

**Michigan Department of Environmental Quality
Water Bureau
July 2006**

**Total Maximum Daily Load for *E. coli* for
East Pond Creek
Macomb County**

INTRODUCTION

Section 303(d) of the federal Clean Water Act and the United States Environmental Protection Agency's (USEPA's) Water Quality Planning and Management Regulations (Title 40 of the Code of Federal Regulations [CFR], Part 130) require states to develop Total Maximum Daily Loads (TMDLs) for water bodies that are not meeting water quality standards (WQS). The TMDL process establishes the allowable loadings of pollutants for a water body based on the relationship between pollution sources and in-stream water quality conditions. TMDLs provide states a basis for determining the pollutant reductions necessary from both point and nonpoint sources to restore and maintain the quality of their water resources. The purpose of this TMDL is to identify the allowable levels of *E. coli* that will result in the attainment of the applicable WQS in East Pond Creek, tributary of the North Branch Clinton River, located in Macomb County, Michigan.

PROBLEM STATEMENT

This water body was placed on the Section 303(d) list in 2002. The TMDL reach for East Pond Creek appears on the 2006 Section 303(d) list as:

EAST POND CREEK

County: Macomb

Location: N. Br. Clinton River confluence u/s to East Mill Lake outlet, NW of Romeo.

NHD Reach Code: 04090003000028

Problem: Untreated sewage discharge, pathogens (Rule 100).

TMDL YEAR(s): 2006

WBID#: 061408G

Size: 8 M

East Pond Creek was placed on the Section 303(d) list due to impairment of recreational uses as indicated by the presence of elevated levels of *E. coli* (Edly and Wuycheck, 2006, in draft). Monitoring data collected by the Michigan Department of Environmental Quality (MDEQ) in 2004 documented exceedances of the daily maximum WQS for *E. coli* at three of four sampling locations and of the 30-day geometric mean WQS at two of four sampling locations during the total body contact recreational season of May 1 through October 31 (Figures 2 and 3, respectively, and Table 1).

NUMERIC TARGET

The impaired designated use addressed by this TMDL is total body contact recreation. The designated use rule (R 323.1100 of the Part 4 rules, WQS, promulgated under Part 31, Water Resources Protection, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended) requires that this water body be protected for total body contact recreation from May 1 to October 31. The target levels for this designated use are the ambient *E. coli* standards established in Rule 62 of the WQS as follows:

R 323.1062 Microorganisms.

Rule 62. (1) All surface waters of the state protected for total body contact recreation shall not contain more than 130 Escherichia coli (E. coli) per 100 milliliters, as a 30-day geometric mean. Compliance shall be based on the geometric mean of all individual samples taken during 5 or more sampling events representatively spread over a 30-day period. Each sampling event shall consist of 3 or more samples taken at representative locations within a defined sampling area. At no time shall the surface waters of the state protected for total body contact recreation contain more than a maximum of 300 E. coli per 100 milliliters. Compliance shall be based on the geometric mean of 3 or more samples taken during the same sampling event at representative locations within a defined sampling area.

The WQS of 130 *E. coli* per 100 milliliters (ml) as a 30-day geometric mean and 300 *E. coli* per 100 ml as a daily geometric mean are the target levels for this TMDL reach from May 1 to October 31. The 2004 monitoring data indicated exceedances of WQS at three of four locations sampled.

DATA DISCUSSION

East Pond Creek was sampled at four locations in the vicinity of Romeo to address this TMDL listing (Figure 1). This water body exceeded the 30-day geometric mean WQS at two stations sampled (Figure 3 and Table 1). Thirty-day geometric mean *E. coli* concentrations in East Pond Creek ranged from 21 *E. coli* per 100 ml in June at Gates and McVicar Roads (EPC1 and EPC3) to 181 *E. coli* per 100 ml in July at Powell Road (EPC4) (Figure 3 and Table 1). The daily geometric mean was exceeded at three of the four sampling locations on East Pond Creek (Figure 2 and Table 1). Daily geometric mean concentrations ranged from 20 *E. coli* per 100 ml on multiple dates at all 4 stations to 1,428 *E. coli* per 100 ml in July at Powell Road (EPC4). Concentrations greater than 300 *E. coli* per 100 ml were found on 3 occasions at the Powell Road (EPC4) station.

The Macomb County Health Department (MCHD) conducts weekly monitoring at two stations on East Pond Creek in the TMDL reach, at M-53 and at Powell Road. The MCHD data at these stations in 2004 and 2005 indicate that *E. coli* levels exceeded WQS on many sample occasions throughout the summer.

SOURCE ASSESSMENT

The listed reach for East Pond Creek is approximately eight miles, beginning at the North Branch Clinton River confluence upstream to the outlet of East Mill Lake. The TMDL watershed, primarily made up of Bruce and Washington Townships and the village of Romeo, is represented by the shaded area in Figure 1. Table 2 shows the distribution of land for each municipality.

The primary pathogen sources for East Pond Creek include agricultural inputs, failing septic systems, and urban runoff, which are common sources for developed and developing areas. Agriculture (including grassland/pastureland) accounts for approximately 50 percent of the land use in the TMDL watershed and can cause bacterial contamination in streams (Purdue University and USEPA, 2004). *E. coli* have been shown to enter water bodies from pastureland runoff and land applications of manure via field drainage systems, such as tiles. Field tiles provide for significant transport of enteric bacteria through tile drainage systems under all manure application protocols and environmental conditions (Jamieson et al., 2002). Overland runoff from land application of manure is another possible source of *E. coli* (Oliver et al., 2005).

Residential land use makes up 13 percent of the TMDL watershed (Purdue University and USEPA, 2004). Unpermitted urban runoff, wildlife inputs via overland runoff, direct deposition, and storm sewer systems are other possible sources of *E. coli*.

There are 19 National Pollutant Discharge Elimination System (NPDES) permitted discharges to East Pond Creek, or its tributaries, in the TMDL reach (Table 3 and Figure 1) including two individual permits, eight certificates of coverage (COCs) under two general permits, and nine notices of coverage under one permit-by-rule. Table 4 contains information on each of the general permits and the permits-by-rule.

The individual permits for the Romeo Wastewater Treatment Plant (WWTP) and the Armada Industrial Park authorize the discharge of treated human waste. Both facilities have limits for fecal coliform and when they are meeting their permit limits it is assumed the WQS for *E. coli* will be met in the discharges. The general permit discharges, including three Municipal Separate Storm Sewer System (MS4) COCs, are not considered to contain treated or untreated human sewage or animal waste; therefore, they are not deemed a significant source of *E. coli* to the East Pond Creek TMDL Watershed. The MS4 permittees are prohibited from discharges that may cause or contribute to a violation of WQS. The general storm water permitted discharges (permit no. MIS110000) require an evaluation of the potential for polluting materials to runoff to the receiving water, such as pollutants from areas where animals are known to congregate. If a source of *E. coli* is found, the permittee is required to address the pollutant in their Storm Water Pollution Prevention Plan. This information is used by the permittee to estimate the annual load of pollutants to the water body and identify the level of control necessary to comply with any established TMDL. The permits-by-rule involve earthwork in the TMDL watershed and are not considered a significant source of *E. coli*. There are no combined sewers or concentrated animal feeding operations in the East Pond Creek TMDL reach.

LINKAGE ANALYSIS

Determining the link between the *E. coli* concentrations in East Pond Creek and the potential sources is necessary to develop the TMDL. This link provides the basis for estimating the total assimilative capacity of the water body and any needed load reductions. For this TMDL, the loading of pathogens appears to enter East Pond Creek during all weather conditions (i.e., wet and dry weather events). Potential sources include agriculture, failing septic systems, and urban runoff. Agriculture runoff could include livestock storage facilities and feedlots, grazed pastures, direct surface runoff of agriculture fields, or underground runoff from subsurface drainage tiles (Jamieson et al., 2002).

To further investigate the potential sources mentioned above, a load duration curve analysis was developed for each sampling station, as outlined by Cleland (2002). A load duration curve is a relatively new method used in TMDL development and considers how flow conditions relate to a variety of pollutant sources (point and nonpoint sources).

The load duration curves for each station sampled on East Pond Creek are included in Appendix A. The flows for the TMDL watershed were estimated using the United States Geological Survey gauge on East Pond Creek in Romeo (Gauge Number 04164100). The data indicate that exceedances of the WQS are observed during both wet and dry weather events. Note that diamonds above the curve toward the left side of the figure are indicative of WQS exceedances during wet weather conditions (higher flows) and diamonds above the curve to the right side of the figure indicate WQS exceedances during dry weather conditions (lower flows). Two of the four stations located on East Pond Creek had *E. coli* exceedances under both wet and dry conditions (Figures A-2 and A-4). The exceedances found during low flow periods (Figures A-2, A-3, and A-4) may be due to failing septic systems upstream of Romeo and/or illicit connections in Romeo. Exceedances observed at station EPC-2 to the north of Romeo

and downstream at station EPC-4 are likely due to runoff from this urbanized area (Figures A-2, A-3, and A-4).

The guiding water quality management principle used to develop the TMDL was that compliance with the numeric pathogen target in East Pond Creek depends on the control of *E. coli* from wet and dry weather sources. If the *E. coli* inputs can be controlled to meet the numeric standards, then total body contact recreation in East Pond Creek will be restored and protected.

TMDL DEVELOPMENT

The TMDL represents the maximum loading that can be assimilated by the water body while still achieving WQS. As indicated in the Numeric Target section, the targets for this pathogen TMDL are the 30-day geometric mean WQS of 130 *E. coli* per 100 ml and daily geometric mean of 300 *E. coli* per 100 ml. Concurrent with the selection of a numeric concentration endpoint, TMDL development also defines the environmental conditions that will be used when defining allowable levels. Many TMDLs are designed around the concept of a “critical condition.” The “critical condition” is defined as the set of environmental conditions that, if controls are designed to protect, will ensure attainment of objectives for all other conditions. For example, the critical conditions for the control of point sources in Michigan are given in R 323.1082 (Mixing zones) and R 323.1090 (Applicability of water quality standards) of the WQS.

In general, the lowest monthly 95 percent exceedance flow for streams is used as a design condition for point source discharges. However, for pathogens in point source discharges of treated or untreated human sewage, levels are restricted to a monthly average limit of 200 fecal coliform per 100 ml regardless of stream flow. Therefore, the design stream flow is not a critical condition for determining the allowable loading of pathogen for WWTPs. In addition, sources of pathogens to East Pond Creek arise from a mixture of wet and dry weather-driven nonpoint sources, as demonstrated in the load duration curves (Appendix A). For these sources, there are a number of different allowable loads that will ensure compliance, as long as they are distributed properly throughout the watershed.

For most pollutants, TMDLs are expressed on a mass loading basis (e.g., pounds per day). For *E. coli*, however, mass is not an appropriate measure, and the USEPA allows pathogen TMDLs to be expressed in terms of organism counts (or resulting concentration) (USEPA, 2001). Therefore, this pathogen TMDL is concentration-based consistent with R 323.1062, and the TMDL is equal to the target concentration of 130 *E. coli* per 100 ml as a 30-day geometric mean and daily geometric mean of 300 *E. coli* per 100 ml in all portions of the TMDL reach for each month of the recreational season (May through October). Expressing the TMDL as a concentration equal to the WQS ensures that the WQS will be met under all flow and loading conditions; therefore, a critical condition is not applicable for this TMDL.

ALLOCATIONS

TMDLs are comprised of the sum of individual waste load allocations (WLAs) for point sources and load allocations (LAs) for nonpoint sources and natural background levels. In addition, the TMDL must include a margin of safety (MOS), either implicitly within the WLA or LA, or explicitly, that accounts for uncertainty in the relation between pollutant loads and the quality of the receiving water body. Conceptually, this definition is denoted by the equation:

$$\text{TMDL} = \sum \text{WLAs} + \sum \text{LAs} + \text{MOS}$$

The term TMDL represents the maximum loading that can be assimilated by the receiving water while still achieving WQS. This pathogen TMDL will not be expressed on a mass loading basis and is concentration-based consistent with USEPA regulations in 40 CFR, Section 130.2(i).

WLAs

Table 3 outlines the 19 permitted point source discharges to the listed reach of East Pond Creek. The discharges include two individual permits, eight COCs under two general permits, and nine notices of coverage under one permit-by-rule. Both individual permits are permitted to discharge treated human waste, although only Romeo WWTP is currently in operation. As previously stated, these two facilities have limits for fecal coliform and when these facilities are meeting their permit limits, it is assumed the WQS for *E. coli* will be met in the discharges. The permitted industrial storm water discharges are not considered significant sources of *E. coli* to East Pond Creek due to the Storm Water Pollution Prevention Plan required in these permits and the prohibition from discharging storm water that may cause or contribute to a violation of the WQS. The MS4 permittees are prohibited from discharging storm water that may cause or contribute to a violation of WQS as well. The MS4 permits for Bruce Township, Romeo, and Macomb County include requirements for an Illicit Discharge Elimination Plan (IDEP) and a Public Education Plan. Other voluntary activities include a Storm Water Pollution Prevention Initiative, a Public Participation Process, and a Watershed Management Plan. The permits-by-rule involve earthwork in the watershed and are not considered a significant source of *E. coli* to the TMDL watershed. The WLA for the above mentioned permits is equal to 130 *E. coli* per 100 ml as a 30-day average and 300 *E. coli* per 100 ml as a daily average during the recreational season between May 1 and October 31. Under future monitoring activities, if an illicit connection to East Pond Creek is discovered, the discharge would be eliminated and the WLA for it will be equal to zero.

LAs

Because this TMDL is concentration based, the LA is equal to 130 *E. coli* per 100 ml. This LA is based on the assumption that all land, regardless of use, will be required to meet the WQS. Therefore, the relative responsibility for achieving the necessary reductions of bacteria and maintaining acceptable conditions will be determined by the amount of land under the jurisdiction of the local unit of government in the watershed. This TMDL reach is located in five municipalities (Table 2). The municipalities making up the watershed are Bruce Township (66 percent), the village of Romeo (16 percent), Washington Township (15 percent), Ray Township (2 percent), and Armada Township (1 percent) (Table 2).

MOS

This section addresses the incorporation of an MOS in the TMDL analysis. The MOS accounts for any uncertainty or lack of knowledge concerning the relationship between pollutant loading and water quality, including the pollutant decay rate if applicable. The MOS can be either implicit (i.e., incorporated into the WLA or LA through conservative assumptions) or explicit (i.e., expressed in the TMDL as a portion of the loadings). This TMDL uses an implicit MOS because no rate of decay was used. Pathogen organisms ordinarily have a limited capability of surviving outside of their hosts and a rate of decay could be developed. However, applying a rate of decay could result in an allocation that would be greater than the WQS, thus no rate of decay is applied to provide for a greater protection of water quality. The MDEQ has determined that the use of the WQS of 130 *E. coli* per 100 ml for the WLA and LA is a more conservative approach than developing an explicit MOS and accounts for the uncertainty in the relationship between pollutant loading and water quality, based on available data and the assumption to not use a rate of decay. Applying the WQS to be met under all flow conditions also adds to the assurance that an explicit MOS is unnecessary.

SEASONALITY

Seasonality in the TMDL is addressed by expressing the TMDL in terms of a total body contact recreation season that is defined as May 1 through October 31 by R 323.1100 of the WQS. There is no total body contact during the remainder of the year primarily due to cold weather. In addition, because this is a concentration-based TMDL, WQS will be met regardless of flow conditions in the applicable season.

MONITORING

Pathogens were monitored weekly at a total of four stations on East Pond Creek from May through September 2004. Future monitoring will take place as part of the five-year rotating basin monitoring as resources allow. When these results indicate that the water body may be meeting WQS, sampling will be conducted by the MDEQ at the appropriate frequency (as defined in the Numeric Target section) to determine if the 30-day geometric mean value of 130 *E. coli* per 100 ml and 300 *E. coli* per 100 ml as a daily maximum are being met.

REASONABLE ASSURANCE ACTIVITIES

Macomb County, Romeo, and Bruce Township are under NPDES Phase 2 storm water permits (MS4). However, East Pond Creek is part of the North Branch Clinton River subwatershed, which was granted deferment from most of the requirements of all MS4 permits because only a small portion of the watershed is urbanized (Macomb County, 2005). Due to this deferment most watershed management activities concerning storm water are voluntary. The MS4 permits require activities that reduce *E. coli* inputs to surface waters through public education of nonpoint source water quality impacts, a storm water management plan, IDEP, and elimination requirements. Due to the deferment for the North Branch Clinton River subwatershed, only the IDEP requirements apply to East Pond Creek.

Macomb County is in the third year of required MS4 permit activities but was under a Voluntary Watershed Permit for two years prior. A partnership between Macomb County and several townships has resulted in countywide efforts to identify all outfalls within county boundaries that discharge to waters of the state. Part of the outfall identification process includes taking one-time samples for *E. coli* and identifying illicit connections. Each municipality will assure that there are no illicit connections to the municipal storm water system from township and city owned and operated properties and facilities. Each municipality within the county is responsible for submitting IDEPs to the MDEQ for approval and implementation.

The Macomb County Public Works Office is required to sample legally established county drain outfalls to locate illicit discharges. Three stations within the East Pond Creek TMDL reach were sampled for *E. coli* in 2005. One of these stations was dry or stagnant and was not sampled. Two others were sampled with single grab samples; none indicated exceedances of the WQS. These two stations were at McVicar Road (EPC3) and at 32-Mile Road just upstream of the confluence with the North Branch Clinton River (Macomb County, 2005).

Future activities in the North Branch Clinton River include the inventory and evaluation of all county road outfalls for *E. coli*, among other parameters, by the Road Commission of Macomb County, similar to work done in 2005 for some cities (e.g., Warren, Sterling Heights, New Baltimore) and townships (Harrison and Clinton) in the county. Additionally, the MCHD is planning to sample and evaluate all county-owned outfalls to surface waters of the state for *E. coli* in an effort to identify and correct illicit discharges, similar to work done in 2005 on Lake St. Clair, the Clinton River, Middle Clinton River, and Red Run Drain (Macomb County, 2005).

The general industrial storm water permit (MIS110000) identified in Table 4 requires that if there is a TMDL established by the MDEQ for the receiving water that restricts a material that could impair or degrade water quality, then the required storm water pollution prevention plan shall identify the level of control for those materials necessary to comply with the TMDL and an estimate developed of the current annual load of those materials via storm water discharges to the receiving stream.

A point of sale regulation will continue to be enforced throughout Macomb County (Macomb County, 2005). This regulation requires that on-site sewage disposal and/or on-site water supply systems be evaluated prior to property transfer. Additionally, new construction or septic systems with problems are required to use municipal sanitary sewers, when available. In 2004 and 2005, 726 septic repair permits were issued (Macomb County, 2005). These types of identification and repair activities may lead to reduced *E. coli* concentrations in East Pond Creek.

The MCHD conducts weekly *E. coli* monitoring at 64 locations in the county, 2 of which are in the East Pond Creek TMDL reach, M-53 (MCHD Station 52.2) and Powell Road (MCHD Station 52). This data is entered into a database and is available to the public at the following link: <http://macombcountymi.gov/publichealth/EH/SurfaceWaterTestData.asp>. The MDEQ works with the MCHD to identify *E. coli* sampling locations and share data. Additional MCHD sampling is conducted at Stations 52.4 (drain outfall near 33-Mile and McVicar) and 52.14 (drain outfall upstream of the Romeo WWTP). Data from these stations helps to track *E. coli* in storm water from portions of the village of Romeo and will continue to be useful in demonstrating that illicit connection removal is effective in curbing the flow of *E. coli* to the TMDL reach.

The village of Romeo continues to actively seek out and disconnect illicit connections. The village has identified 18 illicit connections and has removed them or scheduled their removal including the removal of a significant cross connection between the sanitary and storm sewers in 2005.

The North Branch Clinton River has a subwatershed advisory group consisting of representatives from most communities, pertinent governmental departments, and organizations that are located in the subwatershed. Voluntary efforts made by this advisory group for the period of October 1, 2004 to September 30, 2005, included a presentation that was sponsored by the Farmers Forum in Ray Township to inform attendees on what a watershed is and how human actions affect it. In September 2005, members of the advisory group began conducting stream crossing surveys on approximately 30 percent of the crossings located within the subwatershed. Results from the stream crossing surveys should be available in the Macomb County MS4, 2006 annual report (Macomb County, 2005).

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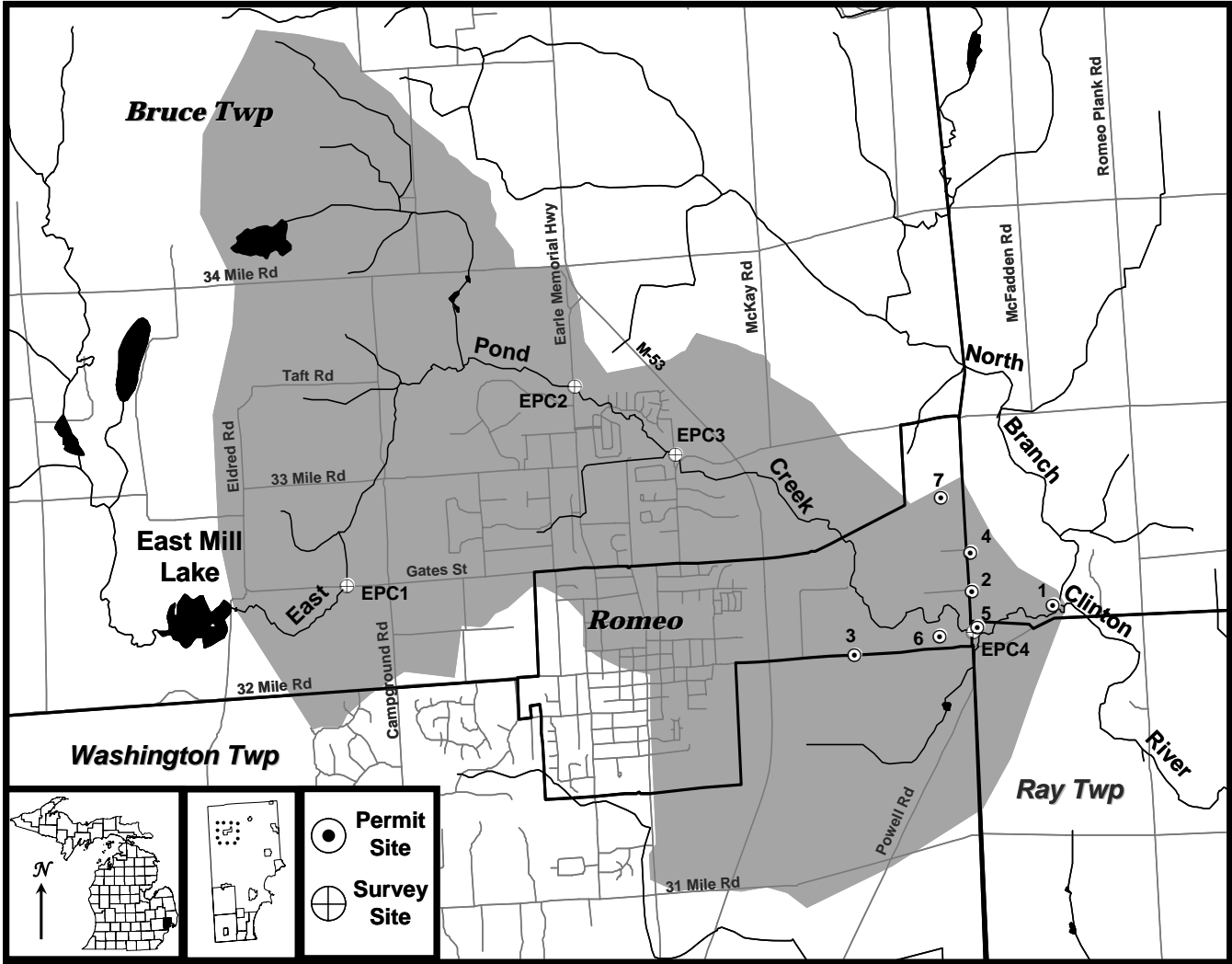


Figure 1. East Pond Creek TMDL reach *E. coli* sampling locations (EPC1-4) and NPDES permitted discharges (numbered, see Table 3 for permit information), vicinity of Romeo, Macomb County, Michigan, 2004. (Note: figure does not contain MS4 permits or permits-by-rule).

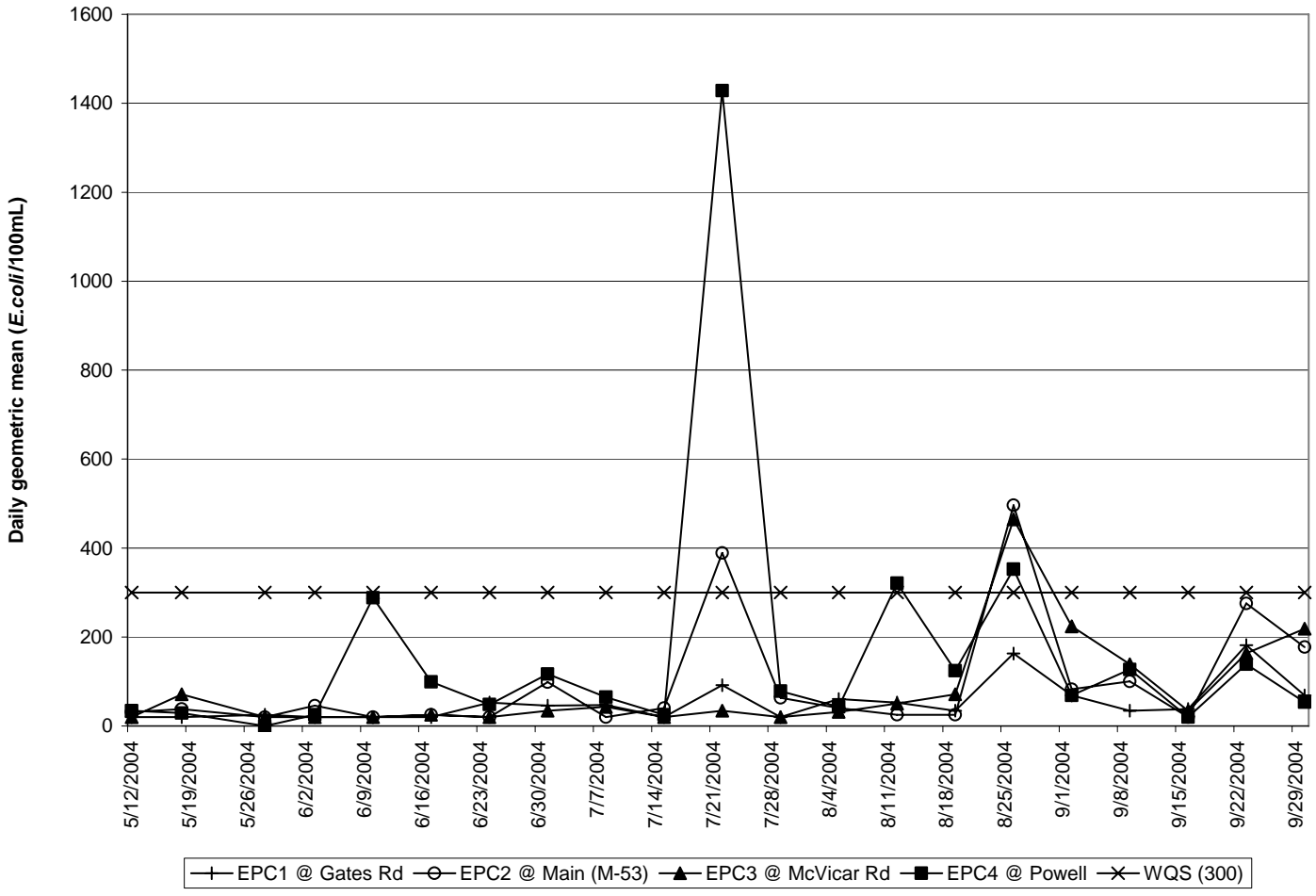


Figure 2. Daily geometric mean for *E. coli* in East Pond Creek, vicinity of Romeo, Macomb County, Michigan, 2004.

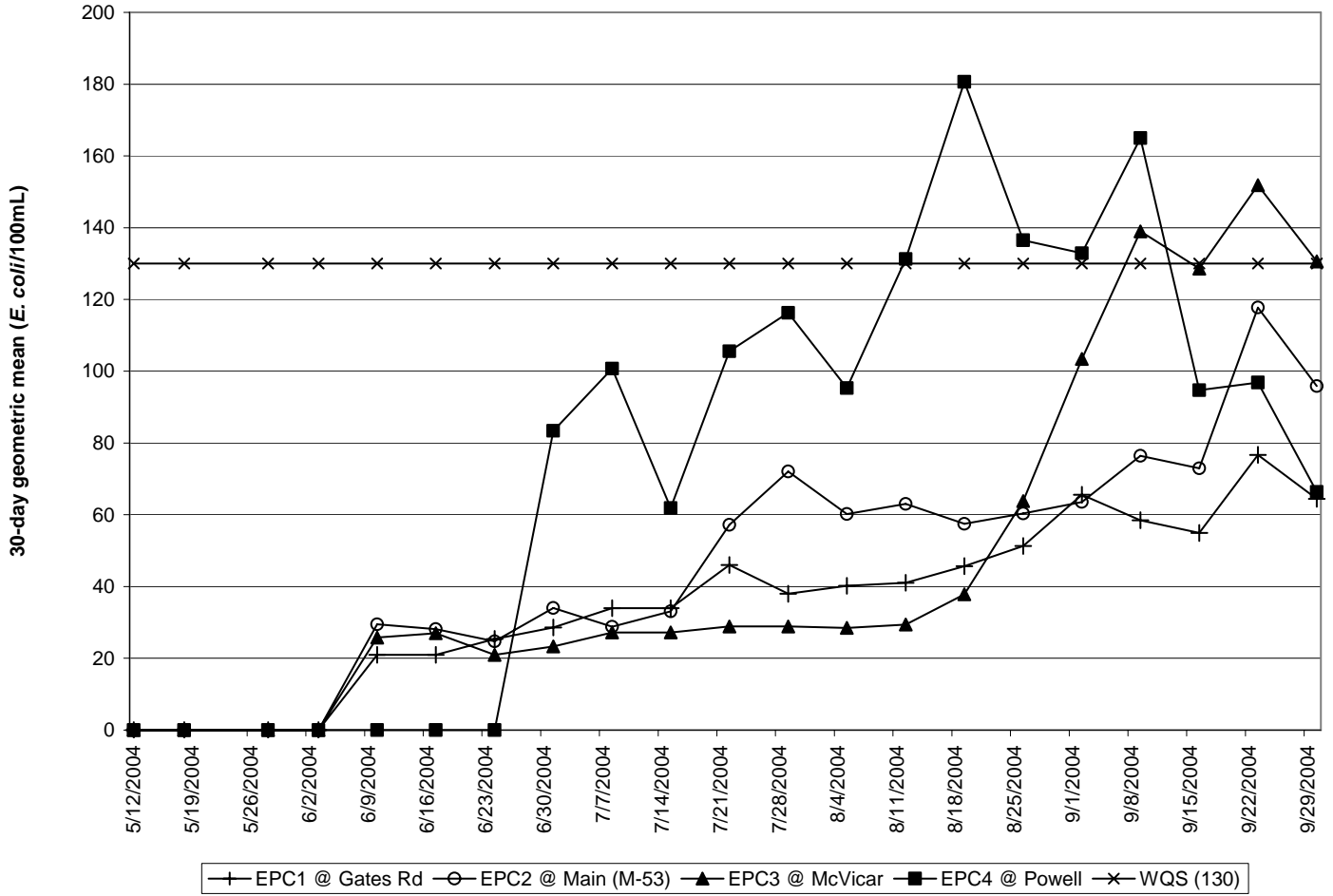


Figure 3. Thirty-day geometric mean for *E. coli* in East Pond Creek, vicinity of Romeo, Macomb County, Michigan, 2004.

Table 1. MDEQ 2004 *E. coli* monitoring data (*E. coli*/100 ml) for East Pond Creek in the vicinity of Romeo. Shaded areas indicate exceedances of the WQS. Data are presented upstream to downstream. Note: precipitation is noted for 24 hours preceding sampling.

	EPC1			EPC2			EPC3			EPC4			
DATE	SAMPLE RESULTS	DAILY G. MEAN	30-day G. MEAN	SAMPLE RESULTS	DAILY G. MEAN	30-day G. MEAN	SAMPLE RESULTS	DAILY G. MEAN	30-day G. MEAN	SAMPLE RESULTS	DAILY G. MEAN	30-day G. MEAN	Precip data
5/12/2004	20	20	---	80	32	---	20	20	---	20	34		.07"
	20			20			20			20			
	20			20			20			100			
5/18/2004	20	20	---	20	38	---	100	71	---	60	29		0.12"
	20			140			180			20			
	20			20			20			20			
5/28/2004	20	25	---	20	20	---	20	20	---	80			0.0"
	20			20			20			20			
	40			20			20			20			
6/3/2004	20	20	---	120	46	---	20	20	---	20	25		0.07"
	20			40			20			20			
	20			20			20			40			
6/10/2004	20	20	21	20	20	29	20	20	26	1000	288		1.38"
	20			20			20			20			
	20			20			20			1200			
6/17/2004	20	20	21	40	25	28	40	25	27	20	99		0.07"
	20			20			20			220			
	20			20			20			220			
6/24/2004	360	52	25	20	20	25	20	20	21	20	48		0.1"
	20			20			20			20			
	20			20			20			280			
7/1/2004	20	46	29	60	99	34	20	34	23	120	117	83	0.0"
	120			160			100			660			
	40			100			20			20			

Table 1. continued (*E. coli*/100 ml).

	EPC1			EPC2			EPC3			EPC4			
DATE	SAMPLE RESULTS	DAILY G. MEAN	30-day G. MEAN	SAMPLE RESULTS	DAILY G. MEAN	30-day G. MEAN	SAMPLE RESULTS	DAILY G. MEAN	30-day G. MEAN	SAMPLE RESULTS	DAILY G. MEAN	30-day G. MEAN	Precip Data
7/8/2004	260	47	34	20	20	29	200	43	27	20	65	101	0.45"
	20			20			20						
	20			20			680						
7/15/2004	20	20	34	20	40	33	20	20	27	20	25	62	0.12"
	20			20			20						
	20			160			40						
7/22/2004	240	92	46	700	389	57	100	34	29	1140	1428	106	0.27"
	20			420			20			1420			
	160			200			20			1800			
7/29/2004	20	20	38	20	63	72	20	20	29	120	78	116	0.0"
	20			80			20			20			
	20			160			20			200			
8/5/2004	140	61	40	160	40	60	20	32	28	20	43	95	0.94"
	80			20			80			20			
	20			20			20			200			
8/12/2004	60	52	41	40	25	63	40	50	29	540	321	131	0.24"
	20			20			40			340			
	120			20			80			180			
8/19/2004	20	34	46	20	25	57	180	71	38	200	124	181	0.0"
	20			20			20			80			
	100			40			100			120			
8/26/2004	240	163	51	580	496	60	580	465	64	320	352	137	0.08"
	180			620			480			380			
	100			340			360			360			

Table 1. continued (*E. coli*/100 ml).

	EPC1			EPC2			EPC3			EPC4			
DATE	SAMPLE RESULTS	DAILY G. MEAN	30-day G. MEAN	SAMPLE RESULTS	DAILY G. MEAN	30-day G. MEAN	SAMPLE RESULTS	DAILY G. MEAN	30-day G. MEAN	SAMPLE RESULTS	DAILY G. MEAN	30-day G. MEAN	Precip Data
9/2/2004	80	68	66	140	82	64	200	224	103	160	68	133	0.0"
	200			200			280			20			
	20			20			200			100			
9/9/2004	100	34	58	20	100	76	320	139	139	640	127	165	0.2"
	20			180			20		160				
	20			280			420		20				
9/16/2004	140	38	55	20	20	73	20	34	129	20	20	95	0.02"
	20			20			100			20			
	20			20			20			20			
9/23/2004	300	182	77	220	276	118	260	163	152	280	139	97	0.0"
	100			340			420		60				
	200			280			40		160				
9/30/2004	40	68	64	400	178	96	140	219	131	380	53	66	0.0"
	40			700			340		20				
	200			20			220		20				

Table 2. Distribution of land for each municipality in the East Pond Creek TMDL reach.

Municipality	County	Square Miles	Percent
Bruce Township	Macomb	6.0	65.6
Armada Township	Macomb	0.11	1.2
Village of Romeo	Macomb	1.45	15.9
Ray Township	Macomb	0.22	2.4
<u>Washington Township</u>	Macomb	<u>1.36</u>	<u>14.9</u>
TOTAL		9.14	100

Table 3. Permitted outfalls to the East Pond Creek TMDL watershed. Source: MDEQ, Water Bureau's NPDES Permit Management System. Map number corresponds to Figure 1 locations.

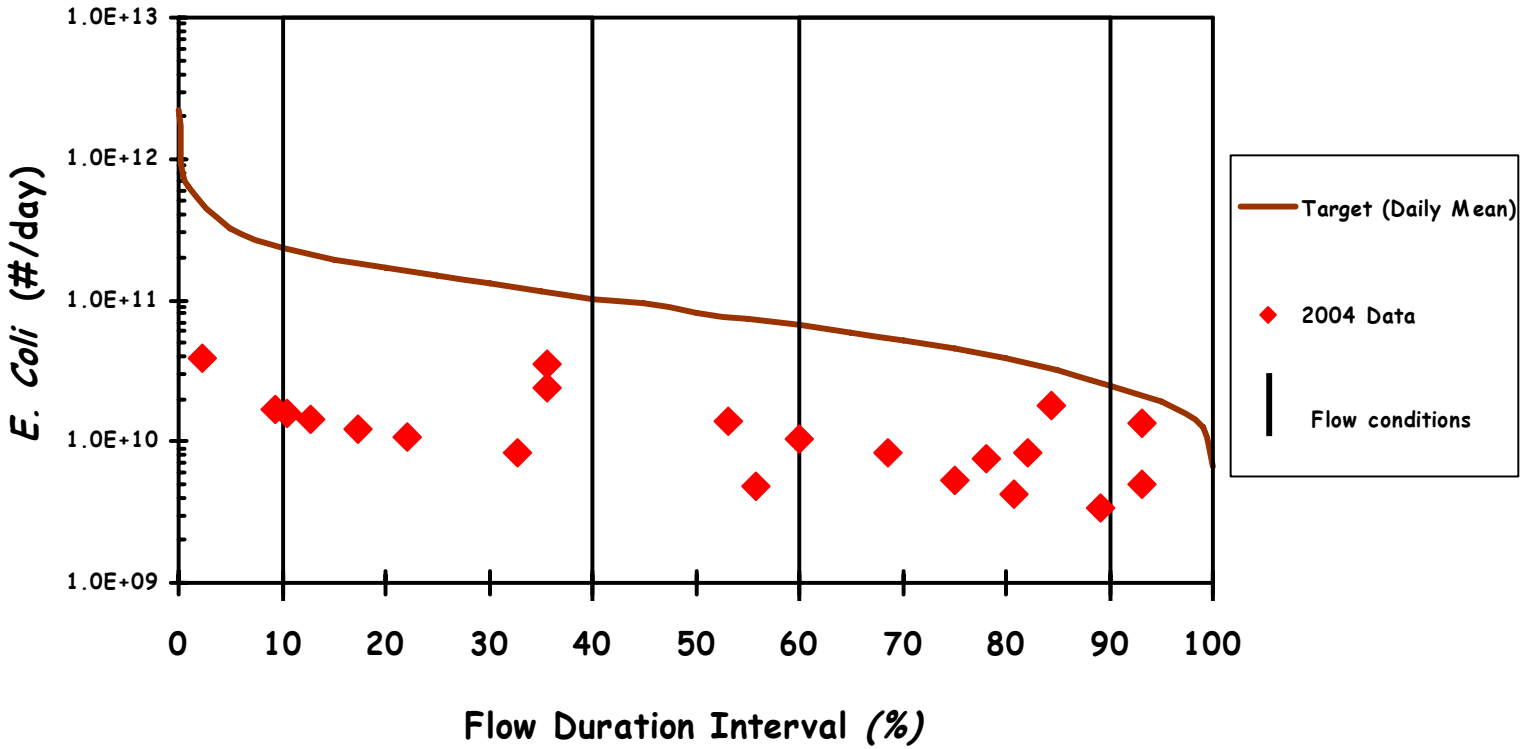
Facility	Control Document Number	County	Receiving Water	Latitude	Longitude	Map Number
Armada Ind Park	MI0055981	Macomb	East Pond Creek	42.806111	-82.971666	1
Romeo WWTP	MI0021679	Macomb	East Pond Creek	42.804166	-82.983333	6
Bruce Twp MS4-Macomb	MIG610307	Macomb	East Pond Creek	----	----	
Romeo MS4-Macomb	MIG610309	Macomb	East Pond Creek	----	----	
Macomb County MS4	MIG610052	Macomb	Countywide	----	----	
Ford-Romeo Engine Plant	MIS110072	Macomb	East Pond Creek	42.803055	-82.992222	3
Kriewall Enterprises Inc	MIS110231	Macomb	East Pond Creek	42.81	-82.98	4
Romeo Expeditors Inc	MIS110383	Macomb	East Pond Creek	42.804722	-82.979444	5
D & N Bending-Romeo	MIS110395	Macomb	East Pond Creek	42.807222	-82.98	2
Rubber Enterprises-Romeo	MIS111308	Macomb	East Pond Creek	42.81396	-82.98278	7
Racz-Colbydale	MIR105085	Macomb	--	42.86837	-82.98963	
Soulliere-Elk Horn Est Condos	MIR105834	Macomb	--	42.85183	-83.00846	
Mancini-E Mill Pond Condo	MIR105957	Macomb	--	42.80694	-83.06671	
Trinity Territory	MIR106917	Macomb	--	42.8245	-82.98793	
Shall-Pheasant Ridge Est	MIR107145	Macomb	--	42.82198	-83.04708	
Kemp-Romeo Corporate Park	MIR108519	Macomb	--	42.81669	-82.99255	
Macomb CRC-McKay Road	MIR108697	Macomb	--	42.89012	-83.00038	
Estates at Clairwood Lane	MIR109045	Macomb	--	42.81335	-83.09725	
Lombardo-Edgemont Comm Condo	MIR109096	Macomb	--	42.81556	-83.01211	

Table 4. Types of General Permits or Permits-by-Rule

Permit Number	Permit Title
General Permit	
MIS110000	Storm water from industrial activities
MIG619000	Storm water discharges from Municipal Separate Storm Sewer Systems (MS4) subject to watershed plan requirements
Permits-by-Rule	
MIR100000	Storm water discharges from construction activities

APPENDIX A

East Pond Creek at Gates Road
Load Duration Curve (2004 Monitoring Data)
Site: EPC1

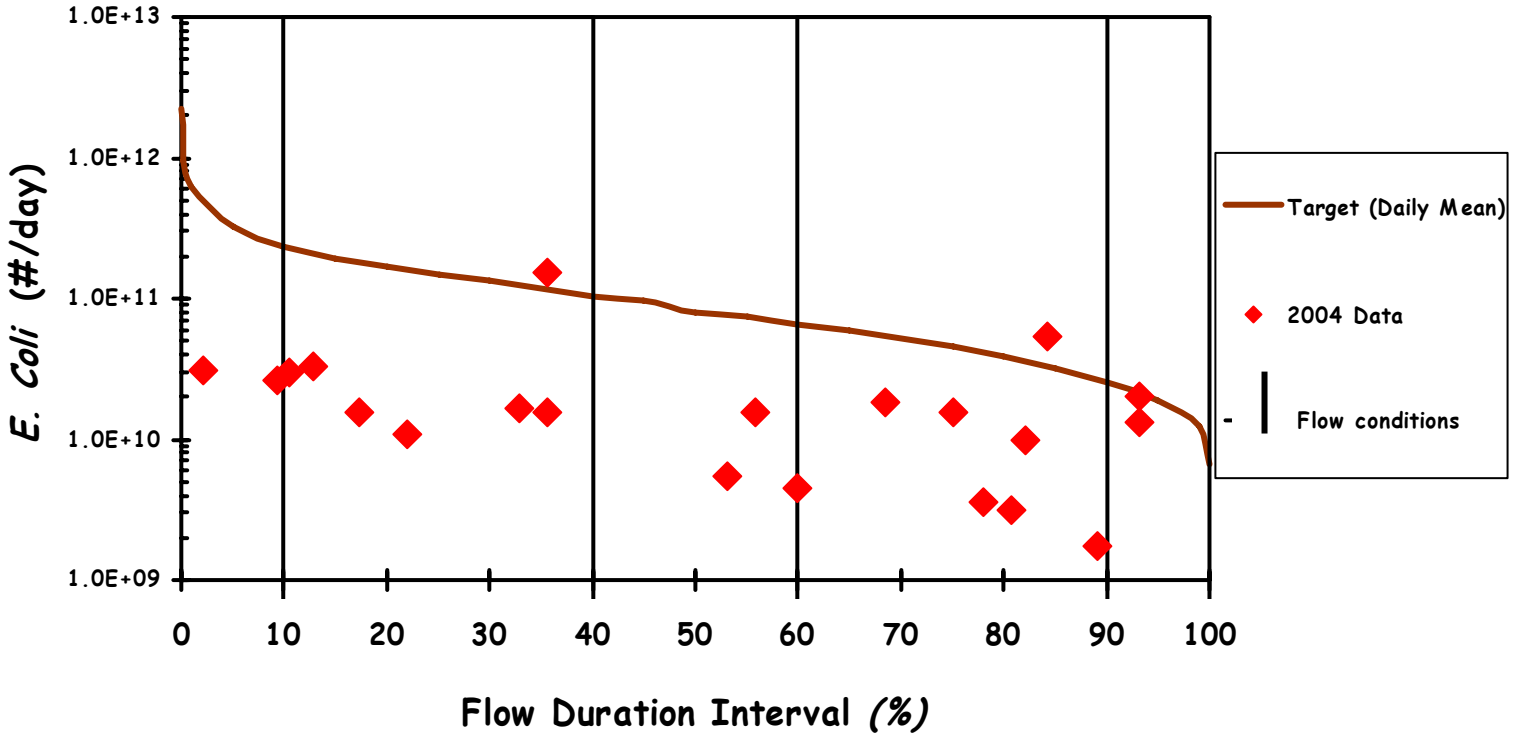


E. Coli Data & USGS Gage 4164100 Duration Interval

21.8 square miles

A-1. East Pond Creek at Gates. Load duration curve based on daily geometric mean.
 Site: EPC1.

East Pond Creek at Main
Load Duration Curve (2004 Monitoring Data)
Site: EPC2

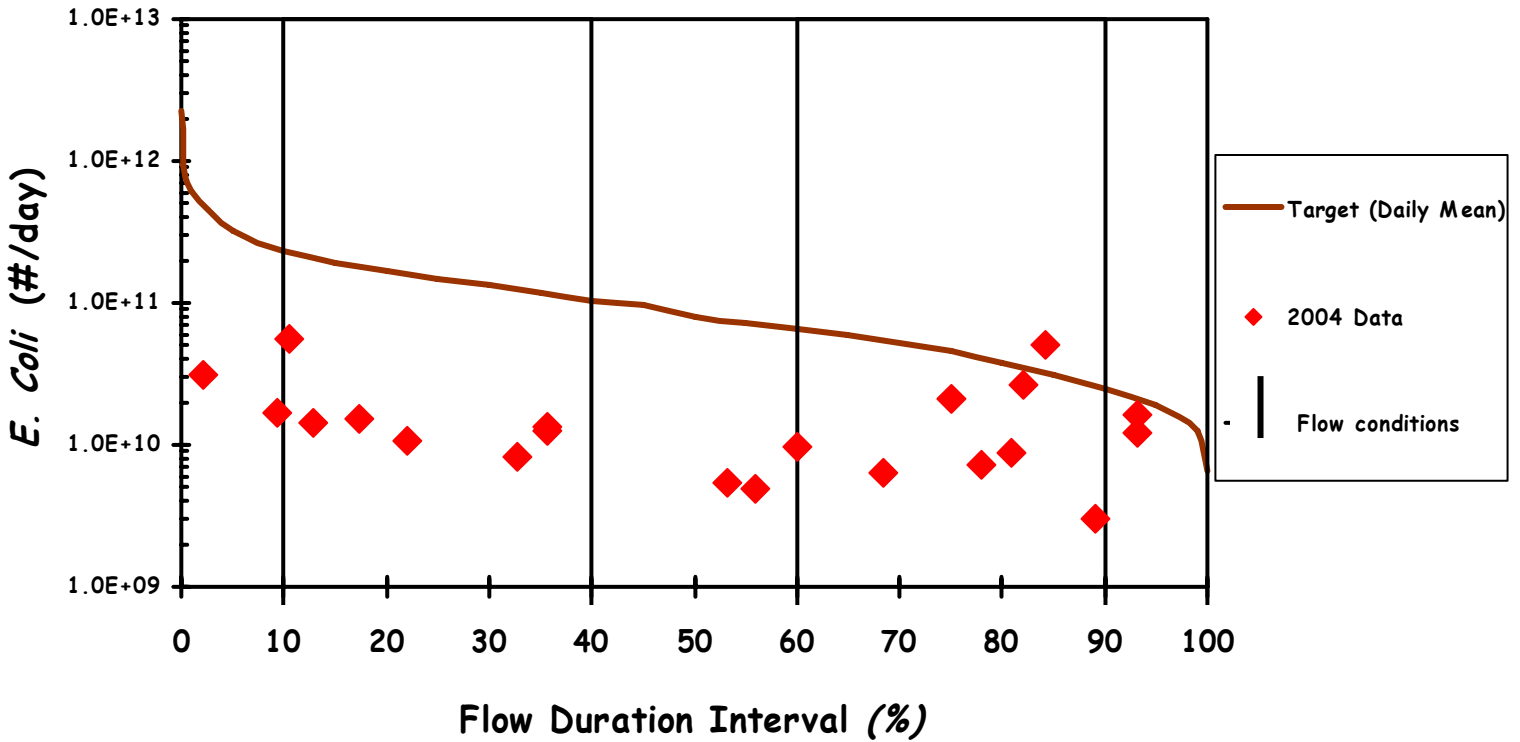


E. Coli Data & USGS Gage 4164100 Duration Interval

21.8 square miles

A-2. East Pond Creek at Main. Load duration curve based on daily geometric mean.
 Site: EPC2.

East Pond Creek at McVicar
Load Duration Curve (2004 Monitoring Data)
Site: EPC3

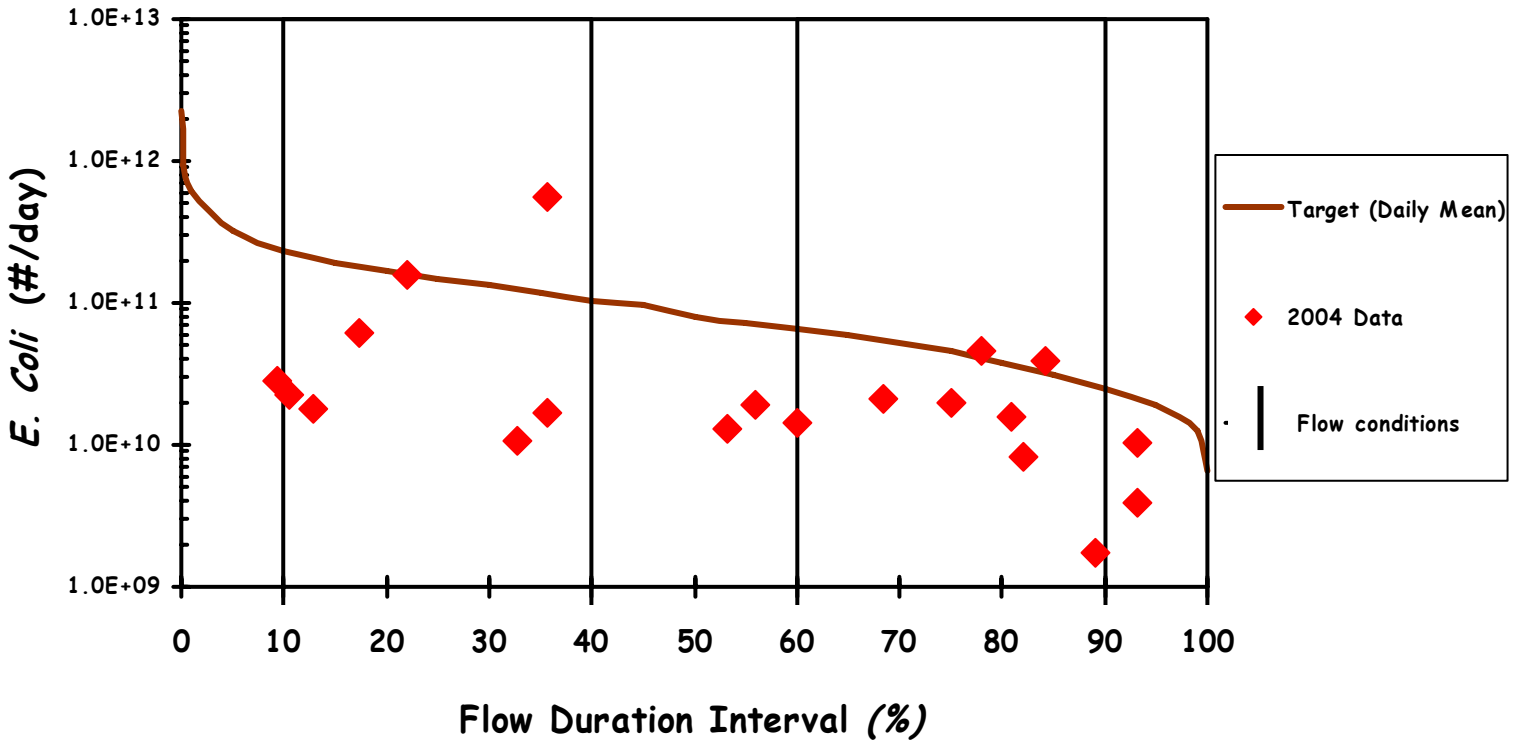


E. Coli Data & USGS Gage 4164100 Duration Interval

21.8 square miles

A-3. East Pond Creek at McVicar. Load duration curve based on daily geometric mean.
 Site: EPC3.

East Pond Creek at Powell
Load Duration Curve (2004 Monitoring Data)
Site: EPC4



E. Coli Data & USGS Gage 4164100 Duration Interval

21.8 square miles

A-4. East Pond Creek at McVicar. Load duration curve based on daily geometric mean.
 Site: EPC4.