Asbjornson, Karen

From: Kurtz, Hunter
Sent: Tuesday, November 18, 2003 1:54 PM
To: Asbjornson, Karen
Subject: FW: South Shore Beach information

CR INBOX

-----Original Message-----
From: Rep.Richards
Sent: Tuesday, November 18, 2003 1:17 PM
To: Sen.Darling; Sen.Roessler; Sen.Plale; Rep.Jeskewitz; Rep.Pocan; Rep.Cullen; Sen.Cowles; Rep.Kaufert; Rep.Kerkman; Rep.Jeskewitz
Subject: South Shore Beach information

Following along with today's discussion in the Audit Committee, I've attached copies of several reports related to South Shore Beach. These are some of the documents that Dr. McLellan of the WATER Institute referred to.

In addition, if you are interested in learning more about the BEACH Act and the Federal mandate to do water quality testing at Great Lakes beaches, I would encourage you to contact Toni Glymph or Ben Vail at WisDNR who have been doing a great job administering and following up with meetings in Oshkosh and other areas to gather statewide information from participants.

For the record, during the 2003 swim season, Bradford Beach was closed 16 days due to ecoli, McKinley Beach was closed 7 days and South Shore was closed 24 days. There were no major sewer overflows during the swim season. When compared with 2002 (again, no overflows during the swimming season) Bradford was closed 21 days, McKinley 23 days and South Shore 47 days. These were all records for the beaches.

You can find historical data on statewide water quality at the Beach Health website at: http://infotrek.er.usgs.gov/servlet/page?_pageid=1993,2002&_dad=portal30&_schema=PORTAL30

As always, if you have any questions about beach closings or algae along Milwaukee's beaches, please feel free to contact Rep. Richards' office anytime.

Tara J. Vasby
Leg. Assistant
Rep. Jon Richards


South Shore beach study GLWI J...


SHORT Beach Task Force Progres...


Cladaphora DNR memo.pdf

MMSD
Preserving The Environment • Improving Water Quality

Kevin L. Shafer, P.E.
Executive Director

November 21, 2003

The Honorable Carol A. Rosseler
Co-Chair, LAB Audit Committee
Wisconsin State Senate
PO Box 7882
Madison, WI 53707

The Honorable Suzanne Jeskewitz
Co-Chair, LAB Audit Committee
Wisconsin State Assembly
PO Box 8952
Madison, WI 53708

Subject: November 18, 2003, Review of the Legislative Audit Bureau's Audit

Dear Co-Chairs:

I would first like to thank you for the opportunity provided the Milwaukee Metropolitan Sewerage District to present the facts about water quality in the Milwaukee area and the causes of pollution that are degrading that water quality. As you understand, this is an extremely important issue not only for the Milwaukee area but the entire United States. Milwaukee is a leader in addressing water pollution and will continue along that path.

During my testimony on Tuesday, there were a number of items I wanted to pass out to you, but due to time constraints and the number of questions, I failed to distribute these items. The following summarizes what is enclosed with this letter.

1. During the testimony, I mentioned a rate study that was done on water and wastewater utilities and discussed the Milwaukee Metropolitan Sewerage District's and the city of Milwaukee's ranking on that study. The first enclosure, entitled, Evaluation of Water and Wastewater Costs, is that study. As you will read when you look at the summary of findings, the Milwaukee area is

- seventh when compared to the 14 least expensive US metropolitan areas;
- third when compared to 20 other Midwest metropolitan areas; and
- first when compared to the 16 Milwaukee Metropolitan Association of Commerce Comparable Metropolitan Area Survey Communities.

2. Additionally, there were questions concerning the Triad Study, which is a study that MMSD initiated to try to determine whether we were accurately reporting combined sewer overflows. Enclosed please find a letter from Triad Engineering, dated July 14, 2003, sent to the editors of the Journal Sentinel paper. Please note the third paragraph, second sentence says, "Using straight-line extension of these three events to conclude that the District under reported overflows by 72 percent is entirely irresponsible and has no scientific basis."

milwaukee metropolitan sewerage district
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3. The third enclosure that I am providing is a Department of Natural Resources memo that summarizes their review of the Triad Study. Note that their review states that there was no cover up or attempt to hide this information. MMSD was merely trying to determine the most accurate results to report.

4. And finally, concerning how we charge our communities for our services. An article was in the Milwaukee Journal Sentinel on Saturday, September 27, 2003, entitled, Suburbs flush with tax disparities. The focus of this article was the inequities of charging for sanitary sewer services based on property tax charges. Unfortunately, the Journal Sentinel did not accurately report the user charge fees that we charge to our communities. Enclosed is an October 6, 2003, letter I sent to the editor of the Journal Sentinel summarizing these errors in their report and asking for a correction. To date, that correction has not been published in the newspaper.

Finally, I would like to just state that while the Milwaukee Metropolitan Sewerage District does find itself in the press a lot, you have to understand that we are one of the strongest environmental agencies in the state of Wisconsin. We have done more to improve water quality in this region than any other local agency that I know of. As my Commission Chair, Dennis Grzezinski, stated, the species of fish that we are finding in our waterways is dramatically higher than prior to the construction of the Deep Tunnel.

These are all very good things, but we need to do more. We need to work together as a region. We need to try to develop a communication that targets water pollution, brings people together on a very elementary issue, and talk about ways that every individual person in the region and in the state can improve water quality. This will not be an easy endeavor. The Milwaukee Metropolitan Sewerage District has started this. We are working cooperatively with the Southeastern Wisconsin Regional Planning Commission and the Department of Natural Resources and our citizens. We are trying to get the word out and to try to talk about the science.

Again, thank you for the opportunity. I felt that the District, yourselves, and the attendees at the meeting all learned a great deal, and I believe it was a major step forward to improving water quality in our region.

Sincerely,

Kevin L. Shafer, P.E.
Executive Director

Cc: The Honorable Robert L. Cowles
The Honorable Alberta Darling
The Honorable Gary R. George

The Honorable Dave Hansen
The Honorable David A. Cullen
The Honorable Dean R. Kaufert
The Honorable Samantha Kerkman
The Honorable Mark Pocan

Enclosures

ED/dg/y/mydocs/corres

EVALUATION OF

WATER & WASTEWATER COSTS

Comparing Milwaukee to Other US Cities
for
Process Wastewater Industrial Customers
and
Residential Customers

September 12, 2003

prepared for

Milwaukee Metropolitan Sewerage District
Milwaukee Metropolitan Association of Commerce
City of Milwaukee Department of Public Works

prepared by

HNTB CORPORATION

EVALUATION OF WATER & WASTEWATER COSTS

Milwaukee versus Other US Cities

1.0 Introduction

The object of this study was to analyze where Milwaukee ranks with respect to total potable water and sewer service charges for industrial and residential customers. The basis for the Industrial comparisons were the "lowest cost" large US Metro areas, other Midwest cities and metro areas, and to the 16 cities used by the Milwaukee Metropolitan Association of Commerce (MMAC) as "comparable metros" to Milwaukee. The basis for the residential comparisons was the 16 MMAC "comparable metros."

The scope of work included gathering data on sewer service costs and potable water costs for a residential customer, and for a typical process wastewater industrial plant. As a part of the analysis, various food and process industry companies were contacted to obtain information on criteria used in determining a new plant location or expansion.

2.0 Summary of Findings

2.1 *Industrial Ranking*

Using a typical process wastewater industrial customer, Milwaukee ranked:

- 7th when compared to the 14 "least expensive" US metro areas (see Appendix A, Table 1)
- 3rd when compared to 20 other Midwest metro areas. (see Appendix A, Table 2)
- 1st when compared to the 16 MMAC "comparable metros." (see Appendix A, Table 3)

2.2 *Residential Ranking*

Costs for the average residential customer in Milwaukee ranked 11th, when compared to the 16 "comparable metros" of the MMAC, as illustrated in Appendix A, Table 4.

2.3 *Property Tax*

All of the analysis includes the $1.70 per $1000 of assessed valuation MMSD property tax rate. This element of sewer user charges has been assumed to be $17,000 per year for the process industry (assuming a plant building value of $10.0 MM and the Wisconsin machinery/equipment exemption from property taxes). The $10.0 MM figure is somewhat conservative – a lower property value assumption would improve Milwaukee's ranking slightly in the Table 1 and 2 comparisons.

The residential property value assumed was $95,000, based upon City of Milwaukee average property value. The other comparable cities do not include any property taxes – even though most communities place at least some sewer or water related costs on property taxes.

2.4 *Rate Basis*

All comparisons noted are for MMSD's 2003 rates versus the current available rates for the other comparable cities and metro areas. **As noted on the charts, Milwaukee's costs in all the comparisons include all local water/sewer related fees - some of the other comparables do not include all fees.** Additional interviews and research would be needed to quantify all of these local fees for all locations as often "published information" does not include all local fees.

2.5 *Industrial Interviews*

Telephone discussions with six large and medium process/ food industries, yielded the following comments with regard to concerns about water/sewer cost and capacity – and relocation/expansion:

- Stability in water and sewer costs is more important than low rates
- Competitiveness of water and sewer costs is also important
- Many innovative solutions are being looked at and implemented for treatment of high strength industrial wastewaters such as:
  - high strength waste discharged directly into municipal digesters
  - construction of high rate pretreatment systems
  - cooperative agreements with the local treatment agency to handle tough waste issues such as oil and grease
- Some metro areas appear to be are more aggressive than Milwaukee in marketing available water/sewer capacity and reasonable rates
- Current press coverage (regarding the "tunnel" that does not work) hurts Milwaukee
- Most investment occurs where plants are already located
- Some good examples of plant expansions have been found, but only a few major new plants have been built in the last 5 years.
- Other issues greatly impact location considerations such as energy costs, air emission issues, and other factors

2.6 *Recommendations*

- **Industrial Customer Date Base:** Continue to gather additional data on industrial expansion and new plant construction – find out what factors were most influential.
- **Survey Competitiveness:** Update the survey periodically to monitor Milwaukee competitiveness – many large agencies such as MMSD perform these surveys annually.

- **Benchmark:** Gather additional data on how metro areas "sell" to large industries (good example is Memphis, TN)
- **Communicate with Existing Customers:** Communicate this information to current industrial customers and other industry groups to show the competitiveness of Milwaukee
- **Explore New Revenue Sources:**
    - Examine if a form of a "flood management fee" for stormwater and flood control related costs would be appropriate for Milwaukee (many communities have established fees in this area and assess them differently than water or sewer charges)
    - Evaluate the use of an "impact fee" for new development and examine if some form of "infill credit" for industrial redevelopment on existing property served by water and sewer service makes sense.

3.0 Background Information

3.1 *Data Collection – Industrial*

Data sources used have been the recent 2002 AMSA survey, and the 2002 (biennial) Raftelis Consulting Survey. Additional data has been obtained through various web sites and through email requests, phone calls and fax replies to obtain additional data or clarify questions on data already obtained. Data in the two published surveys was essentially 2002 data, so 2003 data was obtained through the means noted above. Phone inquiries were made for an "anonymous client," although some Wisconsin agencies asked if the survey was being done for the Milwaukee area.

3.2 *Typical Industry*

The basis for comparison for the cost survey was the following "wet industry" (process wastewater discharger) waste loads and water users:

Industry Wastewater	Values used for comparisons
Water/wastewater per day	200,000 gallons
BOD discharge per day	3,336 #/day (2000 mg/l)
TSS discharge per day	1,668 #/day (1000 mg/l)
Population Equivalent (based upon BOD)	19,600

Using a larger industry which has more wastewater volume and BOD/TSS would not impact the comparisons noted in the report in any material manner.

3.3 *"Least Expensive Metro Areas" – Industrial*

To determine the "least expensive" metro areas for the combined water/wastewater costs, the 10 least expensive sewage treatment agencies in both the AMSA and Raftelis surveys

were determined based upon the reported 2002 Biochemical Oxygen Demand (BOD) costs in $ per pound and the Total Suspended Solids (TSS) costs in $ per pound. A "competitive" cost for these parameters is less than $0.10 per pound for BOD and TSS. Only a handful of metro areas and cities have rates this low. The average rate for both of these parameters, according to the Raftelis survey, was over $0.20 per pound in 2002. The rates noted in Table 1 are the current rates – some have increased above the $0.10 rate level since the AMSA and Raftelis studies were completed.

3.4 *Industrial Interviews*

A number of phone calls were placed to various industrial companies to document their thoughts about the importance of water/sewage treatment availability, and to obtain their comments on costs and related matters.

Industrial data has come from phone call interviews of either environmental personnel or operations personnel at the following types of companies:

- Bakers Yeast Manufacturer
- Brewing Company (2)
- Flavor and Color Manufacturer
- Yeast Extract Flavor Company
- Dairy Flavor Manufacturer
- Process industry wastewater treatment vendor

Included in the phone calls was a major US supplier of high rate, high strength industrial wastewater pretreatment equipment to add to the information base in terms of commercial activity in the sales of private treatment systems to industrial customers. The sale of these systems often occurs when an industry faces high sewer rates or has exhausted the capacity of the municipal treatment system.

The telephone interviews were made for a "private client" who is interested in building a food industry plant somewhere in the US. Questions were asked regarding how the companies looked at various issues, and the responses were summarized in item 2.5 above.

3.5 *Industrial Water and Wastewater Capacity*

Obtaining data on water and sewer capacities was somewhat more difficult than rate data. However, it appears that Milwaukee as well as most of the other communities surveyed have water and sewer capacity to allow for new or expanded process industries of the size used in the comparisons, and most also have the ability to accept even larger process industries.

4.0 Data Collection – Residential

Data sources used were the 2002 AMSA survey, and the 2002 Raftelis Consulting Survey. Additional data has been obtained through various municipality web sites and through email requests, phone calls and fax replies to obtain additional data or clarify

questions on data already obtained. Additional phone and internet inquiries were made to verify that the costs found in the surveys were complete, and included all water/wastewater related costs for a community. In all of the 16 cities surveyed, the "national surveys" did not include all water and sewer related costs.

4.1 *Connection Charges*

The survey did discover that many Cities have significant connection charges for new customers such as a new single family residence. The combined cost for these fees is not included in the residential comparisons. For example, the combined water and sewer connection charge for some communities is about $2500 for a new single family home.

4.2 *The Residential Customer used for comparison*

Basis for comparison for the cost survey was the following typical residential customer waste loads and water uses:

Parameter	Factor	Monthly Use
Water use per month	2.83 persons at 67 gal/day per person	5,767 gallons 7.71 Ccf
BOD discharge per month	2.83 persons at 0.17 pound BOD/day	14.6 pounds
TSS discharge per month	2.83 persons at 0.20 pound TSS/day	17.2 pounds
Connection/Customer Charge	One connection/customer	1.0
Stormwater Charge	City lot	1.0

APPENDIX A

Industrial and Residential Comparison Charts

Table 1. Water and Wastewaster Costs for Medium Sized Process Wastewater Industries

"Lowest Cost" Metro Areas in the US compared to Milwaukee

Rank	Metro Area	Agency Name (water/sewer)	Water cost per 1000 gal	Sewer flow $/1000 gal	BOD $/lb	TSS $/lb	Industrial Water Cost $/year	% above lowest water cost	Industrial Wastewater Total Cost $/year	% above lowest wastewater cost	Total Cost - Industrial Water & Wastewater $/year	% above lowest Total cost	Notes
1	Memphis, TN	Memphis DPW	$ 0.6600	$ 0.4390	$ 0.0270	$ 0.0480	$ 45,000	33%	$ 80,000	0%	$ 128,000	0%	No local fees, rates same as 1979
2	Lima, OH	City of Lima	$ 0.8700	$ 2.1684	$ 0.0180	$ 0.0940	$ 64,000	78%	$ 219,000	174%	$ 283,000	121%	No local fees included
3	Wichita,KS	City of Wichita	$ 0.8957	$ 1.4200	$ 0.0870	$ 0.0580	$ 65,000	81%	$ 221,000	176%	$ 286,000	123%	Have large impact fee
4	Dayton, OH	City of Dayton	$ 1.5900	$ 1.3000	$ 0.0858	$ 0.0583	$ 116,000	222%	$ 208,000	160%	$ 324,000	153%	No local fees included
5	St. Louis, MO	City of St. Louis / Metropolitan Sewerage District	$ 1.4000	$ 1.4037	$ 0.1090	$ 0.0438	$ 102,000	183%	$ 232,000	196%	$ 334,000	161%	No local fees included
6	Providence, RI	City/Narragansett Bay Comm.	$ 2.2328	$ 1.4000	$ 0.0600	$ 0.0600	$ 163,000	353%	$ 190,000	138%	$ 353,000	176%	Large rate increase planned
7	Milwaukee	City/Milwaukee Metropolitan Sewerage District	$ 1.0100	$ 1.9177	$ 0.0785	$ 0.0728	$ 74,000	106%	$ 297,000	271%	$ 371,000	190%	Includes local sewer O&M
8	Knoxville, TN	Knoxville Utility Bd	$ 1.1950	$ 2.2921	$ 0.0700	$ 0.0700	$ 87,000	142%	$ 295,000	269%	$ 382,000	198%	No local fees included
9	Provo, UT	City of Provo	$ 0.4962	$ 1.1021	$ 0.2200	$ 0.0900	$ 36,000	0%	$ 347,000	334%	$ 383,000	199%	No local fees included
10	Springfield, MO	City of Springfield,MO	$ 0.8447	$ 1.1647	$ 0.1500	$ 0.0900	$ 62,000	72%	$ 322,000	303%	$ 384,000	200%	No local fees included
11	Arlington, TX	Trininty River Auth	$ 2.1512	$ 2.1213	$ 0.0500	$ 0.0800	$ 157,000	336%	$ 264,000	230%	$ 421,000	229%	No local fees included
12	Greensboro, NC	City of Greensboro	$ 1.9563	$ 2.0805	$ 0.0800	$ 0.0800	$ 143,000	297%	$ 298,000	273%	$ 441,000	245%	No local fees included
13	Cleveland, OH	NE Ohio	$ 2.1695	$ 2.8209	$ 0.0630	$ 0.0950	$ 158,000	339%	$ 316,000	295%	$ 474,000	278%	No local fees included
14	Aurora, IL	Fox Metro WRD	$ 4.3984	$ 1.5900	$ 0.0580	$ 0.1020	$ 321,000	792%	$ 226,000	183%	$ 547,000	327%	No local fees included

Table 2. Water and Wastewaster Costs for Medium Sized Process Wastewater Industries

Midwest Cities - Comparison to Milwaukee

Rank	Metro Area	Agency Name (water/sewer)	Water cost per 1000 gal	Sewer flow $/1000 gal	BOD $/lb	TSS $/lb	Industrial Water Cost $/year	Wastewater Flow Cost $/year	BOD Cost $/year	TSS Cost $/year	Other Wastewater Costs	% above lowest water cost	Industrial Wastewater Total Cost $/year	% above lowest wastewater cost	Total Cost - Industrial Water & Wastewater $/year	% above lowest Total Cost	Notes
1	Springfield,IL	City/City	$ 1.3900	$ 1.8700	$ 0.0700	$ 0.0500	$ 101,000	$ 121,910	$ 95,235	$ 30,441		18%	$ 238,000	-20%	$ 339,000	0%	No local fees included
2	Peoria, IL	Ind-Am Water/City	$ 1.5800	$ 9.2700	$ 0.1150	$ 0.1130	$ 115,000	$ 19,710	$ 140,029	$ 66,797		35%	$ 229,000	-23%	$ 344,000	1%	No local fees included
3	Milwaukee	City/MMSD	$ 1.0100	$ 1.9177	$ 0.0785	$ 0.0728	$ 74,000	$ 139,992	$ 95,573	$ 44,304		-18%	$ 297,000	0%	$ 371,000	9%	Local sewer O&M included
4	Madison, WI	City/Madison Metro Sewerage District	$ 0.8500	$ 1.6401	$ 0.0995	$ 0.1318	$ 62,000	$ 119,727	$ 120,495	$ 80,242	$ 12,224	-27%	$ 333,000	12%	$ 395,000	17%	Local sewer O&M included
5	Toledo, OH	City/City	$ 0.7945	$ 2.1782	$ 0.1200	$ 0.0900	$ 58,000	$ 159,008	$ 146,117	$ 54,784		-32%	$ 360,000	21%	$ 418,000	23%	No local fees included
6	Louisville, KY	City/Metro District	$ 1.4285	$ 1.0100	$ 0.1995	$ 0.0820	$ 104,000	$ 73,730	$ 212,022	$ 38,444		22%	$ 322,000	8%	$ 426,000	26%	No local fees included
7	Chicago, IL	City/MWRD	$ 1.1591	$ 0.1900	$ 0.1975	$ 0.1520	$ 85,000	$ 13,870	$ 239,875	$ 92,541		6%	$ 348,000	16%	$ 431,000	27%	No local fees included
8	Rochester, MN	City/City	$ 0.7987	$ 0.7987	$ 0.2000	$ 0.1500	$ 56,000	$ 58,116	$ 243,928	$ 91,323		-34%	$ 391,000	32%	$ 447,000	32%	No local fees included
9	Davenport,IA	City/City	$ 2.0900	$ 1.9788	$ 0.0806	$ 0.1761	$ 153,000	$ 144,439	$ 86,067	$ 75,049		80%	$ 306,000	3%	$ 459,000	36%	No local fees included
10	Green Bay, WI	City/GBMSD	$ 1.2987	$ 0.4889	$ 0.1965	$ 0.1739	$ 94,000	$ 34,303	$ 227,090	$ 105,882		11%	$ 367,000	24%	$ 461,000	36%	No local fees included
11	Rockford,IL	City/Rock River Sanitary District	$ 1.6800	$ 0.4011	$ 0.1450	$ 0.2730	$ 121,800	$ 28,278	$ 176,658	$ 166,208		0%	$ 372,000	25%	$ 493,000	45%	No local fees included
12	Cincinnati, OH	City/MSD of Greater Cincinatti	$ 1.3200	$ 2.0100	$ 0.2280	$ 0.1320	$ 96,000	$ 146,730	$ 242,164	$ 56,255		13%	$ 445,000	50%	$ 541,000	60%	No local fees included
13	Racine, WI	City/City	$ 1.4837	$ 1.9281	$ 0.2128	$ 0.1628	$ 102,000	$ 140,535	$ 232,841	$ 74,314		20%	$ 448,000	51%	$ 550,000	62%	No local fees included
14	Detroit, MI	City/Detroit WSD	$ 1.4700	$ 2.0600	$ 0.2060	$ 0.2920	$ 107,000	$ 150,380	$ 219,498	$ 115,534	$ 16,053	28%	$ 488,000	62%	$ 592,000	75%	Sewer Rate Increases planned
15	Kenosha, WI	City/City	$ 1.7700	$ 2.2800	$ 0.2400	$ 0.1400	$ 129,000	$ 164,880	$ 263,010	$ 63,828	$ 12,810	82%	$ 505,000	78%	$ 634,000	87%	No local fees included
16	North Shore, IL	City/NSSD	$ 3.2000	$ 0.2800	$ 0.2850	$ 0.2700	$ 234,000	$ 20,440	$ 306,845	$ 121,505		175%	$ 459,000	55%	$ 693,000	104%	No local fees included
17	Sauget,IL (East St. Louis)	City/American Bottoms S	$ 1.8300	$ 1.7900	$ 0.3939	$ 0.0670	$ 119,000	$ 130,670	$ 413,891	$ 42,374		40%	$ 587,000	98%	$ 706,000	108%	No local fees included
18	Columbus, OH	City/City	$ 1.5200	$ 2.4000	$ 0.2400	$ 0.2900	$ 111,000	$ 175,200	$ 252,248	$ 85,235		31%	$ 623,000	110%	$ 734,000	117%	No local fees included
19	Duluth, MN	City/WLSSD	$ 1.0430	$13.9706	$ -	$ -	$ 76,000	$ 1,018,883	$ -	$ -		-11%	$ 1,020,000	243%	$ 1,096,000	223%	No local fees included
20	Lansing, MI	City/City	$ 1.9553	$ 4.9064	$ 0.4300	$ 0.3300	$ 143,000	$ 358,198	$ 623,585	$ 200,811		98%	$ 1,083,000	265%	$ 1,226,000	262%	No local fees included

Table 3. Water and Wastewater Costs for medium sized process wastewater industries

MMAC Comparison Cities

Rank	Metro Area	Agency Name (water/sewer)	Water cost per 1000 gal	Sewer flow $/1000 gal	BOD $/lb	TSS $/lb	Water Utility Cost $/year	Wastewater Flow Cost $/year	BOD Cost $/year	TSS Cost $/year	Wastewater Utility Cost $/year	Process Industry Total Cost $/year	% above lowest cost	Notes
1	Milwaukee	City/MMSD	$ 1.0100	$ 1.9177	$ 0.0788	$ 0.0726	$ 74,000	$ 139,992	$ 95,873	$ 44,304	$ 297,000	$ 371,000	0%	Includes local sewer O&M
2	Sacramento	City/City	$ 0.7914	$ 0.8730	$ 0.1784	$ 0.1019	$ 58,000	$ 41,829	$ 214,755	$ 62,039	$ 319,000	$ 377,000	2%	Have impact fees
3	Indianapolis	IWB(private) /City	$ 1.7000	$ 1.3992	$ 0.1012	$ 0.1143	$ 124,000	$ 102,142	$ 123,225	$ 69,533	$ 295,000	$ 419,000	13%	No "local" fees found that impact industries
4	Salt Lake City,UT	City/City	$ 1.4700	$ 1.00	$ 0.1500	$ 0.0900	$ 107,000	$ 73,212	$ 182,648	$ 54,784	$ 311,000	$ 418,000	13%	penalty for high summer water use
5	St. Paul	City/MCES	$ 1.5200	$ 2.4000	$ 0.0805	$ 0.1210	$ 111,000	$ 175,200	$ 94,920	$ 55,250	$ 325,000	$ 436,000	18%	Impact fee of $1275/ERU
6	Buffalo	American Water/City	$ 1.7700	$ 1.4825	$ 0.1340	$ 0.1320	$ 129,000	$ 108,231	$ 142,788	$ 80,273	$ 311,000	$ 440,000	19%	No "local" fees found that impact industries
7	Kansas City	City/City	$ 2.9500	$ 1.88	$ 0.1300	$ 0.0820	$ 150,000	$ 115,187	$ 142,464	$ 37,442	$ 295,000	$ 445,000	20%	No "local" fees found that impact industries
8	Orlando	City/City	$ 1.1350	$ 1.9000	$ 0.1798	$ 0.1798	$ 83,000	$ 138,700	$ 186,092	$ 78,628	$ 401,000	$ 484,000	30%	No "local" fees found that impact industries
9	San Antonio	SAWS	$ 1.7700	$ 1.4896	$ 0.1940	$ 0.1798	$ 129,000	$ 108,739	$ 206,094	$ 82,099	$ 380,180	$ 509,180	37%	No "local" fees found that impact industries
10	Durham, NC	City/City	$ 1.5842	$ 3.30	$ 0.1500	$ 0.0800	$ 114,000	$ 240,900	$ 182,648	$ 36,529	$ 480,000	$ 574,000	55%	No "local" fees found that impact industries
11	Charlotte - Gastonia	Charlotte-Mecklenburg Utilities	$ 1.8000	$ 3.0700	$ 0.2400	$ 0.1000	$ 131,000	$ 224,110	$ 292,234	$ 60,882	$ 577,000	$ 708,000	91%	Water and sewer impact fee $2000/ERU
12	Columbus	City/City	$ 1.1297	$ 2.8471	$ 0.3400	$ 0.2000	$ 82,000	$ 193,235	$ 362,248	$ 85,235	$ 641,000	$ 723,000	95%	No "local" fees found that impact industries
13	Chapel Hill (Raleigh-Durham)	Orange Water & Sewer Authority	$ 4.5700	$ 2.8700	$ 0.1900	$ 0.1200	$ 341,000	$ 209,510	$ 207,838	$ 55,890	$ 473,000	$ 814,000	119%	Water and sewer impact fee $2900/ERU
14	Nashville	City/City	$ 2.0858	$ 3.4628	$ 0.2932	$ 0.1400	$ 152,000	$ 252,787	$ 357,012	$ 85,235	$ 695,000	$ 847,000	128%	No "local" fees found that impact industries
15	Pittsburg	City/alcosan	$ 3.2500	$ 4.2500	$ 0.2000	$ 0.2000	$ 237,000	$ 310,980	$ 243,528	$ 121,764	$ 676,000	$ 913,000	148%	No 2003 rate increase
16	Portland	City/City	$ 2.0057	$ 5.1200	$ 0.4630	$ 0.5540	$ 146,000	$ 448,760	$ 478,252	$ 218,236	$ 1,145,000	$ 1,291,000	248%	Impact fee $2500/ERU

Table 4. MMAC Comparison Cities - Average Total Cost - Residential Customers

Rank	Metro Area	Agency Name (water/sewer)	water cost per 1000 gal	water monthly service fee	total water utility cost	% above lowest water cost	sewer service fee per month	sewer flow fee $/1000 gal	sewer flat fee	property tax fee per $1000	total sewer utility cost	% above lowest sewer cost	utility total sewer plus water	% above lowest total utility cost	Additional "Tested" Local Fees	Fees used for & comments	Total of all fees - typical/average residential bill	% above lowest overall cost	Notes
1	Salt Lake City,UT	City/City	$ 0.98	$ 8.62	$ 134	12%	$ 3.92	$ 1.31			$ 138	14%	$ 272	0%	$ 38	storm water fee	$ 308	0	penalty for high summer water use
2	Indianapolis	IWS(private) /City	$ 1.74	$ 9.19	$ 229	92%	$ 2.39	$ 1.34			$ 121	0%	$ 351	29%	$ 18	stormwater fee	$ 369	19%	No additional local fees found
3	St. Paul	City/MCES	$ 2.03	$ 2.40	$ 169	42%		$ 3.24			$ 224	85%	$ 393	45%	$ 5	water testing fee	$ 389	26%	Impact fee of $1275/ERU
4	San Antonio	SAWS	$ 1.37	$ 5.81	$ 175	47%	$ 5.76	$ 1.98			$ 208	70%	$ 381	40%	$ 24	storm water	$ 405	32%	No additional local fees found
5	Columbus	City/City	$ 1.82	$ 3.16	$ 160	28%	$ 2.87	$ 2.40			$ 229	89%	$ 379	39%	$ 34	stormwater fee	$ 413	34%	No additional local fees found
6	Durham, NC	City/City	$ 1.56	$ 2.44	$ 138	15%	$ 3.16	$ 3.30			$ 266	119%	$ 403	48%	$ 22	storm water fee	$ 425	38%	No additional local fees found
7	Charlotte - Gastonia	Charlotte-Mecklenburg Utilities	$ 1.48	$ 1.58	$ 119	0%	$ 1.55	$ 3.07			$ 259	114%	$ 378	39%	$ 55	stormwater fee	$ 433	41%	Water and sewer impact fee $2000/ERU
8	Buffalo	American Water/City	$ 2.31	$ -	$ 189	34%	$ 18.10	$ 1.48			$ 208	144%	$ 455	68%	$ -		$ 455	48%	No additional local fees found
9	Kansas City	City/City	$ 2.06	$ 9.60	$ 258	116%	$ 8.15	$ 1.58			$ 186	53%	$ 443	63%	$ 18	stormwater fee	$ 461	50%	No additional local fees found
10	Orlando	City/City	$ 0.94	$ 7.16	$ 150	26%	$ 9.50	$ 1.90			$ 245	103%	$ 395	48%	$ 66	stormwater fee	$ 461	50%	No additional local fees found
11	Milwaukee	City/MMSD	$ 1.56	$ 4.82	$ 187	40%	$ 1.36	$ 0.87		$ 1.70	$ 237	95%	$ 404	48%	$ 102	local sewer maintenance fees	$ 506	64%	No additional local fees found
12	Sacramento	City/City	$ -	$ 15.92	$ 227	90%			$ 125.52		$ 126	4%	$ 353	30%	$ 208	storm water and street sweeping	$ 558	81%	Have impact fees
13	Pittsburg	City/City	$ 4.64	$ 8.32	$ 433	262%	$ 1.58	$ 2.23			$ 173	43%	$ 606	123%	$ -		$ 606	97%	No 2003 rate increase
14	Nashville	City/City	$ 2.89	$ 2.76	$ 218	83%	$ 8.05	$ 8.03	10% of bill		$ 462	282%	$ 681	151%	$ -		$ 681	121%	Have some unspecified sewer costs on property tax
15	Chapel Hill (Raleigh-Durham)	Orange Water & Sewer Authority	$ 4.21	$ 8.22	$ 390	227%	$ 5.64	$ 2.87			$ 267	120%	$ 657	142%	$ 65	stormwater fee	$ 722	134%	Water and sewer impact fee $2800/ERU
16	Portland	City/City	$ 2.01	$ 1.43	$ 158	31%	$ 2.71	$ 5.98			$ 443	287%	$ 601	121%	$ 137	stormwater fee	$ 738	140%	Impact fee $2500/ERU

TRIAD
ENGINEERING
INCORPORATED

325 East Chicago Street
Milwaukee, Wisconsin 53202
414/291-8840
Fax: 414/291-8841

July 14, 2003

The Morning Mail
Milwaukee Journal Sentinel
P.O. Box 371
Milwaukee, WI 53201-0371
e-mail: jsedit@journalsentinel.com

Regarding MMSD Flow Estimates

The Milwaukee Metropolitan Sewerage District (MMSD) wants to estimate combined sewer overflow volumes as accurately as possible. The Triad Engineering Incorporated (Triad) study, commissioned by the MMSD, is the first phase of a District effort to verify and improve these estimates.

Estimating overflows is a complex process that computes flow estimates based on multiple depth measurements in the rivers and collection system. The process also relies heavily on many critical assumptions. The Triad study recommended a number of revisions to the flow estimating process, including collecting additional data to reduce the reliance on assumptions and confirm the accuracy of estimates. The MMSD has begun to implement these recommendations. Utilizing the Triad recommendations to estimate and report overflows prior to implementation and testing would be inappropriate.

Triad's report computed overflow volumes for only three rainfall events over a 10-year period. Using straight-line extension of these three events to conclude that the District under reported overflows by 72 percent is entirely irresponsible and has no scientific basis.

Confirming the reliability and accuracy of its flow estimating process is of utmost importance to MMSD. It is appropriate and consistent with good scientific practice that the recommendations and improvements presented in the Triad report be implemented, tested, and refined by MMSD prior to modifying its current flow estimating techniques.

Sincerely,

TRIAD ENGINEERING INCORPORATED

Edward T. Manning, Jr., P.E.
President
Triad Engineering Incorporated
M:\L1-999-24.doc

CORRESPONDENCE/MEMORANDUM

State of Wisconsin

DATE: August 11,2003

TO: Todd Ambs AD/5

FROM: Chuck Burney WT/2
Jim Fratrick SER

SUBJECT: MMSD Triad Report

We have completed our initial review of the report "Improvement of the Conveyance System Monitoring and Regulatory Database" prepared by Triad Engineering Incorporated (Triad) for the Milwaukee Metropolitan Sewerage District (MMSD). Our review included both the report itself and the manner in which MMSD handled the report. We have reviewed MMSD files on the report, including related e-mails.

Report : The report was initiated by MMSD in September of 2000, and is not a required report for the WPDES discharge permit. The report has two major goals of reviewing, and improving where necessary the techniques used to prepare flow estimates for Combined Sewer Overflow (CSO) events, plus improving access to metered data and estimated flow rates by updating and upgrading the system monitoring database. The initial draft of the report was submitted to MMSD in January 2002, a later draft in August 2002, and a final draft in December 2002. The August draft had comments prepared by MMSD and submitted to Triad, with preliminary responses from Triad in September of 2002, and then final responses incorporated into the December report. The cover letter of the December report says it is the final report, but the five technical memorandum are all labeled as "final draft", and they constitute approximately 95% of the report. Technical Memorandum #1 deals with the estimation of CSO volumes, while the remaining four-memorandum deal with calibration of dropshaft rating curves, flow estimating within the MIS, technical support documents, and a user manual. In addition to the report, the work product included a software package to be installed on MMSD's network.

The first two drafts of the report do not contain any comparisons between current CSO volume estimates and those that would result from using the proposed system. The December 2002 report contains the first such comparison. There were three historic CSO events evaluated (August 98, June 99, May 00), and the proposed system would result in an increased estimate of CSO volume for the events of 79%, 78% and 59% respectively. The consultant was then asked to run an additional three events (September 00, July 00, June 01), and those estimates resulted in a decreased estimate of CSO volume of –21%, -42% and –98% respectively.

The report found that the CSO volume estimates were very sensitive to the river elevations that were used to prepare the estimates. The current method and the proposed method use different data sets and techniques to estimate the river stage, but the report recommends that more river gages be installed to obtain better data sets for use in preparing future estimates. The additional river gauges will be installed as recommended. The report also makes several other recommendations on changes that Triad believes would improve the volume estimates. MMSD has accepted some of the recommendations and is moving forward to implement them, but has questions on some of the other recommendations and is gathering further information and asking for additional analysis before accepting those recommendations. One of the major concerns with some of the recommendations is that the software delivered by the consultant has

yet to be run successfully on the MMSD's network.

The software was delivered with the report in December 2002, and it is clear from the files that the inability to get the software to work has dominated the MMSD's efforts since receiving the package. A sub-consultant to Triad Engineering prepared the software, and worked on attempting to install the package until March 2003, at which time the MMSD hired programming experts to assist them in installing and running the program. The process continues, and MMSD estimates the instillation and field verification will take up to one year to complete.

MMSD's handling of the report: The file review made it clear to us that the project has been handled by MMSD at the supervisory/staff level and was not made an issue at the administrative level. The staff were aware, starting in December 2002, of the reports prediction that some events would have significantly higher CSO volume estimates, but were also aware, starting in January of 2003, that other events would be estimated with significantly lower CSO volumes. The files show significant level of activity starting in January 2003 focused on trying to install and run the new software. There is no indication that the December report itself was reviewed, other than the review of the draft done in August 2002.

We believe that a briefing in early 2003 by MMSD for DNR staff would have been sufficient to keep us aware that MMSD was working on the issue and what their plan was for addressing remaining concerns. There is no indication of any attempt to "hide" the report, but rather it appears the staff were working hard to resolve problems. It was technical staff working to resolve technical issues. However, it is also clear that project managers recognized the potential implications but did not raise the issue with DNR.

On many projects, including this one, MMSD has augmented their project management staff by hiring consultants, (Steve Weber for this project), to assist MMSD staff on project management. This has resulted in MMSD project management staff being somewhat removed from the day to day handling of the report and software. Steve Weber, the consultant, initiated pay requests, which were then initialed by MMSD staff; e-mails went to Steve Weber directly on resolving problems with the software instillation, etc.

We believe the issue of project management is a concern that should be discussed further with MMSD, as it has arisen on other occasions.

Suburbs flush with tax disparities

With fees largely based on property values, MMSD still stirs animosity

By STEVE SCHULTZE
and MARIE ROHDE
sschultze@journalsentinel.com

Flushing your toilet costs, on average, almost one-third more for Milwaukee suburban dwellers than it does for city residents, primarily a legacy of a system that bases sewer fees on property values.

The disparity in some city-suburban comparisons is even more striking, according to a Journal Sentinel survey. At the extreme, it costs $4.33 a day to flush in upscale River Hills — nearly $1,600 a year. Milwaukee homeowners pay an average of 96 cents a day, or $352 annually.

In Wauwatosa, the daily flush fee comes to $1.24; for New Berlin residents, it averages $1.81; in Whitefish Bay, $1.96; and in Fox Point, doing your daily business costs $1.98.

The cheapest place in the metro area to dispose of your wastewater is West Milwaukee: Just 71 cents a day.

City industrial sewer rates for the city also remain a bargain — so much so that city and business leaders hope to market Milwaukee as a prime location for wet industries with a high volume of liquid waste.

DOWN THE DRAIN

Average cost per day to flush:

River Hills	$4.33
Fox Point	$1.98
New Berlin	$1.81
Milwaukee	96 cents
West Milwaukee	71 cents

The sewer fees for suburban residential users are "shocking," according to state Sen. Alberta Darling, not only in her home community of River Hills but also in a wide swath of suburbs ringing the city.

The lengthy city-suburban "sewer wars" ended in 1997 with Milwaukee prevailing: Sewer charges for the Milwaukee Metropolitan Sewerage District would be based on property

Please see **MMSD, 10A**

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Property-value-based sewer tax is flush with disparities

MMSD, From **1A**

values, not actual use. In practice, that's meant that the more expensive your home is, the more you pay in sewer property taxes.

It's a system that's very rare nationally.

In a new sewer rate survey commissioned by MMSD, Milwaukee was the only one of 16 comparable cities where a major portion of sewer costs falls on property-tax payers. In a much larger national survey, only 13 cities out of 117 used property taxes to pay for sewers. Most that did levy property taxes for sewers had much smaller rates than Milwaukee's, which now stands at about $1.70 for every $1,000 of a home's value.

Although the sewer wars are over, the conflict over sewer costs is not, said Darling, a Republican and vocal critic of MMSD.

"The battle isn't over," Darling said. "The disparity is a huge issue."

She said sewer taxes, along with other property taxes, have become a critical state issue. The high sewer tax paid by many suburban homeowners is helping drive people to lower-cost suburbs or even out of state, she said.

An upcoming hearing by the Legislature's Joint Audit Committee on MMSD will likely take up the topic of sewer charges, she said. The committee has agreed to review progress made by MMSD since a July 2002 state audit faulted the district for its dumping of untreated sewage into local waterways.

Darling also said she is continuing to research the issue of changing MMSD's governance to make it more accountable, including reviewing how other metropolitan areas run their sewer utilities. She plans to introduce legislation next spring, after Milwaukee Mayor John O. Norquist leaves office, she said.

Norquist has been a strong advocate of MMSD and, as mayor, appoints a majority of the 11-member Milwaukee Metropolitan Sewerage Commission.

No comment from city

Steve Jacquart, Norquist's chief of staff, declined to comment on the newspaper's survey, saying he didn't know its methodology.

"All I can say is that all of the taxpayers are going to benefit from MMSD's no tax increase. (for 2004)," Jacquart said. "It shows they are being responsive to ratepayers."

While MMSD has held the tax rate steady for the past several years, that has actually resulted in significant increases in the amount of money property owners had to pay because of annual increases in property values. On average, Milwaukee County property owners paid 6% more on their 2003 bills than they did the year before. The sewerage commission on Monday approved a $71 million levy for next year for sewer projects, keeping it at the same amount as this year.

The Journal Sentinel compiled area sewer charges by contacting local officials in the 27 communities served by MMSD. Sewer charges, which are an amalgam of several items, differ from community to community.

Figures used in the newspaper's survey included those service charges, as well as the MMSD property tax levy. That levy is billed to homeowners directly in the 18 communities, including Milwaukee, that make up MMSD. In those communities, the property tax figure was based on the average assessed home value in each municipality.

Nine other suburbs outside Milwaukee County that are not part of MMSD pay fees to MMSD for sewage treatment and bill homeowners for that cost in a variety of ways.

SEWER TABS COMPARED

THE HIGH COST OF FLUSHING

Suburban property owners on average pay 31% more for sewer service than Milwaukee property owners because rates are based on property values, according to to data compiled by the Journal Sentinel.

*Estimated

COMMUNITY IN MMSD	USE CHARGE	AVG. HOME VALUE	CAPITAL CHARGE	YEARLY TOTAL
Bayside	$185	$250,000*	$425	$610
Brown Deer	$144	$130,000*	$221	$365
Cudahy	$109	$114,015	$194	$303
Fox Point	$165	$328,028	$558	$723
Franklin	$211	$191,500	$326	$537
Glendale	$240	$160,000	$295	$535
Greenfield	$162	$134,000	$285	$447
Greendale	$123	$172,000	$296	$419
Hales Corners	$101	$169,042	$287	$388
Milwaukee	$207	$85,500	$145	$352
Oak Creek	$191	$143,229	$243	$434
River Hills	$514	$628,686	$1,069	$1,582
Shorewood	$176	$220,727	$375	$553
St. Francis	$73	$86,189	$174	$247
Wauwatosa	$138	$185,000	$315	$453
West Allis	$191.08	$113,745	$193	$384
West Milwaukee	$88	$100,572	$171	$259
Whitefish Bay	$240	$280,000*	$476	$716
COMMUNITIES OUTSIDE MMSD THAT PAY TO HAVE THEIR SEWAGE TREATED BY MMSD				
Brookfield	$389	$254,000	$122	$511
Butler	$499.68	N.A.	$0	$500
Elm Grove	$218	$235,000	$421	$639
Germantown	$382	$175,000	$0	$382
Menomonee Falls	$591	N.A.	$0	$591
Mequon	$177	$367,000	$466	$643
Muskego	$400	$191,800	$0	$400
New Berlin	$660	$198,000	$0	$660
Thiensville	$368	N.A.	$0	$368
			AVERAGE COST:	$516.80

Sources: Municipalities

MMSD is touting a survey of sewer rates it commissioned with Milwaukee's favorable ranking to help local development officials try to lure food processors or other industrial firms that use great quantities of water.

The local sewer system has excess capacity because of the closing of breweries and tanneries, said Kevin Shafer, MMSD executive director. Attracting more industry would help drive down industrial sewer rates even more for big local sewer customers, he said.

Miller Brewing is by far the largest commercial user of sewers, paying more than $2 million a year to MMSD to process its wastewater.

"If we can get more industries here that use water, then you can spread that payment out, and it's good for existing industry," Shafer said.

The MMSD survey placed Milwaukee first for having the lowest industrial sewer costs of a group of 16 cities selected by the Metropolitan Milwaukee Association of Commerce as comparable. Milwaukee ranked seventh on industrial sewer rates on a list of 14 cities considered to have relatively low sewer charges.

Milwaukee came in 11th of 16 cities for residential sewer and water rates combined. However, the survey used only Milwaukee's residential sewer charges without accounting for the disparity between city and suburban costs.

The survey, which cost about $10,000, was done by HNTB, a local engineering firm. The report suggests consideration of new revenue sources to help pay for sewers, including "storm water" fees to pay for flood control costs and development "impact fees."

MMSD
Preserving The Environment • Improving Water Quality

Kevin L. Shafer, P.E.
Executive Director

October 6, 2003

Martin Kaiser, Editor
Milwaukee Journal Sentinel
333 West State Street
Milwaukee, WI 53203

Dear Mr. Kaiser:

Earlier this year, the Milwaukee Metropolitan Sewerage District (MMSD) initiated a study to determine where the greater Milwaukee region ranks with cities of similar size on the issue of water and wastewater costs. The need for this study was developed through several conversations with Mr. Tim Sheehy at the Milwaukee Metropolitan Association of Commerce (MMAC) and various people at the City of Milwaukee. The results of this study were released by the MMSD at our September Commission meeting.

The results show that for industrial usage:

- MMSD ranks 1st when compared to the 16 MMAC metropolitan areas in the United States
- MMSD ranks 3rd when compared to 20 other Midwest metropolitan areas
- MMSD ranks 7th or in the middle of the 14 "least expensive" metropolitan areas in the United States

The study also looked at residential rates and found that Milwaukee ranks 11th when compared to the 16 MMAC comparable metropolitan areas in the United States.

These are all very positive results for the Milwaukee region.

The article that appeared in the September 27, 2003, edition of your paper titled, "Suburbs flush with tax disparities," was sparked by the MMAC rate study, yet does not reflect anything from that study. In fact, the reporters performed a separate survey that turned out to be the focus of this article. Unfortunately, their survey has some significant errors. Most notably, the user charges identified by each community are implied to be charges that are collected by MMSD. This, in fact, is not correct. The user charges quoted in the article actually include the MMSD user fee and the fee assessed by the local municipality for local sewer service. The municipality fee is an additional fee that is not revenue for the MMSD. Just to be clear, MMSD receives no revenue from the municipality fee that is added on to the District's fee. The enclosed table

summarizes the user charges and capital charges actually collected by MMSD. While the Journal Sentinel's listing of capital charges is nearly accurate, the user charges are as much as 655.2% overstated.

Additionally, the notion that there is a cost per flush is interesting. Using my hometown of Fox Point as an example, the article uses the yearly total cost of $723 and divides by 365 days to compute an "Average cost per day to flush" of $1.98. This number would make sense if my household, for example, did not use the dishwasher, the washing machine, did not flush any toilet more than once a day, we did not take a shower and we did not wash our hands. Let me assure you, my family like most everyone I know, does perform these other activities at least once per day. All of this flow contributes to the water that is conveyed and treated by MMSD. Calling this a "cost per day to flush" is inaccurate.

Finally, the jist of the article was to highlight the use of property taxes to pay for the capital improvement program. This same article could have been written, but with accurate user charge values, if your reporters had contacted the MMSD. Unfortunately, when I was called to comment for the article I was not told of the independent survey compiled by the Journal Sentinel and was only asked questions about the MMAC rate study. I had no opportunity to review or even comment on the newspaper's findings. In the interest of making certain you are reporting factual information, I should have been asked about this other survey, and I should have been allowed to ask MMSD staff to verify the accuracy of this information.

At MMSD, we understand that we have to improve our performance and how we communicate. We are constantly looking for ways to do both. One goal we are striving to meet is to provide a clearer understanding to the Journal Sentinel of our system. We are more than happy to verify information provided by the Journal Sentinel prior to an article being written. However, we can only improve communication of issues if asked. I would ask that this courtesy be provided on future issues that might require data verification. In this manner, we can all improve our communications to our customers.

Finally, according to your article, at least one member of the State Senate has expressed the desire to review the means by which our communities are charged for sewer services, apparently based on your survey. For such a public debate, it is essential that accurate information be provided to legislators and the public. In that spirit, I ask the Journal Sentinel to correct the factual errors contained in the September 27, 2003, article and print the correct figures for MMSD users. The enclosed chart shows the correct figures.

Please contact me if you have any questions on this issue. Thank you.

Respectfully submitted,

Kevin L. Shafer
Executive Director

Enclosure
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	REPORTED USER CHARGE By JS	2003 **** AVERAGE HOUSEHOLD USER CHARGE	AMOUNT DIFFERENCE	PERCENT VARIANCE	REPORTED CAPITAL CHARGE By JS	ACTUAL CAPITAL CHARGE	AMOUNT DIFFERENCE	PERCENT VARIANCE	REPORTED YEARLY TOTAL By JS	ACTUAL YEARLY TOTAL MMSD	AMOUNT DIFFERENCE	PERCENT VARIANCE
Bayside	$185	$71	$114	158.9%	$425	$425	$0	0.0%	$610	$496	$114	22.9%
Brown Deer	$144	$73	$71	98.6%	$221	$221	$0	0.0%	$365	$294	$71	24.4%
Cudahy	$109	$65	$44	66.9%	$194	$194	$0	0.0%	$303	$259	$44	16.9%
Fox Point	$165	$69	$96	140.2%	$558	$558	$0	0.0%	$723	$626	$97	15.4%
Franklin	$211	$77	$134	174.0%	$326	$326	$0	0.0%	$537	$403	$134	33.4%
Glendale	$240	$67	$173	260.6%	$295	$272	$23	8.5%	$535	$339	$196	58.0%
Greenfield	$162	$71	$91	128.1%	$285	$228	$57	25.1%	$447	$299	$148	49.6%
Greendale	$123	$71	$52	73.2%	$296	$292	$4	1.2%	$419	$363	$56	15.3%
Hales Corners	$101	$70	$31	43.9%	$287	$287	$0	0.1%	$388	$358	$30	8.5%
Milwaukee	$207	$75	$132	175.8%	$145	$145	$0	0.2%	$352	$220	$132	59.7%
Oak Creek	$191	$74	$117	158.1%	$243	$243	$0	0.2%	$434	$317	$117	36.7%
River Hills	$514	$68	$446	655.2%	$1,069	$1,069	$0	0.0%	$1,583	$1,137	$446	39.2%
Shorewood	$178	$67	$111	165.7%	$375	$375	$0	0.0%	$553	$442	$111	25.0%
St. Francis	$73	$70	$3	4.7%	$174	$147	$27	18.8%	$247	$216	$31	14.2%
Wauwatosa	$138	$66	$72	109.9%	$315	$315	$0	0.0%	$453	$380	$73	19.1%
West Allis	$191	$68	$123	182.5%	$193	$193	$0	0.2%	$384	$261	$123	47.2%
West Milwaukee	$88	$67	$21	31.3%	$171	$171	$0	0.0%	$259	$238	$21	8.8%
Whitefish Bay	$240	$72	$168	232.0%	$476	$476	$0	0.0%	$716	$548	$168	30.6%
Brookfield	$389	$75	$314	418.8%	$122	$300	($178)	-146.3%	$511	$375	$136	36.1%
Butler	$500	$63	$437	N/A	$0	$145 *	($140)	N/A	$500	$202	$298	147.3%
Elm Grove	$218	$69	$149	217.5%	$421	$278	$143	34.0%	$639	$347	$292	84.3%
Germantown	$382	$75	$307	N/A	$0	$201	($201)	N/A	$382	$276	$106	38.4%
Menomonee Falls	$591	$68	$523	N/A	$0	$219 **	($219)	N/A	$591	$287	$304	105.8%
Mequon	$177	$73	$104	142.3%	$466	$432	$34	7.3%	$643	$505	$138	27.3%
Muskego	$400	$73	$327	N/A	$0	$192	($192)	N/A	$400	$265	$135	51.0%
New Berlin	$660	$73	$587	N/A	$0	$265	($265)	N/A	$660	$338	$322	95.1%
Thiensville	$368	$63	$305	N/A	$0	$337 ***	($337)	N/A	$368	$400	($32)	-8.0%
							AVERAGE COST		$516.80	$378	$139	36.9%

Note: Capital Charge rate for member communities is $1.70 PER 1,000 of equalized property value.
Capital charge rate for non-member communites is less then $1.70 per 1,000
of equalized property value. However, this rate varies among the non-member communties.

* Home Value per Butler

** Home Value per Menomonee Falls

*** Home Value per Thiensville

**** Does not include the actual Household Hazardous Waster Charge of $2.50 per unit per a year. This charge is billed April 1, 2003.

Great Lakes WATER Institute

Wisconsin Aquatic Technology and Environmental Research

UNIVERSITY of WISCONSIN UWMILWAUKEE

Sandra L. McLellan
Assistant Scientist

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Milwaukee, WI 53204

Research Interests

Dr. Sandra McLellan conducts research primarily focused on understanding the genetics of microorganisms and applying molecular-based approaches to detect and identify bacteria associated with environmental contamination. Her studies in the laboratory have encompassed a broad range of topics in environmental health, including investigation of beach closings by characterizing the genetic relationships among E. coli strains from various hosts so that DNA fingerprinting techniques may be applied to discern sources of contamination in the environment.

Education

- Ph.D., University of Cincinnati, 1998
- B.S., University of Wisconsin-Milwaukee, 1990

Publications

- McLellan, S.L. and A.K. Salmore. 2003. Evidence for localized E. coli loading as the cause of chronic beach closings in a freshwater marina. Water Research. *Accepted for publication.*
- McLellan, S.L., A.K. Salmore, and A.D.Daniels. 2003. Determining host sources of Escherichia coli using Rep-PCR and antibiotic resistance frequency. Applied and Environmental Microbiology. *Accepted for publication.*
- McLellan SL, AD Daniels, AK Salmore. 2002. Elevated indicator bacteria levels at South Shore Beach: Escherichia coli source detection using repetitive element anchored PCR. Great Lakes WATER Institute Technical Report contribution #432.
- McLellan SL, J Shann, D Warshawsky. 2002. Inhibition and enhancement by low molecular weight polycyclic aromatic hydrocarbons on the metabolism of benzo[a]pyrene in Mycobacterium sp. RJGII-135. Environ. Tox. Chem. 21:253-59.
- McLellan SL, AD Daniels, AK Salmore. 2001. Clonal Populations of Thermotolerant Enterobacteriaceae in Recreational Water and Potential Interference with Fecal Escherichia coli Counts. Appl. Environ. Microbiol. 67:4934-8.

Asbjornson, Karen

From: Seaquist, Sara
Sent: Wednesday, December 10, 2003 4:38 PM
To: Asbjornson, Karen
Subject: FW: MMSD storm update

CR email...

-----Original Message-----
From: eCommunications [mailto:Ce@mmsd.com]
Sent: Wednesday, December 10, 2003 4:12 PM
Subject: MMSD storm update

Storm Update

December 10, 2003

As a result of reduced treatment capacity, the Milwaukee Metropolitan Sewerage District (MMSD) conducted an in-plant diversion on December 10, 2003 at its Jones Island Wastewater Treatment Plant.

High flows of rain into Jones Island threatened to wash the biological bugs used in treatment into Lake Michigan, a situation that could harm water quality and cause the District to lose its entire secondary treatment process for two to three weeks.

Secondary treatment is one of four steps in the treatment process, which uses biological bugs to eat or breakdown pollutants in wastewater.

Capacity at Jones Island was reduced because of a maintenance project that is performed annually during the colder months when there is less risk of heavy rains. When the project began, the forecast called for mostly snow and colder temperatures. Near the end of the six-day project, the forecast changed to call for mostly rain. All diverted flows are disinfected and have historically met all federal and state treatment standards for full treatment.

You can find more information on diversions on the District's Web site: <http://www.mmsd.com/home/index.cfm>
Total volume for the number of gallons diverted will not be available until 12/11/03.

Know someone who would like to receive MMSD news or environmental updates? To subscribe or unsubscribe, send a message to: bgraffin@mmsd.com

12/11/2003

Asbjornson, Karen

From: eCommunications [Ce@mmsd.com]
Sent: Monday, December 15, 2003 12:28 PM
Subject: MMSD News Release

Immediate Release
December 15, 2003
Contact: Bill Graffin, Public Information Manager, (414) 225-2077

MMSD saves taxpayers $1.1 million

District maintains strong bond ratings, which lead to future savings

(Milwaukee, WI) -- The Milwaukee Metropolitan Sewerage District (MMSD) has saved its customers $1.1 million by refinancing a portion of its long-term debt.

"Thanks to the strategic financial planning of our money managers, MMSD's taxpayers will save, on average, nearly $76,000 every year for the next 15 years," said Dennis Grzezinski, MMSD commission chairman.

On December 11, 2003, the District refinanced a portion of its 2001 general obligation bond issue by refunding approximately $38 million in bonds.

"The District's solid financial standing with all three bond rating agencies paid off and helped save taxpayers money," said Grzezinski.

Moody's, Standard & Poor's and Fitch Ratings all confirmed MMSD's 'AA+' rating or the equivalent.
"If any of the rating agencies would have lowered the District's rating, we would not have saved as much money on this latest move to refund the bonds. All of the agencies had great things to say, not only about MMSD's financial management, but also, the state and condition of the District's facilities and the efficient operation of those facilities. "

- "Moody's believes the system's financial operations will remain sound based on the conservative budgeting practices of a strong management team, considerable financial flexibility and ample liquidity levels."

- Moody's Investors Service

- "Financial operations are sound …" "The stable outlook reflects the expectation that the District will maintain its strong financial performance as it funds its large capital program."

- Standard & Poor's

- "The stable rating outlook reflects the District's continued ability to meet customer demand through ample system capacity and increased operating efficiency."

- Fitch Ratings

To view all three of the financial reports, visit our Web site: www.mmsd.com <http://www.mmsd.com>.

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Editorial: MMSD's latest controversy

From the Journal Sentinel

Posted: Dec. 15, 2003

Bill Graffin is right. The spokesman for the Milwaukee Metropolitan Sewerage District says that allegations made by a district consultant charging a district official with mismanagement and contracting improprieties are "very serious claims." And the district does seem to be taking the claims seriously, saying it will hire an independent investigator to look into the accusations.

Obviously, the sooner an investigator is hired, the better. An internal review has determined that there was no wrongdoing. But the district already suffers from a negative image in the community - some of which is deserved and some of which is not - and the allegations by Norris & Associates that surfaced last week can only further damage the district's credibility if left unresolved.

Nor was that image enhanced last week when, according to district officials, unexpected weather problems resulted in an in-plant diversion of about 40 million gallons of sewage around one part of the treatment process at the Jones Island treatment plant. The diverted

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flow met federal and state standards for full treatment, according to district officials, but such diversions still concern the public, and rightfully so, any time they happen.

Furthermore, the nature of Norris' accusations - that a district official ordered the firm to bill $600 through its contract for work purportedly done by a friend of a district official - require resolution by someone outside the district.

So district officials are doing the right thing in that regard. But in addition to an investigation into Norris' allegations, perhaps what's needed is a more complete look at all the district's consultant contracts.

A Journal Sentinel report last week noted that two commissioners were unfamiliar with sewerage district consultant Jeff Gillis, who has been paid about $248,000 since late 1997. Gillis has had repeated no-bid contracts with the district because of his "expertise and experience in legislative and policy matters," according to district officials. He has been paid about $41,000 a year for 30 to 40 hours of work a month. Nice work if you can get it, but the same can be said of a few other jobs.

Maybe Gillis has been worth every penny. And maybe not. An outside review could help answer that question. Furthermore, no-bid contracts by their very nature should always raise a few eyebrows.

This is not to buy into the notion being pushed by state Sen. Alberta Darling

(R-River Hills) that the district's governing structure needs to be changed, or even Milwaukee mayoral candidate Tom Barrett's proposal that all contracts be halted and the contracts be publicly aired.

Barrett is right to be concerned about contracts issued administratively without the knowledge of commissioners, but district officials are also right when they argue in turn that halting all contracts now could delay important work that needs to be done to complete a court-ordered $900

million sewer upgrade plan. Furthermore, as a general rule, it is doubtful that every board member of a large firm or agency is familiar with the name of every consultant hired by the executives responsible for daily operations.

Still, an outside review of the contracts could help ease concerns over issues raised by the Norris allegations and the revelations about Gillis. And district officials should understand that it's in the district's interest to ask for such a review sooner rather than later.

From the Dec. 16, 2003 editions of the Milwaukee Journal Sentinel

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From the Dec. 16, 2003 editions of the Milwaukee Journal Sentinel

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Asbjornson, Karen

From: Matthews, Pam
Sent: Thursday, December 18, 2003 9:42 AM
To: Asbjornson, Karen; Mueller, Janice; Chrisman, James
Subject: FW: MMSD eNews

FYI

-----Original Message-----
From: eCommunications [mailto:Ce@mmsd.com]
Sent: Thursday, December 18, 2003 9:16 AM
Subject: MMSD eNews

In case you missed it, this letter to the editor appeared in today's Journal Sentinel.

SEWAGE
Practice of blending is appropriate

The Dec. 11 article stating that 40 million gallons of partially treated sewage was dumped into Lake Michigan missed the mark and misstated the facts on the key practice of blending ("MMSD dumps 40 million gallons"). Blending has been an accepted, environmentally beneficial practice for wastewater treatment plants nationwide for decades.

Despite the article's misleading statement that blending has merely been "OK'd by federal environmental officials as a last-ditch measure," a reading of the Environmental Protection Agency's Nov. 7 guidance on this issue would have revealed that, according to the EPA, blending is a critical environmental and public health safeguard.

As the EPA states, blending ensures that peak flows during periods of heavy rain receive basic treatment in full compliance with a treatment plant's Clean Water Act permit requirements. Blending protects a plant's secondary treatment unit from wash-out, which would cause severe environmental and public health consequences. Blending also protects homes and businesses from sewer backups, which would directly threaten public health.

The Association of Metropolitan Sewerage Agencies urges responsible newspapers like the Milwaukee Journal Sentinel and groups like Friends of Milwaukee Rivers to review the reasons behind the need for blending peak flows as well as the dangerous consequences that could ensue without blending.

Ken Kirk
Executive director

Association of Metropolitan
Sewerage Agencies
Washington

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SB-347. MMSD (Darling) Authorizes the use of design-build construction process for Milwaukee Metropolitan Sewerage District. To Economic Development, Job Creation and Housing.
SB-352. MMSD (Reynolds) Governance of Milwaukee Metropolitan Sewerage District. To Homeland Security, Veterans and Military Affairs and Government Reform

Asbjornson, Karen

From: Kluesner, Elizabeth M
Sent: Monday, August 19, 2002 10:30 AM
To: Asbjornson, Karen
Subject: RE: Re: MMSD

Hi Karen.

The MMSD permit allows them to have 6 combined sewer overflows (CSO's) each year. They have had three CSO's in 2002.

That being said, we are still very concerned about the situation with the MMSD and are working to get some of their problems corrected.

There are a number of DNR technical staff that are working on this issue. I would recommend contacting Duane Schuettpelz for more details. Duane works in our wastewater program and has a lot of background and history on the MMSD story. His direct line is: 266-0156.

Elizabeth M. Kluesner
Legislative Liaison
Wisconsin Department of Natural Resources
(608)264-6266
kluese@dnr.state.wi.us

From: Asbjornson, Karen
Sent: Friday, August 16, 2002 2:01 PM
To: Kluesner, Elizabeth M
Subject: Re: MMSD

Hi Elizabeth,

Can you give me an update on if DNR is doing anything in light of the recent newspaper articles about sewage dumping in Lake Michigan? We got a constituent contact on this and just looking for an update or who I can contact at DNR regarding this issue.

Thanks!

Karen Asbjornson
Office of Senator Roessler

Investigation of

Elevated Bacteria Levels at South Shore Beach:

Escherichia coli Source Detection Using Molecular-Based Methods

Great Lakes WATER Institute Technical Report

JUNE 2002

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Great Lakes WATER Institute
Wisconsin Aquatic Technology & Environmental Research

EXECUTIVE SUMMARY

STUDY OBJECTIVE

The purpose of the South Shore Beach Study was to investigate the sources of elevated *Escherichia coli* (*E. coli)* bacteria levels responsible for frequent beach closings at South Shore Beach through intensive bacterial sampling and genetic DNA fingerprinting techniques. *E. coli* is a bacterium that is present in the gastrointestinal tract of almost all warm blooded animals and is the EPA recommended indicator of fecal pollution for recreational freshwater. *E. coli* may enter waterways as a result of sewage overflows, agricultural runoff or urban stormwater. All of these sources of fecal pollution have been shown to have high concentrations of *E. coli*.

Testing for pathogenic viruses and bacteria on Lake Michigan beaches is not routinely conducted. Rather, general indicators of contamination (such as *E. coli*) are measured, and when levels exceed guidelines set by the EPA, water quality advisories are issued. The correlation between disease causing organisms and *E. coli* levels is poorly established. However, the presence of *E. coli* in water indicates that fecal contamination is present, and any fecal contamination is potentially a health risk. The actual types and amounts of pathogens entering surface waters will be dependent on the source of contamination. Waterfowl can harbor organisms such as *Salmonella* spp., *Campylobacter* spp., and *Giardia*, all of which can be infective to humans. Likewise, cattle are a reservoir for *Cryptosporidium* and *E. coli* 0157:H7, a specific strain of *E. coli* that produces toxins accounting for the symptoms seen with this type of infections. Human sources of contamination present a health risk since many pathogens can be found in the human population including enteroviruses, Norwalk virus, *Shigella*, *Salmonella*, and *Cryptosporidium*. While epidemiological studies have demonstrated an association between elevated *E. coli* levels and gastroenteritis, these studies provide no information as to the source of contamination, the types of pathogens that caused illness, or the magnitude of risk. Further study is needed to better characterize the health risk associated with indicator bacteria levels.

BEACH CLOSINGS IN MILWAUKEE

The high number of beach closings in Milwaukee at South Shore Beach (Figure A) has attracted the attention of citizens, public health officials, the Wisconsin Department of Natural Resources, and state legislators. In 2000, closings spanned 60% of the swimming season (Table A). At times, levels of *E. coli* were 65 times over the EPA recommended limit (235 CFU/100 ml) for recreational waters. This trend seems contrary to the recent progress that has been made in reducing fecal pollution entering Lake Michigan each year. This reduction has been accomplished through substantial improvements the Milwaukee metropolitan sewage system infrastructure and in agricultural management practices within the river basin. Current theories as to the cause of frequent beach closings implicate combined sewer overflows (CSOs) or the architecture of South Shore Beach, located inside the Milwaukee Harbor and surrounded by a breakwall on three sides.

Table A: Days of water quality advisories posted for beaches in Milwaukee

	1997	1998	1999	2000	2001
South Shore	15	20	32	42	28
Bradford[1]	no data	no data	1	12	8 (2)
McKinley[2]	no data	no data	1	5	2 (1)

[1,2] Numbers of total advisories due to algae are shown in parentheses.

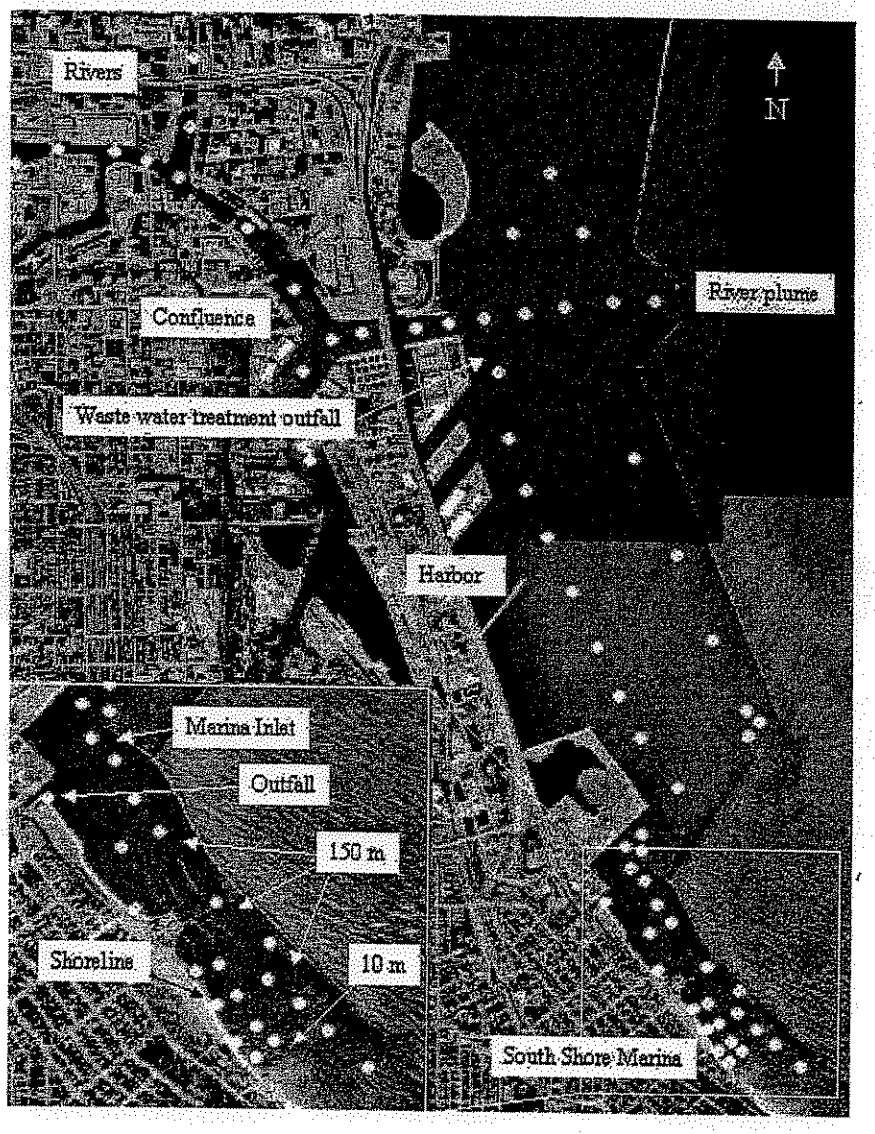


Figure A: Arial photograph of study area including Milwaukee's South Shore Marina, where South Shore Beach is located. This beach is closed more often than the Bradford and McKinley Beaches located immediately north of the harbor. Shown are sample sites for water quality surveys; results for samples days are detailed in Appendix A and B.

The results of this study indicate that the poor water quality of South Shore Beach in 2001 was a local phenomenon and not a reflection of overall water quality in Lake Michigan. There was no correlation between water quality found in the rivers and the Milwaukee harbor and that of South Shore Beach based on the data we collected. Data from intensive water sampling and subsequent *E. coli* quantification demonstrate persistent, localized contamination at South Shore Beach. Roosting birds and stormwater runoff appeared to be two major sources of *E. coli* bacteria levels at South Shore Beach.

Elevated *E. coli* levels in surface waters were concentrated at the shoreline and corresponded with the presence of gulls and waterfowl. The levels of *E. coli* found at the beach area (within two to three meters from shore) were significantly and orders-of-magnitude higher than levels offshore within the breakwall and at the south end of the outer harbor (10 to 150 m from shore), regardless of rainfall. We found that offshore (10 to 150 m) *E. coli* levels did not exceed 235 CFU/100 ml (the EPA guideline for recreational water) in more than 5% of the samples collected for 19 surveys (number of samples = 209). In contrast, samples taken at the beach area exceeded 235 CFU/100 ml in 66% of the samples collected for 43 shoreline surveys (number of samples = 675). The highest levels of *E. coli* were consistently detected at the shoreline site where a large number of birds roost (designated Site 4 in this study, see Figure B and C). At times, levels of *E. coli* at Site 4 reached >27,000 CFU/100 ml. These assessments of water quality are directly relevant to the swimming area, and any evidence of fecal contamination can be considered a health risk. Further studies are needed to determine the occurrence of pathogens in recreational water contaminated by bird feces, as both gulls and waterfowl are known to carry human pathogens.

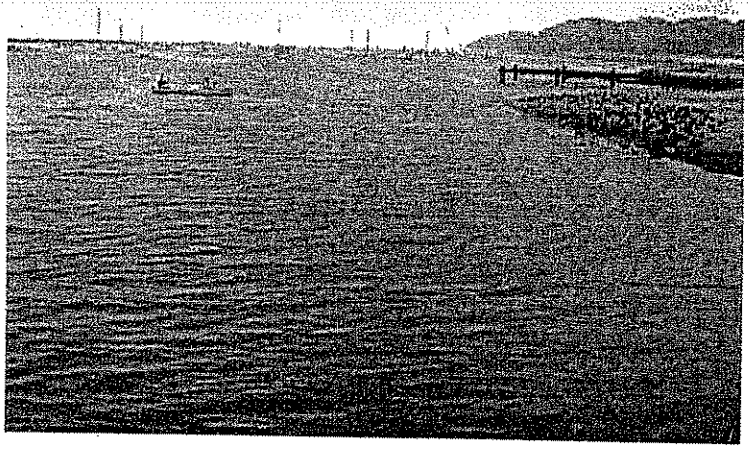


Figure B: South Shore Marina and Beach. The swimming beach, which is monitored for *E. coli*, is located directly south of the boat launch, near a roosting site for waterfowl. The view is of Site 4 facing south towards the swimming beach. Researchers are pictured taking samples by canoe.

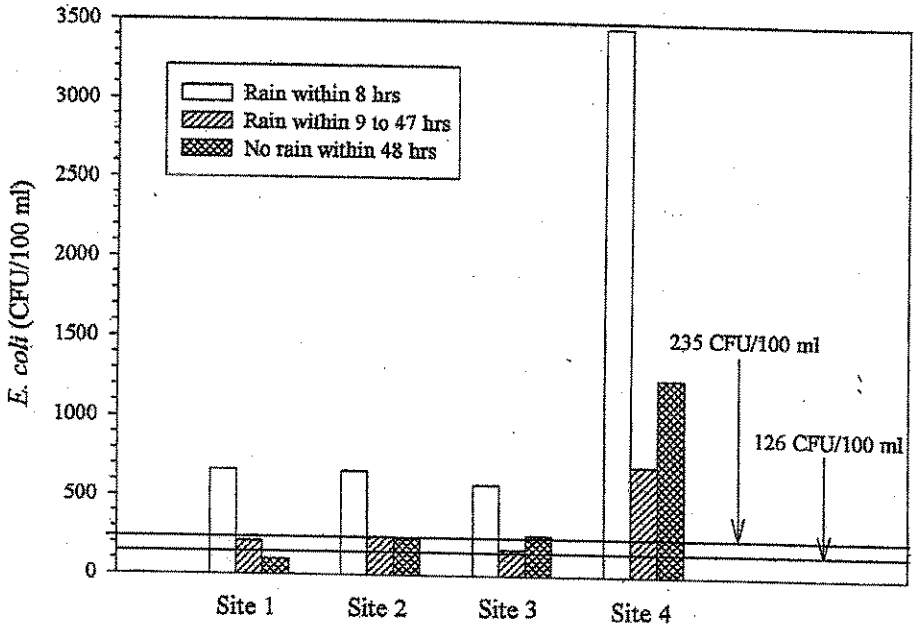


Figure C: Comparison of geometric means of *E. coli* levels at the South Shore Beach shoreline sampling sites (n=155 total samples). Sites 1 to 3 are located in the swimming beach area and site 4 is a bird roost site adjacent to beach area (see Figure A). USEPA single-day water quality limit criterion is 235 CFU/100 ml; five-day geometric mean water quality limit criterion is 126 CFU/100 ml.

Stormwater runoff negatively impacts South Shore Beach water quality. Rainfall events preceded as much as 10-fold increases in shoreline bacterial counts at all sampling sites. The greatest increase in *E. coli* bacteria levels after rain events occurred at sites adjacent to the paved areas. Stormwater runoff sampled directly from the South Shore Beach parking lot was found to have more than 100,000 *E. coli*/100 ml, demonstrating that localized runoff from impervious surfaces may have a major detrimental impact on South Shore Beach water quality. The levels of *E. coli* found in stormwater runoff at South Shore Beach are similar to the levels of fecal bacteria found in urban stormwater from other areas reported by the Wisconsin DNR.

During combined sewer overflow (CSO) events, the Russell Avenue outfall, located approximately 0.4 miles north of the South Shore Beach and within the marina breakwall, may add to the already high bacteria levels found at South Shore Beach. The effect of a CSO event on South Shore Beach water quality may be difficult to recognize since persistent, elevated levels in the beach area may mask the incidence of *E. coli* originating from the outfall. While the beach area may be exposed to contamination from sewage outfalls and stormwater only for a limited number of days, these events may warrant the most consideration for health risk.

IDENTIFYING SOURCES OF BACTERIAL CONTAMINATION

To reliably identify the host origins of *E. coli* using DNA-based methods, an adequate diversity and number of strains must be included in a database to provide a true representation of the overall *E. coli* population, against which unknown strains can be compared. This requires the construction of a database of *E. coli* strains from known sources, and the level of confidence with which *E. coli* in the environment can be classified depends on the quality of the database. We isolated *E. coli* bacteria strains from two host sources that may potentially contaminate South Shore Beach (gulls and sewage), totaling 150 human *E. coli* strains (obtained from Jones Island sewage influent) and 100 gull *E. coli* strains (obtained from South Shore gull droppings). Cluster analysis of the DNA fingerprint patterns did not demonstrate two exclusive groups of isolates from each host, but rather several host-specific subgroups, which indicates that additional coverage of the *E. coli* population may be necessary to determine the overall relationships among isolates. The average rate of correct classification was 79% for sewage and gull isolates as determined by Jackknife analysis using maximum similarity.

DNA fingerprinting proved useful for investigating sources from defined hosts in a localized area, such as non-migratory wildlife at a specific location or agricultural animals within a watershed that share the same pool of *E. coli* strains. Approximately 110 *E. coli* isolated from South Shore Beach water in 2000 were analyzed by fingerprinting methods and the resulting genetic profiles compared with the database of the known *E. coli* sources. Almost one third of these isolates were found to be fecal coliforms other than *E. coli*, and many of these demonstrated that they were identical genetically (e.g. clonal, or derived from a common parent cell) suggesting that replication in the environment had occurred. Of the remaining isolates, approximately half matched with database strains at a similarity of greater than 80%, which was the threshold value where database isolates formed host-specific groups. The majority of these South Shore Beach water isolates were identified as originating from gulls. The isolates that did not match the database strains at the 80% level remained unclassified. Expansion of the sewage, gull, and cow *E. coli* strain database to include additional strains from these groups, as well as strains from other suspected host sources of contamination, will improve the number of environmental isolates that can be reliably classified.

Detection of clonal populations of fecal coliforms (*Klebsiella, Citrobacter,* and *Enterobacter* spp.) in almost one third of the isolates analyzed indicates that *E. coli* is a better indicator of fecal pollution than the fecal coliforms (FC), which may replicate in the environment and falsely elevate bacterial indicator levels. While *E. coli* replication in the environment was not detected in this study, evidence for fecal coliform replication at South Shore beach puts into question the fate of *E. coli* introduced into temperate zone fresh waters and warrants further study.

Our findings demonstrate that widespread impacts (e.g. fecal contamination delivered from the outfalls, rivers, or harbor) cannot be detected at South Shore Beach by measuring *E. coli* levels alone, since persistent, elevated levels in the beach area mask any contamination entering from outside of the marina. The lack of correlation between *E. coli* contamination seen in river and harbor surveys and at South Shore Beach suggests that the same physical characteristics that

magnify water quality problems from local impacts at South Shore may protect that area from regional contamination events. Specifically, the marina breakwall that surrounds South Shore Beach may limit water exchange with the greater harbor area. Low lake levels, resulting in shallow water within the marina also may contribute to limited water circulation.

IMPACTS ON LAKE MICHIGAN

Although stormwater discharge from the rivers did not appear to be delivered to South Shore Beach in significant amounts, increases in *E. coli* levels in the rivers following rainfall indicate there is a serious impact on water quality in the nearshore areas of Lake Michigan that receive river discharge. Two Milwaukee beaches located in close proximity to the harbor are open water beaches and, in contrast to South Shore Beach, are closed far fewer days for bacterial pollution. These beaches, however, are susceptible to contamination from river discharge following large storm events. The number of closings at a beach may be less important than the cause of the closings, because even a single beach closing resulting from a relatively-infrequent widespread contamination event, like a CSO or from urban stormwater, constitutes a pollution problem of large magnitude and of serious concern for human health.

The impact of contamination in urban stormwater on the nearshore environment, including other beaches in the area, is unknown. The fate of contamination from sanitary and combined sewer overflows released into the rivers that enter Lake Michigan is also unknown. Information other than *E. coli* levels may be necessary to track sewage overflows in the Milwaukee River basin and harbor since sewage overflows generally occur during major storm events when large amounts of contaminants are simultaneously introduced from urban stormwater runoff. A useful approach to better estimate the distribution and fate of bacterial contamination would include 1) modeling currents and particle transport to predict where contaminated water will flow and 2) determine the survival times of indicator organisms and co-occurring pathogens in the environment. When coupled with molecular analyses, such studies will provide direct evidence describing the fate of fecal contamination. Alternative indicators such as quantifying human pathogens directly may provide another approach to assess the potential health risk associated with CSOs.

MANAGEMENT

At South Shore Beach, management practices can provide effective tools in addressing localized problems. Significant gains may be made by reconfiguring the parking lot drainage at South Shore marina to prevent stormwater from entering the water adjacent to the swimming beach. Reducing the availability of food and roosting sites may deter gulls and waterfowl. To address broader issues regarding the potential for offshore contamination from the Milwaukee Rivers and stormwater outfalls to reach beach areas, future studies should focus specifically on characterizing upstream source areas in addition to local phenomena.

Figure D: South Shore Beach Parking Lot The parking lot extends to the waters edge, resulting in runoff that drains to marina waters.

Figure E: South Shore Boat Launch The configuration of the boat launch allows stormwater runoff to reach the water.

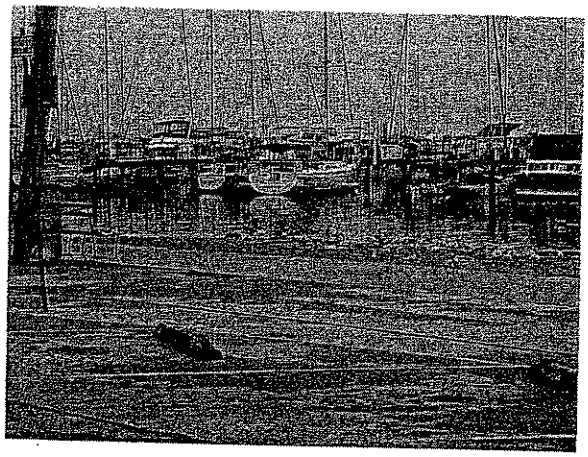


Figure F: South Shore Marina This is a view of Site 4, a known roosting site for waterfowl. The presence of open trashcans provides a food source for birds.

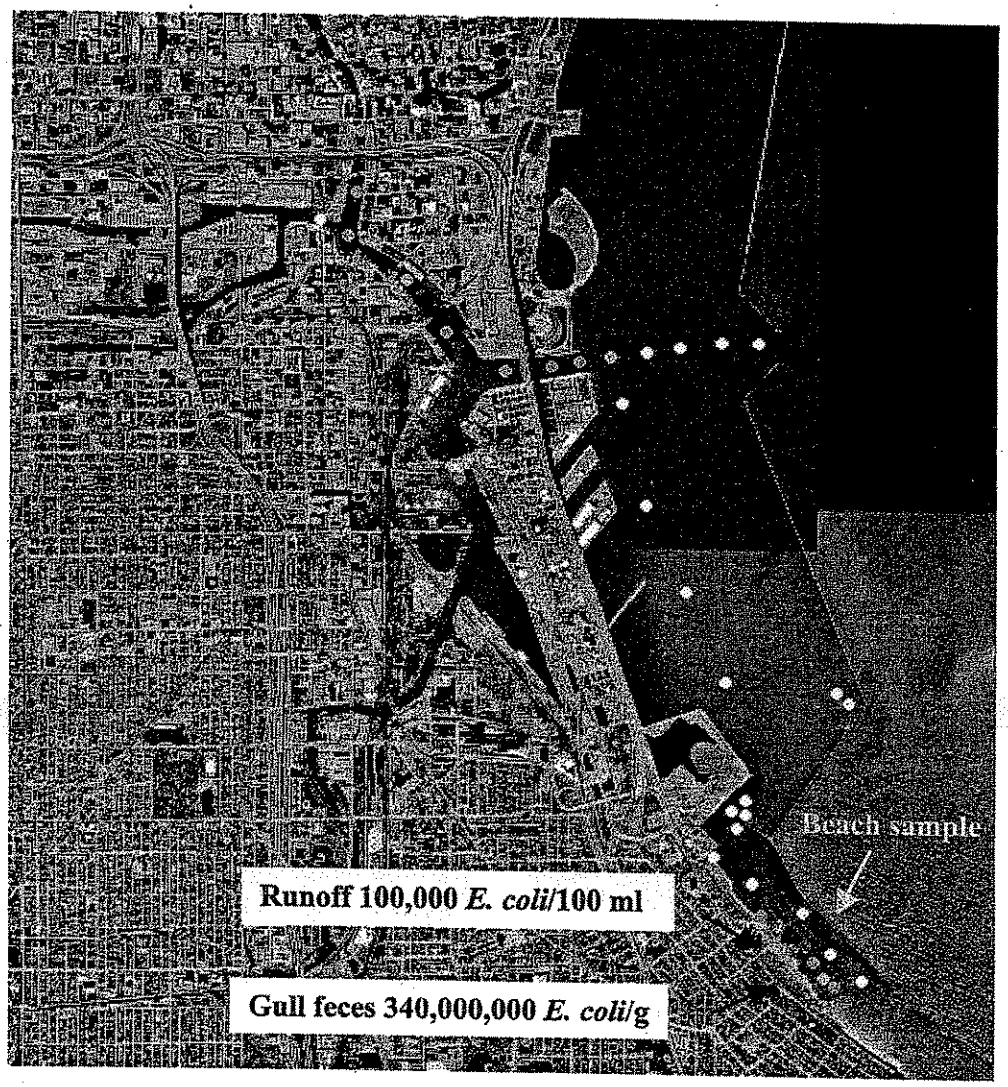


Figure G: Beach water quality is sensitive to local contamination sources due to the close proximity of such inputs. Stormwater runoff levels of *E. coli* have been measured at 100,000 CFU/100 ml. In addition, gull are a significant source of *E. coli* when they are present in beach areas; gull feces have been found to contain an average of 340,000,000
E. coli/g of feces.

Progress Report for Water-Borne Microbe Related Studies and Activities

A Report by the Southeast Wisconsin Beach Task Force

Research Subcommittee

January, 2002

Summary

The ***Southeast Wisconsin Beach Task Force*** was formed in late 2000 to investigate the causes of Lake Michigan beach closures, and to recommend possible improvements to ensure the health of the region's beaches. This is a report of the ***research subcommittee***, which was charged with the following three goals:

1) Identify the sources and amounts of indicator organisms and certain pathogens: tributaries, urban runoff, combined sewer overflows, birds, urban wildlife.

2) Understand "confounding factors" that limit our understanding: regrowth of indicator organisms in sand, for example.

3) Ultimately answer the key question: what is the relationship between indicator organisms and human illness?

Members of the research subcommittee have almost a dozen studies under way in the Milwaukee and Racine Areas. Each of these studies is designed to add a piece to the complex puzzle of beach water quality.

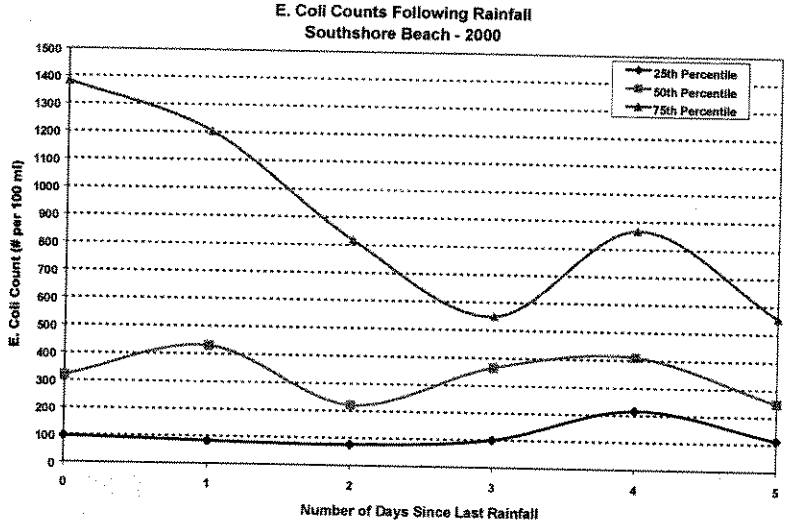
In this report we present preliminary findings of the numerous studies being conducted by the members of the Southeast Wisconsin Beach Task Force. In addition, we have generated some possible solutions to area beach closings, particularly at Milwaukee's South Shore Beach, based on these preliminary results.

What have we learned (so far)?

1) We are not alone.

The Southeast Wisconsin Beach Task Force has been comparing notes with scientists from Indiana, Michigan, Ohio, Florida, Hawaii, and even England. It is clear that the problems we are experiencing in Milwaukee are not unique.

> ***"...it is exceptionally difficult to maintain beneficial uses of water in the face of even low levels of watershed development, given the almost automatic violation of bacterial water quality standards during wet and dry weather. Thus, if a watershed manager has a beach...to protect, they can expect that even a modest amount of watershed development is likely to restrict or eliminate that use."*** - *Watershed Protection Techniques. 3(1): 554-565*

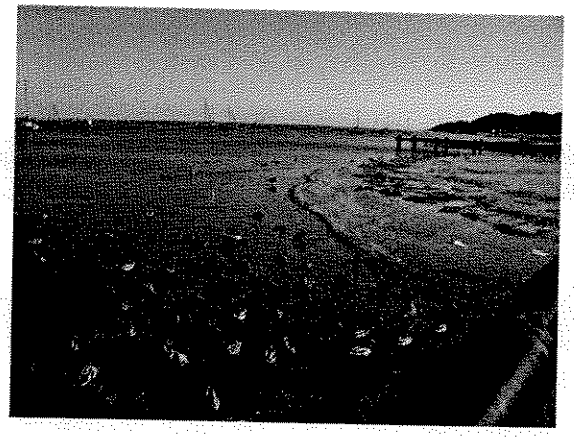


There is no single source of pollution leading to beach closings.

Preliminary results of research shows that frequent poor water quality at South Shore Beach appears to be a local phenomenon and not a reflection of overall water quality in Lake Michigan.

Dr. Sandy McLellan and her associates mapped the distribution of contamination in six river surveys following rain events *without* combined sewer overflows (CSO), and rain events *with* CSO events. Dr. McClellan's team found elevated levels of *E. coli* in the tributaries and the harbor during rain events *regardless* of whether combined sewer overflows had occurred. The contamination was contained within the plume of river water entering the harbor and Lake Michigan through the main harbor gap. Elevated levels of *E. coli* were traced southward toward the gap during certain wind conditions.

Dr. McLellan found high *E. coli* levels within the South Shore Beach breakwall that were significantly higher than at the south end of the outer harbor. These results suggest that South Shore Beach is often affected by local sources of bacteria unrelated to levels in river water or the occasional combined sewer overflow event.



Some local sources of bacteria affecting South Shore Beach water quality include a waterfowl roosting area just north of the beach, stormwater runoff from the parking lot and boat ramp, and possible in-place bacteria colonies multiplying and seeding the water. Information about these sources will be presented in detail throughout the progress report.

What can be done to keep South Shore Beach open?

This is a preliminary report. We don't have definitive answers regarding why the beach is closed as often as it is, whether bacterial contamination is primarily caused by gulls or by people, and how much of a health risk such contamination presents to beach goers.

Yet, in many respects, it doesn't matter whether we have all the answers. At least one researcher has suggested that our current system of managing beaches by monitoring microbial indicators is so flawed that it might be best to abandon it entirely. Instead of focusing so much energy on microbial monitoring, Gareth Rees suggests that we would be better off inventorying and addressing known sources of pathogens (see below).

> ***"...the investment of huge sums of money based on compliance with flawed microbiological standards is entirely inappropriate. Instead a holistic approach based on the assessment of all factors likely to promote risk to recreators is proposed. Such a beach registration scheme would remove the necessity to comply with fundamentally flawed and meaningless numerical standards."*** *– Gareth Rees, "Recreational Waters and Health – Swimming Against the Tide," The Environmentalist 19, 35–38 (1999)*

We don't need to have all the answers from all the studies before using common sense to recommend the actions below to address the South Shore Beach issues.

1) Move or eliminate waterfowl.

Hundreds of gulls and ducks roost only a hundred yards north of the main swimming beach at South Shore Park. The preliminary results of several studies suggest that gulls may be responsible for some of the localized high levels of *E. coli* indicator organisms. We won't know for sure until more testing is complete.

We *do* know that birds in general are carriers of several organisms that can cause disease in people. Salmonella is one such example. Swimming in waters shared by high densities of birds is definitely *not* a good public health practice.

2) Reduce direct stormwater flows to the lake.

The parking area adjacent to South Shore Beach collects gull, duck and dog feces, garbage, and other undesirable material. All of this runs into the water just north of the South Shore Beach swimming area during rainstorms. Structural methods to keep the stormwater from running off directly to the lake can be implemented.

3) Improve water circulation in the beach area.

The current breakwall configuration at South Shore Beach does not allow Lake Michigan water to exchange freely with beach water. Some structural changes to the breakwall could still provide protection from erosion while allowing for better exchange of beach and offshore water. Bradford Beach on the north side of the City of Milwaukee has free exchange of offshore water with the beach. This beach does not have nearly as many bacterial problems as South Shore Beach.

Research Progress Report

The following sections present the preliminary findings of the research conducted by several members of the Southeast Wisconsin Beach Task Force Research Committee. Because some of the studies are rather detailed, some information is cross-referenced by page number to the appendices that follow this report.

What are the water-borne pathogens of concern? Where are they coming from? How widespread are they? What is the best way to test for them? Will exposure to them make me sick? The question and answer format of this report is designed to give the reader appreciation of the complexity of the problems and the interconnectedness between the many factors responsible for the occurrence and origins of pathogens in the environment.

What is a pathogen? How is this different than a microbe?

A ***pathogen*** is a microbe capable of causing disease. The term pathogen is usually restricted to living microbes, which include viruses, rickettsia, bacteria, fungi, yeasts, protozoa, helminths and certain insect larval stages.

The term ***microbe*** refers to *any* microscopic organism regardless of its ability to infect a host organism and cause disease. Microbes are naturally present in the environment and perform many important functions that are actually beneficial to humans. Bacteria present in the respiratory and digestive tracts of healthy humans provide some of our best defenses against disease by competing with pathogenic organisms.

What is an indicator organism?

There are hundreds of disease-causing organisms that have been associated with human disease. However, it is very difficult to detect individual disease-causing organisms, especially viral and protozoan pathogens, in water samples obtained from bathing beaches. Methods for detecting and identifying infectious viruses or parasites are either very difficult to perform or do not exist at all. Bacterial pathogens can be detected, but their fastidious nutritional requirements and susceptibility to environmental stresses also can make the task very difficult (World Health Organization, 1999).

Rather than monitor for several hundred disease-causing organisms, an ***indicator organism*** is usually monitored. An indicator organism doesn't usually cause disease, but rather indicates conditions in which we expect to find associated disease-causing organisms.

What are the main water-borne pathogens and microbes being studied?

Over twenty common enteric (gut) pathogens can be present in fecal contamination. Testing for all the possible disease causing agents is prohibitively expensive so scientists have devised tests for indicator organisms. Total coliform, fecal coliform and Enterococci are names for broad groups of bacteria found in the digestive tracts of warm-blooded animals. These organisms are good indicators of fecal contamination because they are normally present in high numbers in all animals and humans, are easy to test for, and do not survive indefinitely outside the host organism. Pathogens that may occur in feces are often low in numbers compared with the levels of indicator organisms, which makes using indicator organisms more sensitive.

Total coliform is the least sensitive of all the indicator tests because these organisms can occur in nature in the absence of fecal contamination. Tests for total coliform are still used because it has been collected the longest (since the 1920s). *E. coli* is much better at predicting fecal contamination in fresh water since it correlates better with known fecal contamination than total coliforms or fecal coliforms.

These organisms are sometimes associated with pathogens, but water samples showing positive results for the indicator organisms do not necessarily mean the water contains any specific pathogens. More precise and costly tests need to be done to further isolate specific pathogens from water samples.

The most common pathogens found in fresh water include Cryptosporidium, *Giardia* and *Salmonella.* A pathogenic form of *E. coli* (*E. coli* 0157:H7) can be found in water, but is rarely detected.

It's very important to note that not all *E. coli* are created equal. The pathogenic *E. coli* 0157:H7 strain is just one of many forms of *E. coli.* This strain produces a toxin that is harmful to humans, unlike the more common forms of *E. coli* that are found in the digestive tracts of warm-blooded animals, and actually aid in the digestive process. Cattle are the main reservoir for *E. coli* 0157:H7, and are not sensitive to the toxin produced so it is difficult to know which cattle may be harboring this particular strain of bacteria. Manure runoff is the main way *E. coli* 0157:H7 enters rivers and streams, but since not all cattle harbor this specific strain of *E. coli,* and manure runoff from farms is not a common occurrence, the prevalence of *E. coli* 0157:H7 in surface water is somewhat rare.

E. coli 0157:H7 is distinguished from other *E. coli* strains by its lack of tolerance to higher temperatures. Since most *E. coli* can grow at temperatures of about 103-108 degrees F (5-10 degrees higher than human body temperatures) this is an important characteristic used to identify *E. coli.* Due to the nature of *E. coli* testing and analysis, the pathogenic form is not counted with general E. coli counting methods. A more specialized test specifically for *E. coli* 0157:H7 must be conducted to confirm the presence of this organism.

Where are these pathogens and microbes coming from? Is there a pattern?

There are many possible sources of pathogens and other microbes. The difficulty is distinguishing between all the different potential sources. The Wisconsin Department of Natural Resources along with the United States Geological Survey and the University of Wisconsin-Milwaukee Great Lakes WATER Institute is working on a grant provided by the U.S. EPA. The title of the project is *Occurrence and Origins of Pathogens in Wisconsin's Urban Streams.* Also known as the tributary pathogen study, this project has the following four objectives:

1. Conduct a survey of urban streams and rivers to examine the associations between pathogens, land uses, upstream discharges and common inorganic water quality parameters (WDNR)

2. Identify source(s) of pathogens using genetic strain typing, also known as genetic fingerprinting (WATER Institute)

3. Determine total storm pathogen loading at two river sites using an automated sampling station (WDNR and USGS)

4. Explore regional variability by examining two urban sites in a different geographic region of the state (WDNR).

The progress meeting each objective is briefly presented below. Please see the full progress report in Appendix A for more detailed information.

Objective 1. Conduct Survey

Five rounds of sampling were completed at each of 12 sites since April 2001. Four of the sampling rounds were taken during rain events, while one was taken during base-flow conditions. None of the rain events were associated with combined sewer or sanitary sewer overflow events. A summary of the results collected to date by station is presented in Table 1 in Appendix A.

The common indicator organisms (total coliform, fecal coliform and Enterococci) were found in all samples regardless of time and location. Similarly, *E. coli* was found in all but two samples. Counts generally followed the order of total coliform ≥ Enterococci >fecal coliform ≅ *E. coli.* These organisms were found at concentrations one to two orders of magnitude less during base flow than during high flow events. The viral indicator, male specific coliphage, was found in approximately 80 percent of the samples and at concentrations far less than the other indicator organisms.

The three specific pathogens, *Cryptosporidium, Giardia and Salmonella* were isolated in roughly half of the samples collected. Though only two rounds of samples were examined for *Cryptosporidium* and *Giardia,* the order of frequency of occurrence appears to follow *Cryptosporidium* ≥ *Giardia* > *Salmonella.* No *E. coli 0157:H7* was found in any of the samples collected.

Objective 2. Identify Sources

E. coli were isolated from water samples collected at the USGS stations for the four rain events. DNA fingerprinting of isolates from the August and October rain events are in progress at the WATER Institute and will be presented in the October, 2002 final report.

Objective 3. Determine Storm Pathogen Loading

The automated sites were installed in spring, 2001. After some early equipment problems, both sites seem to be functioning properly. Concentrations of indicator organisms and pathogens are in the same range as the other sites. Real-time flows and river conditions for the two automated sites can be accessed through the USGS web site at http://wi.waterdata.usgs.gov.

Objective 4. Determine Regional Variability

Samples were not collected to meet this objective in 2001 because of support staff cuts in the WDNR Superior office this fiscal year. Options for next year are still being explored.

Where are the microbes found in the rivers and beaches coming from? Why are the beaches closed so often?

The ***indicator organism*** *E. coli* has been detected on Lake Michigan's beaches at levels that exceed U.S. EPA's beach guidelines (235 colony forming units (CFU) per 100 milliliters of water). South Shore Beach in Milwaukee was closed a record 42 days of the swimming season in 2000 and 32 days in 2001. The sources of the bacteria remain elusive since data from extensive monitoring programs in the last two years do not demonstrate a correlation between elevated *E. coli* counts and rainfall or known contamination events. Current methods for monitoring *E. coli* in surface waters are only able to enumerate the bacteria which can come from any warm-blooded animal. The different *E. coli* strains from different host species, whether they are from humans, birds or farm animals are not detectable using the classic methods employed for monitoring water quality in rivers and swimming beaches. Only recently have molecular based methods been developed to differentiate distinct strains of *E. coli* and determine the host species (human, bird, or farm animal).

Is there a better way to know if the beaches are safe for swimming?

Possibly. Current methods to detect indicator bacteria and make beach closure decisions rely on water samples collected the previous day. So for a sample collected on Monday, the *E. coli* concentration is not known until early the next day. Beach closure or advisory decisions are therefore sometimes made several hours after the health threat has passed. Models based on water quality and weather conditions can be reliable at predicting *E. coli* concentrations in water at swimming beaches if calibrated using comprehensive data.

Dr. Greg Olyphant (Indiana University) and the City of Milwaukee Health Department are in the process of developing predictive models for South Shore and Bradford Beaches. Reasonably accurate models have been developed for both beaches using a limited set of predictive variables including wind, water temperature, rainfall, turbidity and CSO volumes. The current model successfully predicts whether *E. coli* concentrations at South Shore Beach will be above or below the EPA threshold of 235 cfu/100 ml 73 percent of the time. This is pretty good, but better and more reliable models can be developed using real-time meteorological and water quality data. *Please see Appendix C, project 4 for more detailed information.*

So E. coli is sometimes found at elevated levels in the rivers and at beaches. Does this mean I can get sick from E. coli if I swim at a beach with elevated levels?

Not necessarily. It is important to keep in mind that *E. coli* is an ***indicator organism***. *E. coli* can be associated with pathogens such as *Salmonella*, *Giardia*, and *Cryptosporidium* that are known to cause digestive problems in humans. However, just because *E. coli* is detected, this does not mean that the actual pathogens are present and you're guaranteed to get sick. The U.S. EPA set the beach water quality target of 235 CFU/100 ml of water sample based on human health studies that demonstrate an association between swimming related digestive problems and elevated levels of *E. coli*.

Can the microbes found in the rivers get to the swimming beaches?

The researchers don't really know how much of the contamination that is detected in the rivers gets to beaches. Dr. McLellan and associates did some sampling during the summer, 2001 at South Shore Beach, tributaries and the Milwaukee Harbor to try to shed some light on this. The frequent poor water quality of South Shore Beach appears to be a local phenomenon and not a reflection of overall water quality in Lake Michigan.

Dr. McLellan and her associates came to this conclusion by mapping the distribution of contamination in six river surveys (40-50 sites per survey) during base flow, following rain events without combined sewer overflows (CSO), and rain events with CSO events. They found elevated levels of *E. coli* in the tributaries and the harbor during rain events without CSO and with CSO events. The contamination was contained within the plume of river water entering the harbor and Lake Michigan through the main harbor gap. Elevated levels of *E. coli* were traced southward toward the gap during certain wind conditions.

The elevated *E. coli* levels are limited to the southern area within the South Shore Beach breakwall and are significantly higher than what were detected at the south end of the outer harbor.

What the researchers have found is that there are elevated levels of *E. coli* in the rivers and at South Shore Beach. They do not know if there is a connection.

Are the microbes found from humans or animals? Can we tell the difference?

Some new research is being conducted in the Milwaukee area to help answer these questions. The research is using *E. coli,* the common indicator organism. Studies by Dr. Sandra McLellan from the UW-Milwaukee WATER Institute are currently underway to: 1) build a genetic library of *E. coli* strains from known sources (derived from human sewage, birds and farm animals) 2) compare *E. coli* isolated from water samples (unknown sources) with the genetic library. Because this is a relatively new area of research, the specific methods and applicability of the techniques must be determined. For detailed information please see Appendix B (page ??).

Objective 1. Building a genetic library of E. coli strains

Dr. McLellan and her associates at the WATER Institute are currently determining the appropriate molecular technique to classify *E. coli* from environmental water samples according to the host species from which they are derived. The overall hypothesis is that *E. coli* from a particular host are genetically related and can be distinguished from *E. coli* from different host groups by DNA fingerprinting. Because this is a relatively new area of scientific research, molecular typing of *E. coli* is very time and labor intensive.

Over 500 *E. coli* strains have been isolated from humans (through sewage influent), gull droppings and cattle feedlot detention systems. While building the genetic library, it is important to make sure the bacteria isolated are actually *E. coli.* Dr. McLellan's laboratory has streamlined the isolation process with a 99 percent rate of correct *E. coli* identification.

Objective 2. Comparing E. coli isolated from unknown sources to genetic library

About 100 *E. coli* isolates obtained by Dr. McLellan's laboratory from five sampling days were compared to the genetic library. Ninety percent of the isolates from three of the days (65 isolates) matched most closely to gulls. The sources of the remainder of the isolates could not be determined with at least 80 percent certainty. The preliminary analysis of environmental isolates (unknowns) demonstrates that extensive coverage of the *E. coli* population is necessary to classify strains that are not very similar to strains in the database. This is expected given the diversity of *E. coli* in the natural population. Dr. McLellan expects that additional work with building the genetic library will allow for more reliable classification of most of the isolates. Given the high similarity scores of the environmental isolates to gulls, it is unlikely that they are misclassified. However, the number of strains that were available for each sample day were not adequate to determine relative contributions of different sources (gulls vs human vs other unclassified). *For more information on this work, please see Appendix B, page ?.*

In a separate study, Dr. McLellan and associates are analyzing *E. coli* isolates from raw sewage obtained from the City of Racine Wastewater Treatment Facility, and from gull droppings collected in Racine. The City of Racine Health Department forwarded over 1000 *E. coli* isolates collected from sand, sediment and water to compare to the isolate database under construction at the WATER Institute. Characteristic patterns from the isolates will be compared to the patterns obtained from the sewage samples to look for percent probabilities that they came from the same source. Large amounts of clustering around certain DNA patterns will indicate a greater probability that the *E. coli* isolated from sand, sediment or water either came from humans (sewage) other sources such as gulls.

Are E. coli living in the sand of the beaches and seeding the water?

Possibly.

To answer this question City of Racine Health Department collected daily samples of sand (within one meter of the waters's edge) and sediment (sand under the water) from four sites at North Beach in the City of Racine. Routine water samples were also collected. Preliminary examination of the raw data shows that the density of *E. coli* was greater in the sand than either the sediment or water. Since there is a positive relationship between wave height and numbers of *E. coli* recovered from the water, it appears that the *E. coli* populations in the sand are contributing to the concentrations of *E. Coli* in the water. Statistical analysis of the raw data will be completed early this year (2002). For more information about this study, please contact Julie Kinzelman or Bob Bagley at the City of Racine Health Department.

Does tilling the beach affect E. coli counts?

Yes.

E. coli are sensitive to the effects of sunlight (ultraviolet radiation). Given this, is it better to till the sand to expose *E. coli* to sunlight, or leave it alone? For two weeks in August 2001, the City of Racine Health Department sampled a test plot of beach sand with different treatments: hand tilling at depths greater than those achieved with a mechanical groomer and no tilling. These treatments were compared to a section of the beach that was maintained by a mechanical beach groomer, the current method of maintaining the beach. The results of this experiment were surprising.

The treatment areas (hand tilling and no tilling) yielded lower densities of *E. coli* when compared to the control (mechanically groomed area). The results were especially striking after a significant rainfall. The researchers were not able to determine whether is phenomenon occurs as a result of increasing more sand surface area to the sun, or because of the sand drying out, but further investigation is needed. If the results are duplicated this could have implications for current beach management practices.

What is the relationship between indicator organisms and human illness?

No one knows for sure. The expensive human health (epidemiological) studies have not been conducted. The City of Racine is a candidate for participation in a new U.S. EPA pilot epidemiological study which will be conducted during 2002. This study would be a direct attempt to more clearly characterize the relationships, if any, between *E. coli* (or other appropriate indicators) and human illness.

Where do we go from here?

A lot of work is underway to understand the issues surrounding Lake Michigan beach water quality problems, but we don't have all the answers. This should not keep us from moving forward to implement some initiatives now while we're on the way to better understanding the mechanisms at work.

Specifically:

1. Continue to verify the predictive water quality models in development by the City of Milwaukee and Dr. Greg Olyphant (Indiana University). Dr. Olyphant developed reasonably accurate equations for predicting *E. coli* concentrations at South Shore and Bradford Beaches (73% accuracy for South

Shore Beach). These models can be made more reliable by deploying instruments to measure meteorological and water quality characteristics in real-time. Predictive models will also allow health agencies to alert the public about possible health threats on a more timely basis rather than relying on microbiological data collected on the previous day.

2. Move or eliminate waterfowl.

   Hundreds of gulls and ducks roost only a hundred yards north of the main swimming beach at South Shore Park. The preliminary results of several studies suggest that gulls may be responsible for some of the localized high levels of *E. coli* indicator organisms. We won't know for sure until more testing is complete.

   We *do* know that birds in general are carriers of several organisms that can cause disease in people. Salmonella is one such example. Swimming in waters shared by high densities of birds is definitely *not* a good public health practice.

3. Reduce direct stormwater flows to the lake.

   The parking area adjacent to South Shore Beach collects gull, duck and dog feces, garbage, and other undesirable material. All of this runs into the water just north of the South Shore Beach swimming area during rainstorms. Structural methods to keep the stormwater from running off directly to the lake can be implemented.

4. Improve water circulation in the beach area.

   The current breakwall configuration at South Shore Beach does not allow Lake Michigan water to exchange freely with beach water. Some structural changes to the breakwall could still provide protection from erosion while allowing for better exchange of beach and offshore water. Bradford Beach on the north side of the City of Milwaukee has free exchange of offshore water with the beach. This beach does not have nearly as many bacterial problems as South Shore Beach.