Southeastern Wisconsin Regional Water Supply Planning Program Update

Alternative and Initially Recommended Plans: Waukesha County Focus

SOUTHEASTERN WISCONSIN REGIONAL PLANNING COMMISSION

Waukesha County Cooperation Council

October 27, 2008

#140235

Water Conservation Measures Envisioned Under the Alternative and Composite Water Supply Plan

Base Level Program (1,589,800 persons) Providing a 4% reduction in average day demand, and from 6 to 10% reduction in maximum day demand. Utilities using Lake Michigan with none or modest supply infrastructure needs.

- Water supply efficiency actions, such as leak detection and repair, water production system refinement, system audits
- Moderate level of public I & E
- Outdoor watering restrictions for residential users

Intermediate Level Program (413,000 persons) Providing a 6 to 8% reduction in average day demand, and a 12 to 14% reduction in maximum day demand. Utilities using groundwater supply with no major problems and with supply infrastructure needs or using new surface water supplies with significant infrastructure needs.

- All components of low level program
- Higher level public I & E
- Plumbing retrofits (shower heads, toilet displacement device kits)
- Water conservation rate structure revision and outdoor watering restrictions

Advanced Level Program (273,200 persons) Providing a 10% reduction in average day demand, and an 18% reduction in maximum day demand. Utilities using groundwater supply with aquifer problems and infrastructure needs or using new surface water supplies with major infrastructure needs.

- All components of intermediate level program
- Plumbing fixture management (toilet, washing machine, and water softener replacement rebates)
- More aggressive rate structure and outdoor watering restrictions

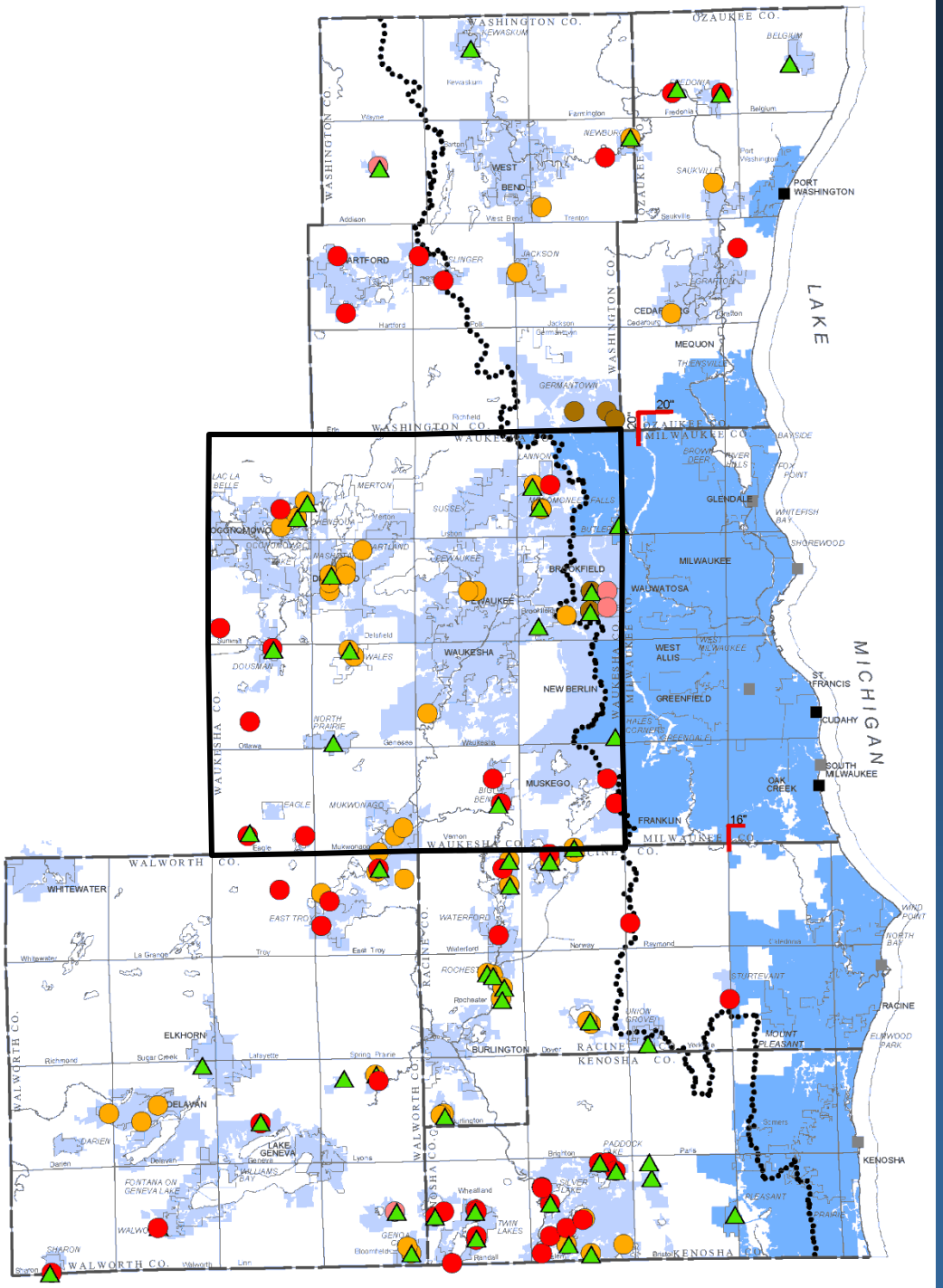
High Level Program (Evaluated and not included in regional plan recommendations – may be considered on a local utility specific basis) Providing a 25 to 35% reduction in average day demand, and a 30 to 50% reduction in maximum day demand

- All components of advanced level program
- Rain Harvesting
- Greywater Reuse System

Note: The measures noted are intended to serve as a guide for local utilities to develop utility specific programs. All programs would be designed to meet requirements of the Compact and State regulations under development. Additional measures may be applicable if needed to meet sewerage system protection or stormwater management objectives.

Regional Water Supply Plan
Alternative Plan 1–Design Year 2035 Forecast Conditions Under Existing Trends and Committed Actions

- AREAS SERVED BY MUNICIPAL WATER UTILITIES PROVIDING WATER FROM LAKE MICHIGAN: 2035
- AREAS SERVED BY MUNICIPAL WATER UTILITIES PROVIDING GROUND WATER: 2035
- EXISTING MUNICIPAL WATER TREATMENT PLANT NEEDING NO EXPANSION
- EXISTING MUNICIPAL WATER TREATMENT PLANT TO BE EXPANDED OR UPGRADED
- PLANNED MUNICIPAL WELL (SHALLOW AQUIFER)
- PLANNED MUNICIPAL WELL (DEEP AQUIFER)
- PLANNED MUNICIPAL WELL AND RESERVOIR STORAGE FACILITY (SHALLOW AQUIFER)
- PLANNED MUNICIPAL WELL AND RESERVOIR STORAGE FACILITY (DEEP AQUIFER)
- PLANNED MUNICIPAL WATER STORAGE FACILITY
- PLANNED WATER TRANSMISSION MAIN
- SUBCONTINENTAL DIVIDE



- Existing 2007 water supply facilities
- Enhanced local water conservation programs
- Continued reliance on groundwater sources to meet 2035 demand (light blue)
- Continued reliance on Lake Michigan water sources for all areas now served, meeting 2035 demand (dark blue)
- Recharge of groundwater at new construction sites to the extent required by State law
- Continued reliance on private wells for residential areas (about 180,000 persons) plus selected agricultural, irrigation, and industrial uses

Regional Water Supply Plan
Alternative Plan 2–Limited Expansion of Lake Michigan Supply

- AREAS SERVED BY MUNICIPAL WATER UTILITIES PROVIDING WATER FROM LAKE MICHIGAN: 2035
- AREAS CONVERTED FROM GROUNDWATER TO SURFACE WATER UNDER ALTERNATIVE PLANS 2 AND 3 COMPARED TO ALTERNATIVE PLAN 1: 2035
- AREAS SERVED BY MUNICIPAL WATER UTILITIES PROVIDING GROUND WATER: 2035
- EXISTING MUNICIPAL WATER TREATMENT PLANT NEEDING NO EXPANSION
- EXISTING MUNICIPAL WATER TREATMENT PLANT TO BE EXPANDED OR UPGRADED
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- PLANNED NEW OR MODIFIED MUNICIPAL PUMP OR METERING STATION
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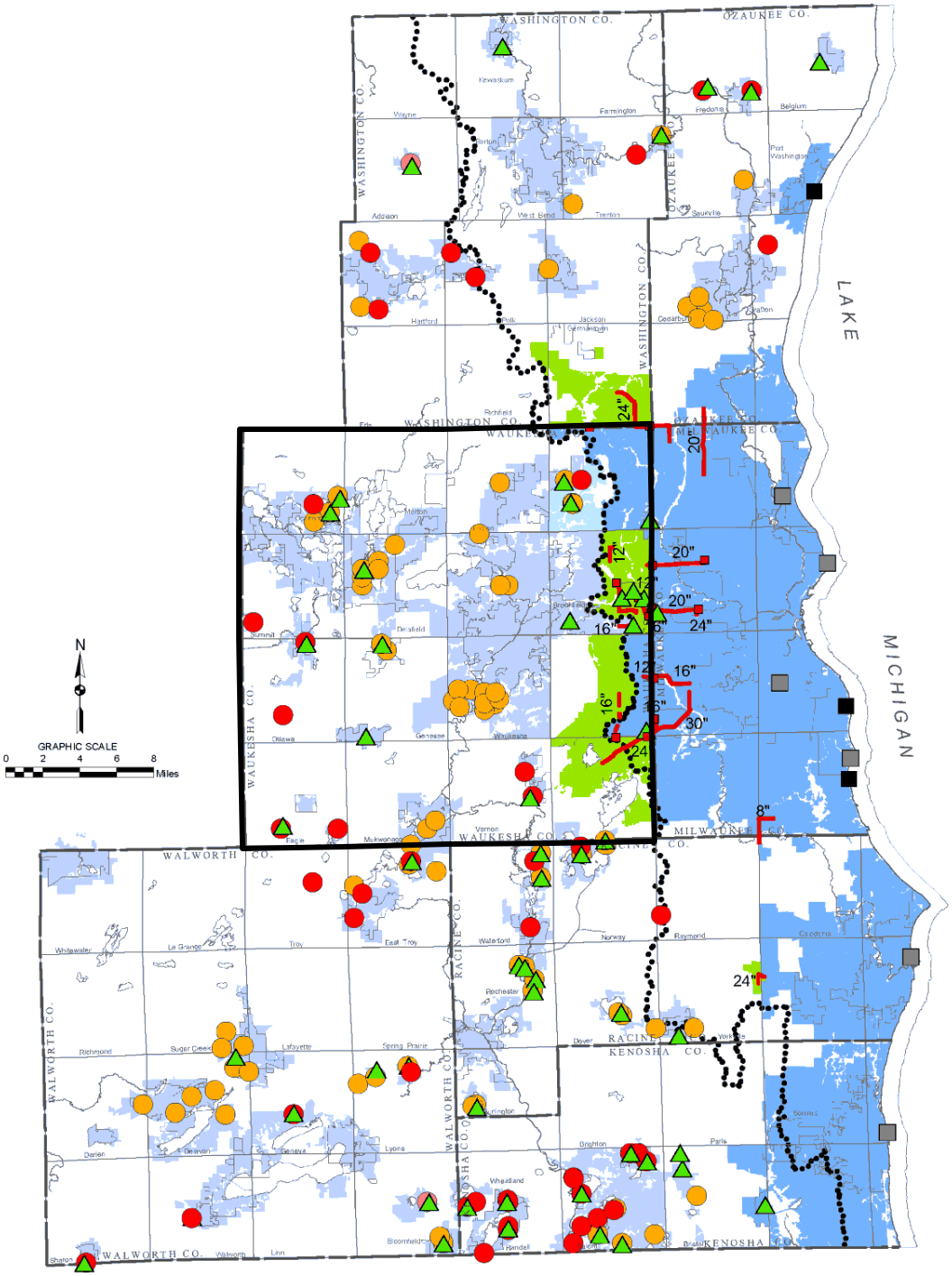
- SUBCONTINENTAL DIVIDE



- Includes most aspects of Alternative Plan 1, but converts certain areas to Lake Michigan supply
  - 4 areas east of the subcontinental divide (Germantown, Elm Grove, Brookfield-east, and Yorkville) all with existing return flow (green)
  - 2 areas west of the divide (New Berlin-central, Muskego) both with existing return flow (green)
  - Includes conversion of selected treated deep aquifer sources to shallow aquifer sources

Regional Water Supply Plan
Alternative Plan 3–Groundwater Recharge

SHALLOW AQUIFER RECHARGE FACILITIES

RAINFALL INFILTRATION FACILITIES (MILLION GALLONS PER YEAR)

- 0.1 - 5.0
- 5.1 - 10.0
- 10.1 - 15.0
- 15.1 - 20.0
- 20.1 - 25.0

WASTEWATER TREATMENT PLANT EFFLUENT INFILTRATION FACILITIES (MILLION GALLONS PER YEAR)

- 146
- 584
- 1,460
- 1,825

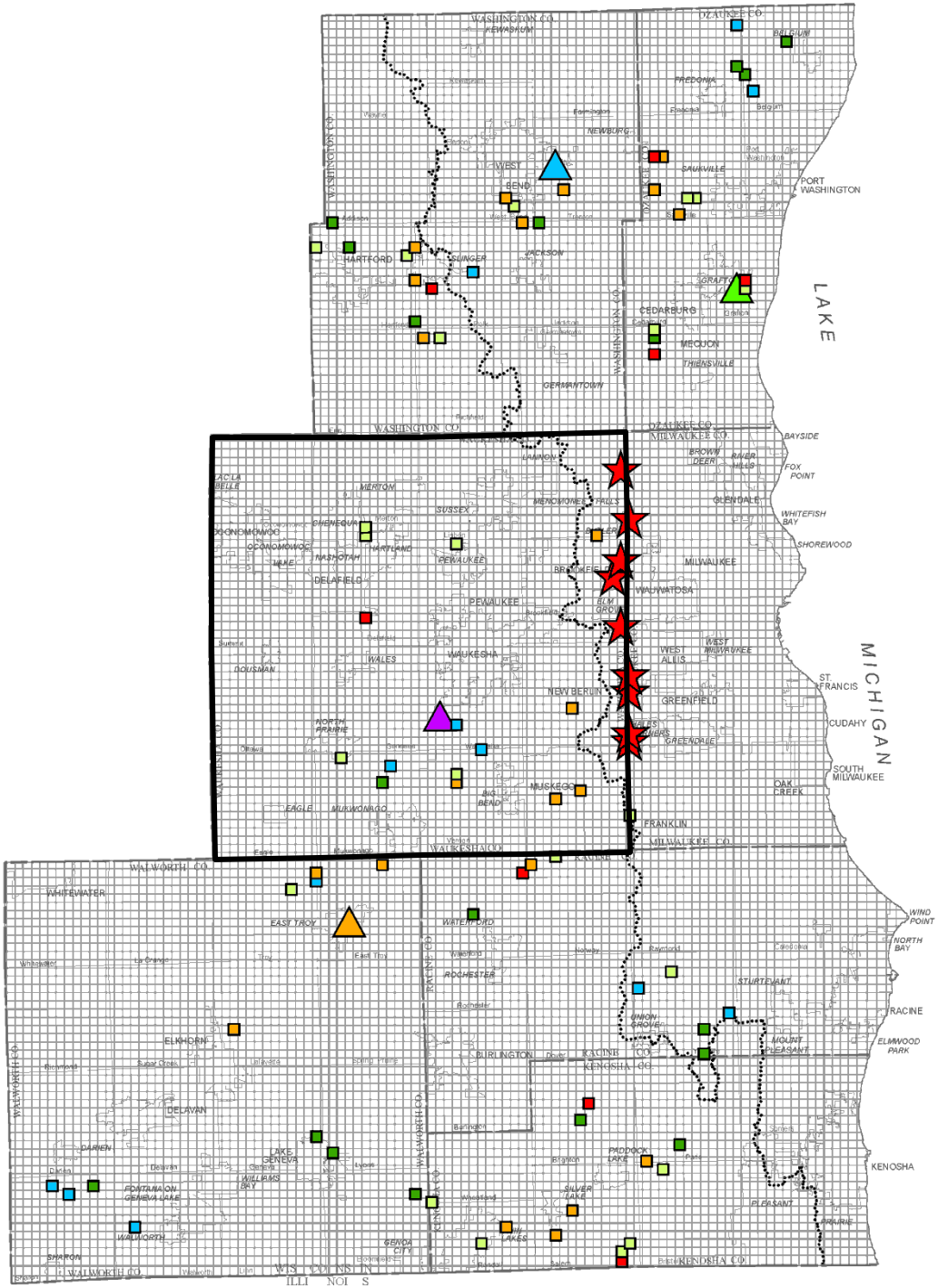
DEEP AQUIFER RECHARGE FACILITIES

INJECTION WELLS (MILLION GALLONS PER YEAR)

- 365

SUBCONTINENTAL DIVIDE

- Includes all aspects of Alternative Plan 2
- Enhancement of rainfall infiltration over 4.0 square miles of open space through bioengineering; sites to be selected
- Protection of most significant groundwater recharge areas through public purchase if necessary
- Recharge of groundwater at new construction sites beyond the extent required in State law
- Redirection of wastewater treatment plant effluent to shallow aquifer after enhanced treatment at 4 demonstration locations
- Recharge deep aquifer with treated Lake Michigan water



Regional Water Supply Plan
Alternative Plan 4–Further Expansion of Lake Michigan Supply

- AREAS SERVED BY MUNICIPAL WATER UTILITIES PROVIDING WATER FROM LAKE MICHIGAN: 2035
- AREAS CONVERTED FROM GROUNDWATER TO SURFACE WATER UNDER ALTERNATIVE PLANS 2 AND 3 COMPARED TO ALTERNATIVE PLAN 1: 2035
- AREAS SERVED BY MUNICIPAL WATER UTILITIES PROVIDING GROUND WATER: 2035
- EXISTING MUNICIPAL WATER TREATMENT PLANT NEEDING NO EXPANSION
- EXISTING MUNICIPAL WATER TREATMENT PLANT TO BE EXPANDED OR UPGRADED
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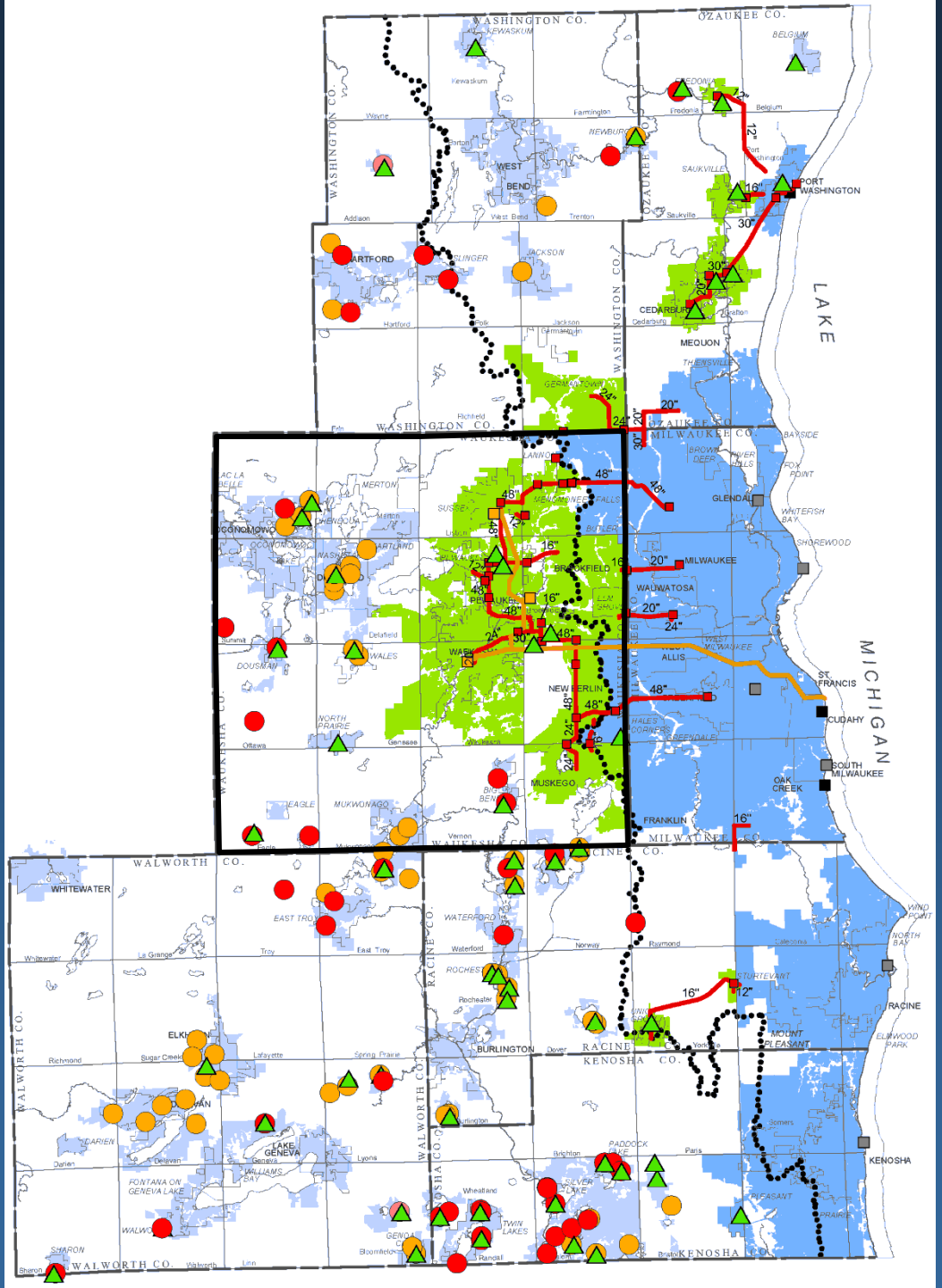
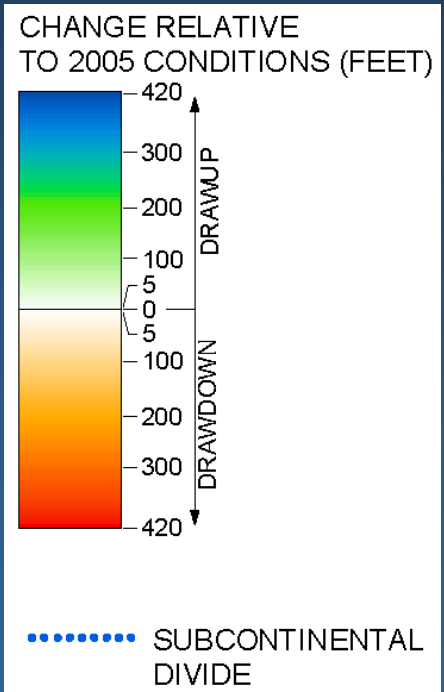
- PLANNED NEW OR MODIFIED MUNICIPAL PUMP OR METERING STATION
- PLANNED WATER TRANSMISSION MAIN
- PLANNED WATER RETURN-FLOW PIPELINE
- SUBCONTINENTAL DIVIDE

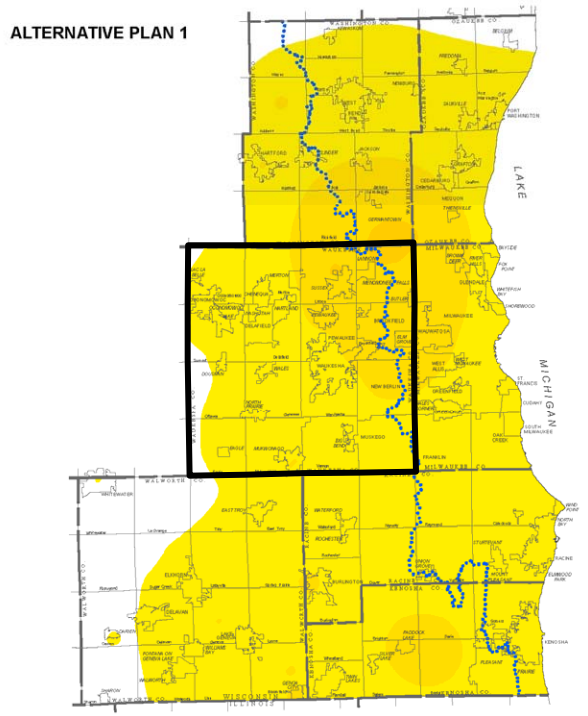


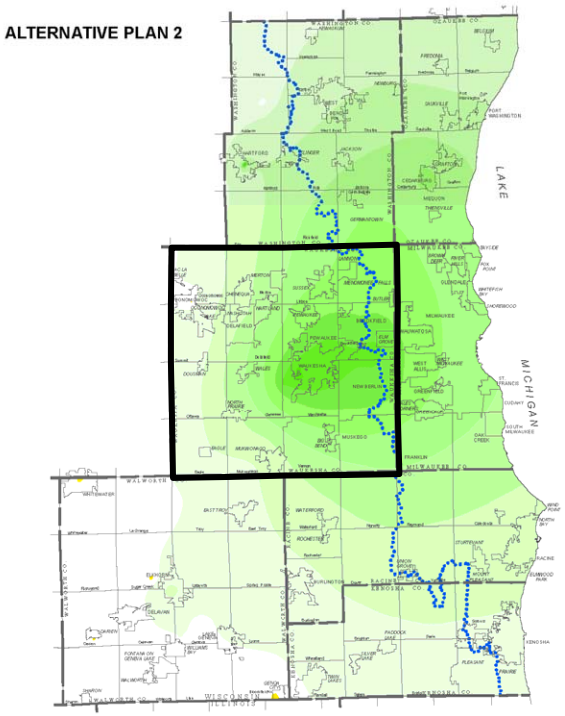
- Includes all aspects of Alternative Plan 2 but with conversion of selected additional areas to Lake Michigan supply all with return flow components
  - 4 areas east of the subcontinental divide (Cedarburg, Grafton, Fredonia, Saukville) (green)
  - 4 areas in communities which straddle the divide (Brookfield-west, Menomonee Falls-west, Brookfield-Town, Union Grove) (green)
  - 9 areas which are in communities west of the divide within a straddling county (Pewaukee-City, Pewaukee-Village, Sussex, portion of the Town of Lisbon, Lannon, Waukesha-City, portions of the Towns of Waukesha, Genessee, and Delafield) (green)

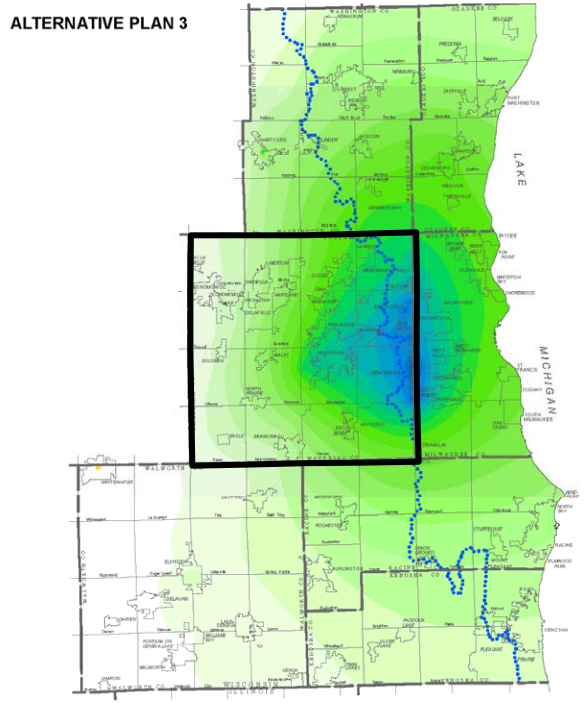
Evaluation of Four Alternative Plans

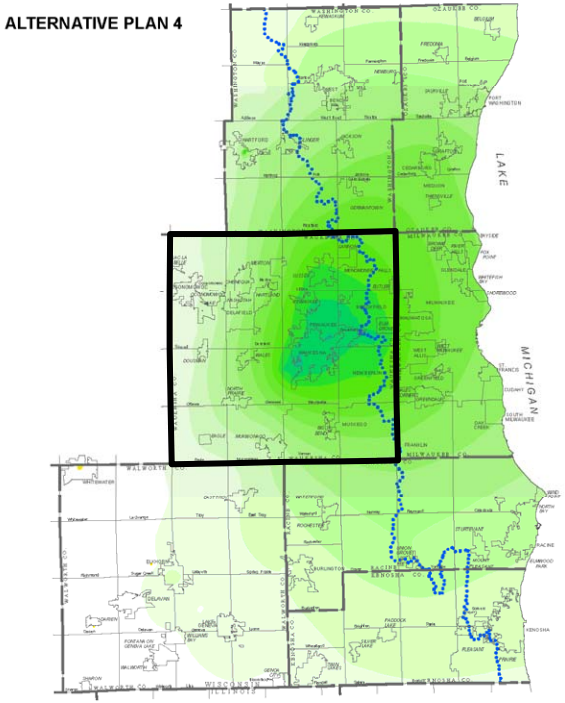
Deep Aquifer Conditions Associated with Alternative Water Supply Plans











Four Alternative Plans

Test and Evaluation Results-Summary

	Capital Costs	Annual Operating and Maintenance Cost	Equivalent Annual Cost	Deep Aquifer Impact	Shallow Aquifer Impact	Surface Water Impact
Alternative Plan 1	$172 million	$5.1 million	$11.3 million	Significant slowdown in the drawdown of the deep aquifer	Localized impact around community wells	4.5% reduction in groundwater derived baseflow
Alternative Plan 2	$222 million	$3.2 million gross -$3.3 million net*	$6.5 million	Drawup in the deep aquifer	Localized impact around community wells	5.3% reduction in groundwater derived baseflow
Alternative Plan 3	$370 million	$8.6 million gross $2.1 million net*	$13.1 million	Drawup in the deep aquifer	Localized impact around community wells	1.7% reduction in groundwater derived baseflow
Alternative Plan 4	$478 million	$7.3 million gross -$14.4 million net**	$18.0 million	Drawup in the deep aquifer	Localized impact around community wells	0.7% reduction in groundwater derived baseflow

*Includes a credit of $6.5 million for reduced household water softening costs.

**Includes a credit of $21.7 million for reduced water softening costs.

Regional Water Supply Plan
Subalternative 1 to the Composite Plan:

- AREAS SERVED BY MUNICIPAL WATER UTILITIES PROVIDING WATER FROM LAKE MICHIGAN: 2035
- AREAS CONVERTED FROM GROUNDWATER TO SURFACE WATER UNDER COMPOSITE SUBALTERNATIVE 1 PLAN: 2035
- AREAS SERVED BY MUNICIPAL WATER UTILITIES PROVIDING GROUND WATER: 2035
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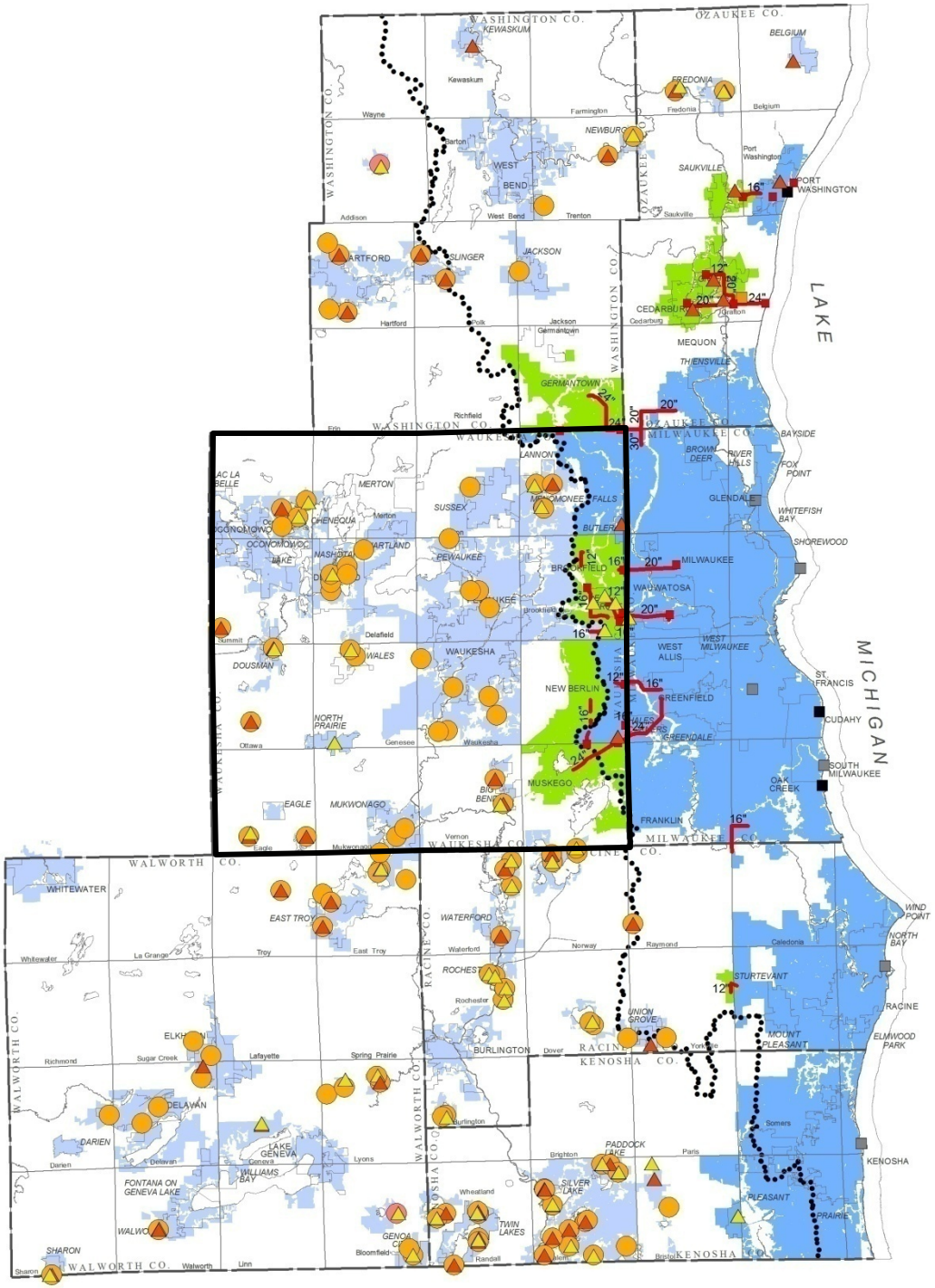
- PLANNED WATER TRANSMISSION MAIN
- SUBCONTINENTAL DIVIDE



- Enhanced local 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
- Enhancement of rainfall infiltration over 2.0 square miles of open space through bioengineering
- Continued reliance on private wells for selected residential areas (about 180,000 persons plus selected agricultural, irrigation, and industrial uses)

Regional Water Supply Plan
Subalternative 2 to the Composite Plan:

- AREAS SERVED BY MUNICIPAL WATER UTILITIES PROVIDING WATER FROM LAKE MICHIGAN: 2035
- AREAS CONVERTED FROM GROUNDWATER TO SURFACE WATER UNDER COMPOSITE SUBALTERNATIVE 2 PLAN: 2035
- AREAS SERVED BY MUNICIPAL WATER UTILITIES PROVIDING GROUND WATER: 2035
- PLANNED MUNICIPAL WELL (SHALLOW AQUIFER)
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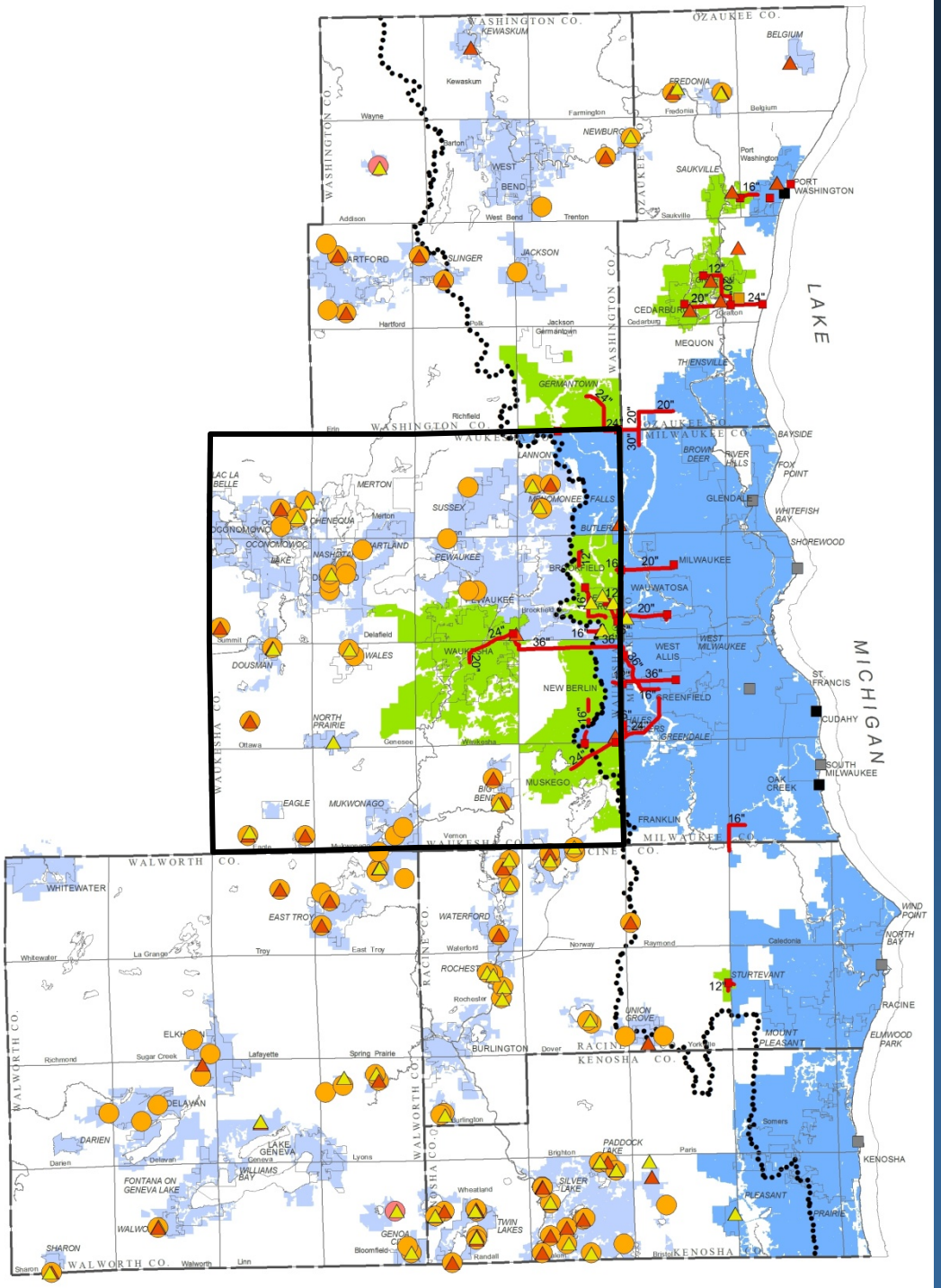
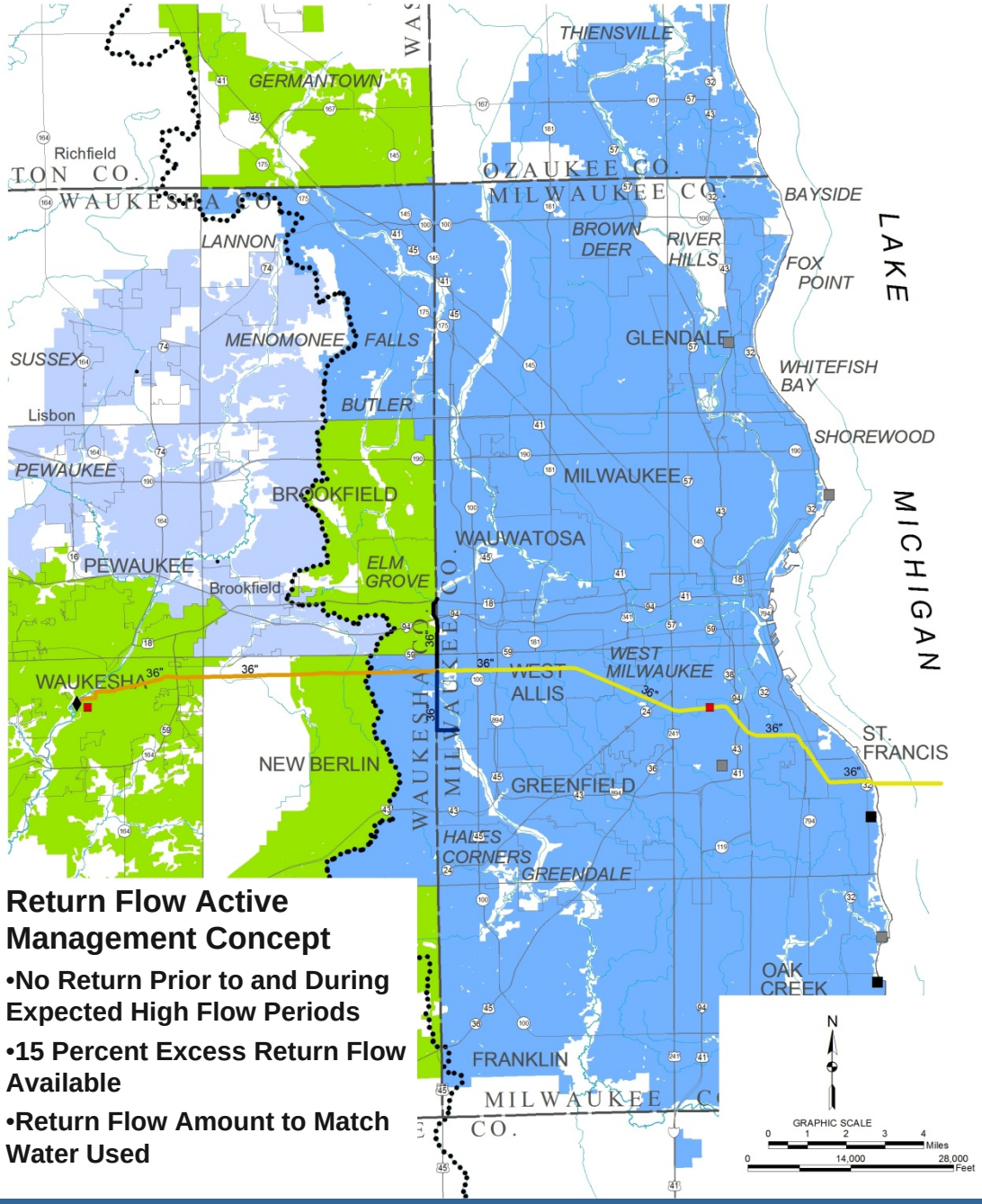


- Includes all aspects of subalternative 1 to the composite plan except:
  - The city of Waukesha water utility is converted to a Lake Michigan supply with a return flow component
  - The enhanced rainfall infiltration acreage is reduced from 2.0 to 1.7 square miles

Options 1 – 4 for Return Flow for Subalternative 2 to the Composite Plan: Return Flow Pipelines to Lake Michigan, Underwood Creek, and Root River

- AREAS SERVED BY PUBLIC WATER UTILITIES PROVIDING WATER FROM LAKE MICHIGAN UNDER ALTERNATIVE PLAN 1: 2035
- AREAS CONVERTED FROM GROUNDWATER TO SURFACE WATER UNDER ALTERNATIVE PLANS 4 COMPARED TO ALTERNATIVE PLAN 1: 2035
- AREAS SERVED BY PUBLIC WATER UTILITIES PROVIDING GROUNDWATER: 2035
- EXISTING MUNICIPAL WATER TREATMENT PLANT NEEDING NO EXPANSION
- EXISTING MUNICIPAL WATER TREATMENT PLANT TO BE EXPANDED OR UPGRADED
- EXISTING MUNICIPAL WASTEWATER TREATMENT PLANT
- PLANNED NEW PUMPING STATION
- PLANNED WATER RETURN FLOW PIPELINE: OPTIONS 1, 2, 3, AND 4
- PLANNED WATER RETURN FLOW PIPELINE: OPTION 1
- PLANNED WATER RETURN FLOW PIPELINE: OPTION 2 AND 4
- PLANNED WATER RETURN FLOW PIPELINE: OPTION 3 AND 4
- SUBCONTINENTAL DIVIDE

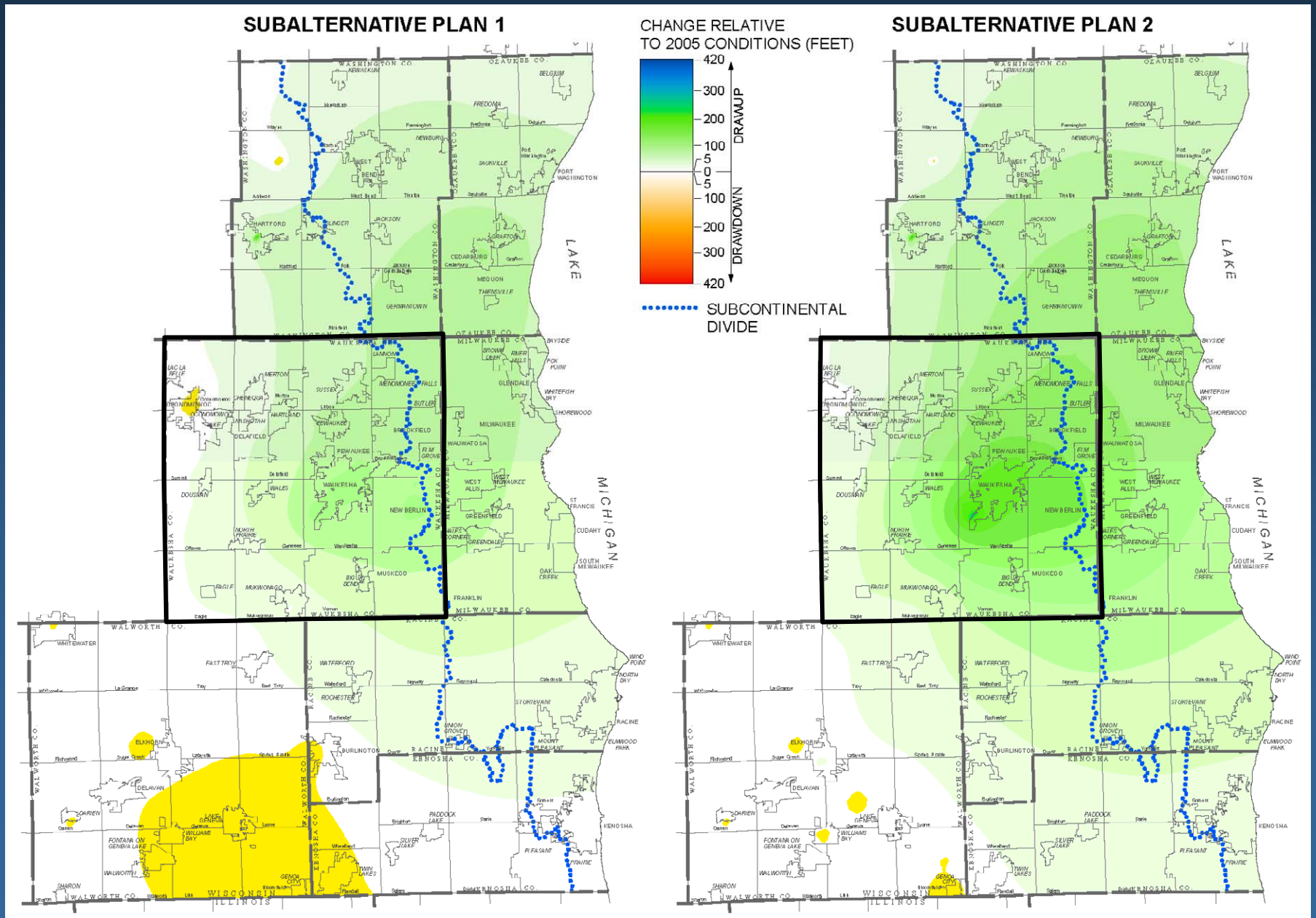


Return Flow Active Management Concept

- **No Return Prior to and During Expected High Flow Periods**
- **15 Percent Excess Return Flow Available**
- **Return Flow Amount to Match Water Used**

Evaluation of Subalternative Composite Plans

Deep Aquifer Conditions Associated with Subalternatives of the Composite Plan



Composite Plans

Test and Evaluation Results-Summary

	Capital Costs	Annual Operating and Maintenance Cost	Equivalent Annual Cost	Deep Aquifer Impact	Shallow Aquifer Impact	Surface Water Impact
Subalternative 1 Composite Plan	$278 million	$5.4 million gross -$4.0 million net*	$10.0 million	Drawup in the deep aquifer	Localized impact around community wells	3.4% reduction in groundwater derived baseflow
Subalternative 2 Composite Plan	$326 million	$8.0 million gross -$8.7 million net*	$8.4 million	Drawup in the deep aquifer	Localized impact around community wells	2.0% reduction in groundwater derived baseflow

*Includes a credit of $9.4 million for reduced household water softening costs.

**Includes a credit of $16.7 million for reduced water softening costs.

Summary of Plan Findings and Recommendations

- Water Conservation
  - The level of water conservation to be implemented should be utility-specific based upon the utility infrastructure needs, the characteristics and sustainability of the source of supply, and consistency with the Compact and Federal and State regulations.
  - The level of water demand reduction which might be expected from water conservation programs utilitywide will vary from 4 to 10 percent in average daily demand and from 6 to 18 percent in maximum day demand. For most Waukesha County communities the recommendations provide for an intermediate or advanced level water conservation providing for from 6 to 10 percent reduction in average daily demand and a 12 to 18 percent reduction in maximum daily demand.
- Groundwater Recharge
  - The recharge areas within southeastern Wisconsin have been identified and ranked low, moderate, high, and very high with regard to the amount of recharge which occurs on each acre of land. Implementation of the 2035 regional land use plan will result in protection of about 80 percent of the area ranked as having high and very high recharge characteristics. In Waukesha County about 85 percent of the high and very high recharge areas are planned for protection based upon the County comprehensive plan and 2035 regional land use plan.

Summary of Plan Findings and Recommendations

Water Supply Sources

- There are viable options which rely on increased use of the shallow groundwater as a source of supply for communities located west of the subcontinental divide in Waukesha County.
- The initially preferred plan relies on the use of a Lake Michigan supply to serve portions of two communities (New Berlin and Muskego) which straddle the subcontinental divide and one community (Waukesha) located west of the subcontinental divide within a straddling county, as well as a number of communities located east of the divide. Other communities would continue to rely on groundwater supplies. This plan is being proposed because of its benefits in the drawup of the deep aquifer, minimizing loss of baseflow in surface water, and reducing chloride discharges to surface waters.

Summary of Plan Findings and Recommendations

- Most Waukesha County utilities would continue to utilize groundwater as a long term source of supply.
- Utility areas expected to continue to use Lake Michigan as a source of supply include
  - Eastern Menomonee Falls
  - Eastern New Berlin
  - Butler
- Utility areas expected to change to a Lake Michigan supply over the planning period (to 2035) include
  - Eastern Brookfield (east of divide)
  - Central New Berlin (straddling community, return flow system already in place)
  - Elm Grove (east of divide)
  - Muskego (straddling community , return flow system already in place)
  - Waukesha (west of divide in straddling county , new return flow system required)
  - Germantown, in adjacent Washington (east of divide)
- A partial recovery or drawup is expected in the deep aquifer.
- Groundwater pumping in the County would remain nearly constant at about 34 mgd from 2005 through 2035. Lake Michigan supply use would increase from about 6 mgd in 2005 to about 22 mgd in 2035.

Summary of Plan Findings and Recommendations

- Selected Waukesha County areas currently served by individual wells are included in the long-term municipal water supply service areas
  - Big Bend
  - Elm Grove
  - Lannon
  - Portion of the Village of Wales
  - Eagle Spring Lake
  - Okauchee Lake
  - Golden Lake
  - Pretty Lake
  - Portion of Town of Delafield
  - Portion of Town of Genessee
  - Portion of Town of Lisbon
  - Portion of Town of Oconomowoc
  - Portion of Town of Summit
  - Portion of Town of Waukesha

  These areas would not be required to be served by municipal utilities. New utilities would be created only if local conditions and initiatives warrant such creation. Absent a demonstrated need, residents and businesses of these areas would remain on individual wells indefinitely.

Summary of Plan Findings and Recommendations

- Recommended high capacity wells siting procedures would involve more site selection and impact analysis, monitoring, and mitigation steps.
- The cost of the new facilities and programs envisioned in the plan for municipal utilities averages $14 per capita per year, with a range of from under $2 per person in Milwaukee County to over $80 per person in outlying areas. The average costs are expected to be about $39 per person in Waukesha County. However, if individual home water treatment (softening) cost reductions are factored in, the average per person costs are much lower.
- For utilities with the largest expected costs (for converting to a Lake Michigan supply), there are expected savings in individual water treatment (softening) which will largely offset the costs.
- The impacts of groundwater pumping on stream baseflow are minimized. 1.5 percent reduction is expected by 2035

Regional Water Supply Planning Program

Remaining Steps in Planning Process	Estimated Time Frame
Public informational meetings, outreach, and other activities	October through December, 2008
Complete planning report (recommended plan, implementation, and summary chapters)	March, 2009