



Barr Engineering Company
4700 West 77th Street • Minneapolis, MN 55435-4803
Phone: 952-832-2600 • Fax: 952-832-2601 • www.barr.com An EEO Employer

Minneapolis, MN • Hibbing, MN • Duluth, MN • Ann Arbor, MI • Jefferson City, MO • Bismarck, ND

Technical Memorandum

To: Bassett Creek Watershed Management Commission
From: Barr Engineering Company
Subject: Bassett Creek E. Coli Bacteria Monitoring 2009
Date: January 14, 2010
Project: 23/27-0051.30-2009-507

Summary

During the months of June, July, August, and September of 2009, Barr Engineering Co. collected water samples at six locations along Bassett's Creek (Figure 1) to determine the presence and quantity of bacteria in the stream. The samples were analyzed at the Minnesota Department of Health (MDH) Lab in St. Paul for *Escherichia coli* (E. coli) bacteria. All samples tested contained E. coli, ranging from 17 organisms (most probable number or MPN) per 100 milliliters (mL) to a maximum of more than 2,400 MPN/100mL. Test results for all samples are shown in Table 1 and all values are in MPN/100mL. The E. coli data are graphically presented in Figures 2 through 8. In 2009, the geometric means by sampling date and sampling location consistently exceeded the state water quality standards (see Table 1).

Background

In response to the listing of Bassett Creek as impaired for fecal coliform, E. coli sampling of Bassett Creek began in July 2008 and is slated to continue through June 2010. The Commission and the MPCA are cooperating in this effort—the Commission is paying for the sample collection, while the MPCA is paying for the laboratory analysis of the samples.

Samples were collected in 250mL plastic bottles provided by MDH directly from the stream, utilizing disposable gloves. The bottles were uncapped and filled underwater, temporarily capped and brought to the surface, then excess water poured off to reach the 'fill line'. Samples were put on ice immediately after collection and delivered directly to the MDH lab after completion of sampling at the sixth site.

Technical Memorandum

To: Bassett Creek Watershed Management Commission
From: Barr Engineering Co.
Subject: Bassett Creek E. Coli Monitoring 2009
Date: January 14, 2010
Page: 2



⊕ E. Coli Sampling Location
□ WMC Boundary

Imagery Source: Aerials Express, 2009

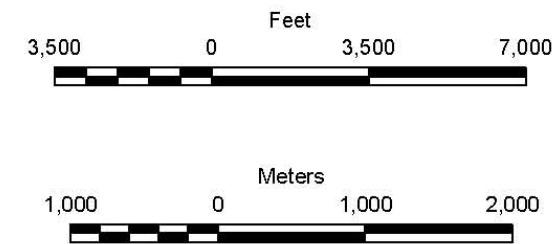


Figure 1
BASSETT CREEK E. COLI
MONITORING LOCATIONS
Hennepin County, MN

Technical Memorandum

To: Bassett Creek Watershed Management Commission
From: Barr Engineering Co.
Subject: Bassett Creek E. Coli Monitoring 2009
Date: January 14, 2010
Page: 3

A laboratory error occurred on the September 1 sampling event when all samples were analyzed for P/A (presence or absence) of total coliform and E. coli rather than for numbers of E. coli bacteria. All stations on September 1 tested positive (P-present) for total coliform and E. coli. An additional September sample event was added on September 21 to attain three sample events with numerical E. coli data during September.

E. coli bacteria were present in Bassett Creek during all 2009 sample events. Higher densities were observed following rainstorms, but bacteria were consistently present in the stream during the lengthy dry periods that occurred during 2009. No significant rainfall occurred for several weeks prior to the June 3 monitoring event and the density of E. coli bacteria ranged from 27 MPN/100 mL at Site 1 to 1,000 MPN/100 mL at Site 5. The greatest number of E. coli bacteria occurred on June 25, July 15, and July 22, when rainfall was observed on the day of and/or the day prior to sampling (Table 2). Geometric mean E. coli on these three dates ranged from 1,471 MPN/100 mL to over 2,400 MPN/100 mL, compared with 315 MPN/100 mL to 649 MPN/100 mL on the other sample dates. Stream velocity also appears to influence the number of bacteria observed. A comparison of the bacterial counts from Site #3, a very slow-flowing pool with soil banks, and Site #6, a swift-flowing rip-rapped section, indicates the geometric mean E. coli bacteria was 1,350 MPN/100 mL at Site 3 and 149 MPN/100 mL at Site 6. Bacteria density was higher in the slower flowing reach.

Under Minnesota state standards (Minnesota Rules Chapter 7050), E. coli is not to exceed 126 organisms (MPN)/100 mL as a geometric mean of not less than five samples representative of conditions within any calendar month, nor shall more than ten percent of all samples taken during any calendar month individually exceed 1,260 organisms (MPN)/100 mL. The standard applies only between April 1 and October 31.

Because only three samples were collected at each site in each month of monitoring (rather than five), the monthly geometric mean for each sampling location was not computed. Instead, two other geometric means were computed, and are shown in Table 1:

- The geometric mean of the data for each sampling date that included all of the sampling locations
- The geometric mean of the data for each sampling location that included all of the sampling dates

In 2009, the geometric means by sampling date and sampling location were consistently greater than 126 MPN/100 mL (see Table 1).

Table 1 also shows the individual samples that exceeded 1,260 organisms per 100 mL in 2009.

Technical Memorandum

To: Bassett Creek Watershed Management Commission
 From: Barr Engineering Co.
 Subject: Bassett Creek E. Coli Monitoring 2009
 Date: January 14, 2010
 Page: 4

Table 1: E. Coli Data, MPN / 100mL

Date	STORET ID						Geometric Mean by Date
	s005-012	s005-013	s005-014	s005-015	s005-016	s005-017	
	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	
6/3/2009	27	140		580	1,000	110	189
6/10/2009	91	160	1,000	180	410	49	194
6/25/2009	>2,400	>2,400	>2,400	>2,400	>2,400	>2,400	>2,400
7/15/2009	440	980	2,400	2,400	2,400	1,700	1,471
7/22/2009	520	330	1,700	1,600	2,419	980	1,017
7/29/2009	140	55	>2,400	390	280	17	180
8/5/2009	99	650	520	1,400	260	96	325
8/12/2009	170	93	310	410	260	47	170
8/24/2009	41	140	520	550	240	89	181
9/8/2009	340	330	>2,400	2,000	370	32	431
9/15/2009	38	650	>2,400	2,400	1,700	310	649
9/21/2009	60	220	2,400	2,000	490	79	367
Geometric Mean by Site	147	292	1,350	1,011	669	149	424

 site dry/no sample collected.
1,700 data in bold indicates individual samples that exceeded 1,260 MPN/100mL

Technical Memorandum

To: Bassett Creek Watershed Management Commission
 From: Barr Engineering Co.
 Subject: Bassett Creek E. Coli Monitoring 2009
 Date: January 14, 2010
 Page: 5

Table 2: Additional Site and Weather Data

Date	Barr Sampler	Sampler's Recorded Weather	Day of Sampling Rainfall (in)	Previous Day Rainfall (in)	E. Coli MPN/100mL Geometric Mean by Date
6/3/2009	MAH2	48F, clear, no significant rain in several weeks	0	0	189
6/10/2009	MAH2	57F, cloudy, sprinkles, rainfall: June 6,7 and 8	0.02	T	194
6/25/2009	MAH2	70F, some rain last night	0.17	0.16	>2,400
7/15/2009	MAH2	70F, cloudy	0	0.04	1,471
7/22/2009	MAH2	65F, clear, rain 7/21 pm	0.24	0.92	1,017
7/29/2009	DJM	60-70F, clear	T	0	180
8/5/2009	DJM	70-75F, clear	0	0	325
8/12/2009	DJM	70-80F, clear, heavy rainfall 8/7 and 8/8	0	0	170
8/24/2009	DJM	65-75F, 50% cloudy, rainfall during past 9 days	0	0	181
9/8/2009	DJM	65F, clear	0	0	431
9/15/2009	DJM	58-68F, clear	0	0	649
9/21/2009	DJM	60F, cloudy	T	0	367

* Rainfall data from http://climate.umn.edu/doc/twin_cities/msp2000's.htm

Table 3: Summary of September 2009 Discharge Monitoring Data

STORET ID	Discharge, CFS						Avg. by Date
	s005-012	s005-013	s005-014	s005-015	s005-016	s005-017	
Date	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	
9/8/2009	0.189	1.43	0.003	1.36	2.23	4.92	1.69
9/15/2009	0.02	1.19	0.007	2.01	1.95	4.91	1.68
9/21/2009	0.02	0.97	0.006	1.03	1.29	3.60	1.15
Avg. by Site	0.08	1.20	0.01	1.47	1.82	4.48	1.51

CFS: cubic feet per second

Technical Memorandum

To: Bassett Creek Watershed Management Commission
From: Barr Engineering Co.
Subject: Bassett Creek E. Coli Monitoring 2009
Date: January 14, 2010
Page: 6

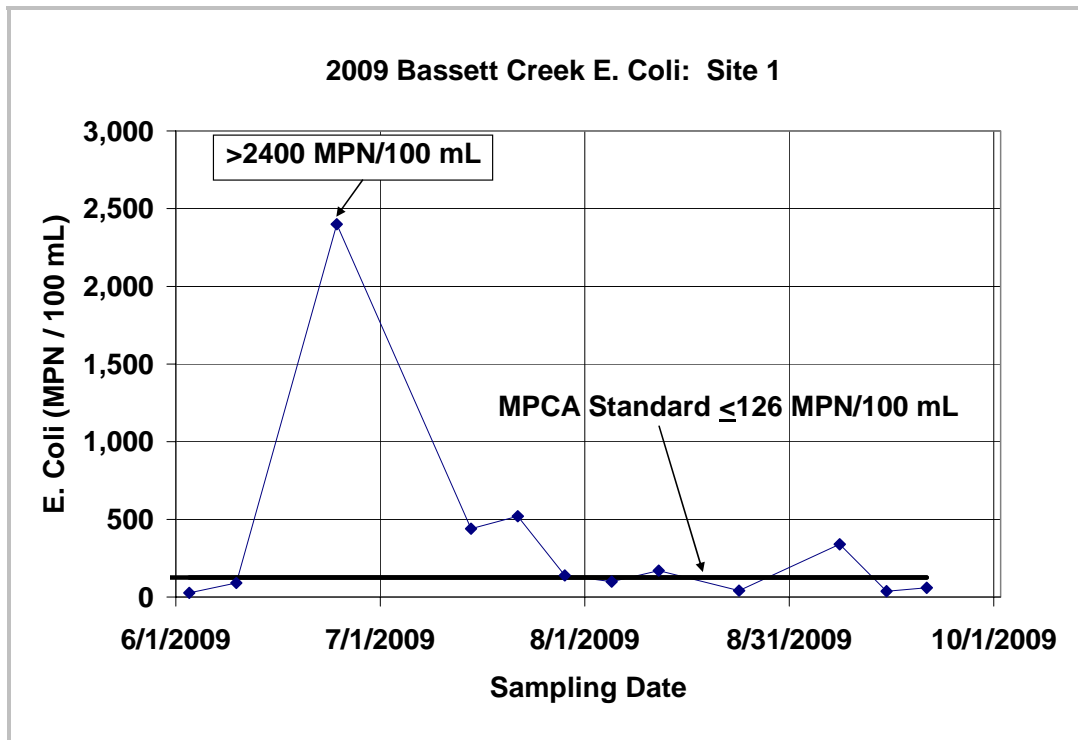


Figure 2. 2009 Bassett Creek E. Coli: Site 1

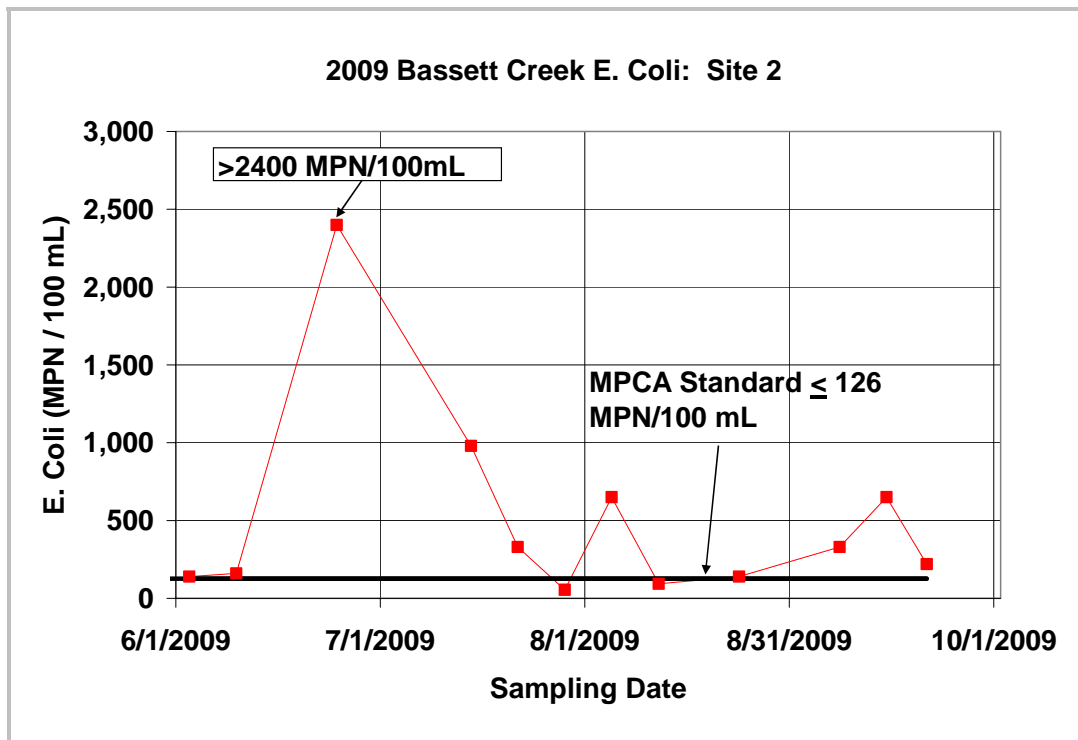


Figure 3. 2009 Bassett Creek E. Coli: Site 2

Technical Memorandum

To: Bassett Creek Watershed Management Commission
From: Barr Engineering Co.
Subject: Bassett Creek E. Coli Monitoring 2009
Date: January 14, 2010
Page: 7

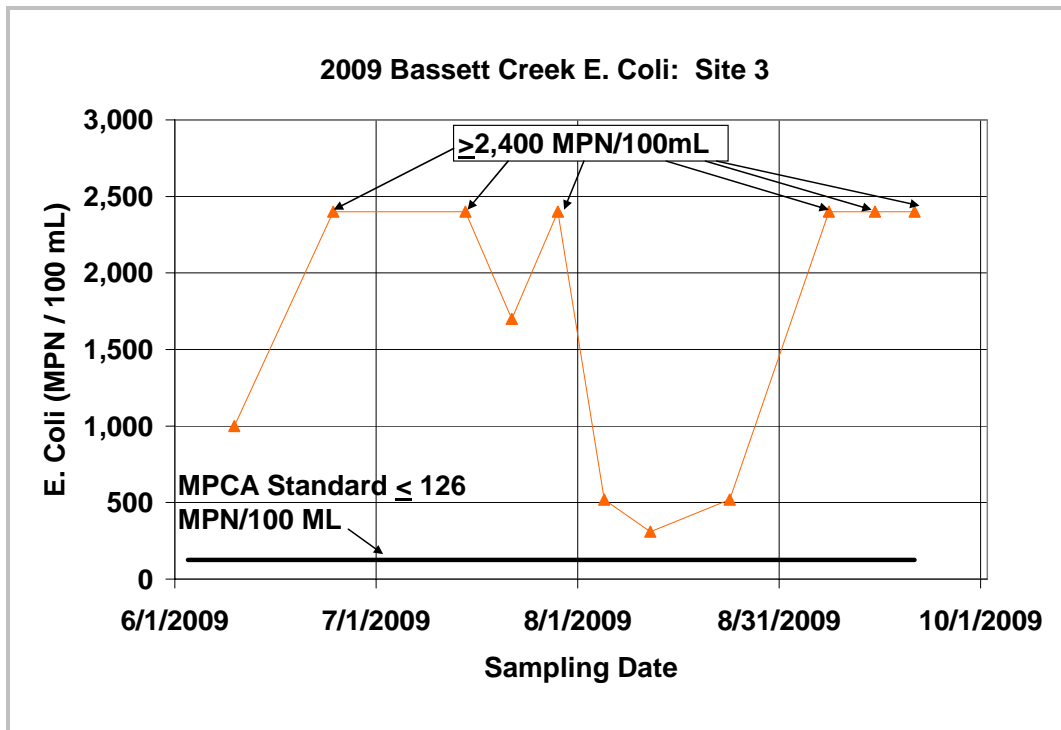


Figure 4. 2009 Bassett Creek E. Coli: Site 3

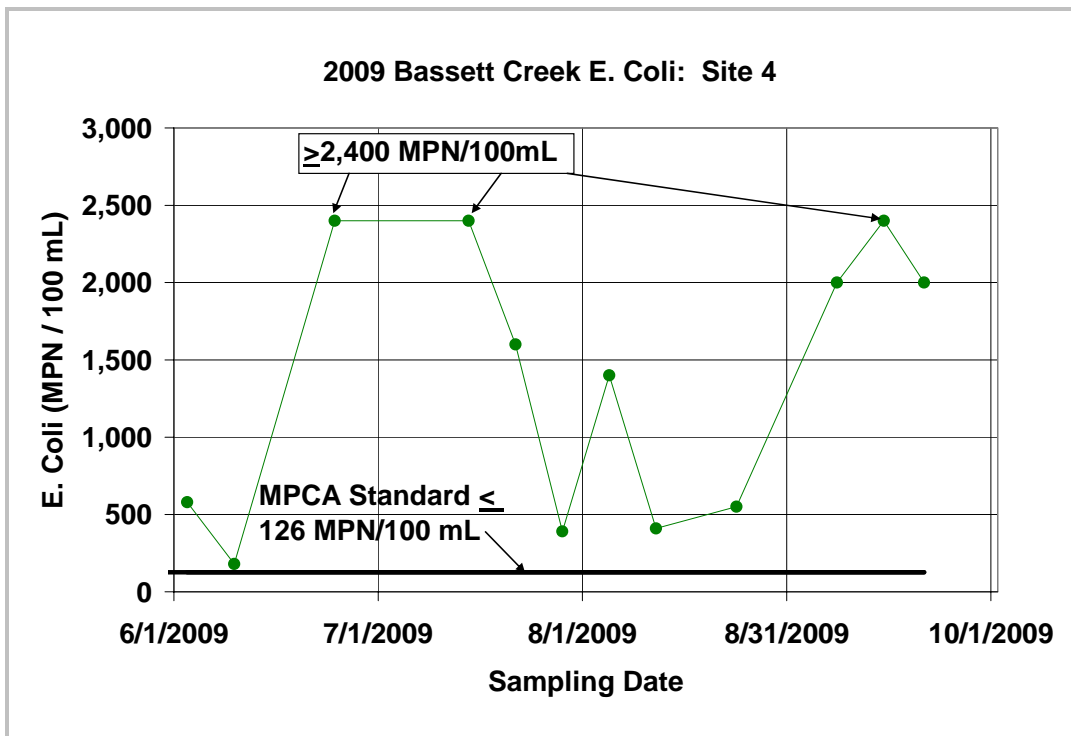


Figure 5. 2009 Bassett Creek E. Coli: Site 4

Technical Memorandum

To: Bassett Creek Watershed Management Commission
From: Barr Engineering Co.
Subject: Bassett Creek E. Coli Monitoring 2009
Date: January 14, 2010
Page: 8

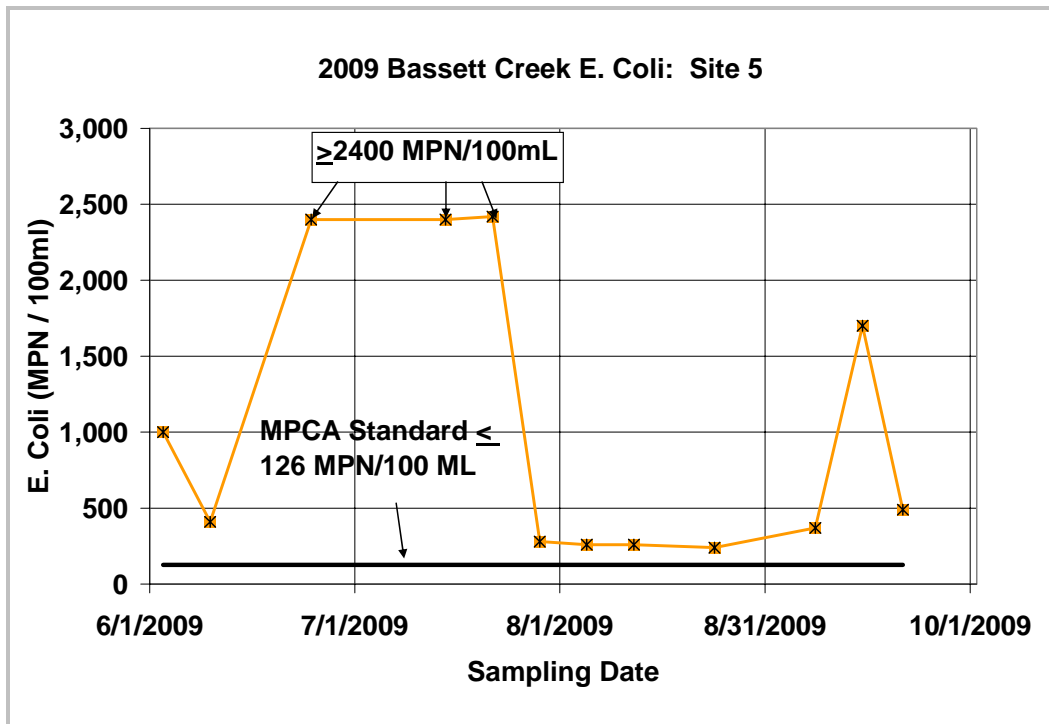


Figure 6. 2009 Bassett Creek E. Coli: Site 5

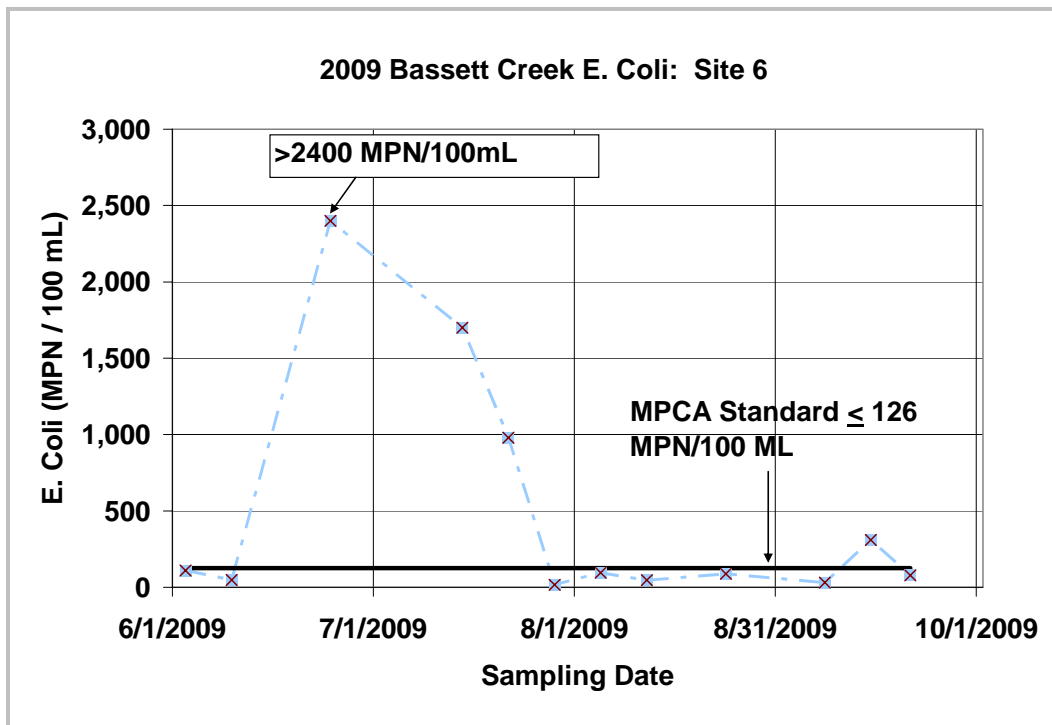


Figure 7. 2009 Bassett Creek E. Coli: Site 6

Technical Memorandum

To: Bassett Creek Watershed Management Commission

From: Barr Engineering Co.

Subject: Bassett Creek E. Coli Monitoring 2009

Date: January 14, 2010

Page: 9

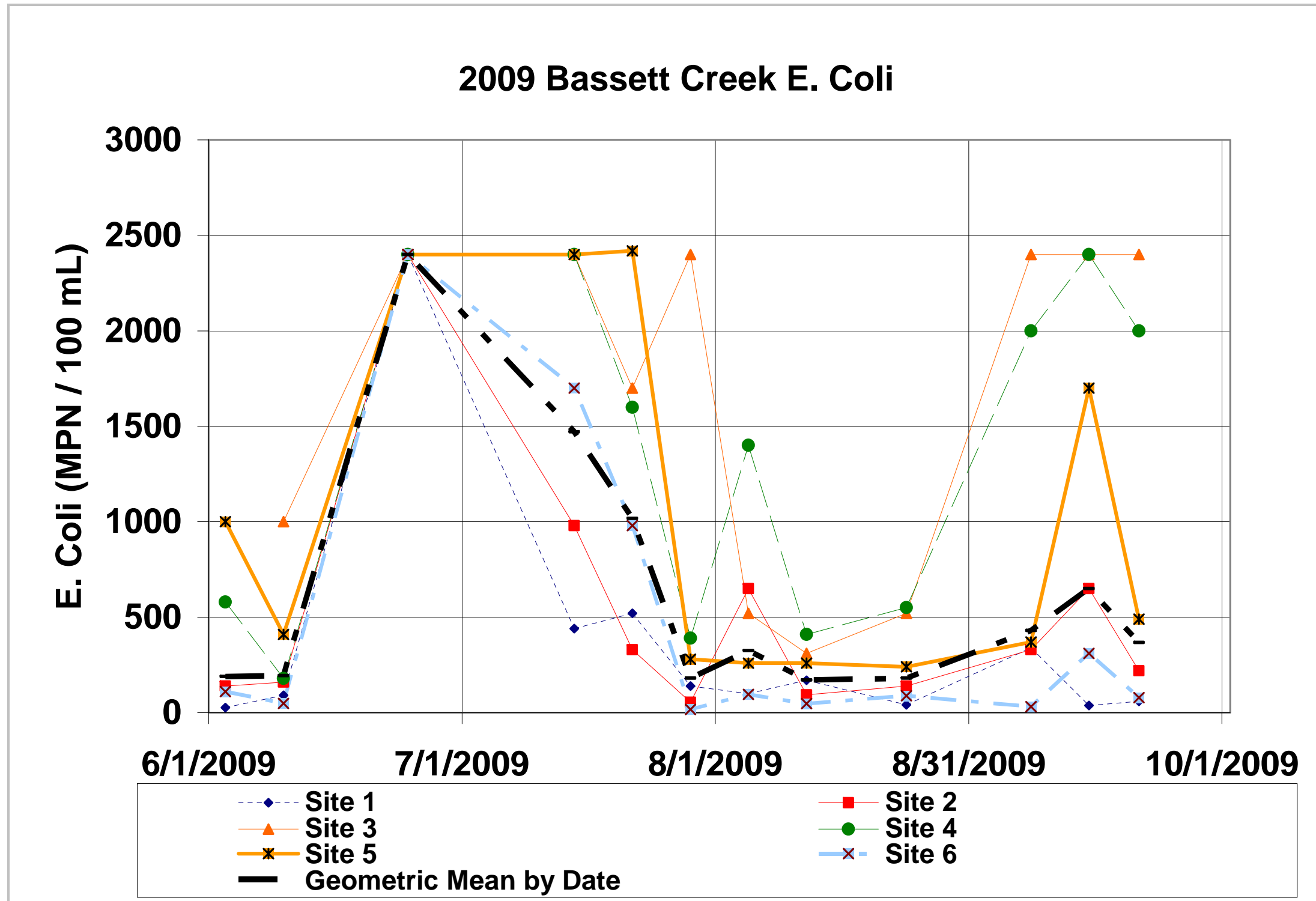


Figure 8. 2009 Bassett Creek E. Coli

Technical Memorandum

To: Bassett Creek Watershed Management Commission
From: Barr Engineering Co.
Subject: Bassett Creek E. Coli Monitoring 2009
Date: January 14, 2010
Page: 10

Sampling Locations:

#1 (STORET ID s005-012)

Location: Plymouth Creek, north of parking lot of building at north corner of Industrial Park Blvd and Teakwood Ln., Plymouth.

Stream conditions: Gravel and silt bottom, often shallow flow

#2 (STORET ID s005-013)

Location: Bassett Creek Main Stem, south of end of Rhode Island Ave., 1 block south of Phoenix St., Golden Valley; downstream of culverts under railroad embankment.

Stream conditions: Gravel and silt bottom, often shallow flow

#3 (STORET ID s005-014)

Location: North Branch of Bassett Creek, just north of 32nd Ave N between Brunswick Ave and Adair Ave, Crystal.

Stream conditions: Silt bottom, very slow to almost stagnant flow in pool caused by woody debris dam in front of box culverts under 32nd Ave N.

#4 (STORET ID s005-015)

Location: Bassett Creek Main Stem, approximately 1,000 ft upstream of junction with Bassett Creek North Branch, near a red house near Golden Valley / Crystal boundary.

Stream conditions: Generally fast flowing, gravel/sand bottom. Waterfowl often present near sampling site.

#5 (STORET ID s005-016)

Location: Bassett Creek Main Stem, back yard of 3900 Bassett Creek Drive, Golden Valley.

Stream conditions: Silt and sand bottom, usually gently flowing.

#6 (STORET ID s005-017)

Location: Bassett Creek Main Stem, at Met Council WOMP station at (closed) Irving Ave. bridge north of city impound lot, Minneapolis.

Stream conditions: Rip rap bottom, generally fast flowing.