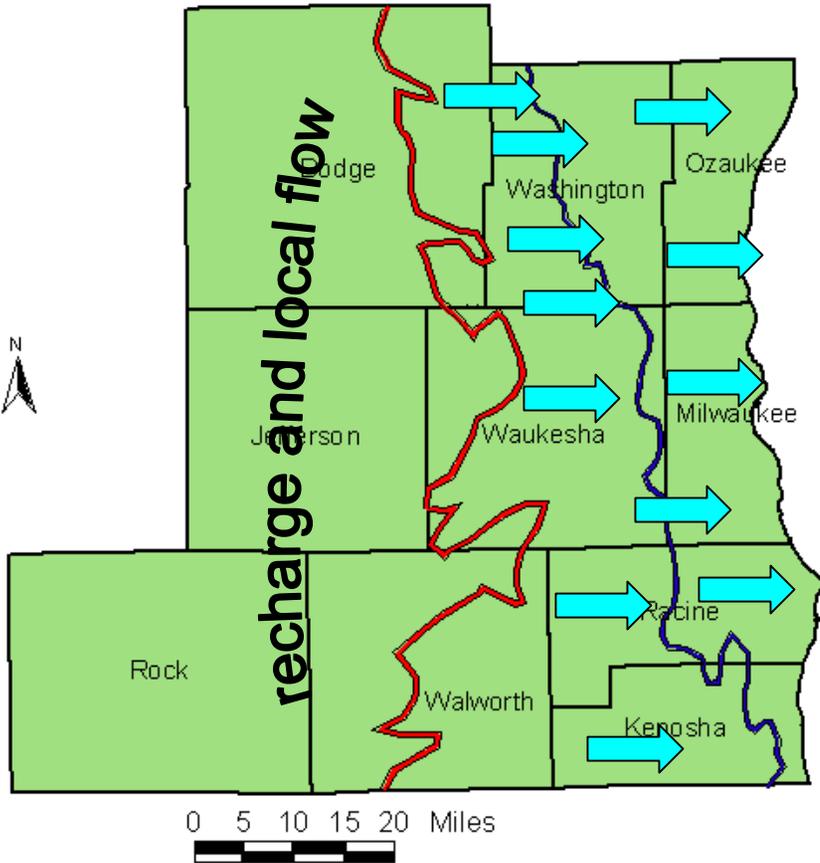
2000



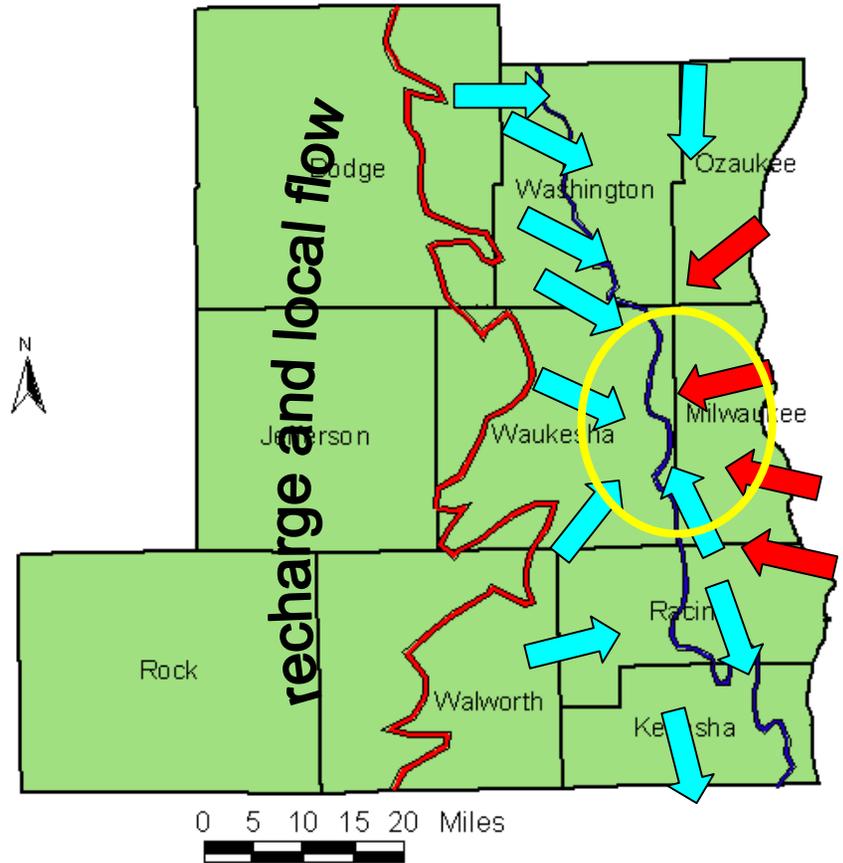
Water Levels in the Sandstone Aquifer
(feet above sea level)

Pumping Has Altered Groundwater Flow Directions

1900



2000





Third and Final Element Proposed Regional Water Supply Plan

- **Development of Water Supply Service Areas and of Forecast Demand for Water Use**
- **Development of Recommendations for Water Conservation Efforts to Reduce Water Demand**
- **Evaluation of Alternative Sources of Supply, Culminating in Identification of Recommended Sources of Supply for Each Service Area and in Recommendations for Development of the Basic Infrastructure Required to Deliver that Supply**



Third and Final Element Proposed Regional Water Supply Plan

- **Identification of Groundwater Recharge Areas to Be Protected from Incompatible Development**
- **Specification of Any New Institutional Structures Found Necessary to Carry Out the Plan Recommendations**
- **Identification of Any Constraints to Development Levels in Subareas of the Region that May Emanate from Water Supply Sustainability Concerns**

WALWORTH CO.

KENOSHA CO.



Water Supply Planning Needs and Challenges

OVERALL CHALLENGE – To Develop a Plan for the Provision of Long-Term Sources of High-Quality Water for the Southeastern Wisconsin Region

- **Secure Adequate Funding for Planning and Implementation**
- **Determine a Balance and an Efficient Management Program for Sources of Supply:**
 - **Lake Michigan**
 - **Shallow Aquifer**
 - **Deep (Regional) Aquifer**
 - **Precipitation (?)**



Water Supply Planning Needs and Challenges

OVERALL CHALLENGE (continued)

- **Balance Groundwater Water Supply Needs with Surface Water Impacts**
- **Integration of Water Supply Planning with Land Use and Comprehensive (“Smart Growth”) Planning**
- **Water Conservation**
- **Cooperate and Coordinate with Tri-State Consortium**

Water Supply Planning Needs and Challenges

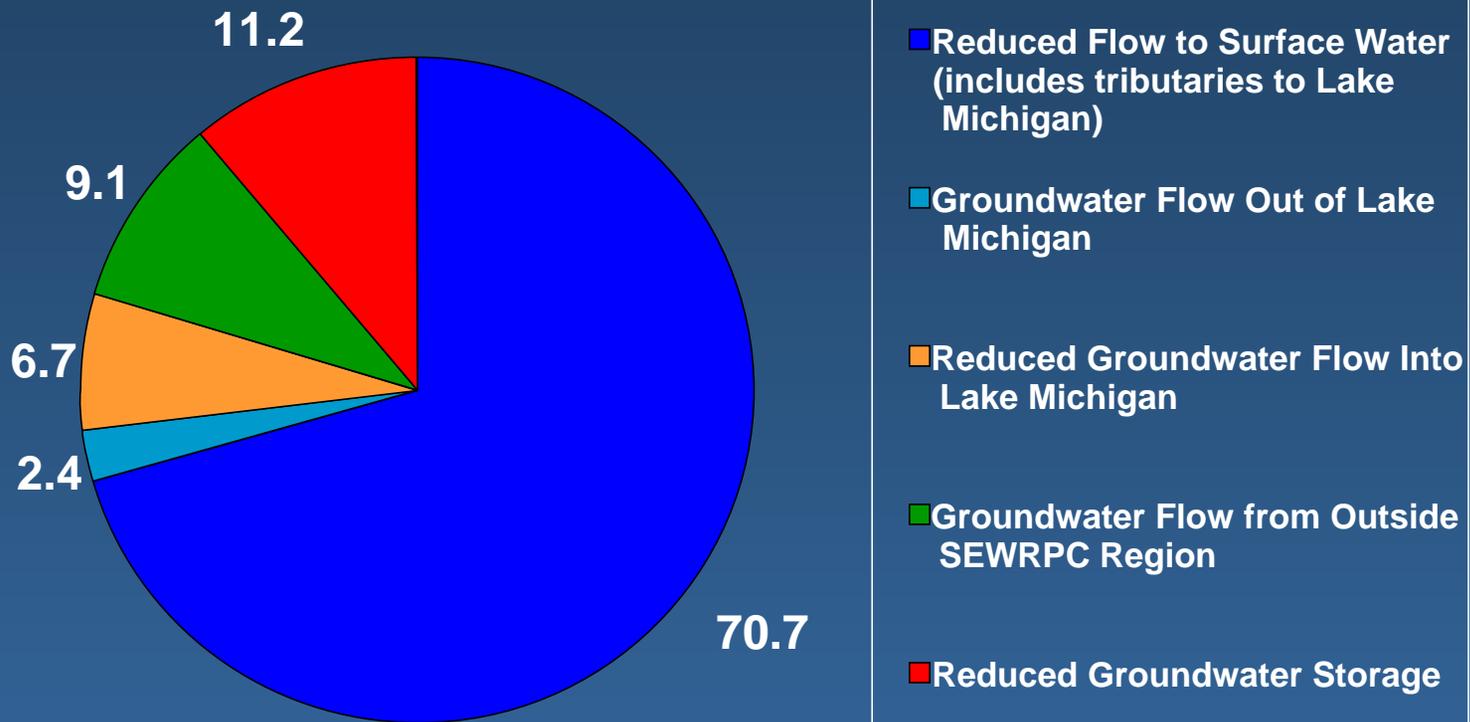
**BALANCE GROUNDWATER WATER SUPPLY
NEEDS WITH SURFACE WATER IMPACTS**



Water Supply Planning Needs and Challenges ***Balance Groundwater Water Supply Withdrawal*** ***Needs with Surface Water Impacts***

SOURCES OF WATER PUMPED FROM WELLS OTHER THAN THOSE PRIVATE WELLS ACCOMPANIED BY ONSITE SEWAGE DISPOSAL SYSTEMS

SOURCES OF WATER FOR ALL WELLS IN SEWRPC REGION



Water Supply Planning Needs and Challenges ***Balance Groundwater Water Supply Withdrawal*** ***Needs with Surface Water Impacts***

**AREA FROM WHICH
GROUNDWATER IS
CONTRIBUTED TO UPPER
PHANTOM LAKE**





Water Supply Planning Needs and Challenges

CHALLENGE – Balance Groundwater Water Supply Needs with Surface Water Impacts

NEEDS

- **Tools to Quantify Impacts on a Hydrologic Unit Basis**
 - **Groundwater Models**
 - **Surface Water Analysis (Models?)**
- **Willingness to and/or Regulation Requiring Consideration of Surface Water Impacts in Initial Regional- and Subregional-Level Planning and in Site-Specific Situations**



Water Supply Planning Needs and Challenges

CHALLENGE – Balance Groundwater Water Supply Needs with Surface Water Impacts

NEEDS (continued)

- **Willingness to Balance Impacts and Recognize Some Surface Water Impacts Are Unavoidable (reasonableness)**



Water Supply Planning Needs and Challenges

CHALLENGE—Integration of Water Supply Planning with Land Use and Comprehensive ("Smart Growth") Planning

NEEDS

- **Link Reasonably Expected Water Supply Capacities As One of Several Factors Considered in Future Land Use Decisions – This Requires Water Supply Facilities Plan**
- **Take Into Account Important Water Supply Considerations in Establishing Land Use Patterns**
 - **Preserve Important Groundwater Recharge Areas**
 - **Protect Existing and Future Well Zone of Contribution Areas**
 - **Promote Local Zoning to Protect Areas Most Susceptible to Groundwater Contamination**



Water Supply Planning Needs and Challenges

CHALLENGE—Integration of Water Supply Planning with Land Use and Comprehensive ("Smart Growth") Planning

NEEDS (continued)

- **Promote Low Impact and Other Development Patterns and Stormwater Management Practices Which Maintain the Natural Hydrology**
- **Potential Limits to Development Density in Selected Areas to Help Achieve a Safe Water Supply**
- **Water Conservation?**



Water Supply Planning Needs and Challenges

CHALLENGE – Water Conservation

NEEDS

- **Determine What Levels Are Achievable and At What Cost**
- **Balance Conservation and Economic Development Objectives**
- **Implementation – How to Achieve**



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YOUR TURN

QUESTIONS? – COMMENTS?

