

**MINUTES OF THE FIFTEENTH MEETING
SEWRPC REGIONAL WATER SUPPLY PLANNING ADVISORY COMMITTEE**

DATE: August 21, 2007

TIME: 9:00 a.m.

PLACE: Lower Level Conference Room
Regional Planning Commission Offices
W239 N1812 Rockwood Drive
Waukesha, Wisconsin

MEMBERS PRESENT

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| Kurt W. Bauer, Chairman | Executive Director Emeritus, SEWRPC |
| Robert P. Biebel, Secretary | Special Projects Environmental Engineer, SEWRPC |
| Thomas J. Bunker | Representative, Water and Wastewater Utility, City of Racine |
| Douglas S. Cherkauer | Professor of Hydrogeology, University of Wisconsin-Milwaukee |
| Lisa Conley | Representative, Town and Country Resource Conservation and Development, Inc. |
| Charles A. Czarkowski | Regional Water Program Expert, Wisconsin Department of Natural Resources, Southeast Region |
| Franklyn A. Ericson | Manager, Environmental Operations & Central Services, S.C. Johnson & Son, Inc. |
| Thomas M. Grisa | Director of Public Works, City of Brookfield |
| Eric J. Kiefer | Manager, North Shore Water Commission |
| Terrence H. Kiekhaefer | Director of Public Works, City of West Bend |
| Carrie M. Lewis | Superintendent, Milwaukee Water Works, City of Milwaukee |
| George E. Melcher | Director, Kenosha County Department of Planning and Development |
| Paul E. Mueller | Administrator, Washington County Planning and Parks Department |
| Nancy Quirk (for Daniel S. Duchniak) | Technical Services Manager, Waukesha Water Utility, City of Waukesha |
| Michael P. Rau | General Manager, We Energies-Water Services |
| Chad Sampson (for Julie A. Anderson) | County Conservationist, Racine County |
| Michael J. Sullivan (for Steven N. Yttri) | Utility Engineer, Water and Sewer Utility, City of Oak Creek |
| Daniel S. Winkler | Director of Public Works and Utilities, City of Lake Geneva |

MEMBERS EXCUSED OR OTHERWISE ABSENT

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| Kenneth R. Bradbury | Hydrogeologist/Professor, Wisconsin Geological and Natural History Survey |
| Michael P. Cotter | Director, Walworth County Land Use and Resource Management Department |
| Charles P. Dunning | Hydrologist, U.S. Geological Survey |
| David Ewig | Water Superintendent, City of Port Washington |
| Jeffrey A. Helmuth | Hydrogeologist Program Coordinator, Wisconsin Department of Natural Resources, Madison |
| Andrew A. Holschbach | Director, Ozaukee County Planning, Resources, and Land Management Department |

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| Thomas J. Krueger | Water and Wastewater Utility Director, Village of Grafton |
| Mark Lurvey | Agricultural Business Operator |
| Matthew Moroney | Executive Director, Metropolitan Builders Association of Greater Milwaukee |
| Jeffrey Musche | Administrator/Clerk, Town of Lisbon |
| Edward St. Peter | General Manager, Water Utility, City of Kenosha |
| Dale R. Shaver | Director, Waukesha County Department of Parks and Land Use |
| James Surfus | Senior Environmental Engineer, Miller Brewing Company |
| George A. Torres | Director, Milwaukee County Department of Transportation & Public Works |

GUESTS

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| Randall R. Kerkman | Administrator, Town of Bristol |
| Steven H. Schultz | Department Head, Water Supply and Wastewater Treatment, Ruekert & Mielke, Inc. |
| Ben Wood | Engineer, Strand Associates, Inc. |

STAFF

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| Joseph E. Boxhorn | Senior Planner, Southeastern Wisconsin Regional Planning Commission |
| Kenneth R. Yunker | Deputy Director, Southeastern Wisconsin Regional Planning Commission |

CALL TO ORDER AND ROLL CALL

Chairman Bauer called the meeting to order at 9:00 a.m. Roll call was taken by circulating an attendance signature sheet, and a quorum was declared present.

CONSIDERATION OF MINUTES OF THE MEETING OF JULY 17, 2007

Chairman Bauer noted that copies of the minutes of the July 17, 2007, meeting of the Committee had been provided to all members of the Committee for review prior to the meeting, and asked that the Committee consider approval of those minutes.

Chairman Bauer reminded the Committee members that all of the revisions which the Committee directed to be made in the materials reviewed at that meeting were intended to be fully documented in the minutes, or in attachments thereto. He noted that approval of the minutes would constitute approval of Chapter VII, "Water Supply Problem Identification and Issues to Be Addressed," of SEWRPC Planning Report No. 52, *A Regional Water Supply Plan for Southeastern Wisconsin*. He noted that the approval would, of course, be subject to any comments received today on the minutes and the attachments thereto.

Mr. Grisa referred to Exhibit D of the July 17, 2007, minutes which included an issue description related to surface water quality. Mr. Grisa noted that under the issue description, there was no discussion of urban and rural stormwater runoff as a source of pollution. He noted that recent studies have supported the finding that nonpoint source pollution is the major contributing source of surface water pollution. The Committee agreed that the text concerned should be expanded to include nonpoint sources as a major source of surface water pollution.

[Secretary's Note: Additional text on nonpoint sources of pollution was added to the section describing the surface water quality issue. A revised copy of the section (formerly Exhibit D of

the minutes July 17, 2007, meeting) setting forth the description of the surface water quality issue is attached hereto as Exhibit A.]

Mr. Grisa also noted that the first and last sentences under the subheading "sewer overflows" seemed to be inconsistent. It was agreed to add the word "Historically" as the first word of the third paragraph on the first page of Exhibit D (now Exhibit A).

There being no further corrections or additions, the minutes of the meeting of July 17, 2007, were approved as amended, on a motion by Mr. Grisa, seconded by Mr. Melcher, and carried unanimously.

CONSIDERATION OF SEWRPC STAFF MEMORANDUM, "CONCEPTUAL FRAMEWORK FOR EXISTING AND FUTURE CONDITION ALTERNATIVE PLANS TO BE CONSIDERED UNDER THE REGIONAL WATER SUPPLY PLANNING PROGRAM FOR SOUTHEASTERN WISCONSIN, REVISED AUGUST 7, 2007"

Chairman Bauer then asked the Committee to consider Agenda Item 3. He noted that all Committee members had received a copy of the SEWRPC Staff Memorandum entitled "Conceptual Framework for Existing and Future Condition Alternative Plans to be Considered Under the Regional Water Supply Planning Program for Southeastern Wisconsin, Revised August 7, 2007" He noted that an earlier version of this memorandum was reviewed by the Regional Water Supply Planning Advisory Committee at its June 7, 2006, meeting. He reminded the Committee that there had been general agreement with the conceptual description of the Base Year 2000 Conditions and the Initial Design Year 2035 forecast conditions based upon existing trends and committed actions. Further detail, however, was requested by the Committee regarding the other alternative plans. He noted that additional detail was being provided in the memo to be reviewed, along with additional detail on the 2035 base year condition.

Chairman Bauer then asked Mr. Biebel to review the memorandum on a page-by-page basis. The following comments were made, questions asked, and actions taken during the review.

Mr. Biebel reported that the Commission staff had prepared three additional maps which were intended to visually depict the sources of supply under each of the alternative plans. Copies of those maps were then distributed.

[Secretary's Note: Copies of the three maps which were distributed, and as amended during the meeting, are included in the revised version of the staff memorandum transmitted with these minutes.]

Mr. Biebel indicated that the intent of presentation of the memorandum to the Committee for review was to obtain Committee concurrence on a conceptual basis of the alternative plans to be considered prior to undertaking the development, description, costing, and comparative evaluation of these plans. He indicated that it was recognized that there may be a need to refine the concepts involved in the alternatives as they are developed, or upon the Committee review of the plans.

Dr. Cherkauer referred to the second sentence in the second full paragraph on page 1. He recommended, and it was agreed, to add the words "base flow to the" before the words "surface waters."

Mr. Grisa referred to the description of Alternative Plan 1 on page 2, and asked if that alternative would include consideration of treatment facilities needed to resolve groundwater quality problems. Mr. Biebel indicated that it would include consideration of such facilities, and it was agreed to add the words "with associated treatment facilities and" after the word "supply" in the second, second-level bulleted item on page 2.

[Secretary's Note: For consistency, the words "and treatment" were also added after the word "supply" under the first second-order bulleted item under Alternative Plan 2 on page 3 (now on page 4).]

Dr. Cherkauer referred to Alternative Plan 1 and asked if the new wells which were found to be needed would be finished in the same aquifers currently being used, and asked how the wells would be distributed. Mr. Biebel replied that new wells needed by a utility would be finished in the same aquifer as the existing wells used by that utility, unless there were reasons which dictated otherwise. In cases where communities used multiple aquifers, judgment would be used to select the aquifer in which the new wells would be assumed to be finished. He indicated further that the staff would place the new wells in the groundwater model cells, and that such placement would be based upon local plans and judgment.

Dr. Cherkauer asked if the alternative plans would assume the implementation of the infiltration requirements for new development as set forth in Chapter NR 151 of the *Wisconsin Administrative Code*. Mr. Biebel responded that was the intent, recognizing, however, that, in many cases, there were exemptions permitted from the specified infiltration requirements based upon the site-specific land use, soils, and depth to groundwater. He indicated that judgments will have to be used to develop valid assumptions on the areawide effectiveness of the infiltration requirements of Chapter NR 151.

Dr. Cherkauer noted that Chapter NR 151 requires that post-development infiltration be from 60 to 90 percent of the pre-development infiltration, depending upon the land use. He asked if there was any evidence that this requirement was being met. Mr. Biebel reported that, in many cases, the basis for determining compliance with Chapter NR 151 was the expected effectiveness of the stormwater management practices proposed to be employed, as such effectiveness is given by the state-of-the-art of the technology involved. He indicated that he did not know of instances where actual monitoring by pre- and post-development measurements of infiltration or runoff have been made. Chairman Bauer suggested that such measurements may be an appropriate topic for university research.

Mr. Czarkowski asked if the process of selecting the generalized sites for new wells would consider regulatory constraints, and cited as an example, the Town of Richfield ordinance. Mr. Biebel reported that a local ordinance, such as the Richfield ordinance, would not be considered a basis for the exclusion from consideration of a new well site, since such an ordinance could not specifically prohibit new wells. He further noted that if a site in the Town appeared to be the best location for a needed new well, it would likely be selected, but that the issue of the local ordinance would have to be raised and considered. After further discussion, it was agreed to add text indicating that regulatory constraints would be considered as the locations of new wells were evaluated.

[Secretary's Note: In order to clarify that regulatory constraints will be considered in water supply facility siting, the text of the fourth second order bulleted item on page 2 has been revised. That revised text is included in the revised version of the staff memorandum transmitted with these minutes.]

In an answer to a further question by Dr. Cherkauer, Mr. Biebel indicated that the potential siting of new wells would not be constrained to locations within the current corporate limits of the communities served. Mr. Biebel noted that the plan design year 2035 water supply service areas often extend well beyond the current corporate limits of the communities needing the wells, and that it was often not feasible to site wells within the existing limits due to development patterns, required site size, and separation requirements from potential pollution sources, such as automobile service stations. He noted that many wells have historically been located beyond the then-current corporate limits of a municipality; and, in nearly all cases, such sites have been annexed to the well owner municipality.

Dr. Cherkauer recalled that one of the options which the City of Waukesha was apparently considering provided for the development of deep aquifer wells in western Waukesha County where that aquifer is not confined. He

suggested that this potential well locational and the related municipal boundary issue be included in the description of the alternative plans concerned. Mr. Grisa indicated that the plan descriptions were intended to comprise conceptual outlines of the alternatives which would be detailed later. Mr. Biebel agreed, indicating that the option of extraterritorial western wells that Dr. Cherkauer raised was an option; but, at this time, it was not known if that option would be included in one or more of the alternative plans as these plans are developed. Upon further discussion, it was agreed that any site-specific descriptions of well locations be deferred until the alternative plans were developed in detail. Dr. Cherkauer recommended, and it was agreed, to indicate that definitive data on potential well locations would be provided as the alternative plans are developed.

[Secretary's Note: In order to clarify that more detail will be provided on well locations as the alternative plans are developed, text was added after the third sentence in the second paragraph on page 1 of the staff memorandum. The revised text is included in the revised version of the memorandum transmitted with these minutes.]

Mr. Bunker referred to Maps 2, 3, and 4 as distributed. He suggested that the Village of Union Grove be considered as an area which would utilize Lake Michigan as a source of supply under one of the alternatives. He indicated that much of the Village was located east of the subcontinental divide, and that the Village had experienced high levels of radium in the water from some of the existing source water wells. He indicated that including the Village as a service area using Lake Michigan water under one of the alternatives would provide valuable information on costs and impacts of that option. After further discussion, it was agreed to include the Village of Union Grove as an area utilizing Lake Michigan as a source of supply under Alternative Plan 4.

[Secretary's Note: The Village of Union Grove has been added as an area utilizing Lake Michigan as a source of supply under Alternative Plan 4. This change is reflected in the revised version of the staff memorandum transmitted with these minutes.]

Mr. Yunker noted that the way in which the alternative plans are to be evaluated will allow the cost and impacts of each component to be separately ascertained. This will allow for decisions to be made logically with respect to the components to be included or excluded from an initially preferred plan.

Mr. Grisa referred to Map 3 and noted that the City of Muskego water service area was noted as utilizing groundwater as a source of supply, while the New Berlin central area was noted as utilizing Lake Michigan as a source of supply. He noted that both areas currently have a return flow component to Lake Michigan and recommended that they be treated similarly. He indicated that New Berlin central area was the only area west of the subcontinental divide added to the Lake Michigan supplied area under Alternative Plan 2 that alternative was described in the memorandum. He recommended that New Berlin not be added to the utilities supplied by Lake Michigan supplies under Alternative Plan 2. Mr. Biebel indicated that if that were done, then the New Berlin central area and Muskego would be the only areas which currently have a direct return flow and which were not proposed to utilize Lake Michigan as a source of supply under Alternative Plan 2. After further discussion, on motion by Mr. Melcher, seconded by Mr. Winkler, and carried, with Dr. Cherkauer voting no, it was agreed to add the City of Muskego service area to the areas utilizing Lake Michigan as a source of supply under Alternative Plan 2, as shown on Map 2.

[Secretary's Note: The City of Muskego water supply service area has been added as an area utilizing Lake Michigan as a source of supply under Alternative Plan 2. The change is reflected in the revised version of the staff memorandum transmitted with these minutes.]

Mr. Winkler asked if the plan would prevent a utility from using a source of supply not recommended if conditions changed in the future. Chairman Bauer responded that the plan would be entirely advisory to the constituent levels, units, and agencies of government concerned. He noted further that the Commission policy was to continuously monitor development within the Region as related to the continued validity of its plans with the

results being documented in its *Annual Reports*. If the results of the monitoring effort indicate that the adopted plans should be revised, the Commission, acting on its own motion, or on the request of its constituent county and local governments, may undertake plan revision or amendment. Such revision should be made following the same procedure used to produce the plans in question. It was hoped, he said, that local planning and plan implementation actions would be consistent with the regional plan.

Mr. Bunker indicated that there were planned water service areas located along the west side of IH 94 in the Town of Yorkville both north and south of the current water service area of the Town of Yorkville Utility District No. 1 that would likely be provided with Lake Michigan water even under Alternative Plan 1 in order to provide efficient fire protection to both sides of IH 94. After some discussion, the staff was directed to review this situation concerned and to recommended any needed changes in the memorandum to the Committee.

[Secretary's Note: In response to Mr. Bunker's recommendation, a review was made of the service area in the Town of Yorkville as provided in the alternative plans. Because of the relatively small size of the planned water supply service area in the Town of Yorkville and the fact that a portion of the area is now served by groundwater, it is recommended that the entire Yorkville water supply service area be included in the groundwater service areas under Alternative Plan 1 which is intended to represent existing trends. Under Alternative Plans 2, 3, and 4, it is recommended that the entire Yorkville area be included in the area receiving Lake Michigan water. This will permit a comparative evaluation of the alternative. Should that evaluation indicate that a combination of supplies to serve the area was desirable, that option could be considered for inclusion in the initially preferred plan.]

Ms. Lewis referred to the description of Alternative Plan 2 on page 3. She recommended, and it was agreed, to change the term "western" water supply area in the City of New Berlin to "central area."

Mr. Grisa referred to the footnote regarding the assumptions on the return flow component for alternatives involving the use of Lake Michigan on page 3 and repeated several times on subsequent pages. He noted that the footnote implied a commitment to return more spent water than was taken out. Mr. Grisa requested, and it was agreed, that the Commission staff would review the footnote and revise it so as to remove the implication for a commitment to return more spent water to Lake Michigan than water removed.

[Secretary's Note: The footnote on page 3 was revised to eliminate the implied commitment to return more spent water to Lake Michigan than was taken out. The revised footnote is included in the revised version of the staff memorandum transmitted with these minutes.]

Mr. Czarkowski referred to the first second order bulleted item under Alternative Plan 3 on page 5. He noted that the implementation of the groundwater injection wells would violate current State regulations and policies, since currently the migration of injected water from a defined area is prohibited. Mr. Biebel agreed, but indicated that it was nonetheless proposed to evaluate this alternative plan component. If, after evaluation, it were determined to constitute a viable part of the recommended plan, then the plan implementation recommendations would have to recognize the need for revised State regulations. After further discussion, it was agreed to note that both the groundwater injection wells described on page 5 and the systems for recharging treated wastewater described on pages 4 and 5, would violate current regulations and require changes to, or variances from, those regulations.

[Secretary's Note: The text on pages 4 and 5 (now only page 5) describing the components of Alternative Plan 3 providing for recharge of treated wastewater and the deep aquifer injection would transcend current regulations. The revised text is included in the revised version of the staff memorandum transmitted with these minutes.]

Mr. Bunker referred to the groundwater injection component of Alternative Plan 3. He indicated that there were practical concerns related to implementation of that component, such as who would bear the cost of the injection and the potential for self-supplied water users to take advantage of the system by siting new wells to access the injected water. After further discussion, it was agreed to expand the text to note the implementation concerns associated with the deep aquifer injection system.

[Secretary's Note: The text describing the deep aquifer injection system on page 5 has been expanded to acknowledge that there will be implementation concerns associated with that component. The expanded text is included in the revised version of the staff memorandum transmitted with these minutes.]

Mr. Yunker noted that the analysis would be conducted in such a way that the costs and impacts of the deep aquifer groundwater injection component of Alternative Plan 3 were segregated, facilitating evaluation of that component.

Mr. Grisa asked why treated wastewater was proposed to be used to recharge the shallow aquifer, while treated Lake Michigan water was proposed to be used to recharge the deep aquifer. Mr. Biebel responded that it was assumed that only water which fully meets drinking water and groundwater standards would be considered suitable for deep aquifer injection. This assumption was made because any pollution of the deep aquifer would be far reaching in affect and while pollution of the shallow aquifer would be localized and could be mitigated more readily. Moreover, depending upon the situation and the use, he said, there may be options for lesser-quality water to be discharged to the shallow aquifer in a manner similar to discharging stormwater runoff or septic system effluent to that aquifer. He observed further that the level of treatment required for the water injection and to either aquifer will have to be given careful consideration as the alternative plan is detailed. Chairman Bauer noted that the state-of-the-art report did address the level and cost of treatment for groundwater recharge systems.

In answer to a question by Mr. Ericson, Mr. Biebel indicated that there was to be a return flow component for all uses of Lake Michigan water as a source of supply under Alternative Plan 4. Mr. Ericson noted that the return flow component requirement should reduce concerns about setting precedents for the use of Lake Michigan supply to significantly larger areas.

Mr. Grisa asked why the Village of Sussex had not been added as a utility which would utilize Lake Michigan as a source of supply under Alternative Plan 4, as described on pages 5 and 6. Mr. Biebel responded that the Sussex area was considered to be marginally suitable for the continued use groundwater as a source of supply under Alternative Plan 4. He noted that because there were groundwater quality problems in the area, and that the location of the area was in proximity of other utilities for which a Lake Michigan supply was to be considered, Sussex area could logically also be considered for such a supply under Alternative Plan 4. After further discussion, it was agreed to add the Village of Sussex area as an area that would utilize Lake Michigan as a source of supply under Alternative Plan 4.

Mr. Rau cited the invaluable nature of the deep sandstone aquifer, which provided a potential future source of water that should be protected from contamination, including nuclear contamination. He suggested an alternative plan be considered which would have all of the utilities in the Region use Lake Michigan as a source of supply preserving the deep aquifer for future use. He indicated that would reduce the drawdown of the deep aquifer and maintain it as an invaluable resource for the future.

Mr. Biebel responded that a conscious decision was made to include a return flow component for all Lake Michigan withdrawals, and indicated that such a component would likely not be practical with respect to large areas of the Region. Mr. Schultz noted that the areas which were identified under Alternative Plan 4 to utilize Lake Michigan as a source of supply had nearly all, at some time, considered such a source of supply in local planning and, therefore, were the areas that were the logical candidates for Lake Michigan water. Mr. Melcher noted that the Chicago area had a very significant economic advantage over the Southeastern Wisconsin Region

by way of its nearly limitless access to Lake Michigan as a source of supply for developing areas located west of the divide. He suggested that expanded use of Lake Michigan water supplies in the Region would be desirable, but only to the extent practicable. Mr. Grisa indicated that the use of Lake Michigan as a source of supply regionwide would be a very costly alternative. Dr. Cherkauer indicated that, in his opinion, there would not be a demand for Lake Michigan supply by the utilities in the northern and western portion of the Region, like the City of West Bend. He indicated that such an alternative plan would be unrealistic when compared to other alternatives, and supported maintaining Alternative Plan 4 as it was set forth in the staff memorandum. Mr. Ericson suggested that it would be difficult to implement a plan providing Lake Michigan supplies to utilities which do not have a significant problem with their current groundwater supply.

After further discussion, it was agreed not to add an alternative that would envision serving the entire Region with Lake Michigan water.

Mr. Grisa noted that the Town of Brookfield Sanitary District No. 4 was shown on Map 4 as using Lake Michigan as a source of supply. However, Table 1 of the staff memorandum indicated groundwater as the source of supply. Mr. Biebel indicated the intent was to utilize Lake Michigan as a source of supply and stated the table would be corrected.

Mr. Grisa requested that Table 1 be revised to indicate two entries for the City of Brookfield, one for the area east of the subcontinental divide and one for the area west of the divide. Mr. Biebel indicated the change would be made.

Mr. Kiefer asked that Table 1 be revised to indicate that the North Shore Water Commission was the water provider for the City of Glendale and the Villages of Fox Point and Whitefish Bay. Mr. Biebel agreed to footnote Table 1 accordingly.

Mr. Sullivan noted that the City of Oak Creek was noted in Table 1 as having a plan for capacity expansion. He indicated that the City's customer communities also envisioned substantial expanded urban development. Chairman Bauer indicated that a distinction should also be made between "planned capacity expansions" and "committed" expansions, particularly in the form of the sizing of already constructed facilities. For example, hydraulic capacity in channels and tanks which would facilitate incremental expansion. These represented sunk capital. Mr. Biebel indicated he would review the table and revise it appropriately to respond to Mr. Sullivan's concern.

[Secretary's Note: Table 1 has been revised to indicate that the comment column abbreviation of "EX" is for the water supply facilities and not the water system service area. In addition, the City of Oak Creek Water Utility comment column abbreviation has been footnoted to indicate the City's water treatment plant is designed to be expanded to 48 mgd in increments.]

Ms. Lewis noted that none of the alternative plans included consideration of consolidating water supply facilities. Mr. Biebel acknowledged that, indicating that the potential for consolidation was proposed to be considered once a preliminary recommended plan was developed and agreed upon. At that time, it was proposed to evaluate on a preliminary basis, the potential for consolidation based upon available budget and cost estimates. For those utilities where such consolidation is found to be potentially viable, a more detailed analysis of the costs and benefits of consolidation will be recommended to be carried out by the utilities as part of the plan implementation.

[Secretary's Note: Following the meeting, Ms. Conley provided written comments on the memorandum to the staff. Those comments recommended that a fifth alternative plan be developed which included a more intensive water conservation program included. A copy of a memorandum setting forth Ms. Conley's comments is attached hereto as Exhibit B. Upon review, it is concluded by the staff that the most practical course of action for

addressing Ms. Conley's comments would be to evaluate the initially preferred alternative in order to determine if there were water supply sustainability concerns with that alternative. That alternative would then be considered under both its initially developed form and in a form with an expanded level of water conservation. The higher level of water conservation considered should be practically achievable as set forth in Chapter VI of the SEWRPC Technical Report No. 43, *State-of-the-Art of Water Supply Practices*. In this regard, it is noted in that report that a relatively high-level water conservation program in Waterloo, Ontario, is achieving less than a 10 percent reduction in water use at a cost of about \$1,000,000 per year. The text under the initially preferred alternative plan on page 7 has been revised to indicate that that plan will be considered in two ways: one with the initially considered level of water conservation, and one with a higher level of water conservation.]

There being no further questions or comments, on a motion by Mr. Bunker, seconded by Dr. Cherkauer, carried, with Ms. Conley abstaining, to the SEWRPC Staff Memorandum entitled "Conceptual Framework for Existing and Future Condition Alternative Plans to be Considered Under the Regional Water Supply Planning Program for Southeastern Wisconsin, Revised August 7, 2007" was approved as amended.

DATE AND TIME OF NEXT MEETING

After brief discussion, it was agreed that the next meeting of the Advisory Committee would be held at the Commission offices on Tuesday, October 23, 2007, beginning at 9:30 a.m. Chairman Bauer noted a full description of at least one of the alternative plans should be available for Committee review at that meeting.

[Secretary's Note: Subsequent to the August 21, 2007, meeting, the next meeting date was changed to November 27, 2007.]

ADJOURNMENT

There being no further business to come before the Committee, on a motion by Mr. Melcher, seconded by Mr. Grisa, and carried unanimously, the meeting was adjourned at 11:00 a.m.

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Exhibit A

Surface Water Quality

Issue Description

Information on existing water quality in the nearshore Lake Michigan areas is summarized in Chapter III of this report and more detailed information is provided in SEWRPC Technical Report No. 39, *Water Quality Conditions and Sources of Pollution in the Greater Milwaukee Watersheds*, in process. The information provided indicates that Lake Michigan provides a high-quality source of supply for public water supply systems. The water taken from offshore deep water intakes is amenable to treatment by conventional methods. Finished water utilizing these methods typically meets, and generally exceeds, Federal and State drinking water quality requirements. Examples of raw water and finished water quality characteristics reported by selected water treatment plants in the Region are summarized in Appendix D of this report.

Several potential issues exist, however, with regard to surface water quality. These issues are related to a number of causes, including nonpoint source pollution, sanitary sewer overflows, pharmaceutical and personal care products, zebra and quagga mussels, and nuisance algae and may have a variety of potential impacts upon surface water quality.

Nonpoint source pollution, also referred to as diffuse source pollution, consists of various discharges of pollutants to the surface waters which cannot be readily identified as point sources. Nonpoint source pollution is transported from the rural and urban land areas of a watershed to the surface waters by means of direct runoff from the land via overland routes, storm sewers, and channels; and by interflow during and shortly after rainfall or rainfall-snowmelt events. Nonpoint source pollution also includes pollutants conveyed to the surface waters via groundwater discharge which is a major source of stream flow between runoff events.

Nonpoint source pollution can cause toxic, organic, nutrient, pathogenic, sediment, radiological, and aesthetic pollution problems. In most of the surface waters of the Region, nonpoint sources are the major source of most pollutants. Accordingly, nonpoint source pollution is of increasing concern in water resources planning and engineering as efforts to abate point source pollution become increasingly successful. The control of nonpoint source pollution is a necessary step in the process of improving surface waters to render such waters suitable for full recreational use and maintenance of a healthy fishery. While nonpoint source pollution has substantial impacts on the quality of inland lakes and streams within the Region, its effects on Lake Michigan have not been to date severe enough to limit the use of the Lake in the vicinity of southeastern Wisconsin for water supply and for recreational uses and fishery maintenance.

Sewer Overflows

Historically, Sewer sewer overflows have constituted a significant surface water quality issue. Two types of sewer overflows occur within the Region that have the potential to contaminate surface waters of the Region: combined sewer overflows (CSOs) and sanitary sewer overflows (SSOs).

Combined sewer overflows are overflows comprised of sanitary sewage and stormwater runoff. Approximately 25 square miles within the Region, located in the City of Milwaukee and the Village of Shorewood, are served by combined sewers. These sewers convey sanitary sewage along with stormwater runoff from adjacent lands. During dry weather, combined sewers function much like sanitary sewers, conveying sewage to a sewage treatment plant. During wet weather, inflow of stormwater can sometimes cause the capacity of the combined sewer system to be exceeded. This can result in excess flow being discharged into nearby surface waters. Effluent from CSOs generally contains a high proportion of stormwater. There are currently 117 combined sewer overflow outfalls in the Region. All of them discharge either into Lake Michigan or into streams tributary to Lake Michigan.

Sanitary sewer overflows consist of raw sanitary sewage entering the surface water system of a watershed either directly from sanitary sewer overflows, or indirectly via flow relief devices to separate storm sewer systems. This direct or indirect conveyance of sanitary sewage to the surface water system of a watershed occurs through various types of flow relief devices as a result of one or more of the following conditions: inadequate sanitary sewage conveyance capacity; excessive infiltration and inflow of clear water during wet weather conditions; and mechanical and/or power failures at sanitary sewage pumping facilities. In order to prevent damage to residential dwellings or to elements of the conveyance system as a result of the aforementioned system failures, a sanitary sewage flow relief device may be provided. Since the promulgation of the regional water quality management plan in 1979 and State and Federal clean water initiatives, it has been the policy within the Region to reduce reliance on such devices as general sewerage system upgrades are implemented.

The frequency of combined sewer overflows into Lake Michigan and into streams tributary to Lake Michigan in the Southeastern Wisconsin Region has decreased from about 50 overflows per year prior to 1994 to less than three per year since 1994 as a result of the completion of the Milwaukee Metropolitan Sewerage District's Water Pollution Abatement Program, including construction of the Inline Storage—or Deep Tunnel—System. Similar reductions have occurred in the frequency of sanitary sewer overflows. Water quality data indicate the sewer overflows are no longer an important concern for water supply system source water in the Region.

Pharmaceuticals and Personal Care Products

Pharmaceuticals and personal care products (PPCPs) encompass thousands of substances that are ingested or externally applied, including prescription and over the counter drugs, fragrances, cosmetics, sunscreen agents, diagnostic agents, and nutritional supplements. Many of these compounds are specifically designed to be biologically active at low concentrations and their presence in drinking water may pose risks to human health and to the health of aquatic and other wildlife.

PPCPs are released into surface waters through a number of mechanisms. The most prevalent and well-documented route is through discharges of municipal and onsite wastewater treatment facilities. Other sources include both agricultural and urban runoff, as well as industrial discharges. While some of these compounds may be fully or partially removed by wastewater treatment facilities, removal efficiencies vary greatly by compound and among treatment plants. Municipal wastewater treatment plants are not specifically designed to remove these chemicals. In addition, in most instances where removal efficiencies have been examined, only the fate of the parent compound has been tracked. Metabolites and transformation products, which may exhibit biological activity, have not been included in these studies. The persistence of PPCPs in the environment varies. Some of these compounds are relatively resistant to breakdown. Others are degraded relatively rapidly in the environment. Despite this, the constant release of many of these substances to the environment may make them effectively persistent. For most, there is a paucity of data on their fate in the environment.

Most existing surface water treatment technologies incidentally remove some level of pharmaceuticals, personal care products, and endocrine disrupting chemicals. Coagulation and flocculation are not particularly effective on most of the substances concerned and, therefore, sedimentation and filtration are typically not very effective in their removal. The chemicals involved are typically synthetic organic compounds, and the treatments for such compounds set forth in Chapter IV of SEWRPC Technical Report No. 43, *State-of-the-Art Water Supply Practices*, under the groundwater and surface water treatment technologies may be effective. Granular activated carbon can be effective in the removal of these chemicals, but release of the chemicals in large concentrations from the carbon appears to occur if regeneration of the carbon is not performed in a timely fashion.¹ Oxidation appears to be effective in deactivating the chemicals involved, although little is, as yet, known about the effects of the compounds formed. Ozone appears to be the most effective oxidant for these contaminants. Chlorine and its derivatives are relatively ineffective and ultraviolet irradiation has almost no effect. Oxidation appears to improve the removal of pharmaceuticals, personal care products, and endocrine disrupting chemicals by sand filtration.

¹American Chemical Society, "Keeping Drugs out of Drinking Water," *Environmental Science & Technology Online News*, September 4, 2002.

Reverse osmosis is effective at removing these chemicals directly, but its use is costly. Other membrane processes appear to be effective after oxidation of the chemicals concerned in the source water. The treatment technology selected will need to be specific for the compounds existing in the source water and multiple treatment technologies may be needed, depending upon the specific chemicals to be removed.

Few data exist on the presence of PPCPs in surface waters. In general, they have been detected in most places that have been examined for their presence. While few data are available for the nearshore areas of Lake Michigan, several of these compounds have been detected at low concentrations in water samples collected from the Milwaukee outer harbor, from streams tributary to Lake Michigan, and from offshore areas of the Lake.² While most attention to the presence of these substances in the environment is relatively recent, the presence of PPCPs in surface water is probably not a new development. Their presence in the environment has become more widely evident in the last decade due to improvements in analytical methodologies which lower the limits of detection for many of these substances. It is likely that these compounds have been present in the environment for as long as they have been used commercially, although perhaps not in current quantities given historic changes in lifestyles and economic conditions.

With some exceptions, the risks posed to humans by PPCPs are essentially unknown. Few data are available on the presence of most PPCPs in drinking water or on the effects of exposure to humans and aquatic life.

Additional information on PPCPs in surface waters is presented in SEWRPC Technical Report No. 39, *Water Quality Conditions and Sources of Pollution in the Greater Milwaukee Watersheds*, under preparation.

Zebra Mussels and Quagga Mussels

The zebra mussel (*Dreissena polymorpha*) is an exotic mollusk that has invaded waters of the Great Lakes region, including Lake Michigan. Adult zebra mussels colonize solid substrates in waters with concentrations of dissolved calcium greater than 15 mg/l.³ These colonies can be very dense; beds of zebra mussels containing up to 100,000 mussels per square meter have been reported in Lake Erie.⁴ Because they prefer to attach to hard substrate, zebra mussels can clog water intakes, increasing operating costs for drinking water plants, power plants, industrial plants, and dams. Left uncontrolled zebra mussel shells can block entire intake pipes over time. Zebra mussel control is typically done through velocity control or through periodic chemical treatment to remove the mussels. Utilizing a variety of pipe sizes and several intake pipes allows flexibility to maintain sufficient velocity to inhibit zebra mussel attachment. More recently, the quagga mussel (*Dreissena bugensis*) has been found in Lake Michigan and may become a problem similar to the zebra mussel. The quagga mussels are active year-round, while zebra mussels are dormant in the winter. Thus, year-round chemical controls may be needed for the quagga mussel. Intakes with limited control over velocity use biocides, often oxidizers, such as potassium permanganate, to eliminate the mussels. Chemical treatment is typically done intermittently as a preventative maintenance activity.

Nuisance Algae

Cyanobacteria, or blue-green algae, have become a concern in some surface waters. Some species of cyanobacteria produce toxins which can be released into water. Cyanobacteria can also create taste and odor

²SEWRPC Technical Report No. 30, Water Quality Conditions and Sources of Pollution in the Greater Milwaukee Watersheds, *in progress*.

³E. Mellina and J.B. Rasmussen, "Patterns in the Distribution of Zebra Mussel (*Dreissena polymorpha*) in Rivers and Lakes in Relation to Substrate and other Physicochemical Factors," Canadian Journal of Fisheries and Aquatic Sciences, Volume 51, 1994.

⁴F.L. Snyder, M.B. Hilgendorf, and D.W. Garton, "Zebra Mussels in North America: The Invasion and its Implications," Ohio Sea Grant, Ohio State University, Columbus, Ohio, <http://www.sg.ohio-state.edu/search.html>, 1977.

problems in water. The conditions favorable to the growth of cyanobacteria are generally not those associated with water supply system source water in the Region as drinking water supplies.

Related Plan Objectives

One plan objective and four standards are directly related to the issues associated with surface water quality:

- Objective—A regional water supply system which protects the public health, safety, and welfare.
- Standard—Water supply systems should be designed, constructed, and operated to deliver finished water to users which meets the drinking water standards established by the Wisconsin Department of Natural Resources to protect the public health, safety, and welfare.
- Standard—The selection of sources of supply and the design, contribution, and operation of related treatment facilities should be made cognizant of the potential presence of unregulated emerging pollutants, such as pharmaceuticals, personal care products, and certain viruses.
- Standard—Water supply sources and treatment processes should be selected to minimize potential problems with subsequent treatment and disposal of created waste streams.
- Standard—Groundwater and surface water sources of water supply should be protected from sources of contamination by appropriate siting, design, and land use regulation.

Basis for Problem Resolution

Each of the design year 2035 alternative plans is to include components intended to address existing and anticipated surface water quality problems. As previously noted, the recommended regional water supply plan is to be selected based upon a comparative evaluation of the ability of the alternative plans to meet the agreed-upon objectives and standards, including those related to surface water quality. The quality of the source water for water supply systems using Lake Michigan as a source of supply is currently not considered a water supply problem, given proper management. Within the Region, the surface water supply treatment systems are considered to be well operated and include facilities designed to properly treat Lake Michigan source water. Given the dynamic nature of surface water quality, it is possible that surface water quality conditions at some locations may change, and that unanticipated surface water quality problems may emerge over the course plan implementation. Each of the alternative plans considered, however, are to include recommendations for continued monitoring of raw and finished water quality in order to identify and address these changing conditions.

As previously noted, the quality of the source water is an important determinant in the development of water supply systems. The Wisconsin Department of Natural Resources has conducted source water assessments for all of the municipal water supply systems within the Region. Such assessments include information on source water quality and recommend needed protection measures. In the case of nonpoint source pollution source and sewer overflows, there are currently in place regulations and programs designed to reduce pollutant from these sources. Given that these sources currently do not significantly limit the use of Lake Michigan as a source of supply in the Region, this issue is expected to be properly managed in the future. In the case of selected contaminants, including many of the emerging and unregulated contaminants, such as pharmaceuticals and personal care products, it is likely to be more effective to remove the chemicals prior to discharge to the environment. This approach also limits environmental exposure of aquatic community. For such contaminants, programs, such as household hazardous waste collections and pharmaceutical collections will be needed. Such programs may be most effectively carried out on a county or subregional level, rather than being left to the individual water or wastewater utilities. Consideration of the need for, and governance of, such programs will be given in the development of the recommended water supply plan and the associated implementation strategy.

Exhibit B

Comments from Lisa Conley – Sept. 11, 2007

I am very sorry to have missed most of the meeting on August 21, and would like to submit the following comments on the:

“Conceptual Framework for Existing and Future Condition Alternative Plans to be Considered Under the Regional Water Supply Planning Program for Southeastern Wisconsin, Revised August 7, 2007”

As our committee’s work has progressed, I have expressed the concern that we have given lip service to “State of the Art” water conservation practices, but that we have not in fact chosen to include measures that would result in dramatically more efficient water use where it is needed in our study area.

Greywater systems have been dismissed as a danger to public health, but in fact they are approved for use in Wisconsin, and are used successfully in other areas of the country and around the world. This can be used as retrofit, or required for new residences in areas of unsustainable water use.

Rain water should have been included as a source of water supply for our area – we do have a good supply of this. The Urban Ecology Center in Milwaukee has a working system, and again – other parts of this country and the world do make good use of this resource, which otherwise becomes a stormwater disposal problem.

The Green built home checklist lists greywater systems as one of the viable practices for water conservation –Green Built Home is implemented in partnership with the Madison Area Builders Association in cooperation with other participating builders associations, leading utilities and organizations that promote green building.

http://www.greenbuilthome.org/docs/GBH_CHKLST_07.pdf

Without these cutting edge measures, the conservation chapter becomes an add-on, rather than a potentially very viable solution to the water shortages we are experiencing.

I would like to see a 5th alternative plan, where the expense and practicality of a more intensive conservation program is considered as a solution to our local water woes alongside the other alternatives we will be considering.

PRELIMINARY DRAFT

SEWRPC Staff Memorandum

CONCEPTUAL FRAMEWORK FOR EXISTING AND FUTURE CONDITION ALTERNATIVE PLANS TO BE CONSIDERED UNDER THE REGIONAL WATER SUPPLY PLANNING PROGRAM FOR SOUTHEASTERN WISCONSIN

(Revised August 731, 2007)

INTRODUCTION

The approved study design¹ for the regional water supply plan includes as Item 5, the “Preparation, Test, and Evaluation of Alternative Plans.” Under that work element, it is envisioned that a number of alternative water supply plans would be prepared for comparative analysis, and Advisory Committee and public evaluation, prior to selection of a recommended plan for adoption and implementation. The alternative plans are intended to include proposals for the use of various combinations of water conservation measures and groundwater sources of supply, as well as for the expansion of the use of Lake Michigan as a source of supply within the constraints of current and proposed law, regulations, and public policies. The design year of the alternative plans is intended to match the design year of the new regional land use plan, 2035. In addition to the alternative plans, the base year 2000 and the initial forecast 2035 conditions would be described for comparative purposes. On a preliminary basis, it is expected that five design year 2035 conditions would be developed and comparatively evaluated.

For each alternative plan, an evaluation of the cost, potential environmental impacts, implementability, security, and other factors will be undertaken. This will require modeling of the performance of the shallow and deep aquifers utilizing the regional groundwater model. That modeling will include an analysis of the impact of each alternative on the base flow to the surface water system as a result of groundwater withdrawals. In order to properly model the performance of the alternative plans, it will be necessary to provided certain definitive details, including a general location and the aquifer to be used, for any new wells found to be needed under each of the alternative plans. This detailing will be done as the alternative plans are designed. The evaluation will also address the capacities of the existing Lake Michigan water treatment plants. The evaluation of the alternatives will include consideration of the consistency with current and proposed future water law. Each alternative plan will also include specific assumptions regarding water conservation and the water supply needs for uses beyond the public water supply service areas.

The alternative plans developed are to be focused on water system sources of supply and directly related infrastructure. Following plan adoption, there will be a need for municipal water supply systems to conduct additional, more-detailed system-specific utility system planning, including planning for the potential consolidation of utilities.

Following evaluation of the alternative plans, an initially preferred alternative will be selected. That plan, along with the alternative plans, will be reviewed at public informational meetings and related elected and appointed public officials outreach activities. Considering the input from the public and public official outreach activities, one plan will be selected as the recommended plan to be used to guide the long range development of regional water supply systems within southeastern Wisconsin. The recommended plan may consist of the initially preferred alternative plan. More likely, the recommended plan will be a refined version of the initially preferred plan that includes components from other alternatives which are found to be sound.

¹SEWRPC, Study Design for a Regional Water Supply Plan for Southeastern Wisconsin, September 26, 2005.

CONCEPTUAL EXISTING AND ALTERNATIVE FUTURE CONDITIONS TO BE EVALUATED

There is a need to initially identify, on a conceptual basis, the existing and alternative future conditions to be evaluated. Once these conditions are agreed upon on a conceptual basis, each condition can be developed in more detail for evaluation purposes. In addition, for those conditions which are to be evaluated in detail using the regional groundwater model, it will be necessary to define each condition in terms of the groundwater model inputs. An earlier version of this memorandum was reviewed by the Regional Water Supply Planning Advisory Committee at its June 7, 2006, meeting. There was general agreement with the definition of the Base Year 2000 Conditions and the Design Year 2035 Forecast Conditions based upon existing trends and committed actions. Further detail, however, was requested by the Committee regarding the other alternative plans. That additional detail is provided herein, along with additional detail on the 2035 base year condition.

The following base year and forecast conditions and alternative plans are proposed to be considered:

- Base Year 2000 Conditions. This condition is intended to identify existing water supply system capacities, committed capacity expansions, and attendant problems for both surface water and groundwater water supply systems under existing conditions. This is the condition for which the regional groundwater model has been developed and calibrated. The model will be refined to reflect specific inputs on private well pumping. That refinement will not require recalibration, as it was considered in a generalized manner during the model development. Map 1 illustrates the areas served by municipal utilities and the sources of supply for those utilities under the base year 2000 conditions. The source(s) of supply for each water utility within the Region under the base year 2000 conditions, as well as notes on the adequacy of the existing supply facilities capacities to meet the year 2000 water demands, are listed on Table 1.
- Alternative Plan 1—Design Year 2035 Forecast Conditions under Existing Trends and Committed Actions. This alternative plan is intended to serve to identify the facilities needed to meet forecast 2035 water demands using water supply facilities similar to those currently in use or committed. Alternative Plan 1 will include the following components:
 - Existing year 2000 water supply facilities;
 - New water supply with associated treatment facilities and infiltration facilities which were known to have been constructed from 2000 through 2006;
 - New water supply and infiltration facilities considered to be committed, as defined by having been funded, as of the end of 2007;
 - Expanded sources of groundwater supply and/or treatment of existing groundwater sources as needed to meet forecast 2035 water demands. The expanded sources will be similar to the existing sources for each water utility, except where known quantity or quality problems preclude the use of such similar sources. In such cases, local plans, if available, or staff judgment will be used to select alternative sources which are the most likely to be implemented. The selection of the general location of new facilities will be made considering service area, local plans, and applicable regulatory constraints, with those constraints being documented. Under this alternative, it will be assumed that communities will continue to rely on groundwater-based systems, unless there are existing commitments to utilize Lake Michigan as a source of supply. At this time, the only known such commitments are the City of Kenosha Water Utility and its contract service utilities; the Village of Pleasant Prairie Water Utility; the Town of Somers Water Utility; and the Town of Bristol Utility District No. 3, where

- intermunicipal agreements are in place and major water supply infrastructure has been developed to provide for both a Lake Michigan supply and a return flow component;
- Expanded Lake Michigan surface water supply facilities as needed to meet the forecast 2035 water demands for areas currently provided with Lake Michigan as a source of supply and areas considered to be committed to such a supply, as noted above. Thus, the areas served by Lake Michigan supply will be similar to those shown on Map 1, but expanded to meet the forecast 2035 service areas;
 - Water conservation program implementation in the manner developed and documented in SEWRPC Technical Report No. 43, *State-of-the-Art of Water Supply Practices*, May 2007, and incorporated into Chapter IV, “Anticipated Growth and Change Affecting Water Supply in the Region,” of SEWRPC Planning Report No. 52, *A Regional Water Supply Plan for Southeastern Wisconsin*;
 - Implementation of current regulatory programs, such as the infiltration requirements of Chapter NR 151 of the *Wisconsin Administrative Code*; and
 - The continued use of private water supply systems to serve residential and nonresidential lands uses located beyond the planned water supply service areas, including agricultural land use. The number and location of such systems is set forth in Chapter IV of SEWRPC Planning Report No. 52, *A Regional Water Supply Plan for Southeastern Wisconsin*.

Map 2 illustrates the areas served by municipal utilities and the sources of supply for those utilities under Alternative Plan 1. The source(s) of supply for each water utility in the Region under Alternative Plan 1, as well as notes on the adequacy of the existing system facilities to meet the forecast 2035 water demands, are listed in Table 1. The groundwater model would be used to simulate the groundwater system and surface water impacts for this alternative plan.

- Alternative Plan 2—Limited Expansion of Lake Michigan Supply. This future 2035 condition alternative plan scenario would be the same as Alternative Plan 1, but would incorporate a limited expanded use of Lake Michigan to selected areas located east of the subcontinental divide, consisting of the Village of Germantown Water Utility, the eastern portion of the City of Brookfield Water Utility service area, the Town of Yorkville Utility District No. 1, and the Village of Elm Grove; and located west of that divide where a return flow component² currently exists, namely, the western central portion of the City of New Berlin Water Utility and the City of Muskego Water Utility sanitary sewerage service areas. All of these areas currently have a return flow component through their sanitary sewerage systems which are connected to the Milwaukee Metropolitan Sewerage District sewerage system or, in the case of the Town of Yorkville Utility District No 1, a return flow via a local sewerage system discharging treated effluent to a Lake Michigan tributary. Reliance would be placed on groundwater as a source for most systems in a manner similar to Alternative Plan 1.

²For purposes of the regional water supply planning effort, a Lake Michigan water supply return flow component is defined as the return of the wastewater from the area under consideration, either directly via a sewerage system, or indirectly via treatment plant effluent conveyance through a pipeline, a watercourse, or a combination of pipeline and watercourse. In most these cases, this will result in more water being returned than used it may be assumed that the return flow will at least equal or probably exceed the amount taken from the source of supply; since the infiltration and inflow component of wastewater flows usually exceed any consumptive uses of water supply. It is recognized that other means for providing a return flow component may be found to be viable and may be considered as individual or groups of water utilities consider options for plan implementation.

However, as noted above, this alternative plan would also assume Lake Michigan supplies would replace groundwater as the source of supply for selected areas where the wastewater is currently returned to Lake Michigan.³ Alternative Plan 2 will include the following components:

- For most utilities existing or committed year 2007 water supply and treatment facilities where no water quantity or quality conditions problems indicate changes are needed;
- Water conservation program implementation at the same levels assumed under the initial 2035 forecast alternative condition;
- Implementation of current regulatory programs;
- Conversion to Lake Michigan as a source of supply for selected utilities, or portions of utilities located east of the subcontinental divide, consisting of the Village of Germantown Water Utility, the eastern portion of the City of Brookfield Water Utility service area, the Town of Yorkville Utility District No. 1, and the Village of Elm Grove; and west of that divide, which currently have a return flow to Lake Michigan,⁴ consisting of the western central portion of the City of New Berlin Water Utility and the City of Muskego Water Utility service area, sanitary sewerage service areas};
- For all systems expected to rely on groundwater as a source of supply, expanded sources of supply and/or treatment of existing groundwater sources will be included as needed to meet 2035 forecast water demands. The expanded sources will be similar to the existing sources for each water utility, except where known quantity or quality problems preclude the use of similar sources. In such cases, local plans, if available, or staff judgments will be used to select alternative groundwater-based sources which are the most likely to be implemented; and
- The continued use of private wells to serve residential and nonresidential lands uses, including agricultural land use. The number and location of such wells is set forth in Chapter IV of SEWRPC Planning Report No. 52, *A Regional Water Supply Plan for Southeastern Wisconsin*.

Map 3 illustrates the areas served by municipal utilities and the sources of supply for those utilities under Alternative Plan 2. The source(s) of supply for each water utility in the Region under Alternative Plan 2 is listed in Table 1. The groundwater model would be used to simulate the groundwater system and surface water impacts for this alternative plan. Groundwater model optimization would be conducted for this alternative.

- Alternative Plan 3—Groundwater Recharge. This future 2035 condition alternative plan would be similar to Alternative Plan 2, but would include shallow groundwater aquifer recharge measures using local rainfall and other local sources as the basis of the recharge and deep aquifer groundwater recharge measures using Lake Michigan treated water as the source of the recharge. Alternative Plan 3 will include the following components:
 - All of the same components included under Alternative Plan 2;
 - The development of rainfall infiltration systems, including treatment and infiltration facilities within each county, totaling about 5 percent of the area to be converted from rural to urban land

³Ibid.

⁴Ibid.

between the years 2000 and 2035. The 5 percent value would exceed the regulatory requirements set forth in Chapter NR 151 imposed on site developers which allow an exemption for meeting the infiltration requirements of more than 1 percent of the development site for residential land and 2 percent for nonresidential lands is required to meet those requirements. These areas would be publicly owned and operated and be specifically designed to enhance infiltration by vegetation and topography selection;

- Groundwater recharge protection—this would be considered by including a provision in the alternative that all of the areas within selected categories based upon their importance for groundwater recharge under the ongoing special study on groundwater recharge areas would be undeveloped or developed in a manner to maintain the natural hydrology;
- The inclusion of stormwater management practices, including treatment and infiltration systems, which maintain the natural hydrology with regard to recharge on all new residential development;
- The development of systems for ~~treatment further treating~~ and recharging wastewater treatment plant effluent into the shallow aquifer at selected locations where drawdown has occurred in the shallow aquifer exceeding five feet compared to predevelopment conditions, or where significant new water supply withdrawals from the shallow aquifer are envisioned under this alternative plan. It is initially envisioned that this alternative plan would include such systems at the City of West Bend in Washington County, the Village of Grafton in Ozaukee County, and the City of Waukesha in Waukesha County. ~~It is recognized that the development of such recharge systems may violate current State regulations and policies regarding groundwater management and that implementation would require changes to, or variances from, those regulations and policies;~~ and
- The development of groundwater injection wells meeting requirements similar to those associated with wells used in an aquifer storage and recovery system with treated Lake Michigan source water as a source and the deep aquifer as the receptor. Initially, it is envisioned the water would come from existing Lake Michigan water treatment facilities. The injection wells would be located east of the subcontinental divide based upon the source of supply and aquifer considerations. The wells would be designed and located in such a way that the deep sandstone groundwater system at the point of injection would be flowing toward Lake Michigan or toward wells where the return flow component⁵ would be to Lake Michigan. It is recognized that there are groundwater quality issues which must be considered for this component of Alternative Plan 3. ~~In addition, the development of such wells would violate current State regulations and policies regarding groundwater injection and implementation would require changes to, or variances from, those regulations and policies. In addition, implementation of this component would face issues of fiscal responsibility and groundwater user allocations for the injected water.~~ However, this component potentially could illustrate a means in meeting the broad objectives of 2003 Wisconsin Act and the recommendations of the State Groundwater Advisory Committee for mitigating the identified groundwater quantity problems within the two designated groundwater management areas within the State. One of these areas being the majority of the Southeastern Wisconsin Region.

Map 3 illustrates the areas served by municipal utilities and the sources of supply for those utilities under Alternative Plan 3. The source, or sources, of supply for each water utility in the Region under Alternative Plan 3 are listed in Table 1. The groundwater model would be used to simulate the

⁵Ibid.

performance of groundwater systems and attendant surface water impacts under this alternative plan. The groundwater surface modeling will be done in a manner which illustrates the impacts of the infiltration-related components by serially applying the model inputs generally in the order of the components as listed above and operating the model to obtain outputs following the addition of selected components. This will allow for the impacts of each component to be segregated and quantitatively estimated separately. Groundwater model optimization would be conducted for this alternative.

- Alternative Plan 4—Further Expansion of Lake Michigan Supply. This future 2035 condition alternative plan would be similar to Alternative Plan 2, plus an expanded use of Lake Michigan as a source of supply given current and proposed regulation and policy constraints. This alternative would assume that additional utilities within the Region lying east of the subcontinental divide, consisting of the City of Cedarburg Light and Water Commission, the Village of Fredonia Municipal Water Utility, the Village of Grafton Water and Wastewater Commission, and the Village of Saukville Municipal Water Utility; and selected utilities straddling or west of the subcontinental divide, consisting of the ~~City of Muskego Water Utility~~, the western portion of the City of Brookfield Water Utility service area, and the western portion of the Village of Menomonee Falls Water Utility service area, ~~the Town of Brookfield Sanitary District No. 4, and the Village of Union Grove Water Utility~~, all of which are classified under the proposed Great Lakes-St. Lawrence River Water Resource Compact as being part or all of a “straddling community;” and to the City of Waukesha Water Works, the City of Pewaukee Water Utility, the Village of Pewaukee Water Utility, ~~the Village of Sussex Water Utility~~, and the Village of Lannon, all of which are classified under the Compact as communities within a straddling county, would be provided with Lake Michigan water. The additional utility service areas assumed to be served by Lake Michigan as a source of supply under Alternative Plan 4 were delineated based upon consideration of a number of factors, including existing infrastructure capacity, aquifer characteristics, and location in relation to potential Lake Michigan sources of supply. The selected additional areas would be provided with Lake Michigan supply in a manner consistent with the proposed Compact. Alternative Plan 4 will include the following components:
 - All of the components included under Alternative Plan 2, except as noted in the last component;
 - Groundwater recharge protection. This would be considered by including a provision in the alternative that all of the areas within selected categories based upon their importance for groundwater recharge under the ongoing special study on groundwater recharge area analyses would be undeveloped or developed in a manner to maintain the natural hydrology; and
 - Provision of Lake Michigan water supply to selected utilities both east and west of the subcontinental divide in a manner consistent with the proposed Great Lakes-St. Lawrence River Water Resources Compact. This alternative would assume that additional utilities within the Region lying east of the subcontinental divide, consisting of the City of Cedarburg Light and Water Commission, the Village of Fredonia Municipal Water Utility, the Village of Grafton Water and Wastewater Commission, and the Village of Saukville Municipal Water Utility; and selected utilities west of or straddling the subcontinental divide, consisting of the ~~City of Muskego Water Utility~~, the western portion of the City of Brookfield Water Utility service area, and the western portion of the Village of Menomonee Falls Water Utility service area, ~~the Town of Brookfield Sanitary District No. 4, and the Village of Union Grove Water Utility~~, all of which are classified under the Compact as all or a part of a straddling community, and to the City of Waukesha Water Works, the City of Pewaukee Water Utility, the Village of Pewaukee Water Utility, ~~the Village of Sussex Water Utility~~, and the Village of Lannon, all of which are classified under the Compact as communities within a straddling county, would be provided

with Lake Michigan water. A return flow component⁶ would be included for each utility or a group of utilities.

Map 4 illustrates the areas served by municipal utilities and the sources of supply for those utilities under Alternative Plan 4. The source(s) of supply for each water utility in the Region under Alternative Plan 4 is listed in Table 1. The groundwater model would be used to simulate the groundwater systems and surface water impacts for this alternative plan. Groundwater optimization would be conducted for this alternative.

- Initially Preferred Alternative. This alternative would be developed based upon a comparative evaluation of alternatives considered. The initially preferred alternative plan will include a subalternative which considers the effects of including an expanded level of water conservation. That level would be determined to approximate the highest level which could practically be expected based upon review of SEWRPC Technical Report No. 43, *State-of-the-Art of Water Supply Practices*. This alternative could include a component which identifies a need for limiting the density of development in subareas of the Region due to groundwater sustainability concerns. Such a component would include recommendations to appropriately amend the adopted regional land use plan and related county and local comprehensive plans. The groundwater model would be used to simulate the groundwater systems and surface water impacts for this alternative plan and the model optimization would be conducted.
- Recommended Plan. This plan would be developed based upon consideration of the findings of the comparative evaluation of the alternative plans considered and input from the public and elected and appointed officials. This alternative could include a component which identifies a need for limiting the density of development in subareas of the Region due to groundwater sustainability concerns. Such a component would include recommendations to appropriately amend the adopted regional land use plan and related county and local comprehensive plans. The groundwater model would be used to simulate the groundwater system and the surface water impacts and the model optimization would be conducted for this recommended plan.

* * *

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08/10/07, Revised 08/31/07, 09/24/07, 10/25/07

⁶Ibid.

PRELIMINARY DRAFT

Table 1

**SOURCES OF WATER SUPPLY UNDER EXISTING AND ALTERNATIVE FUTURE CONDITIONS
FOR WATER SUPPLY SYSTEMS IN THE SOUTHEASTERN WISCONSIN REGION: 2000 AND 2035**

| Water Supply System (by county) | Source of Water Supply ^a | | | | | Comments ^b |
|---|-------------------------------------|--|--|--|--|------------------------|
| | Base Year 2000 | Alternative Plan 1 Year 2035 Forecast Conditions under Existing Trends and Committed Actions | Alternative Plan 2 Limited Expansion of Lake Michigan Supply | Alternative Plan 3 Groundwater Recharge | Alternative Plan 4 Further Expansion of Lake Michigan Supply | |
| Kenosha County | | | | | | |
| Kenosha Water Utility | LMS | LMS | LMS | LMS | LMS | EC-35 |
| Paddock Lake Water Utility | GS | GS | GS | GS | GS | EC-00, NW |
| Pleasant Prairie Water Utility | LMP | LMP | LMP | LMP | LMP | EC-35 |
| Town of Bristol Utility District No. 1 | GD, GS | GD, GS | GD, GS | GD, GS | GD, GS | EC-00, NW, RA |
| Town of Bristol Utility District No. 3 | LMP | LMP | LMP | LMP | LMP | EC-35 |
| Town of Somers Water Utility | LMP | LMP | LMP | LMP | LMP | EC-35 |
| Powers-Benedict-Tomebeau Lakes Area..... | -- | GS | GS | GS | GS | -- |
| Village of Silver Lake | -- | GS | GS | GS | GS | -- |
| Village of Twin Lakes | -- | GS | GS | GS | GS | -- |
| Town of Salem..... | -- | GS | GS | GS | GS | -- |
| Milwaukee County | | | | | | |
| City of Cudahy Water Utility | LMS | LMS | LMS | LMS | LMS | EC-4 |
| City of Franklin Water Utility..... | LMP | LMP | LMP | LMP | LMP | EC-00 |
| City of Glendale Water Utility ^c | LMP | LMP | LMP | LMP | LMP | EC-35 |
| City of Milwaukee Water Works | LMS | LMS | LMS | LMS | LMS | EC-35 |
| City of Oak Creek Water and Sewer Utility..... | LMS | LMS | LMS | LMS | LMS | EC-00, EX ^d |
| City of South Milwaukee Water Utility..... | LMS | LMS | LMS | LMS | LMS | EC-35 |
| City of Wauwatosa Water Utility..... | LMP | LMP | LMP | LMP | LMP | EC-35 |
| City of West Allis Water Utility | LMP | LMP | LMP | LMP | LMP | EC-35 |
| We Energies-Water Services | LMP | LMP | LMP | LMP | LMP | EC-35 |
| Village of Brown Deer Public Water Utility..... | LMP | LMP | LMP | LMP | LMP | EC-35 |
| Village of Fox Point Water Utility ^c | LMP | LMP | LMP | LMP | LMP | EC-35 |
| Village of Greendale Water Utility | LMP | LMP | LMP | LMP | LMP | EC-35 |
| Village of Shorewood Municipal Water Utility | LMP | LMP | LMP | LMP | LMP | EC-35 |
| Village of Whitefish Bay Water Utility ^c | LMP | LMP | LMP | LMP | LMP | EC-35 |
| Ozaukee County | | | | | | |
| City of Cedarburg Light and Water Commission | GD, GS | GD, GS | GS | GS | LMP | EC-35, NW |
| We Energies-Water Services | LMP | LMP | LMP | LMP | LMP | EC-35 |
| City of Port Washington Water Utility | LMS | LMS | LMS | LMS | LMS | EC-00 |
| Village of Belgium Water Utility | GS | GS | GS | GS | GS | EC-35 |
| Village of Fredonia Municipal Water Utility | GS | GS | GS | GS | LMP | EC-00, NW |
| Village of Grafton Water and Wastewater Commission..... | GD, GS, GST | GD, GS, GST | GD, GS, GST | GD, GS, GST | LMP | EC-00, NW, TCE |
| Village of Saukville Municipal Water Utility | GS | GS | GS | GS | LMP | EC-35, NW |
| Town of Fredonia-Waubeka Area | -- | GS | GS | GS | LMP | -- |
| Racine County | | | | | | |
| City of Burlington Water Utility..... | GD | GD | GD | GD | GD | EC-00 |
| City of Racine Water and Wastewater Utility | LMS | LMS | LMS | LMS | LMS | EC-35 |
| Caddy Vista Sanitary District..... | LMP | LMP | LMP | LMP | LMP | EC-00 |
| Caledonia Utility District No. 1 | LMP | LMP | LMP | LMP | LMP | EC-35 |
| Crestview Sanitary District | LMP | LMP | LMP | LMP | LMP | EC-00 |
| North Park Sanitary District (Oak Creek)..... | LMP | LMP | LMP | LMP | LMP | EC-00 |
| North Park Sanitary District (Racine)..... | LMP | LMP | LMP | LMP | LMP | EC-35 |

Table 1 (continued)

| Water Supply System (by county) | Source of Water Supply ^a | | | | | Comments ^b |
|---|-------------------------------------|--|--|--|--|-----------------------|
| | Base Year 2000 | Alternative Plan 1 Year 2035 Forecast Conditions under Existing Trends and Committed Actions | Alternative Plan 2 Limited Expansion of Lake Michigan Supply | Alternative Plan 3 Groundwater Recharge | Alternative Plan 4 Further Expansion of Lake Michigan Supply | |
| Racine County (continued) | | | | | | |
| Sturtevant Water and Sewer Utility | LMP | LMP | LMP | LMP | LMP | EC-35 |
| Village of Union Grove Municipal Water Utility | GDT, GS | GDT, GS | GS | GS | GDT, GSLMP | NW, RA |
| Village of Waterford Water Utility | GD, GS | GD, GS | GD, GS | GD, GS | GD, GS | EC-35, RA |
| Village of Wind Point Municipal Water Utility | LMP | LMP | LMP | LMP | LMP | EC-35 |
| North Cape Sanitary District..... | GS | GS | GS | GS | GS | -- |
| Yorkville Utility District No. 1 | GS | GSLMP | LMP | LMP | LMP | EC-I |
| Town of Burlington-Bohner Lake Area | -- | GS | GS | GS | GS | -- |
| Town of Dover-Eagle Lake Area | -- | GS | GS | GS | GS | -- |
| Northwest Caledonia Area | -- | LMP | LMP | LMP | LMP | -- |
| Town of Norway Area | -- | GS | GS | GS | GS | -- |
| Village of Rochester Area | -- | GS | GS | GS | GS | -- |
| Town of Rochester Area | -- | GS | GS | GS | GS | -- |
| Town of Waterford Area..... | -- | GS | GS | GS | GS | -- |
| Walworth County | | | | | | |
| Delavan Water and Sewerage Commission..... | GD, GS, GST | GD, GS, GST | GD, GS | GD, GS | GD, GS | EC-00, NW, TCE |
| Elkhorn Light and Water..... | GDT | GDT | GS | GS | GS | EC-00, RA, EX |
| Lake Geneva Municipal Water Utility..... | GS | GS | GS | GS | GS | EC-35 |
| Whitewater Municipal Water Utility | GS | GS | GS | GS | GS | -- |
| Darien Water Works and Sewer System..... | GD, GS | GD, GS | GD, GS | GD, GS | GD, GS | EC-35 |
| Village of East Troy Municipal Water Utility | GDT, GS | GDT, GS | GS | GDT, GS | GDT, GS | EC-I, NW |
| Fontana Municipal Water Utility..... | GS | GS | GS | GS | GS | EC-35 |
| Village of Genoa City Municipal Water Utility | GD, GS | GD, GS | GD, GS | GD, GS | GD, GS | -- |
| Sharon Waterworks and Sewer System..... | GD | GD | GD | GD | GD | EC-I |
| Walworth Municipal Water and Sewer Utility | GS | GS | GS | GS | GS | EC-00, NW |
| Williams Bay Municipal Water Utility | GD, GS | GD, GS | GD, GS | GD, GS | GD, GS | EC-35 |
| Pell Lake Sanitary District No. 1..... | GD | GD | GD | GD | GD | EC-00 |
| Town of East Troy Sanitary District No. 3..... | GD | GD | GD | GD | GD | EC-I |
| Lake Como Sanitary District No. 1 | GS | GS | GS | GS | GS | EC-35 |
| Country Estates Sanitary District..... | GST | GST | GS | GS | GS | EC-35, RA |
| Town of Troy Sanitary District No. 1..... | GS | GS | GS | GS | GS | -- |
| Town of Lyons Area | -- | GS | GS | GS | GS | -- |
| Town of East Troy-Potter Lake Area | -- | GS | GS | GS | GS | -- |
| Washington County | | | | | | |
| City of Hartford Water Utilities..... | GD, GS | GD, GS | GS | GS | GS | EC-I, NW, RA |
| City of West Bend Water Utility | GS | GD, GS | GS | GS | GS | EC-35, NW, TCE, VC |
| Village of Germantown Water Utility..... | GDT, GS | GDT, GS | LMP | LMP | LMP | EC-00, NW, RA |
| Village of Jackson Water Utility | GS | GS | GS | GS | GS | EC-35, NW |
| Village of Kewaskum Municipal Water Utility..... | GS | GS | GS | GS | GS | EC-35 |
| Slinger Utilities..... | GS | GS | GS | GS | GS | NW |
| Allenton Sanitary District..... | GD | GD | GD | GD | GD | EC-00 |
| Village of Newburg Area | -- | GS | GS | GS | GS | -- |
| Waukesha County | | | | | | |
| City of Brookfield Municipal Water Utility (<u>east</u>)..... | GDT, GS, GD GS, GD | GDT, GS, GD GDT, GS, GD | GDT, GS, GD-LMP GDT, GS, GD | GDT, GS, GD-LMP GDT, GS, GD | LMP LMP | EC-35, NW, RA |
| <u>City of Brookfield Municipal Water Utility (west)</u> | GD | GD, GS | GD, GS | GD, GS | GD, GS | EC-I, NW, RA |
| Delafield Municipal Water Utility | GD, GS | GD, GS | GSLMP | GSLMP | LMP | EC-00, RA |
| City of Muskego Public Water Utility | GD, GS | LMP | LMP | LMP | LMP | EC-35 |
| City of New Berlin Water Utility (east) | GD, GS | GDT, GS | LMP | LMP | LMP | EC-00, RA |
| City of New Berlin Water Utility (<u>west-central</u>) | GD, GS | GD, GS | GD, GS | GD, GS | GD, GS | EC-35 |
| City of Oconomowoc Utilities | GD, GS | GDT, GS | GS | GDT, GS | LMP | EC-00, RA |
| City of Pewaukee Water and Sewer Utility | GD, GS | | | | | EC-00, NW, RA |

Table 1 (continued)

| Water Supply System (by county) | Source of Water Supply ^a | | | | | Comments ^b |
|---|-------------------------------------|--|--|--|--|-----------------------|
| | Base Year 2000 | Alternative Plan 1 Year 2035 Forecast Conditions under Existing Trends and Committed Actions | Alternative Plan 2 Limited Expansion of Lake Michigan Supply | Alternative Plan 3 Groundwater Recharge | Alternative Plan 4 Further Expansion of Lake Michigan Supply | |
| Waukesha County (continued) | | | | | | |
| City of Waukesha Water Utility..... | GD, GS | GDT, GS | GS | GDT, GS | LMP | EC-00, NW, RA |
| Village of Butler Public Water Utility | GD, GS | LMP | LMP | LMP | LMP | EC-35 |
| Dousman Water Utility | GD | GD | GD, GS | GD, GS | GD, GS | EC-00, NW |
| Village of Eagle Municipal Water Utility | GD, GS | GD, GS | GS | GD, GS | GD, GS | EC-00, PB |
| Hartland Municipal Water Utility | GS, GST | GS, GST | GS, GS | GS, GS | GS, GS | EC-35, TCE |
| Village of Menomonee Falls Water Utility (east)..... | LMP | LMP | LMP | LMP | LMP | EC-35 |
| Village of Menomonee Falls Water Utility (west) | GD, GS | GD, GS | GD, GS | GD, GS | LMP | EC-00, NW, RA |
| Mukwonago Municipal Water Utility | GD, GS | GD, GS | GD, GS | GD, GS | GD, GS | EC-I, RA |
| Village of Pewaukee Water Utility | GD, GS | GD, GS | GD, GS | GD, GS | LMP | EC-00, NW, RA |
| Village of Sussex Water Utility | GD | GDT, GS | GS | GDT, GS | GD-GSLMP | EC-00, NW, RA |
| Brookfield Sanitary District No. 4..... | GS | GS | GS | GS | GSLMP | EC-35 |
| Village of Big Bend..... | -- | GS | GS | GS | GS | -- |
| Village of Elm Grove | -- | GDT, GS | LMP | -- | LMP | -- |
| Village of Lannon | -- | GS | GS | GS | LMP | -- |
| Village of North Prairie | GD, GS | GD, GS | GD, GS | GD, GS | GD, GS | -- |
| Village of Wales | -- | GS | GS | GS | GS | -- |
| Town of Eagle-Eagle Spring Lake Area | -- | GS | GS | GS | GS | -- |
| Town of Oconomowoc-Okauchee Lake Area..... | -- | GS | GS | GS | GS | -- |
| Town of Ottawa-Golden Lake Area..... | -- | GS | GS | GS | GS | -- |
| Town of Ottawa-Pretty Lake Area | -- | GS | GS | GS | GS | -- |

^aSources of supply abbreviations:

LMS = Lake Michigan Self-Supplied

LMP = Lake Michigan Purchased Supply

GS = Groundwater Shallow Aquifer

GST = Groundwater Shallow Aquifer with Special Treatment

GD = Groundwater Deep Aquifer

GDT = Groundwater Deep Aquifer with Special Treatment

^bComments abbreviations:

EC-00 = Existing System Supply Facilities Has Capacity for 2000

EC-35 = Existing System Supply Facilities Has Capacity for 2000 and 2035

EC-I = Existing System Supply Facilities Does Not Have Capacity for 2000 or 2035

EC-4 = Existing System Supply Facilities Has Capacity for 2035 and is Under Capacity for 2000 By a Small Amount

EX = Expansion of Supply Facilities Capacity Planned

NW = New Well or Wells Locally Proposed, Planned, or Under Construction

RA = Radium an Issue of Concern

PB = Exceedances of MCL for Lead in Limited Locations

TCF = Trichloroethylene Detected or Treated for in At Least One Well-Water Meets Standard

VC = Vinyl Chloride Detected in At Least One Well-Water Meets Standard

^cThe North Shore Water Commission provides water to the City of Glendale, the Villages of Fox Point and Whitefish Bay, and to We Energies-Water Services for a portion of the Village of Bayside.

^dThe City of Oak Creek Water Utility treatment plant is designed to be expanded to 48 mgd increments. That expansion would exceed the 2035 demands in the City and its customer communities.

Source: SEWRPC.

#129930 V3 - RWSP STAFF MEMO 08/07/07

310-1001

PCE/KWB/RPB/pk

08/10/07, Revised 08/31/07, 09/24/07

Map 1

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

LEGEND

PUBLIC WATER SUPPLY

■ GROUNDWATER

■ SURFACE WATER

COMMUNITY PUBLIC OTHER THAN MUNICIPAL WATER SUPPLY

■ GROUNDWATER

— SUBCONTINENTAL DIVIDE

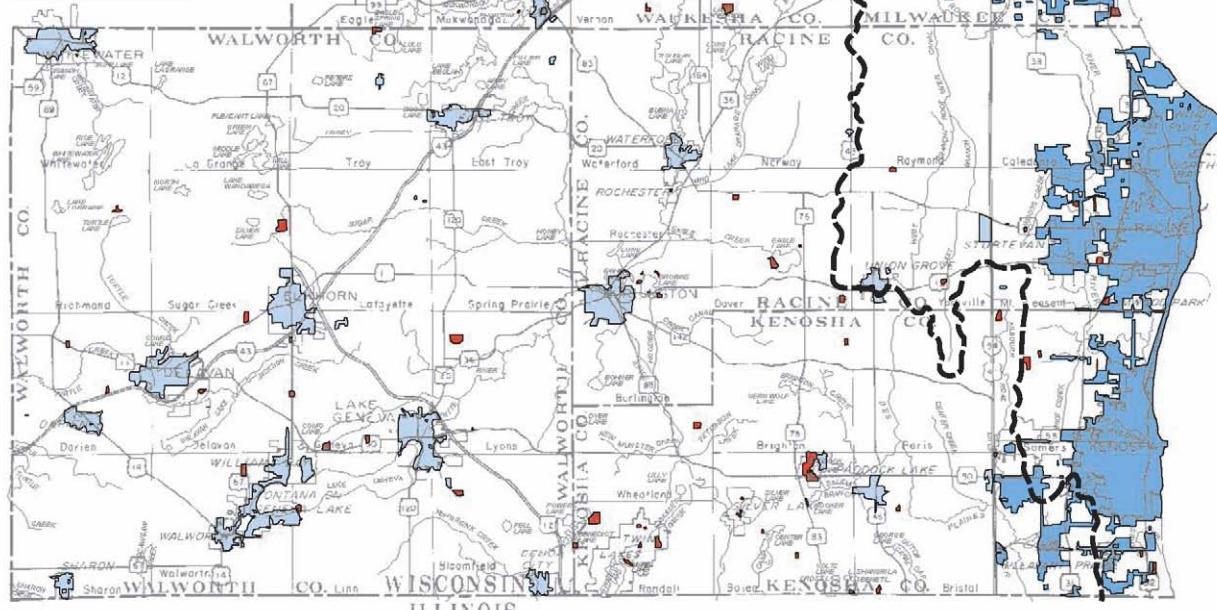
NOTES: 1. THE CITY OF FRANKLIN SYSTEM WAS FULLY CONVERTED FROM GROUNDWATER TO LAKE MICHIGAN SUPPLY IN 1997. PREVIOUSLY, GROUNDWATER AND SURFACE WATER WERE USED IN DIFFERENT PORTIONS OF THE CITY.

2. A PART OF THE VILLAGE OF MENOMONEE FALLS SYSTEM AND THE ENTIRE VILLAGE OF BUTLER SYSTEM WERE CONVERTED TO LAKE MICHIGAN SUPPLY IN 1999 AND 2000, RESPECTIVELY.

3. PORTIONS OF THE CITY OF MEQUON SYSTEM WERE CONVERTED TO A PUBLIC SYSTEM OVER THE PERIOD 1998 THROUGH 2002.

4. THE COUNTRY ESTATES SANITARY DISTRICT PUBLIC SYSTEM, LOCATED IN THE TOWN OF LYONS, WAS INSTALLED IN 2001.

GRAPHIC SCALE
0 1 2 3 4 5 6 MILES
0 5 10 15 20 25 30 35 40,000 FEET



Source: Wisconsin Department of Natural Resources and SEWRPC.

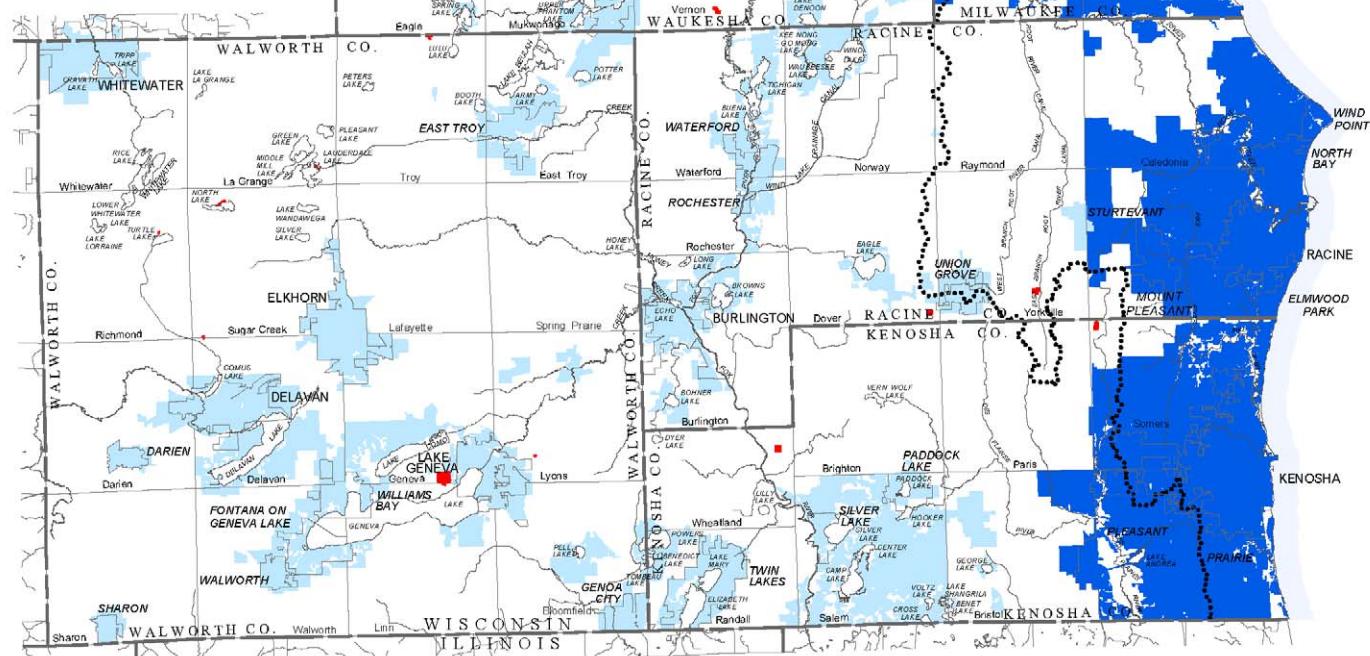
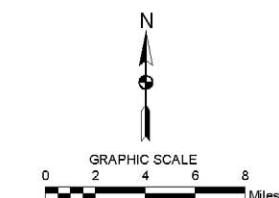
Map 2

ALTERNATIVE FORECAST PLAN 1 -
DESIGN YEAR 2035 FORECAST CONDITIONS
UNDER EXISTING TRENDS AND
COMMITTED ACTIONS

LEGEND

- AREAS SERVED BY PUBLIC WATER UTILITIES PROVIDING WATER FROM LAKE MICHIGAN: 2035
- AREAS SERVED BY PUBLIC WATER UTILITIES PROVIDING GROUNDWATER: 2035
- AREAS SERVED BY PRIVATE WATER UTILITIES PROVIDING GROUNDWATER: 2035

----- SUBCONTINENTAL DIVIDE



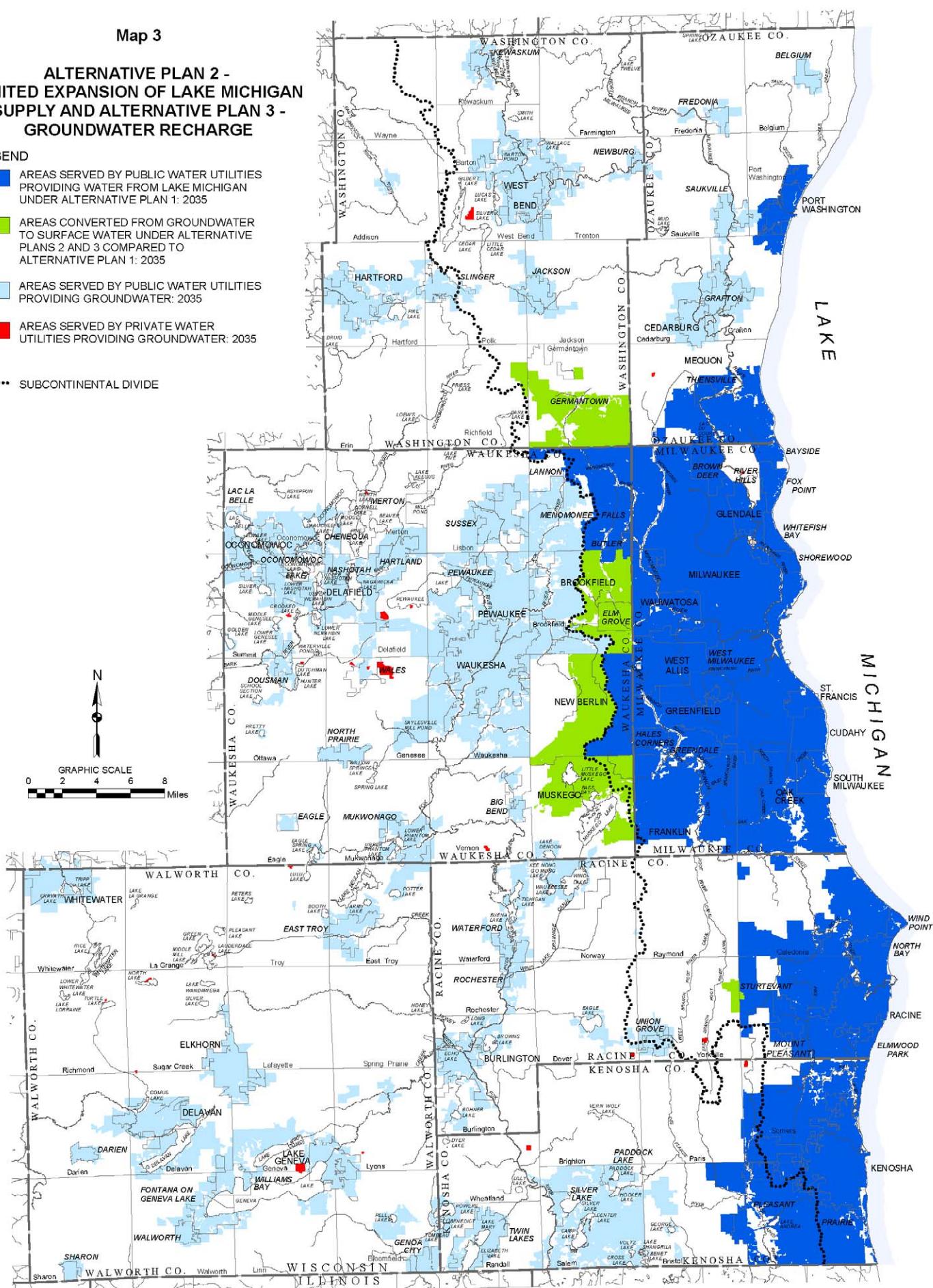
Map 3

**ALTERNATIVE PLAN 2 -
LIMITED EXPANSION OF LAKE MICHIGAN
SUPPLY AND ALTERNATIVE PLAN 3 -
GROUNDWATER RECHARGE**

LEGEND

- █ 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 2 AND 3 COMPARED TO ALTERNATIVE PLAN 1: 2035
 - █ AREAS SERVED BY PUBLIC WATER UTILITIES PROVIDING GROUNDWATER: 2035
 - █ AREAS SERVED BY PRIVATE WATER UTILITIES PROVIDING GROUNDWATER: 2035

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Source: SEWRPC.

Map 4

**ALTERNATIVE PLAN 4 -
FURTHER EXPANSION OF LAKE MICHIGAN
SUPPLY**

LEGEND

- 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 PLAN 4 COMPARED TO ALTERNATIVE PLAN 1: 2035
- AREAS SERVED BY PUBLIC WATER UTILITIES PROVIDING GROUNDWATER: 2035
- AREAS SERVED BY PRIVATE WATER UTILITIES PROVIDING GROUNDWATER: 2035

..... SUBCONTINENTAL DIVIDE

