Water Quality Assessment for the Development of Total Maximum Daily Loads for E. *coli* Bacteria in the St. Joseph River, Elkhart and St. Joseph Counties

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A) Sampling and Analysis Work Plan for the St. Joseph River
B) Previous Data
   i) Data from 305(b) Reports
   ii) Segment Survey of the St. Joseph River: Bristol, Indiana to South Bend, Indiana
C) Quality Assurance/Quality Control Reports for E. *coli* Data
   i) QA/QC Review Report: IDEM/100/29/477/69/2000
   ii) QA/QC Review Report: IDEM/100/29/477/070/2000
   iii) QA/QC Review Report: IDEM/100/29/477/081/2000
   iv) QA/QC Review Report: IDEM/100/29/477/099/2000
   v) QA/QC Review Report: IDEM/100/29/477/089/2000

INTRODUCTION

The St. Joseph River drains approximately 1699 square miles in northern Indiana, and 2586 square miles in southern Lower Michigan. This report will focus only on the main stem of the St. Joseph River within the Indiana border. The river enters Indiana in northern Elkhart County and runs for approximately 41 miles before exiting Indiana in northern St. Joseph County. Main tributaries to the St. Joseph River include the Pigeon River, Little Elkhart River, and Elkhart River.

Section 303 (d) of the Clean Water Act requires States to develop lists of impaired waters needing Total Maximum Daily Loads (TMDLs), and to establish priorities for their development. Streams are to be listed according to the severity of the pollution and the impact on designated uses. Data from Indiana's fixed station monitoring program indicated unacceptable levels of *Escherichia coli* (*E. coli*) bacteria within the St. Joseph River watershed. As a result, the St. Joseph River Main Stem was placed on Indiana's 1996 and 1998 303 (d) lists.

According to 327 IAC 2-1.5-8 (e)(2), *E.coli* bacteria, shall not exceed one hundred twenty-five (125) per one hundred (100) milliliters as a geometric mean based on not less than five (5) samples equally spaced over a thirty (30) day period nor exceed two hundred thirty-five (235) per one hundred (100) milliliters in any one (1) sample in a thirty (30) day period. In addition, at least one wet weather and one dry weather event was included.

METHODS

Sampling Sites and Locations

An initial water-quality assessment consisting of 16 sites, 11 along the main stem of the St. Joseph River, and 5 on its' tributaries, was conducted between September 27 and October 26, 2000 (Figure 1). One *E. coli* survey (5 samples spaced over a 30-day period) was used to determine if the water quality criteria for *E. coli* were still being violated.

Sample Collection

At each site, *E. coli* samples were collected in sterile 100ml plastic, narrow mouth bottles preserved with Sodium Thiosulfate ($Na_2S_2O_3$). *E. coli* pathogen analyses were performed by Environmental Health Laboratories (EHL) in South Bend, Indiana to meet the six (6) hour holding time requirement (Table 1). During transportation, all samples were stored on ice. Duplicates and blanks were also collected for Quality Assurance/Quality Control.

Field Measurements

Simultaneous with the *E. coli* sampling, standard field parameter measurements were taken with a YSI™ multi-parameter water-chemistry analysis unit (Table 2). These parameters included pH, temperature, specific conductance, turbidity, chloride,

chlorophyll, and dissolved oxygen and percent saturation. General field observations were also recorded on the IDEM "Stream Sampling Field Sheet".

Changes in Protocol

Deviations from the sampling work plan occurred at site LMJ150-0005 (map # 12). This site is located on the St. Joseph River below the dam at Prairie Street in Elkhart, Indiana. During sampling, repair began on several of the tainter gates and associated structures. This resulted in sampling inconsistencies. Water samples were taken below the dam at varying degrees of flow depending on the number of gates under construction. One sample was taken upstream of the dam, and one sample was taken where a portion of the river is diverted to drive turbines for electrical generation. The sample taken upstream of the dam violated the one-day *E. coli* standard.

RESULTS

E. coli

Of the sixteen sites sampled, ten sites violated the one time sample count for *E. coli* of 235 per 100 milliliters. Of these ten sites, five violated the geometric mean of 125 per 100 milliliters consisting of five samples equally spaced over a thirty-day period (table 1).* As mentioned above, one of the ten sites that violated the standard had sampling inconsistencies, so proper evaluation of this site may depend on re-sampling. The majority of the violations occurred during wet weather events, so the primary source may be non-point source pollution and/or combined sewer overflows.

*When available, the geometric mean is the value used to make final judgements on stream quality and adherence to water quality standards. Any stream failing to meet this standard will require TMDL development.

Field Measurements

Field measurements taken during this survey were found to be within acceptable ranges.

CONCLUSIONS

The following sites on the St. Joseph River and two of its' tributaries are in violation of the *E. coli* standard based on the geometric mean as stated in 327 IAC 2-1.5-8 (e)(2), and will require TMDL development:

Map Number	Site Name	Description	Stream Name	Geometric Mean
1	LMJ240-0010	Auten Road	St. Joseph River	315
2	LMJ240-0011	Darden Road	St. Joseph River	146
3	LMJ240-0012	Izaak Walton Park	Juday Creek	143
4	LMJ240-0013	Angela Street	St. Joseph River	141
11	LMJ210-0008	SR 120 (E Jackson St) bridge, Elkhart	Elkhart River	157

Table 1: E. coli values for the St. Joseph River

Note: All non-detects for e-coli were assigned the detection limit of 10 counts for calculation of the geometric mean.
Where duplicates are present, the higher value was used for calculating the geometric mean to insure a margin of safety.

H: The analysis for this parameter was performed out of the holding time. Results will be estimated if the analysis was perfomed within 1 1/2 times the holding time.

J: Estimated

Map Number	ProjectID	Site Name	Sample Number	Sample Type	Duplicate ID Number	SampleDate	Parameter	Lab Test Result	Test Units	QA Flags	Stream Name	Geometric Mean
1	2000 St. Joseph River	LMJ240-0010	AA02324	Normal	AA02325	10/4/00	E. Coli	20000	CFU/100mL		St. Joseph River	315
	2000 St. Joseph River	LMJ240-0010	AA02325	Duplicate	AA02324	10/4/00	E. Coli	30000	CFU/100mL		St. Joseph River	
	2000 St. Joseph River	LMJ240-0010	AA02541	Normal		10/12/00	E. Coli	<10	CFU/100mL	H J	St. Joseph River	
	2000 St. Joseph River	LMJ240-0010	AA02780	Normal		10/18/00	E. Coli	30	CFU/100mL		St. Joseph River	
	2000 St. Joseph River	LMJ240-0010	AA01981	Normal		9/27/00	E. Coli	330	CFU/100mL		St. Joseph River	
	2000 St. Joseph River	LMJ240-0010	AA02995	Normal		10/26/00	E. Coli	130	CFU/100mL		St. Joseph River	
2	2000 St. Joseph River	LMJ240-0011	AA02327	Normal		10/4/00	E. Coli	1000	CFU/100mL		St. Joseph River	146
	2000 St. Joseph River	LMJ240-0011	AA02542	Normal		10/12/00	E. Coli	120	CFU/100mL	H J	St. Joseph River	
	2000 St. Joseph River	LMJ240-0011	AA02782	Normal		10/19/00	E. Coli	<10	CFU/100mL		St. Joseph River	
	2000 St. Joseph River	LMJ240-0011	AA01983	Normal		9/27/00	E. Coli	560	CFU/100mL		St. Joseph River	
	2000 St. Joseph River	LMJ240-0011	AA02996	Normal		10/26/00	E. Coli	100	CFU/100mL		St. Joseph River	
3	2000 St. Joseph River	LMJ240-0012	AA02328	Normal		10/4/00	E. Coli	3000	CFU/100mL		Juday Creek	143
	2000 St. Joseph River	LMJ240-0012	AA02543	Normal		10/12/00	E. Coli	110	CFU/100mL	H J	Juday Creek	
	2000 St. Joseph River	LMJ240-0012	AA02783	Normal		10/19/00	E. Coli	<10	CFU/100mL		Juday Creek	
	2000 St. Joseph River	LMJ240-0012	AA01984	Normal		9/27/00	E. Coli	140	CFU/100mL		Juday Creek	
	2000 St. Joseph River	LMJ240-0012	AA02993	Normal		10/26/00	E. Coli	130	CFU/100mL		Juday Creek	
4	2000 St. Joseph River	LMJ240-0013	AA02329	Normal		10/4/00	E. Coli	21000	CFU/100mL		St. Joseph River	141
	2000 St. Joseph River	LMJ240-0013	AA02544	Normal		10/12/00	E. Coli	60	CFU/100mL	H J	St. Joseph River	
	2000 St. Joseph River	LMJ240-0013	AA02784	Normal		10/19/00	E. Coli	<10	CFU/100mL		St. Joseph River	
	2000 St. Joseph River	LMJ240-0013	AA01985	Normal		9/27/00	E. Coli	40	CFU/100mL		St. Joseph River	
	2000 St. Joseph River	LMJ240-0013	AA02997	Normal		10/26/00	E. Coli	110	CFU/100mL		St. Joseph River	
5	2000 St. Joseph River	LMJ240-0014	AA02330	Normal		10/4/00	E. Coli	1700	CFU/100mL		St. Joseph River	85
	2000 St. Joseph River	LMJ240-0014	AA02785	Normal		10/19/00	E. Coli	<10	CFU/100mL		St. Joseph River	
	2000 St. Joseph River	LMJ240-0014	AA01986	Normal		9/27/00	E. Coli	320	CFU/100mL		St. Joseph River	
	2000 St. Joseph River	LMJ240-0014	AA02998	Normal	AA02999	10/26/00	E. Coli	40	CFU/100mL		St. Joseph River	
	2000 St. Joseph River	LMJ240-0014	AA02999	Duplicate	AA02998	10/26/00	E. Coli	20	CFU/100mL		St. Joseph River	
	2000 St. Joseph River	LMJ240-0014	AA02545	Normal		10/12/00	E. Coli	20	CFU/100mL	H J	St. Joseph River	

Map Number	ProjectID	Site Name	Sample Number	Sample Type	Duplicate ID Number	SampleDate	Parameter	Lab Test Result	Test Units	QA Flags	Stream Name	Geometric Mean
6	2000 St. Joseph River	LMJ240-0015	AA02331	Normal		10/4/00	E. Coli	140	CFU/100mL		St. Joseph River	44
	2000 St. Joseph River	LMJ240-0015	AA02786	Normal		10/19/00	E. Coli	<10	CFU/100mL		St. Joseph River	
	2000 St. Joseph River	LMJ240-0015	AA01987	Normal		9/27/00	E. Coli	100	CFU/100mL		St. Joseph River	
	2000 St. Joseph River	LMJ240-0015	AA03000	Normal		10/26/00	E. Coli	40	CFU/100mL		St. Joseph River	
	2000 St. Joseph River	LMJ240-0015	AA02546	Normal		10/12/00	E. Coli	30	CFU/100mL	H J	St. Joseph River	
7	2000 St. Joseph River	LMJ240-0016	AA02332	Normal		10/4/00	E. Coli	90	CFU/100mL		St. Joseph River	28
	2000 St. Joseph River	LMJ240-0016	AA02787	Normal		10/19/00	E. Coli	<10	CFU/100mL		St. Joseph River	
	2000 St. Joseph River	LMJ240-0016	AA01988	Normal	AA01998	9/27/00	E. Coli	10	CFU/100mL		St. Joseph River	
	2000 St. Joseph River	LMJ240-0016	AA01998	Duplicate	AA01988	9/27/00	E. Coli	<10	CFU/100mL		St. Joseph River	
	2000 St. Joseph River	LMJ240-0016	AA03001	Normal		10/26/00	E. Coli	100	CFU/100mL		St. Joseph River	
	2000 St. Joseph River	LMJ240-0016	AA02547	Normal		10/12/00	E. Coli	20	CFU/100mL	H J	St. Joseph River	
8	2000 St. Joseph River	LMJ230-0004	AA02333	Normal		10/4/00	E. Coli	1000	CFU/100mL		Baugo Creek	118
	2000 St. Joseph River	LMJ230-0004	AA02788	Normal		10/19/00	E. Coli	<10	CFU/100mL		Baugo Creek	
	2000 St. Joseph River	LMJ230-0004	AA01989	Normal		9/27/00	E. Coli	200	CFU/100mL		Baugo Creek	
	2000 St. Joseph River	LMJ230-0004	AA03003	Normal		10/26/00	E. Coli	140	CFU/100mL		Baugo Creek	
	2000 St. Joseph River	LMJ230-0004	AA02548	Normal		10/12/00	E. Coli	80	CFU/100mL	H J	Baugo Creek	
9	2000 St. Joseph River	LMJ240-0017	AA02334	Normal		10/4/00	E. Coli	90	CFU/100mL		St. Joseph River	16
	2000 St. Joseph River	LMJ240-0017	AA02789	Normal		10/19/00	E. Coli	10	CFU/100mL		St. Joseph River	
	2000 St. Joseph River	LMJ240-0017	AA01990	Normal		9/27/00	E. Coli	10	CFU/100mL		St. Joseph River	
	2000 St. Joseph River	LMJ240-0017	AA03004	Normal		10/26/00	E. Coli	10	CFU/100mL		St. Joseph River	
	2000 St. Joseph River	LMJ240-0017	AA02549	Normal		10/12/00	E. Coli	<10	CFU/100mL	H J	St. Joseph River	
10	2000 St. Joseph River	LMJ220-0006	AA02335	Normal		10/4/00	E. Coli	500	CFU/100mL		St. Joseph River	52
	2000 St. Joseph River	LMJ220-0006	AA02790	Normal		10/19/00	E. Coli	70	CFU/100mL		St. Joseph River	
	2000 St. Joseph River	LMJ220-0006	AA01991	Normal		9/27/00	E. Coli	<10	CFU/100mL		St. Joseph River	
	2000 St. Joseph River	LMJ220-0006	AA03005	Normal		10/26/00	E. Coli	110	CFU/100mL		St. Joseph River	
	2000 St. Joseph River	LMJ220-0006	AA02550	Normal		10/12/00	E. Coli	10	CFU/100mL	H J	St. Joseph River	
11	2000 St. Joseph River	LMJ210-0008	AA02791	Normal		10/19/00	E. Coli	10	CFU/100mL		Elkhart River	157
	2000 St. Joseph River	LMJ210-0008	AA01992	Normal		9/27/00	E. Coli	470	CFU/100mL		Elkhart River	
	2000 St. Joseph River	LMJ210-0008	AA02336	Normal		10/4/00	E. Coli	5700	CFU/100mL		Elkhart River	
	2000 St. Joseph River	LMJ210-0008	AA03006	Normal		10/26/00	E. Coli	90	CFU/100mL		Elkhart River	
	2000 St. Joseph River	LMJ210-0008	AA02551	Normal		10/12/00	E. Coli	40	CFU/100mL	H J	Elkhart River	

Map Number	ProjectID	Site Name	Sample Number	Sample Type	Duplicate ID Number	SampleDate	Parameter	Lab Test Result	Test Units	QA Flags	Stream Name	Geometric Mean
12	2000 St. Joseph River	LMJ150-0005	AA02792	Normal	AA02797	10/19/00	E. Coli	10	CFU/100mL		St. Joseph River	71
	2000 St. Joseph River	LMJ150-0005	AA01993	Normal		9/27/00	E. Coli	70	CFU/100mL		St. Joseph River	
	2000 St. Joseph River	LMJ150-0005	AA02337	Normal		10/4/00	E. Coli	1800	CFU/100mL		St. Joseph River	
	2000 St. Joseph River	LMJ150-0005	AA02797	Duplicate	AA02792	10/19/00	E. Coli	<10	CFU/100mL		St. Joseph River	
	2000 St. Joseph River	LMJ150-0005	AA03007	Normal		10/26/00	E. Coli	70	CFU/100mL		St. Joseph River	
	2000 St. Joseph River	LMJ150-0005	AA02552	Normal		10/12/00	E. Coli	20	CFU/100mL	H J	St. Joseph River	
13	2000 St. Joseph River	LMJ150-0006	AA01994	Normal		9/27/00	E. Coli	40	CFU/100mL		Pine Creek	78
	2000 St. Joseph River	LMJ150-0006	AA02338	Normal		10/4/00	E. Coli	200	CFU/100mL		Pine Creek	
	2000 St. Joseph River	LMJ150-0006	AA02793	Normal		10/19/00	E. Coli	<10	CFU/100mL		Pine Creek	
	2000 St. Joseph River	LMJ150-0006	AA03008	Normal		10/26/00	E. Coli	240	CFU/100mL		Pine Creek	
	2000 St. Joseph River	LMJ150-0006	AA02553	Normal		10/12/00	E. Coli	150	CFU/100mL	H J	Pine Creek	
14	2000 St. Joseph River	LMJ150-0003	AA01995	Normal		9/27/00	E. Coli	<10	CFU/100mL		St Joseph River	21
	2000 St. Joseph River	LMJ150-0003	AA02339	Normal		10/4/00	E. Coli	140	CFU/100mL		St Joseph River	
	2000 St. Joseph River	LMJ150-0003	AA02794	Normal		10/19/00	E. Coli	<10	CFU/100mL		St Joseph River	
	2000 St. Joseph River	LMJ150-0003	AA03009	Normal		10/26/00	E. Coli	<10	CFU/100mL		St Joseph River	
	2000 St. Joseph River	LMJ150-0003	AA02554	Normal	AA02557	10/12/00	E. Coli	<10	CFU/100mL	H J	St Joseph River	
	2000 St. Joseph River	LMJ150-0003	AA02557	Duplicate	AA02554	10/12/00	E. Coli	30	CFU/100mL	H J	St Joseph River	
15	2000 St. Joseph River	LMJ150-0004	AA01996	Normal		9/27/00	E. Coli	<10	CFU/100mL		St Joseph River	17
	2000 St. Joseph River	LMJ150-0004	AA02340	Normal		10/4/00	E. Coli	80	CFU/100mL		St Joseph River	
	2000 St. Joseph River	LMJ150-0004	AA02795	Normal		10/19/00	E. Coli	10	CFU/100mL		St Joseph River	
	2000 St. Joseph River	LMJ150-0004	AA03010	Normal		10/26/00	E. Coli	<10	CFU/100mL		St Joseph River	
	2000 St. Joseph River	LMJ150-0004	AA02555	Normal		10/12/00	E. Coli	20	CFU/100mL	H J	St Joseph River	
16	2000 St. Joseph River	LMJ140-0009	AA01997	Normal		9/27/00	E. Coli	40	CFU/100mL		Little Elkhart River	39
	2000 St. Joseph River	LMJ140-0009	AA02341	Normal		10/4/00	E. Coli	760	CFU/100mL		Little Elkhart River	
	2000 St. Joseph River	LMJ140-0009	AA02796	Normal		10/19/00	E. Coli	<10	CFU/100mL		Little Elkhart River	
	2000 St. Joseph River	LMJ140-0009	AA03011	Normal		10/26/00	E. Coli	30	CFU/100mL		Little Elkhart River	
	2000 St. Joseph River	LMJ140-0009	AA02556	Normal		10/12/00	E. Coli	10	CFU/100mL	H J	Little Elkhart River	
B	2000 St. Joseph River	BLANK	AA02326	Field Blank		10/4/00	E. Coli	<10	CFU/100mL			10
	2000 St. Joseph River	BLANK	AA02540	Field Blank		10/12/00	E. Coli	<10	CFU/100mL	H J		
	2000 St. Joseph River	BLANK	AA02781	Field Blank		10/19/00	E. Coli	<10	CFU/100mL			
	2000 St. Joseph River	BLANK	AA01982	Field Blank		9/27/00	E. Coli	<10	CFU/100mL			
	2000 St. Joseph River	BLANK	AA02994	Field Blank		10/26/00	E. Coli	<10	CFU/100mL			

St. Joseph River E. coli Assessment

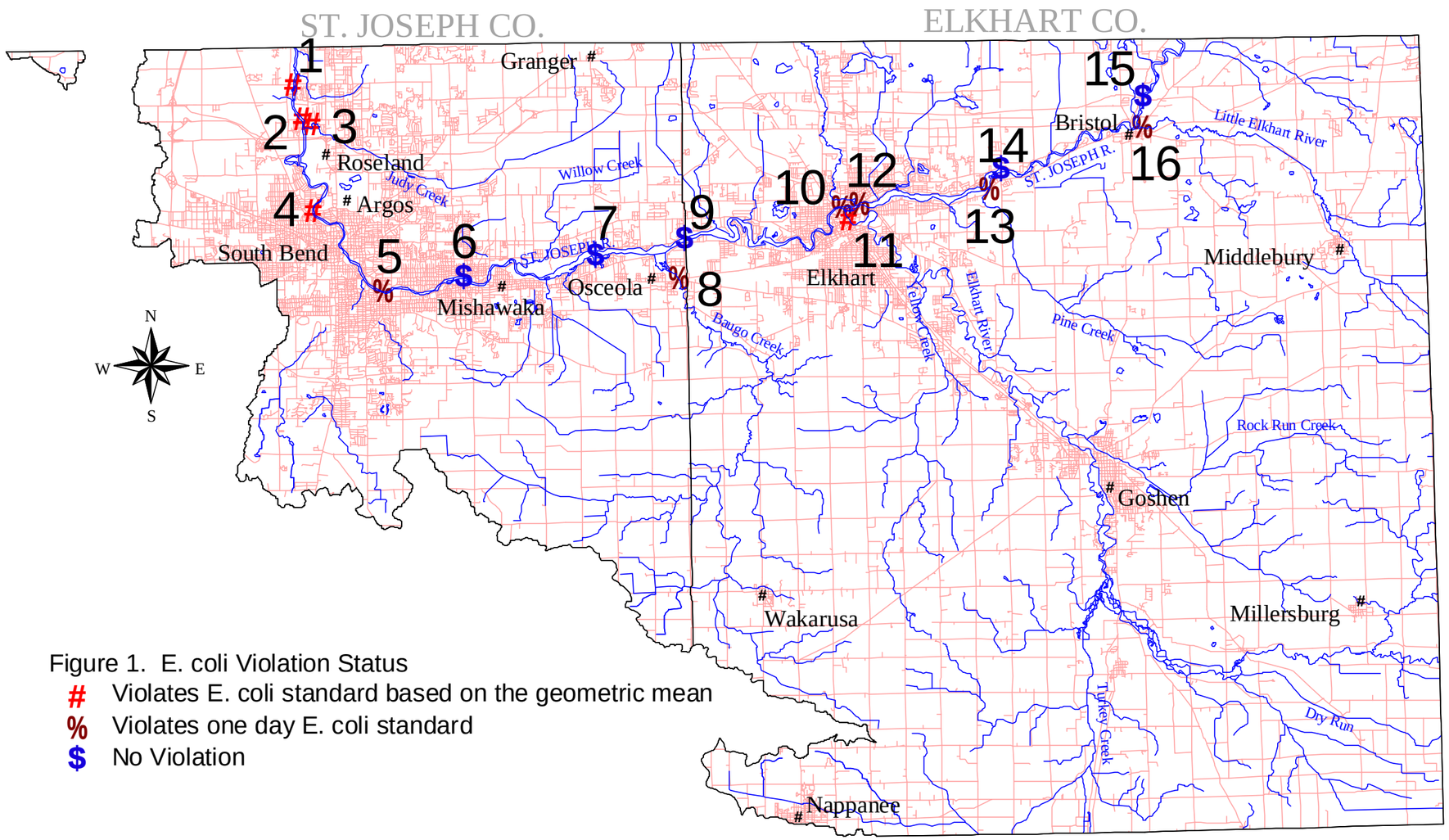

Figure 1. E. coli Violation Status

- # Violates E. coli standard based on the geometric mean
- % Violates one day E. coli standard
- $ No Violation

Table 2: Standard Field Data from the St. Joseph River TMDL Assessment

Map Number	Project ID	Site Name	Sample Number	Sample Date	StreamName	Dissolved Oxygen	pH	Water Temp.	Specific Conductivity	Turbidity	Chloride	Chlorophyll	% Saturation Dissolved Oxygen
1	2000 St. Joseph River	LMJ240-0008	AA01981	9/27/00	St Joseph River	9.38	8.07	14.70	661	14.5	180	3.3	92.7
	2000 St. Joseph River	LMJ240-0008	AA02324	10/4/00	St Joseph River	8.52	8.05	16.22	566	12	210	3.4	87.0
	2000 St. Joseph River	LMJ240-0008	AA02541	10/12/00	St Joseph River	5.76	8.2	10.23	1183	11.1	126.8	4.20	51.50
	2000 St. Joseph River	LMJ240-0008	AA02780	10/19/00	St Joseph River	6.98	8.15	13.86	1172	5.3	61.65	3.5	67.80
	2000 St. Joseph River	LMJ240-0008	AA02995	10/26/00	St Joseph River	9.92	7.98	15.95	1253	5.4	105	3.2	100.40
2	2000 St. Joseph River	LMJ240-0011	AA01983	9/27/00	ST Joseph River	9.98	8.07	15.14	645	17.5	173	4	99.5
	2000 St. Joseph River	LMJ240-0011	AA02327	10/4/00	ST Joseph River	9.60	8.06	16.34	577	8.7	226	3.9	98.1
	2000 St. Joseph River	LMJ240-0011	AA02542	10/12/00	ST Joseph River	7.17	8.19	10.63	1161	12.6	147	3.40	64.90
	2000 St. Joseph River	LMJ240-0011	AA02782	10/19/00	ST Joseph River	7.34	8.17	14.21	1136	5.1	55.23	3.2	71.90
	2000 St. Joseph River	LMJ240-0011	AA02996	10/26/00	ST Joseph River	9.45	7.99	15.89	1212	10.6	108	33.0	95.90
3	2000 St. Joseph River	LMJ240-0012	AA01984	9/27/00	Juday Creek	10.24	8.32	11.59	841	10.2	292	2.3	94.5
	2000 St. Joseph River	LMJ240-0012	AA02328	10/4/00	Juday Creek	9.57	8.21	14.47	611	15.2	266	3.5	94.1
	2000 St. Joseph River	LMJ240-0012	AA02543	10/12/00	Juday Creek	6.49	8.34	8.8	1511	5.1	188.7	2.90	55.40
	2000 St. Joseph River	LMJ240-0012	AA02783	10/19/00	Juday Creek	7.25	8.31	12.01	1420	1.9	89.65	5.1	67.60
	2000 St. Joseph River	LMJ240-0012	AA02993	10/26/00	Juday Creek	9.45	8.12	15.70	1548	1.5	120	3.4	95.40
4	2000 St. Joseph River	LMJ240-0013	AA01985	9/27/00	ST Joseph River	10.60	8.09	15.25	640	18.5	190	4.4	105.3
	2000 St. Joseph River	LMJ240-0013	AA02329	10/4/00	ST Joseph River	10.38	8.09	16.56	570	8.8	252	3.5	106.1
	2000 St. Joseph River	LMJ240-0013	AA02544	10/12/00	ST Joseph River	7.25	8.21	10.75	1150	10.9	177.9	4.00	65.20
	2000 St. Joseph River	LMJ240-0013	AA02784	10/19/00	ST Joseph River	7.63	8.2	14.28	1130	8.5	61.95	4.1	74.70
	2000 St. Joseph River	LMJ240-0013	AA02997	10/26/00	ST Joseph River	9.77	8.02	15.83	1172	11.2	63.2	3.8	98.80
5	2000 St. Joseph River	LMJ240-0014	AA01986	9/27/00	ST Joseph River	9.87	8.03	15.50	640	13.7	177	3.6	99.2
	2000 St. Joseph River	LMJ240-0014	AA02330	10/4/00	ST Joseph River	10.00	8.09	16.27	582	11.5	278	3.4	102.2
	2000 St. Joseph River	LMJ240-0014	AA02545	10/12/00	ST Joseph River	6.63	8.21	11.06	1141	13.9	199.6	3.40	60.70
	2000 St. Joseph River	LMJ240-0014	AA02785	10/19/00	ST Joseph River	7.43	8.15	14.67	1125	6.2	49.79	3.4	73.40
	2000 St. Joseph River	LMJ240-0014	AA02998	10/26/00	ST Joseph River	9.28	7.98	16.02	1162	13.1	56	3.3	93.90
6	2000 St. Joseph River	LMJ240-0015	AA01987	9/27/00	ST Joseph River	10.36	8.05	15.58	634	14.0	178	4	104.3
	2000 St. Joseph River	LMJ240-0015	AA02331	10/4/00	ST Joseph River	10.55	8.11	16.50	583	16.2	283	3.7	108.2
	2000 St. Joseph River	LMJ240-0015	AA02546	10/12/00	ST Joseph River	6.93	8.23	11.25	1134	11.9	207.5	4.60	63.60
	2000 St. Joseph River	LMJ240-0015	AA02786	10/19/00	ST Joseph River	7.6	8.15	14.78	1114	9.3	48.34	4.1	75.20
	2000 St. Joseph River	LMJ240-0015	AA03000	10/26/00	ST Joseph River	9.4	8.01	16.01	1149	12.9	52.3	4.1	95.80
7	2000 St. Joseph River	LMJ240-0016	AA01988	9/27/00	ST Joseph River	10.06	8.05	15.77	633	16.4	179	4.4	101.7
	2000 St. Joseph River	LMJ240-0016	AA02332	10/4/00	ST Joseph River	9.99	8.11	16.81	588	12.7	288	4.1	103.3
	2000 St. Joseph River	LMJ240-0016	AA02547	10/12/00	ST Joseph River	7.05	8.24	11.19	1139	13	224.3	3.50	64.50
	2000 St. Joseph River	LMJ240-0016	AA02787	10/19/00	ST Joseph River	7.56	8.18	14.96	1115	9.6	47.31	4.4	75.20
	2000 St. Joseph River	LMJ240-0016	AA03001	10/26/00	ST Joseph River	9.07	7.97	16.09	1148	15.4	53	4.5	92.70
8	2000 St. Joseph River	LMJ230-0004	AA01989	9/27/00	Baugo Creek	9.46	7.94	12.26	741	7.0	228	2.5	88.4
	2000 St. Joseph River	LMJ230-0004	AA02333	10/4/00	Baugo Creek	8.18	7.87	14.08	605	5	137	4.7	79.9
	2000 St. Joseph River	LMJ230-0004	AA02548	10/12/00	Baugo Creek	5.44	7.96	9.19	1300	6.2	261.3	4.50	47.40
	2000 St. Joseph River	LMJ230-0004	AA02788	10/19/00	Baugo Creek	6.52	7.92	12.78	1270	2.4	56.83	4.1	61.80
	2000 St. Joseph River	LMJ230-0004	AA03003	10/26/00	Baugo Creek	7.04	7.76	15.34	1341	4.1	59	4.1	70.30
9	2000 St. Joseph River	LMJ240-0007	AA01990	9/27/00	St Joseph River	10.29	8.10	15.21	638	9.2	193	3.4	102.6
	2000 St. Joseph River	LMJ240-0007	AA02334	10/4/00	St Joseph River	10.28	8.17	17.03	582	5.2	88	3.7	106.8
	2000 St. Joseph River	LMJ240-0007	AA02549	10/12/00	St Joseph River	8.37	8.29	11.38	1145	7.2	243.8	3.60	77.00
	2000 St. Joseph River	LMJ240-0007	AA02789	10/19/00	St Joseph River	7.34	8.17	14.75	1119	3.2	47.48	3.0	72.60
	2000 St. Joseph River	LMJ240-0007	AA03004	10/26/00	St Joseph River	9	7.93	16.40	1158	4.2		3.0	92.30
10	2000 St. Joseph River	LMJ220-0003	AA01991	9/27/00	St Joseph River	10.28	8.13	15.00	633	10.2	185	3.5	102.2
	2000 St. Joseph River	LMJ220-0003	AA02335	10/4/00	St Joseph River	10.08	8.4	16.77	575	8.8	84	2.7	104.3
	2000 St. Joseph River	LMJ220-0003	AA02550	10/12/00	St Joseph River	6.89	8.28	11.2	1161	9	259.4	4.10	62.80
	2000 St. Joseph River	LMJ220-0003	AA02790	10/19/00	St Joseph River	7.42	8.2	14.07	1150	4.4	54.83	4.6	72.60
	2000 St. Joseph River	LMJ220-0003	AA03005	10/26/00	St Joseph River	8.68	7.97	16.69	1144	5.6	71	5.1	89.40

Map Number	Project ID	Site Name	Sample Number	Sample Date	StreamName	Dissolved Oxygen	pH	Water Temp.	Specific Conductivity	Turbidity	Chloride	Chlorophyll	% Saturation Dissolved Oxygen
11	2000 St. Joseph River	LMJ210-0008	AA01992	9/27/00	Elkhart River	10.69	8.20	13.87	783	7.7	206	2.8	103.7
	2000 St. Joseph River	LMJ210-0008	AA02336	10/4/00	Elkhart River	9.86	8.14	15.72	674	4.9	92	3.3	99.4
	2000 St. Joseph River	LMJ210-0008	AA02551	10/12/00	Elkhart River	6.85	8.24	10.59	1431	15.2	293.8	4.60	62.00
	2000 St. Joseph River	LMJ210-0008	AA02791	10/19/00	Elkhart River	7.52	8.23	13.74	1323	9.3	65.25	6.3	72.80
	2000 St. Joseph River	LMJ210-0008	AA03006	10/26/00	Elkhart River	9.39	8.01	16.28	1390	4.2	83	4.6	96.20
12	2000 St. Joseph River	LMJ150-0005	AA01993	9/27/00	ST Joseph River	10.52	8.16	15.30	611	13.2	184	4.4	105.4
	2000 St. Joseph River	LMJ150-0005	AA02337	10/4/00	ST Joseph River	9.91	8.15	16.68	554	6.6	84	2.9	102.1
	2000 St. Joseph River	LMJ150-0005	AA02552	10/12/00	ST Joseph River	7	8.27	11.72	1097	7.4	279.1	3.70	64.70
	2000 St. Joseph River	LMJ150-0005	AA02792	10/19/00	ST Joseph River	7.56	8.2	14.46	1067	4.6	45.14	3.6	73.30
	2000 St. Joseph River	LMJ150-0005	AA03007	10/26/00	ST Joseph River	8.65	7.99	16.78	1110	6.8	57	2.9	89.80
13	2000 St. Joseph River	LMJ150-0006	AA01994	9/27/00	Pine Creek	10.71	8.12	12.49	781	7.7	239	3.7	100.8
	2000 St. Joseph River	LMJ150-0006	AA02338	10/4/00	Pine Creek	8.88	7.91	13.42	578	7.8	94	4.5	85.0
	2000 St. Joseph River	LMJ150-0006	AA02553	10/12/00	Pine Creek	6.05	8.13	9.68	1400	7	350.9	4.20	53.70
	2000 St. Joseph River	LMJ150-0006	AA02793	10/19/00	Pine Creek	7.47	8.15	13.04	1312	4	50.56	4.7	71.10
	2000 St. Joseph River	LMJ150-0006	AA03008	10/26/00	Pine Creek	10.31	7.93	15.79	1347	5.3	62	3.7	94.80
14	2000 St. Joseph River	LMJ150-0003	AA01995	9/27/00	ST Joseph River	10.01	8.11	14.44	610	7.4	322	3.3	98.2
	2000 St. Joseph River	LMJ150-0003	AA02339	10/4/00	ST Joseph River	8.96	8.07	15.99	546	2.3	88	3.0	90.9
	2000 St. Joseph River	LMJ150-0003	AA02554	10/12/00	ST Joseph River	6.56	8.19	11.02	1104	5	312.9	4.40	59.70
	2000 St. Joseph River	LMJ150-0003	AA02794	10/19/00	ST Joseph River	7.21	8.13	14.01	1070	2.2	43.85	4.0	70.20
	2000 St. Joseph River	LMJ150-0003	AA03009	10/26/00	ST Joseph River	8.65	7.91	16.58	1107	2.6	69	2.8	89.60
15	2000 St. Joseph River	LMJ150-0004	AA01996	9/27/00	ST Joseph River	10.47	8.14	15.19	611	13.9	182	3.7	104.6
	2000 St. Joseph River	LMJ150-0004	AA02340	10/4/00	ST Joseph River	9.39	8.1	16.09	548	10.3	102	2.6	96.2
	2000 St. Joseph River	LMJ150-0004	AA02555	10/12/00	ST Joseph River	6.95	8.3	11.65	1097	5.9	308.4	3.60	64.40
	2000 St. Joseph River	LMJ150-0004	AA02795	10/19/00	ST Joseph River	7.88	8.28	14.74	1058	3.3	41.83	3.5	78.00
	2000 St. Joseph River	LMJ150-0004	AA03010	10/26/00	ST Joseph River	9.2	8.02	16.85	1100	2.2	54.6	3.6	95.00
16	2000 St. Joseph River	LMJ140-0009	AA01997	9/27/00	Little Elkhart River	10.64	8.25	12.64	753	5.8	256	2	100.4
	2000 St. Joseph River	LMJ140-0009	AA02341	10/4/00	Little Elkhart River	8.80	8.1	14.32	628	3.4	156	3.3	86.2
	2000 St. Joseph River	LMJ140-0009	AA02556	10/12/00	Little Elkhart River	6.08	8.26	10.17	1361	4.6	341.9	2.90	54.00
	2000 St. Joseph River	LMJ140-0009	AA02796	10/19/00	Little Elkhart River	7.23	8.19	13.09	1278	3.4	41.4	4.6	69.10
	2000 St. Joseph River	LMJ140-0009	AA03011	10/26/00	Little Elkhart River	8.91	8.03	16.10	1301	19.2	62	2.5	91.50