Regional Water Supply Plan for Southeastern Wisconsin

SOUTHEASTERN WISCONSIN REGIONAL PLANNING COMMISSION

Ozaukee County Water Summit
October 14, 2011

#159281

Background

A Cooperative Program…

SE Wisconsin Water Utilities

USGS science for a changing world

Southeastern Wisconsin Regional Planning Commission

Seven Southeastern Wisconsin Counties

WISCONSIN DEPT. OF NATURAL RESOURCES

UNIVERSITY of WISCONSIN UWMILWAUKEE

UW Extension Wisconsin Geological and Natural History Survey

Background

Objective – To assess whether the water supply for this Region can sustain existing and planned population and development.

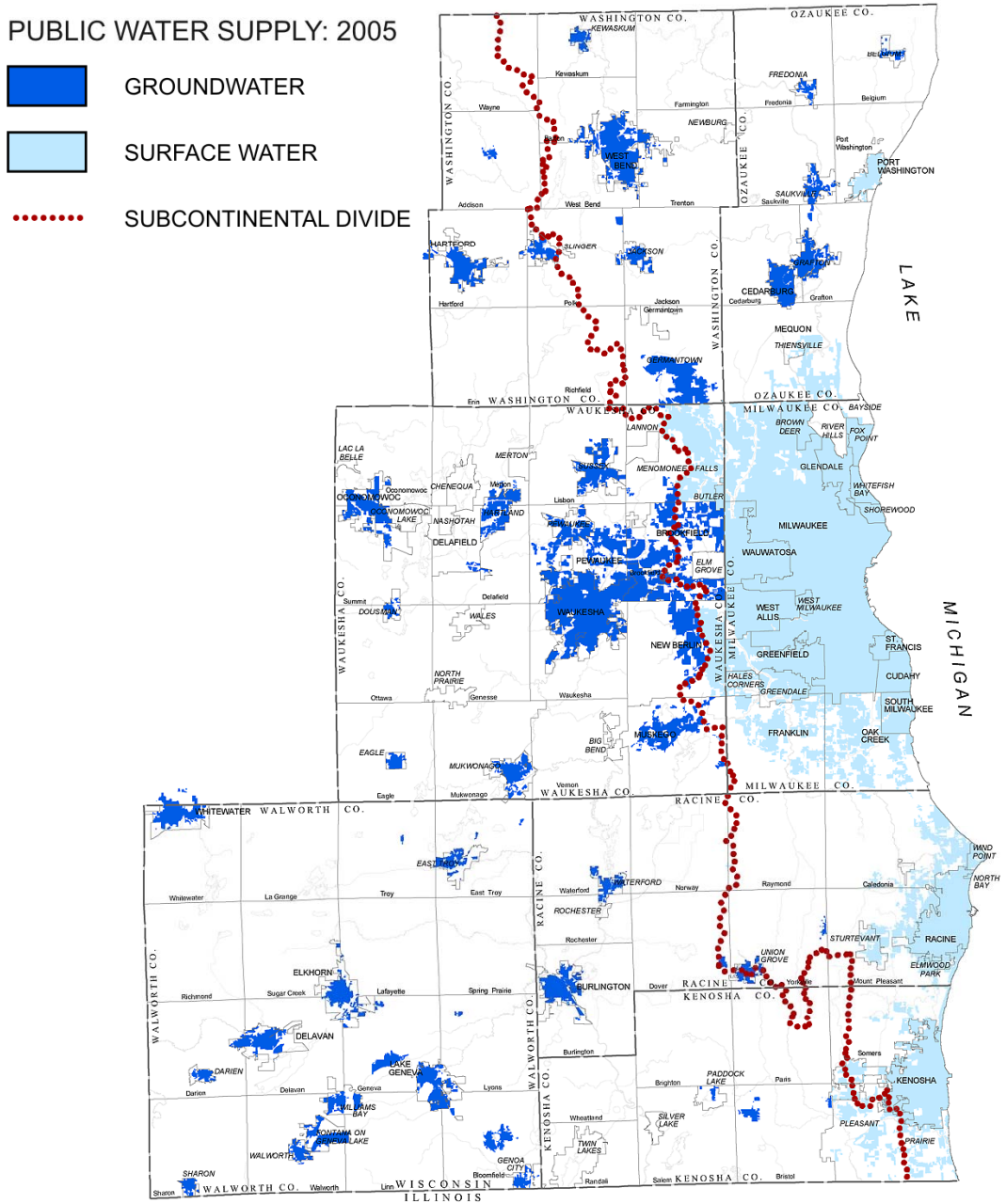
Experience to Date

- **Current water supply (290 mgd)**
  - **Lake Michigan – 9 plants (28 systems) serving 1.2 million people (210 mgd-72%)**
  - **Groundwater – 50 systems serving 400,000 people (55 mgd-19%)**
  - **Groundwater – individual wells serving 350,000 people (25 mgd-9%)**

- **Groundwater deep aquifer – historic 4 to 5 feet annual drawdown and some radium and dissolved solids problems.**

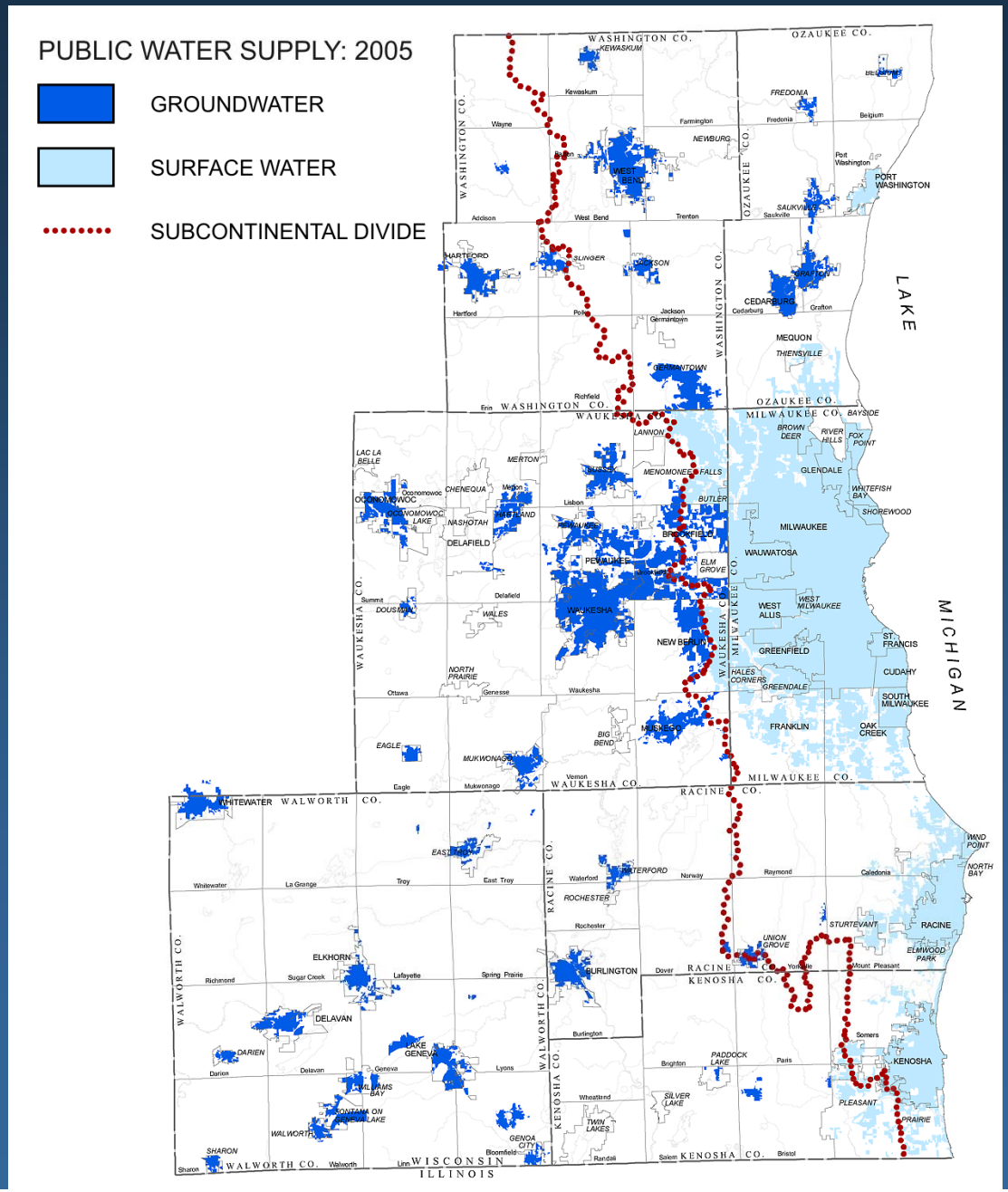
- **Groundwater shallow aquifer – some isolated seasonal supply problems and quality issues.**

- **Lake Michigan water – existing treatment plants operating at less than 50 percent of capacity.**

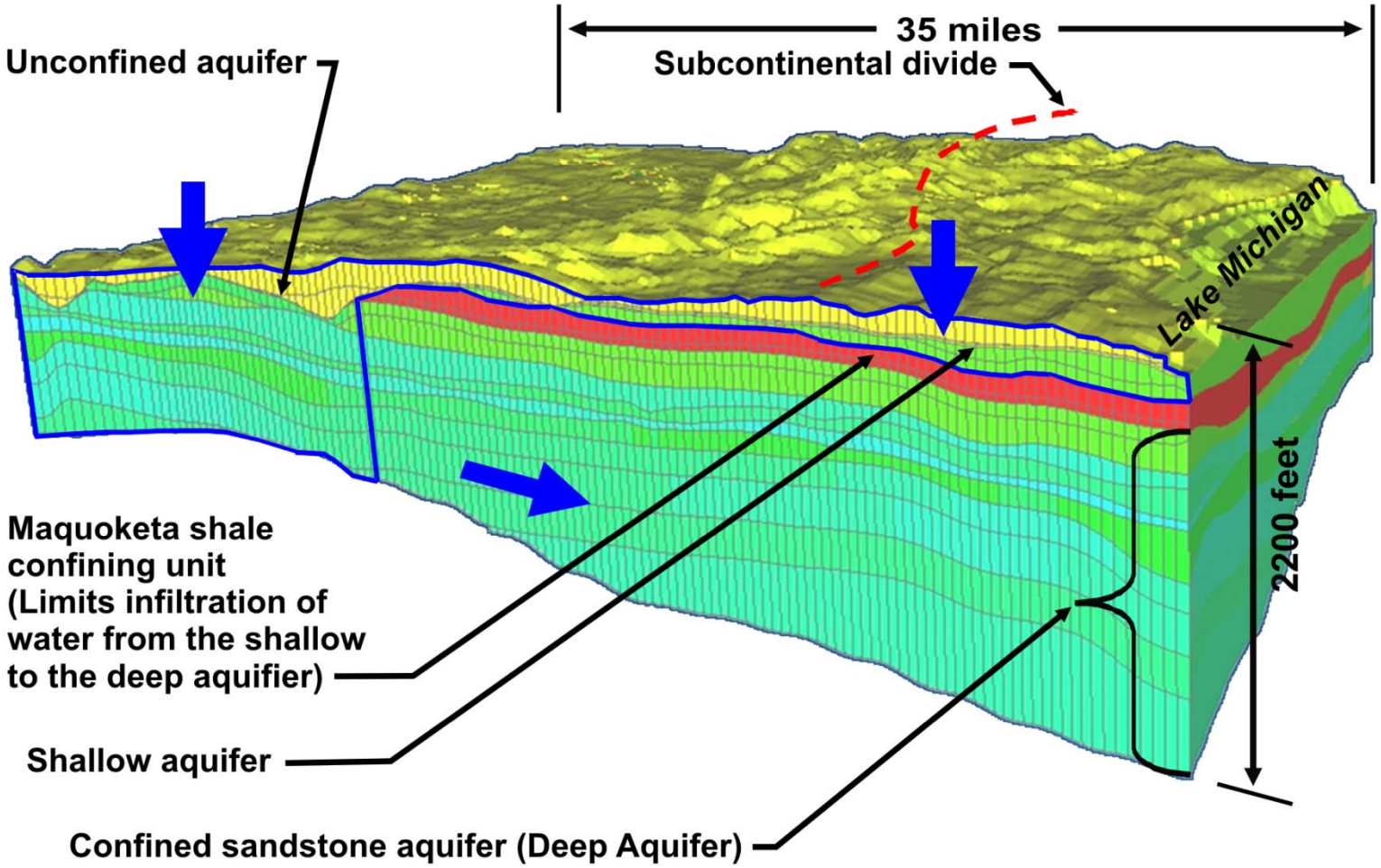


Existing Municipal Water Supply Systems in Ozaukee County

- Cities of Mequon and Port Washington and part of the Village of Thiensville: Lake Michigan supply
- City of Cedarburg and Village of Grafton: (deep and shallow aquifer)
- Villages of Belgium, Fredonia, and Saukville (shallow aquifer)



General Hydrogeology of Southeast Wisconsin

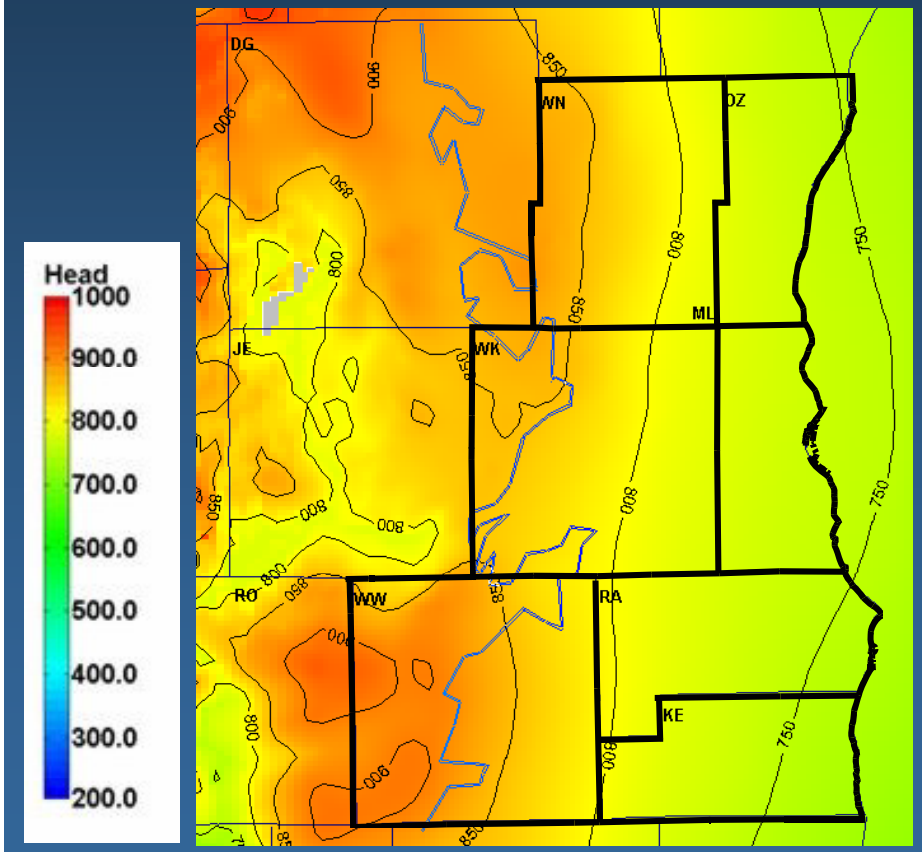


Private residential wells are generally in the shallow aquifer and 100 to 300 feet deep. Most municipal wells are 200 to 800 feet deep with some up to 2,200 feet deep, and are in both the shallow and deep aquifer.

Source: USGS.

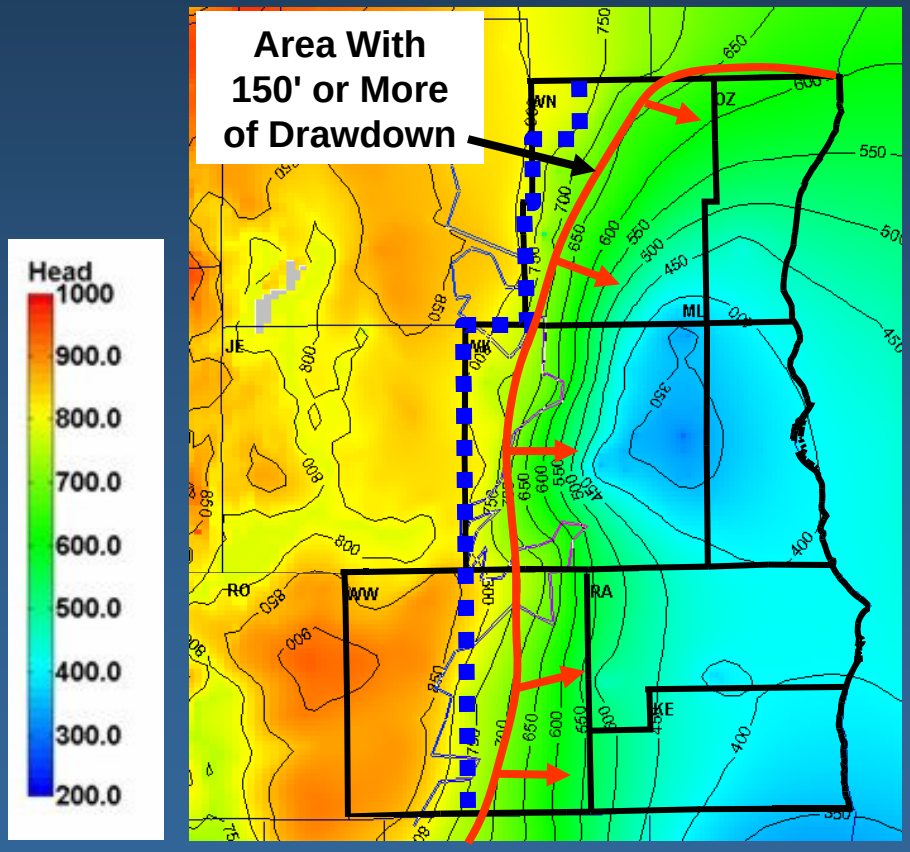
Deep Sandstone Aquifer Drawdown

Pre-1864



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

2000



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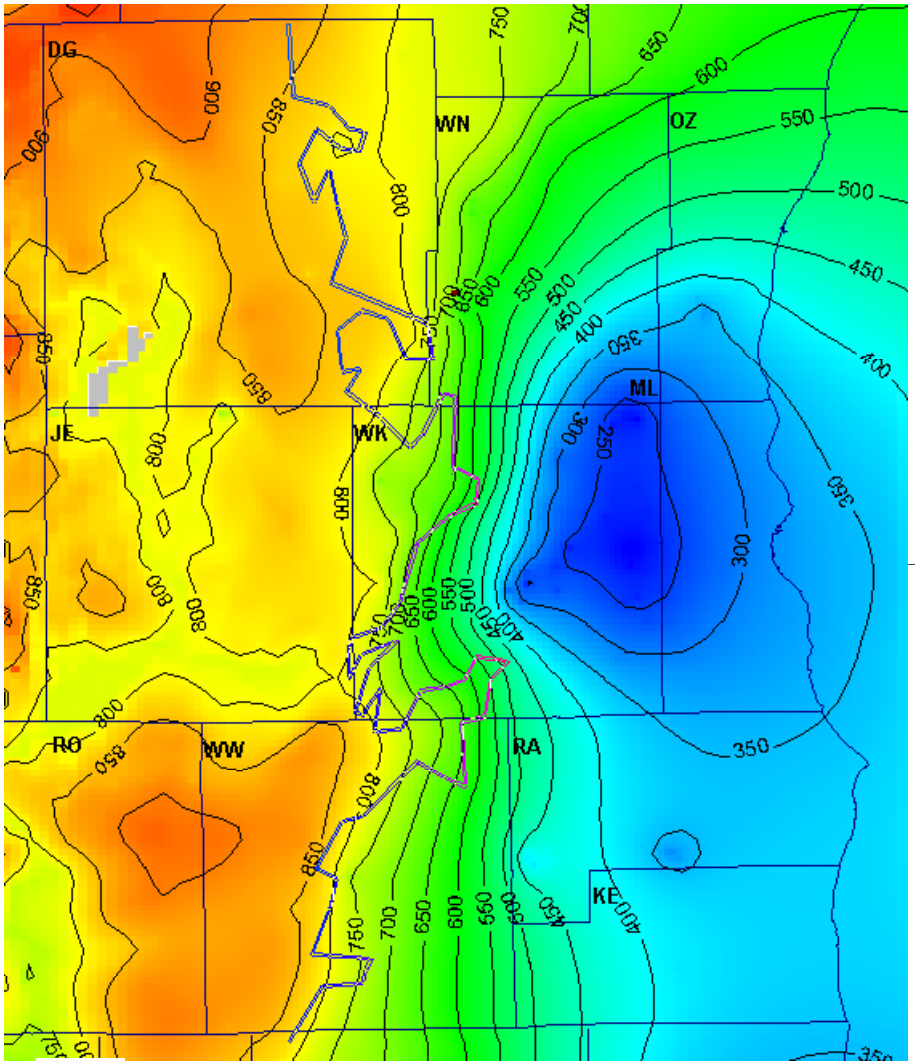
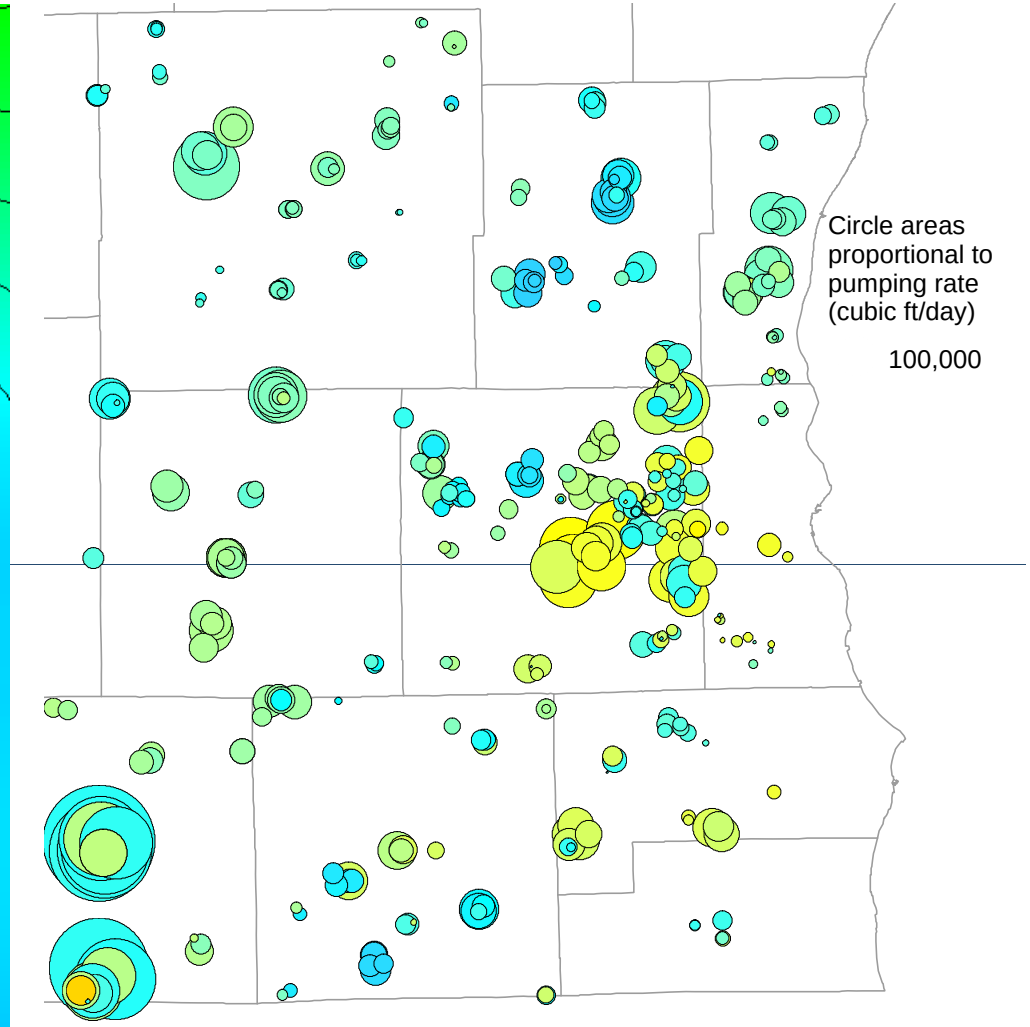




Water Levels in the Sandstone Aquifer
(feet above sea level)

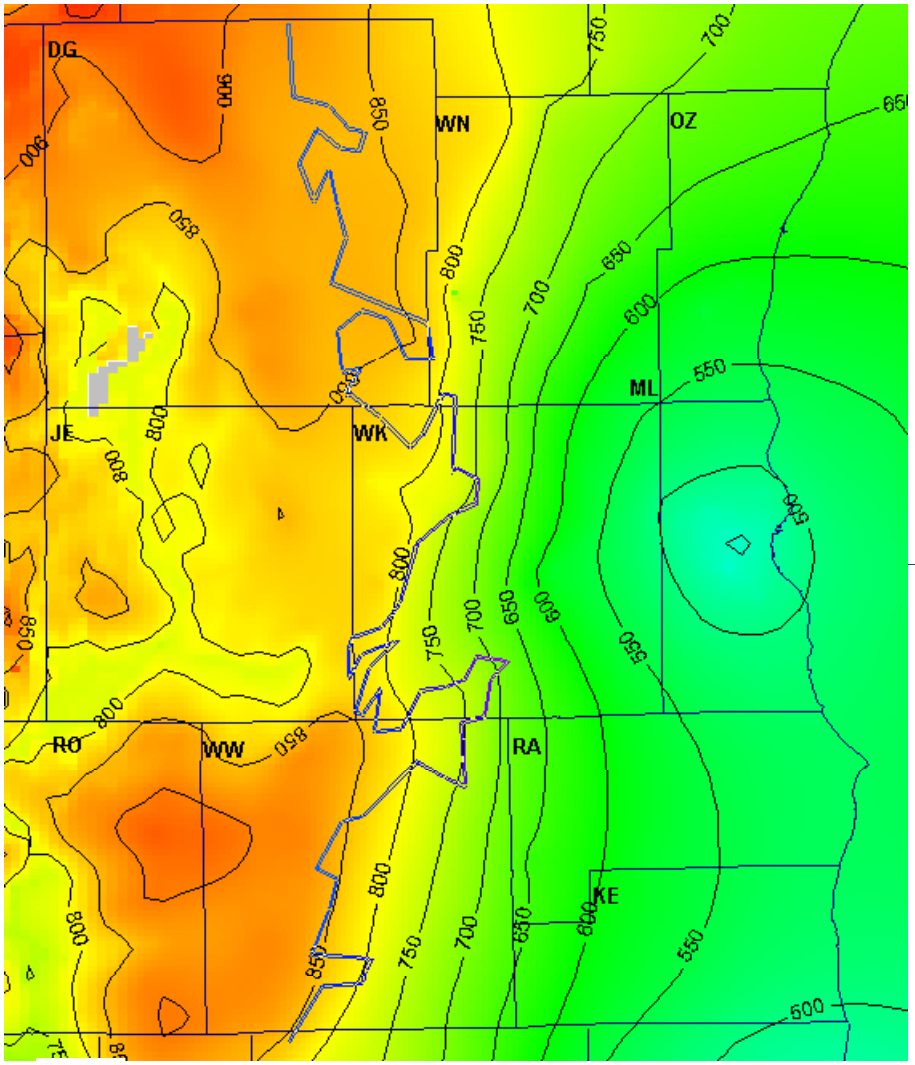
Well Locations and Pumping Rates

Shallow

Mixed or Intermediate Depth

Deep

2010-2020



Water Levels in the Sandstone Aquifer
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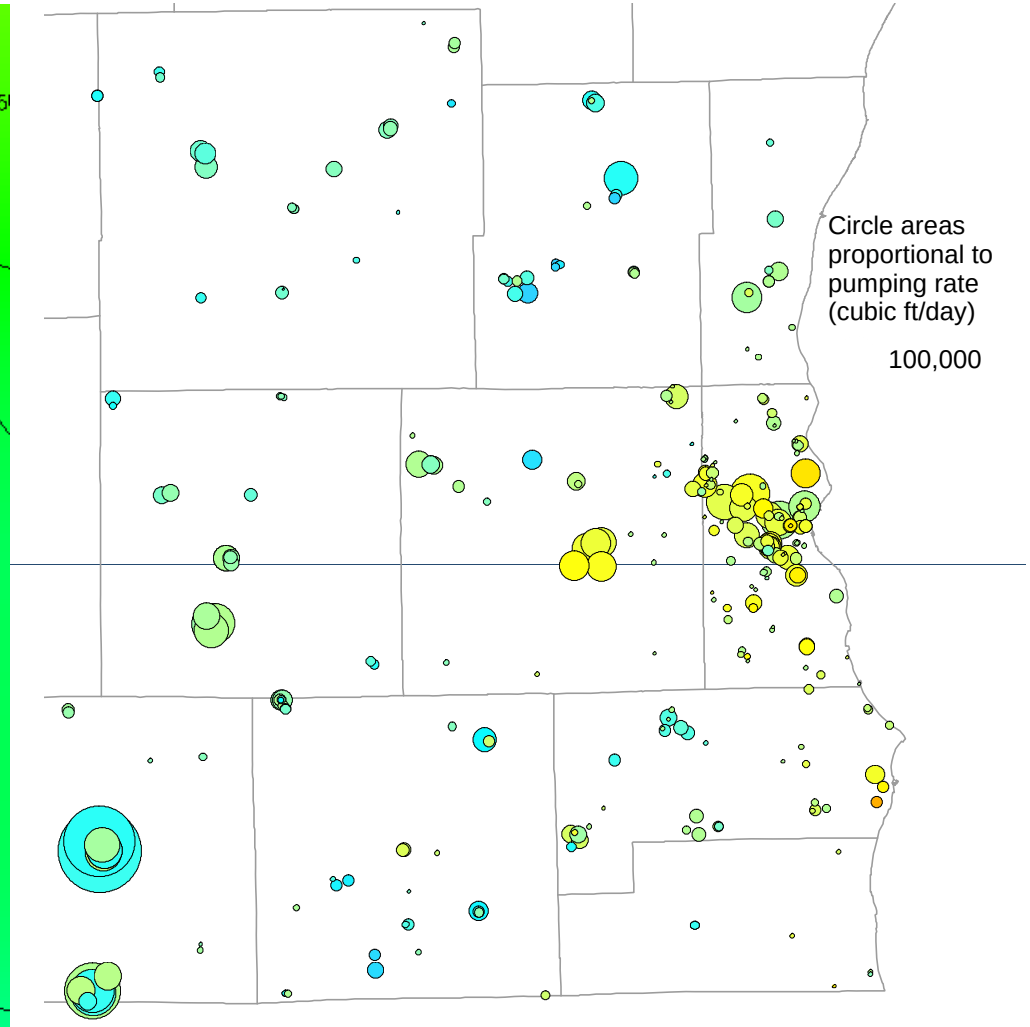


Well Locations and Pumping Rates

Shallow

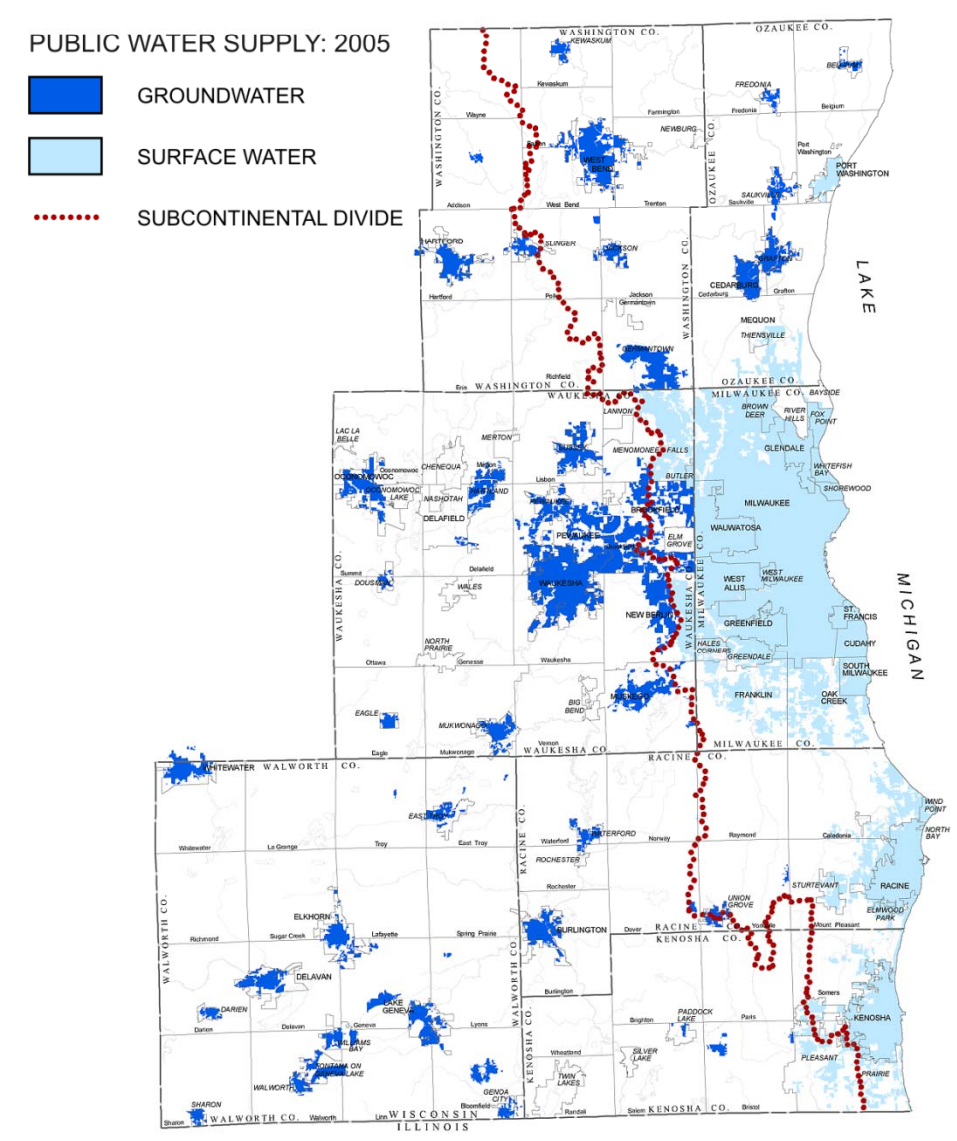
Mixed or Intermediate Depth

Deep

1950-1961

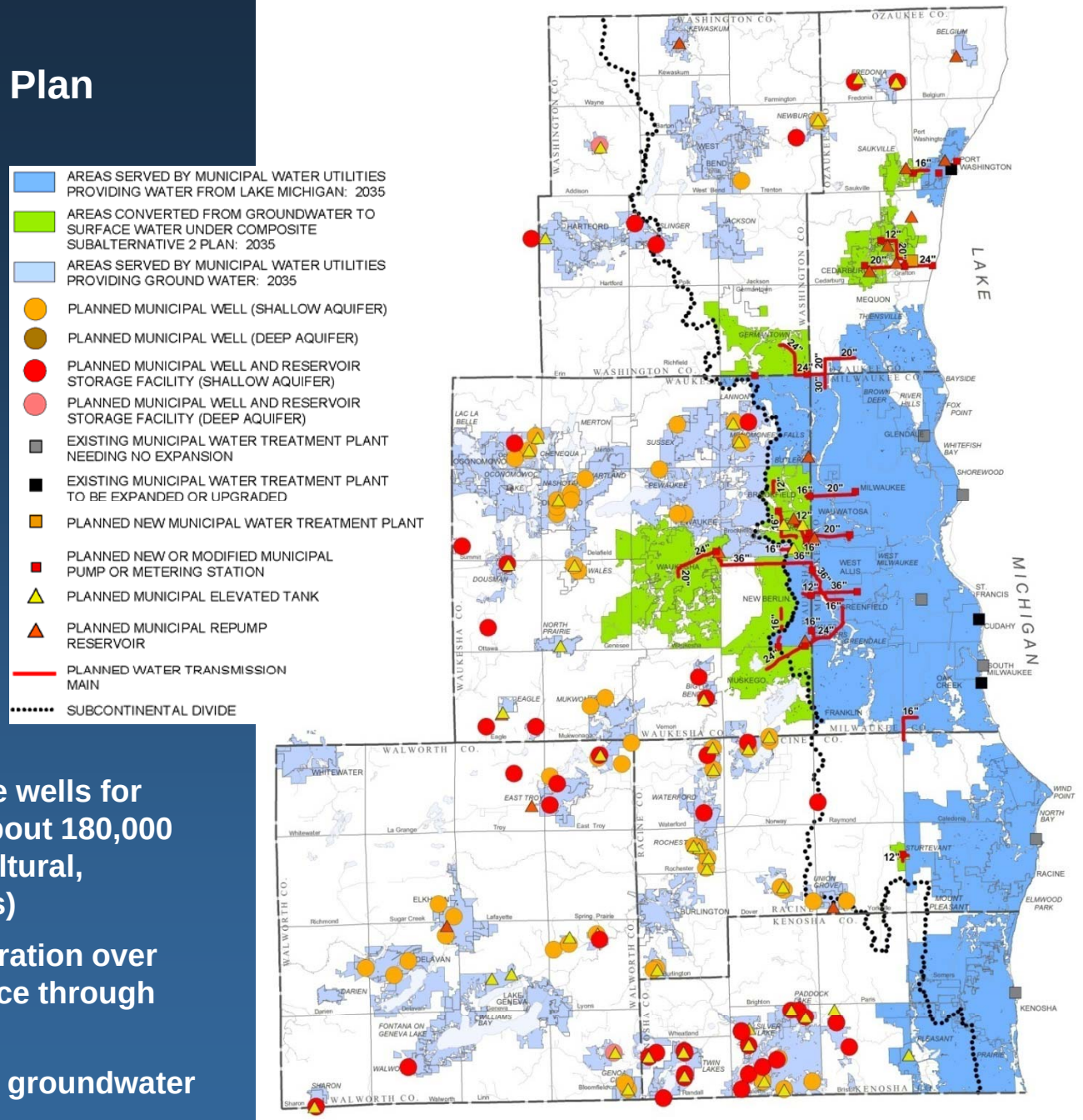
Scope of Study

- Forecast future water use demand in the Region.
- Consider potential of water conservation to reduce future demand.
- Identify groundwater recharge areas which should be protected from development.
- Assess potential for shallow groundwater recharge through infiltration of stormwater runoff and treatment plant effluent.
- Consider potential alternative sources of supply
  - Shallow groundwater
  - Lake Michigan water replacing groundwater east of the subcontinental divide.
  - Lake Michigan water replacing groundwater in "straddling communities" which already have "return flow"
  - Lake Michigan water replacing groundwater in "straddling communities" and "communities in straddling counties" and providing for "return flow".
- Estimate costs and impacts of alternatives
  - Groundwater-Surface Water Interdependence and Impacts
- Identify any development constraints necessary to assure water supply sustainability; consider amending regional land use plan if necessary



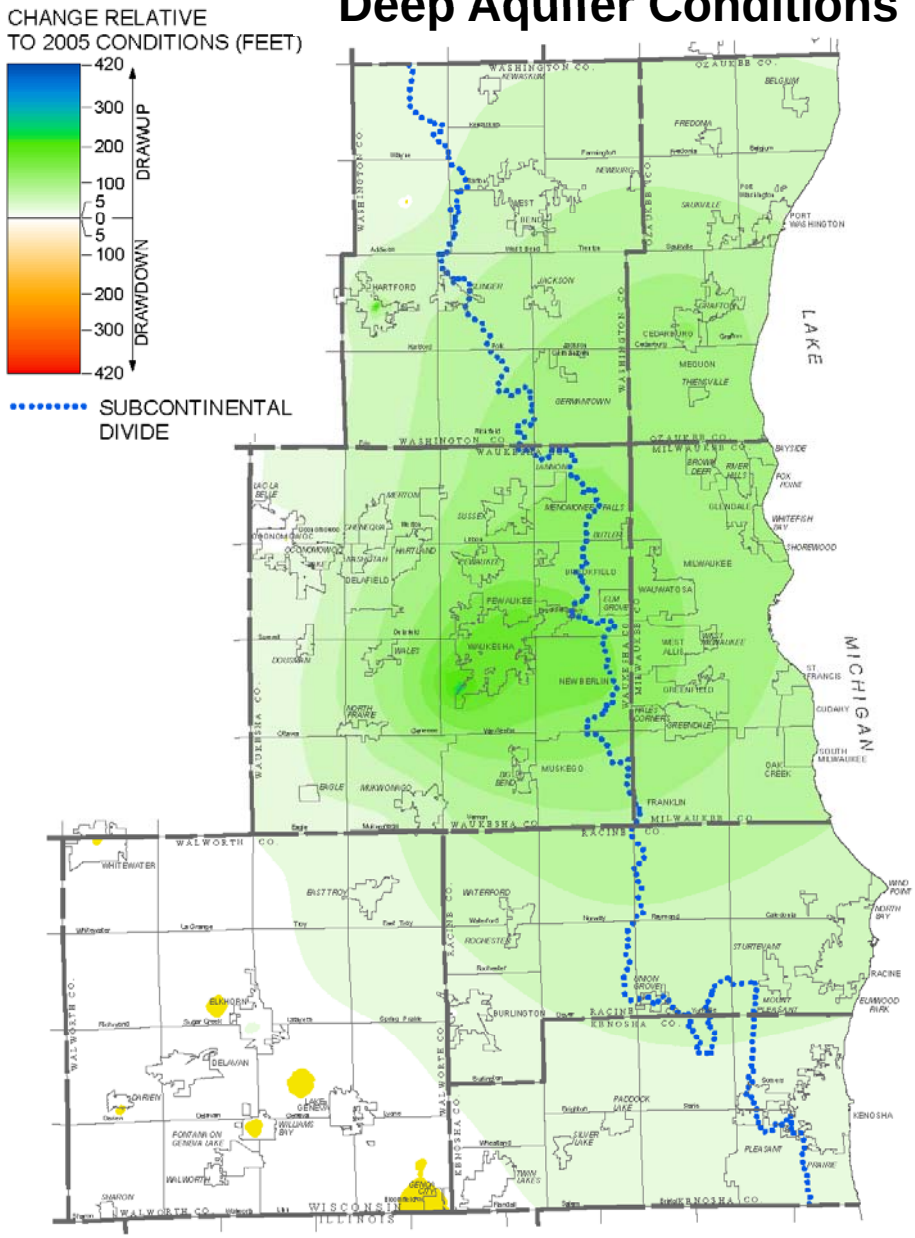
Regional Water Supply Plan

- Enhanced water conservation programs
- Conversion of selected areas with current return flow to Lake Michigan supply
- Conversion of selected groundwater supply from deep to shallow aquifer supply
- The City of Waukesha water utility is converted to a Lake Michigan supply with a return flow component
- Continued reliance on private wells for selected residential areas (about 180,000 persons plus selected agricultural, irrigation, and industrial uses)
- Enhancement of rainfall infiltration over 1.7 square miles of open space through bioengineering
- Preservation of areas of high groundwater recharge

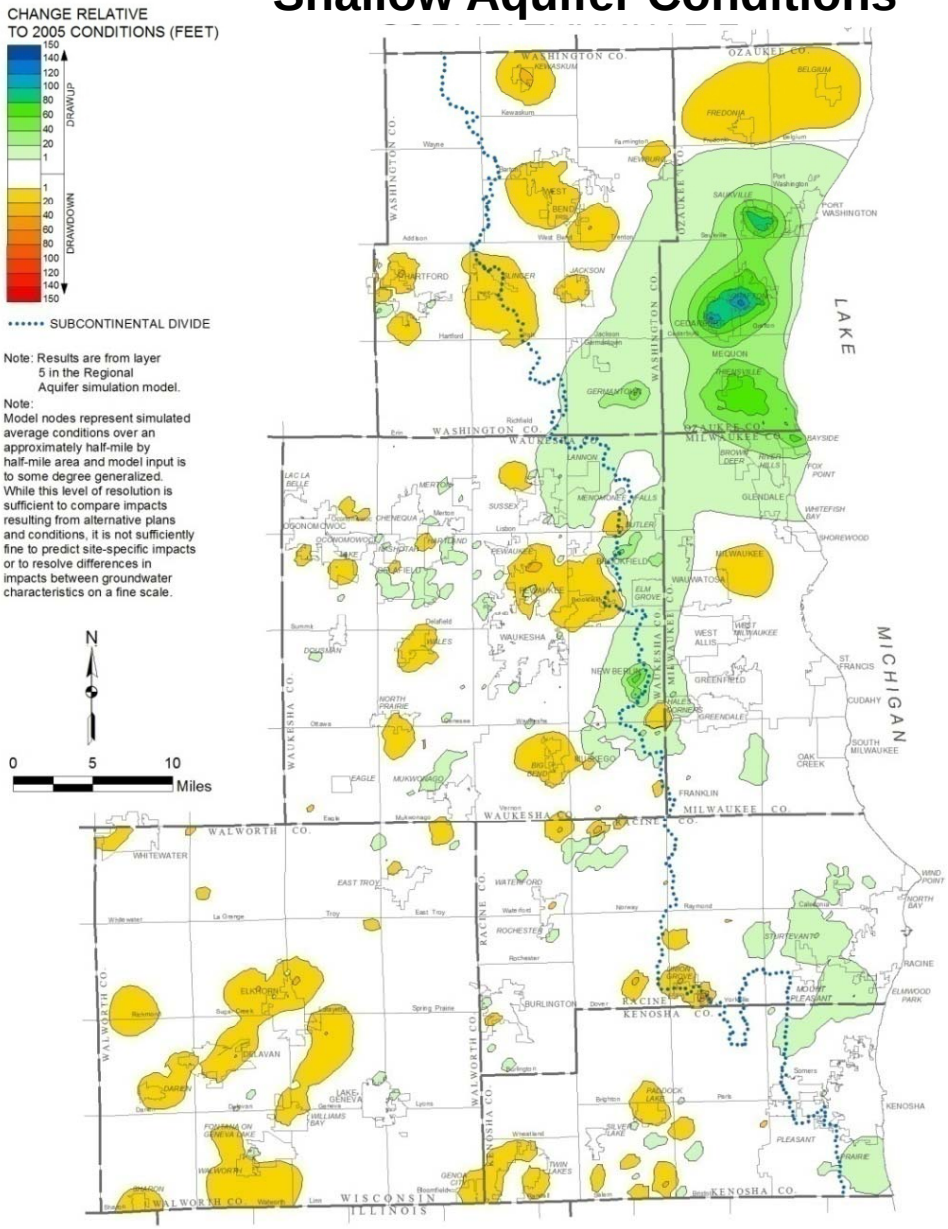


Evaluation of Recommended Plan

Deep Aquifer Conditions

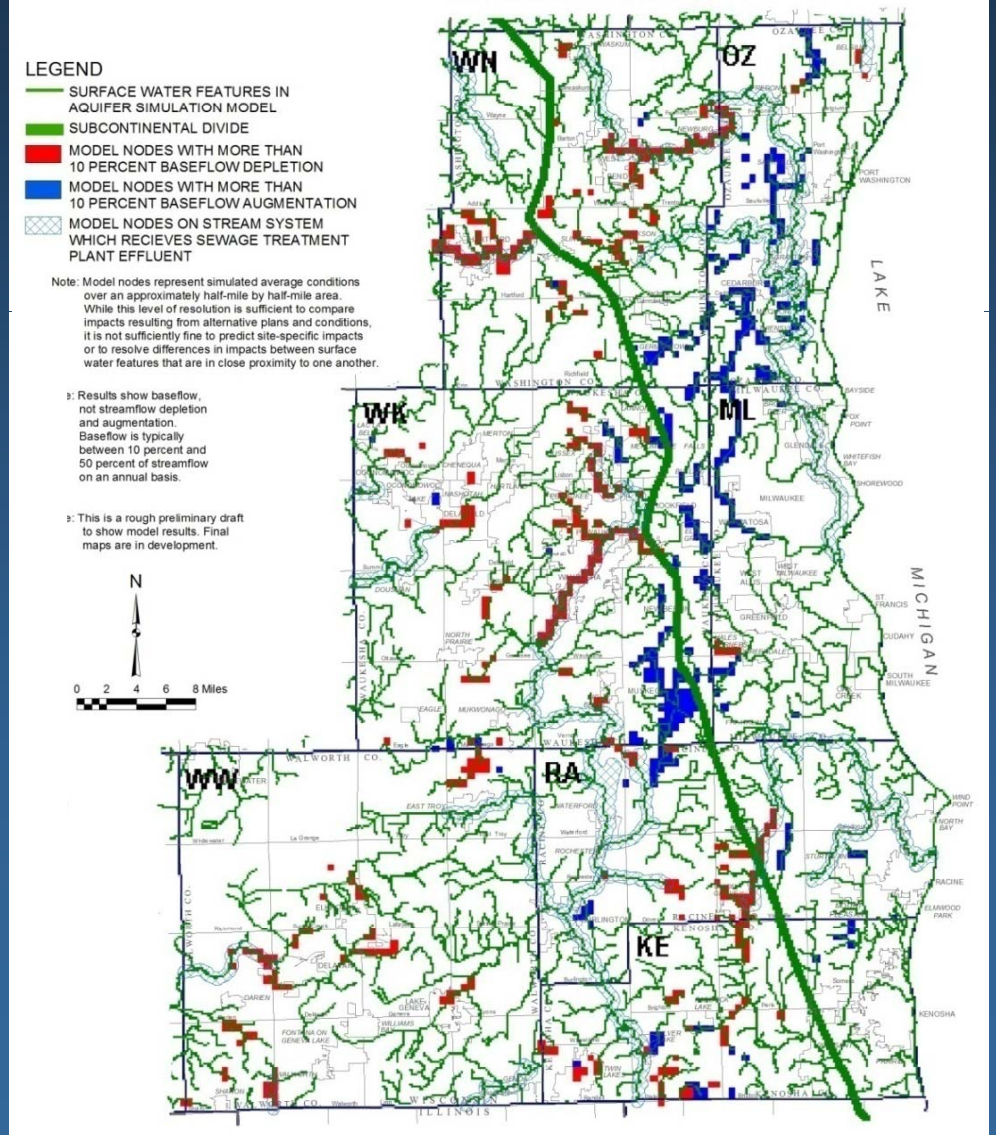


Shallow Aquifer Conditions



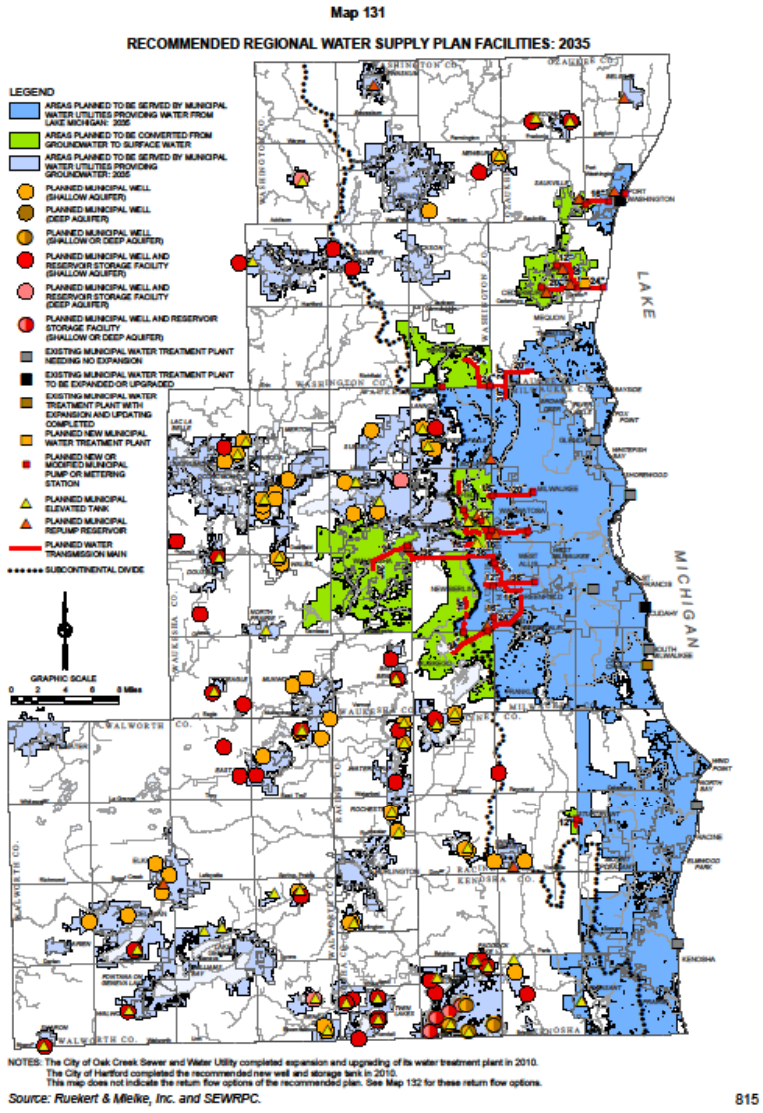
Evaluation of Recommended Plan—continued

Surface Water Impacts



Summary of Recommended Plan for Ozaukee County

- Sources of supply
- Water conservation programs
- Groundwater recharge area protection
- Stormwater management practices
- Enhanced rainfall infiltration systems in strategic locations
- Regulation of high capacity wells



Sources of Supply Plan Component

Two Ozaukee County utilities would continue to utilize Lake Michigan:

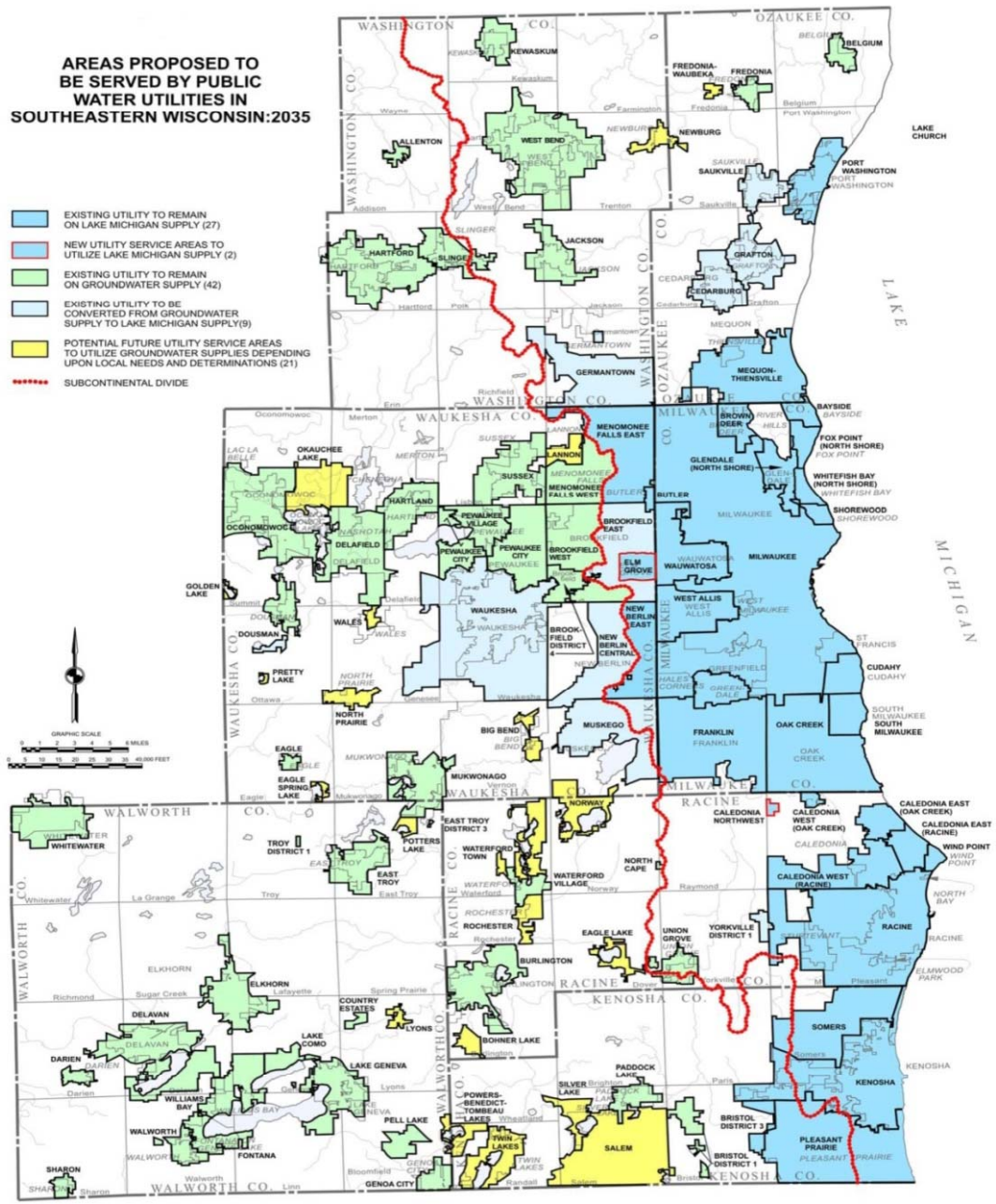
- **Mequon-Thiensville**
- **Port Washington**

Three utilities proposed to change to a Lake Michigan supply over the planning period (to 2035):

- **Cedarburg**
- **Grafton**
- **Saukville**

Two utilities would continue to rely on a shallow aquifer supply:

- **Belgium**
- **Fredonia**



Source: SEWRPC.

Options for Providing the City of Cedarburg and the Villages of Grafton and Saukville with a Lake Michigan Water Supply

- City of Cedarburg and Village of Grafton to be served by a new Lake Michigan water intake facility and treatment plant. Village of Saukville to connect to the City of Port Washington system.
- City of Cedarburg and Villages of Grafton and Saukville to connect to the City of Port Washington system, requiring expansion of the Port Washington water treatment plant.
- City of Cedarburg and Village of Grafton to connect to the City of Milwaukee Water works system. Village of Saukville to connect to the City of Port Washington system.

Sources of Supply Plan Component

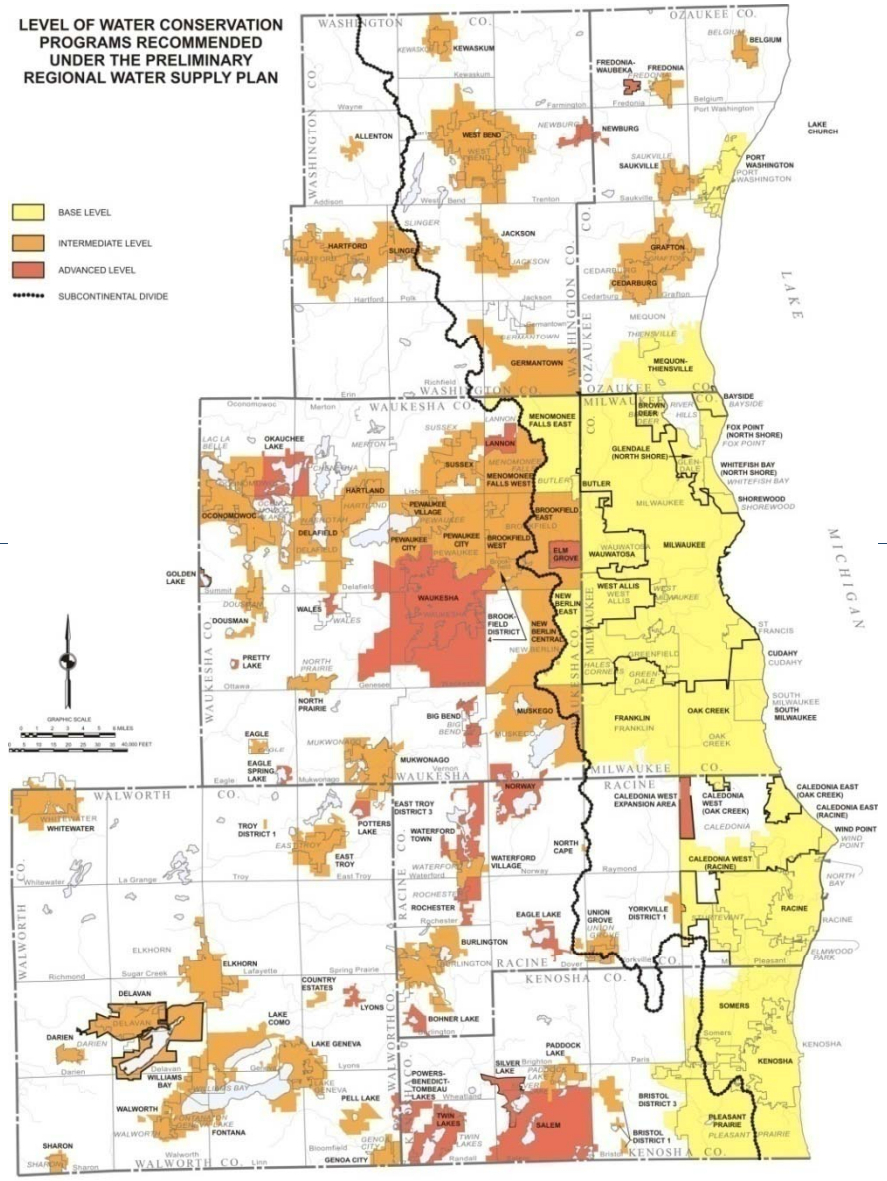
Lake Michigan Water Supply Element

Fundamental reasons for recommending the additional areas be supplied with Lake Michigan waters.

- **Reduction in chloride discharge.**
- **Favorable impacts on recovery of deep aquifer.**
- **Favorable environmental impacts on baseflows to surface waters.**
- **Ability to preserve groundwater for other uses, i.e., agriculture.**
- **Opportunity to use excess water production capacity at potential supplying water utilities.**

Water Conservation Plan Component

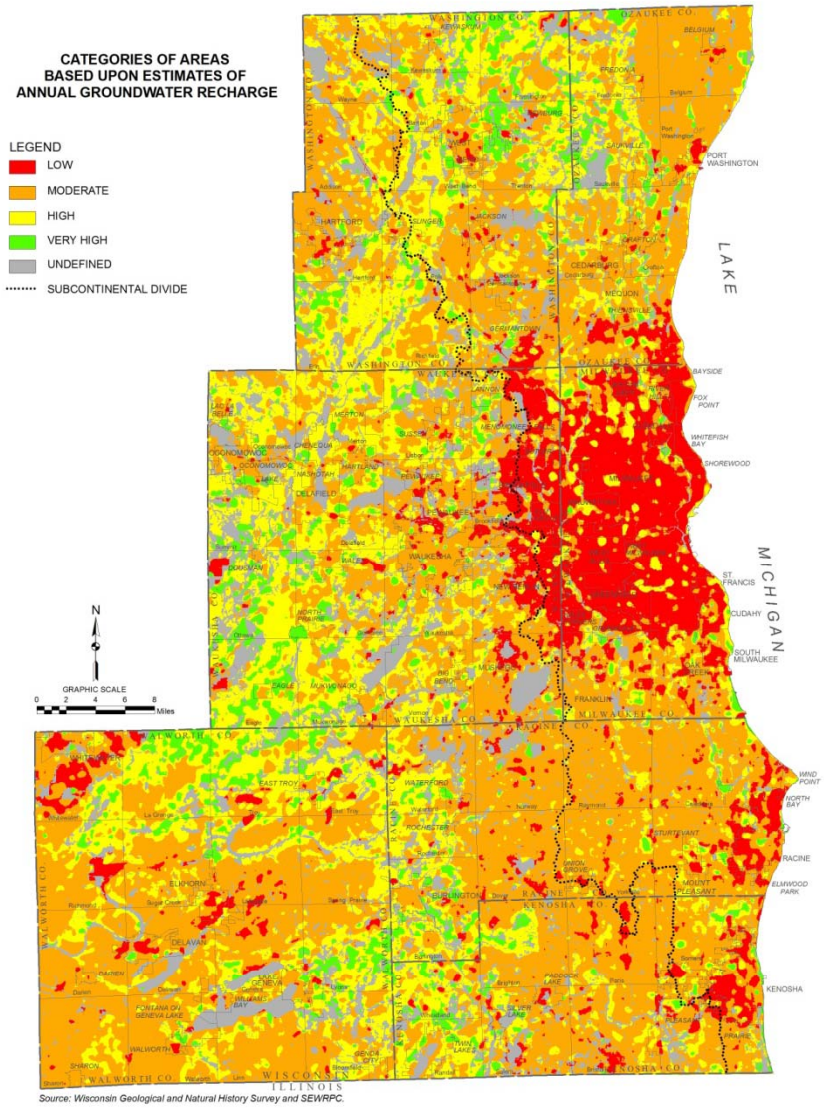
- **Base Level:**
  - Mequon-Thiensville
  - Port Washington
- **Intermediate Level**
  - Belgium
  - Cedarburg
  - Fredonia
  - Grafton
- **Advanced Level**
  - Fredonia-Waubeka
  - Newburg



Source: SEWRPC.

Groundwater Recharge Area Protection Plan Component

- Preserve areas with high/very high recharge
- 74% of such areas in environmental corridors and prime agricultural lands
- Application of Stormwater management practices in areas to be developed



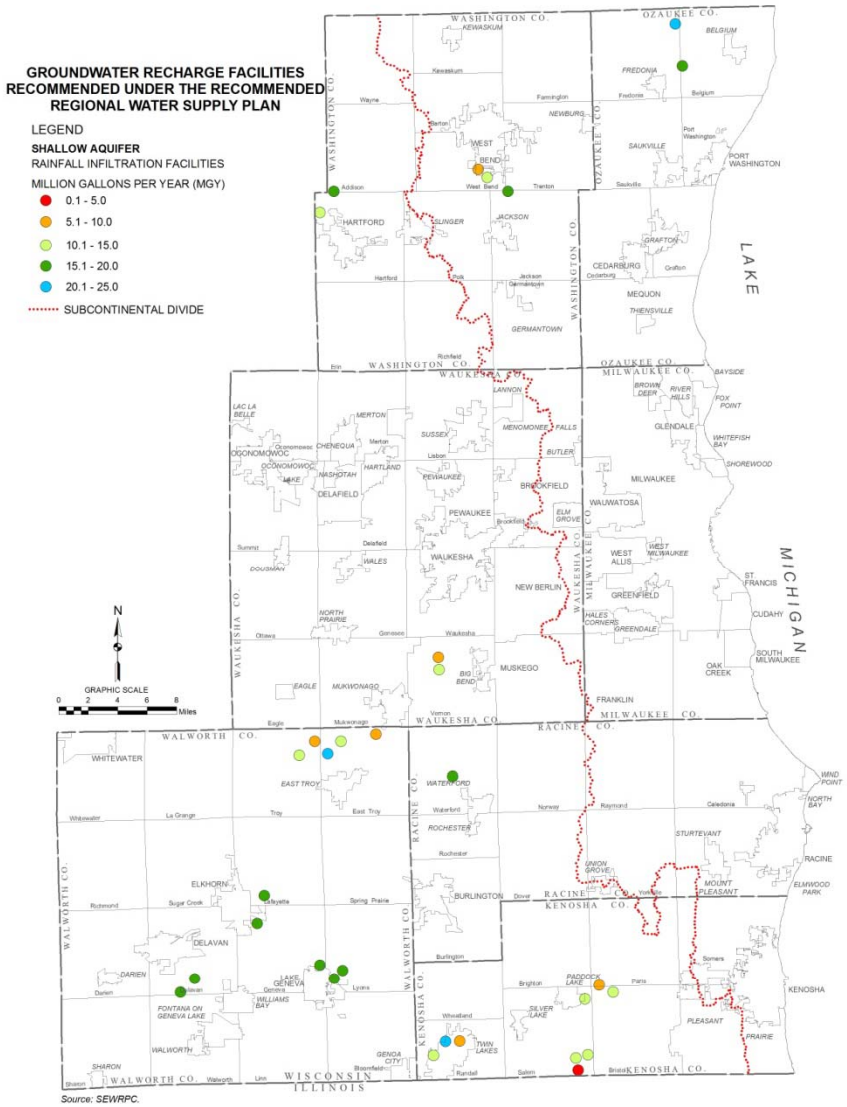
Source: Wisconsin Geological and Natural History Survey and SEWRPC.

Stormwater Management Practices Plan Component

- Recommends implementation of state-of-the-art stormwater management practices, including application of treatment and infiltration systems.
  - Intent is to attempt to maintain the natural recharge of areas upon development.
  - Will largely be implemented through NR 151 stormwater performance standards

Enhanced Rainfall Infiltration Systems Plan Component

- Enhanced rainfall infiltration systems include rain gardens, larger bioretention basins, infiltration ponds, infiltration ditches, and other systems.
  - Proposed where high-capacity wells in the shallow aquifer would result in reductions in base flow to nearby surface waterbodies or wetlands.
  - 32 systems recommended.



Source: SEWRPC.