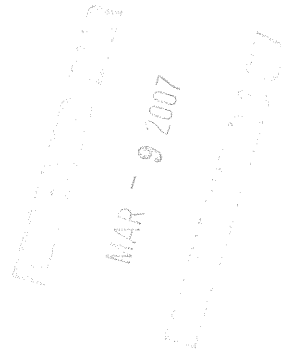


**AMENDED SAMPLE APPLICATION
FOR STRADDLING COMMUNITY
WATER DIVERSION
VOLUME 1**

CITY OF NEW BERLIN
WAUKESHA COUNTY, WISCONSIN
MARCH/2007



March 7, 2007

Mr. Lee Boushon, P.E.
Chief
Drinking Water Systems Section
Wisconsin Department of Natural Resources
P.O. Box 7921
Madison, WI 53707

RE: City of New Berlin, Wisconsin
Amended Sample Application for Straddling Community Water Diversion

Dear Mr. Boushon:

On behalf of the City of New Berlin, Wisconsin we are herewith submitting three (3) copies of this amended sample application for a diversion of Great Lakes Basin water to those portions of New Berlin lying west of the sub continental divide and contained in the Milwaukee Metropolitan Sewerage District (MMSD) service area. This amended sample application is based upon guidelines established in the Great Lakes – St. Lawrence River Basin (Basin) Sustainable Water Resources Agreement (Agreement) and the Great Lakes – St. Lawrence River Basin Sustainable Water Resources Compact (Compact) signed on December 13th, 2005. The City of New Berlin recognizes that these agreements are not binding upon the States or Provinces but rather guides for developing future agreements. Furthermore, the City recognizes that the Boundary Waters Treaty of 1909, the Water Resources Development Act, and other applicable national and international agreements continue unaffected by these agreements. It is the intent of this amended sample application to promote review by the Parties to the Agreements in a spirit of comity and cooperation that the agreements were based upon. This amended sample application is also intended to respond to comments received during the comment period for the original submittal and your correspondence of January 23, 2007.

The City of New Berlin furthermore understands that this is a high profile issue that has captured much regional and national attention. In our review of the issues related to the provision of water to areas that have return flow to the Great Lakes Basin and are considered “Straddling Communities” under the Compact, we find that New Berlin’s situation closely mimics other areas in the state and in other Great Lakes states where withdrawal of water from the basin has been allowed with a return flow component. New Berlin is requesting to be treated consistent with these previous determinations.

In making this application, the City of New Berlin has four primary benefits and initiatives it believes are compelling:

1. There is an overwhelming environmental benefit to the Great Lakes Basin and the Mississippi Basin in southeastern Wisconsin from approval of this proposal.



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2. The cost to society, and in particular the citizens of New Berlin, is minimized if this proposal is approved.
3. New Berlin is a prime example of how zoning controls and community planning can limit and control any type of over development in areas of limited resources.
4. Water conservation has been a benefit to New Berlin and additional methods to promote conservation are underway on a local and regional basis.

BACKGROUND

The City of New Berlin is located in Southeastern Wisconsin and is immediately adjacent to Milwaukee County and areas provided water service by the City of Milwaukee water system. The sub continental divide runs through the eastern portion of the City of New Berlin from north to south, bisecting the City (see Maps 1 and 2). With this feature, the City of New Berlin falls under the definition of a "Straddling Community" in the Agreement and Compact. This definition is:

"...any incorporated City, Town or the equivalent thereof, that is either wholly within any County that lies partly or completely within the Basin or partly in two Great Lakes watersheds but entirely within the Basin, whose corporate boundary existing as of the date set forth in [reference to subsection of agreement or compact] is partly within the Basin or partly within two Great Lakes watersheds."

The City of New Berlin has both a sanitary sewage collection system and a potable water supply system owned and operated by the City. The sanitary sewer system is entirely tributary to the Milwaukee Metropolitan Sewerage District (MMSD) and subsequently to Lake Michigan after treatment at one of two wastewater treatment facilities. The area identified in the most recent facility plan for the MMSD as the tributary area in New Berlin is also shown on Maps 1 and 2.

The City of New Berlin has been providing municipal water service since the 1960's when the City combined a number of private subdivision utilities into the current water system. As the City grew over the last 40 years, seven new wells were completed in the deep sandstone aquifer to provide the majority of the water to the City. Unfortunately, the deep sandstone aquifer in the Southeastern Wisconsin area has been found to have high levels of radionuclides, including combined radium 226 and 228, in excess of the Maximum Contaminant Levels (MCL) promulgated by the United States Environmental Protection Agency (EPA) and subsequently the Wisconsin Department of Natural Resources (DNR). Compliance with the rule was mandated for December



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2006 by the DNR in a consent order signed by the City. Interim compliance methods are underway but the City is now facing an estimated Capital investment of approximately \$4.0 Million and ongoing 20 year O & M costs of another \$2.0 Million to gain compliance with the radionuclide rules. 20 years is most likely the time that the facilities to treat radium would be viable declining water levels and rising saline levels in the deep aquifer will likely result in New Berlin having to find another source by that time.

In doing their due diligence, the City of New Berlin has been reviewing options for providing continued water service since the early 1990's. At that time, the City had completed the takeover and connection to a number of private subdivision water systems. These subdivision systems formed the backbone of the municipal system and included a number of deep sandstone wells. These wells, coupled with a few other deep sandstone wells constructed by the City had been the main source of supply throughout the previous decades. When constructed in the 1960's through the 1980's these sandstone aquifer wells were the best source of water for the area. The wells could be drilled just about anywhere and plentiful supplies would be found. In the early 1990's, it became apparent to many in the area that two problems were emerging in the sandstone aquifer, radium and declining levels. Radium is a naturally occurring element that has always been present in this aquifer. However, it was not until the mid 1970's, with the passage of the Safe Drinking Water Act, that radium was even on the radar screen for regulation. At the same time, communities in the area were also having to set their well pumps deeper and deeper due to declining water levels. For decades beginning with Milwaukee in the early part of the 20th century, the aquifer has been "mined" by over drafting. After most of the water users in Milwaukee county switched to Lake Michigan supplies, the declining water levels were transferred west and centered in an area under New Berlin and other communities. It became apparent that New Berlin may be facing an expensive treatment program which may only last for a few years and then would have to find another source of supply when levels declined even further.

The first studies of the potable (drinking) water resources of the area were performed in the early 1990's and centered on shifting reliance on the sandstone aquifer to shallower dolomite or sand and gravel aquifers. Copies of the text of these studies have been included in Volume II of this document as **Appendix A**. The work performed between 1990 and 2002 to locate alternative groundwater sources is listed below:

- Report on the Phase 1 Study of the Groundwater Exploration Program for the East Half of the City of New Berlin, Wisconsin, GeEx, August 1991



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- Report on the Phase II, Sand and Gravel Well Exploration Studies at the High Point and Woodfield Sites in the East Half of the City of New Berlin, Wisconsin, GeEx, November 1991
- Report on the Phase II, Dolomite Well Exploration Studies at the Westridge and Valley View Park Sites in the East Half of the City of New Berlin, Wisconsin, GeEx, November 1991
- Geothermal Survey for Locating a Dolomite Well Site, Westridge Subdivision, New Berlin Wisconsin, Northern Environmental, June 1992
- Geothermal Survey for Locating a Dolomite Well Site, Valley View Park, New Berlin Wisconsin, Northern Environmental, July 1992
- Shallow Geothermal Survey for Valley View Park Test Well Site, New Berlin, Wisconsin, Northern Environmental, October 1992
- Report on the Geologic Reconnaissance Study for the Siting of Shallow Sand and Gravel Wells, Aquifer Science and Technology a Division of Ruekert & Mielke, August 2000
- Sand and Gravel Test Boring Results, City of New Berlin, Aquifer Science and Technology a Division of Ruekert & Mielke, April 2001
- Report on the Geophysical Logging Study on Well 8, City of New Berlin, Aquifer Science and Technology a Division of Ruekert & Mielke, July 2001

All of these studies were designed to identify areas of the City of New Berlin where non-radium water could be provided on a sustainable basis to meet the existing and future water demands. As a result of the study work, two new dolomite wells were completed in the 1990's and serve to supplement the sandstone wells. In 2003, as a result of the later studies, one site was identified as being geologically, environmentally and financial feasible to construct a high capacity sand and gravel well. That site was developed but due to microbiological problems has not been a consistent source of supply for the City.

As part of the later geological studies, a sand and gravel aquifer was also identified in the far southwestern corner of the City. This area is as far away from the existing water and sewer service areas as any area in the City. During the investigations, a contingent of local homeowners from New Berlin and other local communities organized to fight



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proposed wells in this area. These homeowners have private individual wells and were concerned that their wells were going to be affected by any high capacity well placed in this area. In addition, the cost to construct wells in this area and pipe the water back to the service area was not cost-effective when compared to other options. Under political pressure from these local homeowners and environmental groups, the City chose not to invest any more time and money in this area. This issue was later reviewed in the subsequent studies for future water service cited below.

As a result of the work cited above, the City successfully tapped all available areas that shallow water could be located that:

- Provided quantities of water sufficient for a municipal system
- Were radium free
- Met EPA and DNR Mandatory separation distances from potential contamination sources
- Were geologically acceptable
- Were politically and financially feasible.

In 1998, The City of New Berlin hired consultants to update a study of water supply facilities that was originally prepared in 1990 and served as the precursor to the search for shallow well sources cited above. A copy of the Executive Summary from that Report is included in Volume II of this report as **Appendix B**. That report recommended the City perform a further study of the possibility of obtaining Lake Michigan Water as a supply source for the City, as well as exploring other options such as a new source of supply and/or treatment for radium.

The City of New Berlin then performed a study in 2000-2001 (Ruekert/Mielke 2001) to evaluate how Lake Michigan could be used to serve potable water to the City. A copy of the executive summary of that report is included in Volume II as **Appendix C**. That study, after reviewing four separate Lake Michigan water service options, recommended that the City negotiate with a Lake Michigan water provider for service to the east side of the City. New Berlin, being located immediately adjacent and west of the City of Milwaukee Water service area, selected the City of Milwaukee as the logical provider and successfully negotiated a water service agreement with them. Pumping Stations and water mains were constructed to allow only those areas within the Great



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Lakes surface water basin to be served. The City of New Berlin and the two service areas are also shown on Maps 1 and 2.

During these projects the new regulations relating to Radium were promulgated and the City once again did its due diligence and commissioned a Study of the best method to deal with Radionuclides in drinking water. That study took an in-depth look at the available methods to provide radium free water and the costs and environmental and other impacts related to compliance. A copy of the executive summary of that report is included in Volume II as **Appendix D**.

Based upon the results of that report, it was recommended that the City pursue Lake Michigan water for the entire proposed service area which coincides with the planned service area for MMSD sewers and therefore meets return flow requirements of the Compact. This recommendation was made after careful review of nine options for compliance and six evaluation criteria as well as present worth analysis. Options and Criteria reviewed were:

Options for Compliance

Ion Exchange Softening
Lime Softening
Reverse Osmosis
Greensand Filtration
HMO Filtration
Ion Selective Resins
Surface Water
New Shallow Wells/Blending
Reconstruct Deep Wells

Review Criteria

Reliability
Regulations/Legal
Political/Public Acceptance/Environmental
Operations and Maintenance
Schedule
Infrastructure
Cost-NPV

Figure E-3 in **Appendix D** shows the results of the analysis graphically and table E-1 shows the numerical results. In the discussion related to this analysis, the option of reconstructing wells was the most attractive due to the low cost and chance for a "quick fix". The City pursued this option unsuccessfully. The next options, in order of preference were, Ion Exchange Softening, Reverse Osmosis, and Surface Water (Lake Michigan). These options ranked within a few percent of each other in this analysis. The present worth cost of all options was then reviewed (Table E-2 in **Appendix D**) and it became apparent that Ion Exchange and Reverse Osmosis were cost prohibitive as well as having environmental impacts such as salt production and increased waste of water. The final recommendation was to pursue Lake Michigan water for the entire area because it was cost beneficial and the most environmentally friendly option. If that



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could not be accomplished for regulatory or other reasons, HMO filtration was the next choice. The reason for these recommendations were that under the Agreement and Compact, the City of New Berlin is considered a "Straddling Community" as previously identified. If, however, the timing to gain approval for Lake Michigan supply could not coincide with the required timing by a radium consent order, it was realized that a less favorable option, from an environmental and cost standpoint, may need to be pursued.

The City then signed a consent order outlining the steps that would be taken to reach compliance with the radium rule. Included in this agreement was the fact that New Berlin would pursue Lake Michigan as an option for the entire MMSD service area.

The City also, in following the recommendations of the radium study and consent order, performed logging of two high radium wells to determine if the wells themselves could be rehabilitated to reduce the amount of radium entering the well bore. As a result of the geophysical logging, it was determined that the well construction did not allow for reconstruction at any cost effective level and that the likelihood of success with radium reduction was low. This was the first step in trying to solve the radium project.

Next, in compliance with the consent order, the City had a paper pilot study performed to determine the level of radium removal that could be expected from HMO filters at the three largest wells in the City. This study was successful and in 2006, three HMO plants were designed. These plant designs have now been approved by DNR and the go ahead for construction is awaiting the result of this application. If this application is not approved, the City will go ahead with construction of the plants. Construction of the plants will solve the radium issue at a huge cost to the people of New Berlin and perpetuate environmental degradation from tens of thousands of tons of salts and other contaminants to the Great Lakes basin. Construction of these plans will also increase the amount of water removed from the Mississippi Basin and transmitted to the Great Lakes Basin due to backwash of the filters. These environmental impacts are discussed in depth in following sections.

DISCUSSION OF REVIEW COMMENTS

As part of the review of the previously submitted sample application, the DNR solicited public comments and a number of comments were received from various organizations and private citizens. In addition, comments were received from the other Great Lakes states that were involved in the creation of the Agreement and Compact. Those comments were collated and concisely transmitted to this author on January 23, 2007. This section will provide detail responses to those questions and comments by referencing policies, rules and procedures required by the Wisconsin Public Service



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Commission (PSC), Wisconsin State Statutes, and Wisconsin Department of Natural Resources (DNR).

Efficient Water Use

Wisconsin is one of a few states that has very strict requirements for the monitoring and efficient use of water by public water Utilities. At the recent Governors convention on Water Conversation it was stated that Wisconsin and Alaska by far have the most restrictive water use, regulation, and reporting requirements in the nation because of the Public Service Commission's authority. Unlike many other states, the attention to water accountability is foremost in the eyes of the Public Service Commission, **Appendix E** of this report contains a copy of Wisconsin Administrative code PSC 185 Standards for Water Public Utility Service, which govern the rate setting, metering, monitoring and reporting of water use by public utilities. Section PSC 185.31 (1) contains the requirement that all services to buildings be metered, with a few exceptions. In New Berlin in 2005, there were 9,151 customers of which only 7 (0.08%) were unmetered for various allowable reasons. Other connections for fire protection services exist but were not used in 2005. Estimates of use by the 7 unmetered connections are required on the annual report to the PSC. This is typical for all Wisconsin public water utilities.

The public service commission also requires the following:

- Statutorily all utilities are required to submit a report to PSC by April 1 of the following year that includes the following information:
 - Annual pumpage from wells or surface water sources to the transmission and distribution system
 - Annual metered sales in gallons and dollars by customer class (residential, commercial, industrial, public, fire protection and other)
 - Monthly pumpages from all sources of supply
 - Water used in production
 - Metered and unmetered service connections
 - Estimates of water used for fire fighting
 - All other uses of water



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- Regular bills be sent to customers and all billing information be available to the customer
- Rules for disconnection of service
- Records keeping requirements
- System Engineering requirements
- Customer meter accuracy requirements
- Meter testing Requirements
- Utility operating requirements related to:
 - Water quality
 - Adequacy of supply
 - Minimum and maximum pressures
 - Pumping station metering
 - Restriction of system losses to less than 15 percent of total pumpage including requirements for remedial activities
 - Hydrant flushing records requirements

With all the information that is required by PSC we can provide information on water use over a number of years. Table 1 through table 7 present information that was either taken directly off the PSC Annual Reports or calculated using the information contained in those reports. Information on the tables is as follows:

Table 1 - Annual Water Sales Records: 1979-2005

Table 2 - Customer Records: 1979-2005

Table 3 - Residential Water Demand: 1979-2005

Table 4 - Commercial Water Demand: 1979-2005

Table 5 - Industrial Water Demand: 1979-2005

Table 6 - Unaccounted for Water: 1979-2005

Table 7 - Annual Water Pumpage Records: 1979-2005

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Table 1 is a summary of the total annual pumpage, water sales and unaccounted for water for the last 27 year period on record with PSC. Important trends include the fact that the last five years of total pumpage show a downward trend. This is expanded upon in subsequent tables.

Table 2 is a summary of the total number of customers, by customer class, between 1979 and 2005. It is noted that the number of industrial customers has consistently declined over this period. This decline is accompanied by a residential customer growth rate of less than 1 percent per year and a less than 10 percent per year increase in commercial customers, over the last five years.

Table 3 is a summary of residential water use patterns for the years 1979 to 2005. Noted on the table is the fact that over the 27 year period the average residential use per customer was 244 gallons per day while the last 5 years averaged 217 gallons per customer per day. Total residential annual sales has remained relatively flat over the last 10 years as has average day sales. Conservation efforts which began in 1999 when water supplies were beginning to be taxed have resulted in a residential per customer decrease of over 3 percent in the last 5 years and over 6 percent in the last 10 years. The last two columns in the table reflect recent demographic data for the entire County and based upon that data, an attempt was made to quantify use in gallons per capita per day. Amy Vickers, a nationally recognized expert in water conservation, estimates residential water use nationally at 101 gallons per day per capita, in her book *Water Use and Conservation*, 2001. Using this data for the past five years, New Berlin has been 10 percent or greater below the national average.

However, the Southeastern Wisconsin Regional Planning Commission (SEWRPC) has recently inventoried the seven counties in the region and reports an average residential use per capita of 69.9 gallons in the county. New Berlin is reported to use 58.5 gallons per capita or 58 percent of the national average based upon actual data collected by SEWRPC.

Table 4 is a summary of commercial water use patterns for the years 1979 to 2005. While annual sales have risen at a rate of less than 2 percent over the last 5 years, it is interesting to note that per customer use has declined by over 3 percent per year over that same period.

Table 5 is a summary of industrial water use patterns for the years 1979 to 2005. During the last five years there has been a consistent reduction in annual sales, average day sales and gallons per customer per day.



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Table 6 is a comparison of the water records used to determine the amount of water accounted for by various methods. The end result is a percent of water that can be accounted for by metering and estimation. New Berlin traditional accounts for well over 90 percent of its water and recently has been over 95 percent. "Most U.S. water systems cannot account for between 10 and 25% (sometimes more) of their water supplies, with poorer countries typically having the highest water losses (over 50%)" (Smith & Vickers, 1999). For comparison, Boston had 50 percent unaccounted for water until meters were installed which dropped the unaccounted for to 36 percent (USEPA). New Berlin is at the lowest end of the national average and in many years – well below.

Table 7 provides information on average annual use patterns for average day and peak day pumpage and the ratio between the two for the years 1979 to 2005. This information is generally used to determine sizes of storage structures to meet peak hot weather water demand. The data indicates that sprinkling restrictions and other water conservation efforts appear to be helping eliminate the higher ratios that were at or near 2.25 and bring them below 2.0 on a consistent basis. This also results in additional water savings.

In addition to the requirements of the PSC, water utilities in Wisconsin are also regulated by the DNR through the Wisconsin Administrative Code. Specific chapters relating to water use and water utilities are:

- NR142 - Wisconsin Water Management and Conservation
- NR 809 - Safe Drinking Water
- NR 811 - Requirements for the Operation and Design of Community Water Systems

Chapter NR 142 of the Wisconsin Administrative Code requires approval for water loss if a withdrawal will result in a water loss averaging more than 2,000,000 gallons per day in a 30-day period. In NR 142 "water loss" is defined as "... a loss of water from the basin from which it is withdrawn as a result of interbasin diversion or consumptive use or both". We propose to transfer water from the Great Lakes Basin to the Mississippi River basin thus constituting an "Interbasin Diversion" as defined in NR 142. This transfer of water will most likely ultimately exceed 2,000,000 per day over a given 30-day period. However, the transfer will not result in a water loss to the Great Lakes basin because the area to be served in the Mississippi basin has return flow to the Great Lakes basin via the MMSD sanitary sewer system. Without a water loss no



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approval is required, only a registration of the withdrawal. This is consistent with how these types of withdrawals have been addressed in other areas of the State.

Chapter NR 809 codifies the requirements of the Safe Drinking Water Act and "...establishes minimum standards and procedures for the protection of the public health, safety and welfare in the obtaining of safe drinking water."

Chapter NR 811 defines requirements for design, treatment, storage, pumping, distribution, chemical addition, source development, waste disposal, and operation and maintenance of water systems and appurtenances. Some specific requirements of NR 811 related to this application include:

- The water supplier (New Berlin) is responsible for insuring that the system is operated in a manner that provides adequate, safe water supply to the customers. This application is designed to do just that.
- The water Supplier will provide Monthly reports to the DNR which include the following:
 - Daily quantities of water pumped
 - Daily quantities of chemicals used
 - Daily operation of treatment processes
 - Groundwater depth and static and pumping level measurements weekly
- Cross-connection and interconnection control
- Private well abandonment requirements
- Minimum and Maximum system pressure requirements
- Pressure and leakage testing of water mains

All of these are designed to make sure the utility is monitoring water use and using the available resources in a conservative manner to provide a sustainable, safe source of water supply for the utility customers.



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Conservation Issues

Water conservation in New Berlin is supported by a variety of State, regional and local initiatives that have been implemented or are currently underway. On the State level, Governor Jim Doyle initiated a project entitled Conserve Wisconsin in 2005. As part of the agenda of this initiative, he proposed the following water conservation path for the state (*Italic are direct quotations*):

State Water Conservation Program

- *The Governor will direct the Wisconsin Department of Natural Resources and the Public Service Commission, in close consultation with affected and interested stakeholders, to prepare a report by August 2006 identifying a menu of demand side initiatives to reduce water use in the State of Wisconsin.*
- *As Co-Chair of the Council of Great Lakes Governors, Governor Doyle is leading an effort to develop a comprehensive strategy for all the Great Lakes States relating to water diversions of Great Lakes water out of the basins (Annex 2001).*
- *Part of that effort requires that each state develop a water conservation plan for the basin.*
- *This report will form the basis to begin that effort which will be done in consultation with the Legislature as part of the Annex 2001 process.*
- *Last session the Governor signed Act 310 that is designed to protect against the depletion of Wisconsin's groundwater reserves.*
- *When the law was passed with broad bi-partisan support it was acknowledged that it was an important first step and this proposal continues that effort.*

Following the issuance of this agenda, the PSC and DNR prepared a report on demand side water conservation initiatives for water utilities in Wisconsin. The Executive summary of that report follows (*Italic are direct quotations*):

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*Report to Governor Jim Doyle
A Menu of Demand Side Initiatives for Water Utilities*

As part of his Conserve Wisconsin Agenda, Governor Jim Doyle directed the Department of Natural Resources (DNR) and the Public Service Commission of Wisconsin (PSC) to work with interested stakeholders to identify a menu of demand side initiatives to reduce water use in Wisconsin. This report discusses the resulting menu and is issued at a watershed moment for Wisconsin. Pockets of the state have experienced dropping groundwater levels and major water conservation policy efforts are underway to protect the state's valuable water assets. It is critical that this resource be managed in a way that promotes sustainability.

The menu of demand side initiatives was developed from the information provided at the Governor's Water Conservation Symposium in Sheboygan, Wisconsin, on May 23, 2006. Nationally recognized water conservation experts from across the country shared information on best practices and lessons learned on a wide array of water conservation issues. This was the first symposium of its kind in Wisconsin where local and state officials, water utility managers, consumers and environmentalists had the opportunity to come together for a day and discuss water conservation issues.

Although the water conservation menu is aimed at utilities, it provides useful information for all water consumers, even those on private wells. Approximately two-thirds of Wisconsin's water consumers get their water from utilities.

In addition, although sustainability of the resource explicitly or implicitly underpins every action taken by the state's water utilities, no two Wisconsin water utilities have the same set of water use issues or circumstances. The comprehensive list of water conservation initiatives is designed to provide flexibility for Wisconsin water utilities as they work on their own individual water conservation strategies in the following areas:

- **Water Conservation Education** - *The report points out that education alone won't maintain water conservation gains, but it is an integral part of any water conservation effort.*
- **Water Use Accountability** - *Measurement is a key to efficient use of water and Wisconsin utilities, unlike many other states' utilities, have been metering water*



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sales since the early 1900's. The report illustrates the need for continued and new measurement methods that allow for benchmarking and assessment of conservation activities.

- ***Water-Saving Hardware*** - *More efficient plumbing and water flow restrictors are the actions most frequently taken to conserve water because they do not usually rely on the consumer to curtail use on an ongoing basis.*
- ***Water Conservation Rates*** - *Pricing signals may be effective tools to help water utilities with water conservation goals and may encourage customers to purchase and use water-conserving appliances and fixtures. However, water utilities and environmental advocates both identified the ability of large industrial water consumers to "opt out" of the utility and build their own wells if water rates are too high as a major barrier to these types of pricing signals.*
- ***Water Reuse and Recycling*** - *Using a water supply that meets the minimum quality requirements for the intended purpose provides efficiency and preserves water resources. An example would be the higher quality standards for drinking water versus the standards required for landscape watering.*

The advisory stakeholder group that worked with the PSC and DNR on the Symposium and the menu included water utilities, consumers, environmental groups and business and industry. The group recommends that the agencies take advantage of the momentum of water conservation activities initiated by the Governor's Water Conservation Symposium and this report. Suggestions include public education on the menu of water conservation activities described in this report, collecting baseline data on water use to measure future water conservation efforts, and further development of a statewide water conservation education program.

It is important to note that the menu resulting from the Symposium is a first step that should be reviewed in concert with the Governor's other major water conservation efforts:

- *Governor Doyle chairs the Council of Great Lakes Governors and is leading the effort to develop a comprehensive water management strategy to protect an internationally significant water resource – the Great Lakes. Part of the strategy requires that each state develop a water conservation plan.*

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- *Governor Doyle signed 2003 Wisconsin Act 310, creating the Groundwater Advisory Committee to address the management and sustainability of Wisconsin's groundwater resources.*

Wisconsin is blessed with an abundant and unique supply of water. This menu of demand side initiatives acknowledges the critically important role water has in the ongoing prosperity of the state and its citizens, and the responsibility that flows to those who consume the resource. The initiatives should be used where appropriate to ensure the continued, unqualified availability of the state's water for future generations.

As can be seen from this report, the State is committed to helping individual water utilities implement water conservation programs designed specifically for each unique system. This sentiment is echoed in the Regional Water Supply Plan currently being prepared by the Southeastern Wisconsin Regional Planning Commission (SEWRPC). The first report prepared as part of that planning effort for 78 municipal water utilities in the region is entitled The State of the Art of Water Supply (SOTAR) and includes a chapter on Water Conservation. That draft chapter (containing technical advisory committee comments in edit format) is contained in **Appendix F** in Volume II of this report.

The Regional Water Supply plan is scheduled to be completed in 2007 and implemented shortly thereafter. The southeastern region of Wisconsin is designated as a Groundwater Management Area (GMA) under act 310 of the Wisconsin legislature. This means that an agency, presumably SEWRPC, will be responsible for managing the groundwater resources of the area in and around New Berlin. Without presupposing the results of the planning study, one option for the management of the groundwater resources both in and out of the Great Lakes basin, would be to use Lake Michigan resources, where allowed by current law, in a conservative manner. This would include New Berlin.

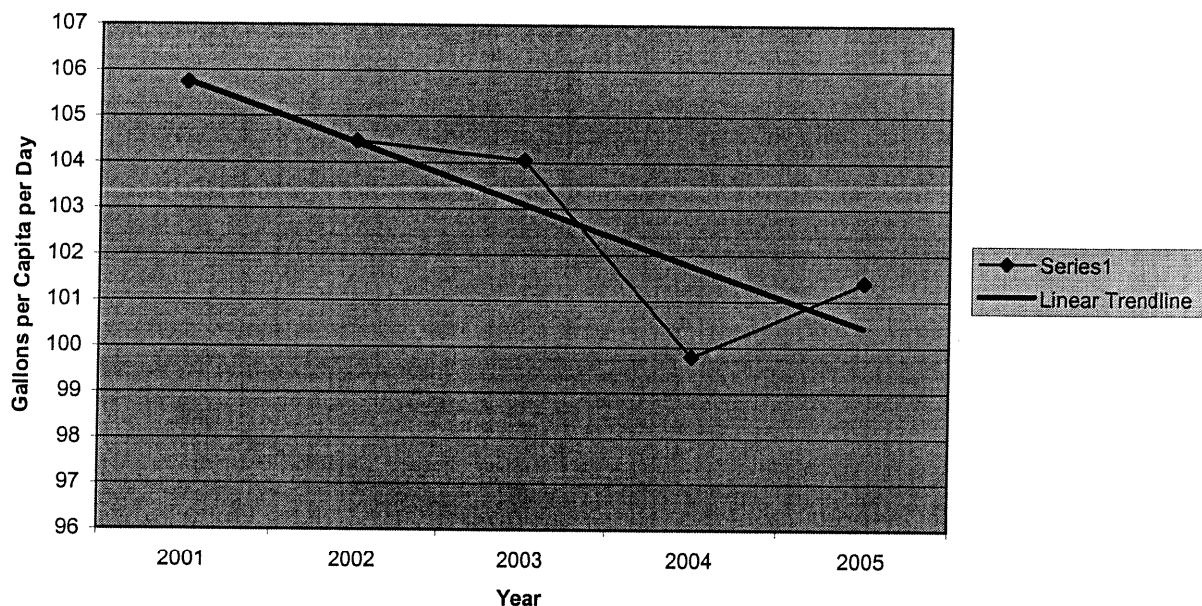
Part of any program will be a conservation effort. The SOTAR includes estimates of the impact of water conservation programs under different circumstances. The report also recognizes that most utilities, like New Berlin, already have instituted some conservation measures. Based upon the data presented in the SOTAR, New Berlin could expect additional conservation efforts to reduce future average water use by 4 to 10 percent. The SEWRPC estimates of water service area population for the last five years of available pumping data show a downward trend in usage per capita. This trend can be traced, in part, to the same period when New Berlin was instituting and enforcing water conservation efforts as part of their water supply planning process



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mentioned previously. The Graph shown in figure 1 provides the total pumpage per capita for the years 2001-2005. Also shown is a linear trend line for this period.

Figure 1
Per Capita Water Pumpage: 2001-2005



If we assume that just one-half the total reduction in pumping per capita during this period is a result of conservation efforts, then the utility has already reduced pumpage per capita by over 2 percent.

The efforts towards conservation on the utility level include the following:

- Lawn Sprinkling Water Conservation Schedule – Lawn Sprinkling is permitted only on an even/odd schedule that matches the day you can sprinkle with the day of the month on an even/odd number basis.
- Public Education Program
 - Annual Consumer confidence report reminds people to repair dripping faucets
 - Leaking toilets use rain barrels for watering and even/odd sprinkling



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- The in-basin portion of the system which is served by softer Lake Michigan water has benefited from additional conservation from discontinued use of water softeners. Assumptions cited later in this document in the environmental impact section indicate that current savings of water is about 3,500 gallons per year per home, or over 4 percent of total annual residential use. Similar savings can be expected in the out of basin service area.
- Water conservation materials and coloring books which are handed out at water meter replacements
- Kids page on the City website with water conservation and information links
- Information on the sprinkling ban on the website, in a quarterly leaflet, in utility bills, and on local access cable
- Free in-home leak detection by utility employees to assist customers in locating leaks
- Inspection of water service stop boxes, water meters and interior plumbing on an annual basis for a percentage of the residents, usually over 10 percent per year

These programs have obviously had an impact, considering the recent reductions in total per capita pumpage and the high level of accountability experienced by the utility. The Utility is investigating additional methods to reduce pumpage through conservation including:

- Conservation rates
- Additional public education
- Fixture change out credits
- Rain Barrel credits
- Adjustments to outdoor water use policies
- Other measures as recommended by SEWRPC

The utility will be reviewing the recommendations from the SEWRPC report in upcoming months and making recommendations for future measures that can achieve



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the additional 4 to 10 percent reduction in use. Examples of all current education materials and other programs are provided in **Appendix G** in Volume II of this report.

Sanitary Sewer Return Flow Issues

One of the concerns related to inter basin transfers of water is related to bringing water into the Lake Michigan Basin from outside the basin. Currently, New Berlin returns all sanitary sewerage to the Lake Michigan basin via the MMSD. Figure 2 shows the approximate split of flow from inside and outside the basin in a map format that provides drainage basin boundaries. This map also shows the results from the 2006 analysis of Rainfall Dependent Infiltration and Inflow (RDII) as measured by the City during 4 rain events in 2006. Areas were ranked as having low, moderate or high potential for RDII. As can be seen, the majority of the area has either low or moderate potential for RDII and the area west of the subcontinental divide is predominantly low or moderate. This is largely due to the ongoing efforts of the City to reduce RDII and maintain a low level. **Appendix H** provides information on the amount of funding used each year for this effort and copies of the most recent report on flow monitoring for RDII.

An important aspect of the application is that New Berlin will be returning an equal or greater amount of water withdrawn from the basin, back to the basin, so there will be zero loss of water. Recent records of water pumpage from year of record 2005 indicate that daily water pumpage for the entire water system (both groundwater and in-basin pumpage of Lake Michigan water) average 3.33 million gallons per day in 2005. For that same period, wastewater flows to the basin averaged 4.83 million gallons per day. A portion of the return flow is from homes that are served now by MMSD sewers but are on private wells. It is estimated about 1,800 homes have private wells that are tributary to MMSD sewers. The majority of these are in the basin. These homes have avoided the issues related to radium in the municipal water supply by remaining on private wells. It is anticipated within the next 20 years and once Lake Michigan water is available to these homes, a majority will connect to the municipal system. This represented about 25 percent of the total difference between water pumpage and sewer flow.

The majority of the sanitary sewer flow over and above the water use rate in the system is infiltration and inflow. The City, in cooperation with MMSD requirements, has undertaken an extensive program to reduce this I/I. This program includes:

- Flow monitoring to identify high I/I areas



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- Sanitary sewer televising to identify areas of I/I
- Sanitary sewer relays in high I/I areas
- Manhole grouting for leaks
- Manhole cover replacement
- Smoke testing for leak identification and repair
- Sump pump connection review

It should also be noted that the City contains no combined storm/sanitary sewers common in many other urban and suburban areas of the country. The City is committed to a continued program of monitoring and control of I/I. The MMSD requires an annual report be submitted outlining the infiltration and inflow management activities of the previous year. MMSD also requires a five year master plan outlining the activities proposed to reduce I/I for the upcoming years. Copies of these are in Appendix H.

Water Pumpage and Sanitary Flows In and Out of Basin

In order to determine the flow splits between the areas within the surface water basin and outside the surface water basin we can refer to metered water pumpage records. As previously indicated, the Water Utility is required by law to monitor pumpage on a daily basis. For year 2006, the water pumped from Lake Michigan to the in basin customers was 641 million gallons and the water pumped from wells to out of basin areas was 651 million gallons. This equates to a 49.6 to 50.4 flow split, or almost exactly 50/50. Based upon the flow monitoring results and engineering analysis it is estimated that about 62 percent of the total I/I is from the portion of the sanitary sewer system within the basin. This means that about 38 percent, or an average of 420,000 gallons per day of groundwater and rainfall from outside the basin is sent to the basin currently. Ongoing efforts will reduce this volume by an estimated 10 to 25 percent.

The accounting for the amounts of water delivered to either side of the basin is relatively simple due to the fact that the flow split is metered at points of delivery for lake water and groundwater. In the future when the entire system is served by lake water, an accounting on a quarterly basis will be made using water meter readings from each customer, divided into in-basin and out-of-basin groups. Using this same data adjusted annually for I/I estimates, an estimate of in-basin and out-of-basin sewer flow can also be made quarterly.



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Future Growth

Of concern to many is the anticipated increase in use of Lake Michigan water in the future. Based upon the estimates contained in the Lake Michigan water study, water use is expected to increase to 2.290 MGD by 2020 and to 2.480 ultimately in the out-of-basin area. This represents an increase of 0.510 MGD by 2020 and 0.700 MGD ultimately. These numbers are based upon an increase in the number of customers in two areas. First, existing homes not served by water will receive water service. This is estimated to include 1878 residential homes system wide with only a few hundred in the out-of-basin area. Second, current zoning allows for 718 new homes by 2020 and 1,119 additional homes ultimately. No appreciable increase in either commercial or industrial customer base or water use is anticipated. This growth is based upon the land use plan in place in 2001 and is only for areas served by MMSD. These figures were further broken down and are refined in Figure 3 and Table 8. These show that there are 2,760 acres of 415 unimproved parcels that could develop within the ultimate MMSD service area. This area available for development in the out-of-basin area represents a relatively small 1.2 percentage of the total area in New Berlin.

The City of New Berlin also began monitoring the water pumpage to areas in the Basin and to areas out of the Basin, as part of the conversion to Lake Michigan supply. This conversion happened in early summer 2005. Records indicate that the highest 30 day pumpage period was in August 2005, where system wide water pumpage averaged 4.32 million gallons per day. Of this, 1.94 million gallons per day was pumped from Lake Michigan to in-Basin areas and 2.38 million gallons per day was pumped from groundwater sources out-of-basin areas. The first full year (2006) of Lake Michigan pumpage to the in-basin areas showed almost exactly a 50/50 split of water use for in and out-of-basin areas. 641 million gallons were used in-basin from Lake Michigan (49.6 percent) and 651 million gallons (50.4 percent) from groundwater for out-of-basin areas were pumped.

The City of New Berlin has also performed studies to estimate future water needs for both in-basin and out of basin areas (Ruekert/Mielke, 2001). These estimates indicate that the ultimate average daily water pumpage (year 2050) will be 2.03 million gallons per day for the in basin areas and 2.48 million gallons for out of basin areas, for a total of 4.51 million gallons per day. A corresponding increase in average day sanitary sewage flow to the basin is anticipated and referenced in Table 9 below. Table 9 summarizes current and estimated 2050 in-basin, out of basin, and total water pumpage and sanitary sewage flows to the basin. Table 9 clearly indicates there will be zero loss of basin water if the entire MMSD Sewerage Service Area in New Berlin is provided Great Lakes Basin water.

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Table 9
Summary of Water Pumpage and Sewage Flows
City of New Berlin, Wisconsin: 2005 and 2050

	2005	2050
Annual Average Day Water Pumpage		
- In Basin (Estimated)	1.76 MG ⁽¹⁾	2.03 MG ⁽²⁾
- Out Of Basin (Estimated)	<u>1.78 MG</u> ⁽¹⁾	<u>2.48 MG</u> ⁽²⁾
- Total	3.54 MG	4.51 MG
Maximum Monthly (30 Day Period) Water Pumpage On A Daily Average		
- In Basin	1.94 MG ⁽³⁾	2.52 MG ⁽⁶⁾
- Out of Basin	<u>2.38 MG</u> ⁽³⁾	<u>3.09 MG</u> ⁽⁶⁾
- Total	4.32 MG	5.61 MG
Average Daily Sewage Flow To Basin		
- In Basin (Estimated)	2.76 MG ⁽⁴⁾	3.93 MG ⁽⁵⁾
- Out of Basin (Estimated)	<u>2.91 MG</u> ⁽⁴⁾	<u>3.27 MG</u> ⁽⁵⁾
- Total	5.05 MG ⁽⁴⁾	7.20 MG
Requested Increase in Average Daily Pumpage to Areas Out of Basin	1.78 MG	2.48 MG
Requested Maximum Monthly (30 Day Period) Increase in Average Daily Pumpage to Areas Out of Basin	2.38 MG	3.09 MG
Average Daily Water Loss to Basin (Average Daily Water Pumpage Minus Average Daily Sewerage Flow to Basin)	-0-	-0-

- (1) Based upon a pumpage split of 49.6 percent in-basin, 51.4 percent out of basin derived from 2006 records.
 (2) Lake Michigan Water Supply Study, Ruekert/Mielke, 2001.
 (3) August, 2005 Water Pumpage Records, City of New Berlin.
 (4) 2005 estimated MMSD total flow adjusted for I/I.
 (5) Current ratio of average day water pumpage to average day sewage flow applied to future water pumpage estimates.
 (6) Current ratio of monthly maximum daily average to annual average day water pumpage applied to 2050 annual average estimates.



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Water Supply Alternatives

A compilation of the work performed to identify options for water service is contained in the Appendix materials in Volume II. A summary of the information was provided in previous sections that showed the path leading to the Lake Michigan option recommendation.

Environmental Impacts

Of primary importance to New Berlin are the positive environmental impacts that will result from the proposal. Specific environmental improvements that will result from approval of this application include:

- Transfer of water between basins will be minimized
- Water will be removed and returned to the Lake Michigan basin in nearly the same location
- The diversion of the wastewater generated with out-of-basin water will be minimized
- Iron and radium releases to Lake Michigan will be avoided
- Tens of thousands of tons of salt released to the lake will be significantly reduced
- Water use by regeneration of water softeners will be significantly reduced
- Groundwater levels in the deep sandstone aquifer that is hydraulically connected to Lake Michigan will begin to rebound
- Shallow groundwater sources outside the divide will no longer be tapped and not returned to their basin
- The area of New Berlin outside the MMSD service area will remain on private wells and septic
- Significant amounts of energy will be saved along with associated reductions in green house gas generation
- Groundwater chemistry changes in the deep sandstone aquifer will be reduced



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These environmental improvements will be discussed in detail in the following section.

Transfer of Water Between Basins Will be Minimized

The Compact and Agreement both cite the fact that not only is it desirable to minimize or eliminate the withdrawal of water from the Great Lakes Basin, but also that it is desirable to minimize the amount of water entering the Great Lakes Basin from outside the Basin. This is further supported by Wisconsin administrative code chapter NR 142 which has substantial review requirements for transfer of water either way across basin boundaries. It should be noted that the requirements of NR 142 provide DNR with authority to approve the types of transfers that currently occur and that are proposed if the transfers are consistent with the requirements of that chapter and certain state statutes.

Presumably, the application, registration and review process established by NR 142 was set up to protect the two basins, Great Lakes and Mississippi, from any environmental issues that would arise out of a transfer of water. It can be inferred that if no transfer occurs, the concerns of this chapter would not apply. It can further be inferred that minimizing any such transfer would in turn minimize concerns with such transfer.

Approval of this application will result in a more normal balance of water withdrawal and return to both basins. Water taken out of Lake Michigan will be returned to lake Michigan in quantities that much more closely match. Currently there is a net increase of out-of-basin water entering the Basin of about 1.056 billion gallons per year. This would be decreased at least to about 412 million gallons per year or, with continued I/I reform, even more. This is over a 60 percent reduction in out-of-basin water entering the basin.

On the Mississippi basin side, the use of shallow and deep groundwater would cease. Concerns with over drafting aquifers in the City would be minimized and water tables would stabilize at levels where nearby private wells would not have issues resulting from City high capacity well influence.

Water Will be Removed and Returned in Close Proximity

The City of New Berlin has two water treatment plants, Linwood and Howard. Either plant can serve as the source of supply for the locations that pump water to New Berlin. All of the sanitary return flow goes to the South Shore Wastewater Treatment Facility under normal conditions. This means that the point of withdrawal and the point of return to the lake is normally about 10 miles apart and a maximum of 15 miles apart,

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depending on which supply plant is being used. This close proximity replaces the water near where it is withdrawn following treatment.

Wastewater Generated Using Out-of-Basin Water will be Minimized

The generation of wastewater will happen no matter where the source of supply is. The roughly 644 million gallons of water currently pumped from wells that flows into the MMSD system will be mostly eliminated under this proposal. That water has significant natural chemical difference from that of the Lake water. Hardness is more than double, iron, radium and many other metals are much higher, pH differs, water temperature differs and the total dissolved solids is much higher. These chemical differences would be minimized under this proposal.

Iron and Radium Releases to Lake Michigan will Cease

If this proposal is not approved, the City has designed and is currently bidding the construction of three radium removal plants which will be constructed to gain compliance with the radium regulations. These treatment plants not only have a high cost economically but have a high environmental impact. The technology which was determined in aforementioned studies is Hydrous Manganese Oxide filtration. This process uses a normal iron filter retrofitted to add a chemical solution known as Hydrous Manganese Oxide (HMO). HMO is added to the water prior to filtration and the radium in the water adsorbs to the manganese component of the HMO solution. Once the adsorption occurs, the resultant particle size is large enough to be removed by the filter. The process also removes the majority of the iron and some other total dissolved solids in small quantities. It is estimated that the process, which has already received DNR construction approval, will result in a significant increase in iron and radium sent to the Milwaukee Wastewater treatment system. Some of this will end up in Lake Michigan and some in the sludge generated by the process and applied as fertilizer. Exact breakdowns would take a detailed study but conservative calculations show that the increased loadings to the treatment facilities will be about 2,200 pounds per year of iron and 822 million picocuries of radiation from radium. Much of this is currently being sent to MMSD via the sanitary sewers now, but if the treatment plants are constructed, the iron and radium would be concentrated in the removal process and more efficiently sent to the system. If Lake water is provided to these areas, the out of basin iron, radium and other constituents would not be transferred to the basin.



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Salt Released to the Lake

The area of major concern is the amount of salts that are currently sent to the Lake. If the HMO facilities are installed, hardness will not be addressed. If lake water is provided, water hardness will drop from about 26 grains per gallon to about 8 grains per gallon according to DNR records. Experience with other communities such as Menomonee Falls shows that when the softer lake water is provided, households discontinue the use of the water softeners. This is evidenced by the fact that essentially no homes in Milwaukee or Milwaukee service areas have home water softeners. In order to estimate the aggregate water and salt savings from discontinuation of softening in New Berlin, the following assumptions were used:

- Currently there are 2650 residential customers in the area to be provided Lake Michigan water
- By 2020, there will be an additional 718 residential homes in the area
- Average residential water consumption is 220 gallons per day per customer. For homes having softeners, 180 gallons per day pass through the softener.
- Groundwater hardness averages 26 grains per gallon
- Average Lake water hardness is 8 grains per gallon
- If current and future customers are served with groundwater, 80 percent will use softeners
- If Future water supply is lake water, 10 percent will use softeners
- Softener capacity is 19,800 grains
- One pound of salt restores 3,350 grains of softener capacity
- Approximately 40 gallons of wastewater is produced during a softener regeneration



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Based upon the above assumptions and projected water demands, the existing and future homes will generate an additional 1.8 million pounds of salts annually which will be sent to the lake. This would be reduced by an estimated 90 percent under the lake water proposal.

Water use by softeners will be reduced by about 9.4 million gallons per year based upon our calculations.

Groundwater Levels in the deep Sandstone will be Positively Affected

Pre-development levels in the sandstone aquifer under New Berlin were over 500 feet higher than current levels. During that time, the normal flow of water in the sandstone was from about 30 miles west of the lake in the Mississippi basin to the east and into the Great Lakes basin. Decades of over pumping the aquifer have reversed the direction of the gradient and now water flows from the Great lakes basin towards the large pumping centers in and around New Berlin. Any proposal that stops the withdrawal of water from the sandstone is a step towards returning the flow to it's predevelopment condition.

Shallow Groundwater Sources Outside the Basin will no Longer be Affected

Currently, New Berlin uses three shallow aquifer dolomite wells for about 25-30 percent of their supply. Even at the rates they are currently pumping these shallow wells, a cone of depression is occurring that affects local private wells. Any continued or expanded reliance on these shallow sources will have even greater, longer lasting affects on the groundwater and hydraulically connected surface waters in the area. If the deep wells are to be pumped because Lake water is not available, the decline in the level of the sandstone aquifer will continue and the well documented problems that exist with radium, saline water intrusion and prohibitive pump setting depths will continue to get worse. At some point it may become financially advantageous to find shallow resources further and further away from the City and the water service area. The City has already experienced vehement opposition to use of the available shallow aquifers and currently these options are cost prohibitive. Any increase in the use of the shallow aquifer will affect local wetlands and surface waters. As a region, any affect to surface waters or wetlands is negative. Flora and fauna in the region do not know that there is a basin divide and do not follow strict rules in staying on one side or the other of the divide. The provision of water and protection of regional resources is a regional issue. The proposal fits in well with the region.



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Areas will Remain on Private Wells and Septic

It is a common mistake to think that this proposal is designed to encourage “urban sprawl”. Currently, the agreement New Berlin has with Milwaukee water for water service to in-basin areas limits the use of water to areas within the basin. The proposed amended service area would limit water service to the MMSD area as shown on Maps 1 and 2.

This means the area shown in white on Maps 1 and 2 would not be served by Lake Michigan or MMSD under this proposal. These homes and lots would continue to be served by private wells and septic or holding tanks. With most homes on septic, about 85 percent of the water used is returned to the ground and this would continue – assisting in the preservation of groundwater levels and wetlands and surface waters for the region.

In addition, The current agreement that New Berlin has with Milwaukee for water service clearly indicates that under no circumstances will New Berlin be allowed to transfer or sell water to any other community in the area. We are not proposing any change to this language. Any agreement that may be reached with a lake water provider different from Milwaukee would also include similar language.

Finally, as previously noted, there simply does not exist enough undeveloped area in the proposed new service area to support “urban sprawl”. Only slightly over 1 percent of the total land area in the City and in the proposed service area is identified as unimproved as shown on Figure 3 attached to this document.

Significant Amounts of Energy will be Saved and Green House Gas Generation Reduced

New Berlin currently uses a tremendous amount of energy to pump water from the deep wells to the system. This will be greatly reduced if the Utility obtains all its water from Lake Michigan. Current estimates of energy use and the decrease in energy use under the proposed plan can be calculated by comparing the current total lift required to deliver water from the deep aquifers (average) to the total lift required for lake water. If we assume 70 percent efficient pumping systems under both scenarios and normal friction and other losses, there will be a savings of about 700,000 Kilowatt Hours of energy used annually by New Berlin to pump water. The Carbon Trust reports energy purchased off the grid uses an average of 0.43 KgCO₂/KWh for a total reduction in carbon emissions of about 300,000 Kilograms annually.



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Other Related Issues

The primary related issue is development related. Many environmental entities have indicated that the continued development of areas in western New Berlin will pave over recharge areas, promote development away from urban centers, increase degradation of natural resources and other traditional arguments against development of suburban areas. New Berlin, through its planning process, has developed very strict land development and zoning practices for areas not included in a designated sanitary sewer service area. For areas west of the MMSD area, minimum lot sizes of 5 acres are the standard and this level of development cannot support the provision of sanitary sewers or water facilities. These areas will remain on private systems and are not shown on any legal documents as being served. As previously mentioned, by current and proposed future agreements, these areas cannot be served.

This amended sample application is a request for the entire MMSD sewer service area in New Berlin to be included in the Lake Michigan Basin and therefore be allowed to receive its water supply from the Basin. All concerns generated during the previous review process have been adequately addressed and based upon this document:

1. There is an overwhelming environmental benefit to the Great Lakes Basin and the Mississippi Basin in southeastern Wisconsin from approval of this proposal.
2. The cost to society, and in particular the citizens of New Berlin, is minimized if this proposal is approved.
3. New Berlin is a prime example of how zoning controls and community planning can limit and control any type of over development in areas of limited resources.
4. Water conservation has been a benefit to New Berlin and additional methods to promote conservation are underway on a local and regional basis.

There is currently no standard format for an application of this nature. The attached document will address the items identified in Article 201 of the Agreement "Exceptions to the Prohibition of Diversions" in light of the information presented above.



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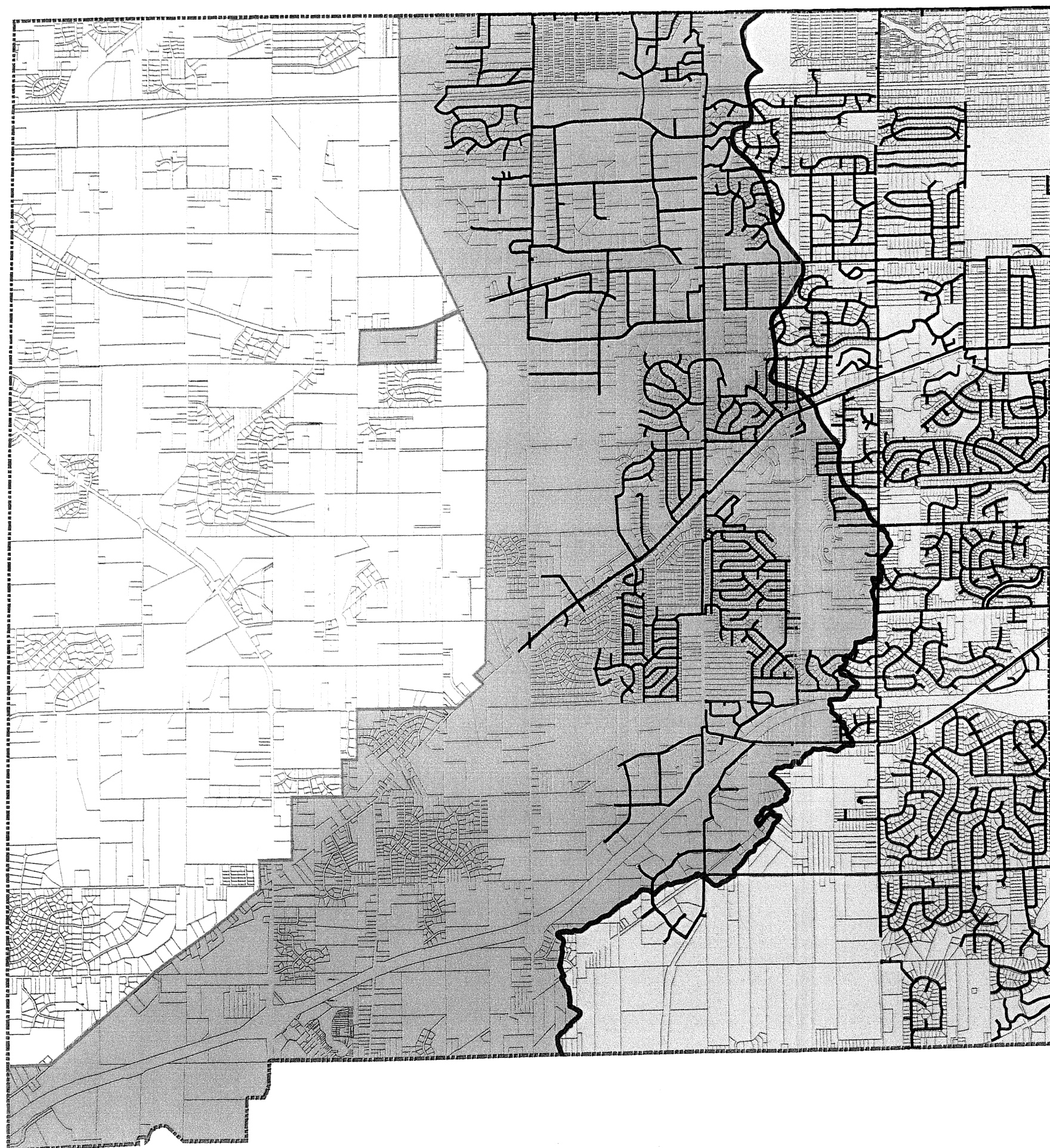
This document, the attached Amended Sample Application Discussion, and attached Appendices comprise the entire Amended Sample Application for Diversion. The City of New Berlin respectfully requests your review and appropriate approvals under current Wisconsin Statutes, codes and practices to allow the City to continue to provide safe and adequate potable water service to the residents and customers of the City.

Respectfully Submitted,

Steven H. Schultz, P.E.
Water Supply and Wastewater Treatment
Department Head

SHS:tag
Enclosures

cc: Jack Chiovatero, Mayor, City of New Berlin
Mark Blum, Attorney, Hippenmeyer Reilly & Moodie, S.C.
William J. Mielke, P.E., Ruekert/Mielke
File








MAP 1

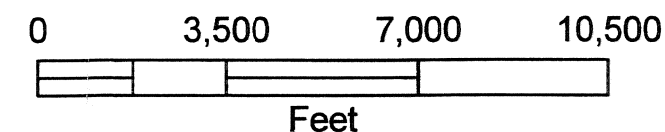
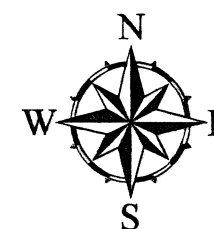
SUB-CONTINENTAL DIVIDE, NEW BERLIN WATER SUPPLY AND MMSD SERVICE AREAS

DIVERSION APPLICATION

CITY OF NEW BERLIN, WAUKESHA COUNTY, WISCONSIN

Legend

-  Sub-Continental Divide
-  Milwaukee Metropolitan Sewerage District Service Area Boundary - Water Returned to Great Lakes Basin
-  Great Lakes Basin - Based upon surface water divide and Milwaukee Water Service Area (Lake Michigan source)
-  Proposed Great Lakes Water Service Area (Ultimate Boundary)
-  Existing Water Mains



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MAP 2

**REGIONAL VIEW OF
SUB-CONTINENTAL DIVIDE,
NEW BERLIN WATER SUPPLY
AND MMSD SERVICE AREAS**

**AMENDED SAMPLE
DIVERSION APPLICATION**

CITY OF NEW BERLIN, WISCONSIN

Legend

-  Sub-Continental Divide
-  Milwaukee Metropolitan Sewerage District Service Area Boundary - Water Returned to Great Lakes Basin
-  Great Lakes Basin - Based upon surface water divide and Milwaukee Water Service Area (Lake Michigan source)
-  Proposed Great Lakes Water Service Area (Ultimate Boundary)
-  Great Lakes Basin
-  City of New Berlin
-  County Lines
-  Corporate/Township Lines

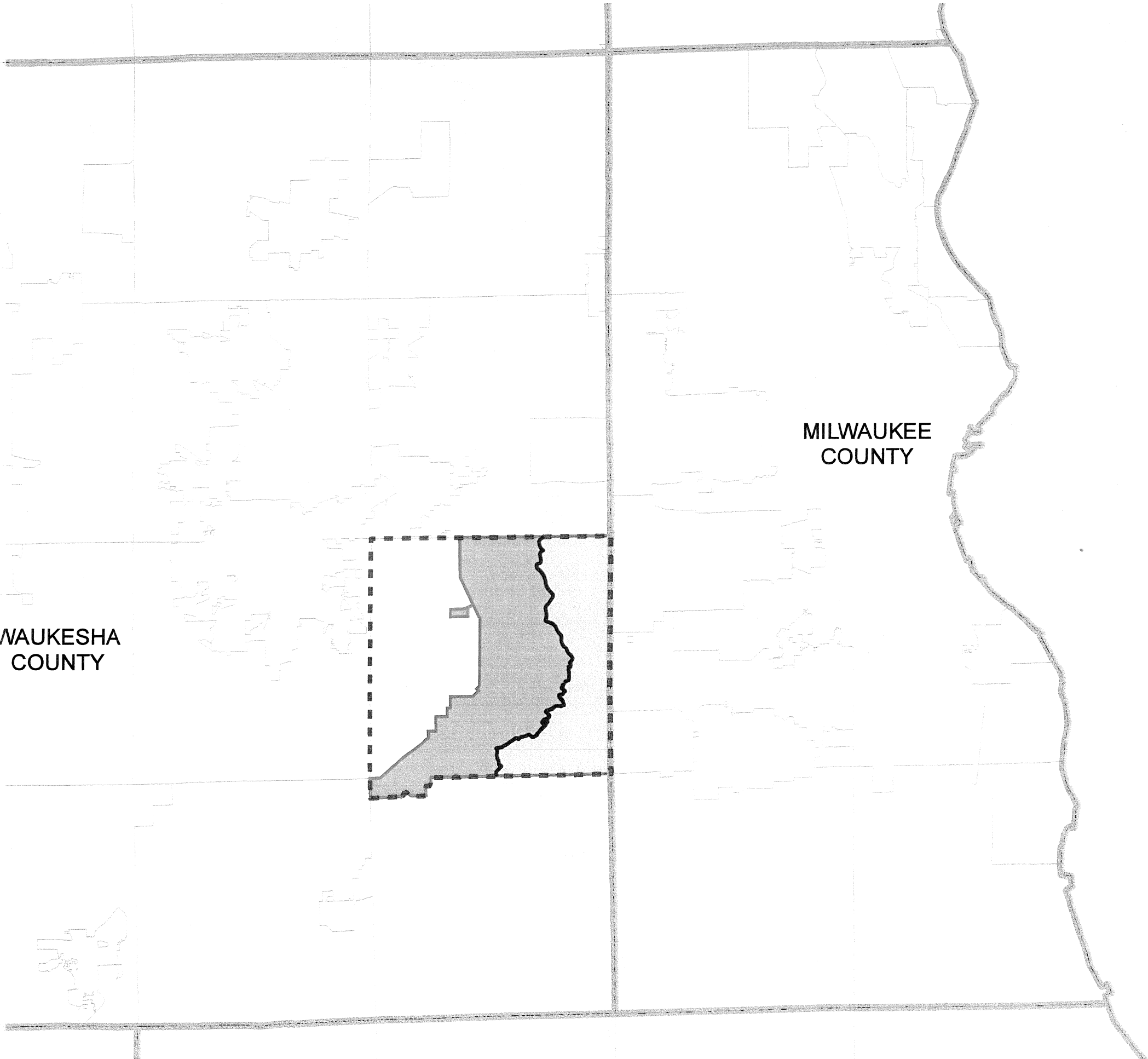
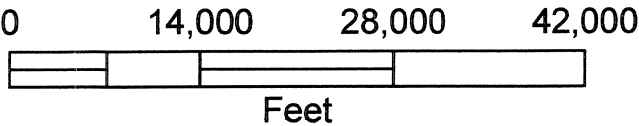
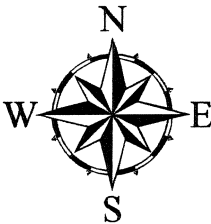


Table 1

Annual Water Sales Records: 1979-2000

New Berlin Water Utility
City of New Berlin, Wisconsin

Year	Annual Water Sales (MGY)					Total Sales (MGY)	Total Pumpage (MGY)	Percent Accounted For
	Residential	Commercial	Industrial	Public	Estimated Other			
1979	242.21	25.75	252.10	6.60	0.00	526.54	580.97	90.6%
1980	292.86	81.25	214.26	6.75	0.00	528.00	547.50	96.4%
1981	249.00	97.56	220.26	7.43	0.00	578.05	612.90	94.3%
1982	269.42	85.29	200.30	25.13	0.00	590.49	648.38	91.1%
1983	319.59	86.26	192.01	7.81	0.00	627.85	710.60	88.4%
1984	330.16	135.76	158.09	9.05	0.00	655.14	770.64	85.0%
1985	370.17	153.31	145.49	14.48	0.00	704.61	801.26	87.9%
1986	336.47	141.97	134.05	0.46	16.53	612.94	734.13	85.7%
1987	399.87	156.29	141.10	14.40	21.53	711.66	844.65	86.8%
1988	535.24	174.85	147.65	15.81	19.85	873.56	1068.19	83.6%
1989	453.30	176.15	127.04	15.82	38.31	772.30	928.81	87.3%
1990	466.65	210.22	113.03	15.92	74.15	805.81	923.68	95.3%
1991	533.79	211.11	113.47	17.36	53.66	875.73	994.04	93.5%
1992	517.18	212.11	113.07	20.72	71.94	863.08	1032.88	90.5%
1993	498.54	211.65	111.14	18.29	64.81	839.63	972.70	93.0%
1994	551.14	242.83	108.53	18.45	89.12	920.94	1180.27	85.6%
1995	558.90	253.12	108.07	17.95	108.75	938.04	1111.53	94.2%
1996	578.34	249.36	108.34	17.18	51.63	953.22	1110.72	90.5%
1997	549.50	251.98	107.55	16.85	62.30	925.88	1092.28	90.5%
1998	586.01	298.31	106.33	19.08	76.03	1009.73	1169.88	92.8%
1999	600.42	298.81	105.17	18.63	62.71	1023.03	1176.62	92.3%
2000	557.02	334.09	109.46	19.41	75.65	1019.99	1187.06	92.3%
2001	583	344.95	98.19	16.3	99.86	1042.44	1248.21	91.5%
2002	607.82	325.8	93.31	14.94	88.69	1041.87	1238.2	91.3%
2003	623.59	338.94	81.91	18.03	93.77	1062.46	1238.19	93.4%
2004	574.01	356.2	80.15	16.16	94.38	1026.52	1192.11	94.0%
2005	618.89	372.08	74.58	13.19	92.28	1078.74	1216.12	96.3%

Maximum Value =

Table 2

Customer Records: 1979-2005

New Berlin Water Utility
City of New Berlin, Wisconsin

Year	Number Of Customers				Total
	Residential	Commercial	Industrial	Public	
1979	1929	37	181	9	2156
1980	2235	84	185	9	2513
1981	2555	110	187	13	2865
1982	2839	133	178	14	3164
1983	3255	160	176	14	3605
1984	3677	173	175	17	4042
1985	3827	204	171	17	4219
1986	3966	267	170	16	4419
1987	5360	1089	174	16	6639
1988	5109	1424	165	19	6717
1989	5272	1026	165	19	6482
1990	5478	502	165	19	6164
1991	5785	505	166	22	6478
1992	6040	556	167	22	6785
1993	6241	573	168	23	7005
1994	6393	554	168	22	7137
1995	6535	576	168	23	7302
1996	6652	598	168	23	7441
1997	6802	637	169	23	7631
1998	6953	663	169	22	7807
1999	7156	752	169	22	8099
2000	7367	873	169	24	8,433
2001	7494	1015	169	24	8702
2002	7560	1053	169	26	8808
2003	7616	1093	167	26	8902
2004	7670	1191	124	27	9012
2005	7691	1299	142	26	9158

Source: PSC, R/M

Table 3

Residential Water Demand: 1979 - 2005

New Berlin Water Utility
City of New Berlin, Wisconsin

Year	No. of Customers	Annual Sales (MG)	Average Day Sales(000)	Gallons per Customer per day	People per Household	Gallons per Capita Use
1979	1929	242.21	663.59	344		
1980	2235	292.86	800.16	358		
1981	2555	249.00	682.19	267		
1982	2839	269.42	738.14	260		
1983	3255	319.59	875.59	269		
1984	3677	330.16	902.08	245		
1985	3827	370.17	1014.16	265		
1986	3966	336.47	921.84	232		
1987	5360	399.87	1095.53	204		
1988	5109	535.24	1462.40	286		
1989	5272	453.30	1241.92	236		
1990	5478	466.65	1278.49	233		
1991	5785	533.79	1462.44	253		
1992	6040	517.18	1413.06	234		
1993	6241	498.54	1365.86	219		
1994	6393	551.14	1509.97	236		
1995	6535	558.90	1531.23	234		
1996	6652	578.34	1580.16	238		
1997	6802	549.50	1505.48	221		
1998	6953	586.01	1605.51	231		
1999	7156	600.42	1644.99	230		
2000	7367	557.02	1526.08	207	2.57	81
2001	7494	583.00	1597.26	213	2.55	84
2002	7560	607.82	1665.26	220	2.53	87
2003	7616	623.59	1708.47	224	2.52	89
2004	7670	574.01	1572.63	205	2.49	82
2005	7691	618.89	1695.59	220	2.48	89
Average				244		
2001-2005 Average				217		

Source: PSC, R/M

Table 4

Commercial Customer Records:1979-2005

New Berlin Water Utility
City of New Berlin, Wisconsin

Year	No. of Customers	Annual Sales (MG)	Average Day Sales(000)	Gallons per Customer per day
1979	37	25.75	70.55	1907
1980	84	81.25	221.99	2643
1981	110	97.56	267.29	2430
1982	133	85.29	233.67	1757
1983	160	86.26	236.33	1477
1984	173	135.76	370.93	2144
1985	204	153.31	420.03	2059
1986	267	141.97	388.96	1457
1987	1089	156.29	428.19	393
1988	1424	174.85	477.73	335
1989	1026	176.15	482.60	470
1990	502	210.22	575.95	1147
1991	505	211.11	578.38	1145
1992	556	212.11	579.54	1042
1993	573	211.65	579.86	1012
1994	554	242.83	665.29	1201
1995	576	253.12	693.48	1204
1996	598	249.36	681.31	1139
1997	637	251.98	690.36	1084
1998	663	298.31	817.29	1233
1999	752	298.81	818.66	1089
2000	873	334.09	915.32	1048
2001	1015	344.94	945.04	931
2002	1053	325.80	892.60	848
2003	1093	338.94	928.60	850
2004	1191	356.20	975.89	819
2005	1299	372.08	1019.40	785

Source: PSC, R/M

Table 5

Industrial Customer Records:1979-2005

New Berlin Water Utility
City of New Berlin, Wisconsin

Year	No. of Customers	Annual Sales (MG)	Average Day Sales(000)	Gallons per Customer per day
1979	181	252.10	690.68	3816
1980	185	214.26	585.41	3164
1981	187	220.26	603.45	3227
1982	178	200.30	548.77	3083
1983	176	192.01	526.05	2989
1984	175	158.09	431.94	2468
1985	171	145.49	398.60	2331
1986	170	134.05	367.26	2160
1987	174	141.10	386.58	2222
1988	165	147.65	403.42	2445
1989	165	127.04	348.05	2109
1990	165	113.03	309.67	1877
1991	166	113.47	310.88	1873
1992	167	113.07	308.93	1850
1993	168	111.14	304.49	1812
1994	168	108.53	297.34	1770
1995	168	108.07	296.08	1762
1996	168	108.34	296.01	1762
1997	169	107.55	294.66	1744
1998	169	106.33	291.32	1724
1999	169	105.17	288.14	1705
2000	169	109.46	299.89	1774
2001	169	98.19	269.01	1592
2002	169	93.31	255.64	1513
2003	167	81.91	224.41	1344
2004	124	80.15	219.59	1771
2005	142	74.58	204.33	1439

Source: PSC, R/M

Table 6

Unaccounted For Water: 1979 - 2005

New Berlin Water Utility
City of New Berlin, Wisconsin

Year	Metered Production (MG)	Total Sales (MG)	Percent Sold	Other Consumption (MG)	Accounted- For Water (MG)	Unaccounted- For Water (MG)	Percent Accounted For (MG)
1975	394.20	375.00	95.1%		375.00	19.20	95.1%
1976	503.70	469.00	93.1%		469.00	34.70	93.1%
1977	529.25	506.94	95.8%		506.94	22.31	95.8%
1978	514.65	509.28	99.0%		509.28	5.37	99.0%
1979	580.97	526.54	90.6%		526.54	54.43	90.6%
1980	547.50	528.00	96.4%		528.00	19.50	96.4%
1981	612.90	578.05	94.3%		578.05	34.85	94.3%
1982	648.38	590.49	91.1%		590.49	57.89	91.1%
1983	710.60	627.85	88.4%		627.85	82.75	88.4%
1984	770.64	655.14	85.0%		655.14	115.50	85.0%
1985	801.26	704.61	87.9%		704.61	96.65	87.9%
1986	734.13	632.47	86.2%	16.53	649.00	85.13	88.4%
1987	844.65	736.19	87.2%	21.53	757.72	86.93	89.7%
1988	1068.19	896.41	83.9%	19.85	916.26	151.93	85.8%
1989	928.81	811.00	87.3%	38.31	849.31	79.50	91.4%
1990	923.68	805.81	87.2%	59.00	864.81	58.87	93.6%
1991	994.04	875.73	88.1%	53.66	929.39	64.65	93.5%
1992	1032.88	863.08	83.6%	71.94	935.02	97.86	90.5%
1993	972.70	839.63	86.3%	64.81	904.44	68.26	93.0%
1994	1180.27	920.94	78.0%	89.12	1010.06	170.21	85.6%
1995	1111.53	938.04	84.4%	108.75	1046.79	64.74	94.2%
1996	1110.72	953.22	85.8%	51.63	1004.85	105.87	90.5%
1997	1092.28	925.88	84.8%	49.58	975.46	116.82	89.3%
1998	1169.88	1009.73	86.3%	76.03	1085.76	84.12	93.5%
1999	1176.62	1023.03	87.0%	62.72	1085.75	90.87	94.7%
2000	1187.06	1019.99	85.9%	75.65	1095.64	91.42	92.3%
2001	1248.21	1042.44	83.5%	99.86	1142.30	105.91	91.5%
2002	1238.2	1041.87	84.1%	88.69	1130.56	107.64	91.3%
2003	1238.19	1062.46	85.8%	93.77	1156.23	81.96	93.4%
2004	1192.11	1026.52	86.1%	94.38	1120.90	71.21	94.0%
2005	1216.12	1078.74	88.7%	92.28	1171.02	45.10	96.3%

Source: PSC, R/M

Table 7

Annual Water Pumpage Records: 1979-2005

New Berlin Water Utility
City of New Berlin, Wisconsin

Year	Pumpage			Ratio
	Annual (MG)	Average Day (MG)	Peak Day (MG)	Peak Day: Average Day
1979	580.97	1.59	3.02	1.90
1980	547.50	1.50	3.76	2.51
1981	612.91	1.68	3.75	2.23
1982	648.38	1.78	3.16	1.78
1983	710.60	1.95	3.77	1.94
1984	770.64	2.11	3.81	1.81
1985	801.26	2.20	4.96	2.26
1986	734.13	2.01	3.14	1.56
1987	844.65	2.31	5.16	2.23
1988	1068.19	2.92	5.79	1.98
1989	928.81	2.54	4.65	1.83
1990	923.68	2.53	4.01	1.58
1991	994.04	2.72	5.52	2.03
1992	1032.88	2.82	6.28	2.23
1993	972.70	2.66	4.75	1.78
1994	1180.27	3.23	7.16	2.21
1995	1111.53	3.05	5.98	1.96
1996	1110.72	3.03	5.13	1.69
1997	1092.28	2.99	6.73	2.25
1998	1169.88	3.21	6.39	1.99
1999	1176.62	3.22	5.30	1.64
2000	1187.06	3.25	4.66	1.43
2001	1248.21	3.42	6.79	1.99
2002	1238.2	3.39	6.32	1.86
2003	1238.19	3.39	6.59	1.94
2004	1192.11	3.27	4.93	1.51
2005	1216.12	3.33	5.61	1.68

Source: PSC, R/M

City of New Berlin Unimproved Area Totals
In MMSD Sewer Service Area and West of Subcontinental Divide.

Future Land Use Type	Total Acres ¹	Total Area ^{1, 2}
Business Park / Industrial	276.09	12,026,652.36
Commercial Center	15.35	668,524.50
Country Residential	530.19	23,094,982.88
Environmental Corridor	21.42	932,872.47
Institutional	35.38	1,541,047.21
Mixed Use Residential	59.17	2,577,522.62
Park	131.76	5,739,447.84
Quarry	198.90	8,663,891.91
Residential Estate	1.73	75,170.19
Rural Commercial	25.81	1,124,078.74
Shoreland-Wetland Conservancy	199.71	8,699,535.38
Suburban Commercial	11.64	506,937.48
Suburban Residential	36.95	1,609,707.53
Upland-Woodland Conservancy	154.21	6,717,512.17
Urban Residential	86.08	3,749,702.22

¹ Totals include all unimproved parcels within the current or ultimate MMSD Sewer Service Area that are west of the Subcontinental Divide. Unimproved Parcels are defined as having an assessed value of less than \$60,000.

² Area figures are expressed in Square Feet.

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Figure 2

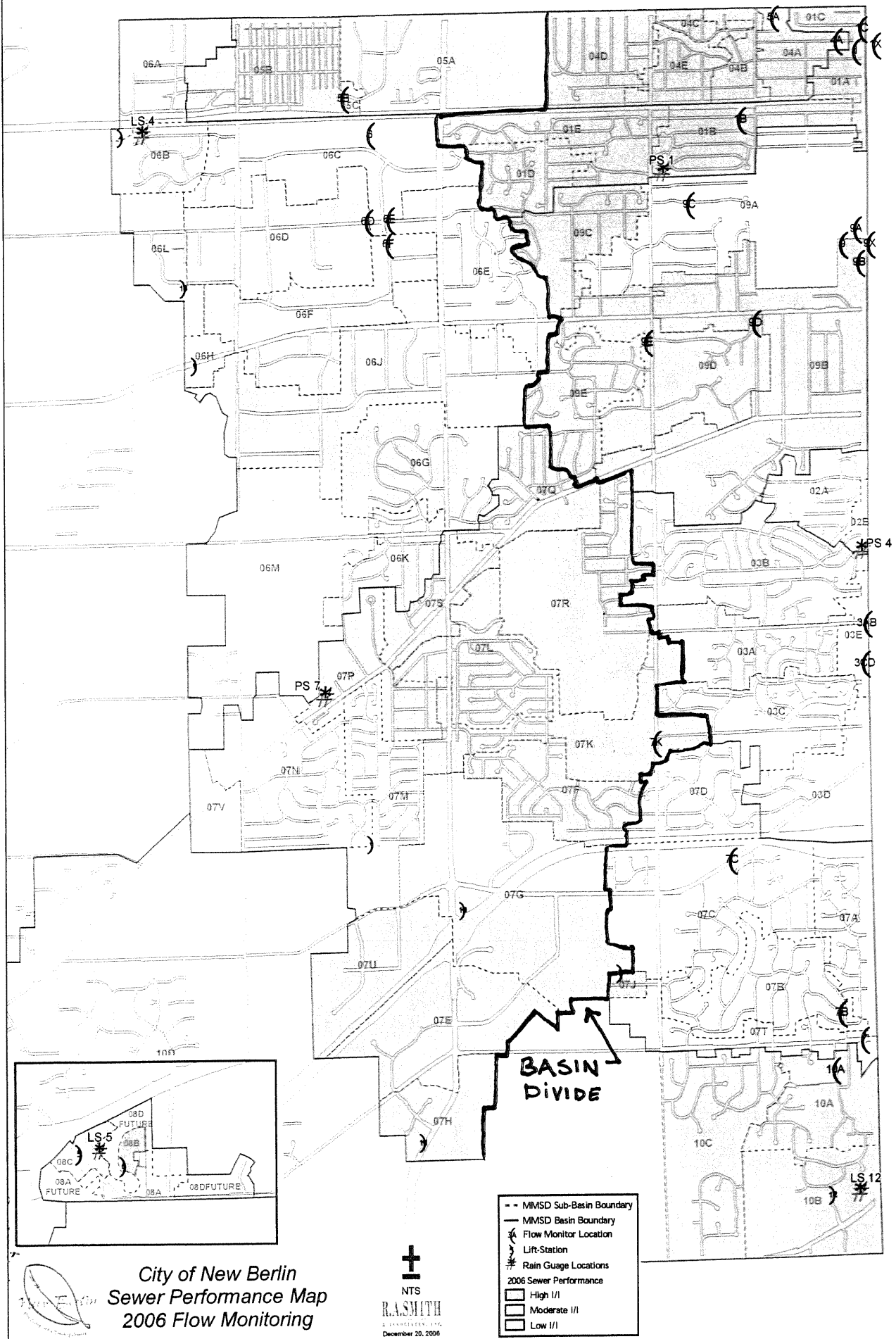
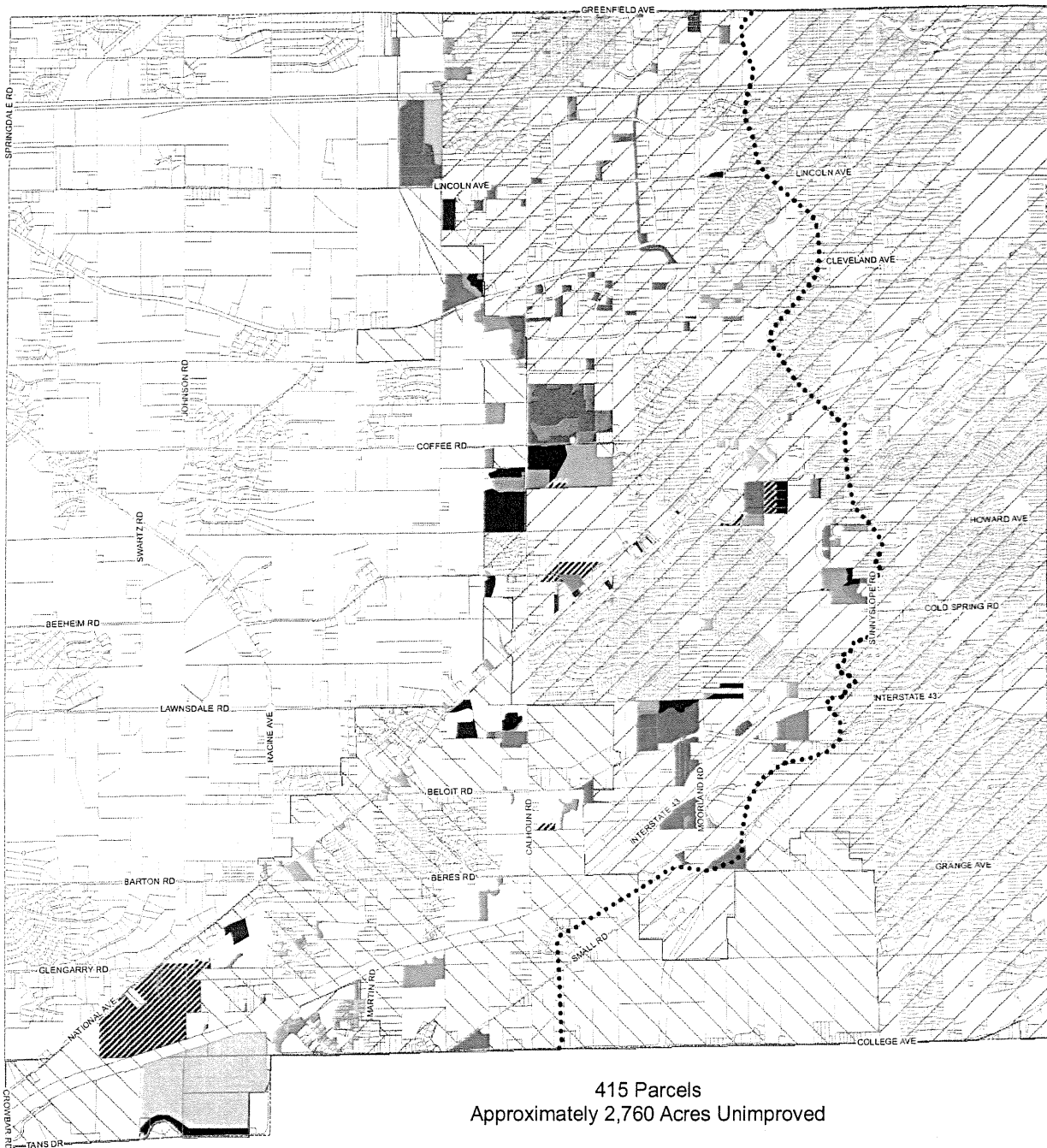


Figure 3 City of New Berlin Unimproved Parcels

Within the Current or Ultimate MMSD Sewer Service Area and West of the Subcontinental Divide
Unimproved Parcels are defined as having an assessed value of less than \$60,000.



Legend

Parcel	Urban Residential	Suburban Commercial
Subcontinental Divide	Suburban Residential	Rural Commercial
City Boundary	Residential Estate	Institutional
MMSD Sewer Service Area	Country Residential	Park
Current	Mixed Use Residential	Quarry
Ultimate	Business Park / Industrial	Upland Conservancy
	Commercial Center	Shoreland-Wetland Conservancy
		Environmental Corridor (Lincoln Ave)

0 1,600 3,200 Feet
1 inch equals 3,200 feet



City of New Berlin
Department of Community Development
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BDF - 8/7/2008
G:\project\006\08MMSD_build_out\Final Map.mxd

Application Discussion Document

Description of Compliance with Article 201 – Exception to the Prohibition of Diversions

The agreement is meant to apply to the eight Great Lakes States in their approach to the management of Basin water. The amount of the temporary withdrawal or diversion of water from the Basin that is proposed, is not sufficient to trigger current international agreements (i.e. Boundary Water Treaty). There are a number of specific elements of Article 201 that must be adequately addressed to have a community comply with the Agreement and these will be addressed in the order they appear in the agreement. Article 201 (1) – Straddling Communities refers to the Exception Standard, which is actually Article 201 (4). Both of these sections are referenced in this document. In analyzing each element of Article 201 mentioned above, the text of the Agreement precedes the response and is listed in bold.

Article 201 (1) – Straddling Communities

- 1. A Proposal to transfer Water to an area within a Straddling Community but outside the Basin or outside the source Great Lake Watershed shall be excepted from the prohibition against Diversions and be managed and regulated by the Originating Party provided that, regardless of the volume of Water transferred, all the Water so transferred shall be used solely for Public Water Supply Purposes within the Straddling Community, and:**

The City of New Berlin is proposing to connect the remainder of the Public Water Supply System to a source of potable water supplied from Lake Michigan and is not proposing any other use than that of a Public Water Supply. Typical water sales by the City of New Berlin to it's water customers, based upon 2005 records which were available at the time of the drafting of this document, includes:

1. Residential 57.4 percent
2. Commercial 34.5 percent
3. Industrial 6.9 percent
4. Public 1.2 percent

- a. **All Water Withdrawn from the Basin shall be returned, either naturally or after use, to the Source Watershed less an allowance for Consumptive Use.**

The area to be served is entirely contained in the MMSD sanitary sewer service area and all Public Water Supply System customers are also MMSD sanitary sewer customers. This means all water not consumed returns to the Basin via the sewer system and is treated by MMSD. There is not a mechanism in place to account for consumption by the public water system users, but estimates show that the average water use in out-of-basin areas of New Berlin is approximately 1.78 million gallons per day. The system wide pumpage in 2006 averaged 3.53 million gallons per day (mgd). In 2006 the winter (January-May and October-December) out-of-basin use averaged approximately 1.67 mgd and the summer (June-September) out-of-basin use averaged approximately 2.01 mgd. The 8.5 to 13.7 percent increase from winter to summer use is due, in some part, to outside water use which could be considered as consumptive use. However, a portion of the increased summer use is also due to water used in industrial and commercial applications. There are no major industrial or commercial operations in New Berlin that incorporate water into their products for distribution outside the basin so a vast majority of this water is returned to the Basin via the sewer system. New Berlin experienced a 3.7 percent unaccounted for level of water use in 2005⁽²⁾ of which a portion is also returned to the ground either in the Basin or out of the Basin through system leakage and a portion is due to water meter inaccuracies. A reasonable estimate of consumptive use is based upon Table 1A below, which shows that in 2006 lake water provided about 50 percent of the total demand to in Basin areas. Consumptive use in areas outside the current surface contour based sub-continental divide can be expressed as follows:

Table 1A
Estimate of Increased Water Use

	2006 Pumpage in Gallons	Percent of Total
Reported Water Pumpage to In-Basin Areas From Milwaukee	641,113,000	49.63%
Reported Water Pumpage From Wells to Out-of Basin Areas	650,601,000	50.37%
Total	1,291,714,000	100.00%

⁽²⁾ Wisconsin Public Service Commission

Table 1A (Continued)
Estimate of Increased Water Use

	2006 Pumpage in Gallons	Percent of Total
January	52,181,000	
February	46,344,000	
March	51,615,000	
April	48,410,000	
May	54,955,000	
June	59,842,000	
July	63,320,000	
August	65,830,000	
September	56,285,000	
October	53,094,000	
November	49,018,000	
December	49,645,000	
	Gallons per Year	Gallons per Day
12 Month Total (adjusted)	650,601,000	1,782,468
May-September Total	245,277,000	2,010,467
Winter Total	405,262,000	1,667,745
		Two-Thirds
Percent Summer Increase in Out-of Basin Areas over Total	12.79%	8.53%
Percent Summer Increase in Out-of Basin Areas over Winter	20.55%	13.70%

In New Berlin we will conservatively assume two-thirds the increase in summer use is due to outside use, or 8.5 to 13.7 percent

Therefore, the allowance for consumptive use out-of-basin based upon 2006 well pumpage records can be expressed as 8.5 to 13.7 percent of the total New Berlin Pumpage.

- i. **[except if it] Is part of a water supply or wastewater treatment system that combines water from inside and outside the basin;**

The New Berlin water and sewerage systems meet this requirement as previously indicated and shown on Map 1.

- ii. **[except if it] Is treated to meet applicable water quality discharge standards and to prevent the introduction of invasive species into the basin.**

The wastewater from New Berlin is treated by the MMSD. The MMSD is required by the Wisconsin Administrative code to meet all applicable water quality discharge standards. In meeting these standards, the MMSD Utilizes an integrated conveyance, storage and treatment system which has a deep tunnel for excess flood storage and two activated sludge wastewater treatment facilities.

Invasive species are generally brought to the Basin from ships ballast, pleasure boating activities in the Basin by boats located outside the basin, and migration of flora and fauna. Invasive species are not known nor expected to enter the Basin via the sanitary sewer system. New Berlin has separate sanitary sewer and storm sewer systems that prohibit transfer of surface water to the sanitary sewer. The sanitary sewer system is generally closed to surface activity with the exception of normal infiltration and inflow. It is designed as essentially a sealed system. As explained in more detail below and in Appendix H, the City of New Berlin has a regular program to minimize infiltration and inflow as well. Part of the efforts to reduce I/I includes preventing surface water drainage from entering the sanitary sewer system through proper storm water management. In 2002, the City instituted a storm water utility that provides ongoing funding for projects that are designed to assist in this manner. While there is no specific accounting of the impact of the storm water management projects, it can be seen from the data (Appendix H) that significant expenditures towards this end have been and will continue to be a priority of the utility.

- iii. **[except if it] Maximizes the portion of water returned to the Source Watershed as basin Water and Minimizes the surface water or groundwater from outside the basin;**

As explained above, The amount of water lost in the proposed service area through Consumptive use is conservatively estimated at 8.5 to 13.7 percent of the total pumpage by New Berlin. It has been estimated by respected authorities that outdoor water use averages 31.7 gallons per capita per day.⁽³⁾ For New Berlin this would equal approximately 13.8 percent of the total residential water use. The remaining eight percent can then be attributed to a combination of water main leaks (3.0 percent), industrial and commercial outdoor use (3.8 percent) and other unaccounted for uses (1.2 percent). These levels, in comparison to levels in other communities in Wisconsin and other areas around the country are extremely low. The Wisconsin Public Service commission requires that unaccounted for water be no greater than 15 percent for utilities classified in the same category as New Berlin. Commercial use in

⁽³⁾ Vickers, Amy, Water Use and Conservation, Water Flow Press, 201, pp. 12-14

gallons per customer per day, since accounting practices were refined in 1990, has declined (Table 4). This is primarily due to the fact that outside use at multifamily and other commercial developments does not contribute a significant portion to gross water use.⁽⁴⁾ A more detailed explanation of the efforts to control outside use and conserve water is contained later in this amended sample application. The results of the analysis above positively indicate that the amount of withdrawn water returned to the basin is maximized by these efforts.

The second requirement of this section of the Agreement is to minimize water entering the Basin from outside the Basin. The primary way this can be accomplished is by ceasing the pumping of groundwater from wells outside the basin and replace it with Basin water that is returned. The City of New Berlin currently has seven wells outside the Basin that serve areas returning water to the basin. In 2005, the total pumpage from these wells was 650,601,000 gallons. This would completely be eliminated under this proposal. This returns both of the basins to a more environmentally natural state.

The second way to reduce the amount of outside water sent to the Basin is to control the amount of infiltration and inflow (I/I) that is occurring in the sanitary sewer system. The City of New Berlin is very active and works in conjunction with MMSD to control I/I, both in and out of the Basin. To date, it is estimated that the City has spent over \$17.0 million in I/I reduction efforts since 1997 (Appendix H). When we compare 2005 water pumpage records with 2005 sanitary sewer return flow records, it can be estimated that 693,552,167 gallons per year of I/I occurred in the sewer system. If we assume approximately half of this is from outside the basin, then 346,776,000 gallons of I/I from outside the Basin, entered the Basin in 2005. This represents 19.7 percent of the total wastewater flow for 2005. Removing the wells from the system and serving the proposed area entirely from the Basin can reduce the total out of Basin flow to the basin by approximately 27.3 percent of total flow. Detail information on I/I reduction efforts are in Appendix H.

⁽⁴⁾ Vickers, Amy, Water Use and Conservation, Water Flow Press, 201, pp. 12-14

- b. If the proposal results in a New or Increased Withdrawal of 100,000 gallons per day (379,000 liters per day) or greater average over any 90-day period, the Proposal shall also meet the Exception Standard: and,**

The proposed withdrawal exceeds 100,000 gallons per day and will meet the exception standard as described in the next section of this application. Anticipated withdrawal levels are contained in Appendix C.

- c. If the proposal results in a new or Increased Consumptive Use of 5 million gallons per day (19 million liters per day) or greater average over any 90-day period, the Proposal shall also undergo Regional Review.**

The proposed withdrawal will not trigger this requirement. Anticipated withdrawal levels are contained in Appendix C.

Exception Standard

4. The following criteria constitute the Exception Standard:

- a. The need for all or part of the Exception cannot be reasonably avoided through the efficient use and conservation of existing water supplies:**

The City of New Berlin has been performing diligent review of the options available for municipal potable water supply since 1999. As part of that review, they have performed the following studies:

- Phase I Geologic Exploration - 1991 - This study was commissioned to locate potential sites for shallow sand and gravel and dolomite wells to add additional capacity to the water system. Two specific areas for further exploration were identified. These areas contained geologically favorable sites for locating dolomite wells.
- Phase II Geologic Exploration – 1991-1992 – Two sites were explored in-depth for drilling locations for dolomite wells. Both sites were proven as acceptable for potable wells and wells were constructed that pumped radium free water to meet the expanding needs of the system. One of the wells was piped to the nearby deep sandstone well no. 8 to make use of an existing underground storage reservoir.
- Geological Reconnaissance – 2000 – Reconnaissance for locating potential sand and gravel well sites was performed. Five specific areas were reviewed but only two were recommended for further exploration. The remaining sites either had contamination potential or did not have geology that was consistent with high capacity well locations.
- Site testing – 2001 – Two sites were tested by the construction of test wells in the sand and gravel aquifer. Both sites were proven to be capable of

providing 600 gpm of water or more. One site was many miles away from the existing system and was dismissed as too costly to develop. The other site was developed into sand and gravel well (no. 11) and helped alleviate water shortages experienced by the City.

- Well no. 8 logging – 2001 - Well No. 8, a deep sandstone well, was logged to determine if saline water intrusion from deep portions of the aquifer could be eliminated. Subsequent backfilling of the well did reduce salinity but at the cost of roughly 1/3 the capacity of the well. This served to increase the need for additional sources of supply.
- Water Supply Study Update – 2001 – This study updated previous studies for current conditions and growth projections. Recommendations included reviewing a Lake Michigan water source while also looking for shallow aquifer sources
- Lake Michigan Water Study – 2003 – This study recommended serving the eastern portion of the City, within the Basin, with Milwaukee water and investigation providing Milwaukee water to the entire community within the MMSD service area.
- Radium Remediation Study – 2004 – As part of this study, a two-pronged approach was recommended for solving the radium problem. First was to seek water for the area west of the divide but in the MMSD service area. The second was to treat the deep sandstone water at the source. The study recognized that treatment was only a temporary solution given the declining water levels and the increasing salinity associated with this source of supply and the study recommended that a Lake Michigan source was the only viable long term solution.

New Berlin is dedicated to water conservation in the public water system. In support of conservation, the City has implemented the following measures:

- Sprinkling restriction in effect year round
- Notices of sprinkling restrictions on the City's website, quarterly leaflet, utility billings and on the local access cable channel. See examples in Appendix C.
- Leaflets available on the City website and references in the annual consumer confidence report (Appendix G)
- Leak detection program (Appendix G)

Through the use of these measures, the City has significantly reduced the peak day and peak hour pumpages on the hot days of summer. Since its inception the sprinkling restrictions have reduced summer average day to peak day peaking

factors from a 1990 - 1999 average of 1.936 to a 2000 - 2004 average of 1.749, a 9.7 percent reduction in peak summer usage.

Education is a key component of any successful conservation program and the City is currently utilizing all available media to educate the public on conservation.

The State of Wisconsin, in Wisconsin Administrative Code Comm 84 mandates the use of conservation fixtures for new homes and for any existing plumbing changes covered by the code. A copy of the relevant portions of the code are contained in Appendix G.

The City will be considering rate structure changes in the future. These may include inclining block rate structures which discourage the use of large amount of water. Until recently, the Public Service Commission (PSC) has not entertained such rate structures. Recent interest in conservation in other communities has caused the PSC to review this position and it is quite possible conservation rates may be a viable option soon.

The program described above has all the needed elements of a successful conservation program and the City believes it meets the requirements of the Agreement.

The basic results of all these reports indicate that:

1. There is not sufficient, shallow, radium compliant water available that meets SDWA standards to serve the City of New Berlin
 2. The deep aquifer contains radium that can be removed, but not in adequate quantities for long term supply.
 3. Lake Michigan is the only viable source for the long term needs of the community.
 4. Conservation can only postpone the eventual need for Lake Michigan water for a few years and the associated costs of postponement are very high, (+/- \$ 4.0 Million).
- b. The Exception shall be limited to quantities that are considered reasonable for the purpose for which it is intended;**

The intended use is for a public water supply. The previous analysis shows that New Berlin is well within industry standards for per capita water use, unaccounted for water use, and outside use. In most cases, the City is well below national averages.

- c. **All Water Withdrawn shall be returned, either naturally or after use, to the Source Watershed less an allowance for Consumptive use. No surface water or groundwater from outside the Basin may be used to satisfy any portion of this criterion except if it:**
- i. **Is part of a water supply or wastewater treatment system that combines water from inside and outside of the Basin;**
 - ii. **Is treated to meet applicable water quality discharge standards and to prevent the introduction of invasive species into the Basin;**

Discussion of this item was contained in the previous analysis.

- d. **The Exception shall be implemented so as to ensure that it shall result in no significant individual or cumulative adverse impacts to the quantity or quality of the Waters and Water Dependent Natural Resources of the Basin with consideration given to the potential Cumulative Impacts of any precedent-setting consequences associated with this proposal:**

Implementation of this proposal will not have significant impacts, nor set precedent for cumulative impacts for the following reasons:

- Transfer of water between basins will be minimized
- Water will be removed and returned to the Lake Michigan basin in nearly the same location
- The diversion of the wastewater generated with out of basin water will be minimized
- Iron and radium releases to Lake Michigan will be avoided
- Tens of thousands of tons of salt released to the lake will be significantly reduced
- Water use by regeneration of water softeners will be significantly reduced
- Groundwater levels in the deep sandstone aquifer that is hydraulically connected to Lake Michigan will begin to rebound
- Shallow groundwater sources outside the divide will no longer be tapped and not returned to their basin
- The area of New Berlin outside the MMSD service area will remain on private wells and septic

- Significant amounts of energy will be saved along with associated reductions in green house gas generation
- Groundwater chemistry changes in the deep sandstone aquifer will be reduced

These environmental improvements are discussed in detail in the following section.

Transfer of Water Between Basins Will be Minimized

The Compact and Agreement both cite the fact that not only is it desirable to minimize or eliminate the withdrawal of water from the Great Lakes Basin, but also that it is desirable to minimize the amount of water entering the Great Lakes Basin from outside the Basin. This is further supported by Wisconsin administrative code chapter NR 142 which has substantial review requirements for transfer of water either way across basin boundaries. It should be noted that the requirements of NR 142 provide DNR with authority to approve the types of transfers that currently occur and that are proposed if the transfers are consistent with the requirements of that chapter and certain state statutes.

Presumably, the application, registration and review process established by NR 142 was set up to protect the two basins, Great Lakes and Mississippi, from any environmental issues that would arise out of a transfer of water. It can be inferred that if no transfer occurs, the concerns of this chapter would not apply. It can further be inferred that minimizing any such transfer would in turn minimize concerns with such transfer.

Approval of this application will result in a more normal balance of water withdrawal and return to both basins. Water taken out of Lake Michigan will be returned to Lake Michigan in quantities that much more closely match. Currently there is a net increase of out-of-basin water entering the Basin of about 1.056 billion gallons per year. This would be decreased at least to about 412 million gallons per year or, with continued I/I reform, even more. This is over a 60 percent reduction in out-of-basin water entering the basin.

On the Mississippi basin side, the use of shallow and deep groundwater would cease. Concerns with over drafting aquifers in the City would be minimized and water tables would stabilize at levels where nearby private wells would not have issues resulting from City high capacity well influence.

Water Will be Removed and Returned in Close Proximity

The City of New Berlin has two water treatment plants, Linwood and Howard. Either plant can serve as the source of supply for the locations that pump water to New Berlin. All of the sanitary return flow goes to the South Shore Wastewater Treatment Facility under normal conditions. This means that the point of

withdrawal and the point of return to the lake is normally about 10 miles apart and a maximum of 15 miles apart, depending on which supply plant is being used. This close proximity replaces the water near where it is withdrawn following treatment.

Wastewater Generated Using Out-of-Basin Water will be Minimized

The generation of wastewater will happen no matter where the source of supply is. The roughly 644 million gallons of water currently pumped from wells that flows into the MMSD system will be mostly eliminated under this proposal. That water has significant natural chemical difference from that of the Lake water. Hardness is more than double, iron, radium and many other metals are much higher, pH differs, water temperature differs and the total dissolved solids is much higher. These chemical differences would be minimized under this proposal.

Iron and Radium Releases to Lake Michigan will Cease

If this proposal is not approved, the City has designed and is currently bidding the construction of three radium removal plants which will be constructed to gain compliance with the radium regulations. These treatment plants not only have a high cost economically but have a high environmental impact. The technology which was determined in aforementioned studies is Hydrous Manganese Oxide filtration. This process uses a normal iron filter retrofitted to add a chemical solution known as Hydrous Manganese Oxide (HMO). HMO is added to the water prior to filtration and the radium in the water adsorbs to the manganese component of the HMO solution. Once the adsorption occurs, the resultant particle size is large enough to be removed by the filter. The process also removes the majority of the iron and some other total dissolved solids in small quantities. It is estimated that the process, which has already received DNR construction approval, will result in a significant increase in iron and radium sent to the Milwaukee Wastewater treatment system. Some of this will end up in Lake Michigan and some in the sludge generated by the process and applied as fertilizer. Exact breakdowns would take a detailed study but conservative calculations show that the increased loadings to the treatment facilities will be about 2,200 pounds per year of iron and 822 million picocuries of radiation from radium. Much of this is currently being sent to MMSD via the sanitary sewers now, but if the treatment plants are constructed, the iron and radium would be concentrated in the removal process and more efficiently sent to the system. If Lake water is provided to these areas, the out of basin iron, radium and other constituents would not be transferred to the basin.

Salt Released to the Lake

The area of major concern is the amount of salts that are currently sent to the Lake. If the HMO facilities are installed, hardness will not be addressed. If lake water is provided, water hardness will drop from about 26 grains per gallon to about 8 grains per gallon according to DNR records. Experience with other

communities such as Menomonee Falls shows that when the softer lake water is provided, households discontinue the use of the water softeners. This is evidenced by the fact that essentially no homes in Milwaukee or Milwaukee service areas have home water softeners. In order to estimate the aggregate water and salt savings from discontinuation of softening in New Berlin, the following assumptions were used:

- Currently there are 2650 residential customers in the area to be provided Lake Michigan water
- By 2020, there will be an additional 718 residential homes in the area
- Average residential water consumption is 220 gallons per day per customer. For homes having softeners, 180 gallons per day pass through the softener.
- Groundwater hardness averages 26 grains per gallon
- Average Lake water hardness is 8 grains per gallon
- If current and future customers are served with groundwater, 80 percent will use softeners
- If Future water supply is lake water, 10 percent will use softeners
- Softener capacity is 19,800 grains
- One pound of salt restores 3,350 grains of softener capacity
- Approximately 40 gallons of wastewater is produced during a softener regeneration

Based upon the above assumptions and projected water demands, the existing and future homes will generate an additional 1.8 million pounds of salts annually which will be sent to the lake. This would be reduced by an estimated 90 percent under the lake water proposal.

Water use by softeners will be reduced by about 9.4 million gallons per year based upon our calculations.

Groundwater Levels in the deep Sandstone will be Positively Affected

Pre-development levels in the sandstone aquifer under New Berlin were over 500 feet higher than current levels. During that time, the normal flow of water in the sandstone was from about 30 miles west of the lake in the Mississippi basin to the east and into the Great Lakes basin. Decades of over pumping the aquifer have reversed the direction of the gradient and now water flows from the Great lakes basin towards the large pumping centers in and around New Berlin. Any proposal

that stops the withdrawal of water from the sandstone is a step towards returning the flow to it's predevelopment condition.

Shallow Groundwater Sources Outside the Basin will no Longer be Affected

Currently, New Berlin uses three shallow aquifer dolomite wells for about 25-30 percent of their supply. Even at the rates they are currently pumping these shallow wells, a cone of depression is occurring that affects local private wells. Any continued or expanded reliance on these shallow sources will have even greater, longer lasting affects on the groundwater and hydraulically connected surface waters in the area. If the deep wells are to be pumped because Lake water is not available, the decline in the level of the sandstone aquifer will continue and the well documented problems that exist with radium, saline water intrusion and prohibitive pump setting depths will continue to get worse. At some point it may become financially advantageous to find shallow resources further and further away from the City and the water service area. The City has already experienced vehement opposition to use of the available shallow aquifers and currently these options are cost prohibitive. Any increase in the use of the shallow aquifer will affect local wetlands and surface waters. As a region, any affect to surface waters or wetlands is negative. Flora and fauna in the region do not know that there is a basin divide and do not follow strict rules in staying on one side or the other of the divide. The provision of water and protection of regional resources is a regional issue. The proposal fits in well with the region.

Areas will Remain on Private Wells and Septic

It is a common mistake to think that this proposal is designed to encourage "urban sprawl". Currently, the agreement New Berlin has with Milwaukee water for water service to in-basin areas limits the use of water to areas within the basin. The proposed amended service area would limit water service to the MMSD area as shown on Maps 1 and 2.

This means the area shown on Maps 1 and 2 would not be served by Lake Michigan or MMSD. These homes and lots would continue to be served by private wells and septic or holding tanks. With most homes on septic, about 85 percent of the water used is returned to the ground and this would continue – assisting in the preservation of groundwater levels and wetlands and surface waters for the region.

In addition, The current agreement that New Berlin has with Milwaukee for water service clearly indicates that under no circumstances will New Berlin be allowed to transfer or sell water to any other community in the area. We are not proposing any change to this language. Any agreement that may be reached with a lake water provider different from Milwaukee would also include similar language.

Finally, as previously noted, there simply does not exist enough undeveloped area in the proposed new service area to support "urban sprawl". Only slightly over 1 percent of the total land area in the City is identified as unimproved and in the proposed area as shown on Figure 3 attached to this document.

Significant Amounts of Energy will be Saved and Green House Gas Generation Reduced

New Berlin currently uses a tremendous amount of energy to pump water from the deep wells to the system. This will be greatly reduced if the Utility obtains all its water from Lake Michigan. Current estimates of energy use and the decrease in energy use under the proposed plan can be calculated by comparing the current total lift required to deliver water from the deep aquifers (average) to the total lift required for lake water. If we assume 70 percent efficient pumping systems under both scenarios and normal friction and other losses, there will be a savings of about 700,000 Kilowatt Hours of energy used annually by New Berlin to pump water. The Carbon Trust reports energy purchased off the grid uses an average of 0.43 KgCO₂/KWh for a total reduction in carbon emissions of about 300,000 Kilograms annually.

Other Related Issues

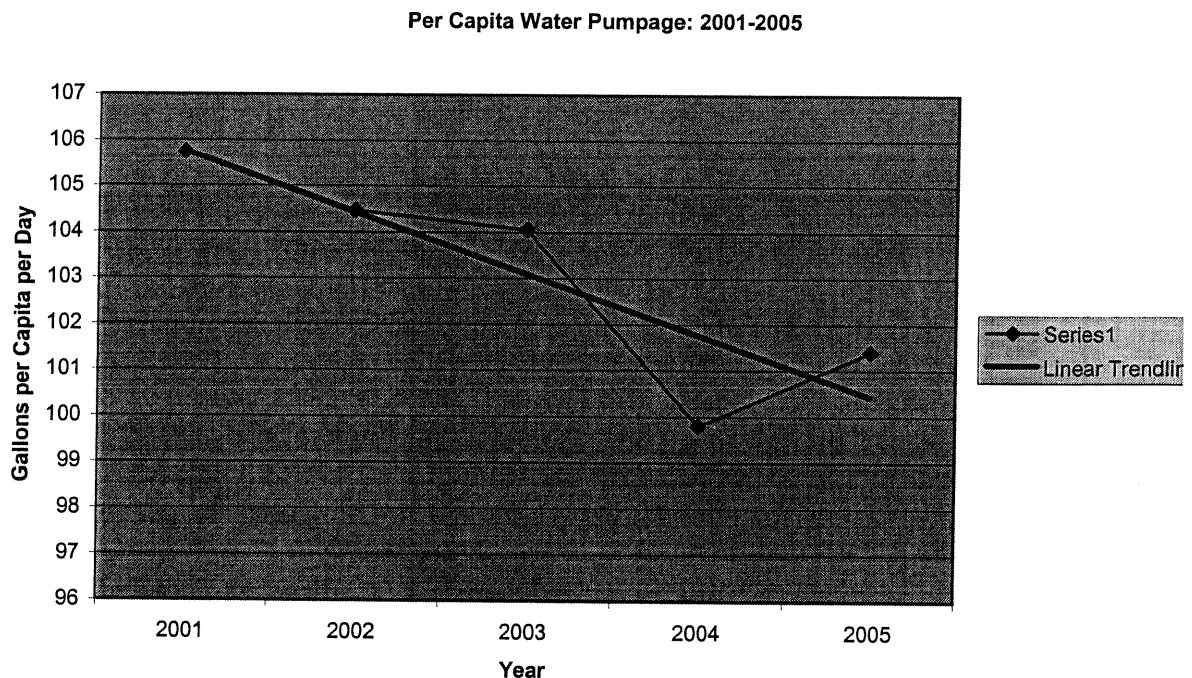
The primary related issue is development related. Many environmental entities have indicated that the continued development of areas in western New Berlin will pave over recharge areas, promote development away from urban centers, increase degradation of natural resources and other traditional arguments against development of suburban areas. New Berlin, through its planning process, has developed very strict land development and zoning practices for areas not included in a designated sanitary sewer service area. For areas west of the MMSD area, minimum lot sizes of 5 acres are the standard and this level of development cannot support the provision of sanitary sewers or water facilities. These areas will remain on private systems and are not shown on any legal documents as being served. As previously mentioned, by current and proposed agreements, these areas cannot be served.

- e. **The Exception shall be implemented so as to incorporate Environmentally Sound and Economically Feasible Water Conservation Measures to minimize Water Withdrawals or Consumptive use:**

The Proposal earlier identified the conservation measures currently in place in New Berlin. In implementing the program, current conservation practices will be continued. The City has also reviewed the State-of-the Art report currently being prepared by the Southeastern Wisconsin Regional Planning Commission (SEWRPC) for the area. This report has an entire section devoted to conservation practices and recommends economically feasible measures that can be used for conservation. The City will invoke those procedures that can be of value and are allowable under current regulations.

The Regional Water Supply plan is scheduled to be completed in 2007 and implemented shortly thereafter. The Southeastern Region of Wisconsin is designated as a Groundwater Management Area (GMA) under act 310 of the Wisconsin legislature. This means that an agency, presumably SEWRPC, will be responsible for managing the groundwater resources of the area in and around New Berlin. Without presupposing the results of the planning study, one option for the management of the groundwater resources both in and out of the Great Lakes basin, would be to use Lake Michigan resources, where allowed by current law, in a conservative manner. This would include New Berlin.

Part of any program will be a conservation effort. The SOTAR includes estimates of the impact of water conservation programs under different circumstances. The report also recognizes that most utilities, like New Berlin, already have instituted some conservation measures. Based upon the data presented in the SOTAR, New Berlin could expect additional conservation efforts to reduce future average water use by 4 to 10 percent. The SEWRPC estimates of water service area population for the last five years of available pumping data show a downward trend in usage per capita. This trend can be traced, in part, to the same period when New Berlin was instituting and enforcing water conservation efforts as part of their water supply planning process mentioned previously. The Graph shown below provides the total pumpage per capita for the years 2001-2005. Also shown is a linear trend line for this period.



If we assume that just one-half the total reduction in pumping per capita during this period is a result of conservation efforts, then the utility has already reduced pumpage per capita by over 2 percent.

The efforts towards conservation on the utility level include the following:

- Lawn Sprinkling Water Conservation Schedule – Lawn Sprinkling is permitted only on an even/odd schedule that matches the day you can sprinkle with the day of the month on an even/odd number basis.
- Public Education Program
 - Annual Consumer confidence report reminds people to repair dripping faucets
 - Leaking toilets use rain barrels for watering and even/odd sprinkling
 - The in-basin portion of the system which is served by softer Lake Michigan water has benefited from additional conservation from discontinued use of water softeners. Assumptions cited later in this document in the environmental impact section indicate that current savings of water is about 3,500 gallons per year per home, or over 4 percent of total annual residential use. Similar savings can be expected in the out of basin service area.
 - Water conservation materials and coloring books which are handed out at water meter replacements
 - Kids page on the City website with water conservation and information links
 - Information on the sprinkling ban on the website, in a quarterly leaflet, in utility bills, and on local access cable
 - Free in-home leak detection by utility employees to assist customers in locating leaks
 - Inspection of water service stop boxes, water meters and interior plumbing on an annual basis for a percentage of the residents, usually over 10 percent per year

These programs have obviously had an impact, considering the recent reductions in total per capita pumpage and the high level of accountability experienced by the utility. The Utility is investigating additional methods to reduce pumpage through conservation including:

- Conservation rates

- Additional public education
- Fixture change out credits
- Rain Barrel credits
- Adjustments to outdoor water use policies
- Other measures as recommended by SEWRPC

The utility will be reviewing the recommendations from the SEWRPC report in upcoming months and making recommendations for future measures that can achieve the additional 4 to 10 percent reduction in use. Examples of all current education materials and other programs are provided in **Appendix G** in Volume II.

- f. **The Exception shall be implemented so as to ensure that it is in compliance with all applicable municipal, State, Provincial and federal laws as well as regional interstate, inter-provincial and international agreements, including Boundary Waters Treaty of 1909.**

The City Attorney has opined that current laws, as mentioned, will be met by this proposal.

- g. **All applicable criteria in this Article have also been met.**

To the best knowledge and intent of the City of New Berlin, all applicable criteria in this article have been met.